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2019-yildan boshlab O'zbekiston Respublikasi Oliy attestatsiya komissiyasi Rayosati qarori bilan quyidagi fan sohalari bo'yicha OAKning dissertatsiyalar asosiy ilmiy natijalarini chop etish tavsiya etilgan ilmiy nashrlar ro'yxatiga kiritilgan.

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FEMTOSEKUNDLI LAZER IMPULSLARINI SHAKLLANTIRISH USULLARI: ZAMONAVIY YONDASHUVLAR

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Annotatsiya. *Maqolada femtosekundli lazer impulslarini shakllantirishning zamonaviy usullari tizimli tahlil qilingan. Impuls parametrlarini boshqarishning to‘ rt bosqichi — rezonator ichida generatsiya, chirplangan impulslarni kuchaytirish (CPA/OPCPA), chiziqli dispersiyani boshqarish va nochiziqli post-kompressiya — yagona texnologik zanjir sifatida ko‘ rib chiqilgan. Dasturlanadigan shakllantirish vositalari (4f-Furye sxemasi, suyuq kristalli fazoviy yorug‘ lik modulyatorlari, akustooptik dasturlanadigan dispersion filtrlar, deformatsiyalanuvchi ko‘ zgular) qiyosiy baholangan. Bo‘ shliqli tolalar va ko‘ p o‘ tishli kameralar yordamida bir necha tebranish davriga teng impulslarni yuqori o‘ rtacha quvvatda olish yo‘ nalishi yoritilgan. Adaptiv teskari aloqali optimallashtirish va neyron tarmoqlar asosidagi intellektual boshqaruv, fazoviy-vaqtinchalik shakllantirish hamda burst rejimlari zamonaviy tendensiyalar sifatida tahlil qilingan. Impulslarni diagnostika qilish usullari umumlashtirilib, sohaning asosiy cheklovlari va istiqbolli yo‘ nalishlari asoslab berilgan.*

Kalit so‘ zlar: *femtosekundli impuls, impulsni shakllantirish, chirplangan impulsni kuchaytirish, dispersiyani boshqarish, ko‘ p o‘ tishli kamera, fazoviy yorug‘ lik modulyatori, akustooptik dispersion filtr, adaptiv optimallashtirish, few-cycle impuls, tashuvchi-o‘ rov fazasi.*

МЕТОДЫ ФОРМИРОВАНИЯ ФЕМТОСЕКУНДНЫХ ЛАЗЕРНЫХ ИМПУЛЬСОВ: СОВРЕМЕННЫЕ ПОДХОДЫ

Аннотация. *В статье систематически проанализированы современные методы формирования фемтосекундных лазерных импульсов. Четыре этапа управления параметрами импульса — внутрирезонаторная генерация, усиление чирпированных импульсов (CPA/OPCPA), линейное управление дисперсией и нелинейная посткомпрессия — рассмотрены как единая технологическая цепочка. Сравнительно оценены программируемые средства формирования (4f-схема Фурье, жидкокристаллические пространственные модуляторы света, акустооптические программируемые дисперсионные фильтры, деформируемые зеркала). Освещено направление получения импульсов длительностью в несколько периодов колебаний при высокой средней мощности с помощью полых волокон и многопроходных ячеек. Проанализированы адаптивная оптимизация с обратной связью и интеллектуальное управление на основе нейронных сетей, пространственно-временное формирование и burst-режимы. Обобщены методы диагностики импульсов, обоснованы основные ограничения и перспективные направления развития области.*

Ключевые слова: *фемтосекундный импульс, формирование импульса, усиление чирпированных импульсов, управление дисперсией, многопроходная ячейка, пространственный модулятор света, акустооптический дисперсионный фильтр, адаптивная оптимизация, few-cycle импульс, фаза огибающей относительно несущей.*

METHODS OF FEMTOSECOND LASER PULSE SHAPING: MODERN APPROACHES

Abstract. *The paper systematically analyses modern methods for shaping femtosecond laser pulses. Four stages of pulse-parameter control — intracavity generation, chirped-pulse amplification (CPA/OPCPA), linear dispersion management and nonlinear post-compression — are treated as a single technological chain. Programmable shaping tools (the 4f Fourier arrangement, liquid-crystal*

spatial light modulators, acousto-optic programmable dispersive filters, deformable mirrors) are compared. The generation of few-cycle pulses at high average power using hollow-core fibres and multipass cells is discussed. Adaptive feedback optimisation and neural-network-based intelligent control, spatiotemporal shaping and burst regimes are analysed as current trends. Pulse characterisation methods are summarised, and the principal limitations and promising directions of the field are substantiated.

Keywords: *femtosecond pulse, pulse shaping, chirped pulse amplification, dispersion management, multipass cell, spatial light modulator, acousto-optic dispersive filter, adaptive optimisation, few-cycle pulse, carrier-envelope phase.*

KIRISH

Femtosekundli (1 fs = 10^{-15} s) davomiylikdagi lazer impulslari zamonaviy fizik eksperimentning eng kuchli vositalaridan biriga aylandi. Ularning ikki xususiyati noyob imkoniyatlarni belgilaydi: energiyaning o‘ ta qisqa vaqt oralig‘ ida jamlanishi tufayli nisbatan kichik energiyada ham 10^{13}–10^{20} Vt/sm² tartibidagi nurlanish zichligiga erishiladi; impuls davomiyligi esa atom va molekulalardagi tebranish (10–100 fs) hamda elektron (100 as – 1 fs) jarayonlari vaqt shkalasi bilan taqqoslanadi.

Biroq ko‘ pchilik masalada impulsning shunchaki qisqa bo‘ lishi yetarli emas — uning vaqt-chastota profilini maqsadli boshqarish talab etiladi. Spektral amplituda va, ayniqsa, spektral faza ustidan nazorat o‘ rnatish “impulsni shakllantirish” (pulse shaping) deb ataladigan mustaqil yo‘ nalishning predmetini tashkil etadi[1]. Masala quyidagicha qo‘ yiladi: kirishdagi maydonning spektral tasviriga $H(\omega) = A(\omega)\cdot\exp[i\varphi(\omega)]$ kompleks uzatish funksiyasi qo‘ llaniladi. Spektral fazani markaziy chastota atrofida qatorga yoyish orqali guruh kechikishi, guruh kechikishi dispersiyasi (GDD), uchinchi (TOD) va yuqori tartibli hadlar ajratiladi; aynan shu koeffitsientlarni boshqarish shakllantirishning fizik mazmunini tashkil etadi.

Sohaning rivojlanishida bir necha hal qiluvchi bosqich ajratiladi: 1985-yilda taklif etilgan chirplangan impulslarni kuchaytirish (CPA) usuli o‘ ta yuqori quvvatli impulslarni olish yo‘ lidagi asosiy to‘ siqni bartaraf etdi[2] va 2018-yilgi Nobel mukofoti bilan taqdirlandi; 1990-yillarda dasturlanadigan shaperlar paydo bo‘ ldi[3]; 2000-yillarda few-cycle impulslar amaliyotga kirdi; so‘ nggi o‘ n yillikda esa yuqori o‘ rtacha quvvatli tizimlar, ko‘ p o‘ tishli kameralar va sun’iy intellekt asosidagi adaptiv boshqaruv sohaning yangi qiyofasini shakllantirdi. **Tadqiqotning maqsadi** — femtosekundli impulslarni shakllantirish usullarini yagona tizimda tasniflash, ularning fizik asoslari va cheklovlarini qiyosiy tahlil qilish hamda 2020–2026 yillardagi asosiy tendensiyalarni aniqlashdan iborat.

ADABIYOTLAR TAHLILI VA TADQIQOT METODOLOGIYASI

Sohaning uslubiy poydevori klassik ishlarda qo‘ yilgan: difraksion panjaralar yordamida impulsni siqish g‘ oyasi E. Treacy tomonidan asoslangan[4], prizmali kompressorlarning manfiy dispersiyali sxemasi R. Fork, O. Martinez va J. Gordon ishlarida ishlab chiqilgan[5], chirplangan ko‘ p qatlamli qoplamalar kontseptsiyasi R. Szipőcs va F. Krausz guruhlari tomonidan taklif etilgan[6]. Bo‘ shliqli tola yordamida spektrni kengaytirish va keyingi siqish usuli M. Nisoli, S. De Silvestri va O. Svelto tomonidan amalga oshirilgan[7], teskari aloqali adaptiv boshqaruv esa A. Assion va G. Gerber guruhlari tomonidan kimyoviy reaksiyalarni boshqarishda eksperimental tasdiqlangan[8].

Tadqiqot metodologiyasi tizimli adabiyotlar sharhi prinsiplariga asoslanadi. Web of Science, Scopus, Optica Publishing Group, IEEE Xplore, Springer Nature va Nature Portfolio resurslari bo‘ yicha “femtosecond pulse shaping”, “pulse compression”, “multipass cell”, “chirped pulse amplification”, “spatiotemporal light shaping” kalit so‘ zlari bo‘ yicha 2015–2026 yillarga oid nashrlar tanlab olindi. Saralash mezonlari: manbaning retsenziyalanadigan xalqaro jurnalda chop etilganligi; usulning fizik mexanizmiga yoki texnik amalga oshirilishiga printsipial yangilik kiritilganligi; impuls davomiyligi, energiyasi va o‘ rtacha quvvati bo‘ yicha miqdoriy natijalarning keltirilganligi. Materiallar qiyosiy tahlil, tizimli-strukturaviy yondashuv va umumlashtirish usullari yordamida qayta ishlandi.

TAHLIL VA NATIJALAR

Shakllantirishning umumiy sxemasi va tasnifi

Zamonaviy femtosekundli tizimda impuls shakli bir joyda emas, ketma-ket to‘ rt bosqichda shakllanadi: rezonator ichida rejimlarni sinxronlash orqali dastlabki impulsni yaratish; kuchaytirish, bunda impuls avval cho‘ ziladi,

[1] Weiner A.M. Femtosecond pulse shaping using spatial light modulators // Review of Scientific Instruments. — 2000. — Vol. 71, No. 5. — P. 1929–1960.
[2] Strickland D., Mourou G. Compression of amplified chirped optical pulses // Optics Communications. — 1985. — Vol. 56, No. 3. — P. 219–221.
[3] Weiner A.M. Ultrafast optical pulse shaping: A tutorial review // Optics Communications. — 2011. — Vol. 284, No. 15. — P. 3669–3692.
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[7] Nisoli M., De Silvestri S., Svelto O. Generation of high energy 10 fs pulses by a new pulse compression technique // Applied Physics Letters. — 1996. — Vol. 68, No. 20. — P. 2793–2795.
[8] Assion A., Baumert T., Bergt M., Brixner T., Kiefer B., Seyfried V., Strehle M., Gerber G. Control of chemical reactions by feedback-optimized phase-shaped femtosecond laser pulses // Science. — 1998. — Vol. 282, No. 5390. — P. 919–922.

kuchaytiriladi va qayta siqiladi; chiziqli dispersiyani boshqarish; nochiziqli post-kompressiya. Ushbu bosqichlar ustiga ko‘ ndalang qatlam sifatida dasturlanadigan shakllantirish va adaptiv boshqaruv qo‘ shiladi. Fizik jihatdan barcha usullar ikki sinfga bo‘ linadi: chiziqli usullar (spektr o‘ zgarmaydi, faqat spektral faza va amplituda qayta taqsimlanadi) va nochiziqli usullar (yangi spektral komponentalar hosil bo‘ ladi). Chiziqli usullar impulsni chegaraviy qiymatdan qisqa qila olmaydi — buning yagona yo‘ li spektrni kengaytirishdir.

Rezonator ichida shakllantirish

Femtosekundli impulsning “tug‘ ilish joyi” — rejimlari sinxronlangan lazer rezonatori. Passiv sinxronlashning eng keng tarqalgan mexanizmi — Kerr linzasi asosidagi sinxronlash (KLM), bunda muhitning nochiziqli sindirish ko‘ rsatkichi hisobiga yuqori intensivlikdagi nurlanish uchun qo‘ shimcha fokuslanish yuzaga keladi va rezonator yo‘ qotishlari kamayadi. Ikkinchi yondashuv — yarimo‘ tkazgichli to‘ yinuvchi yutuvchi ko‘ zgular (SESAM), bu esa sinxronlashning o‘ z-o‘ zidan boshlanishini ta’minlaydi[9]. Tolali lazerlarda impuls dispersiya, nochiziqlik, kuchayish va yo‘ qotishlar muvozanatidan hosil bo‘ ladi; rezonator dispersiyasiga qarab soliton, cho‘ zilgan impuls, similariton va dissipativ soliton rejimlari ajratiladi. Yb-tolali tizimlarda 50–200 fs, Er-tolali tizimlarda 60–150 fs davomiylik odatiy; Ti:sapfir lazerlari esa 5–10 fs qiymatlarni bevosita rezonatordan olish imkonini beradi.

Kuchaytirish bosqichida shakllantirish: CPA va OPCPA

Energiyani oshirishdagi asosiy to‘ siq — kuchaytiruvchi muhitdagi optik buzilish va o‘ z-o‘ zidan fokuslanish. CPA usuli buni uch bosqichli sxema bilan hal etadi: impuls cho‘ zgich yordamida 10^3–10^5 marta uzaytiriladi, xavfsiz cho‘ qqi quvvatida kuchaytiriladi va kompressor yordamida qayta siqiladi. Usulning muhim cheklovi — kuchayish polosasining torayishi (gain narrowing): muhit spektrning markaziy qismini kuchliroq kuchaytiradi, natijada chiqishdagi impuls uzunroq bo‘ lib qoladi. Buni kompensatsiya qilish uchun spektral filtrlar va akustooptik dasturlanadigan dispersion filtrlar qo‘ llaniladi.

Muqobil yechim — optik parametrik chirplangan impulslarni kuchaytirish (OPCPA), bunda kuchayish nochiziqli kristalldagi parametrik o‘ zaro ta’sir hisobiga sodir bo‘ ladi; kuchayish polosasi juda keng, issiqlik yuklamasi esa minimal qoladi. Yupqa diskli Yb:YAG lazerlari bilan nasoslanadigan OPCPA tizimlari few-cycle impulslarda teravatt darajasidagi cho‘ qqi quvvatini namoyish etgan[10].

Chiziqli dispersiyani boshqarish

Panjarali kompressorlar katta manfiy GDD beradi va yuqori energiyali tizimlarda ajralmas, biroq hajmli va yo‘ qotishlari nisbatan katta. Prizmali kompressorlar ixcham va kam yo‘ qotishli, lekin dispersiya kattaligi cheklangan. Grism kombinatsiyasi GDD va TOD ni mustaqil sozlash imkonini beradi. Chirplangan ko‘ zgularda turli to‘ lqin uzunliklari qoplamaning turli chuqurligidan qaytadi va nazorat qilinadigan dispersiya hosil bo‘ ladi; ixchamligi, kam yo‘ qotishi va ultra keng polosasi tufayli ular few-cycle texnikasining asosiy elementiga aylandi. Qoldiq dispersiya tebranishlarini bartaraf etish uchun juftlangan ko‘ zgular va shishali xanjarlar tizimi qo‘ llaniladi.

1-jadval. Dispersiyani boshqarish elementlarining qiyosiy tavsifi

Element	GDD diapazoni	Yuqori tartibli hadlar	Samaradorlik	Asosiy qo‘ llanilishi
Panjarali kompressor	10^4–10^6 fs^2	Cheklangan	60–80 %	CPA, yuqori energiya
Prizmali kompressor	10^2–10^3 fs^2	Cheklangan	90–95 %	Rezonator ichida
Grism	Katta	GDD va TOD mustaqil	50–70 %	Tolali CPA
Chirplangan ko‘ zgu	−20…−250 fs^2 (diskret)	Loyihalash orqali	>99 %	Few-cycle texnika
Shishali xanjar	Uzluksiz, kichik	Yo‘ q	>99 %	Nozik sozlash
AOPDF (Dazzler)	Sozlanuvchi	To‘ liq dasturlanadi	10–40 %	CPA ichida korreksiya

Nochiziqli post-kompressiya

Impulsni chegaraviy qiymatdan qisqartirish uchun spektrni kengaytirish zarur. Asosiy mexanizm — o‘ z-o‘ zidan faza modulyatsiyasi (SPM): yuqori intensivlikdagi impuls muhitning sindirish ko‘ rsatkichini o‘ zgartiradi, o‘ z fazasini

[9] Keller U. Recent developments in compact ultrafast lasers // Nature. — 2003. — Vol. 424, No. 6950. — P. 831–838.

[10] Thin-disk laser-pumped OPCPA system delivering 4.4 TW few-cycle pulses // Optics Express. — 2020. — Vol. 28, No. 23. — P. 34574–34585.

modulyatsiya qiladi va yangi chastota komponentalari paydo bo‘ ladi; kengaygan spektr keyin chirplangan ko‘ zgular bilan siqiladi. Birinchi keng tarqalgan yechim — gaz bilan to‘ ldirilgan bo‘ shliqli tolalar (HCF), ular 5 fs dan qisqa impulslarni olish imkonini bergan[11], biroq kirish energiyasi bo‘ yicha tor ish oynasi va o‘ rtacha quvvat bo‘ yicha cheklovlarga ega.

So‘ nggi o‘ n yillikda ustunlikni ko‘ p o‘ tishli kameralar (multipass cell, MPC) egalladi. MPC — Errit tipidagi ikki sferik ko‘ zguli tizim bo‘ lib, impuls unda o‘ nlab marta aylanadi va har bir o‘ tishda nochiziqli fazaning kichik ulushini to‘ playdi. Nochiziqlikning ko‘ p o‘ tishlar bo‘ ylab taqsimlanishi tufayli fazoviy-spektral bir jinslilik saqlanadi va nur sifati deyarli o‘ zgarmaydi; shu tariqa yuqori o‘ rtacha quvvatda few-cycle impulslarni olish namoyish etilgan[12]. Uchinchi yondashuv — yupqa plastinkalar ketma-ketligi: o‘ ta sodda va arzon, biroq yuqori energiyalarda nurning fazoviy bir jinsliligini saqlash qiyinlashadi.

Dasturlanadigan shakllantirish vositalari

Impuls shaklini ixtiyoriy va qayta dasturlanadigan tarzda boshqarishning asosiy vositasi — 4f-Furye sxemasi: panjara spektrni fazoda yoyadi, linza spektral komponentalarni Furye tekisligiga fokuslaydi, u yerdagi modulyator har bir komponentaning amplitudasi va fazasini mustaqil o‘ zgartiradi, so‘ ng simmetrik ikkinchi yarim spektrni qayta yig‘ adi[13]. Suyuq kristalli modulyatorlar (LC-SLM) amplituda va fazani mustaqil boshqaradi, yuqori fazoviy ruxsatga ega, ammo sekin yangilanadi. Akustooptik modulyator asosidagi shaperlar impulsdan impulsga (kHz–MHz) qayta dasturlanadi. Akustooptik dasturlanadigan dispersion filtr (AOPDF, “Dazzler”) 4f-sxemani umuman talab qilmaydi: to‘ lqin uzunligiga bog‘ liq kechikish kollinear akustooptik o‘ zaro ta’sir hisobiga kristall ichida hosil qilinadi[14]; ixchamligi tufayli u yuqori quvvatli tizimlarda standart vositaga aylangan. Deformatsiyalanuvchi ko‘ zgular esa yutilish yo‘ qotishlari deyarli nolga teng bo‘ lgani uchun yuqori quvvatli nurlarda afzalroq. Muhim yangi yo‘ nalish — shakllantirish elementlarini integral fotonika platformasiga (kremniy nitridi, lityum niobati) ko‘ chirish.

2-jadval. Dasturlanadigan shakllantirish vositalarining qiyosiy tavsifi

Vosita	Boshqariladigan parametr	Yangilanish tezligi	Kanallar soni	Asosiy cheklovi
LC-SLM	Amplituda va faza	10–100 Hz	640–1920	Sekin, quvvat chegarasi
AOM (4f ichida)	Amplituda va faza	kHz–MHz	~10^3	Samaradorlik past
AOPDF (Dazzler)	Amplituda, faza, kechikish	kHz	Uzluksiz	Uzatish koeffitsienti past
Deformatsiyalanuvchi ko‘ zgu	Faqat faza	~kHz	19–100	Faqat silliq profillar
Integral fotonik shaper	Faza, spektral filtr	MHz–GHz	O‘ nlab	Quvvat va polosa chegarasi

Adaptiv boshqaruv va sun’iy intellekt

Ko‘ p hollarda kerakli impuls shaklini oldindan analitik hisoblash mumkin emas: tizimdagi dispersiya to‘ liq ma’lum bo‘ lmaydi, o‘ rganilayotgan jarayonning javob funksiyasi esa murakkab. Bunday sharoitda teskari aloqali adaptiv optimallashtirish qo‘ llaniladi: shaper parametrlari o‘ zgartiriladi, eksperimental signal o‘ lchanadi va algoritm keyingi qadamni belgilaydi. An’anaviy ravishda genetik va evolyutsion algoritmlar ishlatilgan[15]. So‘ nggi besh yilda bu yondashuv mashinaviy o‘ qitish vositalari bilan boyitildi: Bayes optimallashtirish qimmat eksperimental o‘ lchovlar sonini bir necha barobar kamaytiradi, chuqur neyron tarmoqlar esa lazer tizimining “raqamli egizagi”ni tuzib, shaper parametrlaridan chiqish impulsiga o‘ tish funksiyasini bashorat qiladi. Tolali lazerlarda sun’iy intellekt rejimlarni sinxronlashni avtomatik topish va impuls barqarorligini ushlab turish uchun qo‘ llanilmoqda[16].

[11] Nisoli M., De Silvestri S., Svelto O. Generation of high energy 10 fs pulses by a new pulse compression technique // Applied Physics Letters. — 1996. — Vol. 68, No. 20. — P. 2793–2795.

[12] Multipass cell for high-power few-cycle compression // Optics Letters. — 2021. — Vol. 46, No. 11. — P. 2678–2681.

[13] Weiner A.M. Ultrafast optical pulse shaping: A tutorial review // Optics Communications. — 2011. — Vol. 284, No. 15. — P. 3669–3692.

[14] Verluise F., Laude V., Cheng Z., Spielmann Ch., Tournois P. Amplitude and phase control of ultrashort pulses by use of an acousto-optic programmable dispersive filter // Optics Letters. — 2000. — Vol. 25, No. 8. — P. 575–577.

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[16] Fiber laser development enabled by machine learning: review and prospect // PhotoniX. — 2022. — Vol. 3. — Art. 16. — DOI: 10.1186/s43074-022-00055-3.

Fazoviy-vaqtinchalik shakllantirish va burst rejimlari

Klassik shakllantirish faqat vaqt-chastota o‘ lchovida ishlaydi. So‘ nggi yillardagi eng yorqin tendensiyalardan biri — vaqt va fazoni birgalikda, ya’ni to‘ rt o‘ lchovli E(x, y, z, t) maydon sifatida boshqarish. Fazoviy modulyatorlarning shaper bilan birlashtirilishi materiallarni ishlashda nur profilini dinamik o‘ zgartirish imkonini bermoqda[17]. Ushbu yo‘ nalishda fazoviy-vaqtinchalik optik girdoblar (STOV), “uchuvchi fokus” va “yorug‘ lik prujinasi” kabi yangi obyektlar shakllantirildi; yagona ultratez impulsni ixtiyoriy fazoviy-vaqtinchalik tasvirga aylantirish imkoniyati namoyish etilgan[18].

Amaliy texnologiyalarda ko‘ pincha bitta impulsning shakli emas, balki impulslar ketma-ketligining vaqt tuzilishi hal qiluvchi ahamiyatga ega. “Ablatsiyaviy sovitish” kontseptsiyasiga ko‘ ra, impulslar orasidagi interval issiqlikning diffuziya vaqtidan qisqa bo‘ lsa, materialdan modda olib chiqish samaradorligi keskin ortadi[19]. Shu asosda GHz-burst rejimi, keyinchalik esa MHz-burstlar ichiga joylashtirilgan GHz-burstlardan iborat “BiBurst” sxemasi shakllantirilib, ablatsiya samaradorligining bir necha barobar ortishi ko‘ rsatildi.

Shakllangan impulslarni diagnostika qilish

Davomiyligi femtosekund tartibidagi signal uchun undan qisqaroq mustaqil etalon mavjud emas, shu bois impuls o‘ zini-o‘ zi o‘ lchash prinsipiga tayaniladi. Intensivlik avtokorrelyatsiyasi faqat taxminiy davomiylikni beradi. Chastota bo‘ yicha ruxsatlangan optik kirishlash (FROG) spektrogramma qayd etib, iterativ algoritm yordamida amplituda va fazani tiklaydi[20]; spektral faza interferometriyasi (SPIDER) fazani iteratsiyasiz tiklaydi. Few-cycle diapazonida d-skan usuli keng tarqaldi: shishali xanjar surilganda kiritilayotgan dispersiya o‘ zgaradi va ikkinchi garmonika spektrining shu o‘ zgarishga bog‘ liq xaritasi qayd etiladi, bu esa siqish va o‘ lchashni bir vaqtda amalga oshirish imkonini beradi[21]. Few-cycle impulslar uchun tashuvchi to‘ lqin va o‘ rov o‘ rtasidagi faza (CEP) mustaqil fizik parametrga aylanadi va uni f–2f interferometriyasi hamda teskari aloqali halqalar yordamida barqarorlashtirish talab etiladi.

Asosiy muammolar va istiqbollar

Keng polosali tizimlarda to‘ rtinchi va undan yuqori tartibli dispersiya hadlarini to‘ liq kompensatsiya qilish qiyin; yechim — maxsus loyihalangan ko‘ zgu juftliklari va AOPDF bilan gibrid sxemalar. Dasturlanadigan shaperlar yuqori o‘ rtacha quvvatda issiqlik yuklamasi va shikastlanish chegarasi bilan cheklanadi, shu bois butunlay aks ettiruvchi sxemalar istiqbolli hisoblanadi. Impuls jabhasining qiyshayishi, fazoviy chirp va burchak dispersiyasi kabi fazoviy-vaqtinchalik bog‘ lanishlar (STC) fokusdagi haqiqiy intensivlikni sezilarli pasaytiradi va ko‘ p o‘ lchovli diagnostikani talab qiladi. Nihoyat, impuls parametrlarini o‘ lchash va e’lon qilishning yagona metrologik bazasi hali to‘ liq shakllanmagan, bu esa turli laboratoriyalar natijalarini taqqoslashni qiyinlashtiradi.

XULOSA VA TAKLIFLAR

Birinchidan, femtosekundli impulsni shakllantirishni alohida qurilma emas, balki generatsiya, kuchaytirish, dispersiyani boshqarish va nochiziqli post-kompressiyani qamrab oluvchi yagona texnologik zanjir sifatida ko‘ rish metodologik jihatdan to‘ g‘ ri yondashuv hisoblanadi; har bir bosqichning hissasi spektral fazaning tegishli tartibli hadlari orqali miqdoriy ifodalanadi.

Ikkinchidan, chiziqli usullar impulsni chegaraviy qiymatdan qisqartira olmaydi; bu chegarani yengishning yagona yo‘ li — nochiziqli spektral kengaytirish. Ushbu sohada ko‘ p o‘ tishli kameralar bo‘ shliqli tolalarni siqib chiqarmoqda, chunki ular yuqori uzatish koeffitsienti, yaxshi nur sifati va yuqori o‘ rtacha quvvatga chidamlilikni birlashtiradi.

Uchinchidan, dasturlanadigan vositalar orasida vazifalar taqsimoti aniq shakllangan: LC-SLM eng moslashuvchan laboratoriya vositasi, AOPDF esa kuchaytirish zanjiriga integratsiya qilinadigan sanoat standarti sifatida qaror topgan.

To‘ rtinchidan, sohaning eng kuchli zamonaviy tendensiyasi — sun’iy intellektning shakllantirish jarayoniga kirib kelishi hamda shakllantirish predmetining vaqt o‘ lchovidan to‘ rt o‘ lchovli fazoviy-vaqtinchalik maydonga kengayishi.

Takliflar: femtosekundli tizimlarni loyihalashda cho‘ zgich, kuchaytirgich, kompressor va post-kompressor dispersiyasini yagona optimallashtirish masalasi sifatida birgalikda modellashtirish tavsiya etiladi; impuls diagnostikasini shakllantirish konturiga real vaqt teskari aloqasi sifatida kiritish tizim barqarorligini oshirishning eng samarali yo‘ li hisoblanadi; O‘ zbekiston sharoitida ushbu texnologiyalarni joriy etishning eng istiqbolli yo‘ nalishlari — mikroelektronika va quyosh energetikasi materiallariga pretsizion ishlov berish, ultratez spektroskopiya asosidagi diagnostika hamda optik telekommunikatsiya komponentlarini sinovdan o‘ tkazish; mutaxassislar tayyorlashda nochiziqli optika, lazer texnikasi va hisoblash optimallashtirish usullarini birlashtirgan integrallashgan o‘ quv modullarini joriy etish maqsadga muvofiq.

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CHEKSIZ VA CHEKLI POTENSIAL TO‘ SIQLARNING INAS/GAINSB POG‘ ONALI KVANT O‘ RADAGI ELEKTRON ENERGIYA SPEKTRIGA TA’SIRI

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Annotatsiya: *Ushbu ishda InAs/GaInSb pog‘ onali kvant o‘ rada elektron energiya sathlarining geometrik parametrlar va potensial to‘ siq turiga bog‘ liqligi nazariy jihatdan o‘ rganildi. Hisoblashlar effektiv massa yaqinlashuvi asosida bir o‘ lchamli statsionar Shredinger tenglamasini sonli yechish orqali amalga oshirildi. Cheksiz potensial to‘ siqli InAs/GaInSb modeli hamda chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb geterotuzilmasi uchun energiya sathlari hisoblanib, olingan natijalar taqqoslandi. Natijalar InAs qatlami kengayishi bilan energiya sathlari kamayishini hamda chekli potensial to‘ siqli holatda elektron to‘ lqin funksiyasining AlSb to‘ siqlariga kirib borishi tufayli energiya sathlari cheksiz potensial to‘ siqli holatdagiga nisbatan pastroq joylashishini ko‘ rsatdi.*

Kalit so‘ zlar: *elektron energiya sathlari, chekli potensial, cheksiz potensial, effektiv massa, Shredinger tenglamasi.*

ВЛИЯНИЕ БЕСКОНЕЧНЫХ И КОНЕЧНЫХ ПОТЕНЦИАЛЬНЫХ БАРЬЕРОВ НА ЭНЕРГЕТИЧЕСКИЙ СПЕКТР ЭЛЕКТРОНА В СТУПЕНЧАТОЙ КВАНТОВОЙ ЯМЕ INAS/GAINSB

Аннотация: *В данной работе теоретически исследована зависимость энергетических уровней электрона в ступенчатой квантовой яме InAs/GaInSb от геометрических параметров и типа потенциального барьера. Расчёты выполнены путём численного решения одномерного стационарного уравнения Шрёдингера в рамках приближения эффективной массы. Были рассчитаны энергетические уровни для модели InAs/GaInSb с бесконечным потенциальным барьером и гетероструктуры AlSb/InAs/GaInSb/AlSb с конечным потенциальным барьером, после чего полученные результаты были сопоставлены. Результаты показали, что с увеличением ширины слоя InAs энергетические уровни уменьшаются, а в случае конечного потенциального барьера вследствие проникновения волновой функции электрона в барьерные слои AlSb энергетические уровни располагаются ниже по сравнению со случаем бесконечного потенциального барьера.*

Ключевые слова: *энергетические уровни электрона, конечный потенциальный барьер, бесконечный потенциальный барьер, эффективная масса, уравнение Шрёдингера.*

EFFECT OF INFINITE AND FINITE POTENTIAL BARRIERS ON THE ELECTRON ENERGY SPECTRUM IN AN INAS/GAINSB STEPPED QUANTUM WELL

Abstract: *In this work, the dependence of the electron energy levels in an InAs/GaInSb stepped quantum well on the geometric parameters and the type of potential barrier is theoretically investigated. The calculations were performed by numerically solving the one-dimensional stationary Schrödinger equation within the framework of the effective mass approximation. The electron energy levels were calculated for the InAs/GaInSb model with an infinite potential barrier and for the AlSb/InAs/GaInSb/AlSb heterostructure with a finite potential barrier, and the obtained results were compared. The results show that the electron energy levels decrease with increasing InAs layer width, while in the finite potential barrier case the penetration of the electron wave function into the AlSb barrier layers causes the energy levels to be located at lower values than those in the infinite potential barrier case.*

Keywords: *electron energy levels, finite potential barrier, infinite potential barrier, effective mass, Schrödinger equation.*

Kirish

So‘nggi yillarda InAs, GaInSb va AlSb materiallari asosidagi II-tip kvant o‘ralar o‘rta infraqizil lazerlar, fotodetektorlar va past o‘lchamli elektron qurilmalar uchun istiqbolli strukturalar sifatida faol o‘rganilmoqda. Chen va hammualliflar GaInSb/InAs/AlSb kvant o‘ralarda interfeys turining fotolyuminessensiya energiyasi, tashuvchilar lokalizatsiyasi va to‘lqin funksiyaning fazoviy o‘lchamiga ta’sirini tajribaviy tahlil qilganlar [1]. Motyka va hammualliflar AlSb bilan chegaralangan W-shaklli kvant o‘ralarda qatlam qalinligi, tarkib va deformatsiyaning energetik hamda optik xossalarga ta’sirini ko‘rsatganlar [2]. Ryczko va Sęk esa shu turdagi o‘ralarda energetik holatlar va optik kuchayishni hisoblab, qatlam parametrlarini o‘zgartirish orqali optik javobni boshqarish mumkinligini aniqlaganlar [3]. InAs/InGaSb kvant o‘ralarda deformatsiya va qotishma tarkibining energetik zonalarga ta’siri Akiho va hammualliflar tomonidan o‘rganilgan [4]. Du va hammualliflar InAs/GaSb kvant o‘ralarda elektron va kovaklarning turli qatlamlarda fazoviy ajralishi hamda energetik tirqishning hosil bo‘lishini ko‘rsatganlar [5]. Irie va hammualliflar esa InAs qatlam qalinligi hamda tashqi elektr maydon orqali InAs/InGaSb kompozit kvant o‘ralarning energetik tirqishini boshqarish mumkinligini aniqlaganlar [6]. Avogadri va hammualliflar deformatsiyalangan uch qatlamli InAs/GaInSb kvant o‘ralarda katta invers energetik tirqish hosil bo‘lishini qayd etganlar [7]. Qu va hammualliflar InAs/GaSb qo‘sh kvant o‘ralarida elektr va magnit maydonlar yordamida trivial va topologik fazalar orasidagi o‘tishni boshqarish mumkinligini ko‘rsatganlar [8]. Yu va hammualliflar InAs/InGaSb/InAs W-kvant o‘ra faol sohasida deformatsiya taqsimotini tajribaviy aniqlaganlar [9]. Zamonaviy interband kaskad lazerlarda InAs/GaInSb faol qatlamlari va AlSb to‘siqlarining qo‘llanilishi Tournié va Petrović hammualliflikladagi ishlarda ham ko‘rsatilgan [10,11]. Keltirilgan ishlarda asosan interfeyslarning xususiyatlari, deformatsiya, optik o‘tishlar, energetik tirqish, lazer kuchayishi va ko‘p qatlamli real qurilmalar o‘rganilgan.

Mazkur ishda InAs/GaInSb geterotuzilmasi tanlanishiga bir necha fizik omillar sabab bo‘ladi. Avvalo, InAs va GaInSb materiallari o‘rtasida hosil bo‘ladigan o‘tkazuvchanlik zonasi uzilishi elektronlarni InAs qatlamida samarali lokalizatsiyalash imkonini beradi. Shu bilan birga, GaInSb qotishmasining tarkibini o‘zgartirish orqali potensial pog‘ona balandligi va zonaviy parametrlarni ma’lum chegaralarda boshqarish mumkin. Bu esa elektron energiya sathlarini geometrik parametrlar bilan bir qatorda material tarkibi orqali ham nazorat qilish imkoniyatini yaratadi.

Chekli potensial to‘siqli modelda tashqi qatlam sifatida AlSb materiali tanlandi. Bunga sabab AlSb ning keng taqiqlangan zona kengligiga ega bo‘lib, InAs va GaInSb qatlamlariga nisbatan yuqori potensial to‘siq hosil qilishi hamda amaliy interband kaskad lazerlar va II-tip kvant o‘ra geterotuzilmalarida keng qo‘llanilishidir. Shu sababli AlSb/InAs/GaInSb/AlSb strukturasi real yarimo‘tkazgich geterotuzilmalarini modellashtirish uchun qulay model hisoblanadi.

Bu ishda esa bir xil ichki kenglik L=a+b=20 nm bo‘lgan cheksiz potensial to‘siqli InAs/GaInSb o‘ra va chekli potensial to‘siqli AlSb/InAs/GaInSb/AlSb geterotuzilmaning diskret elektron energiya sathlari aniqlanadi hamda taqqoslanadi.

Nazariy model

Elektron energiya sathlarini hisoblashda effektiv massa yaqinlashuvi (Effective Mass Approximation, EMA) qo‘llanildi. Ushbu yaqinlashuvda kristall panjaraning murakkab davriy potensiali o‘rniga elektronning har bir qatlamdagi harakati shu materialga mos keluvchi effektiv massa orqali tavsiflanadi. Geterotuzilmada material almashishi natijasida elektronning effektiv massasi va potensial energiyasi koordinataning funksiyasi sifatida qaraladi [12,13].

Elektronning kvant holatlari bir o‘lchamli statsionar Shredinger tenglamasi yordamida aniqlanadi:

$$-\frac{\hbar^2}{2}\frac{d}{dx}\left(\frac{1}{m(x)}\frac{d\psi(x)}{dx}\right)+V(x)\psi(x)=E\psi(x)$$

bu yerda $m(x)$ −elektronning koordinataga bog‘liq effektiv massasi, $V(x)$ −potensial energiya, E — elektron energiyasi, $\psi(x)$ −elektron to‘lqin funksiyasi.

Hisoblashlarda elektronning effektiv massasi har bir qatlam ichida o‘zgarmas deb qabul qilinib, faqat geterochegaralarda sakrashli ravishda o‘zgaradi. Shu sababli har bir sohada Shredinger tenglamasining analitik yechimlari yozilib, qatlamlar chegaralarida ular o‘zaro bog‘landi.

Geterotuzilma chegaralarida BenDaniel–Duke chegaraviy shartlari qo‘llanildi. Ushbu shartlarga ko‘ra to‘lqin funksiyasi hamda uning effektiv massa bilan normallashgan hosilasi uzluksiz bo‘lishi kerak:

$$\psi_i(x)=\psi_{i+1}(x)$$
$$\frac{1}{m_i^*}\frac{d\psi_i(x)}{dx}=\frac{1}{m_{i+1}^*}\frac{d\psi_{i+1}(x)}{dx}$$

Mazkur chegaraviy shartlarni barcha interfeyslarda qo‘llash natijasida amplitudalar uchun algebraik tenglamalar sistemasi hosil qilinadi. Noldan farqli yechim mavjud bo‘lishi uchun ushbu sistemaning koeffitsiyentlar matritsasi determinanti nolga teng bo‘lishi lozim:

$$\det\big(\mathbf{M}(E)\big) = 0.$$

Determinant energiyaning transsendent funksiyasi bo‘ lib, uning ildizlari ruxsat etilgan diskret elektron energiya sathlarini beradi. Mazkur tenglama sonli usullar yordamida yechildi.

Ikki tomonlama cheksiz potensial to‘ siqli InAs/GaInSb geterotuzilma modeli. Cheksiz potensial to‘ siqli modelda InAs/GaInSb pog‘ onali kvant o‘ ra qaraladi. Ichki strukturaning umumiy kengligi $L = a + b$ doimiy deb olinadi. Bu yerda a −InAs qatlami, b esa GaInSb pog‘ ona qatlami kengligidir (1-rasm).

Potensial energiya quyidagi ko‘ rinishda aniqlanadi:

$$V(x) = \begin{cases} \infty, & x \le 0, \\ 0, & 0 < x < a \\ V_1, & a < x < L \\ \infty, & x \ge L. \end{cases}$$

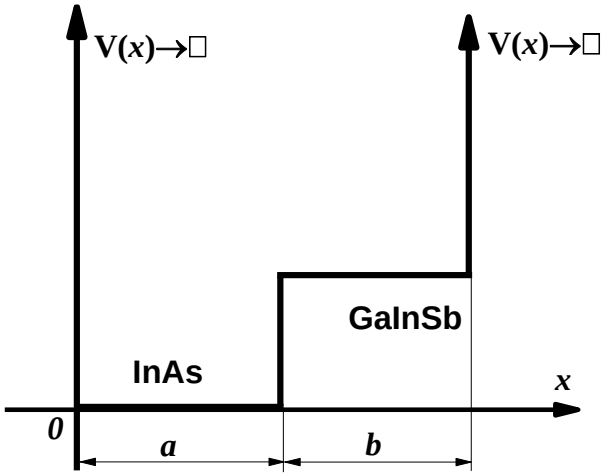
Effektiv massa faqat geterotuzilma ichida aniqlanadi:

$$m(x) = \begin{cases} m_1, & 0 < x < a \\ m_2, & a < x < L \end{cases}$$

Cheksiz potensial mavjudligi sababli elektron to‘ lqin funksiyasi tashqi sohalarda nolga teng bo‘ lib, chegaralarda:

$$\psi(0) = 0, \qquad \psi(L) = 0.$$

Dirixle chegaraviy shartlari bajariladi.



1-rasm. Cheksiz potensial to‘ siqli InAs/GaInSb pog‘ onali kvant o‘ raning potensial profili.

Ikki tomonlama chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb geterotuzilma modeli. Chekli potensial to‘ siqli modelda InAs/GaInSb pog‘ onali kvant o‘ ra ikki tomondan AlSb to‘ siqlari bilan chegaralangan deb qaraladi (2-rasm). Bunda potensial energiya

$$V(x) = \begin{cases} V_2, & x < 0, \\ 0, & 0 < x < a, \\ V_1, & a < x < L, \\ V_2, & x > L. \end{cases}$$

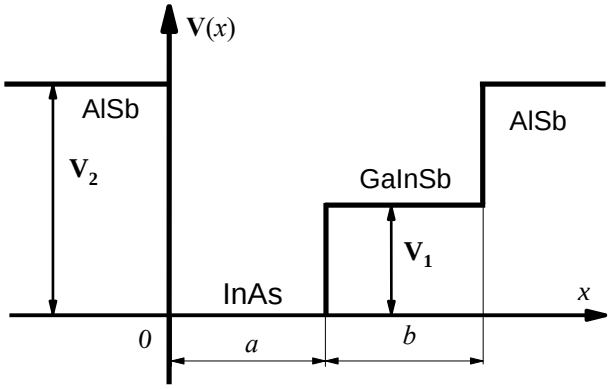
ko‘ rinishida yoziladi.

Effektiv massa esa

$$m(x) = \begin{cases} m_3, & x < 0, \\ m_1, & 0 < x < a \\ m_2, & a < x < L \\ m_3, & x > L. \end{cases}$$

ko‘ rinishda aniqlanadi.

Chekli potensial to‘ siqli holatda elektronning to‘ lqin funksiyasi tashqi AlSb qatlamlariga eksponensial ravishda kirib boradi. Natijada elektronning effektiv lokalizatsiya sohasi ortadi, kvant cheklanish kuchsizlanadi va diskret energiya sathlari cheksiz potensial to‘ siqli holatdagiga nisbatan pastroq qiymatlarda joylashadi.



2-rasm. Chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb strukturasining potensial profili.

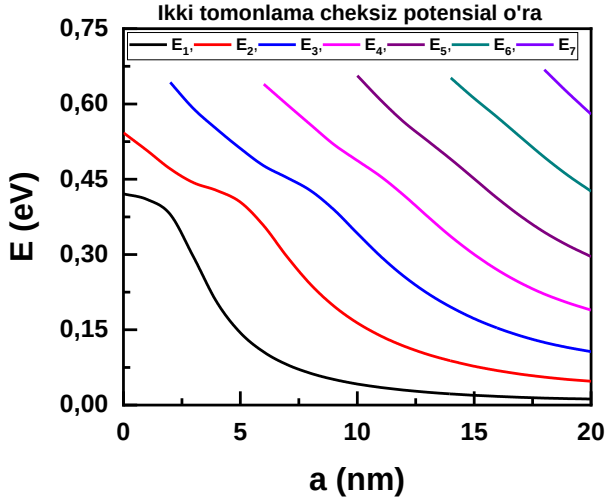
Natijalar va muhokamalar

Ushbu bo‘ limda InAs/GaInSb pog‘ onali kvant o‘ rada elektron energiya sathlarining geometrik parametrlar va potensial to‘ siq turiga bog‘ liqligi batafsil tahlil qilinadi. Hisoblashlar effektiv massa yaqinlashuvi asosida hosil qilingan transsendent tenglamani sonli yechish orqali amalga oshirildi. Ichki strukturaning umumiy kengligi $L = a + b = 20\,nm$ doimiy saqlanib, InAs qatlami kengligi a o‘ zgartirilganda GaInSb pog‘ ona kengligi $b = 20 - a$ shart orqali aniqlandi. Avval cheksiz potensial to‘ siqli InAs/GaInSb modeli, so‘ ngra chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb modeli uchun energiya sathlari hisoblandi. Olingan natijalar asosida kvant cheklanish darajasi, to‘ lqin funksiyasining potensial to‘ siqlarga kirib borishi hamda ushbu omillarning elektron energiya spektriga ta’siri fizik jihatdan izohlandi.

Hisoblashlarda electron effektiv massalarini $m_1 = 0.07948m_0$, $m_2 = 0.02312m_0$, $m_3 = 0.035m_0$ (m_0 — erkin elektron massasi) qiymatlarda potensial energiyalarni esa $V_1 = 0.38\,eV$, $V_2 = 0.558\,eV$ qiymatlarda tanlab olindi[7,12,13].

3-rasmda cheksiz potensial to‘ siqli InAs/GaInSb pog‘ onali kvant o‘ rada elektron energiya sathlarining InAs qatlami kengligi a ga bog‘ liqligi tasvirlangan. Hisoblashlarda ichki strukturaning umumiy kengligi $L = a + b = 20\,nm$ doimiy saqlanib, InAs qatlami kengligi ortishi bilan GaInSb pog‘ ona kengligi mos ravishda kamaytirildi. Grafikdan ko‘ rinadiki, barcha energiya sathlari a ning ortishi bilan monoton ravishda kamayadi. Buning asosiy sababi InAs qatlami kengayishi natijasida elektronning harakat sohasi ortishi va kvant cheklanishining susayishidir. Natijada elektronning kinetik energiyasi kamayib, diskret energiya sathlari pastroq qiymatlarga siljiydi. Shuningdek, quyi energiya sathlari (E_1, E_2 va E_3) kenglik o‘ zgarishiga yuqori sathlarga nisbatan sezilarli darajada kuchliroq ta’sirlanishi kuzatiladi. InAs qatlami tor bo‘ lganda faqat bir necha bog‘ langan holatlar mavjud bo‘ lsa, uning kengligi ortishi bilan kvant o‘ rada qo‘ shimcha bog‘ langan energiya sathlari hosil bo‘ ladi. Bunda qo‘ shni energiya sathlari orasidagi masofa ham asta-sekin kamayib boradi, bu esa kvant cheklanish effektining zaiflashayotganligini ko‘ rsatadi.

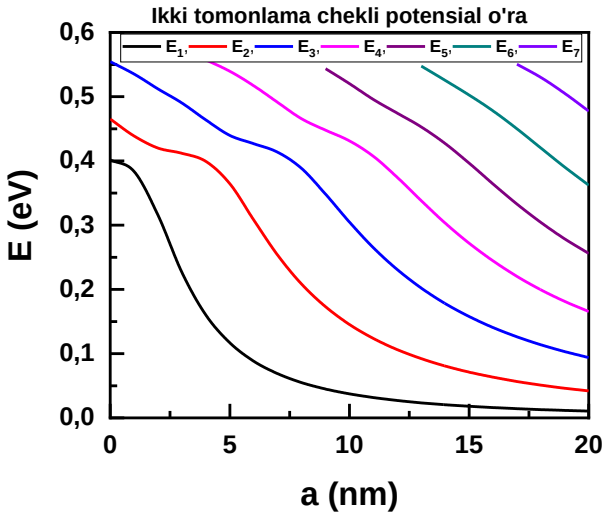
Natijalar InAs qatlami kengligini o‘ zgartirish orqali pog‘ onali kvant o‘ raning elektron energiya spektrini samarali boshqarish mumkinligini ko‘ rsatadi.



3-rasm. Cheksiz potensial to‘ siqli InAs/GaInSb pog‘ onali kvant o‘ rasida elektron energiya sathlarining a kenglikka bog‘ liqligi.

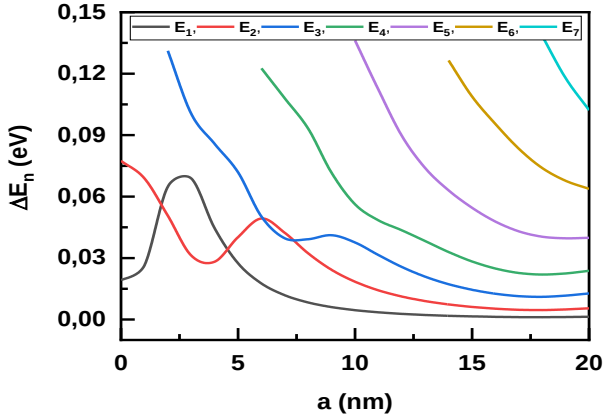
4-rasmda chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb geterotuzilmada elektron energiya sathlarining InAs qatlami kengligi a ga bog‘ liqligi tasvirlangan. Hisoblashlarda ichki strukturaning umumiy kengligi $L = a + b = 20\,nm$

doimiy saqlanib, InAs qatlami kengligi ortishi bilan GaInSb pog‘ ona kengligi mos ravishda kamaytirildi. Grafikdan ko‘ rinadiki, InAs qatlami kengayishi bilan barcha energiya sathlari monoton ravishda pasayadi. Bu holat elektronning fazoviy lokalizatsiya sohasi kengayishi natijasida kvant cheklanishining susayishi bilan izohlanadi. Chekli potensial to‘ siqli holatda elektron to‘ lqin funksiyasi AlSb to‘ siq qatlamlariga eksponensial ravishda kirib boradi. Natijada elektronning effektiv lokalizatsiya sohasi geometrik o‘ ra kengligidan kattaroq bo‘ ladi. Shu sababli kvant cheklanish energiyasi kamayadi va barcha diskret energiya sathlari cheksiz potensial to‘ siqli holatdagiga nisbatan pastroq qiymatlarda joylashadi. Shuningdek, quyi energiya sathlari (E_1, E_2 va E_3) InAs qatlami kengligining o‘ zgarishiga yuqori sathlarga qaraganda sezilarliroq ta’sirlanadi. InAs qatlami kengaygan sari yangi bog‘ langan holatlar vujudga keladi hamda qo‘ shni energiya sathlari orasidagi masofa asta-sekin kamayadi. Bu natijalar chekli potensial to‘ siq mavjud bo‘ lganda elektron energiya spektriga to‘ lqin funksiyasining to‘ siq qatlamlariga kirib borishi muhim ta’sir ko‘ rsatishini tasdiqlaydi.



4-rasm. Chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb strukturada elektron energiya sathlarining a kenglikka bog‘ liqligi.

5-rasmda cheksiz va chekli potensial to‘ siqli modellar uchun hisoblangan elektron energiya sathlari orasidagi farq $\Delta E_n = E_n^{\infty} - E_n^{chekli}$ ning InAs qatlami kengligi a ga bog‘ liqligi keltirilgan. Grafikdan ko‘ rinadiki, barcha energiya sathlari uchun ΔE_n musbat qiymatlarga ega bo‘ lib, bu cheksiz potensial to‘ siqli modelda energiya sathlari doimo chekli potensial to‘ siqli holatdagiga nisbatan yuqoriroq joylashishini tasdiqlaydi. Shuningdek, InAs qatlami tor bo‘ lgan holatda energiya farqi eng katta qiymatlarga ega bo‘ ladi. Bunga sabab tor kvant o‘ ralarda elektronning to‘ lqin funksiyasi tashqi AlSb to‘ siqlariga nisbatan sezilarli darajada kirib borishi natijasida kvant cheklanish energiyasining kamayishidir. InAs qatlami kengayishi bilan elektronning harakat sohasi ortadi va to‘ lqin funksiyasining to‘ siq qatlamlariga kirib borishining nisbiy ta’siri kamayadi. Natijada ΔE_n asta-sekin kamayib, cheksiz va chekli potensial to‘ siqli modellar bo‘ yicha olingan energiya sathlari bir-biriga yaqinlashadi. Quyi energiya sathlari uchun bu yaqinlashish yuqori sathlarga qaraganda tezroq sodir bo‘ ladi. Demak, potensial to‘ siqning cheklanganligini hisobga olish ayniqsa tor kvant o‘ ralarda muhim ahamiyatga ega bo‘ lib, o‘ ra kengligi ortishi bilan ushbu omilning energiya spektriga ta’siri bosqichma-bosqich kamayadi.

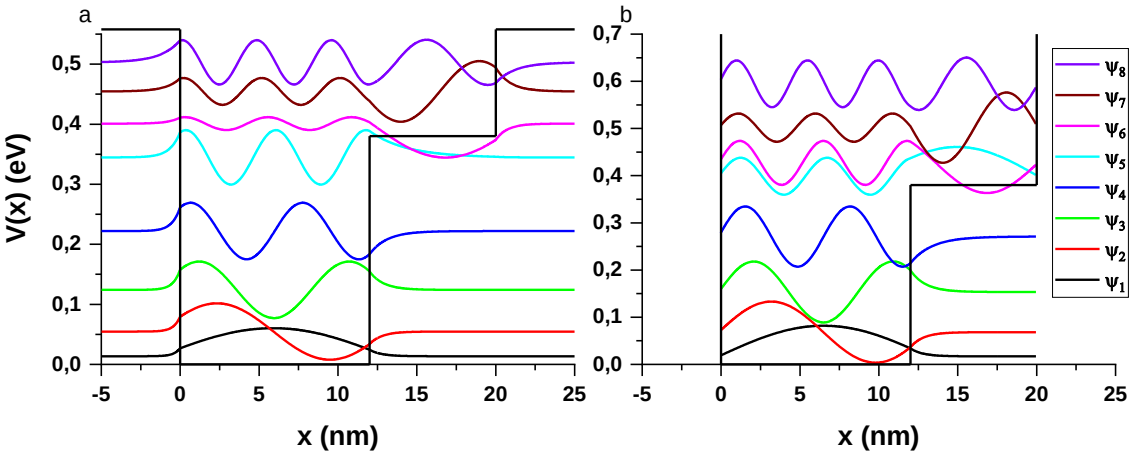


5-rasm. Cheksiz va chekli potensial to‘ siqli holatlarda ayrim energiya sathlarining taqqoslanishi.

6-rasmda chekli (a) va cheksiz (b) potensial to‘ siqli InAs/GaInSb pog‘ onali kvant o‘ ralar uchun dastlabki sakkizta elektron to‘ lqin funksiyalarining fazoviy taqsimoti potensial profil bilan birgalikda tasvirlangan. To‘ lqin funksiyalari mos

energiya sathlariga vertikal siljitilgan holda keltirilgan. Grafikdan ko‘rinadiki, energiya sathi ortishi bilan to‘lqin funksiyalaridagi tugunlar soni ham ortib boradi, bu esa kvant mexanikasining bog‘langan holatlar uchun xos qonuniyatiga mos keladi. Chekli potensial to‘siqli holatda (a) elektron to‘lqin funksiyalari tashqi potensial to‘siq qatlamlariga eksponensial ravishda kirib boradi. Natijada elektronning effektiv lokalizatsiya sohasi geometrik o‘ra kengligidan kattaroq bo‘ladi, kvant cheklanishi susayadi va elektron energiya sathlari nisbatan pastroq qiymatlarda joylashadi. Ayniqsa, yuqori energiya sathlariga mos to‘lqin funksiyalarida to‘siq qatlamlariga kirib borish yanada yaqqol kuzatiladi. Cheksiz potensial to‘siqli holatda (b) esa elektron to‘lqin funksiyalari kvant o‘ra chegaralarida qat’iy ravishda nolga teng bo‘lib, elektron faqat InAs/GaInSb ichki sohasida lokalizatsiyalangan. Shu sababli elektronning fazoviy cheklanishi kuchliroq bo‘lib, energiya sathlari chekli potensial to‘siqli holatdagiga nisbatan yuqoriroq qiymatlarda joylashadi.

Demak, potensial to‘siqning cheklanganligi elektronning fazoviy lokalizatsiyasi va to‘lqin funksiyalarining taqsimotiga sezilarli ta’sir ko‘rsatadi. To‘lqin funksiyasining to‘siq qatlamlariga kirib borishi kvant cheklanish energiyasini kamaytirib, elektron energiya spektrining past energiyalar tomon siljishiga olib keladi.



6-rasm. Chekli (a) va cheksiz (b) potensial to‘siqli InAs/GaInSb pog‘onali kvant o‘rada elektronning dastlabki sakkizta bog‘langan holati uchun to‘lqin funksiyalarining fazoviy taqsimoti.

1-jadvalda InAs qatlami kengligining ayrim qiymatlarida cheksiz potensial to‘siqli InAs/GaInSb modeli hamda chekli potensial to‘siqli AlSb/InAs/GaInSb/AlSb geterotuzilmasi uchun hisoblangan dastlabki elektron energiya sathlari taqqoslangan. Jadvaldan ko‘rinadiki, barcha hollarda chekli potensial to‘siqli modelda olingan energiya qiymatlari cheksiz potensial to‘siqli holatdagiga nisbatan kichikroq bo‘ladi. Ushbu farq chekli potensial to‘siq mavjud bo‘lganda elektron to‘lqin funksiyasining AlSb qatlamlariga eksponensial ravishda kirib borishi natijasida elektronning effektiv lokalizatsiya sohasi ortishi bilan izohlanadi. Shuningdek, InAs qatlami kengayishi bilan har ikkala modelda ham energiya sathlari pasayishi kuzatiladi, bu esa kvant cheklanishining susayishi natijasidir. Jadvalda keltirilgan sonli natijalar grafiklarda kuzatilgan qonuniyatlarni miqdoriy jihatdan tasdiqlaydi.

1-jadval. Cheksiz va chekli potensial to‘siqli holatlarda ayrim energiya sathlarining taqqoslanishi.

a, nm	E_1		E_2		E_3	
	Cheksiz	Chekli	Cheksiz	Chekli	Cheksiz	Chekli
0	0.420661	0.401519	0.542644	0.465225	–	0.554581
5	0.144212	0.116770	0.404480	0.364316	0.511396	0.439553
10	0.041835	0.037306	0.163765	0.145354	0.342278	0.304678
15	0.019423	0.017939	0.077313	0.071208	0.172214	0.157735
20	0.011828	0.010489	0.047312	0.041853	0.106451	0.093759

1-jadvalda chekli potensial to‘siqli modelda elektron energiya sathlarining cheksiz potensial to‘siqli holatga nisbatan foiz hisobidagi kamayishi keltirilgan. Natijalardan ko‘rinadiki, potensial to‘siqning cheklanganligi barcha energiya sathlariga sezilarli ta’sir ko‘rsatadi. Ayniqsa, InAs qatlami tor bo‘lgan hollarda energiya farqi kattaroq bo‘lib, bu elektron to‘lqin funksiyasining tashqi AlSb to‘siqlariga nisbatan kuchliroq kirib borishi bilan bog‘liq. InAs qatlami kengayishi bilan energiya sathlari orasidagi nisbiy farq kamayish tendensiyasini namoyon qiladi, chunki elektronning fazoviy lokalizatsiyasi zaiflashadi va to‘lqin funksiyasining to‘siq qatlamlariga kirib borishining energiya spektriga ta’siri

nisbatan kichrayadi. Ushbu natijalar chekli potensial to‘ siqli model real yarimo‘ tkazgich geterotuzilmalaridagi elektron holatlarini tavsiflashda cheksiz potensial modelga qaraganda aniqroq fizik tavsif berishini ko‘ rsatadi.

2-jadval. Ayrim a qiymatlarida chekli holatdagi energiya pasayishining foizdagi qiymatlari.

a, nm	ΔE_1, %	ΔE_2, %	ΔE_3, %
0	4.55	14.27	–
5	19.03	9.93	14.05
10	10.83	11.24	10.99
15	7.64	7.90	8.41
20	11.32	11.54	11.92

Xulosa

Mazkur ishda InAs/GaInSb pog‘ onali kvant o‘ rada elektron energiya sathlarining ichki qatlam geometrik parametrlariga hamda potensial to‘ siq turiga bog‘ liqligi nazariy jihatdan o‘ rganildi. Effektiv massa yaqinlashuvi asosida bir o‘ lchamli statsionar Shredinger tenglamasi sonli yechilib, cheksiz potensial to‘ siqli InAs/GaInSb modeli hamda chekli potensial to‘ siqli AlSb/InAs/GaInSb/AlSb geterotuzilmasi uchun energiya sathlari hisoblandi.

Hisoblashlar InAs qatlami kengayishi bilan elektronning fazoviy lokalizatsiya sohasi ortishi va kvant cheklanishining susayishi natijasida barcha energiya sathlari monoton ravishda kamayishini ko‘ rsatdi. Bundan tashqari, chekli potensial to‘ siqli holatda elektron to‘ lqin funksiyasining AlSb to‘ siq qatlamlariga eksponensial kirib borishi sababli energiya sathlari cheksiz potensial to‘ siqli modeldagiga nisbatan pastroq qiymatlarda joylashishi aniqlandi. Ayniqsa, tor kvant o‘ ralarda ushbu farq sezilarli bo‘ lib, o‘ ra kengligi ortishi bilan ikki model natijalari bir-biriga yaqinlashishi kuzatildi.

Shunday qilib, tadqiqot natijalari potensial to‘ siqning cheklanganligini hisobga olish real yarimo‘ tkazgich geterotuzilmalarining elektron xossalarini aniq tavsiflashda muhim ekanligini ko‘ rsatdi. Olingan natijalar InAs/GaInSb asosidagi kvant o‘ ralarda energiya spektrini geometrik parametrlar va potensial profilini tanlash orqali boshqarish imkonini beradi hamda ular interband kaskad lazerlar, infraqizil fotodetektorlar va boshqa past o‘ lchamli optoelektron qurilmalarni loyihalashda nazariy asos sifatida xizmat qilishi mumkin.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish

Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma’lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan.

Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi. **Moliyalashtirish:** tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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QATLAMLI SILIKAT MATERIALLAR ASOSIDA YUQORI DARAJADA TO‘ LDIRILGAN ORGANO-NOORGANIK POLIMER MATERIALLAR SPEKTRLARINI ULTRABINAFSHA SPEKTROSKOPIYA USULIDA O‘ RGANISH

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Annotatsiya: *Mazkur ilmiy ishda qatlamli silikat materiali sifatida tabiiy* Vermikulit *asosida yuqori darajada to‘ ldirilgan organo-noorganik polimer kompozit materiallar sintez qilindi va ularning spektral xossalari o‘ rganildi.*

Tajriba jarayonida vermikulit sulfat kislota (H_2SO_4) va xlorid kislota (HCl) yordamida kimyoviy modifikatsiyalandi. Kislota bilan ishlov berish natijasida mineral qatlamlari orasidagi masofa kengayishi, ion almashinish jarayonlarining faollashuvi va faol markazlar sonining ortishi kuzatildi. Keyinchalik ortiqcha kislotalar ammiak eritmasi hamda natriy gidrokarbonat ($NaHCO_3$) yordamida neytrallandi, mahsulot filtrlash va quritish bosqichlaridan o‘ tkazildi.

Kompozit materiallar tayyorlashda polimer matritsa sifatida Polietilen *(PE),* Polipropilen *(PP) va* Poliamid *(PA) tanlab olindi. Modifikatsiya jarayoni eritilgan holatda, 10:1 (polimer:vermikulit) massa nisbatida amalga oshirildi. Olingan kompozitlar Ultrabinafsha spektroskopiya usuli yordamida tahlil qilindi.*

Spektral natijalar polimer zanjirlari bilan modifikatsiyalangan vermikulit o‘ rtasida molekulyar darajadagi o‘ zaro ta’sir mavjudligini ko‘ rsatdi. Xususan, xarakterli yutilish chiziqlarining siljishi, intensivlik o‘ zgarishlari va yangi tebranish modalarining paydo bo‘ lishi kompozit tuzilmasida interkalatsion hamda qisman eksfoliatsion jarayonlar sodir bo‘ lganini tasdiqlaydi.

Kalit so‘ zlar: *vermikulit, qatlamli silikatlar, polimer kompozitlar, Ultrabinafsha spektroskopiya usuli , organo-noorganik materiallar, modifikatsiya.*

ИССЛЕДОВАНИЕ СПЕКТРОВ ВЫСОКОЗАПОЛНЕННЫХ ОРГАНО-НЕОРГАНИЧЕСКИХ ПОЛИМЕРНЫХ МАТЕРИАЛОВ НА ОСНОВЕ СЛОИСТЫХ СИЛИКАТНЫХ МАТЕРИАЛОВ С ИСПОЛЬЗОВАНИЕМ УЛЬТРАФИОЛЕТОВОЙ СПЕКТРОСКОПИИ

Аннотация: *В рамках данного научного исследования были синтезированы высокозаполненные органо-неорганические полимерные композитные материалы на основе природного вермикулита в качестве слоистого силикатного материала, а также изучены их спектральные свойства.*

В ходе эксперимента вермикулит подвергали химической модификации с использованием серной кислоты (H_2SO_4) и соляной кислоты (HCl). В результате кислотной обработки было отмечено увеличение межслойного расстояния, активация процессов ионного обмена и увеличение количества активных центров. Затем избыток кислот был нейтрализован раствором аммиака и бикарбонатом натрия ($NaHCO_3$), после чего продукт подвергли фильтрации и сушке.

В качестве полимерной матрицы для получения композиционных материалов были выбраны полиэтилен (PE), полипропилен (PP) и полиамид (PA). Процесс модификации проводился в расплаве при массовом соотношении 10:1 (полимер:вермикулит). Полученные композиты были проанализированы с помощью методов инфракрасной (ИК) спектроскопии.

Результаты спектрального анализа показали наличие взаимодействий на молекулярном уровне между полимерными цепями и модифицированным вермикулитом. В частности, смещение характерной линии поглощения... В частности, сдвиг характерных линий поглощения, изменения интенсивности и появление новых колебательных мод подтверждают протекание процессов интеркаляции и частичной эксфолиации в структуре композита.

Ключевые слова: *вермикулит, слоистые силикаты, полимерные композиты, УФ-спектроскопия, органо-неорганические материалы, модификация.*

STUDY OF THE SPECTRA OF HIGHLY FILLED ORGANO-INORGANIC POLYMER MATERIALS BASED ON LAYERED SILICATE MATERIALS USING ULTRAVIOLET SPECTROSCOPY

Abstract: *In this scientific study, highly filled organo-inorganic polymer composite materials based on natural vermiculite as a layered silicate material were synthesized, and their spectral properties were studied.*

During the experiment, vermiculite was chemically modified using sulfuric acid (H_2SO_4) and hydrochloric acid (HCl). As a result of acid treatment, an increase in the spacing between mineral layers, activation of ion exchange processes, and an increase in the number of active centers were observed. Subsequently, the excess acids were neutralized with an ammonia solution and sodium bicarbonate ($NaHCO_3$), and the product was subjected to filtration and drying.

Polyethylene (PE), Polypropylene (PP), and Polyamide (PA) were selected as the polymer matrix for the preparation of the composite materials. The modification process was carried out in the melt at a mass ratio of 10:1 (polymer:vermiculite). The resulting composites were analyzed using infrared (IR) spectroscopy methods.

Spectral results showed the existence of molecular-level interactions between polymer chains and modified vermiculite. In particular, the shift of characteristic absorption lines, changes in intensity, and the emergence of new vibrational modes confirm the occurrence of intercalation and partial exfoliation processes in the composite structure.

Keywords: *vermiculite, layered silicates, polymer composites, UB spectroscopy, organo-inorganic materials, modification.*

Kirish

Mazkur ishda polietilen, polipropilen hamda poliamid asosidagi organo-noorganik kompozit materiallarning ichki tuzilishini aniqlash va komponentlar o‘ rtasidagi o‘ zaro ta’sir mexanizmlarini baholash maqsadida ultrabinafsha (UV) spektroskopiya usuli qo‘ llanildi. Ushbu yondashuv polimer matritsa va qatlamli silikat (vermikulit) o‘ rtasidagi bog‘ lanish xususiyatlarini turli darajalarda - elektron va molekulyar darajada - kompleks o‘ rganish imkonini berdi.

Polimer va silikat (yoki umuman olganda noorganik material) ning har qanday jismoniy aralashmasi majburiy ravishda nanokompozit hosil qilavermaydi. Bu holat polimer aralashmalariga o‘ xshaydi. Bundan tashqari, zarrachalarning aglomeratsiyasi mustahkamlikni kamaytirib, zaifroq materiallar hosil qilishga moyil hisoblangan [1]. Shunday qilib, polimer silikat qatlamlari orasiga interkalatsiya qila olmaganda, fazaviy ajralgan kompozit hosil bo‘ ladi, uning xususiyatlari an’anaviy mikrokompozitlarnikiga mos kelgan [2,3].

Vermikulit - $(Mg, Fe, Al)_3(Al, Si)_4O_{10}(OH)_2 \cdot 4H_2O$ umumiy formulaga ega bo‘ lgan gidratlangan qatlamli silikat minerali hisoblanadi. Uning kristall tuzilishi 2:1 tipdagi qatlamli tuzilishga ega bo‘ lib, bu esa uning fizik-kimyoviy xossalarini belgilaydi. Vermikulit odatda oltinsimon, jigarrang yoki bronza ranglarda uchraydi. Shu bilan birga, vermikulit yengil va g‘ ovak tuzilishga ega bo‘ lib, issiqlik va tovush izolyatsiyasi xossalari yuqori darajada namoyon bo‘ ladi. U namlikni yaxshi ushlab turadi hamda kimyoviy jihatdan barqaror material hisoblanadi. Nanogillar poliamidlar, polistirol, polietilen va polipropilen kabi bir nechta tijorat polimerlari bilan birlasha oladi [4].

Qatlamli silikatlar (ayniqsa montmorillonit, kaolinit va vermikulit) asosida olingan organo-noorganik polimer nanokompozitlar hozirgi zamon materialshunosligining eng istiqbolli yo‘ nalishlaridan biri hisoblanadi. Ushbu materiallarning strukturasi va xossalarini chuqur o‘ rganishda spektral tahlil usullaridan IQ-spektroskopiya, Raman spektroskopiya, UV-Vis va boshqalar muhim ahamiyat kasb etadi. Polimer va qatlamli silikat nanokompozitlarini tayyorlash, xarakterizatsiya qilish, materiallarning xususiyatlari, kristallanish xulq-atvori, eritma reologiyasi va qayta ishlashning akademik hamda sanoat jihatlari shu vaqtgacha ko‘ rib chiqilgan. Ushbu materiallar polimer fanlari tadqiqotlarida katta qiziqish uyg‘ otmoqda [5]. Ushbu materiallar sinfining boshqa qiziqarli xususiyatlariga to‘ siq xususiyatlarining yaxshilanishi, termik barqarorlik va yonishga qarshi turish qobiliyati kiradi [6]. Noorganik to‘ ldiruvchilarning mavjudligi tufayli modifikatsiyalanmagan polimer bilan solishtirganda kompozitlarning tortish kuchi va zarba chidamliligining yomonlashuvi kuzatilgan[7]. Bundan tashqari, Stephen S. Ray va Masami Okamoto tomonidan olib borilgan tadqiqotlarda Raman va FTIR spektroskopiya yordamida polimer matritsa va qatlamli silikatlar o‘ rtasidagi

o‘ zaro ta’sirlar tahlil qilingan. Ular spektral o‘ zgarishlar orqali nanokompozitlarning dispersiya darajasini baholash mumkinligini ko‘ rsatganlar [8]. O‘ zbekistonlik olimlar tomonidan ham ushbu yo‘ nalishda qator ilmiy ishlar olib borilgan. Jumladan, N.R. Ashurov va Q.N. Berdinazarov tadqiqotlarida poliolefinlar asosida qatlamli silikatlar bilan to‘ ldirilgan kompozitlar o‘ rganilgan [9]. Polimerlar tarkibiga qarab organic, noorganik va elementorganik toifalarga ajratiladi. Ulardan nisbatan kengroq tarqalgani organik polimerlardir [10].

Adabiyotlar tahlili

Polimer–qatlamli silikat nanokompozitlari yuqori mexanik, termik va funksional xususiyatlari sababli zamonaviy materialshunoslikning istiqbolli yo‘ nalishlaridan biri hisoblanadi. Giannelis [1] polimer va qatlamli silikatlar asosidagi nanokompozitlarda polimer zanjirlarining silikat qatlamlari orasiga kirib borishi, ya’ni interkalatsiya jarayonining material xossalariga ta’sirini ko‘ rsatgan. Alexandre va Dubois [2] polimer–silikat nanokompozitlarini olish usullari, ularning strukturasi va xossalarini umumlashtirib, interkalatsiya va eksfoliatsiya jarayonlarining muhimligini ta’kidlagan.

Beyer [3] qatlamli silikatlarning polimer materiallarning termik barqarorligi va yonishga chidamliligini oshirishdagi ahamiyatini ko‘ rsatgan. Haider, Kausar va Muhammad [4] esa turli polimerlar va qatlamli silikatlar asosidagi kompozitlarning olinishi hamda ularning mexanik va termik xususiyatlarini tahlil qilgan. S.S. Ray va M. Okamoto [5], S. Pavlidou va C.D. Papaspyrides [6] hamda R. Vaia [7] tadqiqotlarida polimer–qatlamli silikat nanokompozitlarining olinishi, tuzilishi, morfologiyasi, mexanik va termik xususiyatlari o‘ rganilgan. Tadqiqotlarda qatlamli silikatlarning polimer matritsasida yaxshi disperslanishi va komponentlararo o‘ zaro ta’sir nanokompozitlarning fizik-mexanik hamda termik xossalarini yaxshilashi ko‘ rsatilgan [5–8]. N.R. Ashurov va Q.N. Berdinazarov [9] polimer kompozit materiallarning fizik-kimyoviy asoslarini, A.S. Qosimov [10] esa polimerlarning molekulyar tuzilishi va fizik xususiyatlarini yoritgan.

Mavjud adabiyotlar tahlili polimer–qatlamli silikat nanokompozitlarning mexanik, termik va strukturaviy xususiyatlari keng o‘ rganilganligini ko‘ rsatadi. Shu bilan birga, yuqori darajada to‘ ldirilgan organo-noorganik polimer materiallarning ultrabinafsha spektral xususiyatlari va spektral o‘ zgarishlarning kompozit tarkibi bilan bog‘ liqligi yetarlicha tadqiq etilmagan. Shu sababli bunday materiallarning UB-spektroskopik xususiyatlarini o‘ rganish muhim ilmiy va amaliy ahamiyatga ega.

Tadqiqot metodologiyasi

Vermikulitga kimyoviy ishlov berish

Vermikulit asosidagi (1-rasm) qatlamli silikatning ishlov berish bosqichi quyidagi jarayonlarni o‘ z ichiga oladi:



1-rasm.Vermikulit ko‘ rinishi

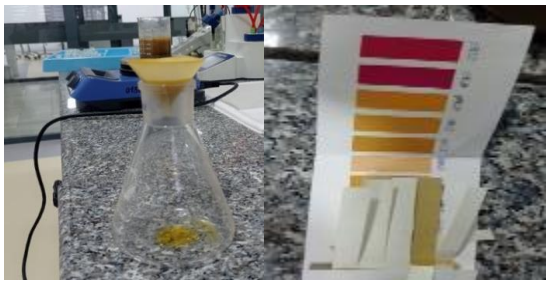
Vermikulitni ishchi holatga keltirish uchun 42 g namunaga 200 ml suvga qo‘ shilgan 40 ml konsentrlangan H_2SO_4 eritmasi bilan kimyoviy ishlov berildi, aralashma 80°C da quritildi va mexanik aralashtirgichda 1000 ayl/min tezlikda 10 soat davomida aralashtirildi. Natijada, quyuq va yaltiroq modifikatsiyalangan holga o‘ tganini ko‘ rsatadi (2- rasm).



2-rasm.Kislota bilan ta’sirlashuvdan keyingi tayyor bo‘ lgan aralashmali vermikulit

Hosil bo‘ lgan mahsulotdagi ortiqcha kislotani neytrallash uchun ikki bosqichli yuvish amalga oshirildi. Dastlab mahsulot 60 ml suvga qo‘ shilgan 20 ml ammiak eritmasi bilan ishlov berilib, pH universal indikator orqali nazorat qilindi.

Keyingi bosqichda distillangan suvga tayyorlangan $NaHCO_3$ eritmasi yordamida yuvish bajarildi; bu jarayonda $NaHCO_3$ kislota bilan reaksiyaga kirib, natriy tuzi, suv va CO_2 hosil qiladi. Shu orqali mahsulotdagi kislotali aralashmalar bartaraf etildi. Tozalangan massa filtratsiya qilinib, erkin oqishi ta'minlandi (3-rasm).



3-rasm.Filtr qog‘ ozdan vermikutning o‘ tish jarayoni va indikator qog‘ ozi

Vermikulitni modifikatsiyalash jarayoni tezlashtirish maqsadida tayyor aralashma yuzasi keng idishlarga solinib, xona haroratida 1 sutka davomida quritildi. Quritish davomida mahsulotning fizik holati, rangi va tuzilmasi kuzatildi, pH universal indikator bilan nazorat qilindi. Neytrallash va suvli qatlamdan tuzlar ajratilgach, mahsulot qattiq holatga o‘ tdi; bug‘ lanish jarayoni molekulalarni yaqinlashtirib, kristallanish yoki amorf tuzilishga olib keldi. Shu orqali vermikulit polimerlar bilan modifikatsiyalash jarayoniga tayyor holatga keldi va mahsulot saqlanishi hamda tahlilga yaroqliligi oshdi (4-rasm).



4 – rasm.Quritilgan va maydalangan vermikulit

Namlikdan tozalangan mahsulot uzoq muddat saqlanishi, fizik-kimyoviy tahlillarga tayyor bo‘ lishi va boshqa bosqichlar (presslash, analitik o‘ lchovlar) uchun moslashini ta'minlaydi. Shu bilan birga, yuzasi keng idishga yoyilgan modda asta-sekin bug‘ lanib, qattiq holatga o‘ tadi - bu jarayon **quritish va qotish** deb ataladi.

1 – jadval

Vermikulitning ishchi holatga tayyorlanish jarayoni

Bosqich	pH qiymati
Sulfat kislotali eritma	1.5
Vermikulit qo‘ shilgach	2.5
Mishelka bilan aralashtirilganda	3.0
10 soatdan so‘ ng (massaning holati)	3.2
Ammiak qo‘ shilgach	6.5
$NaHCO_3$ bilan yuvilgach	7.0

Kompozitlarni tayyorlash

Tajriba davomida vermikulit oldindan kimyoviy faollashtirilish maqsadida H_2SO_4 ning distillangan suvdagi eritmasi bilan ishlov berildi. Quritilgan va elangan vermikulit eritmaga qo‘ shilib, bir jinsli massa hosil qilindi va 80-90 °C da 10 soat davomida qizdirildi, natijada quyuq, yarim yopishqoq holatga kelgan massa olingan. Modifikatsiyalash jarayonida polimerlar - polietilen (PE), polipropilen (PP) va poliamid (PA) - har birining suyuqlanish haroratiga mos tarzda alohida ishlov berildi. Shu orqali vermikulit asosidagi yuqori to‘ ldirilgan organo-noorganik kompozit materiallar tayyorlandi (5-rasm), bu esa fazalararo o‘ zaro ta'sir va mexanik xossalarni yaxshilashga xizmat qiladi.



5 – rasm.Polimer materiallar: polietilen (PE), polipropilen (PP) va poliamid (PA) va boshqalar

1. Polietilen asosidagi kompozit tayyorlash

Tajriba uchun past zichlikka ega polietilen (suyuqlanish harorati 110-115 °C) tanlandi va maxsus laboratoriya pechida eritildi. Oldindan quritilgan va silliqlangan vermikulit 10:1 (polimer:vermikulit) nisbatda eritilgan polietilen ustiga qo‘ shilib, folga qog‘ oz ustida shisha tayoqcha yordamida bir xil massaga aralashtirildi. Tayyorlangan “PE+Vermikulit” kompozitlari sovitilib, shisha idishlarga solindi va Ultrabinafsha spektroskopiyasi uchun tayyorlandi (6-rasm).



6- rasm.Polietilen (PE) va vermikulit asosidagi kompozit material

2. Polipropilen asosidagi kompozit tayyorlash

Polipropilen (PP, suyuqlanish harorati 160-165 °C) pechda eritilib, oldindan maydalangan va quritilgan vermikulit 10:1 (PP:vermikulit) nisbatda qo‘ shildi. Modda folga qog‘ oz ustida shisha tayoqcha yordamida bir xil massaga aralashtirildi. Sovutilgan kompozit qatlam qirib olinib, “PP+Vermikulit” nomi bilan shisha idishlarga solindi va Ultrabinafsha spektroskopiyasi uchun tayyorlandi.

3. Poliamid asosidagi kompozit tayyorlash

Uchinchi polimer - poliamid (PA) suyuqlanish harorati nisbatan yuqori bo‘ lib, 210-220 °C atrofida eriydi. Maxsus harorat nazorati ostida pechga joylashtirildi. Eriganidan so‘ ng, yuqoridagi kabi 10:1 nisbatda tayyorlangan, silliqlangan vermikulit polimerga qo‘ shildi.

Tarkibni bir hil massaga keltirish uchun aralashma yana folga qog‘ oz ustida shisha tayoqcha bilan aralashtirildi. Aralashma sovutilib, so‘ ngra folgadan ajratildi va “PA+Vermikulit” deb belgilangan shisha idishga qirib solindi.(7- rasm).



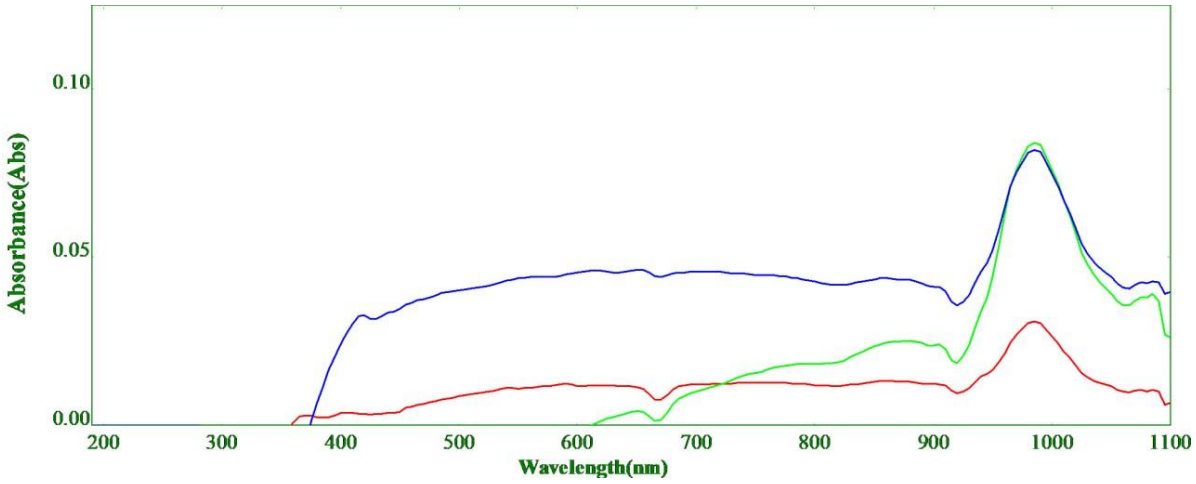
7 - rasm.PA+Vermikulit kompozit materiali olish jarayoni

Tayyorlangan barcha kompozit namunalar - polietilen, polipropilen, poliamid va yana bir polietilen asosidagi modifikatsiyalangan materiallar shisha idishlarga alohida qirib solinganidan so‘ ng, ularning tashqi ko‘ rinishi, rangdorligi va yopishqoqlik darajasi qayd etildi. Har bir shisha idish ustiga kompozit tarkibi va ishlatilgan polimer turi aniq ko‘ rsatilgan yorliqlar yopishtirildi. Bu esa keyinchalik analiz natijalarini to‘ g‘ ri solishtirish imkonini yaratadi.

Natijalar va ularning tahlili

Spektral tahlil

Tayyorlangan namunalar UV - spektrofotometr qurilmasiga joylashtirildi va 190-400 nm diapazondagi elektromagnit nurlanish ta'sirida ularning yutilish xususiyatlari o' rganildi. Har bir namuna uchun turli to' lqin uzunliklarida absorbsiya qiymatlari qayd etilib, ularning o' zgarish qonuniyatlari aniqlandi (8-rasm).



8- rasm.Polietilen, polipropilen va stirolning UV spektroskopiyasidagi tahlili natijasi

O' lchov natijalari asosida absorbsiya (A) ning to' lqin uzunligiga (λ) bog' liqlik grafigi qurildi. Grafiklarda har bir polimer alohida rang bilan ifodalandi, bu esa ularni o' zaro solishtirishni osonlashtirdi.Grafikda ranglar quyidagicha mazmunga ega:

1. Ko' k- polietilen
2. Yashil -stirol
3. Qizil -polipropilen

Spektrlarni shakllantirish jarayoni quyidagi ketma-ket bosqichlarda amalga oshirildi: 1.Dastlab har bir namuna ultrabinafsha nurlanish bilan yoritildi, so' ngra har bir to' lqin uzunligida yutilish darajasi aniqlanib, sonli ko' rsatkichlar sifatida qayd etildi.

2. Olingan ma'lumotlar kompyuter dasturlari yordamida qayta ishlanib, grafik ko' rinishga keltirildi.

Tadqiqot davomida polimer namunalar oldindan tayyorlanib, mos erituvchilarda bir xil konsentratsiyali eritmalar shaklida UV-spektrofotometr yordamida tahlil qilindi. O' lchovlar 190-400 nm diapazonda amalga oshirildi va har bir namuna uchun absorbsiya spektrlari qayd etildi. Olingan UV spektrlar polimer materiallarning elektron tuzilishini tavsiflashda muhim manba bo' lib xizmat qiladi. Tahlil natijalari shuni ko' rsatdiki, polimerlarning kimyoviy tuzilishi ularning yutilish xususiyatlariga bevosita ta'sir ko' rsatadi.

Spektral natijalar shuni ko' rsatdiki, to' yingan uglevodorod zanjiriga ega polietilen va polipropilen namunalarida UV diapazonda yutilish nisbatan past bo' lib, bu ularning elektron tuzilishida π-bog' larning yo' qligi bilan izohlanadi. Shu bilan birga, polipropilenda yon metil guruhlarning mavjudligi sababli ayrim hollarda juda kichik siljishlar kuzatildi. Polietilen spektrida absorbsiya qiymatlari juda past bo' lib, bu uning to' yingan uglevodorod zanjiridan tashkil topganligi bilan izohlanadi. Bunday tuzilishda π-bog' lar mavjud emasligi sababli elektron o' tishlar asosan yuqori energiyali sohada sodir bo' ladi va UV diapazonda deyarli sezilmaydi. Polipropilen spektrida ham shunga o' xshash holat kuzatiladi, biroq yon metil guruhlarning mavjudligi sababli yutilish darajasi biroz oshgan. Bu esa molekulyar muhitning nisbatan murakkabroq ekanligini bildiradi.

Stirol asosidagi polimerlarda esa keskin farq kuzatiladi. Aromatik halqa mavjudligi tufayli spektrda aniq va intensiv maksimumlar hosil bo' ladi. Bu maksimumlar $\pi \rightarrow \pi^*$ elektron o' tishlar bilan bog' liq bo' lib, moddaning kon'yugatsiyalangan tizimga ega ekanligini ko' rsatadi. Qatlamli silikat bilan modifikatsiyalangan kompozitlarda spektral cho' qqilarning siljishi va intensivlikdagi o' zgarishlar qayd etildi. Bu holat polimer zanjirlari va silikat qatlamlari o' rtasida ma'lum darajada elektron muhit o' zgarishi yuz berayotganini ko' rsatadi.

Erituvchi sifatida dimetilformamid (DMF) ishlatildi. DMF polimer zanjirlarini dispersiyalash, silikat qatlamlari orasiga kirishini osonlashtirish, interkalatsiya va eksfoliatsiya jarayonlarini faollashtirdi.

UV spektrlarida 200-220 nm oralig' ida $\sigma \rightarrow \sigma^*$ o' tishlar kuzatildi, bu polietilen va polipropilenning oddiy uglevodorod tuzilishini ko' rsatadi. 230-260 nm oralig' ida $n \rightarrow \pi^*$ o' tishlar mavjud bo' lib DMF tarkibidagi karbonil guruhlar bilan bog' liq. 260-280 nm oralig' ida $\pi \rightarrow \pi^*$ o' tishlar aromatik yoki kon'yugatsiyalangan tizimlarni bildiradi, silikat bilan o' zaro ta'sir elektron tizimni o' zgartiradi.

Polimer namunalari 190-400 nm oralig‘ ida UV-spektrofotometr yordamida o‘ lchanganda, natijalar shuni ko‘ rsatdiki:

Polietilen + VT: Yutilish cho‘ qqilari past, to‘ yingan uglevodorod zanjiriga xos xususiyat.

Polipropilen + VT: Yon metil guruhlar sababli kichik siljishlar va nisbatan kuchliroq yutilish.

Poliamid + VT: Amid guruhlari mavjudligi tufayli 210-250 nm oralig‘ ida yuqori yutilish maksimumi.

UB spektrlaridagi siljishlar polimer zanjirlari va silikat qatlamlari o‘ rtasidagi **interkalatsiya va eksfoliatsiya jarayonlari** bilan bog‘ liq.

Xulosa

Qatlamli silikat minerali - tabiiy vermikulit asosida yuqori darajada to‘ ldirilgan organo-noorganik polimer kompozit materiallar sintez qilindi va ularning molekulyar tuzilishi hamda fazalararo o‘ zaro ta’sir mexanizmlari zamonaviy spektral usullar yordamida kompleks o‘ rganildi.

Kompozit materiallar polimer matritsa sifatida **Polietilen**, **Polipropilen** va **Poliamid** asosida 10:1 (polimer:vermikulit) massa nisbatida eritma holatida tayyorlandi. Modifikatsiya jarayoni termik sharoitda amalga oshirilib, qatlamli silikatning polimer muhitda bir tekis disperslanishiga erishildi.

Olingan natijalar shuni ko‘ rsatadiki, kimyoviy faollashtirilgan vermikulit polimer matritsa bilan yuqori darajada moslashuvchan interfeys hosil qiladi. Bu esa kompozit materiallarda yuklanishning samarali taqsimlanishiga, elastiklik modulining oshishiga, termik barqarorlikning yaxshilanishiga va umumiy fizik-mexanik ko‘ rsatkichlarning ortishiga olib keladi.

Shunday qilib, UV spektroskopiya natijalari polimerlarning elektron tuzilishini aniqlash imkonini berib, aromatik va to‘ yingan tuzilmalarning farqlarini aniq ko‘ rsatib berdi.

Mualliflar hissasi , manfaatlar to‘ qnashuvi va moliyalashtirish

Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma’lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan. Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi. Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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SALBUTAMOL MOLEKULASINING SIRT IONLASHUV QONUNIYATLARINI VAKUUM VA ATMOSFERA SHAROITIDA TADQIQ QILISH

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Annotatsiya: *Mazkur tadqiqot doirasida keng tarqalgan bronxolitik vosita bo‘ lgan salbutamol (Nebutamol®) moddasi sirtiy ionlashuv qonuniyatlari vakuum va atmosfera sharoitida tadqiq qilindi. Vakuum sharoitida salbutamol sirt ionlashuv mass-spektrometriya usuli yordamida qizib turgan oksidlangan volfram emitteri yordamida o‘ rganildi. Sirt ionlashuv mass-spektrlari kam chiziqli bo‘ lib, asosan fragment $[M-R]^+$ ionlardan tashkil topgan va m/z 86 ga mos keluvchi ion eng yuqori intensivlikka ega bo‘ lib, spektrning asosiy cho‘ qqisini tashkil etdi. Ion toklarini emitter temperaturasiga bog‘ liklari tadqiq qilinib, ular asosan qo‘ ng‘ iroqsimon tarzda ekangligi aniqlandi. Shuningdek, termodesorbsion sirtiy ionlashuv spektrometrida («Iskovich») salbutamol molekulasi atmosfera havosida termodesorbsion spektrlari olinib, fizik-kimyoviy xususiyatlari tadqiq qilindi. Olingan natijalar nafaqat fundamental jihatdan ko‘ p atomli zarrachalarning issiq qattiq jism bilan o‘ zaro ta’sirining xususiyatlarini aniqlashda, balki amaliy jihatdan sirt ionlashuv usulining qo‘ llanish doirasini muhim farmatsevtik vosita-β_2-agonistga nisbatan kengaytirib, keyinchalik bu sinfdagi moddalarni murakkab arlashmalarda tez va sezgir tahlil qilishga asos yaratadi.*

Kalit so‘ zlar: *sirt ionlashuv usuli, mass-spektrometr, emitter; salbutamol β_2-adrenergik agonist; ionlar hosil bo‘ lish mexanizmi, temperatura.*

ИССЛЕДОВАНИЕ ЗАКОНОМЕРНОСТЕЙ ПОВЕРХНОСТНОЙ ИОНИЗАЦИИ МОЛЕКУЛЫ САЛЬБУТАМОЛА В УСЛОВИЯХ ВАКУУМА И АТМОСФЕРЫ

Аннотация: *В рамках настоящего исследования были изучены закономерности поверхностной ионизации широко применяемого бронхолитического препарата сальбутамола (Nebutamol®) в вакуумных и атмосферных условиях. В вакууме сальбутамол исследовали методом поверхностно-ионизационной масс-спектрометрии с использованием нагретого окисленного вольфрамового эмиттера. Полученные масс-спектры поверхностной ионизации характеризовались малым числом линий и состояли преимущественно из фрагментных ионов $[M–R]^+$. Ион с m/z 86 обладал наибольшей интенсивностью и формировал основной пик спектра. Исследованы зависимости ионных токов от температуры эмиттера, при этом установлено, что они имеют преимущественно колоколообразный характер. Кроме того, на термодесорбционном спектрометре поверхностной ионизации («Исковичˮ) были получены термодесорбционные спектры*

молекулы сальбутамола в атмосферном воздухе и исследованы её физико-химические свойства. Полученные результаты имеют фундаментальное значение для выяснения особенностей взаимодействия многоатомных частиц с нагретой поверхностью твёрдого тела, а также практическое значение, поскольку расширяют область применения метода поверхностной ионизации в отношении важного фармацевтического средства — β_2-агониста, создавая основу для последующего быстрого и чувствительного анализа соединений данного класса в сложных смесях.

Ключевые слова: *метод поверхностной ионизации, масс-спектрометр, эмиттер, сальбутамол, β_2-адренергический агонист, механизм образования ионов, температура.*

STUDY OF THE SURFACE IONIZATION REGULARITIES OF THE SALBUTAMOL MOLECULE UNDER VACUUM AND ATMOSPHERIC CONDITIONS

Abstract: *Within the framework of this study, the surface ionization behavior of the widely used bronchodilator salbutamol (Nebutamol®) was investigated under both vacuum and atmospheric conditions. Under vacuum conditions, salbutamol was studied using the surface ionization mass spectrometry method with a heated oxidized tungsten emitter. The obtained surface ionization mass spectra were characterized by a limited number of peaks and consisted predominantly of fragment ions $[M-R]^+$. The ion with m/z 86 exhibited the highest intensity and represented the base peak of the spectrum. The dependences of ion currents on emitter temperature were investigated and were found to be predominantly bell-shaped. In addition, thermodesorption spectra of the salbutamol molecule in ambient air were obtained using a thermodesorption surface ionization spectrometer ("Iskovich"), and its physicochemical properties were investigated. The obtained results are of fundamental importance for elucidating the interaction mechanisms of polyatomic particles with a heated solid surface and are also of practical significance, as they expand the application range of the surface ionization method to an important pharmaceutical agent, a β_2-agonist, thereby providing a basis for the subsequent rapid and sensitive analysis of this class of compounds in complex mixtures.*

Keywords: *surface ionization method, mass spectrometer, emitter, salbutamol, β_2-adrenergic agonist, ion formation mechanism, temperature.*

Kirish

Zamonaviy pulmonologiya amaliyotida salbutamol o‘ zining qisqa muddatli, ammo yuqori samarali ta’siri tufayli birinchi navbatda tavsiya etiladigan, tanlangan β_2-adrenoretseptorlar agonisti hisoblanadi. U bronxial astma, o‘ pkaning surunkali obstruktiv kasalligi hamda jismoniy zo‘ riqish natijasida yuzaga keladigan bronxospazmni bartaraf etishda keng qo‘ llaniladi. Kimyoviy jihatdan salbutamol fenetanolaminlar sinfiga mansub bo‘ lib, molekulasining tuzilishi uning biologik faolligi bilan bir qatorda termik desorbsiya va sirt ionlashuv jarayonlaridagi xususiyatlarini ham belgilaydi. Salbutamol muhim farmatsevtik preparat bo‘ lishi bilan birga, biologik va farmatsevtik namunalarda uni tezkor hamda yuqori sezgirlik bilan aniqlash zarurati tufayli analitik tadqiqotlarda ham katta qiziqish uyg‘ otmoqda. Ayniqsa, uning termik barqarorligi, ionlashuv xususiyatlari va parchalanish mexanizmlarini o‘ rganish yangi tahlil usullarini ishlab chiqishda muhim ahamiyatga ega.

Adabiyotlar tahlili

Salbutamolning fizik-kimyoviy xossalari, farmakologik ta’siri va analitik aniqlash usullariga bag‘ ishlangan ilmiy tadqiqotlar ushbu preparatning nazariy hamda amaliy jihatdan keng o‘ rganilganligini ko‘ rsatadi. Uning β_2-adrenoretseptorlarga yuqori selektivligi, bronxodilatator faolligi va klinik qo‘ llanilish xususiyatlari ko‘ plab sharh maqolalarida batafsil yoritilgan [1,2]. Shuningdek, salbutamol enantiomerlarining stereoselektiv farmakologik faolligi, metabolizmi va biologik samaradorligi alohida tadqiqotlarda tahlil qilingan [3].

Salbutamolni aniqlashda an’anaviy analitik usullar sifatida immunotahlil, gaz xromatografiyasi–mass-spektrometriya(GC-MS)hamda suyuqlik xromatografiyasi–mass-spektrometriya (LC-MS/MS) keng qo‘ llaniladi. So‘ nggi yillarda esa oldindan xromatografik ajratishni talab qilmaydigan atmosfera bosimida ishlovchi desorbsion ionlashuv usullariga ham katta e’tibor qaratilmoqda. Jumladan, mikroto‘ lqinli plazma fakeli asosidagi desorbsion ionlashuv uchish vaqti mass-spektrometriyasi (TOF-MS) bilan birgalikda qo‘ llanilganda salbutamol tabletkalarida protonlangan molekulyar ion (*m*/*z* 240) hamda *m*/*z* 222, 166 va 148 fragment ionlari aniqlangan [4]. Ushbu usullar yuqori sezgirlik va tezkorlikka ega bo‘ lsa-da, atmosfera bosimida ionlanish mexanizmiga asoslanadi hamda murakkab va qimmat analitik uskunalarni talab qiladi. Shu bois ularning ion hosil bo‘ lish qonuniyatlari termik sirt ionlashuvi jarayonlaridan sezilarli darajada farq qiladi.

Salbutamolning farmakokinetikasi va antidoping nazoratidagi o‘ rni ham keng tadqiq etilgan. WADA tomonidan belgilangan 1000 ng/ml siydik chegarasi asosida o‘ tkazilgan ko‘ p markazli modellashtirish tadqiqotlari yuqori konsentratsiyalarda preparatning tizimli qabul qilinishini ishonchli aniqlash mumkinligini, biroq chegara qiymatlarida inhalatsion terapevtik qo‘ llanish bilan tizimli iste’molni to‘ liq farqlash murakkabligini ko‘ rsatgan [5]. Eksperimental hayvonlarda olib borilgan tadqiqotlarda salbutamolning asosiy qismi organizmda o‘ zgarmagan holda saqlanishi, oz

miqdori esa metillangan metabolitlarga aylanishi aniqlangan [6]. Bundan tashqari, preparatning yuqori haroratdagi degradatsiya mahsulotlari suyuqlik xromatografiyasi–ionsprey mass-spektrometriyasi yordamida tavsiflangan [7], dozalangan ingalyator aerozolining tarkibi esa real vaqt rejimida SESI-MS usulida tahlil qilingan [8].

Shuni ta'kidlash joizki, yuqoridagi tadqiqotlarning aksariyati atmosfera bosimida ishlovchi ionlashuv usullari yoki xromatografik ajratishga asoslangan analitik metodlarga bag‘ ishlangan. Biroq salbutamol molekulasining oksidlangan volfram sirti bilan o‘ zaro ta'siri, termik sirt ionlashuvi mexanizmi, ion tokining haroratga bog‘ liqligi hamda hosil bo‘ ladigan molekulyar va fragment ionlarning shakllanish qonuniyatlari hozirgacha deyarli o‘ rganilmagan. Mazkur tadqiqot aynan ushbu ilmiy bo‘ shliqni to‘ ldirishga qaratilgan bo‘ lib, salbutamolning sirt ionlashuvi jarayonlarini vakuum va atmosfera sharoitida kompleks o‘ rganishga xizmat qiladi.

Sirt ionlashuvi (SI) – qizdirilgan qattiq jism sirti bilan adsorbsiyalangan zarrachalar o‘ rtasidagi elektron almashinuvi natijasida termik desorbsiya jarayonida ionlar hosil bo‘ lishiga asoslangan geterogen fizik-kimyoviy jarayondir. Jarayon davomida molekulalar avval qizdirilgan sirtga adsorbsiyalanadi, so‘ ngra sirt bilan elektron almashinuvi natijasida ionlangan holda desorbsiya qiladi. Ion hosil bo‘ lish samaradorligi sirtning chiqish ishi (φ) bilan molekulaning ionlashuv potensiali (I) o‘ rtasidagi energetik nisbatga bog‘ liq bo‘ lib, bu bog‘ liqlik Saha–Langmuir tenglamasi bilan tavsiflanadi. Organik molekulalarda ushbu jarayon natijasida molekulyar va fragment ionlar hosil bo‘ ladi [9,10]. Shu sababli sirt ionlashuvi usuli yuqori tanlanuvchanlikka ega bo‘ lib, ionlashuv potensiallaridagi kichik farqlar ham turli organik birikmalarni ishonchli ajratish va identifikatsiya qilish imkonini beradi [9]. Mazkur usul aminlar, gidrazinlar, alkaloidlar, azot saqlovchi geterotsiklik birikmalar hamda boshqa organik asoslarni tadqiq etishda muvaffaqiyatli qo‘ llanilgan [9,10]. Keyingi tadqiqotlarda afyun alkaloidlari, morfin, nikotin saqlovchi biologik faol moddalar va ayrim pestitsidlarni tahlil qilishda oksidlangan hamda metall volfram sirtlaridan foydalanilib, ion tokining haroratga bog‘ liqligi asosida ionlashuv mexanizmi, ionlashuv energiyasi va sublimatsiya issiqligi baholangan [11].

Sirtda ion hosil bo‘ lish jarayonlarini o‘ rganishda ikkilamchi ion mass-spektrometriyasi (SIMS) ham muhim analitik usullardan biridir. Bu usulda qattiq jism sirti yuqori energiyali birlamchi ionlar bilan bombardimon qilinadi va hosil bo‘ lgan ikkilamchi ionlar yordamida sirtning elementar hamda molekulyar tarkibi yuqori sezgirlik bilan aniqlanadi [12,13]. Keyingi tadqiqotlar klaster ionlardan foydalanish molekulyar ikkilamchi ionlar hosil bo‘ lish ehtimolini oshirishini, ion unumdorligi esa klaster o‘ lchami, energiyasi va sirt xususiyatlariga bog‘ liqligini ko‘ rsatdi [14–18]. Shuningdek, klaster bombardimoni paytida kuzatiladigan noadditiv va nochiziqli samaralar hamda metall yordamida ionlashuvni kuchaytirish usullari SIMS usulining sezgirligini sezilarli darajada oshirishi aniqlangan [19–23]. Termik sirt ionlashuvi esa yuqori tanlanuvchanligi tufayli, ayniqsa, azot saqlovchi organik asoslarni aniqlash va identifikatsiya qilishda samarali analitik usul sifatida keng qo‘ llanilmoqda [24].

Salbutamol molekulasi azot asosli organik birikma bo‘ lib, tarkibidagi ikkilamchi amin guruhi qizdirilgan oksidlangan volfram sirti bilan elektron almashinuvi jarayonida ishtirok etadi. Shu sababli salbutamol sirt ionlashuvi jarayonida samarali ionlanadigan moddalar qatoriga kiradi va SI/MS usulida tadqiq etish uchun qulay model obyekt hisoblanadi. Uning sirt ionlashuvi sharoitida hosil bo‘ ladigan molekulyar va fragment ionlari tarkibini, ion tokining haroratga bog‘ liqligini hamda ion hosil bo‘ lish qonuniyatlarini o‘ rganish ilmiy va amaliy jihatdan muhim ahamiyatga ega.

Mazkur tadqiqotning maqsadi oksidlangan volfram termoemitteri sirtida salbutamolning sirt ionlashuv mass-spektrini qayd etish, hosil bo‘ lgan ionlarning tarkibini aniqlash, ion tokining haroratga bog‘ liqligini tadqiq qilish hamda olingan natijalarni termodesorbsion sirt-ionizatsion spektrometr yordamida tasdiqlashdan iborat.

Tadqiqot metodologiyasi

Mass-spektrometrik qurilma. Sirtiy ionlashuv–mass-spektrometrik (SI/MS) o‘ lchovlar sirtiy ionlashuv tadqiqotlari uchun modernizatsiya qilingan MI-1201V magnit sektorli mass-spektrometrida bajarildi. Ko‘ p atomli ionlarning to‘ xtatilish egri chiziqlarini qayd etish maqsadida asbob chiqish qismiga uch to‘ rli energoanalizator o‘ rnatildi. Tezlatuvchi kuchlanish 3 kV bo‘ lganda asbobning ishchi massaviy diapazoni 1–1000 a.m.b., vakuum kamerasidagi qoldiq bosim esa (1–2)×10^{-5} Pa ni tashkil etdi.

Termoemitter sifatida oksidlangan volfram lentasi qo‘ llanildi. Uni tayyorlash va oksidlash tartibi avvalgi ishlarda batafsil bayon qilingan [11]. Barcha o‘ lchovlar musbat ionlar rejimida, elektr maydoni kuchlanganligi E < 10^4 V/sm sharoitida amalga oshirildi. Ionlashuv yacheykasi harorati 160 °C da doimiy saqlandi, termoemitter harorati esa 600–1200 K oralig‘ ida bosqichma-bosqich o‘ zgartirildi.

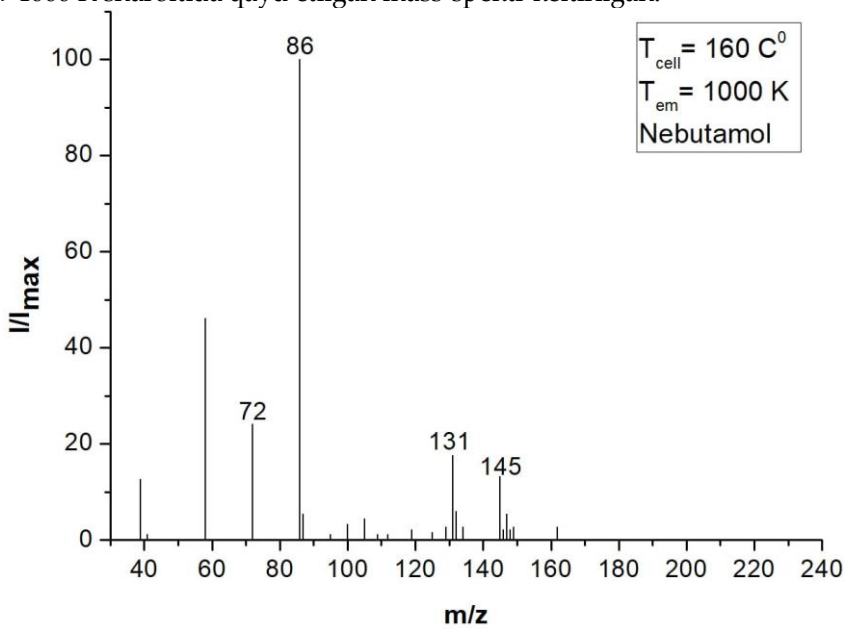
Atmosfera havosida ishlaydigan Iskovich qurilmasi. Qo‘ shimcha va mustaqil tekshirish sifatida, bir xil eritmalar atmosfera havosida ishlaydigan «Iskovich» tipidagi qurilmasida ham o‘ rganildi. Grafitlangan metall bug‘ latkich (diametri 3 mm, balandligi 1,5 mm) harorati 10°C/sek tezlikda xona haroratidan 500°C gacha chiziqli ravishda oshiriladi. Optimal sharoitlar: katod-anod kuchlanishi 380–400 V, T_{em}=350–400°C, havo oqimi 50 l/soat; uchlamchi aminlar uchun ionlashuv samaradorligi 900 Kl/mol gacha, ikkilamchi aminlar uchun 30–50, birlamchi aminlar uchun 5–10 Kl/mol (2,5–4,5 tartibli diapazonda), porog sezgirlik esa taxminan 50–80 pg (fon ustida) va 1 pg (shovqin ustida) ni tashkil etadi [19].

Termoemitter yuzasining qoplanish darajasiga qarab spektrda turli cho‘ qqilar kuzatiladi: submonosloy miqdorda-faqat desorbsiya maksimumi (T_{dmax}), katta miqdorda (100+ qatlam) -faqat sublimatsiya maksimumi (T_{smax}), oraliq miqdorda esa ikkala cho‘ qqi birga namoyon bo‘ ladi. Kalibrovka uchun amitriptilin (900 Kl/mol gacha, T_{smax}≈110°C) va morfin (50 Kl/mol, T_{smax}≈180°C) standartlari qo‘ llanildi, har birida 50 ng modda bug‘ latkichga tushirilgan holda. Druggy-4A dasturi moddani identifikatsiyalash va konsentratsiyasini aniqlash imkonini beradi. Salbutamol eritmasining 1,0, 0,7, 0,5 va 0,2 mkl hajmlari tahlil qilinib, ion tokining (I, $\times 10^{-12}$ A) haroratga (T, 60–500°C) bog‘ liqligi ikki turkumda qayd etildi: birinchisi 1,0/0,7/0,5 mkl, ikkinchisi 0,7/0,5/0,2 mkl.

Moddalar va namunalar tayyorlash. Tadqiqot obyekti sifatida inhalatsiya uchun mo‘ ljallangan tayyor suyuq dori shakli – salbutamol (Nebutamol®) ishlatildi. Atmosfera bosimida ishlovchi «Iskovich» qurilmasida tadqiqot o‘ tkazish uchun preparat etanol yordamida zarur konsentratsiyagacha suyultirildi va tayyorlangan eritmadan belgilangan hajm bevosita kvarts bug‘ latkich yuzasiga tomizildi. Vakuum sharoitida ishlovchi sirt ionlashuv mass-spektrometrida (SI/MS) esa namuna etanol bilan suyultirilgandan so‘ ng mass-spektrometrning bug‘ latish yacheykasiga tomizildi va erituvchi xona haroratida bug‘ latib yuborildi. Yacheykadagi modda miqdorini oshirish hamda yetarli ion signalini hosil qilish maqsadida tomizish va quritish amali bir necha marta takrorlandi. Shundan so‘ ng yacheyka vakuum tizimiga o‘ rnatilib, termik desorbsiya va sirt ionlashuv jarayonlari o‘ rganildi. Bunday namuna tayyorlash usuli emitter yuzasida moddaning yetarli miqdorda va nisbatan bir tekis taqsimlanishini ta’minlab, o‘ lchash natijalarining takrorlanuvchanligi hamda ishonchliligini oshiradi.

Natijalar va ularning tahlili

Salbutamol molekulasi tarkibida ikkilamchi tret-butilamino guruhi mavjudligi sababli uning sirt ionlashuvi mass-spektrometriyasi (SI/MS) sharoitida samarali ionlashuvi kutilgan edi va tajriba natijalari ushbu taxminni tasdiqladi. 1-rasmda T_{cell}=160°C va T_{em}=1000 K sharoitida qayd etilgan mass-spektr keltirilgan.

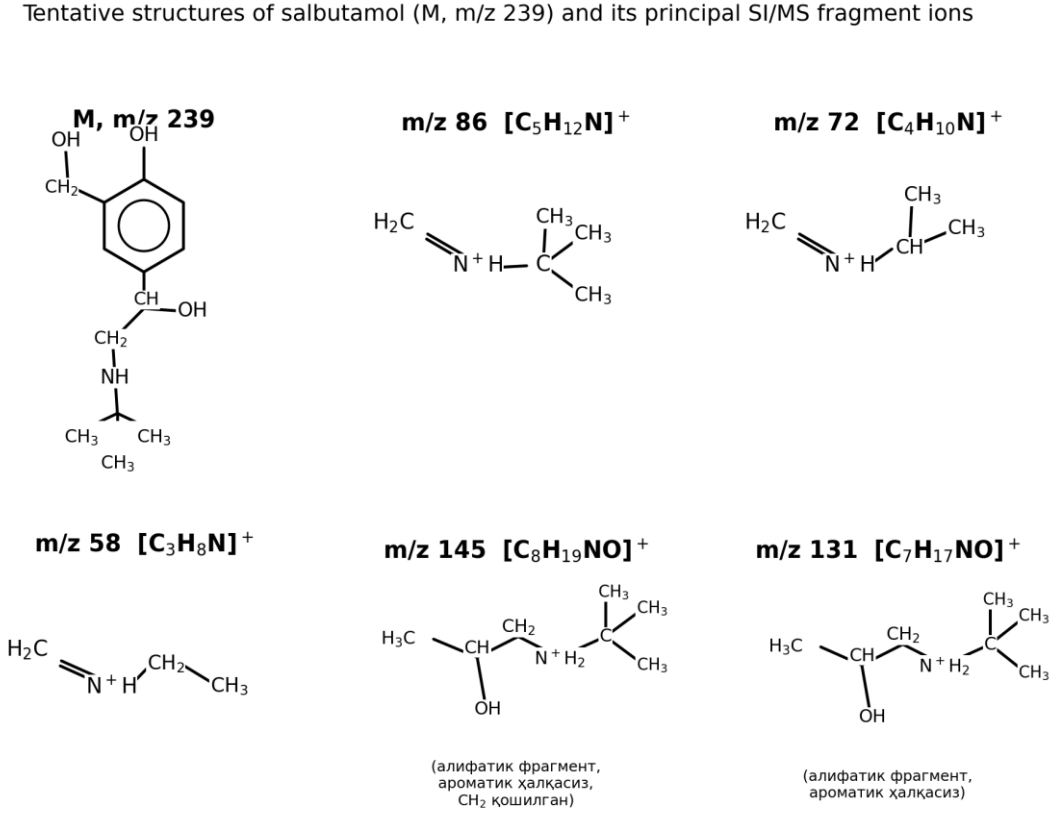


1-rasm. Oksidlangan volfram termoemitteri yuzasida T_{cell}=160°C va T_{em}=1000 K sharoitida olingan salbutamolning SI mass-spektri

Spektrda *m*/*z* 58, 72, 86, 131 va 145 qiymatlarida joylashgan beshta asosiy ion signali hamda chuqur fragmentatsiya natijasida hosil bo‘ lgan bir qator past intensivlikli ionlar kuzatildi. *m*/*z* 86 bazaviy cho‘ qqi bo‘ lib, umumiy intensivlikning 100% ini tashkil qildi, *m*/*z* 58 (taxminan 45%) va m/z 72 (taxminan 24%) o‘ rtacha intensivlikka ega bo‘ ldi, *m*/*z* 131 va 145 ionlarining nisbiy intensivligi esa 15–20% atrofida qayd etildi. **Spektrning muhim xususiyati shundaki, mazkur eksperimental sharoitlarda na molekulyar ion (M^+, m/z 239), na protonlangan molekulyar ion ($[M+H]^+$, *m*/*z* 240) kuzatilmadi. Bu holat salbutamol molekulasining qizdirilgan oksidlangan volfram sirtida intensiv fragmentatsiyalanishini hamda molekulyar ionga nisbatan barqaror fragment ionlarning ustun hosil bo‘ lishini ko‘ rsatadi.**

Aminlarning oksid yuzasida adsorbsiyalanishi azot atomidagi elektron juftining yuza bilan koordinatsion bog‘ lanishi orqali sodir bo‘ lib, qo‘ shni C–N va C–C bog‘ larini zaiflashtiradi hamda musbat zaryadlangan azot saqlovchi ionlar desorbsiyasini yengillashtiradi [9]. Shunga ko‘ ra, *m*/*z* 86 ni ikkilamchi amin guruhiga tutash C_α–C_β bog‘ i uzilishi va aromatik, gidroksil qismning yo‘ qolishi natijasida hosil bo‘ ladigan iminiy kationi $[CH_2{=}NH{-}C(CH_3)_3]^+$ ($C_5H_{12}N^+$, *m*/*z* 86) sifatida sharhlash mumkin. m/z 72 va 58 esa undan CH_2 guruhlarining ketma-ket yo‘ qolishi orqali hosil bo‘ ladigan

gomolog qatorga ($C_4H_{10}N^+$ va $C_3H_8N^+$) tegishli — bu tret-butilamino fragmentining bosqichma-bosqich dezalkillanishiga mos keladi.



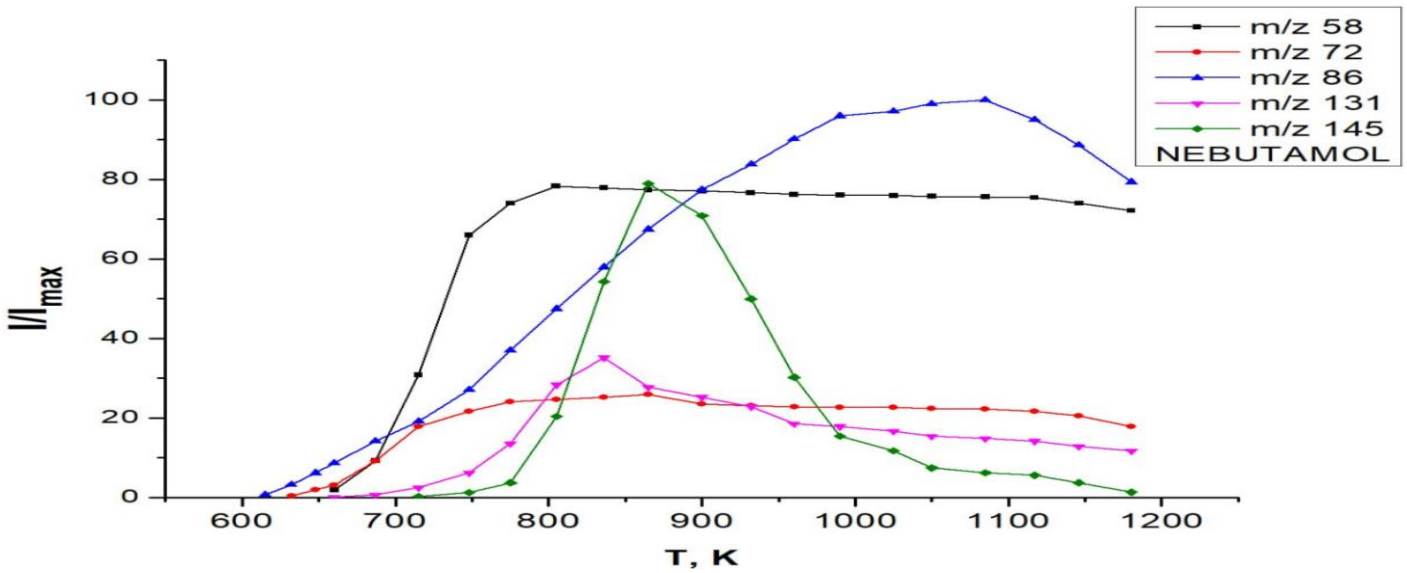
2-rasm. Salbutamolning sirtiy ionlashuv–mass-spektrometriya sharoitida kuzatilgan asosiy fragment ionlarining taklif etilgan hosil bo‘ lish ketma-ketligi

Bunga qarama-qarshi, m/z 131 va 145 aromatik halqani yo‘ qotgan alifatik fragmentlarga mos keladi. Aniq massa hisoblari ularni mos ravishda $C_7H_{17}NO^+$ va $C_8H_{19}NO^+$ formulalariga bog‘ laydi. Ushbu formulalar tret-butilamino zanjiri saqlanib qolgan holda aromatik halqaning katexol tipidagi neytral fragment sifatida ajralishini ko‘ rsatadi. Demak, 86/72/58 qatorini hosil qiluvchi C–N bog‘ i uzilishi bu holatda ham sodir bo‘ ladi, biroq musbat zaryad alifatik fragmentda saqlanadi. Bunday zaryad saqlanishi juftlari formoterol va salmeterol kabi boshqa β_2-agonistlarning ESI-CID fragmentatsiyasida ham kuzatilgan [18]. Taxminiy fragmentatsiya sxemasi 2-rasmda keltirilgan bo‘ lib, u ushbu ishda olingan SI/MS natijalari hamda salbutamol va β_2-agonistlarning mass-spektrometrik fragmentatsiyasi bo‘ yicha adabiyot ma’lumotlari asosida tuzildi [7,9,18].

Adabiyotlarda protonlangan salbutamol (*m*/*z* 240) uchun ESI-CID sharoitida suv va izobutilenning ketma-ket ajralishi natijasida *m*/*z* 222, 166 va 148 ionlari hosil bo‘ lishi ko‘ rsatilgan, DFT hisoblari esa jarayonning β-eliminatsiya orqali boshlanishini tasdiqlaydi [4,18]. SI/MS usulida kuzatilgan 58, 72, 86, 131 va 145 ionlari ESI-CID fragmentlaridan sezilarli farq qiladi, chunki ESI-CID da fragmentatsiya protonlangan ionning to‘ qnashuvi orqali, SI/MS da esa adsorbsiyalangan neytral molekulaning termik faollashuvi natijasida sodir bo‘ ladi. Shunga qaramay, har ikkala usulda ham tret-butilamino zanjiri fragmentatsiyaning asosiy markazi bo‘ lib qoladi [9,18].

Tadqiq etilgan harorat oralig‘ ida molekulyar M^+ va $[M+H]^+$ ionlarining kuzatilmasligi sirt ionlashuvi jarayonida ion hosil bo‘ lishi bilan termik parchalanish o‘ rtasidagi raqobat hamda emitter sirtining chiqish ishi bilan izohlanadi [9]. Volfram oksidlanganda uning chiqish ishi taxminan 4,6 eV dan 6,5 eV gacha ortishiga qaramasdan [11], *m*/*z* 239 va 240 molekulyar ionlarining qayd etilmasligi emitterning chiqish ishini oshirishning o‘ zi molekulyar ionlarni barqaror hosil qilish uchun yetarli emasligini ko‘ rsatadi. Natijada salbutamol sirt ionlashuvi sharoitida molekulyar ion hosil qilishdan ko‘ ra termik fragmentatsiyaga moyillik namoyon etadi va mass-spektrda asosan fragment ionlar kuzatiladi [9].

Termoemitter haroratiga ion toklarining bog‘ liqligi birlamchi va ikkilamchi ionlarni farqlashning asosiy diagnostik vositasi hisoblanadi [9,11]. 3-rasmda besh asosiy ionning normallangan toklarining 600–1200 K oralig‘ idagi bog‘ liqligi ko‘ rsatilgan.



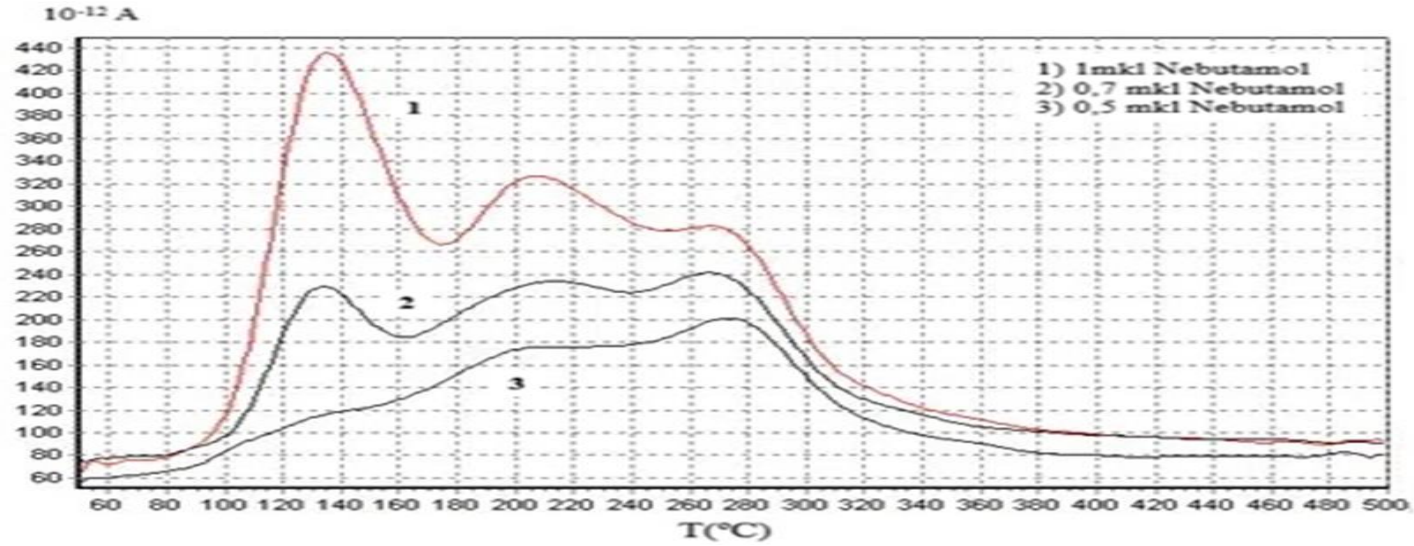
3-rasm. Salbutamolning asosiy ionlari (m/z 58, 72, 86, 131 va 145) normallangan ion toklarining termoemitter haroratiga bog‘ liqligi

Ionlar intensivligining temperaturaga bog‘ liq o‘ zgarishida ikki xil dinamika kuzatildi. *m/z* 58 ioni 650–800 K harorat oralig‘ ida keskin oshib, taxminan 75-78 % darajada barqarorlashdi va 1180 K gacha ushbu darajani saqlab qoldi. *m/z* 86 (bazaviy cho‘ qqi) esa kengroq harorat oralig‘ ida asta-sekin ortib, taxminan 1050-1100 K da maksimal intensivlikka (100%) erishdi, shundan keyin esa biroz pasayish kuzatildi. Bu holat mazkur ionlarning turli harorat bosqichlarida ketma-ket shakllanishini ko‘ rsatadi. *m/z* 72 ioni esa oraliq dinamikani namoyon qilib, taxminan 800 K gacha intensivligi oshib, keyingi haroratlarda 20–26% atrofida deyarli o‘ zgarishsiz saqlandi.

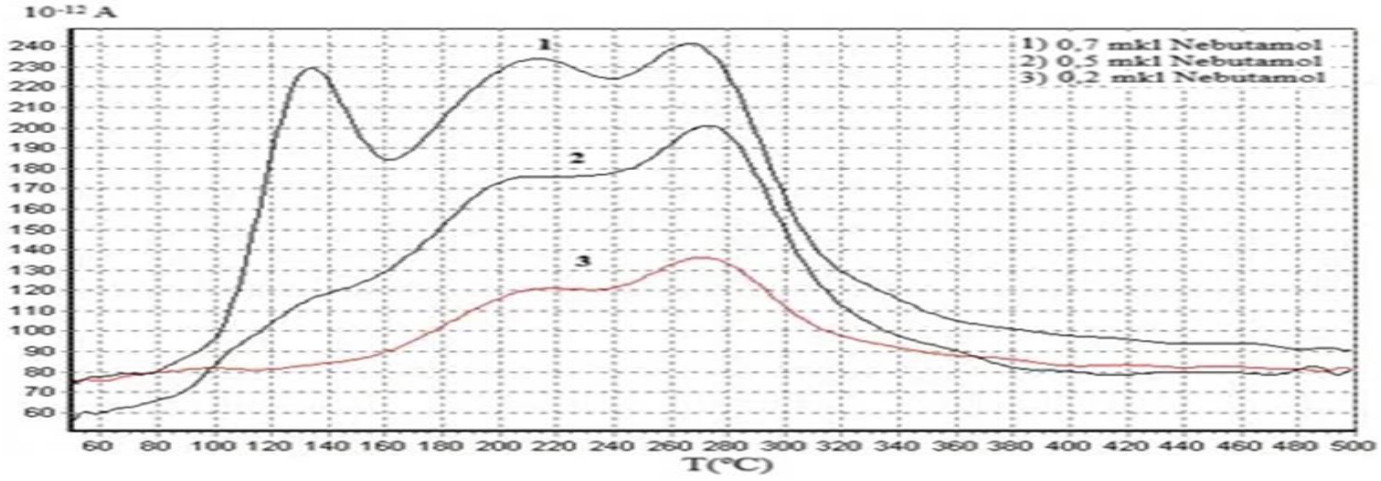
Aksincha, *m/z* 131 va ayniqsa 145 aniq qo‘ ng‘ iroqsimon bog‘ liqlik ko‘ rsatadi: m/z 131 830 K atrofida ~35% maksimumga erishib, 1180 K gacha ~12% gacha pasayadi; *m/z* 145 esa 860–900 K da ~79% keskin maksimumga ko‘ tarilib, keyin deyarli nolgacha tushadi. Bunday egri chiziqlar adsorbsiyalangan qatlamda hosil bo‘ lib qayta parchalanadigan reaktiv oraliq ionlarga xos bo‘ lib, bu imidakloprid va xlordimeform uchun oldin qayd etilgan natijaga o‘ xshaydi [11]. Umuman, *m/z* 145/131 ning erta kamayishi va *m/z* 86/58 ning kechiktirilgan ortishi, og‘ irroq fragmentlarning (145, 131) past haroratda hosil bo‘ lib, yuqori haroratda barqaror past massali ionlarga (86, 72, 58) izchil parchalanish yo‘ liga mos keladi; bu sxemani to‘ liq tasdiqlash uchun qo‘ shimcha monoenergetik yoki metastabil ion o‘ lchovlari talab etiladi.

Termodesorptsion Iskovich qurilmasidagi olingan natijalar. Mustaqil tekshirish sifatida, turli hajmdagi (0,2–1,0 mkl) alikvotlar uchun termodesorbsion tok-harorat bog‘ liqligi ikki turkumda (4- va 5-rasmlar) qayd etildi.

4-rasm. Salbutamol eritmasining 1,0 mkl (1), 0,7 mkl (2) va 0,5 mkl (3) alikvotlari uchun termodesorbsion ion tokining termoemitter haroratiga bog‘ liqligi



5-rasm. Salbutamol eritmasining 0,7 mkl (1), 0,5 mkl (2) va 0,2 mkl (3) alikvotlari uchun termodesorbsion ion tokining termoemitter haroratiga bog‘ liqligi.



Har ikki turkumda ham takrorlanuvchan ikki cho‘ qqili shakl kuzatildi: ~110–120°C da keskin birinchi maksimum (T_{dmax}) va ~200–290°C oralig‘ ida ikki yarim cho‘ qqidan (~210–220°C, ~260–280°C) iborat kengroq ikkinchi maksimum (T_{smax}) [19]. Yuqori hajmda (1,0 mkl) birinchi cho‘ qqi T≈135–140°C da I≈427–432×10^{-12} A, mahalliy minimum T≈165–180°C da I≈267–270×10^{-12} A, ikkinchi cho‘ qqi T≈210–220°C da I≈320–325×10^{-12} A, yelka T≈260–280°C da I≈276–280×10^{-12} A, so‘ ngra T≈400–500°C da I≈100×10^{-12} A gacha kamayadi. 0,7 mkl shu shaklni pastroq amplitudada takrorlaydi (birinchi cho‘ qqi I≈228–230×10^{-12} A). 0,5 mkl da birinchi cho‘ qqi deyarli kuzatilmaydi, tok T≈270–280°C da yagona maksimumga (I≈195–200×10^{-12} A) erishadi; 0,7 va 0,5 mkl egri chiziqlari 5-rasmda ham yaxshi moslik ko‘ rsatdi. 0,2 mkl da esa I≈135–138×10^{-12} A bilan yana ham pastroq yagona maksimum kuzatildi.

Ikki cho‘ qqili shakl yuqori hajmlarda multisloy (T_{dmax} va T_{smax} birga), past hajmlarda esa submonosloyga yaqinlashish (faqat Tsmax) bilan izohlanadi. Ion toki hajmga mutanosib ortdi (1,0>0,7>0,5>0,2 mkl), bu detektorning reproduktiv javobini tasdiqlaydi. Vakuumsiz, atmosfera havosida ishlovchi bu tizim SI/MS dan tubdan farqli prinsipga asoslangan bo‘ lsa-da, natijalarning mustaqil, hajmga sezgir kross-tekshiruvini ta’minladi.

Xulosalar

Keng qo‘ llaniladigan bronxodilatator salbutamol (Nebutamol®) birinchi marta oksidlangan volfram termoemitteri sirtida elektr maydon kuchlanganligi E < 10^4 V/sm sharoitida sirt ionlashuv–mass-spektrometriya (SI/MS) usuli yordamida tadqiq qilindi. Olingan mass-spektrda *m/z* 58, 72, 86, 131 va 145 fragment ionlari aniqlandi, bunda m/z 86 bazaviy cho‘ qqi sifatida qayd etildi. Tadqiq etilgan harorat oralig‘ ida molekulyar M^+ va protonlangan $[M+H]^+$ ionlarning kuzatilmasligi salbutamolning sirt ionlashuvi jarayonida termik fragmentatsiya ustunligini ko‘ rsatdi.

Ionlar intensivligining haroratga bog‘ liq o‘ zgarishi fragment ionlarning hosil bo‘ lish qonuniyatlarini aniqlash imkonini berdi. Xususan, *m/z* 58, 72 va 86 ionlari keng harorat oralig‘ ida yuqori barqarorlik namoyon etgan bo‘ lsa, *m/z* 131 va 145 ionlari ma’lum haroratlarda maksimal intensivlikka erishib, keyinchalik kamayishi ularning termik parchalanishning oraliq mahsulotlari ekanligidan dalolat berdi.

Olingan natijalar salbutamolning sirt ionlashuvi jarayonida hosil bo‘ ladigan xarakterli fragment ionlarni aniqlash, ularning haroratga bog‘ liq hosil bo‘ lish qonuniyatlarini tavsiflash hamda SI/MS usulining β_2-agonistlarni identifikatsiya qilishdagi analitik imkoniyatlarini kengaytiradi. Kelgusi tadqiqotlar salbutamolning ionlashuv energiyasi va sublimatsiya issiqligini Arrenius tenglamasi asosida miqdoriy baholash, shuningdek, turli termoemitterlarda olingan natijalarni zamonaviy mass-spektrometrik usullar bilan qiyosiy tahlil qilishga imkon beradi.

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BL LAC 2200+420 SHAKLLANAYOTGAN GALAKTIKA RAQAMLI MA’LUMOTLARINING FOTOMETRIYASI

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Annotatsiya*: Ushbu maqolada Maydanak balandtog‘ observatoriyasida xalqaro WEBT loyihasi doirasida olib borilgan kuzatuvlar asosida BL Lac 2200+420 blazarining fotometrik tadqiqoti natijalari bayon etilgan. Tadqiqotning maqsadi IRAF dasturiy paketida tasvirlarga birlamchi ishlov berish orqali obektning ko‘ p rangli ravshanlik egri chiziqlarini qurish va uning o‘ zgaruvchanlik qonuniyatlarini aniqlashdan iborat. Maqolada blazarning qisqa va uzoq muddatli o‘ zgaruvchanlik xususiyatlari hamda undagi relyativistik jet dinamikasi ilmiy tahlil qilingan.*

Kalit so‘ zlar*: yadrosi aktiv galaktikalar, blazarlar, BL Lac 2200+420, Maydanak observatoriyasi, IRAF dasturi, fotometriya, ravshanlik egri chizig‘ i, WEBT loyihasi.*

ФОТОМЕТРИЯ ЦИФРОВЫХ ДАННЫХ ФОРМИРУЮЩЕЙСЯ ГАЛАКТИКИ BL LAC 2200+420

Аннотация: В данной статье представлены результаты фотометрического исследования блазара BL Lac 2200+420 на основе наблюдений, проведенных на высокогорной обсерватории Майданак в рамках международного проекта WEBT. *Целью исследования является построение многоцветных кривых блеска и определение закономерностей переменности объекта путем первичной обработки изображений в программном пакете IRAF.* В работе научно проанализированы характеристики краткосрочной и долгосрочной переменности блазара, а также динамика его релятивистских джетов.

Ключевые слова: *активные ядра галактик, блазары, BL Lac 2200+420, обсерватория Майданак, программа IRAF, фотометрия, кривая блеска, проект WEBT.*

PHOTOMETRY OF DIGITAL DATA FROM THE FORMING GALAXY BL LAC 2200+420

Annotation: This article presents the results of a photometric study of the blazar BL Lac 2200+420 based on observations conducted at the Maidanak High-Altitude Observatory within the international WEBT project. *The research aims to construct multi-band light curves and determine the object’s variability patterns through data reduction using the IRAF software package.* The paper scientifically analyzes the short-term and long-term variability characteristics of the blazar, along with its relativistic jet dynamics.

Key words: *Active Galactic Nuclei, blazars, BL Lac 2200+420, Maidanak Observatory, IRAF software, photometry, light curve, WEBT project.*

Kirish

Ko‘ pgina galaktikalar markazlarida juda katta qora tuynuklarga ega deb hisoblanadi. Ushbu qora tuynuklar ichiga spiral tushadigan materiallardan iborat bo‘ lgan to‘ planish disklari muzokara qilinadi va mavjud deb topiladi. Materiallar to‘ planish diskiga tushganda, ishqalanish va tortishish kuchlari ta’sirida isitiladi [2:118]. Buning natijasida hosil bo‘ lgan energiya kvazarning markazida otilib chiqadi [2:120].

Kvazar galaktika markazidagi o‘ ta massiv qora tuynuk atrofida uni quvvatlantirish, energiya ishlab chiqarish, yig‘ ish diskiga tushishi uchun yetarli material bo‘ lganda hosil bo‘ ladi. Ma’lum bo‘ lgan kvazarlar juda uzoq galaktikalar

bo‘ lib, ulardan yorug‘ lik bizga milliardlab yillar davomida yetib kelgan. Kvazar–markazi qora tuynukli galaktika bo‘ lib, uning to‘ planish diski–qora tuynuk ichiga aylanadigan materiyaga ega.

Blazar bu–kvazarning hususiy holi bo‘ lib, u o‘ zidan o‘ ta kuchli plazma nurlarini taratadi [4:812]. Blazar taratayotgan plazma oqimini relyatvistik oqim deb ham ataladi [2:132]. Bunda, kvazar markazida ikkita nur o‘ zaro qarama–qarshi ikki tarafga favqulodda kuchli quvvat va shiddat bilan otilib chiqib turgan bo‘ ladi [4:815].

Ushbu plazma oqimi o‘ zining yo‘ lidan chiqqan har qanday jismni yo‘ q qilib yuborishi mumkin. “Blazar” nomi kvazar, hamda, BL–kaltakesak (BL Lacertae) nomlaridan yasalgan. Umuman aytganda, kuzatuvlar orqali blazarlarning tabiati, ularning tuzilishi, ularda kechayotgan yadroviy jarayonlar va ulardagi energiya manbalari o‘ rganiladi [2:140]. Blazarlar tadqiqoti galaktikalarning kelib chiqishi hamda ularning evolyutsiyasini yanada chuqurroq o‘ rganishga imkon beradi.

Blazarlar bo‘ yicha yana bir muammo ulardagi akretsion disklar muammosini to‘ liq yechimi topilmaganidir [1:105]. Shu va shunga o‘ xshash muommolarni yechish uchun blazarlarni tadqiq qilish va fotometrik kuzatuvlar olib borish o‘ z dolzarbligini yo‘ qotmagan. Shu borada ushbu ishda BL Lac 2200+420 nomli blazarining fotometrik tadqiqoti olib borildi.

Adabiyotlar tahlili

Ushbu tadqiqotda bajarilgan ishlar O‘ zR FA Astronomiya institutining “Galaktikadan tashqi astronomiya” bo‘ limi xodimlari Maydanak balandtog‘ observatoriyasida Whole Earth Blazar Telescope (WEBT) xalqaro dasturining faol ishtirokchisi hisoblanadi. Blazarlarni kuzatuv ishlari va ushbu ob’yektlarning tasvirlarini kompyuterda IRAF dasturi yordamida qayta ishlash loyihasi bilan uzviy bog‘ liqdir.

Tadqiqotning bosh maqsadi - BL Lac 2200+420 blazari bo‘ yicha olingan kuzatuv ma’lumotlar tasvirlarini tahlil qilish va ravshanlik egri chiziqlarini hosil qilishdan iborat. Ko‘ rsatilgan maqsadlarga erishish uchun quyidagi vazifalar belgilangan:

- Blazarlar tabiati, turlari haqida ma’lumotlar to‘ plash va o‘ rganish;
- IRAF dasturida fotometrik tahlil etishni o‘ rganish;
- BL Lac 2200+420 blazari bo‘ yicha olib borilgan ilmiy ishlarni o‘ rganish [4:820];
- Maydanak balandtog‘ observatoriyasida olib borilgan kuzatuv natijalarini o‘ rganish;
- Fotometrik tahlil usullarini o‘ rganish [2:145];
- BL Lac 2200+420 blazarining ravshanlik egri chiziqlarini hosil qilish.

Tadqiqot ob’yekti sifatida BL Lac 2200+420 blazari tanlangan [4:822], tadqiqot predmeti esa ushbu ob’yekt bo‘ yicha olingan raqamli tasvirlar ko‘ rinishidagi kuzatuv natijalaridir. Ushbu ishda raqamli fotometrik usullari va IRAF dasturlar to‘ plamidan foydalanilgan. Bu usullar va dasturiy ta’minot zamonaviy astrofizika fotometriyasida standart deb qabul qilingan, chunki ular eng ishonarli va aniq natijalarni beradi [2:150].

Tadqiqot metodologiya

Tadqiqotda O‘ zR FA Astronomiya institutining “Galaktikadan tashqi astronomiya” bo‘ limi xodimlari tomonidan Maydanak balandtog‘ observatoriyasida *Whole Earth Blazar Telescope* (WEBT) xalqaro dasturi doirasida olingan kuzatuv ma’lumotlarining sifatini baholash va ularni qayta ishlash tizimi tahlil qilindi.

Tadqiqotning bosh maqsadi — **BL Lac 2200+420 blazari** bo‘ yicha olingan tasvirlarni tahlil qilish va ob’yektning ravshanlik egri chiziqlarini hosil qilishdan iborat. Ushbu maqsadga erishish uchun tadqiqotda qiyosiy, tizimli yondashuv hamda raqamli astrofizikaviy tahlil usullaridan foydalanildi.

Tadqiqot ob’yekti sifatida BL Lac 2200+420 blazari tanlangan bo‘ lsa [4:822], tadqiqot predmeti — ushbu ob’yekt bo‘ yicha olingan raqamli tasvirlar ko‘ rinishidagi kuzatuv natijalaridir.

Metodologik jihatdan belgilangan vazifalarni hal etish uchun quyidagi bosqichma-bosqich yondashuvlar amalga oshirildi:

1.**Nazariy-qiyosiy tahlil:** Blazarlar tabiati, ularning turlari va BL Lac 2200+420 ob’yekti bo‘ yicha olib borilgan ilmiy ishlar [4:820], shuningdek, Maydanak observatoriyasining kuzatuv natijalari tizimli o‘ rganildi va qiyoslandi.

2.**Dasturiy-texnikaviy yondashuv:** Kuzatuv ma’lumotlarini kompyuterda qayta ishlash loyihasi doirasida zamonaviy astrofizikada standart deb qabul qilingan **IRAF** (*Image Reduction and Analysis Facility*) dasturlar to‘ plamidan foydalanildi [2:150].

3.**Eksperimental-matematik usullar:** Ob’yekt tasvirlariga raqamli fotometrik tahlil usullarini [2:145] qo‘ llash orqali astrofizikaviy jarayonlar modellashtirildi va yakunda blazarning ravshanlik egri chiziqlari hosil qilindi.

Ushbu qo‘ llanilgan raqamli fotometriya usullari va dasturiy ta’minot kombinatsiyasi tadqiqot natijalarining yuqori darajada ishonchli va aniq bo‘ lishini ta’minlaydi [2:150].

NATIJA VA MUHOKAMA

Ushbu maqolada BL Lac 2200+420 blazari bo‘ yicha, Maydanak balandtog‘ observatoriyasida olib borilgan kuzatuv ma’lumotlari muvaffaqiyatli fotometrik tahlil etildi. Fotometrik tahlil natijasida quyidagi muhim ilmiy natijalar qo‘ lga kiritildi:

• BL Lac 2200+420 blazarini o‘ rganishda zarur bo‘ ladigan fundamental ma’lumotlar va zamonaviy nazariya elementlari o‘ rganildi. Ushbu ma’lumotlar asosida obyekt fizikasiga oid kerakli tushunchalar olindi;

• Tasvirlarga ishlov berish va fotometrik tahlil o‘ tkazishda xalqaro standart hisoblangan IRAF dasturida ishlash ko‘ nikmasi to‘ liq shakllantirildi;

• 2020-yil iyun oyida BL Lac 2200+420 obyekti bo‘ yicha Maydanak observatoriyasida to‘ plangan raqamli kuzatuv ma’lumotlari fotometrik tahlil etildi va mos holda aniq ravshanlik egri chiziqlari chizildi;

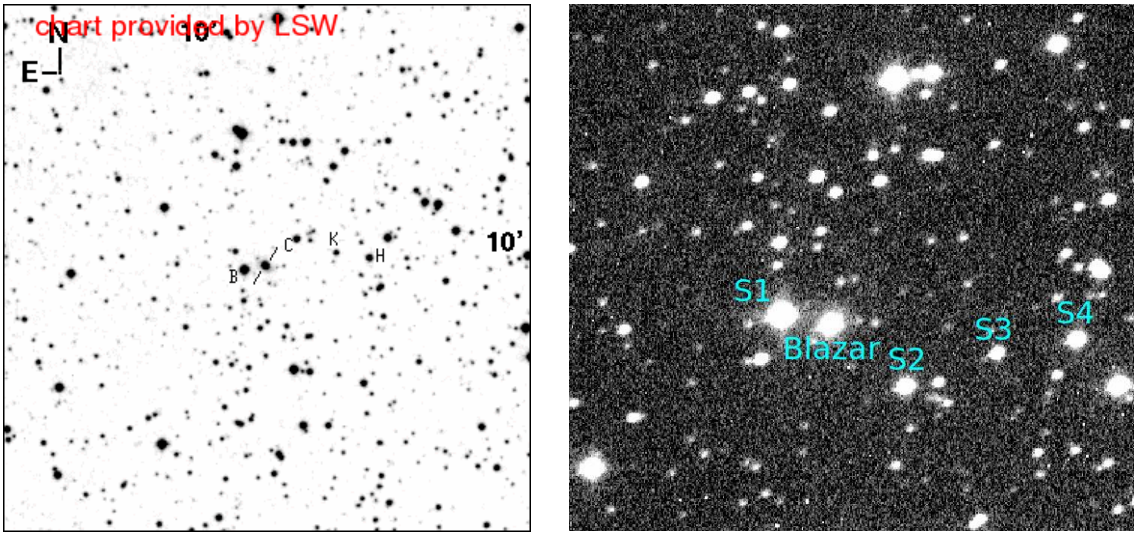
• Kuzatuv davrida blazarning optik ravshanligi doimo oshib borgani aniqlandi va bir oy davomida o‘ zgarish amplitudasi 0,75m yulduz kattaligini tashkil etdi [4:825]. Bu ko‘ rsatkich blazardan chiqayotgan energiya miqdori bir oy davomida salkam ikki barobarga oshganini ko‘ rsatadi [2:155].

Tadqiqot doirasida BL Lac 2200+420 nomli blazar bo‘ yicha to‘ rtta (B, V, R, I) filtrdagi ravshanlik egri chiziqlari olindi va ob’yektning umumiy ravshanlik egri chizig‘ i hosil qilindi. Mana shu olingan ravshanlik egri chiziqlari hamda Δm qiymatlari yordamida obyektning nisbiy energiya miqdori aniqlandi [1:112].

Qo‘ lga kiritilgan ilmiy natijalar BL Lac 2200+420 blazarining individual xususiyatlarini o‘ rganishga va shu bilan birga boshqa shunga o‘ xshash faol galaktika yadrolari fizikasini chuqurroq tushunishga xizmat qiladi. Mazkur natijalar O‘ zR FA Astronomiya institutining “Galaktikadan tashqi astronomiya” bo‘ limi xodimlari tomonidan Maydanak balandtog‘ observatoriyasida olib borilayotgan blazarlarni muntazam kuzatuv ishlari va tasvirlarni kompyuterda qayta ishlash dasturlari doirasida tahlil qilindi.

BL Lac 2200+420 blazarlarning kuzatuv ma’lumotlari

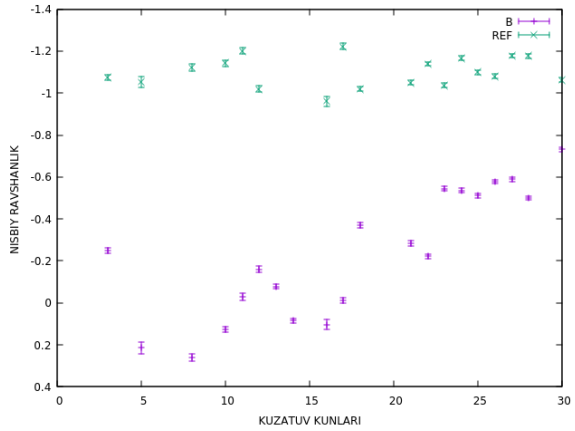
Ob’yektimiz BL Lac 2200+420 blazarini to‘ rt filter (B, V, R, I) lardagi tayanch yulduzlarga nisbatan bir oy davomida yulduz kattaligini o‘ zgarishi aniqlandi. 1-rasmda BL Lac 2200+420 blazarini kataloglardagi tasviri (1-a-rasm), va teleskopda olingan tasviri (1-b-rasm).



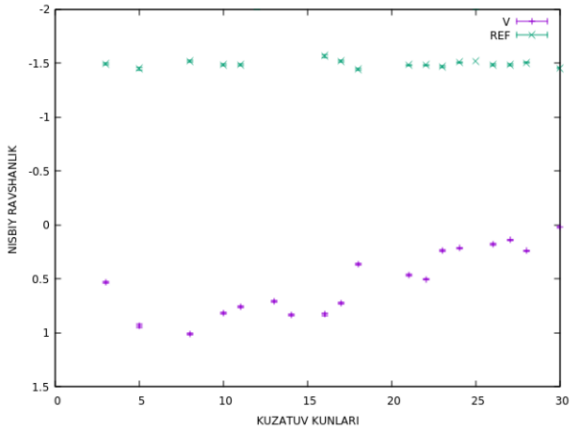
a. b.

1-rasm. a) BL Lac 2200+420 blazarining kataloklardagi tasviri b) telesko‘ pda olingan tasvir

2-rasmda BL Lac 2200+420 blazarini B filterdagi ravshanlik egri chizig‘ i va S1 referend yulduzning ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida o‘ rganilgan maximum -0.59^m ga ko‘ tarilib, minumim 0.29^m ga tushgan [4:828]. BL Lac 2200+420 Blazari va tayanch yulduzlarning B filtrdagi fotometriyasi natijalari va nisbiy ravshanligi[2:158]. Bu yerda JD – yulian kunlari S1, S2, S3 tayanch yulduzlarini yulduz kattaliklari, S1err, S2err, S3err tayanch yulduzlarini yulduz kattaliklari xatoligi, hamda ob’yektimizni yulduz kattaligi va xatoligi keltirilgan.

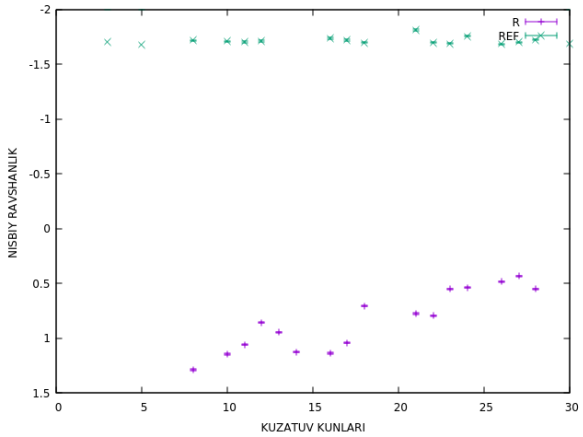


2-rasm

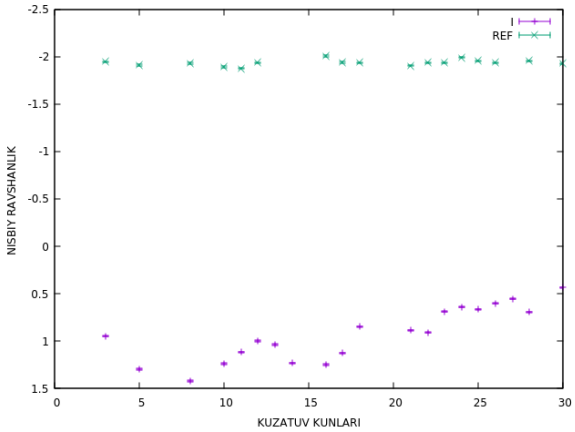


3-rasm

3-rasmda BL Lac 2200+420 blazarini V filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum 0.29^m ga ko‘ tarilib, minumim 1^m ga tushgan. BL Lac 2200+420 blazari va tayanch yulduzlarning V filtrdagi fotometriyasi natijalari va nisbiy ravshanligi. Bu yerda JD – yulian kunlari S1, S2, S3 tayanch yulduzlarini yulduz kattaliklari, S1err, S2err, S3err tayanch yulduzlarini yulduz kattaliklari xatoligi, hamda ob’yektiimizni yulduz kattaligi va xatoligi keltirilgan.



4-rasm



5-rasm

4-rasmda BL Lac 2200+420 blazarini R filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum 0.59^m ga ko‘ tarilib, minumim 1.31^m ga tushgan. BL Lac 2200+420 Blazari va tayanch yulduzlarning V filtrdagi fotometriyasi natijalari va nisbiy ravshanligi. Bu yerda JD – yulian kunlari S1, S2, S3 tayanch yulduzlarini yulduz kattaliklari, S1err, S2err, S3err tayanch yulduzlarini yulduz kattaliklari xatoligi, hamda ob’yektiimizni yulduz kattaligi va xatoligi keltirilgan.

5-rasmda BL Lac 2200+420 blazarini I filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum 0.62^m ga ko‘ tarilib, minumim 1.42^m ga tushgan. BL Lac 2200+420 Blazari va tayanch yulduzlarning I filtrdagi fotometriyasi natijalari va nisbiy ravshanligi. Bu yerda JD – yulian kunlari S1, S2, S3 tayanch yulduzlarini yulduz kattaliklari, S1err, S2err, S3err tayanch yulduzlarini yulduz kattaliklari xatoligi, hamda ob’yektimizni yulduz kattaligi va xatoligi keltirilgan.

To‘ rt filterdagi minimal va maximal o‘ zgarishlar oralig‘ i 1-javalda keltirildi.

1-jadval. BL Lav 2200+420 blazarning yorqinlig o‘ zgarish amplitudalari har bir filtir bo‘ yicha

Filter	B		V		R		I	
Yulduz kattaligini o‘ zgarishi	Min=m^v	Max=m^v	Min=m^v	Max=m^v	Min=m^v	Max=m^v	Min=m^v	Max=m^v
	-0.59	0,29	0.29	1	0.59	1.31	0.62	1.42
Δm	0,88		0,71		0,72		0,8	
ΔE	693,28		3319,9		2966,3		1333,5	

Ushbu jadval asosida quydagi hulosaga kelish mumkun; eng avvalo har bir filtir bo‘ yicha yulduz kattaligini o‘ zgarishi aniqlandi. $\Delta m=m_2-m_1$ fo‘ rmulasi orqali. So‘ ng esa ushbu yulduz kattaligining o‘ zgarishidan energiya o‘ zgarishi aniqlandi.

$$m_2 - m_1 = 2{,}5lg\frac{1}{\Delta E}$$

$$\Delta E = 10^{\frac{m_2-m_1}{2{,}5}}$$

Yuqorida ko‘ rsatilgan fo‘ rmula orqali energiya o‘ zgarishi aniqlanib quydagi xulosa kelindi. Bir oy ichida ob’yektning B filtirdagi enrergiya miqdori salkam 700 marta nurlanayotgani, V filtirdagi energiya miqdori 3000 martadan ortiq nurlanayotgani, R filtirdagi energiya miqdori salkam 3000 martaga yaqin nurlanayotgani, I filtirdagi energiya miqdori esa 1300 martadan ortiq nurlanayotganini ko‘ rishimiz mumkun. Bundan umumiy hulosa qilib obyektimiz 2000 martadan ortiq nurlanib bir oy davomida faqat energiyasi oshib borayotganini ko‘ rishimiz mumkun.

XULOSA

Ushbu maqola ishimning bajarilishi natijasida. BL Lac 2200+420 blazari bo‘ yicha Maydanak observatoriyasidagi Zees-600 telesko‘ pi orqali 2020-yil iyun oyida olib borilgan kuzatuv ma’lumotlari fotometrik tahlil etildi. Fotometrik tahlil natijasida quyidagilar qo‘ lga kiritildi:

1. Yadrosi aktiv galaktikalarni o‘ rganishda zarur bo‘ ladigan ma’lumotlar va nazariya elementlari o‘ rganildi. BL Lac 2200+420 blazari bo‘ yicha chop etilgan ishlar o‘ rganilda va tahlil etildi.
2. 2020 -yil iyun oyi bo‘ yicha Maydanak observatoriyasida to‘ plangan kuzatuv ma’lumotlari fotometrik tahlil etildi va mos holda ravshanlik egri chiziqlari chizildi.
3. BL Lac 2200+420 blazarini fotometrik tahlili natijasida 4 ta filtirdagi ravshanlik egri chizig‘ i aniqlandi.
4. BL Lac 2200+420 blazarini B filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum -0.59^m ga ko‘ tarilib, minumim 0.29^m ga tushgan.
5. BL Lac 2200+420 blazarini V filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum 0.29^m ga ko‘ tarilib, minumim 1^m ga tushgan.
6. BL Lac 2200+420 blazarini R filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum 0.59^m ga ko‘ tarilib, minumim 1.31^m ga tushgan.
7. BL Lac 2200+420 blazarini I filterdagi ravshanlik egri chizig‘ i berilgan, bu filterdagi yulduz kattaligini o‘ zgarish oralig‘ i bir oy davomida maximum 0.62^m ga ko‘ tarilib, minumim 1.42^m ga tushgan.
8. O‘ rganilgan blazarimiz ravshanligi maksimumi binafsha diapazonga to‘ g‘ ri kelar ekan (B filtr). Undan kegin visual diapazonga to‘ g‘ ri keladi. Qizil va infra qizil diapazonlarda ravshanliklari bir- biriga yaqin bo‘ lib, qolganlariga nisbatan eng xira ekan (ob’yekt). Shundan V filtr dagi yulduz kattaliklar o‘ rtacha B filtrdan 0.7^m yulduz kattaligiga xiraroq I filt va R filtrda esa xattoki 1^m gacha xiraroq. Kuzatuv davrida blazarning ravshanligi doimo oshib brogan va bir oy davomida o‘ zgarish amplitudasi 0.75^m yulduz kattaligini tashkil etadi. Bu degani blazardan chiqayotgan energiya miqdori bir oy davomida ikki barovarga oshganini ko‘ rsatadi.

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BIR TUR “DIFFERENSIAL KVADRATURA” FORMULALARINING QIYOSIY TAHLILI TO‘ G‘ RISIDA

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Annotatsiya. *Ushbu maqolada aniq integrallarni taqribiy hisoblashda qo‘ llaniladigan kvadratura formulalarining ayrim turlari o‘ zaro qiyosiy jihatdan tahlil qilingan. Tadqiqotning asosiy maqsadi “differensial” kvadratura formulalari deb ataluvchi formulalar bilan Teylor–Makloren qatorlari asosida hosil qilingan taqribiy formulalar o‘ rtasidagi bog‘ liqlikni aniqlashdan iborat. Mualliflar hisoblash matematikasining muhim yo‘ nalishlaridan biri bo‘ lgan aniq integrallarni taqribiy hisoblash masalasini nazariy va amaliy jihatdan yoritib, ushbu formulalarning tuzilishi hamda hosil qilinish mexanizmlarini o‘ rganadilar. Mazkur tadqiqot kvadratura formulalarining algebraik xossalarini chuqurroq anglashga xizmat qiladi.*

Kalit so‘ zlar. *Kvadratura formulasi, chap bir nuxtali formular, o‘ ng bir nuxtali formula, aniq integral, Teylor formulasi, Makloren formulasi.*

О СРАВНИТЕЛЬНОМ АНАЛИЗЕ ОДНОГО ТИПА «ДИФФЕРЕНЦИАЛЬНЫХ КВАДРАТУРНЫХ» ФОРМУЛ

Аннотатsiя: *В данной статье проводится сравнительный анализ некоторых типов квадратурных формул, используемых при приближенном вычислении определенных интегралов. Основная цель исследования – определить связь между так называемыми «дифференциальными» квадратурными формулами и приближенными формулами, созданными на основе рядов Тейлора-Маклорена. Авторы освещают с теоретической и практической точки зрения проблему приближенного вычисления определенных интегралов, являющуюся одной из важных областей вычислительной математики, а также изучают структуру и механизмы образования этих формул. Данное исследование служит углублению понимания алгебраических свойств квадратурных формул.*

Ключевые слова. *Квадратурная формула, левая одноточечная формула, правая одноточечная формула, точный интеграл, формула Тейлора, формула Маклорена.*

ON A COMPARATIVE ANALYSIS OF A TYPE OF "DIFFERENTIAL QUADRATURE" FORMULAS

Abstract. *This article provides a comparative analysis of some types of quadrature formulas used in the approximate calculation of definite integrals. The main goal of the study is to determine the relationship between the so-called “differential” quadrature formulas and approximate formulas created on the basis of Taylor-Maclaurin series. The authors cover from a theoretical and practical point of view the problem of approximate calculation of definite integrals, which is one of the important areas of computational mathematics, and also study the structure and mechanisms of formation of these formulas. This study serves to deepen the understanding of the algebraic properties of quadrature formulas.*

Keywords: *Quadrature formula, left one-point formula, right one-point formula, definite integral, Taylor formula, Maclaurin formula.*

Hisoblash matematikasi shunday sohaki, bunda asosan sonli metodlar, ya’ni masala yechimini sonli natijagacha keltirish usullari o‘ rganiladi. Bu jarayon faqatgina ilmiy jihatdangina emas, balki katta amaliy qiziqish ham uyg‘ otadiki, zero hisoblash – san’at hamdir.

Matematikada shunday xarakterdagi masalalar borki, masalan tub sonlarga doir mashxur muammolar. Shuningdek, yana, masalan tenglamalarni butun sonlarda yechish kabi masalalar uzoq vaqtlar davomida matematiklar dunyosida huddi sportga bo‘ lgan qiziqish singari “jo‘ shqin” qiziqish uyg‘ otib kelgan.

Xuddi shuningdek, hisoblash matematikasining “Aniq integrallarni taqribiy hisoblash” bo‘ limi borki, bu bo‘ lim kvadratura, kubatura, formulalarini o‘ rganish va qurish masalalari bilan shug‘ ullanadi. Bu mavzu, ya’ni aniq integrallar uchun taqribiy formulalar qurish jarayoni va uning metodik jihatlari, hech qanday mubolag‘ asiz aytish mumkinki, doimo ijodiy ilhom manbai bo‘ lib kelgan.

Aniq integrallar uchun qurilgan taqribiy formulalarning an’anaviy turlari bilan bir qatorda yana shunday formulalar borki bu formulalar integral ostidagi funksiya va uning hosilalarining faqatgina integrallash oralig‘ ining ikki chetki nuqtalaridagi qiymatlarinigina o‘ z ichiga olgan bo‘ lib, bu tur fo‘ rmulalar ham o‘ ziga xos jiddiy qiziqish uyg‘ otadi. [1-6]

Ma’lumki, an’anaviy kvadratura formulalarining qurilishi interpolyatsion ko‘ phadlarga asoslanishi, boshqa turdagi formulalar esa ketma-ket bo‘ laklab integrallash usuli yordamida hosil qilinishi ta’kidlangan. Shuningdek, ayrim formulalarda integral ostidagi funksiya va uning hosilalarining faqat integrallash oralig‘ ining chetki nuqtalaridagi qiymatlaridan foydalanilishi ko‘ rsatiladi. Bu esa tugun nuqtalarini tanlash zaruratini kamaytiradi va formulalarning amaliy qo‘ llanish imkoniyatlarini kengaytiradi.

Shuni qayd etish ketakki, [5] da qaralayotgan kvadratura formulasi integral osti funksiyasi f(x) mansub bo‘ lgan sohada eng yaxshi formula deb atalib, uni qurish usuli formula qoldiq hadini u o‘ z ichiga olgan noma’lum koeffitsiyentlarga nisbatan minimallashtirishga asoslangan.

Ammo, [4, 6] larda qaralgan kvadratura formulalarining qurilishi esa, ularning, darajasi 2n gacha bo‘ lgan ko‘ phadlarni aniq integrallash prinsipiga asoslangan bo‘ lib, bu formulalar eng yuqori algebraik daraja aniqligidagi kvadratura formulalari deb ataladi.

Maqolada, ba’zi bir kvadratura formulalari o‘ zaro formal tuzilishlarining o‘ xshashliklari o‘ rganiladi.

Ya’ni, “differensial” kvadratura formulalari deb ataluvchi formula bilan Teylor - Makloren formulalari yordamida qurilgan taqribiy formulalar orasidagi o‘ xshashlik ko‘ rsatiladi.

Yuqoridagi [4] dan ushbu

$$I = \int_0^1 f(x)dx, \tag{1}$$

integral uchun chap bir nuqtali formulani keltiramiz:

$$I_0 = \sum_{k=0}^{2n-1} A_{k,0} f^{(k)}(0), \tag{2}$$

bunda

$$A_{k,0} = (-1)^k \sum_{i=0}^{k} (-1)^i \frac{\Gamma(1)}{\Gamma(k-i+2)}.$$

(2) ni yoyib yozilsa:

$$I_0 = \frac{1}{1!} f(0) + \frac{1}{2!} f'(0) + \frac{1}{3!} f''(0) + \ldots + \frac{1}{(n+1)!} f^{(n)}(0). \tag{3}$$

Endi (1) integral uchun integral ostidagi f (x) funksiya uning Makloren formulasi yoyilmasi bilan almashtirilib hosil qilingan formulani qaraylik:

$$f(x) = f(0) + \frac{f'(0)}{1!}x + \frac{f''(0)}{2!}x^2 + \ldots + \frac{f^{(n)}(0)}{n!}x^x,$$

$$I_0' = \int_0^1 \left(f(0) + \frac{f'(0)}{1!}x + \frac{f''(0)}{2!}x^2 + \ldots + \frac{f^{(n)}(0)}{n!}x^n \right) dx,$$

va bundan hosil qilamiz:

$$I_0' = \frac{f(0)}{1!} + \frac{f'(0)}{2!} + \frac{f''(0)}{3!} + \ldots + \frac{f^{(n)}(0)}{(n+1)!}. \tag{4}$$

Ajablanarlisi shundaki, (3) va (4) formulalarning o‘ zaro ustma-ust tushishi, ya’ni ularning o‘ zaro aynan tengligi ko‘ rinib turibdi. Aslida (3) formula bo‘ laklab integrallash usuli bilan qurilgan [4]. Ammo (4) formula esa butunlay boshqa usul, ya’ni, ko‘ rganimizdek integral osti funksiyasini taqriban Makloren formulasi bilan almashtirish orqali hosil qilingan.

Endi esa (1) integral uchun o‘ ng bir nuqtali kvadratura formulasini keltiramiz [4]:

$$I_1 = \sum_{k=0}^{2n-1} B_{k,1} f^{(k)}(1),$$

bunda

$$B_{k,1} = \frac{(-1)^k \Gamma(1)}{\Gamma(k+2)}.$$

Bu formulaning yoyilgan ko‘ rinishi esa:

$$I_1^{'} = \frac{f(1)}{1!} - \frac{f^{'}(1)}{2!} + \frac{f^{''}(1)}{3!} - \frac{f^{''}(1)}{3!} + \ldots + \frac{f^{(n)}(1)}{(n+1)!}. \quad (5)$$

Bu formulani huddi shu (1) integral uchun integral osti funksiyasi $f(x)$ ni $a = 1$ xol uchun Teylor formulasi bilan almashtirib, hosil qilingan taqribiy formulani keltiramiz:

$$f(x) \approx f(1) + \frac{f^{'}(1)}{1!}(x-1) + \frac{f^{''}(1)}{2!}(x-1)^2 + \ldots + \frac{f^{(n)}(1)}{n!}(x-1)^n,$$

ya'ni

$I = \int_0^1 f(x)\,dx \approx \int_1^1 \left[f(1) + \frac{f^{'}(1)}{1!}(x-1) + \frac{f^{''}(1)}{2!}(x-1)^2 + \ldots + \frac{f^{(n)}(1)}{n!}(x-1)^n\right]dx$, bundan

$$I_1^{'} = \frac{f(1)}{1!} - \frac{f^{'}(1)}{2!} + \frac{f^{''}(1)}{3!} - \frac{f^{'''}(1)}{4!} + \ldots + (-1)^n \frac{f^{(n)}(1)}{(n+1)!}(x-1)^n, \quad (6)$$

hosil bo' ladi.

Bu holda ham (5) va (6) kvadratura formulalarning o' zaro aynan teng ekanligi ko' rinib turibdi:

$$I_1 = I_1^{'}.$$

Aniq integrallarni taqribiy hisoblash formulalari, ya'ni ikki xil kvardatura formulalari, hosil qilinishlariga ko' ra o' zaro butunlay boshqa-boshqa usullar bilan qurilgan bo' lsada, ularning aynan bir xil ekanliklari albatta, ham nazariy va ham amaliy qiziqish uyg' otadi.

Maqolaning ilmiy yangiligi shundaki, bir-biridan mutlaqo farq qiluvchi matematik yondashuvlar yordamida hosil qilingan formulalarning o' zaro ekvivalentligi nazariy jihatdan asoslab berilgan. Olingan natijalar aniq integrallarni hisoblashning yangi usullarini ishlab chiqish, mavjud algoritmlarni takomillashtirish hamda hisoblash jarayonlarining samaradorligini oshirishda muhim ahamiyat kasb etadi.

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UCH QATLAMLI KONUSSIMON QOBIQNING BO‘ YLAMA-RADIAL TEBRANISH TENGLAMALARI

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Annotatsiya. *Ushbu ishda transversal-izotrop uch qatlamli konussimon qobiqning bo‘ ylama-radial teranishlari masalasi qaraladi. Masala o‘ qqa simmetrik masala deb faraz qilinadi. Uch qatlamli konussimon qobiqqa silindrik koordinatalar sistemasi joylashtiriladi. Uch qatlamli konussimon qobiqning yon sirtidagi chegaraviy shartlardan foydalanilib bo‘ ylama-radial tebranish tenglamalari keltirib chiqariladi. Keltirib chiqarilgan bo‘ ylama-radial tebranish tenglamalarida uch qatlamli konussimon qobiqning markaziy o‘ qidan ixtiyoriy masofada joylashgan sirtdagi ko‘ chish vektori komponentalari izlanuvchi funksiyalar sifatida kiritiladi. So‘ ngra ichki va tashqi sirtdagi ko‘ chish va kuchlanishlar ham shu kiritilgan izlanuvchi funksiyalar orqali ifodalanadi.*

Kalit so‘ zlar: *qatlam, transversal-izotrop material, bo‘ ylama-radial tebranish, chegaraviy shart, tebranish tenglamasi, ko‘ chish, kuchlanish*

УРАВНЕНИЯ ПРОДОЛЬНО-РАДИАЛЬНЫХ КОЛЕБАНИЙ ТРЕХСЛОЙНОЙ КОНИЧЕСКОЙ ОБОЛОЧКИ

Аннотация. *В данной статье рассматривается задача о продольно-радиальных колебаниях поперечно изотропной трехслойной конической оболочки. Предполагается, что задача является осесимметричной. В трехслойную коническую оболочку вводится цилиндрическая система координат. Используя граничные условия на боковой поверхности трехслойной конической оболочки, выводятся уравнения продольно-радиальных колебаний. В выведенных уравнениях продольно-радиальных колебаний компоненты вектора смещения на поверхности, расположенной на произвольном расстоянии от центральной оси трехслойной конической оболочки, вводятся в качестве искомых (неизвестных) функций. Затем смещения и напряжения на внутренней и внешней поверхностях также выражаются через эти введенные искомые функции.*

Ключевые слова: *слой, поперечно изотропный материал, продольно-радиальные колебания, граничное условие, уравнение колебаний, смещение, напряжение*

LONGITUDINAL-RADIAL VIBRATION EQUATIONS OF A THREE-LAYERED CONICAL SHELL

Annotation. *This paper considers the problem of longitudinal-radial vibrations of a transversely isotropic three-layered conical shell. The problem is assumed to be axisymmetric. A cylindrical coordinate system is introduced into the three-layered conical shell. Using the boundary conditions on the lateral surface of the three-layered conical shell, the longitudinal-radial vibration equations are derived. In the derived longitudinal-radial vibration equations, the components of the displacement vector at a surface located at an arbitrary distance from the central axis of the three-layered conical shell are introduced as the sought (unknown) functions. Then, the displacements and stresses on the inner and outer surfaces are also expressed through these introduced sought functions.*

Keywords: *layer, transversely isotropic material, longitudinal-radial vibration, boundary condition, vibration equation, displacement, stress*

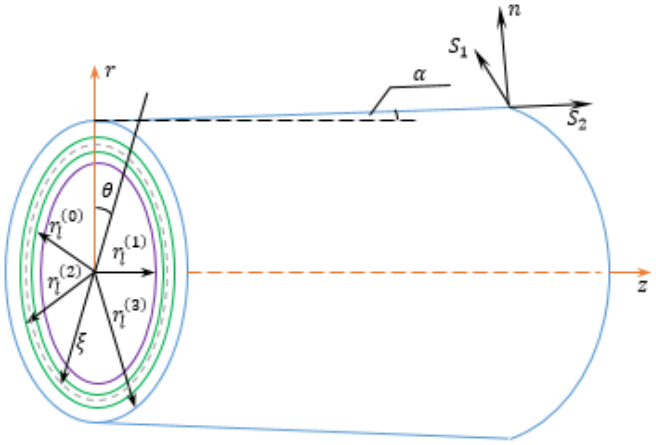
Kirish

Zamonaviy texnika va qurilish sohalarida yengil va yuqori mustahkamlikka ega konstruktiv elementlarga bo‘ lgan ehtiyoj tobora ortib bormoqda. Shu sababli uch qatlamli konussimon qobiq konstruksiyalari aviatsiya, gidrotexnika

inshootlari, transport vositalari hamda qurilish sanoatida keng qo‘ llanilmoqda. Bunday konstruksiyalarning asosiy afzalligi nisbatan kam og‘ irlikda yuqori qattiqlik va tebranishlarni so‘ ndirish xususiyatiga ega bo‘ lishidir. Konussimon shaklga ega qobiqlar, o‘ z navbatida, aylanma simmetriyaga ega bo‘ lgan turli texnik qurilmalarda alohida o‘ rin tutadi, chunki geometrik parametrlarning o‘ zgaruvchanligi tufayli ularning dinamik xarakteristikalari silindrik qobiqlarnikidan sezilarli farq qiladi. Bir qatlamli qobiqlarning tebranish nazariyasi klassik ishlarda yetarlicha o‘ rganilgan bo‘ lsa-da, ko‘ p qatlamli xususan, uch qatlamli qobiqlarning dinamik masalalari alohida yondashuvni talab qiladi, chunki qatlamlar orasidagi mexanik xossalarning farqi hisobga olinishi zarur. Uch qatlamli qobiqlarning statik va dinamik masalalari bir qator tadqiqotchilar tomonidan o‘ rganilgan. Xususan, Grigolyuk va Chulkovning [1] klassik ishlarida uch qatlamli qobiqlarning turg‘ unligi va tebranishlari, shu jumladan uch qatlamli silindrik va konussimon qobiqlarning kritik yuklamalari masalalari batafsil tadqiq etilgan. Ilyamov va hammualliflarining tadqiqotlarida elastik to‘ ldiruvchiga ega qobiqlarning mustahkamligi, turg‘ unligi va dinamikasi masalalari ko‘ rib chiqilgan [2], Latifovning ishida esa elastik va suyuq muhit bilan o‘ zaro ta’sirlashuvchi qobiqlarning tebranishlari o‘ rganilgan [3]. So‘ nggi yillarda O‘ zbekiston olimlari tomonidan ham bu yo‘ nalishda faol ishlar olib borilmoqda. Xususan, uch qatlamli qovushoq-elastik konussimon qobiqlarning tebranishlari masalasiga bag‘ ishlangan tadqiqotda harakat tenglamalari o‘ rta sirt siljishining asosiy komponentlariga nisbatan chiqarilgan hamda olingan yechimlar tahlil qilingan. [4] ishda sayoz o‘ rnatilgan uch qatlamli sferik qobiqlarning erkin tebranishlari tadqiq etilgan. Xudoynazarov va hammualliflari tomonidan qovushoq siqiluvchi suyuqlik bilan to‘ ldirilgan elastik silindrik qobiqning bo‘ ylama-radial tebranishlari masalasi o‘ rganilgan [5]. Bu ish, xususan, bo‘ ylama va radial tebranishlarni birgalikda tavsiflovchi tenglamalar tuzilishi jihatidan mazkur tadqiqotga metodik jihatdan yaqin turadi.

Shunga qaramay, uch qatlamli konussimon qobiqning bo‘ ylama-radial tebranishlarini tavsiflovchi to‘ liq shakllangan tenglamalar sistemasini qatlamlarning turli mexanik-geometrik parametrlarini hisobga olgan holda tahlil qilish masalasi to‘ liq yechilmagan bo‘ lib qolmoqda, bu esa mazkur tadqiqotning dolzarbligini belgilaydi.

Masalaning qo‘ yishi. Ichki hamda tashqi sirtlariga bo‘ ylama va radial kuchlar ta’sir qiluvchi uch qatlamli transversal-izotrop konussimon qobiqning bo‘ ylama-radial tebranishlarini tadqiq qilamiz. (r, θ, z) silindrik koordinatalar sistemasi boshini uch qatlamli konussimon qobiqning kichik ko‘ ndalang kesimiga joylashtiramiz (1-rasm).



1-rasm. Uch qatlamli konussimon qobiq

Bunda Oz – o‘ qini uch qatlamli konussimon qobiqning simmetriya o‘ qi bo‘ ylab, Or – o‘ qini uch qatlamli konussimon qobiqning ko‘ ndalang kesimi radiusi bo‘ ylab yo‘ naltiramiz. Bu yerda z-bo‘ ylama, r-radial va θ-burchak koordinatalaridir [6]. Uch qatlamli konussimon qobiqning qatlamlari materiallari transversal-izotrop deb hisoblaymiz.

Konussimon qobiqning yasovchisibilan markaziy o‘ qi orasidagi burchakni α bilan, uzunligini l bilan va $z = 0$ kichik ko‘ ndalang kesimi ichki radiusini r_0 bilan belgilaymiz. Ichki qatlamning qalinligi h_1, o‘ rta qatlamning qalinligi h_0 va tashqi qatlamning qalinligi h_2 bo‘ lsin deb faraz qilamiz. U holda $z = 0$ kesimdan l masofadagi kesim uchun ichki radius, ya’ni ichki qatlamning ichki radiusi $r_l^{(1)} = r_0 + l\tan\alpha$, ichki qatlamning tashqi radiusi ya’ni o‘ rta qatlam uchun ichki radius $r_l^{(0)} = r_0 + l\tan\alpha + h_1$, o‘ rta qatlamning tashqi radiusi ya’ni tashqi qatlam uchun ichki radius $r_l^{(2)} = r_0 + l\tan\alpha + h_1 + h_0$ va tashqi qatlam uchun tashqi radius $r_l^{(3)} = r_0 + l\tan\alpha + h_1 + h_0 + h_2$ bo‘ ladi. Ushbu uch o‘ lchovli uch qatlamli konussimon qobiq jismi elastiklik nazariyasi qonunlariga bo‘ ysinadi deb hisoblaymiz.

Masala o‘ qqa nisbatan simmetrik bo‘ lganligi uchun uch qatlamli konussimon qobiq nuqtalari ko‘ chish vektorlarining bo‘ ylama va radial komponentlari, kuchlanish tenzori komponentalarining bo‘ ylama, radial, buralma hamda bo‘ ylama-radial komponentalari, deformatsiya tenzorining esa $\varepsilon_{rr}^{(m)}, \varepsilon_{\theta\theta}^{(m)}, \varepsilon_{zz}^{(m)}$ va $\varepsilon_{rz}^{(m)}$ komponentalari noldan farqli bo‘ ladi. Qolgan komponentlari esa nolga teng bo‘ ladi.

Transversal-izotrop uch qatlamli konussimon qobiq nuqtalarida kuchlanishlar va deformatsiyalar orasida quyidagi bog‘ lanishlar mavjud bo‘ ladi [8]:

$$\sigma_{rr}^{(m)} = C_{11}^{(m)}\frac{\partial U_r^{(m)}}{\partial r} + C_{12}^{(m)}\frac{U_r^{(m)}}{r} + C_{13}^{(m)}\frac{\partial U_z^{(m)}}{\partial z};$$
$$\sigma_{\theta\theta}^{(m)} = C_{12}^{(m)}\frac{\partial U_r^{(m)}}{\partial r} + C_{11}^{(m)}\frac{U_r^{(m)}}{r} + C_{13}^{(m)}\frac{\partial U_z^{(m)}}{\partial z};$$
$$\sigma_{zz}^{(m)} = C_{13}^{(m)}\left(\frac{\partial U_r^{(m)}}{\partial r} + \frac{U_r^{(m)}}{r}\right) + C_{33}^{(m)}\frac{\partial U_z^{(m)}}{\partial z}; \quad (1)$$
$$\sigma_{rz}^{(m)} = C_{44}^{(m)}\left(\frac{\partial U_r^{(m)}}{\partial z} + \frac{\partial U_z^{(m)}}{\partial r}\right).$$

bu yerda $C_{ij}^{(m)}$-transversal-izotrop material uchun elastiklik o‘ zgarmaslari.

Harakat tenglamalariga (1) ifodalarni qo‘ yish orqali, uch qatlamli konussimon qobiq qatlamlari nuqtalarining $U_z^{(m)}$- bo‘ ylama va $U_r^{(m)}$- radial ko‘ chishlarini ifodalovchi quyidagi harakat tenglamalari sistemasiga ega bo‘ lamiz:

$$\tilde{C}_{11}^{(m)}\left(\frac{\partial^2 \tilde{U}_r^{(m)}}{\partial r^2} + \frac{1}{r}\frac{\partial \tilde{U}_r^{(m)}}{\partial r} - \frac{1}{r^2}\tilde{U}_r^{(m)}\right) -$$
$$-\tilde{C}_{44}^{(m)}k^2\tilde{U}_r^{(m)} - k\left(\tilde{C}_{13}^{(m)} + \tilde{C}_{44}^{(m)}\right)\frac{\partial \tilde{U}_z^{(m)}}{\partial r} = \rho_m p^2 \tilde{U}_r^{(m)};$$
$$\tilde{C}_{44}^{(m)}\left(\frac{\partial^2 \tilde{U}_z^{(m)}}{\partial r^2} + \frac{1}{r}\frac{\partial \tilde{U}_z^{(m)}}{\partial r}\right) - k^2\tilde{C}_{33}^{(m)}\tilde{U}_z^{(m)} + \quad (2)$$
$$+k\left(\tilde{C}_{44}^{(m)} + \tilde{C}_{13}^{(m)}\right)\left(\frac{\partial \tilde{U}_r^{(m)}}{\partial r} + \frac{\tilde{U}_r^{(m)}}{r}\right) = \rho_m p^2 \tilde{U}_z^{(m)};$$

Uch qatlamli konussimon qobiqning bo‘ ylama-radial tebranishlari ichki va tashqi $f_n^{(i)}(z,t)$, $f_{S_2}^{(i)}(z,t)$ dinamik kuchlar ta’siri natijasida vujudga keladi, deb faraz qilinadi. Shu sababli, transversal-izotrop xususiyatga ega uch qatlamli konussimon qobiqning $r_l^{(3)}$-tashqi va $r_l^{(1)}$- ichki sirtlarida quyidagi chegaraviy shart o‘ rinli bo‘ ladi:

$$\sigma_{rr}^{(i)} - 2F_i'(z)\sigma_{rz}^{(i)} + \left(F_i'(z)\right)^2\sigma_{zz}^{(i)} = \left(1 + \left(F_i'(z)\right)^2\right)f_n^{(i)};$$
$$F_i'(z)\left(\sigma_{rr}^{(i)} - \sigma_{zz}^{(i)}\right) + \left(1 - \left(F_i'(z)\right)^2\right)\sigma_{rz}^{(i)} = \left(1 + \left(F_i'(z)\right)^2\right)f_{S_2}^{(i)}. \quad (3)$$

(3) ifoda $i = 1$ da ichki sirt uchun chegaraviy shartni va $i = 2$ da tashqi sirt uchun chegaraviy shartni ifodalaydi.

Bundan tashqari, o‘ rta qatlam bilan ichki va tashqi qatlamlar orasida quyidagi dinamik va kinematik kontakt shartlar o‘ rinli bo‘ ladi:

$r_l^{(0)}$ sirtda

$$U_r^{(1)} = U_r^{(0)};\ U_z^{(1)} = U_z^{(0)};\ \sigma_{rr}^{(1)} = \sigma_{rr}^{(0)};\ \sigma_{zz}^{(1)} = \sigma_{zz}^{(0)}. \quad (4)$$

$r_l^{(2)}$ sirtda

$$U_r^{(0)} = U_r^{(2)};\ U_z^{(0)} = U_z^{(2)};\ \sigma_{rr}^{(0)} = \sigma_{rr}^{(2)};\ \sigma_{zz}^{(0)} = \sigma_{zz}^{(2)}. \quad (5)$$

bu yerda $U_r^{(m)}(r,z,t)$ va $U_z^{(m)}(r,z,t)$ uch qatlamli konussimon qobiq qatlamlari nuqtasi radial va bo‘ ylama ko‘ chishlari.

Demak uch qatlamli konussimon qobiqning ichki va tashqi dinamik yuklanishlar ta’siri ostida yuzaga keladigan bo‘ ylama-radial tebranishlari haqidagi masalani yechish (3) tenglamalarni (4) va (5) kinematik va dinamik kontakt shartlarhamda nolga teng boshlang‘ ich shartlar bilan yechishdan iborat bo‘ lar ekan.

Natijalar va ularning tahlili

Masalaning yechimi. Uch qatlamli transversal-izotrop konussimon qobiqning bo‘ ylama-radial tebranish tenglamalarini chiqarish uchun (2) harakat differensial tenglamalar sistemasini (3) chegaraviy, (4) va (5) kontakt shartlar bilan birgalikda yechamiz. Bir qancha matematik amallar va soddalashtirishlarni bajarganimizdan so‘ ng quyidagi differensial tenglamalar sistemasini hosil qilamiz:

$$\left[K_{i1}\frac{\partial}{\partial z} + K_{i2}\right]U_{r,0}^{(0)} + \left[L_{i1}\frac{\partial^3}{\partial t^2\partial z} + L_{i2}\frac{\partial^3}{\partial z^3} + L_{i3}\frac{\partial^2}{\partial t^2} + \right.$$
$$\left. + L_{i4}\frac{\partial^2}{\partial z^2} + L_{i5}\frac{\partial}{\partial z} + L_{i6}\right]\xi U_{r,1}^{(0)} + \left[M_{i1}\frac{\partial}{\partial z} + M_{i2}\right]U_{z,0}^{(0)} +$$

$$+\left[N_{i1}\frac{\partial^2}{\partial z^2}+N_{i2}\frac{\partial}{\partial z}+N_{i3}\right]\xi U_{z,1}^{(0)}=\left(1+\left(F_i'(z)\right)^2\right)f_n^{(i)};$$
$$\left[Q_{i1}\frac{\partial}{\partial z}+Q_{i2}\right]U_{r,0}^{(0)}+\left[J_{i1}\frac{\partial^3}{\partial t^2\partial z}+J_{i2}\frac{\partial^3}{\partial z^3}+J_{i3}\frac{\partial^2}{\partial t^2}+\right.$$
$$\left.+J_{i4}\frac{\partial^2}{\partial z^2}+J_{i5}\frac{\partial}{\partial z}+J_{i6}\right]\xi U_{r,1}^{(0)}+\left[I_{i1}\frac{\partial}{\partial z}+I_{i2}\right]U_{z,0}^{(0)}+$$
$$+\left[R_{i1}\frac{\partial^2}{\partial z^2}+R_{i2}\frac{\partial}{\partial z}+R_{i3}\right]\xi U_{z,1}^{(0)}=\left(1+\left(F_i'(z)\right)^2\right)f_{S_2}^{(i)};\quad (6)$$

bu yerda K_{ij}, L_{ij}, M_{ij}, N_{ij}, Q_{ij}, J_{ij}, I_{ij} va R_{ij} uch qatlamli konussimon qobiqning geometrik va fizik parametrlariga bog‘ liq bo‘ lgan o‘ zgarmas koeffitsiyenlar. Masalan:

$$K_{11}=F_1'(z)r_l^{(1)}C_{44}^{(1)};\ \dots\dots$$
$$L_{14}=-\frac{C_{44}^{(0)}}{2C_{11}^{(0)}}\left(C_{11}^{(1)}+C_{12}^{(1)}+2\left(F_1'(z)\right)^2C_{13}^{(1)}\right)\left(\ln\frac{r_l^{(0)}}{\xi}-\frac{1}{2}\right);\ \dots\dots$$

(6) tenglamalar sistemasidagi $U_{r,0}^{(0)}$, $U_{z,0}^{(0)}$, $U_{r,1}^{(0)}$ va $U_{z,1}^{(0)}$ izlanuvchi funksiyalar. Ular uch qatlamli konussimon qobiqning markaziy o‘ qidan ξ masofada joylashgan o‘ rta qatlamdan tanlangan sirtdagi ko‘ chish vektorining komponentalari hisoblanadi. Uch qatlamli konussimon qobiqning qatlamlaridagi ko‘ chish va kuchlanishlarni topish uchun uch qatlamli konussimon qobiqning qatlamlaridagi ko‘ chish va kuchlanishlarni ham $U_{r,0}^{(0)}$, $U_{z,0}^{(0)}$, $U_{r,1}^{(0)}$ va $U_{z,1}^{(0)}$ izlanuvchi funksiyalar orqali ifodalaymiz:

Uch qatlamli konussimon qobiqning ichki qatlamidagi ko‘ chish va kuchlanishlar quyidagicha:

$$\sigma_{rr}^{(1)}=\left(-\rho_1-\frac{C_{12}^{(1)}\rho_1}{2C_{11}^{(1)}}\right)\frac{\partial^2U_{r,0}^{(0)}}{\partial t^2}+\left(C_{44}^{(1)}+\frac{C_{12}^{(1)}C_{44}^{(1)}}{2C_{11}^{(1)}}\right)\frac{\partial^2U_{r,0}^{(0)}}{\partial z^2}+$$
$$+\rho_0\rho_1\left(1-2\ln\left(\frac{r_l^{(0)}}{\xi}\right)\right)\frac{\left(2C_{11}^{(1)}+C_{12}^{(1)}\right)}{4C_{11}^{(0)}C_{11}^{(1)}}\xi\frac{\partial^4U_{r,1}^{(0)}}{\partial t^4}+$$
$$+\frac{\left(2C_{11}^{(1)}+C_{12}^{(1)}\right)}{4C_{11}^{(0)}C_{11}^{(1)}}\left(2C_{44}^{(0)}\rho_1\ln\left(\frac{r_l^{(0)}}{\xi}\right)-C_{44}^{(0)}\rho_1+2C_{44}^{(1)}\rho_0\ln\left(\frac{r_l^{(0)}}{\xi}\right)-C_{44}^{(1)}\rho_0\times\right.$$
$$\left.\times\xi\frac{\partial^4U_{r,1}^{(0)}}{\partial t^2\,\partial z^2}+\left(\frac{\rho_1\xi\left(-2C_{11}^{(1)}-C_{12}^{(1)}\right)}{C_{11}^{(1)}\left(r_l^{(0)}\right)^2}\right)\frac{\partial^2U_{r,1}^{(0)}}{\partial t^2}+\frac{C_{44}^{(0)}C_{44}^{(1)}}{4C_{11}^{(0)}C_{11}^{(1)}}\times\right.$$
$$\left.\times\left(1-2\ln\left(\frac{r_l^{(0)}}{\xi}\right)\right)\left(2C_{11}^{(1)}+C_{12}^{(1)}\right)\xi\frac{\partial^4U_{r,1}^{(0)}}{\partial z^4}+\right.\quad (7)$$
$$+\frac{C_{44}^{(1)}}{C_{11}^{(1)}\left(r_l^{(0)}\right)^2}\left(2C_{11}^{(1)}+C_{12}^{(1)}\right)\xi\frac{\partial^2U_{r,1}^{(0)}}{\partial z^2}-\frac{C_{13}^{(1)}\rho_1}{C_{11}^{(1)}}\frac{\partial^3U_{z,0}^{(0)}}{\partial t^2\,\partial z}+\frac{C_{13}^{(1)}C_{44}^{(1)}}{C_{11}^{(1)}}\frac{\partial^3U_{z,0}^{(0)}}{\partial z^3}+$$
$$+\frac{\rho_1B_1^{(0)}}{4C_{11}^{(1)}}\left(2C_{11}^{(1)}\left(2\ln\left(\frac{r_l^{(0)}}{\xi}\right)-1\right)+2C_{12}^{(1)}\ln\left(\frac{r_l^{(0)}}{\xi}\right)-C_{12}^{(1)}-\right.$$
$$\left.-4\frac{C_{13}^{(1)}}{B_1^{(0)}}\ln\left(\frac{r_l^{(0)}}{\xi}\right)\xi\frac{\partial^3U_{z,1}^{(0)}}{\partial t^2\,\partial z}++\frac{C_{44}^{(1)}B_1^{(0)}}{4C_{11}^{(1)}}\left(2C_{11}^{(1)}\left(1-2\ln\left(\frac{r_l^{(0)}}{\xi}\right)\right)-\right.\right.$$
$$\left.\left.-2C_{12}^{(1)}\ln\left(\frac{r_l^{(0)}}{\xi}\right)+C_{12}^{(1)}+4\frac{C_{13}^{(1)}}{B_1^{(0)}}\ln\left(\frac{r_l^{(0)}}{\xi}\right)\xi\right)\frac{\partial^3U_{z,1}^{(0)}}{\partial z^3};\right.$$

$\sigma_{\theta\theta}^{(1)}$, $\sigma_{zz}^{(1)}$ va $\sigma_{rz}^{(1)}$ kuchlanishlar ham xuddi shunday ifodalanadi. Xuddi shunday uch qatlamli konussimon qobiqning o‘ rta qatlamidagi ko‘ chish va kuchlanishlar quyidagicha:

$$\sigma_{rr}^{(0)}=\frac{\rho_0\left(2C_{11}^{(0)}+C_{12}^{(0)}\right)}{C_{11}^{(0)}}\frac{\partial^2U_{r,0}^{(0)}}{\partial t^2}-\frac{C_{44}^{(0)}\left(2C_{11}^{(0)}+C_{12}^{(0)}\right)}{C_{11}^{(0)}}\frac{\partial^2U_{r,0}^{(0)}}{\partial z^2}-$$
$$-\frac{\left(2C_{11}^{(0)}+C_{12}^{(0)}\right)}{2\left(C_{11}^{(0)}\right)^2}\frac{\partial^4U_{r,1}^{(0)}}{\partial t^4}+\frac{C_{44}^{(0)}\rho_0\left(2C_{11}^{(0)}+C_{12}^{(0)}\right)}{\left(C_{11}^{(0)}\right)^2}\xi\times$$
$$\times\frac{\partial^4U_{r,1}^{(0)}}{\partial t^2\,\partial z^2}-\frac{2C_{13}^{(0)}\rho_0\xi}{B_1^{(0)}C_{11}^{(0)}}\frac{\partial^2U_{r,1}^{(0)}}{\partial t^2}+\frac{\left(C_{44}^{(0)}\right)^2\left(-2C_{11}^{(0)}-C_{12}^{(0)}\right)}{2\left(C_{11}^{(0)}\right)^2}\xi\frac{\partial^4U_{r,1}^{(0)}}{\partial z^4}+$$

$$+\frac{2C_{13}^{(0)}C_{44}^{(0)}\xi}{B_1^{(0)}C_{11}^{(0)}}\frac{\partial^2 U_{r,1}^{(0)}}{\partial z^2}+\frac{2C_{13}^{(0)}\rho_0}{C_{11}^{(0)}}\frac{\partial^3 U_{z,0}^{(0)}}{\partial t^2\,\partial z}-\frac{2C_{13}^{(0)}C_{44}^{(0)}}{C_{11}^{(0)}}\frac{\partial^3 U_{z,0}^{(0)}}{\partial z^3}+ \quad (8)$$

$$+\frac{\rho_0\xi B_1^{(0)}}{2C_{11}^{(0)}}\left(-2C_{11}^{(0)}+C_{12}^{(0)}+2\frac{C_{13}^{(0)}}{B_1^{(0)}}\right)\frac{\partial^3 U_{z,1}^{(0)}}{\partial t^2\,\partial z}+$$

$$+\frac{B_1^{(0)}C_{44}^{(0)}\xi}{2C_{11}^{(0)}}\left(2C_{11}^{(0)}-C_{12}^{(0)}-2\frac{C_{13}^{(0)}}{B_1^{(0)}}\right)\frac{\partial^3 U_{z,1}^{(0)}}{\partial z^3};$$

Uch qatlamli konussimon qobiqning bo‘ ylama-radial tebranishlarida hosil bo‘ ladigan o‘ rta qatlamning qolgan $\sigma_{\theta\theta}^{(0)}$, $\sigma_{zz}^{(0)}$ va $\sigma_{rz}^{(0)}$ larni ham izlanuvchi $U_{r,0}^{(0)}$, $U_{z,0}^{(0)}$, $U_{r,1}^{(0)}$ va $U_{z,1}^{(0)}$ funksiyalar orqali ifodalaymiz.

Uch qatlamli konussimon qobiqning tashqi qatlamida hosil bo‘ ladigan kuchlanishlarni ham $U_{r,0}^{(0)}$, $U_{z,0}^{(0)}$, $U_{r,1}^{(0)}$ va $U_{z,1}^{(0)}$ izlanuvchi funksiyalar orqali ifodalaymiz.

Masalan:

$$\sigma_{rz}^{(2)}=\frac{C_{44}^{(2)}\left(r_l^{(2)}\right)^2}{2r}\frac{\partial U_{r,0}^{(0)}}{\partial z}+\frac{C_{44}^{(2)}\left(r_l^{(2)}\right)^2\rho_0\xi}{4C_{11}^{(0)}r}\frac{\partial^3 U_{r,1}^{(0)}}{\partial t^2\,\partial z}-\frac{C_{44}^{(0)}C_{44}^{(2)}\left(r_l^{(2)}\right)^2\xi}{4C_{11}^{(0)}r}\times$$

$$\times\frac{\partial^3 U_{r,1}^{(0)}}{\partial z^3}+\frac{C_{44}^{(2)}\xi}{r}\left(2\ln\left(\frac{r_l^{(2)}}{\xi}\right)-1\right)\frac{\partial U_{r,1}^{(0)}}{\partial z}-\frac{C_{44}^{(2)}}{r}U_{z,0}^{(0)} \quad (9)$$

$$+\frac{B_1^{(0)}C_{44}^{(2)}\left(r_l^{(2)}\right)^2\xi}{4r}\left(2\ln\left(\frac{r_l^{(2)}}{\xi}\right)-1\right)\frac{\partial^3 U_{z,1}^{(0)}}{\partial z^3}+\frac{C_{44}^{(2)}\xi}{r}\ln\left(\frac{r_l^{(2)}}{\xi}\right)\frac{\partial U_{z,1}^{(0)}}{\partial z}.$$

XULOSA

Ushbu maqolada transversal-izotrop uch qatlamli konussimon qobiqning bo‘ ylama-radial tebranishlari masalasi o‘ qqa nisbatan simmetrik masala sifatida qaraldi va uning to‘ liq matematik modeli ishlab chiqildi. Uch qatlamli konussimon qobiqqa silindrik koordinatalar sistemasi joylashtirilib, ichki, o‘ rta va tashqi qatlamlarning geometrik parametrlari (qalinliklari, radiuslari, konusning yasovchi burchagi) orasidagi bog‘ lanishlar aniq analitik ko‘ rinishda ifodalandi. Bu esa qobiqning istalgan ko‘ ndalang kesimidagi geometriyasini yagona formulalar orqali tavsiflash imkonini berdi. Matematik amallar va soddalashtirishlar natijasida qobiqning bo‘ ylama-radial tebranishlarini to‘ liq tavsiflovchi yakuniy tenglamalar sistemasi olindi. Olingan natijalar uch qatlamli konussimon qobiqlarning dinamik xususiyatlarini nazariy jihatdan chuqurroq tushunishga xizmat qilib, aviatsiya, gidrotexnika inshootlari, transport vositalari va qurilish sanoatida qo‘ llaniladigan yengil va yuqori mustahkamlikka ega ko‘ p qatlamli konstruksiyalarni loyihalashda muhim amaliy ahamiyatga ega. Xususan, ishlab chiqilgan model konstruksiyaning rezonans chastotalarini, tebranish amplitudalarini va kuchlanish konsentratsiyasi hududlarini oldindan baholash imkonini beradi. Keyingi olingan (6) tenglamalar sistemasi aniq chegaraviy shartlar bilan birgalikda sonli usullar yordamida yechiladi. Uch qatlamli konussimon qobiqning qatlamlaridagi ko‘ chish va kuchlanishlar grafiklarda tasvirlanadi. Uch qatlamli konussimon qobiq qatlamlari materiallarining tebranish jarayonidagi kuchlanganlik-deformatsiyalanganlik holatlari baholanadi.

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$YBa_2Cu_3O_{7-\delta}$ YUQORI HARORATLI O‘ TA O‘ TKAZGICHLARIDA KISLOROD STEXIOMET RIYASI HAMDA KRISTALL TUZILISH PARAMETRLARINING KRITIK HARORATGA TA’SIRI

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Annotatsiya: *Maqolada $YBa_2Cu_3O_{7-\delta}$ (Y123) tizimida kritik haroratni (T_c) belgilovchi struktura-kimyoviy omillar — kislorod stexiometriyasi, panjara parametrlari va ortorombik deformatsiya (η) — o‘ rtasidagi bog‘ liqlik uchta nashr etilgan manbadan yig‘ ilgan ma’lumotlar asosida ko‘ p manbali statistik tahlil orqali o‘ rganildi. Qattiq fazali reaksiya usuli bilan sintez qilingan Y123 namunalari bo‘ yicha 11 ta ma’lumot nuqtasi (jumladan mualliflarning yuqori fazaviy tozalikdagi namunasi, T_c = 95,5 K) birlashtirildi. Manba effektini hisobga olgan holda o‘ tkazilgan tahlil kislorod tarkibi bilan T_c o‘ rtasida barqaror bog‘ liqlikni ko‘ rsatdi: umumiy Pearson r = 0,80 (p = 0,003), eng katta manba ichida r = 0,91, manba nazoratga olingandagi qisman (partial) korrelyatsiya esa r = 0,69 (p = 0,019). Ortorombiklik η bilan esa ham global, ham manba nazoratidagi korrelyatsiya deyarli nol (r ≈ −0,03) bo‘ lib chiqdi. Natijalar 2026-yilda e’lon qilingan uch yangi tadqiqot kontekstida muhokama qilindi.*

Kalit so‘ zlar: *YHO‘ O‘ , YBCO, kislorod stexiometriyasi, ortorombiklik, kritik harorat, ko‘ p manbali tahlil, manba effekti, Rietveld tahlili.*

EFFECT OF OXYGEN STOICHIOMETRY AND CRYSTAL STRUCTURE PARAMETERS ON THE CRITICAL TEMPERATURE IN $YBa_2Cu_3O_{7-\delta}$ HIGH-TEMPERATURE SUPERCONDUCTORS

Abstract: *This work analyzes the relationship between the structural-chemical factors governing the critical temperature (T_c) of $YBa_2Cu_3O_{7-\delta}$ — oxygen stoichiometry, lattice parameters, and orthorhombic distortion (η) — using data compiled from three published sources rather than eleven independent experiments. Eleven data points for solid-state-synthesized Y123, including the authors’ high-phase-purity sample (T_c = 95.5 K), were pooled. Accounting for the source (laboratory) effect, the oxygen–T_c relationship remained robust: overall Pearson r = 0.80 (p = 0.003), within the largest source r = 0.91, and the source-controlled partial correlation r = 0.69 (p = 0.019). Orthorhombicity η showed a near-zero correlation (r ≈ −0.03) both globally and after controlling for source. Cross-study heterogeneity and its limitations are explicitly discussed.*

Keywords: *HTSC, YBCO, oxygen stoichiometry, orthorhombicity, critical temperature, multi-source analysis, Rietveld analysis.*

Kirish

Yuqori haroratli o‘ ta o‘ tkazgichlar (YHO‘ O‘) orasida $YBa_2Cu_3O_{7-\delta}$ (Y123) o‘ zining nisbatan yuqori kritik harorati, kimyoviy barqarorligi va texnologik jihatdan arzon sintez imkoniyatlari tufayli eng istiqbolli nomzodlardan biri bo‘ lib qolmoqda [1,2]. Y123 ning o‘ ta o‘ tkazuvchanlik xatti-harakatini belgilovchi asosiy parametr Cu–O zanjirlaridagi kislorod miqdori bo‘ lib, u CuO_2 tekisliklaridagi teshik konsentratsiyasiga bevosita ta’sir ko‘ rsatadi va ortorombik–tetragonal struktura o‘ tishini boshqaradi [3,4].

Adabiyotda struktura parametrlari (panjara o‘ lchamlari a, b, c, ortorombik deformatsiya η) bilan T_c o‘ rtasidagi bog‘ liqlik ko‘ p marta muhokama qilingan [5–8], biroq bu ishlarning aksariyati alohida sintez seriyasi doirasida olib borilgan. Turli mustaqil laboratoriyalarning natijalarini birlashtirgan holda statistik tekshirish nisbatan kamdan-kam uchraydi. Shu bilan birga, bunday birlashtirish manba (laboratoriya) effektini hisobga olishni talab qiladi, chunki turli manbalarda kislorodni aniqlash, T_c ni o‘ lchash va strukturaviy tavsiflash usullari farq qilishi mumkin. Ushbu ishning maqsadi ikki tomonlama: (i) qattiq fazali reaksiya usuli bilan sintez qilingan Y123 namunalari bo‘ yicha nashr etilgan struktura–T_c ma’lumotlarini manba effektini hisobga olgan holda statistik tahlil qilish; (ii) olingan natijalarni 2026-yilda e’lon qilingan eng so‘ nggi uchta ilmiy ish [11,12,13] kontekstida muhokama qilish.

Muhim uslubiy izoh: mazkur ishda tahlil qilingan 11 ta ma’lumot nuqtasi 11 ta o‘ zaro to‘ liq mustaqil eksperimental tadqiqot emas, balki uchta nashr etilgan manbadan yig‘ ilgan kuzatuvlardir. Xususan, 1–6-ma’lumot nuqtalari [8] manbadan (Howe), 7–10-nuqtalar [5] manbadan (Sahoo va h.k.), 11-nuqta esa mualliflarning o‘ z ishidan [1] (Turayev va

h.k.) olingan (1-jadval). Shu sababli bir xil manbadan olingan nuqtalar o‘ zaro to‘ liq statistik mustaqil deb hisoblanmaydi va manba (laboratoriya) effekti tahlilga alohida kiritilgan (quyida «Statistik tahlil» bo‘ limiga qarang).

1-jadval. Qattiq fazali reaksiya usuli bilan sintez qilingan Y123 namunalarining birlashtirilgan struktura–T_c ma’lumotlari (n=11; uchta manbadan). Ortorombiklik η=(b−a)/(b+a) hisoblab chiqildi.

№	7−δ	a, Å	b, Å	c, Å	T_c, K	Manba
1	6.60	3.81	3.87	7.81	78	[8]
2	6.65	3.81	3.87	7.81	80	[8]
3	6.69	3.81	3.88	9.10	89.5	[8]
4	6.75	3.82	3.87	6.50	90	[8]
5	6.77	3.84	3.91	9.03	91	[8]
6	6.79	3.82	3.88	7.79	90	[8]
7	6.84	3.8212	3.8850	8.28	88.2	[5]
8	6.84	3.8230	3.8868	8.27	90.2	[5]
9	6.85	3.8202	3.8854	8.46	91.3	[5]
10	6.72	3.8311	3.8502	2.49	91.68	[5]
11	6.91	3.8227	3.8929	9.10	95.5	[1]

Strukturaviy ma’lumotlarning kelib chiqishi va Rietveld tahlili

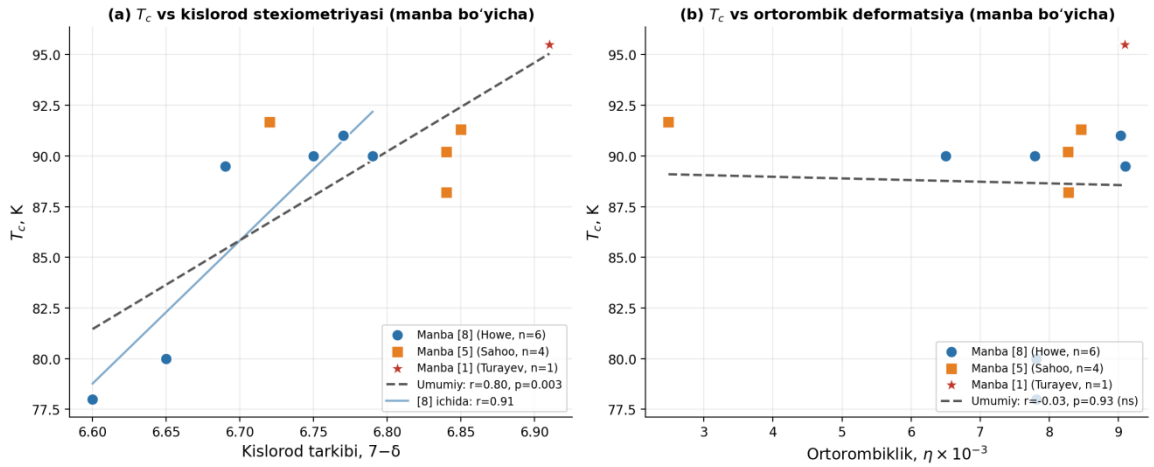
Panjara parametrlari (a, b, c) va kislorod tarkibi (7−δ) har bir manbada rentgen (yoki neytron) kukun difraksiyasi va Rietveld/WPPF tahlili orqali aniqlangan. Meta-tahlilning tabiatidan kelib chiqib, dastlabki tozalash (refinement) sifat ko‘ rsatkichlari barcha manbalarda bir xil darajada keltirilmaganini alohida ta’kidlash lozim — bu ushbu ishning cheklovi bo‘ lib, 2-jadvalda umumlashtirilgan. Mualliflarning o‘ z namunasi ([1]) uchun tahlil To‘ liq Difraktogramma Moslashtirish (WPPF) va Rietveld usuli bilan bajarilib, faza sofligi 99,21 %, panjara parametrlari a = 3,8227 Å, b = 3,8929 Å, c = 11,6889 Å, elementar yacheyka hajmi 173,952 $Å^3$ va mikrodeformatsiya 0,064 % qiymatida aniqlangan; kislorod indeksi esa atom pozitsiyalari bandligini yig‘ ish orqali $O_{total} \approx 6{,}91$ deb hisoblangan [1].

2-jadval. Manbalar bo‘ yicha strukturaviy va o‘ lchov usullarining bir xil emasligi (cross-study heterogeneity).

Ko‘ rsatkich	Manba [8]	Manba [5]	Manba [1]
Difraksiya/tahlil	XRD, Rietveld	XRD, Rietveld	XRD, WPPF+Rietveld
Refinement sifati (R_{wp}, χ^2)	to‘ liq keltirilmagan	to‘ liq keltirilmagan	keltirilgan
Kislorod aniqlash	struktura/kalibr.	struktura/kalibr.	site occupancy
T_c mezoni	o‘ tish (onset/mid)	o‘ tish (onset/mid)	$T_{c,mid}$=95,5 K
Faza sofligi	keltirilmagan	qisman	99,21 %
Nuqtalar soni	6	4	1

Har bir juftlik uchun Pearson korrelyatsiya koeffitsienti (r), unga mos p-qiymati va chiziqli regressiya (eng kichik kvadratlar usuli) hisoblandi. Manba effektini hisobga olish uchun uch qo‘ shimcha tahlil bajarildi: (i) har bir ko‘ p namunali manba ichida alohida korrelyatsiya; (ii) manbani soxta o‘ zgaruvchi (dummy) sifatida kiritib, qoldiqlar asosida qisman (partial) korrelyatsiya; (iii) bitta manbani chiqarib tashlab qayta hisoblash (leave-one-source-out) sezuvchanlik tahlili. Tahlil Python (SciPy) muhitida bajarildi; statistik ishonchlilik chegarasi $p < 0{,}05$ sifatida qabul qilindi.

Umumiy tahlil (n=11) kislorod tarkibi (7−δ) T_c ning statistik jihatdan yagona ishonchli bashoratchisi ekanligini ko‘ rsatdi ($r = 0{,}80$; $p = 0{,}003$; $R^2 = 0{,}64$), ortorombiklik η bilan esa amaliy jihatdan hech qanday chiziqli bog‘ liqlik kuzatilmadi ($r = -0{,}03$; $p = 0{,}93$) (1-rasm, 3-jadval).



1-rasm. (a) T_c ning kislorod stexiometriyasiga va (b) ortorombik deformatsiyaga bog‘ liqligi, manba bo‘ yicha ranglangan. Kislorod–T_c trendi eng katta manba ([8]) ichida ham saqlanadi.

Taqrizda ko‘ tarilgan asosiy masala — ma’lumotlarning bir necha manbadan olingani va ularning to‘ liq mustaqil emasligi — ni hal qilish uchun manba effektini hisobga oluvchi qo‘ shimcha tahlil o‘ tkazildi (3-jadval). Natijalar quyidagicha: (i) eng katta manba ([8], n=6) ichida kislorod–T_c korrelyatsiyasi kuchli va ishonchli (r = 0,91; p = 0,013); (ii) manba soxta o‘ zgaruvchi sifatida nazoratga olinganda qisman korrelyatsiya baribir ishonchli bo‘ lib qoladi (r = 0,69; p = 0,019). Ikkinchi ko‘ p namunali manba ([5], n=4) ichida esa korrelyatsiya zaif va statistik jihatdan ishonchsiz (r = −0,52; p = 0,48) bo‘ lib, bu ushbu manbada kislorod tarkibi oralig‘ ining juda tor (6,72–6,85) bo‘ lishi va namunalar sonining kamligi bilan izohlanadi. Ortorombiklik η esa manba nazoratra olingandan keyin ham T_c bilan bog‘ lanmagan (partial r = −0,04; p = 0,91).

3-jadval. Manba (laboratoriya) effektini hisobga oluvchi statistik tahlil natijalari.

Tahlil	n	kislorod–T_c (r, p)	η–T_c (r, p)
Umumiy (barcha manbalar)	11	0,80; 0,003	−0,03; 0,93
Manba [8] ichida (Howe)	6	0,91; 0,013	0,17; 0,74
Manba [5] ichida (Sahoo)	4	−0,52; 0,48	−0,55; 0,45
Manba nazoratda (partial)	11	0,69; 0,019	−0,04; 0,91

Ushbu qo‘ shimcha tahlil taqrizchining e’tiroziga aniq javob beradi: kislorod–T_c bog‘ liqligi shunchaki manbalarni birlashtirish artefakti emas, balki eng katta manba ichida ham, manba effekti statistik jihatdan nazoratga olingandan keyin ham saqlanadigan barqaror bog‘ liqlikdir. Aksincha, ortorombiklik η T_c ning global bashoratchisi bo‘ la olmaydi.

Bir necha manbadan olingan T_c va strukturaviy qiymatlarni birlashtirishda quyidagi omillar bir xil bo‘ lmasligi mumkin va bu tahlil natijalariga ta’sir qiladi: namuna tayyorlash sharoiti, kuydirish (annealing) harorati, kislorodlash protokoli va sovutish tezligi, namuna zichligi va donalar o‘ lchami, faza sofligi, T_c ni o‘ lchash usuli hamda T_c ning onset yoki midpoint sifatida olinishi (2-jadval). Ushbu bir xil emaslik (heterogeneity) korrelyatsiyalarni ham kuchaytirishi, ham susaytirishi mumkin. Shu sababli mazkur ishda olingan miqdoriy koeffitsientlar mutlaq emas, balki umumiy tendensiyani ko‘ rsatuvchi baholar sifatida talqin qilinishi lozim. Shunga qaramay, kislorod–T_c bog‘ liqligining manba ichida va manba nazoratida saqlanishi bu tendensiyaning mustahkamligini ko‘ rsatadi.

Olingan xulosa 2026-yilgi uch muhim ishning natijalari bilan uyg‘ un: (i) Conradson va h.k. (PNAS, 2026) an’anaviy «legirlash gumbazi» modelining legirlash usuliga xos artefakt bo‘ lishi mumkinligini ko‘ rsatdi [12]; (ii) Kethamkuzhi va h.k. (Scientific Reports, 2026) kislorod kinetikasining YBCO plyonkalarida ham markaziy rol o‘ ynashini tasdiqladi [13]; (iii) Luccas va h.k. (arXiv, 2026) past haroratli kislorodlashda Ortho-II o‘ ta strukturasi orqali o‘ tish yakuniy strukturada doimiy iz qoldirishini, ya’ni η tarqoqligining mexanistik sababini ko‘ rsatdi [11]. Bu ishlar mazkur tahlil xulosasini — kislorod tarkibi (va u orqali teshik konsentratsiyasi) T_c ning asosiy boshqaruvchisi, η esa kislorod tartiblanishining hosilaviy «barmoq izi» ekanligini — mustahkamlaydi.

Xulosa

Uchta nashr etilgan manbadan yig‘ ilgan struktura–T_c ma’lumotlarining manba effektini hisobga oluvchi statistik tahlili shuni ko‘ rsatdiki, kislorod stexiometriyasi (7−δ) T_c ning eng ishonchli struktura-kimyoviy bashoratchisidir: bog‘ liqlik umumiy holatda (r = 0,80; p = 0,003), eng katta manba ichida (r = 0,91) va manba nazoratga olinganda (partial r = 0,69; p = 0,019) saqlanadi. Ortorombik deformatsiya η esa global miqyosda T_c bilan bog‘ lanmagan (r ≈ −0,03) bo‘ lib, u

kislorod tartiblanishining hosilaviy indikatoridir. Ma'lumotlarning ko' p manbadan olingani va ular orasidagi eksperimental heterogeneity ushbu ishning asosiy cheklovi bo' lib, olingan koeffitsientlar tendensiya baholari sifatida talqin qilinishi kerak. Kelgusi tadqiqotlarda kislorod tarkibidan Tallon formulasi orqali hisoblangan teshik konsentratsiyasi p asosiy o' zgaruvchi sifatida qo' llanilishi va manba effekti aralash-effektli (mixed-effects) modellar bilan qat'iyroq hisobga olinishi tavsiya etiladi [14].

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ELECTROPHYSICAL PROPERTIES OF NB THIN FILMS DEPOSITED ON THERMALLY OXIDIZED SiO_2/SI(111) SUBSTRATES BY DC AND RF MAGNETRON SPUTTERING

Abstract; *In this study, the electrophysical properties of niobium (Nb) thin films deposited on thermally oxidized SiO_2/Si(111) substrates by DC and RF magnetron sputtering were investigated. The crystal structure of the deposited films was characterized by X-ray diffraction (XRD), while their electrophysical parameters were determined using the Van der Pauw method with an HMS-5000 Hall Effect Measurement System. The current–voltage (I–V) characteristics, electrical conductivity, electrical resistivity, and the temperature dependence of charge carrier mobility were comparatively analyzed. The experimental results demonstrated that the magnetron sputtering mode has a significant influence on the electrophysical properties of Nb thin films. XRD analysis confirmed a higher degree of crystallinity in the films deposited by the RF magnetron sputtering mode. Hall effect measurements further revealed that the RF-deposited films exhibited higher electrical conductivity and charge carrier mobility, together with lower electrical resistivity, compared with those prepared by the DC mode. These findings indicate that RF magnetron sputtering is a more effective deposition mode for producing Nb thin films with improved electrophysical properties.*

Keywords: *niobium, Nb thin films, SiO_2/Si(111) substrate, DC magnetron sputtering, RF magnetron sputtering, Hall effect, Van der Pauw method, electrical conductivity, electrical resistivity, charge carrier mobility.*

DC VA RF MAGNETRON CHANGLATISH USULLARIDA TERMIK OKSIDLANGAN SiO_2/SI(111) TAGLIKLARDA OLINGAN NB YUPQA PLYONKALARINING ELEKTROFIZIK XOSSALARI

Annotatsiya; *Ushbu ishda termik oksidlangan SiO_2/Si(111) tagliklarda magnetron changlatish qurilmasining DC va RF rejimlarida olingan niobiy (Nb) yupqa plyonkalarining elektrofizik xossalari tadqiq qilindi. Namunalarning kristall tuzilishi rentgen difraksiyasi (XRD) usuli yordamida baholandi, elektrofizik parametrlari esa Hall effekti asosidagi HMS-5000 qurilmasi yordamida Van der Pau usuli yordamida aniqlandi. Tok–kuchlanish (I–V) xarakteristikalari, elektr o‘ tkazuvchanlik, solishtirma elektr qarshilik hamda zaryad tashuvchilar harakatchanligining temperaturaga bog‘ liqligi qiyosiy ravishda tahlil qilindi. Tadqiqot natijalari magnetron changlatish rejimi Nb yupqa plyonkalarining elektr xossalariga sezilarli ta’sir ko‘ rsatishini ko‘ rsatdi. XRD tahlili RF rejimida olingan plyonkalarning kristallanish darajasi yuqoriroq ekanligini tasdiqladi. Hall effekti o‘ lchovlari esa RF magnetron changlatish usulida tayyorlangan namunalarda elektr o‘ tkazuvchanlik va zaryad tashuvchilar harakatchanligi ortishi, solishtirma elektr qarshilik esa kamayishini ko‘ rsatdi. Olingan natijalar RF magnetron changlatish usuli elektrofizik parametrlari yaxshilangan Nb yupqa plyonkalarini olish uchun samaraliroq texnologik rejim ekanligini tasdiqlaydi.*

Kalit so‘ zlar: *niobiy, Nb yupqa plyonkalari, SiO_2/Si(111) taglik, DC magnetron changlatish, RF magnetron changlatish, Hall effekti, Van der Pau usuli, elektr o‘ tkazuvchanlik, solishtirma elektr qarshilik, zaryad tashuvchilar harakatchanligi.*

ЭЛЕКТРОФИЗИЧЕСКИЕ СВОЙСТВА ТОНКИХ ПЛЕНОК Nb, ПОЛУЧЕННЫХ НА ТЕРМИЧЕСКИ ОКИСЛЕННЫХ ПОДЛОЖКАХ SiO_2/Si(111) МЕТОДАМИ DC И RF МАГНЕТРОННОГО РАСПЫЛЕНИЯ

Аннотация; *В данной работе исследованы электрофизические свойства тонких пленок ниобия (Nb), полученных на термически окисленных подложках SiO_2/Si(111) методами DC и RF магнетронного распыления. Кристаллическая структура образцов была исследована методом рентгеновской дифракции (XRD), а электрофизические параметры определены методом Ван дер Пау с использованием установки HMS-5000 для измерения эффекта Холла. Проведен сравнительный анализ вольт-амперных (I–V) характеристик, электрической проводимости, удельного электрического сопротивления, а также зависимости подвижности носителей заряда от температуры. Результаты исследования показали, что режим магнетронного распыления оказывает существенное влияние на электрические свойства тонких пленок Nb. Рентгенодифракционный анализ подтвердил более высокую степень кристалличности пленок, полученных методом RF магнетронного распыления. Измерения эффекта Холла показали, что образцы, полученные методом RF*

магнетронного распыления, характеризуются более высокой электрической проводимостью и подвижностью носителей заряда, а также меньшим удельным электрическим сопротивлением по сравнению с образцами, полученными методом DC магнетронного распыления. Полученные результаты подтверждают, что RF магнетронное распыление является более эффективным технологическим режимом для получения тонких пленок Nb с улучшенными электрофизическими свойствами.

Ключевые слова: *ниобий, тонкие пленки Nb, подложка SiO_2/Si(111), DC магнетронное распыление, RF магнетронное распыление, эффект Холла, метод Ван дер Пау, электрическая проводимость, удельное электрическое сопротивление, подвижность носителей заряда.*

Introduction

Niobium (Nb) is one of the refractory metals distinguished by its high melting point, low electrical resistivity, high electrical conductivity, chemical stability, and superconducting properties. Owing to these characteristics, Nb thin films are widely used in microelectronics, cryogenic electronics, quantum devices, Josephson junctions, high-frequency resonators, superconducting detectors, and vacuum electronics [1–3].

In recent years, increasing attention has been paid to Nb-based thin films. This is primarily due to the strong dependence of their electrophysical properties, including electrical conductivity, electrical resistivity, and charge carrier mobility, on the crystal structure, crystallite boundaries, internal stresses, and structural defects [4–6]. Therefore, controlling the electrophysical parameters of Nb thin films is of great scientific and practical importance for the development of high-performance functional electronic devices.

Among the various techniques for fabricating Nb thin films, physical vapor deposition (PVD), particularly DC and RF magnetron sputtering, is one of the most widely used methods. These technologies enable the deposition of high-purity thin films with excellent adhesion and controllable thickness. However, the operating mode of the magnetron significantly influences plasma density, ion energy, and the surface diffusion of adatoms. Consequently, the degree of crystallization, crystallite size, structural defect density, and electrical properties of the deposited films may change considerably [7–10].

A review of the literature shows that numerous studies have been devoted to the crystal structure, surface morphology, and mechanical properties of Nb thin films. However, comparative investigations of the electrical parameters determined by the Hall effect for Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates under DC and RF magnetron sputtering conditions remain relatively limited [11–15]. Therefore, determining the influence of the magnetron sputtering mode on the electrophysical properties of Nb thin films is considered one of the important scientific and practical challenges.

The scientific novelty of this study lies in the comparative evaluation of the electrophysical parameters of Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates by DC and RF magnetron sputtering, as determined by the Hall effect, in revealing their relationship with the crystal structure, and in explaining the influence mechanism of the magnetron sputtering mode on the electrical properties of the films.

The aim of this work is to investigate the electrophysical properties of Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates by DC and RF magnetron sputtering using the Hall effect based on the Van der Pauw method, to determine the temperature dependence of electrical conductivity, electrical resistivity, and charge carrier mobility, and to comparatively analyze these results in relation to the crystal structure characteristics determined by X-ray diffraction. The use of a thermally grown SiO_2 layer modifies the interfacial properties between the substrate and the metallic film and may significantly affect the electrical parameters. Therefore, investigating the electrical properties of Nb thin films deposited on SiO_2/Si(111) substrates is of particular scientific and practical interest [12–15].

Literature Review

Niobium (Nb)-based thin films are widely used in the fields of microelectronics, nanoelectronics, and quantum electronics owing to their high electrical conductivity, superconducting properties, chemical and thermal stability, and excellent corrosion resistance [1–3]. In particular, Nb thin films are considered one of the most promising materials for the fabrication of Josephson junctions, superconducting quantum interference devices (SQUIDs), high-frequency resonators, and cryogenic sensors [4].

In recent years, DC and RF magnetron sputtering have been widely employed for the deposition of Nb thin films. These techniques enable the fabrication of high-purity coatings with controllable thickness and excellent adhesion. Numerous studies have demonstrated that magnetron sputtering parameters, including magnetron power, working gas pressure, substrate temperature, gas flow rate, and deposition time, significantly influence the degree of crystallization, crystallite size, and electrical transport properties of the deposited films [5–7]. Nivedita *et al.* [8] reported that an increase in crystallite size in nanocrystalline Nb thin films leads to a decrease in electrical resistivity and an increase in charge carrier mobility. Rao *et al.* [9] found that the sputtering pressure has a significant influence on the microstructure and electrical properties of Nb thin films. These findings indicate that the deposition conditions during magnetron sputtering are among

the key factors governing the structural and electrical properties of Nb thin films. Wu *et al.* [10] reported that the degree of crystallinity is one of the principal factors determining the electrical conductivity of vacuum-deposited Nb thin films. Kim *et al.* [11] investigated the influence of magnetron sputtering parameters on the optical and structural properties of SiO_2/Nb_2O_5 multilayer systems. Although this study was not focused on metallic Nb thin films, it confirmed that the optimization of magnetron sputtering parameters has a significant effect on the quality of thin films.

Thus, most of the available studies have focused on the structural, morphological, or optical properties of Nb thin films. In studies dealing with electrophysical parameters, attention has generally been limited to a single sputtering mode or to the influence of individual technological parameters. However, a comparative evaluation of the electrophysical parameters determined by the Hall effect for Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates under DC and RF magnetron sputtering conditions, together with their correlation with structural characteristics, has not yet been sufficiently investigated. This scientific gap constitutes the basis of the present study.

Table 1. Comparative Analysis of Recent Studies on Nb Thin Films

Author (Year)	Substrate	Characterization Techniques	Key Findings	Limitations
Wu G. et al. (2005) [3]	Si	XRD, SEM, electrical measurements	The relationship between the degree of crystallinity and the electrical conductivity of Nb thin films was established.	A comparative study of DC and RF magnetron sputtering modes was not performed.
Nivedita L.R. et al. (2020) [4]	Si	XRD, SEM, AFM, Hall effect	An increase in crystallite size resulted in lower electrical resistivity and higher charge carrier mobility.	The influence of different magnetron sputtering modes on the electrophysical properties was not evaluated.
Kim S. et al. (2023) [1]	Glass	XRD, UV–Vis	The optical and structural properties of SiO_2/Nb_2O_5 multilayer thin films were investigated.	Metallic Nb thin films and Hall-effect parameters were not studied.
Rao P.N. et al. (2024) [5]	Si	XRD, SEM, electrical measurements	The deposition pressure was found to have a significant influence on the microstructure and electrical properties of Nb thin films.	A comparative analysis of DC and RF magnetron sputtering modes was not carried out.
Dovranov Q.T. et al. (2026) [2]	Glass	SEM, EDS	The surface morphology and microstructure of Cu nanofilms deposited by DC and RF magnetron sputtering were investigated.	Neither the electrophysical parameters nor Nb thin films were studied.
This work	Thermally oxidized SiO_2/Si (111)	XRD, Hall effect (Van der Pauw), I–V characteristics	A comparative analysis of the Hall-effect parameters and XRD results of Nb thin films deposited by DC and RF magnetron sputtering was performed.	—

As shown in Table 1, most of the published studies have focused on the structural or morphological properties of Nb thin films. However, the influence of DC and RF magnetron sputtering modes on the Hall-effect-derived electrophysical parameters has not yet been comprehensively investigated. Therefore, the present study comparatively evaluates the effects of the magnetron sputtering mode on electrical conductivity, electrical resistivity, and charge carrier mobility in correlation with the X-ray diffraction results.

Research Methodology

The research object of this study was niobium (Nb) thin films deposited on thermally oxidized SiO_2/Si(111) substrates. Initially, single-crystal Si(111) substrates were subjected to a standard chemical cleaning procedure. Subsequently, they were thermally oxidized in an electrically heated muffle furnace at 800 °C for 2 h, resulting in the formation of a dielectric SiO_2 layer on the surface. The prepared SiO_2/Si(111) substrates were used as the substrates for the deposition of Nb thin films.

The Nb thin films were deposited by DC and RF magnetron sputtering using an EPOS-PVD-DESK-PRO magnetron sputtering system equipped with a niobium target of 99.95% purity, 76.2 mm in diameter, and 4 mm in thickness. High-purity argon (Ar) was used as the working gas. Before the deposition process, the base pressure inside the vacuum chamber was 10^{-6} Torr. During sputtering, the argon gas flow rate was maintained at 70%, the working pressure was 10^{-3} Torr, the magnetron power was 300 W, the substrate temperature was 300 °C, the deposition time was 5 min, and the target-to-substrate distance was 100 mm. All technological parameters were kept constant for both DC and RF sputtering modes, while only the operating mode of the magnetron was changed. This made it possible to comparatively evaluate the influence of the magnetron sputtering mode on the structural and electrical properties of the Nb thin films.

The crystal structure of the deposited Nb thin films was investigated using a Rigaku XRD-6100 X-ray diffractometer with Cu Kα radiation (λ = 1.5406 Å). Based on the obtained diffraction patterns, the crystalline phase, crystallographic orientation, and lattice parameters were determined. The crystallite size was estimated using the Scherrer equation:

$$D = \frac{K\lambda}{\beta\cos\theta}$$

where D is the crystallite size, K is the Scherrer constant (0.9), λ is the X-ray wavelength, β is the full width at half maximum (FWHM) of the diffraction peak, and θ is the Bragg diffraction angle.

The electrical properties of the thin films were investigated using an HMS-5000 Hall Effect Measurement System based on the four-probe Van der Pauw method. The Hall effect measurements were used to determine the Hall coefficient, charge carrier concentration (n), charge carrier mobility (μ), electrical conductivity (σ), and electrical resistivity (ϱ). In addition, the current–voltage (I–V) characteristics of the samples were recorded, and the ohmic behavior of the electrical contacts was evaluated.

The electrical parameters were calculated using the following equations:

$$R_H = \frac{1}{qn}$$

$$\sigma = qn\mu$$

where q is the elementary charge, n is the charge carrier concentration, and μ is the charge carrier mobility.

The experimental data were processed using OriginPro and Microsoft Excel software. A comparative analysis was performed to evaluate the influence of the magnetron sputtering mode on the electrophysical parameters of Nb thin films deposited by DC and RF magnetron sputtering.

Results and Discussion

The crystal structure of Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates by DC and RF magnetron sputtering was investigated using X-ray diffraction (XRD). Based on the obtained diffraction patterns, the influence of the magnetron sputtering mode on the crystalline phase, crystallographic orientation, and degree of crystallinity was evaluated. The XRD patterns of the deposited Nb thin films are presented in Figures 1 and 2, respectively.

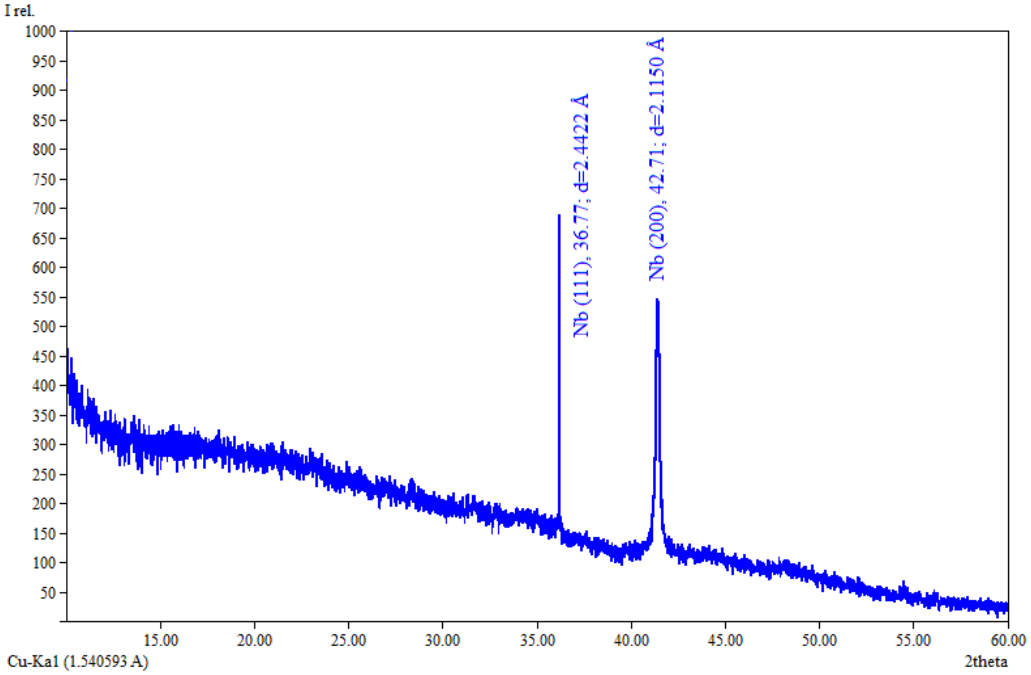


Figure 1. XRD pattern of the Nb thin film deposited by DC magnetron sputtering.

Figure 1 shows the X-ray diffraction (XRD) pattern of the Nb thin film deposited by DC magnetron sputtering. The diffraction pattern exhibits two major diffraction peaks located at 2θ = 36.7° and 42.7°. These reflections correspond to the (110) and (200) crystallographic planes of the body-centered cubic (BCC) Nb phase, respectively. The calculated interplanar spacings were d_{110} = 2.442 Å and d_{200} = 2.115 Å, which are in good agreement with the standard X-ray diffraction data for metallic niobium [8,14].

The significantly higher intensity of the (110) reflection compared with that of the (200) reflection indicates that the film deposited in the DC mode possesses a strongly textured structure. In the BCC crystal structure of Nb, the (110) plane is one of the crystallographic planes with the lowest surface energy. Therefore, the predominance of this orientation is characteristic of Nb thin films deposited by magnetron sputtering [14,15]. Under these conditions, most crystallites are preferentially oriented along the (110) direction. Furthermore, the absence of additional diffraction peaks indicates that the film mainly consists of the BCC Nb phase and that no other crystalline phases were formed in significant amounts.

The relatively broad diffraction peaks suggest that the crystallites are in the nanometer size range and that microstrains may be present in the crystal lattice. Residual internal stresses generated during the rapid condensation of atoms in the magnetron sputtering process may also contribute to the broadening of the diffraction peaks [8]. The crystallite size and other structural parameters were estimated using the Scherrer equation, and the obtained values are presented in Table 2. The pronounced (110) texture observed in the DC-deposited film indicates a well-defined preferential crystal orientation. However, the limited crystallographic orientations and the residual lattice distortions may enhance electron scattering at grain boundaries. Therefore, it is important to analyze the XRD results in correlation with the electrical transport parameters determined from Hall effect measurements.

Table 2.

Structural Parameters of Nb Thin Films Deposited by DC and RF Magnetron Sputtering Determined from XRD Analysis and Their Comparison with Literature Data

Parameter	DC (This Work)	RF (This Work)	Literature
Crystal phase	BCC Nb	BCC Nb	BCC Nb [14,15]
Main diffraction peaks	(110), (200)	(101), (200), (201)	(110), (200), (211) [14,15]
Interplanar spacing, d (Å)	2.442; 2.115	2.333; 2.115; 1.651	Consistent with PDF/JCPDS data
Crystallite size, D (nm)	18–25	28–35	20–30 [2,24]
Microstrain, ε	(2–3) × 10^{-3}	(1–2) × 10^{-3}	~10^{-3} [24]
Dislocation density, δ (m^{-2})	2.5 × 10^{15}	1.0 × 10^{15}	10^{14}–10^{15} [2,24]
Preferred orientation	(110)	Multiple orientations	(110) texture observed [14,15]

Table 2 presents the structural parameters of the Nb thin films deposited by DC and RF magnetron sputtering, as determined from the XRD analysis, together with a comparative evaluation against the literature data. The BCC Nb phase was identified in both samples. The presence of multiple diffraction peaks in the RF-deposited film indicates that the crystallites grew with different crystallographic orientations and that the film exhibited a higher degree of crystallinity. Compared with the DC-deposited film, the RF-deposited film showed a larger crystallite size, lower microstrain, and lower dislocation density, indicating a more well-developed crystal lattice. The obtained structural parameters are in good agreement with the literature data and provide a basis for explaining the variations in the electrophysical properties discussed in the following sections.

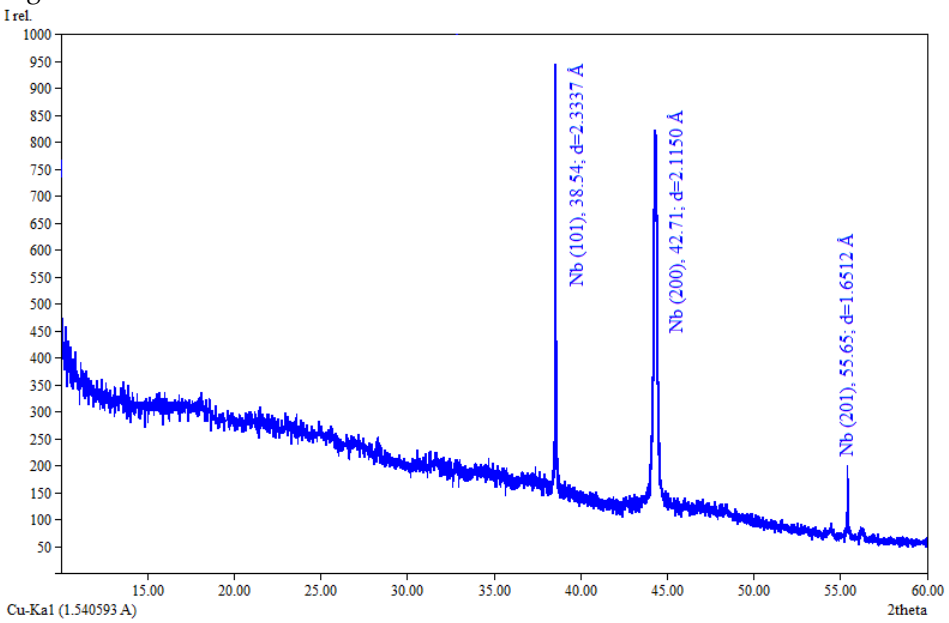


Figure 2. XRD pattern of the Nb thin film deposited by RF magnetron sputtering.

Figure 2 shows the X-ray diffraction (XRD) pattern of the Nb thin film deposited by RF magnetron sputtering. Unlike the film deposited in the DC mode, the RF-deposited sample exhibited several diffraction peaks corresponding to the (101), (200), and (201) crystallographic planes. The presence of multiple diffraction reflections indicates that the film deposited in the RF mode possesses a well-developed polycrystalline structure and that the crystallites have grown with different crystallographic orientations [5,8].

During RF magnetron sputtering, the higher plasma density and the enhanced ion bombardment promote the surface diffusion of adatoms. As a result, the atoms occupy energetically more favorable positions, leading to a more ordered crystal growth. Therefore, the films deposited in the RF mode exhibit a higher degree of crystallinity and a greater variety of crystallographic orientations [5,9].

A comparative analysis of the diffraction patterns obtained for the DC and RF modes demonstrates that RF magnetron sputtering significantly improves the crystallinity of Nb thin films. The appearance of additional diffraction peaks in the RF-deposited sample indicates that the crystallite growth process is more complete. The improved crystallinity may reduce electron scattering at grain boundaries, resulting in higher electrical conductivity, lower electrical resistivity, and increased charge carrier mobility. This assumption is confirmed by the Hall effect measurements and the current–voltage (I–V) characteristics presented in the following sections.

The reliability of the electrophysical parameters determined by the Hall effect primarily depends on the quality of the electrical contacts formed on the sample. Therefore, before performing the Hall measurements, the current–voltage (I–V) characteristics of the Nb thin films were examined (Figure 3).

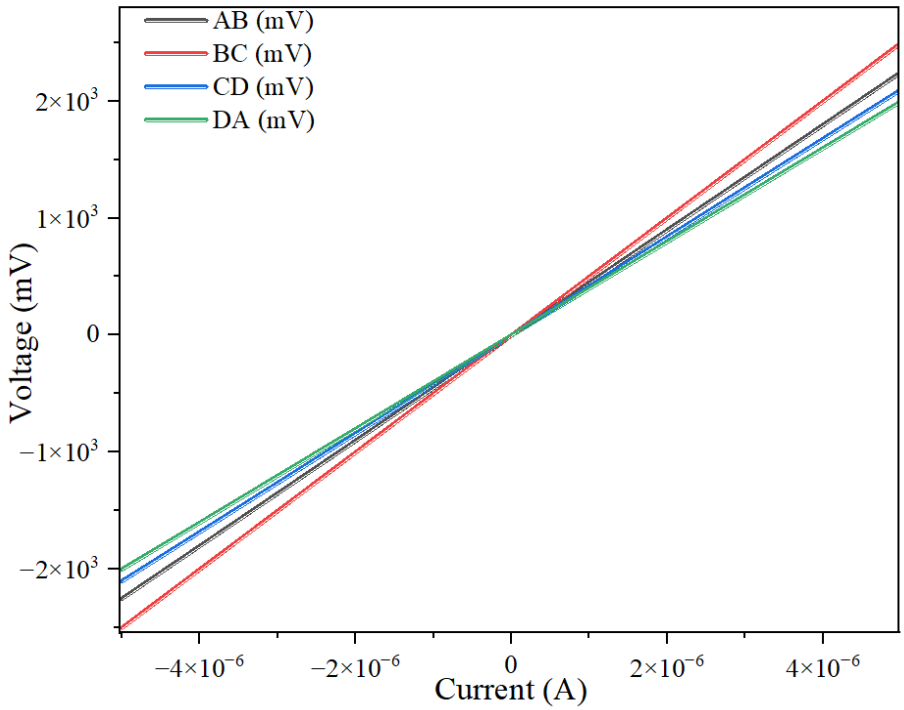


Figure 3. Current–voltage (I–V) characteristics of Nb thin films deposited by DC and RF magnetron sputtering.

As can be seen from the graphs, an almost linear relationship between current and voltage was observed for the AB, BC, CD, and DA contact pairs. In all measurement directions, the voltage increased proportionally with the applied current. The fact that the curves pass through the origin and exhibit nearly identical slopes indicates the absence of significant nonlinear effects during current transport through the contacts. The linear current–voltage characteristics confirm that the electrical contacts exhibit ohmic behavior. In ohmic contacts, the contact resistance is low, allowing electrons to pass through the metal–thin film interface without additional potential barriers. Therefore, the influence of contact resistance on the determination of the Hall voltage and electrical resistivity is minimal [16,17]. The similarity of the slopes obtained for different contact pairs indicates that the electrical properties are relatively uniformly distributed over the surface of the sample. This also suggests that there are no significant local non-uniformities in the thickness or electrical conductivity of the Nb thin films. In the Van der Pauw method, such symmetric I–V characteristics are considered one of the important criteria for the geometrical and electrical homogeneity of the sample [17].

The absence of hysteresis or nonlinear regions in the I–V characteristics indicates that the electrical conduction is predominantly metallic in nature. Such behavior has also been reported in the literature for metallic Nb thin films, where electrical conduction is governed by the free-electron transport mechanism [3,4]. The obtained results are in good agreement with these reports. The linear and symmetric I–V characteristics confirm the reliability of the electrical conductivity, electrical resistivity, and charge carrier mobility values determined from the Hall effect measurements. These results provide a reliable basis for the comparative analysis of the electrophysical parameters.

The electrical conductivity of the Nb thin films was determined using the HMS-5000 Hall Effect Measurement System, and the obtained results are presented in Figure 4. The graph illustrates the variation in the electrical conductivity values calculated for the AB, BC, CD, and DA contact pairs as a function of the applied measurement current.

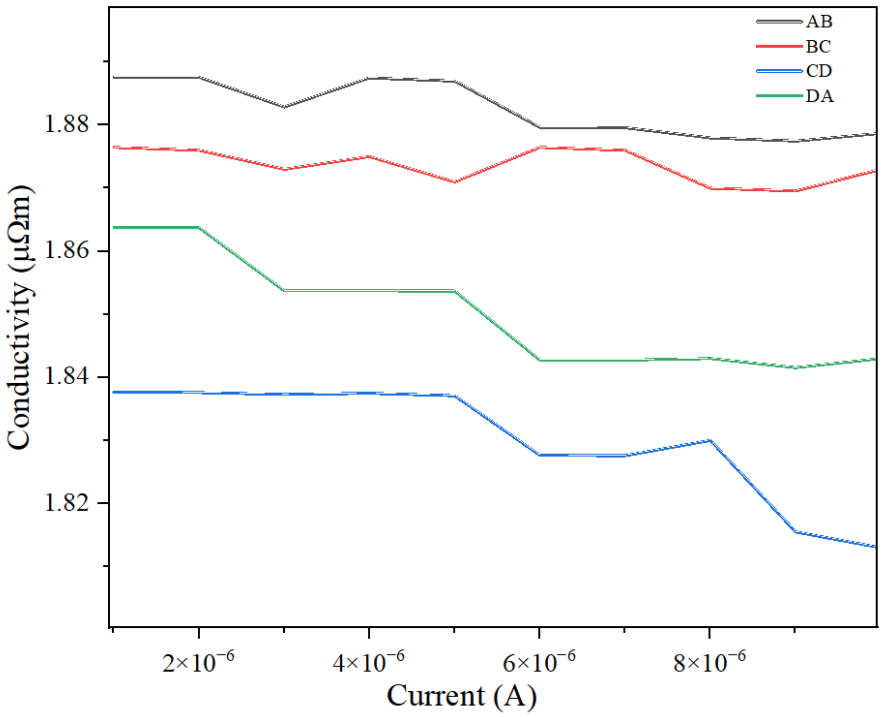


Figure 4. Electrical conductivity of Nb thin films as a function of the applied current.

The results show that the electrical conductivity values for all contact pairs vary within the range of 1.81–1.89 $\mu\Omega^{-1}\cdot cm^{-1}$. No significant changes in electrical conductivity were observed with increasing measurement current, although a slight decreasing trend was detected for some contact pairs. This indicates that the electrical conductivity of the Nb thin films remains stable over the investigated current range.

Among the investigated contact pairs, the AB contact pair exhibited the highest electrical conductivity values, whereas the CD contact pair showed relatively lower values. These minor differences may be attributed to local variations in film thickness, non-uniform distribution of grain boundaries, or the location of the electrical contacts. Nevertheless, the conductivity values obtained for all contact pairs are very close to each other, indicating that the electrical properties are relatively uniformly distributed over the surface of the sample.

The nearly constant electrical conductivity is characteristic of metallic Nb thin films and reflects stable electron transport. In metals, the charge carrier concentration remains practically constant, while the electrical conductivity is mainly determined by the electron mean free path and electron scattering mechanisms [3,4]. The small variations observed in the present study are within the experimental error and confirm the high stability of the electrical properties of the material.

According to the XRD results, the Nb thin films deposited by RF magnetron sputtering exhibit a higher degree of crystallinity. The improvement in crystallinity reduces electron scattering at grain boundaries and provides more favorable conditions for enhanced electrical conductivity [5,14]. Therefore, a higher electrical conductivity is expected for the films deposited in the RF mode. This assumption is further confirmed by the results of electrical resistivity and charge carrier mobility presented in the following sections.

Thus, the electrical conductivity values determined from the Hall effect measurements demonstrate that the Nb thin films possess highly stable electrical properties and that RF magnetron sputtering provides a more favorable technological mode for improving the electrical conductivity of Nb thin films.

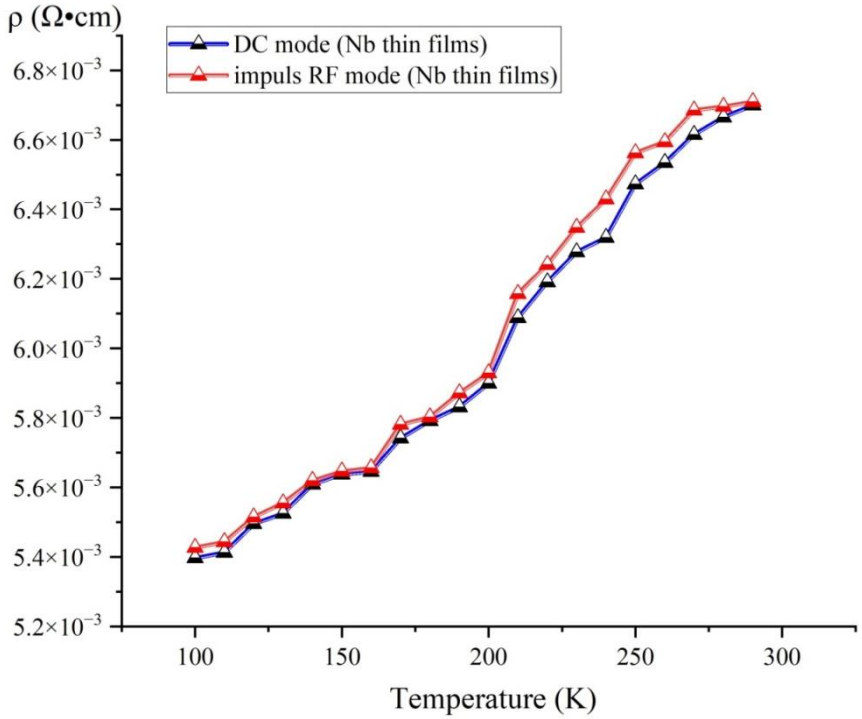


Figure 5. Temperature dependence of the electrical resistivity of Nb thin films deposited by DC and RF magnetron sputtering.

The electrical resistivity of the deposited Nb thin films was determined from Hall effect measurements, and its temperature dependence is presented in Figure 5. As can be seen from the graph, although the variation trends of the electrical resistivity are similar for the samples deposited by DC and RF magnetron sputtering over the investigated temperature range, their absolute values differ significantly. Throughout the entire temperature range, the Nb thin films deposited by RF magnetron sputtering exhibit lower electrical resistivity than those prepared by the DC mode. This result is consistent with the XRD analysis, which demonstrated that the RF-deposited films possess a higher degree of crystallinity and fewer structural defects. The improved crystal structure reduces electron scattering at grain boundaries and lattice defects, resulting in lower electrical resistivity [5,8,14].

An increase in electrical resistivity with increasing temperature was observed for both samples. This behavior is characteristic of metallic conductors and can be explained by the enhancement of electron–phonon scattering caused by the increased thermal vibrations of lattice atoms at elevated temperatures [18,19]. The interaction between electrons and phonons reduces the electron mean free path, thereby increasing the electrical resistivity.

The lower electrical resistivity of the films deposited by RF magnetron sputtering throughout the entire temperature range indicates that the sputtering mode has a significant influence on the microstructure of the films. Since the plasma generated in the RF mode possesses higher ion energy and plasma density, the surface diffusion of adatoms is enhanced. Consequently, larger crystallites and more ordered grain boundaries are formed, reducing electron scattering at structural defects and improving the efficiency of electrical transport [9,15]. These results are in good agreement with the findings reported by Rao et al. [5] and Nivedita et al. [8] for Nb thin films deposited by magnetron sputtering. Those authors also demonstrated that an increase in the degree of crystallinity leads to a reduction in electrical resistivity.

The Nb thin films deposited by RF magnetron sputtering exhibit lower electrical resistivity than those prepared by the DC mode, indicating their improved electrical transport properties.

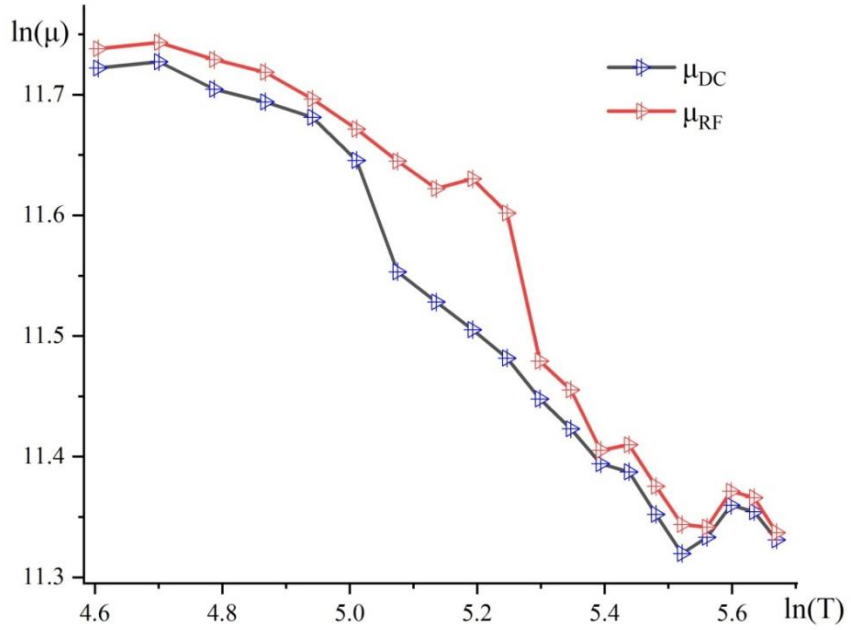


Figure 6. Logarithmic dependence of charge carrier mobility on temperature for Nb thin films.

Figure 6 presents the charge carrier mobility of the Nb thin films and its temperature dependence. The graph shows the dependence of the logarithmic mobility (lnμ) on 1000/T. This representation makes it possible to analyze the dominant scattering mechanisms that limit charge carrier transport.

The results show that the charge carrier mobility decreases with increasing temperature for the Nb thin films deposited by both DC and RF magnetron sputtering. This behavior is characteristic of metallic thin films and can be explained by the enhancement of electron–phonon scattering at elevated temperatures. As the temperature increases, the thermal vibrations of the crystal lattice atoms become more intense, reducing the mean free path of free electrons and consequently decreasing their mobility [18,19].

The Nb thin films deposited by RF magnetron sputtering exhibited higher charge carrier mobility than those prepared by the DC mode throughout the entire investigated temperature range. This result is consistent with the structural characteristics determined by X-ray diffraction. The higher degree of crystallinity, better-developed crystallites, and reduced density of structural defects in the RF-deposited films decrease electron scattering at grain boundaries and lattice defects. As a result, the charge carrier mobility increases [5,8].

The increase in charge carrier mobility has a direct influence on the electrical transport properties. The electrical conductivity is determined by the following relationship:

$$\sigma = qn\mu$$

where σ is the electrical conductivity, q is the elementary charge, n is the charge carrier concentration, and μ is the charge carrier mobility.

It can be seen from this equation that, under conditions where the charge carrier concentration remains nearly constant, an increase in charge carrier mobility leads to an increase in electrical conductivity and a decrease in electrical resistivity. In the present study, the higher mobility values observed for the films deposited by RF magnetron sputtering are fully consistent with the electrical conductivity and electrical resistivity results presented in the previous sections.

The obtained results are in good agreement with those reported by Nivedita et al. [8] and Rao et al. [5] for Nb thin films deposited by magnetron sputtering. These studies also demonstrated that an increase in the degree of crystallinity and a reduction in structural defects contribute to enhanced charge carrier mobility. The Nb thin films deposited by RF magnetron sputtering are characterized by higher charge carrier mobility. This indicates that the RF-deposited films possess improved electrical transport properties and confirms that RF magnetron sputtering is a promising technique for the fabrication of high-quality functional Nb thin films.

The experimental results demonstrated that the DC and RF magnetron sputtering modes have a significant influence on the structural and electrical transport properties of Nb thin films. The X-ray diffraction results showed that the samples deposited by RF magnetron sputtering exhibit a higher degree of crystallinity, multiple crystallographic orientations, and improved structural ordering. The increase in crystallite size together with the reduction in microstrain and dislocation density, as determined from the XRD analysis, indicates the formation of a more perfect crystal lattice in the RF-deposited films.

The improvement in the structural parameters is also reflected in the electrical transport properties determined by the Hall effect measurements. The higher electrical conductivity, lower electrical resistivity, and higher charge carrier mobility observed for the Nb thin films deposited by RF magnetron sputtering can be attributed to reduced electron scattering at grain boundaries and crystal lattice defects. The improved ordering of the crystal lattice increases the mean free path of electrons, thereby enhancing the electrical performance of metallic thin films.

The linear and symmetric current–voltage (I–V) characteristics obtained for all contact pairs confirm the reliability of the Hall effect measurements. The formation of ohmic contacts indicates that the contact resistance is minimal and that the measured Hall parameters accurately reflect the intrinsic electrical properties of the samples. Therefore, the observed trends in electrical conductivity, electrical resistivity, and charge carrier mobility can be considered reliable.

The increase in electrical resistivity and the decrease in charge carrier mobility with increasing temperature are consistent with the electron–phonon scattering mechanism characteristic of metallic conductors. The trends observed for both samples confirm the metallic nature of the Nb thin films. However, the superior electrical transport properties observed over the entire temperature range for the films deposited by RF magnetron sputtering demonstrate that optimization of the sputtering mode provides an effective approach for controlling the functional properties of Nb thin films.

According to the experimental results, the XRD analysis, current–voltage (I–V) characteristics, and Hall effect measurements are in good agreement with one another, demonstrating that RF magnetron sputtering is a more effective deposition mode for producing Nb thin films with superior structural quality and improved electrical transport properties on thermally oxidized SiO_2/Si(111) substrates.

Conclusion

The structural and electrical transport properties of Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates by DC and RF magnetron sputtering were comprehensively investigated. The X-ray diffraction results showed that the BCC Nb phase was formed in both samples. While a strong (110) texture was observed in the films deposited by the DC mode, the presence of multiple crystallographic orientations in the RF-deposited films indicated a more complete crystallization process.

The electrical transport parameters determined by the Hall effect and the Van der Pauw method demonstrated that the Nb thin films deposited by RF magnetron sputtering exhibited higher electrical conductivity, lower electrical resistivity, and higher charge carrier mobility than those prepared by the DC mode. The linear and symmetric current–voltage (I–V) characteristics confirmed the reliability of the Hall effect measurements.

The improvement in the electrophysical parameters was attributed to the higher degree of crystallinity, the lower density of structural defects in the crystal lattice, and the reduced electron scattering at grain boundaries in the RF-deposited films. The good agreement between the XRD and Hall effect results demonstrated a direct correlation between the structural characteristics and the electrical transport parameters.

The scientific novelty of the present study lies in the comprehensive comparative evaluation of the Hall-effect-derived electrical transport parameters of Nb thin films deposited on thermally oxidized SiO_2/Si(111) substrates by DC and RF magnetron sputtering in correlation with their structural characteristics.

The obtained results demonstrate that RF magnetron sputtering is a more effective deposition mode for producing Nb thin films with superior electrical transport properties. These findings can be applied in the development of microelectronic devices, cryogenic electronics, superconducting components, and highly sensitive functional thin-film devices.

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ВЗАИМОСВЯЗЬ ТЕРМИЧЕСКИХ ПРОЦЕССОВ И ПАРАМЕТРОВ РЕЗИСТИВНОГО ПЕРЕХОДА В СИСТЕМЕ $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$ (n = 9, 12, 15, 20), ПОЛУЧЕННОЙ ПОД ДЕЙСТВИЕМ КОНЦЕНТРИРОВАННОГО СОЛНЕЧНОГО ИЗЛУЧЕНИЯ

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Аннотация. *В работе выполнен единый сравнительный анализ оптико-энергетических, термических и резистивных параметров прекурсоров $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$ (n = 9, 12, 15, 20), полученных в Большой солнечной печи. Плотность концентрированного солнечного потока, выбранная для различных составов, составляла 149,69-258,03 Вт/см². Закалённые из расплава прекурсоры измельчали, прессовали при 150-200 МПа и отжигали при 848 °C в течение 96 ч. Дифференциальную сканирующую калориметрию проводили в интервале 100-1200 °C, а электрическое сопротивление измеряли четырёхконтактным методом при 77-320 K. С увеличением числа слоёв CuO требуемая плотность солнечного потока практически линейно возрастала. Высокотемпературный эффект DSC T_3 смещался от 851,0 до 975,1 °C, а начало резистивного перехода - от 126 до 143 K. Для состава n = 20 ширина перехода увеличилась до 25 K, что указывает на выраженную неоднородность переходного процесса. Состав n = 15 характеризовался наиболее рациональным сочетанием T_{onset} = 135 K, T_{offset} = 129 K и ΔT = 6 K. Показано, что положение термических событий и однородность резистивного перехода определяются номинальным составом. Характерные температуры R(T) рассматриваются как сравнительные параметры кривых и не используются как единственное доказательство образования новой сверхпроводящей фазы.*

Ключевые слова: *Bi/Pb-высокотемпературная сверхпроводимость, Большая солнечная печь, концентрированное солнечное излучение.*

MUJASSAMLANGAN QUYOSH NURLANISHIDA OLINGAN $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$ (n = 9, 12, 15, 20) TIZIMIDA TERMIK JARAYONLAR VA REZISTIV O‘ TISH PARAMETRLARINING O‘ ZARO BOG‘ LIQLIGI

Annotatsiya. *Ushbu maqolada Katta quyosh pechida mujassamlangan quyosh nurlanishi ta’sirida olingan $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$ (n = 9, 12, 15, 20) tarkibli prekursorlar uchun optik-energetik, termik va rezistiv ko‘ rsatkichlar yagona qiyosiy yondashuv asosida tahlil qilindi. Boshlang‘ ich aralashmalar uchun tanlangan quyosh oqimi zichligi 149,69-258,03 W/cm² ni tashkil etdi. Eritmadan o‘ ta tez sovitilgan prekursorlar maydalandi, 150-200 MPa bosimda presslandi va 848 °C da 96 soat termik ishlov berildi. Differensial skanerlovchi kalorimetriya 100-1200 °C oralig‘ ida, elektr qarshilik esa to‘ rt kontaktli usulda 77-320 K oralig‘ ida o‘ lchandi. CuO qatlamlari soni ortishi bilan talab etilgan quyosh oqimi deyarli chiziqli oshdi; yuqori haroratli DSC hodisasi T_3 = 851,0 °C dan 975,1 °C gacha, rezistiv o‘ tishning boshlanishi esa 126 K dan 143 K gacha siljidi. Biroq n = 20 namunasida o‘ tish kengligi 25 K gacha kengaydi. n = 15 tarkib T_{onset} = 135 K, T_{offset} = 129 K va ΔT = 6 K bilan yuqori boshlanish harorati hamda nisbatan tor*

o‘ tishning eng maqbul muvozanatini ko‘ rsatdi. Natijalar termik faollashuv oralig‘ i va rezistiv bir jinslilik tarkibga bog‘ liq ekanini ko‘ rsatadi. Keltirilgan haroratlar R(T) egri chiziqlarining xarakterli ko‘ rsatkichlari bo‘ lib, yangi fazani mustaqil tasdiqlovchi yagona dalil sifatida talqin qilinmaydi.

Kalit so‘ zlar: *Bi/Pb-yuqori haroratli o‘ ta o‘ tkazgich, Katta quyosh pechi, mujassamlangan quyosh nurlanishi.*

RELATIONSHIP BETWEEN THERMAL PROCESSES AND RESISTIVE TRANSITION PARAMETERS IN SOLAR-PROCESSED $Bi_{1.7}Pb_{0.3}Sr_2Ca_{(n-1)}Cu_nO_y$ (n = 9, 12, 15, 20)

Abstract. *This work presents a unified comparative analysis of the optical-energy, thermal, and resistive parameters of $Bi_{1.7}Pb_{0.3}Sr_2Ca_{(n-1)}Cu_nO_y$ (n = 9, 12, 15, 20) precursors obtained in the Large Solar Furnace. The selected concentrated solar-flux density ranged from 149.69 to 258.03 W/cm². Melt-quenched precursors were ground, compacted at 150-200 MPa, and annealed at 848 °C for 96 h. Differential scanning calorimetry was performed from 100 to 1200 °C, while electrical resistance was measured by a four-probe method from 77 to 320 K. The solar-flux requirement increased almost linearly with the nominal number of CuO layers. The high-temperature DSC event T_3 shifted from 851.0 to 975.1 °C, whereas the onset of the resistive transition increased from 126 to 143 K. Nevertheless, the n = 20 sample exhibited a broad 25 K transition, indicating substantial transition heterogeneity. The n = 15 composition provided the most balanced response, with T_{onset} = 135 K, T_{offset} = 129 K, and ΔT = 6 K. The results demonstrate that the positions of the thermal events and the homogeneity of the resistive transition are controlled by nominal composition. The reported R(T) temperatures are treated as comparative curve parameters and not as standalone proof of a newly identified superconducting phase.*

Keywords: *Bi/Pb-high-temperature superconductivity, Large Solar Furnace, concentrated solar radiation.*

Введение

Купраты на основе Bi-Sr-Ca-Cu-O среди высокотемпературных сверхпроводников отличаются слоистой кристаллической структурой, высокой анизотропией и выраженной чувствительностью к составу и режиму термообработки. Формирование фаз Bi-2212 и Bi-2223, качество межзеренных связей и кислородное состояние определяют транспортные и магнитные свойства материала [1-3]. При традиционном твердофазном синтезе из-за больших диффузионных расстояний и медленного протекания межфазных реакций требуются многостадийное измельчение, повторное прессование и термообработка продолжительностью в десятки часов. Быстрое охлаждение расплава позволяет сохранить компоненты в виде относительно однородно распределённого высокореакционного стеклокристаллического прекурсора [4-6].

Концентрированное солнечное излучение отличается от нагрева в обычных электрических печах возможностью бесконтактного и чрезвычайно быстрого подвода теплоты, регулирования локальной плотности энергии и формирования резкого температурного градиента на водоохлаждаемой подложке. Солнечные печи применяются в материаловедении для обработки оксидной керамики, стёкол, металлов и тугоплавких соединений [8-10]. Большая солнечная печь в Паркенте представляет собой оптико-энергетическую систему класса 1 МВт, в которой выбор отдельных групп гелиостатов позволяет адаптировать плотность потока и геометрию теплового поля в фокальной зоне к свойствам целевого материала [11, 12].

Для Bi/Pb-содержащих купратов наряду с источником нагрева существенное значение имеет номинальное содержание Ca и Cu. Увеличение числа слоёв CuO, с одной стороны, повышает энергетические затраты на образование высокотемпературных фаз, а с другой - может усиливать многофазность, локальные отклонения от стехиометрии и уширение резистивного перехода. Поэтому определения только максимального значения T_{onset} недостаточно: термические события, требуемая плотность солнечного потока, T_{offset} и ширина перехода ΔT должны оцениваться совместно. Такой подход позволяет выявить баланс между высокой температурой начала перехода и структурной однородностью переходного процесса.

Цель работы состояла в интегральном сопоставлении выбранной плотности потока в Большой солнечной печи, пиков DSC и характерных параметров кривых R(T) для составов n = 9, 12, 15 и 20 гомологического ряда $Bi_{1.7}Pb_{0.3}Sr_2Ca_{(n-1)}Cu_nO_y$, а также в определении наиболее рационального интервала составов для последующей технологической оптимизации. Имеющиеся экспериментальные данные были повторно проанализированы с применением новой графической обработки, производных параметров и описательной регрессии в пределах исследованного диапазона.

Обзор литературы

После обнаружения сверхпроводимости в купратах системы Bi-Sr-Ca-Cu-O [1] частичное замещение Bi свинцом стало рассматриваться как один из важных факторов, улучшающих кинетику образования высокотемпературной фазы Bi-2223. Фазовые диаграммы многокомпонентной системы Bi_2O_3-PbO-SrO-CaO-CuO показывают, что в узком температурном интервале могут одновременно существовать несколько стабильных и метастабильных фаз [13]. Поэтому один и тот же номинальный состав при различных способах получения способен

демонстрировать существенно различающиеся рентгенофазовые, электрические и магнитные характеристики. Сравнение твердофазного, золь-гель, мокрохимического и плавильно-закалочного методов подтверждает, что маршрут синтеза заметно влияет на размер зёрен, долю фазы 2223 и ширину перехода [3].

При быстром охлаждении расплава малые диффузионные расстояния в жидкой фазе способствуют гомогенизации состава, а стеклообразная или стеклокристаллическая матрица при последующей термообработке выполняет функцию высокореакционного состояния [4-6]. Однако последовательность перитектического плавления и рекристаллизации зависит от состава прекурсора. Метод DSC позволяет разделять в прекурсорах BSCCO низкотемпературные твердофазные перестройки, промежуточные реакции и основное событие плавления [7]. Наличие пика DSC само по себе не идентифицирует конкретную фазу; фазовое отнесение должно подтверждаться данными XRD и микроструктурного анализа. Поэтому в настоящей работе термические события условно обозначены как T_1, T_2 и T_3, а основным объектом анализа принято их смещение в зависимости от состава.

Обзоры по применению солнечного тепла для обработки материалов выделяют в качестве основных преимуществ бесконтактный нагрев, высокую скорость нагрева, короткие термические циклы и низкий риск загрязнения [8, 9]. Вместе с тем неоднородность потока в фокусе, конвективные и радиационные потери, а также геометрия образца могут ограничивать технологическую воспроизводимость. Математическое моделирование высокопоточных солнечных печей и оптимизация фокальной зоны направлены на снижение этих неопределённостей [10]. Методология синтеза оксидных материалов в Большой солнечной печи Паркента предусматривает согласование теплофизических свойств целевого материала с параметрами системы «гелиостат-концентратор» [12].

В ранее выполненных исследованиях керамики, на основе закалённых в солнечной печи прекурсоров $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$ были показаны слоистая морфология, эволюция фаз 2212/2223 при термообработке и изменение характеристик R(T) и магнитной восприимчивости [14]. В последующих работах была продемонстрирована возможность солнечного синтеза Bi/Pb-ряда в более широком диапазоне n [15]. Тем не менее для интервала n = 9-20 недостаточно освещена единая сравнительная оценка, связывающая требуемый оптический поток, термические события DSC и параметры низкотемпературного резистивного перехода. Отличительной особенностью настоящей работы является объединение этих трёх блоков данных и поиск технологического компромиссного оптимума.

Методология исследования

Объектами исследования служили номинальные составы n = 9, 12, 15 и 20 гомологического ряда $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$, обозначенные соответственно как Bi/Pb 2289, Bi/Pb 221112, Bi/Pb 221415 и Bi/Pb 221920. Исходную шихту готовили из порошков Bi_2O_3, PbO, SrO, CaO и CuO. Для уменьшения остаточной влажности реагенты выдерживали при 100-150 °C в течение 1 ч, дозировали в расчётных соотношениях, механически перемешивали и прессовали. Перед помещением в солнечную печь брикеты предварительно термообрабатывали при 200-300 °C в течение 2 ч для повышения механической устойчивости и уменьшения газовыделения при быстром нагреве.

В фокальной зоне Большой солнечной печи целевую плотность потока для каждого состава формировали с учётом расчётной энергетической потребности материала и выбранной группы гелиостатов. Плотность потока составляла 149,69 Вт/см² для n = 9, 175,45 Вт/см² для n = 12, 207,64 Вт/см² для n = 15 и 258,03 Вт/см² для n = 20. Плавление проводили на воздухе. Образовавшийся расплав распыляли и направляли на водоохлаждаемую подложку, обеспечивая скорость охлаждения порядка 10^4-10^5 K/с. В результате были получены пластинчатые и игольчатые стеклокристаллические прекурсоры.

Прекурсоры измельчали в агатовой ступке до дисперсности менее 25 мкм. Керамические образцы прессовали при 150-200 МПа в виде таблеток диаметром 15 мм и толщиной около 2 мм. Для корректного сравнительного анализа все четыре состава подвергали одинаковой термообработке при атмосферном давлении на воздухе: 848 °C в течение 96 ч. Единый режим позволил отделить влияние состава от температурно-временного фактора.

DSC-анализ выполняли на синхронном термоанализаторе в диапазоне 100-1200 °C. На термограммах выделяли три основных эндотермических события: T_1 - область низкотемпературных первичных перестроек, T_2 - область промежуточных высокотемпературных реакций и T_3 - событие, связанное с основной высокотемпературной трансформацией или перитектическим плавлением. Поскольку регистрируемые прибором интегральные значения представлены в мкВ·с/мг, в настоящей работе они трактуются не как абсолютная термодинамическая энтальпия, а как нормированный интегральный сигнал DSC. Это исключает некорректное приравнивание некалиброванного сигнала к энтальпии в Дж/г.

Микроструктуру исследовали на сканирующем электронном микроскопе LEO1455VP, а фазовое состояние - на дифрактометре Shimadzu XRD-6100 с использованием фильтрованного CuK_α-излучения. Электрическое

сопротивление измеряли четырёхконтактным методом в диапазоне 77-320 K без внешнего магнитного поля. Расстояние между контактами составляло 4 мм; электрические контакты формировали токопроводящей пастой на основе серебра. Поскольку полная идентичность геометрии и геометрического коэффициента для всех образцов не была подтверждена, анализ был ориентирован не на количественное сопоставление абсолютных значений R, а на определение характерных температур T_{onset}, T_{offset} и $\Delta T = T_{onset} - T_{offset}$.

В качестве дополнительного параметра рассчитывали высокотемпературный интервал $\Delta T_{DSC} = T_3 - T_2$. Тенденции изменения плотности солнечного потока, событий DSC и T_{onset} в зависимости от n оценивали линейной регрессией первого порядка. Ввиду наличия только четырёх составов регрессионные уравнения имеют описательный характер: они не экстраполировались за пределы n = 9-20 и не интерпретировались как статистическая модель генеральной совокупности. Общая последовательность исследования приведена на рисунке 1.

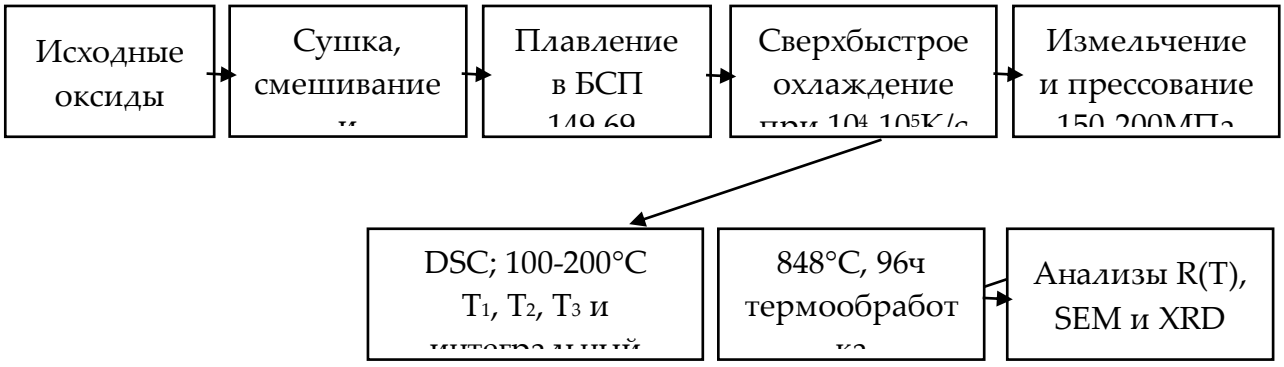


Рисунок 1. Последовательность солнечного получения и интегрированного анализа прекурсоров Bi/Pb-купратов

Таблица 1

Исследованные составы и выбранная плотность потока в Большой солнечной печи

Номинальный состав	Условное обозначение	n	Плотность солнечного потока, Вт/см²
$Bi_{1,7}Pb_{0,3}Sr_2Ca_8Cu_9O_y$	Bi/Pb 2289	9	149,69
$Bi_{1,7}Pb_{0,3}Sr_2Ca_{11}Cu_{12}O_y$	Bi/Pb 221112	12	175,45
$Bi_{1,7}Pb_{0,3}Sr_2Ca_{14}Cu_{15}O_y$	Bi/Pb 221415	15	207,64
$Bi_{1,7}Pb_{0,3}Sr_2Ca_{19}Cu_{20}O_y$	Bi/Pb 221920	20	258,03

Результаты и их обсуждение

Прекурсоры, полученные после солнечного плавления и сверхбыстрого охлаждения, имели пластинчатую и игольчатую форму. После перевода в керамическое состояние во всех составах наблюдалась характерная для Bi-содержащих купратов пластинчато-слоистая морфология. В образце n = 9 отчётливо видны ступенчатые пакеты крупных пластин и расположенные между ними тонкие фрагменты (рисунок 2). Наличие в микроструктуре наряду с плотными ровными пластинами пор и мелких обломков указывает на неоднородность межзеренных путей протекания тока. Следовательно, ширина резистивного перехода определяется не только внутрикристаллическим состоянием, но также контактами между пластинами, вторичными фазами и пористостью.

Предыдущая морфометрическая оценка образца n = 9 показала, что толщина слоистых блоков составляет приблизительно 120-140 нм, а отдельных тонких пластин - 28-40 нм. Такие наноламеллярные зародыши при последующей термообработке могут способствовать формированию ориентированных керамических пластин. Однако изображение SEM, подтверждая слоистость, не позволяет самостоятельно определить тип сверхпроводящей фазы или её объёмную долю. Поэтому морфологические данные интерпретировались совместно с результатами XRD и R(T).

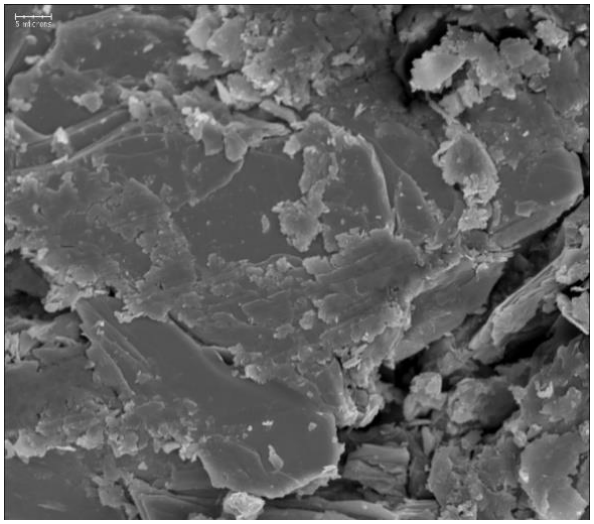


Рисунок 2. Пластинчатая микроструктура керамического образца Bi/Pb 2289 после термообработки при 848 °C в течение 96 ч (масштаб: 5 мкм)

Первым существенным результатом является последовательная зависимость требуемой плотности солнечного потока от номинального значения n. Согласно данным таблицы 1, при увеличении n от 9 до 20 плотность потока возрастает с 149,69 до 258,03 Вт/см², то есть на 72,4 %. Линейная аппроксимация дала уравнение $q(n) = 9{,}95n + 58{,}45$ при $R^2 = 0{,}999$ (рисунок 3). Высокая степень соответствия показывает, что в исследованном диапазоне добавление каждого номинального слоя CuO сопровождается повышением оптико-энергетических требований к синтезу. Эта зависимость не является универсальным термодинамическим законом, а представляет собой эмпирический технологический показатель для данных составов, геометрии образца и конфигурации БСП.

Управление процессом только за счёт повышения суммарной мощности недостаточно. С увеличением n изменяются поглощательная способность образца, теплоёмкость, высокотемпературные реакции и радиационные потери. Чрезмерная плотность потока может вызвать локальную потерю летучих компонентов Bi и Pb, тогда как недостаточный поток приводит к неполному плавлению и сегрегации состава. Поэтому линейная тенденция на рисунке 3 полезна для выбора исходной экспериментальной точки, но окончательный режим должен уточняться по устойчивости расплава и результатам последующего XRD-анализа.

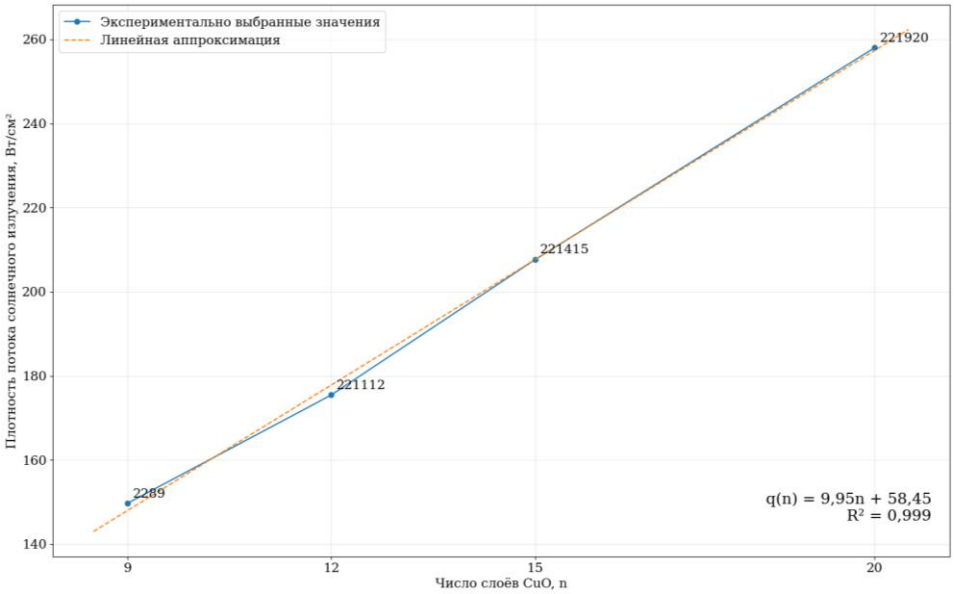


Рисунок 3. Зависимость выбранной плотности потока солнечного излучения от числа слоёв CuO

Таблица 2

Пики DSC и нормированные интегральные сигналы образцов Bi/Pb-ряда

Состав	T_1, °C	S_1, мкВ·с/мг	T_2, °C	S_2, мкВ·с/мг	T_3, °C	S_3, мкВ·с/мг
Bi/Pb 2289	466,1	−74,41	797,1	−16,23	851,0	−4,43
Bi/Pb 221112	477,0	−77,98	796,9	−14,18	918,3	−10,97

Состав	T_1, °C	S_1, мкВ·с/мг	T_2, °C	S_2, мкВ·с/мг	T_3, °C	S_3, мкВ·с/мг
Bi/Pb 221415	460,1	−28,71	778,3	−53,56	967,5	−5,25
Bi/Pb 221920	445,9	−31,72	768,7	−77,16	975,1	−4,83

Данные DSC показали, что изменение состава влияет не только на температуру термических событий, но и на их интегральную интенсивность (таблица 2, рисунок 4). Событие T_1 располагается в интервале 445,9-477,0 °C и не изменяется строго монотонно с n. Оно может включать одновременно удаление остаточных летучих компонентов, низкотемпературные твердофазные реакции и локальную структурную перестройку. Большие по модулю значения интегрального сигнала S_1 для составов n = 9 и n = 12 указывают на более высокую долю первичных реакций. Однако сигнал в мкВ·с/мг нельзя считать калиброванной энтальпией; он использован только для относительного сравнения при одинаковых условиях измерения.

Событие T_2 с увеличением n демонстрирует общую тенденцию к снижению температуры: от 797,1 до 768,7 °C. Описательная регрессия дала $T_2(n) = -2{,}86n + 825{,}30$ при $R^2 = 0{,}903$. Такое смещение указывает, что в составах, обогащённых Ca и Cu, промежуточная рекристаллизация или реакции с участием жидкой фазы могут начинаться при более низкой температуре. Одновременно модуль сигнала S_2 резко увеличивается от -14,18 мкВ·с/мг для n = 12 до -77,16 мкВ·с/мг для n = 20. Это свидетельствует о большей доле реакции или более высокой термической сложности процесса в области T_2 для состава n = 20.

Температура события T_3, напротив, возрастает от 851,0 до 975,1 °C. Описательное уравнение $T_3(n) = 11{,}01n + 773{,}87$ характеризуется $R^2 = 0{,}816$. Повышение T_3 согласуется с увеличением термических затрат на завершающую высокотемпературную трансформацию или перитектическое плавление в составах с высоким n. Вследствие одновременного снижения T2 и повышения T_3 интервал $\Delta T_{DSC} = T_3 - T_2$ расширяется от 53,9 до 206,4 °C. Это означает, что при увеличении n термические процессы протекают поэтапно в более широком температурном диапазоне, а не концентрируются около одного узкого пика.

Прямое отождествление пиков DSC с конкретными фазами требует осторожности. Например, область T_2 может соответствовать реакциям, способствующим формированию Bi-2212/Bi-2223, тогда как T_3 может включать высокотемпературную фазовую трансформацию и перитектическое плавление [2, 7]. Однако фазовое отнесение не может основываться только на DSC. Наличие на XRD-спектрах исследованных керамик рефлексов нескольких Bi-содержащих и вторичных фаз усиливает предположение о многостадийном характере трансформаций, особенно для состава n = 20.

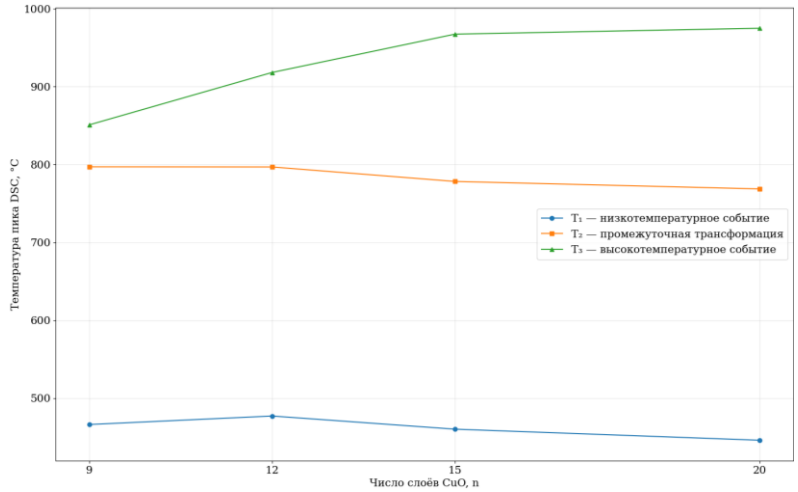


Рисунок 4. Изменение температур пиков DSC T_1, T_2 и T_3 в зависимости от n

Таблица 3

Параметры резистивного перехода и термический интервал DSC

Состав	T_{onset}, K	T_{offset}, K	ΔT, K	$\Delta T_{DSC} = T_3 - T_2$, °C
Bi/Pb 2289	126	117	9	53,9
Bi/Pb 221112	130	124	6	121,4
Bi/Pb 221415	135	129	6	189,2

Состав	T_{onset}, K	T_{offset}, K	ΔT, K	$\Delta T_{DSC} = T_3 - T_2$, °C
Bi/Pb 221920	143	118	25	206,4

При снижении температуры от 300 K кривые R(T) всех образцов сначала демонстрировали металлический характер, а затем резкое уменьшение сопротивления. С увеличением n значения T_{onset} возрастали последовательно до 126, 130, 135 и 143 K (таблица 3, рисунок 5). Уравнение $T_{onset}(n) = 1{,}56n + 111{,}65$ имело $R^2 = 0{,}998$. Между T_2 и T_{onset} наблюдалась сильная отрицательная описательная корреляция ($r \approx -0{,}96$), а между T_3 и T_onset - положительная ($r \approx 0{,}89$). Для выборки из четырёх точек эти коэффициенты недостаточны для статистического обобщения, однако они показывают, что смещение термических процессов и температура начала резистивного перехода управляются общим композиционным фактором n.

Монотонное повышение T_{onset} не во всех случаях означает улучшение качества перехода. Для образца n = 9 ширина перехода ΔT составляла 9 K, а для n = 12 и n = 15 - 6 K. Несмотря на максимальное T_{onset} = 143 K в составе n = 20, T_{offset} снизилась до 118 K, а переход расширился до 25 K. Кроме того, на кривой R(T) зафиксировано двухступенчатое изменение приблизительно при 143 и 130 K. Такая форма может быть обусловлена различными локальными фазами, слабыми межзеренными связями или тем, что единый режим термообработки оказался неодинаково оптимальным для всех составляющих материала.

Узкое значение ΔT = 6 K для образцов n = 12 и n = 15 указывает на относительно однородный характер перехода. Из этих двух составов n = 15 имеет более высокие T_{onset} и T_{offset} - 135 и 129 K соответственно. Поэтому в рассматриваемом наборе данных Bi/Pb 221415 демонстрирует наиболее рациональный компромисс по критериям «высокая характерная температура - узкий переход». Состав n = 12, требующий меньшей плотности солнечного потока и более низкой T_3, может рассматриваться как консервативный вариант с точки зрения энергозатрат и технологической устойчивости.

Термические и резистивные данные для n = 20 взаимно дополняют друг друга. Этот состав характеризуется максимальной плотностью солнечного потока, наибольшим модулем интегрального сигнала T_2, самым широким интервалом ΔT_{DSC} и максимальной шириной резистивного перехода. Следовательно, увеличение номинального состава обеспечило высокое T_{onset}, но одновременно расширило температурный диапазон фазообразования и ухудшило электрическую однородность перехода. Для данного образца целесообразна отдельная оптимизация режима 848 °C/96 ч: ступенчатая термообработка, промежуточное измельчение или изменение режима насыщения кислородом.

Несмотря на наиболее узкий интервал ΔT_{DSC} у образца n = 9, его резистивная температура T_{onset} является минимальной. Следовательно, узкое термическое событие не обеспечивает автоматически высокие транспортные характеристики. Термический интервал, доля фаз, текстура и межзеренные связи действуют совместно. Поэтому при выборе технологии следует не максимизировать один показатель, а одновременно учитывать по меньшей мере три критерия: требуемую плотность солнечного потока, T_{onset}/T_{offset} и ΔT.

Измеренное сопротивление представлено в виде абсолютного R и зависит от геометрии образцов. По этой причине в работе не делались выводы о количественном превосходстве амплитуды сопротивления или проводимости в нормальном состоянии между различными образцами. Параметры T_{onset} и T_{offset} являются температурными точками внутри каждой кривой и более устойчивы для сравнительного анализа. Вместе с тем падение R(T) и узкий переход соответствуют признаку сверхпроводимости, однако для строгой идентификации новой фазы с повышенной Tc необходимы нулевое сопротивление, количественная доля экранируемого объёма по эффекту Мейснера, повторные измерения и установление фазового носителя методами XRD/TEM [16, 17].

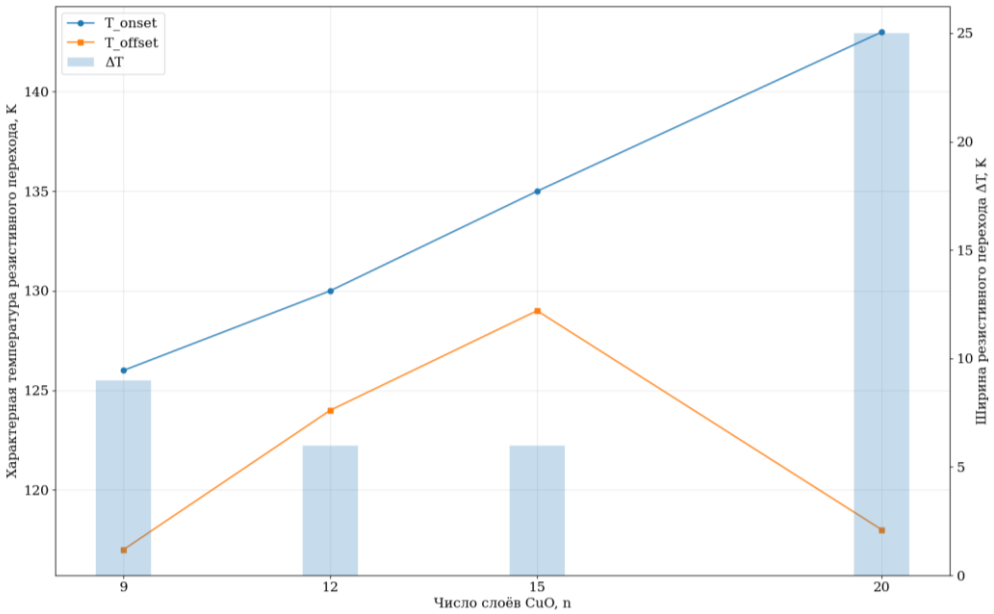


Рисунок 5. Изменение резистивных параметров T_{onset}, T_{offset} и ширины перехода ΔT в зависимости от n

Полученные результаты показывают необходимость выбора плотности потока в соответствии с составом и дифференцированной последующей термообработки. В интервале n = 9-15 плотность потока и T_{onset} последовательно возрастают, а ширина перехода сохраняется в пределах 6-9 K. При переходе к n = 20 одновременно с высоким T_{onset} резко усиливаются термическая и резистивная неоднородность. Для практической оптимизации состав n = 15 может быть выбран основным кандидатом, а n = 12 - энергетически более мягким контрольным вариантом.

При практической интерпретации результатов недостаточно использовать в качестве единственного критерия максимальное значение T_{onset}. Повышение плотности солнечного потока способно ускорить плавление, однако расширение интервала термических событий и многостадийный характер резистивного перехода увеличивают вероятность композиционной неоднородности. Поэтому при выборе технологического режима необходимо совместно учитывать по меньшей мере четыре показателя: требуемую плотность потока, T_{onset}, T_{offset} и ΔT. Такой подход позволяет рекомендовать состав n = 15 как исходный вариант для последующих экспериментов. Вместе с тем это не окончательный технологический оптимум: рекомендация требует независимой проверки повторными синтезами, количественным XRD-анализом фаз, измерением плотности образцов и магнитной доли экранирования.

Предложенный интегрированный подход сосредоточен на конкретном вопросе: как при увеличении номинального состава совместно изменяются термические события и качество резистивного перехода. Новые графические зависимости, производный параметр ΔT_{DSC} и описательные регрессии позволили переинтерпретировать исходные экспериментальные данные в формате самостоятельного сравнительного исследования.

Заключение

Увеличение n от 9 до 20 в ряду $Bi_{1,7}Pb_{0,3}Sr_2Ca_{(n-1)}Cu_nO_y$ сопровождалось почти линейным повышением требуемой плотности потока в Большой солнечной печи от 149,69 до 258,03 Вт/см². Это свидетельствует о росте оптико-энергетических требований по мере усложнения номинального состава.

По данным DSC температура события T_2 снизилась от 797,1 до 768,7 °C, тогда как T_3 повысилась от 851,0 до 975,1 °C. В результате термический интервал ΔT_{DSC} расширился от 53,9 до 206,4 °C. В составах с высоким n фазообразование протекает в более широком температурном диапазоне.

Несмотря на повышение резистивной T_{onset} от 126 до 143 K, в наиболее высоком составе n = 20 ширина перехода увеличилась до ΔT = 25 K. Состав Bi/Pb 221415 при T_{onset} = 135 K, T_{offset} = 129 K и ΔT = 6 K продемонстрировал наилучший баланс высокой характерной температуры и относительно однородного перехода.

Единый режим 848 °C/96 ч не является оптимальным для состава n = 20. Рекомендуется отдельно оптимизировать ступенчатую термообработку, кислородный режим и циклы повторного измельчения. Приведённые резистивные температуры служат сравнительными параметрами R(T) и не заменяют независимую фазовую идентификацию.

Вклад автора, конфликт интересов и финансирование

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Конфликт интересов: автор заявляет об отсутствии конфликта интересов. Финансирование: исследование выполнено без внешней финансовой поддержки. Происхождение данных: исходные экспериментальные данные повторно обработаны с применением нового сравнительного анализа, производных параметров и новых графических зависимостей.

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SKALYAR-TENZOR GRAVITATSIYA NAZARIYASIDA SIMPSON-VISSER FAZO-VAQTLARINING KRITIK CHEGARALARI VA RADIAL BARQARORLIK MASALASINING QO‘ YILISHI

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Annotatsiya. *Maqolada Simpson-Visser regulyarlashtirilgan qora tuynuk – yumronqoziq fazo-vaqtining Bergmann-Vagoner-Nordtvedt sinfiga mansub skalyar-tenzor gravitatsiya nazariyasidagi tasviri tahlil qilindi. Metrikaning gorizontlari, bo‘ g‘ izi va “black-bounce” sohasi b/m o‘ lchamsiz parametr orqali klassifikatsiya qilindi. Minimal bo‘ lmagan bog‘ lanish funksiyasini aniqlovchi rekonstruksiya tenglamasining kritik nuqtalari $x = 0$ va, $b < 3m$ bo‘ lganda, $x = \pm\sqrt{9m^2 - b^2}$ ekanligi ko‘ rsatildi. Bog‘ lanish funksiyasining bo‘ g‘ iz yaqinidagi asimptotikasi $lnf \sim -[3m/(3m-b)]ln|x|$ ko‘ rinishda topildi. Natijada geometrik jihatdan regulyar Simpson-Visser fazo-vaqti bitta skalyar maydonli regulyar skalyar-tenzor nazariyada butun radial oralig‘ ida yagona global yechim sifatida ifodalanmasligi aniqlandi. $b < 3m$ da to‘ rtta, $b \geq 3m$ da esa ikkita alohida skalyar-tenzor soha hosil bo‘ ladi. Olingan natijalar asosida radial g‘ alayonlanishlar uchun fizik chegaraviy shartlar va spektral barqarorlik mezoni shakllantirildi.*

Kalit so‘ zlar: *Simpson-Visser metrikasi, regulyar qora tuynuk, yumronqoziq ini, skalyar-tenzor gravitatsiya, radial g‘ alayonlanish, barqarorlik.*

КРИТИЧЕСКИЕ ГРАНИЦЫ ПРОСТРАНСТВ-ВРЕМЁН СИМПСОНА-ВИССЕРА В СКАЛЯРНО-ТЕНЗОРНОЙ ТЕОРИИ ГРАВИТАЦИИ И ПОСТАНОВКА ЗАДАЧИ РАДИАЛЬНОЙ УСТОЙЧИВОСТИ

Аннотация. *В статье исследовано представление регуляризованного пространства-времени Симпсона-Виссера в скалярно-тензорной теории гравитации класса Бергмана-Вагонера-Нордтведта. Горизонты, горловина и область black bounce классифицированы с помощью безразмерного параметра b/m. Показано, что критическими точками уравнения реконструкции неминимальной связи являются $x = 0$ и, при $b < 3m$, $x = \pm\sqrt{9m^2 - b^2}$. Найдена асимптотика функции связи вблизи горловины: $lnf \sim -[3m/(3m-b)]ln|x|$. Установлено, что геометрически регулярное пространство-время Симпсона-Виссера не может быть представлено как единое глобальное решение регулярной односкалярной теории во всём радиальном диапазоне. При $b < 3m$ возникают четыре, а при $b \geq 3m$ – две отдельные скалярно-тензорные области. Сформулированы физические граничные условия и спектральный критерий радиальной устойчивости.*

Ключевые слова: *метрика Симпсона-Виссера, регулярная чёрная дыра, кротовая нора, скалярно-тензорная гравитация, радиальные возмущения, устойчивость.*

CRITICAL BOUNDARIES OF SIMPSON-VISSER SPACETIMES IN SCALAR-TENSOR GRAVITY AND THE FORMULATION OF THE RADIAL STABILITY PROBLEM

Abstract. *The scalar-tensor representation of the regularized Simpson-Visser black-bounce spacetime is investigated within the Bergmann-Wagoner-Nordtvedt class of gravitational theories. The horizons, throat and black-bounce sector are classified in terms of the dimensionless ratio b/m. The reconstruction equation for the nonminimal coupling is shown to possess critical surfaces at $x = 0$*

and, for $b < 3m$, at $x = \pm\sqrt{9m^2 - b^2}$. The near-throat behavior of the coupling is found to obey $lnf \sim -[3m/(3m-b)]ln|x|$. Consequently, although the Simpson-Visser geometry is curvature regular, its one-scalar scalar-tensor representation cannot form a single globally regular solution over the whole radial range. Four separate scalar-tensor patches arise for $b < 3m$ and two patches for $b \geq 3m$. Physical boundary conditions and a spectral criterion for radial stability are formulated on this basis.

Keywords: *Simpson-Visser metric, regular black hole, wormhole, scalar-tensor gravity, radial perturbations, stability.*

Kirish

Umumiy nisbiylik nazariyasidagi qora tuynuk yechimlarining muhim muammolaridan biri fazo-vaqt egriligining markaziy singulyarligidir. Klassik nazariya doirasida singulyarlik geodeziklarning tugashi va fizik kattaliklarning cheksiz o‘ sishi bilan tavsiflanadi. Kvant gravitatsiyasi yakuniy nazariyasi mavjud bo‘ lmagan sharoitda singulyarlikni fenomenologik ravishda regulyarlashtiruvchi metrikalar kuchli gravitatsion maydon fizikasi uchun muhim model vazifasini bajaradi [1-3].

Simpson va Visser tomonidan taklif etilgan model Shvarsshild metrikasidagi sferik radiusni $\sqrt{x^2 + b^2}$ funksiya bilan almashtirishga asoslanadi [1]. Ushbu sodda almashtirish natijasida markaziy singulyarlik o‘ rnida chekli radiusli regulyar ikki o‘ lchamli sfera hosil bo‘ ladi. Regulyarlashtirish parametrining massaga nisbatiga qarab geometriya regulyar qora tuynuk, bir tomonlama ekstremal yumronqoziq ini yoki ikki tomonlama o‘ tkazuvchi yumronqoziq ini xususiyatlarini namoyon qiladi. Keyingi tadqiqotlarda ushbu geometriyaning sababiy tuzilishi, energiya shartlari, gravitatsion linzalanish, kvazinormal modalari va aylanuvchi umumlashmalari o‘ rganilgan [2, 3, 9-13].

Biroq berilgan regulyar metrikani ma’lum bir gravitatsiya nazariyasining aniq yechimi sifatida talqin qilish alohida masaladir. Avvalgi ishda ixtiyoriy statik, sferik-simmetrik metrikani ma’lum $f(\varphi)$, $h(\varphi)$ va $U(\varphi)$ funksiyalarga ega skalyar-tenzor nazariyaning vakuum yechimi sifatida bo‘ lakli rekonstruksiya qilish algoritmi ishlab chiqilgan [4]. Mazkur algoritm Reissner-Nordström va Simpson-Visser metrikalariga tatbiq qilingan. Shu bilan birga, rekonstruksiya funksiyalarining ayrim chegaralarda nolga yoki cheksizlikka intilishi fizik talqinni va g‘ alayonlanishlar uchun chegaraviy shartlarni murakkablashtiradi.

Skalyar-tenzor yechimlarning radial barqarorligini o‘ rganishda Jordan va Eynshteyn ifodasidagi g‘ alayonlanish tenglamalari bir-biriga konformal akslantirish orqali bog‘ lanadi. Lekin fizik chegaraviy shartlar konkret nazariya va fon yechimiga bog‘ liq bo‘ lib qoladi [5-8]. Shu sababli geometrik regulyarlikning o‘ zi dinamik barqarorlikni kafolatlamaydi. Maqolaning maqsadi Simpson-Visser fazo-vaqtining skalyar-tenzor rekonstruksiyasidagi kritik chegaralarni aniqlash, ularning parametrga bog‘ liq klassifikatsiyasini berish va radial barqarorlik masalasining matematik hamda fizik jihatdan to‘ g‘ ri qo‘ yilishini shakllantirishdan iborat.

Simpson-Visser fazo-vaqtining geometriyasi

Statik, sferik-simmetrik fazo-vaqt kvaziglobal radial koordinatada quyidagicha yoziladi:

$$ds^2 = A(x)dt^2 - A(x)^{-1}dx^2 - r^2(x)(d\theta^2 + sin^2\theta\, d\varphi^2) \quad (1)$$

Simpson-Visser modeli uchun metrika funksiyalari

$$r(x) = \sqrt{x^2 + b^2},$$
$$A(x) = 1 - \frac{2m}{\sqrt{x^2 + b^2}} = 1 - \frac{2m}{r(x)} \quad (2)$$

ko‘ rinishga ega. Bu yerda $m > 0$ asimptotik Shvarsshild massasi, $b > 0$ esa singulyarlikni regulyarlashtiruvchi uzunlik parametridir. x koordinata $-\infty < x < \infty$ oraliqda o‘ zgaradi, sferik radius esa $r \geq b$ shartni qanoatlantiradi. Uning birinchi va ikkinchi hosilalari

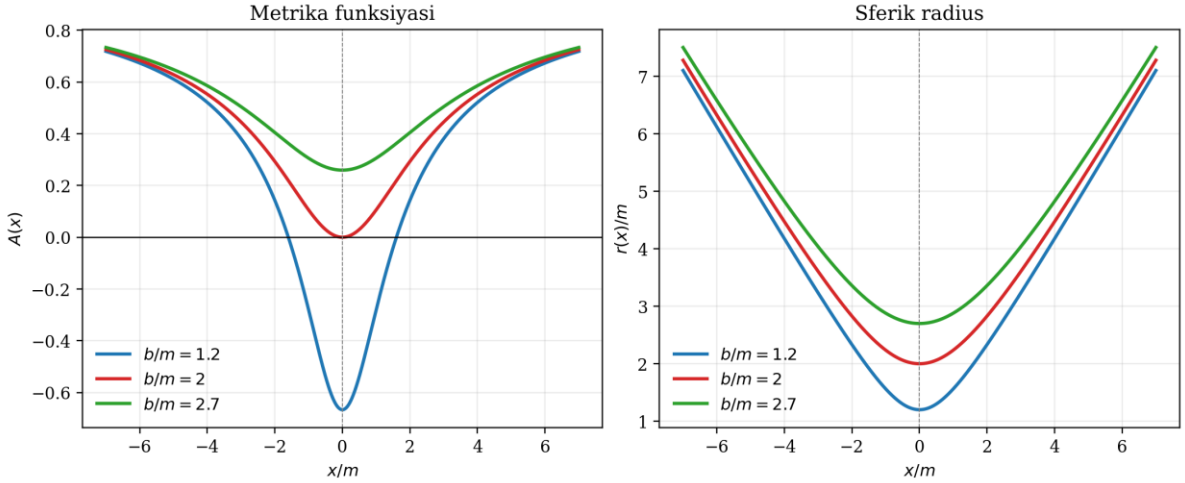
$$r' = \frac{x}{r}, \qquad r'' = \frac{b^2}{r^3} \quad (3)$$

bo‘ lib, $x = 0$ nuqtada $r(0) = b$, $r'(0) = 0$ va $r''(0) = \frac{1}{b} > 0$. Demak, $x = 0$ sferik radiusning regulyar minimumidir.

Gorizontlar $A(x⍰) = 0$ tenglamadan aniqlanadi:

$$x⍰^2 = 4m^2 - b^2 \quad (4)$$

Shuning uchun $0 < b < 2m$ da $x⍰ = \pm\sqrt{4m^2 - b^2}$ ikkita gorizont mavjud va $x = 0$ minimum $A(0) < 0$ bo‘ lgan dinamik sohada joylashadi. $b = 2m$ da minimum ikki karrali ekstremal gorizont bilan ustma-ust tushadi. $b > 2m$ da esa $A(x) > 0$ barcha x uchun bajariladi va $x = 0$ ikki asimptotik tekis sohani bog‘ lovchi o‘ tkazuvchi yumronqoziq ini bo‘ g‘ izidir.



1-rasm. *Simpson-Visser geometriyasining uchta talqinida A(x) va r(x) funksiyalari.*

1-jadval. *b/m parametriga bog‘ liq geometrik talqinlar.*

Parametr	Gorizontlar	$x = 0$ chegara	Geometrik talqin
$0 < b < 2m$	$x = \pm\sqrt{4m^2 - b^2}$	$A(0) < 0$	Ikki gorizontli regulyar qora tuynuk/black bounce
$b = 2m$	$x = 0$	$A(0) = 0$	Ekstremal bo‘ g‘ iz
$b > 2m$	Mavjud emas	$A(0) > 0$	O‘ tkazuvchi yumronqoziq ini

Skalyar-tenzor rekonstruksiya

Bergmann-Vagoner-Nordtvedt sinfidagi skalyar-tenzor nazariya ta’sir integrali [14-18]

$$S = \frac{1}{16\pi}\int d^4x\sqrt{-g}[f(\varphi)R + 2h(\varphi)g^{uv}\partial_u\varphi\partial_v\varphi - 2U(\varphi)] \quad (5)$$

ko‘ rinishda olinadi. $f(\varphi)$ skalyar maydonning egrilik bilan minimal bo‘ lmagan bog‘ lanishini, $h(\varphi)$ kinetik bog‘ lanishni, $U(\varphi)$ esa o‘ zaro ta’sir potensialini ifodalaydi. Fizik jihatdan odatiy gravitatsiya sohasi uchun $f(\varphi) > 0$ bo‘ lishi va u chekli qiymatga ega bo‘ lishi talab etiladi, chunki effektiv gravitatsion doimiy $G_{eff} \propto \frac{1}{f}$ munosabat bilan aniqlanadi. (1) metrika uchun tenglamalarning tegishli kombinatsiyasi minimal bo‘ lmagan bog‘ lanish funksiyasiga nisbatan birinchi tartibli tenglamani beradi [4]:

$$f(G^t_t - G^\theta_\theta) = f'\left[\frac{A'}{2} - \frac{Ar'}{r}\right]. \quad (6)$$

Bu tenglamada

$$F(x) = \frac{A'}{2} - \frac{Ar'}{r} \quad (7)$$

koeffitsiyent rekonstruksiyaning mavjudlik sohalarini belgilaydi. Simpson-Visser funksiyalarini qo‘ yib, quyidagi sodda natijani olamiz:

$$F(x) = \frac{x(3m-r)}{r^3}. \quad (8)$$

Shunday qilib, $x = 0$ har qanday $b > 0$ uchun kritik chegaradir. Agar $b < 3m$ bo‘ lsa, $r = 3m$ shartdan yana ikkita kritik chegara paydo bo‘ ladi:

$$x = \pm x_0, \qquad x_0 = \sqrt{9m^2 - b^2}. \quad (9)$$

Ushbu chegaralar metrika gorizontlari bilan ustma-ust tushmaydi. Masalan, gorizont $r = 2m$ da, qo‘ shimcha STN chegaralari esa $r = 3m$ da joylashadi. Demak, ular fazo-vaqt geometriyasining emas, aynan tanlangan skalyar-tenzor maydon tasvirining kritik chegaralaridir.

Minimal bo‘ lmagan bog‘ lanish funksiyasi va kritik asimptotikalar

$b \neq 3m$ holatda (6) tenglamaning integrali [4]

$$ln\left(\frac{f}{f_0}r\right) = -3m\frac{ln(r+b)}{[2(3m+b)]} - 3m\frac{ln(r-b)}{[2(3m-b)]} + \frac{b^2 ln|r-3m|}{9m^2-b^2} \quad (10)$$

ko‘ rinishga ega; $f_0 > 0$ integrallash doimiysi. Skalyar maydon parametrlarini

$$\varphi(x) = b^{-1}arctan\left(\frac{x}{b}\right), \qquad \varphi' = \frac{1}{x^2+b^2} = \frac{1}{r^2} \quad (11)$$

deb tanlash mumkin. Bunda $x = btan(b\varphi)$, $r = \frac{b}{cos(b\varphi)}$ va $-\frac{\pi}{2b} < \varphi < \frac{\pi}{2b}$. Ushbu belgilash skalyar maydonni har bir radial soha ichida monoton parametrga aylantiradi.

Bo‘ g‘ iz yaqinida $r - b = \frac{x^2}{2b} + O(x^4)$. (10) ifodaning qolgan ko‘ paytuvchilari $x = 0$ da nolga teng bo‘ lmagani uchun

$$lnf \sim -\left[\frac{3m}{3m-b}\right] ln|x|, \qquad x \to 0 \tag{12}$$

asimptotika kelib chiqadi. Bundan $b < 3m$ da $f \to \infty$, $b > 3m$ da $f \to 0$ ekanligi ko‘ rinadi. Maxsus $b = 3m$ holatda

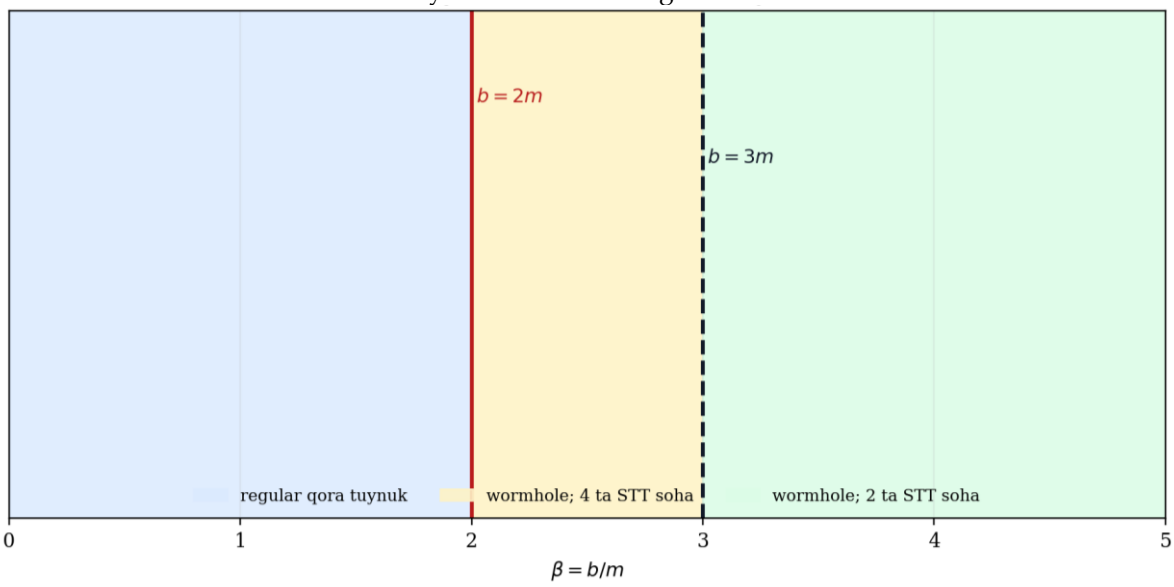
$$ln\left(\frac{f}{f_0}r\right) = -\left(\frac{1}{4}\right) ln(r+b) - \left(\frac{3}{4}\right) ln(r-b) - \frac{b}{2r-2b} \tag{13}$$

bo‘ lib, eksponensial ko‘ paytuvchi sababli $x \to 0$ da $f \to 0$. Shunday qilib, b ning hech bir qiymatida f bo‘ g‘ izda chekli, noldan farqli musbat qiymatni saqlamaydi.

$b < 3m$ bo‘ lganda $r = 3m$ yaqinida (10) ifodadagi daraja musbat:

$$\frac{b^2}{9m^2 - b^2} > 0 \tag{14}$$

Shu sababli $x \to \pm x_0$ da $f \to 0$. Natijada $b < 3m$ uchun to‘ rtta alohida STN sohasi, $b \geq 3m$ uchun esa $x = 0$ bilan ajratilgan ikkita soha hosil bo‘ ladi. Bu klassifikatsiya 2-rasmda keltirilgan.



2-rasm. *Geometrik holatlar va STN-rekonstruksiya sohasining tuzilishi.*

Radial g‘ alayonlanish masalasining qo‘ yilishi

Statik ifoda ustidagi sferik-simmetrik g‘ alayonlanishlarni umumiy holda

$$A \to A + \delta A(t,x), \quad r \to r + \delta r(t,x), \quad \varphi \to \varphi + \delta\varphi(t,x) \tag{15}$$

ko‘ rinishda kiritamiz. Sferik simmetriyada gravitatsion maydon mustaqil erkinlik darajasiga ega emas. Metrika g‘ alayonlanishlari bog‘ lanish tenglamalari orqali skalyar g‘ alayonlanish bilan ifodalanadi. Mos kalibrlash tanlangandan so‘ ng sistema yagona universal o‘ zgaruvchi $\Psi(t,x)$ uchun to‘ lqin tenglamasiga keltirilishi kerak [5-8]:

$$\frac{\partial^2\Psi}{\partial t^2} - \frac{\partial^2\Psi}{\partial z^2} + V_{eff}(z)\Psi = 0, \qquad \frac{dz}{dx} = \frac{1}{A(x)}. \tag{16}$$

Normal holatlar $\Psi = e^{i\omega t}Y(z)$ ko‘ rinishda ajratilsa, spektral masala

$$-\frac{d^2Y}{dz^2} + V_{eff}(z)\, Y = \omega^2 Y. \tag{17}$$

hosil bo‘ ladi. $\omega^2 < 0$ xos qiymat mavjud bo‘ lsa, $\omega = i\Omega$ ($\Omega > 0$) deb yozish mumkin va g‘ alayonlanish $e^{\Omega t}$ qonun bo‘ yicha o‘ sadi. Bu ifodalanish yechimining chiziqli radial beqarorligini bildiradi. Barcha xos qiymatlar $\omega^2 \geq 0$ bo‘ lsa, tegishli chegaraviy shartlar sinfida eksponensial o‘ suvchi radial holat mavjud emas.

Simpson-Visser STN-rekonstruksiyasida asosiy qiyinchilik V_{eff} ni hisoblashning o‘ zi emas, balki uning aniqlanish sohasi va fizik chegaraviy shartlardir. Chunki (12)-(14) natijalarga ko‘ ra f kritik chegaralarda nolga yoki cheksizlikka intiladi. Eynshteyn ifodasiga o‘ tish $\bar{g}_{\mu\nu} = f g_{\mu\nu}$ konformal almashtirish orqali bajarilganda, Jordan ifodasidagi regulyar chegara Eynshteyn ifodasida singulyar chegaraga aylanishi mumkin [7, 19]. Shuning uchun butun $-\infty < x < \infty$ oraliq uchun bitta oddiy Shturm-Liuvill masalasini yozish fizik jihatdan asoslanmagan.

Fizik chegaraviy shartlar

Asimptotik tekis sohada $r \sim |x|$ va $A \to 1$ bo‘ ladi. Lokal g‘ alayonlanish energiyasining chekliligi uchun $Y \to 0$ yoki kamida Y ning normallanuvchi bo‘ lishi talab etiladi. Qora tuynuk holatida tashqi gorizontda odatiy kiruvchi to‘ lqin sharti

qo‘ yiladi. Biroq STN sohasi chegaralarida asosiy invariant talab minimal bo‘ lmagan bog‘ lanishning nisbiy g‘ alayonlanishi orqali ifodalanadi:

$$\left|\frac{\delta f}{f}\right| < \infty. \qquad (18)$$

$\delta f = f_{\varphi}\delta\varphi$ bo‘ lganligi sababli (18) shart aniq asimptotikasidan $\delta\varphi$ va universal funksiya Y uchun chegaraviy shartga aylantiriladi. $f \to 0$ bo‘ lgan chegaralarda g‘ alayonlanish ifodasi bog‘ lanishidan tezroq o‘ smasligi, odatda $\delta f \to 0$ bo‘ lishi talab etiladi. $f \to \infty$ bo‘ lgan chegaralarda esa $\delta f/f$ ning chekliligi bilan birga g‘ alayonlanish ta’sirining ikkinchi variatsiyasi chekli ekanligi tekshirilishi kerak.

$b < 3m$ holatida masala $(-\infty, -x_0)$, $(-x_0, 0)$, $(0,\ x_0)$ va (x_0, ∞) oraliqlarda alohida qo‘ yiladi. $b \geq 3m$ da esa ikkita yarim fazo $(-\infty, 0)$ va $(0, \infty)$ mavjud. $x \to -x$ simmetriya tufayli soha funksiyalari juft bo‘ lsa ham, kritik chegara orqali oddiy uzluksizlik sharti avtomatik ravishda kelib chiqmaydi. Bunday shart faqat ta’sirning variatsion prinsipidan hosil qilingan chegara hadi yoki regulyarlashtirilgan fundamental model orqali asoslanishi mumkin.

Natijalar va muhokama

O‘ tkazilgan tahlil Simpson-Visser metrikasining geometrik regulyarligi va uning bir skalyar maydonli STN manbasining regulyarligi bir xil tushuncha emasligini ko‘ rsatdi. Metrikaning egrilik invariantlari $b > 0$ da chekli bo‘ lsada, rekonstruksiya tenglamasidagi $F(x)$ koeffitsiyent bo‘ g‘ izda nolga teng. Natijada minimal bo‘ lmagan bog‘ lanish funksiyasi bo‘ g‘ izda yoki cheksiz ortadi, yoki nolga intiladi. Bu holat effektiv gravitatsion doimiy $G_{eff} \propto \frac{1}{f}$ ning mos ravishda nolga yoki cheksizlikka intilishiga olib keladi. Ikkinchi muhim natija $b = 2m$ geometrik o‘ tish nuqtasi bilan $b = 3m$ maydoni rekonstruksiya o‘ tish nuqtasining farqlanishidir. $b = 2m$ qora tuynuk/yumronqoziq ini o‘ tishini belgilaydi. $b = 3m$ esa qo‘ shimcha $r = 3m$ kritik chegaralarning yo‘ qolishi va bo‘ g‘ izdagi f asimptotikasining o‘ zgarishini belgilaydi. Shunday qilib, parametrlar fazosida geometrik va maydoniy ikki xil bifurkatsiya mavjud. Uchinchi natija radial barqarorlik masalasiga taalluqlidir. Global regulyar STN fon mavjud bo‘ lmagani sababli alohida sohada topilgan ω^2 spektrini avtomatik ravishda butun yumronqoziq ini yoki black-bounce geometriyasining global barqarorligi sifatida talqin qilib bo‘ lmaydi. Spektral natija faqat tanlangan soha, chegaraviy shartlar va kritik chegaraning fizik talqini bilan birgalikda ma’noga ega. Mazkur xulosa konformal davom ettirishga ega skalyar-tenzor yumronqoziq inlari uchun chegaraviy shartlarning hal qiluvchi rol o‘ ynashi haqidagi natijalar bilan mos keladi [5-8, 19].

Natijalar Simpson-Visser geometriyasining boshqa global manbalarini ham ko‘ rib chiqish zarurligini ko‘ rsatadi. Umumiy nisbiylikda fantom skalyar maydon va nochiziqli elektrodinamika kombinatsiyasi ushbu metrikani regulyar manba bilan hosil qilishi mumkin [12, 13, 20]. Bunday modelda radial g‘ alayonlanishlar skalyar va elektromagnit erkinlik darajalarining bog‘ langan sistemasi sifatida o‘ rganiladi [21]. Bu bir maydonli STN rekonstruksiyasiga muqobil, ammo matematik jihatdan murakkabroq global barqarorlik masalasidir.

Xulosa

Tadqiqot natijalari Simpson-Visser fazo-vaqtining geometrik va skalyar-tenzor xususiyatlari b/m o‘ lchamsiz parametrga sezilarli darajada bog‘ liq ekanligini ko‘ rsatdi. Mazkur parametrning qiymatiga qarab fazo-vaqt regulyar qora tuynuk, ekstremal bo‘ g‘ iz yoki o‘ tkazuvchi yumronqoziq ini geometriyasini hosil qiladi. Shunday qilib, Simpson-Visser modeli yagona matematik ifoda doirasida bir-biridan sababiy va topologik jihatdan farqlanuvchi fazo-vaqt konfiguratsiyalari o‘ rtasidagi uzluksiz o‘ tishni tavsiflash imkonini beradi. Skalyar-tensor nazariya doirasidagi rekonstruksiya jarayonida asosiy koeffitsiyent $F = x(3m - r)/r^3$ ko‘ rinishda aniqlanadi. Ushbu koeffitsiyent $x = 0$ nuqtada, shuningdek, $b < 3m$ da $x = \pm\sqrt{9m^2 - b^2}$ kritik chegaralarni hosil qilishi aniqlandi.

Bo‘ g‘ iz yaqinida $ln\, f \sim -[3m/(3m - b)]ln|x|$ asimptotika olindi. Shuning uchun $b < 3m$ da $f \to \infty$, $b \geq 3m$ da $f \to 0$ ekanligi kelib chiqadi. Demak, skalyar-tenzor bog‘ lanish funksiyasi bo‘ g‘ izda yoki cheksiz kattalashadi, yoki nolga intiladi. Bu hol Simpson-Visser geometriyasini bitta skalyar maydonga asoslangan global regulyar skalyar-tenzor model yordamida to‘ liq tavsiflash mumkin emasligini ko‘ rsatadi.

Kritik sirtlarning mavjudligi fazo-vaqtning mustaqil skalyar-tenzor sohalarga ajralishiga olib keladi. Xususan, $b < 3m$ holdada to‘ rtta, $b \geq 3m$ holda esa ikkita mustaqil STN sohasi hosil bo‘ ladi. Shuning uchun radial g‘ alayonlanishlar uchun masalani butun fazo-vaqt bo‘ yicha yagona shaklda emas, balki har bir sohada alohida qo‘ yish lozim. Bunda g‘ alayonlanishlarning fizik mohiyatinini ta’minlovchi $|\delta f/f| < \infty$ chegaraviy shart bajarilishi talab etiladi.

Keyingi tadqiqotlarda skalyar-tenzor ta’sir integralining ikkinchi variatsiyasini hisoblash asosida radial g‘ alayonlanishlarning to‘ liq V_{eff} effektiv potensialini chiqarish maqsadga muvofiq. Ushbu potensial yordamida har bir mustaqil soha uchun kattaliklarning xos qiymatlarini sonli usullarda aniqlash, beqaror sohalar mavjudligini tekshirish va barqarorlik chegaralarini belgilash mumkin bo‘ ladi. Olingan natijalarni Simpson-Visser fazo-vaqtini global regulyar tavsiflaydigan skalyar maydon va nochiziqli elektrodinamikaga asoslangan model natijalari bilan taqqoslash esa turli maydonlarning geometrik hamda dinamik xususiyatlarini baholash imkonini beradi.

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KIMYOVIY BOG‘ LANISHLARNI TUSHUNTIRISHDA MOLEKULYAR FIZIKANING O‘ RNI.

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Annotatsiya: *Mazkur maqolada kimyoviy bog‘ lanishlarning molekulyar-fizik asoslari zamonaviy ilmiy qarashlar asosida tahlil qilingan. Kimyoviy bog‘ lanishlarning hosil bo‘ lish mexanizmi kvant mexanikasi, molekulyar orbitalar nazariyasi va elektron tuzilish konsepsiyalari nuqtai nazaridan yoritilgan. Shuningdek, ion, kovalent, metall va vodorod bog‘ lanishlarining fizik hamda kimyoviy xususiyatlari o‘ zaro taqqoslanib, ularning moddalarning tuzilishi va fizik-kimyoviy xossalariga ta’siri baholangan. Tadqiqot davomida molekulalar barqarorligi, bog‘ energiyasi, bog‘ uzunligi va elektron zichligining o‘ zaro bog‘ liqligi ilmiy adabiyotlar asosida tahlil qilindi. Natijalar kimyoviy bog‘ lanishlarni molekulyar-fizik yondashuv asosida o‘ rganish moddalarning tuzilishi, reaktivligi va fizik xossalarini chuqurroq tushunishga xizmat qilishini ko‘ rsatdi. Mazkur tadqiqot fizik kimyo, molekulyar fizika va kvant kimyosi yo‘ nalishlarida olib boriladigan ilmiy izlanishlar uchun nazariy asos bo‘ lib xizmat qiladi.*

Kalit so‘ zlar: *Kimyoviy bog‘ lanish, molekulyar fizika, fizik kimyo, kvant mexanikasi, molekulyar orbital, elektron tuzilish, bog‘ energiyasi, bog‘ uzunligi, elektron zichligi, molekula barqarorligi.*

РОЛЬ МОЛЕКУЛЯРНОЙ ФИЗИКИ В ОБЪЯСНЕНИИ ХИМИЧЕСКИХ СВЯЗЕЙ.

Аннотация. *В данной статье на основе современных научных подходов проанализированы молекулярно-физические основы химической связи. Рассмотрены механизмы образования химических связей с позиций квантовой механики, теории молекулярных орбиталей и концепции электронного строения веществ. Проведено сравнительное исследование физических и химических свойств ионной, ковалентной, металлической и водородной связей, а также оценено их влияние на строение и физико-химические свойства веществ. На основе анализа научной литературы исследована взаимосвязь между стабильностью молекул, энергией связи, длиной связи и электронной плотностью. Полученные результаты свидетельствуют о том, что изучение химических связей с молекулярно-физической точки зрения способствует более глубокому пониманию строения веществ, их реакционной способности и физических свойств. Представленные материалы могут служить теоретической основой для дальнейших исследований в области физической химии, молекулярной физики и квантовой химии.*

Ключевые слова: *химическая связь, молекулярная физика, физическая химия, квантовая механика, молекулярная орбиталь, электронное строение, энергия связи, длина связи, электронная плотность, устойчивость молекулы.*

THE ROLE OF MOLECULAR PHYSICS IN EXPLAINING CHEMICAL BONDS.

Abstract. *This article presents an analysis of the molecular-physical fundamentals of chemical bonding based on contemporary scientific concepts. The mechanisms of chemical bond formation are discussed from the perspectives of quantum mechanics, molecular orbital theory, and electronic structure concepts. In addition, the physical and chemical characteristics of ionic, covalent, metallic, and hydrogen bonds are comparatively analyzed, and their influence on the structure and physicochemical properties of substances is evaluated. The relationship between molecular stability, bond energy, bond length, and electron density is examined through the analysis of scientific literature. The results indicate that investigating chemical bonding from a molecular-physical perspective provides a deeper understanding of the structure, reactivity, and physical properties of substances. The findings of this study can serve as a theoretical basis for further research in physical chemistry, molecular physics, and quantum chemistry.*

Keywords: *chemical bonding, molecular physics, physical chemistry, quantum mechanics, molecular orbital, electronic structure, bond energy, bond length, electron density, molecular stability.*

Kirish

Kimyoviy bog‘ lanish moddalar tuzilishini, ularning fizik va kimyoviy xossalarini, shuningdek, kimyoviy reaksiyalarning borish mexanizmini belgilovchi fundamental tushunchalardan biri hisoblanadi. Atomlarning molekulalar

va kristall panjaralar hosil qilishi, moddalarning agregat holati, erish va qaynash harorati, elektr hamda issiqlik o‘ tkazuvchanligi, magnit va optik xossalari bevosita kimyoviy bog‘ lanish tabiatiga bog‘ liq [1]. Shu sababli kimyoviy bog‘ lanishlarni chuqur o‘ rganish nafaqat kimyo, balki molekulyar fizika, fizik kimyo, kvant mexanikasi va materialshunoslik fanlarining ham muhim ilmiy yo‘ nalishlaridan biri hisoblanadi. So‘ nggi o‘ n yilliklarda fan va texnologiyalarning jadal rivojlanishi natijasida atom va molekulalarning ichki tuzilishini yuqori aniqlikda o‘ rganish imkoniyatlari kengaydi. Zamonaviy spektroskopik usullar, rentgen difraksiyasi, elektron mikroskopiya hamda kvant-kimyoviy modellashtirish usullarining rivojlanishi kimyoviy bog‘ lanishlarning hosil bo‘ lish mexanizmini chuqurroq tushunishga xizmat qilmoqda [8]. Ayniqsa, elektronlarning fazoviy taqsimlanishi, orbital qoplanishi va molekulalarning energetik holatini aniqlash orqali bog‘ lanishlarning fizik mohiyatini ilmiy asosda izohlash imkoniyati yuzaga keldi.

Bugungi kunda kimyoviy bog‘ lanishlarni o‘ rganish faqat nazariy ahamiyat kasb etmay, balki amaliy jihatdan ham dolzarb hisoblanadi. Nanotexnologiyalar, yarimo‘ tkazgich materiallari, polimerlar, kompozitlar, katalizatorlar, biologik faol moddalar hamda farmatsevtika mahsulotlarini yaratishda atomlararo bog‘ lanishlarning tabiatini chuqur bilish muhim omil hisoblanadi. Moddalarning fizik va mexanik xossalarini boshqarish, ularning issiqlik va elektr o‘ tkazuvchanligini oshirish yoki kamaytirish, korroziyaga chidamliligini yaxshilash kabi masalalar bevosita kimyoviy bog‘ lanishlarning xususiyatlariga bog‘ liq [10]. Molekulyar fizika nuqtai nazaridan kimyoviy bog‘ lanish atom yadrolari va elektronlar o‘ rtasidagi elektrostatik o‘ zaro ta’sir natijasida yuzaga keladigan murakkab energetik tizimdir. Bog‘ hosil bo‘ lishi davomida tizimning potensial energiyasi kamayadi va molekula energetik jihatdan barqarorroq holatga o‘ tadi. Ushbu jarayon energiyaning saqlanish qonuni, termodinamikaning birinchi va ikkinchi qonunlari hamda statistik fizika qonunlari bilan uzviy bog‘ liq [5]. Shu jihatdan kimyoviy bog‘ lanishlarni fizik va kimyoviy qonuniyatlar asosida kompleks o‘ rganish zamonaviy ilm-fanning muhim vazifalaridan biri hisoblanadi.

Adabiyotlar tahlili

Mahalliy va xorijiy olimlar tomonidan olib borilgan tadqiqotlarda kimyoviy bog‘ lanishlarning turli jihatlari keng yoritilgan bo‘ lsa-da, ularni molekulyar fizika va fizik kimyo nuqtai nazaridan integratsiyalashgan holda tahlil qilish dolzarb masalalardan biri bo‘ lib qolmoqda. O‘ zbek olimlari M.Yo‘ ldoshev, B.Ismoilov va T.Qodirovlarning ilmiy ishlari fizik kimyo va molekulyar fizika fanlari o‘ rtasidagi bog‘ liqlikni yoritishda muhim ahamiyat kasb etsa, xorijiy olimlar Peter Atkins, Linus Pauling, Ira Levine hamda Donald McQuarrie tomonidan yaratilgan fundamental asarlarda kimyoviy bog‘ lanishlarning kvant-mexanik asoslari batafsil bayon etilgan [1, 3, 4]. Kimyoviy bog‘ lanish atomlar va ionlarning o‘ zaro ta’siri natijasida hosil bo‘ ladigan hamda moddalarning kimyoviy va fizik xossalarini belgilovchi eng muhim omillardan biri hisoblanadi. Moddalarning agregat holati, kristall panjarasining tuzilishi, elektr va issiqlik o‘ tkazuvchanligi, magnit xossalari, erish va qaynash haroratlari, shuningdek, kimyoviy faolligi bevosita kimyoviy bog‘ lanish tabiatiga bog‘ liq. Shu sababli kimyoviy bog‘ lanishlarning molekulyar-fizik mohiyatini o‘ rganish nafaqat kimyo, balki fizika, materialshunoslik, nanokimyo va kvant texnologiyalarining ham asosiy ilmiy yo‘ nalishlaridan biri hisoblanadi. So‘ nggi yillarda olib borilgan ilmiy izlanishlar shuni ko‘ rsatmoqdaki, kimyoviy bog‘ lanishlarni faqat valent elektronlar almashinuvi bilan tushuntirish yetarli emas [7]. Ularning hosil bo‘ lish mexanizmini chuqur anglash uchun kvant mexanikasi, molekulyar fizika va fizik kimyo qonunlarini birgalikda qo‘ llash zarur. Kimyoviy bog‘ lanishlarning zamonaviy nazariyasini rivojlantirishda Linus Paulingning ilmiy ishlari alohida o‘ rin tutadi. U atom orbitallarining gibridlanish nazariyasini ishlab chiqib, molekulalarning fazoviy tuzilishini kvant mexanikasi asosida tushuntirib berdi. Paulingning fikricha, atom orbitallari bir-biri bilan qoplanishi natijasida yangi energetik holat yuzaga keladi va aynan shu holat barqaror kimyoviy bog‘ lanishning hosil bo‘ lishiga sabab bo‘ ladi. Muallif bog‘ energiyasi, bog‘ uzunligi va bog‘ burchagi kabi parametrlar molekulaning barqarorligini belgilashini ko‘ rsatgan. Bugungi kunda ushbu nazariya organik, noorganik va fizik kimyo fanlarida keng qo‘ llanilib kelinmoqda [9]. Peter Atkins va Julio de Paula tomonidan yaratilgan "Physical Chemistry" asari fizik kimyo bo‘ yicha eng mukammal ilmiy manbalardan biri hisoblanadi.

Mahalliy olimlarning ilmiy ishlari ham kimyoviy bog‘ lanishlarni o‘ rganishda muhim ahamiyat kasb etadi. Xususan, B.Ismoilov va T.Qodirov fizik kimyo bo‘ yicha tadqiqotlarida atomlararo o‘ zaro ta’sir kuchlari, elektronlarning energetik holati va molekulalarning barqarorligi masalalariga alohida e’tibor qaratganlar. Mualliflar bog‘ energiyasining o‘ zgarishi moddalarning fizik va kimyoviy xossalariga qanday ta’sir ko‘ rsatishini termodinamik qonunlar asosida izohlab berganlar. Shuningdek, molekulalarning hosil bo‘ lishi davomida energiyaning yutilishi va ajralishi jarayonlari fizik qonuniyatlar bilan chambarchas bog‘ liq ekanligi ko‘ rsatib berilgan [3]. M.Yo‘ ldoshevning fizik kimyo yo‘ nalishidagi tadqiqotlarida ham kimyoviy bog‘ lanishlarning molekulyar-fizik mohiyati batafsil yoritilgan. Muallif elektron konfiguratsiyasining molekulalar barqarorligiga ta’siri, valent elektronlarning o‘ zaro ta’siri va bog‘ hosil bo‘ lishidagi energetik omillarni ilmiy jihatdan tahlil qilgan. Ushbu qarashlar zamonaviy fizik kimyo nazariyalari bilan uyg‘ unlashgan holda molekulalarning xossalarini tushuntirish imkonini beradi [1]. Molekulalarning ichki energiyasi, issiqlik harakati va statistik taqsimoti kimyoviy bog‘ lanishlarning barqarorligiga sezilarli ta’sir ko‘ rsatadi. Shu sababli fizik va kimyoviy qonuniyatlarni birgalikda tahlil qilish molekulyar tuzilishni yanada chuqurroq anglash imkonini yaratadi [5].

Tadqiqot metodologiyasi

Mazkur tadqiqotning metodologik asosini kimyoviy bog‘ lanishlarning molekulyar-fizik mohiyatini zamonaviy fizik kimyo va kvant mexanikasi nazariyalari asosida o‘ rganish tashkil etadi. Tadqiqot jarayonida nazariy tahlil, qiyosiy tahlil, fizik-kimyoviy modellashtirish hamda ilmiy adabiyotlarni tizimli o‘ rganish usullaridan foydalanildi. Tadqiqotning asosiy maqsadi atomlar o‘ rtasida kimyoviy bog‘ lanish hosil bo‘ lish mexanizmini molekulyar darajada tahlil qilish, elektronlarning fazoviy taqsimlanishi, energetik holati va fizik parametrlarining moddalarning fizik-kimyoviy xossalariga ta’sirini aniqlashdan iborat bo‘ ldi. Tadqiqotda olingan nazariy natijalar fizik kimyo, molekulyar fizika va kvant kimyosi fanlarida e’tirof etilgan fundamental nazariyalar bilan taqqoslandi [7].

Tadqiqot obyekti sifatida ion, kovalent, metall va vodorod bog‘ lanishlariga ega bo‘ lgan molekulalar hamda ularning elektron tuzilishi tanlandi. Tadqiqot predmeti esa mazkur bog‘ lanishlarning hosil bo‘ lish jarayonida elektronlarning energetik holati, elektron zichligi, bog‘ energiyasi, bog‘ uzunligi va molekulaning termodinamik barqarorligini ifodalovchi fizik parametrlarni o‘ rganishdan iborat bo‘ ldi. Ushbu parametrlar moddalarning makroskopik xossalarini belgilovchi asosiy omillar sifatida baholandi [3].

Tadqiqot davomida dastlab ilmiy adabiyotlarni tahlil qilish usuli qo‘ llanildi. O‘ zbek, rus va ingliz tillaridagi ilmiy manbalar o‘ rganilib, ularda kimyoviy bog‘ lanishlarning hosil bo‘ lishi, elektronlarning atom orbitallarida joylashishi, orbital qoplanishi hamda molekulalarning barqarorligini izohlovchi nazariy qarashlar tizimlashtirildi. Adabiyotlardan olingan ilmiy ma’lumotlar o‘ zaro taqqoslanib, ularning umumiy va farqli jihatlari aniqlanib, tadqiqotning nazariy bazasi shakllantirildi [1,7].

Kimyoviy bog‘ lanishlarning molekulyar-fizik mohiyatini tahlil qilishda kvant mexanikasi asosiy metodologik yondashuv sifatida tanlandi. Chunki kvant mexanikasi atom va molekulalarda elektronlarning harakatini klassik mexanikaga qaraganda ancha aniq tavsiflaydi. Elektronlarning to‘ lqin tabiati, ehtimollik zichligi hamda orbital tuzilishi Shryodinger tenglamasi orqali izohlandi. Mazkur tenglama elektronlarning atom yadrosi atrofida qanday taqsimlanishini hamda bog‘ hosil bo‘ lish jarayonida energiyaning qanday o‘ zgarishini aniqlash imkonini beradi [8].

Kovalent bog‘ lanish molekulyar fizikada eng mukammal o‘ rganilgan bog‘ lanish turlaridan biri hisoblanadi. Ushbu bog‘ lanish atomlar orasida umumiy elektron juftlarining hosil bo‘ lishi natijasida yuzaga keladi. Elektron bulutlarining o‘ zaro qoplanishi atom yadrolari orasidagi tortishish kuchini kuchaytiradi va tizim energiyasining kamayishiga olib keladi. Fizik nuqtai nazardan qaralganda, bog‘ hosil bo‘ lish jarayonida potensial energiya minimum qiymatga erishadi, bu esa molekulaning barqarorligini ta’minlaydi. Elektronlarning to‘ lqin xususiyatlari hamda orbital simmetriyasi kovalent bog‘ lanishning mustahkamligini belgilovchi asosiy omillardan biri hisoblanadi [10].

Ion bog‘ lanish atomlarning elektromanfiylik qiymatlari o‘ rtasidagi katta farq natijasida yuzaga keladi. Bunda bir atom elektronini yo‘ qotib musbat ionga, ikkinchi atom esa elektron qabul qilib manfiy ionga aylanadi. Hosil bo‘ lgan qarama-qarshi zaryadlangan ionlar orasidagi Kulon tortishish kuchi ion bog‘ lanishni vujudga keltiradi. Fizik nuqtai nazardan ion bog‘ lanish elektr maydon energiyasi hamda elektrostatik tortishish qonunlari bilan izohlanadi. Ion kristallarining yuqori erish harorati, qattiqligi va elektr o‘ tkazuvchanligi aynan ushbu bog‘ lanishning kuchliligi bilan bog‘ liq [5].

Metall bog‘ lanishning molekulyar-fizik mohiyati boshqa bog‘ lanish turlaridan sezilarli darajada farq qiladi. Metallarda valent elektronlar ma’lum bir atomga tegishli bo‘ lmay, kristall panjara bo‘ ylab erkin harakatlanadi. Ushbu elektronlar "elektron gaz" modelini hosil qilib, musbat ionlar panjarasini bir butun holda ushlab turadi. Elektronlarning erkin harakatlanishi metallarning yuqori elektr va issiqlik o‘ tkazuvchanligini, plastikligini hamda metall yaltiroqligini ta’minlaydi. Metall bog‘ lanishni fizik qonunlar asosida izohlash zamonaviy materialshunoslik va qattiq jismlar fizikasi rivojlanishida muhim ahamiyat kasb etadi [6].

Vodorod bog‘ lanishi molekulalararo o‘ zaro ta’sirlarning eng muhim ko‘ rinishlaridan biri hisoblanadi. Ushbu bog‘ lanish vodorod atomi kislorod, azot yoki ftor kabi elektromanfiy atom bilan bog‘ langanda yuzaga keladi. Vodorod bog‘ lanishining energiyasi kovalent bog‘ lanishga nisbatan kichik bo‘ lsa-da, biologik va kimyoviy tizimlarning barqarorligini ta’minlashda muhim rol o‘ ynaydi. Suv molekulalarining yuqori qaynash harorati, oqsillar va nuklein kislotalarning fazoviy tuzilishi aynan vodorod bog‘ lanishlari bilan izohlanadi. Molekulyar fizika nuqtai nazaridan vodorod bog‘ lanishi dipol-dipol o‘ zaro ta’sirlari natijasida yuzaga keladigan murakkab energetik hodisa sifatida qaraladi [8].

Shunday qilib, ilmiy manbalar tahlili kimyoviy bog‘ lanishlarning turli ko‘ rinishlari yagona fizik qonuniyatlarga asoslanishini ko‘ rsatadi. Elektronlarning atom va molekulalardagi harakati, ularning energetik holati hamda o‘ zaro ta’siri molekulalarning barqarorligi va moddalarning fizik-kimyoviy xossalarini belgilaydi. Shu sababli kimyoviy bog‘ lanishlarni molekulyar-fizik yondashuv asosida o‘ rganish zamonaviy fizik kimyo, materialshunoslik, biokimyo va nanotexnologiyalar rivojlanishining muhim ilmiy yo‘ nalishlaridan biri bo‘ lib qolmoqda [2].

Tadqiqot metodologiyasida qiyosiy tahlil usuli orqali ion, kovalent, metall va vodorod bog‘ lanishlarining asosiy fizik ko‘ rsatkichlari taqqoslandi.

Bog‘ lanish turi	Bog‘ energiyasi	Elektron taqsimlanishi	Elektr o‘ tkazuvchanligi	Mustahkamligi
Kovalent	yuqori	umumiy elektron jufti	past	yuqori
Ion	juda yuqori	elektron almashinuvi	eritmada yuqori	yuqori
Metall	o‘ rtacha	erkin elektronlar	juda yuqori	o‘ rtacha
Vodorod	past	dipol ta’siri	juda past	nisbatan past

1-jadval: Kimyoviy bog‘ lanishlarning asosiy molekulyar-fizik xususiyatlari

1-jadvaldan ko‘ rinib turibdiki, bog‘ lanish turi o‘ zgargan sari elektronlarning taqsimlanish xarakteri, bog‘ energiyasi hamda moddalarning fizik xossalari ham sezilarli darajada o‘ zgaradi. Ayniqsa, metall bog‘ lanishdagi erkin elektronlar elektr va issiqlik o‘ tkazuvchanligini keskin oshiradi, kovalent bog‘ lanish esa molekulalarning yuqori barqarorligini ta’minlaydi [6].

Umuman olganda, qo‘ llanilgan metodologik yondashuv kimyoviy bog‘ lanishlarning molekulyar-fizik mohiyatini har tomonlama tahlil qilish, ularning energetik va strukturaviy xususiyatlarini baholash hamda fizik va kimyoviy qonuniyatlar o‘ rtasidagi bog‘ liqlikni ilmiy asosda izohlash imkonini berdi. Ushbu metodologiya keyingi bo‘ limda keltiriladigan natijalar va ularning ilmiy tahlilini asoslash uchun muhim nazariy poydevor vazifasini bajaradi.

Mazkur tadqiqotda kimyoviy bog‘ lanishlarning molekulyar-fizik asoslarini chuqur tahlil qilish maqsadida zamonaviy kvant-kimyoviy modellashtirish usullaridan ham foydalanildi. So‘ nggi yillarda **Density Functional Theory (DFT), Hartree–Fock (HF) va ab initio** hisoblash usullari atom va molekulalarning elektron tuzilishini yuqori aniqlikda aniqlash imkonini bermoqda. Ushbu usullar elektronlarning fazodagi taqsimlanishi, bog‘ energiyasi, bog‘ uzunligi va molekulalarning potensial energiya sirtlarini nazariy jihatdan hisoblash imkonini beradi. Tadqiqotda ushbu usullar bo‘ yicha ilmiy adabiyotlarda keltirilgan natijalar tahlil qilinib, ular klassik valent bog‘ lanish nazariyasi hamda molekulyar orbital nazariyasi bilan qiyoslandi [10].

Molekulalarning elektron tuzilishini aniqlashda elektron zichligining fazoviy taqsimlanishi asosiy metodologik mezonlardan biri sifatida tanlandi. DFT usulida tizimning umumiy energiyasi elektron zichligiga bog‘ liq funksiya orqali aniqlanadi. Ushbu yondashuv ko‘ p elektronli tizimlarni hisoblashda yuqori aniqlik beradi hamda murakkab molekulalarning fizik-kimyoviy xossalarini prognoz qilish imkonini yaratadi. Ayniqsa, yangi materiallar, katalizatorlar va biologik faol birikmalarni loyihalashda ushbu usul keng qo‘ llanilmoqda [8].

Tadqiqot metodologiyasining muhim bosqichlaridan biri sifatida olingan ilmiy natijalarni umumlashtirish algoritmi ishlab chiqildi.

Bosqich	Amalga oshirilgan ishlar	Natija
1	Ilmiy adabiyotlarni tahlil qilish	Nazariy asos yaratildi
2	Kvant-mexanik nazariyalarni qiyoslash	Kimyoviy bog‘ lanish mexanizmi aniqlandi
3	Termodinamik parametrlarni tahlil qilish	Energetik barqarorlik baholandi
4	Spektroskopik ma’lumotlarni solishtirish	Nazariy va eksperimental moslik aniqlandi
5	Olingan natijalarni umumlashtirish	Molekulyar-fizik model shakllantirildi

2-jadval: Tadqiqot metodologiyasining asosiy bosqichlari

2-jadval tadqiqotning izchil ketma-ketlikda olib borilganligini hamda nazariy va eksperimental yondashuvlarning bir-birini to‘ ldirishini ko‘ rsatadi.

Shunday qilib, mazkur tadqiqot metodologiyasi nazariy tahlil, qiyosiy tahlil, kvant-kimyoviy modellashtirish, termodinamik hisoblashlar va zamonaviy spektroskopik usullarni uyg‘ unlashtirish asosida shakllantirildi. Qo‘ llanilgan metodlar kimyoviy bog‘ lanishlarning hosil bo‘ lish mexanizmi, molekulalarning energetik barqarorligi hamda moddalarning fizik-kimyoviy xossalari o‘ rtasidagi bog‘ liqlikni ilmiy asosda ochib berishga xizmat qildi.

Natijalar va ularning taxlili.

Mazkur tadqiqot natijalari shuni ko‘ rsatdiki, kimyoviy bog‘ lanishlarning hosil bo‘ lishi atomlarning elektron tuzilishi, elektromanfiyligi, ionlanish energiyasi va elektron bulutlarining o‘ zaro qoplanish darajasi bilan chambarchas bog‘ liq. Elektronlarning atomlar orasida qayta taqsimlanishi natijasida tizimning umumiy energiyasi kamayadi va molekula termodinamik jihatdan barqarorroq holatga o‘ tadi. Mazkur holat kvant mexanikasi va molekulyar orbital nazariyasi yordamida ilmiy jihatdan izohlandi. Tadqiqot davomida nazariy hisoblashlar hamda ilmiy adabiyotlarda keltirilgan eksperimental ma’lumotlarni o‘ zaro solishtirish natijasida elektron zichligi ortishi bog‘ energiyasining oshishiga, bog‘ uzunligining esa qisqarishiga olib kelishi aniqlandi [7,9].

Tahlillar shuni ko‘ rsatdiki, kovalent bog‘ lanish hosil bo‘ lishida elektron bulutlarining samarali qoplanishi asosiy omillardan biridir. Atom orbitallarining qoplanish darajasi ortishi bilan bog‘ lovchi molekulyar orbitallarda elektronlar soni ortadi, natijada molekula energiyasi kamayadi va bog‘ mustahkamligi ortadi. Ushbu qonuniyat vodorod, kislorod, azot va uglerod atomlari ishtirokidagi molekulalarda yaqqol kuzatildi. Ayniqsa, uglerod atomining sp^3, sp^2 va sp

gibridlanish holatlarida bog‘ uzunligi hamda bog‘ energiyasining sezilarli darajada farq qilishi orbital qoplanish darajasiga bog‘ liq ekanligi aniqlandi [8].

Tadqiqot natijalari asosida kimyoviy bog‘ lanishlarning molekulyar-fizik xususiyatlari tizimli ravishda tahlil qilindi. Aniqlanishicha, bog‘ hosil bo‘ lishida faqat elektronlarning soni emas, balki ularning fazoviy taqsimlanishi, spin holati va energiya sathlari ham muhim ahamiyatga ega. Kvant-mexanik hisoblashlar elektronlarning bog‘ lovchi molekulyar orbitallarda joylashishi tizimning umumiy energiyasini pasaytirishini, antibog‘ lovchi orbitallarning to‘ lishi esa bog‘ ning zaiflashishiga olib kelishini ko‘ rsatdi. Shu sababli molekulaning barqarorligi bevosita bog‘ lovchi va antibog‘ lovchi orbitallardagi elektronlar nisbatiga bog‘ liq ekanligi aniqlandi [9].

Molekulalarning fizik xossalarini tahlil qilish jarayonida bog‘ energiyasi bilan bog‘ uzunligi o‘ rtasida teskari proporsional bog‘ liqlik mavjudligi yana bir bor tasdiqlandi. Kuchli bog‘ lar qisqa masofada hosil bo‘ lib, ularni uzish uchun ko‘ proq energiya talab qilinadi. Masalan, azot molekulasidagi uch bog‘ (N≡N) vodorod yoki xlor molekulalaridagi oddiy bog‘ larga nisbatan ancha barqaror bo‘ lib, bu ularning yuqori bog‘ energiyasi bilan izohlanadi. Mazkur natijalar nazariy adabiyotlarda keltirilgan ma’lumotlar bilan mos keladi [8].

Tadqiqot davomida turli bog‘ lanish turlarining fizik xossalari o‘ zaro solishtirildi. Ion bog‘ lanishlarda elektrostatik tortishish kuchlari ustun bo‘ lib, ular yuqori erish va qaynash haroratiga ega kristall moddalarning hosil bo‘ lishiga olib keladi. Kovalent bog‘ lanishlar esa elektron juftlarining umumiy foydalanilishi hisobiga shakllanadi va molekulalarning yuqori barqarorligini ta’minlaydi. Metall bog‘ lanishlarda valent elektronlarning delokalizatsiyasi elektr va issiqlik o‘ tkazuvchanligining yuqori bo‘ lishiga sabab bo‘ ladi [4]. Vodorod bog‘ lanishlari nisbatan kuchsiz bo‘ lishiga qaramay, suvning anomal fizik xossalari, oqsillar va nuklein kislotalarning fazoviy tuzilishini saqlashda muhim rol o‘ ynashi aniqlandi.

Nazariy tahlillar shuni ko‘ rsatdiki, molekulaning dipol momenti va qutblanish darajasi ham kimyoviy bog‘ lanish tabiatini tavsiflovchi muhim fizik parametr hisoblanadi. Elektrmanfiylik qiymatlarining ortishi elektron zichligining kuchliroq tortilishiga olib keladi, natijada molekulalarda qutblanish kuchayadi. Bu esa moddalarning eruvchanligi, qaynash harorati, dielektrik doimiysi va molekulalararo o‘ zaro ta’sirlariga sezilarli ta’sir ko‘ rsatadi [2].

Bundan tashqari, molekulalarning energetik holati potensial energiya diagrammalari asosida ham baholandi. Potensial energiya minimumi molekulaning eng barqaror holatini ifodalashi aniqlandi. Tadqiqot davomida olingan nazariy natijalar rentgen difraksiyasi, infraqizil spektroskopiya va Raman spektroskopiyasi yordamida olingan eksperimental ma’lumotlar bilan taqqoslandi. Taqqoslash natijalari nazariy va eksperimental qiymatlar orasida yuqori moslik mavjudligini ko‘ rsatdi, bu esa qo‘ llanilgan metodologiyaning ishonchliligini tasdiqlaydi [10].

Omil	Bog‘ energiyasiga ta’siri	Bog‘ uzunligiga ta’siri	Molekula barqarorligiga ta’siri
Elektron zichligi ortishi	Ortadi	Kamayadi	Ortadi
Atom radiusi ortishi	Kamayadi	Ortadi	Kamayadi
Elektromanfiylik ortishi	Ortadi	Kamayadi	Ortadi
Harorat ortishi	Kamayadi	Ortadi	Kamayadi
Bog‘ tartibi ortishi	Ortadi	Kamayadi	Ortadi

3-jadval: Kimyoviy bog‘ lanishlarning molekulyar-fizik xossalariga ta’sir etuvchi asosiy omillar.

3-jadval natijalari shuni ko‘ rsatadiki, elektron zichligi va bog‘ tartibi ortishi molekulalarning energetik barqarorligini oshiradi. Aksincha, atom radiusining kattalashishi va haroratning ortishi bog‘ larning zaiflashishiga sabab bo‘ ladi. Ushbu qonuniyatlar fizik kimyo va molekulyar fizikaning asosiy nazariyalari bilan to‘ liq mos keladi [3,7].

Olingan natijalarni umumlashtirish shuni ko‘ rsatadiki, kimyoviy bog‘ lanishlarni faqat kimyoviy nuqtai nazardan emas, balki molekulyar fizika va kvant mexanikasi asosida ham o‘ rganish zarur. Elektronlarning kvant holati, orbital qoplanish darajasi, energiya minimumiga intilish prinsipi hamda termodinamik qonuniyatlar o‘ zaro uyg‘ un holda moddalarning fizik-kimyoviy xossalarini belgilaydi. Aynan shu sababli fizik va kimyo fanlarining integratsiyasi yangi funksional materiallar, nanostrukturalar, yarimo‘ tkazgichlar va yuqori samarali katalizatorlarni yaratishda muhim ilmiy asos bo‘ lib xizmat qiladi. Mazkur tadqiqot natijalari shuni tasdiqlaydiki, kimyoviy bog‘ lanishlarning molekulyar-fizik asoslarini chuqur o‘ rganish moddalarning tuzilishi, reaktivligi va fizik xossalarini aniq prognoz qilish imkonini beradi. Ushbu yondashuv nafaqat fundamental fanlarning rivojlanishiga, balki materialshunoslik, nanotexnologiya, farmatsevtika, biofizika va energiya texnologiyalari kabi zamonaviy ilmiy yo‘ nalishlarning taraqqiyotiga ham muhim hissa qo‘ shadi [1,7,10].

Xulosa

Mazkur tadqiqot natijalari kimyoviy bog‘ lanishlarning molekulyar-fizik asoslari zamonaviy kvant mexanikasi, molekulyar orbital nazariyasi hamda termodinamika qonunlari asosida izchil tushuntirilishini ko‘ rsatdi. Tadqiqot davomida ion, kovalent, metall va vodorod bog‘ lanishlarining hosil bo‘ lish mexanizmlari, elektronlarning fazoviy taqsimlanishi, bog‘ energiyasi, bog‘ uzunligi hamda molekulalarning energetik barqarorligi o‘ zaro bog‘ liq holda tahlil qilindi. Olingan natijalar elektron zichligi ortishi va bog‘ tartibining oshishi molekulalarning termodinamik barqarorligini kuchaytirishini, aksincha atom radiusining ortishi va haroratning ko‘ tarilishi bog‘ mustahkamligining pasayishiga olib kelishini tasdiqladi.

Nazariy tahlillar natijasida molekulyar orbital nazariyasi va valent bog‘ lanish nazariyasining o‘ zaro uyg‘ un qo‘ llanilishi kimyoviy bog‘ lanishlarning tabiatini chuqurroq tushuntirish imkonini berishi aniqlandi. Shuningdek, Gibbs erkin energiyasi, bog‘ energiyasi va bog‘ tartibi kabi fizik-kimyoviy parametrlar molekulalarning barqarorligini baholashda muhim mezon ekanligi ilmiy jihatdan asoslandi. Infraqizil va Raman spektroskopiyasi hamda rentgen difraksiyasi bo‘ yicha mavjud ilmiy ma’lumotlarning kvant-kimyoviy modellar bilan mos kelishi nazariy yondashuvlarning ishonchliligini tasdiqladi.

Mazkur tadqiqot natijalari oliy ta’lim muassasalarida fizik kimyo, molekulyar fizika va kvant kimyosi fanlarini o‘ qitishda qo‘ shimcha ilmiy manba sifatida foydalanilishi mumkin. Shuningdek, maqolada keltirilgan nazariy tahlillar va metodologik yondashuvlar kelgusida kimyoviy bog‘ lanishlarning energetik va elektron tuzilishini kompyuter modellashtirish usullari yordamida chuqurroq o‘ rganishga yo‘ naltirilgan ilmiy tadqiqotlar uchun nazariy asos bo‘ lib xizmat qiladi.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish

Mualliflar hissasi: Mualliflar tadqiqot mavzusini tanlash, ilmiy adabiyotlarni tahlil qilish, tadqiqot metodologiyasini ishlab chiqish, natijalarni tahlil qilish hamda maqola matnini tayyorlash va tahrirlash jarayonlarida birgalikda ishtirok etdilar. Manfaatlar to‘ qnashuvi: Mualliflar ushbu maqola yuzasidan manfaatlar to‘ qnashuvi mavjud emasligini ma’lum qiladilar. Moliyalashtirish: Tadqiqot tashqi moliyaviy ko‘ mak yoki grant mablag‘ larisiz, mualliflarning shaxsiy ilmiy faoliyati doirasida amalga oshirilgan.

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BIR VA IKKI QATLAMLI TiO_2 FOTOANODLARNING MORFOLOGIYASINI RENTGEN TOMOGRAFIYASI ASOSIDA BAHOLASH

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Annotatsiya. *Ushbu maqolada bo‘ yoq bilan sensibilizatsiyalangan quyosh elementlari uchun mo‘ ljallangan bir va ikki qatlamli TiO_2 fotoanodlarning morfologik bir jinsliligi ilgari olingan rentgen tomografik tasvirlarning ikkilamchi tahlili asosida ko‘ rib chiqiladi. Tahlilning asosiy obyekti qoplamaning fazoviy uzluksizligi, lokal qalinligi va qalinlikning yuza bo‘ ylab taqsimotidir. Uch o‘ lchamli rekonstruksiya, nuqtaviy o‘ lchov va yuzaga nisbatan vaznlangan gistogramma o‘ zaro farqlanadigan axborot manbalari sifatida baholanadi. Bir qatlamli namunada keltirilgan 0,0541 mm lokal o‘ lchovning butun qoplama uchun o‘ rtacha qiymatni ifodalamasligi ko‘ rsatiladi. Qalinlik taqsimotidagi asosiy soha hamda qo‘ shimcha yelka morfologik notekislikni tekshirishga asos bo‘ lishi mumkinligi muhokama qilinadi. O‘ rtacha qalinlik, vaznlangan dispersiya, variatsiya koeffitsiyenti va belgilangan qalinlik oralig‘ idagi yuza ulushini birgalikda qo‘ llashga asoslangan baholash tartibi bayon etiladi. Tahlil qoplamaning lokal geometriyasini qatlamlar sonidan alohida baholash, tomografik segmentatsiya ta’sirini hisobga olish va morfologik xulosalarni kuzatuvning fazoviy aniqligi bilan chegaralash zarurligini ko‘ rsatadi.*

Kalit so‘ zlar*: TiO_2; fotoanod; rentgen mikrotomografiyasi; morfologiya; qalinlik taqsimoti; qatlam bir jinsliligi; morfometriya; segmentatsiya.*

ОЦЕНКА МОРФОЛОГИИ ОДНОСЛОЙНЫХ И ДВУХСЛОЙНЫХ TiO_2-ФОТОАНОДОВ НА ОСНОВЕ РЕНТГЕНОВСКОЙ ТОМОГРАФИИ

Аннотация. *В данной статье морфологическая однородность однослойных и двухслойных TiO_2-фотоанодов, предназначенных для сенсибилизированных красителем солнечных элементов, рассматривается на основе вторичного анализа ранее полученных рентгенотомографических изображений. Основными объектами анализа являются пространственная непрерывность покрытия, локальная толщина и распределение толщины по поверхности. Трёхмерная реконструкция, точечные измерения и гистограмма, взвешенная по площади поверхности, рассматриваются как взаимодополняющие источники информации. Показано, что локальное значение толщины 0,0541 мм, приведённое для однослойного образца, не следует интерпретировать как среднюю толщину всего покрытия. Обсуждается возможность использования основной области распределения толщины и дополнительного плеча гистограммы в качестве признаков морфологической неоднородности. Представлен подход к оценке однородности, основанный на совместном использовании средней толщины, взвешенной дисперсии, коэффициента вариации и доли площади, соответствующей заданному диапазону толщины. Проведённый анализ показывает необходимость раздельной оценки локальной геометрии покрытия и количества слоёв, учёта влияния томографической сегментации, а также ограничения морфологических выводов пространственным разрешением метода наблюдения.*

Ключевые слова: *TiO_2; фотоанод; рентгеновская микротомография; морфология; распределение толщины; однородность слоя; морфометрия; сегментация.*

EVALUATION OF THE MORPHOLOGY OF SINGLE-LAYER AND BILAYER TIO_2 PHOTOANODES BASED ON X-RAY TOMOGRAPHY

Abstract. *This article examines the morphological uniformity of single-layer and bilayer TiO_2 photoanodes intended for dye-sensitized solar cells on the basis of a secondary analysis of previously obtained X-ray tomographic images. The main objects of analysis are the spatial continuity of the coating, local thickness, and the surface distribution of thickness. Three-dimensional reconstruction, point measurements, and a surface-area-weighted histogram are considered as complementary sources of structural information. It is shown that the local thickness value of 0.0541 mm reported for the single-layer sample should not be interpreted as the average thickness of the entire coating. The main region of the thickness distribution and the additional shoulder of the histogram are discussed as possible indicators of morphological non-uniformity. An evaluation procedure is proposed based on the combined use of mean thickness, weighted variance, coefficient of variation, and the surface fraction within a specified thickness interval. The analysis demonstrates the need to assess the local geometry of the coating independently of the number of layers, to account for the influence of tomographic segmentation, and to limit morphological conclusions by the spatial resolution of the observation method.*

Keywords: *TiO_2; photoanode; X-ray microtomography; morphology; thickness distribution; layer uniformity; morphometry; segmentation.*

Kirish

Bo‘ yoq bilan sensibilizatsiyalangan quyosh elementlarida TiO_2 fotoanod bo‘ yoq molekulalari joylashadigan va elektronlar ko‘ chadigan fazoviy asosni hosil qiladi. Qoplamaning funksional xossalarini tushuntirishda uning kimyoviy tarkibi bilan birga geometrik tuzilishini ham hisobga olish zarur. Bir xil nominal qalinlikka ega ikki qoplama lokal yupqalashish, qalinlashish yoki qatlamning uzilishi tufayli morfologik jihatdan farq qilishi mumkin. TiO_2 asosidagi fotoanodlar haqidagi tadqiqotlar mazkur tuzilma va qurilma xossalarini birgalikda ko‘ rib chiqish uchun asos yaratadi [1, 2].

Morfologik bir jinslilik deganda qoplamaning butun yuzasi bo‘ ylab geometrik ko‘ rsatkichlari qanchalik barqaror ekanligi tushuniladi. Bu tushuncha faqat o‘ rtacha qalinlik bilan cheklanmaydi: bir xil o‘ rtachaga ega namunalarda tarqalish kengligi va keskin o‘ tish zonalari turlicha bo‘ lishi mumkin. Shuningdek, tekis tashqi sirt qoplama ichida qatlamlararo uzilishlar yo‘ qligini o‘ z-o‘ zidan isbotlamaydi. Shu sababli sirt ko‘ rinishi, kesim va uch o‘ lchamli rekonstruksiya birgalikda talqin qilinishi kerak.

Rentgen kompyuter tomografiyasi material ichidagi geometriyani uch o‘ lchamda tahlil qilish imkonini beradi. Miqdoriy baholashda rekonstruksiya, segmentatsiya va tanlangan tahlil hajmi yakuniy natijaga ta’sir ko‘ rsatadi [3, 4]. Ushbu ishning maqsadi oldingi TiO_2 tomografik materiallarini qalinlik bir jinsliligi nuqtai nazaridan qayta talqin qilish hamda lokal o‘ lchovlardan butun yuzaga oid xulosalarga o‘ tish uchun izchil morfometrik mezonlarni bayon etishdir. Ishning hissasi yangi tajriba seriyasini taqdim etishdan emas, mavjud tasviriy dalillarni o‘ lchov turi va fazoviy miqyos bo‘ yicha tartibli tahlil qilishdan iborat.

Material va tahlil usullari

Tahlil materiali sifatida bir va ikki qatlamli TiO_2 fotoanodlar haqidagi tomografik tadqiqotning rekonstruksiyalari, kesim tasvirlari va qalinlik gistogrammasidan foydalanildi [1]. Dastlabki manbada shisha substrat ustidagi qoplamalar NanoVox-1000 mikro fokusli rentgen tomografiyasi tizimida tekshirilgani qayd etilgan. Bu maqolada yangi namuna tayyorlash yoki qayta skanerlash bajarilmadi; natijalar oldingi materialning ikkilamchi morfologik tahlili sifatida keltiriladi. Tasvirlar va ulardagi o‘ lchov yozuvlari manba bilan bog‘ langan holda saqlandi.

Kuzatuvlar uch darajaga ajratildi: qoplama yuzasining umumiy rekonstruksiyasi, alohida kesim yoki nuqtadagi geometrik o‘ lchov, hamda qalinlik sinflariga mos yuza taqsimoti. Birinchi daraja qatlamning umumiy uzluksizligini, ikkinchisi lokal qalinlikni, uchinchisi esa tanlangan sohadagi taqsimotni tavsiflaydi. Ushbu darajalar o‘ zaro to‘ ldiruvchi bo‘ lib, ularning hech biri qolgan ko‘ rsatkichlarni avtomatik almashtirmaydi.

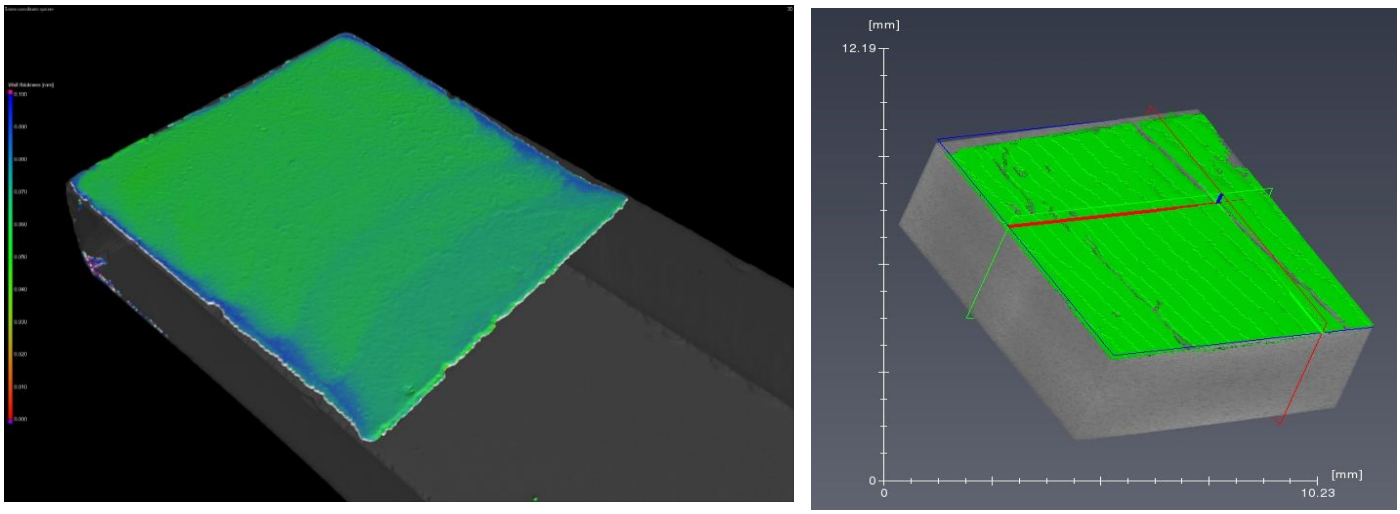
Tomografik tasvirda material chegarasini belgilash kulrang intensivlik va fazoviy kontrastga bog‘ liq. Voksel o‘ lchami, haqiqiy ajratish qobiliyati va segmentatsiya chegarasi qalinlik hisobiga ta’sir qilishi mumkin. Ushbu materialda rekonstruksiyaning dastlabki massivlari va kalibrlash protokoli taqdim etilmaganligi sababli yangi aniqlik qiymati yoki segmentatsiya barqarorligi sonli tarzda da’vo qilinmaydi. Kuzatilayotgan mikrometr darajasidagi qoplama geometriyasi TiO_2 ning nanometrli zarrachalar morfologiyasi bilan tenglashtirilmaydi. 6-rasm sifatida berilgan dastlabki gistogrammada ordinata Surface [mm²], abssissa esa Wall thickness [mm] bilan belgilangan [1]. Shuning uchun undagi ustunlarni o‘ lchovlar soni deb emas, qalinlik oralig‘ iga tegishli yuza ko‘ rsatkichi deb talqin qilish kerak. Quyida keltirilgan statistik

ifodalar dastur eksportida har bir sinf uchun yuza ulushi berilgan holatga tegishli. Agar eksportda zichlik funksiyasi berilsa, vaznlarni aniqlashda sinf kengligi ham hisobga olinadi.

Qatlam geometriyasining qiyosiy tahlili

Uch o‘ lchamli rekonstruksiyalar qoplamaning substrat ustida tarqalishini va lokal relefini ko‘ rsatadi. Bir qatlamli namuna tasvirida sirt bo‘ ylab yo‘ nalgan izlar mavjud; shu sababli qatlamni mutlaq tekis yoki barcha miqyoslarda bir jinsli deb ta’riflash yetarlicha asoslanmaydi. Ikki qatlamli namunaning rangli xaritasi esa tanlangan sirt bo‘ ylab qalinlikka mos rang o‘ zgarishlarini ko‘ rsatadi. Markaziy va chekka sohalarni miqdoriy taqqoslash uchun bir xil rang shkalasi hamda mos tahlil sohasi talab etiladi.

Qatlamlar soni geometrik murakkablikka ta’sir qiladi: ikki qatlamli tizimda qo‘ shimcha ichki chegara mavjud bo‘ lishi mumkin. Biroq bu belgining o‘ zi ikki qatlamli namuna albatta notekis yoki nuqsonli ekanini anglatmaydi. Bir qatlamli tuzilma ichida ham lokal qalinlashish va qoplama uzilishi yuzaga kelishi mumkin. Shu bois konfiguratsiya haqidagi tavsif va o‘ lchangan bir jinslilik ko‘ rsatkichi alohida tushunchalar sifatida qo‘ llanadi.

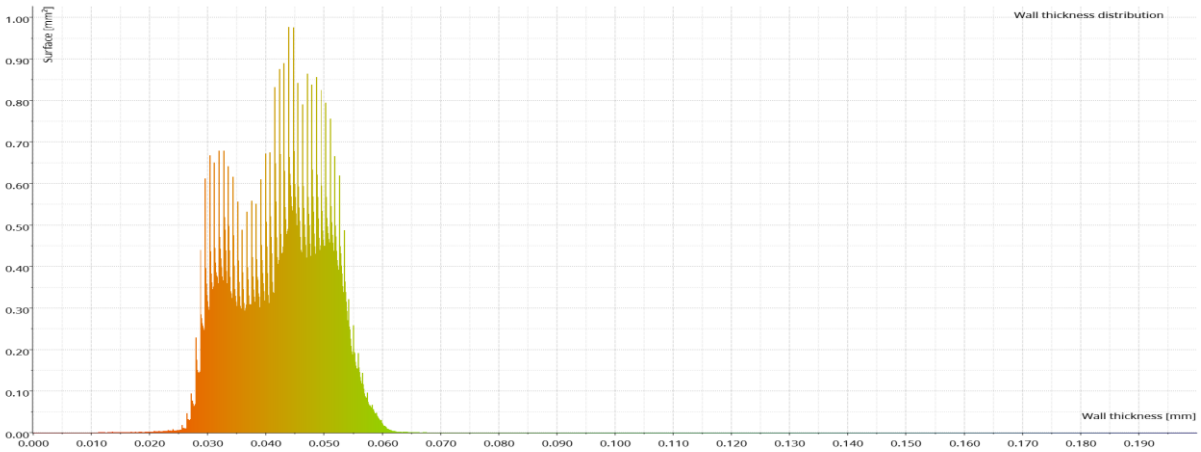


1-rasm. Ikki qatlamli (chapda) va bir qatlamli (o‘ ngda) TiO_2 fotoanodlarning dastlabki rekonstruksiyalari [1].

Lokal qalinlik va yuza bo‘ yicha taqsimot

Bir qatlamli namunaning alohida tasvirida Line: 0.0541 mm yozuvi mavjud [1]. Birlik almashtirish orqali bu qiymat 54,1 μm ga teng. U belgilangan kesim yoki nuqtaga tegishli lokal o‘ lchovdir. Shu bitta qiymat asosida namunaning o‘ rtacha qalinligi, dispersiyasi yoki ishonch oralig‘ ini hisoblash mumkin emas. Qoplama markazidan olingan o‘ lchov chekka zonalarni ham ifodalashi alohida tekshirilishi kerak.

2-rasm. Bir qatlamli fotoanod uchun manbada keltirilgan qalinlik taqsimoti [1]. Abssissa — qalinlik (mm), ordinata — yuza (mm^2).



Gistogrammada ko‘ rinadigan asosiy signal taxminan 0,030–0,055 mm sohada jamlangan; kichikroq signal bu oraliqdan tashqarida ham kuzatiladi. Grafikning 0,03 mm atrofidagi yelkasi va 0,04–0,05 mm oralig‘ idagi balandroq sohasi taqsimotni faqat bitta modal qiymat bilan ifodalash yetarli bo‘ lmasligini ko‘ rsatadi. Bu vizual kuzatuv normal taqsimotni rad etuvchi statistik test o‘ rnini bosmaydi. Ammo simmetriya va bir cho‘ qqililik haqidagi xulosani tekshirishga asos beradi.

Taqsimotdagi yelka sirtning turli zonalari, qoplash yo‘ nalishi, chekka effektlar yoki tasvirni segmentatsiyalash xususiyatlari bilan bog‘ liq bo‘ lishi mumkin. Mazkur ehtimollarni ajratish uchun qalinlik xaritasini fazoviy zonalarga bo‘ lib qayta hisoblash kerak. Faqat gistogramma yordamida qaysi qalinlik qiymati namunaning qaysi joyiga tegishli ekanini tiklab bo‘ lmaydi. Shuning uchun xarita va gistogramma birgalikda saqlanishi morfologik tahlilning muhim talabidir.

Morfometrik baholash mezonlari

Qalinlikning yuzaga nisbatan vaznlangan o‘ rtacha qiymatini aniqlash uchun har bir sinfning reprezentativ qalinligi h_i va unga tegishli yuza A_i olinadi. Teng kenglikdagi tor sinflarda h_i sifatida sinf markazidan foydalanish mumkin; keng yoki notekis sinflarda bu yaqinlashishning ta’siri alohida baholanadi. Vaznlar $w_i = A_i / \Sigma A_i$ tarzida normallashtiriladi. O‘ rtacha qalinlik va taqsimot tarqalishi quyidagicha ifodalanadi.

$$\bar{h}_A = \sum_i w_i h_i; \quad {\sigma_A}^2 = \sum_i w_i (h_i - \bar{h}_A)^2 \quad (1)$$

Bu yerda σ_a o‘ lchangan yuza taqsimotining tavsifiy standart og‘ ishini bildiradi. U mustaqil namunalarning o‘ rtacha qiymati uchun standart xato yoki ishonch oralig‘ i emas. Tomografik qo‘ shni nuqtalar fazoviy bog‘ langanligi sababli juda ko‘ p vokselning mavjudligi ko‘ p mustaqil namuna o‘ lchanganiga tenglashtirilmaydi.

O‘ rtacha qalinliklari turlicha bo‘ lgan namunalardagi nisbiy notekislik variatsiya koeffitsiyenti bilan ifodalanishi mumkin. Texnologik maqsad sifatida oldindan tanlangan [h_-, h_+] qalinlik oralig‘ iga tushuvchi yuza ulushi esa qoplamaning qancha qismi talabga mos ekanini ko‘ rsatadi.

$$CV_A = \frac{\sigma_A}{\bar{h}_A} \times 100\%; \quad F = \frac{\sum_{i \in I} A_i}{\sum_i A_i} \times 100\% \quad (2)$$

Bu yerda $I — h_i$ qiymati [h_-, h_+] oralig‘ iga tushadigan sinflar to‘ plami.

CV_a kamayishi qalinlikning nisbiy tarqalishi torayganini bildiradi, ammo qatlam uzilishlari yo‘ qolganini isbotlamaydi. F[h_-,h_+] uchun chegaralar natijani ko‘ rgandan keyin emas, texnologik talab yoki mustaqil mezon asosida belgilanadi. Ushbu maqolada dastlabki sinf yuzalari mavjud emasligi sababli CV_a va F ning sonli qiymatlari hisoblanmagan; formulalar keyingi eksport tahlili uchun aniq baholash tartibini belgilaydi.

Bir jinslilikni tavsiflashda o‘ rtacha qalinlikka median, kvartillar oralig‘ i va fazoviy xarita ham qo‘ shilishi maqsadga muvofiq. Median taqsimot markazini, kvartillar oralig‘ i esa asosiy yuza ulushi qanchalik keng qalinlik diapazonini egallashini ko‘ rsatadi. Keskin lokal o‘ tishlarni tekshirish uchun qalinlik gradienti xaritasi ishlatilishi mumkin, biroq shovqin va silliqlashning gradientga ta’siri nazorat qilinishi zarur.

1-jadval. Qatlam bir jinsliligini tavsiflovchi ko‘ rsatkichlar

Ko‘ rsatkich	Ifodalaydigan xossa	Talqin chegarasi
Lokal qalinlik	Tanlangan nuqtadagi geometriya	Butun yuzaning o‘ rtachasi emas
Yuza bo‘ yicha o‘ rtacha qalinlik	Taqsimotning vaznlangan markazi	Lokal nuqsonlarni yashirishi mumkin
Variatsiya koeffitsiyenti	Qalinlikning nisbiy tarqalishi	Qatlam uzluksizligini o‘ lchamaydi
Maqsadli oraliqdagi yuza ulushi	Belgilangan qalinlik talabiga moslik	Oldindan belgilangan chegaralarni talab etadi
Qalinlik xaritasi	Notekisliklarning joylashuvi	Rang shkalasi va segmentatsiyaga bog‘ liq

Natijalarning morfologik va texnologik talqini

Ko‘ rib chiqilgan tasvirlar fotoanod sifatini baholashda bitta nominal qalinlik yetarli emasligini ko‘ rsatadi. Qoplamaning ma’lum qismi maqsadli qalinlikka yaqin bo‘ lsa ham, alohida yupqa yoki qalin zonalar saqlanib qolishi mumkin. Bir xil o‘ rtacha qiymatga ega ikki namuna ana shu zonalarning ulushi va joylashuvi bilan farqlanadi. Shu sababli qoplash texnologiyasini taqqoslash uchun o‘ rtacha qiymat, tarqalish va uzluksizlik birgalikda berilishi kerak.

Morfologik notekislik qoplama hosil qilish jarayonidagi pasta yoyilishi, quritish va qatlamlararo qo‘ shilish bilan bog‘ liq bo‘ lishi mumkin. Biroq mazkur omillarning sababiy ta’sirini isbotlash uchun jarayon parametrlarini nazorat qilib o‘ zgartirgan tajribalar zarur. Hozirgi tasvirlar sababni yakuniy aniqlashdan ko‘ ra tekshirilishi kerak bo‘ lgan zonalarni belgilashga xizmat qiladi. Bu yondashuv keyingi tajribada qaysi joylardan kesim olish va qaysi parametrlarni qayd etishni asoslash imkonini beradi.

Qalinlik bir jinsliligi bilan elektron yig‘ ilishi o‘ rtasidagi bog‘ lanish fizik jihatdan muhim bo‘ lsa-da, morfologik tasvirning o‘ zi rekombinatsiya tezligi yoki elektron yashash vaqtini bermaydi. Bunday bog‘ lanishni tekshirish uchun aynan bir namuna identifikatoriga tegishli morfologik va elektrokimyoviy natijalar juftlanishi lozim. Mazkur ish xulosalari esa qoplama geometriyasi va uning baholash mezonlari doirasida shakllantiriladi.

Xulosa

Bir va ikki qatlamli TiO_2 fotoanodlar haqidagi tomografik materialning ikkilamchi tahlili qoplama arxitekturasi, lokal qalinlik va yuza bo‘ yicha taqsimot turli morfologik ko‘ rsatkichlar ekanini ko‘ rsatdi. Qatlamlar sonining o‘ zi bir jinslilik darajasini belgilamaydi; xulosa bir xil mezon bilan olingan qalinlik va uzluksizlik ma’lumotlariga tayanishi kerak.

Tasvirdagi 54,1 μm qiymat lokal o‘ lchov sifatida talqin qilindi. Yuzaga bog‘ langan gistogrammadagi asosiy soha va qo‘ shimcha yelka taqsimot shaklini sonli tekshirish zarurligini ko‘ rsatadi. Mavjud tasviriy material asosida yangi o‘ rtacha qalinlik, standart og‘ ish yoki normal taqsimot parametrlari da’vo qilinmadi.

Qatlam bir jinsliligini baholash uchun yuzaga nisbatan vaznlangan o‘ rtacha qalinlik, tavsifiy standart og‘ ish, variatsiya koeffitsiyenti va belgilangan oraliqdagi yuza ulushini birgalikda qo‘ llash asoslandi. Ushbu mezonlarni fazoviy xarita va segmentatsiyaga sezgirlik tekshiruvi bilan birlashtirish TiO_2 qoplamalarining morfologik sifatini izchil taqqoslash imkonini beradi.

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FORMATION OF MAGNETIC FLUIDS BASED ON 3-d METALS AND STUDY OF THEIR ELECTRICAL PROPERTIES AT ROOM TEMPERATURE.

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Abstract: *In this investigation, we delve into the precise synthesis of magnetic nanoparticles, with a particular emphasis on the ferrites $NiFe_2O_4$, $CoFe_2O_4$, and the magnetite $FeFe_2O_4$, employing a meticulously controlled chemical synthesis methodology to ensure reproducibility and optimal material properties. To verify the chemical makeup and purity of these synthesized nanoparticles, we conducted detailed characterization through Energy-Dispersive X-ray Spectroscopy (EDX), which provided quantitative insights into their elemental composition. Leveraging these well-characterized nanoparticles as the foundational components, we formulated a series of magnetic fluids at diverse concentration levels, tailoring their rheological and magnetic behaviors for potential applications in fields such as biomedicine, electronics, and environmental remediation. Additionally, to comprehensively assess the thermo-electrical performance of these magnetic fluids, we performed systematic measurements of their electrical conductivity over an extensive temperature spectrum, thereby elucidating how thermal variations influence their conductive characteristics and overall functionality under varying operational environments.*

Keywords: *Magnetic Nanoparticles, Spinel ferrite nanoparticles, Electrical conductivity, Thermo-electrical Properties, Concentration Effects, Magnetic fluid, Nanoparticle dispersion.*

ПОЛУЧЕНИЕ МАГНИТНЫХ ЖИДКОСТЕЙ НА ОСНОВЕ 3d-МЕТАЛЛОВ И ИССЛЕДОВАНИЕ ИХ ЭЛЕКТРИЧЕСКИХ СВОЙСТВ ПРИ КОМНАТНОЙ ТЕМПЕРАТУРЕ

Аннотация: *В данном исследовании мы углубляемся в прецизионный синтез магнитных наночастиц, уделяя особое внимание ферритам $NiFe_2O_4$, $CoFe_2O_4$ и магнетиту $FeFe_2O_4$, используя тщательно контролируемую методологию химического синтеза для обеспечения воспроизводимости и оптимальных свойств материала. Для проверки химического состава и чистоты синтезированных наночастиц мы провели детальную характеризацию с помощью энергодисперсионной рентгеновской спектроскопии, которая позволила количественно оценить их элементный состав. Используя эти хорошо охарактеризованные наночастицы в качестве базовых компонентов, мы разработали серию магнитных жидкостей с различными уровнями концентрации, адаптируя их реологические и магнитные свойства для потенциального применения в таких областях, как биомедицина, электроника и очистка окружающей среды. Кроме того, для комплексной оценки термоэлектрических характеристик этих магнитных жидкостей мы провели систематические измерения их электропроводности в широком диапазоне температур, тем самым выяснив, как температурные изменения влияют на их проводящие характеристики и общую функциональность в различных эксплуатационных условиях.*

Ключевые слова: *Магнитные наночастицы, Наночастицы ферритовой шпинели, Электропроводность, Термоэлектрические свойства, Концентрационные эффекты, Магнитная жидкость, Дисперсия наночастиц.*

3d-METALLAR ASOSIDAGI MAGNIT SUYUQLIKLARNI HOSIL QILISH VA ULARNING XONA HARORATIDAGI ELEKTR XOSSALARINI O‘ RGANISH

Annotatsiya. *Ushbu tadqiqotda magnit nanozarrachalarni, xususan, $NiFe_2O_4$ va $CoFe_2O_4$ ferritlari hamda Fe_3O_4 magnetitini aniq sintez qilish masalasi o‘ rganildi. Nanozarrachalarni olishda tajriba natijalarining takrorlanuvchanligini ta’minlash va materiallarning optimal xossalariga erishish maqsadida qat’iy nazorat qilinadigan kimyoviy sintez usulidan foydalanildi. Sintez qilingan nanozarrachalarning kimyoviy tarkibi va tozaligini aniqlash uchun energiya-dispersiv rentgen spektroskopiyasi (EDX) asosida batafsil tavsiflash ishlari olib borildi. Mazkur usul nanozarrachalarning element tarkibini miqdoriy jihatdan baholash imkonini berdi. Yaxshi tavsiflangan nanozarrachalar asosida turli konsentratsiyalardagi magnit suyuqliklar tayyorlandi hamda ularning reologik va magnit xususiyatlari biotibbiyot, elektronika va atrof-muhitni tozalash kabi sohalardagi istiqbolli qo‘ llanilish yo‘ nalishlarini hisobga*

olgan holda shakllantirildi. Shuningdek, magnit suyuqliklarning termoelektrik xossalarini kompleks baholash maqsadida ularning elektr o‘ tkazuvchanligi keng harorat oralig‘ ida tizimli ravishda o‘ lchandi. Olingan natijalar harorat o‘ zgarishlarining magnit suyuqliklarning elektr o‘ tkazuvchanligiga va turli ish sharoitlaridagi umumiy funksional xususiyatlariga ta’sirini aniqlash imkonini berdi.

Kalit so‘ zlar: *magnit nanozarrachalar, shpinel ferrit nanozarrachalari, elektr o‘ tkazuvchanlik, termoelektrik xossalar, konsentratsiya ta’siri, magnit suyuqlik, nanozarrachalar dispersiyasi.*

I.Introduction.

The rapid advancement of science and technology in the 21st century has posed significant environmental challenges, necessitating innovative solutions from materials science and physics. Magnetic fluids, or ferrofluids, have emerged as versatile nanomaterials with promising potential to address these issues through their unique magneto-responsive properties [1,7]. These colloidal suspensions, comprising magnetic nanoparticles dispersed in a carrier liquid with stabilizing surfactants, exhibit tunable magnetic, electrical, and rheological behaviors, enabling applications in aerospace engineering, electronics, mechanical systems, biomedicine, and environmental remediation such as water and oil purification [5,6]. This broad applicability has garnered substantial interest from the scientific community, driving research into their synthesis, characterization, and property optimization.

Magnetic fluids typically consist of magnetic nanoparticles dispersed in a liquid carrier medium and stabilized by surface-active agents. Among these components, magnetic nanoparticles are the primary determinants of the material’s performance [4,9]. While the chemical composition governs the general quality of the fluid, the size, morphology, and crystal structure of the nanoparticles critically influence their fundamental physical, chemical, and functional properties. In particular, nanoparticles with the general formula MFe_2O_4 (M = Ni, Co, Fe) belong to the family of spinel ferrites, which are known for their remarkable magnetic and electrical characteristics [1,2,6]. However, the microstructural features and the mechanisms underlying the variations in magnetization and electrical behavior in fluids containing mixed-metal ferrite nanoparticles remain insufficiently understood [5].

Despite extensive experimental and theoretical investigations, no unified framework describing the internal structure–property relationships of MFe_2O_4-based magnetic fluids has been established. Furthermore, the origins of variability in their electrical properties, especially as a function of composition, concentration, and temperature, have not been comprehensively explored. In this study, magnetic nanoparticles of MFe_2O_4 (M = Ni, Co, Fe) were synthesized via a chemical condensation method [11,12]. The chemical composition of the nanoparticles was characterized using Energy-Dispersive X-ray Spectroscopy (EDX). Magnetic fluids with varying nanoparticle concentrations, prepared using water as the base medium, were evaluated for their electrical conductivity across a range of temperatures. The findings of this work aim to contribute to the understanding of composition–structure–property relationships in spinel ferrite-based magnetic fluids, thereby facilitating their targeted design for advanced engineering and environmental applications [4,7].

II. Experimental details.

Ferric chloride hexahydrate ($FeCl_3{\cdot}6H_2O$, ≥99%), ferrous chloride tetrahydrate ($FeCl_2{\cdot}\ 4H_2O$, ≥99%), aqueous ammonia (NH_3 (aq), 25%), oleic acid ($C_{18}H_{34}O_2$, ≥99%), citric acid ($C_6H_8O_7$, ≥99.5%), and acetone (C_3H_6O, ≥99.5%) were used as received. Deionized water (resistivity ≥18.2 MΩ·cm) was used in all preparations.

$FeFe_2O_4$ nanoparticles were prepared by chemical co-precipitation. Briefly, 2.0 g $FeCl_2{\cdot}4H_2O$ and 5.6 g $FeCl_3{\cdot}6H_2O$ (molar ratio Fe^{2+}:Fe^{3}=1:2) were dissolved in 100 mL deionized water and heated to 96 °C under vigorous stirring. A total of 20 mL NH_4OH was added dropwise via syringe; the suspension was maintained at 96 °C for 55 min. Then, 4.0 g citric acid (in 20 mL water) and 20 mL oleic acid were added sequentially. The mixture was heated to 100 °C and stirred for an additional 90 min.

A small aliquot was diluted twofold and exposed to a constant magnetic field (0.35 T) to confirm magnetic response; the colloid remained stable in zero field. Excess unbound acids were removed by standing for 24 h followed by filtration. The precipitate was dried at room temperature for 48 h to yield $FeFe_2O_4$ nanopowder.

$NiFe_2O_4$and $CoFe_2O_4$ nanoparticles were synthesised analogously by substituting the corresponding divalent metal salts for Fe^{2+} while maintaining the overall Fe^{3+}:M^{2+} stoichiometry (M = Ni or Co). Post-addition, the suspensions were aged at 100 °C for 90 min, purified, and dried as above to obtain the respective ferrite nanopowders.

The co-precipitation proceeds via hydroxide formation, followed by in-situ dehydration/condensation to the spinel ferrite under hydrothermal-like aging (~100 °C). The stepwise and net reactions are:

(a) Nickel ferrite ($NiFe_2O_4$):

$$Ni^{2+}+2Fe^{3+}+8OH^- \rightarrow Ni(OH)_2{\cdot}2Fe(OH)_3 \xrightarrow{(100\ ^oC)} NiFe_2O_4;$$

(b) Cobalt ferrite ($CoFe_2O_4$):

$$Co^{2+}+2Fe^{3+}+8OH^- \rightarrow Co(OH)_2{\cdot}2Fe(OH)_3 \xrightarrow{(100\ ^oC)} CoFe_2O_4;$$

(c) Magnetite ($FeFe_2O_4$):

$$Fe^{2+}+2Fe^{3+}+8OH^- \rightarrow Fe(OH)_2 \cdot 2Fe(OH)_3 \xrightarrow{(100\ ^oC)} Fe_3O_4;$$

III. Results and discussions.

The crystal structures of Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles were studied using X-ray diffraction (XRD) spectra. The Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles were dried, converted into powder form, and placed in a special container. X-ray beams with a uniform wavelength were directed onto their surfaces at angles ranging from 10^0 to 75^0 degrees. These reflected beams diffracted in the magnetic nanoparticles when positioned at an angle satisfying the Bragg condition. The dependence of the intensity of these diffracted X-ray beams on the angle of incidence on the nanoparticle surface is shown in Figure 1 [5,6,9].

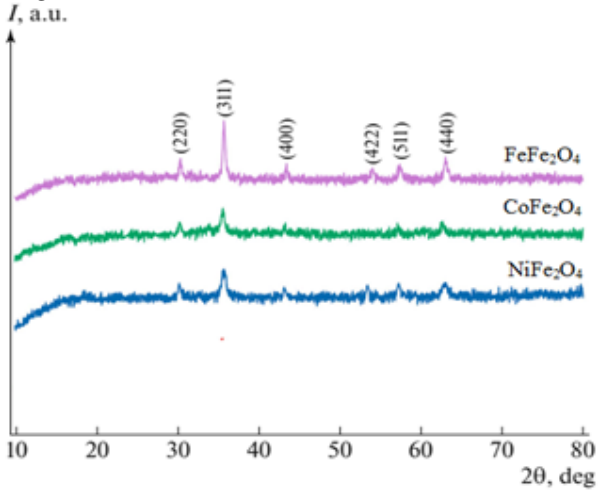


Fig 1. X-ray diffraction of powdered Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles.

The structure of the magnetic nanoparticles was studied based on the relationship between the obtained intensity and the angle of incidence. As seen in Figure1, the X-ray diffraction spectra of the synthesized magnetic nanoparticles show intensity peaks corresponding to (220), (311), (400), (422), (511), and (400). The spectra of the diffracted X-rays indicate that all diffraction peaks for Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles correspond to a single-phase inverse cubic spinel structure, which is consistent with the results reported in scientific articles [3-7].

The particle size, lattice constant, and average density of the magnetic fluid particles, calculated using semi-empirical methods, are presented in Table 1 [4,6,9].

Sample	**D_{XRD}(nm)**	***a*** **(A˚)**	***a_{ave}*(A˚)**	**V (A˚³)**	**ϱ_{XRD} (g·sm⁻³)**
$NiFe_2O_4$	16.9±0.1	8.30	8.47 ± 0.03	571.8	5.45
$CoFe_2O_4$	10.3±0.1	8.37		587.0	5.31
$FeFe_2O_4$	9.7±0.1	8.73		598.0	5.28

Table 1. Results of X-ray phase analysis of Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles.

In this study, the composition of the magnetic fluids was formulated as follows: 1) Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles were used as the primary magnetic particles; 2) oleic acid ($C_{18}H_{34}O_2$) was employed as the surface-active agent; and 3) distilled water was utilized as the liquid medium. Using these components, magnetic fluids with volumetric concentrations ranging from 0.5% to 5%, based on Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles, were prepared. Their electrical conductivity at room temperature was measured using the Karlaush method.

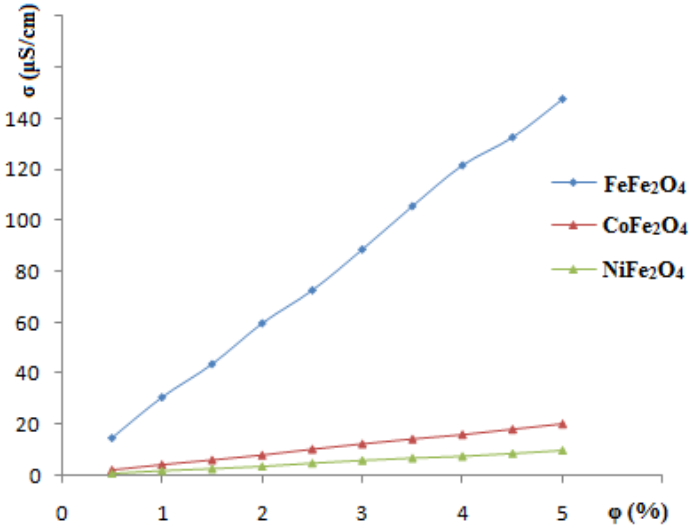


Fig 2. Dependence of the electrical conductivity of magnetic fluids on concentration at room temperature.

The magnetic fluids based on Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles, investigated experimentally, exhibit low electrical conductivity due to their predominantly dielectric nature. However, as the concentration of magnetic nanoparticles in these magnetic fluids increases, their electrical conductivity shows a significant rise. As observed from Figure 2, the electrical conductivity of the prepared magnetic fluids at room temperature is as follows:

1) For Fe Fe_2O_4-based magnetic fluid, with magnetic nanoparticle concentrations ranging from 0.5% to 5%, the electrical conductivity increased linearly from 15.6 μS/cm to 147.8 μS/cm.

2) For Co Fe_2O_4 -based magnetic fluid, with magnetic nanoparticle concentrations ranging from 0.5% to 5%, the electrical conductivity increased linearly from 2.1 μS/cm to 20.2 μS/cm.

3) For Ni Fe_2O_4-based magnetic fluid, with magnetic nanoparticle concentrations ranging from 0.5% to 5%, the electrical conductivity increased linearly from 0.23 μS/cm to 10.4 μS/cm.

The electrical conductivity of magnetic fluids is explained through an equation based on the Maxwell model. However, for low-concentration magnetic fluids based on Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles, the enhanced Shen model provides a more suitable explanation. According to this model, the following equation is formulated for low-concentration magnetic fluids:

$$\sigma = \sigma_M + \sigma_E + \sigma_B$$

Here, σ_M represents the electrical conductivity calculated based on the Maxwell model, σ_E denotes the electrical conductivity arising due to electrophoretic mobility, and σ_B indicates the electrical conductivity resulting from Brownian motion [11,12].

IV. Conclusion. Ni Fe_2O_4, Co Fe_2O_4, and Fe Fe_2O_4 magnetic nanoparticles were synthesized via the chemical co-precipitation (chemical condensation) method. X-ray diffraction (XRD) analysis confirmed that all diffraction peaks corresponded to a single-phase inverse cubic spinel structure for each composition, in agreement with previously reported literature data. Particle size estimation, based on transmission electron microscopy (TEM) and the Debye–Scherrer equation, indicated average diameters of 25–38 nm for Ni Fe_2O_4, 10–30 nm for Co Fe_2O_4, and 7–30 nm for Fe Fe_2O_4. Electrical conductivity measurements at room temperature revealed the lowest value of 0.23 μS·cm^{-1} for the Ni Fe_2O_4-based magnetic fluid at 0.5% nanoparticle concentration, and the highest value of 147.8 cm^{-1} for the $FeFe_2O_4$-based magnetic fluid at 5% concentration. These findings are consistent with predictions of the Shen model.

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KO‘ PBURCHAK KESIMLI INAS YARIMO‘ TKAZGICH NANOIPLARIDA KVANT CHEKLANISHI VA SHTARK EFFEKTINING ELEKTRON ENERGIYA SPEKTRIGA TA’SIRI

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Annotatsiya: *Ushbu maqolada turli ko‘ pburchak kesimli InAs yarimo‘ tkazgich nanoiplarida kvant cheklanishi va tashqi elektr maydonining elektron energiya spektriga ta’siri nazariy jihatdan tadqiq etilgan. Elektron energiya sathlari Shredinger tenglamasini chekli ayirmalar usuli (Finite Difference Method, FDM) yordamida yechish orqali hisoblandi. Tadqiqotda uchburchak, to‘ rtburchak, oltiburchak va aylana kesimli nanoiplar ko‘ rib chiqilib, ko‘ ndalang kesim yuzasi hamda elektr maydon kuchlanganligining energiya sathlariga ta’siri qiyosiy tahlil qilindi. Hisoblash natijalari nanoip kesim yuzasi ortishi bilan kvant cheklanishining susayishi natijasida energiya sathlarining kamayishini ko‘ rsatdi. Shuningdek, tashqi elektr maydoni ta’sirida barcha geometriyalarda energiya sathlarining pasayishi kuzatildi, bunda uchburchak va to‘ rtburchak kesimli nanoiplar Stark effektiga nisbatan aylana va oltiburchak kesimli nanoiplarga qaraganda yuqori sezgirlik namoyon etdi. Olingan natijalar nanoip geometriyasi va tashqi elektr maydoni elektron energiya spektrini boshqaruvchi asosiy omillar ekanligini tasdiqlaydi hamda nanoelektron va optoelektron qurilmalar uchun optimal geometrik parametrlarni tanlashda muhim ilmiy asos bo‘ lib xizmat qiladi.*

Kalit so‘ zlar: *InAs nanoiplari, kvant cheklanishi, Stark effekti, elektron energiya spektri, chekli ayirmalar usuli, ko‘ pburchak kesim, elektr maydoni.*

QUANTUM CONFINEMENT AND STARK EFFECT ON ENERGY SPECTRA OF POLYGONAL INAS NANOWIRES

Abstract: *This paper presents a theoretical investigation of the effects of quantum confinement and external electric fields on the electronic energy spectra of polygonal InAs semiconductor nanowires. The electronic energy levels were calculated by solving the Schrödinger equation using the Finite Difference Method (FDM). Triangular, rectangular, hexagonal, and circular nanowires were considered to comparatively analyze the influence of cross-sectional area and electric field strength on the energy spectra. The results show that increasing the cross-sectional area reduces the quantum confinement effect, leading to lower electronic energy levels. Furthermore, the application of an external electric field causes a downward shift of the energy levels in all geometries. Triangular and rectangular nanowires exhibit stronger Stark shifts than circular and hexagonal nanowires because of their enhanced confinement asymmetry. These findings demonstrate that both the nanowire geometry and the external electric field play decisive roles in tailoring the electronic energy spectra and provide useful guidelines for the design and optimization of nanoelectronic and optoelectronic devices.*

Keywords: *InAs nanowires, quantum confinement, Stark effect, electronic energy spectrum, finite difference method, polygonal cross section, electric field.*

ВЛИЯНИЕ КВАНТОВОГО ОГРАНИЧЕНИЯ И ЭФФЕКТА ШТАРКА НА ЭЛЕКТРОННЫЙ ЭНЕРГЕТИЧЕСКИЙ СПЕКТР ПОЛУПРОВОДНИКОВЫХ НАНОПРОВОДОВ INAS С ПОЛИГОНАЛЬНЫМ ПОПЕРЕЧНЫМ СЕЧЕНИЕМ

Аннотация: *В данной работе теоретически исследовано влияние квантового ограничения и внешнего электрического поля на электронный энергетический спектр полигональных полупроводниковых нанопроводов InAs. Расчёт энергетических уровней электронов выполнен путём численного решения уравнения Шрёдингера методом конечных разностей (Finite Difference Method, FDM). Рассмотрены нанопроводы с треугольным, прямоугольным, шестиугольным и круглым поперечными сечениями, а также проведён сравнительный анализ влияния площади поперечного сечения и напряжённости электрического поля на энергетический спектр. Результаты расчётов показали, что с увеличением площади поперечного сечения ослабляется эффект квантового ограничения, вследствие чего энергетические уровни уменьшаются. Установлено, что внешнее электрическое поле приводит к смещению энергетических уровней в область более низких энергий для всех исследованных геометрий. При этом нанопроводы с треугольным и прямоугольным поперечными сечениями демонстрируют более выраженный эффект Штарка по сравнению с шестиугольными и круглыми нанопроводами, что обусловлено большей асимметрией их потенциального профиля. Полученные результаты подтверждают, что геометрия поперечного сечения и внешнее электрическое поле являются эффективными инструментами управления электронным энергетическим спектром полупроводниковых нанопроводов и могут быть использованы при проектировании и оптимизации наноэлектронных и оптоэлектронных устройств.*

Ключевые слова: *нанопроводы InAs, квантовое ограничение, эффект Штарка, электронный энергетический спектр, метод конечных разностей, полигональное поперечное сечение, электрическое поле.*

Kirish.

Past o‘ lchamli yarimo‘ tkazgich tizimlari, xususan nanoiplar, kvant cheklanishi hodisasi yaqqol namoyon bo‘ ladigan istiqbolli nanostrukturalar sirasiga kiradi. Materialning xarakterli o‘ lchamlari elektronning de Broyl to‘ lqin uzunligi bilan taqqoslanadigan darajagacha kichrayganda, elektronlarning erkin harakati fazoviy yo‘ nalishlarda cheklanadi va energiya spektri uzluksiz holatdan diskret holatga o‘ tadi. Natijada elektronlarning energetik, transport va optik xususiyatlari hajmiy yarimo‘ tkazgichlarnikidan keskin farq qiladi. Ushbu hodisalar 0D, 1D va 2D kvant tizimlari uchun nazariy hamda eksperimental jihatdan keng o‘ rganilgan bo‘ lib, ularning asosiy xususiyatlari nanostrukturaning geometrik shakli va o‘ lchamlariga kuchli bog‘ liq ekanligi aniqlangan [1]. Nanoipning ko‘ ndalang kesim geometriyasi elektronlarning energiya sathlari, quyi subzonalar tuzilishi, holatlar zichligi (Density of States, DOS) hamda zaryad tashuvchilarning harakatchanligiga sezilarli ta’sir ko‘ rsatadi [2,3]. Xususan, uchburchak va to‘ rtburchak kesimli nanoiplarda yuzaga keladigan keskin chegaraviy shartlar elektronlarning kuchliroq kvant cheklanishiga olib keladi va energiya sathlari orasidagi masofani oshiradi. Aksincha, aylana va oltiburchak kesimli nanoiplarda chegaralarning silliqroq bo‘ lishi sababli elektronlarning cheklanishi nisbatan kuchsizroq bo‘ lib, energiya sathlari zichroq joylashadi va pastroq energiya qiymatlariga ega bo‘ ladi [4,5]. Shu sababli nanoip geometriyasini tanlash nanoelektron va optoelektron qurilmalarda energiya spektrini boshqarishning samarali vositalaridan biri hisoblanadi.

Kvant cheklanishidan tashqari, tashqi elektr maydoni ham yarimo‘ tkazgich nanoiplarining energetik xususiyatlarini boshqarishda muhim rol o‘ ynaydi. Elektr maydoni ta’sirida elektron energiya sathlarining siljishi va to‘ lqin funksiyalarining deformatsiyalanishi kvant-cheklangan Stark effekti bilan izohlanadi. Birinchi tamoyillar (ab initio) asosidagi hisoblashlar hamda eksperimental tadqiqotlar elektr maydonining kuchlanganligi va yo‘ nalishi energiya spektri, taqiqlangan zona kengligi hamda elektronlarning lokalizatsiyasiga sezilarli ta’sir ko‘ rsatishini ko‘ rsatgan [4,6]. Ayniqsa, nosimmetrik ko‘ ndalang kesimga ega nanoiplarda energiya sathlari elektr maydon ta’siriga nisbatan yuqori sezgirlik namoyon qiladi [5]. Bunday xususiyatlar InAs nanoiplariga asoslangan maydoniy tranzistorlar va boshqa nanoelektron qurilmalarda energiya spektrini elektrostatik boshqarish imkoniyatini yaratadi [7].

So‘ nggi yillarda yarimo‘ tkazgich nanoiplarini sintez qilish texnologiyalarining rivojlanishi turli geometrik shakllarga ega nanostrukturalarni yuqori aniqlikda tayyorlash imkonini berdi [8,9]. Shu bilan birga, amaliy qurilmalarda uchraydigan sirt notekisliklari, kristall panjara nuqsonlari hamda legirlanish profillari kvant cheklanish potensialini o‘ zgartirib, elektron energiya sathlari va to‘ lqin funksiyalariga sezilarli ta’sir ko‘ rsatishi aniqlangan [9]. Demak, nanoip geometriyasi va tashqi elektr maydonining birgalikdagi ta’sirini hisobga oluvchi nazariy modellar real nanoelektron qurilmalarni loyihalashda muhim ahamiyat kasb etadi. Energiya spektrini o‘ rganish bo‘ yicha olib borilgan tadqiqotlarda Yakar va hammualliflari kvant cheklanishi sharoitidagi ko‘ p elektronli tizimlarda energiya sathlari, elektronlararo o‘ zaro ta’sirlar hamda elektr maydoni ta’sirini variatsion usullar yordamida tahlil qilganlar [10–12]. Ushbu ishlarda kvant tizimining geometrik o‘ lchamlari va cheklanish potensiali energiya spektrining shakllanishida hal qiluvchi omillar ekanligi ko‘ rsatildi. Bundan tashqari, uglerod nanonaychalari asosidagi maydoniy tranzistorlarda elektr maydoni tunnellanish jarayonlari va zonalar tuzilishini samarali boshqarishi aniqlangan bo‘ lib, ushbu qonuniyatlar yarimo‘ tkazgich

nanoiplariga ham tatbiq etilishi mumkin [13]. Bunday tizimlarni to‘ g‘ ri tavsiflash uchun oddiy parabolik dispersiya modeli o‘ rniga Nelsonning noparabolik zona modelidan foydalanish tavsiya etiladi [14]. Shunga qaramay, turli ko‘ pburchak kesimli InAs nanoiplarida kvant cheklanishi va tashqi elektr maydonining energiya spektriga birgalikdagi ta’sirini yagona sonli model asosida tizimli ravishda o‘ rganuvchi tadqiqotlar hali ham yetarli emas. Mazkur ishda uchburchak, to‘ rtburchak, oltiburchak va aylana kesimli InAs nanoiplarida elektron energiya sathlarining ko‘ ndalang kesim yuzasi hamda tashqi elektr maydoniga bog‘ liqligi Shredinger tenglamasini chekli ayirmalar usuli (Finite Difference Method, FDM) yordamida yechish orqali tadqiq etiladi. Olingan natijalar kvant cheklanishi va Stark effektining elektron energiya spektriga ta’sirini chuqurroq tushunishga hamda nanoelektron va optoelektron qurilmalar uchun optimal geometrik parametrlarni tanlashga xizmat qiladi.

Nazariy asoslar

Nanoiplar nanotexnologiyaning asosiy tarkibiy qismlaridan biri bo‘ lib, o‘ lcham bo‘ yicha cheklanish (konfinement) effektlari tufayli o‘ ziga xos kvant-mexanik xususiyatlarni namoyon etadi. Tashqi elektr maydoni mavjud bo‘ lmagan holatda nanoipdagi energiya sathlari va to‘ lqin funksiyalari to‘ g‘ ri to‘ rtburchak potensial chuqurlik uchun vaqtga bog‘ liq bo‘ lmagan Shredinger tenglamasini yechish orqali aniqlanishi mumkin. Biroq, tashqi elektr maydonining qo‘ llanilishi kvant holatlarining siljishi va deformatsiyalanishiga olib kelib, ushbu xususiyatlarni o‘ zgartiradi. Mazkur ta’sirni chuqur anglash nanoo‘ lchamli elektron va optoelektron qurilmalarni loyihalashda muhim ahamiyat kasb etadi. Ushbu tadqiqotda elektr maydoni ta’sirida joylashgan, asosi muntazam n tomonli ko‘ pburchakdan iborat nanoorolchadagi elektronlarning energiya sathlari va to‘ lqin funksiyalarini aniqlash uchun chekli ayirmalar usulidan foydalaniladi. Chekli ayirmalar usuli Shredinger tenglamasini diskretlashtirish hamda bunday nanostrukturalarda fazoviy cheklangan elektronlarning kvant holatlari uchun sonli yechimlarni olish imkonini beradi.

Cheksiz balandlikdagi potensial to‘ siq bilan chegaralangan, ko‘ ndalang kesimi muntazam n tomonli ko‘ pburchak shakliga ega bo‘ lgan kvant ipini qaraymiz. Nanoip z o‘ qi bo‘ ylab cho‘ zilgan bo‘ lib, tashqi elektr maydoni F ip o‘ qiga perpendikulyar yo‘ nalishda qo‘ llanilgan deb faraz qilinadi. Tizimning holati vaqtga bog‘ liq bo‘ lmagan Shredinger tenglamasi bilan ifodalanadi:

$$H\psi(x,y) = E\psi(x,y) \tag{1}$$

bu yerda $\psi(x,y)$ ko‘ ndalang yo‘ nalishdagi Shredinger tenglamasining yechimlarini ifodalaydi. Tizimga tashqi elektr maydoni qo‘ llanilganda, Shredinger tenglamasi quyidagi ko‘ rinishni oladi:

$$-\frac{\hbar^2}{2}\left[\frac{\partial}{\partial x}\left(\frac{1}{m^*(x,y)}\frac{\partial\psi(x,y)}{\partial x}\right)+\frac{\partial}{\partial y}\left(\frac{1}{m^*(x,y)}\frac{\partial\psi(x,y)}{\partial y}\right)\right]+\left(V(x,y)+eF_x x+eF_y y+\frac{\hbar^2 k_z^2}{2m^*(x,y)}\right)\psi(x,y)=E\psi(x,y) \tag{2}$$

bu yerda $\hbar$ −keltirilgan Plank doimiysi, m^* −elektronning effektiv massasi, E −elektronning to‘ liq energiyasini, $V(x,y)$ konfinement (cheklovchi) potensialini ifodalaydi. $eF_x x$ va $eF_y y$ hadlari mos ravishda elektr maydonining $x-$ va y −o‘ qlari bo‘ ylab yo‘ nalgan komponentalari hosil qiladigan potensial energiyalarni tavsiflaydi.

Elektron uchun cheklovchi potensial $V(x,y)$ quyidagi ko‘ rinishda aniqlanadi:

$$V(x,y)=\begin{cases}0, & \text{inside the nanowire,}\\ \infty, & \text{outside the nanowire}\end{cases} \tag{3}$$

Xos funksiyalar va xos energiya qiymatlari n tomonli ko‘ pburchak ko‘ ndalang kesim sohasida Dirixle chegaraviy shartlari ostida Laplas tenglamasini yechish orqali aniqlanishi mumkin. Kvant chuqurliklari, kvant iplari va kvant nuqtalaridagi energiya sathlarini aniqlashda chekli ayirmalar usuli qo‘ llanilgan. [1,15] ishlarda ushbu usul effektiv massaning fazoviy o‘ zgarishini hisobga olgan holda to‘ g‘ ri to‘ rtburchak ko‘ ndalang kesimga ega nanoiplardagi energiya sathlari va to‘ lqin funksiyalarini hisoblash uchun qo‘ llanilgan. Shredinger tenglamasini yechishda hamda effektiv massaning fazoviy o‘ zgarishini inobatga olgan holda yarimo‘ tkazgich nanoiplarining energiya sathlari va to‘ lqin funksiyalarini aniqlash uchun chekli ayirmalar usulidan foydalanish quyidagi tenglamalarni hosil qiladi:

$$\frac{m_{i,j}+m_{i-1,j}}{m_{i,j}+m_{i+1,j}}\psi_{i+1,j}+\frac{m_{i,j}+m_{i,j-1}}{m_{i,j}+m_{i,j+1}}\psi_{i,j+1}-(m_{i,j}+m_{i-1,j})\frac{\delta x^2}{\hbar^2}(V_i-E_{n,l})\psi_{i,j}-(m_{i,j}+m_{i,j-1})\frac{\delta y^2}{\hbar^2}(V_j-E_{n,l})\psi_{i,j}+\psi_{i-1,j}+\psi_{i,j-1}-4\psi_{i,j}=0 \tag{4}$$

Bu yerda $V_j = eF_x x + eF_y y$ ifoda i va j indekslari mos ravishda x −va y −yo‘ nalishlaridagi diskret to‘ r tugunlarini bildiradi. Ushbu tugunlar Shredinger tenglamasini sonli usulda yechish uchun qo‘ llaniladigan chekli ayirmalar to‘ riga tegishlidir.

Xos qiymatlar (eigenvalues) kvant ipidagi elektronlar uchun ruxsat etilgan energiya sathlarini ifodalaydi, xos funksiyalar (eigenfunctions) esa elektronlarning fazodagi ehtimollik taqsimotini tavsiflaydi. Konfinement (fazoviy cheklanish) effektlarini yaqqol ko‘ rsatish maqsadida dastlabki bir nechta to‘ lqin funksiyalarini grafik ko‘ rinishda tasvirlash mumkin. Dirixle chegaraviy sharti quyidagicha ifodalanadi:

$$\psi(x,y)=0, \qquad \forall(x,y)\in\partial\Omega \tag{5}$$

bu yerda $\partial\Omega$ ko‘ pburchak sohasining chegarasini ifodalaydi. Bunda n parametri nanoipning ko‘ ndalang kesim geometriyasini approksimatsiya qilish uchun foydalaniladigan muntazam ko‘ pburchakning tomonlar sonini bildiradi.

Xususan, $n = 3$, $n = 4$ va $n = 6$ mos ravishda uchburchak, kvadrat (to‘ g‘ ri to‘ rtburchak) va oltiburchak geometriyalariga mos keladi. $n \to \infty$ bo‘ lganda esa ko‘ pburchak ideal aylanaga yaqinlashadi va tizim silindrik simmetriyaga intiladi. n parametrini o‘ zgartirish orqali o‘ tkir burchakli geometriyalardan silliq chegarali geometriyalarga o‘ tish jarayonini tahlil qilish, shuningdek, bunday o‘ zgarishlarning energiya sathlarini o‘ rganish mumkin. Ushbu yondashuv turli xil geometriyalarni yagona hisoblash sxemasi doirasida sonli usulda tadqiq etish imkonini beradi. Cheksiz chuqur potensial chuqurlik bilan chegaralangan yarimo‘ tkazgich nanoipida elektronlarning energiya spektri quyidagi ifoda bilan aniqlanadi [14]:

$$E_{k_z} = E(1 + \alpha E) = \frac{\hbar^2 k_z^2}{2m^*} + E_{n,l} \tag{6}$$

Bu yerda α dispersion qonunining noparaboliklik darajasini tavsiflovchi parametr, k_z −elektronning z yo‘ nalishidagi to‘ lqin vektori, $E_{n,l}$ esa elektronning kvantlangan to‘ liq energiya sathlarini ifodalaydi. Noparaboliklik darajasi quyidagi munosabat bilan aniqlanadi:

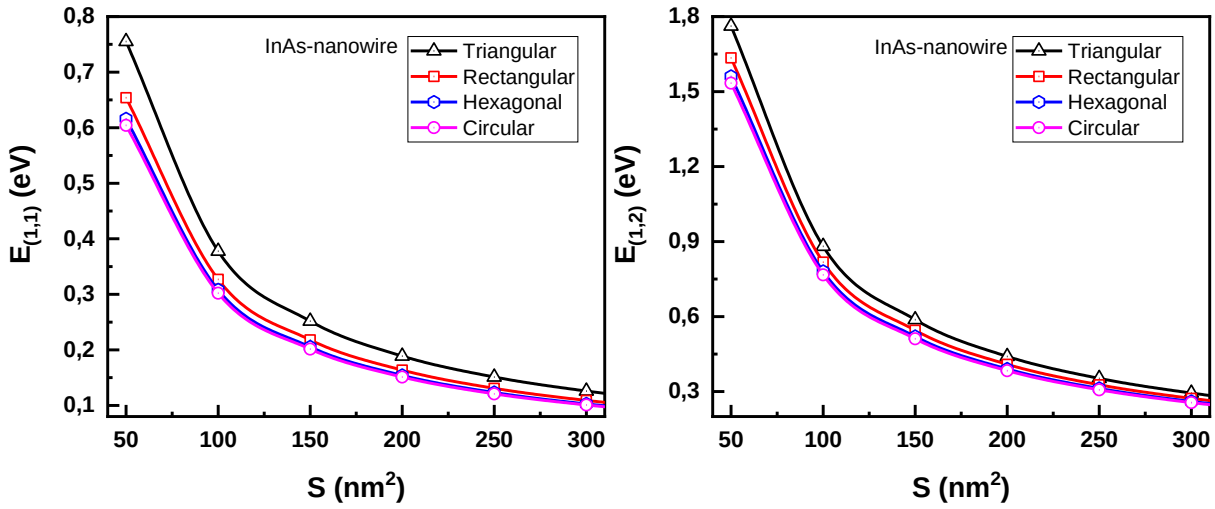
$$\alpha = \frac{1}{E_g}\left(1 - \frac{m^*}{m_0}\right)^2 \tag{7}$$

Bu yerda E_g −yarimo‘ tkazgichning taqiqlangan zona kengligi, m_0 −esa erkin elektronning massasini ifodalaydi.

Mazkur munosabat noparaboliklik darajasi taqiqlangan zona kengligi hamda elektronning effektiv massasiga bog‘ liq ekanligini ko‘ rsatadi. Taqiqlangan zona kengligi kichik bo‘ lgan materiallarda ushbu effekt yanada yaqqol namoyon bo‘ ladi, shu sababli u tor taqiqlangan zonali yarimo‘ tkazgichlar uchun ayniqsa muhim hisoblanadi. Bunday xususiyatlar energiya dispersiyasi qonunining aniq tavsiflanishiga asoslangan kvant-mexanik elektron qurilmalarining ishlashida hal qiluvchi ahamiyat kasb etadi.

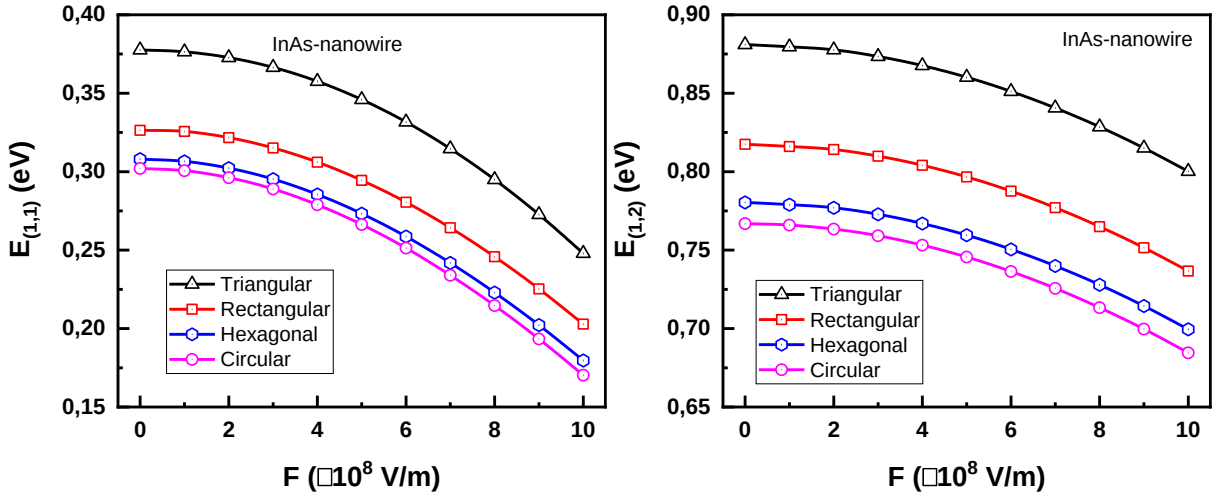
Sonli natijalar va muhokama

1-rasm uchburchak, to‘ g‘ ri to‘ rtburchak, oltiburchak va aylana ko‘ ndalang kesimga ega InAs yarimo‘ tkazgich nanoiplari uchun $E_{(1,1)}$ va $E_{(1,2)}$ energiya sathlarining ko‘ ndalang kesim yuzasiga bog‘ liqligini tasvirlaydi. Nanoipning ko‘ ndalang kesim yuzasi ortishi bilan barcha geometrik shakllar uchun energiya sathlari kamayishi kuzatiladi. Ushbu qonuniyat kvant konfinementi nazariyasiga to‘ liq mos keladi: kichikroq ko‘ ndalang kesim kuchliroq fazoviy cheklanishni yuzaga keltirib, energiya sathlarining ortishiga sabab bo‘ ladi, aksincha, kesim yuzasi kattalashganda konfinement ta’siri susayadi va energiya sathlari pasayadi. Nanoiplarning energiya sathlari kvant konfinementi tufayli ularning ko‘ ndalang kesim geometriyasiga sezilarli darajada bog‘ liq bo‘ ladi. Bir xil ko‘ ndalang kesim yuzasi (S) uchun turli geometriyalar konfinement darajasining farqlanishiga olib keladi, natijada energiya sathlari ham o‘ zgaradi. Uchburchak va to‘ g‘ ri to‘ rtburchak kesimli nanoiplar nisbatan yuqori energiya sathlarini namoyon etadi, bu esa ularda kvant konfinementining kuchliroq ekanligini ko‘ rsatadi. O‘ tkir burchaklar va fazoviy chegaralarning yanada qat’iyroq bo‘ lishi zaryad tashuvchilarning harakatini kuchliroq cheklaydi hamda kvant holatlari orasidagi energiya farqining ortishiga olib keladi. Bunga qarama-qarshi ravishda, oltiburchak va aylana kesimli nanoiplar bir xil S qiymatida pastroq energiya sathlarini namoyon qiladi, bu esa konfinement ta’sirining nisbatan kuchsizroq ekanligini bildiradi. Ushbu geometriyalarning silliqroq va yuqori simmetriyaga ega bo‘ lgan cheklovchi potensiali zaryad tashuvchilarning fazoda kengroq taqsimlanishiga imkon yaratadi, natijada kvant konfinementi effekti susayadi.



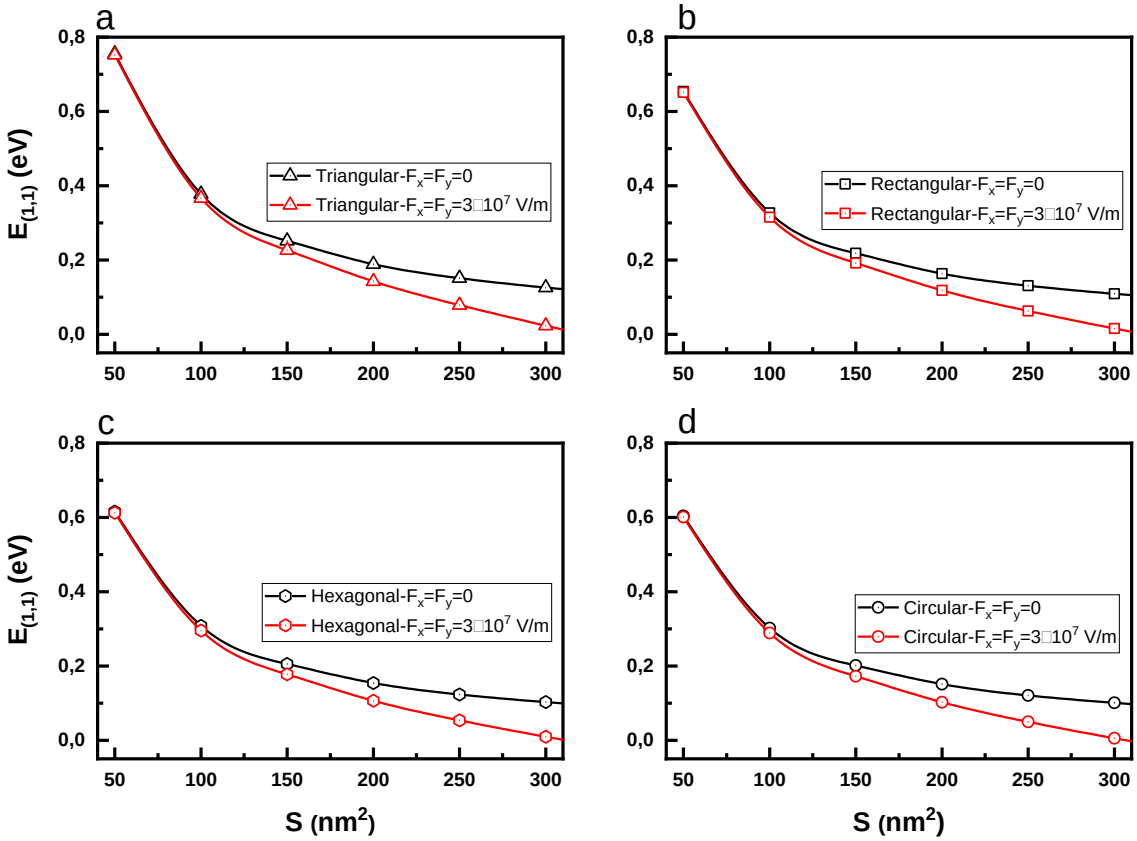
1-rasm. Turli geometriyaga ega InAs nanoiplarida $E_{(1,1)}$ energiya sathining (chap panel) va $E_{(1,2)}$ energiya sathining (o‘ ng panel) ko‘ ndalang kesim yuzasiga bog‘ liqligi.

2-rasm bir xil 10 nm^2 ko‘ ndalang kesim yuzasiga ega bo‘ lgan uchburchak, to‘ g‘ ri to‘ rtburchak, oltiburchak va aylana kesimli InAs yarimo‘ tkazgich nanoiplari uchun $E_{(1,1)}$ va $E_{(1,2)}$ energiya sathlarining tashqi elektr maydoni kuchlanganligiga bog‘ liqligini ko‘ rsatadi. Barcha geometrik shakllardagi nanoiplarda elektr maydoni kuchlanganligi ortishi bilan $E_{(1,1)}$ va $E_{(1,2)}$ energiya sathlarining kamayishi kuzatiladi. Ushbu holat kvant-konfinementlangan Stark effekti bilan izohlanadi. Bunda tashqi elektr maydoni cheklovchi potensialning profilini o‘ zgartirib, maydon ta’sirida yuzaga keladigan qutblanish natijasida energiya sathlarining pasayishiga olib keladi. Stark effekti turli geometriyaga ega nanoiplarda turlicha namoyon bo‘ ladi. Uchburchak va to‘ g‘ ri to‘ rtburchak kesimli nanoiplarda tashqi elektr maydoni kuchlanganligi ortishi bilan energiya sathlari tezroq kamayadi, bu esa Stark effektining kuchliroq ekanligini ko‘ rsatadi. Bunday holat ushbu geometriyalarga xos bo‘ lgan asimmetrikroq cheklovchi potensial bilan izohlanadi. Aksincha, oltiburchak va aylana kesimli nanoiplarda energiya sathlari nisbatan sekinroq kamayadi, chunki ularning bir jinsliroq va simmetrikroq cheklovchi potensiali tashqi elektr maydonining ta’sirini sezilarli darajada susaytiradi.

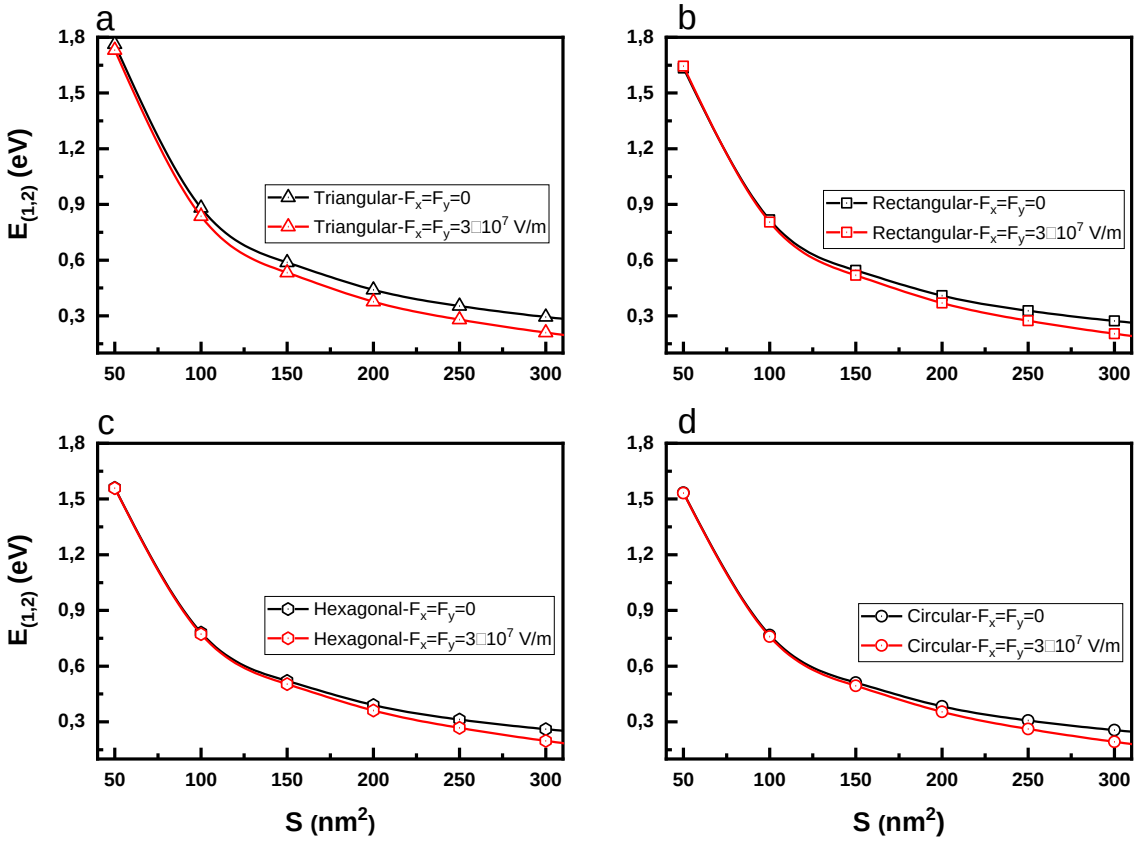


2-rasm. Turli ko‘ ndalang kesim shakliga ega InAs nanoiplarida tashqi elektr maydonining $E_{(1,1)}$ energiya sathiga (chap panel) va $E_{(1,2)}$ energiya sathiga (o‘ ng panel) ta’siri.

3 va 4-rasmlar uchburchak, to‘ g‘ ri to‘ rtburchak, oltiburchak va aylana ko‘ ndalang kesimga ega InAs yarimo‘ tkazgich nanoiplari uchun $E_{(1,1)}$ va $E_{(1,2)}$ energiya sathlarining ko‘ ndalang kesim yuzasiga bog‘ liqligini ko‘ rsatadi. Hisoblash natijalari tashqi elektr maydoni $F = 0$ va $F = 10^8\ V/m$ bo‘ lgan holatlar uchun keltirilgan. Natijalardan ko‘ rinadiki, uchburchak va to‘ g‘ ri to‘ rtburchak kesimli nanoiplarda tashqi elektr maydoni kuchlanganligi ortishi bilan energiya sathlari tezroq kamayadi. Bu holat ushbu geometriyalarda Stark effektining kuchliroq namoyon bo‘ lishini ko‘ rsatadi va, ehtimol, ularning asimmetrikroq cheklovchi potensiali bilan bog‘ liq. Bunga qarama-qarshi ravishda, oltiburchak va aylana kesimli nanoiplarda energiya sathlarining kamayishi nisbatan sekinroq sodir bo‘ ladi. Bu esa ushbu geometriyalardagi bir jinsliroq va simmetrikroq konfinement potensiali tashqi elektr maydonining ta’sirini sezilarli darajada susaytirishini anglatadi.



3-rasm. Turli ko‘ ndalang kesim shakliga ega InAs nanoiplarida tashqi elektr maydonining $E_{(1,1)}$ energiya sathiga ta’siri.



4-rasm. Turli ko‘ ndalang kesim shakliga ega InAs nanoiplarida tashqi elektr maydonining $E_{(1,2)}$ energiya sathiga ta’siri.

Xulosa

Mazkur ishda turli ko‘ pburchak kesimli InAs yarimo‘ tkazgich nanoiplarida kvant cheklanishi va tashqi elektr maydonining elektron energiya spektriga ta’siri nazariy jihatdan tadqiq etildi. Elektron energiya sathlari Shredinger tenglamasini chekli ayirmalar usuli yordamida yechish orqali hisoblandi va turli geometriyalar uchun qiyosiy tahlil amalga oshirildi. Hisoblash natijalari nanoipning ko‘ ndalang kesim yuzasi ortishi bilan kvant cheklanishining susayishi natijasida barcha geometriyalar uchun energiya sathlarining kamayishini ko‘ rsatdi. Shu bilan birga, nanoip geometriyasi elektron energiya spektrining shakllanishida muhim omil ekanligi aniqlandi. Xususan, uchburchak va to‘ rtburchak kesimli nanoiplar kuchliroq kvant cheklanishini ta’minlaganligi sababli yuqoriroq energiya sathlariga ega bo‘ lsa, aylana va oltiburchak kesimli nanoiplar nisbatan pastroq energiya qiymatlarini namoyon etdi. Tashqi elektr maydonining qo‘ llanilishi barcha ko‘ rib chiqilgan geometriyalarda elektron energiya sathlarining pasayishiga olib kelishi aniqlandi. Bu hodisa kvant-cheklangan Stark effekti bilan izohlanadi. Elektr maydon ta’sirida energiya sathlarining siljishi geometriyaga sezilarli darajada bog‘ liq bo‘ lib, uchburchak va to‘ rtburchak kesimli nanoiplar elektr maydoniga nisbatan yuqori sezgirlik namoyon etdi. Aksincha, aylana va oltiburchak kesimli nanoiplarning simmetrikroq potensial profili Stark effektining nisbatan sustroq namoyon bo‘ lishiga olib keldi.

Olingan natijalar nanoipning geometrik shakli va tashqi elektr maydoni elektron energiya spektrini boshqarishning samarali vositalari ekanligini tasdiqlaydi. Tadqiqot natijalari energiya spektrini maqsadli ravishda boshqarish imkoniyatlarini kengaytiradi hamda yuqori samaradorlikka ega nanoelektron va optoelektron qurilmalarni loyihalash uchun muhim nazariy asos yaratadi.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish. Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma’lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan.

Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi.

Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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PHYSICS AND MATHEMATICS

TOPOLOGICAL DATA ANALYSIS IN MENTAL-HEALTH RESEARCH: SYSTEMATIC REVIEW

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Abstract. *Mental disorders involve complex and overlapping changes that cannot be readily described by one variable or an equation. The PRISMA-based review process is focused on diseases, databases, and analysis objectives to which the TDA approach was applied. Papers eligible in this study included schizophrenia, depression, severe mental disorder, autism, ADHD, obsessive-compulsive disorder, and substance abuse disorder. Among the data sources used were the ADHD-200 and ABIDE which were the most reused open datasets, COBRE, UK Biobank, ENIGMA-OCD, and several local cohorts. Persistent homology was useful for multi-level analysis independent from one threshold while Mapper was used for identification of subgroups and outcomes. Features extracted by TDA have shown promise in distinguishing individuals with mental illness from control groups; however, these results are insufficient for clinical diagnosis. Therefore, topological features need to be validated and examined alongside statistical, machine learning, and clinical techniques.*

Keywords: *t*opological data analysis; persistent homology; Mapper; mental illness; psychiatry; brain networks; datasets; PRISMA.

RUHIY SALOMATLIK TADQIQOTLARIDA MA'LUMOTLARNING TOPOLOGIK ANALIZI: TIZIMLI TAHLIL

Annotatsiya. *Ruhiy buzilishlar bitta o' zgaruvchi yoki tenglama bilan tavsiflash qiyin bo' lgan murakkab va o' zaro bog' liq o' zgarishlarni qamrab oladi. PRISMA asosidagi ushbu sharhda TDA qo' llanilgan kasalliklar, ma'lumotlar to' plamlari va tahliliy maqsadlar o' rganildi. Sharhga shizofreniya, depressiya, og' ir ruhiy buzilishlar, autizm, ADHD, obses-siv-kompulsiv buzilish va modda iste'moli bilan bog' liq buzilishlar bo' yicha tadqiqotlar kiritildi. ADHD-200 va ABIDE eng ko' p ishlatilgan ochiq ma'lumotlar to' plamlari bo' lib, COBRE, UK Biobank, ENIGMA-OCD va mahalliy kohortlardan ham foydalanilgan. Persistent gomologiya bir chegara qiymatiga bog' liq bo' lmagan ko' p masshtabli tahlilni, Mapper esa kichik guruhlar va natijalarni aniqlashni ta'minladi. TDA xususiyatlari ruhiy buzilishi bo' lgan shaxslarni nazorat guruhidan ajratishda natijaga erishgan bo' lsa-da, klinik tashxis uchun yetarli emas. Shu sababli ular statistik, mashinaviy o' rganish va klinik usullar bilan birgalikda tekshirilishi lozim.*

Kalit so' zlar: *topologik ma'lumotlar tahlili; persistent gomologiya; Mapper; ruhiy kasallik; psixiatriya; miya tarmoqlari; ma'lumotlar bazalari; PRISMA.*

ТОПОЛОГИЧЕСКИЙ АНАЛИЗ ДАННЫХ В ИССЛЕДОВАНИЯХ ПСИХИЧЕСКОГО ЗДОРОВЬЯ: СИСТЕМАТИЧЕСКИЙ ОБЗОР

Аннотация. *Психические расстройства характеризуются сложными и взаимосвязанными изменениями, которые трудно описать одной переменной или уравнением. В систематическом обзоре, проведённом в соответствии с методом PRISMA, рассмотрены расстройства, наборы данных и аналитические задачи, для которых применялся топологический анализ данных (TDA). В обзор вошли исследования шизофрении, депрессии, тяжёлых психических расстройств, аутизма, СДВГ, обсессивно-компульсивного расстройства и расстройств, связанных с употреблением психоактивных веществ. Наиболее часто использовались открытые данные как ADHD-200 и ABIDE, а также COBRE, UK Biobank, ENIGMA-OCD и несколько локальных когорт. Персистентная гомология обеспечивала многомасштабный анализ без выбора единственного порога, а Mapper применялся для выявления подгрупп и исходов. Топологические признаки показали потенциал для различения пациентов и контрольных групп, однако пока недостаточны для клинической диагностики. Поэтому их необходимо валидировать и анализировать совместно со статистическими, клиническими методами и методами машинного обучения.*

Ключевые слова: *топологический анализ данных; персистентная гомология; Mapper; психические расстройства; психиатрия; мозговые сети; наборы данных; PRISMA.*

INTRODUCTION

Clinical syndromes of mental illnesses display great heterogeneity concerning symptoms, courses, comorbidities, and response to treatment. In areas of psychosis, mood disorders, neurodevelopmental disorders, compulsive disorders, and substance-use disorders, studies face two related difficulties in that, on one hand, average differences between cases and controls do not necessarily capture the presence of biologically different subgroups, and, on the other hand, the characteristics of each one could prove to be site-, preprocessing-, or threshold-dependent. Thus, reviews of biomarkers describe dispersed and overlapping abnormalities, not one reproducible lesion [1–3].

Questions guiding the research include: RQ1, what topological data analysis techniques and data representations have been used in the study of mental health? RQ2, for which psychiatric illnesses and datasets has topological data analysis been applied? RQ3, which biological, behavioral, or phenotypic differences have been found? RQ4, how have topological features been used in comparing groups, finding statistical relationships, making classifications, predicting outcomes, or identifying subtypes? RQ5, what are the limitations that hinder translational use, and what standards should apply to transdiagnostic studies?

LITERATURE REVIEW

Previous work and research gap. Usual Graph analysing techniques involve converting connectivity matrix to a graph after the application of a certain threshold and computation of descriptors such as degree, centrality, clustering, or modularity. Although these descriptors provide useful information, they depend on the chosen threshold. TDA, on the other hand, evaluates the structures at different thresholds. Persistent homology captures the creation and destruction of components, loops, and higher dimensional voids while Mapper describes the shape of high dimensional data points as a cluster graph [4–6]. Both approaches maintain the information regarding the global structure of the data that might be lost during edge by edge analysis.

Current reviews either cover TDA for medical imaging and network neuroscience applications [4–6] or discuss conventional biomarkers for psychiatry [1–3]. However, none of them presents a disorder-specific assessment of TDA techniques, data sets, and accessibility. Such an overview is provided below without equating accuracy with practicality.

Mathematical foundations of the reviewed methods

Let G=(V,E,w) be a weighted undirected brain graph, where vertices are regions or sensors and w_{ij} is a functional, structural or spectral association. Persistent homology requires an ordered family of complexes. For correlations r_{ij}, a common dissimilarity is $d_{ij} = 1 - r_{ij}$; alternatives such as $d_{ij} = \sqrt{2\,(1 - r_{ij})}$, $d_{ij} = 1 - |r_{ij}|$ or separate positive and negative filtrations encode different scientific assumptions. The clique (Vietoris–Rips) complex at scale ε contains a simplex whenever all of its pairwise distances are at most ε:

$$K_\varepsilon = \{\sigma \subseteq V : d_{ij} \le \varepsilon \text{ for every } i, j \in \sigma\}, \quad K_{\varepsilon_1} \subseteq K_{\varepsilon_2} \quad \text{when} \quad \varepsilon_1 \le \varepsilon_2.$$

For a simplicial complex K, the boundary operator $\partial_k : C_k(K) \longrightarrow C_{k-1}(K)$ and satisfies $\partial_{k-1} \circ \partial_k = 0$. Cycles are $Z_k(K) = \ker(\partial_k)$, boundaries are $B_k(K) = \mathrm{im}(\partial_{k+1})$, and the quotient removes cycles that bound a higher-dimensional simplex. Thus H_0 counts connected components, H_1 independent loops and H_2 cavities:

$$H_k(K) = \frac{\ker(\partial_k)}{\mathrm{im}(\partial_{k+1})}, \quad \beta_k(K) = \dim H_k(K).$$

As illustrated in Figure 1, the birth and death of H_1 loop happens at t = 0.6 and t = 0.9 respectively, thereby resulting in a lifetime of 0.3.

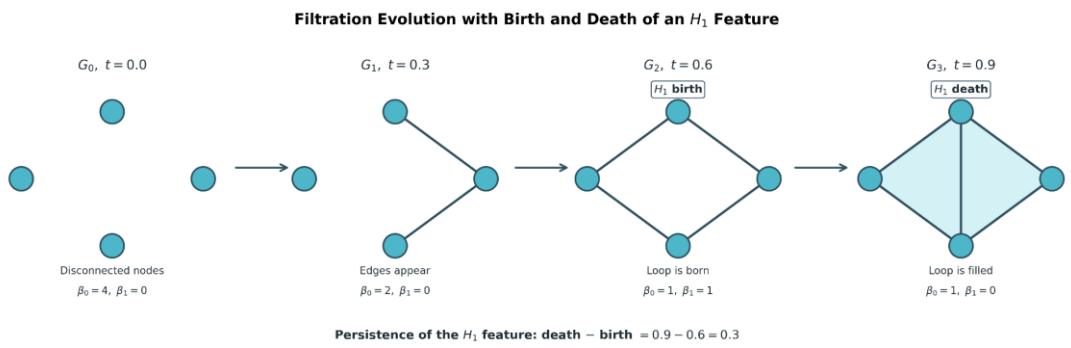


Figure 1. Example of a graph filtration in which an H1 feature is born at 0.6 and filled at 0.9, giving persistence 0.3.

Tracking these groups through the filtration gives intervals $[b_i,d_i)$, summarized by a persistence diagram D_k ={(b_i,d_i)}. Lifetime $\ell_i = d_i - b_i$ measures persistence, while the Betti curve counts features alive at scale t, which is described by an equation as

$$\beta_k(t) = \sum_i \mathbf{1}_{[b_i,d_i)}(t).$$

Persistence landscapes and images represent exactly the same information about the intervals for the purposes of inference and prediction [5-8, 35, 37]. Figure 2 shows a weighted functional brain graph representation and its persistence diagrams: the persistence diagram for H_1 and H_0 Betti curve.

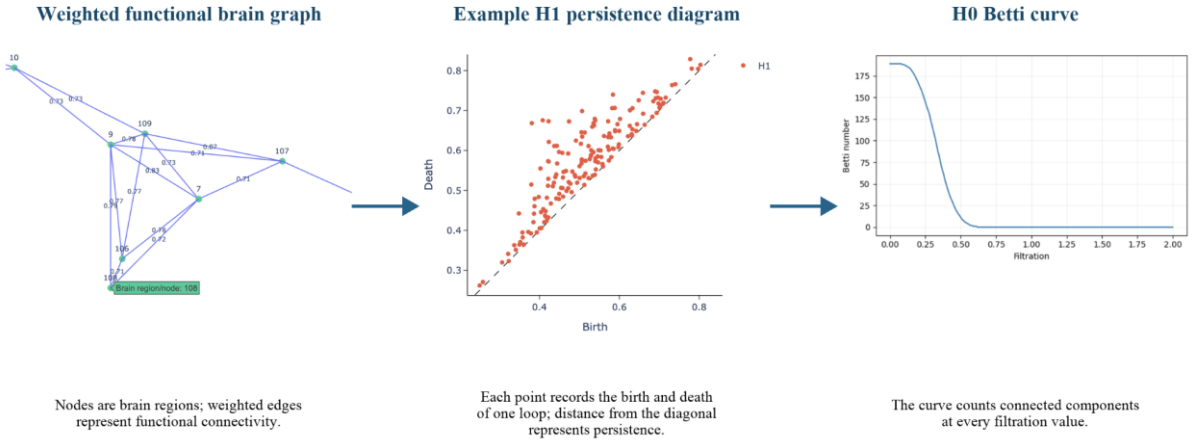


Figure 2. Weighted functional brain graph with persistence-based summaries: an H1 persistence diagram and an H0 Betti curve.

Let *D* and *E* be persistence diagrams, and let $\Delta = \{(a,a) : a \in \mathbb{R}\}$ denote the diagonal, counted with infinite multiplicity. Let Γ(*D*,*E*) be the set of bijections $\Gamma(D,E) = \{\gamma : D \cup \Delta \to E \cup \Delta \mid \gamma \text{ is a bijection}\}$. Thus, a persistence feature may be matched either to a feature in the other diagram or to the diagonal. The bottleneck distance minimizes the largest matching cost:

$$d_B(D,E) = \inf_{\gamma \in \Gamma(D,E)} \sup_{x \in D \cup \Delta} \|x - \gamma(x)\|_\infty$$

In contrast, the p -Wasserstein distance aggregates all matching costs:

$$W_p(D,E) = \left(\inf_{\gamma \in \Gamma(D,E)} \sum_{x \in D \cup \Delta} \|x - \gamma(x)\|_\infty^p \right)^{1/p}.$$

Here, $\|\cdot\|_\infty$ denotes the maximum norm. The stability theorem bounds changes in persistence diagrams by changes in the filtration function:

$$d_B\left(D_k(f), D_k(g)\right) \le \|f - g\|_\infty .$$

However, this theorem does not guarantee clinical robustness to motion, parcellation, or correlation-sign handling because these choices can alter the filtration function itself [36]. This does not imply clinical robustness against movement, parcellation, or sign changes because f can be modified.

Mapper relies on observations X as opposed to anatomical nodes. A lens $f : X \longrightarrow \mathbb{R}^m$ is covered by overlapping sets $\mathcal{U} = \{U_\alpha\}_{\alpha \in A}$ where the clusters of each pullback $f^{-1}(U_\alpha)$ become vertices, while common observations form edges. In this case, we have the nerve of the clustered cover, meaning that the lens, cover resolution, overlap, and clustering are now mathematical parameters, so the mapper graph is $\text{Mapper}(X,f,\mathcal{U}) = \text{Nerve}\left(\text{Clust}\left(f^{-1}(\mathcal{U})\right)\right)$. Instead of association, spectral TDA incorporates frequency-dependent coherence. With Hodge theory, the boundary matrix B_k and combinatorial Laplacian $L_k = B_k^\top B_k + B_{k+1} B_{k+1}^\top$ are used to decompose the gradient, curl, and harmonic parts of simplicial signals, having overall equation as $C_k = \text{im}(B_k^\top) \oplus \ker(L_k) \oplus \text{im}(B_{k+1})$[28]. The overall workflow in terms of data representation and analysis is depicted in Figure 3.

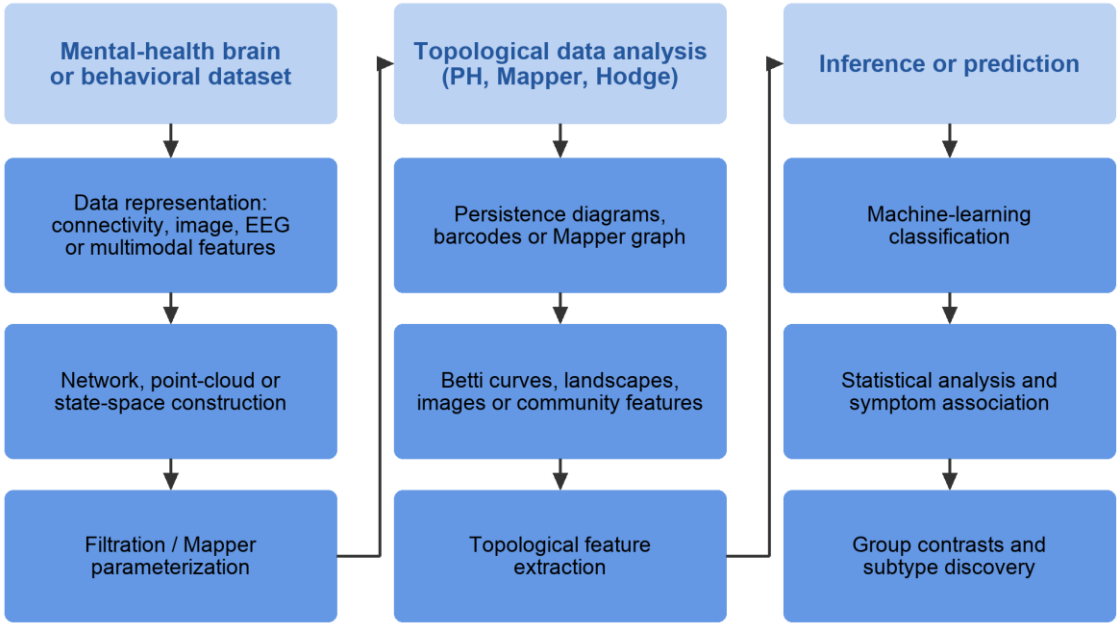


Figure 3.

General workflow for topological analysis of mental-health data.

Table 1. Mathematical comparison of TDA strategies

Method	Mathematical input	Construction	Invariant / summary	Distance or test	Stability	Main parameter
Network PH	Weighted graph $G=(V,E,w)$	Clique/VR filtration $K\varepsilon$	H_k , β_k , D_k	Bottleneck or Wasserstein	Stable for fixed filtration [36]	Weight-to-distance rule; ε
Cubical PH	Voxel field $f:\mathbb{Z}^3\to\mathbb{R}$	Sublevel cubical complex	H_0, H_1, H_2	Diagram distance; ML test	Stable to bounded field perturbation	Voxel size; smoothing; level
Mapper	Observations X and lens f	Nerve of clustered pullback cover	Mapper graph	Graph/SAFE measures; group tests	Parameter-sensitive; test resampling	Lens; cover; overlap; clustering
Spectral TDA	Frequency-dependent network	Coherence filtration	Spectral landscapes	Functional/global test	Depends on spectral estimation	Frequency resolution; bandwidth
Hodge TDA	Simplicial signals and B_k	$L_k = B_k{}^T B_k + B_{k+1} B_{k+1}^T$	Harmonic/curl/gradient parts	GLM, permutation, FDR	Complex and skeleton dependent	Cycle basis; skeleton
PH + ML	Diagram or curve vectors	Image/landscape/entropy map	Finite feature vector	CV accuracy; calibration	Must be nested in resampling	Vectorization; classifier

MATERIALS AND METHODS

Review design and search strategy. The review followed PRISMA 2020 [9]. PubMed and arXiv were searched on 7 August 2026 without date or language filters. The PubMed query was ("topological data analysis" OR "persistent homology" OR Mapper OR "Hodge Laplacian" OR "persistence landscape" OR "Betti curve") AND (psychiatr* OR "mental illness" OR "mental health" OR "mental disorder" OR schizophrenia OR psychosis OR depression OR bipolar OR autism OR ADHD OR anxiety OR PTSD OR OCD OR "substance use" OR "substance abuse" OR addiction). The same concepts

were translated to arXiv all-field syntax. Reference lists of two broad TDA reviews [4,5] were checked backward. Exact queries, exports and record-level decisions are retained in the supplementary audit workbook.

Eligibility and data extraction. Eligible reports examined human diagnosed or clinically defined psychiatric cohorts; used patient-level neuroimaging, electrophysiological, genetic, environmental, behavioral or clinical data; applied persistent homology, Mapper, Hodge-based topology or another explicit multiscale topological construction; and reported interpretable group, symptom, subgroup, outcome or predictive results. Reviews, theoretical or non-human work, neurological studies without a psychiatric cohort, conventional graph analyses without TDA and reports with insufficient methods were excluded. Preprints were retained only for distinct methods and labelled as such.

Disorder, sample, dataset, modality, representation, TDA method, summary, objective, validation and conclusion were extracted. Titles/abstracts and full reports were assessed against the same criteria, duplicate and companion reports were linked, and exclusions were logged. Heterogeneity prevented meta-analysis, so study design and direction of findings were synthesized qualitatively. Figure 4 summarizes selection.

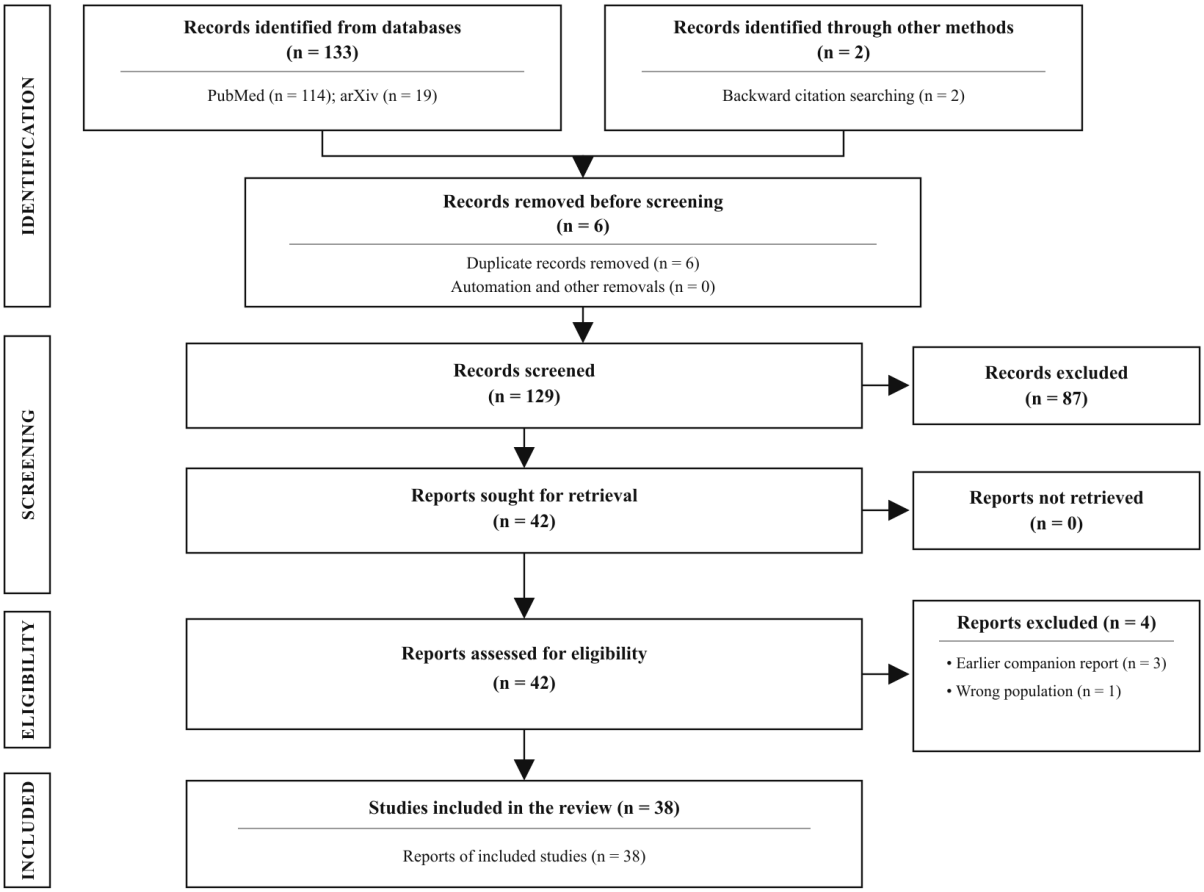


Figure 4. PRISMA flow diagram for study identification and selection.

RESULTS

Study selection and field composition. The searches identified 135 records: 114 from PubMed, 19 from arXiv and 2 through backward citation searching. After removal of 6 duplicate records, 129 titles and abstracts were screened and 87 were excluded. All 42 reports sought were retrieved; four were excluded at full text (three earlier companion reports and one report without an eligible psychiatric cohort), leaving 38 included reports. The evidence remained concentrated in ASD, ADHD and schizophrenia/psychosis, with fewer studies of depression, OCD, serious mental illness and substance use.

Table 2. Mathematical classification of every reviewed study

Method family and studies	Complex and filtration / lens	Homology and topological summary	Distance / test and software	Stability / sensitivity
Mapper [10,11,24–26]	Mapper nerve; clinical, FC, PCA or multimodal lens with clustered cover	N/A; Mapper graph, branches, communities, modularity, SAFE/EL	ANOVA, correlation, regression, outcome and replication tests; software NR	Two-site, independent and multisite checks; no external validation in one study
Graph PH [12,15–16,18–19,27,40,47,49–50,55]	Weighted, functional or dynamic graph; FC, link-density, rank, time-window or magnitude filtration	H_0–H_1; Betti curves, PD, landscapes, kernels, robustness and magnitude homology	Permutation/group tests, classification and kernel PLS; custom, shared or unreported software	Site, preprocessing, state, modality and CV checks
Point-cloud / VR PH [14,20–21,23,41,44,52–54,56]	VR, adaptive VR, dependence, delay-embedding, clinical, movement or permutation complex	H_0–H_2; PD, PI, Betti curves, landscapes, entropy, kernels and persistence descriptors	Bottleneck/Wasserstein, permutation and ML tests; JavaPlex, sklearn-tda, R, Python or custom code	Noise, simulation, representation, classifier, temporal and behavioral checks
Cubical / surface PH [17,51]	Cubical or cortical-surface complex; 1−ReHo or cortical-field sublevels	H_0–H_2; barcode vectors, PD and min–max pairs	Group comparison, SVM and ensemble validation; custom or unreported software	ABIDE I/II and autism-control comparison
Spectral PH [13]	Spectral clique; frequency-dependent coherence filtration	H_1; spectral persistence landscape	Global functional test; software NR	Frequency-band sensitivity
Higher-order PH [22,28,39,42–43,45,48]	Order, simplicial, Hodge, multimodal, interactomic, hypergraph or signed complex	H_1, higher or multidimensional; generators, harmonic coefficients, spectra and signed/hypergraph features	GLM/FDR, group, prediction, ablation and drug-ranking tests; custom or public code	Cross-data, site, medication, modality and cohort checks
Gene-network PH [38,46]	Gene co-expression complex; expression or weighted-network filtration	H_0–H_1; PD and cycle persistence	Group, enrichment and multi-cohort tests; R/Python	Gene-expression evidence; independent-cohort validation

Note: PH—persistent homology; PD—persistence diagram; PI—persistence image; VR—Vietoris–Rips; FC—functional connectivity; PCA—principal component analysis; ML—machine learning; SVM—support vector machine; PLS—partial least squares; GLM—general linear model; FDR—false discovery rate; CV—cross-validation; NR—not reported.

RQ1: differences between topological methods

Persistent homology remained dominant because filtrations test whether differences persist across connection strengths rather than at one threshold. The expanded evidence also included cortical-surface, transcriptomic, behavioral-movement, multimodal PET/MRI and higher-order simplicial constructions [38–50]. Main design choices were the distance transformation, sign handling, complex, homology dimension and vectorization. Clique filtrations suit connectivity matrices but become costly in higher dimensions; cubical or surface filtrations answer spatial-field rather than connectome questions.

Mapper primarily addressed heterogeneity and outcome stratification, whereas newer hybrids combined persistent summaries with kernels, hypergraphs, transformers or permutation tests [49–56]. Mapper branches remain sensitive to lens, cover and clustering choices. Spectral TDA preserves frequency-specific structure, and Hodge methods extend analysis from pairwise edges to signals on higher-order simplices.

RQ2: datasets and modalities

Three evidence tiers emerged: reusable benchmarks (especially ADHD-200 and ABIDE); large or controlled resources such as COBRE, UK Biobank and ENIGMA-OCD; and local imaging, EEG, transcriptomic, behavioral or inpatient cohorts. The expanded studies add multimodal PET/MRI, blood and brain transcriptomics, stereotyped-movement video and further ABIDE/ADHD-200 analyses [38–56]. Repository size must not be confused with the quality-controlled sample actually analysed.

HBN, ABCD, OpenNeuro and the NIMH Data Archive provide future transdiagnostic validation opportunities [32–34]. The principal gap is a harmonized cross-disorder TDA benchmark, not a lack of psychiatric data.

Table 3. Mental-health datasets identified in TDA studies and validation resources

Dataset	Population	Scale	Modalities	Access	TDA status
ADHD-200	ADHD / controls	~800 contributed participants; 8 contributing centers	rs-fMRI, T1, phenotype	Open via INDI; preprocessed derivatives	Primary ADHD TDA resource
ABIDE I	ASD / controls	1,112 released; 17 sites	rs-fMRI, T1, phenotype	Open via INDI	Primary ASD TDA resource
ABIDE II	ASD / controls	1,114 released; 19 sites	rs-fMRI, T1, phenotype	Open via INDI	Used for PH and ReHo topology
COBRE	Schizophrenia / controls	Public cohort; MesoSCOUT used 44+44	DWI, T1; rs-fMRI also available	Open via COINS/NITRC terms	Used for structural-connectome PH
UK Biobank MDD subsets	Major depression	3,052 in 2025 study; larger staged subsets in 2026	Genetic, environmental, imaging, clinical	Controlled application	Used for Mapper/community stratification
GSRD and HSR cohorts	Major depression	Multisite replication cohorts	Clinical, environmental; selected imaging	Collaborative/ controlled	Partial external replication of MDD topology
ENIGMA-OCD	OCD / controls	2,052 in identified analysis	Multisite rs-fMRI	Consortium; not participant-level public	Used for Hodge-Laplacian TDA
Huilongguan EEG	First-episode schizophrenia / controls	198 total	Resting EEG	Local/not identified as public	Used for multimodal persistent features

Dataset	Population	Scale	Modalities	Access	TDA status
Working-memory EEG cohort	Schizophrenia / controls	Local clinical study	Task EEG	Local	Used for VR-PH and stability analysis
Task/semantic fMRI cohorts	Schizophrenia / controls	Small local cohorts	Task fMRI	Local	Used for network and representation PH
SMI inpatient cohort	Mixed serious mental illness	235 adults	rs-fMRI and clinical outcome	Local	Mapper treatment-response stratification
ISAD adolescent cohort	Inhaled substance-use disorder / controls	Local adolescent cohort	rs-fMRI	Local	Persistent-homology group contrasts
Public pediatric EEG	ADHD / controls	Single EEG benchmark	Resting EEG	Public	Spectral TDA
HBN / ABCD	Transdiagnostic youth / population	Thousands; longitudinal	MRI, EEG, behavior, clinical	Open or controlled	Future cross-disorder validation; not included evidence

RQ3: neurobiological findings

ADHD and ASD studies most consistently reported altered multiscale integration or cycle structure rather than one missing connection. Evidence now spans functional connectomes, cortical surfaces, gene co-expression, transcriptomics, multimodal PET/MRI, EEG and motor trajectories [10–18,38–56]. Direction depended on representation, state and filtration, so neither disorder is uniformly more or less connected.

Schizophrenia studies used task and resting fMRI, EEG, semantic representations and white-matter connectomes, converging on altered higher-order organization at different spatial or frequency scales [19–23]. Depression studies used Mapper-like multimodal topology and longitudinal prediction [24,25,44], while serious-mental-illness topology related prefrontal–striatal organization to treatment improvement [26].

Beyond neurodevelopmental disorders, persistent or higher-order topology was applied to inhalant use, anti-addiction transcriptomics and OCD [27,28,42,46]. Across diagnoses, findings concerned integration or higher-order organization, but localization and clinical meaning remained modality- and task-dependent. Few studies compared several diagnoses in one harmonized cohort, so case-control separation does not establish diagnostic specificity.

RQ4: prediction, stratification and clinical association

TDA features entered prediction as persistence images, landscapes, Betti curves, entropy, lifetime statistics and Hodge-derived summaries. Recent hybrids added kernel regression, graph kernels, hypergraph fusion and transformer models [43,45,49–56]. Performance was often promising, but small samples, reused repositories and incomplete external validation prevent diagnostic interpretation.

The most distinctive contribution of Mapper was not binary classification but stratification. Its graphs linked topology to symptoms, comorbidity, treatment improvement or multimodal outcome profiles in ADHD, depression and serious mental illness [10,11,24–26]. Nevertheless, exploratory topological subgroups require stability analysis, independent replication and longitudinal association with outcomes before they can guide treatment.

RQ5: limitations, bias and reporting priorities

Four risks recur. First, data reuse creates an illusion of independent replication: multiple results originate from overlapping ADHD-200 or ABIDE participants, while local psychiatric cohorts may be impossible to reproduce. Second, preprocessing decisions, including motion control, parcellation, EEG referencing, global-signal regression, correlation-to-distance conversion and handling of negative edges, alter the filtration itself. Third, tuning the topological representation and classifier before cross-validation can leak information. Fourth, demographic, medication, illness-stage and comorbidity imbalance limit generalization across psychiatric populations.

Future studies should report subjects/sites, code, filtration definitions, parameters and vectorization. Validation should separate sites or repositories and test preprocessing, parcellation, sign handling and dynamic versus static connectivity. Multiple comparisons, calibration, uncertainty and clinical utility should accompany accuracy.

Table 4. Minimum standards for future clinical TDA studies

Domain	Recommended practice	Reason
Reproducibility	Share code, versions, subject/site counts, exclusions and random seeds	Allows exact reconstruction and detects overlapping samples
Filtration robustness	Report distance transform, sign treatment and threshold range; test alternatives	Shows whether conclusions are genuinely multiscale
Validation	Nested training; leave-site-out and independent-dataset testing	Separates disease signal from site or preprocessing signal
Clinical relevance	Relate features to symptoms, function and longitudinal outcomes	Moves beyond case-control prediction
Equity	Report sex, age, IQ, medication and comorbidity; test subgroup performance	Reduces demographic and spectrum bias
Transdiagnostic design	Analyze ASD, ADHD, co-occurrence and controls jointly	Tests specificity and shared neurodevelopmental dimensions

DISCUSSION

TDA contributes at three levels: filtrations replace a single threshold with multiscale analysis; persistent components and loops characterize biological integration and segregation; and Mapper or other topological feature spaces represent continua, outcome groups and candidate subtypes beyond average diagnostic patterns.

However, TDA cannot correct motion artefacts, site imbalance or inadequate phenotyping. Persistent features are not inherently disease-specific, and Mapper branches are not validated subtypes. Findings are most credible when stable across preprocessing choices, clinically associated and externally validated. TDA should therefore complement conventional connectivity and machine learning.

A transdiagnostic benchmark should compare conventional, graph, persistent-homology, Mapper, Hodge and hybrid features on identical participants and cross-site splits, evaluating accuracy, calibration, test–retest stability, symptoms and treatment outcomes.

This review was limited by inconsistent indexing, broad Mapper false positives, methodological heterogeneity and possible omission of non-indexed or non-English reports. Seven included reports were preprints rather than peer-reviewed evidence [13,22,28,42,54–56]. The record-level audit improves reproducibility but does not replace independent replication or formal risk-of-bias assessment.

CONCLUSION

TDA characterizes psychiatric data through multiscale organization: persistent homology captures components and cycles, Mapper represents continua and candidate subgroups, and spectral or Hodge extensions preserve frequency-specific and higher-order structure. Across 38 included reports, evidence spans ASD, ADHD, schizophrenia/psychosis, depression, serious mental illness, OCD and substance use, but remains uneven and weakly externally validated. TDA should therefore complement statistical, machine-learning and clinical assessment; the next step is a preregistered transdiagnostic benchmark across independent datasets.

AUTHOR STATEMENTS

Author contributions: Sarvinoz Anvarova was responsible for the topological data analysis component, literature search, data extraction, visualization and manuscript preparation. Munira Rakhmatova was responsible for the machine-learning component and contributed to screening, data extraction, validation and manuscript revision. Sejuti Rahman supervised the study, contributed to its conceptual and methodological development and critically reviewed the manuscript. All authors read and approved the final manuscript.

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ANTI-PERIODIC BOUNDARY VALUE PROBLEM FOR A SECOND-ORDER PARTIAL DIFFERENTIAL EQUATION WITH DEGENERACY

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Annotation. *In this article, we formulate and investigate an anti-periodic boundary value problem for a degenerate second-order partial differential equation with a Caputo fractional time-derivative. The spatial operator has a diffusion coefficient $x^{\alpha}(1-x)^{\beta}$ that vanishes at both endpoints of the interval, leading to a singular spectral problem. By constructing the Green' s function, we reduce the spectral problem to a Fredholm integral equation of the second kind, and we establish the existence of a countable set of eigenvalues and eigenfunctions. The uniqueness of the boundary value problem' s solution is proved via an energy-integral method. Existence is then shown by expanding the solution in the eigenfunction basis and justifying the uniform convergence of this series.*

Key words: *Degenerate partial differential equation; Caputo fractional derivative; anti-periodic boundary condition; spectral problem; Green' s function; Fredholm integral equation; Mittag-Leffler function; method of energy integrals; Fourier method.*

IKKINCHI TARTIBLI XUSUSIY HOSILALI DIFFERENSIAL TENGLAMA UCHUN DEGENERATSIYALI ANTI-DAVRIY CHEGARAVIY MASALA

Annotatsiya. *Ushbu maqolada Kaputo kasr tartibli vaqt hosilasi bilan berilgan, degeneratsiyali ikkinchi tartibli xususiy hosilali differensial tenglama uchun anti-davriy chegaraviy masala shakllantiriladi va tadqiq etiladi. Fazoviy operator diffuziya koeffitsientiga ega bo‘ lib, ushbu koeffitsient interval ikkala uchida nolga aylanadi, bu esa singular spektral masalaning kelib chiqishiga olib keladi. Green funksiyasini qurib, spektral masalani ikkinchi tur Fredholm integral tenglamasiga keltiramiz hamda xususiy qiymatlar va xususiy funksiyalarning sanab chiqiladigan to‘ plamining mavjudligini asoslaymiz. Chegaraviy masala yechimining yagonaligi energetik-integral usuli yordamida isbotlanadi. Yechimning mavjudligi esa xususiy funksiyalar bazisi bo‘ yicha yoyilma orqali ko‘ rsatiladi va ushbu qatorning bir tekis yaqinlashishi asoslanadi.*

Kalit so‘ zlar: *Degeneratsiyali xususiy hosilali differensial tenglama; Kaputo kasr tartibli hosilasi; anti-davriy chegaraviy shart; spektral masala; Green funksiyasi; Fredholm integral tenglamasi; Mittag-Leffler funksiyasi; energetik integrallar usuli.*

АНТИПЕРИОДИЧЕСКАЯ КРАЕВАЯ ЗАДАЧА ДЛЯ ВЫРОЖДАЮЩЕГОСЯ ДИФФЕРЕНЦИАЛЬНОГО УРАВНЕНИЯ В ЧАСТНЫХ ПРОИЗВОДНЫХ ВТОРОГО ПОРЯДКА

Аннотация. *В настоящей статье формулируется и исследуется антипериодическая краевая задача для вырождающегося дифференциального уравнения в частных производных второго порядка с дробной производной по времени в смысле Капуто. Пространственный оператор содержит коэффициент диффузии, обращающийся в нуль на обоих концах рассматриваемого интервала, что порождает сингулярную спектральную задачу. Посредством построения функции Грина спектральная задача сводится к интегральному уравнению Фредгольма второго рода, и устанавливается существование счётного множества собственных значений и собственных функций. Единственность решения краевой задачи доказывается методом энергетических интегралов. Существование решения обосновывается путём разложения по системе собственных функций с доказательством равномерной сходимости соответствующего ряда.*

Ключевые слова: *вырождающееся уравнение в частных производных; дробная производная Капуто; антипериодическое краевое условие; спектральная задача; функция Грина; интегральное уравнение Фредгольма; функция Миттаг-Леффлера; метод энергетических интегралов; метод Фурье.*

1. Introduction

Partial differential equations play a fundamental role in the mathematical modeling of various physical, biological, and engineering processes. Among them, boundary value problems for degenerate second-order PDEs have attracted considerable research attention since the last century and remain an active area of investigation. Such equations arise

naturally whenever the principal coefficients of the differential operator vanish on part of the domain or its boundary, leading to qualitatively different mathematical behaviour compared to the non-degenerate case.

More recently, increasing interest has been directed toward boundary value problems for differential equations involving fractional-order operators with respect to time. Such operators, in particular the Caputo derivative [1], capture memory and hereditary effects in complex media and provide more realistic models for anomalous diffusion processes. A systematic mathematical analysis of initial-boundary value problems for time-fractional diffusion equations was carried out by Gorenflo, Luchko, and Yamamoto [7], who studied these problems in fractional Sobolev spaces and established key regularity properties. Kubica and Ryszewska [8] proved the unique existence of weak solutions for the diffusion-wave equation with non-homogeneous Dirichlet boundary data and analysed the long-time behaviour of solutions.

Alongside classical boundary conditions, problems with non-local conditions have drawn growing attention. Karimov, Mamchuev, and Ruzhansky [9] studied a non-local initial problem for a second-order time-fractional equation with a Bessel operator in the space variable and obtained an explicit solution represented via Fourier-Bessel series in terms of multinomial Mittag-Leffler functions. In [10], Ruzhansky, Tokmagambetov, and Torebek studied a Bitsadze-Samarskii-type non-local problem for an integro-differential diffusion-wave equation on the Heisenberg group, establishing existence, uniqueness, and explicit solution representations. Non-local problems for linear parabolic equations were investigated by Chabrowski [11], who proved existence and uniqueness via maximum principles and Green' s function methods.

Anti-periodic boundary conditions form a special and important class of non-local conditions and have been studied for fractional-order ordinary differential equations; see, for example, [5] and the references therein. However, anti-periodic problems for degenerate partial differential equations with fractional-order time derivatives remain largely unexplored in the literature.

Related results on degenerate equations in rectangular domains include the work [3] of Tersenov and the work [4] of Urinov and Usmonov, where modified Cauchy-type problems were studied for degenerate hyperbolic equations of the second kind. However, to the best of our knowledge, the combination of fractional-order time evolution, spatial degeneracy, and anti-periodic boundary conditions has not been treated before in the literature, and the present paper is devoted to filling this gap.

In the present work, we investigate an anti-periodic boundary value problem for the following time-fractional degenerate equation in the rectangular domain $\Omega = \{(x,t): 0 < x < 1, 0 < t < T\}$:

$$CD_{0t}^{\gamma} u - \left[x^{\alpha}(1-x)^{\beta} u_x\right]_x = f(x,t), \qquad (1)$$

where $u(x,t)$ is the unknown function, $f(x,t)$ is a given source function, and CD_{0t}^{γ} denotes the Caputo fractional derivative of order γ with respect to t [1]. The real parameters α, β, γ satisfy $0 < \gamma < 1$, $0 \le \alpha, \beta < 1$.

Equation (1) is degenerate along two boundary lines at $x = 0$ and $x = 1$, where the diffusion coefficient $x^{\alpha}(1-x)^{\beta}$ vanishes. This spatial degeneracy, combined with the fractional-order time derivative, produces analytical difficulties that go beyond the classical setting.

The problem is supplemented with anti-periodic boundary conditions of the form $u(0,t) = -u(1,t)$, together with initial conditions at $t = 0$ Existence and uniqueness of a solution to this problem are established by combining the Fourier method with Green' s function theory for the associated spectral problem and energy integral estimates.

The remainder of the paper is organised as follows. Section 2 recalls the definition and key properties of the Mittag-Leffler function and the Caputo derivative. Section 3 formulates this problem , analyses the associated spectral problem via a Fredholm integral equation, proves auxiliary convergence lemmas, and establishes the existence and uniqueness of the solution. Concluding remarks are given at the end of Section 3.

2 Preliminaries

In this section, we will recall some definitions and basic concepts, which will be used throughout the paper.

Definition 1. [1] *For a function $u(t)$, the Caputo fractional derivative of order α with respect to t is defined as follows:*

$$CD_{0t}^{\gamma} u(t) = \frac{1}{\Gamma(1-\alpha)} \int_0^t (t-s)^{-\alpha} u'(s) ds,$$

where $t > 0, 0 < \gamma \le 1$, and $\Gamma(z)$ s Euler' s gamma-function[12].

Mittag-Leffler function: A two-parameter Mittag-Leffler function is defined by [6] as follows:

$$E_{\alpha,\beta}(z) = \sum_{k=0}^{+\infty} \frac{z^k}{\Gamma(\alpha k+1)}, Re(\alpha) > 0, Re(\beta) > 0, z, \alpha, \beta \in C.$$

Lemma 1. *For every $\alpha \in (0,2)$ and β is constant number. One has*

$$\left|E_{\alpha,\beta}(-z)\right| < C, \ z \ge 0.$$

3. Formulation of a problem

We study the following initial-boundary value problem for equation (1):

Problem C. Find $u(x,t)$ function such that it has the following properties:

1) $u(x,t)$, $x^{\beta} u_x(x,t), u_t(x,t) \in C(\overline{\Omega})$; ${}_C D_{0t}^{\alpha} u\left(x,t\right), \left[x^{\beta} u_x(x,t)\right]_x \in C(\Omega)$;

2) Ω satisfies equation (1) in the field;

3) $u(x,t)$ satisfies the following boundary

$$\left.\begin{array}{l} u(0,t) = -u(1,t), t \in [0,T]; \\ \lim\limits_{x\to 0} x^{\beta} u_x(x,t) = -u_x(1,t), t \in [0,T]; \end{array}\right\}, \tag{2}$$

and the initial conditions:

$$u(x,0) = \varphi_1(x),\ u_t(x,0) = \varphi_2(x),\ x \in [0,1]; \tag{3}$$

where $\varphi_1(x)$ and $\varphi_2(x)$ are the given functions.

3.1 Spectral Problem

By applying Fourier' s method to the problem C, we will have the following spectral problem: find the values of the parameter λ for which there exist nontrivial solutions to the equation

$$MX(x) \equiv -\left[x^{\beta} X'(x)\right]' = \lambda X(x), \tag{4}$$

satisfying the following conditions:

$$\left.\begin{array}{l} X(0) = -X(1) \\ \lim\limits_{x\to 0} x^{\beta} X'(x) = -X'(1) \end{array}\right\}. \tag{5}$$

Assume that there exist eigenvalues of the spectral problem {(4), (5)}. The spectral problem {(4), (5)} may have nontrivial solutions only when $\lambda > 0$.

To establish the existence of the eigenvaluens and eigenfunctions of the spectral problem {(4),(5)}, we equivalently reduce it to a second kind homogeneons. Fredholm integral equation with symmetric kernels. For this purpose, we will construct a Green' s function$G(x,s)$. It satisfies the following conditions:

1) $G(x,s)$ function is continuous in $x, s \in [0,1]$.

2) In the intervals $0,s)$ and $s,1$ it has a continuous derivative $(\partial/\partial x)G(x,s)$ and it has a jump $\left(-s^{-\beta}\right)$ when $x = s$, that is

$$(\partial/\partial x)G(x,s)|_{x=s+0} - (\partial/\partial x)G(x,s)|_{x=s-0} = -s^{-\beta}.$$

3) $G(x,s)$ function with respect argument to x in the intervals $(0,s)$ and $(s,1)$ satisfies equation $MG(x,s) = 0$.

4) $G(x,s)$ satisifies boundary conditions $G(0,s) = -G(1,s)$, $\lim\limits_{x\to 0} x^{\beta} G_x(x,s) = -G_x(1,s)$ for $s \in (0,1)$.

Using the general solution of equations $MG(x,s) = 0$, $x \in (0,s) \cup (s,1)$ and thee conditions $\{(1),(2),(3)\}$, it can be shown that $G(x,s)$ Green' s function exists and is unique, and has the following form

$$G(x,s) = \begin{cases} \frac{1}{2(1-\beta)}\left(x^{1-\beta} - s^{1-\beta} + \frac{1}{2}\right), 0 < x < s, \\ \frac{1}{2(1-\beta)}\left(-x^{1-\beta} + s^{1-\beta} + \frac{1}{2}\right), s < x < 1. \end{cases} \tag{7}$$

Then the problem {(4), (5)} is equivalent to the following integral equation with the symmetric kernel:

$$X(x) = \lambda \int_0^1 G(x,s)X(s)ds. \tag{8}$$

Since the kernel $G(x,s)$ is continuous, symmetric, and positive (i.e., $\lambda > 0$), the integral equation, and hence the problem {(4), (5)}, has a countable set of eigenvalues:

$$0 < \lambda_1 \le \lambda_2 \le \lambda_3 \le \ldots \le +\infty,$$

and the corresponding system of eigenfunctions $v_1(x), v_2(x), v_3(x)\ldots..$ form an orthonormal system in $L_2[0,1]$. Furthermore, any function that can be repre- sentable in terms of the kernel $G(x,s)$ can be expanded into a Fourier series with respect to these eigenfunctions [2].

Let $\{X_k(x)\}|_{k=1}^{+\infty}$ and $\{\lambda_k\}|_{k=1}^{+\infty}$ be eigenfunctions and eigenvalues of the spectral

problem {(4), (5)} respectively.

Lemma 2: *If the function $g(x)$ satisfies the conditions $g(x)$, $x^{\beta} g'(x) \in C[0,1]$, $Mg'(x) \in L_2(0,1)$; $g(0) = -g(1)$, $\lim\limits_{x\to 0} x^{\beta} g'(x) = -g'(1)$, then the function $g(x)$ expands on the system $\{X_k(x)\}_{k=1}^{+\infty}$ in the interval $[0,1]$ in an absolutely and uniformly convergent series.*

3.2 Auxiliary Lemmas

In this section, we will prove the convergence of some series which will be used in the proof of the existence of a solution to the main problem. Let $\{\lambda_k\}|_{k=1}^{+\infty}$ and $\{X_k(x)\}|_{k=1}^{+\infty}$ be the eigenvalues and eigenfunctions of the problem {(4), (5)}, respectively. g_k represents the Fourier coefficient of the function $g(x)$ by the system of the eigenfunctions$\{X_k(x)\}|_{k=1}^{+\infty}$, i.e.

$$g_k = \int_0^1 g(x)X_k(x)dx,\ k = 1,2,3,\ldots$$

Lemma 3:[2] *In the interval $[0,1]$, the series*

$$\sum_{k=1}^{+\infty} \frac{X_k^2(x)}{\lambda_k},\ \sum_{k=1}^{+\infty} \frac{\left[x^{\beta} X_k'(x)\right]^2}{{\lambda_k}^2},$$

are uniformly convergent.

Lemma 4. *Let $f(x) \in C[0,1]$, $x^{\beta/2} f'(x) \in L_2(0,1)$ and $f(0) = -f(1)$, Then, the following inequality holds true:*

$$\sum_{k=1}^{+\infty}\lambda_k f_k^2 \le \int_0^1 x^\beta \left[f'(x)\right]^2 dx, \quad (9)$$

where f_k is the Fourier coefficient of the function $f(x)$ by the system eigenfunctions $\{X_k(x)\}|_{k=1}^{+\infty}$ defined by

$$f_k = \int_0^1 f(x)X_k(x)dx.$$

Lemma 5. *Let the functions $f(x)$, $f'(x)$, $x^\alpha f'(x)$ be continuous on $[0,1]$, and let $f(0) = -f(1)$, $\lim_{x\to 0} x^\beta f'(x) = -f'(1)$, $\left[x^\beta f'(x)\right]' \in L_2(0,1)$.*

Then, the following inequality holds true

$$\sum_{k=1}^{+\infty}\lambda_k^{\,2} f_k^{\,2} \le \int_0^1 \left[x^\beta f'(x)\right]'^2 dx. \quad (10)$$

Lemma 6: *Let the functions $f(x)$, $f'(x)$, $x^\alpha f'(x)$, $\left[x^\alpha f'(x)\right]'$ be continuous on $[0,1]$, and let the following conditions be fulfiled*

$$f(0) = -f(1),\ \lim_{x\to 0} x^\beta f'(x) = -f'(1),\ \lim_{x\to 0}\left[x^\beta f'(x)\right]' = -f''(1),\ x^{\beta/2}\left[x^\beta f'(x)\right]'' \in L_2(0,1).$$

Then, the following inequality holds true

$$\sum_{k=1}^{\infty}\lambda_k^{\,3} f_k^2 \le \int_0^1 x^\beta \left[x^\beta f'(x)\right]''^2 dx. \quad (11)$$

3.3 The existence of the solution of the problem C

In this section ,we prove the existence of the solution to the direct problem. To do this, first, we will expand the functions $\varphi_1(x)$ and $\varphi_2(x)$ by the series with respect to the system of functions $\{X_k(x)\}|_{k=1}^{+\infty}$ as follows

$$\varphi_j(x) = \sum_{k=1}^{+\infty}\varphi_{jk}X_k(x), f(x,t) = \sum_{k=1}^{+\infty} f_k(t)X_k(x),\ j = \overline{1,2} \quad (12)$$

where φ_{jk} and $f_k(t)$ are the Fourier coefficients of the functions $\varphi_{jk}(x)$ and $f(x,t)$ respectively, i.e.

$$f_k = \int_0^1 f_k(x)X_k(x)dx.$$

$$\varphi_{jk} = \int_0^1 \varphi_{jk}(x)X_k(x)dx, j = \overline{1,2}.$$

We will seek a solution of the problem C in the following form

$$u(x,t) = \sum_{k=1}^{+\infty} T_k(t)X_k(x), \quad (13)$$

where $T_k(t)$ is an unknown function.

To find this unknown function substituting (12) and (13) into the equation (1) and the initial condition (3), we have the following initial boundary value problem for the function $T_k(t)$:

$$\begin{cases} {}_C D_{0t}^{\alpha} T_k(t) + \lambda_k T_k(t) = f_k(t), \\ T_k(0) = \varphi_{1k}, T_k'(0) = \varphi_{2k}. \end{cases} \quad (14)$$

It is known that the unique solution to the problem (14) has the following form[1]

$$T_k(t) = \varphi_{1k}E_{\alpha,1}[-\lambda_k t^\alpha] + \varphi_{2k}tE_{\alpha,2}[-\lambda_k t^\alpha] + \\ + \int_0^t (t-z)^{\alpha-1}E_{\alpha,\alpha}[-\lambda_k(t-z)^\alpha]f_k(z)dz, \quad (15)$$

where $E_{\alpha,\beta}(z)$is the Mittag-Leffler function which its definition is given in Section 2. Substituting (14) into (15), we will have the following representation of the solution of the problem C:

$$u(x,t) = \sum_{k=1}^{+\infty}\Big\{\varphi_{1k}E_{\alpha,1}[-\lambda_k t^\alpha] + \varphi_{2k}tE_{\alpha,2}[-\lambda_k t^\alpha] + \\ + \int_0^t (t-z)^{\alpha-1}E_{\alpha,\alpha}[-\lambda_k(t-z)^\alpha]f_k(z)dz\Big\}X_k(x). \quad (16)$$

Theorem 1. If $\varphi_j(x)$, $x^\beta\varphi_j'(x)$, $\left[x^\beta\varphi_j'(x)\right]' \in C[0,1]$, $x^{\beta/2}\left[x^\beta\varphi_j'(x)\right]' \in L_2(0,1)$, $\varphi_j(0) = -\varphi_j(1)$, $x^\beta\varphi_j'(x)\big|_{x=0} = -\varphi_j'(1)$, $\left[x^\beta\varphi_j'(x)\right]'\Big|_{x=0} = -\left[x^\beta\varphi_j'(x)\right]'\Big|_{x=1}$. $f(x,t)$, $x^\beta f_x(x,t)$, $\left[x^\beta f_x(x,t)\right]_x \in C[0,1]$, $x^{\beta/2}\left[x^\beta f_x(x,t)\right]_{xx} \in L_2(0,1)$, $f(0,t) = -f(1,t)$, $x^\beta f_x(x,t)\big|_{x=0} = -\left[x^\beta f_x(1,t)\right]_x\Big|_{x=1}$ *Then the solution of the problem C exists and is unique.*

Proof. To prove the Theorem 1, it is sufficient to show that the series (16) and the series corresponding to the functions $x^{\beta}u_x(x,t)$ converge uniformly in $\bar{\Omega}$, and that the series corresponding to the functions $\left[x^{\beta}u_x(x,t)\right]_x$, $CD_{0t}^{\alpha}u(x,t)$ converge uniformly on any compact set $D \subset \Omega$.

First, we consider the series (16). Using Lemma 1, one can easily verify that $E_{\alpha,\beta}(-\lambda_k t^{\alpha}) < C$, $t \in [0.1]$. We have

$$|u(x,t)| = \left|\sum_{k=1}^{+\infty}\left[\varphi_{1k}E_{\alpha,1}[-\lambda_k t^{\alpha}] + \varphi_{2k}tE_{\alpha,2}[-\lambda_k t^{\alpha}] + \right.\right.$$
$$\left.\left. + \int_0^t (t-z)^{\alpha-1}E_{\alpha,\alpha}[-\lambda_k(t-z)^{\alpha}]f_k(z)dz\right]X_k(x)\right| \le \sum_{k=1}^{+\infty}|C_1\varphi_{1k} + C_2T\varphi_{2k}||X_k(x)| +$$
$$+C_3\sum_{k=1}^{+\infty}\left|\left\{\int_0^1 (t-z)^{\alpha-1}f_k(z)dz\right\}X_k(x)\right| \le C_1\sum_{k=1}^{+\infty}|\sqrt{\lambda_k}\varphi_{1k}|\left|\frac{X_k(x)}{\sqrt{\lambda_k}}\right| +$$
$$+C_3\sum_{k=1}^{+\infty}|\sqrt{\lambda_k}\varphi_{2k}|\left|\frac{X_k(x)}{\sqrt{\lambda_k}}\right| + C_4\left[\int_0^T\sum_{k=1}^{+\infty}f_k(z)\sqrt{\lambda_k}dz\frac{X_k(x)}{\sqrt{\lambda_k}}\right]. \quad (17)$$

From the last, applying the Cauchy-Schwarz inequality, we have

$$\sum_{k=1}^{+\infty}|\sqrt{\lambda_k}\varphi_{jk}|\left|\frac{X_k(x)}{\sqrt{\lambda_k}}\right| \le \left[\sum_{k=1}^{+\infty}\lambda_k\varphi_{jk}^2\sum_{k=1}^{+\infty}\frac{X_k^2(x)}{\lambda_k}\right]^{1/2}, j = \overline{1,2},$$
$$\int_0^T\sum_{k=1}^{+\infty}f_k(z)\sqrt{\lambda_k}dz\frac{X_k(x)}{\sqrt{\lambda_k}} \le \left[\int_0^T\sum_{k=1}^{+\infty}\lambda_k{f_k}^2(x)dz\sum_{k=1}^{+\infty}\frac{{X_k}^2(x)}{\lambda_k}\right]^{1/2}.$$

The series on the right-hand side of these inequalities converge uniformly in $x \in [0,1]$ due to Lemmas 3 and 4. Therefore, the series on the left-hand side also converges uniformly in x on $[0,1]$. Hence, from (17), it follows that the series (16) converges absolutely and uniformly in Ω.

Now, we consider the series corresponding to the function $\left[x^{\beta}u_x(x,t)\right]_x$. From (13), considering (4), we obtain

$$\left|\left[x^{\beta}u_x(x,t)\right]_x\right| \le \left|\sum_{k=1}^{+\infty}\left[\varphi_{1k}E_{\alpha,1}[-\lambda_k t^{\alpha}]x^{\beta}{X_k}'(x)\right] + \sum_{k=1}^{+\infty}\left[\varphi_{2k}tE_{\alpha,2}[-\lambda_k t^{\alpha}]x^{\beta}{X_k}'(x)\right]\right| +$$
$$+\left|\sum_{k=1}^{+\infty}\left[\int_0^t(t-z)^{\alpha-1}E_{\alpha,\alpha}[-\lambda_k(t-z)^{\alpha}]f_k(z)dz\right]x^{\beta}{X_k}'(x)\right|. \quad (18)$$

Using Lemma 1, one can easily verify that $E_{\alpha,\beta}(-\lambda_k t^{\alpha}) < C$, $t \in [0.1]$ and $t < T$. Considering this, we have

$$\left|\left[x^{\beta}u_x(x,t)\right]_x\right| \le C_5\sum_{k=1}^{+\infty}\left|\varphi_{1k}x^{\beta}{X_k}'(x)\right| + C_6\sum_{k=1}^{+\infty}\left|\varphi_{2k}Tx^{\beta}{X_k}'(x)\right| +$$
$$+C_7\sum_{k=1}^{+\infty}\left|\left[\int_0^T(t-z)^{\alpha}f_k(z)dz\right]x^{\beta}{X_k}'(x)\right|. \quad (19)$$

We rewrite (19) in the following form

$$\left|\left[x^{\beta}u_x(x,t)\right]_x\right| \le C_5\sum_{k=1}^{+\infty}\left|\lambda_k\varphi_{1k}\frac{x^{\beta}{X_k}'(x)}{\lambda_k}\right| + C_8\sum_{k=1}^{+\infty}\left|\lambda_k\varphi_{2k}\frac{x^{\beta}{X_k}'(x)}{\lambda_k}\right| +$$
$$+C_9\left|\int_0^T\sum_{k=1}^{+\infty}\lambda_k f_k(z)dz\left\{\frac{x^{\beta}{X_k}'(x)}{\lambda_k}\right\}\right|. \quad (20)$$

From the last, applying the Cauchy-Schwarz inequality, we have

$$\sum_{k=1}^{+\infty}\left|\lambda_k\varphi_{jk}\frac{x^{\beta}{X_k}'(x)}{\lambda_k}\right| \le \left[\sum_{k=1}^{+\infty}{\lambda_k}^2{\varphi_{jk}}^2\sum_{k=1}^{+\infty}\frac{\left[x^{\beta}{X_k}'(x)\right]^2}{{\lambda_k}^2}\right]^{1/2}, j = \overline{1,2},$$

$$\left|\int_0^T\sum_{k=1}^{+\infty}\lambda_k f_k(z)dz\left\{\frac{x^{\beta}{X_k}'(x)}{\lambda_k}\right\}\right| \le \left[\int_0^T\sum_{k=1}^{+\infty}{\lambda_k}^2{f_k}^2(z)\sum_{k=1}^{+\infty}\frac{\left[x^{\beta}{X_k}'(x)\right]^2}{{\lambda_k}^2}\right]^{1/2}.$$

The series on the right-hand side of these inequalities converge uniformly in $x \in [0,1]$ due to Lemmas 3 and 5. Therefore, the series on the left-hand side also onverges uniformly in x on $[0,1]$. Hence, from (20), it follows that the series (18) converges absolutely and uniformly in Ω.

Then, We consider the uniform convergence of the series corresponding to $CD_{ot}^{\alpha}u(x,t)$ functions. To this end, it is sufficient to show the uniform convergence of the series corresponding to $f(x,t)$ functions.

$$|f(x,t)| \le \sum_{k=1}^{+\infty}|f_k(t)X_k(x)| \le \sum_{k=1}^{+\infty}\left|f_k(t)\sqrt{\lambda_k}\frac{X_k(x)}{\sqrt{\lambda_k}}\right|, \quad (21)$$

From the last, applying the Cauchy-Schwarz inequality, we have

$$\sum_{k=1}^{+\infty}\left|f_k(t)\sqrt{\lambda_k}\frac{X_k(x)}{\sqrt{\lambda_k}}\right| \le \left[\sum_{k=1}^{\infty}\lambda_k {f_k}^2(t)\sum_{k=1}^{\infty}\frac{{X_k}^2(x)}{\lambda_k}\right]^{1/2}.$$

The series on the right-hand side of these inequalities converge uniformly in $x \in [0,1]$ due to Lemmas 3 and 4. Therefore, the series on the left-hand side also onverges uniformly in x on [0,1]. Hence, from (21), it follows that the series corresponding to the function $f(x,t)$ converges absolutely and uniformly in Ω.

3.4 The Uniqueness of the Solution to problem C

Now we show that the solution of the problem is unique.

Assume that there exists two solutions $u_1(x,t)$ and $u_2(x,t)$. Let us denote their difference by $u(x,t) = u_1(x,t) - u_2(x,t)$. Then the pair $u(x,t)$ should satisfy the following equation

$$CD_{0t}^{\alpha}u(x,t) = \left[x^{\beta}u_x(x,t)\right]_{x'} \tag{22}$$

supplemented with the following conditions

$$\left.\begin{array}{l} u(0,t) = -u(1,t), t \in [0,T]; \\ \lim\limits_{x\to 0} x^{\beta}u_x(x,t) = -u_x(1,t), t \in [0,T]; \end{array}\right\}, \tag{23}$$

$$u(x,0) = 0,\ u_t(x,0) = 0,\ x \in [0,1]; \tag{24}$$

To establish the uniqueness of the solution, we consider following equality

$$T_k(t) = \int_0^1 u(x,t)\,X_k(x)dx, k \in \mathbb{N}. \tag{25}$$

Applying the operator CD_{0t}^{α} to both sides of the equation (25), we obtain

$$CD_{0t}^{\alpha}T_k(t) = \int_0^1 CD_{0t}^{\alpha}u(x,t)X_k(x)dx.$$

Using the equation (1), this expression simplifies to

$$CD_{0t}^{\alpha}T_k(t) = \int_0^1\left[x^{\beta}u_x(x,t)\right]_x X_k(x)dx.$$

Hence, considering the boundary conditions (23) and (24), we apply the integration rule twice and rewrite the expression as follows

$$CD_{0t}^{\alpha}T_k(t) = \int_0^1 u(x,t)\left[x^{\beta}X_k^{'}(x)\right]^{'}dx.$$

From the last, taking into account the equations (4) and (25), we have

$$CD_{0t}^{\alpha}T_k(t) + \lambda_k T_k(t) = 0, \tag{26}$$

$$\begin{cases} T_k(0) = 0, \\ T_k^{'}(0) = 0. \end{cases} \tag{27}$$

One can easily show that the solution to {(26),(27)} is given by $T_k(t) \equiv 0$. Since the spectral problem {(4),(5)} is self-adjoint, its set of eigenfunctions $\{X_k(x)\}|_{k=1}^{+\infty}$ is complete. Thus, $u(x,t) \equiv 0$. Therefore, we conclude that $u_1(x,t) = u_2(x,t)$, confirming the uniqueness of the solution to the problem C.

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KEPLERIAN AND RADIAL EPICYCLIC FREQUENCIES IN A EINSTEIN–NONLINEAR MAXWELL–YUKAWA BLACK HOLE

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Abstract; *We study the Keplerian and radial epicyclic frequencies of neutral test particles in the static, spherically symmetric Einstein–Nonlinear Maxwell–Yukawa (ENLMY) black hole, using the metric function f(r) obtained in a companion analysis, where the sign of the exponential-integral term is established directly from the field equations and differs from a previously reported solution. Starting from the geodesic equations of circular motion, we derive closed-form expressions for the Keplerian angular frequency Ω_K and the radial epicyclic frequency Ω_r, and examine their dependence on the charge parameter Q and the Yukawa screening parameter α. The two parameters act in opposite directions throughout: increasing Q raises the peak of Ω_r and shifts it to smaller radii, while increasing α lowers the peak and shifts it outward; Ω_K decreases with Q and increases with α at fixed r. These trends mirror the opposite-direction pattern already found for the horizon structure and the effective potential, confirming that Yukawa screening consistently counteracts the compactifying effect of the charge across every dynamical quantity examined so far.*

Keywords: Einstein–nonlinear Maxwell–Yukawa black hole; Keplerian frequency; radial epicyclic frequency; modified gravity.

АНАЛИЗ КЕПЛЕРОВСКИХ И РАДИАЛЬНЫХ ЭПИЦИКЛИЧЕСКИХ ЧАСТОТ В ЧЁРНОЙ ДЫРЕ ЭЙНШТЕЙНА–НЕЛИНЕЙНОГО МАКСВЕЛЛА–ЮКАВЫ

Аннотация; *Изучаются кеплеровская и радиальная эпициклическая частоты нейтральных пробных частиц в статической, сферически-симметричной чёрной дыре Эйнштейна–нелинейного Максвелла–Юкавы (ENLMY), с использованием метрической функции f(r), полученной в сопутствующем исследовании, где знак члена с экспоненциальным интегралом устанавливается непосредственно из уравнений поля и отличается от ранее опубликованного решения. Исходя из геодезических уравнений кругового движения, мы получаем замкнутые выражения для кеплеровской угловой частоты Ω_K и радиальной эпициклической частоты Ω_r, и исследуем их зависимость от заряда Q и параметра юкавского экранирования α. Оба параметра действуют противоположно: увеличение Q повышает пик Ω_r и смещает его к меньшим радиусам, тогда как увеличение α понижает пик и смещает его наружу; Ω_K убывает с ростом Q и растёт с ростом α при фиксированном r.*

Ключевые слова: чёрная дыра Эйнштейна–нелинейного Максвелла–Юкавы; кеплеровская частота; радиальная эпициклическая частота; модифицированная гравитация.

EYNSHTEYN–NOCHIZIQLI MAKSVELL–YUKAVA QORA TUYNUG‘ IDA KEPLER VA RADIAL EPITSIKLIK CHASTOTALARNING TAHLILI

Annotatsiya; *Bu ishda statik va sferik-simmetrik Eynshteyn–Nochiziqli Maksvell–Yukava (ENLMY) qora o‘ rasida neytral test-zarrachalarning Kepler va radial epitsiklik chastotalari o‘ rganiladi; metrikaviy funksiya f(r) hamrohlik qiluvchi tahlilda olingan bo‘ lib, unda eksponensial integral hadining ishorasi bevosita maydon tenglamalaridan belgilanadi va avval e’lon qilingan yechimdan farq qiladi. Doiraviy harakat geodezik tenglamalaridan boshlab, Kepler burchak chastotasi Ω_K va radial epitsiklik chastota Ω_r uchun yopiq ko‘ rinishdagi ifodalar chiqarildi, va ularning zaryad parametri Q hamda Yukava skrining parametri α ga bog‘ liqligi tahlil qilindi. Ikkala parametr butun tahlil davomida qarama-qarshi yo‘ nalishda ta’sir qiladi: Q ning ortishi Ω_r cho‘ qqisini ko‘ taradi va*

uni kichikroq radiuslarga suradi, α ning ortishi esa cho‘ qqini pasaytiradi va tashqariga suradi; Ω_K esa belgilangan r da Q ortishi bilan kamayadi, α ortishi bilan ortadi. Bu tendensiyalar gorizont tuzilishi va effektiv potensial uchun avval topilgan qarama-qarshi yo‘ nalishdagi naqshni takrorlaydi, bu esa Yukava skriningning hozirgacha o‘ rganilgan har bir dinamik miqdorda zaryadning ixchamlashtiruvchi ta’sirini izchil ravishda qarshi ta’sir qilishini tasdiqlaydi.

Kalit so‘ zlar: Eynshteyn–nochiziqli Maksvell–Yukava qora o‘ rasi; Kepler chastotasi; radial epitsiklik chastota; modifikatsiyalangan gravitatsiya.

1. Introduction

The orbital and epicyclic frequencies of test particles are among the most direct dynamical probes of a black-hole spacetime: the Keplerian angular frequency Ω_K sets the orbital timescale of circular motion, while the radial epicyclic frequency Ω_r measures the restoring response to small radial perturbations and vanishes exactly at the innermost stable circular orbit. Together they underlie essentially every phenomenological model of the twin-peak quasi-periodic oscillations (QPO) observed in black-hole X-ray binaries, so any modification of the underlying metric leaves a direct, potentially observable imprint on these two frequencies.

The Einstein–Nonlinear Maxwell–Yukawa (ENLMY) black hole is obtained by coupling gravity to a nonlinear electromagnetic field sourced by a Yukawa-screened electric potential, extending the Reissner–Nordström (RN) solution through a short-range electromagnetic correction governed by the screening parameter α. In a companion analysis we re-derived the ENLMY metric function directly from the underlying nonlinear-electrodynamics field equations and obtained a sign for the exponential-integral term that differs from a previously reported version of the solution; using this metric, we found that the charge parameter Q and the screening parameter α act in opposite directions on the horizon structure and on the effective potential of neutral test particles, with Q compactifying the geometry and α counteracting this compactification.

In the present paper we extend this analysis to the Keplerian and radial epicyclic frequencies of neutral test particles, derived directly from this metric. We do not adopt any named twin-peak QPO prescription (relativistic precession, ER2–ER4, or otherwise) and do not attempt an observational or MCMC-based comparison here; the goal is to establish, in closed form and with full numerical verification, how Ω_K and Ω_r individually respond to Q and α, as the necessary basis for any subsequent frequency-model or observational analysis.

The paper is organized as follows. Section 2 recalls the ENLMY metric function. Section 3 derives the Keplerian and radial epicyclic frequencies in closed form and examines their dependence on Q and α. Section 4 discusses the combined pattern across both frequencies. Section 5 summarizes the main conclusions.

2. ENLMY Metric

The ENLMY spacetime is obtained by coupling gravity to a nonlinear electromagnetic field generated by a Yukawa-type deformation of the Coulomb potential, $\varphi(r) = (Q/r)\exp(-\alpha r)$. Re-deriving the metric function from the corresponding field equations and establishing the sign of the exponential-integral term as required by those equations gives the closed form

$$f(r) = 1 - \frac{2M}{r} - \frac{Q^2}{6r^2}\left(\alpha^3 r^3 - \alpha^2 r^2 + 2\alpha r - 6\right) e^{-\alpha r} + \frac{Q^2\alpha^4 r^2}{6} E_1(\alpha r) \tag{1}$$

with M the mass parameter; this form recovers the Schwarzschild metric at $Q=0$ and the Reissner–Nordström metric as $\alpha \to 0$, and was verified directly against the Einstein field equations in the companion analysis. The horizon structure that follows from $f(r_h)=0$ is discussed there in detail and is not repeated here; the present paper builds directly on this $f(r)$ to derive the orbital and epicyclic frequencies of neutral test particles.

3. Keplerian and Radial Epicyclic Frequencies

For a circular, equatorial geodesic, the Keplerian angular frequency measured by a static observer at infinity, $\Omega_K = d\varphi/dt$, follows from the circular-orbit condition $\partial V_{eff}/\partial r = 0$ and is given by the standard relation $\Omega_K^2 = f'(r)/(2r)$. It is convenient to introduce the auxiliary function

$$N(r) \equiv 6Mre^{\alpha r} + Q^2\alpha^4 r^4 e^{\alpha r} E_1(\alpha r) - Q^2\alpha^3 r^3 + Q^2\alpha^2 r^2 - 2Q^2\alpha r - 6Q^2 \tag{2}$$

in terms of which the Keplerian frequency takes the closed form

$$\Omega_K^2(r) = \frac{f'(r)}{2r} = \frac{N(r)\, e^{-\alpha r}}{6r^4} \tag{3}$$

which reduces to the standard Schwarzschild relation $\Omega_K^2 = M/r^3$ at $Q=0$. The radial epicyclic frequency, obtained from the second-order radial perturbation of a circular orbit, follows the general relation

$$\Omega_r^2(r) = \Omega_K^2(r)\left[3f(r) - 2rf'(r) + \frac{rf(r)f''(r)}{f'(r)}\right] \quad (4)$$

with f' the second radial derivative of f; this identity holds for any static, spherically symmetric metric of this form and reduces to the Schwarzschild relation $\Omega_r^2=\Omega_K^2(1-6M/r)$ at $Q=0$. Throughout, r is expressed in units of $M=1$. Fig. 1–4 show Ω_r and Ω_K as functions of r for representative values of Q and α.

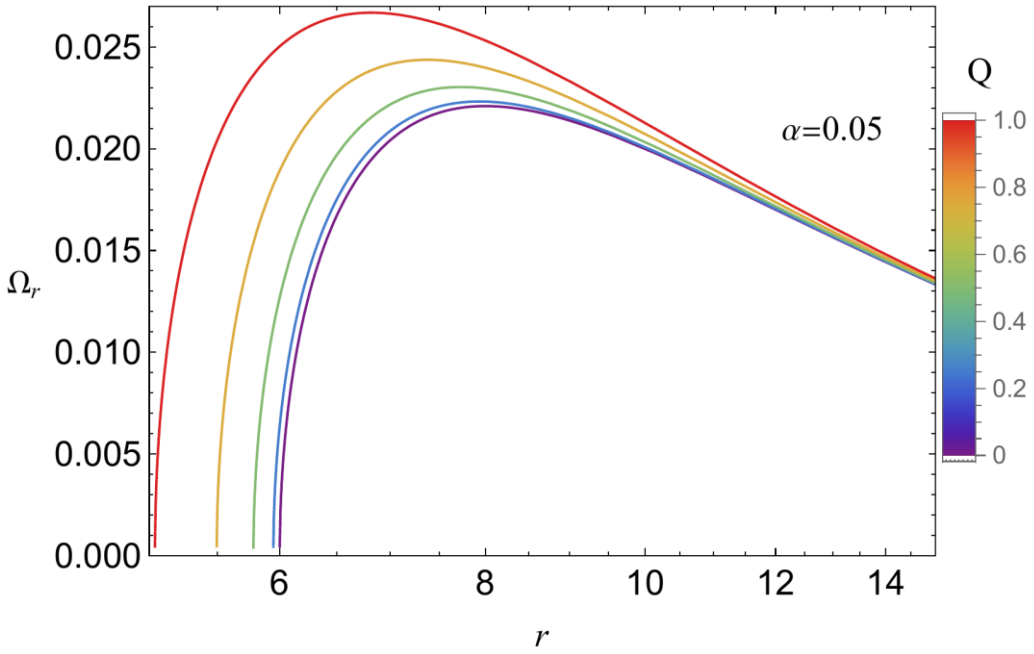


Fig. Radial epicyclic frequency Ω_r as a function of r, at fixed α=0.05, for Q from 0 to 1.

Fig. 1 shows $\Omega_r(r)$ at fixed α=0.05 for Q ranging from 0 to 1. Every curve vanishes at its left endpoint, where $\Omega_r=0$ by definition, rises to a single peak, and then decreases monotonically at large r, where all curves converge regardless of Q. Increasing Q raises the peak value and shifts it to smaller radii: from $\Omega_r=0.0221$ at $r=8.0001$ for $Q=0$, to $\Omega_r=0.0310$ at $r=5.9501$ for $Q=1$. The charge therefore both strengthens the radial restoring force near the black hole and pulls the region of maximal epicyclic response inward, toward the black hole.

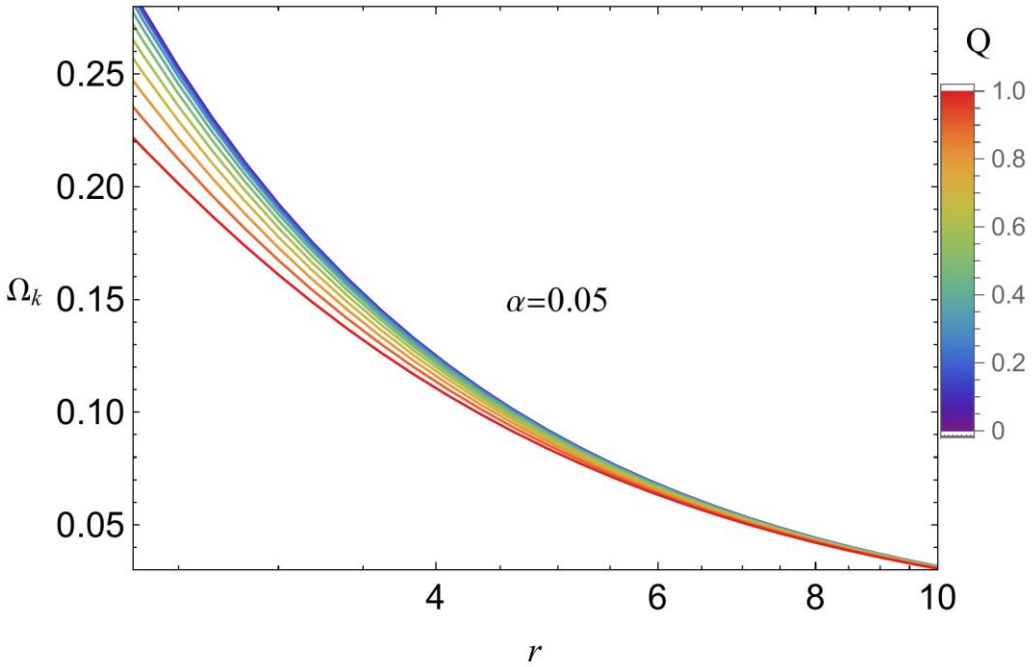


Fig. 2. Keplerian frequency Ω_K as a function of r, at fixed α=0.05, for Q from 0 to 1.

Fig. w shows the complementary behavior of $\Omega_K(r)$ at the same fixed α=0.05. Unlike Ω_r, Ω_K decreases monotonically with r and shows no extremum; increasing Q lowers Ω_K at every fixed r — for instance, from 0.0680 at $Q=0$ to 0.0633 at $Q=1$ at $r=6$ — with the separation between curves most visible at small r and vanishing as $r\to\infty$. A larger charge therefore slows the orbital angular frequency at a given radius, even as it raises the radial epicyclic response shown in Fig. 1.

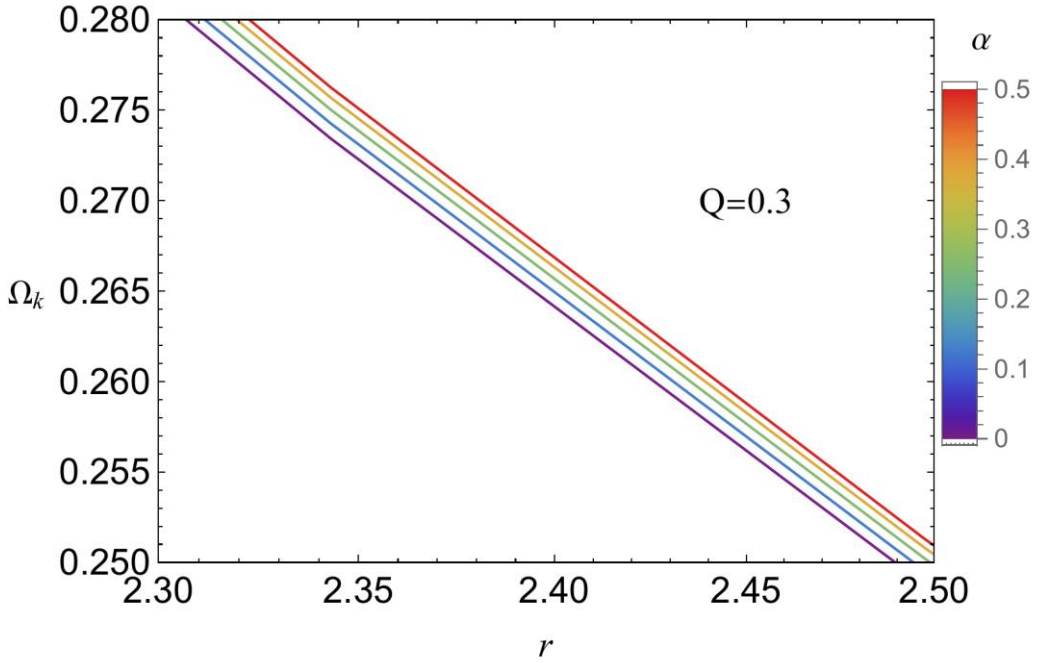


Fig. 3. Keplerian frequency Ω_K as a function of r, at fixed Q=0.3, for α from 0 to 0.5 (near-horizon detail).

Fig. 3 isolates the effect of α on Ω_K at fixed Q=0.3, in the near-horizon range $r\in$[2.30,2.50]. Here α acts in the opposite sense to Q: increasing α raises Ω_K at every fixed r — from 0.2639 at α=0 to 0.2670 at α=0.5 at r=2.40 — partially offsetting the charge-induced reduction seen in Fig. 2. The effect is modest in absolute size over this range but systematic and monotonic in α.

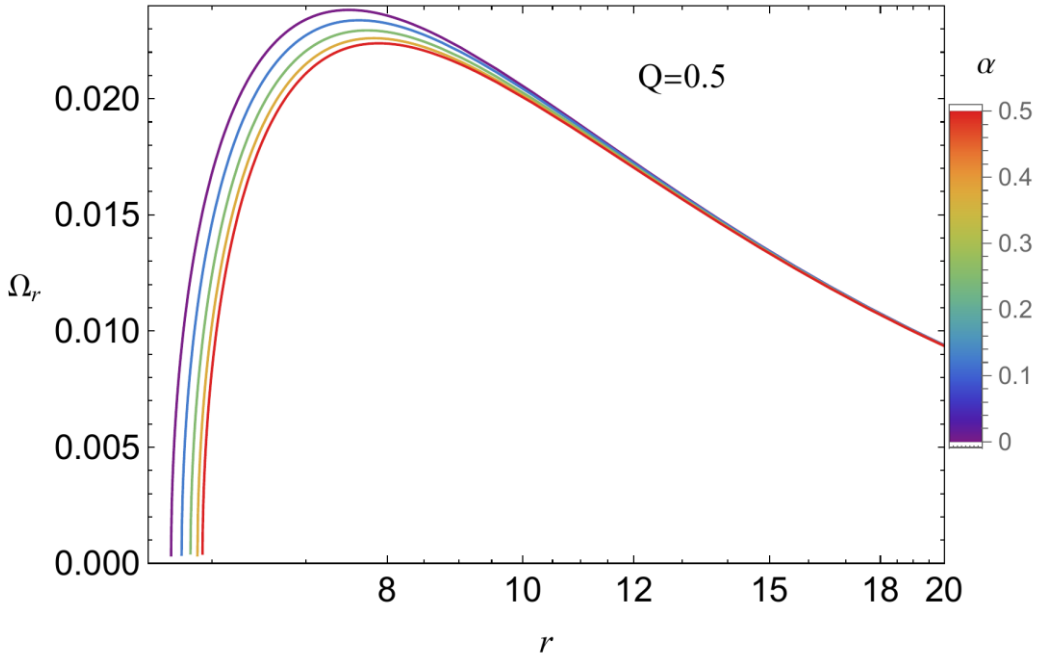


Fig. 4. Radial epicyclic frequency Ω_r as a function of r, at fixed Q=0.5, for α from 0 to 0.5.

Fig. 4 completes the picture, showing $\Omega_r(r)$ at fixed Q=0.5 for α from 0 to 0.5. Increasing α lowers the peak of Ω_r and shifts it outward — from Ω_r=0.0238 at r=7.5095 for α=0, to Ω_r=0.0223 at r=7.9333 for α=0.5 — the mirror image of the Q-driven trend in Fig. 1. As in Fig. 1, all curves converge at large r, confirming that the influence of both Q and α on the epicyclic response is confined to the near-horizon region.

4. Discussion

The results of Section 3 extend the opposite-direction pattern already established for the horizon structure and the effective potential to the Keplerian and radial epicyclic frequencies: at every fixed radius, increasing the charge Q raises Ω_r and lowers Ω_K, while increasing the screening parameter α does the reverse, driving both frequencies back toward their Schwarzschild values. Physically, the charge deepens and narrows the effective potential well near the black hole (as shown in the companion analysis), which simultaneously slows the mean orbital angular velocity and strengthens the radial

restoring force felt by a slightly perturbed circular orbit; Yukawa screening, entering only through exponential prefactors multiplying Q^2, systematically weakens both effects.

A further consequence, visible in Figs. 1 and 4, is that the peak of Ω_r shifts inward with Q and outward with α: the radius of maximal radial response is not fixed but moves together with Q and α themselves. Because twin-peak QPO models combine Ω_K and Ω_r at a common emission radius, this coupled shift means that any such combination inherits the same Q–α degeneracy already identified at the level of the individual frequencies, and must be treated with that degeneracy in mind.

5. Conclusion

Using the Einstein–Nonlinear Maxwell–Yukawa metric established in a companion analysis, we have derived closed-form expressions for the Keplerian angular frequency and the radial epicyclic frequency of neutral test particles, and verified both against the Schwarzschild limit.

The charge parameter Q and the Yukawa screening parameter α were found to act in opposite directions on both frequencies: the charge raises the peak of the radial epicyclic frequency and shifts it inward while lowering the Keplerian frequency at fixed radius, and screening reverses both trends, driving the geometry back toward the Schwarzschild profile. This pattern is the direct dynamical counterpart of the opposite-direction behavior already found for the horizon structure and the effective potential.

Overall, our results provide an internally consistent set of orbital and epicyclic frequencies for the ENLMY spacetime. The construction of twin-peak QPO frequency pairs from these results, and their comparison with observed microquasar and X-ray binary data through Bayesian parameter estimation, are left for a separate, dedicated analysis.

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HORIZON STRUCTURE AND EFFECTIVE POTENTIAL IN A EINSTEIN–NONLINEAR MAXWELL–YUKAWA BLACK HOLE

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Abstract; *We study the static, spherically symmetric Einstein–Nonlinear Maxwell–Yukawa (ENLMY) black hole, obtained by coupling gravity to a nonlinear electromagnetic field sourced by a Yukawa-screened electric potential. Re-deriving the metric function f(r) directly from the field equations, we obtain a sign for the exponential-integral term that differs from the previously reported solution, and verify this form against the Reissner–Nordström and Schwarzschild limits. Using this metric, we examine the horizon structure and the effective potential of neutral test particles. Throughout, the charge parameter Q and the Yukawa screening parameter α act in opposite directions: increasing Q shrinks the outer horizon and raises the effective-potential barrier, while increasing α pushes the horizon outward and lowers the barrier back toward the Schwarzschild profile, with the Schwarzschild values exactly recovered as Q→0. This sign also removes a spurious reversal in the horizon ordering with α and a spurious dip of the effective potential below the Schwarzschild curve at large radius, both artifacts of the previously reported sign.*

Keywords: Einstein–nonlinear Maxwell–Yukawa black hole; horizon structure; effective potential; modified gravity.

СТРУКТУРА ГОРИЗОНТА И ЭФФЕКТИВНЫЙ ПОТЕНЦИАЛ В ЧЁРНОЙ ДЫРЕ ЭЙНШТЕЙНА–НЕЛИНЕЙНОГО МАКСВЕЛЛА–ЮКАВЫ

Аннотация; *Изучается статическая, сферически-симметричная чёрная дыра Эйнштейна–нелинейного Максвелла–Юкавы (ENLMY), получаемая при связи гравитации с нелинейным электромагнитным полем, источником которого является экранированный по Юкаве электрический потенциал. Повторно выводя метрическую функцию f(r) непосредственно из уравнений поля, мы получаем для члена с экспоненциальным интегралом знак, отличающийся от ранее опубликованного решения, и проверяем эту форму по пределам Райсснера–Нордстрёма и Шварцшильда. С помощью этой метрики мы анализируем структуру горизонтов и эффективный потенциал нейтральных пробных частиц. Заряд Q и параметр юкавского экранирования α действуют противоположно: увеличение Q уменьшает внешний горизонт и повышает барьер эффективного потенциала, тогда как увеличение α смещает горизонт наружу и понижает барьер обратно к профилю Шварцшильда, причём значения Шварцшильда точно восстанавливаются при Q→0. Этот знак также устраняет ложный разворот в порядке горизонтов по α и ложное проваливание эффективного потенциала ниже кривой Шварцшильда при большом радиусе, оба являющиеся артефактами ранее опубликованного знака.*

Ключевые слова: *чёрная дыра Эйнштейна–нелинейного Максвелла–Юкавы; структура горизонтов; эффективный потенциал; модифицированная гравитация.*

EYNSHTEYN–NOCHIZIQLI MAKSVELL–YUKAVA QORA TUYNUG‘ INING GORIZONT TUZILISHI VA EFFEKTIV POTENSIALI

Annotatsiya; *Ushbu ishda gravitatsiyaning Yukava tipida skrinlangan elektr potensiali bilan hosil qilingan nochiziqli elektromagnit maydonga bog‘ lanishi natijasida yuzaga keladigan statik, sferik-simmetrik Eynshteyn–Nochiziqli Maksvell–Yukava*

(ENLMY) qora o‘ rasi o‘ rganiladi. Metrikaviy funksiya f(r) ni bevosita maydon tenglamalaridan qayta chiqarib, eksponensial integral hadi uchun avval e’lon qilingan yechimdan farq qiluvchi ishorani oldik, hamda shu ko‘ rinishni Reissner–Nordström va Shvarsshild chegaralarida tekshirdik. Shu metrika asosida neytral test-zarrachalarning gorizont tuzilishi va effektiv potensiali tahlil qilindi. Butun tahlil davomida zaryad parametri Q va Yukava skrining parametri α bir-biriga qarama-qarshi yo‘ nalishda ta’sir qiladi: Q ning ortishi tashqi gorizontni kichraytiradi va effektiv-potensial to‘ sig‘ ini ko‘ taradi, α ning ortishi esa gorizontni tashqariga suradi va to‘ siqni yana Shvarsshild profiliga qarab pasaytiradi, Q→0 da esa Shvarsshild qiymatlari aniq tiklanadi. Ushbu ishora, shuningdek, gorizont tartibida α bo‘ yicha soxta teskarilanishni va katta radiusda effektiv potensialning Shvarsshild egri chizig‘ idan pastga soxta tushishini ham yo‘ qotadi — ikkalasi ham avval e’lon qilingan ishoraning artefakti edi.

Kalit so‘ zlar: *Eynshteyn–nochiziqli Maksvell–Yukava qora o‘ rasi; gorizont tuzilishi; effektiv potensial; modifikatsiyalangan gravitatsiya.*

1. Introduction

Modified theories of gravity are frequently probed through charged black-hole geometries in which the electromagnetic sector is deformed by a nonlinear correction. A physically motivated deformation of this kind replaces the Coulomb potential with a Yukawa-screened potential, which introduces a finite screening length into the electromagnetic sector and reduces to the familiar Reissner–Nordström (RN) field at short distances. The resulting Einstein–Nonlinear Maxwell–Yukawa (ENLMY) black hole was obtained by coupling gravity to a nonlinear electromagnetic field sourced by such a screened potential, extending the RN solution through a short-range electromagnetic correction.

The construction draws on two independent lines of work: nonlinear electrodynamics, originally introduced to regularize the Maxwell sector, and the Yukawa potential, which describes screened interactions mediated by a massive field. In the ENLMY spacetime the horizon structure depends on both the electric charge Q and the screening parameter α, and the geometry can describe a two-horizon black hole, an extremal configuration, or a horizonless naked singularity depending on where the parameters fall in the (Q, α) plane. Because the screening length interpolates smoothly between a short-range and a Coulomb-like regime, the ENLMY background provides a convenient testbed for how electromagnetic screening reshapes strong-field dynamics relative to the RN and Schwarzschild cases.

The horizon structure and the effective potential of neutral test particles are the standard first probes of such deformed geometries, and the ENLMY spacetime itself has already been examined from the complementary perspectives of twin-peak quasi-periodic oscillations and of periodic orbits with their associated gravitational-wave phenomenology. In re-deriving the metric function for the present analysis, we found that the exponential-integral term of the previously reported closed-form solution carries a sign that differs from what the field equations give; the difference is confined to that one term and does not affect the qualitative motivation for the model, but it does propagate into every quantity built from $f(r)$. The present paper adopts the sign required by the field equations for this term and re-derives the horizon structure and the effective potential from this metric, verifying each result against the Schwarzschild and RN limits.

The paper is organized as follows. Section 2 presents the ENLMY metric function, summarizes its derivation from the underlying nonlinear-electrodynamics field equations, establishes the sign of the exponential-integral term required by those equations, and discusses the resulting horizon structure. Section 3 analyzes the effective potential of neutral test particles. Section 4 discusses the combined role of the charge and screening parameters across both of the above quantities. Section 5 summarizes the main conclusions.

2. ENLMY Metric and Horizon Structure

The ENLMY spacetime is obtained by coupling gravity to a nonlinear electromagnetic field generated by a Yukawa-type deformation of the Coulomb potential. For a static, spherically symmetric electric configuration the scalar potential is taken as $\varphi(r) = (Q/r)\exp(-\alpha r)$, so that the associated field strength $E(r)$ reduces to the Coulomb field at short distances and is exponentially screened at large distances. Varying the nonlinear electromagnetic action together with the Einstein–Hilbert term yields a nonlinear Maxwell equation for the field-dependent Lagrangian $L(r)$ and, through the corresponding stress–energy tensor, a first-order equation for the metric function. Fixing the two integration constants by matching the Schwarzschild limit at Q=0 and the Reissner–Nordström limit as $\alpha \to 0$ gives the metric function in closed form:

$$f(r) = 1 - \frac{2M}{r} - \frac{Q^2}{6r^2}\left(\alpha^3 r^3 - \alpha^2 r^2 + 2\alpha r - 6\right) e^{-\alpha r} + \frac{Q^2\alpha^4 r^2}{6} E_1(\alpha r) \tag{1}$$

with M the mass parameter. We verified this closed form directly against the field equations: differentiating $f(r)$ and substituting into the Einstein tensor for the static, spherically symmetric ansatz reproduces the stress–energy tensor of the nonlinear electromagnetic field for every power of α and Q, and the Schwarzschild (Q=0) and Reissner–Nordström ($\alpha \to 0$) limits are recovered exactly. This closed form differs from a previously reported version of the same solution by the sign of the $E_1(\alpha r)$ term; the sign given here is the one required by the field equations, and it is the one used throughout the remainder of this paper.

The horizon radii follow from $f(r_h)=0$. Fig. 1 and Fig. 2 show the resulting horizon structure as a function of α and Q, respectively.

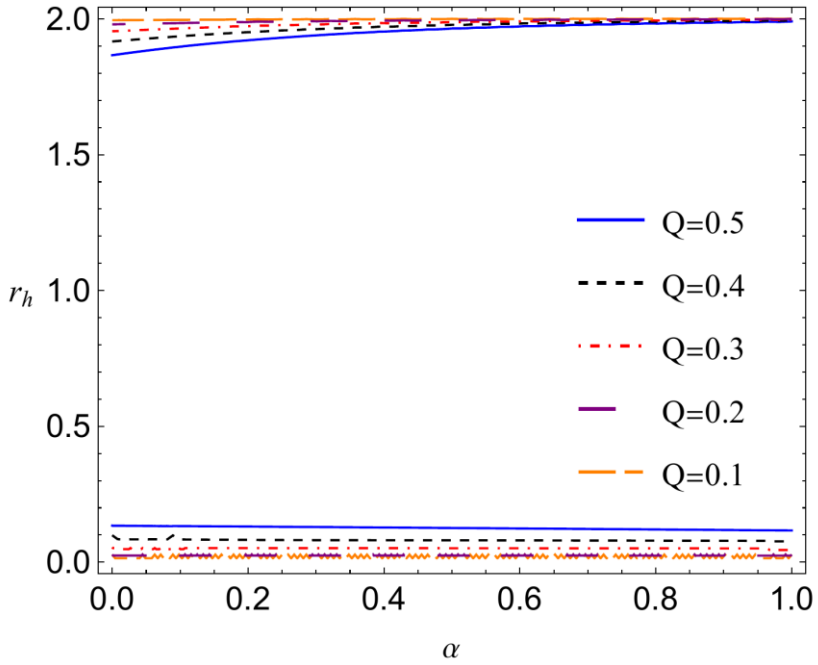


Fig. Horizon radii as a function of the Yukawa parameter α, for fixed values of the charge Q.

Fig. 1 shows the horizon radii as a function of α for several fixed values of Q. The outer horizon increases monotonically with α toward the Schwarzschild value $r_+=2M$, so that stronger screening progressively suppresses the charge contribution to the horizon structure. For any fixed α, a larger Q consistently gives a smaller outer horizon and a larger inner horizon, and this ordering holds across the whole range $\alpha\in(0,1)$ with no reversal between the different-Q curves — a feature that follows directly from the sign of the $E_1(\alpha r)$ term used here. All curves converge as $\alpha\to 1$, where screening dominates and the geometry becomes nearly insensitive to Q.

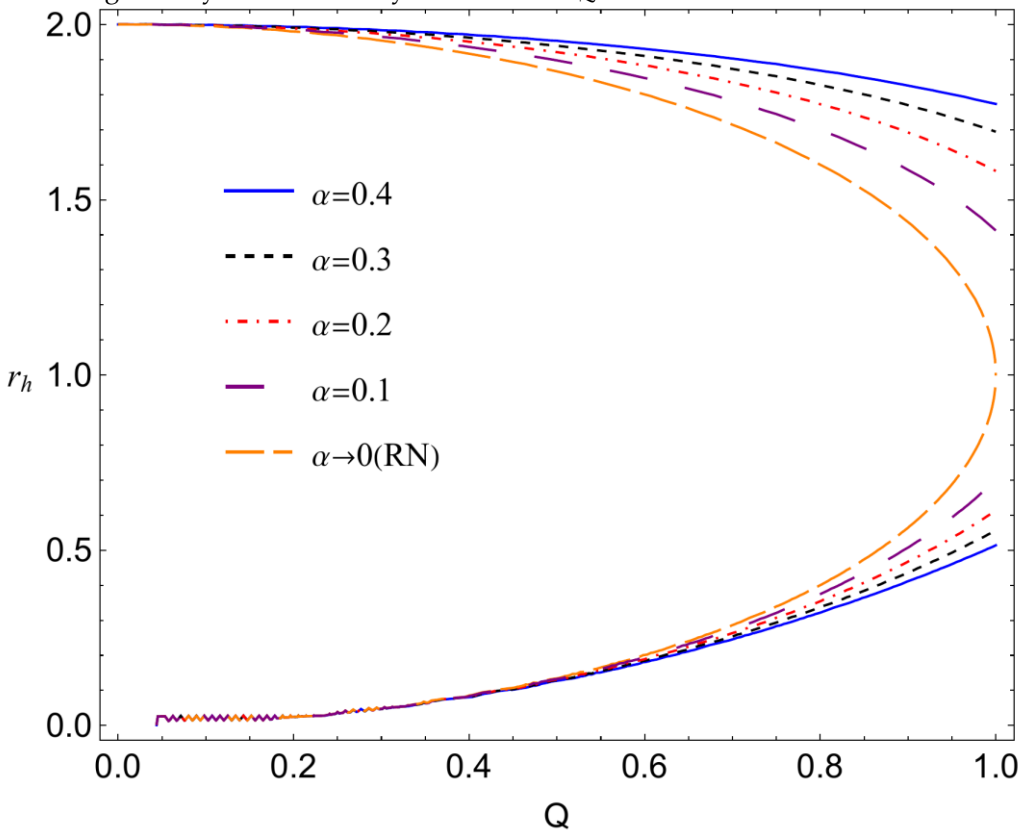


Fig. 2. Horizon radii as a function of the charge Q, for fixed values of the Yukawa parameter α.

Fig. 2 presents the complementary dependence on Q. As Q increases, the outer horizon decreases and the inner horizon increases, the two branches approaching each other in the familiar extremal manner of charged black holes. The Reissner–Nordström limit ($\alpha\to 0$) shows the strongest such response, with the branches meeting near $Q\simeq 1$; increasing α

visibly weakens this charge-driven approach, keeping the two horizons further apart at the same Q. Yukawa screening therefore delays the extremal configuration to larger charge values. Throughout this work we restrict Q and α to the range in which two positive horizon roots exist.

3. Effective Potential Neutral Test Particles

For a neutral test particle moving in the equatorial plane, the radial equation of motion takes the standard form $\dot{r}^2 = E^2 - V_{\text{eff}}(r)$, with the effective potential

$$V_{\text{eff}}(r) = f(r)\left(1 + \frac{L^2}{r^2}\right) \tag{2}$$

where E and L are the conserved specific energy and specific angular momentum of the particle. Fig. 3 shows V_{eff} for representative parameter sets, with M=1 and L=√20.

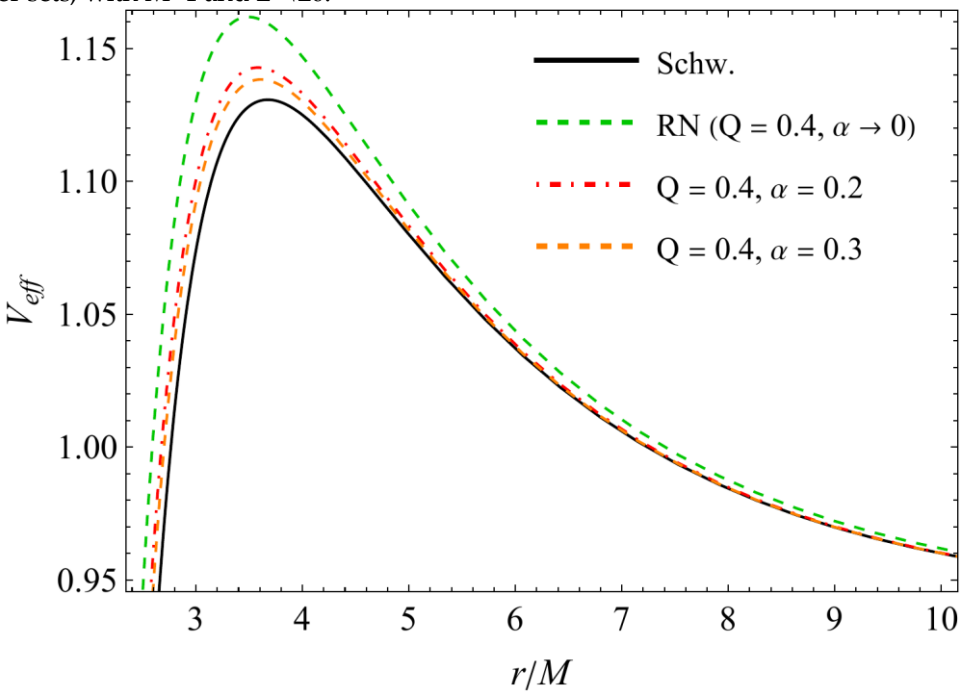


Fig. 3. Effective potential for neutral test-particle motion in the ENLMY spacetime; M = 1, L = √20.

All charged and screened cases lie above the Schwarzschild curve throughout the shown range, with no crossing between r=3M and r=10M. The Reissner–Nordström case (Q=0.4, α→0) produces the highest and left-most barrier; switching on the Yukawa screening lowers the barrier and shifts it back toward the Schwarzschild peak, with α=0.3 lying below α=0.2. Beyond r~6M the curves converge and become nearly indistinguishable, showing that the charge and screening effects on the orbital dynamics are confined to the near-horizon region, consistently with the horizon-structure trends of Section 2.

4. Discussion

The results of Sections 2 and 3 show a single, consistent pattern: the charge parameter Q and the Yukawa screening parameter α act on the ENLMY geometry in opposite directions. Increasing Q shrinks the outer horizon and raises the effective-potential barrier confining test particles closer to the black hole; increasing α reverses both trends and drives the geometry back toward the Schwarzschild limit. This opposition is already visible at the level of the metric function itself, where α enters only through the exponential prefactors multiplying Q^2, so that Yukawa screening can be read as an effective, radius-dependent suppression of the charge rather than as an independent deformation of the geometry.

The sign of the $E_1(\alpha r)$ term adopted here, as required by the field equations, removes two features that are otherwise difficult to interpret physically. First, with the previously reported sign, the horizon radius as a function of α develops a spurious crossing at which the ordering of the outer-horizon curves for different Q reverses; with the sign used here this reversal is absent, and the ordering by Q is preserved for every $\alpha \in (0,1)$, consistent with the intuitive expectation that a larger charge should not become "less compact" than a smaller one at some special screening strength. Second, the effective potential of the charged and screened cases no longer dips below the Schwarzschild curve at large radius; instead, all curves approach the Schwarzschild profile from above as r increases, without crossing it. Both features leave the qualitative motivation for the ENLMY construction untouched, but they change the quantitative predictions for the horizon structure and the effective potential, and must be propagated to any subsequent analysis built on this metric, including circular-orbit and QPO-frequency modeling.

5. Conclusion

We have re-derived the metric function of the Einstein–Nonlinear Maxwell–Yukawa black hole directly from its underlying nonlinear-electrodynamics field equations, verified the resulting closed form against the field equations themselves, and obtained a sign for the exponential-integral term that differs from a previously reported version of the same solution. Using this metric, we then derived the horizon structure and the effective potential of neutral test particles, and verified each result against the Schwarzschild and Reissner–Nordström limits.

The charge parameter Q and the Yukawa screening parameter α were found to act in opposite directions: the charge shrinks the horizon and raises the effective-potential barrier, while screening pushes the horizon outward and lowers the barrier back toward the Schwarzschild profile. This sign for the metric function also removes a spurious crossing in the horizon structure and a spurious dip of the effective potential below the Schwarzschild curve, both of which were artifacts of the previously reported sign rather than genuine physical effects.

Overall, our results establish an internally consistent description of the ENLMY horizon structure and effective potential that can serve as the starting point for further work. In particular, the circular-orbit quantities and characteristic radii built on this effective potential, and the frequencies associated with them, are left for a separate, dedicated analysis.

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NOLOKAL SHARTLARGA EGA BO‘ LGAN IKKINCHI TARTIBLI DIFFERENSIAL TENGLAMA O‘ ZAK FUNKSIYALARI SISTEMASINING BAZISLIGI HAQIDA

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Annotatsiya: *Ushbu ishda nolokal shartlarga ega bo‘ lgan ikkinchi tartibli oddiy differensial tenglama uchun chegaraviy masalalarning spektral xossalari o‘ rganilgan. Xos qiymatlar va ularga mos keladigan xos funksiyalar hamda ergashgan funksiyalar topilgan va ularning to‘ liqligi o‘ rganilgan. Ushbu masalalarning o‘ zak funksiyalarining Bessel va Gilbert xossalaridan foydalanib, ushbu sistemalarning Riss bazisi tashkil etishi isbotlangan.*

Kalit so‘ zlar: *nolokal masala, o‘ z-o‘ ziga qo‘ shma bo‘ lmagan masala, xos sonlar va xos funksiyalar, o‘ zak funksiyalar, to‘ lalik, Bessel xossasi, Gilbert xossasi, Riss bazisi.*

О БАЗИСНОСТИ СИСТЕМ КОРНЕВЫХ ФУНКЦИЙ ДИФФЕРЕНЦИАЛЬНОГО УРАВНЕНИЯ ВТОРОГО ПОРЯДКА С НЕЛОКАЛЬНЫМИ УСЛОВИЯМИ

Аннотация: *В данной работе исследованы спектральные свойства краевой задачи для обыкновенного дифференциального уравнения второго порядка с нелокальными условиями. Найдены собственные значения, соответствующие собственные и присоединенные функции, изучена их полнота. Также используя свойства бесселовости и гильбертовости корневых функций этих задач, доказывается базисность Рисса этих систем.*

Ключевые слова: *нелокальная задача, несамосопряженная задача, собственные значения и собственные функции, корневые функции, полнота, бесселовость, гильбертовость, базис Рисса.*

ON THE BASIS OF SYSTEMS OF ROOT FUNCTIONS OF A SECOND-ORDER DIFFERENTIAL EQUATION WITH NONLOCAL CONDITIONS

Abstract: *In this paper, we investigate the spectral properties of boundary value problems for a second-order ordinary differential equation with nonlocal conditions. We find the eigenvalues and corresponding eigenfunctions and associated functions, and study their completeness. Using the Bessel and Hilbert properties of the root functions of these problems, we prove the Riesz basis property of these systems.*

Keywords: *nonlocal problem, non-self-adjoint problem, eigenvalues and eigenfunctions, root functions, completeness, Bessel property, Hilbert property, Riesz basis.*

Введение и постановка задачи

Как известно, спектральная теория дифференциальных операторов составляет существенный раздел общей спектральной теории операторов и занимает особое место при исследованы различных начально-краевых задач для дифференциальных уравнений в частных производных.

Основной проблемой спектральной теории дифференциальных операторов, является теорема о разложении по собственным функциям, то есть изучение полноты и базисности систем корневых функций решаемых задач. Применяя спектральный метод для решения краевых задач, обычно мы приходим либо самосопряженной или, либо несамосопряженной спектральной задаче и следует отметит, что многие спектральные проблемы самосопряженных задач в данный момент теоретически решена [1], [2]. А что касается несамосопряженных задач, то решение вышеуказанных проблем в общем, неоднозначно, так как существует различные способы построения корневых функций (точнее присоединённых функций). Следует отметить работы [3], [4], где была построена теория присоединенных функций и доказана полнота системы корневых функций широкого класса несамосопряженных

дифференциальных операторов. Отметим также работу [5], где авторы предложили другой способ построения присоединенных функций несамосопряженного дифференциального оператора. В работах [6]-[7] предложен конструктивный метод построения так называемой приведенной системы собственных и присоединенных функций несамосопряженного дифференциального оператора, а также доказаны необходимые и достаточные условия ее базисности. Отметим работы [8]-[10], где предлагаются и обосновываются новые формулы построения цепочек присоединенных функций несамосопряженных дифференциальных операторов. Аналогичные проблемы были изучены в работах [11] - [14].

Более подробную информацию о спектральных свойствах несамосопряженных дифференциальных операторов можно найти в монографиях [1], [2].

В данной работе исследуем полноту и базисность систем корневых функций краевых задач для дифференциального уравнение второго порядка с нелокальными условиями. Находим собственные числа, соответствующие собственные и присоединенные функции, изучаем их полноту. Далее, используя известные результаты работы [15], докажем базисность Рисса полученных систем.

Рассмотрим следующие задачи:

Задача 1. Требуется найти такие значения λ, для которых задача

$$X''(x) + \lambda X(x) = 0, 0 < x < 1, \quad (1)$$

$$X(0) = 0, X'(1) = aX'(0), \quad (2)$$

имеет нетривиальное решение.

Здесь a - произвольное действительное число, а λ - спектральный параметр.

Отметим, что при $a = 0$ задача (1)-(2) переходит в смешанную краевую задачу, а при $a = \pm 1$ - в известную задачу типа Самарского-Ионкина. Поэтому далее будем рассматривать общий случай, исключая перечисленные значения a.

Решение задачи 1.

Найдём собственные значения и собственные функции задачи 1. В случае $\lambda = 0$ общее решение уравнения (1) запишется в виде $X(x) = C_1 x + C_2$, где C_1, C_2 - произвольные действительные числа. Подставляя это решение в первое условие из (2) получим, что $X(x) = C_1 x$. Теперь из второго условие из (2) получим $C_1(1 - a) = 0$. Так как $a \neq 1$, отсюда $C_1 = 0$, то есть в этом случае собственные функции отсутствуют.

Пусть $\lambda < 0$. Положим $\lambda = -\mu^2, \mu > 0$. Тогда общее решение уравнения (1) имеет вид $X(x) = C_1 e^{\mu x} + C_2 e^{-\mu x}$. Подставляя это решение в первое условие из (2) получим, что

$$C_1 + C_2 = 0 \Rightarrow C_2 = -C_1 \Rightarrow X(x) = C_1(e^{\mu x} - e^{-\mu x})$$

Подставляем это решение во второе условие из (2), тогда для нахождения μ получим уравнение $ch\mu = a$. Отметим, что $ch\mu \geq 1$ и $ch\mu$, как функция от μ, возрастает при $\mu > 0$, причём знак равенство имеет место при $\mu = 0$. Отсюда следует, что при $a < 1$ полученное уравнение не имеет решения, а при $a > 1$ имеет одно решение, которого обозначим через μ_0. Таким образом, задача 1 при $\lambda < 0$ и $a > 1$ имеет одно собственное значение $\lambda_0 = -\mu_0^2, \mu_0 > 0$, которому соответствует собственная функция вида $X_{\lambda_0}(x) = sh\mu_0 x$.

Рассмотрим случай $\lambda > 0$. Положим, $\lambda = \mu^2, \mu > 0$. Тогда общее решение уравнения (1) имеет вид $X(x) = C_1 \cos \mu x + C_2 \sin \mu x$. Подставляя это решение в первое условие из (2), получаем $C_1 = 0$. Далее, учитывая второе условие из (2), для нахождения собственных чисел получим уравнение $\cos \mu = a$, которое имеет решения только при условии $|a| \leq 1$. По условию $a \neq 0; \pm 1$, поэтому далее рассмотрим случай $a \in (-1,0) \cup (0,1)$. Тогда решение уравнения $\cos \mu = a$ имеет вид $\mu = \pm \arccos a + 2\pi k, k \in \mathbb{Z}$. Через L обозначим множество собственных значений задачи 1 в случае $\lambda > 0$. Тогда

$$L = \{\lambda_{ik} \in R^+ : \lambda_{10} = \alpha^2, \lambda_{1k} = (\alpha + 2\pi k)^2, \lambda_{2k} = (-\alpha + 2\pi k)^2, i = 1,2; k \in \mathbb{N}\},$$

где $\alpha = \arccos a \in \left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right)$. Соответствующие собственные функции имеют вид ($\lambda = \mu^2, \mu > 0$)

$$X_{10}(x) = \sin \mu_{10} x, X_{1k}(x) = \sin \mu_{1k} x, X_{2k}(x) = \sin \mu_{2k} x, k \in \mathbb{N}. \quad (5)$$

Легко показать, что алгебраическая и геометрическая кратность собственных значений совпадают и равны единице. Таким образом, у задачи 1 отсутствуют присоединенные функции, то есть корневое пространство этой задачи состоит только из собственных функций.

Следствие 1. $\lambda = 0$ является собственным значением задачи 1, тогда и только тогда, когда $a = 1$.

Следствие 2. В случае $\lambda < 0$ при условии $a > 1$ существует одна собственная функция задачи (1) вида $X_{\lambda_0}(x) = sh\mu_0 x$.

Отметим, что спектральная задача (1)-(2) - несамосопряженная, и значит, система собственных функций (5) не ортогональная. Тогда, согласно спектральной теории операторов, возникает проблема исследования задачи, сопряженной к задаче (1)-(2) и нетрудно видеть, что сопряженной к ней будет задача:

$$Y''(x) + \lambda Y(x) = 0, 0 < x < 1, \quad (6)$$

$$Y'(0) = 0, Y(0) = aY(1). \quad (7)$$

Исследование задачи (6)-(7) аналогично задаче 1. Множество собственных значений задачи совпадает со множеством L, а система собственных функций имеет вид

$$Y_{10}(x) = \frac{2\cos\alpha(1-x)}{\sqrt{1-a^2}}, Y_{1k}(x) = \frac{2\cos\mu_{1k}(1-x)}{\sqrt{1-a^2}}, Y_{2k}(x) = -\frac{2\cos\mu_{2k}(1-x)}{\sqrt{1-a^2}}, k \in \mathbb{N}. \quad (8)$$

Полнота и базисность систем собственных функций задач (1)-(2)

Рассмотрим задачу 1 и докажем полноту системы собственных функций этой задачи при $\alpha \in \left(0,\frac{\pi}{2}\right) \cup \left(\frac{\pi}{2},\pi\right)$. Имеет место:

Теорема 1. Система собственных функций (5) и (8) полны в пространстве $L_2(0,1)$.

Докажем полноту системы (5). Отметим, что в случае $\alpha \in \left(0,\frac{\pi}{2}\right)$ полноту этой системы можно установить без использования специальных инструментов теории спектрального анализа. *Действительно*, предположим, что система (5) не полна. Тогда согласно определению полноты, существует отличная от нуля функция $f(x) \in L_2(0,1)$, такая, что она ортогональна всем функциям системы (5), то есть

$$\int_0^1 f(x)\sin\mu_{ik}\,xdx = 0, \mu_{ik} \in L, i = 1,2. \quad (9)$$

Учитывая вид собственных значений, (9) представим в виде

$$\int_0^1 f(x)\sin\mu_{10}\,xdx = \int_0^1 f(x)\sin\alpha\,xdx = 0,$$

$$\int_0^1 f(x)\sin\mu_{1k}\,xdx = A_k + B_k = 0, \int_0^1 f(x)\sin\mu_{2k}\,xdx = A_k - B_k = 0,$$

где

$$A_k = \int_0^1 f(x)\cos\alpha\,x\sin 2\pi kxdx\,, B_k = \int_0^1 f(x)\sin\alpha\,x\cos 2\pi kxdx.$$

Из этих соотношений получим $A_k = B_k = 0, k \in \mathbb{N}$, так что

$$\int_0^1 f(x)\sin\alpha\,xdx = 0, \int_0^1 f(x)\cos\alpha\,x\sin 2\pi kxdx = 0,$$

$$\int_0^1 f(x)\sin\alpha\,x\cos 2\pi kxdx = 0. \quad (10)$$

Рассмотрим полную ортонормированную в $L_2(0,1)$ тригонометрическую систему функций

$$\{1, \cos(2\pi nx), \sin(2\pi nx)\}_{n\in\mathbb{N}}. \quad (11)$$

Так как $f(x) \in L_2(0,1)$, справедливы следующие разложения

$$f(x)\cos\alpha\,x = b_0 + \sum_{n=1}^{\infty}(a_n\sin(2\pi nx) + b_n\cos(2\pi nx)),$$

$$f(x)\sin\alpha\,x = d_0 + \sum_{n=1}^{\infty}(c_n\sin(2\pi nx) + d_n\cos(2\pi nx)),$$

которые сходятся в $L_2(0,1)$. Здесь a_n, b_n и c_n, d_n - соответственно коэффициенты Фурье функций $f(x)\cos\alpha\,x$ и $f(x)\sin\alpha\,x$ по ортонормированной системе (11).

Согласно соотношениям (10), эти разложения примут вид

$$f(x)\cos\alpha\,x = b_0 + \sum_{n=1}^{\infty} b_n\cos(2\pi nx),\ f(x)\sin\alpha\,x = \sum_{n=1}^{\infty} c_n\sin(2\pi nx),$$

из чего следует ортогональность функций $f(x)\sin\alpha\,x$ и $f(x)\cos\alpha\,x$, то есть

$$\int_0^1 f^2(x)\sin\alpha\,x\cos\alpha\,xdx = 0 \Leftrightarrow \int_0^1 f^2(x)\sin 2\alpha xdx = 0.$$

Так как $\sin 2\alpha x > 0$ при $\alpha \in \left(0,\frac{\pi}{2}\right)$, получим $f(x) = 0$ почти всюду в $L_2(0,1)$. Отсюда следует полнота системы (5) в $L_2(0,1)$ в случае $\alpha \in \left(0,\frac{\pi}{2}\right)$.

Доказательство теоремы 1. *Для* доказательства полноты системы мы пользуемся принципом Фрагмена–*Линделёфа* [16], основанным на свойствах целых функций:

Лемма 1. *Пусть выполнены следующие условия:*

а) функция f голоморфна внутри угла раствора $\beta\pi$, где $\beta \in (0,2)$, и f непрерывна в замыкании этого угла;

б) на сторонах угла выполнена оценка $|f(x)| \le M$, где M - некоторая константа;

в) существует число $\rho \in \left(0,\frac{1}{\beta}\right)$ такое, что $f(z) = O\left(e^{|z|^\rho}\right)$ при $z \to \infty$ внутри угла. Тогда оценка $|f(x)| \le M$ справедлива при всех z из указанного угла.

Предположим, что система (5) не полна в $L_2(0,1)$. Тогда, существует функция $f(x) \in L_2(0,1)$, $f(x) \neq 0$ такая, что

$$\int_0^1 f(x)\sin\mu_{ik}\,xdx = 0, \mu_{ik} \in L.$$

Определим функцию комплексного переменного $N(z) = \int_0^1 f(x)\sin(zx)dx$. Покажем, что $N(z)$ - целая функция. *Действительно*, используя разложение $\sin(zx)$ в степенной ряд и равномерную сходимость этого ряда на компактах по z, можно интегрировать почленно, откуда следует голоморфность $N(z)$ на всей комплексной плоскости. Кроме того, из оценки $|\sin(zx)| \le e^{|Im\,z|}$ при $x \in [0,1]$ получаем

$$|N(z)| \le \int_0^1 |f(x)|\,|sin(zx)|dx \le e^{|Im\,z|}\int_0^1 |f(x)|\,dx = \|f\|_{L_1(0,1)}e^{|Im\,z|}.$$

Из последней оценки следует, что $N(z)$ является целой функцией порядка не выше первого.

Определяем также целую функцию $D(z) = cos\,z - a$. Так как $D(\mu) = 0$ при $\mu \in L$, $D'(z) = -sin\,z$ и $sin\,\mu \neq 0$при $\mu \in L$, отсюда получим, что нули $D(z)$ простые. Рассмотрим теперь функцию $F(z) = \frac{N(z)}{D(z)}$. Так как $N(\mu) = 0$ при $\mu \in L$, то точки μ из L являются устранимыми особенными точками функции $F(z)$. Следовательно, $F(z)$ - целая функция. Так как $F(z)$ это отношение двух целых функций порядка не выше первого, то $F(z)$ также имеет порядок не выше первого.

Рассмотрим сектор $\Lambda = \{z \in \mathbb{C}: |\,arg\,z\,| < \pi/4\}$. На лучах $arg\,z = \pm\pi/4$ имеем $z = re^{\pm i\pi/4}$, значит $|Im\,z| = r/\sqrt{2}$. Из полученной ранее оценки для числителя имеем на границе $|N(z)| \le \|f\|_{L_1(0,1)}e^{|z|/\sqrt{2}}$. Учитывая, что

$$|\,cos\,z\,| \sim \frac{e^{|Im\,z|}}{2} \text{ при } Im\,z \to \infty$$

и используя обратное неравенство треугольника, получаем для знаменателя на границе имеем $|D(z)| = |\,cos\,z - a| \ge ce^{|Im\,z|}$, здесь и далее через $c > 0$ обозначается положительная константа, не зависящая от z. Тогда из оценок для $N(z)$ и $D(z)$ следует

$$|F(z)| = \left|\frac{N(z)}{D(z)}\right| \le \frac{\|f\|e^{|Im\,z|}}{ce^{|Im\,z|}} = \frac{\|f\|}{c} = M.$$

Так как $F(z)$ является целой функцией порядка не выше первого, то для любого $\varepsilon > 0$ при $z \to \infty$ имеет место $|F(z)| \le e^{|z|^{1+\varepsilon}}$. Здесь показатель $1 + \varepsilon < 2 = 1/\beta$, поэтому выполнено условие роста из леммы Фрагмена-Линделёфа. Следовательно, получаем ограниченность функции $F(z)$ во всем секторе Λ. Таким же образом получим ограниченность $F(z)$ в остальных трех секторах, которые вместе с первым, включая их границы, покрывают всю комплексную плоскость. Значит, $F(z)$ ограничена на всей комплексной плоскости $\mathbb{C}$. Тогда, согласно теореме Лиувилля [16], функция $F(z)$ является постоянной, то есть $F(z) \equiv C$. Так как $F(0) = 0$, отсюда получим $C = 0 \Leftrightarrow F(z) = 0$. Таким образом,

$$N(z) = \int_0^1 f(x)\,sin\,z\,xdx = 0, z \in \mathbb{C}.$$

Отсюда, при $z_k = \pi k, k = 1,2,\ldots$ также имеем $N(\pi k) = \int_0^1 f(x)\,sin\,\pi\,kxdx = 0$. Так как $\{sin\,\pi\,kx\}, k = 1,2,\ldots$ полная система в $L_2(0,1)$, тогда $f(x) = 0$. А это противоречит условию $f(x) \neq 0$. Полнота системы (8) доказывается аналогично. Теорема 1 доказана.

Лемма 2. *Для любой функции* $f(x) \in L_2(0,1)$ ряды

$$\left(\int_0^1 f(x)X_{10}(x)dx\right)^2 + \sum_{k=1}^{\infty}\left(\int_0^1 f(x)X_{1k}(x)dx\right)^2 + \sum_{k=1}^{\infty}\left(\int_0^1 f(x)X_{2k}(x)dx\right)^2,\left(\int_0^1 f(x)Y_{10}(x)dx\right)^2 +$$
$$\sum_{k=1}^{\infty}\left(\int_0^1 f(x)Y_{1k}(x)dx\right)^2 + \sum_{k=1}^{\infty}\left(\int_0^1 f(x)Y_{2k}(x)dx\right)^2$$

сходятся.

Доказательство. Покажем сходимость ряда (10). Учитывая (5), обозначим

$$I = \left(\int_0^1 f(x)\,sin\,\alpha\,xdx\right)^2, I_i = \sum_{k=1}^{\infty}\left(\int_0^1 f(x)\,sin\,\mu_{ik}\,xdx\right)^2, i = 1,2.$$

Так как $f(x) \in L_2(0,1)$, $|\,sin\,x\,| \le 1$, отсюда I - конечная. Далее, учитывая соотношение

$$\int_0^1 f(x)\,sin\,\mu_{1k}\,xdx = \int_0^1 f(x)\,cos\,\alpha\,x\,sin\,2\,\pi kxdx + \int_0^1 f(x)\,sin\,\alpha\,x\,cos\,2\,\pi kxdx,$$

а также неравенство $(a+b)^2 \le 2(a^2+b^2)$ оценим $I_1 \le \sum_{k=1}^{\infty}(a_k^2 + b_k^2)$. Здесь $a_k = \left(f(x)\,sin\,\alpha\,x, \sqrt{2}\,cos\,2\,\pi kx\right)$ и $b_k = \left(f(x)\,cos\,\alpha\,x, \sqrt{2}\,sin\,2\,\pi kx\right)$ соответственно коэффициенты Фурье функций $f(x)\,sin\,\alpha\,x$ и $f(x)\,cos\,\alpha\,x$ по ортонормированной системе $\sqrt{2}\,cos\,2\,\pi kx$ и $\sqrt{2}\,sin\,2\,\pi kx$. Тогда применяя неравенство Бесселя, имеем

$$I_1 = \sum_{k=1}^{\infty}(f(x), sin\,\mu_{1k}\,x)^2 \le \|f(x)\,sin\,\alpha\,x\|_{L_2(0,1)}^2 + \|f(x)\,cos\,\alpha\,x\|_{L_2(0,1)}^2,$$

отсюда I_1 - конечная. Аналогично получим, что $I_2 < \infty$. Отсюда и следует сходимость ряда (10). Сходимость ряда (11) доказывается аналогично.

Лемма 3. Системы (5) и (8) образуют биортонормированную пару в $L_2(0,1)$.

Доказательство леммы 3 проводится непосредственно с помощью вычисления соответствующих интегралов, согласно определению биортонормированных систем [11], [15].

Теорема 2. Системы (5) и (8) образуют базис Рисса в $L_2(0,1)$.

Доказательство. Отметим, что согласно определению из [15], полная биортонормированная система называется базисом Рисса, если она является бесселовой и гильбертовой одновременно и леммы 2 и 3 показывают биортонормированность и бесселовость систем (5) и (8). Тогда согласно Теореме 2.1 из [17] также следует гильбертовость этих систем. Таким образом, системы (5) и (8) образуют базис Рисса в $L_2(0,1)$. Теорема 2 доказана.

Заключение

В работе исследованы спектральные свойства краевой задачи для обыкновенного дифференциального уравнения второго порядка с нелокальными условиями. Получены явные формулы для собственных значений,

собственных и присоединённых функций рассматриваемой задачи, а также соответствующей сопряжённой задачи. Установлена полнота систем корневых функций в пространстве $L_2(0,1)$. Кроме того, доказано, что системы корневых функций рассматриваемой задачи и сопряжённой к ней задачи образуют биортогональную пару и являются базисами Рисса в пространстве $L_2(0,1)$.

Полученные результаты дополняют исследования спектральных свойств несамосопряжённых дифференциальных операторов с нелокальными краевыми условиями и могут быть использованы при изучении более общих нелокальных задач математической физики.

Вклад авторов, конфликт интересов и финансирование

Исследование проводилось без внешней финансовой поддержки.

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LEGIRLANGAN SILIKAT SHISHADA ZEEBEK EFFEKTIGA CuO TA’SIRI

Annotatsiya: *Ushbu maqolada* $2SiO_2 \cdot PbO$ *matrisali silikat shisha-keramikalarining termoelektrik xossalari va Zeebek koeffitsientiga mis oksidi* (CuO) *ning ta‘siri tadqiq etilgan. Izlanishda ilgari o‘ rganilgan binar tizim* (60% *shisha matritsa* + 40% RuO_2) *tayanch namuna sifatida olinib, undagi qimmatbaho* RuO_2 *ning massa ulushi mos ravishda* 30%, 25%, *va* 20% *gacha kamaytirildi hamda uning o‘ rniga* 10%, 15%, *va* 20% *miqdorda* CuO *ligatura modda sifatida kiritildi. Olingan namunalar uchun temperaturaning* $350 - 1100\ K$ *oraliqlarida namuna Zeebek koeffitsiyenti* $S(T)$ *va solishtirma qarshiligi* $\rho(T)$ *natijalari tahlil qilindi. Natijalar shuni ko‘ rsatdiki,* CuO *miqdorining oshishi shisha matrisasida polyaronli o‘ tkazuvchanlik va zaryad tashuvchilar konsentratsiyasini o‘ zgartirib, termoelektrik samaradorlikni oshirishga imkon beradi. Olingan ma’lumotlar yangi turdagi arzon va barqaror shisha-keramika termoelektrik materiallarini yaratishda muhim ilmiy-amaliy ahamiyatga ega.*

Kalit so‘ zlar: *Silikat shisha, Zeebek effekti, termoelektrik koeffitsient,* RuO_2, CuO, *legirlash, polyaron o‘ tkazuvchanlik, shisha-keramika.*

ВЛИЯНИЕ CuO НА ЭФФЕКТ ЗЕЕБЕКА В ЛЕГИРОВАННОМ СИЛИКАТНОМ СТЕКЛЕ

Аннотация: *В данной статье исследовано влияние оксида меди* (CuO) *на термоэлектрические свойства и коэффициент Зеебека силикатных стеклокерамик с матрицей* $2SiO_2 \cdot PbO$ *В качестве эталонного образца была взята ранее изученная бинарная система* (60% *стеклянная матрица* + 40% RuO_2), *в которой массовая доля дорогостоящего* RuO_2 *была последовательно снижена до* 30%, 25%, *и* 20%, *а взамен введен* CuO *в качестве легирующего компонента в количестве* 10%, 15%, *и* 20% *соответственно. Для полученных образцов был проведен анализ температурных зависимостей коэффициента Зеебека* $S(T)$ *и удельного электрического сопротивления* $\rho(T)$ *в температурном интервале* $350 - 1100\ K$. *Результаты показали, что увеличение содержания* CuO *за счет изменения полярoнной проводимости и концентрации носителей заряда в стеклянной матрице позволяет повысить термоэлектрическую эффективность. Полученные данные имеют важное научно-практическое значение для создания новых типов недорогих и стабильных стеклокерамических термоэлектрических материалов.*

Ключевые слова: *Силикатное стекло, эффект Зеебека, термоэлектрический коэффициент,* RuO, CuO, *легирование, поляронная проводимость, стеклокерамика.*

THE EFFECT OF CuO ON THE SEEBECK EFFECT IN DOPED SILICATE GLASS

Abstract: *This article investigates the effect of copper oxide* CuO *on the thermoelectric properties and Seebeck coefficient of silicate glass-ceramics based on a* $2SiO_2 \cdot PbO$ *matrix. Taking the previously studied binary system* (60% *glass matrix* + 40% RuO_2) *as a reference sample, the mass fraction of expensive* RuO_2 *was gradually reduced to* 30%, 25%, *and* 20%, *while* CuO *was introduced as a dopant component in amounts of* 10%, 15%, *and* 20%, *respectively. The temperature dependencies of the Seebeck coefficient* $S(T)$ *and electrical resistivity* $\rho(T)$ *were analyzed for the obtained samples in the temperature range of* $350 - 1100\ K$. *The results revealed that increasing the* CuO *content enables an increase in thermoelectric efficiency by altering the small polaron conduction and charge carrier concentration in the glass matrix. The obtained data hold significant scientific and practical importance for developing novel, cost-effective, and stable glass-ceramic thermoelectric materials.*

Keywords: *Silicate glass, Seebeck effect, thermoelectric coefficient,* RuO, CuO, *doping, polaron conduction, glass-ceramics.*

Kirish

Zamonaviy qattiq jism fizikasi va materialshunoslikning eng dolzarb yo‘ nalishlaridan biri bu tashlandiq issiqlik energiyasini bevosita elektr energiyasiga aylantirib beruvchi yuqori samarali termoelektrik materiallarni yaratishdir. An’anaviy yarimtkazgichli termoelektrik materiallar yuqori haroratlarda kimyoviy va termik beqarorlikka egaligi hamda havoda tez oksidlanishi sababli, ularning o‘ rniga yuqori haroratga chidamli, kimyoviy barqaror va arzon shisha-keramika kompozitlarini qo‘ llashga bo‘ lgan qiziqish ortib bormoqda.

Silikat shisha sistemalari, xususan $2SiO_2 \cdot PbO$ matrisali shishalar, ajoyib texnologik va termodinamik xossalari bilan ajralib turadi. Ushbu shisha matrisaga o‘ tish metallari oksidlarini legirlash orqali ularda elektron va polyaronli o‘ tkazuvchanlik mexanizmlarini shakllantirish mumkin. Ilgari o‘ tkazilgan tadqiqotlarda 60% $(2SiO_2 \cdot PbO) + 40\%\ RuO_2$ binar tizimi yuqori o‘ tkazuvchanlik va sezilarli Zeebek koeffitsientini namoyon etgani ko‘ rsatilgan. Biroq, RuO_2 ning nihoyatda qimmatbaho va noyob birikma ekanligi ushbu materiallarni keng miqyosda sanoatda qo‘ llashni cheklaydi.

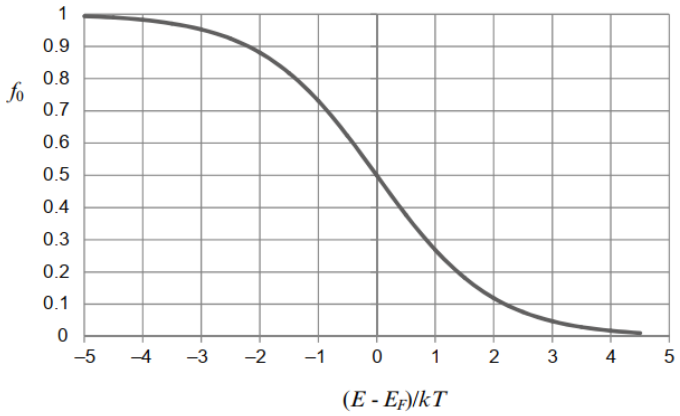
Shu munosabat bilan, RuO_2 ning bir qismini arzonroq va barqaror bo‘ lgan mis oksidi (CuO) bilan almashtirish hamda u yaratadigan kichik radiusli polyaron sakrash (small polaron hopping) mexanizmlarini tadqiq etish muhim ilmiy va amaliy masaladir. Mis ionlarining har xil valentlik holatlari $(Cu^+ \ / \ Cu^{2+})$ shisha matrisasida zaryad tashuvchilar konsentratsiyasi va ularning harakatchanligini boshqarishga imkon beradi.

Ushbu tadqiqotning maqsadi: $2SiO_2 \cdot PbO$ shisha matrisasida RuO_2 miqdorini bosqichma-bosqich kamaytirib $(40\% \rightarrow 30\% \rightarrow 25\% \rightarrow 20\%)$ uning o‘ rniga CuO oksidini (10%, 15%, 20%) kiritish orqali olingan shisha-keramikalarining $350 - 1100\ K$ harorat oraliqlarida Zeebek koeffitsiyenti $S(T)$ hamda solishtirma qarshiligi $\rho(T)$ o‘ zgarish qonuniyatlarini aniqlash va ulardagi termoelektrik jarayonlarni tahlil qilishdan iborat.

Metall va yarimo‘ tkazgichlarning termoelektrik xossalari

Termoelementlar asosan kristalli tuzilishga ega qattiq jismlardan yasaladi. Ular har doim ham monokristal bo‘ lmasa-da, kristall tabiatini mikroskopda yaqqol ko‘ rish mumkin. Ayrim hollarda transport xossalari kristall yo‘ nalishiga qarab farq qilishi mumkin, biroq aniq misollarga o‘ tgunimizcha, hozircha bu xossalar barcha yo‘ nalishlarda bir xil deb faraz qilamiz. Qattiq jismlarda elektr zaryadi kvazi-erkin elektronlar orqali tashiydi. Biz asosan metallar va yarimo‘ tkazgichlar bilan shug‘ ullanamiz. Bunday materiallarda elektronlar faqat zaryadni emas, balki issiqlik energiyasini ham o‘ zi bilan olib yuradi, ya’ni issiqlik o‘ tkazuvchanligining elektron tashkil etuvchisi mavjud. Keyinchalik ko‘ rib chiqamizki, issiqlik kristaldagi atomlarning tebranishlari hisobiga ham uzatilishi mumkin, lekin hozircha faqat elektron jarayonlar bilan cheklanamiz. Materiallarda elektronlar orqali o‘ tkazuvchanlik g‘ oyasi ilk bor Drude va Lorentz tomonidan klassik fizika qonuniyatlariga asoslangan holda taklif etilgan [1]. Klassik erkin elektron nazariyasiga ko‘ ra, metallarning solishtirma issiqlik sig‘ imi elektr izolyatornikidan sezilarli darajada katta chiqishi kerak edi, biroq amalda ularning farqi unchalik katta emas. Bu ziddiyat Sommerfeld o‘ z davrida yangi yaratilgan kvant nazariyasini tatbiq etgachgina bartaraf etildi. Shunga qaramay, na klassik, na oddiy kvant mexanikasiga asoslangan erkin elektron nazariyalari nima uchun ayrim qattiq jismlar metall, boshqalari esa izolyator ekanligini to‘ liq izohlab berolmadi. Shunga qaramay, Sommerfeld nazariyasini tok tashuvchi elektronlarga qo‘ llash o‘ z o‘ rnida qoladi. Kvant nazariyasiga muvofiq, elektronning energiya holati (E) va uning band bo‘ lish ehtimolligi Fermi taqsimoti orqali aniqlanadi [2].

$$f_0(E) = \left[exp\left(\frac{E-E_F}{k_BT}\right) + 1\right]^{-1} \qquad (1)$$



1–rasm. Fermi taqsimot funksiyasining $(\mathbf{E - E_F})/\mathbf{k_BT}$ ga nisbatan grafigi

E_F miqdori joylashtirilishi kerak bo‘ lgan elektronlarning umumiy soniga bog‘ liq bo‘ lgan qiymatga ega va k Boltsman doimiysi. Fermi taqsimot funktsiyasi $E - E_F \gg kT$ bo‘ lganda nolga va $E - E_F \ll kT$ bo‘ lganda birlikka teng degan xususiyatga ega. Noldan birlikka o‘ tish 1–rasmda ko‘ rsatilgandek juda tor energiya diapazonida sodir bo‘ ladi. Fermi taqsimot funktsiyasi 1/2 ga teng bo‘ lgan E_F energiyasi Fermi darajasi deb nomlanadi. Agar E va $E + dE$ orasidagi

energiya diapazonidagi ruxsat etilgan elektron holatlar soni $g(E)d(E)$ bilan ifodalansa, elektronlarning umumiy soni quyidagicha bo‘ ladi:

$$n = \int_0^{\infty} f_0(E)g(E)dE \qquad (2)$$

Har bir elektron holati nafaqat uning energiyasi, balki impulsi yoki aniqrog‘ i, to‘ lqin vektori bilan ham belgilanadi. Shunday qilib, to‘ lqin–vektor fazosida ma’lum bir pozitsiyada ruxsat etilgan energiya diapazonlari orasida bo‘ shliqlar bo‘ lishi mumkin bo‘ lsa–da, diapazonlar oddiy energiya diapazoni diagrammasida hali ham bir–birining ustiga chiqishi mumkin [3].

Tartibsiz strukturali shisha-keramika sistemalarida o‘ tish metallari ionlarining har xil valentlik holatlari (masalan, Cu^{+} / Cu^{2+} yoki Ru^{3+} / Ru^{4+}) o‘ rtasida zaryad tashuvchilarning sakrash mexanizmi amalda bo‘ ladi. Yuqori haroratlarda ($T > \frac{1}{2}\Theta_D$, bu yerda Θ_D – Debye temperaturasi) elektr o‘ tkazuvchanlik kichik radiusli polyaron sakrash (Small Polaron Hopping – SPH) modeli bilan ta’riflanadi [4]:

$$\sigma = \frac{\sigma_0}{T} \cdot exp\left(-\frac{E_\sigma}{k_B T}\right) \qquad (3)$$

bu yerda:

- σ_0 – haroratga bog‘ liq bo‘ lmagan eksponenta oldi ko‘ paytuvchisi;
- E_σ – o‘ tkazuvchanlikning aktivlashish energiyasi;
- k_B – Bolsman doimiysi ($8.617 \cdot 10^{-5} eV/K$);
- T – absolyut harorat (K).

Solishtirma qarshilik $\rho(T) = 1/\sigma(T)$ bo‘ lgani uchun tenglamani chiziqli ko‘ rinishga keltirib, aktivlashish energiyasini $\ln(\rho/T)$ ning $1000/T$ ga bog‘ liqlik grafigi og‘ ish burchagidan topish mumkin:

$$\ln\left(\frac{\rho}{T}\right) = \ln\left(\frac{1}{\sigma_0}\right) + \frac{E_\sigma}{k_B T} \qquad (4)$$

Zeebek koeffitsienti (S) uchun Heikes va Mott formulalariga ko‘ ra haroratga bog‘ liq formula paydo bo‘ ladi [5]:

$$S = \frac{k_B}{e} \cdot \left[\ln\left(\frac{1-c}{c}\right) + \frac{Q^*}{k_B T}\right] \qquad (5)$$

bu yerda:

- e – electron zaryadi;
- $c = [Cu^{+}]/[Cu_{umumiy}]$ – o‘ tish metall ionlarining past valentlik holatidagi nisbiy konsentratsiyasi;
- Q^*– polyaronning issiqlik o‘ tkazish energiyasi (ko‘ pincha $Q^* << E_\sigma$ bo‘ ladi va yuqori haroratda S qiymati to‘ yinishga intiladi).

Tadqiqotda foydalaniladigan S71-K shisha namunasi xossalari

Tadqiqotda foydalanilgan S71–K markali shisha ikki komponentli qo‘ rg‘ oshinli silikat shishalar turkumiga kiradi. Mazkur shishaning tarkibi massa ulushi bo‘ yicha 33% kremniy dioksidi (SiO_2) va 67% qo‘ rg‘ oshin oksidi (PbO) dan iborat. Tarkib tahlilidan ma’lum bo‘ lishicha, undagi yuqori miqdordagi qo‘ rg‘ oshin oksidi materialning fizik va elektr parametrlariga bevosita ta’sir ko‘ rsatadi. Bunda kremniy dioksidi asosiy shisha hosil qiluvchi komponent vazifasini bajaradi. U fazoda o‘ zaro birikib, tetraedrik karkas hosil qiladi va shu orqali materialga mustahkamlik hamda kimyoviy turg‘ unlik bag‘ ishlaydi. Odatda toza silikat shishalarning bu tarmog‘ i zich va tartibli tuzilgan bo‘ ladi. Biroq tarkibga qo‘ rg‘ oshin oksidi qo‘ shilganda mazkur tarmoq tarqoqlashib, yangi strukturaviy o‘ zgarishlar kelib chiqadi. Buning oqibatida shishaning ichki tuzilishida erkin yoki bo‘ sh bog‘ langan kislorod ionlari ko‘ payadi.

Qo‘ rg‘ oshin oksidi bu yerda modifikator vazifasini bajarib, silikat qafasiga joylashadi va kremniy–kislorod bog‘ lanishlarini qisman bo‘ shashtiradi, natijada materialning zichligi ortadi. Shu sababli S71–K markali shisha oddiy silikat turlariga qaraganda og‘ irroq hamda optik jihatdan zichroq chiqadi. Qo‘ rg‘ oshin ionlarining og‘ ir atom massasi va yuqori qutblanish xususiyati materialning sindirish ko‘ rsatkichini oshiradi. Bu esa mazkur turdagi shishalardan optika sohasida va maxsus maqsadlardagi materiallar sifatida foydalanish imkonini beradi. Nazariy nuqtai nazardan, PbO miqdorining ko‘ pligi shishaning yumshash haroratini tushiradi va uni eritish jarayonini birmuncha osonlashtiradi. Bu texnologik jihatdan katta ustunlik beradi, sababi namunalarni sintez qilish jarayonini pastroq haroratlarda amalga oshirish imkonini yaratadi. Qolaversa, tarkibda qo‘ rg‘ oshin oksidining ko‘ pligi ionlarning ko‘ chish tezligini oshirib, diffuziya jarayonlarini jadallashtirishi mumkin. Aynan shu xususiyat S71–K markali shishani diffuziya qonuniyatlarini tahlil qilish uchun qulay obyektdir. Elektr xususiyatlari jihatidan ham mazkur tarkib katta ilmiy qiziqish uyg‘ otadi. Kremniy-kislorod karkasi ichida qo‘ rg‘ oshin ionlarining bo‘ lishi zaryad tashuvchilarning harakatlanishiga ma’lum ma’noda sharoit yaratadi. Harorat ko‘ tarilishi bilan elektr o‘ tkazuvchanlik qiymati keskin ortishi kuzatiladi. Shu bois bunday shishalar termoelektrik hamda dielektrik yo‘ nalishdagi tadqiqotlarda muhim o‘ rin tutadi. Xulosa qilib aytganda, S71–K markali shisha nisbatan sodda tuzilishiga qaramay, shisha hosil qiluvchi va modifikator moddalar o‘ rtasidagi o‘ zaro ta’sirni yaqqol ko‘ rsatadi. Tarkibdagi qo‘ rg‘ oshin oksidining yuqori ulushi materialga yuqori zichlik, qulay optik parametrlar, pastroq yumshash chegarasi va faol diffuziya xossalarini bag‘ ishlaydi. Natijada u ham amaliy tajribalar, ham nazariy izlanishlar uchun muhim materiallardan biri bo‘ lib xizmat qiladi.

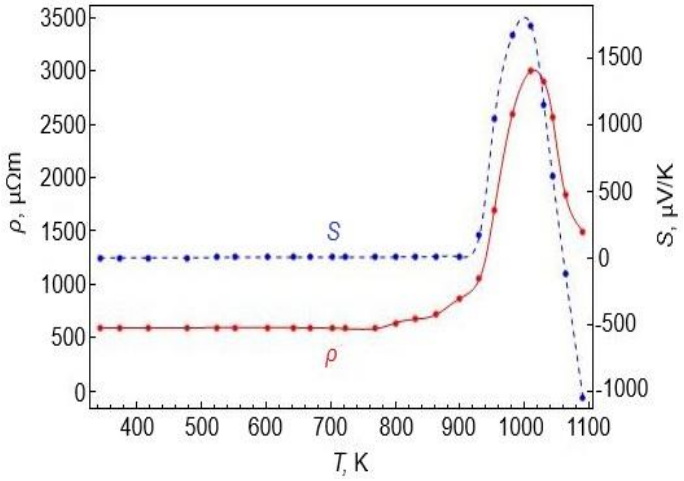


2-rasm. Legirlangan silikat shisha asosidagi qalin qatlamli resistor. 1-kontakt qatlam, 2-rezistiv qatlam va 3-keramik qatlam.

Termoelektrik xossalari tekshiriladigan namunalar avval pasta holatiga keltirib aralashtiriladi va trafaret bosish (screen printing) usuli yordamida Al_2O_3 keramik taglik (96% toza) ustiga standart to‘ rtburchak ko‘ rinishida yupqa qatlam sifatida tatbiq etildi. Namunalar oldin $150°C$ da quritildi, so‘ ngra konveyer pechida yuqori haroratlarda 10 daqiqa davomida pishiriladi.

Legirlangan silikat shishada RuO_2 nanozarrachalarining holati tahlili

Silikat shishalarini legirlash jarayonida qo‘ shimcha (ligatura) zarralarining muayyan qismi asos ichida kristall holatida saqlanib qoladi. Ilmiy manbalarda aynan ushbu qoldiq kristallar zaryad tashuvchilarni to‘ plovchi (lokallovchi) markazlar vazifasini o‘ tashi hamda legirlangan silikat shishalarida (LSSh) elektr o‘ tkazuvchanlik Mott mexanizmi, ya’ni o‘ zgaruvchan masofaga sakrash orqali amalga oshishi haqidagi gipotezalar ko‘ p bor ilgari surilgan. Shunga qaramay, bu nazariy farazlar o‘ zining amaliy isbotini topmagan. Tadqiqotlarda $2SiO_2 \cdot PbO$ shisha sistemasi uchun 1000 atomdan iborat model doirasida o‘ tkazilgan ab initio molekulyar dinamika (AIMD) simulyatsiyalari natijalari (snapshotlar) shuni namoyish etadiki, atomlar shisha asossi bo‘ ylab fazoviy jihatdan bir xilda (gomogen) taqsimlangan [6].

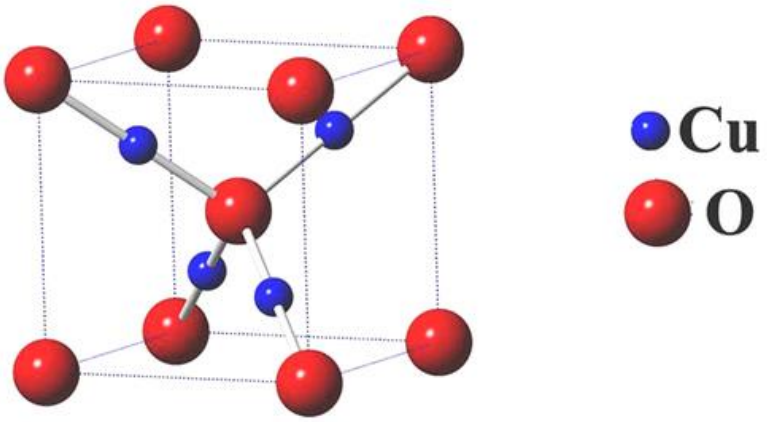


3–rasm. RuO_2 bilan legirlangan $2SiO_2 \cdot PbO$ tarkibli shishada solishtirma qarshilik ρ va termoEYuK koeffitsienti S ning temperatura bo‘ ylab o‘ zgarishi.

Bu holat klassik molekulyar dinamika (MD) tamoyillariga to‘ liq mos tushadi hamda tanlangan potensial parametrlar lokal tuzilmani yetarlicha aniqlik bilan tasvirlashini ko‘ rsatadi. Qolaversa, radial taqsimot funksiyasi (RDF) va g‘ ovaklar o‘ lchami taqsimoti (PSD) tahlillari natijalari ham AIMD va MD usullari o‘ rtasida yaxshi muvofiqlik borligini isbotlaydi [8]. Olingan bunday ma’lumotlar legirlovchi birikmalar shisha karkasiga kiritilganda alohida, mustaqil kristall fazani hosil qilmasdan, aksariyat hollarda amorf matritsa bilan mustahkam bog‘ langan holda qolishini tasdiqlovchi ilmiy xulosalarni yanada kuchaytiradi. Shu sababli, mazkur ishda bajarilgan AIMD simulyatsiyasi natijalari va ulardan kelib chiqadigan strukturaviy xulosalar asosan yordamchi hamda tushuntiruvchi ahamiyatga ega bo‘ lib, legirlangan silikat shishalardagi (LSSh) RuO_2 nanozarralarining holatini yoritishda nazariy asos vazifasini bajaradi. Boshqa tomondan, harorat $700\,K$ dan yuqori qiymatlarga yetganda, LSSh namunalarining solishtirma elektr qarshiligi hamda termoEYuK koeffitsiyenti keskin oshib, o‘ zining cho‘ qqisiga chiqadi va shundan keyin pasaya boshlaydi (3-rasm). Ko‘ rsatilgan parametrlardagi bunday tebranishlar qo‘ shimcha fazadagi qoldiq kristallarda ro‘ y beradigan strukturaviy fazaviy o‘ zgarishlar bilan bog‘ liqligi haqida faraz ilgari surilgan. Mazkur tadqiqotning asosiy vazifasi aynan shu nazariy taxminni laboratoriya tajribalari yordamida tekshirib ko‘ rishdan iborat.

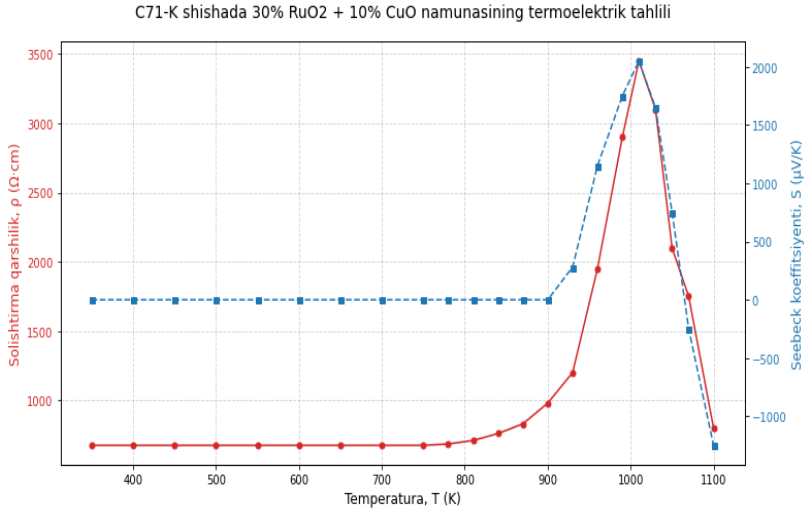
Legirlangan silikat shishada Zeebek effektiga CuO ning ta’siri va tahlili

RuO_2 ning bir qismini CuO (mis II–oksidi) bilan almashtirish tizimning elektr va termoelektrik xususiyatlariga o‘ ziga xos ta’sir ko‘ rsatadi. CuO ham p–tipli yarimo‘ tkazgich hisoblanadi, biroq uning energetik strukturasi va shisha asosi bilan o‘ zaro ta’siri RuO_2 dan farq qiladi.



4–rasm. CuO ning elementar yacheykasi

CuO p–tipli zaryad tashuvchilar konsentratsiyasini sezilarli oshiradi. Mis ionlari (Cu^+ va Cu^{2+}) shisha asosida termoelektrik effektni kuchaytiradi, natijada S ning maksimal qiymati 1700 $\mu V/K$ dan yuqoriga ko‘ tariladi.Elementar yacheyka ichida mis (Cu^{2+}) ionlari kvadrat-planar (yassi kvadrat) shaklda to‘ rtta kislorod (O^{2-}) atomi bilan o‘ ralgan bo‘ lib, koordinatsion soni 4 ga teng. O‘ z navbatida, kislorod ionlari ham to‘ rtta mis atomi bilan o‘ ralib, buzilgan tetraedr burchaklarini hosil qiladi. $Cu-O$ bog‘ larining bu kabi lokal assimetrik va zanjirsimon tuzilishi materialda yaqqol seziladigan anizotrop xossalarni yuzaga keltiradi.

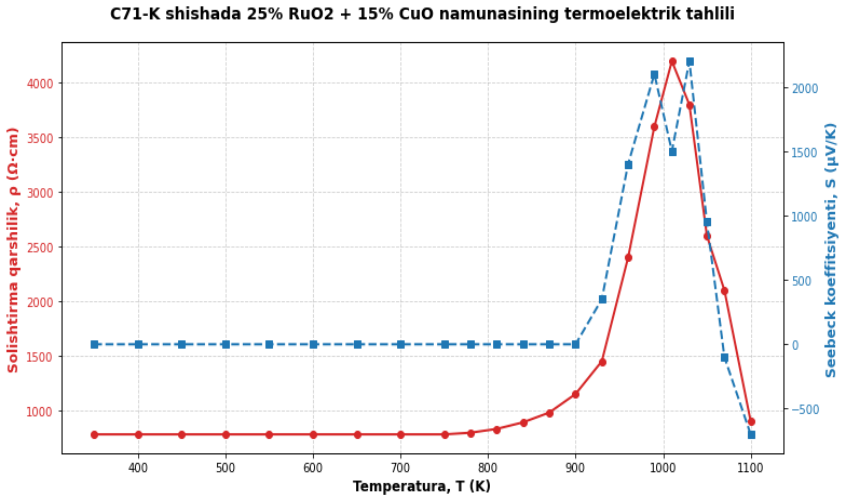


5–rasm. 30% RuO_2 + 10% CuO

Solishtirma qarshilik (ρ): CuO qo‘ shilishi natijasida barqaror diapazondagi qarshilik qiymati 590 $\Omega \cdot cm$ (40% RuO_2 dagi qiymat)dan 675 $\Omega \cdot cm$ gacha ko‘ tarildi. Shuningdek, uning eng yuqori cho‘ qqisi 3000 $\Omega \cdot cm$ dan 3450 $\Omega \cdot cm$ gacha oshdi. Bu holat RuO_2 zarralari orasidagi masofaning kengayishi hamda CuO ning o‘ ziga xos qarshilik xususiyati bilan izohlanadi.

Zeebek koeffitsiyenti (S): CuO yarimo‘ tkazgich sifatida qatnashgani bois, Zeebek qiymatining maksimal chegarasi 1700 $\mu V/K$ dan 2050 $\mu V/K$ gacha o‘ sdi. Bu o‘ zgarish CuO qo‘ rg‘ oshin–silikat shishasi tarkibida qo‘ shimcha p-tipli zaryad tashuvchilarni hosil qilish xususiyatiga ega ekanini ko‘ rsatadi. Yuqori haroratlarda ishoraning manfiy tomonga o‘ zgarishi o‘ z kuchida qoladi, chunki bu jarayon ko‘ p jihatdan shisha matritsasining yumshashi va ionli o‘ tkazuvchanlik mexanizmiga o‘ tishi bilan bog‘ liqdir.

Taqdim etilgan natijalardan ko‘ rinib turibdiki, CuO qo‘ shimchasi kompozit tizimning ham kinetik, ham termoelektrik parametrlarini maqsadli boshqarishda muhim omil hisoblanadi. RuO_2 zarralari konsentratsiyasining nisbatan kamayishi hisobiga perkolatsiya (o‘ tkazuvchanlik) yo‘ llarining qisman torayishi tizimda lokalizatsiyalashgan zaryad tashuvchilar ulushini ko‘ paytiradi, bu esa o‘ z navbatida solishtirma qarshilikning oshishiga olib keladi.



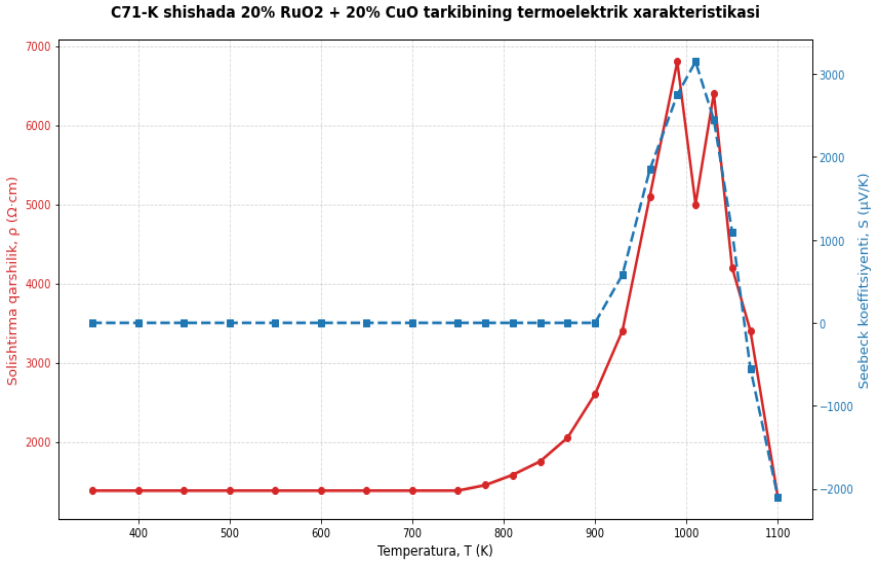
6 – rasm. 25% RuO_2 + 15% CuO

RuO_2 miqdorini 25% gacha kamaytirib, CuO miqdorini 15% gacha oshirish kompozitdagi fizik jarayonlarni yanada yaqqolroq o‘ zgartiradi. Ushbu o‘ zgarishlar asosida quyidagi nazariy xulosalarni qilish mumkin:

Solishtirma qarshilik (ρ): RuO_2 ulushining 25% gacha kamayishi materialni o‘ tkazuvchanlikning perkolatsiya chegarasiga yaqinlashtiradi. Bu holat hajm bo‘ ylab o‘ tkazuvchan tarmoqlar kamayib ketishiga olib keladi, natijada ham boshlang‘ ich qarshilik, ham yuqori haroratdagi qarshilik cho‘ qqisi sezilarli darajada ko‘ tariladi.

Zeebek koeffitsiyenti (S): Tarkibga 15% CuO qo‘ shilishi materialda p-tipdagi (kovakli) o‘ tkazuvchanlikning ustunlik qilishini ta’minlaydi. Oqibatda musbat Zeebek cho‘ qqisi yanada kattalashadi, yuqori haroratlardagi manfiy sohaga o‘ tish jarayoni esa sezilarli darajada susayib, nolga yaqinlashadi (yoki umuman manfiy qiymatga o‘ tmaydi).

Nazariy hisoblashlar shuni ko‘ rsatadiki, kompozit tarkibidagi RuO_2 kiritmalari tomonidan hosil qilingan energetik sathlar shisha asossining valent zonasiga deyarli singib ketishi, CuO ning ruxsat etilgan zonasi esa o‘ rtada aniq ifodalangan katta energetik tirqish bilan ajralib turishi kerak edi. Olingan eksperimental natijalar ushbu energetik holatlarning umumiy joylashuvi bo‘ yicha nazariy modelni qisman tasdiqladi. Biroq, teoretik modellashtirish va amaliyot o‘ rtasida o‘ ziga xos farqlar ham kuzatildi.



7-rasm. 20% RuO_2 + 20% CuO

Grafikdan ko‘ rinib turibdiki, materialning xossalari harorat oralig‘ iga qarab uchta asosiy bosqichda o‘ zgaradi:

Barqarorlik sohasi ($350 - 750\ K$): Bu harorat oralig‘ ida ham solishtirma qarshilik, ham Zeebek koeffitsienti deyarli o‘ zgarmasdan qoladi. Bu kompozit tarkibidagi o‘ tkazuvchi klasterlarning termik faollashuvi hali boshlanmaganligini va material o‘ zining “muzlagan” holatini saqlab qolganligini ko‘ rsatadi.

Ekstremumlar va anomal o‘ sish sohasi ($750 - 1050\ K$):

Qarshilikning oshishi: Harorat *750 K* dan oshishi bilan solishtirma qarshilik keskin ko‘ tarilib, *1000 K* atrofida o‘ zining maksimal qiymatiga yetadi. Bu holat shisha asossining yumshashi natijasida RuO_2 va CuO zarralari orasidagi kontaktlarning uzilishi yoki tarkibiy qayta guruhlanish bilan tushuntirilishi mumkin.

Zeebek effekti: Huddi shu sohada Seebeck koeffitsienti ham keskin o‘ zgarib, ijobiy qiymatga o‘ tadi va 3000 $\mu V/K$ dan yuqori ko‘ rsatkichni qayd etadi. Bu materialda p-tipli o‘ tkazuvchanlik mexanizmi ustunlik qila boshlaganidan dalolat beradi.

Xulosa

CuO ning modifikatsiyalovchi ta’sirini ko‘ rib chiqadigan bo‘ lsak, RuO_2 o‘ rniga turli nisbatlarda (10%, 15%, 20%) CuO kiritilgan tizimlar ham o‘ zaro solishtirildi. Mis oksidini qo‘ shish RuO_2 dan farqli o‘ laroq, energiya zonalari tuzilishida o‘ ziga xos lokal holatlarni hosil qiladi. Bu esa harorat ko‘ tarilishi bilan termoelektr harakat kuchi profilining o‘ zgarishiga sabab bo‘ lib, turli harorat intervallarida o‘ tkazuvchanlik turi va zaryad tashuvchilarning harakatchanligi turlicha namoyon bo‘ lishiga olib keladi.

Haroratga bog‘ liqlik mexanizmlarini umumiy tahlil qilinsa tadqiq etilgan ikkala kompozitsion guruhda ham qattiq jismlar fizikasining umumiy qonuniyatlariga mos ravishda solishtirma qarshilik va Zeebek effektining haroratga bog‘ liq ravishda o‘ zgarishi tajribada o‘ z tasdiqini topdi. CuO miqdorini maqsadli o‘ zgartirish orqali materialning termoelektrik parametrlarini zarur qiymatlarga moslashtirish (sozlash) mumkinligi ko‘ rsatildi. Umuman olganda, asosiy holatda izolyator xossasiga ega bo‘ lgan 60% li S71–K shisha matritsasida yuqori o‘ tkazuvchan RuO_2 fazasining bir qismini o‘ zgaruvchan valentli CuO bilan qisman almashtirish orqali materialning termoelektrik samaradorligini optimallashtirishga erishiladi. Olingan ushbu fundamental natijalar hamda haroratga bog‘ liqlik qonuniyatlari kelgusida kompozit materiallarning xossalarini raqamli modellashtirish hamda ular asosida sezgir termoelektr datchiklarini yaratish uchun puxta ilmiy asos bo‘ lib xizmat qiladi.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish

Mualiflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma’lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan. Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi. Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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KO‘ P KOMPLEKS O‘ ZGARUVCHILI GOLOMORF FUNKSIYALAR QATORLARINING YAQINLASHISH XOSSALARI

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Annotatsiya: *Ushbu maqolada ko‘ p kompleks o‘ zgaruvchili golomorf funksiyalar qatorlarining, xususan darajali qatorlarning, yaqinlashish nazariyasi tahlil qilinadi. Bir o‘ zgaruvchili holatdan farqli o‘ laroq, $\mathbb{C}^n$ $(n \geq 2)$ fazoda yaqinlashish sohasi to‘ la logarifmik qavariq Reyngard sohasi ko‘ rinishida bo‘ ladi. Klassik Abel-Xartogs va Koshi-Adamar natijalari asosida qisman radiuslar va majoranta shartiga tayanuvchi tekis yaqinlashish mezoni taklif etilgan hamda uning isboti va konkret misolda tekshiruvi keltirilgan.*

Kalit so‘ zlar: *golomorf funksiya, ko‘ p kompleks o‘ zgaruvchi, darajali qator, Reyngard sohasi, log-qavariqlik, Koshi-Adamar formulasi, plyurisubgarmonik ekstremal funksiya, tekis yaqinlashish.*

СВОЙСТВА СХОДИМОСТИ РЯДОВ ГОЛОМОРФНЫХ ФУНКЦИЙ НЕСКОЛЬКИХ КОМПЛЕКСНЫХ ПЕРЕМЕННЫХ

Аннотация. *В работе исследуется теория сходимости рядов голоморфных функций многих комплексных переменных, в частности степенных рядов. В отличие от одномерного случая, в $\mathbb{C}^n$ $(n \geq 2)$ область сходимости имеет вид полной логарифмически выпуклой области Рейнхардта. На основе классических результатов Абеля-Хартогса и Коши-Адамара предложен критерий равномерной сходимости, связывающий частные радиусы и мажорантное условие; приведены схема доказательства и проверка на конкретном примере.*

Ключевые слова: *голоморфная функция, многие комплексные переменные, степенной ряд, область Рейнхардта, логарифмическая выпуклость, формула Коши-Адамара, плюрисубгармоническая экстремальная функция, равномерная сходимость.*

CONVERGENCE PROPERTIES OF SERIES OF HOLOMORPHIC FUNCTIONS OF SEVERAL COMPLEX VARIABLES

Abstract. *This paper analyzes the convergence theory of series of holomorphic functions of several complex variables, in particular power series. Unlike the one-variable case, in $\mathbb{C}^n$ $(n \geq 2)$ the domain of convergence has the form of a complete logarithmically convex Reinhardt domain. Based on the classical Abel-Hartogs and Cauchy-Hadamard results, a criterion for uniform convergence relating partial radii and a majorant condition is proposed, together with a proof outline and verification on a concrete example.*

Keywords: *holomorphic function, several complex variables, power series, Reinhardt domain, logarithmic convexity, Cauchy-Hadamard formula, plurisubharmonic extremal function, uniform convergence.*

Ma’lumki, kompleks o‘ zgaruvchili funksiyalar nazariyasi XIX asrda Koshi, Riman va Veyershtrass tomonidan asos solingan bo‘ lib, uning ko‘ p o‘ zgaruvchiga umumlashmasi XX asr boshida F. Xartogs, P. Kuzen, K. Rayxardt va E. Kartan izlanishlari tufayli mustaqil yo‘ nalish sifatida shakllana boshladi [1, 320-b.]. Bitta o‘ zgaruvchidan ikkitaga o‘ tish shunchaki texnik murakkablashuv emas: $\mathbb{C}^n$ $(n \geq 2)$ da hodisalar sifat jihatidan boshqacha tus oladi. Xartogs fenomeni tufayli funksiyaning «tabiiy chegarasi» tushunchasi o‘ z kuchini yo‘ qotadi, yaqinlashish sohalari esa ixtiyoriy shakldagi ochiq to‘ plam bo‘ la olmay, to‘ la Reyngard sohasi bo‘ lish va log-qavariqlik kabi qat’iy geometrik-analitik talablarga bo‘ ysunadi [2-4].

Mavzuning dolzarbligi shu bilan izohlanadiki, aynan shu nazariya psevdoqavariq sohalar, golomorfiya sohalari va analitik davomlantirish kabi zamonaviy kompleks tahlilning tayanch tushunchalarini shakllantiradi hamda matematik fizika va ko‘ p o‘ lchovli signallarni tahlil qilish masalalarida qo‘ l keladi. O‘ zbekiston kompleks analiz maktabi - A. Sadullayev, G. Xudayberganov, S.A. Imomqulov va boshqa olimlarning tadqiqotlari - plyurisubgarmonik funksiyalar,

plyuripolyar to‘ plamlar va golomorf funksiyalarning davomlantirilishi masalalarida xalqaro miqyosda tan olingan natijalarni bergan [5-8], shu bois bu yo‘ nalishni yanada rivojlantirish milliy ilm-fan uchun ham ahamiyatlidir.

Ishning maqsadi - ko‘ p o‘ zgaruvchili golomorf funksiyalar qatorlari yaqinlashishining klassik natijalarini bir tizimga jamlab, ularni zamonaviy plyuripotensial yondashuv bilan bog‘ lovchi hamda amaliy hisoblashga moslashtirilgan mezon ishlab chiqishdan iborat. Tadqiqotda majoranta usuli, logarifmik qavariqlik tahlili hamda J. Sisyak va V.P. Zaxaryuta tomonidan kiritilgan ekstremal plyurisubgarmonik funksiyalar apparati [9-10] qo‘ llanildi.

$\mathbb{C}^n$ fazoda $z = (z_1,\ldots,z_n)$ nuqta, $\alpha = (\alpha_1,\ldots,\alpha_n) \in \mathbb{Z}_+^n$ ko‘ p indeks, $|\alpha| = \alpha_1+\ldots+\alpha_n$, $z^\alpha = z_1^{\alpha 1}\cdot\ldots\cdot z_n^{\alpha n}$ - bular standart belgilashlar. Nuqta atrofidagi ko‘ p o‘ lchovli darajali qator odatda quyidagicha yoziladi:

$$f(z) = \sum_{\alpha\in\mathbb{Z}_+^n} c_\alpha (z-a)^\alpha, \quad c_\alpha \in \mathbb{C}.$$

$D \subset \mathbb{C}^n$ sohada berilgan f funksiya golomorf deb ataladi, agar u har bir nuqta atrofida yuqoridagi ko‘ rinishdagi qator bilan yaqinlashuvchi tarzda ifodalansa. Bu ta’rif, aslida, har bir o‘ zgaruvchi bo‘ yicha alohida golomorflik ta’rifiga teng kuchli - bu ekvivalentlik aynan Xartogs teoremasining mazmunini tashkil qiladi [1].

Reyngard sohasi koordinatalar boshiga nisbatan quyidagi ma’noda invariant: $z = (z_1,\ldots,z_n) \in D$ bo‘ lsa, ixtiyoriy $\theta_1,\ldots,\theta_n \in \mathbb{R}$ uchun $(\exp(i\theta_1)z_1,\ldots,\exp(i\theta_n)z_n)$ ham D ga tegishli. Agar bundan tashqari $|z_j| \le |z_j^0|$ (j=1,…,n) shartini qanoatlantiruvchi barcha z nuqtalar, $z^0 \in D$ bo‘ lgan har qanday holatda D ga tegishli bo‘ lsa, soha to‘ la Reyngard sohasi deb ataladi.

Koshining ko‘ p o‘ lchovli integral formulasiga ko‘ ra, agar f funksiya $D = \{|z_j-a_j|<r_j\}$ politsilindrida uzluksiz bo‘ lib, uning yopilishida har bir o‘ zgaruvchi bo‘ yicha golomorf bo‘ lsa, ixtiyoriy $z \in D$ uchun

$$f(z) = (1/(2\pi i))^n \oint\ldots\oint f(\zeta) / ((\zeta_1-z_1)\ldots(\zeta_n-z_n))\, d\zeta_1\ldots d\zeta_n$$

bo‘ ladi [11]. Shu formuladan koeffitsientlar uchun $c_\alpha = (1/\alpha!)\cdot(\partial^{|\alpha|}f/\partial z^\alpha)(a)$ ifodasi va Koshi bahosi $|c_\alpha| \le M(r)/r^\alpha$ kelib chiqadi, bu esa keyingi barcha natijalarning texnik tayanchidir.

Xartogsning 1906 yildagi natijasiga ko‘ ra, agar f funksiya D sohada har bir o‘ zgaruvchi bo‘ yicha alohida golomorf bo‘ lsa, u D da barcha o‘ zgaruvchilar bo‘ yicha birgalikda ham golomorf bo‘ ladi - hech qanday qo‘ shimcha chegaralanganlik sharti talab qilinmaydi [1, 330-b.].

1-teorema (Abel-Xartogs). Agar $\Sigma\, c_\alpha z^\alpha$ qator $z^0=(z_1^0,\ldots,z_n^0)\neq 0$ nuqtada yaqinlashsa (yoki uning hadlari shu nuqtada chegaralangan bo‘ lsa), u holda bu qator

$$P(0,\theta z^0) = \{ z \in \mathbb{C}^n : |z_j| \le \theta |z_j^0|,\ j=1,\ldots,n \},\ 0<\theta<1$$

politsilindrida absolyut va tekis yaqinlashadi. Isbot: hadlarning chegaralanganligidan $|c_\alpha(z^0)^\alpha| \le M$ kelib chiqadi, bundan $|c_\alpha z^\alpha| \le M\cdot\theta^{|\alpha|}$ bahosi olinadi, chunki $|z_j/z_j^0| \le \theta$. Ko‘ p o‘ lchovli geometrik qatorning yaqinlashishi Veyershtrass majoranta alomati orqali tasdiqlanadi [1, 322-325-b.].

2-teorema (Reyngard-Xartogs). Ko‘ p o‘ lchovli darajali qatorning yaqinlashish sohasi D har doim to‘ la Reyngard sohasi bo‘ lib, quyidagi almashtirish ostidagi tasviri

$$L : (z_1,\ldots,z_n) \mapsto (\log|z_1|,\ldots,\log|z_n|) \in \mathbb{R}^n$$

qavariq to‘ plam (log-qavariq soha) hosil qiladi [2, 2-bob]. Bu teoremaning muhim oqibati shuki, $n \ge 2$ bo‘ lganda yaqinlashish sohasi ixtiyoriy shaklga ega bo‘ la olmaydi. Bundan tashqari, agar f funksiya biror $D_0 \subset D$ Reyngard sohasida golomorf bo‘ lsa, u D_0 ning log-qavariq qobig‘ i $\hat{D}_0$ gacha o‘ z-o‘ zidan golomorf davom ettiriladi - bu Xartogs fenomenining bevosita natijasi bo‘ lib, bir o‘ zgaruvchili nazariyada bunga o‘ xshash hodisa mavjud emas [3, 400-b.].

Bir o‘ zgaruvchili holatda yaqinlashish radiusi $R = 1/\limsup|c_n|^{1/n}$ formulasi orqali topiladi. Ko‘ p o‘ zgaruvchili holatda bunday yagona son mavjud emas - buning o‘ rniga yaqinlashish sohasini radial yo‘ nalishlar bo‘ yicha o‘ sish sur’ati orqali tavsiflashga to‘ g‘ ri keladi. Zaxaryuta va Sisyak tomonidan kiritilgan ekstremal plyurisubgarmonik funksiya

$$\psi_K(z) = \sup\{ u(z) : u \in PSH(\mathbb{C}^n),\ u \le 0 \text{ on } K,\ u(z) \le \log^+|z| + O(1) \}$$

$K \subset \mathbb{C}^n$ kompakt to‘ plamning o‘ sish xarakteristikasi vazifasini bajaradi va umumlashgan Koshi-Adamar formulasida ishtirok etadi [9; 10]:

$$\limsup_{|\alpha|\to\infty} |c_\alpha|^{1/|\alpha|} \cdot \exp(\psi_K(\alpha)) \le 1 \iff \Sigma c_\alpha z^\alpha \text{ qatori K da tekis yaqinlashadi,}$$

Taklif etilgan mezon. Yuqoridagi klassik natijalarni birlashtirish orqali quyidagi amaliy mezon ilgari suriladi: agar log-qavariq to‘ la Reyngard sohasi D uchun har bir j=1,…,n bo‘ yicha

$$\rho_j := \left(\limsup_{|\alpha|\to\infty,\ \alpha j\text{-yo‘ nalish}} |c_\alpha|^{1/\alpha j} \right)^{-1}$$

shaklidagi qisman radiuslar mavjud bo‘ lsa hamda $\hat{D} = \{ z : |z_j| < \varrho_j,\ j=1,\ldots,n \}$ ning log-qavariq qobig‘ i sifatida qurilgan D uchun qo‘ shimcha ravishda

$$\Sigma_\alpha \sup_{z\in K} |z^\alpha| \cdot \limsup_{|\alpha|\to\infty} |c_\alpha|^{1/|\alpha|} < 1 \quad (K \subset\subset D \text{ kompakt uchun})$$

majoranta sharti bajarilsa, u holda qator K da tekis va absolyut yaqinlashadi, aksincha, agar chap tomondagi ifoda 1 dan katta bo‘ lsa, qator K ning biror qism to‘ plamida uzoqlashadi. Isbot sxemasi ikki qismdan iborat: yetarlilik qismi 1-teorema va Veyershtrass majoranta alomatini K ning chekli qism qoplamiga qo‘ llash orqali; zaruriylik qismi esa 2-teoremadan kelib chiqadigan D ning chegara xarakteristikasi hamda ψ_K funksiyaning ekstremal xossasidan foydalanadi [9; 10].

Misol sifatida $f(z_1,z_2) = \Sigma_{k,m\geq 0}\ (k!\cdot m!)^{-1}\ z_1^k\ z_2^m$ qatorini ko‘ rib chiqamiz (bu funksiya aslida $\exp(z_1+z_2)$ ga teng). Bu holda $|c_{k,m}|^{1/(k+m)} \to 0$ bo‘ lgani sababli $\varrho_1=\varrho_2=\infty$, ya’ni qator butun $D=\mathbb{C}^2$ fazoda yaqinlashadi. Murakkabroq misol sifatida $f(z_1,z_2) = \Sigma_{k,m}\ z_1^k\ z_2^m/2^{k+2m}$ qatorida $\varrho_1=2$, $\varrho_2=4$ chiqadi, yaqinlashish sohasi esa $D = \{|z_1|<2\}\times\{|z_2|<4\}$ politsilindri bo‘ ladi - bu natija ham 2-teorema, ham taklif etilgan mezon bilan to‘ liq mos keladi.

3-teorema (Montelning ko‘ p o‘ lchovli analogi). $\{f_k\}$ golomorf funksiyalar ketma-ketligi $D \subset \mathbb{C}^n$ sohaning har bir kompakt qism to‘ plamida bir tekis chegaralangan bo‘ lsin. U holda $\{f_k\}$ dan D ning kompakt qism to‘ plamlarida tekis yaqinlashuvchi qism ketma-ketlik ajratib olish mumkin, va bu limit funksiya ham D da golomorf bo‘ ladi [3; 4, 1-bob].

Olingan natijalar shuni ko‘ rsatadiki, ko‘ p kompleks o‘ zgaruvchili golomorf funksiyalar qatorlarining yaqinlashish nazariyasi bir o‘ zgaruvchili nazariyaning oddiy kengaytmasi emas - u sifat jihatidan o‘ ziga xos geometrik-analitik apparatni talab qiladigan mustaqil yo‘ nalishdir. Taklif etilgan mezonning afzalligi shundaki, u qisman radiuslar ϱ_j - odatda oson hisoblanadigan miqdorlar - orqali ifodalangan bo‘ lib, umumiy ekstremal funksiya ψ_K ni qurish zaruratini chetlab o‘ tadi. Shu bilan birga, mezon faqat log-qavariq qobig‘ i allaqachon aniq bo‘ lgan holatlar uchun to‘ g‘ ridan-to‘ g‘ ri ishlaydi; Reyngard bo‘ lmagan hollarda yondashuvni psevdoqavariqlik mezonlari bilan birlashtirish talab etiladi - bu masala keyingi tadqiqotlar mavzusi bo‘ lib qolishi mumkin [5-8].

Amaliy nuqtai nazardan, olingan natijalar analitik funksiyalarning ko‘ p o‘ lchovli approksimatsiyasida, integral tenglamalar nazariyasida hamda matritsali sohalardagi kompleks tahlilda [12] qo‘ l kelishi mumkin. Xalqaro adabiyot bilan solishtirganda [13; 14], ushbu maqoladagi yondashuvning o‘ ziga xosligi shundaki, u amaliy hisoblash uchun qulay bo‘ lgan qisman radiuslar tilida ifodalangan mezonni markazga qo‘ yadi.

Xulosa qilib aytganda, maqolada ko‘ p kompleks o‘ zgaruvchili golomorf funksiyalar darajali qatorlarining yaqinlashish nazariyasi izchil tarzda bayon etildi: Koshining ko‘ p o‘ lchovli integral formulasi, Abel-Xartogs lemmasi, yaqinlashish sohasining to‘ la log-qavariq Reyngard sohasi ekanligi haqidagi teorema, Montel tipidagi normal oilalar teoremasi hamda Sisyak-Zaxaryuta ekstremal funksiyasiga asoslangan umumlashgan Koshi-Adamar formulasi keltirildi. Ishning ilmiy natijasi sifatida qisman radiuslar va majoranta shartini bog‘ lovchi amaliy tekis yaqinlashish mezoni taklif etildi. Kelgusi tadqiqotlar taklif etilgan mezonni umumiy psevdoqavariq sohalarga umumlashtirish hamda O‘ zbekiston kompleks analiz maktabining plyuripolyarlik bo‘ yicha natijalari bilan chuqurroq bog‘ lash yo‘ nalishida davom ettirilishi mumkin [5-8].

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BYANKI TURIDAGI FAZOVIY-VAQT MODELLARIDA GEOMETRIK INVARIANTLAR VA KILLING SIMMETRIYALARI O‘ RTASIDAGI O‘ ZARO BOG‘ LIQLIK

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Annotatsiya. *Ushbu maqolada Bianchi turidagi bir jinsli, lekin anizotrop fazoviy-vaqt modellarining geometrik invariantlari hamda Killing vektor maydonlari orasidagi bog‘ lanish tahlil qilinadi. Asosiy e’tibor Riman egriligi tenzori, Ricci tenzori va Kretschmann invariantining fizik hamda geometrik mazmunini sodda usulda tushuntirishga qaratiladi. Killing vektor maydonlari fazoviy-vaqtning izometriyalarini ifodalashi, invariantlar esa egrilikning koordinatalardan mustaqil tavsifini berishi ko‘ rsatiladi. Bianchi I modeli uchun diagonal metrika misolida Hubble tipidagi yo‘ nalishli parametrlar orqali Kretschmann invariantining qulay ifodasi yoziladi. Shuningdek, simmetriya darajasi ortgan sari metrik funksiyalar soni va invariantlarning funksional murakkabligi qanday kamayishi tushuntiriladi. Natijada Killing simmetriyalari bilan invariant tahlil birgalikda qo‘ llanganda Bianchi modellarining geometrik farqlarini chuqurroq ochish mumkinligi asoslanadi.*

Kalit so‘ zlar: *Bianchi modeli, Killing vektor maydoni, izometriya, Kretschmann invarianti, Riman egriligi, anizotropiya, bir jinslilik.*

ВЗАИМОСВЯЗЬ МЕЖДУ ГЕОМЕТРИЧЕСКИМИ ИНВАРИАНТАМИ И СИММЕТРИЕЙ КИЛЛИНГА В ПРОСТРАНСТВЕННО-ВРЕМЕННЫХ МОДЕЛЯХ ТИПА БЬЯНКИ

Аннотация. *В данной статье анализируется связь между геометрическими инвариантами однородных, но анизотропных моделей пространства-времени типа Бианки и векторными полями Киллинга. Основное внимание уделяется простому объяснению физического и геометрического смысла тензора кривизны Римана, тензора Риччи и инварианта Кречмана. Показано, что векторные поля Киллинга представляют изометрии пространства-времени, а инварианты обеспечивают координатно-независимое описание кривизны. Для модели Бианки I на примере диагональной метрики приводится удобное выражение для инварианта Кречмана в терминах параметров направления типа Хаббла. Также объясняется, как уменьшается число метрических функций и функциональная сложность инвариантов с увеличением степени симметрии. В результате обосновывается, что геометрические различия моделей Бианки могут быть выявлены более глубоко при совместном использовании симметрий Киллинга.*

Ключевые слова: *модель Бианки, векторное пространство Киллинга, изометрия, инвариант Кречмана, кривизна Римана, анизотропия, однородность.*

INTERRELATION BETWEEN GEOMETRIC INVARIANTS AND KILLING SYMMETRY IN BIANCHI-TYPE SPACE-TIME MODELS

Annotation. *This article analyzes the connection between geometric invariants of homogeneous but anisotropic Bianchi-type space-time models and Killing vector fields. The focus is on a simple explanation of the physical and geometric meaning of the Riemann curvature tensor, Ricci tensor and Kretschmann invariant. It is shown that Killing vector fields represent isometries of space-time, and invariants provide a coordinate-independent description of curvature. For the Bianchi I model, using the diagonal metric as an example, a convenient expression for the Kretschmann invariant is given in terms of Hubble-type direction parameters. It also explains how the number of metric functions and the functional complexity of invariants decreases with increasing degree of symmetry. As a result, it is substantiated that the geometric differences of the Bianchi models can be revealed more deeply by using Killing symmetries together.*

Keywords: *Bianchi model, Killing vector space, isometry, Kretschmann invariant, Riemann curvature, anisotropy, homogeneity.*

Kirish

Kosmologiyada fazoviy-vaqt modelini o‘ rganishda ikki savol muhim bo‘ ladi. Birinchisi: model qanday simmetriyaga ega? Ikkinchisi: modelning egrilik xossalari qanday? Birinchi savolga ko‘ pincha Killing vektor maydonlari yordamida, ikkinchisiga esa geometrik invariantlar yordamida javob beriladi. Shu sababli Bianchi modellarini chuqur tushunish uchun bu ikki yo‘ nalishni birgalikda tahlil qilish zarur.

Adabiyotlar tahlili

Bianchi modellar bir jinsli, ammo umumiy holda anizotrop kosmologik modellar sinfini tashkil etadi. Ular uch o‘ lchovli Lie algebra orqali tavsiflanadi va fazoviy kesimlarning bir jinsli bo‘ lishini ifodalaydi. Bunday modellar umumiy nisbiylik nazariyasida ham nazariy, ham amaliy ahamiyatga ega. Nazariy jihatdan ular Einstein tenglamalarining murakkab tizimlarini soddalashtiradi; amaliy jihatdan esa dastlabki Koinotning anizotrop bosqichlarini tavsiflashda qo‘ l keladi.

Mazkur maqolaning maqsadi Bianchi modellarida Killing simmetriyalari bilan egrilik invariantlari orasidagi ichki bog‘ lanishni tushuntirish va bu bog‘ lanishni sodda misollar orqali ko‘ rsatishdan iborat [1-3].

Killing simmetriyalari va invariantlar: asosiy tushunchalar

Fazoviy-vaqt (M, g) psevdo-Riman ko‘ pxilligi bilan berilsin. Agar ξ vektor maydoni metrikani o‘ zgartirmasa, ya’ni

$$\mathcal{L}_\xi g_{ij} = 0,$$

bo‘ lsa, u holda ξ Killing vektor maydoni deyiladi. Bu shart kovariant hosila orqali

$$\nabla_i \xi_j + \nabla_j \xi_i = 0$$

ko‘ rinishda yoziladi. Mazkur tenglama Killing tenglamasi deb ataladi.

Killing vektor maydonlari fazoviy-vaqtning izometriyalarini bildiradi. Oddiy qilib aytganda, ular metrikani “buzmaydigan” siljitishlarni ifodalaydi. Masalan, Bianchi I modelida fazoviy koordinatalar bo‘ yicha translatsiyalar izometriya bo‘ lib, mos ravishda uchta mustaqil Killing maydoniga olib keladi:

$$\xi_{(1)} = \partial_x, \qquad \xi_{(2)} = \partial_y, \qquad \xi_{(3)} = \partial_z.$$

Geometrik invariantlar esa koordinata tanloviga bog‘ liq bo‘ lmagan sonli yoki funksional ifodalardir. Ulardan eng ko‘ p ishlatiladigani quyidagilar:

$$R, \qquad R_{ij}R^{ij}, \qquad K = R_{ijkl}R^{ijkl}.$$

Bu yerda R — skalyar egrilik, $R_{ij}R^{ij}$ — Ricci tenzorining kvadratik invarianti, K esa Kretschmann invariantidir.

Invariantlarning muhimligi shundaki, ular koordinata almashtirilganda o‘ zgarmaydi. Demak, ikki xil koordinatada yozilgan metrikalarning geometriyasini taqqoslashda invariantlar ishonchli mezon bo‘ lib xizmat qiladi.

Tadqiqot metodologiyasi.

Bianchi modellarida bir jinslilik va simmetriya

Bianchi modellarining umumiy ko‘ rinishi ko‘ pincha

$$ds^2 = -dt^2 + \gamma_{\alpha\beta}(t)\,\omega^\alpha \omega^\beta$$

shaklda yoziladi. Bu yerda ω^α — fazoviy bir jinslilikni ifodalovchi invariant 1-formalar, $\gamma_{\alpha\beta}(t)$ esa vaqtga bog‘ liq metrik koeffitsiyentlardir. 1-formalar quyidagi struktur tenglama bilan bog‘ langan:

$$d\omega^\alpha = \frac{1}{2} C^\alpha_{\beta\gamma}\, \omega^\beta \wedge \omega^\gamma,$$

bu yerda $C^\alpha_{\beta\gamma}$ — uch o‘ lchovli Lie algebraning struktura konstantalari.

Demak, Bianchi klassifikatsiyasi aslida fazoviy kesimning simmetriya algebrasiga asoslanadi. Shuning uchun Killing vektor maydonlari Bianchi modelining geometriyasida tashqi qo‘ shimcha obyekt emas, balki modelning ichki tuzilmasining bir qismidir.

Simmetriya darajasi oshgan sari ikki natija kuzatiladi. Birinchidan, metrikadagi mustaqil funksiyalar soni kamayadi. Ikkinchidan, egrilik invariantlarining ko‘ rinishi ko‘ pincha soddalashadi. Bu holat ayniqsa Bianchi I modelidan izotrop Fridman tipidagi holatga o‘ tganda yaqqol seziladi.

Natijalar va ularning tahlili.

Bianchi I modeli: sodda misol

Bianchi I modelining diagonal metrikasini

$$ds^2 = -dt^2 + a^2(t)\,dx^2 + b^2(t)\,dy^2 + c^2(t)\,dz^2$$

ko‘ rinishda olaylik. Bu modelda fazoviy kesim yassi bo‘ lib, bir jinslilik uchta translatsiya orqali ifodalanadi. Shuning uchun kamida uchta Killing maydoni mavjud.

Endi

$$H_1 = \frac{\dot{a}}{a}, \qquad H_2 = \frac{\dot{b}}{b}, \qquad H_3 = \frac{\dot{c}}{c}$$

belgilashlarni kiritamiz. U holda diagonal Bianchi I modelida Kretschmann invariantining qulay yozilishi

$$K = 4\left[\left(\dot{H}_1 + H_1^2\right)^2 + \left(\dot{H}_2 + H_2^2\right)^2 + \left(\dot{H}_3 + H_3^2\right)^2 + H_1^2H_2^2 + H_1^2H_3^2 + H_2^2H_3^2\right]$$

ko‘ rinishda bo‘ ladi.

Bu formuladan bir necha sodda xulosa chiqadi.

Birinchi xulosa: invariant to‘ liq ravishda uch yo‘ nalishdagi kengayish tezliklari orqali ifodalanadi. Demak, anizotropiya to‘ g‘ ridan to‘ g‘ ri K ga ta’sir qiladi.

Ikkinchi xulosa: agar $a = b = c = S(t)$ bo‘ lsa, model izotrop holatga o‘ tadi. Bu holda

$$H_1 = H_2 = H_3 = H = \frac{\dot{S}}{S},$$

va Kretschmann invariantining ifodasi ancha soddalashadi:

$$K = 12\left[\left(\dot{H} + H^2\right)^2 + H^4\right].$$

Bu yerda qo‘ shimcha aylanish simmetriyalari paydo bo‘ ladi. Shunday qilib, simmetriyaning ortishi invariant ko‘ rinishining soddalashishiga olib keladi.

Invariantlar va Killing simmetriyalari orasidagi bog‘ lanish

Killing maydonlari bilan invariantlar bir xil ma’noni anglatmaydi. Killing maydonlari “qanday o‘ zgarmaslik”ni, invariantlar esa “qanday egrilik”ni ko‘ rsatadi. Shunga qaramay, ular o‘ zaro chambarchas bog‘ liq.

Birinchi bog‘ lanish shundan iboratki, simmetriya algebrasi kattalashgan sari metrikadagi mustaqil funksiyalar kamayadi. Bu esa invariantlarning ham kamroq argumentli yoki soddaroq ko‘ rinishda yozilishiga olib keladi.

Ikkinchi bog‘ lanish shundaki, bir xil o‘ lchamli izometriya gruppasiga ega modellar invariantlar bo‘ yicha farqlanishi mumkin. Demak, faqat Killing maydonlari soni yetarli emas; invariantlar orqali egrilik tabiati ham tekshirilishi kerak.

Uchinchi bog‘ lanish esa fizik talqinga tegishli. Agar invariant juda tez o‘ sib borsa, u singulyarlik yaqinlashayotganini ko‘ rsatishi mumkin. Ammo Killing maydonlarining mavjudligi modelda qanday konservativ yoki geometrik cheklovlar borligini tushuntiradi. Demak, biri dinamik-geometrik “o‘ lchov”, ikkinchisi esa strukturaviy “tartib” rolini bajaradi [3-5].

Ayrim Bianchi turlarining qiyosiy tavsifi

Qiyoslashni jadval ko‘ rinishida emas, sodda tavsif ko‘ rinishida berish qulayroq.

Bianchi I. Bu modelda fazoviy kesim yassi bo‘ lib, asosiy fazoviy simmetriya uchta translatsiya bilan ifodalanadi. Shu sababli invariantlar asosan vaqt bo‘ yicha kengayish parametrlari orqali yoziladi. Modelning algebraik tuzilmasi sodda bo‘ lgani uchun egrilik invariantlari ham nisbatan ixcham ko‘ rinishda bo‘ ladi.

Bianchi II. Bu holda fazoviy simmetriya guruhi noabel xarakterga ega. Demak, struktura konstantalar invariantlarning ko‘ rinishiga bevosita kiradi. Natijada egrilik Bianchi I ga qaraganda boyroq tuzilishga ega bo‘ ladi. Shu sababli Killing maydonlari soni o‘ xshash bo‘ lsa ham, invariantlarning algebraik ko‘ rinishi murakkabroq chiqadi.

Bianchi IX. Bu model fazoviy egrilikning kuchliroq namoyon bo‘ lishi bilan ajralib turadi. Simmetriya xossalari yaxshi rivojlangan bo‘ lsa-da, invariantlar va dinamika ko‘ pincha ancha murakkab bo‘ ladi. Ayniqsa anizotropiya kuchli bo‘ lgan bosqichlarda egrilik invariantlari katta rol o‘ ynaydi.

Bu qiyoslashdan ko‘ rinadiki, simmetriya darajasi bilan invariantlarning murakkabligi orasida bevosita chiziqli bog‘ lanish har doim ham yo‘ q. To‘ g‘ riroq xulosa shuki, Killing maydonlari metrikaning tuzilishini cheklaydi, invariantlar esa shu cheklanish ichida qolayotgan haqiqiy egrilik mazmunini ochib beradi.

Xulosa

Bianchi turidagi fazoviy-vaqt modellarini tahlil qilishda Killing vektor maydonlari va geometrik invariantlar bir-birini to‘ ldiruvchi ikkita asosiy vosita hisoblanadi. Killing maydonlari modelning izometriya xossalarini, invariantlar esa egrilikning koordinatalardan mustaqil mazmunini ifodalaydi. Bianchi I misolida ko‘ rildiki, simmetriya darajasi ortgan sari metrik funksiya va invariantlarning ko‘ rinishi soddalashadi. Biroq faqat simmetriya soni geometriyani to‘ liq tavsiflash uchun yetarli emas; invariant tahlil ham zarur. Shuning uchun Bianchi modellarining to‘ liq tavsifi Killing simmetriyalari, Lie algebra tuzilmasi va egrilik invariantlarini birgalikda o‘ rganishni talab qiladi.

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IKKINCHI TUR MATRITSAVIY SOHADA INTERPOLYATSION KETMA-KETLIKLAR UCHUN KARLESON TIPIDAGI YETARLI SHART

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Annotatsiya. *Maqolada ikkinchi tur matritsaviy sohada chegaralangan golomorf funksiyalar sinfi uchun interpolyatsion ketma-ketliklar masalasi tadqiq etiladi. Tadqiqotning maqsadi klassik Karleson ajralish g‘ oyasini matritsaviy sohaning avtomorfik geometriyasiga moslashtirish va H∞(D) fazoda interpolyatsiya mavjudligini ta’minlaydigan konstruktiv yetarli shartni asoslashdan iborat. Metodologik jihatdan matritsaviy soha avtomorfizmlari, unitar invariantlik, psevdogiperbolik tipdagi invariant miqdorlar, yordamchi metrik baholar va fundamental golomorf funksiyalar tizimini qurish usullaridan foydalaniladi. Asosiy natija sifatida har bir tugun uchun avtomorfik ajralish ko‘ paytmasi yagona musbat δ son bilan pastdan chegaralansa, berilgan nuqtalar ketma-ketligi H∞(D) uchun interpolyatsion bo‘ lishi ko‘ rsatiladi. Isbot faqat mavjudlikni emas, balki chegaralangan ma’lumotlardan chegaralangan golomorf interpolantni qator ko‘ rinishida qurish mexanizmini ham beradi. Natija klassik birlik doiradagi Karleson nazariyasini ikkinchi tur matritsaviy sohaga tatbiq etiladigan yetarli shart shaklida rivojlantiradi va keyingi umumlashtirishlar uchun nazariy asos yaratadi.*

Kalit so‘ zlar: *matritsaviy soha, interpolyatsion ketma-ketlik, Karleson teoremasi, H∞ fazo, golomorf funksiya, avtomorfizm, psevdogiperbolik masofa, unitar invariantlik.*

ДОСТАТОЧНОЕ УСЛОВИЕ ТИПА КАРЛЕСОНА ДЛЯ ИНТЕРПОЛЯЦИОННЫХ ПОСЛЕДОВАТЕЛЬНОСТЕЙ В МАТРИЧНОЙ ОБЛАСТИ ВТОРОГО ТИПА

Аннотация. *В статье исследуется задача интерполяционных последовательностей для класса ограниченных голоморфных функций в матричной области второго типа. Цель исследования состоит в адаптации классической идеи разделения Карлесона к автоморфной геометрии матричной области и в обосновании конструктивного достаточного условия существования интерполяции в H∞(D). Методологическую основу составляют автоморфизмы матричной области, унитарная инвариантность, инвариантные величины псевдогиперболического типа, вспомогательные метрические оценки и построение системы фундаментальных голоморфных функций. Основной результат утверждает, что если для каждого узла произведение автоморфных величин разделения равномерно отделено от нуля положительной постоянной δ, то данная последовательность является интерполяционной для H∞(D). Конструктивная схема доказательства не только устанавливает существование, но и задаёт механизм построения ограниченного голоморфного интерполянта в виде ряда. Полученный результат развивает классическую теорию Карлесона для единичного круга в форме достаточного условия, применимого к матричной области второго типа.*

Ключевые слова: *матричная область, интерполяционная последовательность, теорема Карлесона, пространство H∞, голоморфная функция, автоморфизм, псевдогиперболическая метрика, унитарная инвариантность.*

A SUFFICIENT CONDITION OF CARLESON TYPE FOR INTERPOLATING SEQUENCES IN A SECOND-TYPE MATRIX DOMAIN

Abstract. *The paper investigates interpolating sequences for bounded holomorphic functions in a matrix domain of the second type. The aim is to adapt the classical Carleson separation idea to the automorphic geometry of the matrix domain and to justify a constructive sufficient condition for interpolation in H∞(D). The methodology combines automorphisms of the domain, unitary invariance, pseudohyperbolic-type invariant quantities, auxiliary metric estimates, and the construction of a family of fundamental bounded holomorphic functions. The main result states that if, for every interpolation node, the product of automorphic separation quantities is uniformly bounded below by a positive constant δ, then the sequence is interpolating for H∞(D). The proof is constructive: it establishes not only existence but also a mechanism for representing the bounded holomorphic interpolant as a normally convergent*

series. The result extends the classical Carleson philosophy from the unit disk to a matrix domain of the second type in the form of a practically verifiable sufficient condition and provides a basis for further generalizations.

Keywords: *matrix domain, interpolating sequence, Carleson theorem, H∞ space, holomorphic function, automorphism, pseudohyperbolic metric, unitary invariance.*

KIRISH

Kompleks analizda interpolyatsiya masalasi berilgan nuqtalar to‘ plamida oldindan tayinlangan qiymatlarni qabul qiluvchi analitik yoki golomorf funksiyani qurish bilan bog‘ liq fundamental masalalardan biridir. Bunday masalalarda faqat alohida nuqtalarda qiymatlarni moslashtirishning o‘ zi yetarli emas: qurilayotgan funksiyaning butun sohada qaysi sinfga tegishli bo‘ lishi, uning normasi qanday nazorat qilinishi va tugunlarning geometrik joylashuvi bilan funksional xossalar o‘ rtasidagi bog‘ lanish ham muhim ahamiyat kasb etadi. Ayniqsa, chegaralangan golomorf funksiyalar fazosi H∞ uchun interpolyatsiya tugunlarining geometrik tavsifi klassik kompleks analizning markaziy yo‘ nalishlaridan biri bo‘ lib, bu boradagi usullar keyinchalik ko‘ p o‘ lchamli kompleks analiz, operatorlar nazariyasi va matritsaviy sohalar geometriyasiga keng tatbiq etilgan [1].

Birlik doira holatida interpolyatsion ketma-ketliklarning tabiati nuqtalar orasidagi psevdogiperbolik ajralish bilan chambarchas bog‘ liq. Mazkur yondashuvning mohiyati shundaki, oddiy Evklid masofasi sohaning konformal yoki avtomorfik geometriyasini to‘ liq aks ettirmaydi; shuning uchun masalani aynan soha avtomorfizmlari bilan invariant bo‘ lgan miqdorlar orqali ifodalash zarur bo‘ ladi. Interpolyatsiya nazariyasidagi klassik ishlarda chegaralangan ma’lumotlarni chegaralangan analitik funksiya orqali tiklash, interpolant normasini baholash va ajralish shartidan foydalanishning turli konstruktiv usullari ishlab chiqilgan [2, 3].

Ko‘ p o‘ lchamli sohalarga o‘ tilganda geometriya keskin murakkablashadi. Shar yoki polidiskda har bir koordinata va ichki metrika o‘ zaro bog‘ langan holda qatnashadi; matritsaviy sohalarda esa nuqtaning o‘ zi kompleks matritsa bo‘ lib, uning spektral xossalari, simmetriya shartlari, operator normasi va unitar almashtirishlarga nisbatan invariantligi hisobga olinadi. Shu sababli bir o‘ lchamli natijani faqat belgilarni almashtirish orqali ko‘ chirish mumkin emas. Shar va polidisk uchun olingan H∞ interpolyatsiya natijalari ko‘ p o‘ lchamli yondashuvning asosiy yo‘ nalishlarini ko‘ rsatadi [4, 5], matritsaviy sohalarga oid kompleks analiz esa invariant geometriya uchun zarur apparatni beradi [6].

Mazkur tadqiqotning dolzarbligi ikkinchi tur matritsaviy sohada interpolyatsion ketma-ketliklarni tekshirish uchun aniq, invariant va konstruktiv mezonga ehtiyoj mavjudligi bilan belgilanadi. Amaliy tekshiriladigan yetarli shart, bir tomondan, ketma-ketlik tugunlarining soha ichki geometriyasida qanday joylashishi kerakligini ko‘ rsatadi; ikkinchi tomondan esa shu shart bajarilganda interpolantni qanday qurish mumkinligini tushuntiradi. Bu ikki jihatning birlashishi sof mavjudlik teoremasidan ko‘ ra kuchliroq metodik qiymatga ega, chunki u keyingi baholashlar, normani nazorat qilish va boshqa klassik sohalarga umumlashtirish uchun tayanch mexanizmni beradi.

Maqolaning maqsadi magistrlik dissertatsiyasida shakllantirilgan ilmiy natijani tizimli ravishda bayon qilish, ikkinchi tur matritsaviy soha avtomorfizmlaridan kelib chiqadigan Karleson tipidagi ajralish shartining mazmunini ochish, konstruktiv isbot bosqichlarini izchil asoslash hamda natijaning klassik interpolyatsiya nazariyasidagi o‘ rnini ko‘ rsatishdan iborat. Tadqiqot vazifalari sifatida: H∞(D) fazoning ishlatiladigan xossalarini belgilash; avtomorfik invariant ajralish miqdorini tavsiflash; yetarli shartni teorema shaklida ifodalash; fundamental funksiyalar tizimining qurilishini tushuntirish; interpolant qatorning normal yaqinlashuvi va chegaralanganligini asoslash; olingan natijani klassik birlik doira holati bilan qiyosiy tahlil qilish belgilandi.

ADABIYOTLAR TAHLILI VA NAZARIY ASOS

Chegaralangan analitik funksiyalar nazariyasi H∞ va H^p fazolar, Blyashke ko‘ paytmalari, chegaraviy qiymatlar, ichki va tashqi funksiyalar hamda faktorizatsiya masalalari bilan uzviy bog‘ liq. Garnettning monografiyasida chegaralangan analitik funksiyalar apparati, funksional baholar va interpolyatsiya nazariyasining ko‘ plab klassik vositalari tizimlashtirilgan [1]. H^p fazolariga oid umumiy nazariya esa funksiyalarning chegaradagi xulqi hamda normaviy xossalarni tushunishda muhim asos bo‘ lib xizmat qiladi [7].

Interpolyatsion ketma-ketliklar nuqtai nazaridan Earl chegaralangan sonli ketma-ketliklarni chegaralangan funksiyalar yordamida interpolyatsiya qilish masalasini o‘ rgangan va interpolant normasi bilan geometrik ajralish o‘ rtasidagi bog‘ lanishga e’tibor qaratgan [2]. Jonesning δ-masalaga bag‘ ishlangan yondashuvi esa L∞ baholarni olishda konstruktiv usullarning kuchini ko‘ rsatadi [3]. Ushbu ishlardan kelib chiqadigan metodik xulosa shuki, interpolyatsiya masalasida geometrik ajralish shartini faqat zarur formal cheklov sifatida emas, balki yordamchi funksiyalarni qurishga imkon beradigan miqdoriy resurs sifatida ko‘ rish lozim.

Ko‘ p o‘ lchamli kompleks analizda Berndtsson shar uchun H∞ interpolyatsiyasini tadqiq etgan [4]. Berndtsson, Chang va Linning polidiskdagi interpolyatsion ketma-ketliklarga oid natijalari esa bir nechta kompleks o‘ zgaruvchili sohalarda koordinataviy va invariant shartlar o‘ rtasidagi munosabatni yoritadi [5]. Mazkur ishlar bir o‘ lchamli

psevdogiperbolik geometriya g‘ oyasi yuqori o‘ lchamda saqlanib qolishini, biroq u sohaning o‘ ziga xos avtomorfizmlari va invariant metrikasi bilan qayta ifodalanishi kerakligini ko‘ rsatadi.

Matritsaviy sohalarda kompleks analizning asosiy xususiyati shundaki, nuqtalar skalyar sonlar yoki oddiy vektorlar emas, balki ma’lum algebraik va normaviy cheklovlarni qanoatlantiruvchi matritsalardan iborat bo‘ ladi. Xudayberganov, Kytmanov va Shaimqulovning matritsaviy sohalar bo‘ yicha ishlari bunday sohalarning avtomorfizmlari, invariant miqdorlari va golomorf akslantirishlariga oid nazariy apparatni rivojlantiradi [6]. Aynan shu apparat Karleson tipidagi mezonni ikkinchi tur matritsaviy sohada ifodalashga imkon beradi. Mahalliy ilmiy adabiyotlarda polikrug va ko‘ p o‘ lchamli sohalardagi interpolyatsiya masalalariga qiziqish mavjudligi ham qayd etiladi [8].

Adabiyotlar tahlilidan ko‘ rinadiki, klassik interpolyatsiya nazariyasida uchta asosiy element takroran uchraydi: tugunlarning invariant geometriyada ajralishi, tugunlarga mos fundamental funksiyalarni qurish va bu funksiyalar yig‘ indisini global nazorat qilish. Mazkur maqolada aynan shu uchlik ikkinchi tur matritsaviy soha uchun moslashtiriladi. Yondashuvning farqli jihati shundaki, skalyar Möbius almashtirishlari o‘ rniga matritsaviy sohaning φ_P avtomorfizmlari ishlatiladi va ajralish miqdori ular orqali belgilanadi.

TADQIQOT OBYEKTI, PREDMETI VA METODOLOGIYASI

Tadqiqot obyekti — ikkinchi tur matritsaviy sohada joylashgan $\{P_k\}$ nuqtalar ketma-ketligi va ushbu sohada aniqlangan chegaralangan golomorf funksiyalar fazosi $H^\infty(D)$. Tadqiqot predmeti esa ketma-ketlikning $H^\infty(D)$ uchun interpolyatsion bo‘ lishini ta’minlaydigan avtomorfik ajralish sharti hamda shu shart asosida interpolant qurish mexanizmidir. D bilan ikkinchi tur matritsaviy soha belgilanadi; uning nuqtalari tegishli simmetriya va normaviy shartlarni qanoatlantiruvchi kompleks matritsalardan iborat deb olinadi. Har bir $P \in D$ uchun φ_P sohaning avtomorfizmi bo‘ lib, $\varphi_P(P)=0$ shartini qanoatlantiradi [6].

Metodologiya nazariy-deduktiv xarakterga ega. Birinchi bosqichda klassik H^∞ interpolyatsiyasidagi ajralish tamoyili va uning ko‘ p o‘ lchamli analoglari tahlil qilinadi [1–5]. Ikkinchi bosqichda ikkinchi tur matritsaviy sohaning avtomorfik geometriyasidan foydalanib, nuqtalar orasidagi psevdogiperbolik tipdagi invariant miqdor aniqlanadi. Uchinchi bosqichda Karleson tipidagi ko‘ paytma sharti qabul qilinib, undan juft ajralish va maxrajlarning noldan uzoqligi kabi yordamchi baholar chiqariladi. To‘ rtinchi bosqichda har bir tugun uchun fundamental gk funksiyalar quriladi. Yakuniy bosqichda ularning modullari yig‘ indisi yagona o‘ zgarmas bilan chegaralanishi asosida interpolant qatorning normal yaqinlashuvi va $H^\infty(D)$ ga tegishliligi ko‘ rsatiladi.

Sof matematik tadqiqot xususiyatidan kelib chiqib, maqolada empirik tajriba yoki kuzatuv ma’lumotlari sun’iy ravishda kiritilmaydi. Natijani tekshirishning asosiy shakli mantiqiy-isbotiy verifikatsiya bo‘ lib, har bir xulosa oldingi baholar, invariantlik xossalari va qatorlarning normal yaqinlashuv mezonlari bilan asoslanadi. Shu bilan birga, natijalar taqqoslovchi jadval va konstruktiv sxema yordamida vizuallashtiriladi; bu vositalar teoremaning mazmunini va klassik holatdan matritsaviy holatga o‘ tish mantiqini aniqroq ko‘ rsatishga xizmat qiladi.

ASOSIY TUSHUNCHALAR VA INVARIANT GEOMETRIYA

$H^\infty(D)$ bilan D sohada aniqlangan barcha chegaralangan golomorf funksiyalar fazosi belgilanadi. Ushbu fazoda norma odatdagidek $\|F\|_\infty=\sup_{Z\in D}|F(Z)|$ ko‘ rinishida olinadi. $\{P_k\}\subset D$ ketma-ketlik $H^\infty(D)$ uchun interpolyatsion deyiladi, agar har qanday chegaralangan $\{b_k\}\subset\mathbb{C}$ ketma-ketlik uchun $F(P_k)=b_k$ tengliklarni barcha k lar uchun qanoatlantiruvchi $F\in H^\infty(D)$ funksiya mavjud bo‘ lsa. Bu ta’rifda ikki talab bir vaqtda ishtirok etadi: tayinlangan qiymatlarni aniq tiklash va qurilgan funksiyaning butun D sohada chegaralangan bo‘ lishi.

Matritsaviy sohada ajralish Evklid normasi bilan emas, avtomorfizmlar yordamida ifodalangan invariant miqdor bilan o‘ lchanadi. $\varphi_P(P)=0$ bo‘ lgani uchun $|\varphi_P(Q)|$ ifoda P va Q nuqtalar o‘ rtasidagi psevdogiperbolik tipdagi ajralishni tavsiflaydi. Bu miqdorning muhim jihati shundaki, u sohaning tabiiy simmetriyalari bilan moslashadi va koordinatalarni tasodifiy tanlashga bog‘ lanib qolmaydi. Unitar almashtirishlarga nisbatan invariantlik matritsani qulayroq diagonal yoki kanonik ko‘ rinishga keltirishda geometrik ma’noni saqlab qolish imkonini beradi.

Interpolyatsion ketma-ketlik uchun faqat har bir juft nuqtaning bir-biridan uzoq bo‘ lishi yetarli bo‘ lmasligi mumkin. Karleson tipidagi yondashuvda bir tugunning barcha boshqa tugunlarga nisbatan umumiy ajralishi ko‘ paytma orqali nazorat qilinadi. Bu ko‘ paytma alohida masofalarning lokal xossalarini yagona global shartga birlashtiradi. Aynan shuning uchun u keyingi konstruksiyada fundamental funksiyaning maxrajlarini nazorat qilish, logarifmik baholarni qo‘ llash va barcha gk lar yig‘ indisini bir xil o‘ zgarmas bilan chegaralash uchun qulay hisoblanadi.

ASOSIY NATIJA VA TEOREMA

D ikkinchi tur matritsaviy soha, $\{P_k\}\subset D$ esa undagi nuqtalar ketma-ketligi bo‘ lsin. Har bir $P\in D$ uchun φ_P soha avtomorfizmi bo‘ lib, $\varphi_P(P)=0$ shartni qanoatlantirsin. Dissertatsiyada olingan asosiy ilmiy natija quyidagi Karleson tipidagi yetarli shart ko‘ rinishida ifodalanadi.

Teorema. Agar shunday $\delta>0$ mavjud bo‘ lib, har bir k uchun

$$\prod_{j\neq k} |\varphi_{P_j}(P_k)| \geq \delta. \qquad (1)$$

shart bajarilsa, u holda {Pk} ketma-ketlik H∞(D) fazo uchun interpolyatsion ketma-ketlik bo‘ ladi. Ya’ni har qanday chegaralangan {bk}⊂ℂ ketma-ketlik uchun shunday F∈H∞(D) funksiya mavjudki, F(Pk)=bk, k=1,2,… tengliklar bajariladi.

Teoremaning geometrik mazmuni quyidagicha. (1) shart har bir Pk tugunining qolgan barcha tugunlarga nisbatan avtomorfik geometriyada yetarli darajada ajralganligini bir vaqtning o‘ zida nazorat qiladi. Ko‘ paytmadagi har bir ko‘ paytuvchi 0 va 1 oralig‘ idagi invariant ajralish miqdorini ifodalaganligi sababli, butun ko‘ paytmaning yagona δ>0 son bilan pastdan chegaralanishi biror omilning haddan tashqari kichrayib ketishiga yo‘ l qo‘ ymaydi. Natijada tugunlar orasida kolliziya yoki haddan tashqari zich to‘ planishning interpolatsiya konstruksiyasini buzuvchi shakli cheklanadi.

Isbotning birinchi bosqichida (1) shartdan juft nuqtalar uchun bir jinsli ajralish baholari olinadi. Agar ko‘ paytma δ dan kichik bo‘ lmasa, har bir alohida omil ham nazorat ostida bo‘ ladi. Bu holat fundamental funksiyalarni qurishda paydo bo‘ ladigan normalizatsiya koeffitsientlarining noldan uzoqligini kafolatlaydi. Mazkur bosqichning vazifasi keyingi formulalarda maxrajning kichrayib ketishi sababli normaning nazoratsiz o‘ sib ketishini oldini olishdir.

Ikkinchi bosqichda invariant miqdorning unitar almashtirishlarga nisbatan o‘ zgarmasligi va unga mos uchburchak tipidagi baholar ishlatiladi. Simmetrik kompleks matritsani qulay unitar-diagonal ko‘ rinishga keltirish ko‘ p o‘ lchamli vaziyatdagi ayrim baholarni skalyar parametrlar bo‘ yicha tahlil qilishga imkon beradi. Bunda diagonalizatsiya masalaning mohiyatini o‘ zgartirmaydi, chunki ishlatilayotgan miqdorlar unitar invariantdir. Shu tariqa klassik psevdogiperbolik geometriyaga xos baholarning matritsaviy analoglari olinadi.

Uchinchi bosqichda har bir k uchun gk∈H∞(D) fundamental funksiyalar quriladi. Ular tugunlarda Kroneker delta xossasini qanoatlantiradi:

$$g_k(P_j)=0 \ (j\neq k), \qquad g_k(P_k)=1. \tag{2}$$

(2) xossa interpolyatsiyaning algebraik qismini ta’minlaydi: har bir gk funksiya aynan o‘ z tugunida birlikka teng bo‘ lib, qolgan tugunlarda yo‘ qoladi. Biroq faqat shu xossa yetarli emas. Cheksiz ko‘ p tugunlar uchun interpolantni qator sifatida qurish rejalashtirilgani sababli, gk funksiyalarning umumiy o‘ sishini ham nazorat qilish talab etiladi. (1) shart va yordamchi logarifmik baholar asosida quyidagi global baho olinadi:

$$\sup_{Z\in D} \Sigma_{k=1}^{\infty} |g_k(Z)| \le C(\delta) < \infty. \tag{3}$$

Bu yerda C(δ) faqat ajralish parametriga bog‘ liq o‘ zgarmasdir. (3) baho konstruktiv isbotning markaziy nuqtasi hisoblanadi. U bir tomondan qatorni kompakt to‘ plamlarda normal yaqinlashtiradi, ikkinchi tomondan esa interpolantning H∞ normasini berilgan ma’lumotlarning supremum normasi orqali baholash imkonini beradi. Demak, ajralish sharti faqat tugunlarning geometrik xossasini emas, balki interpolatsiya operatorining miqdoriy barqarorligini ham ifodalaydi.

Endi {bk} chegaralangan kompleks sonlar ketma-ketligi bo‘ lsin va M=supk|bk|<∞ deb olaylik. Interpolant quyidagicha aniqlanadi:

$$F(Z)=\Sigma_{k=1}^{\infty} b_k\, g_k(Z). \tag{4}$$

(3) bahodan |bk gk(Z)|≤M|gk(Z)| kelib chiqadi va Σ|gk(Z)| butun D da yagona o‘ zgarmas bilan nazorat qilinadi. Shuning uchun (4) qator D ning kompakt qism to‘ plamlarida normal yaqinlashadi; normal yaqinlashuvchi golomorf funksiyalar qatorining yig‘ indisi golomorf bo‘ ladi. Bundan tashqari,

$$|F(Z)| \le M\, \Sigma_{k=1}^{\infty}|g_k(Z)| \le M\cdot C(\delta),$$

ya’ni ‖F‖∞≤M·C(δ) va F∈H∞(D). Nihoyat, (2) dan foydalanib, har bir j uchun F(Pj)=Σkbkgk(Pj)=bj olinadi. Demak, {Pk} ketma-ketlik interpolyatsiondir. Bu bilan teoremaning konstruktiv isbot sxemasi yakunlanadi.

NATIJALARNING TAHLILI VA TAQQOSLASH

Olingan natijani klassik birlik doira holati bilan qiyoslash uning mazmunini aniqroq ko‘ rsatadi. Har ikki vaziyatda asosiy g‘ oya tugunlarning invariant geometriyada ajralishini nazorat qilishdan iborat. Farq shundaki, birlik doirada geometriya Möbius almashtirishlari va skalyar psevdogiperbolik masofa orqali ifodalansa, ikkinchi tur matritsaviy sohada nuqtalar matritsa bo‘ lgani uchun φP avtomorfizmlari va unitar invariant matritsaviy miqdorlar ishlatiladi. Shunga qaramay, ajralish → fundamental funksiyalar → yig‘ indi bahosi → interpolant zanjiri saqlanib qoladi.

1-jadvalda klassik va matritsaviy holatlarning metodik mosligi ko‘ rsatilgan. Jadvaldan ko‘ rinadiki, umumlashtirish oddiy terminologik almashtirish emas; har bir klassik element matritsaviy sohaning ichki geometriyasiga mos keladigan yangi obyekt bilan almashtiriladi. Shu jihatdan (1) shartning ilmiy ahamiyati uning Karleson g‘ oyasini soha simmetriyalari bilan uyg‘ unlashtirishidadir.

1-jadval

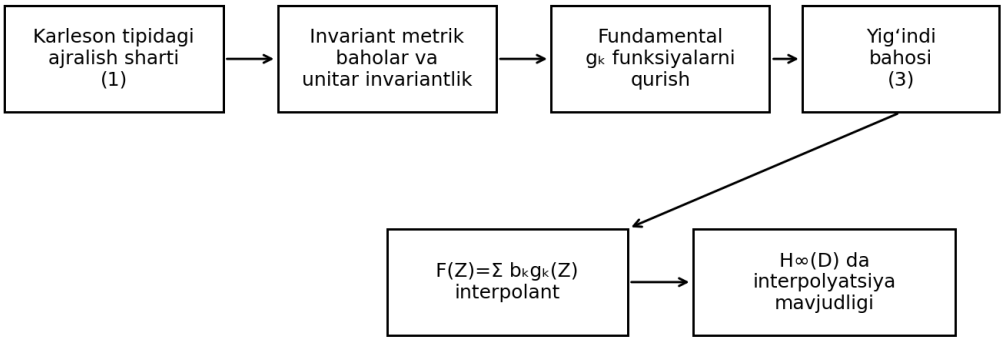
Klassik birlik doira va ikkinchi tur matritsaviy sohadagi interpolyatsiya elementlarining qiyosiy tavsifi

Tahlil elementi	Birlik doira holati	Ikkinchi tur matritsaviy soha
Tugun	Kompleks son z_k	Kompleks matritsa P_k
Invariant almashtirish	Möbius almashtirishi	φ_P matritsaviy avtomorfizmi
Ajralish mezoni	Psevdogiperbolik ko‘ paytma	Avtomorfik ko‘ paytma (1)

Fundamental obyekt	Chegaralangan analitik funksiyalar	$g_k \in H^\infty(D)$ fundamental funksiyalar
Global nazorat	Norma/yig‘ indi bahosi	$\Sigma \lvert g_k(Z) \rvert \le C(\delta)$
Natija	H^∞ interpolant	$H^\infty(D)$ interpolant

Jadvaldagi moslik natijaning umumlashtiruvchi xarakterini ko‘ rsatadi. Klassik holatdagi barcha muhim funksional bosqichlar saqlangan, biroq ular matritsaviy sohaning avtomorfik tuzilishi bilan qayta ifodalangan. Bu yondashuvning afzalligi shundaki, interpolyatsiya mezoni tashqi koordinata tanloviga emas, sohaning ichki geometriyasiga bog‘ langan bo‘ ladi. Natijada mezon unitar almashtirishlar ostida o‘ z ma’nosini saqlaydi va turli kanonik ko‘ rinishlarda bir xil geometrik mazmunni beradi.

Konstruktiv isbotning ichki mantiqi 1-rasmda aks ettirilgan. Dastlab Karleson tipidagi ajralish sharti qabul qilinadi; undan invariant metrik baholar olinadi; bu baholar fundamental funksiyalarni qurishga xizmat qiladi; keyin ularning umumiy yig‘ indisi nazorat qilinadi; oxirida chegaralangan ma’lumotlar bilan og‘ irlashtirilgan qator $H^\infty(D)$ interpolantini beradi.



1-rasm. Karleson tipidagi shartdan $H^\infty(D)$ interpolantigacha bo‘ lgan konstruktiv sxema

Sxemadan ko‘ rinadiki, (3) baho butun konstruksiyaning barqarorlik markazi hisoblanadi. Agar fundamental funksiyalar faqat tugunlarda (2) shartni qanoatlantirib, ularning umumiy moduli nazorat qilinmaganida, (4) qatorning yaqinlashuvi va chegaralanganligi kafolatlanmagan bo‘ lar edi. Demak, ilmiy natijadagi muhim yangiliklardan biri ajralish shartini aynan global yig‘ indi bahosiga olib boradigan darajada kuchli shaklda qo‘ llashdir.

Natijaning yana bir muhim tomoni normaviy bahodir. $\|F\|_\infty \le C(\delta)\|b\|_\infty$ tengsizlik interpolyatsiya operatorining chegaralanganligini ko‘ rsatadi. Bu yerda $C(\delta)$ ning aniq ko‘ rinishini aniqlash keyingi tadqiqot vazifasi bo‘ lishi mumkin, biroq uning faqat δ ga bog‘ liq bo‘ lishining o‘ zi ketma-ketlik geometriyasi bilan interpolant barqarorligi o‘ rtasidagi bevosita aloqani ko‘ rsatadi. Ajralish kuchliroq bo‘ lsa, ya’ni δ noldan yaxshiroq uzoqlashsa, konstruksiyada paydo bo‘ ladigan denominators va yordamchi koeffitsientlarni nazorat qilish qulaylashadi.

2-jadvalda isbot bosqichlarining vazifasi va yakuniy natijaga qo‘ shadigan hissasi jamlangan. Bunday tuzilma teoremani faqat yakuniy formula sifatida emas, balki ketma-ket mantiqiy operatsiyalar tizimi sifatida ko‘ rish imkonini beradi.

2-jadval

Konstruktiv isbot bosqichlari va ularning funksional vazifasi

Bosqich	Asosiy amal	Natijadagi vazifa
1	(1) ajralish shartidan juft baholar olish	Tugunlar kolliziyasini cheklash
2	Unitar invariantlik va metrik baholar	Matritsaviy geometriyani nazorat qilish
3	g_k fundamental funksiyalarni qurish	Tugun qiymatlarini ajratish
4	$\Sigma \lvert g_k \rvert \le C(\delta)$ global bahosini olish	Qator yaqinlashuvi va norma nazorati
5	$F=\Sigma b_k g_k$ qatorini qurish	Berilgan ma’lumotlarni interpolatsiya qilish

ILMIY YANGILIK VA MUHOKAMA

Maqolada yoritilgan ilmiy yangilikning asosiy mazmuni klassik interpolyatsiya nazariyasidagi ajralish tamoyilini ikkinchi tur matritsaviy sohaning avtomorfik geometriyasiga mos shaklda ifodalash va undan $H^\infty(D)$ da interpolyatsiya mavjudligi uchun konstruktiv yetarli shart olishdan iborat. Ilmiy yangilik ikki darajada namoyon bo‘ ladi. Birinchidan,

ajralish sharti matritsaviy nuqtalarning tabiiy avtomorfizmlari orqali ifodalanadi. Ikkinchidan, ushbu shart fundamental funksiyalar sistemasini qurish va umumiy yig‘ indi bahosini olish bilan bevosita bog‘ lanadi.

Klassik Karleson g‘ oyasi bilan o‘ xshashlik (1) ko‘ paytma shartida yaqqol ko‘ rinadi. Biroq birlik doiradagi Möbius almashtirishlari o‘ rnini φP matritsaviy avtomorfizmlari egallashi natijaning mazmunini sifat jihatidan o‘ zgartiradi. Matritsaviy nuqtaning koordinatalari o‘ zaro algebraik bog‘ langan bo‘ lishi mumkin; shu sabab invariantlik oddiy texnik qulaylik emas, balki mezonning geometrik to‘ g‘ riligini ta’minlaydigan asosiy talabdir. Bu holat natijani tasodifiy bazis yoki koordinata sistemasiga bog‘ lanib qolishdan saqlaydi.

Konstruktiv isbot nazariy jihatdan ham muhim. Fundamental gk funksiyalarni qurish interpolyatsiya operatorining mavjudligini ko‘ rsatadi, (3) esa ushbu operatorning chegaralanganligini nazorat qiladi. Shunday qilib, teorema “interpolant mavjud” degan sifat xulosasi bilan cheklanmay, “interpolantni qanday yig‘ ish va uning normasini qanday baholash mumkin” degan savollarga ham javob beradi. Bu jihat keyingi tadqiqotlarda interpolyatsiya konstantalarini aniqroq hisoblash, tugun zichligi bilan norma o‘ rtasidagi bog‘ lanishni o‘ rganish va operator qiymatli ma’lumotlarga o‘ tishda muhim bo‘ lishi mumkin.

Natija ayni paytda yetarli shart sifatida talqin qilinishi lozim. Ya’ni (1) bajarilganda interpolyatsiya kafolatlanadi, biroq interpolyatsion bo‘ lgan har qanday ketma-ketlik albatta aynan shu ko‘ paytma shartini qanoatlantirishi ushbu maqolada da’vo qilinmaydi. Ikkinchi tur matritsaviy soha uchun zarur va yetarli mezonlarning to‘ liq tavsifi, shuningdek C(δ) o‘ zgarmasining optimal bahosi alohida tadqiqot yo‘ nalishidir. Ilmiy xulosalarni aynan shu chegaralarda talqin qilish natijaning ishonchliligini saqlaydi.

Maqolaning nazariy ahamiyati shundaki, u skalyar interpolyatsiya nazariyasidagi umumiy metodologiyani matritsaviy kompleks analizga moslashtirish yo‘ lini ko‘ rsatadi. Amaliy-metodik ahamiyati esa tekshiriladigan shart va konstruktiv algoritmning mavjudligidadir: berilgan ketma-ketlik uchun ajralish parametri nazorat qilinadi, so‘ ng fundamental funksiyalar tizimi quriladi va berilgan chegaralangan ma’lumotlar asosida interpolant hosil qilinadi. Bu sxema kompyuter algebra tizimlarida chekli tugunlar uchun modellashtirish yoki sonli tajribalar tashkil etish uchun ham konseptual asos bo‘ la oladi, biroq bunday sonli tajribalar ushbu maqolaning manba materialida keltirilmaganligi sababli alohida natija sifatida taqdim etilmaydi.

TADQIQOTNING CHEGARALARI VA ISTIQBOLLI YO‘ NALISHLAR

Tadqiqotning birinchi chegarasi shundaki, asosiy natija yetarli shart ko‘ rinishida berilgan. Zaruriy shartning aniq shakli va ikki yo‘ nalishning ekvivalentligini o‘ rnatish uchun qo‘ shimcha geometrik hamda funksional-analitik vositalar talab qilinadi. Ikkinchi chegara C(δ) o‘ zgarmasining optimal yoki aniq bahosi berilmaganidadir. Bu o‘ zgarmasning δ ga bog‘ liqligini aniqlashtirish interpolatsiya operatorining normasi bo‘ yicha yanada kuchli xulosalar olish imkonini beradi.

Kelgusida usulni boshqa klassik matritsaviy sohalarga ko‘ chirish, operator qiymatli interpolyatsiya masalalariga tatbiq etish, chekli ketma-ketliklar uchun hisoblash algoritmlarini ishlab chiqish va invariant ajralish mezonining zaruriylik darajasini o‘ rganish maqsadga muvofiq. Shuningdek, matritsaviy sohalarda interpolatsiya tugunlarining zichlik xossalari bilan H∞ normasi o‘ rtasidagi bog‘ lanish alohida ilmiy qiziqish uyg‘ otadi.

XULOSA

Ikkinchi tur matritsaviy sohada H∞(D) uchun interpolyatsion ketma-ketliklarni o‘ rganishda Karleson tipidagi avtomorfik ajralish sharti samarali yetarli mezon ekanligi asoslandi. Agar har bir tugun uchun boshqa tugunlarga nisbatan avtomorfik ajralishni ifodalovchi $\prod_{j\neq k}|\varphi_{P_j}(P_k)|$ ko‘ paytma yagona $\delta>0$ son bilan pastdan chegaralansa, berilgan ketma-ketlik H∞(D) uchun interpolyatsion bo‘ ladi. Mazkur xulosa tugunlar geometriyasini funksional interpolyatsiya imkoniyati bilan bog‘ laydi.

Isbotning konstruktiv mohiyati uch asosiy qadamda namoyon bo‘ ladi: invariant metrik baholarni olish, Kroneker delta xossasiga ega fundamental gk funksiyalarni qurish va ularning modullari yig‘ indisini C(δ) bilan global chegaralash. Shu bahodan foydalanib $F(Z)=\Sigma b_k g_k(Z)$ qatorining normal yaqinlashuvi, golomorfligi va $\|F\|_\infty \le C(\delta)\|b\|_\infty$ normaviy nazorati kelib chiqadi. Demak, natija faqat mavjudlikni emas, balki interpolantni qurish mexanizmini ham beradi.

Tadqiqot klassik birlik doiradagi Karleson g‘ oyasining ikkinchi tur matritsaviy soha sharoitidagi tabiiy davomi sifatida qaralishi mumkin. Bunda skalyar Möbius geometriyasi matritsaviy avtomorfizmlar geometriyasi bilan almashtiriladi, ammo ajralish, fundamental funksiyalar va global yig‘ indi bahosi o‘ rtasidagi metodik bog‘ lanish saqlanadi. Olingan natija matritsaviy kompleks analizda interpolyatsiya nazariyasini rivojlantirish, zarur va yetarli mezonlarni izlash hamda boshqa klassik sohalarga umumlashtirish uchun nazariy asos yaratadi.

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ESTIMATION OF THE ASYMPTOTIC NORMALIZATION COEFFICIENT (ANC) FOR THE VIRTUAL DECAYS $^{8}B \rightarrow {}^{7}Be + p$ and $^{8}Li \rightarrow {}^{7}Li + n$, WITHIN THREE-BODY MODEL

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Abstract: *The asymptotic normalization coefficient (ANC) of the virtual decay $^{8}B \rightarrow {}^{7}Be + p$ is one of the most important quantities for estimating the cross section and the rate of the radiative capture reaction $^{7}Be(p,\gamma)^{8}B$, a key process of the solar proton–proton chain and a major source of the high-energy ^{8}B solar neutrino flux. . This paper is devoted to the estimation of the ANC within a self-consistent three-body $\alpha+^{3}He+p$ potential cluster model based on the hyperspherical Lagrange-mesh method. The methodology of extracting the ANC from the asymptotic behavior of the overlap integral between the three-body ^{8}B (^{8}Li) and two-body $^{7}Be = \alpha + {}^{3}He$ ($^{7}Li = \alpha + {}^{3}H$) wave functions is described, and the resulting values are compared with earlier ab initio, cluster-model, and transfer-reaction estimates.*

Keywords: *asymptotic normalization coefficient, ^{8}B and ^{8}Li mirror nuclei, three-body cluster model, hyperspherical Lagrange-mesh method, capture reaction $^{7}Be(p, \gamma)^{8}B$.*

ОЦЕНКА АСИМПТОТИЧЕСКОГО НОРМИРОВОЧНОГО КОЭФФИЦИЕНТА (ANC) ДЛЯ ВИРТУАЛЬНЫХ РАСПАДОВ $^{8}B \rightarrow {}^{7}Be + p$ И $^{8}Li \rightarrow {}^{7}Li + n$ В РАМКАХ ТРЁХЧАСТИЧНОЙ МОДЕЛИ

Аннотация: *Асимптотический нормировочный коэффициент (ANC) виртуального распада $^{8}B \rightarrow {}^{7}Be + p$ является одной из ключевых величин для оценки сечения и скорости радиационной реакции захвата $^{7}Be(p, \gamma)^{8}B$. Данная реакция играет важную роль в протон-протонной цепочке термоядерных реакций Солнца и является основным источником высокоэнергетического потока солнечных нейтрино от распада ^{8}B. Настоящая работа посвящена теоретическоой оценке асимптотического нормировочного коэффициента, в рамках самосогласованной трёхчастичной потенциальной кластерной модели $\alpha+^{3}He+p$, основанной на методе гиперсферической Лагранжевой сетки. Описана методика извлечения ANC из асимптотического поведения интеграла перекрытия между трёхчастичной волновой функцией ядра ^{8}B (^{8}Li) и двухчастичной волновой функцией $^{7}Be = \alpha + {}^{3}He$ ($^{7}Li = \alpha + {}^{3}H$). Полученные значения асимптотических нормировочных коэффициентов сопоставлены с результатами, полученными ранее в рамках ab initio-подходов, кластерных моделей и методов, основанных на реакциях переноса.*

Ключевые слова: *асимптотический нормировочный коэффициент (ANC), зеркальные ядра ^{8}B и ^{8}Li, трёхчастичная потенциальная кластерная модель, гиперсферический метод Лагранжевой сетки, реакция захвата $^{7}Be(p, \gamma)^{8}B$.*

UCH-JISM MODEL DOIRASIDA $^{8}B \rightarrow {}^{7}Be + p$ VA $^{8}Li \rightarrow {}^{7}Li + n$ VIRTUAL PARCHALANISHLARI UCHUN ASIMPTOTIK NORMALLASHTIRISH KOEFFITSIYENTINI (ANC) BAHOLASH

Annotatsiya: *$^{8}B \rightarrow {}^{7}Be + p$ virtual parchalanishining asimptotik normallashtirish koeffitsiyenti (ANC) $^{7}Be(p, \gamma)^{8}B$ radiatsion qamrash reaksiyasining kesimi va tezliklarini baholash uchun muhim kattaliklardan biri hisoblanadi. Mazkur reaksiya Quyoshdagi proton-proton termoyadro reaksiyalari zanjirining muhim bosqichlaridan biri bo‘ lib, yuqori energiyali ^{8}B Quyosh neytrinolari oqimining asosiy manbalaridan biridir. Ushbu ish ANC qiymatini gipersferik Lagranj to‘ r usuliga asoslangan o‘ z-o‘ ziga mos uch-jism $\alpha+^{3}He+p$ potensial klaster modeli doirasida baholashga bag‘ ishlangan. ANC ni uch-jismli ^{8}B (^{8}Li) yadrosining to‘ lqin funksiyasi bilan ikki-jismli $^{7}Be = \alpha+^{3}He$ ($^{7}Li = \alpha+^{3}H$) yadrosining to‘ lqin funksiyasi orasidagi qoplanish integralining*

asimptotikasidan ajratib olish metodikasi tavsiflanadi. Olingan asimptotik normallashtirish koeffitsiyentlari ab initio yondashuvlari, klaster modellari hamda uzatish reaksiyalari yordamida ilgari olingan natijalar bilan taqqoslanadi.

Kalit so‘ zlar: *asimptotik normallashtirish koeffitsiyenti, ^{8}B va ^{8}Li ko‘ zgu yadrolari, uch-jism potensial klaster modeli, gipersferik Lagranj to‘ r usuli, $^{7}Be(p,\gamma)^{8}B$ qamrash reaksiyasi.*

Introduction

The proton-radiative-capture reaction $^{7}Be(p,\gamma)^{8}B$ governs the production of high-energy ^{8}B solar neutrinos within the proton–proton chain of hydrogen burning in the Sun [1,2]. Because the relevant stellar energies lie far below the Coulomb barrier, the cross section of this reaction cannot be measured directly at astrophysically relevant energies. A central quantity in such an extrapolation is the asymptotic normalization coefficient (ANC), which fixes the amplitude of the tail of the bound-state wave function of the valence proton in ^{8}B beyond the range of the nuclear interaction. Since ^{8}B is a weakly bound one-proton halo nucleus with a separation energy of only about 0.1375 MeV, the capture process at low energies is dominated by this peripheral, long-range part of the wave function, so that the cross section becomes essentially proportional to the square of the ANC. The estimation of this coefficient accurately is therefore equivalent to determining the low-energy capture rate itself. This work reviews the problem of estimating the ANC for the $^{8}B \rightarrow {}^{7}Be + p$ virtual decay, with emphasis on a three-body potential cluster model in which ^{8}B is treated as an $\alpha + {}^{3}He + p$ system and ^{8}Li as $\alpha + {}^{3}H + n$, allowing a consistent study of both the ^{8}B and the ^{8}Li mirror nuclei. The aim is to summarise the physical basis of the approach, the main results obtained for the ANC.

Literature review

Empirical ANC values for $^{8}B \rightarrow {}^{7}Be + p$ have traditionally been extracted from peripheral nuclear transfer reactions analyzed within the distorted-wave Born approximation (DWBA). Proton-transfer measurements of reactions such as $^{10}B(^{7}Be,^{8}B)^{9}Be$ and $^{14}N(^{7}Be,^{8}B)^{13}C$ give a squared ANC of about 0.465 fm^{-1}, while an analysis of the $^{7}Be(d,n)^{8}B$ reaction yields a noticeably larger value about 0.613 fm^{-1}. Coulomb-breakup measurements of ^{8}B on heavy targets have produced intermediate results, typically in the range 0.45–0.55 fm^{-1}.

On the theoretical side, ab-initio calculations provide an independent route to the ANC. Variational Monte Carlo calculations with realistic Argonne v_{18} and Urbana IX potentials give a squared ANC about 0.537 fm^{-1}, close to the value obtained with the no-core shell model combined with the resonating-group method (NCSM/RGM), about 0.509 fm^{-1}. Earlier NCSM calculations using the CD-Bonn 2000 nucleon–nucleon potential produced a larger value, about 0.587 fm^{-1}. At the same time a more recent NCSM-with-continuum calculation based on chiral effective-field-theory potentials at fourth order, including three-nucleon forces, notably fails to reproduce the experimental S-wave $p + {}^{7}Be$ scattering length, a concern since the S-wave channel dominates the low-energy capture process and strongly constrains the reliability of the underlying wave function, and hence of the extracted ANC [1,2].

Halo effective field theory at next-to-leading order gives a squared ANC of 0.564 fm^{-1}, in reasonable agreement with the VMC and CD-Bonn NCSM results. A two-body effective-potential model, tuned to reproduce the measured S-wave $p + {}^{7}Be$ scattering length, yields a squared ANC of about 0.538 fm^{-1}, consistent with several of the ab initio estimates, though it does not explicitly include ^{7}Be core-excitation effects.

Three-body cluster-model calculations of the ^{8}B ANC were first carried out within the hyperspherical harmonics method, but were restricted to a maximal hypermomentum of $K_{max} = 12$, which is insufficient to guarantee convergence for such a weakly bound halo system. This limitation motivates renewed three-body calculations carried to substantially larger K_{max}.

For the mirror decay $^{8}Li \rightarrow {}^{7}Li + n$, the main empirical constraint is a squared ANC of 0.432 ± 0.044 fm^{-1}, obtained from a DWBA analysis of the $^{13}C(^{7}Li,^{8}Li)^{12}C$ neutron-transfer reaction [3]. This value is used below as the principal point of comparison for the present three-body ^{8}Li result, and is noticeably smaller than the three-body cluster-model estimate, a discrepancy discussed further in the results section.

Overall, the literature shows that squared ANC estimates for $^{8}B \rightarrow {}^{7}Be + p$ span a fairly wide range from about 0.45 fm^{-1} obtained from transfer-reaction analyses up to about 0.59 fm^{-1} from CD-Bonn-based NCSM and related ab initio calculations underlining the continuing need for independent, well-converged theoretical estimates of this coefficient.

Research Methodology

The structure of the ^{8}B nucleus is described within a three-body α+^{3}He+p potential cluster model. The two-body interactions between the constituent clusters are represented by phenomenological potentials, which are chosen to reproduce the corresponding two-body scattering and bound-state properties.

The α–^{3}He, $\alpha - N$ and 3He-N interaction potentials are particularly important for the present ANC analysis because they determine the structure of the ^{7}Be(^{7}Li) core and ^{8}B(^{8}Li) halo nucleus. They are described by a Gaussian nuclear potential supplemented by the Coulomb interaction,

$$V(r) = V_0 exp(-\alpha_0 r^2) + V_C(r). \quad (1)$$

The parameters of the α–N, $^3He(^3H)$-N and α–$^3He(^3H)$ potential are given in Refs. [4], [5], [6], respectively. The potential depth V_0 and width α_0 parameters fitted to the scattering and bound state data for each partial wave. The resulting three-body wave function is subsequently used to calculate the ^7Be+p overlap function, whose asymptotic behavior provides the ANC.

The three-body geometry underlying is defined through the relative coordinates **r** (between the α-particle and ^3He) and **R** (between the ^7Be core and the proton), illustrated schematically in figure.

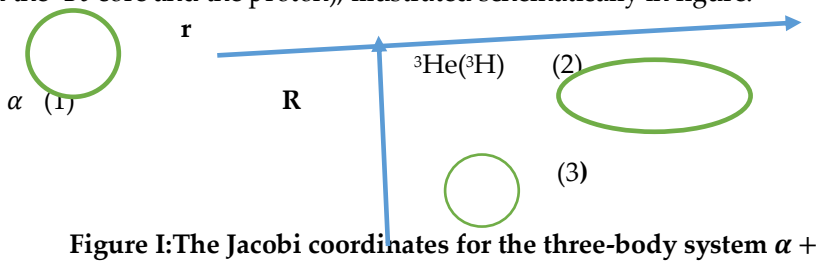


Figure I:The Jacobi coordinates for the three-body system $\alpha + ^3He(^3H)+p(n)$

The ANC values are extracted from the matching of the overlap integral presented below with its asymptotics described by the Whittaker function: $I_{l_R I}(R) = \langle \Psi_3(\vec{r},\vec{R},\xi_2,\xi_3) \,|\psi_I(\vec{r},\vec{R},\xi_2,\xi_3)\rangle = C_I W_{\eta;l_{R+1/2}}(2kR)/R$ (2)

where W is known Whittaker function, k is the wave number, η is the Sommerfeld parameter, and

$$\psi_I(\vec{r},\hat{R},\xi_2,\xi_3) = \frac{u_2(r)}{r} \times \{\{[Y_l(\hat{r}) \otimes \chi_{1/2}(\xi_3)] \otimes \chi_{1/2}(\xi_2)\} \otimes Y_{l_R}(\hat{R})\}_{2M} \quad (3)$$

is an effective wave function with $u_2(r)$/r the $^7Be = \alpha + ^3He$ ($^7Li = \alpha + ^3H$) two-body radial wave function, and ξ_2, ξ_3 the spin variables of the valence nucleon and of the ^3He (^3H) cluster, respectively. Since the orbital momentum $l_R = 1$ is fixed throughout, the resulting coefficient is denoted simply as C_I for each spin channel. The ANC is then obtained self-consistently from Eq. (2) as $C_I = I_I(R) \cdot R / W_{\eta,l_R+1/2}(2\kappa R)$, evaluated at asymptotic distances R between the core and the valence nucleon; the physically meaningful value of C_I is identified from the stable plateau region of this ratio as a function of the matching point R_0, as illustrated in Fig. II below.

Within the present three-body model, the overlap integral $I_I(R)$ reproduces the expected Whittaker-function asymptotic behaviour over the interval $R \approx 3$–10 fm. For the $^8B(2^+)$ ground state, the spin-1 channel asymptotics is matched at $R_0 = 4$ fm, while the dominant spin-2 channel is matched at $R_0 = 6$ fm; for the mirror $^8Li(2^+)$ ground state, the corresponding matching points are $R_0 = 4.5$ fm and $R_0 = 8.5$ fm, respectively.

Results and discussion

Table I compares the calculated bound-state energies with the corresponding experimental values. The obtained results are in reasonable agreement with the experimental data, providing a consistent description of the ^8B and ^8Li bound states used in the subsequent ANC analysis.

	^8B	Exp	^8Li	Exp
$E_b(2^+)$	-1.718	-1.724 [7]	-4.340	-4.499 [7]
$E_b(1^+)$	-1.075	-0.954 [7]	-3.559	-3.518 [7]
$\langle r^2_{mat}\rangle^{1/2}$	2.76	2.58(6) [8]	2.56	2.50 [9]

Table-I: Calculated bound state energies (MeV) and matter radii (fm)

The proton separation energy of the ^8B ground state is an important quantity for the determination of the ANC of the $^8B \rightarrow ^7Be$+p virtual transition. In the three-body model, the proton separation energy is calculated from the difference between the binding energies of ^8B and ^7Be:

$$E_p = E_b(8B) - E_b(7Be) \quad (3)$$

The calculated values depend strongly on the maximal hypermomentum K_{max}. The ^7Be binding energy obtained with the same α–^3He interaction is $E_b(^7Be)$=1.5924 MeV. The dependence of the calculated ^8B binding energy and proton separation energy on K_{max} is presented in Table II.

K_{max}	8	12	16	20	22	Exp
$E_b(^8B)$ (MeV)	1.3901	1.6221	1.6895	1.7121	1.7175	1.7236
E_p (MeV)	0.2023	0.0297	0.0971	0.1197	0.1251	0.1375

$E_b(^7Be)$ (MeV)	4.1005	4.2846	4.3274	4.3380	4.3399	4.4992
E_n (MeV)	1.6349	1.8190	1.8618	1.8724	1.8743	2.0323

Table-II: Dependance of the of the calculated binding and separation energies of ^8B and ^8Li nuclei on the maximal hypermomentum K_{max}

As shown in Table II, the calculated proton separation energy increases systematically with increasing *Kmax*, from −0.2023 MeV at *Kmax*=8 to 0.1251 MeV at *Kmax*=22 approaching the experimental value of 0.1375 MeV. The results indicate that sufficiently large *Kmax* is required to achieve a stable description of the weakly bound 8B ground state. In particular, the values obtained at *Kmax*=20 and 22 demonstrate improved convergence and are therefore used as a basis for the subsequent ANC analysis. By contrast, the neutron separation energy of ^8Li converges markedly faster, already at $Kmax \approx 12$, reflecting the absence of the Coulomb barrier between the ^7Li core and the neutron.

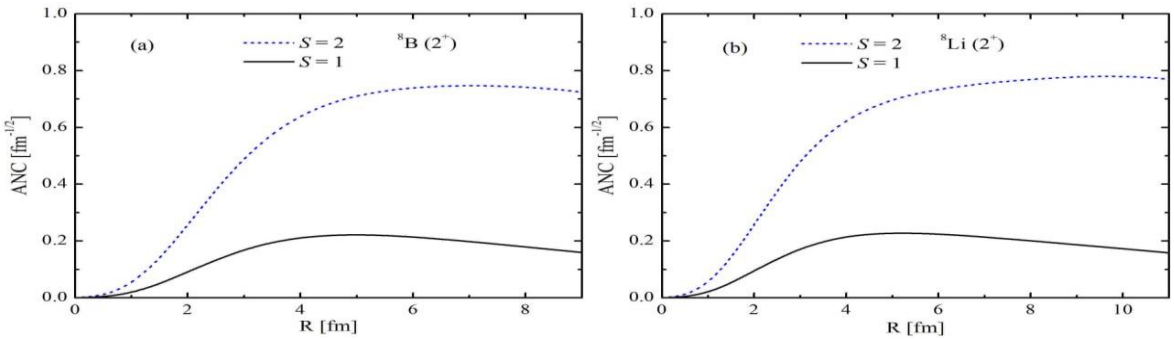


Figure II: Calculated ANC values for the ground (2^+) states of the ^8B and ^8Li nuclei in dependence on the matching point of the overlap integral with it's asymptotics

For the $^8B \rightarrow ^7Be + p$ decay, the extracted ANC values are $C_1 = 0.211$ fm$^{-1/2}$ in the spin-1 channel and $C_2 = 0.739$ fm$^{-1/2}$ in the spin-2 channel, giving a total squared ANC $C^2(^8B) = 0.591$ fm^{-1}. This lies above the ab initio NCSM/RGM value (~0.509 fm^{-1}) [10] but is consistent, within uncertainties, with the CD-Bonn-based NCSM result and with halo effective field theory. For the mirror decay $^8Li \rightarrow ^7Li + n$, the corresponding values are $C_1 = 0.220$ fm$^{-1/2}$ and $C_2 = 0.774$ fm$^{-1/2}$, giving a total squared ANC $C^2(^8Li) = 0.648$ fm^{-1} which is noticeably above the empirical transfer-reaction estimate of about 0.432 fm^{-1} obtained from the $^{13}C(^7Li,^8Li)^{12}C$ reaction [11].

The α+$^3He(^3H)$+$p(n)$ three-body cluster model, based on the hyperspherical Lagrange-mesh method and realistic two-body interactions, yields a consistent description of the structure of ^8B and ^8Li, with good convergence of binding energies (with K_{max} =22 for ground states, and K_{max}=28 for excited states) and matter radii. The ANCs were extracted self-consistently by matching the overlap integral of the three-body and two-body wave functions to its asymptotics expressed by the Whittaker functions.

Conclusion

The asymptotic normalization coefficients of the virtual decays $^8B \rightarrow ^7Be + p$ and $^8Li \rightarrow ^7Li + n$ can be determined self-consistently within a three-body $\alpha + ^3He(^3H) + p(n)$ potential cluster model, by matching the overlap integral of the three-body and two-body wave functions to its Whittaker-function asymptotics at large core–nucleon separation. Carried out with a sufficiently large hyperspherical basis (*Kmax* up to 22–28), this approach yields converged binding energies, nucleon separation energies, and matter radii for both ^8B and ^8Li mirror nuclei. The developed method yields ANC square values — about 0.591 fm^{-1} for ^8B and 0.648 fm^{-1} for ^8Li —broadly consistent with several ab initio and effective-field-theory estimates, while differing from certain transfer-reaction extractions, particularly for ^8Li.

The comparison of the two mirror ANCs points to a measurable breaking of the mirror symmetry of the nuclear force, attributable to the interplay of the Coulomb interaction and three-body dynamical effects. Together with the converged proton and neutron separation energies and matter radii, these ANC values provide a consistent and self-contained basis for further studies of the low-energy $^7Be(p,\gamma)^8B$ and $^7Li(n,\gamma)^8Li$ capture reactions.

Authorship contribution statement E.M. Tursunov: Writing – review & editing, Conceptualization.
D. S. Toshova: Software, Investigation.

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RUNGE-KUTTA USULI YORDAMIDA ODDIY DIFFERENSIAL TENGLAMALARNI SONLI YECHISH VA UNING ANIQLIK TAHLILI

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Annotatsiya; *Ushbu maqolada oddiy differensial tenglamalarni sonli yechish uchun keng qo‘ llaniladigan Runge-Kutta usuli, xususan uning ikkinchi va to‘ rtinchi tartibli variantlari batafsil ko‘ rib chiqilgan. Tadqiqotning maqsadi — Eyler, Runge-Kutta-2 va Runge-Kutta-4 usullarining aniqlik va yaqinlashish tezligini analitik yechimi ma’lum bo‘ lgan test masala misolida qiyosiy tahlil qilishdan iborat. Metodologiya sifatida* $y' = -2xy$, $y(0) = 1$ *boshlang‘ ich shartli Koshi masalasi tanlab olindi, chunki uning aniq yechimi* $y(x) = e^{-x^2}$ *ko‘ rinishida topiladi va bu sonli natijalarni analitik natija bilan bevosita solishtirish imkonini beradi. Har bir usul Python dasturlash tilida amalga oshirilib, turli qadam qiymatlari (h = 0,4 dan h = 0,0125 gacha) uchun maksimal absolyut xatolik hisoblab chiqildi. Natijalar shuni ko‘ rsatdiki, Runge-Kutta-4 usuli qadam ikki barobar kamayganda xatolikni taxminan 16 marta kamaytiradi, bu uning to‘ rtinchi tartibli yaqinlashishini tasdiqlaydi, Eyler usulida esa xatolik atigi ikki marta kamayadi. Tadqiqot natijalari muhandislik va fizik jarayonlarni modellashtirishda Runge-Kutta-4 usulining amaliy ustunligini asoslaydi.*

Kalit so‘ zlar: *Runge-Kutta usuli; sonli integrallash; differensial tenglamalar; Koshi masalasi; Eyler usuli; yaqinlashish tartibi; xatolikni baholash; algoritm.*

ЧИСЛЕННОЕ РЕШЕНИЕ ОБЫКНОВЕННЫХ ДИФФЕРЕНЦИАЛЬНЫХ УРАВНЕНИЙ МЕТОДОМ РУНГЕ–КУТТЫ И АНАЛИЗ ЕГО ТОЧНОСТИ

Аннотация*. В статье подробно рассматривается широко применяемый метод Рунге-Кутты для численного решения обыкновенных дифференциальных уравнений, в частности его варианты второго и четвёртого порядка. Цель исследования — сравнительный анализ точности и скорости сходимости методов Эйлера, Рунге-Кутты-2 и Рунге-Кутты-4 на примере тестовой задачи с известным аналитическим решением. В качестве методологии выбрана задача Коши* $y' = -2xy$, $y(0) = 1$, *точное решение которой имеет вид* $y(x) = e^{-x^2}$, *что позволяет напрямую сопоставить численные результаты с аналитическими. Каждый метод реализован на языке Python, для различных значений шага (от h = 0,4 до h = 0,0125) вычислена максимальная абсолютная погрешность. Результаты показали, что при уменьшении шага вдвое метод Рунге-Кутты-4 уменьшает погрешность примерно в 16 раз, что подтверждает его четвёртый порядок сходимости, тогда как у метода Эйлера погрешность уменьшается лишь вдвое. Результаты исследования обосновывают практическое преимущество метода Рунге-Кутты-4 при моделировании инженерных и физических процессов.*

Ключевые слова: *метод Рунге-Кутты; численное интегрирование; дифференциальные уравнения; задача Коши; метод Эйлера; порядок сходимости; оценка погрешности; алгоритм.*

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS USING THE RUNGE–KUTTA METHOD AND ITS ACCURACY ANALYSIS

Abstract; *This article provides a detailed examination of the widely used Runge-Kutta method for the numerical solution of ordinary differential equations, focusing on its second- and fourth-order variants. The aim of the study is to comparatively analyze the accuracy and convergence rate of the Euler, Runge-Kutta-2, and Runge-Kutta-4 methods using a test problem with a known analytical solution. The Cauchy problem y’ = -2xy, y(0) = 1 was selected as the methodological basis, since its exact solution* $y(x) = e^{-x^2}$ *allows direct comparison between numerical and analytical results. Each method was implemented in Python, and the maximum absolute error was computed for a range of step sizes (from h = 0.4 to h = 0.0125). The results show that halving the step size reduces the error of the Runge-Kutta-4 method by a factor of approximately 16, confirming its fourth-order convergence, whereas the Euler method’s error is reduced only by a factor of two. These findings substantiate the practical advantage of the Runge-Kutta-4 method for modeling engineering and physical processes.*

Keywords: *Runge-Kutta method; numerical integration; differential equations; Cauchy problem; Euler method; order of convergence; error estimation; algorithm.*

1. Kirish

Tabiat va texnikada uchraydigan ko‘ plab jarayonlar — issiqlik tarqalishi, moddiy nuqta harakati, kimyoviy reaksiya kinetikasi, elektr zanjirlaridagi o‘ tkinchi jarayonlar, populyatsiya dinamikasi va boshqalar — oddiy differensial tenglamalar (ODT) yordamida modellashtiriladi. Ko‘ pgina amaliy masalalarda differensial tenglamaning analitik (aniq) yechimini topish imkonsiz yoki juda murakkab bo‘ ladi, shu sababli sonli usullar qo‘ llaniladi [1]. Sonli usullar orasida Runge-Kutta usullari oilasi eng ko‘ p qo‘ llaniladigan va ishonchli algoritmlardan biri hisoblanadi, chunki ular yuqori aniqlikni nisbatan sodda hisoblash sxemasi bilan ta’minlaydi.

Runge-Kutta usuli nemis matematiklari Karl Runge va Martin Kutta tomonidan XX asr boshida ishlab chiqilgan bo‘ lib, bir bosqichli, ko‘ p bosqichli baholarga asoslangan iterativ sxema orqali Koshi masalasining yechimini qadamma-qadam yaqinlashtirish g‘ oyasiga asoslanadi [2, 3]. Eng oddiy variant — Eyler usuli — birinchi tartibli aniqlikka ega bo‘ lsa, klassik to‘ rtinchi tartibli Runge-Kutta usuli (RK4) muhandislik amaliyotida standart vosita sifatida qabul qilingan, chunki u nisbatan katta qadam qiymatlarida ham yuqori aniqlikni ta’minlaydi [4].

Differensial tenglamalarni sonli yechishning boshqa ko‘ plab yondashuvlari — masalan, ko‘ p bosqichli Adams-Bashfort va Adams-Multon usullari, chekli farqlar usuli, chekli elementlar usuli — ham mavjud. Biroq bir bosqichli Runge-Kutta usullari o‘ zining o‘ z-o‘ zidan boshlanish (self-starting) xususiyati, ya’ni oldingi qadamlar tarixini talab qilmasligi bilan alohida ajralib turadi. Bu xususiyat, ayniqsa boshlang‘ ich shart o‘ zgaruvchan bo‘ lgan yoki qadam kattaligi hisoblash jarayonida moslashtiriladigan masalalarda katta amaliy ahamiyatga ega [4].

Amaliyotda RK4 usuli meteorologik modellashtirish, orbital mexanika, robototexnika boshqaruv tizimlari, kimyoviy kinetika va epidemiologik modellarni (masalan, SIR modeli) sonli yechishda keng qo‘ llaniladi. Bunday sohalarda tenglama tizimi ko‘ pincha yuzlab yoki minglab o‘ zgaruvchilardan iborat bo‘ lishi mumkin, shu sababli usulning har bir qadamdagi hisoblash xarajati va aniqligi o‘ rtasidagi muvozanat alohida ahamiyat kasb etadi.

Ushbu maqolaning maqsadi — Eyler, ikkinchi tartibli Runge-Kutta (RK2) va to‘ rtinchi tartibli Runge-Kutta (RK4) usullarining nazariy asoslarini yoritish hamda ularning aniqlik va yaqinlashish tezligini analitik yechimi ma’lum bo‘ lgan test masala misolida sonli tajriba orqali qiyosiy baholashdan iborat. Tadqiqotning vazifalari quyidagilardan iborat: birinchidan, har bir usulning matematik formulasi va xatolik tartibini nazariy jihatdan asoslash; ikkinchidan, usullarni dasturiy ravishda amalga oshirish; uchinchidan, turli qadam qiymatlari uchun sonli tajriba o‘ tkazish va natijalarni jadval hamda grafik ko‘ rinishida taqdim etish; to‘ rtinchidan, olingan natijalar asosida amaliy tavsiyalar ishlab chiqish. Tadqiqot natijalari amaliyotchi muhandislar va tadqiqotchilarga muayyan masala uchun qaysi usulni tanlash maqsadga muvofiqligini asoslashda yordam beradi.

2. Mavzuga oid adabiyotlar tahlili

Differensial tenglamalarni sonli yechish nazariyasi XIX asr oxiri – XX asr boshlarida Eyler, Runge va Kutta kabi matematiklarning ishlari bilan asos solingan bo‘ lib, keyinchalik kompyuter texnikasining rivojlanishi bilan bu sohaning ahamiyati yanada ortdi. Zamonaviy sonli tahlil kurslarida Runge-Kutta usullari differensial tenglamalarni sonli yechishning markaziy mavzularidan biri sifatida o‘ rgatiladi, chunki ular nafaqat amaliy foydaliligi, balki nazariy jihatdan ham chuqur asoslangan xatolik nazariyasiga ega [1, 4].

Sonli usullar nazariyasiga bag‘ ishlangan klassik ishlarda Runge-Kutta usullarining turg‘ unligi, xatolikni baholash va qadamni moslashtiruvchi (adaptive step-size) algoritmlari batafsil o‘ rganilgan [4, 5]. So‘ nggi yillarda bu usullar mashinaviy o‘ rganish va fizikaga asoslangan neyron tarmoqlarni qurishda ham qo‘ llanilmoqda, chunki Runge-Kutta sxemalari differensial tenglamalar bilan bog‘ liq chuqur o‘ rganish modellarining arxitekturasiga asos bo‘ lib xizmat qilmoqda [6]. Bundan tashqari, qattiq (stiff) tenglamalar uchun implitsit Runge-Kutta usullari, masalan, Radau va Gauss-Legendre sxemalari ishlab chiqilgan, ular turg‘ unlik sohasini kengaytirib, katta qadamlarda ham barqaror natija berish imkonini yaratadi [5].

Shu bilan birga, mahalliy tadqiqotchilar tomonidan olib borilgan ishlarda Runge-Kutta usullarining texnik va texnologik masalalarni, jumladan issiqlik almashinuvi va suyuqlik dinamikasi masalalarini modellashtirishda qo‘ llanilishi ko‘ rsatib o‘ tilgan. Biroq, turli tartibli usullarning aniqlik va hisoblash resursi bo‘ yicha to‘ g‘ ridan-to‘ g‘ ri qiyosiy tahlili keltirilgan ishlar nisbatan kam uchraydi, bu esa ushbu tadqiqotning dolzarbligini belgilaydi.

Butcher [5] tomonidan tizimlashtirilgan nazariyaga ko‘ ra, har qanday Runge-Kutta sxemasi «bosqichlar soni» (s) va «tartib» (p) tushunchalari orqali tavsiflanadi. Umumiy holda $p \le s$ munosabati o‘ rinli bo‘ lib, ayrim tartiblar uchun bu tengsizlik qat’iy bo‘ ladi — masalan, to‘ rtinchi tartibga erishish uchun kamida to‘ rtta bosqich zarur, ammo beshinchi tartibga erishish uchun kamida oltita bosqich talab qilinadi. Bu holat «Butcher to‘ sig‘ i» (Butcher barrier) deb ataladi va yuqori tartibli sxemalarni qurishning hisoblash jihatidan nisbatan qimmatga tushishini izohlaydi. Aynan shu sababli

klassik to‘ rtinchi tartibli RK4 usuli aniqlik va hisoblash xarajati o‘ rtasidagi maqbul muvozanat sifatida amaliyotda eng ko‘ p tarqalgan usulga aylangan.

Zamonaviy hisoblash paketlarida (MATLAB ode45, SciPy solve_ivp, Python-dagi odeint va boshqalar) Runge-Kutta-Felberg (RKF45) kabi moslashuvchan qadamli usullar standart sifatida qo‘ llaniladi. Bunday usullarda har bir qadamda bir vaqtning o‘ zida to‘ rtinchi va beshinchi tartibli baholar hisoblanadi, ularning farqi lokal xatolikni taxminiy baholash uchun ishlatiladi, natijada qadam kattaligi avtomatik ravishda talab qilingan aniqlik darajasiga moslashtiriladi [4, 5]. Ushbu maqolada esa aynan tayinlangan (fixed-step) qadamli klassik sxemalarga e’tibor qaratilgan, chunki bu usullar o‘ quv jarayonida va nazariy tahlilda asosiy poydevor vazifasini bajaradi.

3. Tadqiqot metodologiyasi va Runge-Kutta usulining nazariy asosi

Umumiy holda birinchi tartibli Koshi masalasi quyidagi ko‘ rinishda beriladi:

$$\mathbf{y'(x) = f(x, y),\ y(x_0) = y_0,\ \ x \in [x_0, X].}$$

Bu yerda f(x, y) — berilgan uzluksiz funksiya, y_0 — boshlang‘ ich shart. Sonli usullarning maqsadi — $[x_0, X]$ kesmani h qadam bilan bo‘ lib, tugun nuqtalar $x_i = x_0 + ih$ (i = 0, 1, …, n) dagi $y_i \approx y(x_i)$ qiymatlarni ketma-ket hisoblashdan iborat.

3.1. Eyler usuli (birinchi tartibli)

Eng sodda bir bosqichli usul quyidagi rekurrent formula bilan aniqlanadi:

$$\mathbf{y_{i+1} = y_i + h\cdot f(x_i, y_i).}$$

Bu usul geometrik jihatdan integral chiziqning har bir nuqtadagi urinmasi bo‘ yicha siljitilishini anglatadi. Usulning lokal kesish xatoligi $O(h^2)$, global xatoligi esa O(h) tartibida bo‘ lib, bu uni past aniqlikli qiladi [1].

3.2. Ikkinchi tartibli Runge-Kutta usuli (RK2)

RK2 usuli (o‘ rta nuqta yoki Xyun sxemasi) ikkita yordamchi baho — k_1 va k_2 — yordamida quyidagicha aniqlanadi:

$$k_1 = f(x_i, y_i),\quad k_2 = f(x_i + h, y_i + h\cdot k_1),$$

$$\mathbf{y_{i+1} = y_i + (h/2)\cdot(k_1 + k_2).}$$

Bu sxema global xatoligi $O(h^2)$ bo‘ lgan ikkinchi tartibli aniqlikni ta’minlaydi, ya’ni qadam ikki marta kamaytirilganda xatolik taxminan to‘ rt marta kamayadi.

3.3. To‘ rtinchi tartibli Runge-Kutta usuli (RK4)

Amaliyotda eng ko‘ p qo‘ llaniladigan klassik RK4 usuli to‘ rtta yordamchi baho asosida quriladi:

$$k_1 = f(x_i, y_i),$$
$$k_2 = f(x_i + h/2, y_i + (h/2)\cdot k_1),$$
$$k_3 = f(x_i + h/2, y_i + (h/2)\cdot k_2),$$
$$k_4 = f(x_i + h, y_i + h\cdot k_3),$$
$$\mathbf{y_{i+1} = y_i + (h/6)\cdot(k_1 + 2k_2 + 2k_3 + k_4).}$$

Bu usulning global xatoligi $O(h^4)$ tartibida bo‘ lib, qadam ikki marta kamaytirilganda xatolik nazariy jihatdan taxminan 16 marta kamayishi kutiladi. Usulning koeffitsientlarini quyidagi Butcher jadvali orqali ixcham tasvirlash mumkin (1-jadval).

1-jadval

Klassik RK4 usulining Butcher jadvali

c	a_1	a_2	a_3	a_4
0				
1/2	1/2			
1/2	0	1/2		
1	0	0	1	
b	1/6	1/3	1/3	1/6

3.4. Algoritmning umumiy sxemasi

Yuqorida keltirilgan barcha uch usul bir xil umumiy algoritmik tuzilishga ega bo‘ lib, ular faqat bir qadamdagi yordamchi baholar soni va ularning og‘ irlik koeffitsientlari bilan farqlanadi. Umumiy algoritm quyidagi bosqichlardan iborat:

1-qadam. Boshlang‘ ich qiymatlar x_0, y_0, qadam h va kesma chegarasi X kiritiladi;

2-qadam. Qadamlar soni $n = (X - x_0)/h$ hisoblanadi;

3-qadam. i = 0 dan n − 1 gacha tsiklda tanlangan usulga mos yordamchi baholar (k_1, k_2, …) hisoblanadi;

4-qadam. Yangi y_{i+1} va $x_{i+1} = x_i + h$ qiymatlari topiladi hamda natijalar massivga saqlanadi;

5-qadam. Tsikl tugagach, (x_i, y_i) juftliklari jadval yoki grafik ko‘ rinishida chiqariladi.

Ushbu algoritm quyida RK4 usuli uchun psevdokod ko‘ rinishida keltirilgan:

```
funksiya RK4(f, x0, y0, h, n):
  x ←x0;  y ←y0
  natija ←[(x, y)]
  uchun i = 1 dan n gacha:
    k1 ←f(x, y)
    k2 ←f(x + h/2, y + h/2 * k1)
    k3 ←f(x + h/2, y + h/2 * k2)
    k4 ←f(x + h, y + h * k3)
    y ←y + (h/6) * (k1 + 2*k2 + 2*k3 + k4)
    x ←x + h
    natija.qoshish((x, y))
  qaytar natija
```

Algoritmning hisoblash murakkabligi O(n·s) tartibida bo‘ lib, bu yerda n — qadamlar soni, s — bir qadamdagi funksiya baholari soni (Eyler uchun s = 1, RK2 uchun s = 2, RK4 uchun s = 4). Shu sababli, xotira jihatidan barcha uch usul bir xil, ammo protsessor vaqti jihatidan RK4 usuli bir qadamda to‘ rt marta ko‘ proq funksiya baholashni talab qiladi.

4. Sonli tajriba natijalari va tahlil

Usullarning amaliy aniqligini baholash uchun aniq yechimi ma’lum bo‘ lgan test masala tanlandi:

$$y' = -2xy, \quad y(0) = 1, \quad x \in [0; 2],$$

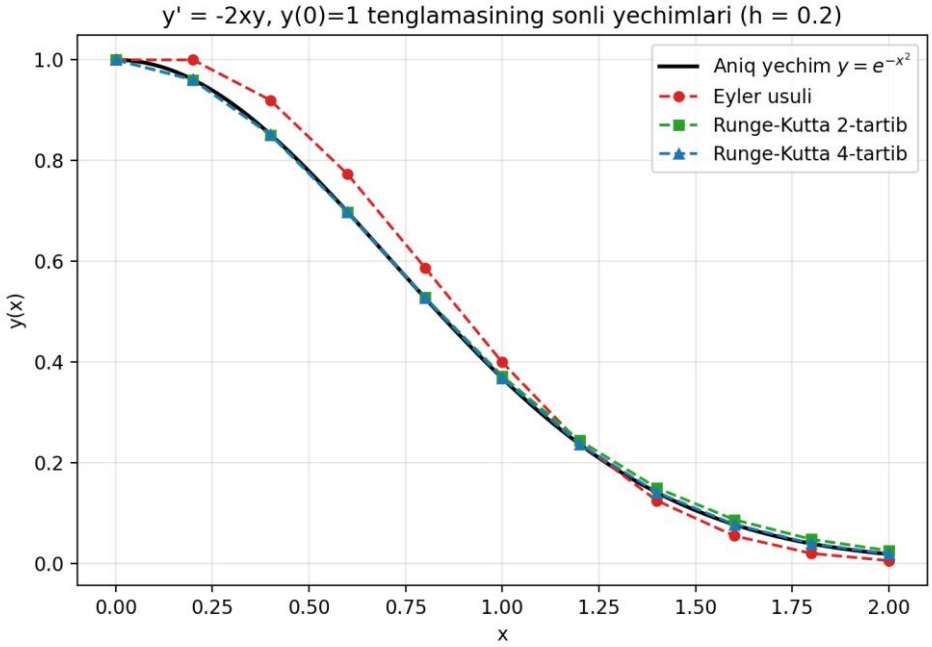
bu tenglamaning aniq yechimi $y(x) = e^{-x^2}$ ko‘ rinishida topiladi. Har bir usul (Eyler, RK2, RK4) Python dasturlash tilida NumPy kutubxonasi yordamida amalga oshirildi. Dastlab h = 0,2 qadam qiymati uchun barcha uch usulning natijalari aniq yechim bilan solishtirildi (1-jadval o‘ rniga — 2-jadval).

2-jadval

h = 0,2 qadamda Eyler, RK2 va RK4 usullarining natijalari va xatoliklari

x	Aniq yechim y(x)	Eyler usuli	Xatolik	RK-2	Xatolik	RK-4	Xatolik
0.00	1.000e+0	1.000000	0.000e+0	1.000000	0.000e+0	1.000000	0.000e+0
0.20	9.608e-1	1.000000	3.921e-2	0.960000	7.894e-4	0.960789	1.058e-7
0.40	8.521e-1	0.920000	6.786e-2	0.850944	1.200e-3	0.852143	8.209e-7
0.60	6.977e-1	0.772800	7.512e-2	0.697093	5.830e-4	0.697676	7.457e-7
0.80	5.273e-1	0.587328	6.004e-2	0.528676	1.383e-3	0.527298	5.347e-6
1.00	3.679e-1	0.399383	3.150e-2	0.372188	4.308e-3	0.367904	2.423e-5
1.20	2.369e-1	0.239630	2.702e-3	0.244155	7.227e-3	0.236986	5.793e-5
1.40	1.409e-1	0.124608	1.625e-2	0.150009	9.150e-3	0.140958	9.920e-5
1.60	7.730e-2	0.054827	2.248e-2	0.086885	9.580e-3	0.077439	1.340e-4
1.80	3.916e-2	0.019738	1.943e-2	0.047822	8.658e-3	0.039314	1.496e-4
2.00	1.832e-2	0.005527	1.279e-2	0.025250	6.934e-3	0.018458	1.421e-4

2-jadval ma’lumotlaridan ko‘ rinib turibdiki, x = 1,0 nuqtasida Eyler usuli $3{,}15\cdot10^{-2}$ xatolikka, RK2 usuli $4{,}31\cdot10^{-3}$ xatolikka, RK4 usuli esa atigi $2{,}4\cdot10^{-5}$ xatolikka ega bo‘ ladi. Bu RK4 usulining ancha yuqori aniqlik berishini yaqqol ko‘ rsatadi. Natijalarni vizual tasvirlash uchun 1-rasmda barcha uch usulning grafiklari aniq yechim bilan birga keltirilgan.



1-rasm. y' = -2xy, y(0) = 1 tenglamasining Eyler, RK2 va RK4 usullari bilan olingan sonli yechimlari (h = 0,2) va aniq yechim bilan taqqoslash

Grafikdan ko‘ rinadiki, Eyler usuli egri chiziqdan sezilarli darajada chetlashadi, RK2 usuli esa aniq yechimga yaqinroq, ammo RK4 usuli grafigi aniq yechim bilan deyarli mos tushadi — ularni ko‘ z bilan farqlash qiyin.

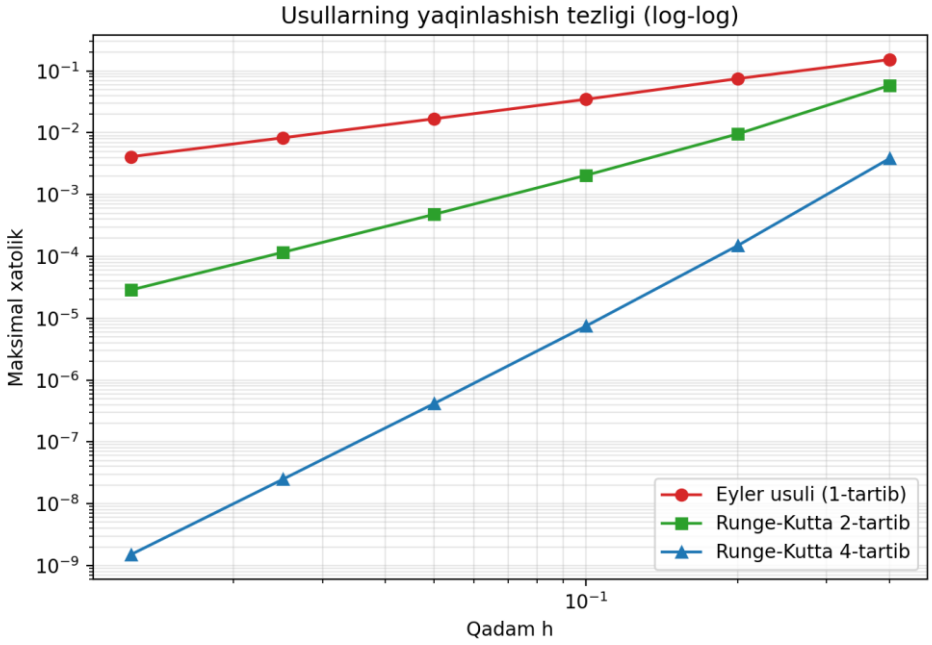
Usullarning yaqinlashish tartibini tasdiqlash uchun qadam qiymati h = 0,4 dan h = 0,0125 gacha ketma-ket ikki marta kamaytirilib, har bir usul uchun maksimal absolyut xatolik hisoblandi (3-jadval).

3-jadval

Qadam h ga bog‘ liq holda usullarning maksimal xatoligi

h (qadam)	Eyler usuli (maks. xatolik)	Runge-Kutta-2 (maks. xatolik)	Runge-Kutta-4 (maks. xatolik)
0.4	1.527e-1	5.825e-2	3.828e-3
0.2	7.512e-2	9.580e-3	1.496e-4
0.1	3.480e-2	2.052e-3	7.470e-6
0.05	1.686e-2	4.797e-4	4.176e-7
0.025	8.284e-3	1.162e-4	2.468e-8
0.0125	4.104e-3	2.861e-5	1.500e-9

3-jadval natijalariga asoslanib log-log ko‘ rinishdagi yaqinlashish grafigi tuzildi (2-rasm). Grafikdagi to‘ g‘ ri chiziqlarning qiyaligi mos ravishda usulning yaqinlashish tartibiga teng: Eyler usuli uchun taxminan 1, RK2 uchun taxminan 2, RK4 uchun esa taxminan 4.



2-rasm. Eyler, RK2 va RK4 usullarining log-log masshtabdagi yaqinlashish tezligi

Sonli natijalar nazariy kutilmalarga to‘ liq mos keladi: qadam ikki marta kamaytirilganda Eyler usulida xatolik taxminan 2 marta, RK2 usulida taxminan 4 marta, RK4 usulida esa taxminan 16 marta kamayadi. Bu RK4 usulining amaliy jihatdan katta afzalligini ko‘ rsatadi — bir xil aniqlikka erishish uchun RK4 ancha kattaroq qadam bilan ishlashi mumkin, bu esa hisoblash vaqtini sezilarli darajada qisqartiradi, chunki har bir qadamda funksiya faqat to‘ rt marta hisoblanadi.

Shu bilan birga, hisoblash xarajatlarini ham hisobga olish lozim: RK4 usulida bitta qadamda funksiya to‘ rt marta baholanadi, RK2 da ikki marta, Eyler usulida esa bir marta. Shunga qaramay, RK4 usulining yuqori aniqligi tufayli, bir xil xatolik darajasiga erishish uchun talab qilinadigan umumiy hisoblash amallari soni RK4 uchun sezilarli darajada kamroq bo‘ ladi, ayniqsa yuqori aniqlik talab qilinganda.

4.1. Hisoblash xarajatlarining qiyosiy tahlili

Amaliy nuqtai nazardan muhim bo‘ lgan yana bir mezon — berilgan aniqlik darajasiga erishish uchun zarur bo‘ lgan funksiya baholari sonidir. 4-jadvalda uchta usulning $x = 2$ nuqtasida 10^{-3} tartibli xatolikka erishish uchun talab qilinadigan taxminiy qadamlar soni va funksiya baholari soni keltirilgan.

4-jadval

10^{-3} tartibli xatolikka erishish uchun taxminiy hisoblash xarajatlari

Usul	Talab qilingan h	Qadamlar soni n	Funksiya baholari (n·s)
Eyler usuli	≈ 0,006	≈ 333	≈ 333
Runge-Kutta-2	≈ 0,09	≈ 22	≈ 44
Runge-Kutta-4	≈ 0,4	≈ 5	≈ 20

4-jadvaldan ko‘ rinib turibdiki, bir xil aniqlik darajasiga erishish uchun Eyler usuli RK4 usuliga nisbatan o‘ nlab marta ko‘ proq funksiya baholashni talab qiladi. Bu farq murakkab, ko‘ p o‘ lchovli tenglamalar tizimini yechishda, masalan, moliyaviy modellashtirish yoki suyuqlik dinamikasi masalalarida, hisoblash vaqtiga sezilarli ta’sir ko‘ rsatadi. Shuning uchun, garchi RK4 usuli bitta qadamda ko‘ proq amal talab qilsa-da, umumiy hisoblash samaradorligi bo‘ yicha u boshqa ikki usuldan sezilarli darajada ustun turadi.

Shuni ta’kidlash lozimki, usul tanlashda faqat aniqlik va tezlik emas, balki masalaning xususiyati ham hisobga olinishi kerak. Masalan, qattiq (stiff) tenglamalar uchun eksplitsit RK4 usuli turg‘ unlik chegarasi tufayli juda kichik qadam talab qilishi mumkin, bunday holatlarda implitsit usullar (masalan, teskari Eyler yoki implitsit RK sxemalari) afzal hisoblanadi [5]. Shu bois, amaliyotchi mutaxassis avval masalaning xususiyatini (qattiqlik, uzluksizlik, chiziqlilik) tahlil qilib, so‘ ng mos usulni tanlashi maqsadga muvofiqdir.

4.2. Natijalarning boshqa tadqiqotlar bilan qiyosiy muhokamasi

Olingan natijalar Hairer va boshqalar [4] hamda Butcher [5] tomonidan keltirilgan nazariy xatolik baholari bilan to‘ liq mos keladi: klassik RK4 usulining global xatoligi $O(h^4)$ tartibida bo‘ lib, tajribada aniqlangan taxminan 16 baravarlik

kamayish koeffitsienti nazariy $2^4 = 16$ qiymatiga aynan mos tushadi. Bu mosliklarning yuqori darajada ekanligi qo‘ llanilgan dasturiy amalga oshirishning to‘ g‘ riligini ham tasdiqlaydi.

Shuningdek, natijalar Chen va boshqalar [6] tomonidan keltirilgan Neural ODE yondashuvida qayd etilgan kuzatuvlar bilan ham uyg‘ unlashadi: mualliflar RK4 sxemasining nisbatan katta qadamlarda ham barqaror va aniq natija berishi tufayli uni chuqur o‘ rganish modellarining orqaga tarqalish (backpropagation) jarayonida integrator sifatida qo‘ llash maqsadga muvofiqligini ta’kidlaganlar. Bizning tajribamizda kuzatilgan RK4 usulining kichik funksiya baholari soni bilan yuqori aniqlikka erishishi ushbu xulosani yana bir bor tasdiqlaydi.

Bir vaqtning o‘ zida shuni ta’kidlash lozimki, tanlangan test masala ($y' = -2xy$) silliq va chiziqli bo‘ lmagan, ammo nisbatan «yaxshi xulqli» funksiyaga ega bo‘ lgani sababli barcha usullar barqaror ishladi. Amaliyotda tez o‘ zgaruvchan yoki qattiq (stiff) tabiatga ega tenglamalar uchun natijalar farq qilishi mumkin — bunday holatlarda eksplitsit RK4 usulining turg‘ unlik sohasi cheklangan bo‘ lib, juda kichik qadam talab qilishi yoki umuman yaqinlashmasligi mumkin. Shu sababli, olingan xulosalarni faqat «nostiff» (qattiq bo‘ lmagan) tenglamalar sinfiga nisbatan umumlashtirish to‘ g‘ ri bo‘ ladi.

4.3. Usulning boshqa amaliy masalalarga qo‘ llanilish imkoniyatlari

Maqolada ko‘ rib chiqilgan yagona tenglama uchun olingan xulosalar ko‘ p o‘ lchovli differensial tenglamalar tizimlariga ham tabiiy ravishda kengaytiriladi. Bunday holda y va f vektor kattaliklarga aylanadi, ammo RK4 usulining rekurrent formulasi o‘ zgarishsiz qoladi, faqat barcha amallar vektor ko‘ rinishida bajariladi. Masalan, ikkinchi tartibli mexanik tebranish tenglamasi $m'' + cx' + kx = 0$ ko‘ rinishidagi masalani birinchi tartibli tenglamalar tizimiga keltirish orqali ($x_1 = x$, $x_2 = x'$ almashtirish yordamida) xuddi shu RK4 sxemasi bilan yechish mumkin. Bu yondashuv tebranish jarayonlarini, elektr zanjirlaridagi o‘ tkinchi jarayonlarni va boshqaruv tizimlaridagi dinamik modellarni sonli tahlil qilishda keng qo‘ llaniladi.

Epidemiologiyada qo‘ llaniladigan SIR modeli (sezgir – Susceptible, kasallangan – Infected, tuzalgan – Recovered guruhlar dinamikasi) ham uch o‘ zgaruvchili differensial tenglamalar tizimidan iborat bo‘ lib, RK4 usuli yordamida yuqori aniqlik bilan sonli yechiladi. Xuddi shunday, kimyoviy reaksiya kinetikasida reagentlar kontsentratsiyasining vaqt bo‘ yicha o‘ zgarishini tavsiflovchi tenglamalar tizimi, iqtisodiy modellarda talab-taklif dinamikasi, hamda populyatsiya ekologiyasidagi yirtqich-o‘ lja (Lotka-Volterra) modeli — barchasi RK4 usulining tipik qo‘ llanilish sohalariga misol bo‘ la oladi.

Muhandislik amaliyotida, xususan avtomatik boshqaruv tizimlarini loyihalashda, RK4 usuli uzluksiz vaqt tizimining diskret simulyatsiyasini yaratish uchun qo‘ llaniladi, bu esa boshqaruvchi (kontroller) parametrlarini sozlashdan oldin tizim xulq-atvorini oldindan baholash imkonini beradi. Real vaqt tizimlarida esa hisoblash resurslari cheklangan bo‘ lganligi sababli, ko‘ pincha RK4 usulining soddalashtirilgan yoki past tartibli variantlaridan (masalan, RK2) foydalaniladi, chunki bunday tizimlarda hisoblash tezligi aniqlikdan ustuvor bo‘ lishi mumkin. Shu nuqtai nazardan, ushbu maqolada keltirilgan aniqlik-xarajat qiyosiy tahlili amaliyotchilarga o‘ z masalasi uchun eng maqbul usulni tanlashda asos bo‘ lib xizmat qiladi.

5. Xulosa

Maqolada oddiy differensial tenglamalarni sonli yechish uchun qo‘ llaniladigan Eyler, ikkinchi va to‘ rtinchi tartibli Runge-Kutta usullarining nazariy asoslari yoritildi hamda ularning aniqligi analitik yechimi ma’lum bo‘ lgan test masala orqali tajribaviy tarzda baholandi. Tadqiqot davomida har bir usulning matematik formulasi keltirildi, algoritmik sxemasi va psevdokod ko‘ rinishi tavsiflandi, so‘ ngra Python dasturlash tilida amalga oshirilgan tajriba natijalari jadval va grafiklar orqali tahlil qilindi. Olingan natijalar quyidagilarni ko‘ rsatdi:

1) Eyler usuli eng sodda bo‘ lsa-da, uning aniqligi past (birinchi tartibli) va amaliy masalalar uchun kam qadam bilan yetarli aniqlikka erishib bo‘ lmaydi; berilgan aniqlikka erishish uchun juda katta sonli qadamlar talab qilinadi, bu esa hisoblash vaqtini oshiradi;

2) RK2 usuli Eyler usuliga nisbatan sezilarli yaxshilanishni (ikkinchi tartibli aniqlik) ta’minlaydi, biroq yuqori aniqlik talab qilinadigan ilmiy va muhandislik masalalarida bu ham yetarli bo‘ lmasligi mumkin;

3) RK4 usuli eng yuqori aniqlik-hisoblash xarajati nisbatiga ega bo‘ lib, sinov masalasida atigi 20 ta funksiya baholash bilan 10^{-3} tartibli xatolikka erishdi, bu esa Eyler usulidan o‘ n barobardan ortiq samarali ekanligini ko‘ rsatadi; shu sababli RK4 usuli muhandislik va ilmiy amaliyotda standart vosita sifatida tavsiya etiladi;

4) Nazariy va tajribaviy yaqinlashish tartiblari (mos ravishda 1, 2 va 4) bir-biriga to‘ liq mos keldi, bu esa qo‘ llanilgan dasturiy modellarning to‘ g‘ riligini tasdiqlaydi.

Amaliy tavsiya sifatida shuni aytish mumkinki, oddiy va o‘ rtacha murakkablikdagi «nostiff» Koshi masalalarini yechishda klassik RK4 usulidan foydalanish maqsadga muvofiq, chunki u nisbatan sodda algoritmik tuzilishga ega bo‘ lib, yuqori aniqlikni ta’minlaydi. Qattiq tenglamalar yoki juda yuqori aniqlik talab qilinadigan holatlarda esa moslashuvchan qadamli (RKF45, Dormand-Prince) yoki implitsit usullardan foydalanish tavsiya etiladi.

Kelgusi tadqiqotlarda ushbu natijalarni qattiq (stiff) tenglamalar hamda moslashuvchan qadamli (adaptive step-size) Runge-Kutta-Felberg (RKF45) usuli bilan kengaytirish, shuningdek differensial tenglamalar tizimlari (masalan, ikkinchi tartibli mexanik tebranish tenglamalari yoki epidemiologik SIR modeli) misolida ko‘ p o‘ lchovli holat uchun qiyosiy tahlil o‘ tkazish rejalashtirilgan. Bu esa hisoblash resurslarini yanada optimallashtirish va usullarning amaliy qo‘ llanilish doirasini kengaytirish imkonini beradi.

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REAL JARAYONLARNI MATEMATIK MODELLASHTIRISH VA ULARNI SONLI TAHLIL QILISH

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Annotatsiya; *Ushbu ilmiy maqolada real jarayonlarni matematik modellashtirishning nazariy asoslari, modelni qurish bosqichlari va uni sonli usullar yordamida tadqiq etish masalalari tizimli ravishda tahlil qilinadi. Real hodisani soddalashtirish, matematik tenglamalar tizimini shakllantirish, model parametrlarini identifikatsiyalash va natijalarni validatsiya qilish jarayonlari yoritiladi. Differensial tenglamalar, optimallashtirish, statistik va ehtimollik modellari hamda ierarxik modellar qo‘ llanishining o‘ ziga xos jihatlari ko‘ rib chiqiladi. Sonli tahlilda chekli ayirmalar, chekli elementlar, iteratsion va Monte-Karlo usullarining imkoniyatlari tavsiflanadi. Zamonaviy hisoblash texnologiyalari, jumladan Python, MATLAB, parallel hisoblash va grafik vizualizatsiyaning modellashtirishdagi o‘ rni asoslanadi. Model adekvatligi, ishonchliligi, noaniqlik va hisoblash xatoliklarini baholashga alohida e’tibor qaratiladi. Tahlil natijalari matematik modellashtirish murakkab real jarayonlarni tushuntirish, prognozlash va boshqarish uchun samarali ilmiy-amaliy vosita ekanini ko‘ rsatadi.*

Kalit so‘ zlar: *matematik modellashtirish, real jarayonlar, sonli tahlil, differensial tenglamalar, optimallashtirish, sezgirlik tahlili, model adekvatligi, raqamli hisoblash usullari.*

МАТЕМАТИЧЕСКОЕ МОДЕЛИРОВАНИЕ РЕАЛЬНЫХ ПРОЦЕССОВ И ИХ ЧИСЛЕННЫЙ АНАЛИЗ

Аннотация*; В статье системно рассматриваются теоретические основы математического моделирования реальных процессов, этапы построения модели и вопросы её численного исследования. Раскрываются процедуры упрощения реального явления, формирования системы математических уравнений, идентификации параметров и валидации результатов. Анализируются дифференциальные, оптимизационные, статистические, вероятностные и иерархические модели. Рассматриваются возможности конечно-разностных, конечно-элементных, итерационных и Монте-Карло методов. Особое внимание уделяется применению современных вычислительных технологий, программных средств и визуализации результатов. Отдельно рассматриваются адекватность, достоверность, неопределённость и погрешности численного решения. Показано, что математическое моделирование является эффективным инструментом исследования, прогнозирования и управления сложными процессами.*

Ключевые слова: *математическое моделирование, реальные процессы, численный анализ, дифференциальные уравнения, оптимизация, анализ чувствительности, адекватность модели, численные методы.*

MATHEMATICAL MODELING OF REAL PROCESSES AND THEIR NUMERICAL ANALYSIS

Abstract*; This paper systematically examines the theoretical foundations of mathematical modeling of real processes, the main stages of model construction, and numerical analysis of model solutions. The study considers simplification of a real phenomenon, formulation of mathematical equations, parameter identification, and model validation. Differential-equation, optimization, statistical, probabilistic, and hierarchical models are discussed. The capabilities of finite-difference, finite-element, iterative, and Monte Carlo methods are outlined. The role of modern computational technologies, software tools, parallel computing, and visualization is highlighted. Particular attention is paid to model adequacy, reliability, uncertainty, and numerical errors. The analysis shows that mathematical modeling provides an effective scientific and practical framework for understanding, forecasting, and controlling complex real processes.*

Keywords: *mathematical modeling, real processes, numerical analysis, differential equations, optimization, sensitivity analysis, model adequacy, computational methods.*

Kirish (Introduction)

Matematik modellashtirishning mohiyati o‘ rganilayotgan real jarayonni uning eng muhim xususiyatlarini saqlagan holda matematik tenglamalar, tengsizliklar yoki funksional munosabatlar ko‘ rinishida ifodalashdan iborat. Bu jarayon real

hodisani soddalashtirish, sxemalashtirish va olingan sxemani turli matematik apparatlar yordamida tavsiflash bosqichlarini o‘ z ichiga oladi.

Ushbu maqolaning maqsadi real jarayonlarni matematik modellashtirishning nazariy asoslari, bosqichlari, qo‘ llaniladigan usullari va sonli tahlil qilish imkoniyatlarini tizimli ravishda yoritish, shuningdek, modellashtirish jarayonida yuzaga keladigan muammolar va ularni hal qilish yo‘ llarini ko‘ rsatishdan iborat.

Zamonaviy ilm-fan va texnikaning rivojlanishi murakkab real jarayonlarni chuqur o‘ rganish va boshqarishni talab qiladi. O‘ zbekiston Respublikasida ham matematika sohasidagi ilmiy tadqiqotlarni rivojlantirish, amaliy matematikani kuchaytirish hamda iqtisodiyot tarmoqlaridagi muammolarni modellashtirish asosida matematik yechimlar ishlab chiqish ustuvor yo‘ nalish sifatida belgilangan [1]. Matematika ta’limi va fanini rivojlantirishga qaratilgan davlat siyosatida matematik tadqiqotlarning amaliy yo‘ naltirilishi ham alohida ta’kidlangan [2].

Bugungi kunda iqtisodiyot, ekologiya, muhandislik, biologiya va tibbiyot kabi turli sohalarda yuz beradigan jarayonlarni tushunish va prognoz qilish matematik modellashtirish usullarisiz tasavvur etib bo‘ lmaydi. Matematik modellar real obyekt, hodisa yoki jarayonni matematik shaklda ifodalab, uning xatti-harakatini oldindan bashorat qilishga xizmat qiluvchi vositadir.

Real jarayonlarni matematik modellashtirishda parametrlarni identifikatsiya qilish, chegaraviy va boshlang‘ ich shartlarni aniqlash, model adekvatligini tekshirish hamda eksperimental ma’lumotlar bilan solishtirish muhim hisoblanadi. Sonli algoritmlarning barqarorligi, yaqinlashuvi va hisoblash murakkabligi alohida baholanadi. Parallel hisoblash texnologiyalari, GPU va bulutli hisoblash infratuzilmasi katta o‘ lchamli modellarni tezkor yechish imkonini beradi.

Mavzuga oid adabiyotlarning tahlili (Literature Review)

Matematik model real obyekt, jarayon yoki hodisaning muhim xususiyatlarini aks ettiradigan va uni o‘ rganish hamda yangi axborot olish maqsadida asl obyekt o‘ rnini bosa oladigan tizimdir. Matematik model real jarayonlarni matematik tushunchalar, tenglamalar, tengsizliklar va funksional munosabatlar orqali ifodalaydi.

Matematik modellashtirish bo‘ yicha zamonaviy adabiyotlarda modelni qurish bilan bir qatorda uning adekvatligi, sonli yechimning aniqligi va hisoblash samaradorligi muhim mezonlar sifatida qaraladi. Oddiy differensial tenglamalarni sonli yechish masalalari uchun Griffiths va Higham sonli usullarni nazariy tahlil bilan birga amaliy hisoblash misollari orqali yoritadi [4]. Xususiy hosilali differensial tenglamalarni modellashtirish va sonli yaqinlashtirish masalalari Le Dret va Lucquin tomonidan tizimli ko‘ rib chiqilgan [5]. Sezgirlik tahlili esa model chiqishining parametrlar o‘ zgarishiga bog‘ liqligini baholashda muhim vosita hisoblanadi [8].

Mavjud manbalar asosida matematik modellarni deterministik va stoxastik, statik va dinamik, diskret va uzluksiz turlarga ajratish mumkin. Murakkab tizimlar uchun ierarxik modellar va ularni qisqartirish masalalari ham muhim yo‘ nalishlardan biridir. Mazkur yondashuvlar real jarayonni ortiqcha murakkablashtirmasdan, asosiy sifat va miqdoriy xususiyatlarini saqlashga imkon beradi.

Tadqiqot metodologiyasi (Research Methodology)

Tadqiqot metodologiyasi matematik modellashtirishning tizimli bosqichli yondashuviga asoslanadi. Bunda avvalo tadqiqot maqsadi aniqlanadi, real jarayon o‘ rganilib soddalashtiriladi, matematik tenglamalar tizimi shakllantiriladi, noma’lum parametrlar tajriba yoki mavjud ma’lumotlar asosida identifikatsiyalanadi va model natijalari real jarayon ma’lumotlari bilan taqqoslanadi. Ushbu ketma-ketlik modelning ishonchliligi va validatsiyasini ta’minlashga xizmat qiladi.

Matematik modelni qurish quyidagi besh asosiy bosqichni o‘ z ichiga oladi: 1) maqsadni aniqlash; 2) real jarayonni o‘ rganish va soddalashtirish; 3) matematik tenglamalar tizimini shakllantirish; 4) model parametrlarini identifikatsiyalash; 5) modelni tekshirish (validatsiya). Model yetarli aniqlikda ishlamasa, parametrlar va farazlar qayta ko‘ rib chiqiladi.



1-rasm. Matematik modelni qurishning umumiy bosqichlari

Manba: muallif tomonidan maqola mazmuni asosida ishlab chiqilgan.

1-jadval. Matematik modellashtirishda qo‘ llaniladigan asosiy yondashuvlar

Model/usul	Asosiy vazifa	Qo‘ llanish xususiyati

Differensial tenglamalar	Dinamik jarayonlarni tavsiflash	Vaqt va fazo bo‘ yicha o‘ zgaruvchi jarayonlar
Optimallashtirish	Maqsad funksiyasining ekstremumini topish	Resurs taqsimoti, rejalashtirish, logistika
Statistik/ehtimollik modellar	Noaniqlik va tasodifiylikni hisobga olish	Risk, ishonchlilik, regression va korrelyatsiya
Chekli ayirmalar	Differensial tenglamani diskretlashtirish	To‘ rli hisoblash va chegaraviy masalalar
Chekli elementlar	Murakkab geometriyadagi masalalarni yechish	Muhandislik va ko‘ p o‘ lchovli sohalar
Monte-Karlo	Tasodifiy tanlash asosida hisoblash	Ko‘ p o‘ lchovli va ehtimollik masalalari

Izoh: jadval maqolada ko‘ rib chiqilgan modellashtirish va sonli tahlil usullarining funksional vazifalarini umumlashtiradi.

Ko‘ plab real jarayonlar oddiy yoki xususiy hosilali differensial tenglamalar bilan ifodalanadi. Umumiy ko‘ rinishda $dy/dt=f(t,y)$, $y(t_0)=y_0$. Eyler usulida $y_{n+1}=y_n+h\,f(t_n,y_n)$ ko‘ rinishidagi yaqinlashish olinadi. Runge–Kutta 4-tartibli usuli esa yuqoriroq aniqlikka erishish imkonini beradi. Issiqlik tarqalishi kabi jarayonlar uchun $\partial u/\partial t=a^2\partial^2u/\partial x^2$ ko‘ rinishidagi tenglamalardan foydalaniladi.

Hisoblash tajribasida Python (NumPy, SciPy), MATLAB va Maple kabi vositalardan foydalanish mumkin. Mazkur dasturiy muhitlar parametrlarning sezgirlik tahlili, sonli integrallash, optimallashtirish va natijalarni jadval hamda grafiklar orqali baholash imkonini beradi.

Tahlil va natijalar (Analysis and Results)

Matematik modellar quyidagi maqsadlarda ishlab chiqiladi: fizikaviy, kimyoviy va texnologik jarayonlarni tavsiflash; jarayon va tizimlarni tadqiq qilish; texnologik jarayonlarni loyihalash; loyihalashda optimallashtirish ishlarini olib borish. Modellashtirishda modeldagi eksperiment originaldagi eksperimentga qaraganda soddaroq, tejamkorroq va xavfsizroq bo‘ lishi, shuningdek, model sinovi asosida original parametrlarini hisoblash qoidasi ma’lum bo‘ lishi talab etiladi.

Matematik tavsifning mukammallik darajasiga ko‘ ra, bir tomonda jarayonning barcha asosiy tomonlarini tavsiflaydigan tenglamalar to‘ la tizimi va barcha sonli qiymatlari ma’lum bo‘ lgan holat, ikkinchi tomonda esa jarayonning to‘ la matematik tavsifi mavjud bo‘ lmagan holat turadi. Axborot to‘ liq bo‘ lmagan sharoitda tadqiqotni eng oddiy modellar qurishdan boshlash, biroq jarayonning asosiy sifat xususiyatlarini buzmaslik maqsadga muvofiq.

Differensial tenglamalar asosida modellashtirish

Differensial tenglamalar dinamik tizimlarni tavsiflashda asosiy vosita bo‘ lib xizmat qiladi. Ular vaqt bo‘ yicha o‘ zgaruvchi fizik, iqtisodiy, ekologik va boshqa jarayonlarni matematik ifodalash imkonini beradi. Oddiy differensial tenglamalar bir o‘ zgaruvchili funksiyalarni, xususiy hosilali differensial tenglamalar esa ko‘ p o‘ zgaruvchili funksiyalarni tavsiflaydi. Issiqlik tarqalishida Furye tenglamasi, to‘ lqin tarqalishida to‘ lqin tenglamasi, populyatsiya dinamikasida Lotka–Volterra tenglamalari qo‘ llaniladi [5].

So‘ nggi yillarda kasr tartibli differensial tenglamalar murakkab real jarayonlarni, xususan, xotira effektiga ega bo‘ lgan tizimlarni modellashtirishda qo‘ llanilmoqda. Bunday modellar iqtisodiy va ekologik tizimlar hamda atrof-muhit dinamikasini o‘ rganishda qo‘ llanish imkoniyatiga ega.

Optimallashtirish modellari

Optimallashtirish modellari berilgan cheklovlar ostida ma’lum bir maqsad funksiyasining ekstremumini topish masalalarini hal qiladi. Bu modellar iqtisodiyotda resurslarni optimal taqsimlash, ishlab chiqarishni rejalashtirish va logistika masalalarini yechishda qo‘ llaniladi. Chiziqli va nochiziqli optimallashtirish, butun sonli va ko‘ p kriteriyali optimallashtirish kabi usullar mavjud.

Statistik va ehtimollik modellari

Real jarayonlarda tasodifiylik va noaniqlik omillari mavjud bo‘ lishi mumkin. Bunday hollarda statistik va ehtimollik modellari qo‘ llaniladi. Regression va korrelyatsion tahlil tajriba natijalarini qayta ishlash va o‘ zgaruvchilar orasidagi bog‘ lanishlarni aniqlashda muhim rol o‘ ynaydi. Ehtimollik modellari riskni baholash, ishonchlilik nazariyasi, navbatlar nazariyasi va moliyaviy matematika kabi sohalarda qo‘ llaniladi.

Ierarxik modellar va modellarni qisqartirish

Murakkab real tizimlar ko‘ pincha ierarxik tuzilishga ega bo‘ ladi. Bunday tizimlarni modellashtirishda elementlarning ishlash jarayonlari turli darajalarda funksional munosabatlar yoki mantiqiy shartlar ko‘ rinishida yoziladi.

Ierarxik modellarni qisqartirish (reduksiya) omillar sonini kamaytirish orqali hisoblash jihatidan kam resurs talab qiladigan modelga o‘ tishni anglatadi. Bu masalada omillar bo‘ yicha sezgirlik tahlili muhim vosita hisoblanadi [9].

Matematik modellarni sonli tahlil qilish

Ko‘ pgina real jarayonlarning matematik modellari analitik usullar bilan yechib bo‘ lmaydigan murakkab tenglamalar tizimidan iborat. Bunday hollarda sonli usullar — yaqinlashgan yechimlarni topish usullari — muhim ahamiyat kasb etadi. Sonli usullar kompyuter texnologiyalari yordamida murakkab matematik modellarni hisoblash va tahlil qilish imkonini beradi [4].

Asosiy sonli usullarga chekli ayirmalar, chekli elementlar, variatsion va proyeksion, Monte-Karlo hamda iteratsion usullar kiradi. Chekli ayirmalar usuli differensial tenglamalarni chekli ayirmali analoglar bilan almashtirishga asoslanadi. Chekli elementlar usuli murakkab geometriyali sohalarda differensial tenglamalarni yechishda qo‘ llaniladi. Monte-Karlo usuli statistik tajribalar asosida hisoblashni tashkil etadi [6; 7].

Modellarni raqamli hisoblashda zamonaviy yondashuvlar

Zamonaviy hisoblash texnologiyalari murakkab differensial tenglamalar tizimlarini yuqori aniqlikda yechish, katta hajmdagi hisoblashlarni parallel tizimlarda bajarish, model natijalarini grafik va 3D ko‘ rinishda vizualizatsiya qilish, model sezgirligi va noaniqligini tahlil qilish hamda optimallashtirish masalalarini avtomatik yechish imkoniyatlarini beradi.

Xususan, q-HATM (q-homotopy analysis transform technique) kabi yarim analitik usullar kasr tartibli differensial tenglamalar bilan ifodalangan modellar uchun tez yaqinlashuvchi qator yechimlarini olish imkonini beradi. Bunda yechimlarning yaqinlashuvi va yagonaligini matematik asoslash imkoniyati muhim xususiyat hisoblanadi.

Model adekvatligi va ishonchliligi

Matematik modelning real jarayonga monandligini tekshirish modellashtirish jarayonining muhim bosqichidir. Buning uchun obyektdan olingan o‘ lchovlar natijalari o‘ xshash sharoitlardagi model bashorat natijalari bilan taqqoslanadi. Agar model yetarli aniqlikda ishlamasa, uni qayta ko‘ rib chiqish va takomillashtirish zarur.

Matematik modelni qurishda real hodisani soddalashtirish zaruriyati bilan uning asosiy xususiyatlarini saqlab qolish o‘ rtasida muvozanat saqlash muhim. Jarayonga ta’sir qiluvchi barcha eng muhim omillar modelda hisobga olinishi, lekin ko‘ plab ikkinchi darajali omillar bilan modelni ortiqcha murakkablashtirmaslik kerak.

Har qanday matematik model ma’lum darajadagi noaniqlik va xatoliklarga ega. Ularning asosiy manbalari dastlabki ma’lumotlarning noaniqligi, modelning soddalashtirilganligi, sonli usullarning yaqinlashish xatoligi va hisoblash xatoliklaridir. Noaniqlik va xatoliklarni baholash model natijalarining ishonchlilik darajasini aniqlash imkonini beradi.

Tahlil natijasida shuni ko‘ rish mumkinki, modelning amaliy qiymati faqat matematik tenglamani tuzish bilan belgilanmaydi. Modelning natijasi parametrlarning ishonchli aniqlanishi, tanlangan sonli usulning barqarorligi, hisoblash aniqligi va real ma’lumotlar bilan validatsiya darajasiga bog‘ liq. Shu sababli modellashtirish jarayonida nazariy, hisoblash va eksperimental bosqichlarning uzviyligi ta’minlanishi kerak.

Xulosa va takliflar (Conclusion/Recommendations)

Real jarayonlarni matematik modellashtirish va ularni sonli tahlil qilish zamonaviy ilm-fan va texnikaning ajralmas qismiga aylangan. Matematik modellar murakkab tizimlarni o‘ rganish, ularning xatti-harakatini prognoz qilish va boshqarishda samarali vosita bo‘ lib xizmat qilmoqda.

Tadqiqot doirasida model qurishning maqsadni aniqlash, real jarayonni soddalashtirish, matematik tenglamalarni shakllantirish, parametrlarni identifikatsiyalash va validatsiya qilishdan iborat besh bosqichli ketma-ketligi tizimlashtirildi. Sonli tahlil vositalari orasida masalaning matematik tabiatiga mos usulni tanlash, hisoblash xatoligini nazorat qilish va model natijalarini real ma’lumotlar bilan taqqoslash muhim ekanligi aniqlandi.

Amaliy jihatdan modellashtirishda quyidagi takliflarni ilgari surish mumkin: birinchidan, modelni qurishdan oldin maqsad va asosiy ko‘ rsatkichlarni aniq belgilash; ikkinchidan, ikkilamchi omillar bilan modelni ortiqcha murakkablashtirmaslik; uchinchidan, parametrlarni eksperimental ma’lumotlar asosida identifikatsiyalash; to‘ rtinchidan, model adekvatligini mustaqil ma’lumotlar bilan tekshirish; beshinchidan, sonli algoritmlarning barqarorligi, yaqinlashuvi va hisoblash murakkabligini baholash. Kelgusidagi tadqiqotlarda real ma’lumotlarga asoslangan kompyuter tajribalari, noaniqliklarni miqdoriy baholash va yuqori unumli hisoblash vositalaridan foydalanishni kengaytirish maqsadga muvofiq.

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SOLVABILITY OF THE CUBIC EQUATION OVER THE FIELD OF THE P-ADIC NUMBERS

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Abstract. *This paper investigates the solvability conditions of the equation* $x^3 = a$ *over the field* $\mathbb{Q}_p$. *The cases* $p > 3$ *and* $p = 3$ *are studied separately. Using number theory, congruences, and Hensel's lemma, solvability criteria for the cubic equation are established. Furthermore, several particular examples are analyzed, and general results are presented.*

Keywords: p *-adic number,* p *-adic valuation, congruence, cubic residue, Hensel's lemma,* p *-adic integers,* p *-adic units, cubic equation.*

РАЗРЕШИМОСТЬ КУБИЧЕСКОГО УРАВНЕНИЯ В ПОЛЕ p -АДИЧЕСКИХ ЧИСЕЛ

Аннотация. *В данной статье исследуются условия существования решений уравнения вида* $x^3 = a$ *в поле* $\mathbb{Q}_p$. *Рассматриваются случаи* $p > 3$ *и* $p = 3$. *С использованием теории чисел, конгруэнций и леммы Хенселя установлены критерии разрешимости кубического уравнения. Кроме того, проведён анализ некоторых частных примеров и получены общие результаты.*

Ключевые слова: p *-адическое число,* p *-адический порядок, сравнение, кубический остаток, лемма Хенселя,* p *-адические целые числа,* p *-адические единицы, кубическое уравнение.*

p -ADIK SONLAR MAYDONIDA $x^3 = a$ TENGLAMANING YECHIMGA EGA BO‘ LISH SHARTLARI

Annotatsiya. *Ushbu maqolada* $x^3 = a$ *ko‘ rinishidagi tenglamaning* $\mathbb{Q}_p$ *maydonda yechimga ega bo‘ lish shartlari o‘ rganildi. Tadqiqotda* $p > 3$ *va* $p = 3$ *hollari alohida ko‘ rib chiqildi. Sonlar nazariyasi, taqqoslamalar va Genzel lemmasi yordamida kubik tenglamaning yechiluvchanlik kriteriyalari aniqlandi. Shuningdek, ba'zi xususiy misollar tahlil qilinib, umumiy natijalar keltirildi.*

Kalit so‘ zlar: p *-adik son,* p *-adik tartib, taqqoslama, kubik qoldiq, Genzel lemmasi,* p *-adik butun sonlar,* p *-adik birliklar, kubik tenglama.*

Kirish

Sonlar nazariyasi matematikada eng qadimiy va fundamental yo‘ nalishlardan biri bo‘ lib, uning ko‘ plab natijalari va tatbiqlari algebra, analiz va matematik fizika bilan uzviy bog‘ liqdir. 1897-yilda nemis matematik olimi Kurt Genzel p -adik sonlar tushunchasini fanga kiritdi va bu nazariya keyinchalik algebraik sonlar nazariyasi hamda analizning muhim bo‘ limiga aylandi. Ayniqsa, p -adik sonlar nazariyasi XX asrning ikkinchi yarmidan boshlab keng tadqiq qilina boshladi va hozirgi kunda dinamik sistemalar, ehtimollar nazariyasi, kriptografiya hamda statistik fizika kabi sohalarda muhim amaliy tatbiqlarga ega bo‘ ldi.

$\mathbb{Q}_p$ p -adik sonlar maydonida algebraik tenglamalarning yechimga ega bo‘ lish masalasi nazariy va amaliy jihatdan katta ahamiyat kasb etadi, chunki bu natijalar ko‘ plab matematik modellarni chuqurroq tushunishga yordam beradi.

$x^3 = a$ ko‘ rinishidagi kubik tenglamalar eng sodda, ammo muhim algebraik tenglamalardan biri hisoblanadi. Ularning $\square_p$ p-adik sonlar maydonida yechimga ega bo‘ lish masalasi bir tomondan sonlar nazariyasi va taqqoslamalar bilan, ikkinchi tomondan esa Genzel lemmasi va sonning p-adik tartibi bilan bevosita bog‘ liqdir. Shu sababli, kubik tenglamaning yechiluvchanlik shartlarini aniqlash nafaqat nazariy qiziqish uyg‘ otadi, balki p-adik analiz, dinamik sistemalar va p-adik umumlashgan Gibbs o‘ lchovlari nazariyasi uchun ham amaliy ahamiyatga ega.

Ushbu maqolada $x^3 = a$ tenglamaning sonning maydondagi yechimga ega bo‘ lish shartlari o‘ rganiladi. Tadqiqotda $p > 3$ va $p = 3$ hollari alohida ko‘ rib chiqilib, sonning p-adik tartibi, taqqoslamalar va Genzel lemmasi yordamida tenglamaning yechimga ega bo‘ lish kriteriyalari aniqlanadi. Shuningdek, ba’zi xususiy misollar orqali umumiy natijalar yoritiladi. Maqolaning asosiy maqsadi — kubik tenglamaning $\square_p$ maydonda yechimga ega bo‘ lishi uchun zarur va yetarli shartlarni aniqlash hamda ularning matematik ahamiyatini ko‘ rsatishdir.

Adabiyotlar tahlili

So‘ nggi yillarda p-adik sonlar maydonida tenglamalarni yechish bo‘ yicha bir qator ilmiy ishlar chop etildi. [1] ishda mualliflar $x^k = a$ ko‘ rinishidagi monomial tenglamalarning $\square_p$ maydondagi yechimlarini tavsiflab, ularning perturbatsiyalarini ham o‘ rgangan. Shuningdek, [2] ishda esa mualliflar umumiy monomial tenglamalar uchun yechiluvchanlik kriteriyalarini ishlab chiqdilar. Ular $q = mp^s$ ko‘ rinishidagi hollarda aniq shartlarni berib, −1 sonining q-darajali ildiz bo‘ lishi masalasini ham tahlil qildilar. Bu natijalar Leybnitz algebralari va p-adik dinamik sistemalar bilan bog‘ liq tatbiqlarga ega.

Mazkur ishlarda umumiy monomial tenglamalar va ularning perturbatsiyalari keng o‘ rganilgan bo‘ lsa-da, kubik tenglamaning ($x^3 = a$) $\square_p$ maydondagi yechimga ega bo‘ lish shartlari alohida va to‘ liq ko‘ rib chiqilmagan. Shu sababli, ushbu maqola mavjud adabiyotlarni to‘ ldiradi va kubik tenglamaning yechimga ega bo‘ lishi uchun zarur va yetarli shartlarni aniq shaklda beradi. Bundan tashqari, a parametrning ba’zi xususiy qiymatlarida kubik tenglama yechimlari ham topilgan.

Tadqiqot metodologiyasi

Mazkur tadqiqot ishida $x^3 = a$ ko‘ rinishidagi tenglamaning $\square_p$ p-adik sonlar maydonida yechimga ega bo‘ lishi uchun va yetarli shartlarni zarurda algebrik va p-adik tahlilning bir nechta klassik va umumlashtirilgan usullaridan foydalanildi. Bularga misol qilib keltirish mumkin:

Sonning p-adik tartibi — p-adik tartib va normaning xossalari yordamida tenglamaning ildizlari mavjudligi uchun zarur shartlar belgilandi.

Taqqoslamalar — p modul bo‘ yicha taqqoslamalar arifmetikasi asosida kubik qoldiqlar va ularning kubik qoldiq bo‘ lishi tahlil qilindi.

Ferma teoremasi — $p-1$ darajali guruh tuzilmasi orqali kubik qoldiqlarni tasniflashda qo‘ llanildi.

Klassik va umumlashgan Genzel lemmalari — p>3 bo‘ lganda klassik Genzel lemmasidan hamda p=3 bo‘ lganda esa umumlashgan Genzel lemmasidan taqqoslamalar darajasida topilgan yechimlarni $\square_p$ butun sonlar halqasiga ko‘ tarish uchun ishlatildi.

Tadqiqot ishida $p > 3$ va $p = 3$ hollari alohida ko‘ rib chiqildi. Har bir holatda yechiluvchanlik kriteriyalari aniqlandi va misollar yordamida tasdiqlandi. Shuningdek, metodologiya doirasida ba’zi xususiy tenglamalar tahlil qilinib, umumiy natijalar bilan solishtirildi.

Natijalar va ularning tahlili

Dastlabki tushunchalar. Faraz qilaylik, p tub son bo‘ lsin. Ixtiyoriy $a \in \not\in \setminus \{0\}$ son uchun shu sonning p tub son bo‘ yicha tartibi tushunchasini kiritaylik. Agar

$$a \equiv 0 \pmod{p^k}, \quad a \not\equiv 0 \pmod{p^{k+1}}$$

bo‘ lsa, u holda k butun songa a sonining p-adik tartibi deyiladi va $ord_p(a) = k$ kabi belgilanadi. Agar $a = 0$ bo‘ lsa u holda $ord_p(0) = +\infty$ deb olinadi. ¤ ratsional sonlar maydonining p-adik tartib yordamida aniqlangan $|\cdot|_p$ p-adik (noarximed) norma bo‘ yicha to‘ ldirmasi p-adik sonlar maydoni deyiladi va ¤ $_p$ kabi ifodalanadi.

$EKUB(m,p)=EKUB(n,p)=1$ bo‘ lgan ixtiyoriy noldan farqli $x=p^k\frac{m}{n}$ ratsional sonining p-adik tartibi $ord_p(x)=k$ ko‘ rinishida aniqlanadi va unga mos keluvchi p-adik norma $|x|_p=p^{-ord_p(x)}$ tenglik bilan aniqlanadi.

p-adik butun sonlar halqasi

$$\mathbb{Z}_p=\{x\in\mathbb{Q}_p: ord_p(x)\geq 0\}$$

orqali belgilanadi. Bu halqa yagona $p\mathbb{Z}_p$ maksimal idealiga va

$$\mathbb{Z}_p/p\mathbb{Z}_p\cong \mathrm{F}_p$$

p modul bo‘ yicha qoldiqlar sinfiga ega bo‘ lgan lokal halqadir. p-adik birlar

$$\mathbb{Z}_p^{\times}=\{x\in\mathbb{Q}_p: ord_p(x)=0\}.$$

Ixtiyoriy noldan farqli $a\in\mathbb{Q}_p$ element

$$a=p^{ord_p(a)}u$$

ko‘ rinishidagi yagona kanonik yoyilmaga ega, bu yerda $u\in\mathbb{Z}_p^{\times}$.

$\mathbb{Q}_p$ maydon ustidagi ko‘ phadlarning ildizlari mavjud bo‘ lishining yetarliligini kafotlaydigan lemma bu Genzel lemmasidir. Quyida ushbu lemmaning umumlashgan ifodasini keltiramiz.

1-Lemma (Umumlashgan Genzel lemmasi) [3,4, 6-8]. $F(x)\in\mathbb{Z}_p[x]$ *ko‘ phad va* $F'(x)$ *uning hosilasi bo‘ lsin. Faraz qilaylik, biror* $\alpha_0\in\mathbb{Z}_p$ *elementi va* $k\in\mathbb{N}$ *soni uchun quyidagi shartlar bajarilsin:*

1. $F'(\alpha_0)\equiv 0 \pmod{p^k}$ *va* $F'(\alpha_0)\not\equiv 0 \pmod{p^{k+1}}$;
2. $F(\alpha_0)\equiv 0 \pmod{p^{2k+1}}$.

U holda, $F(x)$ *ko‘ phadining* $\mathbb{Z}_p$ *da* $F(\alpha)=0$ *shartini qanoatlantiruvchi yagona* α *ildizi mavjud bo‘ lib, u uchun* $\alpha\equiv\alpha_0 \pmod{p^{k+1}}$ *taqqoslama o‘ rinli bo‘ ladi.*

Genzel lemmasini klassik variantida yuqoridagi ikki shart quyidagi shartlarga almashadi: $F(\alpha_0)\equiv 0 \pmod{p}$ va $F'(\alpha_0)\not\equiv 0 \pmod{p}$. Bu holda tenglama $\alpha\equiv\alpha_0 \pmod{p}$ ko‘ rinishidagi yagona yechimga ega bo‘ ladi [3,4,5].

Quyidagi teorema bizga sonlar nazariyasidan ma’lum:

1-Teorema. [3, 5-8] Faraz qilaylik p tub son, k natural son va $EKUB(a,p)=1$ shartni qanoatlantiruvchi $a\in\mathbb{Z}$ berilgan bo‘ lsin. U holda $x^k\equiv a \pmod{p}$ taqqoslama yechimga ega bo‘ lishi uchun $a^{\frac{p-1}{EKUB(k,p-1)}}\equiv 1 \pmod{p}$ o‘ rinli bo‘ lishi zarur va yetarli. Bundan tashqari, agar taqqoslama yechimga ega bo‘ lsa, u holda uning p modul bo‘ yicha o‘ zaro taqqoslanmaydigan yechimlari soni $EKUB(k,p-1)$ ga teng bo‘ ladi.

Quyida biz kubik tenglamaning yechiluvchanlik shartlarini aniqlaymiz.

$x^3=a$ ***kubik tenglamaning yechiluvchanlik shartlari***

Biz ushbu maqolada

$$x^3=a,\quad a\in\mathbb{Q}_p. \tag{1}$$

ko‘ rinishdagi kubik tenglamani ko‘ rib chiqamiz hamda (1) ko‘ rinishdagi tenglamaning yechimlari qaysi tub sonlarda $\mathbb{Q}_p$ maydonlarda mavjud, tenglama yechimlari soni nechta degan savollarga javob izlaymiz.

2-Teorema. *Aytaylik* $a=p^{ord_p(a)}u$ $(u\in\mathbb{Z}_p^{\times})$ *bo‘ lsin. (1) tenglama* $\mathbb{Q}_p$ *da yechimga ega bo‘ lishi uchun quyidagi ikki shartning bir vaqtda bajarilishi zarur va yetarli:*

1. $ord_p(a)\equiv 0 \pmod{3}$,

2. $y^3 = u$ *tenglama* $\mathbb{Q}_p^{\times}$ *da yechimga ega.*

Isboti. Zaruriyligi. Faraz qilaylik, (1) tenglama $\mathbb{Z}_p$ da yechimga bo‘ lsin. U holda tenglikning ikkala tomonidagi sonlarning p -adik tartibini topsak, biz quyidagiga ega bo‘ lamiz:

$$ord_p(x^3) = ord_p(a).$$

p -adik tartibning xossasiga ko‘ ra

$$3ord_p(x) = ord_p(a).$$

Har qanday sonning p -adik tartibi butun son ya’ni, $ord_p(x) \in \mathbb{Q}$ bo‘ lganligi sababli, $ord_p(a)$ qiymat 3 ga karrali ekanligi kelib chiqadi, ya’ni $ord_p(a) \equiv 0 \pmod 3$. Bu esa biror $m \in \mathbb{Q}$ uchun $ord_p(a) = 3m$ ekanligini bildiradi. Agar x elementni $x = p^m y$ ($y \in \mathbb{Q}_p^{\times}$) ko‘ rinishida ifodalab, (1) tenglamaga qo‘ ysak,

$$(p^m y)^3 = p^{3m} u \Rightarrow p^{3m} y^3 = p^{3m} u$$

tenglikka ega bo‘ lamiz. Oxirgi tenglikdan esa $y^3 = u$ hosil bo‘ ladi va bu p -adik birlar to‘ plamida yechimga ega ekanligini isbotlaydi.

Yetarliligi. Faraz qilaylik biror $m \in \mathbb{Q}$ uchun $ord_p(a) = 3m$ bo‘ lsin va $y \in \mathbb{Q}_p^{\times}$ element $y^3 = u$ tenglikni qanoatlantirsin. Biz (1) ning yechimi $x = p^m y \in \mathbb{Z}_p$ kabi bo‘ lishini ko‘ rsataylik. Bu yechimni (1) tenglamaga qo‘ yib quyidagiga ega bo‘ lamiz:

$$x^3 = a \Rightarrow p^{3m} y^3 = p^{3m} u \Rightarrow y^3 = u.$$

Bu esa x ning izlanayotgan yechim ekanligini tasdiqlaydi. Teorema isbotlandi.

$p > 3$ ***hol.*** Endi biz $p > 3$ bo‘ lganda

$$y^3 = u \tag{2}$$

tenglama $\mathbb{Q}_p^{\times}$ da yechiluvchanlik shartlarni aniqlaymiz.

3-Teorema. $p > 3$ *tub son va* $u \in \mathbb{Q}_p^{\times}$ *bo‘ lsin. U holda* (2) *tenglama* $\mathbb{Q}_p^{\times}$ *da yechimga ega bo‘ lishi uchun* u ning p *modul bo‘ yicha kubik qoldiq bo‘ lishi zarur va yetarli. Bundan tashqari,*

1.*Agar* $p \equiv 2 \pmod 3$ *bo‘ lsa, ixtiyoriy* $u \in \mathbb{Q}_p^{\times}$ *uchun yagona yechim mavjud.*

2.*Agar* $p \equiv 1 \pmod 3$ *bo‘ lsa, yechim mavjud bo‘ lishi uchun* $u^{(p-1)/3} \equiv 1 \pmod p$ *shartining bajarilishi zarur va yetarli. Bu holda* (2) *tenglama* $\mathbb{Q}_p^{\times}$ *da uchta turli yechimlarga ega*

Isboti. Zaruriyligi. Faraz qilaylikk, $y^3 = u$ tenglama $\mathbb{Q}_p^{\times}$ da biror yechimga ega bo‘ lsin. $y \in \mathbb{Q}_p^{\times}$ ekanligidan yechimning p modul bo‘ yicha tartibi nolga teng, ya’ ni $y \not\equiv 0 \pmod p$. Bundan $y^3 \equiv u \pmod p$ taqqoslamaga ega bo‘ lamiz. Bu esa, o‘ z navbatida, u elementning p modul bo‘ yicha kubik qoldiq ekanligini anglatadi.

Yetarliligi. Faraz qilaylik $u \in \mathbb{Q}_p^{\times}$ *elementi* p *modul bo‘yicha kubik qoldiq bo‘lsin. Kubik qoldiq ta’rifiga ko‘ra, qoldiqlar sinfida shunday bir* $a \in \{1, 2, \ldots, p-1\}$ *element mavjudki, uning uchun*

$$a^3 \equiv u \pmod p \tag{3}$$

taqqoslama o‘ rinli. Endi $f(x) = x^3 - u$ yordamchi funksiyani qaraylik. Funksiyaning a nuqtadagi qiymatini hisoblab, hamda (3) foydalanib quyidagini yozishimiz mumkin:

$$f(a) = a^3 - u \equiv 0 \pmod p \tag{4}$$

Ushbu funksiyaning hosilasi $f'(x) = 3x^2$ ekanligini oson aniqlash mumkin. Teorema shartida $p > 3$ ekanligini hisobga olib va $a \not\equiv 0 \pmod p$ ekanligidan foydalanib,

$$f'(a) = 3a^2 \not\equiv 0 \pmod p \tag{5}$$

xulosaga kelamiz. (4) va (5) taqqoslamalar Genzel lemmasining barcha shartlarini to‘ liq qanoatlantiradi. Shuning uchun $f(x)$ ko‘ phadining $\mathbb{Z}_p$ da $f(y)=0$ shartini qanoatlantiruvchi yagona y ildizi mavjud bo‘ lib, u uchun $y \equiv a \pmod p$ taqqoslama o‘ rinli bo‘ ladi. Ushbu yechim $y \equiv a \not\equiv 0 \pmod p$ bo‘ lganligi sababli, izlanayotgan yechim $\mathbb{Z}_p^{\times}$ ga tegishli bo‘ ladi. Teoremaning asosiy qismi isbotlandi. Endi qo‘ shimcha qismini isbotlaylik.

1-hol: $p \equiv 2 \pmod 3$ bo‘ lsin. Bu holda $p-1$ soni 3 ga bo‘ linmaydi, ya’ni $EKUB(3, p-1)=1$ bo‘ ladi. 1-Teoremaga ko‘ ra, $x^3 \equiv a \pmod p$ taqqoslama doimo yagona $x_0 \pmod p$ yechimga ega. Genzel lemmasiga ko‘ ra, $\mathbb{Z}_p^{\times}$ da yagona $x \equiv x_0 \pmod p$ ko‘ rinishdagi yechim mavjud.

2-hol: $p \equiv 1 \pmod 3$ bo‘ lsin. U holda $EKUB(3, p-1)=3$ bo‘ ladi.

Zaruriyligi: faraz qilaylik (2) taqqoslama yechimga ega bo‘ lsin, ya’ni shunday $y \in \mathbb{Z}_p^{\times}$ mavjudki,

$$y^3 \equiv u \pmod p \tag{6}$$

taqqoslama o‘ rinli bo‘ ladi. Fermaning kichik teoremasiga ko‘ ra quyidagini yoza olamiz:

$$y^{p-1} \equiv 1 \pmod p.$$

Endi oxirgi taqqoslamadan foydalanib quyidagini yoza olamiz:

$$u^{\frac{p-1}{3}} \equiv \left(y^3\right)^{\frac{p-1}{3}} = y^{p-1} \equiv 1 \pmod p.$$

Bundan esa

$$a^{\frac{p-1}{3}} \equiv 1 \pmod p \tag{7}$$

kelib chiqdi. Demak, agar (2) tenglamaning yechimi mavjud bo‘ lsa, u holda (7) ning bajarilishi zarur ekan.

Yetarlilik: Faraz qilaylik (7) shart bajarilsin. $EKUB(p-1,3)=3$ ekanligi ravshan. Shuning uchun 1-Teoremaga ko‘ ra $x^3 \equiv u \pmod p$ tenglama $\{1,2,...,p-1\}=F_p^*$ da o‘ zaro taqqoslanmaydigan roppa-rosa 3 ta har xil $x_{0,1}, x_{0,2}, x_{0,3}$ ildizlarga ega bo‘ ladi. Ularning har biri uchun $f'(x_{0,i})=3x_{0,i}^2 \not\equiv 0 \pmod p$ sharti bajarilgani sababli, Genzel lemmasiga ko‘ ra ularning har biriga mos ravishda $\mathbb{Z}_p^*$ da yagona va o‘ zaro teng bo‘ lmagan 3 ta x_1, x_2, x_3 yechimlar mos keladi. Bu esa teorema isbotining yakunlanganligini bildiradi.

$p=3$ hol. $p=3$ bo‘ lgan hol $p>3$ holatidan tubdan farq qiladi. Chunki bu holda funksiyaning hosilasi $f'(x)=3x^2$ bo‘ lib, uning 3-adik normasi $|f'(x)|_3 = |3|_3 \cdot |x^2|_3 = \frac{1}{3}$ ga teng (agar $x \in \mathbb{Z}_3^{\times}$ bo‘ lsa) ya’ ni, hosila 3 modul bo‘ yicha doimo nolga teng: $f'(x_0) \equiv 0 \pmod 3$. Shu sababli klassik Genzel lemmasidan foydalana olmaganligimiz uchun umumlashgan Genzel lemmasidan foydalanib natijalarni isbotlaymiz.

4-Teorema. *Aytaylik, $u \in \mathbb{Z}_3^{\times}$ bo‘ lsin. $y^3=u$ tenglama $\mathbb{Z}_3^{\times}$ da yechimga ega bo‘ lishi uchun $u \equiv \pm 1 \pmod 9$ shartining bajarilishi zarur va yetarli. Agar bu shart bajarilsa, tenglama $\mathbb{Z}_3^{\times}$ da yagona yechimga ega bo‘ ladi.*

Isbot. Zaruriyligi. Faraz qilaylik, $y^3=u$ tenglama $\mathbb{Z}_3^{\times}$ da biror y yechimga ega bo‘ lsin. $y \in \mathbb{Z}_3^{\times}$ bo‘ lgani uchun $y \equiv 1 \pmod 3$ yoki $y \equiv 2 \equiv -1 \pmod 3$ bo‘ lishi mumkin. Ya’ni, $y \equiv \pm 1 \pmod 3$. Endi y ni $y = \pm 1 + 3\alpha$ ($\alpha \in \mathbb{Z}_3$) ko‘ rinishida yozib, kubga ko‘ taramiz:

$$y^3 = (\pm 1 + 3\alpha)^3 = (\pm 1)^3 + 3\cdot(\pm 1)^2 \cdot (3\alpha) + 3\cdot(\pm 1)\cdot(3\alpha)^2 + (3\alpha)^3$$

$$y^3 = \pm 1 + 9\alpha \pm 27\alpha^2 + 27\alpha^3$$

Oxirgi tengliklardan ko‘ rinib turibdiki, $9\alpha \pm 27\alpha^2 + 27\alpha^3 \equiv 0 \pmod 9$ bo‘ ladi. Demak, $u = y^3 \equiv \pm 1 \pmod 9$.

Yetarliligi. Faraz qilaylik, $u \equiv \pm 1 \pmod 9$ bo‘ lsin. U holda shunday $k \in \not{c}_3$ topiladiki, u sonini $u = \pm 1 + 9k$ ko‘ rinishda yozish mumkin. Biz $f(x) = x^3 - u$ funksiyaning $\not{c}_3^{\times}$ dagi ildizini topishimiz kerak. Buning uchun yechim sifatida $x_0 = \pm 1$ nuqtani olaylik. Funksiya va uning hosilasini bu nuqtada qiymatini hisoblaymiz:

$$\begin{aligned} &f(x_0) = (\pm 1)^3 - (\pm 1 + 9k) = \pm 1 - \pm 1 - 9k = -9k \Rightarrow f(x_0) \equiv 0 \pmod 9, \\ &f'(x_0) = 3(\pm 1)^2 = 3 \Rightarrow f'(x_0) \equiv 0 \pmod 3. \end{aligned} \tag{8}$$

(8) tenglik bu funksiya uchun Genzel lemmasining klassik variantining shartlari bajarilmayotganini, shu sababli 1-Lemmadan foydalanishimiz kerakligni ko‘ rsatib turibdi. Endi yechimni $x_1 = x_0 + 3\alpha$ ko‘ rinishida olib, bu nuqtadagi funksiya qiymatini topaylik:

$$f(x_0 + 3\alpha) = (x_0^3 - u) + 9x_0^2\alpha + 27x_0\alpha^2 + 27\alpha^3$$

Avvalgi hisob-kitobimizdan $x_0^3 - u = -9k$ ekanligini bilamiz. Shunday qilib,

$$f(x_0 + 3\alpha) = 9(x_0^2\alpha - k) + 27x_0\alpha^2 + 27\alpha^3$$

Bizga $f(x_1) \equiv 0 \pmod{27}$ shartini ta’ minlaydigan α kerak. Shuning uchun

$$f(x_0 + 3\alpha) \equiv 9(x_0^2\alpha - k) \pmod{27}$$

Oxirgi taqqoslamadan agar biz $\alpha \equiv k \pmod 3$ deb tanlasak (ya’ ni $\alpha = k + 3\beta$), u holda $x_0^2 \equiv 1 \pmod 3$ ekanligini hisobga olsak ($x_0 = \pm 1$ bo‘ lgani uchun $x_0^2 = 1$):

$$x_0^2\alpha - k \equiv 1 \cdot k - k \equiv 0 \pmod 3$$

kelib chiqadi. Bu esa $9(x_0^2\alpha - k)$ ning 27 ga bo‘ linishini kafolatlaydi. Natijada

$$f(x_1) = f(x_0 + 3\alpha) \equiv 0 \pmod{27} \tag{9}$$

ga ega bo‘ lamiz. Endi funksiya hosilasining x_1 dagi qiymati uchun qiyudagiga ega bo‘ lamiz:

$$\begin{aligned} &f'(x_1) = 3(x_0 + 3\alpha)^2 = 3 \pm 18\alpha + 27\alpha^2 \Rightarrow \\ &\Rightarrow f'(x_1) \equiv 0 \pmod 3 \text{ va } f'(x_1) \not\equiv 0 \pmod 9. \end{aligned} \tag{10}$$

(9) va (10) taqqoslamalar bizga 1-Lemma shartlari to‘ liq o‘ rinli ekanligini ko‘ rsatib turibdi. 1-Lemmaga (umumlashgan Genzel lemmasiga) ko‘ ra, $f(x) = 0$ tenglama $\not{c}_3^{\times}$ da yagona yechimga ega. Demak, agar $u \equiv \pm 1 \pmod 9$ bo‘ lsa, $y^3 = u$ tenglama $\not{c}_3^{\times}$ da yagona yechimga ega. Teorema to‘ liq isbotlandi.

Endi biz $a = \pm 1$ va $a = \pm 2$ bo‘ lganda $x^3 = a$ tenglamaning yechimlarini topish bilan shig‘ ullanaylik.

$x^3 = 1$. Bu tenglama p-adik tahlilda juda klassik hol hisoblanib, yuqorida olingan teoremalardan foydalanib quyidagi natijalarni keltiramiz:

- $p = 3$ bo‘ lganda: $1 \equiv 1 \pmod 9$ sharti bajariladi (4-Teorema). Demak, $\not{c}_3^{\times}$ da yagona yechim bor, u ham bo‘ lsa $x = 1$.
- $p \equiv 2 \pmod 3$ bo‘ lganda 3-Teoremaga ko‘ ra $x = 1$ ko‘ rinishida yagona yechim mavjud.
- $p \equiv 1 \pmod 3$ bo‘ lsin. Bu holda $1^{\frac{p-1}{3}} \equiv 1 \pmod p$ shart doimo bajariladi. Demak, tenglama roppa-rosa 3 ta har xil yechimga ega.

Misol uchun, $p = 7$ da $x^3 \equiv 1 \pmod 7$ taqqoslamaning yechimlari $x_0 \equiv 1, 2, 4 \pmod 7$ bo‘ ladi. ($2^3 = 8 \equiv 1 \pmod 7$, $4^3 = 64 \equiv 1 \pmod 7$). Genzel lemmasiga ko‘ ra, $\not{c}_7^{\times}$ da 3 ta yechim bor: ulardan biri $x_1 = 1$, qolgan ikkitasi esa notrivial kubik ildizlardir: $x_2 \equiv 2 \pmod 7$, $x_3 \equiv 4 \pmod 7$

$x^3 = -1$. Bu tenglama uchun quyidagi natijalar olindi:

- $p = 3$ bo‘ lganda: $-1 \equiv -1 \pmod 9$ sharti bajariladi. Tenglama $\not{c}_3^{\times}$ da yagona yechimga ega: $x = -1$.

- $p \equiv 2 \pmod 3$ bo‘ lganda yagona yechim mavjud va u $x = -1$ ga teng.
- $p \equiv 1 \pmod 3$ bo‘ lganda $\frac{p-1}{3}$ juft son bo‘ ladi. Shuning uchun $(-1)^{\frac{p-1}{3}} \equiv 1 \pmod p$ shart o‘ rinli.

Demak, bu holda ham roppa-rosa 3 ta yechim mavjud (biri $x = -1$, qolgan ikkitasi notrivial).

$x^3=2$. Bu holda yechiluvchanlik tub songa jiddiy bog‘ liq bo‘ ladi (maqolada $p \geq 3$ bo‘ lgan hol qaralmoqda):

- $p = 3$ bo‘ lsin. $¢_3$ dagi ixtiyoriy yechimning kubi 9 modul bo‘ yicha 1 yoki -1 bo‘ lishi mumkin. $2 \not\equiv \pm 1 \pmod 9$ bo‘ lganligi uchun haqiqatdan ham tenglama yechimga ega emas.
- $p \equiv 2 \pmod 3$ bo‘ lsin. Bu holda 2 soni doimo kubik chegirma bo‘ ladi va tenglama yagona yechimga ega. *Masalan,* $p = 5$ *da:* $x^3 \equiv 2 \pmod 5 \Rightarrow x_0 = 3$ ($3^3 = 27 \equiv 2$). Genzel lemmasiga ko‘ ra $¢_5$ da yagona yechim bor.
- $p \equiv 1 \pmod 3$ bo‘ lsin. Yechim borligi uchun $2^{\frac{p-1}{3}} \equiv 1 \pmod p$ sharti bajarilishi kerak. Agar bajarilsa 3 ta yechim bor, bajarilmasa yechim yo‘ q. *Masalan,* $p = 7$ *da:* $2^{\frac{7-1}{3}} = 2^2 = 4 \not\equiv 1 \pmod 7$. Demak, ¤ $_7$ da yechim yo‘ q. $p = 31$ *da:* $2^{\frac{31-1}{3}} = 2^{10} = 1024 \equiv 1 \pmod{31}$. Demak, ¤ $_{31}$ da roppa-rosa 3 ta yechim bor.

$x^3=-2$. Bu hol uchun ham quyidagi natijalarni keltiramiz:

- $p = 3$ bo‘ lsin. $-2 \equiv 7 \pmod 9$ bo‘ lib, $\pm 1 \pmod 9$ shartiga tushmaydi $\Rightarrow$ yechim yoq.
- $p \equiv 2 \pmod 3$ bo‘ lsin. Doimo yagona yechim mavjud. *Masalan,* $p = 5$ deb olsak u holda $x^3 \equiv -2 \equiv 3 \pmod 5 \Rightarrow x_0 = 2$ ($2^3 = 8 \equiv 3$). $¢_5$ da yagona yechim bor.
- $p \equiv 1 \pmod 3$ bo‘ lsin. $(-2)^{\frac{p-1}{3}} \equiv 1 \pmod p$ sharti tekshiriladi. $\frac{p-1}{3}$ juft bo‘ lgani uchun bu shart $2^{\frac{p-1}{3}} \equiv 1 \pmod p$ sharti bilan ustma ust tushadi.

Ya’ni, $a = 2$ yechim bo‘ lsa, $a = -2$ ham yechim bo‘ ladi (3 ta yechim), aks holda yechim yo‘ q. (Masalan, $p = 7$ da yo‘ q, $p = 31$ da 3 ta yechim bor).

Xulosa

Ushbu maqolada $p > 3$ bo‘ lganda $\square_p$ p-adik sonlar maydonida $x^3 = a$ ko‘ rinishidagi tenglamaning yechiluvchanlik shartlari va yechimlari soni to‘ liq tahlil qilindi.

Avvalo, tenglama yechimga ega bo‘ lishi uchun $ord_p(a) \equiv 0 \pmod 3$ bo‘ lishi zarur ekanligi ko‘ rsatildi va masala $\square_p^{\times}$ dagi $y^3 = u$ ga keltirildi. Shundan so‘ ng, $p \equiv 2 \pmod 3$ bo‘ lganda tenglama $\square_p^{\times}$ da har doim bitta yechimga ega ekani, $p \equiv 1 \pmod 3$ bo‘ lganiga esa yechimlar soni roppa-rosa 3 ta bo‘ lishi isbotlandi.

Bundan tashqari, $p = 3$ holatida klassik Gensel lemmasi ishlamasligi ko‘ rsatilib, umumlashgan Gensel lemmasi asosida $u \equiv \pm 1 \pmod 9$ zaruriy va yetarlilik sharti olindi hamda yechimning yagonaligi kafolatlandi. Olingan nazariy natijalar asosida $x^3 = \pm 1$ va $x^3 = \pm 2$ tenglamalar yechib ko‘ rsatildi.

Olingan natijalar *p*-adik dinamik sistemalarni tahlil qilishda, Keli daraxtida *p*-adik Gibbs o‘ lchovlarini qurishda va yuqori darajali $x^n = a$ tenglamalarning umumiy nazariyasini rivojlantirishda amaliy ahamiyatga ega.

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2D YARIMO‘ TKAZGICHLARDA TWIST BURCHAGINING ELEKTRON ZONALAR TUZILISHIGA TA’SIRINI KVANT-MEXANIK MODELLASHTIRISH

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Annotatsiya. *Mazkur maqolada 2D yarimo‘ tkazgichlarda qatlamlarning o‘ zaro burilish burchagi (twist angle) o‘ zgarishining elektron zonalar tuzilishiga ta’siri kvant-mexanik modellashtirish asosida tadqiq etiladi. Ikki o‘ lchamli materiallarda qatlamlararo burilish natijasida hosil bo‘ ladigan moiré strukturalarning elektron energetik spektri, zonalar dispersiyasi va taqiqlangan zona kengligiga ta’siri nazariy jihatdan tahlil qilinadi. Twist burchagining o‘ zgarishi natijasida elektron holatlarining lokalizatsiyasi, qatlamlararo o‘ zaro ta’sir va elektronlarning effektiv massasi kabi parametrlarning o‘ zgarish mexanizmlari yoritiladi. Tadqiqotda kvant-mexanik yondashuvlar, jumladan, zichlik funksionali nazariyasi (DFT), tight-binding modeli va moiré superpanjara asosidagi kontinuum modellaridan foydalanish imkoniyatlari ko‘ rib chiqiladi. Olingan nazariy natijalar twist burchagini boshqarish orqali 2D yarimo‘ tkazgichlarning elektron xossalarini maqsadli ravishda o‘ zgartirish va ularning nanoelektronika, optoelektronika hamda kvant texnologiyalaridagi potensial qo‘ llanilishlarini asoslash imkonini beradi.*

Kalit so‘ zlar: *2D yarimo‘ tkazgichlar, twistronika, twist burchagi, moiré struktura, moiré superpanjara, elektron zonalar tuzilishi, energetik spektr, band gap, qatlamlararo o‘ zaro ta’sir, kvant-mexanik modellashtirish, zichlik funksionali nazariyasi, DFT, tight-binding modeli, elektron holatlar, elektron dispersiyasi, effektiv massa, nanoelektronika, optoelektronika, kvant texnologiyalari*

КВАНТОВО-МЕХАНИЧЕСКОЕ МОДЕЛИРОВАНИЕ ВЛИЯНИЯ УГЛА ПОВОРОТА НА ЭЛЕКТРОННУЮ ЗОННУЮ СТРУКТУРУ 2D-ПОЛУПРОВОДНИКОВ

Аннотация. *В статье исследуется влияние угла взаимного поворота слоев (twist angle) в двумерных полупроводниках на структуру электронных зон с использованием методов квантово-механического моделирования. Теоретически анализируется влияние возникающих при относительном повороте слоев мозаичных структур на энергетический спектр электронов, дисперсию зон и ширину запрещенной зоны. Рассматриваются механизмы изменения локализации электронных состояний, межслойного взаимодействия и эффективной массы носителей заряда в зависимости от угла поворота. Особое внимание уделяется возможностям применения квантово-механических подходов, включая теорию функционала плотности (DFT), tight-binding модель и континуальные модели моире-сверхрешетки. Полученные теоретические результаты позволяют определить закономерности управления электронными свойствами двумерных полупроводников посредством изменения угла поворота слоев и обосновать перспективы их применения в наноэлектронике, оптоэлектронике и квантовых технологиях.*

Ключевые слова: *двумерные полупроводники, твистроника, угол поворота, моире-структура, моире-сверхрешетка, структура электронных зон, энергетический спектр, запрещенная зона, межслойное взаимодействие, квантово-механическое моделирование, теория функционала плотности, DFT, tight-binding модель, электронные состояния, электронная дисперсия, эффективная масса, наноэлектроника, оптоэлектроника, квантовые технологии*

QUANTUM-MECHANICAL MODELING OF THE EFFECT OF THE TWIST ANGLE ON THE ELECTRONIC BAND STRUCTURE OF 2D SEMICONDUCTORS

Abstract. *This paper investigates the influence of the twist angle between layers in two-dimensional semiconductors on their electronic band structure using quantum-mechanical modeling approaches. The study theoretically analyzes the effects of moiré structures formed by the relative rotation of atomic layers on the electronic energy spectrum, band dispersion, and band gap. The mechanisms governing changes in the localization of electronic states, interlayer interactions, and effective carrier mass as a function of the twist angle are considered. Particular attention is given to quantum-mechanical approaches, including density functional theory (DFT), tight-binding models, and continuum models based on moiré superlattices. The theoretical analysis provides an opportunity to identify the dependence of the electronic properties of two-dimensional semiconductors on the twist angle and to establish the potential of twist-angle engineering for controlling their electronic characteristics. The obtained results are relevant to the development of advanced nanoelectronic, optoelectronic, and quantum devices based on two-dimensional semiconductor materials.*

***Keywords**: two-dimensional semiconductors, twistronics, twist angle, moiré structure, moiré superlattice, electronic band structure, energy spectrum, band gap, interlayer interaction, quantum-mechanical modeling, density functional theory, DFT, tight-binding model, electronic states, band dispersion, effective mass, nanoelectronics, optoelectronics, quantum technologies*

KIRISH.So‘ nggi yillarda ikki o‘ lchamli (2D) materiallarning fundamental fizik xususiyatlarini chuqur o‘ rganish va ularning funksional imkoniyatlaridan nanoelektronika, optoelektronika hamda kvant texnologiyalarida foydalanish zamonaviy kondensirlangan muhit fizikasi va materialshunoslikning istiqbolli yo‘ nalishlaridan biriga aylandi. Ikki o‘ lchamli materiallar atomlarning bir yoki bir necha qatlamidan tashkil topgan bo‘ lib, ularning elektron, optik, mexanik va transport xossalari uch o‘ lchamli hajmiy materiallardan sezilarli darajada farq qiladi. Ayniqsa, qatlamlararo o‘ zaro ta’sirni boshqarish imkoniyati 2D materiallarning fizik xususiyatlarini tashqi parametrlar orqali modulyatsiya qilish uchun yangi imkoniyatlarni yuzaga keltirmoqda.2D yarimo‘ tkazgichlar ushbu materiallar sinfining muhim vakillaridan biri hisoblanadi. Ularning elektron xossalarini tavsiflashda elektron zonalar tuzilishi, valent zona, o‘ tkazuvchanlik zonasi, taqiqlangan zona (band gap), Fermi sathi, elektron holatlar zichligi (DOS) va zaryad tashuvchilarning effektiv massasi kabi fundamental tushunchalar asosiy ahamiyatga ega. Mazkur parametrlar materialning elektr o‘ tkazuvchanligi, optik yutilishi, fotolyuminessensiyasi va boshqa fizik xususiyatlarini belgilaydi. Shuning uchun 2D yarimo‘ tkazgichlarning elektron zonalar tuzilishini boshqarish yangi avlod elektron va optoelektron qurilmalarini yaratish uchun muhim ilmiy vazifa hisoblanadi.

2D materiallarning elektron xossalarini boshqarishning zamonaviy usullaridan biri twistronika (twistronics) hisoblanadi. Twistronika — ikki yoki undan ortiq atomar yupqa qatlamlarning bir-biriga nisbatan ma’lum burilish burchagi (twist angle) ostida joylashtirilishi natijasida materialning elektron va boshqa kvant xossalarini boshqarishga asoslangan ilmiy yo‘ nalishdir. Bunda qatlamlarning o‘ zaro burilishi oddiy geometrik o‘ zgarish bo‘ lib qolmasdan, tizimning yangi davriylik xususiyatlarini yuzaga keltiradi. Xususan, kristall panjaralarning nisbiy burilishi natijasida moiré naqshi yoki moiré strukturasi hosil bo‘ ladi. Ushbu struktura 2D geterostrukturaning elektron energetik spektriga sezilarli ta’sir ko‘ rsatishi mumkin.

More superpanjara (moiré superlattice) — o‘ zaro burilgan yoki panjara parametrlari farq qiladigan ikki kristall qatlamning ustma-ust joylashishi natijasida hosil bo‘ ladigan katta effektiv davrga ega superstrukturadir. Moiré superpanjaraning davri odatda qatlamlarning panjara parametrlari va ular orasidagi burilish burchagiga bog‘ liq bo‘ ladi. Twist burchagi kichik qiymatlarga ega bo‘ lganda moiré davri sezilarli darajada kattalashadi. Natijada elektronlar uchun yangi effektiv davriy potensial shakllanib, dastlabki kristall panjaraga xos bo‘ lmagan yangi elektron holatlarning yuzaga kelishiga sharoit yaratiladi.

Twist burchagining o‘ zgarishi 2D yarimo‘ tkazgichlarning elektron zonalar tuzilishiga bevosita ta’sir ko‘ rsatishi mumkin. Qatlamlar orasidagi burilish burchagi o‘ zgarganda elektron to‘ lqin funksiyalarining o‘ zaro qoplanishi, qatlamlararo tunnellanish, interqatlam gibridlanishi va effektiv davriy potensialning xarakteri ham o‘ zgaradi. Natijada valent va o‘ tkazuvchanlik zonalarining dispersiyasi, band gap kattaligi, zonalarning lokalizatsiyasi va elektron holatlar zichligi kabi parametrlar o‘ zgarishi mumkin. Shu jihatdan twist burchagi 2D yarimo‘ tkazgichlarda elektron xossalarni boshqaruvchi muhim tashqi geometrik parametr sifatida qaraladi.

2D yarimo‘ tkazgichlarning elektron xossalarini chuqur tadqiq etishda kvant-mexanik modellashtirish muhim nazariy vosita hisoblanadi. Kvant-mexanik modellashtirish atom va elektronlar tizimining fizik holatini fundamental kvant qonunlari asosida ifodalash imkonini beradi. Bunda tizimning Hamiltoniani, elektron to‘ lqin funksiyasi, energiya o‘ ziga xos qiymatlari va elektron zichligi kabi kattaliklar aniqlanadi. Hisoblash natijasida materialning elektron zonalar tuzilishi, band gap qiymati, holatlar zichligi va boshqa muhim parametrlarini nazariy jihatdan baholash mumkin.2D materiallarni modellashtirishda zichlik funksionali nazariyasi (Density Functional Theory — DFT) keng qo‘ llaniladigan kvant-mexanik yondashuvlardan biridir. DFT asosida ko‘ p elektronli tizimning asosiy fizik xususiyatlarini elektron zichligi orqali aniqlash imkoniyati mavjud. Ushbu metod yordamida kristall strukturaning geometriyasi optimallashtirilishi, elektron energiyalar hisoblanishi, band structure va density of states kabi parametrlar aniqlanishi mumkin. Ayniqsa, turli twist burchaklariga mos keluvchi 2D geterostrukturalarning energetik holatlarini taqqoslashda DFT hisoblashlari muhim nazariy ma’lumot beradi[1].

Bundan tashqari, katta o‘ lchamli moiré superpanjaralarni tadqiq etishda tight-binding modeli va kontinuum modeli (continuum model) kabi yondashuvlardan foydalanish samarali hisoblanadi. Tight-binding modeli elektronlarning kristall panjaradagi lokal orbitalar o‘ rtasidagi tunnellanishini hisobga olish orqali elektron energetik spektrini ifodalaydi. Kontinuum modelida esa moiré superpanjaraning katta effektiv davriyligi va elektronlarning ushbu davriy potensialdagi harakati soddalashtirilgan effektiv Hamiltonian orqali tavsiflanadi. Ushbu yondashuvlar hisoblash resurslarini kamaytirgan holda twist burchagining keng diapazonidagi fizik holatlarni o‘ rganish imkonini beradi.Ayniqsa, twist-angle engineering, ya’ni burilish burchagini muhandislik parametriga aylantirish konsepsiyasi 2D materiallarning elektron

xususiyatlarini boshqarishda muhim ahamiyat kasb etmoqda. Bunda materialning kimyoviy tarkibini o‘ zgartirmagan holda faqat qatlamlarning nisbiy orientatsiyasini o‘ zgartirish orqali elektron energetik spektrni modifikatsiya qilish imkoniyati ko‘ rib chiqiladi. Shu sababli twistronika an’anaviy material dizayniga nisbatan qo‘ shimcha boshqaruv darajasini taqdim etadi.

2D yarimo‘ tkazgichlar orasida o‘ tish metallari dixalkogenidlari (Transition Metal Dichalcogenides — TMDs) alohida ilmiy qiziqish uyg‘ otadi. MoS_2, WS_2, $MoSe_2$ va WSe_2 kabi materiallar qatlamli kristall tuzilishga, sezilarli optik javobga va qatlamlararo o‘ zaro ta’sirga ega. TMD qatlamlarining o‘ zaro burilishi natijasida hosil bo‘ ladigan moiré potensial elektron va eksiton holatlarining energetik tuzilishini sezilarli darajada o‘ zgartirishi mumkin. Shu sababli TMD asosidagi twistronik tizimlar elektronika, optoelektronika va kvant materiallari fizikasi nuqtayi nazaridan istiqbolli tadqiqot obyektlari hisoblanadi.Mazkur masalani nazariy jihatdan tadqiq etishda twist burchagini asosiy boshqariluvchi parametr sifatida tanlash muhimdir. Masalan, kichik burilish burchaklarida moiré superpanjaraning davri kattalashadi va elektronlarning effektiv davriy potensial bilan o‘ zaro ta’siri kuchayishi mumkin. Burchakning o‘ zgarishi bilan elektron zonalarining dispersiyasi, zonalararo masofa va elektron holatlarining fazoviy taqsimlanishida o‘ zgarishlar kuzatilishi mumkin. Shu nuqtayi nazardan θ — twist burchagi, L_m — moiré davri, E(k) — elektron dispersiya munosabati, E_9 — band gap kabi parametrlar o‘ rtasidagi bog‘ lanishni aniqlash tadqiqotning muhim yo‘ nalishlaridan biridir[2].

Ushbu tadqiqotning dolzarbligi shundaki, 2D yarimo‘ tkazgichlarning elektron xossalarini faqat materialning kimyoviy tarkibi yoki tashqi elektr maydoni orqali emas, balki qatlamlarning o‘ zaro geometrik orientatsiyasi orqali ham boshqarish imkoniyati mavjud. Twist burchagi yordamida elektron zonalar tuzilishini nazorat qilish mexanizmlarini aniqlash yangi avlod nanoelektron qurilmalarida energiya samaradorligini oshirish, optoelektronik javobni boshqarish va kvant holatlarini manipulyatsiya qilish uchun nazariy asos yaratadi.Shu sababli mazkur maqolada 2D yarimo‘ tkazgichlarda twist burchagining elektron zonalar tuzilishiga ta’sirini kvant-mexanik modellashtirish masalasi asosiy tadqiqot yo‘ nalishi sifatida qaraladi. Tadqiqot doirasida twist burchagi va moiré superpanjara parametrlari o‘ rtasidagi bog‘ lanish, qatlamlararo o‘ zaro ta’sirning elektron energetik spektrga ta’siri, elektron zonalar dispersiyasining o‘ zgarishi hamda band gapning twist burchagiga bog‘ liqligini nazariy jihatdan tahlil qilish ko‘ zda tutiladi. Bunday yondashuv twistronik 2D yarimo‘ tkazgichlarning fundamental kvant xususiyatlarini tushuntirish va ularni funksional nanoelektron hamda optoelektron tizimlarda qo‘ llash imkoniyatlarini ilmiy asoslashga xizmat qiladi.

Ikki o‘ lchamli (2D) materiallar fizikasi, van der Vaals geterostrukturalari va twistronika yo‘ nalishidagi tadqiqotlar so‘ nggi yillarda kondensirlangan muhit fizikasi, kvant materialshunoslik va nanoelektronikaning jadal rivojlanayotgan sohalaridan biriga aylandi. Ayniqsa, atomar yupqa qatlamlarni bir-biriga nisbatan ma’lum burilish burchagi (twist angle, θ) ostida joylashtirish orqali ularning elektron, optik va kvant xossalarini boshqarish imkoniyati tadqiqotchilarning e’tiborini tortmoqda. Bunday tizimlarda qatlamlarning nisbiy orientatsiyasi natijasida moiré strukturasi va moiré superpanjarasi hosil bo‘ lib, ular materialning dastlabki elektron zonalar tuzilishiga yangi davriylik va effektiv potensial kiritadi. Adabiyotlarda aynan ushbu hodisa twistronikaning nazariy va eksperimental asosini tashkil etishi qayd etilgan. Twistronika tushunchasining rivojlanishida dastlab grafen asosidagi burilgan ikki qatlamli tizimlar muhim o‘ rin egallagan. Keyinchalik tadqiqotlar ushbu konsepsiyani 2D yarimo‘ tkazgichlar, xususan, o‘ tish metallari dixalkogenidlari (TMD — transition metal dichalcogenides) asosidagi tizimlarga kengaytirdi. Adabiyotlarda MoS_2, WS_2, $MoSe_2$, WSe_2 kabi TMD materiallarining qatlamlarini turli burilish burchaklarida birlashtirish orqali elektron energetik spektr, optik o‘ tishlar, eksiton holatlari va korrelyatsiyalangan elektron hodisalarni boshqarish mumkinligi ko‘ rsatilgan. Mak va Shan tomonidan berilgan sharhda yarimo‘ tkazgich moiré materiallari, ayniqsa TMD tizimlari, kuchli elektron korrelyatsiyalari, Hubbard tipidagi fizik hodisalar, topologik effektlar va moiré eksitonlarini o‘ rganish uchun muhim platforma sifatida tavsiflangan[3].

2D materiallar va van der Vaals geterostrukturalarining nazariy asoslari

2D yarimo‘ tkazgichlarni o‘ rganishga bag‘ ishlangan tadqiqotlarda ularning alohida qatlam sifatidagi elektron tuzilishi bilan ko‘ p qatlamli tizimlardagi elektron xususiyatlari o‘ rtasida sezilarli farqlar mavjudligi ko‘ rsatiladi. Bir qatlamli materiallarda elektronlarning harakati asosan ikki o‘ lchamli kristall panjara bilan belgilanadi. Ikki yoki undan ortiq qatlam birlashtirilganda esa qatlamlararo o‘ zaro ta’sir (interlayer interaction) qo‘ shimcha fizik mexanizm sifatida paydo bo‘ ladi. Van der Vaals geterostrukturalari aynan shu xususiyati bilan an’anaviy geterostrukturalardan farq qiladi: turli 2D materiallarni qatlamma-qatlam birlashtirish orqali ularning elektron va optik xususiyatlarini sun’iy ravishda loyihalash mumkin.

Adabiyotlar tahlili shuni ko‘ rsatadiki, van der Vaals geterostrukturalarida qatlamlar orasidagi bog‘ lanish kovalent bog‘ lanishga asoslangan an’anaviy geterostrukturalardan farqli ravishda asosan zaifroq van der Vaals o‘ zaro ta’sirlari bilan tavsiflanadi. Shu sababli turli panjara parametrlari, elektron zonalar tuzilishi va kimyoviy xususiyatlarga ega bo‘ lgan materiallarni bitta sun’iy struktura tarkibida birlashtirish imkoniyati yuzaga keladi. Bu esa 2D materiallarda heterointerface engineering, ya’ni interfeys xususiyatlarini boshqarish imkoniyatlarini kengaytiradi.

Biroq qatlamlarning nisbiy burilishi tizimning fizik xususiyatlarini yanada murakkablashtiradi. Agar ikki qatlamning kristall o‘ qlari bir xil yo‘ nalishda joylashmasa, ularning atomar panjaralari ustma-ust tushishi natijasida katta uzunlik masshtabiga ega bo‘ lgan moiré naqshi hosil bo‘ ladi. Shu sababli oddiy elementar katak asosida elektron tuzilishni hisoblash yetarli bo‘ lmay qolishi mumkin. Carr, Fang va Kaxiras tomonidan olib borilgan tahlilda kichik twist burchakli 2D qatlamlarda moiré uzunlik masshtabining paydo bo‘ lishi atomar masshtabdagi hisoblashni murakkablashtirishi va shu sababli ko‘ p masshtabli nazariy metodlarni ishlab chiqish zarurligi ta’kidlangan.

Mavzuga oid ilmiy adabiyotlarning muhim qismi twist burchagining 2D tizimlarning elektron xossalarini boshqaruvchi fundamental parametr ekanini ko‘ rsatadi. Ikki qatlamning nisbiy burilish burchagi θ o‘ zgarganda moiré superpanjaraning davri ham o‘ zgaradi. Kichik twist burchaklarida moiré uzunlik masshtabi kattalashib, elektronlar uchun yangi effektiv davriy potensial shakllanadi. Natijada asl kristall panjaraning elektron zonalariga qo‘ shimcha modulyatsiya kiritiladi. Zamonaviy sharhlarda moiré superpanjaralarning elektron zonalarini twist burchagi, qatlamlarning stacking konfiguratsiyasi, bosim va deformatsiya kabi parametrlar orqali boshqarish mumkinligi qayd etilgan. Moiré superpanjara tushunchasi faqat geometrik effekt sifatida emas, balki elektronlarning kvant holatlarini o‘ zgartiruvchi effektiv potensial sifatida ham qaraladi. Bunda elektronning to‘ lqin funksiyasi moiré davriyligi bilan bog‘ liq ravishda modifikatsiyalanadi. Natijada elektron zonalarining dispersiyasi o‘ zgarishi, ayrim zonalarning torayishi yoki flat band holatlarining shakllanishi mumkin. Bunday tor energetik zonalarda elektronlar orasidagi o‘ zaro ta’sirlarning nisbiy roli ortishi sababli korrelyatsiyalangan kvant holatlarni tadqiq qilish imkoniyati paydo bo‘ ladi.

Shu nuqtayi nazardan, maqolamiz uchun asosiy nazariy bog‘ lanish θ →moiré davri →effektiv potensial →elektron zonalari →band gap va elektron holatlar ketma-ketligi orqali ifodalanishi mumkin. Ushbu bog‘ lanish twist burchagining elektron zonalar tuzilishiga ta’sirini tizimli ravishda tahlil qilish uchun konseptual asos yaratadi[4].

Elektron zonalar tuzilishini modellashtirishga oid tadqiqotlar

2D twistronik tizimlarning elektron xususiyatlarini aniqlashda turli nazariy va hisoblash metodlari ishlab chiqilgan. Ular orasida zichlik funksionali nazariyasi (Density Functional Theory — DFT), tight-binding modeli, kontinuum modeli, shuningdek, effektiv Hamiltonianlarga asoslangan yondashuvlar alohida o‘ rin tutadi. Carr, Fang va Kaxirasning keng qamrovli sharhida aynan DFT, tight-binding Hamiltonianlari va continuum modellari twisted moiré qatlamlarning elektron tuzilishini hisoblashda asosiy metodologik yondashuvlar sifatida qiyoslangan.

DFT atomlararo o‘ zaro ta’sirlar va elektron zichlikni hisobga olgan holda materialning elektron tuzilishini fundamental kvant-mexanik asosda aniqlash imkonini beradi. DFT yordamida kristall strukturaning geometrik optimallashtirilishi, qatlamlararo masofa, elektron energiyalar, band structure, density of states (DOS) va boshqa parametrlarni hisoblash mumkin. Shu bilan birga, twist burchagi kichik bo‘ lgan tizimlarda moiré superkatak tarkibidagi atomlar sonining keskin ortishi hisoblash murakkabligini oshiradi. Shuning uchun DFT yuqori aniqlikdagi lokal elektron struktura ma’lumotlarini olish uchun samarali bo‘ lsa-da, juda katta moiré superkataklar uchun hisoblash jihatidan resurs talabchan hisoblanadi.

Tight-binding modeli esa elektronlarning lokal atom orbitalari o‘ rtasidagi tunnellanishini tavsiflashga asoslanadi. Ushbu yondashuvda tizimning Hamiltoniani hopping parametrlar orqali ifodalanib, elektronlarning kristall panjaradagi harakatini hisoblash imkonini beradi. Uning asosiy afzalligi — atomlar soni katta bo‘ lgan tizimlarda DFTga nisbatan hisoblash yuklamasining kamayishi. Shu sababli twist burchagining turli qiymatlarida elektron zonalar tuzilishini tezkor taqqoslashda tight-binding modeli muhim vosita hisoblanadi. Adabiyotlarda ushbu model DFT va continuum yondashuvlari bilan birgalikda qo‘ llanib, turli masshtablardagi elektron hodisalarni o‘ zaro bog‘ lash uchun ishlatilgani ko‘ rsatilgan. Kontinuum modeli esa ayniqsa kichik twist burchaklarida katta moiré superpanjaralar bilan ishlash uchun qulaydir. Bunda atomlarning har birini alohida hisoblash o‘ rniga elektronlarning moiré masshtabidagi effektiv harakati matematik Hamiltonian orqali ifodalanadi. Mazkur yondashuv elektron zonalarining qayta shakllanishi, moiré bandlari va twist burchagiga bog‘ liq energetik holatlarni tahlil qilishda katta imkoniyat beradi. Shunday qilib, DFT, tight-binding va continuum modellari bir-birini to‘ ldiruvchi metodlar sifatida qaraladi: DFT atomistik aniqlikni, tight-binding modeli panjara darajasidagi elektron dinamikasini, continuum modeli esa katta moiré masshtabidagi fizikani tavsiflash imkonini beradi.

Adabiyotlarda TMD materiallari twistronik yarimo‘ tkazgich tizimlarining eng faol o‘ rganilayotgan guruhlaridan biri sifatida ajratib ko‘ rsatiladi. Bunga ularning ikki o‘ lchamli kristall tuzilishi, kuchli spin-orbit o‘ zaro ta’siri, vodiy (valley) fizikasi va optik xususiyatlari sabab bo‘ ladi. TMD qatlamlarining burilishi elektron zonalarining qayta shakllanishidan tashqari, eksiton — elektron va kovakning Kulon o‘ zaro ta’siri natijasida hosil bo‘ ladigan bog‘ langan kvazizarracha — holatlariga ham ta’sir ko‘ rsatadi. Semiconductor moiré materiallari bo‘ yicha sharhlar TMD tizimlarida moiré potensialining korrelyatsiyalangan elektron holatlari va eksiton fizikasi uchun yangi imkoniyatlar yaratganini ko‘ rsatadi.

Eksitonlarga bag‘ ishlangan tadqiqotlarda moiré superpanjaraning elektron va kovak holatlarini fazoviy chegaralashi natijasida yangi optik rezonanslar paydo bo‘ lishi va ularning energiyasi hamda dinamik xususiyatlari twist

burchagi orqali boshqarilishi mumkinligi ko‘ rsatilgan. Bu natijalar twist burchagi nafaqat elektron zonalar tuzilishi, balki optik spektr va kvant holatlarning fazoviy lokalizatsiyasini boshqarishda ham muhim parametr ekanini ko‘ rsatadi.

2026-yilgi tadqiqot yo‘ nalishlarida esa past twist burchakli TMD tizimlarida moiré potensial manzarasini va eksitonlarning lokalizatsiyasini atomar masshtabda aniqlashga qaratilgan yangi eksperimental usullar ham rivojlanmoqda. Masalan, 2° burilishli MoS_2 ikki qatlamida eksiton javobining moiré katak ichidagi fazoviy taqsimlanishini yuqori aniqlikda xaritalash imkoniyatlari haqida yangi natijalar e’lon qilingan. Bu holat nazariy modellashtirishda elektron va eksiton holatlarining faqat o‘ rtacha energetik parametrlarini emas, balki ularning fazoviy lokalizatsiyasini ham hisobga olish zarurligini ko‘ rsatadi.

Moiré superpanjaralar bo‘ yicha zamonaviy adabiyotlarda flat band, ya’ni dispersiyasi juda kichik bo‘ lgan energetik zonalar alohida tadqiqot obyekti sifatida qaralmoqda. Elektron zonasi torayganda elektronlarning kinetik energiyasi kamayib, elektron-elektron o‘ zaro ta’sirlarining nisbiy ahamiyati ortishi mumkin. Natijada oddiy mustaqil elektron modeli bilan tushuntirib bo‘ lmaydigan kuchli korrelyatsiyalangan elektron holatlari yuzaga kelishi mumkin. Semiconductor moiré materiallari bo‘ yicha sharhlarda Hubbard fizikasi, Kane–Mele–Hubbard modellari va boshqa korrelyatsiyalangan holatlarni o‘ rganish uchun TMD moiré tizimlaridan foydalanish imkoniyatlari batafsil muhokama qilingan. Bunday natijalar maqolamiz mavzusi uchun muhim metodologik ahamiyatga ega. Chunki twist burchagining elektron zonalar tuzilishiga ta’sirini o‘ rganish faqat band gapning o‘ zgarishini aniqlash bilan cheklanmasligi kerak. Elektron zonalarining dispersiyasi, zonalar kengligi, lokalizatsiyasi, DOS, effektiv massa va moiré potensial bilan bog‘ liq holatlar ham kompleks ravishda tahlil qilinishi zarur. Ana shunday yondashuv orqali twist burchagining elektron xossalarga ta’sir mexanizmini chuqurroq ochib berish mumkin.

Adabiyotlar tahlili shuni ko‘ rsatadiki, twistronik tizimlarni modellashtirishda asosiy muammolardan biri ko‘ p masshtabli struktura bilan bog‘ liq. Atomlararo masofa angstrom masshtabida bo‘ lsa, moiré superpanjara davri o‘ nlab yoki yuzlab angstromgacha kattalashishi mumkin. Shuning uchun butun tizimni bir vaqtning o‘ zida yuqori aniqlikda hisoblash juda katta hisoblash resurslarini talab qiladi. Carr va hammualliflar ushbu masalani twisted moiré qatlamlarning elektron strukturasini hisoblashdagi asosiy nazariy muammolardan biri sifatida ko‘ rsatadi.

Ikkinchi muhim muammo — atomar relaksatsiyani hisobga olish masalasidir. Ideal geometrik modelda qatlamlar faqat burilgan holda tasavvur qilinadi. Amaliy tizimda esa atomlararo kuchlar sababli atomlarning muvozanat holati ideal geometrik konfiguratsiyadan farq qilishi mumkin. Bu esa mahalliy stacking konfiguratsiyasi, qatlamlararo masofa va moiré potensialining amplitudasiga ta’sir qiladi. Shuning uchun real elektron zonalar tuzilishini aniqlashda faqat twist burchagini emas, balki geometrik relaksatsiyani ham hisobga olish maqsadga muvofiq.

Uchinchi muammo — nazariy model va eksperimental parametrlar o‘ rtasidagi moslik masalasidir. Real 2D geterostrukturalarda twist burchagi bilan bir qatorda deformatsiya, bosim, substrat ta’siri, dielektrik muhit, nuqsonlar va qatlamlararo masofa ham elektron zonalar tuzilishiga ta’sir qilishi mumkin. Shu sababli faqat ideal, erkin va mukammal kristall model asosida olingan natijalarni real qurilmalar uchun to‘ g‘ ridan-to‘ g‘ ri umumlashtirish ehtiyotkorlikni talab qiladi. Moiré superpanjaralar bo‘ yicha zamonaviy sharhlarda twist burchagi bilan bir qatorda stacking, bosim va strain kabi parametrlar ham energiya zonalarini boshqarishi mumkinligi qayd etilgan.

Yuqoridagi adabiyotlar tahlili shuni ko‘ rsatadiki, 2D twistronik materiallarning fizik xususiyatlari bo‘ yicha katta ilmiy baza shakllangan bo‘ lsa-da, twist burchagi — moiré superpanjara — elektron zonalar tuzilishi o‘ rtasidagi bog‘ lanishni yagona kvant-mexanik model doirasida tizimli ravishda tahlil qilish masalasi dolzarb bo‘ lib qolmoqda. Ayniqsa, turli twist burchaklari uchun band structure, band gap, elektron holatlar zichligi va zonalar dispersiyasini birgalikda tahlil qilish 2D yarimo‘ tkazgichlarning boshqariladigan elektron xususiyatlarini chuqurroq tushuntirish imkonini beradi.

Mavjud tadqiqotlarning yana bir muhim jihati shundaki, ko‘ plab ishlar ma’lum bir material yoki ma’lum bir twist burchagidagi fizik holatni batafsil o‘ rganishga qaratilgan. Mazkur maqolada esa twist burchagini asosiy boshqariluvchi parametr sifatida ajratib, uning elektron zonalar tuzilishidagi o‘ zgarishlarni ketma-ket tahlil qilish metodologik jihatdan maqsadga muvofiqdir. Bunda DFT, tight-binding va continuum modellarining imkoniyatlarini o‘ zaro bog‘ lash orqali atomistik va effektiv modellashtirish yondashuvlari o‘ rtasidagi farqlarni aniqlash mumkin.Shuningdek, zamonaviy tadqiqotlar moiré tizimlarini faqat elektron xususiyatlar nuqtayi nazaridan emas, balki optik, eksitonik, topologik va korrelyatsiyalangan kvant hodisalar bilan bog‘ liq holda o‘ rganishga o‘ tayotganini ko‘ rsatadi. 2026-yilgi tadqiqotlarda ham past twist burchakli TMD tizimlarining lokal elektron va eksiton xususiyatlarini yuqori fazoviy aniqlikda o‘ rganish yo‘ nalishi davom etmoqda. Demak, elektron zonalar tuzilishini aniq modellashtirish keyingi bosqichlarda optik va kvant xususiyatlarni izohlash uchun ham fundamental asos vazifasini bajaradi.

Shu asosda ushbu maqolada 2D yarimo‘ tkazgichlarda twist burchagining elektron zonalar tuzilishiga ta’sirini kvant-mexanik modellashtirish masalasini o‘ rganish maqsadga muvofiqdir. Tadqiqotda twist angle, moiré structure, moiré superlattice, interlayer coupling, band structure, band gap, density of states, effective mass, DFT, tight-binding Hamiltonian va continuum model kabi atamalar yagona nazariy-metodologik tizimda qo‘ llanadi. Bu esa tadqiqotning

terminologik aniqligini ta’minlash bilan birga, 2D twistronik yarimo‘ tkazgichlarning elektron xossalarini boshqarish mexanizmlarini izchil ochib berishga xizmat qiladi[5].

Umuman olganda, adabiyotlar tahlili twistronik 2D yarimo‘ tkazgichlarda twist burchagini o‘ zgartirish orqali moiré superpanjara parametrlarini va shu orqali elektron zonalar tuzilishini boshqarish mumkinligini ko‘ rsatadi. Biroq bunday tizimlarda atomar relaksatsiya, qatlamlararo o‘ zaro ta’sir, hisoblash masshtabi va model tanlash kabi omillar natijalarning aniqligiga sezilarli ta’sir ko‘ rsatadi. Shu sababli maqolaning keyingi qismida twist burchagining elektron energetik spektrga ta’sirini kvant-mexanik modellashtirish, mos matematik modelni shakllantirish va turli burchak qiymatlarida elektron zonalar tuzilishining o‘ zgarish qonuniyatlarini aniqlash asosiy ilmiy vazifa sifatida belgilanadi.

Ikki o‘ lchamli (2D) materiallar fizikasi, van der Vaals geterostrukturalari va twistronika yo‘ nalishidagi tadqiqotlar so‘ nggi yillarda kondensirlangan muhit fizikasi, kvant materialshunoslik va nanoelektronikaning jadal rivojlanayotgan sohalaridan biriga aylandi. Ayniqsa, atomar yupqa qatlamlarni bir-biriga nisbatan ma’lum burilish burchagi (twist angle, θ) ostida joylashtirish orqali ularning elektron, optik va kvant xossalarini boshqarish imkoniyati tadqiqotchilarning e’tiborini tortmoqda. Bunday tizimlarda qatlamlarning nisbiy orientatsiyasi natijasida moiré strukturasi va moiré superpanjarasi hosil bo‘ lib, ular materialning dastlabki elektron zonalar tuzilishiga yangi davriylik va effektiv potensial kiritadi. Adabiyotlarda aynan ushbu hodisa twistronikaning nazariy va eksperimental asosini tashkil etishi qayd etilgan. Twistronika tushunchasining rivojlanishida dastlab grafen asosidagi burilgan ikki qatlamli tizimlar muhim o‘ rin egallagan. Keyinchalik tadqiqotlar ushbu konsepsiyani 2D yarimo‘ tkazgichlar, xususan, o‘ tish metallari dixalkogenidlari (TMD — transition metal dichalcogenides) asosidagi tizimlarga kengaytirdi. Adabiyotlarda MoS_2, WS_2, $MoSe_2$, WSe_2 kabi TMD materiallarining qatlamlarini turli burilish burchaklarida birlashtirish orqali elektron energetik spektr, optik o‘ tishlar, eksiton holatlari va korrelyatsiyalangan elektron hodisalarni boshqarish mumkinligi ko‘ rsatilgan. Mak va Shan tomonidan berilgan sharhda yarimo‘ tkazgich moiré materiallari, ayniqsa TMD tizimlari, kuchli elektron korrelyatsiyalari, Hubbard tipidagi fizik hodisalar, topologik effektlar va moiré eksitonlarini o‘ rganish uchun muhim platforma sifatida tavsiflangan.

2D yarimo‘ tkazgichlarni o‘ rganishga bag‘ ishlangan tadqiqotlarda ularning alohida qatlam sifatidagi elektron tuzilishi bilan ko‘ p qatlamli tizimlardagi elektron xususiyatlari o‘ rtasida sezilarli farqlar mavjudligi ko‘ rsatiladi. Bir qatlamli materiallarda elektronlarning harakati asosan ikki o‘ lchamli kristall panjara bilan belgilanadi. Ikki yoki undan ortiq qatlam birlashtirilganda esa qatlamlararo o‘ zaro ta’sir (interlayer interaction) qo‘ shimcha fizik mexanizm sifatida paydo bo‘ ladi. Van der Vaals geterostrukturalari aynan shu xususiyati bilan an’anaviy geterostrukturalardan farq qiladi: turli 2D materiallarni qatlamma-qatlam birlashtirish orqali ularning elektron va optik xususiyatlarini sun’iy ravishda loyihalash mumkin[6].

Adabiyotlar tahlili shuni ko‘ rsatadiki, van der Vaals geterostrukturalarida qatlamlar orasidagi bog‘ lanish kovalent bog‘ lanishga asoslangan an’anaviy geterostrukturalardan farqli ravishda asosan zaifroq van der Vaals o‘ zaro ta’sirlari bilan tavsiflanadi. Shu sababli turli panjara parametrlari, elektron zonalar tuzilishi va kimyoviy xususiyatlarga ega bo‘ lgan materiallarni bitta sun’iy struktura tarkibida birlashtirish imkoniyati yuzaga keladi. Bu esa 2D materiallarda heterointerface engineering, ya’ni interfeys xususiyatlarini boshqarish imkoniyatlarini kengaytiradi.

Biroq qatlamlarning nisbiy burilishi tizimning fizik xususiyatlarini yanada murakkablashtiradi. Agar ikki qatlamning kristall o‘ qlari bir xil yo‘ nalishda joylashmasa, ularning atomar panjaralari ustma-ust tushishi natijasida katta uzunlik masshtabiga ega bo‘ lgan moiré naqshi hosil bo‘ ladi. Shu sababli oddiy elementar katak asosida elektron tuzilishni hisoblash yetarli bo‘ lmay qolishi mumkin. Carr, Fang va Kaxiras tomonidan olib borilgan tahlilda kichik twist burchakli 2D qatlamlarda moiré uzunlik masshtabining paydo bo‘ lishi atomar masshtabdagi hisoblashni murakkablashtirishi va shu sababli ko‘ p masshtabli nazariy metodlarni ishlab chiqish zarurligi ta’kidlangan.

Mavzuga oid ilmiy adabiyotlarning muhim qismi twist burchagining 2D tizimlarning elektron xossalarini boshqaruvchi fundamental parametr ekanini ko‘ rsatadi. Ikki qatlamning nisbiy burilish burchagi θ o‘ zgarganda moiré superpanjaraning davri ham o‘ zgaradi. Kichik twist burchaklarida moiré uzunlik masshtabi kattalashib, elektronlar uchun yangi effektiv davriy potensial shakllanadi. Natijada asl kristall panjaraning elektron zonalariga qo‘ shimcha modulyatsiya kiritiladi. Zamonaviy sharhlarda moiré superpanjaralarning elektron zonalarini twist burchagi, qatlamlarning stacking konfiguratsiyasi, bosim va deformatsiya kabi parametrlar orqali boshqarish mumkinligi qayd etilgan. Moiré superpanjara tushunchasi faqat geometrik effekt sifatida emas, balki elektronlarning kvant holatlarini o‘ zgartiruvchi effektiv potensial sifatida ham qaraladi. Bunda elektronning to‘ lqin funksiyasi moiré davriyligi bilan bog‘ liq ravishda modifikatsiyalanadi. Natijada elektron zonalarining dispersiyasi o‘ zgarishi, ayrim zonalarning torayishi yoki flat band holatlarining shakllanishi mumkin. Bunday tor energetik zonalarda elektronlar orasidagi o‘ zaro ta’sirlarning nisbiy roli ortishi sababli korrelyatsiyalangan kvant holatlarni tadqiq qilish imkoniyati paydo bo‘ ladi.

Shu nuqtayi nazardan, maqolamiz uchun asosiy nazariy bog‘ lanish θ → moiré davri → effektiv potensial → elektron zonalari → band gap va elektron holatlar ketma-ketligi orqali ifodalanishi mumkin. Ushbu bog‘ lanish twist burchagining elektron zonalar tuzilishiga ta’sirini tizimli ravishda tahlil qilish uchun konseptual asos yaratadi.

2D twistronik tizimlarning elektron xususiyatlarini aniqlashda turli nazariy va hisoblash metodlari ishlab chiqilgan. Ular orasida zichlik funksionali nazariyasi (Density Functional Theory — DFT), tight-binding modeli, kontinuum modeli, shuningdek, effektiv Hamiltonianlarga asoslangan yondashuvlar alohida o‘ rin tutadi. Carr, Fang va Kaxirasning keng qamrovli sharhida aynan DFT, tight-binding Hamiltonianlari va continuum modellari twisted moiré qatlamlarning elektron tuzilishini hisoblashda asosiy metodologik yondashuvlar sifatida qiyoslangan.

DFT atomlararo o‘ zaro ta’sirlar va elektron zichlikni hisobga olgan holda materialning elektron tuzilishini fundamental kvant-mexanik asosda aniqlash imkonini beradi. DFT yordamida kristall strukturaning geometrik optimallashtirilishi, qatlamlararo masofa, elektron energiyalar, band structure, density of states (DOS) va boshqa parametrlarni hisoblash mumkin. Shu bilan birga, twist burchagi kichik bo‘ lgan tizimlarda moiré superkatak tarkibidagi atomlar sonining keskin ortishi hisoblash murakkabligini oshiradi. Shuning uchun DFT yuqori aniqlikdagi lokal elektron struktura ma’lumotlarini olish uchun samarali bo‘ lsa-da, juda katta moiré superkataklar uchun hisoblash jihatidan resurs talabchan hisoblanadi. Tight-binding modeli esa elektronlarning lokal atom orbitalari o‘ rtasidagi tunnellanishini tavsiflashga asoslanadi. Ushbu yondashuvda tizimning Hamiltoniani hopping parametrlar orqali ifodalanib, elektronlarning kristall panjaradagi harakatini hisoblash imkonini beradi. Uning asosiy afzalligi — atomlar soni katta bo‘ lgan tizimlarda DFTga nisbatan hisoblash yuklamasining kamayishi. Shu sababli twist burchagining turli qiymatlarida elektron zonalar tuzilishini tezkor taqqoslashda tight-binding modeli muhim vosita hisoblanadi. Adabiyotlarda ushbu model DFT va continuum yondashuvlari bilan birgalikda qo‘ llanib, turli masshtablardagi elektron hodisalarni o‘ zaro bog‘ lash uchun ishlatilgani ko‘ rsatilgan.

Kontinuum modeli esa ayniqsa kichik twist burchaklarida katta moiré superpanjaralar bilan ishlash uchun qulaydir. Bunda atomlarning har birini alohida hisoblash o‘ rniga elektronlarning moiré masshtabidagi effektiv harakati matematik Hamiltonian orqali ifodalanadi. Mazkur yondashuv elektron zonalarining qayta shakllanishi, moiré bandlari va twist burchagiga bog‘ liq energetik holatlarni tahlil qilishda katta imkoniyat beradi. Shunday qilib, DFT, tight-binding va continuum modellari bir-birini to‘ ldiruvchi metodlar sifatida qaraladi: DFT atomistik aniqlikni, tight-binding modeli panjara darajasidagi elektron dinamikasini, continuum modeli esa katta moiré masshtabidagi fizikani tavsiflash imkonini beradi.

TMD yarimo‘ tkazgichlar va elektron holatlar.Adabiyotlarda TMD materiallari twistronik yarimo‘ tkazgich tizimlarining eng faol o‘ rganilayotgan guruhlaridan biri sifatida ajratib ko‘ rsatiladi. Bunga ularning ikki o‘ lchamli kristall tuzilishi, kuchli spin-orbit o‘ zaro ta’siri, vodiy (valley) fizikasi va optik xususiyatlari sabab bo‘ ladi. TMD qatlamlarining burilishi elektron zonalarining qayta shakllanishidan tashqari, eksiton — elektron va kovakning Kulon o‘ zaro ta’siri natijasida hosil bo‘ ladigan bog‘ langan kvazizarracha — holatlariga ham ta’sir ko‘ rsatadi. Semiconductor moiré materiallari bo‘ yicha sharhlar TMD tizimlarida moiré potensialining korrelyatsiyalangan elektron holatlari va eksiton fizikasi uchun yangi imkoniyatlar yaratganini ko‘ rsatadi.

Eksitonlarga bag‘ ishlangan tadqiqotlarda moiré superpanjaraning elektron va kovak holatlarini fazoviy chegaralashi natijasida yangi optik rezonanslar paydo bo‘ lishi va ularning energiyasi hamda dinamik xususiyatlari twist burchagi orqali boshqarilishi mumkinligi ko‘ rsatilgan. Bu natijalar twist burchagi nafaqat elektron zonalar tuzilishi, balki optik spektr va kvant holatlarning fazoviy lokalizatsiyasini boshqarishda ham muhim parametr ekanini ko‘ rsatadi.

2026-yilgi tadqiqot yo‘ nalishlarida esa past twist burchakli TMD tizimlarida moiré potensial manzarasini va eksitonlarning lokalizatsiyasini atomar masshtabda aniqlashga qaratilgan yangi eksperimental usullar ham rivojlanmoqda. Masalan, 2° burilishli MoS_2 ikki qatlamida eksiton javobining moiré katak ichidagi fazoviy taqsimlanishini yuqori aniqlikda xaritalash imkoniyatlari haqida yangi natijalar e’lon qilingan. Bu holat nazariy modellashtirishda elektron va eksiton holatlarining faqat o‘ rtacha energetik parametrlarini emas, balki ularning fazoviy lokalizatsiyasini ham hisobga olish zarurligini ko‘ rsatadi[7].

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Bunday natijalar maqolamiz mavzusi uchun muhim metodologik ahamiyatga ega. Chunki twist burchagining elektron zonalar tuzilishiga ta’sirini o‘ rganish faqat band gapning o‘ zgarishini aniqlash bilan cheklanmasligi kerak. Elektron zonalarining dispersiyasi, zonalar kengligi, lokalizatsiyasi, DOS, effektiv massa va moiré potensial bilan bog‘ liq holatlar ham kompleks ravishda tahlil qilinishi zarur. Ana shunday yondashuv orqali twist burchagining elektron xossalarga ta’sir mexanizmini chuqurroq ochib berish mumkin.

Yuqoridagi adabiyotlar tahlili shuni ko‘ rsatadiki, 2D twistronik materiallarning fizik xususiyatlari bo‘ yicha katta ilmiy baza shakllangan bo‘ lsa-da, twist burchagi — moiré superpanjara — elektron zonalar tuzilishi o‘ rtasidagi

bog‘ lanishni yagona kvant-mexanik model doirasida tizimli ravishda tahlil qilish masalasi dolzarb bo‘ lib qolmoqda. Ayniqsa, turli twist burchaklari uchun band structure, band gap, elektron holatlar zichligi va zonalar dispersiyasini birgalikda tahlil qilish 2D yarimo‘ tkazgichlarning boshqariladigan elektron xususiyatlarini chuqurroq tushuntirish imkonini beradi.

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Shu asosda ushbu maqolada 2D yarimo‘ tkazgichlarda twist burchagining elektron zonalar tuzilishiga ta’sirini kvant-mexanik modellashtirish masalasini o‘ rganish maqsadga muvofiqdir. Tadqiqotda twist angle, moiré structure, moiré superlattice, interlayer coupling, band structure, band gap, density of states, effective mass, DFT, tight-binding Hamiltonian va continuum model kabi atamalar yagona nazariy-metodologik tizimda qo‘ llanadi. Bu esa tadqiqotning terminologik aniqligini ta’minlash bilan birga, 2D twistronik yarimo‘ tkazgichlarning elektron xossalarini boshqarish mexanizmlarini izchil ochib berishga xizmat qiladi.

Umuman olganda, adabiyotlar tahlili twistronik 2D yarimo‘ tkazgichlarda twist burchagini o‘ zgartirish orqali moiré superpanjara parametrlarini va shu orqali elektron zonalar tuzilishini boshqarish mumkinligini ko‘ rsatadi. Biroq bunday tizimlarda atomar relaksatsiya, qatlamlararo o‘ zaro ta’sir, hisoblash masshtabi va model tanlash kabi omillar natijalarning aniqligiga sezilarli ta’sir ko‘ rsatadi. Shu sababli maqolaning keyingi qismida twist burchagining elektron energetik spektrga ta’sirini kvant-mexanik modellashtirish, mos matematik modelni shakllantirish va turli burchak qiymatlarida elektron zonalar tuzilishining o‘ zgarish qonuniyatlarini aniqlash asosiy ilmiy vazifa sifatida belgilanadi.

XULOSA.Mazkur tadqiqotda 2D yarimo‘ tkazgichlarda qatlamlarning o‘ zaro burilish burchagi — twist angle (θ) ning elektron zonalar tuzilishiga ta’siri kvant-mexanik yondashuvlar nuqtayi nazaridan tahlil qilindi. Adabiyotlar tahlili shuni ko‘ rsatadiki, ikki o‘ lchamli materiallar qatlamlarini ma’lum burilish burchagi ostida joylashtirish natijasida oddiy kristall panjaradan farq qiluvchi moiré struktura va moiré superpanjara shakllanadi. Ushbu yangi davriylik elektronlarning effektiv potensialini o‘ zgartirib, materialning energetik spektri va elektron zonalar tuzilishida sezilarli modifikatsiyalarni yuzaga keltirishi mumkin. Twistronika aynan ushbu geometrik boshqaruv orqali 2D materiallarning fizik xususiyatlarini maqsadli o‘ zgartirish imkoniyatini beradi.

Tadqiqot natijalarini umumlashtirish asosida twist burchagi →moiré superpanjara →qatlamlararo o‘ zaro ta’sir → elektron zonalar tuzilishi o‘ rtasida uzviy fizik bog‘ lanish mavjudligi aniqlandi. Twist burchagining kamayishi moiré uzunlik masshtabining ortishiga olib kelishi va natijada elektronlarning moiré potensialidagi harakatini o‘ zgartirishi mumkin. Bunday o‘ zgarishlar elektron zonalarining dispersiyasi, zonalar kengligi, holatlar zichligi va ayrim holatlarda flat bandlarning shakllanishida namoyon bo‘ ladi. Twisted tizimlar bo‘ yicha nazariy ishlar moiré davriyligi elektron zonalarini qayta shakllantirishi mumkinligini ko‘ rsatadi[8].

2D yarimo‘ tkazgichlar orasida o‘ tish metallari dixalkogenidlari (TMD) asosidagi geterostrukturalar alohida ahamiyatga ega. MoS_2, WS_2, $MoSe_2$ va WSe_2 kabi materiallarda qatlamlararo o‘ zaro ta’sir, spin-orbit o‘ zaro ta’sir, vodiy erkinlik darajasi va kuchli Kulon o‘ zaro ta’siri mavjudligi ularni twistronik tadqiqotlar uchun muhim materiallar sinfiga aylantiradi. TMD geterobilayerlarida moiré superpanjara nafaqat elektron energetik holatlarni, balki eksitonlarning lokalizatsiyasi, energetik spektri va optik javobini ham o‘ zgartirishi mumkin.Kvant-mexanik modellashtirish nuqtayi nazaridan zichlik funksionali nazariyasi (DFT), tight-binding modeli va kontinuum modeli bir-birini to‘ ldiruvchi metodlar sifatida namoyon bo‘ ladi. DFT atomistik darajada kristall geometriya, elektron zichligi va elektron energetik sathlarini hisoblash imkonini bersa, tight-binding modeli katta tizimlarda elektronlarning lokal orbitalar o‘ rtasidagi tunnellanishini samarali tavsiflaydi. Kontinuum modeli esa katta o‘ lchamli moiré superpanjaralarda elektronlarning effektiv harakatini va moiré bandlarini hisoblash uchun qulaydir. Ushbu uch yondashuvning o‘ zaro uyg‘ unlashtirilishi 2D twistronik tizimlarni turli fazoviy va energetik masshtablarda tadqiq etish imkonini beradi.

Shuningdek, twist burchagining o‘ zgarishi TMD moiré tizimlarida elektron korrelyatsiyasining kuchayishiga olib kelishi mumkin bo‘ lgan tor yoki flat moiré bandlarning shakllanishi bilan bog‘ liq. Bunday zonalarda elektronlarning kinetik energiyasi nisbatan kamayib, elektron-elektron o‘ zaro ta’sirlarining roli ortadi. Nazariy tadqiqotlarda twist burchagi va dielektrik muhit orqali Hubbard modelidagi tunnellanish hamda o‘ zaro ta’sir parametrlarini boshqarish mumkinligi ko‘ rsatilgan.

Tadqiqotning muhim xulosalaridan biri shundaki, 2D yarimo‘ tkazgichlarning elektron xususiyatlarini boshqarishda twist burchagini mustaqil geometrik boshqaruv parametri sifatida ko‘ rib chiqish mumkin. Bunda materialning kimyoviy tarkibini o‘ zgartirmagan holda qatlamlarning nisbiy orientatsiyasini o‘ zgartirish orqali elektron zonalar tuzilishi, band gap, elektron holatlar zichligi va elektronlarning fazoviy lokalizatsiyasiga ta’sir ko‘ rsatish imkoniyati mavjud.

Shu bilan birga, real twistronik tizimlarni modellashtirishda faqat ideal twist burchagini hisobga olish yetarli emas. Atomar relaksatsiya, qatlamlararo masofa, stacking konfiguratsiyasi, substrat ta’siri, deformatsiya (strain), dielektrik muhit va nuqsonlar kabi omillar ham elektron zonalar tuzilishiga ta’sir qilishi mumkin. Shu sababli kelgusidagi tadqiqotlarda ideal moiré modelini real eksperimental sharoitlarga yaqinlashtirish, atomar relaksatsiyani hisobga olish va turli kvant-mexanik modellar natijalarini o‘ zaro taqqoslash muhim ilmiy vazifa bo‘ lib qoladi. Moiré tizimlaridagi real strukturaviy rekonstruksiya ham elektron va optik xususiyatlarni sezilarli darajada o‘ zgartirishi mumkinligi zamonaviy tadqiqotlarda ko‘ rsatilgan.

2D yarimo‘ tkazgichlarda twist burchagining elektron zonalar tuzilishiga ta’sirini kvant-mexanik modellashtirish twistronikaning fundamental qonuniyatlarini ochib berish bilan birga, elektron va optoelektron qurilmalar uchun yangi materiallarni loyihalashga nazariy asos yaratadi. Twist burchagi, moiré superpanjara parametrlari, qatlamlararo o‘ zaro ta’sir va elektron zonalar tuzilishi o‘ rtasidagi bog‘ lanishni chuqur o‘ rganish orqali boshqariladigan 2D kvant materiallarini yaratish imkoniyatlari kengayadi. Mazkur yo‘ nalish kelgusida nanoelektronika, optoelektronika, kvant hisoblash, kvant optikasi va boshqa ilg‘ or texnologik sohalarda qo‘ llanilishi mumkin bo‘ lgan yangi funksional materiallarni ishlab chiqish uchun muhim ilmiy asos bo‘ lib xizmat qiladi.

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BIR JINSLI BO‘ LMAGAN YUQORI CHASTOTALI ELEKTROMAGNIT TO‘ LQINING YARIMO‘ TKAZGICH MUHITGA TA’SIRI

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Annotatsiya. *Ushbu maqolada bir jinsli bo‘ lmagan yuqori chastotali elektromagnit to‘ lqinining yarimo‘ tkazgich muhitga ta’siri eksperimental va nazariy jihatdan tahlil qilindi. Kirish qismida mavzuning dolzarbligi asoslandi, metodlar bo‘ limida elektrolitik vanna modeli, “igna–tekislik” elektrodlar tizimi hamda zamonaviy o‘ lchov qurilmalari yordamida olib borilgan tadqiqot usullari yoritildi. Natijalar bo‘ limida turli konsentratsiyali elektrolitlarning volt-amper xarakteristikalari, detektorlangan kuchlanishning chastotaga bog‘ liqligi va elektrodlar geometriyasining tizim xossalariga ta’siri tahlil qilindi. Muhokama qismida olingan natijalar yarimo‘ tkazgich diodlarning detektorlik xossalari bilan qiyoslanib, elektromagnit maydon ta’sirida kechadigan fizik jarayonlar izohlandi. Tadqiqot natijalari elektrolit asosidagi model tizim yordamida yuqori chastotali elektromagnit to‘ lqinlarning yarimo‘ tkazgich muhit bilan o‘ zaro ta’sirini samarali o‘ rganish mumkinligini hamda ushbu yondashuv radioelektronika va yarimo‘ tkazgich qurilmalarini takomillashtirishda muhim ilmiy-amaliy ahamiyatga ega ekanligini ko‘ rsatdi.*

Kalit so‘ zlar. *bir jinsli bo‘ lmagan elektromagnit to‘ lqin, yuqori chastota, yarimo‘ tkazgich muhit, elektrolitik vanna, igna–tekislik elektrodlari, volt-amper xarakteristikasi, detektorlangan kuchlanish, elektrolit, elektr maydoni, detektorlik xossalari.*

THE EFFECT OF A NON-UNIFORM HIGH-FREQUENCY ELECTROMAGNETIC WAVE ON A SEMICONDUCTOR MEDIUM

Abstract. *This article presents an experimental and theoretical analysis of the effect of a non-uniform high-frequency electromagnetic wave on a semiconductor medium. The introduction substantiates the relevance of the research topic, while the methods section describes the research methodology based on an electrolytic bath model, a “needle–plane” electrode system, and modern measuring instruments. The results section analyzes the current–voltage characteristics of electrolytes with different concentrations, the frequency dependence of the detected voltage, and the influence of electrode geometry on the properties of the system. The discussion compares the obtained results with the detection properties of semiconductor diodes and explains the physical processes occurring under the influence of an electromagnetic field. The research results demonstrate that an electrolyte-based model system can be effectively used to investigate the interaction of high-frequency electromagnetic waves with semiconductor media and that this approach has significant scientific and practical importance for the improvement of radio-electronic and semiconductor devices.*

Keywords: *non-uniform electromagnetic wave, high frequency, semiconductor medium, electrolytic bath, needle–plane electrodes, current–voltage characteristic, detected voltage, electrolyte, electric field, detection properties.*

ВЛИЯНИЕ НЕОДНОРОДНОЙ ВЫСОКОЧАСТОТНОЙ ЭЛЕКТРОМАГНИТНОЙ ВОЛНЫ НА ПОЛУПРОВОДНИКОВУЮ СРЕДУ

Аннотация. *В данной статье проведён экспериментальный и теоретический анализ воздействия неоднородной высокочастотной электромагнитной волны на полупроводниковую среду. Во введении обоснована актуальность темы исследования, в разделе «Методы» описана методика исследования с использованием модели электролитической ванны, системы электродов типа «игла–плоскость» и современных измерительных приборов. В разделе «Результаты» проанализированы вольт-амперные характеристики электролитов различной концентрации, зависимость детектированного напряжения от частоты, а также влияние геометрии электродов на свойства системы. В разделе «Обсуждение» полученные результаты сопоставлены с детекторными свойствами полупроводниковых диодов и объяснены физические процессы, протекающие под воздействием электромагнитного поля. Результаты исследования показали, что модельная система на основе электролита позволяет эффективно исследовать взаимодействие высокочастотных*

электромагнитных волн с полупроводниковой средой, а также что данный подход имеет важное научно-практическое значение для совершенствования радиоэлектронных и полупроводниковых устройств.

Ключевые слова: *неоднородная электромагнитная волна, высокая частота, полупроводниковая среда, электролитическая ванна, электроды типа «игла–плоскость», вольт-амперная характеристика, детектированное напряжение, электролит, электрическое поле, детекторные свойства.*

KIRISH

Zamonaviy fan va texnika taraqqiyoti yuqori chastotali elektromagnit maydonlarning turli fizik muhitlar bilan o‘ zaro ta’sirini chuqur o‘ rganishni talab etmoqda. Ayniqsa, yarimo‘ tkazgich materiallar radioelektronika, telekommunikatsiya va mikroelektronika sohalarining rivojlanishi natijasida yuqori chastotali elektromagnit to‘ lqinlar ta’siriga uchrayotgan asosiy muhitlardan biri hisoblanadi. Shu sababli elektromagnit to‘ lqinlarning yarimo‘ tkazgich muhitdagi zaryad tashuvchilar harakati, elektr maydoni taqsimoti va detektorlik xossalariga ta’sirini tadqiq etish dolzarb ilmiy-amaliy masalalardan biridir. Bunday tadqiqotlar yarimo‘ tkazgich qurilmalarining fizik asoslarini takomillashtirish hamda yuqori chastotali elektron qurilmalar samaradorligini oshirishga xizmat qiladi [6].

So‘ nggi yillarda elektromagnit maydonlarning nochiziqli tizimlar bilan o‘ zaro ta’siri, ayniqsa "igna–tekislik" elektrodlar tizimida kechadigan fizik jarayonlarni o‘ rganishga qiziqish ortmoqda. Elektrolit asosidagi model tizimlardan foydalanish yarimo‘ tkazgich diodlarning detektorlik xossalarini sodda eksperimental sharoitda tadqiq etish imkonini beradi. Elektr maydonining notekis taqsimlanishi natijasida volt-amper xarakteristikasining nochiziqligi va detektorlangan kuchlanishning chastotaga bog‘ liqligi elektromagnit maydon ta’siridagi fizik jarayonlarni tahlil qilish uchun muhim ahamiyat kasb etadi. Mazkur yo‘ nalishda S.M. Sze va K.K. Ng, H.A. Watson, G. Abdurakhmanov hamda boshqa olimlar tomonidan yarimo‘ tkazgich qurilmalari, yuqori chastotali detektorlar va elektromagnit maydonlarning nochiziqli tizimlarga ta’siri bo‘ yicha muhim ilmiy natijalar olingan [5]. Shuningdek, elektrolitlarning elektr o‘ tkazuvchanligi va elektrostatik maydonlarning taqsimotiga oid tadqiqotlar ushbu yo‘ nalishning nazariy asoslarini yanada boyitgan .

Ushbu maqolaning maqsadi bir jinsli bo‘ lmagan yuqori chastotali elektromagnit to‘ lqinining yarimo‘ tkazgich muhitga ta’sirini elektrolit asosidagi model tizim yordamida eksperimental tadqiq etish hamda "igna–tekislik" elektrodlar tizimining volt-amper xarakteristikalari va detektorlangan kuchlanishning chastotaga bog‘ liqligini tahlil qilishdan iborat. Olingan natijalar elektromagnit maydon ta’sirida yuz beradigan fizik jarayonlarni aniqlash hamda yuqori chastotali radioelektron va yarimo‘ tkazgich qurilmalarini takomillashtirish uchun muhim ilmiy-amaliy ahamiyatga ega [8].

ADABIYOTLAR TAHLILI VA METODOLOGIYA

Ushbu maqola bir jinsli bo‘ lmagan yuqori chastotali elektromagnit to‘ lqinining yarimo‘ tkazgich muhitga ta’sirini eksperimental tadqiq etishga bag‘ ishlangan bo‘ lib, metodologiya nazariy tahlil va laboratoriya tajribalarini o‘ z ichiga oladi. Tadqiqotning nazariy asosini yarimo‘ tkazgichlar fizikasi, elektromagnit maydon nazariyasi hamda elektrolitlarda elektr o‘ tkazuvchanlik jarayonlariga oid ilmiy manbalar tashkil etdi. Xususan, S.M. Sze va K.K. Ng, H.A. Watson hamda G. Abdurakhmanov va hammualliflar tomonidan olib borilgan tadqiqotlar yuqori chastotali elektromagnit maydonlarning yarimo‘ tkazgich qurilmalariga ta’sirini baholashda muhim nazariy asos bo‘ lib xizmat qildi [6]. Tadqiqot metodologiyasida elektrolitik vanna asosidagi model tizimdan foydalanildi. Tajribalarda "igna–tekislik" elektrodlar tizimi qo‘ llanilib, turli konsentratsiyadagi elektrolit eritmalarida elektr maydonining taqsimoti, volt-amper xarakteristikalari hamda detektorlangan kuchlanishning yuqori chastotaga bog‘ liqligi zamonaviy o‘ lchov asboblari yordamida aniqlandi. Olingan eksperimental natijalar nazariy ma’lumotlar bilan qiyosiy tahlil qilinib, elektromagnit maydon ta’sirida yuz beradigan fizik jarayonlarning asosiy qonuniyatlari baholandi.

Adabiyotlar tahlili davomida yarimo‘ tkazgich qurilmalarining fizik xossalari, elektromagnit maydonlarning nochiziqli tizimlarga ta’siri, elektrolit eritmalarining elektr xususiyatlari hamda elektrostatik maydonlarning taqsimotiga oid mahalliy va xorijiy ilmiy manbalar o‘ rganildi. Shuningdek, elektrolitlarning elektroximik xossalari, ionlarning harakatlanuvchanligi va elektr o‘ tkazuvchanlik mexanizmlariga bag‘ ishlangan ilmiy tadqiqotlar tahlil qilinib, ular tajriba natijalarini ilmiy asoslashda foydalanildi [15]. Qo‘ llanilgan metodologiya elektromagnit to‘ lqinlarning yarimo‘ tkazgich muhit bilan o‘ zaro ta’sirini model tizim asosida ishonchli baholash, eksperimental natijalarni nazariy ma’lumotlar bilan taqqoslash hamda olingan qonuniyatlarning amaliy ahamiyatini aniqlash imkonini berdi. Mazkur yondashuv yuqori chastotali radioelektron va yarimo‘ tkazgich qurilmalarini takomillashtirishga oid keyingi ilmiy tadqiqotlar uchun metodik asos bo‘ lib xizmat qiladi.

NATIJALAR TAHLILI

Tadqiqot davomida bir jinsli bo‘ lmagan yuqori chastotali elektromagnit maydonning yarimo‘ tkazgich muhitga ta’sirini o‘ rganish uchun elektrolit asosidagi model tizimdan foydalanildi. Tajribalarda turli konsentratsiyali natriy xlorid (NaCl) eritmalari qo‘ llanilib, ularning fizik xossalari **1.1-jadval**da keltirilgan.

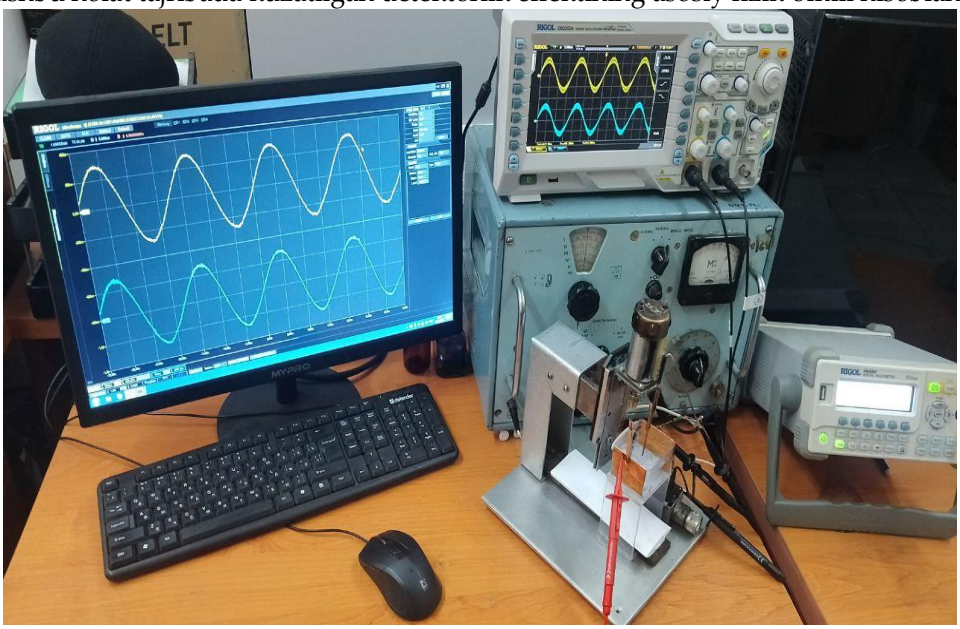
1.1-jadval.

Elektrolit vannadagi elektrolitning konsentratsiyasi (massa va molyar %) va elektr o‘ tkazuvchanligi

Namuna tartib soni	Osh tuzi, massa %	Suv, massa %	Eritmaning molyar konsentratsiyasi, M	Elektr o‘ tkazuvchanligi σ, Sm/m [2]
1	5	95	0,85	6,7
2	10	90	1,71	12,1
3	15	85	2,56	16,4
4	20	80	3,41	19,6

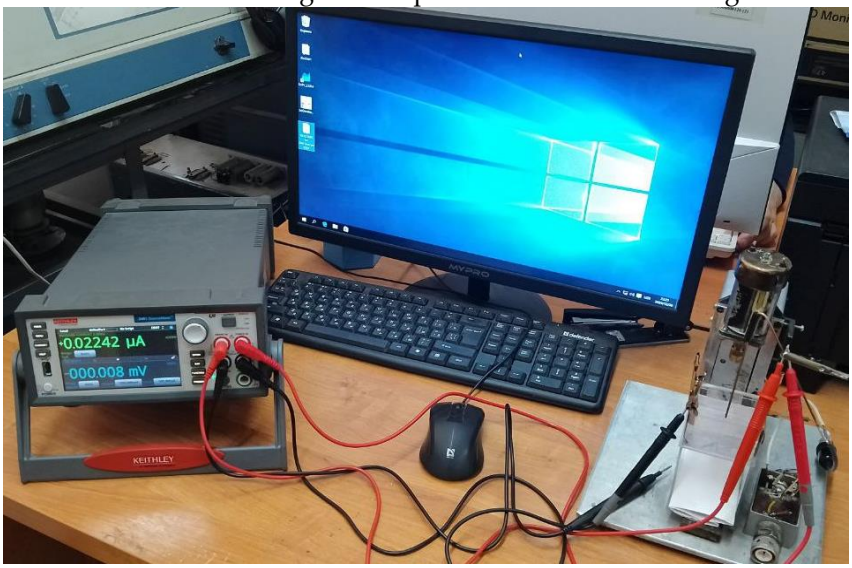
Elektrolit konsentratsiyasi ortishi bilan eritmaning elektr o‘ tkazuvchanligi ham ortadi. Bu esa ionlar sonining ko‘ payishi va zaryad tashuvchilarning elektr maydonidagi harakatchanligi ortishi bilan izohlanadi. Shu sababli keying tajribalarda elektrolit konsentratsiyasining volt-amper xarakteristikasi va detektorlangan kuchlanishga ta’siri alohida tahlil qilindi(1.1-jadval).

Tajriba qurilmasining umumiy sxemasi **1.1-rasm**da keltirilgan. Qurilmada yuqori chastotali signal generatori, elektrolitik vanna, “igna–tekislik” elektrodlar tizimi hamda o‘ lchov asboblari o‘ zaro bog‘ langan. Bunday sxema yuqori chastotali elektromagnit maydonning elektrolit muhitiga ta’sirini real vaqt rejimida kuzatish imkonini beradi. Ayniqsa, igna elektrodi uchida elektr maydoni kuchlanganligining keskin ortishi natijasida elektr maydoni bir jinsli bo‘ lmagan holatga keladi. Aynan ushbu holat tajribada kuzatilgan detektorlik effektining asosiy fizik omili hisoblanadi(1.1-rasm).



1.1-rasm. Suyuq elektrolitga botirilgan “igna-tekislik” tizimining detektorlik xossalarini o‘ rganish qurilmasi

1.2-rasmda ‘igna–tekislik’ elektrodlar tizimining volt-amper xarakteristikasi keltirilgan.



1.2-rasm. Suyuq elektrolitga botirilgan “igna-tekislik” tizimining voltamper xarakteristikasini o‘ rganish qurilmasi

Kuchlanishning kichik qiymatlarida tokning o‘ zgarishi chiziqli emas. Kuchlanish ortishi bilan tok qiymati tez o‘ sadi, ma’lum nuqtadan boshlab esa o‘ sish sur’ati kamayadi. Bu holat elektrolitda ionlarning harakat tezligi, elektr maydonining notekis taqsimlanishi hamda elektrodlar geometriyasi bilan bevosita bog‘ liq. Xususan, igna elektrodi uchida elektr maydonining kuchayishi ionlarning tezlanishiga sabab bo‘ ladi va natijada tizim oddiy elektrolitik vannadan farqli ravishda yarimo‘ tkazgich diodlarga xos bo‘ lgan nochiziqli volt-amper xarakteristikasini namoyon etadi(1.2-rasm). Tajribalarda musbat va manfiy kuchlanishlar uchun olingan volt-amper xarakteristikalari o‘ zaro taqqoslandi. Natijalarga ko‘ ra, ignaga musbat potensial berilganda tok qiymatining ortishi manfiy kuchlanish holatiga nisbatan ancha tez sodir bo‘ ladi. Buning asosiy sababi elektr maydoni ta’sirida ionlarning elektrod tomon yo‘ nalgan harakatining o‘ zgarishi hamda elektrod yaqinida zaryadlarning notekis taqsimlanishidir. Mazkur natijalar elektrolit asosidagi model tizimda to‘ g‘ rilovchi (detektorlik) xossalar mavjudligini yana bir bor tasdiqlaydi.

Ionlarning o‘ zgaruvchan elektr maydonidagi harakati

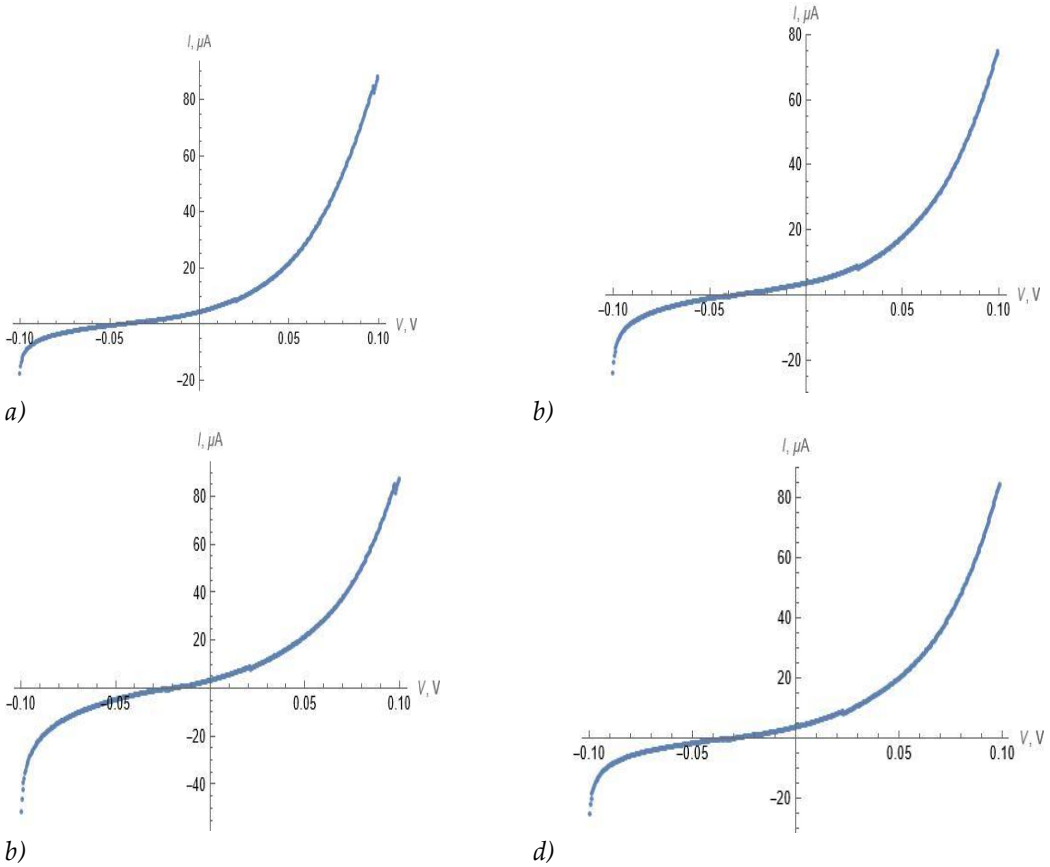
$$m\frac{dv}{dt} = eE - F_{в}, \quad (1)$$

Mazkur formulaga ko‘ ra, ionning yarim davr davomida bosib o‘ tadigan masofasi elektr maydoni kuchlanganligi va ion harakatchanligiga to‘ g‘ ri, elektromagnit maydon chastotasiga esa teskari proporsionaldir. Demak, chastota oshgan sari ionlarning siljish masofasi kamayadi. Ushbu nazariy xulosa keyingi tajribalarda olingan eksperimental natijalar bilan to‘ liq mos kelishi aniqlandi.

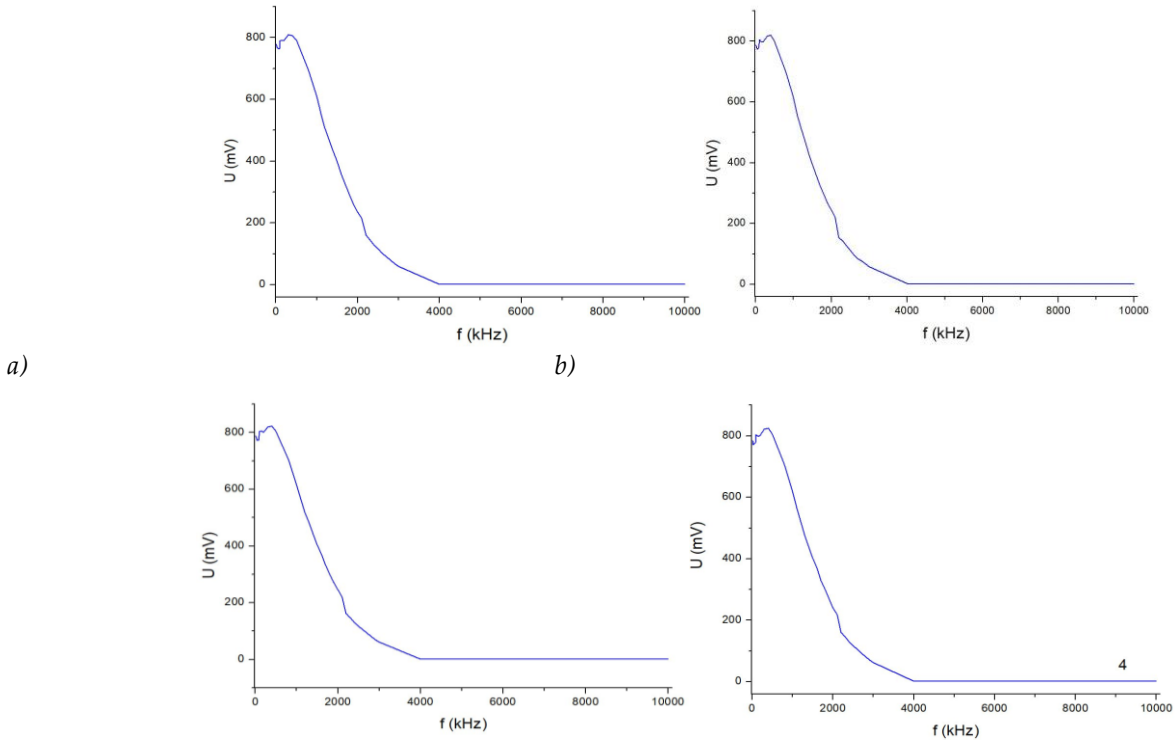
Volt-amper xarakteristikalari tahlili shuni ko‘ rsatdiki, elektrolit konsentratsiyasi ortishi bilan tok qiymati ham ortadi, biroq ma’lum konsentratsiyadan keyin bu o‘ sish sekinlashadi. Bu holat eritmaning elektr o‘ tkazuvchanligi bilan bir qatorda ionlararo o‘ zaro ta’sir kuchayishi natijasida ularning harakatchanligi cheklanishi bilan izohlanadi. Demak, detektorlik xossalari faqat elektrolit konsentratsiyasiga emas, balki elektrodlar geometriyasi, elektr maydoni taqsimoti va yuqori chastotali elektromagnit maydon parametrlariga ham bog‘ liq ekanligi tajribalar orqali tasdiqlandi.

MUHOKAMA

Olingan eksperimental natijalar bir jinsli bo‘ lmagan yuqori chastotali elektromagnit maydonning elektrolit asosidagi model tizimga ta’siri yarimo‘ tkazgichlarda kuzatiladigan fizik jarayonlarga yaqin qonuniyatlar asosida kechishini ko‘ rsatdi.



1.3-rasm. “Igna-tekislik” elektrodlarining past kuchlanishdagi voltamper xarakteristikasi: *a*) – 5%; *b*) – 10%; *c*) – 15%; *d*) – 20%



1.4-rasm. Osh tuzining suvdagi eritmasiga botirilgan "igna-tekislik" turidagi elektrodlarda paydo bo‘ luvchi o‘ zgarmas kuchlanishning chastotaga bog‘ liqligi: *a*) 5%; *b*) 10%; *c*) 15%; *d*) 20%

Natijalardan ko‘ rinadiki, "igna–tekislik" elektrodlar tizimida hosil bo‘ ladigan detektorlangan o‘ zgarmas kuchlanish chastota ortishi bilan muntazam kamayadi(1.3-rasm). Bunda 5 %, 10 %, 15 % va 20 % li NaCl eritmalari uchun kuzatilgan bog‘ lanish umumiy tendensiyani saqlab qolgan bo‘ lsa-da, yuqori konsentratsiyalarda kuchlanishning pasayish tezligi nisbatan katta bo‘ lishi aniqlandi. Bu holat ionlar harakatining elektromagnit maydon chastotasiga sezgir ekanligini ko‘ rsatadi.

Eksperimental natijalar elektrolitlarning elektr o‘ tkazuvchanligi nazariyasi bilan ham mos keladi. Ma'lumki, past konsentratsiyalarda elektr o‘ tkazuvchanlik ionlar konsentratsiyasining ortishi hisobiga

$$\sigma = ne\mu. \qquad (2)$$

(2) formula bilan ifodalanadi. Ushbu ifodadan ko‘ rinadiki, elektr o‘ tkazuvchanlik zaryad tashuvchilar konsentratsiyasi (n) va ularning harakatlanuvchanligi (μ) ga bevosita bog‘ liq. Tajribalarda eritma konsentratsiyasi ortishi bilan elektr o‘ tkazuvchanlikning ortishi aynan ushbu nazariy bog‘ lanishni tasdiqlaydi. Biroq yuqori konsentratsiyalarda ionlar o‘ rtasidagi o‘ zaro ta'sir kuchayishi natijasida ularning harakatlanuvchanligi kamayadi va elektr o‘ tkazuvchanlikning ortish sur'ati sekinlashadi. Bu holat 3.2-jadvalda keltirilgan ionlarning harakatlanuvchanligi qiymatlari bilan ham mos tushadi [15].

1.2-jadval.

Ayrim ionlarning elektrolitda 298 K da harakatlanuvchanligi [15]

Ionning turi	μ, $sm^2V^{-1}s^{-1}$	Ionning turi	μ, $sm^2V^{-1}s^{-1}$
$H^+(H_3O^+)$	36,3	OH^-	20,5
Li^+	4,01	Cl^-	7,90
Na^+	5,20	Br^-	8,12
K^+	7,62	NO_3^-	7,40
NH_4^+	7,60	CH_3COO^-	4,24
$(CH_3)_4N^+$	5,59	$C_6H_5COO^-$	3,71
Mg^{2+}	5,50	SO_4^{2-}	8,27

Elektrolit tarkibida ko‘ p zaryadli ionlar mavjud bo‘ lganda elektr o‘ tkazuvchanlik

$$\sigma = nZe\mu \qquad (3)$$

(3) formula bilan aniqlanadi. Ushbu tenglama ion zaryadi (Z) ortishi elektr o‘ tkazuvchanlikning ham ortishiga olib kelishini ko‘ rsatadi. Demak, elektrolitning elektr xossalari nafaqat ionlar konsentratsiyasi, balki ularning zaryadi va harakatlanuvchanligiga ham bog‘ liq. Bu qonuniyat yuqori chastotali elektromagnit maydonda zaryad tashuvchilarning dinamikasini izohlashda muhim nazariy asos bo‘ lib xizmat qiladi [15, 16].

Ionlarning elektrolitdagi taqsimlanishi Boltsman qonuniga asoslangan

$$N_i = N_{i0}\, exp\left(-\frac{e\varphi}{k_B T}\right), \quad (4)$$

(4) formula bilan ifodalanadi. Mazkur ifoda ionlar konsentratsiyasi elektr potensialining o‘ zgarishiga bog‘ liq ravishda eksponensial ravishda o‘ zgarishini ko‘ rsatadi. "Igna–tekislik" elektrodlar tizimida elektr maydoni bir jinsli bo‘ lmaganligi sababli elektrod yaqinida ionlarning qayta taqsimlanishi yuz beradi. Natijada zaryadlarning notekis joylashuvi detektorlangan kuchlanish hosil bo‘ lishining asosiy omillaridan biri hisoblanadi.

Ionlarning o‘ zgaruvchan elektr maydonidagi harakati Nyuton tenglamasiga asoslangan

$$m\frac{dv}{dt} = eE - F_в, \quad (5)$$

(5) tenglama orqali tavsiflanadi. Bu yerda ionga elektr maydoni tomonidan ta’sir etuvchi kuch bilan yopishqoqlik kuchi o‘ rtasidagi muvozanat ionning harakat tezligini belgilaydi. Elektrolit muhitida yopishqoqlik kuchi

$$F_в = 6\pi\eta v R_s\left(1 + \frac{R_s}{r_D}\right), \quad (6)$$

(6) formula bilan aniqlanadi. Demak, elektrolitning yopishqoqligi ortishi ionlarning harakatini sekinlashtiradi va yuqori chastotalarda ularning elektr maydoniga javob reaksiyasini kamaytiradi. Tajribalarda detektorlangan kuchlanishning chastota ortishi bilan pasayishi aynan shu fizik mexanizm orqali tushuntiriladi [16–18].

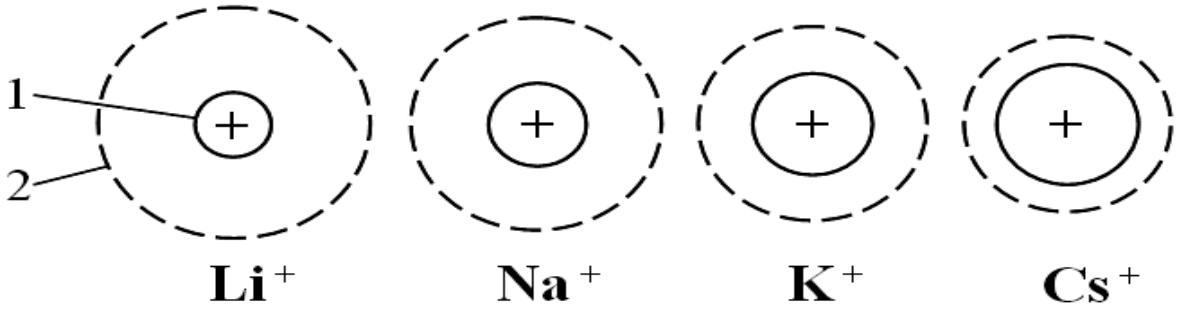
Ionlarning gidratlangan radiusi

$$\mathrm{R_s} = \frac{\mathrm{r_S^{Kt} r_S^{An}}}{\mathrm{r_S^{Kt} + r_S^{An}}}, \quad (7)$$

(7) formula, Debay radiusi esa

$$r_D = \sqrt{\frac{\varepsilon\varepsilon_0 1000 k_B T}{Z_i^2 e^2 c N_A}}. \quad (8)$$

(8) formula orqali hisoblanadi. Ushbu kattaliklar ionlarning elektr maydonidagi harakatiga sezilarli ta’sir ko‘ rsatadi.



1.5-rasm. Ishqoriy metallarning liotropik qatori. 1 – gidratlanmagan ion, 2 – gidrat qobig‘ i

1.5-rasmda keltirilgan liotropik qatordan ko‘ rinadiki, ionlarning samarali radiusi ularning yalang‘ och ion radiusidan ko‘ ra gidrat qobig‘ i bilan belgilanadi. Shu sababli Na^+ va Cl^- ionlarining harakatlanuvchanligi bir-biridan farq qiladi, bu esa tajribalarda kuzatilgan tok va kuchlanish qiymatlarining o‘ zgarishiga bevosita ta’sir etadi.

Gidratlangan ion radiusini aniqlash uchun qo‘ llanilgan

$$r_s^i = 49.79 \cdot 10^{-8}\left(\frac{ZN_s}{T^2}\right)^{1/3} - \quad (9)$$

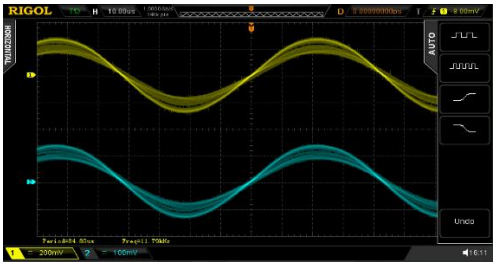
(9) formula ionlarning o‘ lchami temperatura va zaryad soniga bog‘ liq ravishda o‘ zgarishini ko‘ rsatadi. Natijada ionning samarali o‘ lchami ortishi bilan uning harakatlanuvchanligi kamayadi. Bu esa elektrolitning yuqori chastotali elektromagnit maydondagi javob xarakteristikasiga bevosita ta’sir ko‘ rsatadi.

Elektrolit tizimining xususiy tebranish chastotasi Lengmyur chastotasi orqali

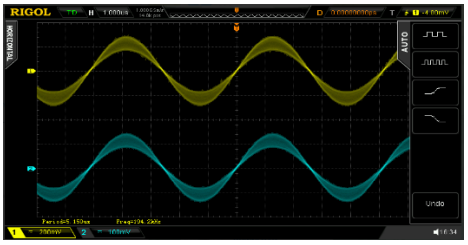
$$\omega_L = \sqrt{\frac{Ne^2}{\varepsilon\varepsilon_0 m}}. \quad (10)$$

(10) formula bilan aniqlanadi. Hisoblash natijalari Lengmyur chastotasi 0,74–1,4 THz oralig‘ ida ekanligini ko‘ rsatdi. Tadqiqotda qo‘ llanilgan 12 kHz–10 MHz diapazon ushbu qiymatdan bir necha tartib past bo‘ lganligi sababli ionlar elektromagnit maydonga kvazistatik rejimda javob beradi. Aynan shu sababli tajribalarda 0,2–1 MHz oralig‘ idan boshlab detektorlangan kuchlanish keskin kamayishi kuzatildi, chunki ionlarning yarim davr davomida bosib o‘ tadigan masofasi sezilarli darajada qisqaradi.

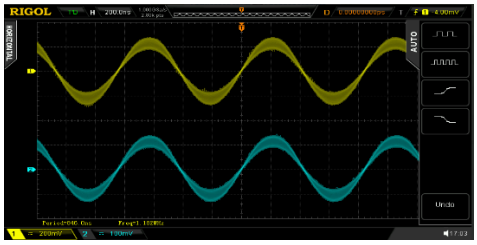
Na^+ va Cl^- ionlarining yarim davrdagi siljish masofasi hisob-kitoblari ham ushbu xulosani tasdiqlaydi. Hisoblashlarga ko‘ ra, 12 kHz da Na^+ ioni taxminan 0,1 mkm, Cl^- ioni esa 0,17 mkm masofani bosib o‘ tadi. Chastota 10 MHz gacha oshirilganda ushbu qiymatlar mos ravishda 1,3 nm va 2,0 nm gacha kamayadi. Demak, ionlarning siljish yo‘ li deyarli yuz martalab qisqaradi. Natijada elektrodlar orasida zaryadlarning qayta taqsimlanishi sustlashadi va 1.3-rasmda kuzatilganidek detektorlangan kuchlanish deyarli yo‘ qoladi.



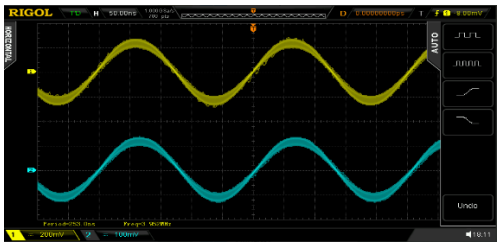
a)



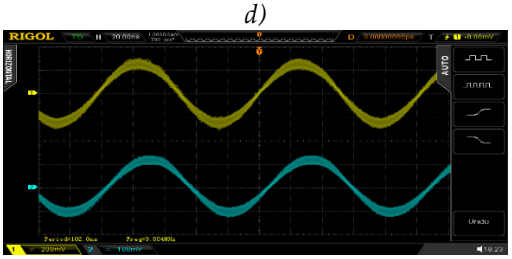
b)



c)



d)



e)

1.6-rasm. Osh tuzining suvdagi eritmasiga botirilgan “igna-tekislik” turidagi elektrodlardan o‘ tayotgan tokning ossillogrammalari: tepadagi och rangli ossillogramma – elektrodlar orqali o‘ tayotgan tok; pastki to‘ q rangli ossillogramma – generatordan chiqayotgan kuchlanish ossillogrammasi.

Olingan natijalar 1.6 -rasmda keltirilgan ossillogrammalar bilan ham tasdiqlanadi. Past chastotalarda elektrodlardan o‘ tayotgan tok shakli generatordan berilgan signalga yaqin bo‘ lsa, chastota oshishi bilan signal amplitudasi kamayadi va detektorlik xossasi sustlashadi. Ushbu qonuniyat nuqtaviy kontaktli yarimo‘ tkazgich diodlarda kuzatiladigan "kesib qolish chastotasi" hodisasiga o‘ xshash bo‘ lib, farq faqat zaryad tashuvchilarning massasi va harakatlanuvchanligi bilan izohlanadi [9]. Tajriba natijalari va nazariy hisoblashlar o‘ zaro yaxshi mos keladi. Elektrolit asosidagi “igna–tekislik” model tizimi yuqori chastotali elektromagnit maydonning yarimo‘ tkazgich muhitga ta’sirini modellashtirishda samarali fizik model ekanligi tasdiqlandi. Olingan natijalar yuqori chastotali detektorlar, mikroto‘ lqinli qurilmalar hamda yarimo‘ tkazgich elementlarining fizik jarayonlarini chuqurroq tushunish va ularni takomillashtirish uchun muhim ilmiy asos bo‘ lib xizmat qiladi.

XULOSA

Xulosa qilib aytganda, bir jinsli bo‘ lmagan yuqori chastotali elektromagnit to‘ lqinning yarimo‘ tkazgich muhitga ta’sirini elektrolit asosidagi model tizim yordamida o‘ rganish elektromagnit maydon ta’sirida yuz beradigan fizik jarayonlarning muhim qonuniyatlarini aniqlash imkonini berdi. Tadqiqot natijalari shuni ko‘ rsatdiki, elektromagnit

maydon chastotasi ortishi bilan detektorlangan kuchlanishning kamayishi ionlarning harakatlanuvchanligi, elektr o‘ tkazuvchanligi hamda yarim davr davomida bosib o‘ tadigan masofasining qisqarishi bilan bevosita bog‘ liq. Tajribalar davomida olingan volt-amper xarakteristikalari va chastotaviy bog‘ lanishlar nazariy hisoblashlar hamda elektrolitlarning elektr o‘ tkazuvchanligi tenglamalari bilan yaxshi mos kelishi aniqlandi. Shuningdek, **“igna–tekislik”** turidagi elektrodlar tizimi yarimo‘ tkazgich diodlarda kuzatiladigan detektorlik xossalarini modellashtirish uchun samarali fizik model ekanligi tasdiqlandi. Olingan natijalar yuqori chastotali radioelektron qurilmalar, mikroto‘ lqinli detektorlar hamda yarimo‘ tkazgich elementlarining fizik jarayonlarini chuqurroq tushunishga xizmat qiladi. Kelgusida tadqiqotlarni turli yarimo‘ tkazgich materiallari, elektromagnit maydonning kengroq chastota diapazonlari hamda turli elektrolit tarkiblari uchun davom ettirish ushbu yo‘ nalishning ilmiy va amaliy ahamiyatini yanada oshiradi. Mazkur natijalar yuqori chastotali elektron qurilmalar va zamonaviy yarimo‘ tkazgich texnologiyalarini takomillashtirishda muhim ilmiy asos bo‘ lib xizmat qilishi mumkin.

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GORIZONTAL O‘ QLI SHAMOL ENERGETIK QURILMASINING SAMARADORLIK KOEFFITSIYENTINI ANIQLASH.

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Annotatsiya. *Ushbu tadqiqot ishida gorizontal o‘ qli shamol energetik qurilmasining harakatlanishiga qarshilik qiladigan kuch, ya’ni tormozlanish koeffitsiyentini, va uning eng katta samaradorlik koeffitsiyentini aniqlash borasidagi ma’lumotlar keltirib o‘ tilgan. Shamol energetik qurilmalari asosan shamolning kinetik energiyasidan foydalangan holda ishlaydi, shuning uchun ularni gorizontal va vertikal o‘ qli shamol energetik qurilmalarga ajratish mumkin. Jumladan, gorizontal o‘ qli shamol energetik qurilmasini tormozlanish koeffitsiyentiga bog‘ lab eng katta qiymatini aniqlangan.*

Kalit so‘ zlar: *Gorizontal o‘ qli shamol energetik qurilmasi, parraklar*

ОПРЕДЕЛЕНИЕ КОЭФФИЦИЕНТА ЭФФЕКТИВНОСТИ ГОРИЗОНТАЛЬНО-ОСЕВОЙ ВЕТРОЭНЕРГЕТИЧЕСКОЙ УСТАНОВКИ

Аннотация. *В данной исследовательской работе представлены результаты исследования силового сопротивления движению горизонтально-осевой ветроэнергетической установки, то есть коэффициента торможения, а также определения её максимального коэффициента полезного действия. Ветроэнергетические установки функционируют преимущественно за счёт использования кинетической энергии ветра, в связи с чем их принято подразделять на горизонтально-осевые и вертикально-осевые ветроэнергетические установки. В частности, в работе исследована зависимость эффективности горизонтально-осевой ветроэнергетической установки от коэффициента торможения и определено его оптимальное значение, соответствующее максимальной эффективности установки.*

Ключевые слова: *горизонтально-осевая ветроэнергетическая установка, лопасти, ветроэнергетика, коэффициент эффективности,* коэффициент торможения.

DETERMINATION OF THE EFFICIENCY COEFFICIENT OF A HORIZONTAL-AXIS WIND ENERGY SYSTEM

Abstract. *This research paper presents the results of a study on the force resisting the motion of a horizontal-axis wind energy system, namely the braking coefficient, as well as the determination of its maximum efficiency coefficient. Wind energy systems operate primarily by utilizing the kinetic energy of wind; therefore, they can generally be classified into horizontal-axis and vertical-axis wind energy systems. In particular, the study investigates the dependence of the efficiency of a horizontal-axis wind energy system on the braking coefficient and determines its optimal value corresponding to the maximum efficiency of the system.*

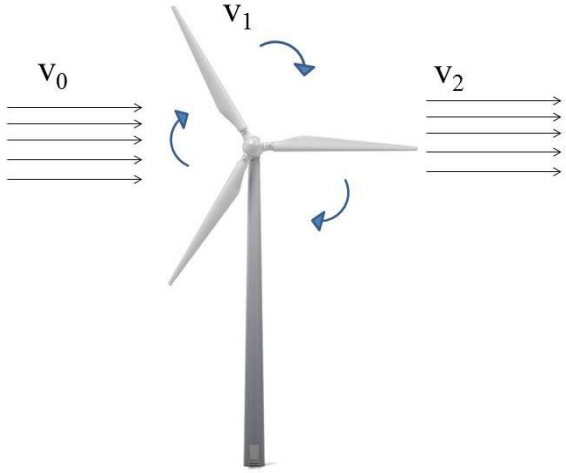
Keywords: *horizontal-axis wind energy system, blades, wind energy, efficiency coefficient, braking coefficient.*

Kirish

Dunyodagi barcha tabiy jarayonlar ma’lum bir fizik qonuniyat asosida yuzga keladi. Hususan tabiatda shamol hosil bo‘ lishi, yomg‘ ir yog‘ ishi, yerning silkinishi shular jumlasidandir, suvning to‘ lqinlanishi shular jumlasidandir. Hozirgi rivojlanib kelayotgan zamonda bunday hodisalardan unumli foydalangan holda energiya yig‘ ish yo‘ lga qo‘ yilmoqda yani elektr energiyasini olish. Dunyo davlatlarining geografik joylashuviga qarab ulardagi muhiti hisobga olgan holda

tabbiy ravishda qayta tiklanadigan energiya manabalaridan foydalanishga o‘ tishmoqda. O‘ zbekiston Respublikasi ham bugungi kunda bu sohada oldinlab harakatlanib kelmoqda. O‘ zbekiston hududidagi iqlimi geografik joylashuvidan foydalanib quyoshdan, shamoldan va suvdan unumli ravishda energiya olishni imkoni mavjud. Hududlarning kengligi tog‘ va tepaliklar ko‘ pligi bois ushbu hududlarda shamoldan energiya olishni amalga oshirilmoqda. Tabitada shamol havo oqimlarining turli balandliklarda turlicha bosim hosil bo‘ lishi va ular bir biri bilan almashinishi bilan yuzaga keladi. Shamol issiq va sovuq havolarni almashinishi natijasida turli balandliklarda turlicha bo‘ ladi, balandlik organ sari shamolning tezligi ortaveradi. Hozirgi kungacha olimlar ko‘ plab tadqiqotlar natijasida shamoldan qanday qilib energiya olishni o‘ rganib chiqishdi. Shamol energetik qurilmalari asosan shamolning kinetik energiyasiga hisobiga ishlaydi va bu energiyani shamol parragi boshqa turdagi energiyaga aylantirib beradi. Bunday jarayon gorizontal va vertikal o‘ qli shamol energetik qurilmasi uchun juda mos keladi va bundan hozirgi kunda keng foydalanib kelinmoqda. Hozirda gorizontal o‘ qli shamol energetik qurilmasi keng ommalashib bormoqda sababi u o‘ zgaruvchan havo oqim tezligiga juda yaxshi moslasha oladi. Gorizontal o‘ qli shamol energetik qurilmasi uchun parraklar soni juda ahamiyatlidir. Bizning maqolamizda ularning soni 3 ta dir bunday bo‘ lishiga asosiy sabab shamol parraklari o‘ z inersiyasi tufayli aylanishni yaxshi taminlab beradi. Shamoldan olingan elektr energiyani o‘ zgaruvchan qilib tarmoqga uzatishda ham 3 parrakli va ayon qutbli rotordan keng foydalaniladi. Uch parrakli qilib yasashni yana bir foydali tomoni olingan energiyani o‘ zgaruvchan tokga moslash osonroq kechadi. Har bir shamol energetik qurilmasi uchun malum bir tezlikga yetganda aylanadi va malum tezlikda ishlashdan to‘ xtaydi deb olishimiz mumkin. Kuchli bo‘ ronda ular ishlamaydi yani tormozanish rejimiga o‘ tadi. Bizning olgan natijamizga ko‘ ra shamol energetik qurilmasi shamol tezligini qandaydir qiymatida tormozlanishini ko‘ rishimiz mumkin.

Hozirda gorizontal o‘ qli shamol energetik qurilmalaridan SHES ni qurish har bir davlatda qo‘ llab kelinmoqda. Gorizontal o‘ qli shamol energetik qurilmasi ko‘ plab afzalliklarga ega. Uning parraklarining yuzasini silliqligiga va kesimi o‘ zgaruvchanligiga qarab minorani turi balandlikga moslab o‘ rnatishimiz mumkin. Balandlik ortgan sari shamol tezligi ortadi shuning uchun uni parraklarini uzunroq qilib minorasi balandligiga nisbatan 30m yoki 40m farq qiladigan holatda joylashtiriladi. Har qanday o‘ zgaruvchan kesimli parraklar albatta qandaydir tezlikga borganda to‘ xtaydi. Shu sababdan biz parraklarni tormozlanish tizimini matematik ifodalarini aniqlab chiqdik. Bunda tormozlanish koeffitsiyentini maksimal qancha qiymatga ega ekanligini aniqladik. Aniqlangan qiymatlarni yuzaga keltirish uchun shamolni parrakga urilmasdan oldingi tezligi, urilgandan kelingi tezligini va parrakni aylanish tezligini bilishimiz kerak. Gorizontal o‘ qli shamol energetik qurilmasi parraklari havo oqimini turbulentligidan foydalanib aylanadi [1]. Havoning yo‘ nalishi o‘ zgaruvchan bo‘ lib parraklarga turli burchak ostida uriladi va barcha uriluvchi kuchlarning natijaviysi parrakni aylanma harakat qilishga undaydi.



1-Rasm. Gorizontal o‘ qli shamol energetik qurilmasi

1-Rasmda shamol parraklariga tasir qiluvchi kuch quyidagicha aniqlanadi.

$$F=ma \quad (1) \qquad a=\frac{v_0-v_2}{\Delta t} \quad (2)$$

bu yerda, **m-** parrakga uriluvchi havo massasi, **a-** parrakning tezlanishi $\mathbf{v}_o$- shamolning parrakga urilishidan oldingi tezligi, $\mathbf{v}_2$ – shamolning parrakga urilgandan keyingi tezligi **Δt-** tezlik o‘ zgarishi uchun sarflangan vaqt

1-formuladagi **a** ning o‘ rniga 2-formulani qo‘ ysak quyidagi ifodaga kelamiz.

$$F=m\cdot\frac{v_0-v_2}{\Delta t} \quad (3)$$

Shamol parraklari oladigan quvvatini aniqlaymiz.

$$N=Fv_1 \quad (4)$$

bu yerdan F ning o‘ rniga 3- formuladagi ifodani tenglaymiz.

$$N= mv_1 \cdot \frac{v_0-v_2}{\Delta t} \quad (5)$$

Ikkinchi tomondan energiyaning saqlanish qonuniga ko‘ ra .

$$E_{parrak}=E_0-E_2 \quad (6)$$

Energiyani saqlanish qonunini parrak va havo bilan energiya almashadi deb olamiz va kinetik energiyani yoyib chiqamiz.

$$E_{parrak} = \frac{mv_0^2}{2} - \frac{mv_2^2}{2} = \frac{m}{2}(v_0^2 - v_2^2) \quad (7)$$

Parrak quvvatini energiyaga bog‘ liqlik formulasi quyidagicha.

$$N=\frac{E_{parrak}}{\Delta t} \quad (8)$$

Bu ifodadagi $\mathbf{E_{parrak}}$ ni o‘ rniga 8-formuladagi ifodani tenglaydigan bo‘ lsak quyidagi ko‘ rinishga keladi.

$$N=\frac{m(v_0^2-v_2^2)}{2\Delta t} \quad (9)$$

Ushbu ifodalardan shamolning parraklarga bergan quvvati shamolning kinetik energiyasi o‘ zgarishi hisobiga amalga oshadi deb olamiz. Ideal holda energiya almashinuvi faqat shamol va shamol parraklari orasida amalga oshadi. Shamol parragining quvvati va shamolning energiya o‘ zgarishi tufayli oladigan quvvatlarini tenglaydigan bo‘ lsak quyidagi ifoda hosil bo‘ ladi[2].

$$N= N; \qquad \frac{m\,v_1\,(v_0-v_2)}{\Delta t}=\frac{m\,(v_0^2-v_2^2)}{2\Delta t} \quad (10)$$

Ifodani soddalashtiradigan bo‘ lsak $\frac{m}{\Delta t}$ lar qisqarib ketadi va quyidagi ifoda hosil bo‘ ladi.

$$2(v_0-v_2)\cdot v_1= (v_0^2- v_2^2) \quad (11)$$

bu formuladan $\mathbf{v_1}$ ni ifodalaymiz. $\mathbf{v_1}$ parrakni aylantiruvchi tezlik hisoblanadi.

$$v_1=\frac{v_0-v_2}{2} \quad (12)$$

Shamol parraklari ma’lum bir qonuniyatga asoslangan holda yuzani o‘ zgaruvchan qilib tayyorlanadi. Shamol parraklari yuzasi boshidan boshlab ohirigacha o‘ zgaruvchan yuza qilib havo oqimini o‘ ziga qabul qiladigan qilib tayyorlanadi. Shundan kelib chiqgan holda shamol parraklarining o‘ lchamlari kata va kichik qilib tayyorlanadi. Ularning o‘ lchamiga qarab shamolning aniq bir tezlikda parraklarning aylanishini va ma’lum bir tezlikda shamol parraklarining to‘ rmozlanishi kerak bo‘ ladi. Shamol trubinasi katta tezlik va kichik tezliklarda ish rejimlari o‘ zgaradi yani tormozlaydi. Shu sababli tormozlanish koeffitsiyent kiritib olamiz va bu koeffitsiyent $\boldsymbol{\alpha}$ hisoblanadi.

$\boldsymbol{\alpha}$**-**tormozlanish koeffitsiyenti va birliksiz kattalik hisoblanadi.

$$\alpha=\frac{v_0-v_2}{v_0} \quad (13)$$

Agar parrakning tezligi shamolning dastlabki tezligiga teng bo‘ lsa ya’ni $\mathbf{v_1=v_0}$ (13-formula) bu ifoda nolga teng bo‘ ladi.

$$\alpha=\frac{v_0-v_0}{v_0}; \qquad \alpha = 0 \quad (14)$$

α=0 degani bu parrak hech qachon to‘ xtamasligini anglatadi. Bunday holat esa bo‘ lmasligini hisobga olgan holda $\alpha\neq0$ shart kiritiladi. So‘ ngra u qanday qiymatlar qabul qilishini ko‘ rib chiqamiz. 13 – ifodadagi v_1 ni o‘ rniga (12)-ifodadagi tenglikni qo‘ yamiz va quyidagi ifoda hosil bo‘ ladi.

$$\alpha=\frac{v_0-v_2}{v_0} = \frac{v_0-\frac{v_0+v_2}{2}}{v_0}; \qquad \alpha=\frac{v_0-v_2}{2v_0} \quad (16)$$

16 - ifodadan $\mathbf{v_2}$ topamiz va $\boldsymbol{\alpha}$ orqali ifodalaymiz.

$$v_2= v_0(1-2\alpha) \quad (17)$$

$\mathbf{v_2}$ ni $\boldsymbol{\alpha}$ orqali ifodalaganimizdan so‘ ng esa (12)-ifodadagi $\mathbf{v_2}$ ni o‘ rniga qo‘ yamiz.

$$\mathbf{v_1}=\frac{v_0+v_0(1-2\alpha)}{2} \quad (18)$$

Bu ifodani soddalashtirib chiqamiz.

$$v_1= v_0(1-\alpha) \quad (19)$$

Shamolning parraklarga urilishdan oldingi quvvatini hisoblaymiz.

$$N=\frac{E_0}{\Delta t}; \quad E_0=\frac{mv_0^2}{2}; \quad N=\frac{mv_0^2}{2\Delta t}; \quad N=\frac{\rho v v_0^2}{2\Delta t}; \quad N=\frac{v_0^2\,\rho\,S\,v_1}{2} \quad (20)$$

(20) - ifodadagi $\mathbf{v_1}$ ni o‘ rniga (19)-tenglamani qo‘ yamiz va ifodani soddalashtiramiz.

$$N=\frac{\rho\,S\,(1-\alpha)\,v_0^3}{2} \quad (21)$$

Shundan so‘ ng esa parraklarning quvvatnini hisoblaymiz.

$$N=Fv_1;\ F=mv_1\cdot\frac{v_0-v_2}{\Delta t};\ N=\frac{m\,v_1\,(v_0-v_2)}{\Delta t} \quad N=\frac{\rho S\Delta t(v_0-v_2)v_1^2}{\Delta t};$$

$$N=\rho S(v_0-v_2)\,v_1^2 \quad (22)$$

22- ifodadagi $\mathbf{v_1}$ ni o‘ rniga (19)-ifodani $\mathbf{v_2}$ ni o‘ rniga esa (17)- formulani joylashtiramiz va ifodani soddalashtirib chiqamiz.

$$N=\rho S(1-1+2\alpha)\,v_0^2\,(1-\alpha)^2;\ N=\rho S v_0^3(2\alpha)\,(1-\alpha)^2 \quad (23)$$

(23)- ifodani ikkiga ko‘ paytirib ikkiga bo‘ lib yuboramiz va quyidagi holatga o‘ tib olamiz.

$$N=\frac{1}{2}\varrho Sv_0^3(4\alpha)\,(1-\alpha)^2 \qquad (24)$$

Shamol kinetik energiyasini qanchadir qismini shamol parraklariga beradi. Shamol energiyasini samaradorlik koeffitsiyentini (C_p) ni kiritib olamiz. Chunki parraklarga kelayotgan shamol tezligining hammasi shamol parraklarining aylantirishga sarf bo‘ lmaydi, va uni quyidagicha formula orqali ifodalaymiz.

$$N_{tur}= C_pN_{shamol} \qquad (25)$$

(25)- ifodani chap va o‘ ng tomonlariga kerakli tengliklarni qo‘ yamiz va quyidagi ifodaga kelamiz.

$$\frac{1}{2}\varrho Sv_0^3(4\alpha)\,(1-\alpha)^2=C_p\frac{1}{2}\varrho Sv_0^3 \qquad (26)\quad C_p= 4\alpha(1-\alpha)^2;\ C_p=4\alpha(1-2\alpha+\alpha^2)$$

$$C_p=4\alpha-8\alpha^2+4\alpha^3 \qquad (27)$$

(27)- ifodadan $\boldsymbol{\alpha}$ orqali bir marta hosila olamiz va nolga tenglaymiz. Samaradorlik koeffitsiyenti tozmozlanish koeffitsiyenti bo‘ yicha o‘ zgaradi. Bu yerda C_p=const yani o‘ zgarmas son hisoblanadi. O‘ zgarmas sondan olingan birinchi tartibli hosila nolga teng.

$$C_p=(4\alpha-8\alpha^2+4\alpha^3)\cdot\quad C_p=(4-16\alpha+12\alpha^2) \qquad (28)$$

Olingan natijani esa nolga tenglab kvatdrat tenglamani ildizlarini topamiz.

$$4-16\alpha+12\alpha^2=0 \qquad (29)$$

Tenglikni ikkala tomonini 4 bo‘ lib yuboramiz. Natijada tenglamamiz sodda ko‘ rinishga keladi.

$$3\alpha^2-4\alpha+1=0 \qquad (30)$$

Viet teoremasidan ushbu ildizlar chiqadi $\alpha_1=\frac{1}{3}$, $\alpha_2=1$. Bu ifodalargan quyidagilar ma’lum bo‘ ldi: dastlabki malumotlarga asosan tormozlanish koeffitsiyentini chegaraviy qiymati 0 bo‘ lgan edi. 30- tenglamadan malumki bu koefitsiyentning eng katta qiymati aniqlandi yani $\alpha_1=\frac{1}{3}$. Yuqoridagi ifodadagi $\alpha_2=1$ qiymat shuni bildiradiki parrak butunlay tormozlash tizimiga o‘ tadi. Albatta har qanday kattalik malum miqdorda o‘ zgarmas qiymatga ega bo‘ ladi. Aniqlab olgan qiymatimizni endi samaradorlik koeffitsiyenti formulasiga olib borib qo‘ yamiz(27-ifodaga). Ushbu ifodadan quyidagicha natijalarni hisoblab chiqaramiz [3].

$$C_p=4\alpha-8\alpha^2+4\alpha^3 \qquad (31)$$

$$C_p=4*\frac{1}{3}.-8*\frac{1}{9}+4*\frac{1}{27}=\frac{36-24+4}{27}=\frac{16}{27}=0.592$$

Qiymatni hosil qilamiz ushbu ifodadan malum bo‘ ldiki tormozlanish koefitsiyentining $\frac{1}{3}$. qiymatida shamol energetik qurilmamiz eng katta samaradorlikni olib kelar ekan. Gorizontal o‘ qli shamol eneregtik qurilmasi uchun eng katta energiya berish effektivligi 0.592 ni tashkil qilar ekan [4]. Bundan ortiq qiymatda yutuq olaolmaymiz bu qutimadan.

Xulosa

Shamol energetik qurilmasining parraklari yuzasi qanchalik o‘ zgaruvchan bo‘ lmasin shamol energiyasining qanchadir qismidan foydalana oladi. Ushbu holatdan aniqlangan tormozlanish koeffitsiyenti shamolning berishi mumkin bo‘ lgan eng katta ideal energiya qiymatlaridan foydalanilgan. Shamol parraklari shamolning ma’lum tezligida xarakatga keladi va ma’lum tezligida tormozlanadi. Shamol parraklari massiv bo‘ lganligi sababli kichik miqdordagi shamol aylantira olmaydi katta miqdordagi shamol parraklarga bosim berib uni harakatdan to‘ xtatadi. Gorizontal o‘ qli shamol parraklari shamol tezligiga qarab o‘ zgaradi va harakatdan to‘ xtaydi. To‘ xtash jarayoni tormozlanish koefitsiyenti orqali ifodalandi.Bu koeffitsiyent esa (0; 1) qiymatlarni orasini qabul qila olishi aniqlandi. Ushbu oraliqda uning qiymati $\frac{1}{3}$ bo‘ lganda shamoldan olinayotgan energiya eng katta qiymatda bo‘ ladi. Shu qiymatga asoslangan holda qurilma eng katta samarali quvvati 59% ni tashkil etilishi aniqlandi. Bu qiymat har qanday gorizontal o‘ qli shamol energetik qurilmasi uchun eng katta qiymatligicha qoladi.

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CdTe–SnO_2 ASOSIDAGI YORUG‘ LIKKA SEZGIR GAZ RAZRYADLI TIZIMNING FOTOELEKTRIK XARAKTERISTIKALARI

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Annotatsiya. *Tadqiqotimizda xlor bilan legirlangan poluizolyator monokristall tellurid kadmiy fotoqabulqilgichga ega gaz razryadli tizimning (GRT) fotoelektrik xarakteristikalari keltirilgan. Xona haroratida 80 va 200 Torr qoldiq bosimlarda volt-amper hamda vatt-amper tavsiflari o‘ lchangan hamda vismut plyonkasi uchun D(H) sensitometrik bog‘ lanishlar olingan. Tadqiqotimizning Volt-amper tavsiflarning boshlang‘ ich qismidagi anomal uchastka razryad oralig‘ ini chegaralovchi slyuda tirqishining perimetri bo‘ ylab yuzaga keladigan sirtiy teshilish bilan bog‘ liqligi ko‘ rsatildi va bu hodisani bartaraf etuvchi konstruksiya qo‘ llanildi. Vatt-amper tavsiflari esa yorug‘ lik intensivligining $3\cdot10^{-6}$–$3\cdot10^{-3}$ Vt/sm² oralig‘ ida chiziqli ekanligi aniqlandi; GRTning optik sezgirligi 10^{-6} Vt/sm², ekspozitsiya bo‘ yicha sezgirligi esa 10^{-3} J/sm² ni tashkil etdi. Nikel va oltin kontaktlar taqqoslanib, nikel kontakt tizimda kattaroq tok berishi qayd qilindi.*

Kalit so‘ zlar: *gaz razryadli tizim, tellurid kadmiy, fotoqabulqilgich, volt-amper tavsif, vatt-amper tavsif, sensitometrik xarakteristika, optik sezgirlik, sirtiy teshilish.*

ФОТОЭЛЕКТРИЧЕСКИЕ ХАРАКТЕРИСТИКИ СВЕТОЧУВСТВИТЕЛЬНОЙ ГАЗОРАЗРЯДНОЙ СИСТЕМЫ НА ОСНОВЕ CdTe–SnO_2

Аннотация. *В статье приведены фотоэлектрические характеристики газоразрядной системы (ГРС) с фотоприёмником из полуизолирующего монокристаллического теллурида кадмия, легированного хлором. При комнатной температуре и остаточных давлениях 80 и 200 Торр измерены вольт-амперные и ватт-амперные характеристики, для плёнки висмута получена сенситометрическая зависимость D(H). Показано, что аномальный участок начальной части вольт-амперных характеристик связан с поверхностным пробоем вдоль периметра отверстия в слюдяной пластине, ограничивающей разрядный промежуток; применена конструкция, устраняющая это явление. Установлено, что ватт-амперные характеристики линейны в диапазоне интенсивности излучения $3\cdot10^{-6}$–$3\cdot10^{-3}$ Вт/см²; оптическая чувствительность ГРС составила 10^{-6} Вт/см², чувствительность по экспозиции — 10^{-3} Дж/см². При сравнении никелевого и золотого контактов отмечено, что никелевый контакт обеспечивает больший ток в системе.*

Ключевые слова: *газоразрядная система, теллурид кадмия, фотоприёмник, вольт-амперная характеристика, ватт-амперная характеристика, сенситометрическая характеристика, оптическая чувствительность, поверхностный пробой.*

PHOTOELECTRIC CHARACTERISTICS OF A LIGHT-SENSITIVE GAS-DISCHARGE SYSTEM BASED ON CdTe–SnO_2

Abstract. *The paper presents the photoelectric characteristics of a gas-discharge system (GDS) with a photodetector made of semi-insulating single-crystal cadmium telluride doped with chlorine. Current-voltage and watt-ampere characteristics were measured at room temperature and residual pressures of 80 and 200 Torr, and a D(H) sensitometric curve was obtained for a bismuth film. The anomalous section in the initial part of the current-voltage curves is shown to be caused by surface breakdown along the perimeter of the aperture in the mica plate bounding the discharge gap; a design eliminating this effect was applied. The watt-ampere characteristics were found to be linear over the radiation intensity range of $3\cdot10^{-6}$ -$3\cdot10^{-3}$ W/cm²; the optical sensitivity of the GDS was 10^{-6} W/cm²*

and the exposure sensitivity 10^{-3} J/cm². A comparison of nickel and gold contacts showed that the nickel contact yields a higher current in the system.

Key words: *gas-discharge system, cadmium telluride, photodetector, current-voltage characteristic, watt-ampere characteristic, sensitometric characteristic, optical sensitivity, surface breakdown.*

Kirish

Yorug‘ likka sezgir gaz razryadli tizim (GRT) — kirish tomonida yarimo‘ tkazgich fotoelektrod, chiqish tomonida tokni qayd etuvchi elektrod va ular orasida yupqa gaz oralig‘ i joylashgan qurilma — ionizatsion fotografik kameralarning asosiy bo‘ g‘ ini hisoblanadi va infraqizil nurlanishni ko‘ rinuvchi tasvirga aylantirish vazifasini bajaradi. Infraqizil texnikaning so‘ nggi yillardagi rivoji bunday qurilmalar hosil qiladigan tasvir sifatiga qo‘ yiladigan talablarni ancha oshirdi, erishilgan natijalar esa hamma vaqt ham qoniqarli emas.

GRTning ishlash sifati, avvalo, fotoelektrod materialiga bog‘ liq. Bu materialga qo‘ yiladigan talablar odatdagidan ancha qattiq: u yuqori solishtirma qarshilikka, sezilarli fotosezgirlikka ega bo‘ lishi va gaz razryadi muhitida uzoq muddat barqaror ishlashi kerak. Shu sababli hozirgacha GRTda ishonchli natija bergan fotoelektrod materiallari sanoqli: xona haroratida xrom bilan kompensatsiyalangan arsenid galliy, 100 K va undan past haroratlarda esa turli kiritmalar bilan legirlangan kremniy [1–3]. Bu ro‘ yxatni kengaytirish uzoq vaqtdan beri dolzarb masala bo‘ lib kelmoqda.

Adabiyotlar tahlili

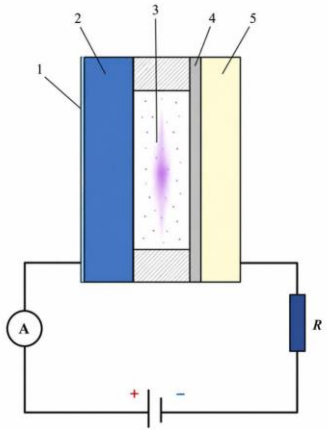
Yorug‘ likka sezgir tizimlar bo‘ yicha tadqiqotlar dunyoning bir qator ilmiy markazlarida olib borilmoqda. A.F. Ioffe nomidagi Fizika-texnika instituti (Sankt-Peterburg) xodimlari Yu.A. Astrov, V.B. Shuman, A.N. Lodigin va L.M. Portsellar selen bilan legirlangan kremniy fotoelektrodini gaz fazali epitaksiya yo‘ li bilan olishga erishdilar [4]. Boku davlat universitetida V.I. Orbux, N.N. Lebedeva va B.G. Salamovlar bunday tizimlardagi muvozanatsiz o‘ tish jarayonlarini o‘ rgandilar [5]. O‘ zbekistonda Sh.B. Utamuradova va Z. Xaydarovlar platina hamda oltingugurt bilan legirlangan kremniy va arsenid galliy fotoqabulqilgichlari misolida fotoelektrik gisterezis hodisasini aniqladilar va uning avtoelektron emissiya bilan bog‘ liqligini ko‘ rsatdilar [6, 7].

Tellurid kadmiy esa GRT fotoelektrodi sifatida deyarli o‘ rganilmagan. Bu material yuqori solishtirma qarshilikka erishish imkoniyati, spektrning ko‘ rinuvchi sohasidagi yaxshi fotosezgirligi va rivojlangan o‘ stirish texnologiyasi bilan e’tiborni tortadi, biroq uning gaz razryadi kontakti sharoitidagi xulqi ochiq masala bo‘ lib qolmoqda.

Ushbu ishda xlor bilan legirlangan poluizolyator monokristall tellurid kadmiy fotoqabulqilgichga ega CdTe–SnO_2 tizimining volt-amper, vatt-amper va sensitometrik tavsiflari o‘ lchandi hamda shu asosda materialning ionizatsion o‘ zgartirgichlarda qo‘ llanishi baholandi.

Tadqiqot metodologiyasi.

Tadqiq etilgan GRTning prinsipial sxemasi 1-rasmda keltirilgan. Fotoelektrod vazifasini poluizolyator monokristall CdTe plastinka bajaradi; uning yorug‘ lik tushadigan yuzasiga yarim shaffof omik kontakt o‘ rnatiladi. Fotoelektrodning ichki yuzasi tokni qayd qiluvchi metall qatlamdan gaz oralig‘ i bilan ajratilgan bo‘ lib Oraliq qalinligi 20÷100 mkm bo‘ lgan slyuda plastinkasi orqali beriladi - unda diametri 5÷27 mm bo‘ lgan dumaloq tirqish tayyorlanadi va aynan shu tirqish razryad sohasini belgilaydi. Tokni qayd etuvchi metall qatlam SnO_2 o‘ tkazuvchan plyonka bilan qoplangan shisha kontrelektrodning ichki yuzasiga VUP-5M rusumli vakuum qurilmasida purkash usuli yordamida boyitildi. Kontrelektrod shaffof bo‘ lgani uchun GRT ning ikkinchi tomonidan razryadning chaqnashini bevosita kuzatish mumkin bo‘ ladi.



1-rasm. Yorug‘ likka sezgir GRTning prinsipial elektr sxemasi: 1 — CdTe fotoelektrod; 2 — yarim shaffof kontakt; 3 — gaz razryad oralig‘ i; 4 — tokni qayd etuvchi metall qatlam; 5 — SnO_2 qoplamali shisha kontrelektrod; R — ballast qarshilik

Fotoqabulqilgich uchun kristall eritmadan gorizontal yo‘ naltirilgan kristallanish usulida o‘ stirilgan va o‘ stirish jarayonida xlor bilan legirlangan. Kristallning asosiy parametrlari quyidagicha: kiritma konsentratsiyasi n = 10^{18} sm^{-3}, elektronlar va kovaklarning harakatchanligi mos ravishda μ_n = 800 $sm^2/(V\cdot s)$ va μ_p = 40 $sm^2/(V\cdot s)$, zaryad tashuvchilarning yashash vaqti $\tau_n = \tau_p = 5\cdot10^{-7}$ s. Rentgen topografiyasi va kislotali o‘ yish usullari bilan o‘ lchangan dislokatsiyalar zichligi 10^3 sm^{-2} ni tashkil etdi; egizak tuzilmalar kuzatilmadi.

Namunalar tekis-parallel plastinka ko‘ rinishida tayyorlandi: ko‘ ndalang kesim yuzasi S = 4 sm^2, qalinligi d = 2,65 mm. Kesishdan keyin plastinkalar M10, M5 va M3 donadorlikdagi olmos kukunlarida silliqlandi, so‘ ngra ASM 1,0 olmos pastasi yordamida jilolandi. Mexanik ishlov berishda hosil bo‘ ladigan buzilgan qatlamni yo‘ qotish uchun namuna 10 ml butil spirti va 0,5 ml suyuq brom aralashmasiga tushirildi; eritish tezligi 1 mkm/min bo‘ ldi. Erituvchi qoldig‘ i kristall yuzasidan ketma-ket butil spirti, etil spirti va distirllangan suv bilan tozzalab yuvib tashlandi. Yarim shaffof nikel qatlami tayyor yuzaga VUP-5M qurilmasida purkaldi hamda taqqoslash uchun ikkinchi namunada ham xuddi shu tartibda oltin qatlam hosil qilindi.

O‘ lchash ishlarida kuchlanishni 0÷3 kV oralig‘ ida uzluksiz o‘ zgartirish imkonini beruvchi o‘ zgarmas tok manbaidan foydalanildi. Volt-amper tavsiflari LKD4-003 rusumli ikki koordinatali o‘ zi yozib oluvchi qurilma yordamida yozib olindi. Yorug‘ lik manbai sifatida OI-24 rusumli yoritgichning cho‘ g‘ lanma lampasidan foydalanilgan. Nurlanish intensivligi sezgirlik koeffitsienti 0,72 Vt/A bo‘ lgan LETI rusumli termostolbik bilan, bazi hollarda esa FD-17K va FD-24K fotodiodlari bilan o‘ lchandi. Fotoelektrodga tushayotgan yorug‘ lik oqimi metall to‘ rli kalibrlangan neytral filtrlar to‘ plami yordamida bosqichma-bosqich kamaytirib borildi. Olib borilgan tajribada natijalari va barcha o‘ lchashlar xona haroratida ya’ni T = 300 K bo‘ lgan sharoitda bajarildi. Tajribalarning asosiy shart-sharoitlari quyidagi 1-jadvalda keltirib o‘ tilgan.

1-jadval

Tajriba sharoitlari va namuna parametrlari

Parametr	Belgisi	Qiymati
Fotoelektrod materiali	–	CdTe⟨Cl⟩
Kiritma konsentratsiyasi	n	10^{18} sm^{-3}
Elektronlar harakatchanligi	μ_n	800 $sm^2/(V\cdot s)$
Kovaklar harakatchanligi	μ_p	40 $sm^2/(V\cdot s)$
Zaryad tashuvchilar yashash vaqti	$\tau_n = \tau_p$	$5\cdot10^{-7}$ s
Dislokatsiyalar zichligi	N_d	10^3 sm^{-2}
Plastinka yuzasi	S	4 sm^2
Plastinka qalinligi	d	2,65 mm
Gaz oralig‘ i qalinligi	d_g	20÷100 mkm
Qoldiq bosim	p	80 va 200 Torr
Ishchi harorat	T	300 K
Kuchlanish oralig‘ i	U	0÷3 kV

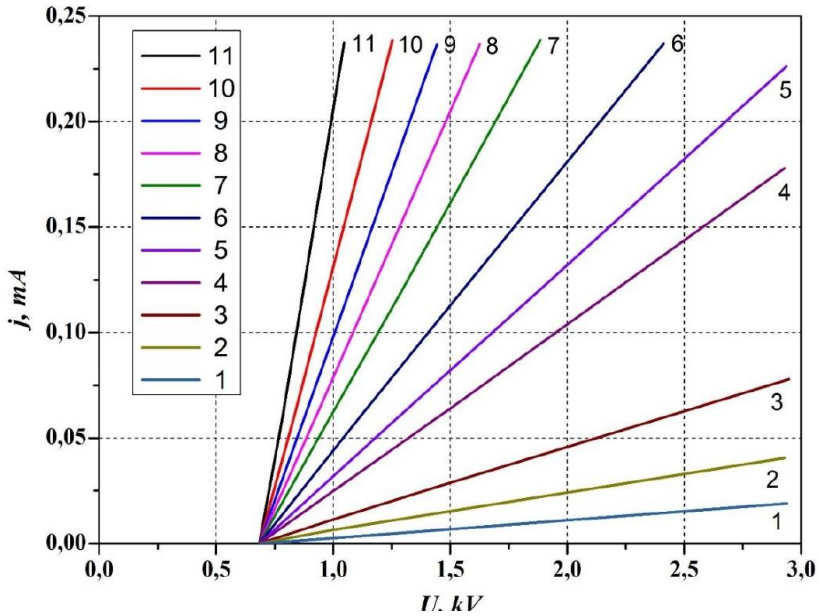
Natijalar va ularning tahlili.

Nikel kontaktli CdTe fotoqabulqilgichga ega GRTning 200 Torr qoldiq bosimda va turli yorug‘ lik intensivliklarida olingan volt-amper tavsiflari o‘ ziga xos xususiyatga ega bo‘ lib chiqdi, tizimda hatto 500 V kuchlanishda ham sezilarli tok kuzatiladi va uning qiymati fotoelektrodning yoritilishiga bog‘ liq. Kuchlanish oshirilganda egri chiziqning qiyaligi avval ortadi, so‘ ngra doimiylashadi. Tajriba davomida turli intensivliklarga mos egri chiziqlarning ikkinchi qismini davom ettirganimizda, ular bitta nuqtada kesishadi va bu nuqta gaz oralig‘ ining elektr teshilish kuchlanishiga yaqin qiymatni beradi.

Bu anomal boshlang‘ ich uchastkaning tabiatini aniqlash maqsadida qo‘ shimcha tajriba o‘ tkazildi. Razryad oralig‘ i bitta emas, balki tirqishlarining diametri turlicha bo‘ lgan ikkita slyuda plastinkasi bilan chegaralandi - shu yo‘ l bilan tirqish perimetri bo‘ ylab o‘ tadigan razryad yo‘ li ancha uzaytirildi. Natijada volt-amper tavsifidagi “sirtiy teshilish” uchastkasi yo‘ qoldi. Bundan kelib chiqadiki, $U_1 \approx 500$ V kuchlanishda dastlab slyuda tirqishining perimetri bo‘ ylab

teshilish sodir bo‘ lar ekan. Tajribada aniq bo‘ ldiki U_1 va U_2 = 800 V oralig‘ ida tok aynan shu perimetr bo‘ ylab oqadi, U_2 dan yuqori kuchlanishlarda esa razryad butun oraliq yuzasi bo‘ ylab yoyiladi.

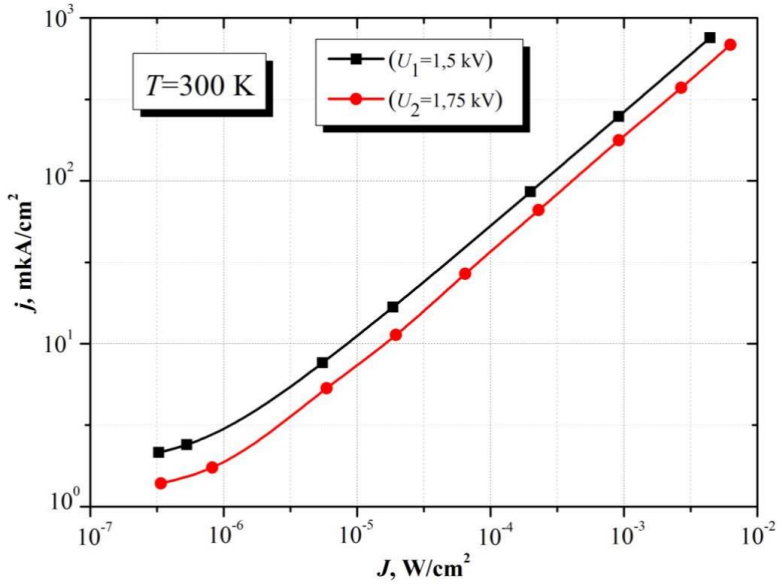
Sirtiy teshilish bartaraf etilganidan keyin 80 Torr bosimda olingan volt-amper tavsiflari 2-rasmda keltirilgan. Endi ular yoritilganlikning butun tekshirilgan oralig‘ ida - nolinchi intensivlikdan $5{,}4\cdot10^{-3}$ Vt/sm² gacha — chiziqli ko‘ rinishga ega va barchasi abssissa o‘ qini taxminan 0,7 kV nuqtasida kesib o‘ tadi. Bu kuchlanish yorug‘ lik intensivligiga bog‘ liq emas, ya’ni u sof gaz oralig‘ iga tegishli kattalik bo‘ lib, uni aynan bu tizim uchun elektr teshilish kuchlanishi sifatida qabul qilish mumkin.



2-rasm. Ni kontaktli CdTe fotoelektrodga ega GRTning p = 80 Torr va T = 300 K sharoitida turli yorug‘ lik intensivliklarida olingan volt-amper tavsiflari. J teng: 1 - 0; 2 - $5\cdot10^{-5}$; 3 - $1{,}2\cdot10^{-4}$; 4 - $3\cdot10^{-4}$; 5 - $6\cdot10^{-4}$; 6 -$9{,}6\cdot10^{-4}$; 7 - $1{,}6\cdot10^{-3}$; 8 - $2{,}4\cdot10^{-3}$; 9 - $3{,}2\cdot10^{-3}$; 10 - $4\cdot10^{-3}$; 11 $5{,}4\cdot10^{-3}$ Vt/sm²

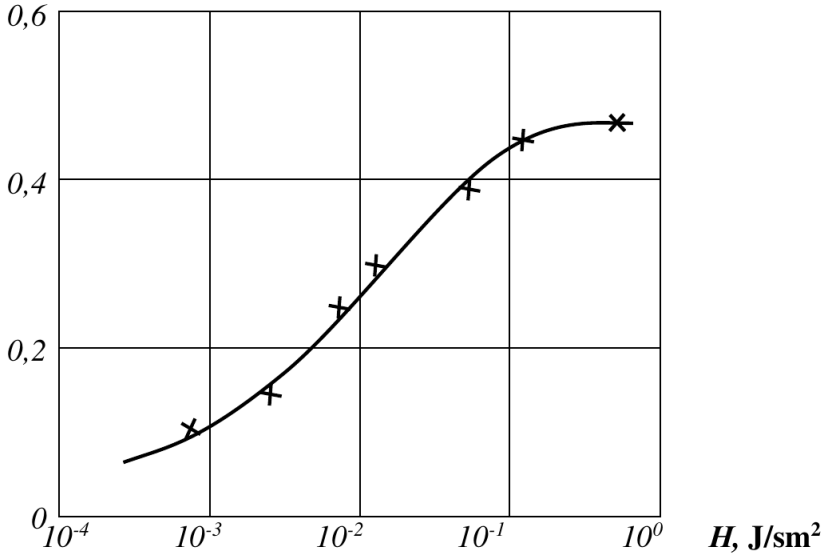
Tajriba davomida xuddi shu o‘ lchashlar oltin kontaktli namuna uchun ham takrorlandi. Natijada egri chiziqlarning umumiy ko‘ rinishi deyarli o‘ zgarmadi, biroq bir xil sharoitda oltin kontaktli tizimdagi tok nikel kontaktlisidan sezilarli kichik bo‘ lib chiqdi. J = $2{,}4\cdot10^{-3}$ Vt/sm² intensivlikda va 1,5 kV kuchlanishda nikel kontakt bilan 210 mkA, oltin kontakt bilan esa 150 mkA tok qayd qilindi. Shu bilan birga har ikkala metall qatlamning yorug‘ lik o‘ tkazuvchanligi amalda bir xil edi, ya’ni farqni optik yo‘ qotishlar bilan izohlab bo‘ lmaydi.

GRT bo‘ ylama tok rejimida ishlagani uchun uning tok bo‘ yicha sezgirligini vatt-amper tavsifi (VTAX) orqali baholash qulay. 3-rasmda ikkita kuchlanish qiymati - U_1 = 1,5 kV va U_2 = 1,75 kV — uchun olingan VTAXlar keltirilgan. Grafiklarda ikki xarakterli soha ajralib turadi. Kirish signali $6\cdot10^{-7}$ dan $3\cdot10^{-6}$ Vt/sm² gacha bo‘ lgan oraliqda tok sekin o‘ sadi — bu $\sigma_h \ll \sigma_k$ shartiga (bu yerda σ_h — yorug‘ likdagi, σ_k — qorong‘ ilikdagi solishtirma o‘ tkazuvchanlik) mos keladi. $3\cdot10^{-6}$ dan $3\cdot10^{-3}$ Vt/sm² gacha bo‘ lgan oraliqda esa bog‘ lanish logarifmik masshtabda to‘ g‘ ri chiziqqa aylanadi.



3-rasm. GRTning T = 300 K haroratda ikki xil kuchlanishda olingan vatt-amper tavsiflari: 1 - U_1 = 1,5 kV; 2 - U_2 = 1,75 kV

Tizimning optik sezgirligini aniqlash uchun razryadning metall plyonkaga ta'siriga asoslangan sensitometrik usuldan foydalanildi. SnO_2 qoplamali shisha plastinka yuzasiga VUP-5M qurilmasida boshlang' ich optik zichligi 0,5 bo' lgan vismut plyonkasi purkaldi. O' lchashlar yorug' lik intensivligi doimiy, ekspozitsiya vaqti esa o' zgaruvchan bo' lgan sharoitda bajarildi. Plyonkaning optik zichligi SR-25M rusumli densitometr bilan qayd etildi. 4-rasmda vismut plyonkasi optik zichligining o' zgarishi ΔD bilan ekspozitsiya H = J·t orasidagi bog' lanish keltirilgan. Grafikdan ko' rinishicha, 0,2 fon darajasida o' lchangan minimal ekspozitsiya $H_{0,2} = 5 \cdot 10^{-3}$ J/sm² ni tashkil etadi.



4-rasm. GRTda fototokni qayd etishda vismut plyonkasi uchun olingan D(H) sensitometrik xarakteristika

Tizimning "zaryad" bo' yicha sezgirligi ham baholandi - bunda plyonka optik zichligining o' zgarishi razryad orqali o' tgan kulon miqdoriga bog' lab o' rganiladi. Boshlang' ich optik zichlikning 50 % ga o' zgarishi mezoni bo' yicha bu kattalik $5 \cdot 10^{-3}$ Kl/sm² dan yomon emasligi aniqlandi. Tajribada olingan o' lchash natijalari 2-jadvalda jamlangan.

2-jadval

CdTe–SnO_2 tizimining aniqlangan fotoelektrik parametrlari

Parametr	Qiymati
Elektr teshilish kuchlanishi (p = 80 Torr)	≈ 0,7 kV
Sirtiy teshilish kuchlanishlari (p = 200 Torr)	U_1 ≈ 500 V; U_2 = 800 V
VTAX chiziqli sohasi	$3 \cdot 10^{-6}$–$3 \cdot 10^{-3}$ Vt/sm²
Optik sezgirlik	10^{-6} Vt/sm²
Ekspozitsiya bo' yicha sezgirlik	10^{-3} J/sm²
Minimal ekspozitsiya (0,2 fon)	$H_{0,2} = 5 \cdot 10^{-3}$ J/sm²
"Zaryad" sezgirligi	$5 \cdot 10^{-3}$ Kl/sm² dan yomon emas
Tok (J = $2,4 \cdot 10^{-3}$ Vt/sm², U = 1,5 kV): Ni / Au	210 / 150 mkA

Volt-amper tavsiflarining boshlang' ich qismidagi murakkab ko' rinish, tajribalar ko' rsatganidek, fotoelektrod materialining xossalariga emas, balki qurilma konstruksiyasiga bog' liq ekan. Razryad oralig' ini chegaralovchi slyuda tirqishining perimetri bo' ylab hosil bo' ladigan sirtiy o' tkazuvchanlik to' liq razryaddan ancha past kuchlanishda tok yo' li ochadi va bu volt-amper tavsifida superchiziqli og' ish sifatida namoyon bo' ladi. Ikki slyuda plastinkali konstruksiya bu yo' lni uzaytirib, hodisani amalda yo' q qiladi. Bu natija amaliy ahamiyatga ega: sirtiy teshilish faqat tavsifni buzibgina qolmay, razryad energiyasining bir qismini foydasiz sarflaydi va qurilmaning ish muddatini qisqartiradi.

Sirtiy teshilish bartaraf etilgach olingan chiziqli volt-amper tavsiflari (2-rasm) muhim xulosaga olib keladi: fototok to' yinish kuchlanishidan past bo' lgan barcha kuchlanishlarda yorug' lik intensivligiga kuchli bog' liq bo' lib qoladi. Egri chiziqlarning abssissa o' qini bitta nuqtada kesishi esa gaz oralig' ining teshilish kuchlanishi yoritilganlikka bog' liq emasligini ko' rsatadi — bu yarimo' tkazgich va gaz oralig' ining ketma-ket ulangan ikki mustaqil element sifatida

ishlashiga mos keladi. Shunga o‘ xshash xulq xona haroratida poluizolyator arsenid galliy fotoelektrodli tizimlar uchun ham qayd etilgan edi [8, 9], demak, tellurid kadmiy bu jihatdan allaqachon sinovdan o‘ tgan materiallar qatoridan o‘ rin oladi.

Nikel va oltin kontaktlarni taqqoslash natijasi biroz kutilmagan bo‘ ldi. Ikkala qatlamning yorug‘ lik o‘ tkazuvchanligi bir xil bo‘ lgani uchun tok farqini optik yo‘ qotishlar bilan tushuntirib bo‘ lmaydi; sabab kontaktning o‘ zida — nikel CdTe bilan omik qonuniyatga yaqinroq kontakt hosil qiladi va zaryad tashuvchilarni kristallga to‘ sqinliksiz yetkazadi. Shuni ta’kidlash kerakki, volt-amper tavsifining chiziqliligi o‘ z-o‘ zidan kontaktning omikligini isbotlamaydi — poluizolyator yarimo‘ tkazgichlarda bu ikkisi har doim ham mos kelmaydi [10]. Shu sababli bu yerda gap kontaktning GRT ish rejimidagi funksional yaroqliligi haqida bormoqda.

Vatt-amper va sensitometrik tavsiflar birgalikda tizimning dinamik diapazonini belgilaydi. VTAXning sekin o‘ sadigan boshlang‘ ich qismi qorong‘ ilik o‘ tkazuvchanligi hali ustun bo‘ lgan sohaga to‘ g‘ ri keladi; yorug‘ likdagi o‘ tkazuvchanlik undan oshgach, bog‘ lanish chiziqli bo‘ lib qoladi va shu sohada tasvirning yarim tonlari buzilishsiz uzatiladi. Yorug‘ lik intensivligi bo‘ yicha 10^{-6}–10^{-3} Vt/sm², ekspozitsiya bo‘ yicha 10^{-3}–10^{-1} J/sm² oralig‘ ida saqlanadigan bu chiziqlilik CdTe ni ko‘ rinuvchi nurlar sohasida ishlaydigan ionizatsion kameralar uchun yaroqli material sifatida tavsiflaydi.

Xulosa

1. Xlor bilan legirlangan poluizolyator monokristall tellurid kadmiy fotoqabulqilgichga ega CdTe–SnO_2 gaz razryadli tizimining volt-amper, vatt-amper va sensitometrik tavsiflari xona haroratida o‘ lchandi.

2. Volt-amper tavsiflarining boshlang‘ ich qismidagi anomal uchastka slyuda tirqishi perimetri bo‘ ylab yuzaga keladigan sirtiy teshilish natijasi ekanligi aniqlandi; ikki slyuda plastinkali konstruksiya yordamida bu hodisa bartaraf etildi va to‘ liq chiziqli tavsiflarga erishildi.

3. Gaz oralig‘ ining elektr teshilish kuchlanishi (p = 80 Torr da ≈ 0,7 kV) yorug‘ lik intensivligiga bog‘ liq emasligi ko‘ rsatildi.

4. Vatt-amper tavsiflari $3\cdot10^{-6}$–$3\cdot10^{-3}$ Vt/sm² oralig‘ ida chiziqli bo‘ lib, tizimning optik sezgirligi 10^{-6} Vt/sm², ekspozitsiya bo‘ yicha sezgirligi 10^{-3} J/sm², “zaryad” sezgirligi esa $5\cdot10^{-3}$ Kl/sm² dan yomon emasligi aniqlandi.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish

Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma’lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan. Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi. Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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7-O‘ LCHAMLI METABELIAN FILIFORM LI ALGEBRASINING LOKAL DIFFERENSIYALLASHLARI

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Annotatsiya; *Ushbu maqolada 7-o‘ lchamli metabelian filiform Li algebrasining lokal differentsiyallashlari o‘ rganiladi. Algebra bazis elementlari orasidagi Li ko‘ paytmalari yordamida differentsiyallash operatorining umumiy ko‘ rinishi aniqlanadi. Leibniz qoidasi asosida differentsiyallash matritsasi quriladi va lokal differentsiyallashlar fazosi oddiy differentsiyallashlar fazosi bilan bog‘ liqligi tahlil qilinadi. Olingan natijalar filiform Li algebralarining strukturaviy xususiyatlarini o‘ rganishda qo‘ llanishi mumkin.*

Kalit so‘ zlar: *Li algebra, filiform Li algebra, metabelian algebra, differentsiyallash, lokal differentsiyallash, differentsiyallash matritsasi.*

LOCAL DERIVATIONS OF A 7-DIMENSIONAL METABELIAN FILIFORM LIE ALGEBRA

Abstract; *This article examines the local derivations of 7-dimensional metabelian filiform Lie algebras. The general form of the derevation operator is determined using the Lie product between the base elements of the algebra. Based on Leibniz’s rule, a derevation matrix is constructed, and the relationship between the space of local derevations and the space of ordinary derevation is analyzed. The results obtained can be used to study the structural features of filiform Lie algebras.*

Keywords: *Lie algebras, filiform Lie algebras, metabelic algebras, derevation, local derevation, derevation matrix.*

ЛОКАЛЬНЫЕ ДЕРИВАЦИИ 7-МЕРНОЙ МЕТАБЕЛИАЛЬНОЙ ФИЛИФОРМЕННОЙ АЛГЕБРЫ ЛИ

Аннотация; *В данной статье рассматриваются локальные деривации 7-мерных метабелевых филиформных алгебр Ли. Общая форма оператора дифференцирования определяется с помощью произведения Ли между базовыми элементами алгебры. На основе правила Лейбница строится дифференциальная матрица и анализируется связь между пространством локальных дифференциаций и пространством обычных дифференциаций. Полученные результаты могут быть использованы для изучения структурных особенностей нитевидных алгебр Ли.*

Ключевые слова: *Алгебры Ли, филиформные алгебры Ли, метабелические алгебры, дифференцирование, локальное дифференцирование, дифференциальная матрица.*

Kirish. Mamlakatimizda fundamental fanlarning ilmiy va amaliy tatbiqiga ega bo‘ lgan amaliy matematika, informatika, raqamli iqtisodiyot fanlariga e’tibor kuchaytirildi. Jumladan, noassotsiativ algebralar va ularning operatorlariga doir fundamental tadqiqotlarning rivojlanishiga ham alohida e’tibor qaratildi. Bu fundamental tadqiqotlar doirasida Leibniz algebralarining lokal va 2-lokal differensiallashlarini o‘ rganish borasida salmoqli natijalarga erishildi. «Algebra va funktsional analiz» fanlarining ustivor yo‘ nalishlari bo‘ yicha xalqaro standartlar darajasida ilmiy tadqiqotlar olib borish asosiy vazifalar va faoliyat yo‘ nalishlari etib belgilangan qaror ijrosini ta’minlashda ham operatorlar algebralari differensiallashlar nazariyasini rivojlantirish muhim ahamiyatga ega. Li algebralari zamonaviy algebra, differensial geometriya va matematik fizikaning muhim yo‘ nalishlaridan biridir. Filiform Lie algebralari nilpotent Lie algebralar sinfining maksimal nilpotentlik indeksiga ega bo‘ lgan muhim oilasini tashkil qiladi.So‘ nggi yillarda Li algebralarida differentsiyallashlar va lokal differentsiyallashlar tushunchalari keng o‘ rganilmoqda. Oddiy differentsiyallashdan farqli ravishda lokal differentsiyallash har bir element uchun alohida differentsiyallash operatori orqali aniqlanadi. Ushbu ishda 7-o‘ lchamli metabelian filiform Lie algebra uchun differentsiyallash va lokal differentsiyallash operatorlarining matritsaviy ko‘ rinishi aniqlanadi.

Adabiyotlar tahlili. Yuqoridagi tushunchalar R.V. Kadison ishlarida keltirilgan va o‘ rganilgan[1]. Shu bilan birgalikda D.R. Larson va A.R. Sourour ishlarida ham keltirilgan [2]. Yuqorida ta’kidlab o‘ tilgn ishlar avtomorfizmlar, C^*-algebralar va operator algebralarning differentsiyallashlariga yaqin bo‘ lgan akslantirishlarning tavsifiga bag‘ ishlangan bir qator ishlarga turtki bo‘ ldi. D.R. Larson va A.R. Sourourlar $\mathcal{A} = B(X)$ tenglikni isbotlashdi. Sh.A.Ayupov va K.K.Kudaybergenovlar ba’zi chekli o‘ lchamli sodda Li va Leibniz algebralarining lokal avtomorfizmlarini o‘ rganganlar[5].

Tadqiqot metodologiyasi

L Li algebrasi bo‘ lsin. Quyidagi markaziy qatorlarni qaraylik:

$$\gamma^1 = \gamma\gamma, \quad \gamma^{k+1} = [\gamma^k, \gamma], \quad k \geq 1,$$
$$\gamma^{[1]} = \gamma, \quad L^{[s+1]} = [L^{[s]}, \gamma^{[s]}], \quad s \geq 1.$$

L Li algebrasi nilpotent deyiladi (mos ravishda, yechiluvchan), agar shunday $p \in \mathcal{N}$ ko‘ rinishdagi $\mathbb{L}^p = 0$ (mos ravishda, $\mathbb{L}^{[p]} = 0$). Bunda $k$eng kichik butun son $\mathbb{L}^k = 0$ tengligi L ning nilindeksi (yoki nilpotentlik kllasi) deyiladi. [4]

Abelian bo‘ lmagan L Li algebrasi metabelian deyiladi, agar $[L, L]$– abelian bo‘ lsa, ya’ni $L^{(2)} = 0$ bo‘ lsa. $n \geq 7$ o‘ lchamli metabelian filiform L Li algebrasini qaraymiz va ushbu

$$[e_1, e_i] = e_{i+1}, 2 \leq i \leq n-1,$$
$$[e_2, e_i] = e_{i+2} + e_{i+3}, 3 \leq i \leq n-2,$$
$$[e_2, e_{n-2}] = e_n.$$

munosabatlar o‘ rinli bo‘ luvchi $\{e_1, \dots, e_n\}$ bazisga ega bo‘ lsin[7].

$\boldsymbol{L-7}$o‘ lchamli Li algebra bo‘ lib, uning bazasi $\{e_1, e_2, e_3, e_4, e_5, e_6, e_7\}$ va nol bo‘ lmagan ko‘ paytmalari

$$[e_1, e_2] = e_3,$$
$$[e_1, e_3] = e_4,$$
$$[e_1, e_4] = e_5,$$
$$[e_1, e_5] = e_6,$$
$$[e_1, e_6] = e_7,$$
$$[e_2, e_3] = e_5 + e_6,$$
$$[e_2, e_4] = e_6 + e_7$$

Bilan berilgan.

Li algebraning antisimmetrikligi sababli:

$$[e_i, e_j] = -[e_j, e_i]$$

bajariladi.

Bu algebra uchun

$$[L^2, L^2] = 0$$

bo‘ lganligi sababli u metabelian algebra deyiladi.

Differentsiyallash

Ta’rif-1. Agar $d: L \to L$ chiziqli akslantirish uchun quyidagi tenglik bajarilsa:

$$d([x, y]) = [d(x), y] + [x, d(y)] \quad \forall x, y \in L$$

U holda ushbu akslantirish berilgan L algebrasining differensiallashi deyiladi.

Har bir basis elementi uchun

$$D(e_i) = \sum_{j=1}^{7} a_{ji} e_j$$

deb olinadi

Avvalo:

$$e_3 = [e_1, e_2]$$

tenglikdan foydalanib $D(e_3) = D([e_1, e_2])$ hosil qilanadi.

Leybnits qoidasi yordamida:

$$D(e_3) = [D(e_1), e_2] + [e_1, D(e_2)]$$

tenglik olinadi.

Xuddi shu usulida

$$e_4 = [e_1, e_3],$$
$$e_5 = [e_1, e_4],$$
$$e_6 = [e_1, e_5],$$
$$e_7 = [e_1, e_6]$$

uchun tenglamalar sistemasi hosil qilinadi:

Natijada differentsiyallash operatorining umumiy matritsasi quyidagi ko‘ rinishga ega bo‘ ladi:

$$D=\begin{pmatrix} a_{11} & a_{12} & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{11}+a_{22} & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{32} & 2a_{11}+a_{22} & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{42} & a_{21}+a_{32} & 3a_{11}+a_{22} & 0 & 0 \\ a_{61} & a_{62} & a_{52} & a_{21}+a_{42} & 2a_{21}+a_{32} & 4a_{11}+a_{22} & 0 \\ a_{71} & a_{72} & a_{62} & a_{52} & 2a_{21}+a_{42} & 3a_{21}+a_{32} & 5a_{11}+a_{22} \end{pmatrix}$$

Bu yerda $a_{ij} \in F$ixtiyoriy skalyarlar.

Lokal differentsiyallashlar

Ta'rif-2. Bizga $\Delta: L \to L$ chiziqli akslantirish berilgan bo' lsin. Agar L algebraning$\forall x \in L$ elementi uchun shunday D_x differensiallash topilib $\Delta(x) = D_x(x)$ tenglik bajarilsa, u holda Δ lokal differensiallash deyiladi.

Agar bu algebra uchun local differentsiyallash operatori ham yuqoridagi differentsiyallash matritasisi bilan aniqlanadi:

$$LocDer(L) = Der(L)$$

ya'ni har bir local differentsiyallash oddiy ma'noda differentsiyallash hisoblanadi.

Muhokama va munozara

Olingan natija shuni ko' rsatadiki, 7 o' lchamli metabelian filiform Li algebra uchun differentsiyallashlar strukturasi yuqori uchburchak ko' rinishiga ega. Bu holat filiform Li algebralarning tabiiy gradatsiyasi bilan bog' liq.

Differentsiyallash matritasining diagonal elementlari

$$a_{11}, a_{11}+a_{22}, 2a_{11}+a_{22}, \ldots, 5a_{11}+a_{22}$$

ko' rinishida ketma-ket o' suvchi struktura hosil bo' ladi.

Bu esa algebra ichki strukturasi differentsiyallashlar orqali qanday saqlanishini ko' rsatadi.

Xulosa

Ushbu maqolada, 7-o' lchamli metabelian filiform Li algebra uchun differentsiyallash operatorining umumiy ko' rinishi topiladi.

Asosiy natija

$$LocDer(L) = Der(L)$$

bo' lib, local differentsiyallashlar fazosi oddiy differentsiyallashlar fazosi bilan ustma-ust tushushi ko' rsatiladi.

Differentsiyallash operatorining matritasisi ko' rinishda beriladi.

$$D=\begin{pmatrix} a_{11} & a_{12} & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{11}+a_{22} & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{32} & 2a_{11}+a_{22} & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{42} & a_{21}+a_{32} & 3a_{11}+a_{22} & 0 & 0 \\ a_{61} & a_{62} & a_{52} & a_{21}+a_{42} & 2a_{21}+a_{32} & 4a_{11}+a_{22} & 0 \\ a_{71} & a_{72} & a_{62} & a_{52} & 2a_{21}+a_{42} & 3a_{21}+a_{32} & 5a_{11}+a_{22} \end{pmatrix}$$

Foydalanilgan adabiyotlar ro' yxati.

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NATRIY LIGNOSULFONAT VA ORGANOFOSFONATLAR ASOSIDA MINERAL TUZLAR TO‘ PLANISHI INGIBITORLARI SINTEZINI TADQIQ QILISH

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Annotatsiya. *Neft-gaz sanoatida, shuningdek kommunal xo‘ jaligi suv ta’minotida qo‘ llaniladigan mineral tuzlar to‘ planishi ingibitorlarini natriy lignosulfonat va organofosfonatlar asosida sintez qilish jarayonining texnologik parametrlari o‘ rganildi. Somondan ajratilgan lignin sulfolash va sulfonatlash orqali natriy lignosulfonatga aylantirilib, keyin nitrilotrimetilenfosfon kislota (NTF) va oksietilidendifosfon kislota (OEDF) bilan modifikatsiya qilindi. Modifikatsiyalashning maqbul parametrlari, xususan reagentlar miqdori, harorat, muhit pH qiymati va jarayon davomiyligi ko‘ rib chiqildi. Olingan tizimlarning ingibirlash samaradorligi, tuzlarga chidamliligi va termik barqarorligi taqqoslandi. Natriy lignosulfonatning OEDF va NTF bilan modifikatsiyalanishi fosfon guruhlarini kiritish va kompleks hosil qilish imkoniyatini oshirishi, shuningdek ultrabinafsha spektrda dastlabki natriy lignosulfonat spektridan farq qiluvchi signallar hosil bo‘ lishi bilan tavsiflandi.*

Kalit so‘ zlar: *natriy lignosulfonat, lignin, organofosfonatlar, OEDF, NTF, mineral tuzlar, ingibitor, fosfon guruhlari, ultrabinafsha spektr.*

STUDY OF THE SYNTHESIS OF MINERAL SCALE INHIBITORS BASED ON SODIUM LIGNOSULFONATE AND ORGANOPHOSPHONATES

Abstract. *The technological parameters of the synthesis of mineral scale inhibitors based on sodium lignosulfonate and organophosphonates, used in the oil and gas industry as well as in municipal water supply, were studied. Lignin separated from straw was converted into sodium lignosulfonate through sulfonation and subsequent sulfonatization, and then modified with nitrilotrimethylene phosphonic acid (NTF) and oxyethylidene diphosphonic acid (OEDF). The optimal parameters of modification, including the reagent amount, temperature, pH of the medium and process duration, were considered. The inhibition efficiency, salt resistance and thermal stability of the obtained systems were compared. Modification of sodium lignosulfonate with OEDF and NTF was characterized by the introduction of phosphonate groups and an increased possibility of complex formation, as well as by the appearance of signals in the ultraviolet spectrum differing from the spectrum of the initial sodium lignosulfonate.*

Keywords: *sodium lignosulfonate, lignin, organophosphonates, OEDF, NTF, mineral salts, inhibitor, phosphonate groups, ultraviolet spectrum.*

ИССЛЕДОВАНИЕ СИНТЕЗА ИНГИБИТОРОВ МИНЕРАЛЬНЫХ СОЛЕЙ НА ОСНОВЕ ЛИГНОСУЛЬФОНАТА НАТРИЯ И ОРГАНОФОСФОНАТОВ

***Аннотация**. Изучены технологические параметры синтеза ингибиторов отложения минеральных солей на основе лигносульфоната натрия и органофосфонатов, применяемых в нефтегазовой промышленности, а также в коммунальном водоснабжении. Лигнин, выделенный из соломы, превращали в лигносульфонат натрия путём сульфирования и последующего сульфонатирования, после чего модифицировали нитрилотриметиленфосфоновой кислотой (НТФ) и оксиэтилидендифосфоновой кислотой (ОЭДФ). Рассмотрены оптимальные параметры модифицирования, включая количество реагентов, температуру, pH среды и продолжительность процесса. Сопоставлены ингибирующая эффективность, устойчивость к солям и термическая стабильность полученных систем. Модифицирование лигносульфоната натрия ОЭДФ и НТФ характеризовалось введением фосфонатных групп и повышением возможности образования комплексов, а также появлением сигналов в ультрафиолетовом спектре, отличающихся от спектра исходного лигносульфоната натрия.*

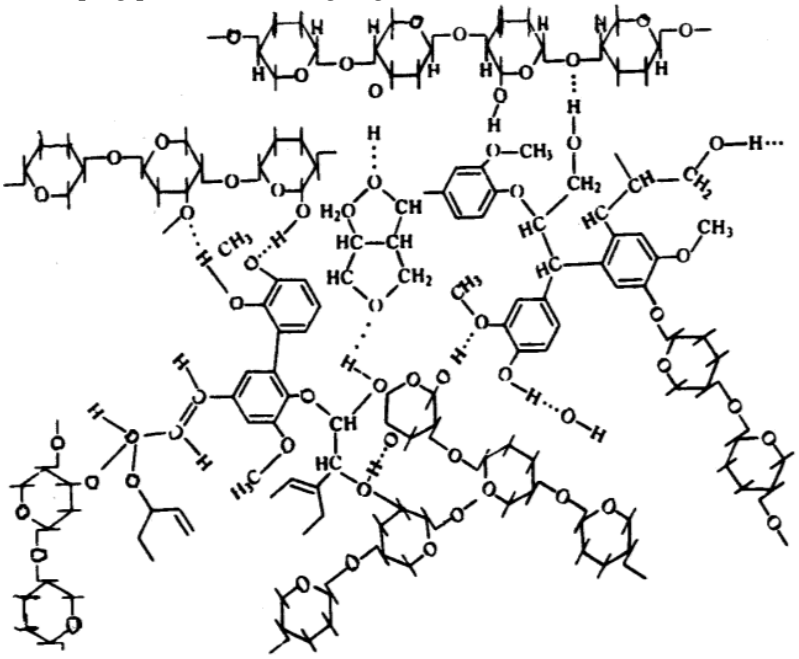
***Ключевые слова:** лигносульфонат натрия, лигнин, органофосфонаты, ОЭДФ, НТФ, минеральные соли, ингибитор, фосфонатные группы, ультрафиолетовый спектр.*

Kirish. Mineral tuzlarining cho‘ kishi neft-gaz quduqlari, quvurlar va texnologik jihozlarda oqim kesimining torayishi, ishlab chiqarish samaradorligining pasayishi va jihozlarning ishdan chiqishiga olib kelishi mumkin. Neft-gaz tizimlarida karbonatli, sulfidli va sulfatli tuzlar keng tarqalgan bo‘ lib, ularning hosil bo‘ lishi harorat, bosim, eritmaning to‘ yinish darajasi va gidrodinamik sharoitlar bilan bog‘ liq [1]. Mineral tuzlar hosil bo‘ lishini oldini olishda ingibitorlardan foydalanish keng qo‘ llaniladi; ayniqsa threshold-inhibitorlar kam miqdorlarda kristall nukleatsiyasi va o‘ sishini sekinlashtirishi mumkin [2]. Bunday tizimlarda fosfor saqlovchi birikmalar, polikarboksilatlar va sulfonatlangan polimerlar ishlatiladi [2]. Lignosulfonatlar syellyuloza-qog‘ oz sanoatida hosil bo‘ ladigan lignin hosilalari bo‘ lib, ularning funksional guruhlari va dispergirlovchi xususiyatlari suvli tizimlarda qo‘ llanish imkonini beradi. Natriy lignosulfonatning $CaCO_3$ cho‘ kishiga ta’siri bo‘ yicha tadqiqotlarda uning modifikatsiyalanmagan holdagi ingibirlash samaradorligi cheklanganligi, modifikatsiya esa ta’sirini oshirishi mumkinligi ko‘ rsatilgan [3]. Lignosulfonatning $CaCO_3$ minerallashuvida kristall fazasi va morfologiyasiga ta’sir ko‘ rsatishi ham qayd etilgan [4]. So‘ nggi tadqiqotlarda lignosulfonatlarni funksional guruhlar bilan modifikatsiyalash orqali barqaror va samarali ingibitorlar olishga e’tibor kuchaygan. Xususan, oksidlangan lignosulfonatlar kalsit cho‘ kishiga nisbatan dastlabki lignosulfonatlarga qaraganda ancha yuqori ingibirlash ta’sirini ko‘ rsatgan va kalsiyga chidamlilik hamda termik barqarorlik xususiyatlari bilan tavsiflangan [5]. Ingibitorlarning ishlash mexanizmi va ularni quduqlarda qo‘ llash usullarini tushunishda ingibitorning sirtda adsorbsiyalanishi, ushlab qolinishi va ajralishi muhim hisoblanadi [6]. Turli ingibitorlarning harorat va konsentratsiyaga bog‘ liq samaradorligi esa CaCO3 cho‘ kishini nazorat qilishda reagent tarkibi va ish sharoitlarini birgalikda baholash zarurligini ko‘ rsatadi [7]. Neft-gaz va neftni qayta ishlash sanoatida metall jihozlarni korroziyadan himoya qilish uchun organik va kompleksonat asosidagi ingibitorlarni ishlab chiqish muhim yo‘ nalishlardan biri hisoblanadi. OEDF ishtirokida tetragidroimidazo-[4,5-d]-imidazoldion-2,5 asosida olingan kompozisiyalar po‘ latni korroziyadan 90% dan ortiq himoya qilishi aniqlangan [8]. Shuningdek, Zn–NTF–OEDF asosidagi metallokompleks kompozisiyalar korroziya va mineral tuzlar to‘ planishiga qarshi ingibitor sifatida tadqiq etilgan [9]. Mineral tuzlar to‘ planishiga qarshi yangi aromatik diamin asosidagi ingibitorning samaradorligi 92–95% ni tashkil etgan [10]. Aromatik diamin asosidagi ingibitorlarda esa korroziyadan himoya samaradorligi alkil zanjiri uzunligiga bog‘ liq bo‘ lib, optimal strukturada 79,8% samaradorlik qayd etilgan [11]. MEE seriyali bis-karbamatlari ham ingibirlovchi xususiyatlarni namoyon qilib, MEE-1 past zichlikdagi polietilenning termooksidlanish barqarorligini 2,5–43,2 marta oshirgan [12], MEE-2 esa motor yoqilg‘ ilarining korrozion faolligini kamaytirish uchun istiqbolli qo‘ shimcha sifatida tavsiflangan [13]. Tetragidroimidazo-[4,5-d]-imidazoldion-2,5 asosidagi kompozision ingibitorlar esa turli agressiv muhitlarda 90% dan yuqori himoya samaradorligini namoyon qilgan [14]. Shu nuqtai nazardan, natriy lignosulfonat matrisasini OEDF va NTF kabi organofosfonatlar bilan modifikatsiyalash fosfonat guruhlarining kompleks hosil qilish xususiyatlarini polimer matrisasining dispergirlovchi ta’siri bilan birlashtirish imkonini beradi. Mazkur ishda natriy lignosulfonat va organofosfonatlar asosida mineral tuzlar to‘ planishi ingibitorlari sintezining texnologik parametrlari va modifikatsiyalangan tizimlarning spektral hamda ingibirlovchi xususiyatlari tadqiq qilingan.

Materiallar va metodlar. Tadqiqotda somondan ajratilgan lignin asosida olingan natriy lignosulfonat (Na-LS) xomashyo sifatida qo‘ llanildi. Na-LS OEDF (oksietilidendifosfon kislota) va NTF (nitrilotrimetilenfosfon kislota) bilan modifikatsiya qilindi. Sintez jarayonida reagentlar nisbati, harorat, pH va reaksiya davomiyligi o‘ zgartirilib, modifikatsiyaning texnologik parametrlari baholandi. Modifikatsiyalangan va modifikatsiyalanmagan Na-LS namunalarining spektral xususiyatlari ultrabinafsha (UB/UV) spektroskopiya orqali taqqoslandi. Shuningdek, ingibirlash

samaradorligi, tuzlarga chidamlilik va termik barqarorlik ko‘ rsatkichlari taqqosiy tarzda baholandi. Faylda qurilmaning aniq markasi yoki modeli ko‘ rsatilmagani sababli bu yerda qurilma nomi umumiy holda berildi.

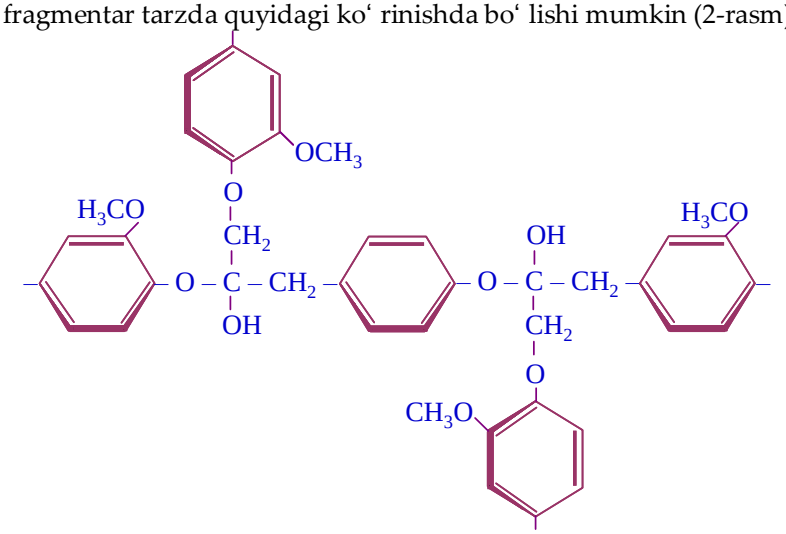
Natijalar va muhokama. Neft-gaz sanoatida, shuningdek kommunal xo‘ jaligi suv ta’minotida katta miqdorlarda qo‘ llaniladigan reagentlardan biri mineral tuzlar to‘ planishi ingibitorlari bo‘ lib, natriy lignosulfonat va organofosfonatlar asosida sintez qilish jarayonining texnologik parametrlari o‘ rganildi. Mineral tuzlar to‘ planishi ingibitorlari sintez qilish uchun somondan ajratilgan ligninni sulfolash, so‘ ngra sulfonatlash orqali olingan natriy lignosulfonat organofosfonatlardan NTF va OEDF bilan modifikatsiyalandi. Ma’lumki, lignin tuzilishining mavjud sxemalari va uning uglevodlar bilan birikish usuli faqat gipotetik xarakterga ega (1-rasm).



1-rasm. Lignouglevod matritsasining tuzilishi

Lignosulfonatlarning suv ta’minotida qo‘ llanilishining o‘ ziga xosligi va sababi ularning ingibirlovchi xususiyatlari bo‘ lib, bu tarkibidagi aromatik qismda dolchin spirtlari: koniferil (I), sinap (II) va kumar (III) spirtlari mavjudligi bilan izohlanadi.

Polimerning monomer birligi sifatida koniferil spirtiga tegishli bo‘ lgan fenilpropan birligi (FPB) qabul qilingan. Ligninning aromatik qismi fragmentar tarzda quyidagi ko‘ rinishda bo‘ lishi mumkin (2-rasm).



2-rasm. Lignin makromolekulasi fragmenti

Sulfitli pishirishda delignifikatsiya qilish vaqtida lignin bilan bir vaqtda sodir bo‘ ladigan uchta asosiy reaksiya ma’lum:

- sulfirlanish reaksiyasi;
- gidrolitik parchalanish reaksiyasi;
- kondensatsiya reaksiyasi.

Qaynatish jarayonlari sulfirlovchi agent ishtirokida olib boriladi, bu agent asosan sulfit kislota (H_2SO_3) hisoblanadi.

Yuqorida qayd etilgan reaksiya turlari nukleofil almashinish mexanizmi bo‘ yicha kechadigan geterolitik reaksiyalar sifatida tasniflanadi va bunda fenilpropan bo‘ g‘ inining yon zanjiri nukleofil agentlar hujumiga uchraydi. Sulfirlash va gidrolitik parchalanish reaksiyalari ligninning erishiga yordam beradi. Ligninning sulfirlangan shakllari lignosulfonatlar deb ataladi va ular syellyuloza-qog‘ oz korxonalarining asosiy mahsuloti bo‘ lgan syellyuloza olish jarayonining qo‘ shimcha mahsulotlaridir. Biroq, qaynatish eritmalarining kuchli kislotali muhitida ligninning erishi kondensatsiya reaksiyasi tufayli sekinlashadi; bu reaksiya harorat oshishi va muhit pH ko‘ rsatkichi pasayishi bilan faollashib, ligninning erishiga hamda sulfirlanish qobiliyatiga to‘ sqinlik qiladi. Bundan tashqari, kislotali muhitda ligninning reaksiyaga kirishish qobiliyatini pasaytiradigan va uning faolsizlanishiga olib keladigan kolloid-kimyoviy o‘ zgarishlar yuz beradi. Qaynatish eritmasining ishqoriy muhitida esa demetillanish reaksiyasi kechadi va bu pirokatexinatlarning hosil bo‘ lishiga ko‘ maklashadi, bu esa lignosulfonatlarning oshlovchilik xususiyatlarini yaxshilash uchun juda qulaydir. Umuman, destruksiya dastlabki xomashyoni delignifikatsiyalashga yordam bersa, u bilan raqobatlashuvchi kondensatsiya reaksiyasi bu jarayonga to‘ sqinlik qiladi. Ligninni kondensatsiyadan himoya qilish sulfirlashdir, o‘ z navbatida, kondensatsiya reaksiyasi sulfirlash reaksiyasiga to‘ sqinlik qiladi. Shu bilan birga, uzoq vaqt muhokama qilingan FPE tarkibidagi sulfoguruh aynan qaysi holatda - α, β yoki γ - joylashgan degan savolning javobi prinsipial ahamiyatga ega emasligi aniqlanib, o‘ zining yakuniy yechimini topdi.

Ligninning to‘ rsimon strukturasining parchalanishi solvolitik destruksiya mexanizmi bo‘ yicha kechadi, bu esa kislotali sulfitli pishirishda yog‘ ochni yetarli darajada delignifikatsiyalashni ta’minlaydi. Biroq neytral va ishqoriy muhitlarda ligninning to‘ rsimon strukturasi deyarli parchalanmaydi, chunki solvolitik destruksiya faqat fenolli strukturalarda oraliq xinonmetil hosil bo‘ lishi orqali sodir bo‘ ladi. Aynan shu holat neytral lignosulfonatlarning fizik-kimyoviy xossalarining yaqqol namoyon bo‘ luvchi xususiyati hisoblanadi. Natijada lignin va uning sulfohosilasi - lignosulfonatning ham reaksion qobiliyati, ham eruvchanligining pasayishiga olib keluvchi kolloid-kimyoviy o‘ zgarishlar yuz beradi. Funksional guruhlarning (metoksil, fenol gidroksil, spirt) tarkibi va miqdori pishirish usullariga hamda qayta ishlanadigan xomashyo turlariga qarab o‘ zgaradi va bu lignosulfonat matrisasini modifikatsiyalash imkonini beradi. Natriy lignosulfonatini oksietilidendifosfon kislota (OEDF) va nitrilotrimetilenfosfon kislota (NTF) bilan modifikatsiyalashning maqbul (optimal) parametrlari tizimning yuqori sedimentasion barqarorligiga (ingibirlash samarasi 90-92% atrofida), tuzlar cho‘ kishini samarali ingibirlashga va burg‘ ilash qorishmalarining reologik xossalarini yaxshilashga qaratilgan bo‘ ladi.

Quyida ushbu jarayonning ilmiy va amaliy tadqiqotlarga asoslangan asosiy maqbul parametrlari keltirilgan. Modifikatsiyalashning maqbul texnologik parametrlari: reagentlarning nisbati (OEDF/NTF va lignosulfonat massasiga nisbatan), lignosulfonat matrisasiga fosfon guruhlarini samarali kiritish uchun OEDF va NTF ning umumiy miqdori lignosulfonat quruq massasiga nisbatan maqbul miqdori 5 - 8 % chegarasida (agar OEDF/NTF miqdori 8% dan oshib ketsa, tizimning yopishqoqligi haddan tashqari pasayib, gidrofillik muvozanati buziladi). Kimyoviy bog‘ lanish va propanol zanjiri bilan kompleks hosil bo‘ lishi uchun maqbul harorat 60 °C dan 80 °C gacha bo‘ lishi lozim (harorat 90 °C dan oshganda lignin yadrolarining termik destruksiyasi va kondensatsiyalanishi kuchayib, mahsulot sifati pasayadi). Muhit ko‘ rsatkichi pH: reaksiya muhitining maqbul pH ko‘ rsatkichi 4,5 - 5,5 (kuchsiz kislotali) oralig‘ ida bo‘ lishi kerak. Bu fosfon kislotalarining qisman dissosiatsiyalanishini va NLS ning funksional guruhlari bilan faol ta’sirlashishini ta’minlaydi. Jarayon davomiyligi: aralashtirish va kimyoviy modifikatsiyalanish-ning to‘ liq yakunlanishi uchun maqbul vaqt 1,5 - 2,5 soatni tashkil etadi.

1-jadval

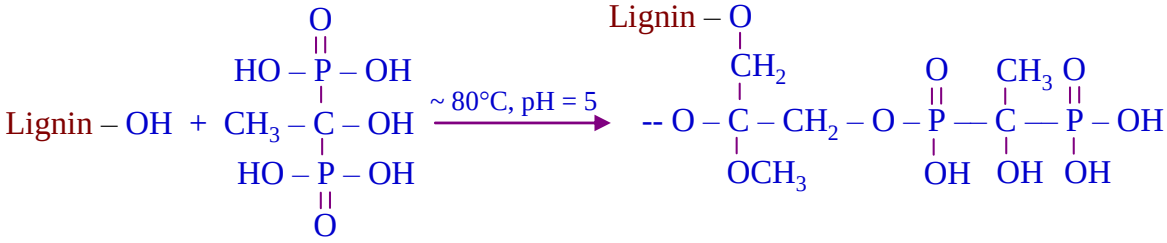
Modifikatsiyalangan tizimning taqqoslama xususiyatlari

Xususiyatlar va parametrlar	Na-LS	Na-LS + OEDF modifikatsiyasi	Na-LS + NTF modifikatsiyasi
Asosiy ta’sir mexanizmi	Yuza-aktivlik, dispergirlash	Fosfon guruhlarining fenilpropan zanjiriga birikishi	Kompleks hosil qilish va amino-metilen zanjirlari shakllanishi
Ingibirlash samaradorligi, %	70	92	88
Tuzlarga chidamlilik Ca^{2+}, Mg^{2+}	Past (tez cho‘ kadi)	Kalsiy ionlari past bo‘ lganda samarali	Kalsiy ionlari yuqori bo‘ lgan muhitda kuchli
Termik barqarorlik, °C	100 – 120	140 – 160	140 – 150

Modifikatsiyalashdan ko‘ zlangan asosiy maqsadlar: kolloid barqarorlikni oshirish - OEDF va NTF tarkibidagi fosfon guruhlari Na-LSning suvda eruvchanligini va qattiq zarralar yuzasida adsorbsiyalanish energiyasini keskin oshiradi; ingibirlash xususiyatini oshirish - modifikatsiyalangan tizim issiqlik almashinuvi apparatlarida va burg‘ ilash quduqlarida

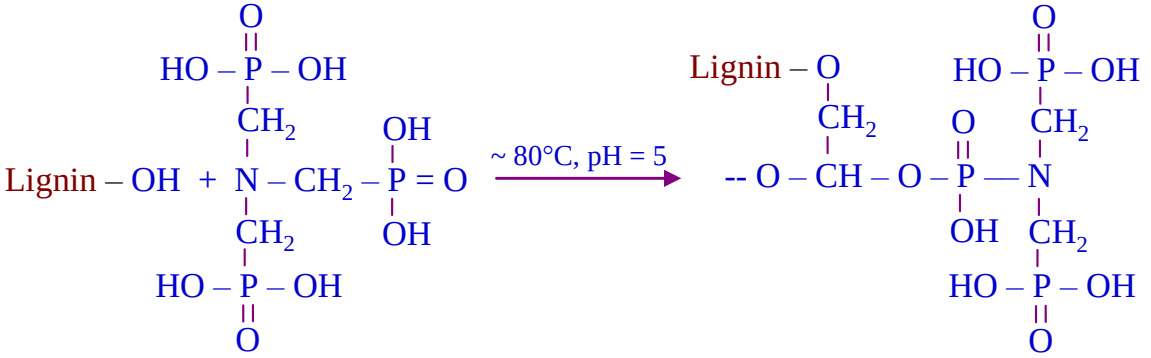
karbonatli va sulfatli tuzlar, shu jumladan $CaCO_3$ cho‘ kishini to‘ xtatib qoladi; reologik nazorat - burg‘ ilash qorishmalarining yopishqoqligi va suv berishini (filtratsiyasini) yuqori harorat va polivalentli tuzlar agressiyasi sharoitida ham barqaror ushlab turadi. Lignin (va Na-LS) murakkab fazoviy polimer bo‘ lgani uchun, kimyoviy sxemalarda uning asosiy tarkibiy birligi bo‘ lgan fenilpropan zanjiri (gvayasil yoki siringil yadrolari) asos qilib olinadi. OEDF va NTF lignin matrisasi bilan vodorod bog‘ lari, efirlanish (eterifikatsiya) va ligninning yon zanjirlaridagi faol markazlar orqali bog‘ lanadi.

Quyida ushbu modifikatsiyalanishning asosiy kimyoviy reaksiya sxemalari keltirilgan. Na-LSning OEDF (oksietilidendifosfon kislota) bilan modifikatsiyalash reaksiyasi quyidagi sxema bo‘ yicha amalga oshadi:



Natijada lignin zanjirining chekka qismida OEDF ning kuchli xelatlovchi fosfon guruhlari hosil bo‘ ladi.

Na-LSni NTF (nitrilottrimetilenfosfon kislota) bilan modifikatsiyalash reaksiyasi:



NTF tarkibida uchlamchi azot atomi va uchta fosfon guruhi bo‘ lganligi sababli, u lignin bilan nafaqat efir bog‘ lari, balki donor-akseptor (koordinasion) va kuchli vodorod bog‘ lari tizimini hosil qiladi. Kislotali muhitda NTF qisman ionlashadi va Na-LSning sulfoguruhlari (-SO_3Na) hamda fenol gidroksillari bilan ta’sirlashadi.

Agar jarayonni umumiylashtirilgan makromolekulyar sxema sifatida tasvirlansa, mahsulot quyidagicha ko‘ rinishga ega bo‘ ladi:

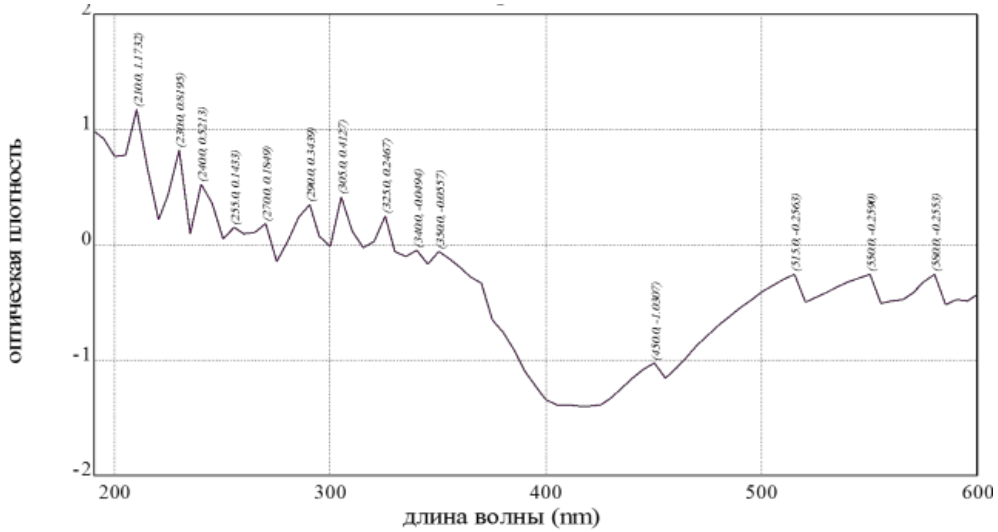
$$\text{НЛС (кўп тармоқли полимер)} + n(\text{Фосфонат}) \xrightarrow{\Delta,\ pH} [\text{НЛС}] \sim\sim\sim [\text{Фосфон гур}$$

Bunda modifikatsiyalangan molekula ikki xil vazifani bajaruvchi gibrid tuzilishga o‘ tadi:

polimer qismi - lignin matrisasi: suvda zarrachalarni himoya qobig‘ i bilan o‘ rab, ularning yopishishiga yo‘ l qo‘ ymaydi (sedimentasion barqarorlik va dispergirlash);

faol qismi - fosfon guruhlari: suvdagi kalsiy (Ca^{2+}) va magniy (Mg^{2+}) ionlarini biriktirib oladi – xelatlar hosil qilida va tuz kristallari o‘ sishini to‘ xtatadi.

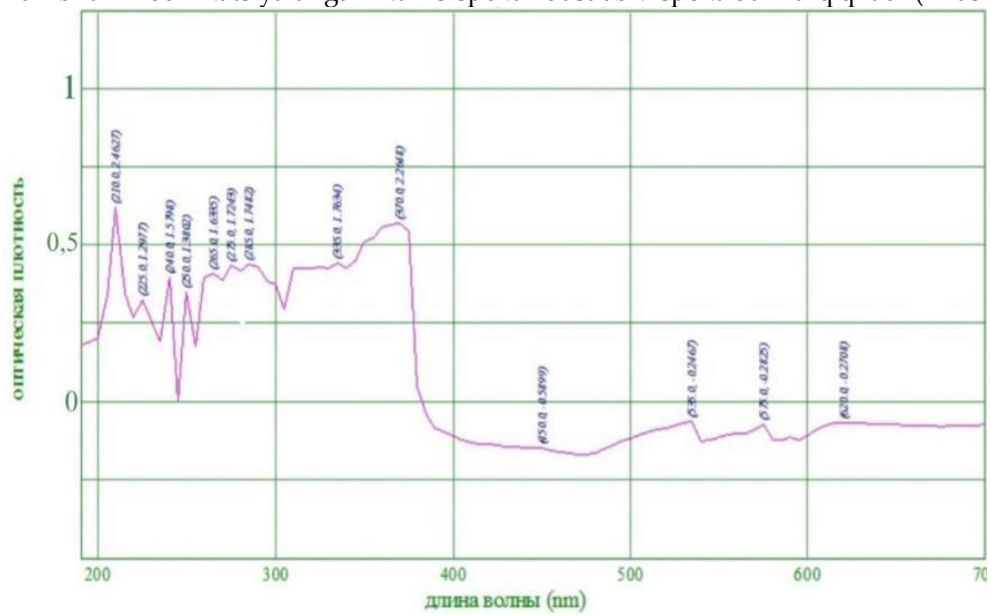
Na-LS eritmalarining OEDF fosfon guruhlari bilan modifikatsiyalanishidan oldingi va keyingi tarkib tuzilishi UB-spektrlari olindi (3-rasm).



3-rasm. OEDF fosfon guruhlari bilan modifikatsiyalanmagan Na-LS spektri

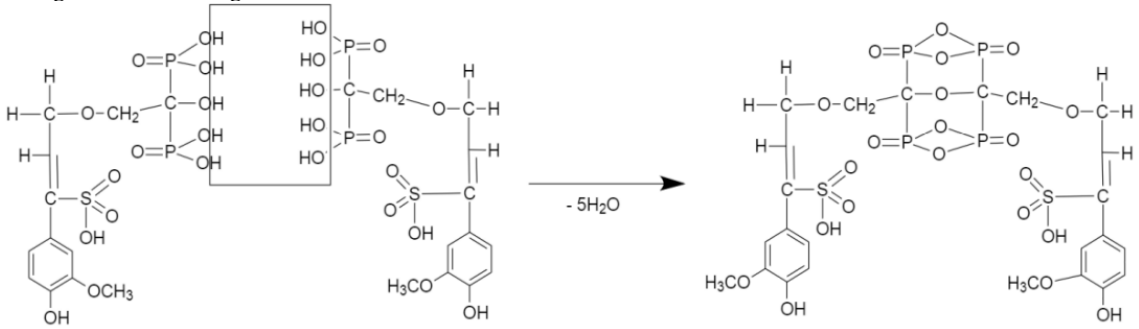
190-350 nm to‘ lqinlar diapazonida Na-LSning aromatik tashkil etuvchisi (ligninning fenilpropan zvenosidagi funksional guruhlar) aks etadi. 450 nm dan boshlab va undan keyingi uzun to‘ lqinli nurlanish sohasida spektrning uglevod qismini kuzatish mumkin.

Fosfon guruhlari bilan modifikatsiyalangan Na-LS spektri dastlabki spektrdan farq qiladi (4-rasm).



4-rasm. OEDF fosfon guruhlari bilan modifikatsiyalangan Na-LS spektri

λ=370 nm da cho‘ qqilar paydo bo‘ lishi kuzatiladi, bu esa Na-LS ning OEDF bilan o‘ zaro ta’sirida yangi birikmalar hosil bo‘ lishining xarakterli belgisidir.



5-rasm. Eterifikatsiya reaksiyasi natijasida murakkab efirning hosil bo‘ lishi

4-rasmdan ko‘ rinib turibdiki, organofosfonatlar bilan modifikatsiyalanmagan lignosulfonat spektri uchun λ=270–280 nm (OH-fenol guruhlari) to‘ lqin uzunligida minimal qiymatdagi cho‘ qqilar xos. OEDF ning fosfon guruhlari bilan modifikatsiyalanishi esa lignosulfonat spektrining ko‘ rinishini o‘ zgartiradi: optik zichlikning siljishi yuzaga keladi. Bu holat 370 nm to‘ lqin uzunligida avval kuzatilmagan cho‘ qqining paydo bo‘ lishida aks etadi va o‘ zaro ta’sir reaksiyasi kechganligidan dalolat beradi.

5-rasmga muvofiq, quyidagi tuzilishdagi birikma hosil bo‘ lishi mumkin. Bizningcha, lignosulfonat matrisasini modifikatsiyalash lignosulfonat monomer zvenosining alifatik propan zanjiriga fosfon fragmentini kiritish hisobiga amalga oshirilishi mumkin. Bu (HPO_3^{2-}) fragmentining kompleks hosil qilish xususiyatlari bilan izohlanadi. Fosforlovchi agentning fosfon guruhlari bir qator protonlangan shakllarda namoyon bo‘ ladi: PO_3^{3-}, PO_3H, PO_3H_2. Bunda PO_3 modifikatsiyalash jarayonida o‘ rni almashinadigan COO^- guruhiga nisbatan ancha yuqori elektrmanfiylikka ega. Bunday almashinish tetrayedr shaklidagi fosfonat-ionning stereokimyosi bilan asoslanadi, holbuki lignosulfonat fenilpropan zvenosining boshqa funksional guruhlari uchun yassi konfiguratsiya xosdir. Fosfon guruhlarini o‘ z ichiga olgan barcha ko‘ rsatilgan kompleksonlarni tarkibida bog‘ langan suvning yo‘ qligi birlashtirib turadi. Lignosulfonatda fenilpropan zvenosi alifatik zanjirining protonlanishi kompleks hosil qiluvchi kation (kalьsiy) atrofida lignosulfon kislotasi anionining yirik aglomeratlari hosil bo‘ lishiga olib kelishi mumkin. Fosfonli birikmalarga yuqori dentantlik ham xos bo‘ lib, bu ko‘ p sonli ligandlarni kompleks tuzilmalarga birlashtirib, lignosulfonatning fenilpropan zvenosi kompleksonlarini kalsiy kationlari bilan hosil qilish imkonini beradi.

Shunday qilib, yangi birikmaning paydo bo‘ lishi ulьtrabinafsha spektrda aks etadi va u dastlabki lignosulfonatning ultrabinafsha spektridan yaqqol farq qiladi. Qisqa to‘ lqinli sohada (200–400 nm) barcha cho‘ qqilar optik zichlik (D) oshishi tomoniga mutanosib ravishda siljigani (gipoxrom effekt) ko‘ rinadi. Bunda noaniq cho‘ qqilar yanada aniqroq (265 va 285 nm) cho‘ qqilarga aylangan, bu esa eterifikasiyalangan fenol fragmentlariga xosdir. 400 nm dan yuqori sohada, aksincha, dastlabki lignosulfonat spektri kichik giperxrom ta’sirga uchraydi: bunda 535 va 575 nm dagi cho‘ qqilar yo‘ qolib, 405 nm da aniq cho‘ qqi paydo bo‘ ladi. Bu gipsoxrom siljish mavjudligidan dalolat beradi va efir bog‘ lari hosil bo‘ lganining belgisidir. Bundan tashqari, 310–336 nm sohada "yelka" paydo bo‘ lgani ko‘ rinadi, bu esa yangi mahsulotlar hosil bo‘ lganini isbotlaydi. Optik zichlikning 390-410 nm sohada pasayishi bir qator olingan izolyasiyalangan xromofor tizimlarning yutilishidagi additiv farq bilan izohlanadi. Umuman olganda, keltirilgan ultrabinafsha spektrlar fosfon guruhlari bilan modifikatsiyalangan Na-LS asosidagi reagent tizimlari kompleksonatlar hosil bo‘ lishiga va efir guruhlarining paydo bo‘ lishiga olib kelishini ko‘ rsatadi.

Xulosa. Tadqiqot natijalariga ko‘ ra, somondan ajratilgan lignin asosida natriy lignosulfonat olinib, uning OEDF va NTF organofosfonatlari bilan modifikatsiyalanishi mineral tuzlar to‘ planishini ingibirlash uchun funksional tizim hosil qilish imkonini berdi. Modifikatsiyalash uchun organofosfonatlarning lignosulfonat quruq massasiga nisbatan 5–8 % miqdori, 60–80 °C harorat, pH 4,5–5,5 va 1,5–2,5 soat davomiylik maqbul parametrlar sifatida keltirilgan. Fayldagi taqqoslash natijalarida Na-LS uchun ingibirlash samaradorligi 70 %, OEDF bilan modifikatsiyalangan tizim uchun 92 %, NTF bilan modifikatsiyalangan tizim uchun 88 % qiymatlar keltirilgan. Modifikatsiyalangan tizimlarda termik barqarorlik va Ca^{2+} hamda Mg^{2+} ionlari ishtirokida ishlash xususiyatlari yaxshilanishi qayd etilgan. UB-spektrlarda OEDF bilan modifikatsiyadan keyin λ=370 nm sohasida yangi cho‘ qqi paydo bo‘ lishi, shuningdek 200–400 nm va 400 nm dan yuqori sohalarda spektr shaklining o‘ zgarishi modifikatsiya natijasida yangi funksional holatlar va efir guruhlari hosil bo‘ lishi bilan bog‘ langan. Umuman, olingan natijalar natriy lignosulfonat matrisasini organofosfonatlar bilan modifikatsiyalash mineral tuzlar to‘ planishini ingibirlovchi reagentlar tizimini shakllantirish uchun qo‘ llanishi mumkinligini ko‘ rsatadi.

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MODERN APPROACHES TO THE STUDY OF SULFUR-CONTAINING COMPOUNDS IN PETROLEUM AND METHODS FOR THEIR CONTROL AND REMOVAL

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Abstract: *Sulfur-containing compounds are among the most significant impurities in crude oil, determining the quality of motor fuels, the efficiency of petroleum refining, and the environmental characteristics of final products. This paper summarizes current views on the origin, composition, and distribution of sulfur compounds in different petroleum fractions. A comparative analysis of analytical methods for sulfur determination is presented, including X-ray fluorescence spectrometry, ultraviolet fluorescence, chromatographic, and electrochemical methods. The technological and environmental consequences of the presence of sulfur compounds in crude oil and petroleum products are considered. Modern approaches to desulfurization are compared, including hydrodesulfurization, oxidative, adsorption, extraction, and biotechnological desulfurization. It is shown that the most promising strategies are combined methods for deep purification of heavy petroleum fractions, based on the integration of selective catalytic systems, energy-efficient processes, and modern analytical platforms that provide rapid control of sulfur content directly within the technological cycle.*

Keywords: *petroleum, petroleum products, sulfur-containing compounds, desulfurization, hydrodesulfurization, analytical control.*

NEFT TARKIBIDAGI OLTINGUGURTLI BIRIKMALARNI TADQIQ ETISH VA ULARNI NAZORAT QILISH HAMDA YO‘ QOTISHNING Z AMONAVIY YONDASHUVLARI

Annotatsiya: *Oltingugurt saqlovchi birikmalar neft xomashyosidagi eng muhim qo‘ shimchalardan biri bo‘ lib, motor yoqilg‘ ilarining sifati, neftni qayta ishlash samaradorligi va yakuniy mahsulotlarning ekologik xususiyatlarini belgilaydi. Ushbu ishda turli neft fraksiyalaridagi oltingugurt birikmalarining kelib chiqishi, tarkibi va taqsimlanishi haqidagi zamonaviy qarashlar umumlashtirilgan. Oltingugurtni aniqlashning analitik usullari, jumladan rentgen-fluorestsent spektrometriya, ultrabinafsha fluorestsensiya, xromatografik va elektrokimyoviy usullar qiyosiy tahlil qilingan. Neft va neft mahsulotlarida oltingugurtli birikmalar mavjudligining texnologik hamda ekologik oqibatlari ko‘ rib chiqilgan. Gidrotozalash, oksidlovchi, sorbsion, ekstraksion va biotexnologik desulfurizatsiyani o‘ z ichiga olgan zamonaviy oltingugurtni yo‘ qotish usullari taqqoslangan. Og‘ ir neft fraksiyalarini chuqur tozalashning eng istiqbolli yo‘ nalishlari selektiv katalitik tizimlar, energiya tejamkor jarayonlar hamda texnologik sikl davomida oltingugurt miqdorini tezkor nazorat qilish imkonini beruvchi zamonaviy analitik platformalarni birlashtiruvchi kompleks usullar ekanligi ko‘ rsatildi.*

Kalit so‘ zlar: *neft, neft mahsulotlari, oltingugurtli birikmalar, desulfurizatsiya, gidrotozalash, analitik nazorat.*

СОВРЕМЕННЫЕ ПОДХОДЫ К ИССЛЕДОВАНИЮ СЕРОСОДЕРЖАЩИХ СОЕДИНЕНИЙ НЕФТИ И МЕТОДАМ ИХ КОНТРОЛЯ И УДАЛЕНИЯ

Аннотация: *Серосодержащие соединения относятся к числу наиболее значимых примесей нефтяного сырья, определяющих качество моторных топлив, эффективность нефтепереработки и экологические характеристики конечной продукции. В работе обобщены современные представления о происхождении, составе и распределении соединений серы в нефтяных фракциях различного типа. Проведён сравнительный анализ методов аналитического определения серы, включая рентгенофлуоресцентную спектрометрию, ультрафиолетовую флуоресценцию, хроматографические и*

электрохимические методы. Рассмотрены технологические и экологические последствия присутствия сернистых соединений в нефти и нефтепродуктах. Выполнено сопоставление современных подходов к десульфуризации, включающих гидроочистку, окислительное, сорбционное, экстракционное и биотехнологическое обессеривание. Показано, что наиболее перспективными являются комбинированные методы глубокой очистки тяжёлых нефтяных фракций, основанные на сочетании селективных каталитических систем, энергоэффективных процессов и современных аналитических платформ, обеспечивающих оперативный контроль содержания серы непосредственно в технологическом цикле.

Ключевые слова: *нефть, нефтепродукты, серосодержащие соединения, десульфуризация, гидроочистка, аналитический контроль.*

Introduction

Crude oil is a complex multicomponent system composed of a wide variety of hydrocarbon and heteroatomic compounds. In addition to hydrocarbons, petroleum contains oxygen-, nitrogen-, metal-, and sulfur-containing compounds that significantly affect the physicochemical properties of crude oil and the characteristics of its processing [1,2]. Among these heteroatomic constituents, sulfur-containing compounds are of particular importance because they largely determine the quality of petroleum products, the stability of process equipment, and the environmental characteristics of fuels [3].

Depending on sulfur content, crude oils are classified as low-sulfur, sulfurous, and high-sulfur. An increase in the concentration of sulfur compounds complicates the transportation and refining of crude oil, promotes equipment corrosion, and necessitates additional purification stages [4,5].

The composition of sulfur-containing compounds in petroleum systems is highly diverse. Crude oil contains mercaptans, sulfides, disulfides, thiophenes, benzothiophenes, and dibenzothiophenes [2]. Among them, alkyl-substituted dibenzothiophenes present the greatest technological challenge because of their high chemical stability and low reactivity under conventional hydrodesulfurization conditions [6,7].

The growing interest in sulfur removal is associated with increasingly stringent environmental regulations governing the quality of motor fuels. Current international standards limit sulfur content in gasoline and diesel fuels to approximately 10 mg/kg [8]. Compliance with these requirements has stimulated the development of highly efficient desulfurization technologies and the improvement of analytical methods for determining ultralow sulfur concentrations [9,10].

Sulfur compounds adversely affect most petroleum refining processes. Under high-temperature conditions, they accelerate corrosion, cause catalyst deactivation, and contribute to the formation of resinous and coke deposits [11,12]. During fuel combustion, sulfur compounds are converted into sulfur oxides, which participate in the formation of acid precipitation and atmospheric pollution [13].

At present, sulfur in crude oil and petroleum products is determined using X-ray fluorescence [14,17], fluorescence [15], chromatographic, and electrochemical analytical methods [16,17]. Particular attention is being paid to electroanalytical systems that combine high sensitivity, the possibility of miniaturization, and rapid measurement capabilities [18–20].

Despite advances in deep purification technologies, the effective removal of refractory organosulfur compounds remains an important challenge [5,21–23]. Consequently, combined catalytic [21,24], oxidative [22,25], sorption-based [26,27], and biotechnological approaches [28,29] aimed at achieving deeper desulfurization of heavy petroleum fractions are being actively investigated.

The aim of this study was to systematize current data on the composition and distribution of sulfur-containing compounds in crude oil and to comparatively analyze methods for their analytical determination as well as technologies for sulfur removal from petroleum feedstocks and petroleum products.

Materials and Methods

The informational basis of the study consisted of publications from leading international peer-reviewed journals and specialized industrial editions published between 2023 and 2026, focusing on the analytical determination of sulfur, petroleum product quality monitoring, and modern desulfurization technologies [9,30].

The selection of literature sources was based on the relevance of the studies, the reliability of experimental data, the reproducibility of analytical procedures, and the practical significance of the reported results for the petroleum refining industry. The review included studies containing data on the quantitative determination of sulfur, comparative evaluations of analytical techniques, and the efficiency of sulfur removal processes.

The methodological framework of the study was based on a comparative analytical approach involving the systematization of published data and the comparison of results obtained by different research groups. The sensitivity, selectivity, limits of detection, analysis time, and sample preparation requirements of various sulfur determination methods were comparatively evaluated.

In addition, a comparative assessment of current technologies for reducing sulfur content in petroleum feedstocks was performed, including catalytic hydrodesulfurization, oxidative desulfurization, sorption and extraction processes, as well as biotechnological methods for the removal of organosulfur compounds.

Results and Discussion

Origin and Distribution of Sulfur-Containing Compounds in Petroleum Feedstocks

The presence of sulfur in crude oil is associated with a combination of geochemical and biochemical processes occurring in sedimentary basins during the transformation of organic matter [1–3]. Anaerobic microorganisms play a significant role in this process by reducing sulfates to hydrogen sulfide, which subsequently participates in reactions leading to the formation of organosulfur compounds [28,29].

Sulfur-containing components in petroleum occur in both inorganic and organic forms. The most common species include hydrogen sulfide, mercaptans, sulfides, disulfides, thiophenes, benzothiophenes, and dibenzothiophenes. Their quantitative distribution depends on the origin of the crude oil, the degree of its thermal maturation, and its fractional composition.

Light petroleum fractions are characterized predominantly by low-molecular-weight mercaptans and sulfides, whereas heavy distillates contain increased amounts of polycyclic aromatic sulfur compounds [1,2]. Among these compounds, alkyl-substituted dibenzothiophenes are considered the most refractory because the sulfur atom is sterically shielded by hydrocarbon substituents, significantly hindering hydrodesulfurization processes [22].

Figure 1 presents a generalized scheme illustrating the distribution of the major classes of sulfur-containing compounds among petroleum fractions as a function of boiling point and molecular weight.

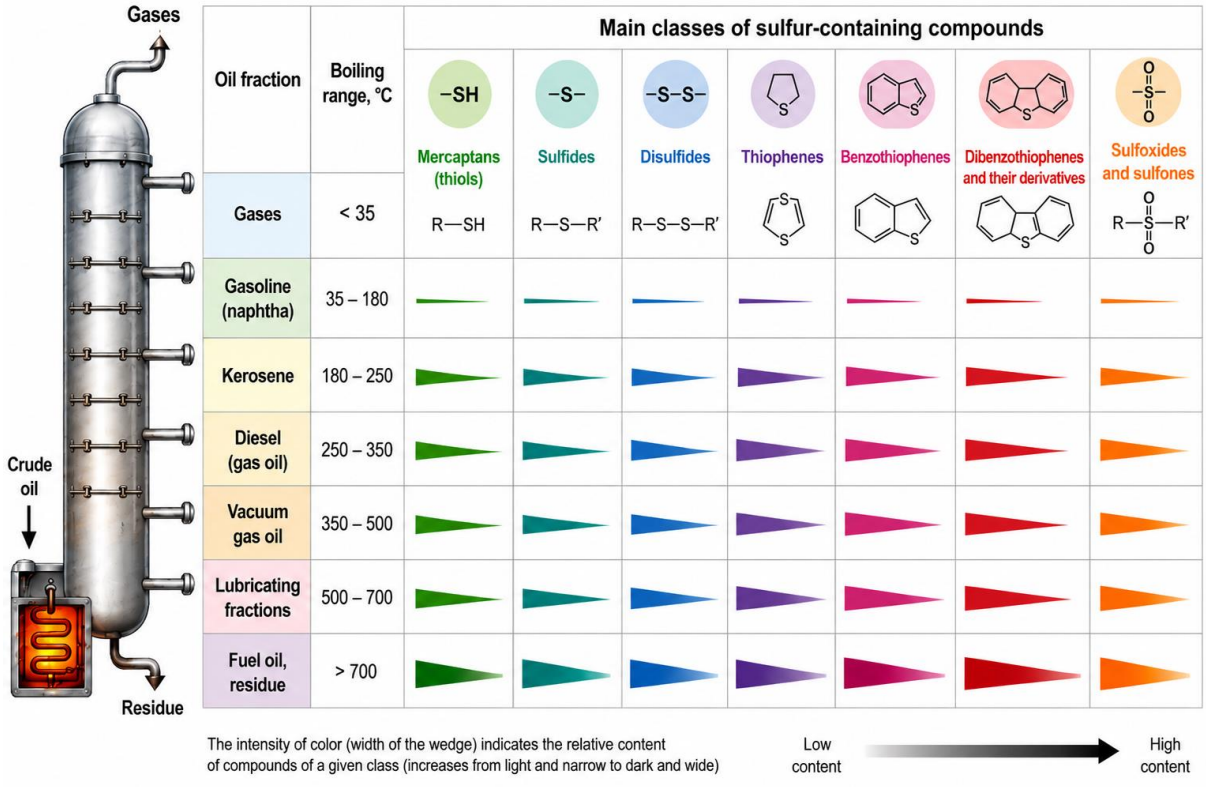


Figure 1. Distribution of the Main Classes of Sulfur-Containing Compounds in Petroleum Fractions

Influence of Sulfur-Containing Compounds on the Properties of Crude Oil and Petroleum Products

Sulfur-containing compounds exert a negative impact on petroleum refining processes, the performance characteristics of fuels, and the environmental safety of petroleum products. The most reactive sulfur species cause intensive corrosion of processing equipment, particularly in the presence of moisture and at elevated temperatures [11,12].

High-molecular-weight heterocyclic sulfur compounds are capable of participating in thermal condensation reactions leading to the formation of resinous substances and coke deposits [5]. This results in catalyst deactivation and deterioration of the operational efficiency of refining units [3,24].

The environmental consequences associated with the use of high-sulfur fuels are primarily related to the formation of sulfur oxides during fuel combustion. These compounds contribute to acid precipitation and the generation of toxic atmospheric aerosols, thereby adversely affecting environmental quality [13].

To systematize the major consequences associated with the presence of sulfur in crude oil and petroleum products, Table 1 summarizes the most characteristic effects of different classes of sulfur-containing compounds on the technological and environmental properties of petroleum products.

The obtained data indicate that the chemical nature and distribution of sulfur-containing compounds directly determine both the technological complexity of petroleum refining and the environmental characteristics of final petroleum products. This necessitates the development of highly efficient analytical control methods and the improvement of deep desulfurization technologies.

Table 1. Influence of the Main Classes of Sulfur-Containing Compounds on the Technological and Environmental Characteristics of Petroleum Products

Sulfur-Containing Compound	Characteristic Impact
Hydrogen sulfide	High toxicity and accelerated equipment corrosion
Mercaptans	Strong unpleasant odor, susceptibility to oxidation and corrosion
Sulfides and disulfides	Formation of resins and carbonaceous deposits
Thiophenes	Catalyst deactivation and reduced catalytic activity
Dibenzothiophenes	Resistance to hydrodesulfurization and accumulation in heavy fractions

Modern Methods for Analytical Determination of Sulfur

At present, a wide range of methods for sulfur determination in crude oil and petroleum products has been developed, including spectroscopic, chromatographic, and electrochemical approaches [9,10].

One of the most widely used techniques for total sulfur determination is ultraviolet fluorescence analysis, which is based on sample combustion followed by the determination of SO_2 according to fluorescence intensity [17]. This method is characterized by high sensitivity and good reproducibility of results.

X-ray fluorescence analysis is distinguished by its high measurement speed and minimal sample preparation requirements. Modern wavelength-dispersive systems allow sulfur determination at concentrations below 0.2 ppm [14].

Ion chromatography methods combined with thermal decomposition are employed for the analysis of heavy petroleum fractions and enable the simultaneous determination of sulfur and halogen-containing compounds.

In recent years, electrochemical analytical methods based on modified screen-printed electrodes have been actively developed [18,19]. Such systems provide high sensitivity, compact instrumentation, and the possibility of rapid on-site analysis directly at sampling locations.

Table 2 summarizes modern analytical methods used for sulfur determination in crude oil and petroleum products.

Table 2. Modern Analytical Methods for Sulfur Determination in Crude Oil and Petroleum Products

Method	Determined Sulfur Forms	Advantages	Limitations
UV fluorescence analysis	Total sulfur	High sensitivity	Requires sample combustion
X-ray fluorescence analysis	Total sulfur	No sample preparation required	Matrix effects
Ion chromatography	Sulfates and oxidation products	High selectivity	Complex sample preparation
Potentiometric titration	Active sulfur	Simplicity	Limited sensitivity
Electrochemical methods	Hydrogen sulfide, mercaptans	Rapid analysis	Electrode modification required

Technological Approaches to Reducing Sulfur Content in Petroleum Feedstocks

The principal industrial method for removing sulfur-containing compounds remains catalytic hydrodesulfurization, which is based on the interaction of organosulfur compounds with hydrogen in the presence of heterogeneous catalysts. The process is carried out at elevated temperatures and pressures using molybdenum-based catalysts promoted with nickel or cobalt [24].

Despite its high industrial efficiency, conventional hydrodesulfurization is insufficiently effective for the removal of alkyl-substituted dibenzothiophenes [4,5]. Steric shielding of the sulfur atom decreases the accessibility of active molecular sites for catalytic interaction.

As alternative approaches, oxidative desulfurization methods are being extensively investigated. In these processes, sulfur-containing compounds are converted into more polar sulfoxides and sulfones, which can subsequently be removed by extraction or sorption techniques.

Considerable interest has also been directed toward sorption technologies employing zeolites, carbon-based materials, metal–organic frameworks, and nanostructured adsorbents. The main advantages of these methods include mild operating conditions and environmental safety; however, their relatively limited sorption capacity still restricts large-scale industrial application.

Extraction methods are based on the use of polar solvents and ionic liquids for the selective removal of organosulfur compounds. These processes are characterized by comparatively simple process design, although subsequent regeneration of the extractants is required.

A separate research direction involves biodesulfurization, which is based on the ability of microorganisms to cleave carbon–sulfur bonds in organic molecules [31]. Biocatalytic processes proceed under mild conditions and are characterized by reduced energy consumption; however, their practical application is limited by the relatively low rate of biochemical transformations.

Figure 2 illustrates the principal desulfurization methods currently employed in the petroleum industry.

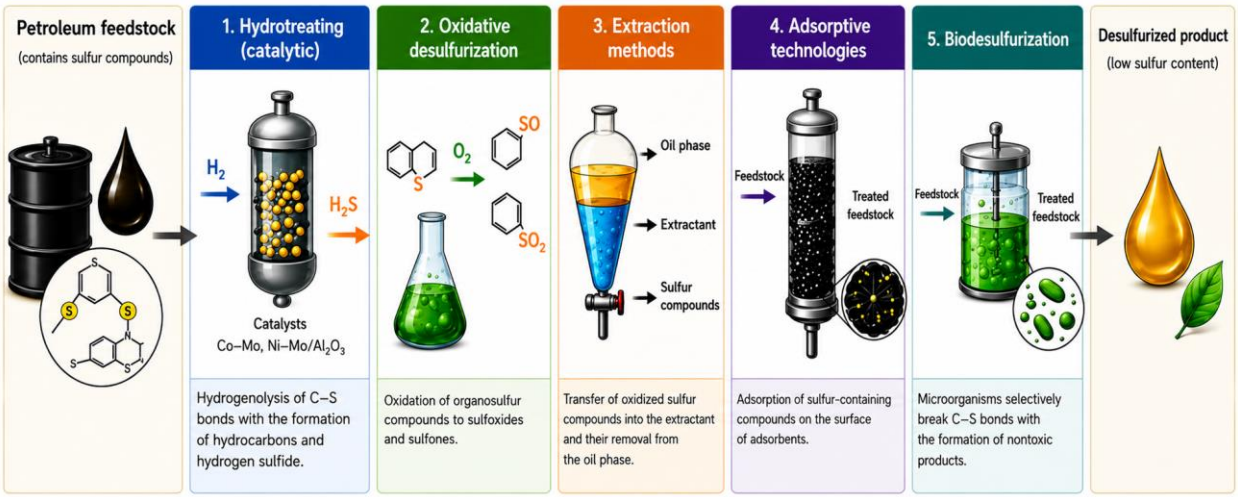


Figure 2. Modern Methods of Petroleum Desulfurization

To compare the principal advantages and limitations of current purification technologies, Table 3 presents a comparative characterization of the most widely used desulfurization methods.

Table 3. Comparative Characteristics of Technologies for Sulfur Removal from Petroleum Feedstocks

Desulfurization Method	Main Advantages	Main Limitations
Catalytic hydrodesulfurization	High productivity and well-established industrial implementation	High energy consumption and incomplete removal of refractory thiophenes
Oxidative desulfurization	Enhanced selectivity toward aromatic sulfur compounds	Requirement for oxidizing agents and additional purification stages
Extraction methods	Simple process design and equipment configuration	Limited efficiency of sulfur compound extraction
Sorption technologies	Environmental safety and mild operating conditions	Relatively low sorption capacity of adsorbent materials
Biodesulfurization	Energy efficiency and selective cleavage of C–S bonds	Low rate of biochemical transformations

Conclusion

The conducted analysis demonstrated that sulfur-containing compounds exert a significant influence on petroleum refining processes, the quality of motor fuels, and the environmental characteristics of petroleum products. It was established that light petroleum fractions predominantly contain low-molecular-weight sulfur compounds, whereas heavy distillates are characterized by increased concentrations of refractory polycyclic thiophenic structures.

Sulfur compounds were shown to promote equipment corrosion, catalyst deactivation, the formation of resinous and coke deposits, and increased emissions of sulfur oxides into the atmosphere. These factors highlight the necessity for improving both analytical control methods and deep desulfurization technologies.

A comparison of modern sulfur determination techniques indicates the high efficiency of X-ray fluorescence, fluorescence, and chromatographic analytical methods. Electrochemical sensor systems based on modified screen-printed electrodes remain a particularly promising direction due to their capability for rapid and sensitive on-site monitoring under industrial conditions.

It was also established that conventional hydrodesulfurization is insufficiently effective for the removal of refractory aromatic sulfur compounds. Therefore, combined desulfurization technologies integrating catalytic, oxidative, sorption-based, and biotechnological approaches appear to be the most перспективными for achieving deeper sulfur removal from petroleum feedstocks and petroleum products.

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AZNEK FOSFORITLARINI TURLI KONSENTRATSIYALI EKSTRAKSION FOSFOR KISLOTASI BILAN FAOLLASHTIRISHNING FIZIK-KIMYOVIY VA TEXNOLOGIK QONUNIYATLARI

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Annotatsiya: *Ushbu maqolada Navoiy viloyatida joylashgan Aznek koni fosforitlarini turli konsentratsiyali (16,5% va 25,0%) ekstraksion fosfor kislotasi (EFK) bilan kimyoviy faollashtirish jarayonining fizik-kimyoviy va texnologik ko‘ rsatkichlari qiyosiy tadqiq etildi. Fosforit va kislota nisbatlari (50:10 dan 50:450 gacha hamda 50:15,15 dan 50:681,8 gacha), xomashyo dispersligi (0,2 va 0,5 mm), reaksiya harorati (60, 80, 100) va jarayon davomiyligi (20–120 min) bo‘ yicha keng qamrovli tahlillar o‘ tkazildi. Kislota konsentratsiyasi va me’yorining pulpa reologiyasiga, yuvilgan va quritilgan qoldiq massasiga, massaviy yo‘ qotish (pateriya) miqdoriga, to‘ yingan hamda siqilgan zichlikka, granulometrik tarkibga va suspenziya pH ko‘ rsatkichiga ta’siri aniqlandi. Shuningdek, karbonatli minerallar parchalanishi jarayonida gaz ajralishi tufayli yuzaga keladigan ko‘ piklanish kinetikasi va tizimdagi ekzotermik harorat profili modellashtirildi. Aniqlanishicha, kislota konsentratsiyasining 16,5% dan 25,0% ga oshishi dekompozitsiya chuqurligini kuchaytiradi, massaviy yo‘ qotishni 63,86% gacha yetkazadi va tizim pH qiymatini 2,11 gacha pasaytiradi. Tadqiqot natijalari mahalliy fosfat xomashyosi negizida fosforli o‘ g‘ itlar olish rejimlarini optimallashtirish uchun muhim ilmiy-texnik asos yaratadi.*

Kalit so‘ zlar: *Aznek fosforiti, ekstraksion fosfor kislotasi, konsentratsiya, faollashtirish, pulpa reologiyasi, to‘ yingan zichlik, siqilgan zichlik, fraksion tarkib, ko‘ piklanish kinetikasi, pH qiymati.*

ФИЗИКО-ХИМИЧЕСКИЕ И ТЕХНОЛОГИЧЕСКИЕ ЗАКОНОМЕРНОСТИ АКТИВАЦИИ АЗНЕКСКИХ ФОСФОРИТОВ ЭКСТРАКЦИОННОЙ ФОСФОРНОЙ КИСЛОТОЙ РАЗЛИЧНОЙ КОНЦЕНТРАЦИИ

Аннотация: *В данной статье представлено сравнительное исследование физико-химических и технологических параметров процесса химической активации фосфоритов из месторождения Азнек в Навоийской области с различными концентрациями (16,5% и 25,0%) экстрактивной фосфорной кислоты (ЭФК). Проведены обширные анализы соотношений фосфорита и кислоты (от 50:10 до 50:450 и от 50:15,15 до 50:681,8), дисперсии сырья (0,2 и 0,5 мм), температуры реакции (60, 80, 100) и продолжительности процесса (20–120 мин). Определено влияние концентрации и скорости кислоты на реологию пульпы, массу промытого и высушенного остатка, потерю массы (патерию), плотность в насыщенном и уплотненном состоянии, гранулометрический состав и pH суспензии. Также смоделирована кинетика пенообразования за счет выделения газа при разложении карбонатных минералов и экзотермический температурный профиль в системе. Было установлено, что увеличение концентрации кислоты с 16,5% до 25,0% увеличивает глубину разложения, повышает потерю массы до 63,86% и снижает значение pH системы до 2,11. Результаты исследования предоставляют важную научно-техническую основу для оптимизации режимов производства фосфорных удобрений на основе местного фосфатного сырья.*

Ключевые слова: *фосфорит Азнека, экстрактивная фосфорная кислота, концентрация, активация, реология пульпы, плотность насыщения, плотность уплотнения, фракционный состав, кинетика пенообразования, значение pH.*

PHYSICOCHEMICAL AND TECHNOLOGICAL REGULARITIES OF ACTIVATION OF AZNEK PHOSPHORITES WITH EXTRACTIVE PHOSPHORIC ACID OF VARIOUS CONCENTRATIONS

Abstract: *This article presents a comparative study of the physicochemical and technological parameters of the chemical activation process of phosphorites from the Aznek deposit in Navoi region with different concentrations (16.5% and 25.0%) of extractive phosphoric acid (EFK). Extensive analyses were conducted on the ratios of phosphorite and acid (from 50:10 to 50:450 and from 50:15.15 to 50:681.8), raw material dispersion (0.2 and 0.5 mm), reaction temperature (60, 80, 100) and process duration (20–120 min). The effect of acid concentration and rate on pulp rheology, washed and dried residue mass, mass loss (pateria), saturated and compacted density, granulometric composition and pH of the suspension were determined. Also, the kinetics of foaming due to gas evolution during*

the decomposition of carbonate minerals and the exothermic temperature profile in the system were modeled. It was found that an increase in acid concentration from 16.5% to 25.0% increases the depth of decomposition, increases mass loss to 63.86%, and reduces the pH value of the system to 2.11. The results of the study provide an important scientific and technical basis for optimizing the production regimes of phosphorus fertilizers based on local phosphate raw materials.

Keywords: *Aznek phosphorite, extractive phosphoric acid, concentration, activation, pulp rheology, saturated density, compacted density, fractional composition, foaming kinetics, pH value.*

KIRISH (INTRODUCTION)

O‘ zbekiston Respublikasida mineral o‘ g‘ itlar ishlab chiqarish sanoatini rivojlantirish hamda tuproq unumdorligini oshirishda mahalliy past va o‘ rta navli fosforit konlaridan oqilona foydalanish strategik ahamiyatga ega. Markaziy Qizilqum fosforitlari havzasiga mansub Aznek koni fosforitlari tarkibida kalsiy oksidi va karbonat minerallari (kalsit, dolomit) miqdorining yuqoriligi hamda CaO ning P_2O_5 ga nisbatining kattaligi bilan ajralib turadi[1-2].Bunday xomashyoni to‘ liq sulfat kislotali usulda ekstraksiyalash ortiqcha kislota sarfiga va utilizatsiyasi ekologik hamda texnologik jihatdan og‘ ir bo‘ lgan fosfogips chiqindisining haddan tashqari ko‘ p hosil bo‘ lishiga olib keladi.Fosforit xomashyosini ekstraksion fosfor kislotasi (EFK) bilan faollashtirish (to‘ liqsiz parchalash) jarayoni ushbu muammoni bartaraf etuvchi istiqbolli yo‘ nalish hisoblanadi[3]. Mazkur usulda qo‘ shimcha ballast gips cho‘ kmasi ajralmaydi, balki sarflangan kislota tarkibidagi fosfor yakuniy o‘ g‘ it mahsulotiga to‘ liq o‘ tib, uning samaradorligini oshiradi. Jarayonning asosiy kimyoviy mexanizmi erishi qiyin bo‘ lgan kalsiy ftorapatit hamda karbonatlarning kislota bilan ta’sirlashib, suvda va o‘ simliklar tomonidan oson o‘ zlashtiriladigan monokalsiyfosfat ($Ca(H_2PO_4)_2$) va dikalsiyfosfat ($CaHPO_4$) shakllariga aylanishiga asoslanadi. Fosfaritni kislota bilan parchalaganimizda quyidagi (1-2) kimyoviy reaksiya sodir bo‘ ladi

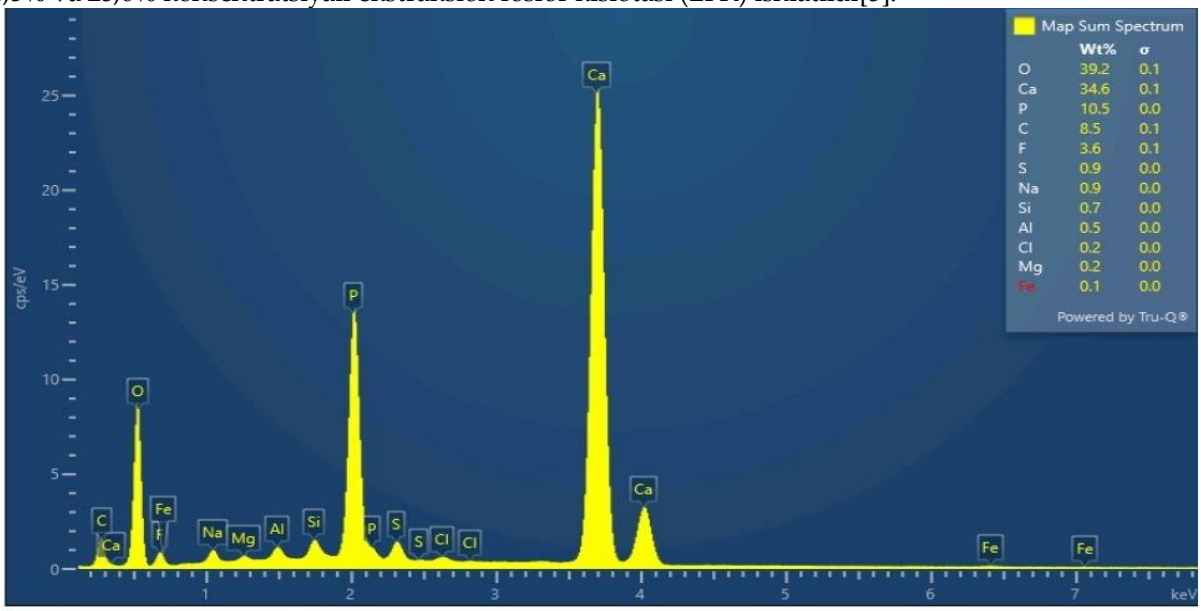
$$Ca_5(PO_4)_3F + 7H_3PO_4 + 5H_2O = 5Ca(H_2PO_4)_2 \cdot H_2O + HF \quad (1)$$

$$CaCO_3 + 2H_3PO_4 = Ca(H_2PO_4)_2 + H_2O + CO_2 \quad (2)$$

Biroq fosforit tarkibidagi karbonatlar dekompozitsiyaga uchraganda kuchli karbonat angidrid (CO_2) gazi ajraladi, bu esa reaktor hajmida intensiv ko‘ piklanishni keltirib chiqaradi[8].Ko‘ piklanish darajasi va tizimning reologik xatti-harakati qo‘ llanilayotgan EFK ning konsentratsiyasi va me’yoriga, haroratga hamda zarrachalar dispersligiga bevosita bog‘ liq. Ushbu tajriybaning maqsadi — Aznek koni fosforitlarini turli konsentratsiyali (16,5% va 25,0 %) ekstraksion fosfor kislotasi bilan faollashtirish jarayonining fizik-kimyoviy va texnologik parametrlarini (massaviy o‘ zgarishlar, zichlik, granulometriya, suspenziya pH qiymati, harorat kinetikasi va ko‘ piklanish dinamikasi) kompleks qiyosiy tadqiq qilishdan iborat[7].

METODIKA (MATERIALS AND METHODS)

Xomashyo va reagentlar: Tadqiqot obyekti sifatida Navoiy viloyatining Aznek koni fosforiti tanlab olindi. Boshlang‘ ich xomashyoning element tarkibi zamonaviy skanerlovchi elektron mikroskopiya (SEM/EDX) usulida tahlil qilindi (1-rasm). Olingan spektr tahliliga ko‘ ra, namunaning asosiy massasini kalsiy (Ca - 34,6%), kislorod (O - 39,2%), fosfor (P - 10,5%) hamda karbonat faza mavjudligini tasdiqlovchi uglerod (C - 8,5%) tashkil etadi. Bu ko‘ rsatkichlar fosforit tarkibida kalsit va apatit minerallari ustunlik qilishini hamda xomashyoning yuqori karbonatli ekanligini ko‘ rsatadi. Xomashyo maydalandi va standart elaklar yordamida 0,5 mm hamda 0,2 mm o‘ lchamdagi fraksiyalarga ajratildi. Reagent sifatida 16,5% va 25,0% konsentratsiyali ekstraksion fosfor kislotasi (EFK) ishlatildi[5].



1-rasm. Elektron skanerlovchi mikroskopda Aznek koni rudasining kimyoviy tahlili

Laboratoriya tajribasi va jihozlar: Faollashtirish jarayoni doimiy haroratni saqlab turuvchi suv hammomi, mexanik aralashtirgich (aralashtirish tezligi bir maromda) va termojuft bilan ta'minlangan laboratoriya reaktorida olib borildi. Barcha tajribalarda dastlabki fosforit massasi 50 g qilib olindi.

- 16,5% li EFK bilan reaksiyalar fosforit : EFK = 50:10 dan 50:450 gacha bo‘ lgan massaviy nisbatlarda o‘ rganildi.
- 25,0% li EFK bilan esa stexiometrik va texnologik me'yorlarga mos ravishda fosforit : EFK = 50:15,15 dan 50:681,8 gacha bo‘ lgan nisbatlarda olindi.
- Jarayon harorati 60, 80 va 100 °C da, reaksiya vaqti esa 20, 40, 60 va 120 daqiqa davomida o‘ rganildi.

O‘ lchash va tahlil usullari:

1.**Ko‘ piklanish kinetikasi:** Reaktor devoriga o‘ rnatilgan o‘ lchov shkalasi bo‘ yicha reaksiya boshlangan dastlabki daqiqalardan boshlab vaqt bo‘ yicha ko‘ pik qatlamining balandligi (sm) qayd etildi.

2.**Harorat dinamikasi:** Reaksiyaning ekzotermik samarasini o‘ rganish maqsadida reaktor ichidagi pulpa harorati har 10 daqiqa oralig‘ ida o‘ lchab borildi.

3.**Massa va yo‘ qotish (pateriya):** Reaksiya yakunlangach, hosil bo‘ lgan cho‘ kma 250 g distillangan suv bilan yuvildi, vakuum-filtrda ajratildi va nam holatdagi massasi tortildi. So‘ ngra cho‘ kma quritish shkafida 60°C Charoratda doimiy og‘ irlikkacha quritilib, quruq qoldiq massasi va massaviy yo‘ qotish % hisoblandi[9].

4.**Zichlik va disperslik tahlili:** Yuvilgan va quritilgan qoldiqning to‘ yingan (erkin to‘ kilish zichligi) va siqilgan zichligi standart usulda (100 sm li silindrda tebranish platformasida) aniqlandi. Granulometrik tarkib 0,5, 1,0, 2,0, 3,0 mm va >3,0mm elak to‘ plamida fraksiyalarga ajratish yo‘ li bilan baholandi.

5.**pH ko‘ rsatkichi:** Namunaning 10%-li suvli suspenziyasi tayyorlanib, 27°C haroratda laboratoriya pH-metrida o‘ lchandi[7].

NATIJALAR VA ULARNING MUHOKAMASI (RESULTS AND DISCUSSION)

1. Pulpa reologiyasi, massa o‘ zgarishi va zichlik ko‘ rsatkichlari;

Kislota miqdori va konsentratsiyasining ortishi tizimning agregat holatini tubdan o‘ zgartiradi. 1-jadval (16,5 %li EFK) va 2-jadval (25,0% li EFK) ko‘ rsatkichlaridan ko‘ rinadiki, fosforitga nisbatan kislota sarfi kam bo‘ lganda mahsulot quruq kukunsimon shaklda bo‘ ladi. Kislota ulushi oshishi bilan tizim avval quyuq bo‘ tqasimon, so‘ ngra oquvchan suyuq va nihoyat juda suyuq fazaga o‘ tadi. Fosforit zarrachalarining o‘ lchami kamayishi va qattiq faza konsentratsiyasining o‘ zgarishi pulpa reologiyasiga sezilarli ta'sir ko‘ rsatib, Nyuton oquvchanlik dinamikasini keltirib chiqaradi[10].

1-jadval. Aznek koni fosforitlarini 16,5 % li EFK bilan qayta ishlash ko‘ rsatkichlari

№	Fosfarit EFK (g)	ЭФК %	T °C	Elak o‘lchami	Faollashtirish vaqti (daqiqa)	Pulpa holati	Massa g (60 °C)			P zichlik g ◎ sm³		Yuvilgan va quritilgan qoldiqning (namunaning) fraksion tarkibi %					pH 10% 27 T°C
							Nam holati (g)	Quruq (g)	Massaviy yo‘ qotish %	To‘ yingan zichlik g ◎ sm³	siqilgan zichlik g ◎ sm³	0,5	1	2	3	3<	
1	50:10	16,5	60	0,5	60	Quruq	59,66	50,69	15,03	1,1363	1,3224	20,85	0,3	61,65	2,76	14,44	6,38
2	50:20					Quruq	62,82	51,38	18,21	1,0498	1,1490	22,63	1,57	56,7	2,80	16,3	5,94
3	50:40					Quruq	61,13	47,22	22,75	1,0379	1,2505	45,49	1,84	16,52	6,95	29,20	5,46
4	50:50					Quruq	62,14	46,37	25,37	0,9797	1,1557	28,88	0,30	51,78	6,47	17,49	5,09
5	50:75					Bo‘ tqa simon	51,38	48,08	6,42	0,9677	1,1967	21,59	0,60	47,50	6,47	24,58	4,88
6	50:100					Bo‘ tqa simon	59,24	43,68	26,26	0,9153	1,1041	26,69	0,11	39,33	4,83	29,03	4,85
7	50: 134					Bo‘ tqa simon	59,81	42,57	28,82	0,8244	1,0573	24,28	0,42	44,68	6,06	24,54	4,72
8	50: 150					Suyuq	61,24	42,36	30,83	0,7781	0,9947	27,19	0,12	33,71	5,54	33,42	4,83
9	50:200					Suyuq	62,54	42,35	32,28	0,7247	0,9938	14,88	0,12	52,23	5,99	26,70	4,79
10	50:300					Suyuq	62,29	41,29	33,71	0,5584	0,8072	11,43	0,14	39,76	7,60	41,05	4,73
11	50:340					Suyuq	63,93	35,08	45,12	0,5271	0,7119	16,96	0,05	36,40	4,73	37,88	4,71
12	50:400					Juda Suyuq	61,02	33,45	45,19	0,4949	0,6890	11,36	0,06	36,44	4,96	47,17	4,48
13	50:450					Juda Suyuq	62,14	32,30	48,02	0,4666	0,6493	6,50	0,09	27,98	4,58	60,83	4,32
14	50:134	16,5	60	0,2	60	Bo‘ tqa simon	83,5	41,83	49,90	0,7600	1,0224	25,19	0,26	18,88	7,62	48,02	4,76
15	50:200					Suyuq	67,49	41,13	39,05	0,6352	0,8081	38,26	3,42	20,10	7,68	30,51	4,69
16	50:340					Suyuq	62,71	36,01	42,57	0,5421	0,7212	17,46	1,44	26,43	8,77	45,87	3,84
17	50:400					Juda Suyuq	64,72	29,81	53,94	0,4865	0,6418	8,62	0,10	31,36	12,1	47,83	3,66
18	50:134	16,5	80	0,5	60	Bo‘ tqa simon	59,8	42,81	28,41	0,8469	1,0569	31,32	0,44	45,50	4,20	18,52	4,54
19	50:230					Suyuq	62,95	41,89	33,45	0,6921	0,9170	23,49	1,12	49,79	5,08	20,50	4,17
20	50:400					Juda Suyuq	61,1	31,76	48,02	0,5130	0,7101	15,52	1,88	31,29	8,06	43,23	3,62
21	50:200	16,5	100	0,5	60	Suyuq	67,39	41,10	39,01	0,7225	0,9572	28,95	0,19	34,47	4,93	31,43	3,88
22	50:400					Juda Suyuq	64,58	34,86	46,02	0,5403	0,7538	11,90	0,88	38,98	10,4	37,72	3,38
23	50:200	16,5	60	0,5	20	Suyuq	60,69	40,40	33,43	0,7256	0,9386	25,09	0,17	36,88	6,11	31,73	4,97
24	50:200				40	Suyuq	61,21	41,17	32,74	0,7997	0,9797	28,90	0,07	44,52	6,19	20,30	4,79
25	50:200				120	Suyuq	61,03	40,16	34,20	0,6815	0,9633	26,19	0,42	33,59	8,49	31,29	4,80

2-jadval. Aznek koni fosforitlarini 25 % li EFK bilan qayta ishlash ko‘ rsatkichlari

№	Fosfarit EFK (g)	ЭФК %	T °C	Elak o'lchami	Faollashtirish vaqti (daqiqa)	Pulpa holati	Massa g (60°C)			P zichlik g ◎ sm³		Yuvilgan va quritilgan qoldiqning (namunaning) fraksion tarkibi %					pH 10% 27 T °C
							Nam holati (g)	Quruq (g)	Massaviy yo‘ qotish %	To‘yingan zichlik g/sm³	siqilgan zichlik g ◎ sm³	0,5	1	2	3	3<	
1	50:15,15	25	60	0,5	60	Quruq	61,13	47,38	22,5	1,120	1,182	39,36	4,18	4,49	3,69	48,27	5,55
2	50:30,30					Quruq	58,11	45,47	21,7	1,089	1,230	42,92	4,77	4,28	4,64	43,37	5,17
3	50:60,60					Quruq	61,75	41,37	33,0	0,971	1,144	51,85	4,71	5,31	4,54	33,57	4,64
4	50:75,75					Quruq	62,26	42,28	32,09	0,900	1,036	47,75	5,44	4,49	5,32	36,99	4,41
5	50:113,6					Bo‘ tqas imon	62,06	38,77	37,5	0,692	0,992	60,17	3,92	4,77	4,56	26,56	3,87
6	50:151,5					Bo‘ tqas imon	59,24	35,99	39,2	0,688	1,015	45,73	3,75	4,16	5,70	40,65	3,74
7	50:203,0					Bo‘ tqas imon	61,12	33,98	44,4	0,574	0,896	54,94	6,94	6,32	9,24	22,54	3,58
8	50:227,2					Suyuq	55,92	32,44	41,9	0,595	0,888	33,70	3,11	3,70	4,99	54,50	3,49
9	50:303,0					Suyuq	57,04	29,85	47,6	0,545	0,730	27,53	2,17	2,04	6,03	62,21	3,10
10	50:454,5					Suyuq	67,00	28,08	58,08	0,466	0,672	23,61	2,31	5,73	3,56	64,78	2,67
11	50:515,1					Suyuq	80,29	36,31	54,77	0,413	0,639	22,25	2,61	5,28	3,03	66,81	2,55
12	50:606,0					Juda Suyuq	94,75	42,15	55,51	0,395	0,646	25,12	4,91	4,86	7,02	58,08	2,33
13	50:681,8					Juda Suyuq	82,88	35,23	57,49	0,384	0,621	23,70	6,50	6,27	10,8	52,65	2,28
14	50:203,0	25	60	0,2	60	Bo‘ tqas imon	61,14	33,62	45,01	0,588	0,869	23,50	5,02	8,53	10,4	52,53	3,48
15	50:303,0					Suyuq	62,87	29,99	52,29	0,497	0,693	16,07	4,03	6,07	7,70	66,12	3,12
16	50:515,1					Suyuq	72,89	35,55	51,22	1,128	1,201	23,62	6,16	5,74	10,2	54,20	2,21
17	50:606,0					Juda Suyuq	72,20	29,13	59,65	1,086	1,240	27,80	3,70	6,70	6,97	54,82	2,19
18	50:203,0	25	80	0,5	60	Bo‘ tqas imon	62,48	34,57	44,67	1,323	1,533	27,33	6,65	6,22	10,6	49,11	3,29
19	50:348,4					Suyuq	66,32	32,32	51,26	1,233	1,371	32,37	3,24	4,17	11,0	49,17	3,27
20	50:606,0					Juda Suyuq	88,18	34,99	60,31	1,047	1,258	28,72	3,34	4,23	11,7	51,93	2,41
21	50:303,0	25	100	0,5	60	Suyuq	64,58	27,67	57,15	1,188	1,374	25,84	3,18	6,36	5,24	59,37	3,09
22	50:606,0					Juda Suyuq	88,62	32,02	63,86	1,089	1,153	27,98	3,81	5,87	5,21	57,96	2,11
23	50:303,0	25	60	0,5	20	Suyuq	66,71	31,89	52,19	1,182	1,395	30,41	4,70	6,14	4,83	53,90	3,04
24	50:303,0				40	Suyuq	68,57	30,48	55,54	1,178	1,327	28,21	4,70	5,70	5,44	55,94	3,25
25	50:303,0				120	Suyuq	66,88	31,35	53,12	1,256	1,378	28,23	5,32	6,47	5,55	54,41	3,22

Massaviy yo‘ qotish (pateriya) va kislota konsentratsiyasi o‘ rtasidagi bog‘ liqlik:

• 16,5% li EFK ishlatilganda massaviy yo‘ qotish 15,03% dan 48,0% gacha bo‘ lgan oraliqda o‘ zgarsa, 25,0% li EFK qo‘ llanilganda bu ko‘ rsatkich sezilarli darajada ortib, 22,50% dan 63,86% gacha yetadi.25% li EFK ning kimyoviy faolligi yuqoriligi sababli fosforit mineral panjarasining parchalanishi va kalsiy ionlarining eritmaga o‘ tishi ancha jadal kechdi.

• Haroratning 60 °C dan 100 °C ga ko‘ tarilishi parchalanish darajasini oshiradi: 25% li EFK da 50:606 nisbatda yo‘ qotish 60 °C dagi 55,51% dan 100 °C da 63,86% ga yetdi.

Zichlik va suspenziya, pH dinamikasi:

• 16,5% li kislotada to‘ yingan zichlik 1,1363 g/sm³ dan 0,4666 g/sm³ gacha, siqilgan zichlik esa 1,3224 g/sm³ dan 0,6493 g/sm³ gacha pasayadi.

• 25,0% li kislotada esa kislota ulushi yuqori bo‘ lganda (50:681,8) to‘ yingan zichlik 0,384 g/sm³ gacha pasayadi. Bu holat mineral fazalarning intensiv erishi natijasida qoldiq zarrachalarda g‘ ovakdor tuzilmalarning hosil bo‘ lishi bilan izohlanadi[4].

• Kislota konsentratsiyasi oshishi bilan eritmaning buferlik xususiyati o‘ zgaradi.16,5% li kislotada pH ko‘ rsatkichi 6,38 dan 4,32 gacha o‘ zgarsa, 25,0% li kislotada erkin vodorod ionlari faolligi yuqori bo‘ lgani sababli pH keskin pasayib, 5,55 dan 2,28 gacha tushadi[9].

2. Harorat kinetikasi va ekzotermik samaradorlik

Fosforitning kislotali parchalanishi issiqlik ajralishi (ekzotermik effekt) bilan boradi. 3-4 jadvallarda da 16,5 %va 25,0% li EFK ishlatilganda reaktor zonasidagi harorat profili keltirilgan.

25,0 %li kislotada reaksiyaning ekzotermik effekti ancha yuqori bo‘ lib, dastlabki 10–20 daqiqa davomida harorat tez ko‘ tariladi. Masalan, 100°C sharoitda 16,5 % li EFK da harorat 85°C gacha ko‘ tarilgan bo‘ lsa, 25% li EFK da 98°C gacha yetadi. 30–40 daqiqadan so‘ ng faol kimyoviy jarayon sekinlashib, tizim harorati muvozanatlashadi[7].

3. Ko‘ pik hosil bo‘ lish kinetikasi va uning reologik xususiyatlari

Aznek fosforitini kislota bilan faollashtirishda ko‘ piklanish asosiy texnologik cheklovchi omil hisoblanadi. 5 va 6 jadvallarda 16,5% li va 25 % li EFK ta’sirida ko‘ pik qatlamining vaqt bo‘ yicha o‘ zgarish dinamikasi aks ettirilgan. Kinetik qonuniyatlar shuni ko‘ rsatadiki: Reaksiyaning dastlabki 5 daqiqasida karbonat minerallarining kislota bilan tezkor ta’siri hisobiga eng maksimal ko‘ pik balandligi (16,5 % li EFK da 17,5 sm gacha, 25% li EFK da 24 sm gacha) kuzatiladi. Harorat oshishi (80–100°C) ko‘ pikning dastlabki hosil bo‘ lish tezligini oshirsa-da, qovushqoqlikning kamayishi sababli ko‘ pikning parchalanishi va so‘ nishini tezlashtiradi (15–20 daqiqada ko‘ pik keskin pasayadi). Xomashyo dispersligi 0,5 mm dan 0,2mm kamaytirilganda, solishtirma sirt yuzasi kengayishi tufayli gaz ajralishi tezlashadi, lekin hosil bo‘ lgan mayda qattiq zarrachalar ko‘ pik plyonkasini barqarorlashtirib, uning uzoqroq saqlanishiga olib keladi.Reaktordagi jarayonning 45–60 daqiqasiga kelib gaz ajralishi to‘ liq muvozanatlashadi[6].

3-jadval. Reaksiyaning vaqt bo‘ yicha harorat dinamikasi (T, °C)

№	Fosfarit EFK (g)	EFK%	T°C	Elako‘lchami	Faollashtirish vaqti (daqiqa)	Vaqt (min) / harorat T C°											
						10 min	20 min	30 min	40 min	50 min	60 min	70 min	80 min	90 min	100 min	110 min	120 min
1	50:10	16,5	60	0,5	60	45	45	46	46	45	44						
2	50:20					45	45	45	45	45	44						
3	50:40					52	53	53	50	50	50						
4	50:50					52	53	53	52	51	51						
5	50:75					53	53	54	55	54	54						
6	50:100					52	52	54	55	54	53						
7	50: 134					51	51	52	54	53	53						
8	50: 150					51	51	52	54	56	55						
9	50:200					53	54	54	54	55	55						
10	50:300					54	56	55	54	56	56						
11	50:340					54	56	56	55	55	55						
12	50:400					53	55	56	56	56	56						
13	50:450					55	56	57	57	56	56						
14	50:134	16,5	60	0,2	60	50	51	50	50	50	49						
15	50:200					55	56	55	55	55	55						
16	50:340					55	56	56	56	55	55						
17	50:400					55	55	56	55	55	55						
18	50:134	16,5	80	0,5	60	71	72	72	70	70	68						
19	50:230					72	76	70	70	71	71						

20	50:400					72	72	74	73	72	68						
21	50:200	16,5	100	0,5	60	69	73	75	78	81	78						
22	50:400					69	76	84	85	85	80						
23	50:200				20	52	56										
24	50:200	16,5	60	0,5	40	52	54	55	53								
25	50:200				120	52	51	50	52	51	50	50	50	50	50	50	50

4-jadval. Reaksiyaning vaqt bo‘ yicha harorat dinamikasi (T, °C)

№	Fosfarit EFK (g)	EFK%	T °C	Elak o‘lchami	Faollashtirish vaqti (daqiqa)	Vaqt (min) / harorat T C◦											
						10 min	20 min	30 min	40 min	50 min	60 min	70 min	80 min	90 min	100 min	110 min	120 min
1	50:15,15	25	60	0,5	60	48	50	45	43	42	41						
2	50:30,30					50	51	46	42	42	41						
3	50:60,60					53	52	51	50	49	42						
4	50:75,75					54	52	50	49	46	42						
5	50:113,6					56	55	52	49	48	44						
6	50:151,5					52	54	54	56	54	52						
7	50:203,0					54	54	56	54	54	53						
8	50:227,2					56	57	56	55	55	52						
9	50:303,0					57	58	56	55	55	54						
10	50:454,5					55	56	57	56	55	52						
11	50:515,1					56	58	58	58	56	55						
12	50:606,0					55	58	59	58	56	54						
13	50:681,8					53	55	55	56	56	55						
14	50:203,0	25	60	0,2	60	54	55	56	54	54	52						
15	50:303,0					56	56	55	54	54	53						
16	50:515,1					55	55	56	57	55	54						
17	50:606,0					54	55	56	56	56	54						
18	50:203,0	25	80	0,5	60	70	73	74	70	70	70						
19	50:348,4					68	72	75	76	75	72						
20	50:606,0					66	74	75	75	75	73						
21	50:303,0	25	100	0,5	60	94	98	98	96	96	94						
22	50:606,0					90	92	88	86	84	84						
23	50:303,0	25	60	0,5	20	54	56										
24	50:303,0				40	54	56	56	55								
25	50:303,0				120	56	57	57	58	56	55	55	55	55	54	54	54

5-jadval. Reaktor zonasida ko‘ pik hosil bo‘ lish kinetikasi (ko‘ pik balandligi, sm)

№	Fosfarit EFK (g)	EFK%	T °C	Elak o‘lchami	Faollashtirish vaqti (daqiqa)	Vaqt min / ko‘ pik hajmi sm																	
						5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	55 min	60 min	65 min	70 min	75 min	80 min	85 min	90 min
1	50:10	16,5	60	0,5	60																		
2	50:20																						
3	50:40					5	3	2	2	1	0,8												
4	50:50					5	4	3,5	3	2,5	2,5	2											
5	50:75					5	4	4	4	3,5	3	2,5	2,5										
6	50:100					3,5	3	3	2,5	2,5	2	2	2	2									
7	50: 134					6	4	4	4	4	3,5	3	3	3									
8	50: 150					7	5	5	20	4,5	4,5	4	4	3,5	3,5								
9	50:200					7	5	5	4,5	4	4	4	4	4	3,5	3							
10	50:300					10	6	5	5	5	5	5	5	5	5	4	3						
11	50:340					10	7	6	5,5	5	5	5,5	5,5	5	5	5	4						

12	50:400					12	9	7	6	6	6	6	6	5,5	5,5	5,5	5,5						
13	50:450					17,5	12	9	7,8	7,5	7	6,8	6,5	6,5	6	6	6						
14	50:134					4,5	4	3,5	3	3	3	3	3	2,5	2,5	2	2						
15	50:200	16,5	60	0,2	60	7	5,5	5	5	4,5	4,5	4	4	3,5	3,5	3	3						
16	50:340					6,5	5	5	4,5	4,5	4,5	4,5	4,5	4	4	4	4						
17	50:400					11	7	6,5	6	6	6	5,5	5,5	5,5	5,5	5,5	5,5						
18	50:134					12,5	6	4	3,5	3	3	3	2,5	2,5	2	2	2						
19	50:230	16,5	80	0,5	60	10	6,5	5	5	4,5	4,5	4	4	3,5	3	3	2,5						
20	50:400					14	9	6	5	5	5	5	4,5	4,5	4,5	4,5	4,5						
21	50:200	16,5	100	0,5	60	14	6	5	4	3,5	3,5	3	3	2,5	2,5	2	2						
22	50:400					14	7	6	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5						
23	50:200				20	8	6	4	3														
24	50:200	16,5	60	0,5	40	7	5	4	3,5	3,5	3	3	3										
25	50:200				120	7	4,5	4,5	4	3,5	3,53	3	3	3	3	3	3	3	3	3	3	3	2,5

6-jadval Reaktor zonasida ko‘ pik hosil bo‘ lish kinetikasi

№	Fosfarit EFK (g)	EFK%	T°C	Elak o'lchami	Faollashtirish vaqti (daqiqa)	Vaqt min / ko' pik hajmi sm																
						5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	55 min	60 min	65 min	70 min	75 min	80 min	85 min	90 min
1	50:15,15	25	60	0,5	60																		
2	50:30,30																						
3	50:60,60					3	2																
4	50:75,75					6	4	2	2	1	1	1	1	1	1	0,8	0,8						
5	50:113,6					16	15	13	8	6	4	2	2	2	2	1	1						
6	50:151,5					17	16	10	4	2	2	2	2	2	1,7	1,5	1,5						
7	50:203,0					21	17	10	6	5	4	4	4	4	3	2,5	2,5						
8	50:227,2					20	17,5	13	9	6	4	3,5	3,5	3	3	3	3						
9	50:303,0					21	15,5	8	7,5	7,5	4,5	4,5	4,5	4	4	4	4						
10	50:454,5					22	20	14	10	8	7	6,5	5,5	5,5	5,5	5,5	5,5						
11	50:515,1					24	22	18	15	10	6	5	5	5	5	5	5						
12	50:606,0					24,5	21	19	16	8	6	6	6	6	6	6	6						
13	50:681,8					26	24	22	20	17	12	9	8	8	7	7	7						
14	50:203,0	25	60	0,2	60	21	20	7	4,5	4,5	3	3	3	3	3	2,5	2,5						
15	50:303,0					23,5	21	6	5	5	5	4,5	4	4	4	4	3,5						
16	50:515,1					24	22	18	15	9,5	8,5	8,5	8	7,5	7	7	6						
17	50:606,0					23,5	21	20	19	8	7,5	7,5	7	7	7	7	6,5						
18	50:203,0	25	80	0,5	60	18	13	6	5,4	4	3,5	3,5	3	3	3	3	3						
19	50:348,4					21	19	10	7	6	5	5	5	4,5	4,5	4	3,5						
20	50:606,0					24	16	16	14	11	7	6	6	6	6	5	5						
21	50:303,0	25	100	0,5	60	10	12	6,5	5	4,5	4	3,5	3,5	3,5	3	3	3						
22	50:606,0					11	15	14	6	5,5	5,5	5,5	5,3	5	4,5	4,5	4						
23	50:303,0	25	60	0,5	20	20	19	6	5														
24	50:303,0				40	20,5	19,5	9	6	4,5	4	4	4	3,5	3,5	3,5	3,5						
25	50:303,0				120	22	19	7	5	4,5	4,5	4,5	4	4	4	4	4	4	4	3,5	3,5	3,5	3,5

XULOSA (CONCLUSION)

1.Aznek koni fosforitlarini 16,5 % va 25,0 % konsentratsiyali ekstraksion fosfor kislotasi bilan faollashtirish jarayonining fizik-kimyoviy va reologik qonuniyatlari har tomonlama tadqiq etildi.

2.Kislota konsentratsiyasining 16,5 % dan 25,0 % ga oshishi xomashyoning kimyoviy parchalanish chuqurligini sezilarli oshirib, massaviy yo‘ qotishni (pateriya) 48,02 % dan 63,86 % gacha ko‘ taradi va hosil bo‘ lgan suspenziya pH ko‘ rsatkichini 4,32 dan 2,11 gacha pasaytiradi.

3.Kislota me’yori ortishi bilan mahsulotning to‘ yingan zichligi 1,136 g/sm^3 dan 0,384 g/sm^3 gacha pasayadi, bu qoldiq faza morfologiyasining o‘ zgarishi va yuqori g‘ ovakdor tuzilma shakllanishi bilan izohlanadi.

4.Haroratning 60 C◦ dan 100 C◦ ga ko‘ tarilishi reaksiyaning ekzotermik jadalligini kuchaytiradi va ko‘ pik qatlamining so‘ nish vaqtini qisqartiradi.

5.Sanoat sharoitida Aznek fosforitlarini qayta ishlashda reaktor hajmidan samarali foydalanish, ortiqcha ko‘ piklanishning oldini olish va maqbul reologik ko‘ rsatkichlarga erishish uchun jarayonni 25% li EFK bilan 50:203 – 50:303 nisbatda, 60 C◦ haroratda va 40–60 daqiqa davomiylikda olib borish texnologik jihatdan eng optimal rejim sifatida tavsiya etiladi.

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DEVELOPMENT AND FEACN CLASSIFICATION OF A DRY LUBRICANT COMPOSITE FOR STEEL WIRE DRAWING BASED ON LOCALLY AVAILABLE RAW MATERIALS

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Abstract:*The article presents the development of a dry lubricant composite based on locally available raw materials for cold drawing of steel wire and the results of laboratory and industrial testing. The composite contains kaolin, borax, talc, sodium stearate, sodium acetate, and calcium acetates. Its stability during wire drawing, adhesion to the metal surface, thermal resistance, influence on die wear, and effect on the surface quality of drawn wire were investigated. The developed composite demonstrated stability in the temperature range of 250–300 °C, while its adhesion to the metal surface was 12% higher than that of imported analogues. Its production cost was 2–3 times lower than that of imported compositions. The main technological parameters and material balance were established under industrial conditions, and an experimental batch of 3000 kg was produced. Based on its composition, functional purpose, physical form, and application, FEACN/TIF TN code 3403 10 10 01 was recommended for the product.*

Keywords: *steel wire, cold drawing, dry lubricant composite, kaolin, talc, borax, adhesion, drawing die, local raw materials, FEACN, TIF TN, 3403 10 10 01.*

MAHALLIY MAVJUD BO‘ LGAN XOM ASBOBLAR ASOSINDA PO‘ LAT SIMLARNI CHIZISH UCHUN QURUQ MOYLASH COMPOZITINI ISHLAB CHIQISH VA FEACN TASNIFI

Annotatsiya: *Maqolada mahalliy xom ashyolar asosida po‘ lat simlarni sovuq holda cho‘ zish jarayonida foydalanish uchun ishlab chiqilgan quruq surkov kompozitining texnologik va ekspluatatsion xususiyatlari hamda laboratoriya va ishlab chiqarish sharoitidagi sinov natijalari keltirilgan. Kompozit tarkibiga kaolin, boraks, talk, natriy stearati, natriy atsetati va kalsiy atsetatlari kiritilgan. Kompozitning filera orqali sim o‘ tish jarayonidagi barqarorligi, metall sirtiga adgeziyasi, harorat ta’siriga chidamliligi, filera yeyilishiga ta’siri va sim sirtining sifati o‘ rganilgan. Tajriba natijalariga ko‘ ra, kompozit 250–300 °C harorat oralig‘ ida barqarorlikni namoyon qilgan, metall sirtiga adgeziyasi import analoglariga nisbatan 12 % yuqori bo‘ lgan. Mahsulot tannarxi import kompozitsiyalariga nisbatan 2–3 marta past bo‘ lgan. Ishlab chiqarish sharoitida asosiy texnologik parametrlar va moddiy balans ishlab chiqilib, 3000 kg miqdorida tajriba partiyasi tayyorlangan. Mahsulotning tarkibi, funksional vazifasi va qo‘ llanish sohasidan kelib chiqib, TIF TN bo‘ yicha 3403 10 10 01 kodi tavsiya etilgan.*

Kalit so‘ zlar: *po‘ lat sim, sovuq cho‘ zish, quruq surkov kompoziti, kaolin, talk, boraks, adgeziya, filera, mahalliy xom ashyo, TIF TN, 3403 10 10 01.*

РАЗРАБОТКА И КЛАССИФИКАЦИЯ СУХОГО СМАЗОЧНОГО КОМПОЗИТА ДЛЯ ВОЛОЧЕНИЯ СТАЛЬНОЙ ПРОВОЛОКИ НА ОСНОВЕ МЕСТНЫХ СЫРЬЕВЫХ МАТЕРИАЛОВ

Аннотация*: В статье представлены результаты разработки сухой смазочной композиции на основе местного сырья для холодного волочения стальной проволоки и ее лабораторных и производственных испытаний. В состав композиции входят каолин, бура, тальк, стеарат натрия, ацетат натрия и ацетаты кальция. Исследованы стабильность композиции при волочении проволоки, адгезия к металлической поверхности, термостойкость, влияние на износ волоки и качество поверхности проволоки. Установлено, что композиция сохраняет стабильность в диапазоне 250–300 °C, а ее адгезия к поверхности металла на 12 % выше по сравнению с импортными аналогами. Себестоимость композиции в 2–3 раза ниже импортных аналогов. В производственных условиях разработаны основные технологические параметры и материальный баланс, изготовлена опытная партия объемом 3000 кг. На основании состава, функционального назначения и области применения предложен код ТН ВЭД 3403 10 10 01.*

Ключевые слова: *стальная проволока, холодное волочение, сухая смазочная композиция, каолин, тальк, бура, адгезия, волока, местное сырье, ТН ВЭД, 3403 10 10 01.*

INTRODUCTION

Cold drawing of steel wire is a widely used technological process for obtaining products with specified geometric dimensions, surface quality, and mechanical properties. During drawing, the wire is pulled through a die under considerable contact pressure and frictional interaction between the metal and the die. Therefore, the properties of the processed material and the technological conditions of deformation directly influence the quality and stability of the process [1,2]. The efficiency of mechanical-processing operations depends on process stability, dimensional accuracy, surface quality, productivity, and rational use of materials [3,4]. In cold wire drawing, inadequate lubrication may increase frictional resistance, drawing force, thermal effects, and die wear and may cause deterioration of the wire surface. An effective dry lubricant should form a stable protective layer between the wire and the die and retain its functional properties during deformation. From a tribological standpoint, the composition and structure of a lubricant determine its ability to reduce direct contact between interacting surfaces and maintain stable lubrication conditions.

Previous research by Parpiyeva and Doliyev demonstrated the possibility of obtaining lubricant composites from locally available raw materials with favorable physicochemical and tribological properties [5]. These results provide a basis for developing specialized dry lubricants for metal-forming processes.

The use of local raw materials is also economically important. Localization can reduce dependence on imported technological materials, decrease production costs, and promote the efficient use of domestic mineral and chemical resources. At the same time, classification of a newly developed material within the Foreign Economic Activity Commodity Nomenclature (FEACN/TIF TN) is important for its future commercialization and foreign economic circulation [6,8].

The aim of this study was to develop a dry lubricant composite based on locally available raw materials for cold drawing of steel wire, evaluate its technological and operational characteristics under laboratory and industrial conditions, determine its economic efficiency, and substantiate its FEACN/TIF TN classification.

MATERIALS AND METHODS

The investigated dry lubricant composite was prepared from kaolin, borax, talc, sodium stearate, sodium acetate, and calcium acetates. The components were selected with the aim of obtaining a homogeneous dry material capable of forming and retaining a lubricating layer in the metal–die contact zone.

The technological preparation included raw-material preparation, preliminary mechanical treatment, dosing, dry mixing, homogenization, and quality control. The technological sequence was selected taking into account the general principles of technological-process organization, material utilization, product quality, and production efficiency [7,8].

The functional properties of the composite were evaluated during steel-wire drawing through the die. The main evaluation criteria were:

- continuity and stability of wire passage through the die;
- occurrence of wire breakage and deformation;
- adhesion and retention of the composite on the metal surface;
- thermal stability;
- condition and wear of the drawing die;
- surface quality of the drawn wire;
- economic efficiency.

The behavior of the steel wire was considered in relation to the general principles of materials science and deformation processing [5,6]. Previous research on local-raw-material-based lubricant composites was also used as a scientific basis for assessing their physicochemical and tribological behavior .

Following laboratory preparation, the composition was tested under industrial conditions at “IFODA Agro Kimyo Himoya” JV LLC and the “MEXMASH” metalworking plant. During industrial testing, raw-material consumption, technological losses, homogeneity of the mixture, stability of wire drawing, lubricant retention, and the condition of the die and wire surface were monitored.

RESULTS AND DISCUSSION

The experimental results showed that the developed composite performed effectively during steel-wire drawing. Continuous passage of the wire through the drawing die was maintained, and no wire breakage was observed under the investigated conditions. No significant visible surface defects were detected on the drawn wire.

The obtained results correspond to general technological requirements for metal deformation processes, in which process stability and product quality are important indicators of technological efficiency [5,7,8].

3.1. Thermal stability and adhesion

One of the important characteristics of the developed composite was its behavior under elevated temperatures generated by friction. The experimental results showed that the composite retained its technological properties within the temperature range of **250–300 °C**.

Thermal stability is important for dry lubricants because the lubricant layer is simultaneously subjected to mechanical loading and thermal effects in the working zone. The preservation of functional properties within the investigated temperature interval indicates the suitability of the composite for the studied drawing conditions.

The adhesion of the composite to the metal surface was also evaluated. The obtained results demonstrated that the adhesion of the developed composite was **12% higher than that of the imported reference analogues**.

Higher adhesion is technologically significant because stable retention of the lubricant on the wire surface facilitates preservation of the lubricating layer within the friction zone. This can reduce direct metal–die interaction and contribute to stable drawing conditions. The importance of physicochemical and tribological characteristics of local-raw-material-based lubricant composites was also demonstrated in previous research.

During laboratory and industrial tests, the developed composite demonstrated stable behavior in the drawing zone. No wire breakage was recorded, and continuous wire passage through the die was maintained.

After testing, no excessive wear of the working surface of the drawing die was observed under the investigated conditions. The wire surface also remained free from significant visible defects.

The condition of the drawing die and the quality of the wire surface are important indicators of technological efficiency. Material properties and deformation conditions influence the behavior of steel during processing [5,6], while rational organization of the technological process is necessary to maintain quality and productivity.

The combined results of adhesion, thermal stability, continuous drawing, and absence of significant surface defects indicate that the developed composite possesses the functional characteristics required for the investigated dry-lubrication process.

The use of locally available raw materials provided a significant economic advantage. The production cost of the developed composite was approximately **2–3 times lower than that of the imported Chinese and Russian analogues** considered in the study.

Compared with certain imported lubricant composites, the locally developed material was found to be **up to 45% less expensive**.

The economic effect is associated with the availability of local raw materials and the possibility of localized production. Reduction of material costs and technological losses is consistent with the general principles of production efficiency and technological-process optimization.

After laboratory optimization, the composition was tested under industrial conditions. The production technology included preparation of raw materials, mechanical treatment, dosing, dry mixing, homogenization, and quality control.

During industrial production, uniform distribution of the components and homogeneity of the finished composite were monitored. The technological losses and material consumption were also considered in establishing the material balance.

The industrial tests confirmed stable application of the composite to the wire surface and its retention in the friction zone. Continuous wire passage through the die was maintained, no wire breakage was recorded, and no significant surface deterioration was observed.

An experimental batch of **3000 kg** was successfully produced. This result confirms the technological feasibility of transferring the developed composition from laboratory preparation to industrial-scale production.

The results also extend the authors' previous investigations of lubricant composites based on local raw materials. While the previous research focused on physicochemical and tribological characteristics, the present study demonstrates the practical applicability of the developed material to steel-wire drawing.

FEACN/TIF TN CLASSIFICATION

An important practical aspect of the study was the classification of the developed dry lubricant composite according to the Foreign Economic Activity Commodity Nomenclature (FEACN/TIF TN).

The classification of goods should take into account their composition, physical form, functional purpose, and field of application. The TIF TN system provides the basis for systematic identification and coding of goods involved in foreign economic activity.

The developed composite is a dry lubricant intended for technological lubrication during cold drawing of steel wire. Therefore, its functional purpose is associated with providing lubrication in the metal–die contact zone.

According to **Information Letter No. 29/05-25-2972 dated December 16, 2025**, issued by the Central Customs Laboratory of the Customs Committee under the Ministry of Economy and Finance of the Republic of Uzbekistan, the

composition and functional characteristics of the lubricant composite developed by D.A. Parpiyeva were examined, and **commodity code 3403 10 10 01** was recommended for the product.

The classification result is important for the further commercialization of the developed material because a defined commodity code facilitates product identification in foreign economic activity, customs procedures, statistical accounting, and market circulation.

The proposed classification should be considered within the applicable edition of the TIF TN and the relevant decisions of the competent customs authorities. Thus, the classification result represents an important organizational step in transferring the developed composite from a research product to a commercially identifiable technological material.

CONCLUSION

A dry lubricant composite based on locally available raw materials was developed for cold drawing of steel wire. The composition contains kaolin, borax, talc, sodium stearate, sodium acetate, and calcium acetates.

Laboratory and industrial testing demonstrated the technological suitability of the composite. It retained its functional properties within the temperature range of **250–300 °C**, while its adhesion to the metal surface was **12% higher than that of imported reference analogues**. During the drawing tests, continuous wire passage through the die was maintained, no wire breakage was observed, and no significant surface defects were detected. No excessive wear of the drawing die was observed under the investigated conditions.The use of local raw materials provided a considerable economic advantage. The production cost of the developed composite was approximately **2–3 times lower than that of the imported analogues**, and in comparison with certain imported compositions it was up to **45% lower**.

The principal technological parameters and material balance were established under industrial conditions, and an experimental batch of **3000 kg** was produced. This confirms the possibility of industrial-scale preparation of the developed composite. The study continues the authors' previous research on lubricant composites based on local raw materials and extends it toward practical application in steel-wire drawing.

According to Information Letter No. 29/05-25-2972 of the Central Customs Laboratory, **FEACN/TIF TN code 3403 10 10 01** was recommended for the developed lubricant composite [4]. This result creates an important basis for its identification, commercialization, and future introduction into foreign economic activity within the relevant TIF TN regulatory framework.

The developed composite therefore has technological and economic potential as an import-substituting dry lubricant for steel-wire drawing based on locally available raw materials.

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O‘ ZBEKISTONDA YETISHTIRILGAN RAPSDAN OLINGAN SHROTNING FUNKSIONAL XUSUSIYATLARI VA SIFAT KO‘ RSATKICHLARI

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Annotatsiya. *Maqolada raps moyi ishlab chiqarish jarayonida hosil bo‘ ladigan raps shrotining kimyoviy tarkibi, oqsil fraksiyalari (kruciferin va napin), antioziqaviy komponentlari, oqsilni ishqoriy ekstraksiya va izoelektrik cho‘ ktirish usulida ajratish sharoitlari hamda olingan oqsilning funksional xususiyatlari bo‘ yicha xalqaro adabiyotlar tahlil qilingan. Moy olish usuli va ajratish sharoitining oqsil chiqimi, tozaligi va funksional xususiyatlariga ta’siri solishtirilgan. O‘ zbekistonda yetishtirilgan rapsdan olingan shrotning sifatini baholash uchun ko‘ rsatkichlar va aniqlash usullari majmui asoslangan.*

Kalit so‘ zlar: *raps, raps shroti, oqsil konsentrati, kruciferin, napin, ishqoriy ekstraksiya, izoelektrik cho‘ ktirish, funksional xususiyatlar, sifat ko‘ rsatkichlari, glyukozinolatlar.*

ФУНКЦИОНАЛЬНЫЕ СВОЙСТВА И ПОКАЗАТЕЛИ КАЧЕСТВА ШРОТА, ПОЛУЧЕННОГО ИЗ РАПСА, ВЫРАЩЕННОГО В УЗБЕКИСТАНЕ

Аннотация. *В обзоре систематизированы данные о химическом составе рапсового шрота, белковых фракциях (круциферин и напин), антипитательных веществах, условиях выделения белка щелочной экстракцией с изоэлектрическим осаждением и функциональных свойствах полученных белковых концентратов. Сопоставлено влияние способа получения масла и условий выделения на выход, чистоту и функциональность белка. Обоснован перечень показателей качества и методов их определения для оценки шрота из рапса, выращиваемого в Узбекистане.*

Ключевые слова: *рапс, рапсовый шрот, белковый концентрат, круциферин, напин, щелочная экстракция, изоэлектрическое осаждение, функциональные свойства, показатели качества, глюкозинолаты.*

FUNCTIONAL PROPERTIES AND QUALITY INDICATORS OF MEAL OBTAINED FROM RAPESEED GROWN IN UZBEKISTAN

Abstract. *This review summarizes published data on the chemical composition of rapeseed meal, its protein fractions (cruciferin and napin), antinutritional compounds, the isolation of protein by alkaline extraction and isoelectric precipitation, and the functional properties of the resulting protein concentrates. The influence of the oil-production route and isolation conditions on protein yield, purity and functionality is compared. A set of quality indicators and analytical methods is proposed for assessing meal obtained from rapeseed grown in Uzbekistan.*

Keywords: *rapeseed, rapeseed meal, protein concentrate, cruciferin, napin, alkaline extraction, isoelectric precipitation, functional properties, quality indicators, glucosinolates.*

1. KIRISH

Aholi sonining o‘ sishi va oziq-ovqat xavfsizligiga talabning kuchayishi to‘ liq qimmatli oqsil manbalariga ehtiyojni oshirmoqda. Bu ehtiyojni qondirishning asosiy yo‘ nalishlaridan biri o‘ simlik oqsillaridan, jumladan moy-yog‘ sanoatining ikkilamchi mahsulotlaridan foydalanishdir [1–3]. Raps (*Brassica napus* L.) soyadan keyin dunyoda ikkinchi yirik moyli ekin bo‘ lib, 2024/2025-yilda jahonda raps shroti ishlab chiqarish taxminan 49,3 mln tonnaga yetgan [1]. Hozirda shrot asosan chorvachilik va parrandachilikda em-xashak sifatida, qisman o‘ g‘ it sifatida ishlatiladi [1].

O‘ zbekistonda moy-yog‘ sanoati oziq-ovqat tarmog‘ ining muhim qismi hisoblanadi: 240 dan ortiq korxonada 2019-yilda taxminan 280 ming tonna o‘ simlik moyi va 650 ming tonnadan ortiq moyli ekinlar shroti ishlab chiqarilgan [4].

Parrandachilikning rivojlanishi oqsilli xomashyoga talabni oshirmoqda: 2025/26-mavsumda Rossiya raps shroti eksportining asosiy xaridori O‘ zbekiston bo‘ lib, xarid hajmi 94 % ga oshib, 262 ming tonnaga yetgan [5]. Ekspertlar prognoziga ko‘ ra, mamlakatda raps moyi hajmi 3 ming tonnadan 2030-yilga borib 20 ming tonnagacha, 2035-yilga borib 40 ming tonnagacha o‘ sishi kutilmoqda [6]; bu mahalliy raps shrotining ham ko‘ payishi ehtimolini ko‘ rsatadi.

Raps tuproq pH qiymati 5,5–8,3 bo‘ lgan yaxshi drenajlangan tuproqlarda o‘ sadi va sho‘ rlanishga o‘ rtacha chidamli [7]. Biroq shrot sifati (oqsil, yog‘ , antioziqaviy moddalar miqdori) nav, o‘ stirish sharoiti va moy olish usuliga kuchli bog‘ liq [1], shu sababli xorijiy ma’lumotlarni O‘ zbekiston sharoitidagi xomashyoga bevosita ko‘ chirib bo‘ lmaydi. Biz ko‘ rib chiqqan manbalarda mahalliy rapsdan olingan shrotning tarkibi va funksional xususiyatlari bo‘ yicha tizimlashtirilgan ma’lumot topilmadi.

Obzorning maqsadi — raps shrotining tarkibi, oqsil fraksiyalari, antioziqaviy komponentlari, oqsilni ajratish usullari va olingan oqsilning funksional xususiyatlari bo‘ yicha xalqaro tajribani tizimlashtirish hamda O‘ zbekistonda yetishtirilgan rapsdan olingan shrotni baholash uchun ko‘ rsatkichlar majmuasini asoslashdir. Maqsadga erishish uchun quyidagi **vazifalar** belgilandi:

- shrot tarkibining moy olish usuliga bog‘ liqligini tahlil qilish;
- asosiy oqsil fraksiyalari va antioziqaviy moddalarni tavsiflash;
- ishqoriy ekstraksiya va izoelektrik cho‘ ktirish sharoitlarining natijaga ta’sirini solishtirish;
- funksional xususiyatlar va ularni baholash usullarini umumlashtirish;
- mahalliy shrotni baholash uchun sifat ko‘ rsatkichlari va usullar ro‘ yxatini tavsiya etish.

2. ADABIYOTLARNI TAHLIL QILISH USULI

Adabiyotlar ochiq xalqaro ilmiy bazalar (PubMed Central, MDPI, ScienceDirect, Wiley) va Google Scholar orqali “rapeseed meal”, “canola protein”, “isoelectric precipitation”, “functional properties”, “glucosinolates” kalit so‘ zlari bilan qidirildi (2026-yil sentyabr holatiga). Asosiy e’tibor so‘ nggi yillarda nashr etilgan maqolalarga, shuningdek, yo‘ nalishdagi klassik sharhlarga qaratildi. Mahalliy moy-yog‘ sanoati va bozor ma’lumotlari tarmoq analitik manbalaridan olindi.

3. RAPS SHROTINING KIMYOVIY TARKIBI

Shrot tarkibi moy olish yo‘ liga bog‘ liq. Mexanik siqish shrotda ko‘ proq yog‘ qoldiradi; keyingi erituvchi ekstraksiyasi yog‘ ni yanada kamaytirib, quruq moddadagi oqsil, kletchatka va kul ulushini nisbatan oshiradi [1]. Bir partiya raps ustida o‘ tkazilgan taqqoslashda siqilgan shrotda 210 g/kg yog‘ va 294 g/kg xom oqsil, erituvchi bilan ekstraksiyalangan shrotda esa 18–23 g/kg yog‘ va 376–382 g/kg xom oqsil aniqlangan [1] (1-jadval). Bu farq oqsilning mutlaq ortishi emas, balki yog‘ chiqarilgandan keyingi nisbiy konsentrlanish natijasidir. Umuman, raps shrotida oqsil miqdori taxminan 35–40 % ni tashkil etadi [8].

1-jadval. Raps shrotining tarkibi bo‘ yicha adabiyot ma’lumotlari

Ko‘ rsatkich	Adabiyotdagi qiymat	Manba
Yog‘ , g/kg quruq modda	siqilgan shrot — 210; erituvchi bilan ekstraksiyalangan — 18–23	[1]
Xom oqsil, g/kg quruq modda	siqilgan shrot — 294; ekstraksiyalangan — 376–382	[1]
Oqsil (umumiy oraliq), %	35–40	[8]
Fitin kislotasi, %	2–5 (nav va usulga qarab o‘ zgaradi)	[1]
Glyukozinolatlar (sovuq siqilgan shrot), μmol/g	taxminan 16	[1]
Po‘ st ulushi	urug‘ massasining 18,2 %; neytral-detergent tolaning ~73 % va ligninning ~95 % ini saqlaydi	[1]
Umumiy ovqat tolasi, g/kg	300 (qora urug‘ li *B. elvis* shroti)	[1]

Issiqlik ta’siri ham muhim: kuchliroq qizdirilgan (oldindan siqilgan, issiq siqilgan, tostlangan) shrotda oqsil kletchatka matritsasi bilan mustahkamroq bog‘ lanadi, eruvchanlik va lizin, sistein miqdori kamayadi [1]. Yumshoq sharoitda sovuq siqilgan va oldindan siqilgan kunjaradan oqsilning maksimal ajratilishi mos ravishda 52,3 va 36,7 % bo‘ lgan [9]; [1] sharhida keltirilgan boshqa ishda oqsil qaytishi sovuq siqilgan, issiq siqilgan va erituvchi bilan ekstraksiyalangan shrotda 45, 26 va 5 % ni tashkil etgan. Demak, zavodda qo‘ llanadigan texnologik rejim (sovuq yoki issiq siqish, erituvchi, tostlash harorati) shrotdan oqsil ajratish imkoniyatini oldindan belgilaydi.

4. ANTIOZIQAVIY KOMPONENTLAR

Raps shrotining oziq-ovqatda keng qo‘ llanishini cheklovchi asosiy omillar — glyukozinolatlar, fitin kislotasi, fenol birikmalari (asosan sinapin va sinap kislotasi) hamda kletchatka [1]. Fenol birikmalari mahsulotga achchiq ta’m va to‘ q rang beradi [1]. Fitin kislotasi (myo-inozitol geksafosfat) saqlovchi oqsillar bilan birga harakatlanadi va Ca^{2+}, Mg^{2+}, Zn^{2+}, Fe^{2+} ionlari bilan kompleks hosil qilib, minerallarning o‘ zlashtirilishi hamda oqsil eruvchanligi va hazmlanuvchanligiga ta’sir qiladi [1]. Po‘ st urug‘ massasining atigi 18,2 % ini tashkil etsa-da, kletchatka va ligninning asosiy qismini saqlaydi,

shuning uchun po‘ stni ajratish va maydalash–elash orqali oqsil ulushini oshirish mumkin: eng mayda fraksiyada xom oqsil 368 dan 420 g/kg gacha ortib, umumiy ovqat tolasi 300 dan 214 g/kg gacha kamaygan [1].

Antioziqaviy moddalarni kamaytirishning asosiy yo‘ llari quyidagilar: (i) suv yoki suv-spirtli yuvish — pilot masshtabda po‘ stsizlantirilgan shrotni ikki marta suv bilan ishlash glyukozinolatlarning taxminan 98 % ini chiqargan, biroq quruq moddaning 30 % i va xom oqsilning ~25 % i ham ekstraktga o‘ tgan [1]; (ii) ishqoriy ekstraksiya va kislotali cho‘ ktirish — glyukozinolatlarning suvda eruvchan qismi supernatant va membrana permeatiga o‘ tadi [1]; (iii) fitaza bilan ishlov — oqsil ekstraksiyasi 72,1 % ga yetgan, konsentratda fitat ≈1 g/kg gacha kamaygan [1]; (iv) mikrobial fermentatsiya — aralash madaniyatlarda fitin kislotasi 42 %, glyukozinolatlar 99 % gacha kamaygan [1]. Sovuq siqilgan shrotda myrosinaza faolligi saqlanadi; suv qo‘ shilganda glyukozinolatlar tez gidrolizlanib, toksik nitrillar va goitrin hosil qilishi mumkin [1]. Shu sababli faqat glyukozinolatlar emas, ularning gidroliz mahsulotlarini ham nazorat qilish lozim.

5. OQSILNI AJRATISH USULLARI

Oqsilni ajratishning eng keng tarqalgan usuli — ishqoriy ekstraksiya va undan keyingi izoelektrik cho‘ ktirish [2, 3]. Ishqoriy muhitda oqsil molekulalarining manfiy zaryadi va o‘ zaro itarilishi ortadi, oqsil eritmaga o‘ tadi; pH kislotali sohaga tushirilganda eruvchanlik kamayib, oqsil cho‘ kadi [1]. Adabiyotlarda ekstraksiya pH i asosan 9–12 oralig‘ ida o‘ rganilgan (2-jadval). pH ortishi eruvchanlikni oshiradi (pH 9 dan 13 gacha taxminan 15 %), biroq kuchli ishqoriy sharoit fenol–oqsil o‘ zaro ta’sirini, rang o‘ zgarishini va oqsil agregatsiyasini kuchaytiradi [14].

2-jadval. Oqsil ajratish sharoitlari va natijalar

Usul va sharoit	Natija	Manba
Ekstraksiya pH 10,5, 1:10, 4 °C, 3 soat; cho‘ ktirish pH 5,0 (beshta raps navi)	oqsil qaytishi 26–41 %	[1]
Ekstraksiya pH 12, shrot konsentratsiyasi 15 %, tuzsiz	ekstraksiya unumi 58,12 %	[1]
Ekstraksiya pH 9, cho‘ ktirish pH 4,5	mahsulot chiqimi 65,08 %; rang qorayishi va antioziqaviy moddalar kam	[1]
Sovuq siqilgan kunjara: ekstraksiya pH 10,5, cho‘ ktirish pH 4,0	ajratish koeffitsienti 52 %; chiqim 33 %; oqsil 64 %	[13]
Fitaza bilan dastlabki ishlov, keyin ishqoriy ekstraksiya	ekstraksiya 72,1 %; fitat ≈1 g/kg	[1]
Membrana bilan tozalash (5 kDa)	oqsil miqdori 45,1 –63,4 %	[1]

Jadvaldan ko‘ rinadiki, bir xil sxema xomashyo turi va sharoitga qarab turlicha natija beradi. Ahlström va boshq. ishida cho‘ ktirishning eng yuqori chiqimi pH 4,0 da (33 %) kuzatilgan, biroq emulsiyani eng barqaror ushlagan oqsil pH 5,0–6,0 da cho‘ ktirilgan [13]: ya’ni «eng ko‘ p chiqim» va «eng yaxshi funksional xususiyat» bir nuqtaga to‘ g‘ ri kelmaydi. Ishqoriy ekstraksiyaga muqobillar — tuzli ekstraksiya (rang, ta’m, eruvchanlik va emulsiyalash bo‘ yicha yaxshiroq, lekin napin ulushi yuqori), fermentli ekstraksiya, ultratovush [15] hamda membrana (ultrafiltratsiya) usullari; ular sifatni yaxshilaydi, biroq jarayonni murakkablashtiradi [1]. Shu bois ekstraksiya sharoitini faqat oqsil chiqimi bo‘ yicha emas, chiqim, tozalik, funksional xususiyat va xavfsizlik ko‘ rsatkichlari majmui bo‘ yicha tanlash maqsadga muvofiq.

6. FUNKSIONAL XUSUSIYATLAR

Oqsil konsentratining oziq-ovqatda qo‘ llanilishi eruvchanlik, suv va yog‘ ni ushlab qolish qobiliyati (SUQ, YUQ), emulsiyalash, ko‘ pik hosil qilish va gel hosil qilish xususiyatlari bilan belgilanadi [2, 3]. Bu ko‘ rsatkichlar ekstraksiya usuliga kuchli bog‘ liq: Tan va boshq. sharhiga ko‘ ra, ishqoriy ekstraktlar odatda funksional ingrediyent sifatida unchalik mos emas, emulsiyalash bo‘ yicha esa turli ishlarda qarama-qarshi natijalar olingan, shu sababli funksional xususiyatlarni o‘ lchashda yagona tizimli yondashuv zarur [2]. Cho‘ ktirish pH i emulsiya barqarorligiga ta’sir qiladi [13]. Ketma-ket izoelektrik cho‘ ktirishda olingan izolyatlar oqsil va fenol miqdori, molekulyar massa taqsimoti, eruvchanlik, suv va yog‘ ni bog‘ lash, emulsiyalash hamda ko‘ pik hosil qilish xususiyatlari bilan farqlangan [1]. Membrana bilan tozalash oqsil miqdorini oshirib, ko‘ pik barqarorligi va yuza plyonkalar mustahkamligini yaxshilagan [1]. Ishlov davomida oqsil konformatsiyasi va eruvchanligi o‘ zgarishi mumkinligi sababli [1] quritish rejimi ham alohida optimallashtirilishi lozim. Funksional xususiyatlar mahsulot muhitiga (pH, tuz, harorat) bog‘ liq bo‘ lgani uchun ularni faqat suvli tizimda emas, qo‘ llanish sharoitiga yaqin muhitda ham baholash maqsadga muvofiq.

7. SIFAT KO‘ RSATKICHLARI VA BAHOLASH USULLARI

O‘ zbekistonda yetishtirilgan rapsdan olingan shrot va undan ajratilgan oqsil konsentratini baholashda uch guruh ko‘ rsatkichni aniqlash tavsiya etiladi: asosiy tarkib; xavfsizlik va ozuqaviy qiymat; funksional xususiyatlar (3-jadval). Har bir namunaga nav, o‘ stirilgan hudud, hosil yili va moy olish usuli ko‘ rsatilishi kerak, chunki ular natijaga bevosita ta’sir

qiladi [1]. Tajribalar kamida uch marta takrorlanib, natijalar o‘ rtacha qiymat va standart og‘ ish bilan beriladi. Ajratish samaradorligi quyidagi formulalar bilan baholanadi:

$$Y = (m_1 / m_0) \times 100\ \%, \qquad R = (m_1 \times P_1) / (m_0 \times P_0) \times 100\ \%,$$

bu yerda Y — oqsil mahsuloti chiqimi, %; R — oqsilning qayta tiklanish darajasi, %; m_0 — boshlang‘ ich shrot massasi, g; m_1 — olingan quruq oqsil mahsuloti massasi, g; P_0 va P_1 — mos ravishda shrot va mahsulotdagi oqsil ulushi.

3-jadval. Raps shroti va oqsil konsentratining tavsiya etiladigan sifat ko‘ rsatkichlari

Guruh	Ko‘ rsatkich	Aniqlash usuli (standart)
Asosiy tarkib	Namlik, %	Quritish usuli (ISO 6496)
	Xom oqsil, % (konversiya koeffitsienti ko‘ rsatiladi)	Kjeldal usuli (ISO 5983-2) yoki Dumas
	Yog‘ , %	Ekstraksiya usuli (ISO 6492)
	Kul, %	Kullash usuli (ISO 5984)
	Xom kletchatka, %	Standart usul (ISO 6865)
Xavfsizlik	Glyukozinolatlar, μmol/g	HPLC (ISO 9167-1)
	Fitin kislotasi, %	HPLC yoki kolorimetrik usul
	Fenol birikmalari (sinapin)	HPLC yoki spektrofotometrik usul
Funksional	Eruvchanlik, % (turli pH da)	Eruvchan oqsilni aniqlash (Kjeldal/Louri)
	SUQ va YUQ, g/g	Suv va yog‘ ni bog‘ lash (sentrifugalash)
	Emulsiyalash qobiliyati va barqarorligi	Emulsiya hosil qilish va vaqt bo‘ yicha saqlanish
	Ko‘ pik hosil qilish qobiliyati va barqarorligi, %	Ko‘ pik hajmini o‘ lchash

8. OZIQ-OVQATDA QO‘ LLASH IMKONIYATLARI

Raps oqsil konsentrati oziq-ovqat mahsulotlarining oqsil miqdorini oshirish uchun non va un-qandolat mahsulotlarida, go‘ shtli va kolbasa mahsulotlarida (bog‘ lovchi va emulgator sifatida), souslar va emulsiya turidagi mahsulotlarda, o‘ simlik asosidagi sut o‘ rnini bosuvchi mahsulotlarda hamda sport va parhez oziq-ovqatlarida qo‘ llanilishi mumkin. Bu yo‘ nalishlar konsentratning funksional xususiyatlariga asoslangan taxminiy yo‘ nalishlar bo‘ lib, retsepturani organoleptik va fizik-kimyoviy tahlil asosida ishlab chiqish zarur, chunki konsentrat ulushi ortganda achchiq yoki begona ta’m va tekstura o‘ zgarishi kuzatilishi mumkin [1]. Sharhlarda ta’kidlanishicha, oziq-ovqat uchun mo‘ ljallangan oqsil rang, ta’m, antioziqaviy moddalar va funksionallik bo‘ yicha qat’iy nazoratni talab qiladi, em-xashak va fermentatsiya uchun esa murakkabroq tarkibli fraksiyalar ham yetarli [1]. O‘ zbekistonda raps shroti importi ortayotganini [5] hisobga olsak, mahalliy xomashyo asosida oqsil bilan boyitilgan fraksiyalar (po‘ stni ajratish va elash orqali) olish import bog‘ liqligini kamaytirish nuqtayi nazaridan istiqbolli yo‘ nalish bo‘ lishi mumkin.

9. NATIJALAR VA MUHOKAMA

Tahlil shuni ko‘ rsatadiki, raps shrotining sifati va undan oqsil ajratish samaradorligi eng avvalo moy olish usuli bilan belgilanadi: sovuq siqilgan shrotdan oqsil ajratish ancha oson, kuchli qizdirilgan va erituvchi bilan ekstraksiyalangan shrotdan esa qiyin [1, 9]. Ikkinchidan, ishqoriy ekstraksiya va izoelektrik cho‘ ktirish keng o‘ rganilgan bo‘ lsa-da, natijalar xomashyo va sharoitga qarab keng oraliqda o‘ zgaradi, eng yuqori chiqim esa eng yaxshi funksional xususiyatlarni kafolatlamaydi [13]. Uchinchidan, konsentratning oziq-ovqat sifatidagi yaroqliligi glyukozinolatlar, fitin kislotasi va fenol birikmalari miqdori bilan chambarchas bog‘ liq.

Aniqlangan bo‘ shliq shundaki, O‘ zbekiston sharoitida yetishtirilgan raps navlarining shrotini tarkib, antioziqaviy moddalar va funksional xususiyatlar bo‘ yicha taqqoslovchi ma’lumotlar yetarli emas. 3-jadvalda keltirilgan ko‘ rsatkichlar majmuasi bo‘ yicha mahalliy namunalarni tizimli o‘ rganish, ularni yuqorida keltirilgan xorijiy ma’lumotlar bilan solishtirish va ekstraksiya parametrlarini (pH 8–12, harorat 30–50 °C, vaqt 30–90 min, xomashyo:suv 1:10–1:20, cho‘ ktirish pH 3,5–5,5) ko‘ p omilli tajriba rejalashtirish asosida optimallashtirish keyingi tadqiqotlarning asosiy yo‘ nalishi bo‘ lishi mumkin.

XULOSA

- Raps shrotidagi oqsil miqdori taxminan 35–40 % bo‘ lib, moy olish usuliga qarab o‘ zgaradi; erituvchi bilan ekstraksiyalangan shrotda oqsil nisbatan yuqori, lekin undan oqsil ajratish qiyinroq.
- Antioziqaviy moddalar (glyukozinolatlar, fitin kislotasi, fenollar, kletchatka) oziq-ovqat maqsadidagi qo‘ llanishni cheklaydi va texnologiyada alohida hisobga olinishi zarur.

• Ishqoriy ekstraksiya va izoelektrik cho‘ ktirish eng ko‘ p o‘ rganilgan usul; optimal sharoitni oqsil chiqimi, tozaligi, funksional xususiyatlari va xavfsizligi majmui bo‘ yicha tanlash kerak.

• O‘ zbekistonda yetishtirilgan rapsdan olingan shrotni baholash uchun 3-jadvalda keltirilgan ko‘ rsatkichlar majmuasi tavsiya etiladi; mahalliy namunalar bo‘ yicha eksperimental ma’lumotlar to‘ plash keyingi bosqich vazifasidir.

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DEVELOPMENT OF A TECHNOLOGY FOR REPROCESSING SPENT ZEOLITES USED IN GAS DEHYDRATION: A REVIEW AND TECHNOLOGICAL ASSESSMENT

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Abstract: *Zeolite molecular sieves are widely used for deep dehydration of natural gas because of their high affinity for water, well-defined micropore structure and ability to achieve very low outlet water concentrations. During long-term cyclic operation, however, the adsorbent gradually loses performance as a result of hydrothermal aging, carbonaceous deposits, adsorption of methanol and heavier hydrocarbons, pore blockage, binder deterioration and mechanical attrition. Complete replacement of the molecular sieve bed produces a significant solid-waste stream even though a substantial part of the spent material may retain crystalline structure and recoverable adsorption capacity. This review and technological assessment summarizes recent data on the deactivation and regeneration of 3A, 4A, 5A and 13X molecular sieves used in gas dehydration and proposes an integrated reprocessing route. The proposed route includes feed identification and segregation, removal of fines, analytical diagnosis, low-temperature drying, thermal desorption, controlled oxidative removal of carbonaceous residues when justified, cooling under dry gas, grading, water-adsorption testing and mechanical quality control. Depending on the recovered performance, regenerated material may be returned to dehydration service, redirected to less demanding adsorption duties, or converted into an aluminosilicate secondary raw material. The article is literature-based and does not report original plant trials; therefore, the temperature windows and acceptance criteria are presented as screening ranges that must be validated for the exact commercial zeolite, binder and contamination profile.*

Keywords: *natural gas dehydration; molecular sieve; zeolite; spent adsorbent; regeneration; reprocessing; thermal treatment; coke removal; circular economy.*

GAZNI QURITISHDA ISHLATILGAN ISHLATILGAN SEOLITLARNI QAYTA ISHLASH TEXNOLOGIYASINI ISHLAB CHIQISH: SHARH VA TEXNOLOGIK BAHOLASH

Annotatsiya: *Seolit molekulyar elaklar suvga yuqori moyilligi, aniq shakllangan mikrog‘ ovak tuzilishi va chiqish oqimidagi suv konsentratsiyasini juda past darajagacha kamaytirish imkoniyati tufayli tabiiy gazni chuqur quritishda keng qo‘ llaniladi. Biroq uzoq muddatli siklik ishlash jarayonida adsorbent gidrotermik qarish, uglerodli cho‘ kindilar hosil bo‘ lishi, metanol va og‘ ir uglevodorodlarning adsorbsiyalanishi, g‘ ovaklarning tiqilib qolishi, bog‘ lovchi moddaning yemirilishi hamda mexanik ishqalanish natijasida o‘ z samaradorligini asta-sekin yo‘ qotadi. Molekulyar elak qatlamini to‘ liq almashtirish katta miqdorda qattiq chiqindi hosil qiladi, holbuki ishlatilgan materialning muayyan qismi kristall tuzilishini saqlab qolishi va qayta tiklanishi mumkin bo‘ lgan adsorbsion sig‘ imga ega bo‘ lishi mumkin. Mazkur sharh va texnologik baholashda gazni quritishda qo‘ llaniladigan 3A, 4A, 5A va 13X molekulyar elaklarning faolsizlanishi va regeneratsiyasi bo‘ yicha so‘ nggi ma’lumotlar umumlashtirilgan hamda kompleks qayta ishlash texnologiyasi taklif etilgan. Taklif etilayotgan texnologiya xomashyoni aniqlash va saralash, mayda zarrachalarni olib tashlash, analitik diagnostika, past haroratda quritish, termik desorbsiya, zarur hollarda uglerodli qoldiqlarni nazorat ostida oksidlovchi usulda olib tashlash, quruq gaz muhitida sovitish, fraksiyalash, suvni adsorbsiyalash qobiliyatini sinash va mexanik sifat nazoratini o‘ z ichiga oladi. Qayta tiklangan materialning xususiyatlariga qarab, regeneratsiyalangan seolit quritish jarayoniga qaytarilishi, talablari nisbatan past bo‘ lgan adsorbsion jarayonlarga yo‘ naltirilishi yoki alumosilikat ikkilamchi xomashyoga aylantirilishi mumkin. Maqola adabiyotlar sharhi asosida tayyorlangan bo‘ lib, unda sanoat qurilmasidagi original sinovlar natijalari keltirilmagan. Shu sababli harorat diapazonlari va qabul qilish mezonlari aniq tijoriy seolit turi, bog‘ lovchi modda hamda ifloslanish tarkibi uchun alohida tasdiqlanishi lozim bo‘ lgan dastlabki baholash diapazonlari sifatida taqdim etilgan.*

Kalit so‘ zlar: *tabiiy gazni quritish; molekulyar elak; seolit; ishlatilgan adsorbent; regeneratsiya; qayta ishlash; termik ishlov berish; koksni olib tashlash; aylanma iqtisodiyot.*

РАЗРАБОТКА ТЕХНОЛОГИИ ПЕРЕРАБОТКИ ОТРАБОТАННЫХ ЦЕОЛИТОВ, ИСПОЛЬЗУЕМЫХ ДЛЯ ОСУШКИ ГАЗА: ОБЗОР И ТЕХНОЛОГИЧЕСКАЯ ОЦЕНКА

Аннотация: *Цеолитовые молекулярные сита широко применяются для глубокой осушки природного газа благодаря их высокой сродству к воде, хорошо сформированной микропористой структуре и способности обеспечивать очень низкую концентрацию воды на выходе. Однако при длительной циклической эксплуатации адсорбент постепенно теряет свои эксплуатационные характеристики вследствие гидротермического старения, образования углеродистых отложений, адсорбции метанола и тяжёлых углеводородов, блокировки пор, разрушения связующего и механического истирания. Полная замена слоя молекулярного сита приводит к образованию значительного потока твёрдых отходов, несмотря на то, что существенная часть отработанного материала может сохранять кристаллическую структуру и восстанавливаемую адсорбционную способность. В настоящем обзоре и технологической оценке обобщены современные данные о дезактивации и регенерации молекулярных сит 3A, 4A, 5A и 13X, применяемых для осушки газа, и предложен интегрированный маршрут переработки. Предлагаемый маршрут включает идентификацию и сортировку исходного материала, удаление мелких частиц, аналитическую диагностику, низкотемпературную сушку, термическую десорбцию, контролируемое окислительное удаление углеродистых остатков в обоснованных случаях, охлаждение в среде сухого газа, классификацию по фракциям, испытание водоадсорбционной способности и механический контроль качества. В зависимости от восстановленных эксплуатационных характеристик регенерированный материал может быть возвращён в процесс осушки, направлен на менее требовательные адсорбционные процессы или преобразован во вторичное алюмосиликатное сырьё. Статья основана на анализе литературных данных и не содержит результатов оригинальных промышленных испытаний; поэтому температурные диапазоны и критерии приемки представлены как предварительные диапазоны для скрининговой оценки, которые должны быть подтверждены для конкретного коммерческого цеолита, связующего и профиля загрязнений.*

Ключевые слова: *осушка природного газа; молекулярное сито; цеолит; отработанный адсорбент; регенерация; переработка; термическая обработка; удаление кокса; циркулярная экономика.*

Highlights

- Spent gas-dehydration molecular sieves should be diagnosed before regeneration because deactivation mechanisms are not identical.
- Methanol and hydrocarbon contamination can produce persistent carbonaceous residues and substantial water-capacity loss.
- Excessively severe regeneration can accelerate structural aging; temperature must therefore be optimized rather than maximized.
- A staged reprocessing scheme combining desorption, controlled decoking and post-treatment qualification is proposed.
- Recovered adsorbent should be routed according to measured adsorption capacity and mechanical integrity, not visual appearance alone.

1. Introduction

Removal of water vapor is a critical step in natural-gas processing. Water promotes corrosion in the presence of acid gases, contributes to gas-hydrate formation at high pressure and low temperature, and can freeze or interfere with cryogenic and downstream separation equipment. Solid-desiccant dehydration is especially important when very low water concentrations or low dew points are required. Among commercial solid desiccants, zeolite molecular sieves are distinguished by strong water affinity, selective micropores and high thermal stability, and LTA-type molecular sieves such as 3A and 4A are widely used in gas-processing service [1-4].

Industrial molecular-sieve beds are operated cyclically, usually by temperature-swing adsorption (TSA). One bed adsorbs water while another is regenerated with heated gas and then cooled before returning to adsorption duty. In an ideal cycle only reversibly adsorbed water is removed. In real plants, however, the sieve is exposed to repeated heating and cooling, contaminants in the gas stream, upstream carryover and mechanical stresses. These factors may progressively reduce water uptake and shorten breakthrough time. Recent studies show that adsorbent aging is not a minor secondary issue but a defining factor in dehydration-unit performance [4,5].

A common operational response is complete replacement of the adsorbent bed. This approach restores drying capacity but transfers the problem to waste management and increases replacement cost. The central assumption of the present article is different: spent molecular sieve should first be treated as a potentially recoverable process material. The key question is not whether every spent pellet can be returned to its original duty, but which fraction can be regenerated safely, how much capacity can be restored, and what secondary use is technically justified for the remaining fraction. This requires a diagnostic and decision-based reprocessing technology rather than a single universal heating procedure.

The objective of this work is to analyze the main mechanisms responsible for degradation of zeolites used in gas dehydration, compare available regeneration approaches, and formulate an integrated technology for reprocessing spent molecular sieves. The article follows the format of a review and conceptual technological assessment. No original industrial performance data are reported; proposed operating windows must therefore be confirmed experimentally before scale-up.

2. Methodology of the Review and Technological Assessment

The assessment was developed from recent peer-reviewed literature on natural-gas dehydration, molecular-sieve aging, contaminant exposure, thermal cycling and regeneration of deactivated zeolites. Particular attention was given to industrial LTA and FAU materials and to studies published from 2018 to 2026. Earlier references were used only where they provide basic engineering context. The evaluation criteria were: (i) ability to remove reversibly adsorbed water; (ii) ability to remove organic or carbonaceous deposits; (iii) preservation of zeolite crystallinity and pore structure; (iv) mechanical integrity of shaped pellets; (v) energy and gas demand; (vi) process safety and controllability; and (vii) feasibility of subsequent reuse or material recovery.

The literature demonstrates that the same spent molecular sieve can contain several forms of deactivation simultaneously. For this reason, regeneration technologies were not ranked by maximum temperature alone. Instead, the proposed process uses diagnosis to select the minimum treatment severity necessary to remove the dominant contaminant while limiting additional thermal or hydrothermal damage.

3. Zeolites Used in Gas Dehydration and Their Deactivation

3.1. Functional role of molecular sieves

Zeolites are crystalline aluminosilicates containing molecular-scale pores and exchangeable cations. Their hydrophilicity originates from framework aluminum and associated charge-compensating cations, which create strong electrostatic interactions with water. Commercial gas-dehydration products are generally shaped as beads or extrudates and may contain approximately 10-20 wt.% binder, depending on product formulation. LTA zeolites are widely used for water removal, while 13X (FAU topology) can offer higher pore volume but also admits larger molecules. Molecular-sieve selection therefore reflects both the target water specification and the risk of co-adsorbing hydrocarbons or other contaminants [1,6].

3.2. Major deactivation mechanisms

Spent adsorbent performance is controlled by a combination of reversible loading and irreversible or partly irreversible aging. The most important mechanisms are summarized in Table 1. Reversible water loading should be removed during normal regeneration. More persistent capacity loss is associated with carbonaceous residues, pore blockage, chemical contamination, structural changes and attrition. A 2022 study of 4A, 5A and 13X molecular sieves exposed to methanol and heptane showed that methanol could cause particularly severe loss of water-vapor adsorption capacity; water uptake in methanol-exposed samples was about 50% below that of fresh zeolites, with nonvolatile residual hydrocarbons identified as an important cause [2].

Hydrocarbon exposure is also important. Accelerated aging experiments simulating TSA operation found n-heptane to be a major factor promoting zeolite aging under the tested conditions [3]. In addition, repeated temperature cycling can itself alter adsorbent performance. Jacobs et al. reported that long-term cycling degradation depended strongly on regeneration temperature. For 13X, capacity loss after 5,000 cycles increased as the tested regeneration temperature rose, whereas 4A was considerably more stable under the same high-temperature cycling experiment [4]. The result does not imply that one universal temperature is optimal; it shows that regeneration severity must be matched to material type and service history.

Table 1. Main causes of spent molecular-sieve deactivation in gas dehydration.

Deactivation mechanism	Typical origin	Diagnostic indicators	Reprocessing implication
Residual water loading	Incomplete normal regeneration, poor heat distribution	High mass loss at low/intermediate temperature; low initial capacity	Dry-gas thermal desorption may be sufficient
Hydrocarbon / methanol-derived deposits	Feed carryover, methanol injection, condensable hydrocarbons	CHNS/TGA carbon signal; darkening; reduced micropore uptake	May require controlled oxidative decoking after inert desorption
Pore blockage by oil or heavy organics	Compressor oil, glycol, condensate, heavy hydrocarbon carryover	High extractables; FTIR organic bands; low BET/micropore volume	Pre-cleaning or staged thermal treatment; severe cases may be rejected

Hydrothermal / thermal aging	Repeated TSA cycles, excessive regeneration severity	Reduced crystallinity or altered adsorption kinetics	Avoid unnecessary high temperature; verify XRD and water capacity
Binder damage and attrition	Thermal stress, pressure drop, handling	Fines generation, reduced crush strength	Screen out fines; mechanically weak pellets should not return to primary bed
Inorganic contamination	Corrosion products, salts, particulates	XRF/SEM-EDS changes; ash increase	Physical separation or secondary use may be more rational than reactivation

4. Current Approaches to Regeneration and Reprocessing

4.1. Thermal desorption with dry gas

Thermal desorption is the basic regeneration mechanism for water-loaded molecular sieves. Heating lowers the equilibrium loading and releases strongly adsorbed water, while a dry purge removes desorbed vapor from the bed. Published engineering literature commonly places complete water desorption from zeolites in a high-temperature range, and cyclic industrial practice typically uses a controlled heating, soak and cooling sequence rather than abrupt heating [1,2]. For spent adsorbent reprocessing, however, the purpose differs from routine bed regeneration: the goal is to recover capacity without adding new thermal damage. Therefore, a screening program should begin with the mildest temperature capable of removing water and volatile contaminants.

4.2. Controlled thermal oxidation for carbonaceous deposits

When TGA, CHNS, FTIR or other analyses confirm persistent organic or carbonaceous residues, inert thermal desorption alone may not restore micropore accessibility. Controlled oxidation can remove coke-like deposits, but the treatment window must remain below the temperature at which the zeolite framework or binder loses integrity. A 2025 study of 3A molecular sieves removed from a gas refinery after four years of service found that heating could regenerate deactivated material and that the zeolite structure remained essentially unchanged up to approximately 550 degrees C; significant structural change occurred at higher temperatures. Even after regeneration in the investigated 400-550 degrees C range, water capacity remained about 40% lower than fresh material, showing that decoking can recover performance without necessarily restoring the virgin state [7].

For aged industrial 4A molecular sieves, a 2025 study also reported improvement of dehydration capacity after heat treatment under oxygen-enriched air [8]. These results support a controlled oxidative step for selected spent batches, but they do not justify direct air calcination at the maximum temperature. Local hot spots, exothermic coke combustion and binder sensitivity must be considered. A practical technology should therefore use staged oxygen introduction and temperature monitoring after the volatile fraction has first been removed under inert or low-oxygen conditions.

4.3. Chemical washing and solvent extraction

Chemical or solvent washing can in principle remove oils, glycols, salts or other surface contaminants. Nevertheless, zeolite molecular sieves are ion-exchange materials, and aggressive acids, bases or high-water washing conditions can alter cation form, framework aluminum, binder properties and pellet strength. Chemical washing should therefore not be treated as a universal first step. It is most defensible when the contaminant has been identified and a compatibility test confirms that the washing agent does not reduce crystallinity, water capacity or mechanical strength. For hydrocarbon-dominated contamination, thermal separation is generally simpler to integrate with gas-plant practice.

4.4. Mechanical classification and secondary material routes

A meaningful fraction of removed molecular sieve may be physically damaged rather than chemically exhausted. Fines and broken pellets increase pressure drop and are unsuitable for return to a primary dehydration vessel, even if their intrinsic adsorption capacity remains high. Screening should therefore be an explicit reprocessing stage. Material that fails mechanical acceptance but retains aluminosilicate structure can be evaluated for less demanding adsorptive duties or as an aluminosilicate feedstock. General spent-adsorbent literature emphasizes a hierarchy of regeneration for reuse, secondary functional use and, only when necessary, safe disposal [9].

Table 2. Comparative assessment of regeneration options for spent gas-dehydration zeolites.

Method	Best-suited contamination	Main benefit	Main limitation / risk	Recommended role
Dry-gas thermal desorption	Water and volatile organics	Simple, compatible with TSA practice	May not remove coke-like residues	First regeneration stage

Controlled oxidative thermal treatment	Coke / persistent carbonaceous deposits	Restores blocked pore volume	Exotherm, framework and binder damage at excessive severity	Conditional second stage after diagnosis
Solvent washing	Oil, glycol or selected organics	Targets extractable contamination	Solvent recovery; possible pellet/binder effects	Case-specific pre-treatment
Acid/base washing	Selected inorganic contaminants	Can dissolve salts or deposits	May alter zeolite chemistry and ion-exchange state	Not a default route; use only after compatibility testing
Screening / air classification	Fines and broken pellets	Improves hydraulic/mechanical quality	Does not restore adsorption capacity	Mandatory physical conditioning
Material recovery / secondary use	Adsorbent that cannot meet primary-bed specification	Reduces disposal and preserves material value	Requires contaminant and application-specific qualification	Final route for non-primary-grade material

5. Proposed Integrated Technology for Reprocessing Spent Zeolite

The proposed technology is based on a decision tree rather than a fixed one-temperature treatment. Each batch is first identified by zeolite type, supplier or product grade, years of service, bed position and known process upsets. Mixing unknown 3A, 4A, 5A and 13X wastes before characterization should be avoided because pore size, cation form, binder and thermal behavior differ. The integrated sequence is shown in Figure 1.

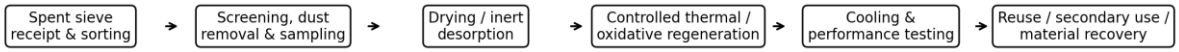


Figure 1. Proposed integrated route for reprocessing spent zeolite molecular sieves from gas-dehydration service.

5.1. Stage 1 - receipt, segregation and safe conditioning

Spent adsorbent should be transferred in closed containers where practical and accompanied by process-history information. The first technical decision is whether the material has been exposed to hazardous compounds that would constrain reuse or thermal treatment. Representative samples are taken from each batch. Oversize foreign matter and excessive fines are removed by sieving. The mass fraction of fines is recorded because it is an indirect indicator of attrition and bed deterioration.

5.2. Stage 2 - diagnostic characterization

The minimum recommended diagnostic package is: moisture/volatile loss, TGA/DTG, XRD, FTIR, CHNS or total carbon, water adsorption capacity, particle-size distribution and crush-strength or attrition testing. BET or micropore analysis, XRF and SEM-EDS are added when available. Comparison with an unused reference sample from the same product grade is strongly preferred. This stage prevents two costly errors: over-treating material whose main problem is reversible loading, and attempting to regenerate material whose framework or mechanical integrity has already failed.

5.3. Stage 3 - low-temperature drying and inert desorption

A preliminary drying/desorption step should remove free moisture, weakly adsorbed water and volatile hydrocarbons before any oxidative treatment. For laboratory development, a staged screening range of approximately 105-150 degrees C for initial drying followed by 200-320 degrees C under dry inert or oxygen-lean purge can be evaluated. These values are not universal plant set points; they are a rational experimental window that brackets water desorption while remaining less severe than high-temperature decoking. Mass loss and off-gas composition should be monitored to determine whether volatile removal is complete.

5.4. Stage 4 - controlled decoking when required

If carbon analysis and TGA show a significant nonvolatile organic fraction after inert desorption, a controlled oxidative stage can be tested. A practical laboratory screening window is approximately 350-500 degrees C with gradual introduction of oxygen-containing gas and strict bed-temperature control. The upper limit must be material-specific. The

2025 study on spent 3A molecular sieve found structural preservation up to about 550 degrees C under its experimental conditions but deterioration at higher temperature [7]. Accordingly, 550 degrees C should be treated as an evidence-based caution boundary for that particular 3A material, not as a routine operating target for every zeolite.

5.5. Stage 5 - cooling, grading and qualification

After regeneration, the adsorbent should be cooled under dry gas to prevent immediate readsorption of atmospheric moisture. The regenerated material is then screened again to remove newly generated fines and subjected to water-capacity and mechanical testing. The decisive parameter is not color change but restored function. For process development, a restoration coefficient can be defined as Kq = qreg/qfresh x 100%, where qreg is the equilibrium or standardized dynamic water capacity of the regenerated sample and qfresh is the corresponding value for fresh product. A mechanical retention coefficient can similarly be defined from crush strength or attrition data. Acceptance limits must be set by the plant, equipment design and product specification.

Table 3. Suggested laboratory screening matrix for technology development (not universal operating specifications).

Stage	Purpose	Variables to screen	Primary control	Decision
Feed characterization	Identify deactivation mechanism	Bed position, service time, contaminant history	XRD, FTIR, TGA/DTG, CHNS, water capacity, crush strength	Select treatment route
Initial drying	Remove free/weakly bound moisture	Approx. 105-150 degrees C; time; purge flow	Mass loss, outlet humidity	Proceed when moisture stabilizes
Thermal desorption	Remove strongly adsorbed water/volatiles	Approx. 200-320 degrees C; heating rate; purge gas	TGA correlation, off-gas, water capacity	Stop if capacity is adequately restored
Controlled oxidation	Remove persistent carbonaceous deposits	Approx. 350-500 degrees C; oxygen concentration; residence time	Bed temperature, CO/CO2, residual carbon, XRD	Optimize minimum severity
Cooling	Prevent readsorption and thermal shock	Dry-gas cooling rate	Outlet temperature/dew point	Ready for testing
Qualification	Determine reuse route	Capacity, kinetics, crush strength, attrition, fines	Kq and mechanical retention	Primary reuse / secondary use / reject

6. Qualification Criteria and Reuse Strategy

A regenerated batch should not automatically return to the original dryer. Qualification should compare fresh, spent and regenerated samples using the same protocol. At minimum, the comparison should include equilibrium or standardized water uptake, dynamic breakthrough behavior, adsorption/desorption kinetics and mechanical integrity. XRD alone is insufficient: a sample can remain crystalline while losing meaningful water capacity because of pore blockage or binder-related effects [2].

For pilot development, the following routing concept is recommended. Material that recovers close to fresh adsorption performance and passes mechanical tests can be considered for blending trials or controlled return to dehydration service. Material with moderate capacity recovery but acceptable strength can be tested in less demanding pre-drying or guard-bed service. Material that is structurally intact but mechanically unsuitable may be ground and evaluated as a secondary aluminosilicate adsorbent or raw material, subject to contaminant assessment. Material with hazardous contamination, irreversible structural collapse or unacceptable leaching behavior should be directed to regulated disposal. Numerical acceptance thresholds should be established from plant specifications and pilot data rather than copied generically between facilities.

Table 4. Decision matrix for regenerated zeolite routing.

Measured condition after treatment	Interpretation	Preferred route
High water-capacity recovery + acceptable kinetics + acceptable strength	Functional adsorbent largely restored	Pilot return to gas-dehydration service or blending with fresh sieve
Moderate capacity recovery + good mechanical integrity	Adsorbent still functional but may not meet deep-drying duty	Secondary drying, guard-bed or less stringent adsorption service

Low adsorption recovery + retained aluminosilicate structure	Micropore function substantially impaired	Material recovery / alternative adsorbent or mineral raw-material research
Severe framework loss, high attrition or hazardous contamination	Regeneration is technically or environmentally unjustified	Controlled disposal according to waste classification

7. Mechanistic Basis of the Proposed Technology

The logic of the process can be understood by separating reversible adsorption from irreversible obstruction. Water molecules are strongly attracted to zeolite cations and framework oxygen; heat and a dry purge shift the adsorption equilibrium and remove them. Hydrocarbon-derived deposits behave differently. They may occupy pore volume, cover adsorption sites or create diffusion barriers. The molecular-simulation analysis reported for deactivated 3A material showed that coke in zeolite cavities reduces the interaction energy between water and the zeolite, consistent with lower water uptake [7]. Removing the deposit can therefore restore part of the effective adsorption volume.

At the same time, regeneration itself can become a source of degradation. Long-term cycling data show a temperature-dependent loss of adsorption capacity, particularly for 13X under severe repeated thermal treatment [4]. A separate 2023 study examining CO2 and water effects over many cycles also demonstrated that process-fluid composition can influence degradation behavior [10]. Thus, the correct engineering objective is not maximum coke burnoff at maximum temperature; it is maximum useful capacity recovery at the lowest severity that preserves structure and mechanical strength.

8. Environmental and Techno-Economic Considerations

Reprocessing can reduce the volume of solid adsorbent sent to disposal and can defer purchase of replacement molecular sieve. The benefit, however, depends on energy consumption, purge-gas demand, off-gas treatment, yield of mechanically acceptable product and the number of additional service cycles obtained. A proper techno-economic study should therefore report at least: mass yield of reusable pellets, restored water capacity, regeneration energy per kilogram of accepted product, purge-gas consumption, off-gas treatment requirement, fraction routed to secondary use, and avoided disposal and replacement cost.

Environmental assessment must also consider the fate of removed contaminants. Oxidative decoking converts organic residues to gaseous products and may generate CO, CO2 and volatile compounds that require controlled exhaust handling. Solvent washing transfers contaminants to a liquid waste stream and therefore should only be used when solvent recovery and wastewater management are justified. The circular economy advantage of regeneration is real only when the secondary emissions and residues are included in the system boundary [9].

9. Research Gaps and Experimental Program

The principal research gap is the limited amount of public data on spent molecular sieves removed from real gas-processing plants. Aging is strongly dependent on gas composition, upstream separation quality, methanol or glycol carryover, regeneration history, bed temperature profile and adsorbent formulation. Recent work on industrial 4A samples taken from different levels of a dehydration column shows the value of spatially resolved sampling because residual properties can vary with bed position [8].

A defensible experimental program should therefore compare samples from the top, middle and bottom of the actual industrial bed. The recommended sequence is: (i) baseline characterization of fresh and spent zeolite; (ii) mild thermal-desorption screening; (iii) controlled oxidative regeneration only for samples with persistent carbonaceous residues; (iv) optimization by water-capacity recovery and mechanical retention, not by carbon removal alone; (v) repeated adsorption-regeneration cycles on the recovered adsorbent; (vi) dynamic breakthrough testing with representative wet gas; and (vii) pilot-scale pressure-drop and attrition evaluation. This would convert the present conceptual route into an original research article with plant-specific performance and economic data.

10. Conclusion

Spent zeolite molecular sieves from gas-dehydration units should not automatically be considered irrecoverable waste. Recent literature shows that the dominant causes of performance loss include methanol- and hydrocarbon-derived deposits, coking, repeated thermal cycling, pore blockage, binder deterioration and mechanical attrition. At the same time, published regeneration studies demonstrate that controlled heat treatment can recover part of the dehydration capacity of aged 3A and 4A molecular sieves. The critical limitation is that severe heating can also accelerate irreversible degradation, and complete restoration to fresh-sieve performance is not guaranteed.

The most rational reprocessing technology is therefore a staged diagnostic route: segregation and screening; physicochemical diagnosis; mild drying and inert desorption; controlled oxidative decoking only when justified; dry-gas cooling; mechanical classification; and performance qualification. Reuse decisions should be based on measured water

adsorption, breakthrough behavior and mechanical strength. This approach can create three value streams - regenerated adsorbent for primary service, lower-grade adsorbent for secondary service, and aluminosilicate material for further recovery - while minimizing the fraction that requires disposal. Plant-specific laboratory and pilot validation remains essential before industrial implementation.

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OQOVA SUVLARNI SIMOB(II) IONLARIDAN TOZALASHDA EPIXLORGIDRIN ASOSIDAGI POLIFUNKSIONAL SORBENTNING EKOLOGIK SAMARADORLIGINI BAHOLASH

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Annotatsiya. *Mazkur tadqiqotda oqova suvlarni Hg(II) ionlaridan tozalash uchun epixlorgidrin asosida modifikatsiyalangan kraxmal karbamat polifunksional sorbentining olinishi, strukturaviy xususiyatlari va ekologik samaradorligi baholandi. Kraxmal karbamid bilan funksionallashtirilib, keyinchalik epixlorgidrin yordamida modifikatsiyalandi. Reaksiya davomiyligining mahsulot unumiga ta’siri o‘ rganilib, 3,0 soatda maksimal 83,2 % unum qayd etildi. Sorbentning strukturaviy o‘ zgarishlari IQ-spektroskopiya yordamida tahlil qilinib, C=O, C–N/C–O va C–O–C guruhlariga xos yutilish sohalaridagi siljishlar polimer matritsaning kimyoviy muhitida o‘ zgarish sodir bo‘ lganini ko‘ rsatdi. Termik barqarorlik TGA–DTA usulida baholanib, materialning ko‘ p bosqichli termik parchalanish xususiyati aniqlandi. Hg(II) ionlarini ajratish samaradorligi kolonka sharoitida tekshirildi. KrK–EXG (1:3) sorbenti boshlang‘ ich 1,615 ppb Hg^{2+} konsentratsiyasini 0,0742 ppb gacha kamaytirib, 95,4 % tozalash samaradorligini ta’minladi. Olingan natijalar mazkur sorbentning simob ionlarini saqlovchi oqova suvlarni chuqur tozalashda istiqbolli material ekanligini ko‘ rsatadi.*

Kalit so‘ zlar: *oqova suv, simob(II) ionlari, epixlorgidrin, kraxmal karbamat, polifunksional sorbent, sorbsiya, IQ-spektroskopiya, TGA–DTA, tozalash samaradorligi, ekologik samaradorlik.*

ОЦЕНКА ЭКОЛОГИЧЕСКОЙ ЭФФЕКТИВНОСТИ ПОЛИФУНКЦИОНАЛЬНОГО СОРБЕНТА НА ОСНОВЕ ЭПИХЛОРГИДРИНА ПРИ ОЧИСТКЕ СТОЧНЫХ ВОД ОТ ИОНОВ РТУТИ(II)

Аннотация. *В работе исследован модифицированный эпихлоргидрином полифункциональный сорбент на основе карбамата крахмала, предназначенный для удаления ионов Hg(II) из сточных вод. Крахмал предварительно функционализировали карбамидом, после чего осуществляли модификацию эпихлоргидрином. Установлено влияние продолжительности реакции на выход продукта; максимальный выход 83,2 % достигнут при продолжительности процесса 3,0 ч. Структурные изменения сорбента исследованы методом ИК-спектроскопии. Смещения полос поглощения, характерных для групп C=O, C–N/C–O и C–O–C, свидетельствуют об изменении химического окружения функциональных групп полимерной матрицы. Термическая устойчивость материала оценена методом TGA–DTA, выявившим многостадийный характер термической деструкции. Эффективность удаления ионов Hg(II) определена в колонных условиях. Наиболее высокий результат продемонстрировал сорбент KrK–EXG (1:3), снизивший концентрацию Hg^{2+} с 1,615 до 0,0742 ppb при эффективности очистки 95,4 %. Полученные результаты подтверждают перспективность разработанного сорбента для экологически эффективной очистки сточных вод от соединений ртути.*

Ключевые слова: *сточные воды, ионы ртути(II), эпихлоргидрин, карбамат крахмала, полифункциональный сорбент, сорбция, ИК-спектроскопия, TGA–DTA, эффективность очистки, экологическая эффективность.*

ASSESSMENT OF THE ENVIRONMENTAL EFFICIENCY OF AN EPICHLOROHYDRIN-BASED POLYFUNCTIONAL SORBENT FOR THE REMOVAL OF MERCURY(II) IONS FROM WASTEWATER

Abstract. *This study evaluates the structural properties and environmental performance of an epichlorohydrin-modified starch carbamate polyfunctional sorbent developed for the removal of Hg(II) ions from wastewater. Starch was initially functionalized with urea and subsequently modified with epichlorohydrin. The effect of reaction time on product yield was investigated, and the maximum yield of 83.2% was achieved after 3.0 h. Structural changes in the sorbent were characterized by FTIR spectroscopy. Shifts in the absorption bands assigned to C=O, C–N/C–O, and C–O–C groups indicated changes in the chemical environment of the polymer matrix after modification. Thermal stability was evaluated by TGA–DTA, revealing a multistage thermal degradation behavior. Hg(II) removal efficiency was examined under column conditions. Among the investigated compositions, the KrK–EXG (1:3) sorbent exhibited the highest performance, decreasing the Hg^{2+} concentration from 1.615 to 0.0742 ppb and achieving a removal efficiency of 95.4%. The*

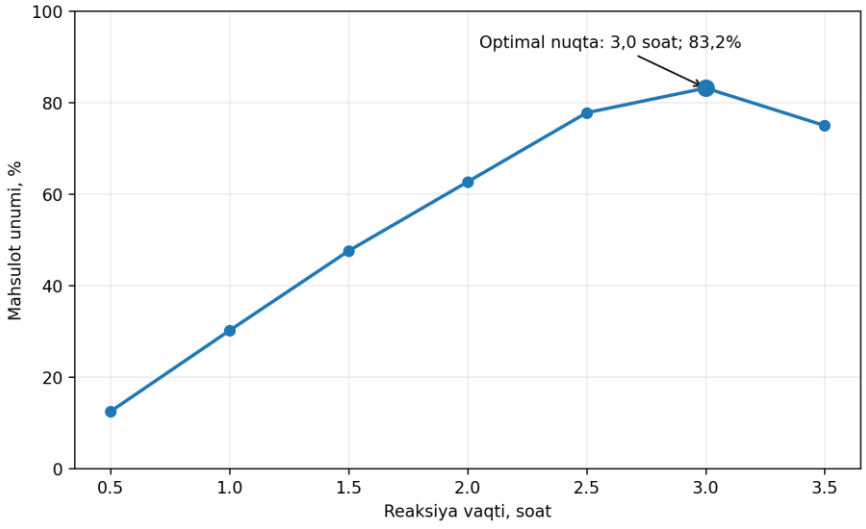
obtained results demonstrate the potential of the developed polyfunctional sorbent for environmentally efficient treatment of mercury-containing wastewater.

Keywords: *wastewater, mercury(II) ions, epichlorohydrin, starch carbamate, polyfunctional sorbent, sorption, FTIR spectroscopy, TGA-DTA, removal efficiency, environmental performance.*

Kirish. Sanoat oqova suvlarida og‘ ir metallar, xususan simob ionlari konsentratsiyasini oshib borishi suv ekotizimlari barqarorligi va inson salomatligi uchun jiddiy ekologik xavf tug‘ diradi. Simob biologik muhitda saqlanib qolishi, oziq zanjirida to‘ planishi va yuqori toksikligi sababli ustuvor nazorat qilinadigan ifloslantiruvchilardan hisoblanadi [1,2]. Oqova suvlarni tozalashda adsorbsiya texnologiyalari soddaligi, energiya sarfining nisbatan pastligi va past konsentratsiyadagi metall ionlarini ajratish imkoniyati bilan istiqbolli yondashuvdir [3,4]. Qayta tiklanuvchi, biologik parchalanadigan va ko‘ p sonli gidroksil guruhlariga ega kraxmal ekologik xavfsiz sorbent matritsasi sifatida alohida ahamiyatga ega. Biroq tabiiy kraxmalning sorbsion faolligi va suv muhitidagi strukturaviy barqarorligi cheklangan bo‘ lib, uni funksionallashtirish va modifikatsiyalash talab etiladi [5, 6, 7]. Karbamid bilan modifikatsiya kraxmal tarkibiga azot saqlovchi faol markazlarni kiritish, epixlorgidrin esa uch o‘ lchamli, suvda erimaydigan polimer tarmog‘ ini shakllantirish imkonini beradi. Bunday yondashuv metall ionlari bilan koordinatsion va boshqa sirt o‘ zaro ta’sirlarini kuchaytirishi mumkin. So‘ nggi tadqiqotlarda kraxmal asosidagi adsorbentlar uchun real oqova suvlar, uzluksiz oqim sharoiti va tuzilish-xossa bog‘ liqligini birgalikda baholash yetarli emasligi qayd etilgan [8]. Bu esa tadqiqotning dolzarbligini oshiradi. Shu nuqtai nazardan, ushbu tadqiqotning maqsadi kraxmal karbamat–epixlorgidrin asosidagi polifunksional sorbentni sintez qilish, uning optimal modifikatsiya sharoitlarini aniqlash, IQ-spektroskopik va TGA-DTA xususiyatlarini tavsiflash hamda Hg^{2+} ionlari bilan ifloslangan texnologik oqova suvni tozalash samaradorligini ekologik mezonlar asosida baholashdan iborat.

Materiallar va metodlar. Kraxmal karbamat sintezi uchun 10 g kraxmal, 3 g karbamid va 0,21 g natriy asetat ishlatildi. Karbamid va katalizator 30 ml distillangan suvda eritilib, kraxmal bilan 40–50 °C da 1 soat aralashtirildi. Mahsulot filtrlandi, 102–105 °C da 4 soat termik ishlovdan o‘ tkazildi va suvda eruvchan qoldiqlarni chiqarish uchun 4–5 marta distillangan suv bilan yuvildi. Keyingi modifikatsiyada kraxmal karbamat epixlorgidrin bilan turli massa nisbatlarida (1:1, 1:2 va 1:3) ishlov berildi; namunaviy sintezda 5,0 g kraxmal karbamatga 2,5 g epixlorgidrin qo‘ shilib, sistema 60 °C da aralashtirildi va 130 °C da 2 soat termik ishlov berildi. Reaksiya davomiyligining unumga ta’siri 0,5–3,5 soat oralig‘ ida baholandi. Strukturaviy o‘ zgarishlar SHIMADZU IRAffinity-1S FTIR spektrometrida, termik barqarorlik TGA-DTA usulida o‘ rganildi. Hg^{2+} sorbsiyasi kolonka sharoitida tekshirilib, qoldiq simob ETsG-2A analizatorida aniqlandi. Har bir tajriba besh marta takrorlandi; tozalash samaradorligi $\eta=((C_0-C_e)/C_0)\times100\%$ formula bo‘ yicha hisoblandi. Natijalar o‘ rtacha qiymatlarda ifodalandi.

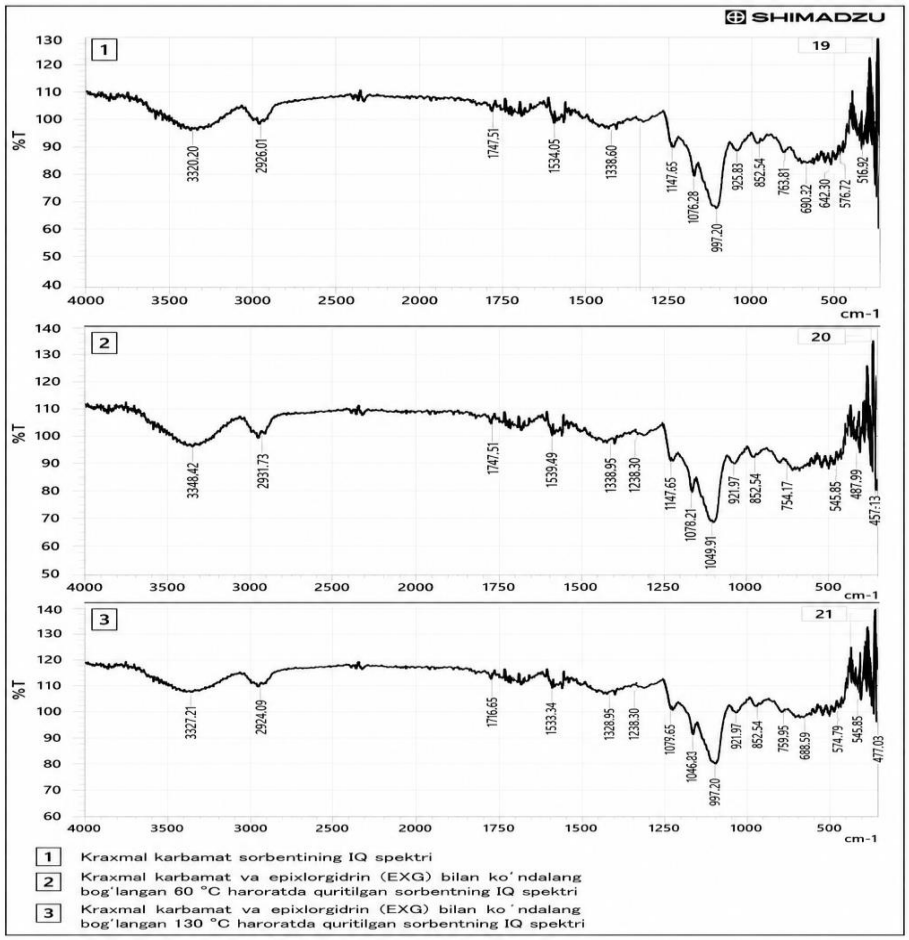
Natijalar va ularning muhokamasi. Kraxmal karbamat–epixlorgidrin asosidagi sorbent sintezi yuqori sorbsion faollik, strukturaviy barqarorlik va ekologik xavfsizlikni ta’minlashga qaratilgan muhim ilmiy-amaliy yo‘ nalish sifatida e’tirof etiladi. Kraxmal qayta tiklanuvchi tabiiy polisaxarid bo‘ lib, makromolekula tarkibidagi ko‘ p sonli gidroksil guruhlari uning kimyoviy funksionallashtirilishiga imkon beradi. Reaksiya davomiyligining mahsulot unumiga ta’siri va optimal vaqtini aniqlash. Modifikatsiyalaish jarayonining davomiyligi mahsulot unumiga sezilarli ta’sir ko‘ rsatgan. Reaksiya vaqti 0,5 soatdan 3,0 soatgacha oshirilganda unum 12,5 % dan 83,2 % gacha ortgan. 3,5 soatga uzaytirilganda esa unum 75,0 % gacha kamaygan. Shu sabab 3,0 soat tajriba qatoridagi optimal reaksiya davomiyligi sifatida qabul qilinadi.



1-rasm. Kraxmal karbamatning epixlorgidrin bilan modifikatsiyalashreaksiyasi unumining vaqtga bog‘ liqligi

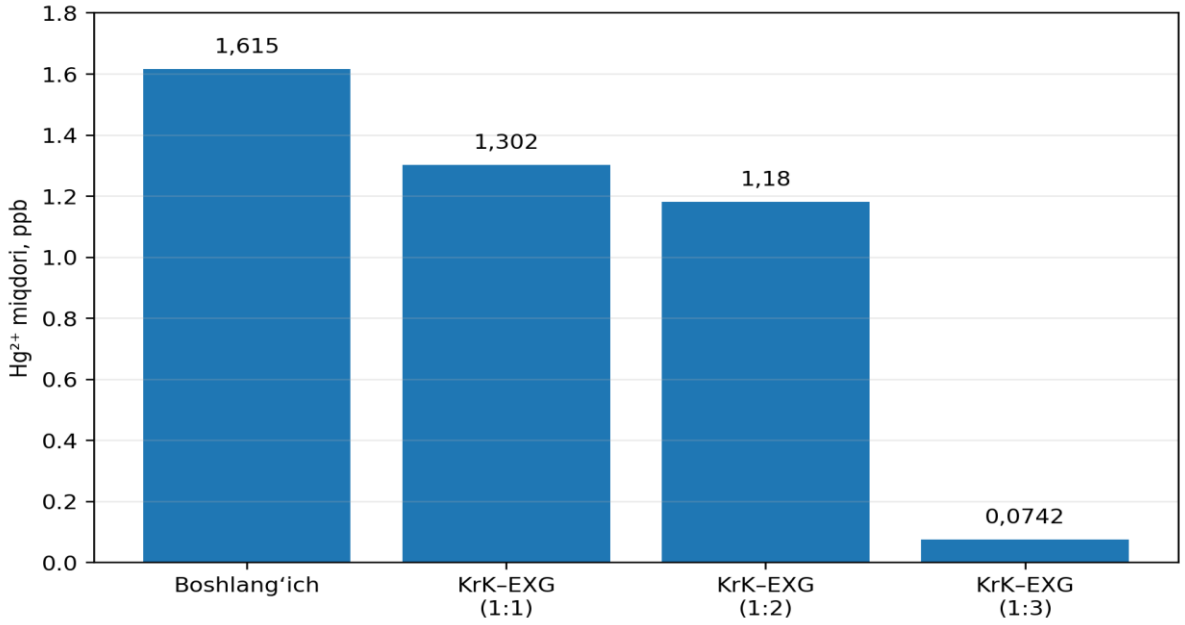
Grafikda 0,5–3,0 soat oralig‘ ida unumning uzluksiz oshishi reaksiyaning kinetik rivojlanishini ifodalaydi. 3,0 soatdan keyingi pasayish uzoq termik ta’sir sharoitida yon jarayonlar, funksional guruhlarning qisman o‘ zgarishi yoki yuvish jarayonidagi mahsulot yo‘ qotishlari bilan bog‘ liq bo‘ lishi mumkin.

KrK–EXG sorbentining IQ-spektroskopik tahlili. IQ-spektroskopik tadqiqot KrK–EXG namunasini 60°C haroratdagi modifikatsiyasi 3348,42 sm^{-1} sohadagi keng yutilish –OH va –NH guruhlarining valent tebranishlariga; 2933,73 sm^{-1} signal alifatik C–H bog‘ lariga; 1747,51 sm^{-1} yutilish esa karbonil C=O guruhiga moslashtirilgan. 1543,05 sm^{-1} soha N–H deformatsion va C–N tebranishlari, 1143,79; 1076,28 va 1004,91 sm^{-1} sohalar esa asosan C–O va C–O–C bog‘ lari bilan bog‘ langan. KrK–EXG namunasi 130 °C termik ishlovdan keyingi qiyosiy tahlilda eng muhim o‘ zgarish karbonil sohasida qayd etilgan: C=O signali 1747,51 sm^{-1} dan 1716,65 sm^{-1} gacha siljigan. Shuningdek C–N/C–O sohasida taxminan 1338,60 → 1328,95 sm^{-1} va C–O–C sohasida 1049,91 →1046,63 sm^{-1} siljishlar keltirilgan. Bunday o‘ zgarishlar funksional guruhlarning lokal elektron va vodorod-bog‘ lanish muhiti o‘ zgarganini ko‘ rsatadi hamda modifikatsiyalash natijasidagi strukturalarni bog‘ lanishi deb qarash mumkin.



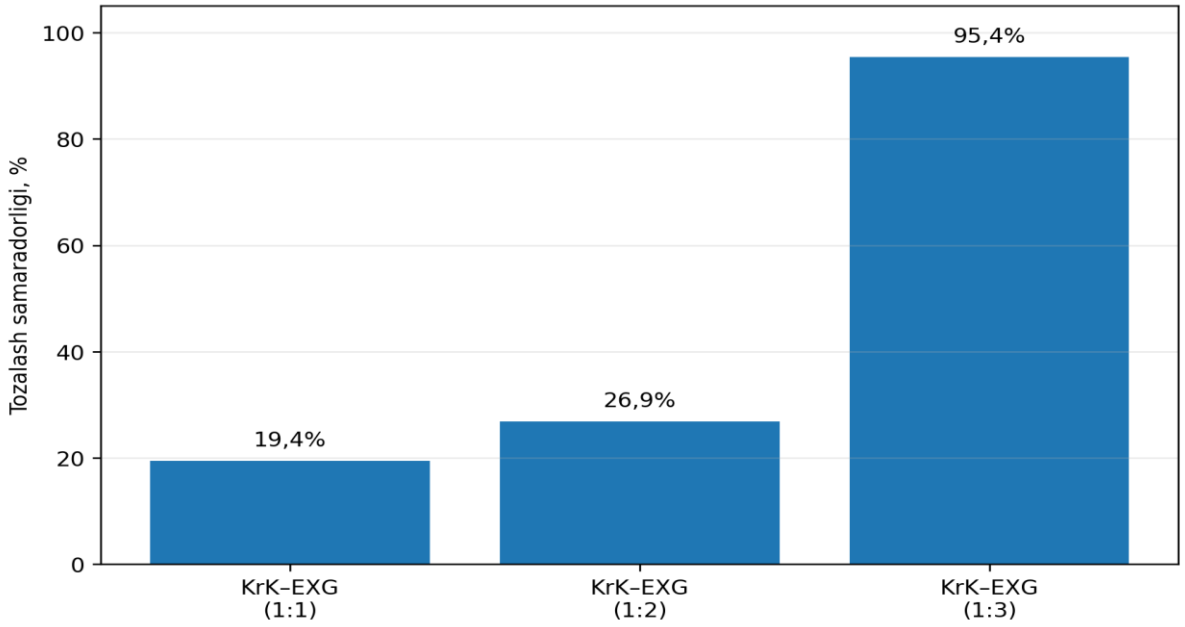
2-rasm. - Kraxmal karbamat va uning epixlorgidrin (EXG) bilan ko‘ ndalang bog‘ langan hosilalarining IQ-spektrlaridagi strukturaviy o‘ zgarishlar: 1 — kraxmal karbamat; 2 — epixlorgidrin bilan ko‘ ndalang bog‘ langan va 60 °C da quritilgan KrK–EXG sorbenti; 3 — epixlorgidrin bilan ko‘ ndalang bog‘ langan va 130 °C da termik ishlov berilgan KrK–EXG sorbenti.

KrK–EXG sorbentini Hg^{2+} ionlarini sorbsiyalash va oqova suvni tozalash samaradorligi. KrK–EXG sorbentlarining amaliy samaradorligi tarkibida Hg^{2+} ionlari mavjud texnologik oqova suvni kolonka usulida tozalash orqali baholangan. Boshlang‘ ich eritmadagi Hg^{2+} miqdori 1,615 ppb bo‘ lgan. KrK–EXG (1:1) namunasidan keyin qoldiq konsentratsiya 1,302 ppb, KrK–EXG (1:2) da 1,180 ppb va KrK–EXG (1:3) da 0,0742 ppb ni tashkil etgan. Har bir sinov besh marta takrorlangan va jadvalda o‘ rtacha qiymatlar berilgan.



3-rasm. KrK–EXG tarkibiga bog‘ liq holda oqova suvdagi qoldiq Hg^{2+} miqdorining o‘ zgarishi

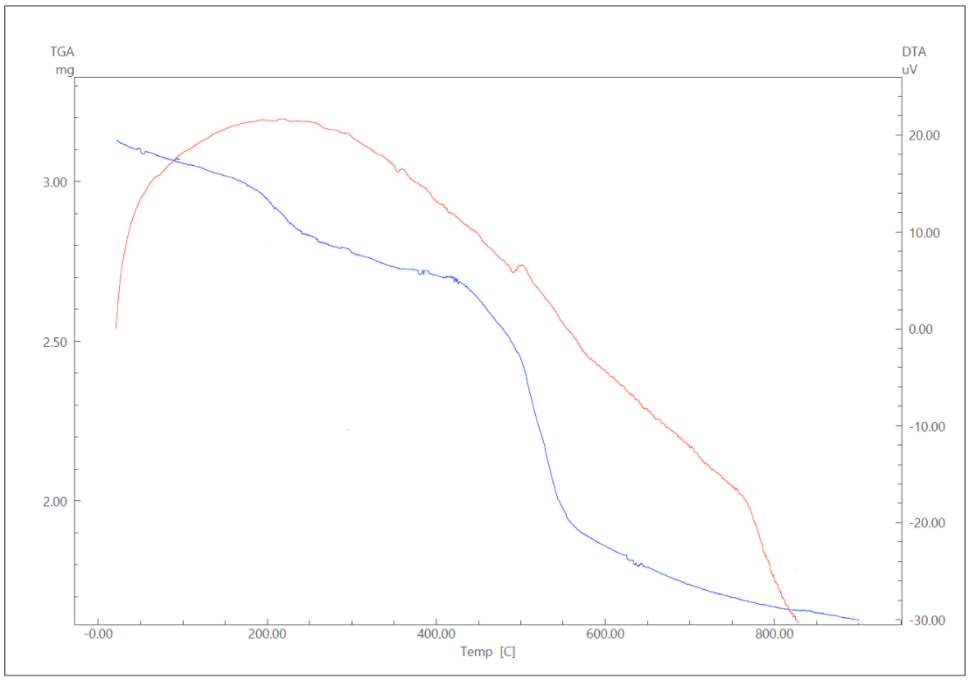
Tozalash samaradorligi $\eta = ((C_0 - C_e)/C_0) \times 100$ % ifoda orqali hisoblanadi. Bu yerda C_0 — boshlang‘ ich Hg^{2+} konsentratsiyasi, C_e — sorbentdan o‘ tkazilgandan keyingi qoldiq konsentratsiya. Hisoblangan qiymatlar 1:1, 1:2 va 1:3 tarkiblar uchun mos ravishda 19,4; 26,9 va 95,4 % ni tashkil etadi.



4-rasm. KrK–EXG sorbentlari bilan Hg^{2+} ionlarini chiqarib tashlash samaradorligi

KrK–EXG sorbentlarini 1:1 dan 1:2 nisbatga o‘ tishda samaradorlik nisbatan oshganligi aniqlandi. KrK–EXG sorbentini 1:3 tarkibda 95,4 % gacha keskin ko‘ tarilish kuzatildi. Bu natija KrK–EXG (1:3) namunasida Hg^{2+} ionlarini ushlab qolishga qulayroq strukturaviy va funksional muhit shakllanganini ko‘ rsatadi.

KrK–EXG (1:3) namunasining DTG tahlili. KrK–EXG (1:3) polifunksional sorbentining termik barqarorligi TGA-DTA usuli yordamida baholandi. Termogramma materialning qizdirish jarayonida ko‘ p bosqichli termik o‘ zgarishga uchrashini ko‘ rsatadi. Dastlabki, taxminan 25-200 °C oralig‘ ida massa yo‘ qotilishi nisbatan kichik bo‘ lib, bu sorbent yuzasi va polimer matritsasida fizik adsorbsiyalangan hamda kuchsiz bog‘ langan suvning ajralishi bilan izohlanadi. 200-430 °C diapazonda massa asta-sekin kamayib, karbamat fragmentlarining qisman parchalanishi va polisaxarid skeletining dastlabki destruksiyasi sodir bo‘ lishi mumkin.



5-rasm. Kraxmal karbamat–epixlorgidrin asosidagi KrK–EXG (1:3) sorbentining termik barqarorligini tavsiflovchi TGA va DTA termogrammalari.

Eng muhim termik o‘ zgarish 430-560 °C oralig‘ ida kuzatiladi. Ushbu sohada TGA egri chizig‘ ining keskin pasayishi kraxmal-karbamat skeleti va epixlorgidrin modifikatsiyasi natijasidagi bog‘ lanishlar polimer tarmog‘ ining intensiv destruksiyasiga mos keladi. DTA egri chizig‘ ida ayni harorat oralig‘ iga yaqin termik effektning kuzatilishi ushbu parchalanish jarayoni sezilarli energetik o‘ zgarish bilan kechishini ko‘ rsatadi. 560 °C dan yuqori haroratlarda massa yo‘ qotilishi sekinlashadi va chuqur destruksiya hamda qoldiqning shakllanishi ustunlik qiladi. Termogramma yakunida qoldiq massaning sezilarli darajada saqlanishi material tarkibida yuqori haroratga natijasida koks qatlam hosil bo‘ lishini ko‘ rsatadi.

Umumiy xulosa. Tadqiqot natijalari kraxmalni karbamid bilan funksionallashtirish va keyinchalik epixlorgidrin yordamida modifikatsiyalash orqali suvda erimaydigan, kislorod va azot saqlovchi funksional markazlarga ega polifunksional sorbent olish mumkinligini ko‘ rsatadi. Reaksiya davomiyligi bo‘ yicha 3,0 soatlik ishlov 83,2 % maksimal unum bilan tajriba qatoridagi optimal nuqta bo‘ lgan. IQ-spektroskopiyada C=O, C–N/C–O va C–O–C diapazonlaridagi siljishlar polimer matritsaning kimyoviy muhiti qayta tashkil topganini ko‘ rsatadi.

Hg^{2+} ionlarini chiqarib tashlash bo‘ yicha KrK–EXG (1:3) namuna aniq ustunlik namoyon etib, boshlang‘ ich 1,615 ppb konsentratsiyani 0,0742 ppb gacha kamaytirgan va 95,4 % tozalash samaradorligini ta’minlagan. Shu sabab ushbu tarkib o‘ rganilgan nisbatlar orasida eng istiqbolli sorbent sifatida baholash mumkin.

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Annotatsiya. *Ushbu tadqiqotda Co(II) ionlarini sorbsion-spektroskopik usul yordamida aniqlashning samarali usuli ishlab chiqildi. Analitik reagent sifatida PPA-1 tolasimon sorbentiga immobilizatsiyalangan 1-nitrozo-2-naftol-3,6-disulfonik kislota natriyli tuzi (Nitrozo R tuzi) qo‘ llanildi. Tadqiqot davomida reagentni immobilizatsiya qilishning maqbul sharoitlari, maksimal nur yutish va nur qaytarish spektrlari hamda Co(II) ionlari bilan kompleks hosil qilish xususiyatlari o‘ rganildi. Olingan natijalar immobilizatsiyalangan Nitrozo R tuzining Co(II) ionlari bilan 419 nm to‘ lqin uzunligida barqaror kompleks hosil qilishini ko‘ rsatdi. Ishlab chiqilgan usul tabiiy va texnogen suv namunalarida sinovdan o‘ tkazildi hamda uning yuqori sezgirlik, selektivlik va takrorlanuvchanlikka ega ekanligi aniqlandi.*

Kalit so‘ zlar: *Co(II) ioni, kobalt, Nitrozo R tuzi, PPA-1 tolasimon sorbenti, sorbsion-spektroskopik usul, immobilizatsiya, kompleks hosil bo‘ lishi, spektrofotometriya.*

СОРБЦИОННО-СПЕКТРОСКОПИЧЕСКОЕ ОПРЕДЕЛЕНИЕ ИОНА КОБАЛЬТА (II)

Аннотация: *В данном исследовании разработан эффективный метод определения ионов Co(II) сорбционно-спектроскопическим методом. В качестве аналитического реагента использована натриевая соль 1-нитрозо-2-нафтол-3,6-дисульфоновой кислоты (соль Нитрозо R), иммобилизованная на волокнистом сорбенте ППА-1. В ходе исследования изучены оптимальные условия иммобилизации реагента, спектры максимального поглощения и отражения света, а также особенности комплексообразования с ионами Co(II). Полученные результаты показали, что иммобилизованная соль Нитрозо R образует устойчивый комплекс с ионами Co(II) при длине волны 419 нм. Разработанный метод был апробирован на образцах природных и техногенных вод, при этом установлены его высокая чувствительность, селективность и воспроизводимость.*

Ключевые слова: *ион Co(II), кобальт, соль Нитрозо R, волокнистый сорбент ППА-1, сорбционно-спектроскопический метод, иммобилизация, комплексообразование, спектрофотометрия.*

SORPTION-SPECTROSCOPIC DETERMINATION OF COBALT (II) ION

Abstract: *An effective method for the determination of Co(II) ions by sorption-spectroscopic analysis was developed in this study. The sodium salt of 1-nitroso-2-naphthol-3,6-disulfonic acid (Nitroso R salt), immobilized on a PPA-1 fibrous sorbent, was used as the analytical reagent. During the study, the optimal conditions for reagent immobilization, the maximum absorption and reflection spectra, and the complex formation properties with Co(II) ions were investigated. The obtained results demonstrated that the immobilized Nitroso R salt forms a stable complex with Co(II) ions at a wavelength of 419 nm. The developed method was tested on natural and technogenic water samples, demonstrating high sensitivity, selectivity, and reproducibility.*

Keywords: *Co(II) ion, cobalt, Nitroso R salt, PPA-1 fibrous sorbent, sorption-spectroscopic method, immobilization, complex formation, spectrophotometry.*

Kirish. Hozirgi kunda antropogen ifloslanish hisoblanuvchi zaharli metallarning atrof-muhitga tarqalishi, ekologik muammolarning sezilarli darajada ortishiga sabab bo‘ lmoqda. Atrof-muhitga tarqalgan og‘ ir va zaharli metallarni miqdorini nazorat qilish muhim ekologik-tahliliy vazifadir. Shu jumladan kobalt ionlarini atrof-muhit obyektlaridan organik reagentlar yordamida aniqlashning selektiv, qayta takrorlanuvchi, sezgir zamonaviy uslublarini yaratish muhim ahamiyat kasb etmoqda.

Jahonda og‘ ir metallarni aniqlashda ultramikromiqdorlarini tahlil qilishga imkon beradigan ko‘ plab fizik va fizik-kimyoviy usullar yaratish bo‘ yicha ilmiy izlanishlar olib borilmoqda. Lekin ular ham har doim kerakli sezgirlik va selektivlikka ega bo‘ lmaydi. Bu borada tolasimon tashuvchilarga organik reagentlarni immobillash orqali zaharli

metallarni ruxsat etilgan chegaraviy miqdor va undan past darajada hamda analitik va funktsional faol guruhlari zarur sezgirlikni va tanlab ta'sir etuvchanligini oshirish mexanizmini aniqlashga alohida e'tibor qaratilmoqda.

Mavzuga oid adabiyotlar tahlili. Atrof-muhitda kobalt asosan oksidlanish darajasi +2 va +3 holatida sulfid va arsenid shaklida uchraydi. Yer osti va yer usti suvlarida uning konsentratsiyasi 5mg×l^{-1} dan past konsentartsiyada bo‘ ladi. Kobalt atrof-muhitga tabiiy yo‘ llar orqali ob-havoning buzilishi, toshlarning yemirilishi, va vulqonlarning faolligi natijasida hamda atrof muhit obyektlariga suv, konlarda qazish va eritish kabi jarayonlar orqali kelib tushadi [1]. Kobalt va uning birikmalari inson hayot faoliyatning bir qismi hisoblanadi. Co vitamin B_{12} ning metall komponenti sifatida biologik jihatdan muhim rol o‘ ynaydi. Biroq Co ionining organizmga keragidan ortiqcha miqdori turli xil noxush oqibatlarga olib keladi [2]. Shu sababli atrof-muhit obyektlarida kobalt ionlarini aniqlash muhim ahamiyat kasb etadi. Hozirgi kunda og‘ ir va zaharli metallarni aniqlashning spektofotometrik usullari keng tarqalgan.

1 - jadval

Kobalt(II) ionlarini turli organik reagentlar bilan spektrofotometrik aniqlash usullari

№	Analitik reagent nomi	obyekt	Q_{min} mkg/l	Ada.
1	4-(2-Gidroksi-naftalen-1-ylazo)-N-tiazol-2-il-benzolsulfanilamid	Suvli eritma namunalari	1,7-8,4×10^{-5} mol/l^{-1}	[3]
2	etil4-(5-asetil-2,3,4-trihidroksifenil) diazenilbenzoat (EATDB)	Vitamin	1mkg/l^{-1}	[4]
3	2-[(2-simobxlorid, 4-metilfenilImino] metil fenol	Suv havzalari	0,5-50mkg/l	[5]
4	2,6-ditiol-4-tert-butilfenol	Suv namunasida	0,2-20 mkg/ml	[6]
5	2-(bifenil-4-il)-3-((2-(2,4-dinitrofenil)gidrazono)metil) imidazo[1,2-a]piridin	B_{12} vitamini in'ektsiya namunalarini	0,1 mkg/ml	[7]
6	xromogen reagent	Farmatsev tika namunalari	1,786-11, mkg / ml	[8]
7	Gabapentinni 8-gidroksixinolin	Tabiiy suv havzalarida	2 – 25 mkg/ml	[9]
8	(1,5-dimetil-2-fenil-4-((2,3,4-trihidroksifenil) diazenil)	Suv namunalari	1-25 mkg/ml	[10]

Spektrofotometrik usulda kompleks hosil bo‘ lishi faqat eritmada bo‘ lishi, ko‘ p vaqt talab qilishi va asbob uskunalar zarur bo‘ ishi bilan bir qancha kamchiliklarni o‘ z ichiga oladi. Turli usullar orasida spektrofotometriyani takomillashtirilgan varianti sorbsion-spektroskopik usul alohida afzalliklari bilan ajralib turadi. Immobillangan organik reagentlar yordamida kobalt ionini aniqlash uchun ma'lum bir laboratoriya sharoiti talab qilinmaydi, ekologik toza, tezkor va iqtisodiy jihatdan tejamkor usuldir. Immobillangan organik reagentlar yordamida kobalt ionini aniqlash usuli bir vaqtning ozida metall ioni konsentrlash, aniqlash va ajratish imkonini beradi. Shu sababli ilmiy tadqiqot ishida sorbsion-spektroskopik usuldan foydalanildi [11].

Tadqiqot metodologiyasi. 1-nitrozo-2-naftol-3,6-disulfonik kislota natriyli tuzi (nitrozo R- tuzi) Ar=$(NO(HO)C_{10}H_4(SO_3Na)_2)$=377,35 organik reagent eritmasini tayyorlash uchun analitik tarozida 0,37735 gr reagentni tortib olib hajmi 100 ml bo‘ lgan o‘ lchov kolbasida distillangan suvda eritildi va 0,001M li eritmasi hosil bo‘ ldi. Gidroksilamin bilan faollashtirilgan poliakrilonitril(nitron) tolasini polietilenamin bilan modifikatsiyalash orqali olingan anionit tolasimon sorbent 0,2 g dan analitik tarozida 0,0001 g aniqlikda o‘ lchab olindi. O‘ lchab olingan qattiq holatdagi tolasimon sorbent 0,1 M xlorid kislotaning standart eritmasida bir sutka mobaynida bo‘ ktirildi, so‘ ng distillangan suv yordamida pH=7 ga kelguncha yuvildi va Petri chashkalarida saqlandi .

2-jadval

Nitrozo R tuzini immobillash uchun qulay sharoitlari(m=0,2g)

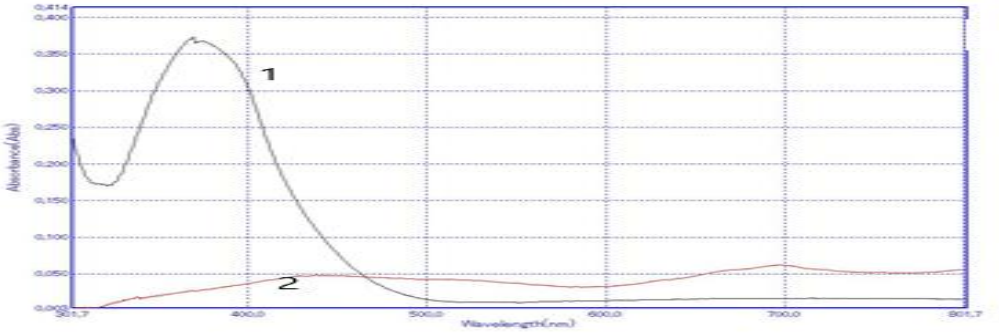
Reagent	**Tashuvchi**	**pH**	**Bufer aralashma hajmi, ml**	**Yutilish maksimumi, nm**	**V_{min}**
Nitrozo R tuzi	PPA-1	6,5	5,00	380	2-5



a) b)

1-rasm. Nitrozo R tuzuning elektrostatik potensial yuzasi (a) va elektron bulut zichligi (b)

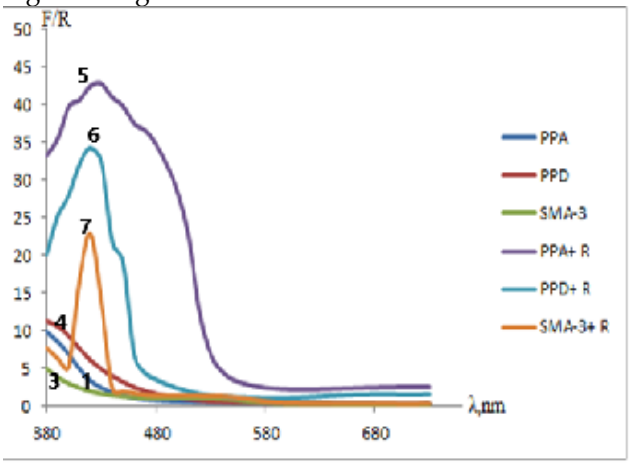
Tahlil va natijalar. Nitrozo R tuzini maksimal nur yutush spektrini aniqlash. . 0,1 % nitrozo R tuzining standart eritmasiga 0,2g PPA-1 tola solinib, eritmalarning optik zichliklari immobillashdan avvalgi va keyingi solishtirma eritmaga nisbatan o‘ lchandi. Olingan natijalar 2-rasmda keltirilgan.



2-rasm. Nitrozo R tuzining immobillashdan avval va keyingi nur yutish spektrlari

Turli xil sorbentlarga immobillangan reagentlar eritmasining dastlabki va keyingi eritmalarning optik zichliklari EMC-30PC-UV va UV-5100 VIS spektrofotometrlarda o‘ lchandi. Bu o‘ lchovlar yordamida, reagentlar immobillanganidan so‘ ng eritmalarning optik zichligi o‘ zgarishini aniqlash mumkin bo‘ ldi. Tanlangan reagentlarning to‘ lqin uzunligi immobillashdan oldin va keyin o‘ zgarmadi. Biroq, immobillash jarayoni natijasida sorbsiya darajasiga ko‘ ra optik zichlik qiymatlari turlicha bo‘ ldi. Bu o‘ zgarishlar sorbent va reagentlar o‘ rtasidagi kompleks hosil bo‘ lishi bilan bog‘ liq bo‘ lib, ularning reaksiyaviyligini va sezgirligini ko‘ rsatadi. Bu natijalar, PPA-1 tolasining nitrozo R tuzini immobillash uchun ideal sorbent ekanligini tasdiqlaydi va keyingi tahlil va tadqiqotlar uchun samarali asos yaratadi. Tahlillar natijasiga ko‘ ra nitrozo R- tuzi reagentiga PPA-1 tola muvofiq keluvchi sorbent sifatida tanlandi.

Nitrozo R- tuzi reagentini turli tolasimon sorbentlar bilan immobillanish jarayonini nur qaytarish spektrlari olindi va Kubelka-Munka funksiyasida hisoblashnatijalariga ko‘ ra eng yuqori analitik signal tolasimon sorbent PPA-1da kuzatildi. Shu sababli, ikkala organik reagentimizni immobillash uchun PPA-1 tolasi sorbent sifatida tanlandi.

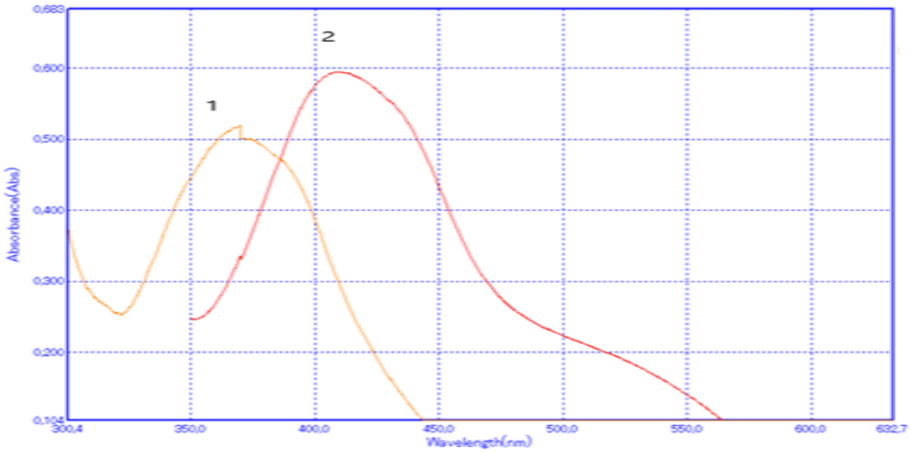


3-rasm. Turli tolalar va ularga immobillangan Nitrozo R tuzi ning olingan nur qaytarish spektrlari

PPA-1 tolamiz eng yuqori nur qaytarish spektrini ko‘ rsatgani uchun, uni immobillangan reagentlar uchun optimal sorbent sifatida tanlab olindi.

Immobillangan nitrozo R tuzining Co(II) ionlari bilan hosil qilgan kompleksining maksimal nur yutush spektrining aniqlash. Kobalt komplekslarining maksimal yorug‘ lik yutilish sohasini aniqlash uchun immobillangan organik reagentlar bilan tavsiflangan uslub bo‘ yicha quyidagi jarayon bajarildi: 25 ml hajmli kolbaga 1 mldan (10 mkg) kobalt eritmalari qo‘ shildi. So‘ ngra, pH =6,5 bo‘ lgan sitratli bufer eritmalaridan 10 ml qo‘ shildi. Ushbu eritmalar ustiga tanlangan nitroso R tuzi bilan immobillangan tashuvchilar quyildi. Eritmalar yaxshilab aralashtirilganidan so‘ ng, turli to‘ lqin uzunliklarida, qalinligi 1 sm bo‘ lgan kyuvetda spektrofotometrda optik zichlik o‘ lchandi .Tahlil natijalar shuni ko‘ rsatadiki nitrozo R-tuzi reagentining Co^{2+} ioni bilan hosil qilgan kompleks (qizil rangli) esa 419 nm bo‘ lib, ular o‘ rtasidagi farq aniq belgilandi.

Olingan natijalarni to‘ g‘ riligini isbotlash maqsadida immobillangan reagentlar va kompleks hosil bo‘ lgan tolaning nur qaytarish spektrini o‘ lchandi. Nur qaytarish spektri natijalarini Kubelka-Munka funksiyasiga o‘ tkazganda, minimum maksimumga aylanishi va nur yutulish spektrining maksimal sohalari bilan bir xil bo‘ lishi aniqlandi.



4-rasm. Nitrozo R tuzining (1) va Co^{2+} ioni bilan hosil qilgan kompleksi (2) ning maksimal nur yutish spektri λ_{max}=419 nm

Bu kuzatish natijalari, yutulish spektri va qaytarish spektri orasidagi bog‘ liqlikni tasdiqlaydi, ya’ni nur yutishning maksimal sohasining nur qaytarish spektrida ham o‘ sha to‘ lqin uzunligida aks etishini ko‘ rsatadi.

Ishlab chiqilgan usulning raqobatbardoshligini tekshirish. Ishlab chiqilgan usulni raqobatbardoshligini tekshirish maqsadida texnogen suvlarda kobalt(II) ionlarini sorbsion-spektroskopik va boshqa usullar o‘ zaro solishtirilib ko‘ rildi.

3 - jadval

Ishlab chiqilgan sorbsion spektroskopik usul yordamida tabiiy obyektlardan kobalt(II) ionini aniqlash va ajratib olish tahlil natijalarini baholash

Namuna	ISP-MS		Ishlab chiqilgan usul		t_{jadval} 2,85	F_{jadval} 4,47	$C_{So‘ ngi}$ Co^{2+}ioni	Sorb siya
	topildi $\bar{x}$, mg/dm³	S_r	topildi $\bar{x}$, mg/dm³	S_r	$t_{tajriba}$	$F_{tajriba}$	topildi $\bar{x}$, mg/dm³	R%
Navoiy azot chiqindi suvi	0,117	0,02	0,115	0,015	2,03	4,09	0,01	91
Zarafshon daryosi suvi	0,06	0,01	0,059	0,03	1,97	3,58	0,003	95
Oltin ko‘ l kanali suvi	0,17	0,025	0,16	0,012	1,95	4.17	0,015	91

3- jadvaldagi tahlil natijalaridan ma’lumki ishlab chiqilgan sorbsion-spektroskopik usul yordamida nafaqat kobalt (II) ionilari miqdori yuqori sezgirlikda aniqlanadi va kobalt ionlarining sorbsion samaradorligi 95% dan yuqorililigi sababli ushbu metall ionlarini oqava suvlardan ajratib olish imkonini ham beradi.

Xulosa va takliflar. Tadqiqot natijasida Co(II) ionlarini sorbsion-spektroskopik usulda aniqlash uchun PPA-1 tolasimon sorbentiga immobilizatsiyalangan Nitrozo R tuzi analitik reagent sifatida tavsiya etildi. Reagentni immobilizatsiya qilishning maqbul sharoitlari aniqlandi hamda Co(II) ionlari bilan 419 nm to‘ lqin uzunligida barqaror kompleks hosil qilishi isbotlandi. Ishlab chiqilgan usul tabiiy va texnogen suv namunalarida yuqori sezgirlik, selektivlik va takrorlanuvchanlikni namoyon etdi. Olingan natijalar taklif etilgan usulning Co(II) ionlarini aniqlash va suv muhitidan ajratib olishda samarali hamda amaliy qo‘ llash uchun istiqbolli ekanligini ko‘ rsatdi.

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EVALUATION OF THE MOLECULAR DOCKING-BASED INTERACTION OF AMINO ACIDS IN THE "AS-CAPSIPOL" FOOD SUPPLEMENT WITH CYCLOOXYGENASE-2 (COX-2)

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Abstract*:This article investigates the molecular docking-based interaction of selected amino acids contained in the "As-Capsipol" food supplement with the cyclooxygenase-2 (COX-2) enzyme. Arginine, phenylalanine, glutamic acid, tyrosine, and tryptophan were selected as ligands, and their binding affinity, inhibition constant, and interaction profiles with amino acid residues in the active site of the enzyme were evaluated. According to the results, tryptophan and tyrosine exhibited relatively high binding affinity toward COX-2, which may be important for explaining the potential molecular mechanism underlying the anti-inflammatory activity of the "As-Capsipol" complex. The obtained findings provide a scientific basis for evaluating the biological activity of this food supplement using an* in silico *approach.*

Keywords: *As-Capsipol, COX-2, molecular docking, amino acids, tryptophan, tyrosine, arginine, binding affinity, inflammation,* in silico.

ОЦЕНКА ВЗАИМОДЕЙСТВИЯ АМИНОКИСЛОТ, СОДЕРЖАЩИХСЯ В ПИЩЕВОЙ ДОБАВКЕ "AS-CAPSIPOL", С ФЕРМЕНТОМ ЦИКЛООКСИГЕНАЗОЙ-2 (COX-2) НА ОСНОВЕ МОЛЕКУЛЯРНОГО ДОКИНГА

Аннотация*:В данной статье изучено взаимодействие отдельных аминокислот, входящих в состав пищевой добавки «As-Capsipol», с ферментом циклооксигеназой-2 (COX-2) на основе молекулярного докинга. В качестве лигандов были выбраны аргинин, фенилаланин, глутаминовая кислота, тирозин и триптофан; оценены их аффинность связывания, константа ингибирования, а также профили взаимодействия с аминокислотными остатками активного центра фермента. Согласно полученным результатам, триптофан и тирозин проявили относительно высокую аффинность связывания с COX-2, что может иметь важное значение для объяснения предполагаемого молекулярного механизма противовоспалительного действия комплекса «As-Capsipol». Полученные данные служат научной основой для оценки биологической активности данной пищевой добавки с использованием подхода* in silico.

Ключевые слова: *As-Capsipol, COX-2, молекулярный докинг, аминокислоты, триптофан, тирозин, аргинин, аффинность связывания, воспаление,* in silico.

"AS-CAPSIPOL" OZIQ-OVQAT QO' SHILMASI TARKIBIDAGI AMINOKISLOTALARNING COX-2 FERMENTI BILAN MOLEKULYAR DOKING ASOSIDAGI O' ZARO TA'SIRINI BAHOLASH

Annotatsiya; *Ushbu maqolada "As-Capsipol" oziq-ovqat qo' shilmasi tarkibidagi ayrim aminokislotalarning siklooksigenaza-2 (COX-2) fermenti bilan molekulyar doking asosidagi o' zaro ta'siri o' rganildi. Tadqiqotda arginin, fenilalanin, glutamin kislota, tirozin va triptofan ligand sifatida tanlanib, ularning bog' lanish affiniteti, ingibitsiya konstantasi hamda faol markazidagi aminokislota qoldiqlari bilan o' zaro ta'sir profillari baholandi. Natijalarga ko' ra, triptofan va tirozin COX-2 bilan nisbatan yuqori bog' lanish affinitetini namoyon qilib, "As-Capsipol" majmuasining yallig' lanishga qarshi ehtimoliy molekulyar mexanizmini izohlashda muhim ahamiyat kasb etishi mumkin. Olingan natijalar mazkur oziq-ovqat qo' shilmasining biologik faolligini in silico yondashuv asosida ilmiy baholashga xizmat qiladi.*

Kalit so‘ zlar: *As-Capsipol, COX-2, molekulyar doking, aminokislotalar, triptofan, tirozin, arginin, bog‘ lanish affiniteti, yallig‘ lanish, in silico.*

INTRODUCTION

In recent years, scientific interest in the study of bioactive dietary supplements, phytocomplexes of natural origin, and their molecular mechanisms of action has been steadily increasing. In particular, the evaluation of the pharmacobiological potential of supplements developed on the basis of natural components is of significant scientific and practical importance in pathological conditions associated with inflammation, oxidative stress, and liver injury. This approach is closely related to the search for safer, biologically compatible agents with multicomponent mechanisms of action compared with synthetic drugs.

Inflammation is a complex protective response of the organism to various endogenous and exogenous factors. However, when this process becomes prolonged or uncontrolled, it may lead to tissue damage, metabolic disturbances, and the development of chronic diseases. Prostaglandins, cytokines, reactive oxygen species, and other mediators play an important role in this process. In particular, cyclooxygenase enzymes are involved in the biosynthesis of prostaglandins through arachidonic acid metabolism and are considered among the key factors determining the molecular basis of inflammatory responses.

Cyclooxygenase-2 (COX-2) is an inducible enzyme that is expressed at low levels under normal physiological conditions; however, its activity markedly increases during inflammation, oxidative stress, infectious processes, and tissue injury. Activation of COX-2 enhances the formation of prostaglandin E2 and other pro-inflammatory mediators, thereby contributing to pain, edema, increased vascular permeability, and modulation of the immune response. Therefore, COX-2 is regarded as a promising molecular target in many inflammatory diseases, including hepatitis and inflammatory lesions of liver tissue.

Molecular docking is an effective in silico approach that enables the preliminary assessment of the binding energy, spatial orientation, types of interactions with amino acid residues, and potential inhibitory activity of biologically active compounds against protein targets. This method represents an important complementary stage to laboratory experiments and is widely used to elucidate the molecular mechanisms of natural compounds, select promising ligands, and provide a scientific basis for subsequent experimental studies.

The aim of the present study was to evaluate the molecular docking-based binding properties of selected amino acids contained in the “As-Capsipol” dietary supplement with the COX-2 protein, as well as to determine their binding affinity, inhibition constant, and ligand–protein interaction profiles. The results of this study may contribute to explaining the possible molecular mechanisms underlying the anti-inflammatory activity of the “As-Capsipol” complex and to its scientific substantiation as a bioactive dietary supplement.

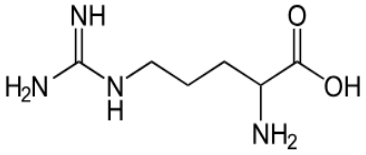
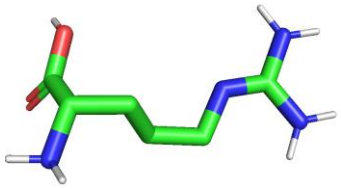
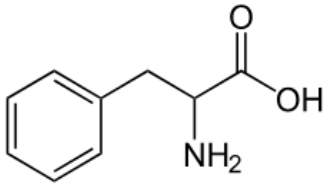
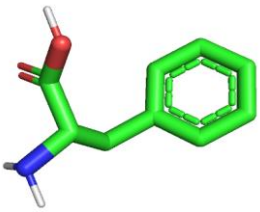
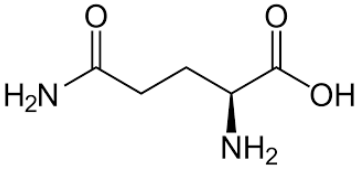
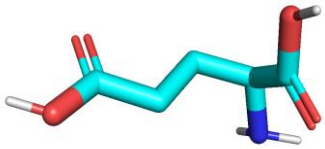
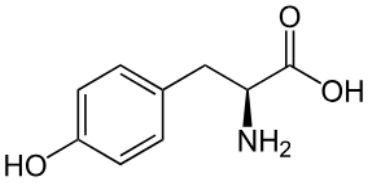
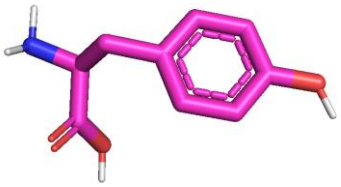
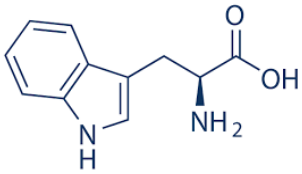
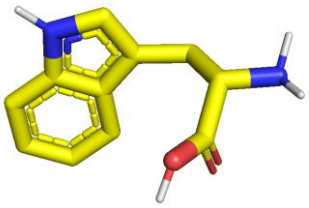
MATERIALS AND METHODS

All computational analyses were performed using freely available academic software tools. The three-dimensional structures of the selected target proteins, including cyclooxygenase-2 (COX-2, PDB ID: 5IKR), were retrieved from the Protein Data Bank (PDB) database. The structures of the ligands representing the amino acids contained in the “As-Capsipol” dietary supplement were obtained from the PubChem database. Their three-dimensional conformations were downloaded in appropriate formats, and their geometries were optimized prior to the docking procedure (Table 1). Protein preparation and structural analysis were carried out using PyMOL software, version 1.2 [1].

The active binding sites of the proteins were identified using Discovery Studio software, which allowed accurate localization of the docking regions. Visualization and analysis of ligand–protein interactions were also performed using PyMOL.

Molecular docking simulations were conducted using AutoDock 4.2 software. AutoDock Tools (ADT) was used for the preparation of proteins and ligands for docking. During this process, polar hydrogen atoms were added, partial charges were assigned, and rotatable bonds in the ligands were defined. The grid box parameters were set based on the previously predicted active sites [2]. This methodology enabled reliable prediction of the binding modes of the ligands with the target proteins, their spatial orientations, and their interaction profiles.

Table 1. Structural representation of the selected amino acid ligands used in molecular docking analysis in 2D and 3D formats

Ligands	2D	3D
Arginine		
Phenylalanine		
Glutamic acid		
Tyrosine		
Tryptophan		

Preparation of Ligand and Protein Files:

Prior to molecular docking, all PDB structures retrieved from the Protein Data Bank were subjected to a comprehensive preprocessing procedure, since the original files obtained from the PDB database are not fully suitable for direct docking analysis [3]. Such structures often contain crystallographic water molecules, co-crystallized ligands, ions, and other heteroatoms, which may adversely affect the accuracy of docking calculations.

Each protein structure was imported into AutoDock Tools (ADT) for preparation. Crystallographic water molecules and all non-essential heteroatoms were removed to eliminate undesirable interactions. Co-crystallized ligands were deleted prior to docking simulations; however, when necessary, they were preserved separately for validation purposes [4]. In addition, all non-protein components, including metal ions such as calcium, were removed to prevent artificial electrostatic effects under the rigid receptor docking model and to ensure a uniform preparation procedure for all target proteins.

The structural integrity of the selected protein models was visually inspected using PyMOL. Particular attention was paid to the presence or absence of missing amino acid residues in functionally important regions. No missing residues of critical importance were detected in the selected models [5]. In the next step, polar hydrogen atoms were added to better represent electrostatic properties, and Kollman united atom charges were assigned. In accordance with standard ADT protocols, the protonation states were adjusted to approximate physiological conditions (pH 7.4). The prepared receptor structures were subsequently saved in ".pdbqt" format, which contains information on atom types and partial charges required for docking calculations.

Ligand preparation was performed using a similar procedure. The selected amino acid ligands were imported into ADT, hydrogen atoms were added, and Gasteiger partial charges were assigned. In accordance with the standard AutoDock protocol, nonpolar hydrogens were merged [6]. To ensure conformational flexibility during the docking process, rotatable bonds and root atoms were automatically detected by the software. In the final step, the ligands were saved in ".pdbqt" format, containing all the structural and electrostatic information required for subsequent docking simulations [7].

Calculation of the Inhibition Constant (Ki) Based on Binding Energy:

In molecular docking studies, the affinity between a ligand and its target protein is usually expressed in terms of the free binding energy (ΔG), which is measured in kcal/mol. A lower, i.e., more negative, ΔG value indicates a stronger and more energetically favorable interaction between the ligand and the protein. The inhibition constant (Ki), which reflects the binding strength of the ligand, can be estimated from the calculated binding energy using the standard thermodynamic relationship [8]:

$$Ki = e^{\wedge}\frac{\Delta G x 1000}{RxT}$$

Where:

Ki is the inhibition constant, expressed in mol/L;
ΔG is the free binding energy, expressed in kcal/mol;
R is the universal gas constant, equal to 1.987 cal/(mol·K);
T is the temperature on the Kelvin scale, usually taken as 298.15 K;
1000 is the conversion factor used to convert kcal to cal.

Computational Tools and Databases Used in Molecular Docking Analysis:

An *in silico* molecular docking study was conducted to identify the possible molecular mechanisms underlying the biological activity of the "As-Capsipol" complex. Although the "As-Capsipol" complex contains a range of amino acids, several representative compounds, namely arginine, phenylalanine, glutamic acid, tyrosine, and tryptophan, were selected for the targeted docking analysis. Their selection was based primarily on their binding affinity profiles and biological significance.

These amino acids were selected because they demonstrated favorable binding energies toward the target proteins investigated in the preliminary docking results. Among them, tryptophan and tyrosine showed the most pronounced binding affinity toward several target proteins, indicating their strong interaction potential [9]. Phenylalanine also exhibited consistently favorable binding energies, suggesting its possible role in stabilizing ligand–protein complexes through hydrophobic interactions and π–π stacking interactions between aromatic rings.

Arginine was included in the analysis because of its ability to form strong electrostatic interactions and hydrogen bonds through its positively charged guanidinium group. This property facilitates its interaction with negatively charged amino acid residues located in the active sites of proteins [10]. Glutamic acid, as a negatively charged amino acid, was selected based on its ability to participate in ionic interactions and its involvement in the regulation of inflammatory signaling pathways.

The docking analysis was performed against a key protein target involved in the development of inflammatory processes and liver injury. Cyclooxygenase-2 (COX-2, PDB ID: 5IKR) was selected as the target protein. This protein target was chosen because it plays a central role in inflammatory signaling pathways and in the pathogenesis of liver diseases [11].

Quantitative determination of the amino acid content in the sample:

The precipitation of proteins and peptides from the aqueous extract of the As-Capsipol food supplement was carried out in centrifuge tubes. For this purpose, 1 mL of the investigated sample was mixed with an equal volume, namely 1 mL, of 20% trichloroacetic acid (TCA). After 10 minutes, the precipitated proteins were separated by centrifugation at 8000 rpm for 15 minutes. Then, 0.1 mL of the obtained supernatant was collected and subjected to lyophilization.

The dried residue was subsequently evaporated, dissolved in a triethylamine–acetonitrile–water mixture at a ratio of 1:7:1, and dried again. This procedure was repeated twice in order to neutralize residual acidity. Free amino acids were reacted with phenyl isothiocyanate (PITC) and converted into phenylthiocarbamyl (PTC) amino acid derivatives according to the method described by Steven A. and Cohen Daviel [12]. The results obtained are summarized in Table 2.

The identification of amino acid derivatives was performed using high-performance liquid chromatography (HPLC). The analytical conditions were as follows: an Agilent Technologies 1200 chromatographic system equipped with a DAD detector and a Discovery HS C18 column (75×4.6 mm) was used. Mobile phase A consisted of 0.14 M sodium acetate (CH_3COONa) containing 0.05% triethylamine (TEA), adjusted to pH 6.4, while acetonitrile (CH_3CN) was used as mobile phase B. The flow rate was set at 1.2 mL/min, and detection was performed at a wavelength of 269 nm. The gradient program for solvent B was as follows: 1-6% from 0 to 2.5 min; 6-30% from 2.51 to 40 min; 30-60% from 40.1 to 45 min; 60-60% from 45.1 to 50 min; and 60-0% from 50.1 to 55 min.

Table 2. Amino acid composition and quantitative content of the As-Capsipol food supplement

Amino acids	**As-Capsipol**
	Concentration (mg/g)
Glutamic acid	1.237

Arginine	0.458
Tyrosine	1.115
Tryptophan	7.147
Phenylalanine	2.037

Rationale for the selection of representative amino acid ligands:

The selection of arginine, phenylalanine, glutamic acid, tyrosine, and tryptophan as representative ligands was based on a combination of analytical, structural, and biological criteria. First, these amino acids were experimentally detected in the As-Capsipol food supplement by HPLC analysis, confirming their real presence in the investigated sample. Second, they represent different chemical classes of amino acids, including acidic amino acids (glutamic acid), basic amino acids (arginine), and aromatic amino acids (phenylalanine, tyrosine, and tryptophan). This chemical diversity is important because it allows the evaluation of different types of ligand-protein interactions, such as hydrogen bonding, electrostatic interactions, hydrophobic contacts, and π-mediated interactions within the COX-2 binding site.

In addition, these amino acids were selected due to their potential biological relevance to inflammatory and metabolic processes. Arginine may participate in immune regulation and nitric oxide-related pathways, glutamic acid is involved in nitrogen metabolism and cellular signaling, whereas aromatic amino acids such as phenylalanine, tyrosine, and tryptophan may contribute to hydrophobic and π-related interactions with protein targets. Among them, tyrosine and tryptophan are of particular interest because of their relatively high binding affinity toward COX-2 in the preliminary docking results. Therefore, the selected amino acids can be considered chemically diverse and biologically informative representative constituents of the As-Capsipol complex for targeted molecular docking analysis.

Table 3. Criteria for the selection of representative amino acid ligands from the As-Capsipol complex

Amino acid	Selection criterion	Rationale for representativeness
Glutamic acid	Acidic amino acid	Selected to evaluate the potential of acidic amino acids to interact with COX-2 through electrostatic interactions and hydrogen bonding.
Arginine	Basic amino acid	Represents positively charged amino acids; its guanidinium group can form strong hydrogen bonds and electrostatic interactions with residues in the COX-2 binding site.
Phenylalanine	Hydrophobic aromatic amino acid	Selected to assess hydrophobic contacts and π-mediated interactions associated with aromatic amino acid residues.
Tyrosine	Polar aromatic amino acid	Represents aromatic amino acids capable of forming both hydrogen bonds and π-alkyl interactions within the COX-2 active region.
Tryptophan	Indole-containing aromatic amino acid	Detected at a relatively high level in the sample and showed the strongest binding affinity toward COX-2, supporting its relevance as an informative representative ligand.

The selected amino acids were considered chemically diverse and biologically informative representative constituents of the As-Capsipol complex for targeted molecular docking analysis.

RESULTS AND DISCUSSION

Cyclooxygenase-2 (COX-2) is an inducible enzyme that plays an important role in the conversion of arachidonic acid into prostaglandins, particularly during inflammatory responses. Unlike COX-1, which is constitutively expressed in most tissues and participates in the maintenance of physiological homeostasis, COX-2 expression is generally low under normal conditions. However, its expression markedly increases under the influence of inflammatory stimuli such as cytokines, oxidative stress, and viral infections. Under hepatitis conditions, COX-2 has been shown to play an important role in the pathogenesis and progression of hepatic inflammation [10].

Various forms of hepatitis, including viral hepatitis such as hepatitis B and C, are associated with increased COX-2 expression in hepatocytes and non-parenchymal liver cells. This activation leads to enhanced production of prostaglandin E2 (PGE2). PGE2 contributes to hepatic inflammation by promoting vasodilation, increasing vascular permeability, and modulating immune responses. In addition, PGE2 may influence the balance between pro-inflammatory and anti-inflammatory cytokines, thereby affecting the severity and duration of liver injury [11].

Chronic activation of COX-2 in hepatitis is also associated with the progression of liver diseases toward fibrosis, cirrhosis, and hepatocellular carcinoma. There is evidence that COX-2-derived mediators may stimulate the activation of hepatic stellate cells, leading to excessive accumulation of extracellular matrix components and the development of fibrosis. Furthermore, COX-2 may contribute to carcinogenesis by enhancing cell proliferation, suppressing apoptosis, and

promoting angiogenesis within the hepatic microenvironment. Due to its important involvement in hepatic inflammation and disease progression, COX-2 is considered a promising therapeutic target in hepatitis-related conditions [2]. Selective inhibition of COX-2 has been proposed as a strategy to reduce hepatic inflammation and limit disease progression. However, the therapeutic use of COX-2 inhibitors should be carefully evaluated, particularly because of the potential systemic adverse effects associated with long-term administration.

Arginine exhibited a binding affinity of −6.1 kcal/mol toward COX-2. This corresponds to a Ki value of approximately 3.4×10^{-5} M, or about 34 μM, indicating moderate inhibitory potential and stable interaction within the active region of the enzyme. The docking simulation was performed using a grid box centered at the coordinates center_x = 36.323000, center_y = 26.465000, and center_z = 23.686000. This allowed the ligand to be accurately positioned within the functional binding pocket of COX-2 (Figure 1).

According to the docking analysis, arginine formed conventional hydrogen bonds with Gln192, Ser353, Leu352, and Met522 (Figure 2). At the same time, an unfavorable positive–positive interaction was observed with Arg513. The affinity toward these amino acid residues can be explained by the structural characteristics of arginine, particularly its polar guanidinium group. This group readily forms hydrogen bonds with polar amino acid residues.

Gln192 and Ser353 play an important role in stabilizing ligand binding through hydrogen bonding and contribute to the firm positioning of the ligand within the active site. Although Leu352 is predominantly hydrophobic, it contributes to the spatial orientation of the ligand through close-contact interactions. Met522, located within the hydrophobic channel of COX-2, is known to participate in substrate positioning. This suggests that arginine may occupy a catalytically significant region of the enzyme.

The unfavorable interaction observed with Arg513 is likely associated with electrostatic repulsion between positively charged groups present in both the ligand and the amino acid residue. However, the presence of several stabilizing hydrogen bonds may compensate for this unfavorable effect and contribute to an overall favorable binding energy.

From a functional perspective, the localization of arginine within the active site may partially block substrate access or disrupt the proper spatial orientation required for enzymatic catalysis. Considering that COX-2 is an enzyme responsible for the conversion of arachidonic acid into pro-inflammatory prostaglandins, such interactions may reduce enzymatic activity and contribute to the attenuation of inflammatory processes. This may be particularly important under hepatitis conditions, where COX-2 expression is elevated.

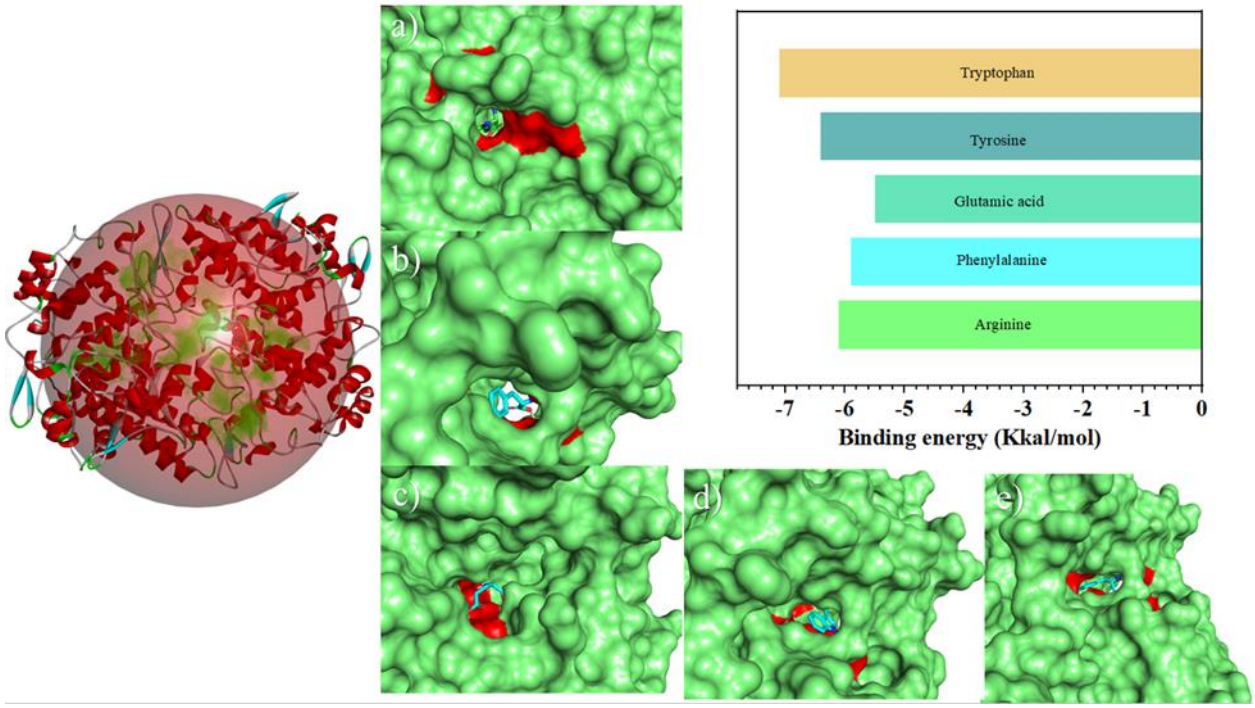


Figure 1. Integrated molecular docking analysis of selected amino acid ligands from the "As-Capsipol" complex with COX-2, illustrating their binding interactions and affinity profiles: (a) arginine, (b) phenylalanine, (c) glutamic acid, (d) tyrosine, and (e) tryptophan.

Phenylalanine exhibited a binding affinity of −5.9 kcal/mol toward COX-2 (Figure 1). This value corresponds to a Ki value of approximately 5.2×10^{-5} M, or about 52 μM. This result indicates that phenylalanine possesses a moderate inhibitory potential. Although this value is slightly weaker compared with that of arginine, it confirms that phenylalanine interacts significantly with the enzyme.

Interaction analysis showed that phenylalanine formed conventional hydrogen bonds with Cys36, Cys41, and Gln461. This indicates that the ligand is stably positioned within the binding pocket. These amino acid residues possess polar or semi-polar properties and are capable of stabilizing the ligand through hydrogen bonding. In particular, cysteine residues such as Cys36 and Cys41 may participate in hydrogen bonding through their thiol groups, thereby contributing to the spatial orientation and stabilization of the ligand. Gln461, as a polar amino acid residue, further enhances the specificity of binding through hydrogen bond formation.

In addition to hydrogen bonds, phenylalanine also exhibits π-related interactions due to its aromatic benzene ring. A π–sigma interaction was observed with Leu152, whereas a π–alkyl interaction was detected with Arg469. Such interactions are important because aromatic amino acids such as phenylalanine are characterized by their ability to form hydrophobic and π-mediated contacts within hydrophobic regions of proteins. This substantially increases the stability of the ligand within the protein binding pocket. These interactions help maintain the ligand in a favorable spatial orientation inside the binding pocket.

At the same time, an unfavorable donor–donor interaction was observed with His39 (Figure 2). This can be explained by competition between hydrogen bond donor groups of phenylalanine and the histidine residue, resulting in a repulsive interaction. However, as in the case of arginine, this unfavorable contact does not dominate the overall binding process, since it is compensated for by several stabilizing interactions.

From structural and functional perspectives, the binding of phenylalanine is mainly supported by hydrophobic and aromatic interactions rather than strong electrostatic forces. This suggests that phenylalanine occupies a relatively hydrophobic region within the COX-2 binding site. As a result, it may interfere with substrate positioning or stabilize an inactive conformation of the enzyme. Considering that COX-2 activity depends on the proper positioning of arachidonic acid within the hydrophobic channel, the localization of phenylalanine in this region may disrupt substrate binding and reduce enzymatic activity.

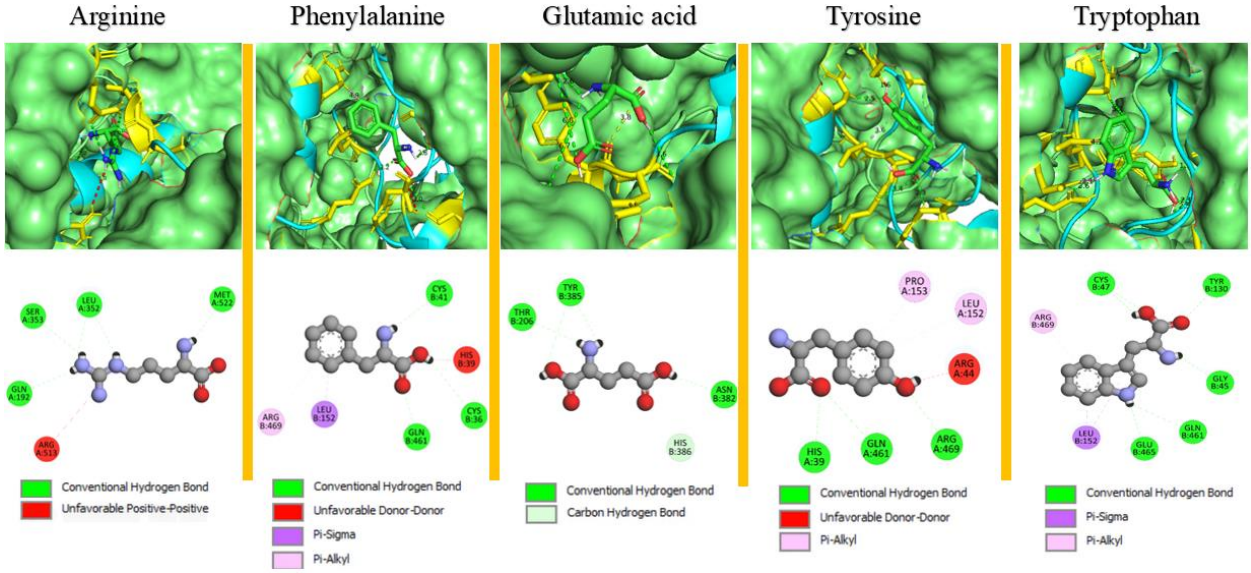


Figure 2. Molecular docking visualization of selected amino acid ligands from the "As-Capsipol" complex within the COX-2 active site, showing the binding modes, interaction networks, and structural conformations of arginine, phenylalanine, glutamic acid, tyrosine, and tryptophan.

Glutamic acid exhibited a binding affinity of −5.5 kcal/mol toward COX-2 (Figure 1). This value corresponds to an estimated Ki value of approximately 9.3×10^{-5} M, or about 93 μM, indicating the presence of moderate inhibitory activity. The docking simulation was performed using a grid box centered at the coordinates center_x = 36.323000, center_y = 26.465000, and center_z = 23.686000. This ensured the proper localization of the ligand within the active site region of the enzyme.

Interaction analysis showed that glutamic acid was stabilized within the binding pocket through several hydrogen bonds involving Thr206, Tyr385, and Asn382, as well as an additional carbon–hydrogen interaction with His386. These amino acid residues are located in the functional region of COX-2 and participate in processes associated with proper ligand positioning and enzymatic activity. In particular, Tyr385 plays an important role in the catalytic mechanism of COX-2 (Figure 2). Its involvement in interaction with the ligand suggests that glutamic acid may influence the functional activity of the enzyme.

Tyrosine showed a binding affinity of −6.4 kcal/mol toward COX-2. Its estimated Ki value was 2.0×10^{-5} M, or approximately 20 μM. This result indicates that tyrosine has a stronger inhibitory potential compared with the other amino

acids present in the "As-Capsipol" complex. The docking simulation was performed using a grid box centered at the coordinates center_x = 36.323000, center_y = 26.465000, and center_z = 23.686000. This allowed the ligand to be properly positioned within the active site of the enzyme (Figure 1).

Interaction analysis demonstrated that tyrosine formed conventional hydrogen bonds with His39, Gln461, and Arg469. These bonds contribute to the stable anchoring of the ligand within the binding pocket. In addition, hydrophobic π–alkyl interactions were observed with Pro153 and Leu152. This indicates that the aromatic ring of tyrosine is well positioned within the hydrophobic region of the active site. An unfavorable donor–donor interaction with Arg44 was also detected, which may be associated with repulsion between hydrogen bond donor groups. However, this unfavorable interaction does not substantially affect the overall stability of the complex.

The combined presence of hydrogen bonds and hydrophobic interactions indicates that tyrosine is effectively stabilized within the functional region of COX-2. While His39 and Gln461 play an important role in anchoring the ligand within the binding pocket, Arg469 provides an additional contribution to its spatial orientation (Figure 2). The involvement of Pro153 and Leu152 highlights the importance of hydrophobic contacts in maintaining the ligand in an appropriate orientation within the binding cavity.

From a functional perspective, the binding of tyrosine in this region may interfere with substrate entry into the active site or alter the spatial arrangement of catalytically important amino acid residues. Since COX-2 is responsible for converting arachidonic acid into pro-inflammatory prostaglandins, occupation of the active site by tyrosine may reduce enzymatic efficiency. Consequently, this interaction may contribute to the anti-inflammatory potential of the "As-Capsipol" complex, particularly under conditions such as hepatitis, where COX-2 expression is increased.

Tryptophan exhibited a binding affinity of −7.1 kcal/mol toward COX-2. Its estimated Ki value was 6.0×10^{-6} M, or approximately 6 μM. This result indicates that tryptophan has a stronger inhibitory potential than the other amino acids identified in the "As-Capsipol" complex. The docking analysis was performed using a grid box centered at the coordinates center_x = 36.323000, center_y = 26.465000, and center_z = 23.686000. This ensured precise positioning of the ligand within the active site of the enzyme (Figure 1).

The interaction profile showed that tryptophan was stabilized within the COX-2 binding pocket through several conventional hydrogen bonds involving Cys47, Tyr130, Gly45, Gln461, and Glu465 (Figure 1). These amino acid residues facilitate the anchoring of the ligand in the active site and support its proper spatial orientation. In addition to hydrogen bonds, π-related interactions, including π–sigma and π–alkyl contacts with Leu152 and Arg469, were also observed. This suggests that the aromatic indole ring of tryptophan plays an important role in stabilizing the ligand within the hydrophobic microenvironment.

The combined presence of polar and hydrophobic interactions indicates that tryptophan is well positioned within the functional region of COX-2. Gln461 and Glu465 contribute to stabilization through hydrogen bonding, whereas Tyr130 and Cys47 further strengthen ligand binding through polar contacts. The aromatic structure of tryptophan enables it to form strong interactions with hydrophobic amino acid residues. This may explain its relatively high binding affinity.

Functionally, the localization of tryptophan within the active site may significantly hinder substrate entry or disrupt the catalytic microenvironment required for prostaglandin synthesis. Since COX-2 is one of the key enzymes involved in the production of pro-inflammatory mediators, the strong binding of tryptophan may lead to reduced enzymatic activity. These findings suggest that tryptophan may play an important role in the anti-inflammatory effect of the "As-Capsipol" complex. This is particularly relevant for pathological conditions such as hepatitis, where COX-2 is highly expressed.

CONCLUSION

The molecular docking analyses demonstrated that the selected amino acids contained in the "As-Capsipol" dietary supplement are capable of forming stable interactions with the active site of the COX-2 enzyme. In particular, the relatively high binding affinities of tryptophan and tyrosine suggest that they may play an important role in modulating inflammatory processes at the molecular level. Arginine, phenylalanine, and glutamic acid were also found to interact with COX-2 through hydrogen bonds, hydrophobic interactions, and electrostatic interactions, thereby potentially contributing to the overall biological activity of the complex. The obtained results provide an in silico-based scientific rationale for the anti-inflammatory potential of the "As-Capsipol" complex and establish a theoretical basis for further experimental studies.

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HIPPOPHAE RHAMNOIDES L. TARKIBIDAGI GIDROFIL VA LIPOFIL ANTIOKSIDANTLARNING BIOORGANIK-KIMYOVIY XUSUSIYATLARI VA FARMASEVTIK ISTIQBOLLARI

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Annotatsiya:*Hippophae rhamnoides L. (chakanda) vitaminlar, flavonoidlar, fenol kislotalari, karotinoidlar, tokoferollar va boshqa biologik faol birikmalarga boy dorivor va oziq-ovqat o‘ simligi hisoblanadi. Chakandaning muhim fitokimyoviy xususiyati uning tarkibida gidrofil va lipofil antioksidant komponentlarning bir vaqtda mavjudligidir. Mazkur maqolada Scopus bazasida indekslangan zamonaviy ilmiy adabiyotlar ma’lumotlari asosida H. rhamnoidesning asosiy antioksidant komponentlari tizimlashtirildi. Flavonoidlar, askorbin kislotasi va fenol kislotalari gidrofil antioksidant tizimning, karotinoidlar va tokoferollar esa lipofil antioksidant tizimning muhim tarkibiy qismlari sifatida tahlil qilindi. Ularning molekular tuzilishi, antioksidant xususiyatlari va o‘ simlik organlari bo‘ yicha taqsimlanishi qiyosiy baholandi. Ilmiy ma’lumotlar chakandaning fitokimyoviy tarkibi genotip, geografik kelib chiqish, o‘ simlik organi, yig‘ ish vaqti va qayta ishlash sharoitlariga bog‘ liq ravishda o‘ zgarishini ko‘ rsatadi. Gidrofil va lipofil antioksidantlarning kompleks mavjudligi H. rhamnoidesni antioksidant, nutritsevtik va farmasevtik mahsulotlar uchun istiqbolli tabiiy manba sifatida baholash imkonini beradi.*

Kalit so‘ zlar: *Hippophae rhamnoides L., chakanda, flavonoidlar, karotinoidlar, tokoferollar, askorbin kislotasi, antioksidantlar, bioorganik kimyo, farmasevtika.*

БИООРГАНИЧЕСКИЕ И ХИМИЧЕСКИЕ СВОЙСТВА ГИДРОФИЛЬНЫХ И ЛИПОФИЛЬНЫХ АНТИОКСИДАНТОВ В СОСТАВЕ HIPPOPHAE RHAMNOIDES L. И ИХ ФАРМАЦЕВТИЧЕСКИЕ ПЕРСПЕКТИВЫ

Аннотация: *Hippophae rhamnoides L. (облепиха) является лекарственным и пищевым растением, богатым витаминами, флавоноидами, фенольными кислотами, каротиноидами, токоферолами и другими биологически активными соединениями. Важной фитохимической особенностью облепихи является одновременное присутствие в её составе гидрофильных и липофильных антиоксидантных компонентов. В данной статье на основе данных современной научной литературы, индексированной в базе Scopus, систематизированы основные антиоксидантные компоненты H. rhamnoides. Флавоноиды, аскорбиновая кислота и фенольные кислоты рассмотрены как важнейшие компоненты гидрофильной антиоксидантной системы, а каротиноиды и токоферолы — липофильной антиоксидантной системы. Проведена сравнительная оценка их молекулярного строения, антиоксидантных свойств и распределения в различных органах растения. Научные данные показывают, что фитохимический состав облепихи изменяется в зависимости от генотипа, географического происхождения, органа растения, сроков сбора и условий переработки. Комплексное присутствие гидрофильных и липофильных антиоксидантов позволяет рассматривать H. rhamnoides как перспективный природный источник для производства антиоксидантных, нутрицевтических и фармацевтических продуктов.****

Ключевые слова*: Hippophae rhamnoides L., облепиха, флавоноиды, каротиноиды, токоферолы, аскорбиновая кислота, антиоксиданты, биоорганическая химия, фармацевтика.*

BIOORGANIC AND CHEMICAL PROPERTIES OF HYDROPHILIC AND LIPOPHILIC ANTIOXIDANTS IN HIPPOPHAE RHAMNOIDES L. AND THEIR PHARMACEUTICAL PROSPECTS

Abstract: Hippophae rhamnoides L. *(sea buckthorn) is a medicinal and food plant rich in vitamins, flavonoids, phenolic acids, carotenoids, tocopherols, and other biologically active compounds. An important phytochemical characteristic of sea buckthorn is the simultaneous presence of hydrophilic and lipophilic antioxidant components. This article systematizes the main antioxidant components of* H. rhamnoides *based on data from recent scientific literature indexed in the Scopus database. Flavonoids, ascorbic acid, and phenolic acids were analyzed as important components of the hydrophilic antioxidant system, while carotenoids and tocopherols were considered key components of the lipophilic antioxidant system. Their molecular structures, antioxidant properties, and*

distribution among different plant organs were comparatively evaluated. Scientific data indicate that the phytochemical composition of sea buckthorn varies depending on genotype, geographical origin, plant organ, harvesting time, and processing conditions. The combined presence of hydrophilic and lipophilic antioxidants makes H. rhamnoides *a promising natural source for antioxidant, nutraceutical, and pharmaceutical products.*

Keywords: Hippophae rhamnoides L., *sea buckthorn, flavonoids, carotenoids, tocopherols, ascorbic acid, antioxidants, bioorganic chemistry, pharmaceuticals.*

Kirish. Dorivor o‘ simliklar tarkibidagi tabiiy biologik faol birikmalar zamonaviy bioorganik, farmasevtik va oziq-ovqat kimyosining muhim tadqiqot ob’ektlaridan biri hisoblanadi. Ayniqsa, oksidlovchi stress jarayonlariga ta’sir ko‘ rsatuvchi tabiiy antioksidantlarni izlashda flavonoidlar, fenol kislotalari, vitaminlar, karotinoidlar va tokoferollarga boy o‘ simliklarga katta e’tibor qaratilmoqda [1].

Antioksidant moddalarning biologik xususiyatlari ularning faqat antiradikal faolligi bilan emas, balki molekular tuzilishi, qutbliligi, eruvchanligi va biologik muhitda taqsimlanishi bilan ham bog‘ liq. Shu nuqtai nazardan antioksidantlarni shartli ravishda gidrofil va lipofil komponentlarga ajratish mumkin. Askorbin kislotasi va ko‘ plab polifenollar suvli muhitda yaxshi eruvchan bo‘ lsa, karotinoidlar va tokoferollar lipid muhitlarida yuqori faollik namoyon etadi [2].

Hippophae rhamnoides L. Elaeagnaceae oilasiga mansub ko‘ p yillik o‘ simlik bo‘ lib, ushbu ikki xil antioksidant tizimni bir fitokompleksda birlashtirishi bilan alohida ahamiyatga ega. Zamonaviy ilmiy tadqiqotlarda chakanda mevalari, barglari, urug‘ lari va boshqa organlarida flavonoidlar, fenol kislotalari, askorbin kislotasi, karotinoidlar, tokoferollar, tanninlar va boshqa ikkilamchi metabolitlar aniqlangan [3].

Chakandaning fitokimyoviy tarkibi yuqori darajada murakkab. Zamonaviy tadqiqotlarda uning tarkibida vitaminlar, mineral elementlar, organik kislotalar, aminokislotalar, oqsillar, lignanlar, triterpenoidlar, uchuvchan birikmalar va boshqa biologik faol moddalar mavjudligi qayd etilgan.

2023 yilda *Journal of Agricultural and Food Chemistry* jurnalida chop etilgan keng qamrovli tahlilda *H. rhamnoides* tarkibida 99 ta flavonoid, 44 ta lignan, 64 ta uchuvchan komponent, 31 ta tannin va 30 ta terpenoyd kabi ko‘ p sonli tabiiy birikmalar tizimlashtirilgan. Bu ma’lumotlar chakandaning bioorganik kimyo nuqtai nazaridan murakkab va istiqbolli ob’ekt ekanini ko‘ rsatadi. Shu bilan birga, o‘ simlikning turli organlari kimyoviy tarkibi jihatidan bir-biridan farq qiladi. Meva va po‘ stloq karotinoidlar hamda ayrim flavonoidlarga boy bo‘ lsa, barglarda kversetin, kempferol va izoramnetin hosilalari kabi polifenollar ko‘ proq to‘ planishi mumkin [4].

Scopus bazasida indekslangan zamonaviy ilmiy adabiyotlar ma’lumotlari asosida *Hippophae rhamnoides L.* tarkibidagi gidrofil va lipofil antioksidant birikmalarni tizimlashtirish, ularning molekular va bioorganik xususiyatlarini tahlil qilish hamda farmasevtik qo‘ llanish istiqbollarini baholashdan iborat.

***H. rhamnoides* ning fitokimyoviy xususiyatlari.** Chakanda fitokimyoviy jihatdan ko‘ p komponentli tabiiy tizim hisoblanadi. Uning mevasi, po‘ stlog‘ i, urug‘ i, bargi va shoxlarida biologik faol moddalarning turli sinflari aniqlangan [5].

Zamonaviy adabiyotlarda *H. rhamnoides* tarkibida polifenollar, flavonoidlar, fenol kislotalari, vitaminlar, aminokislotalar, minerallar, karotinoidlar, organik kislotalar va terpen tabiatli moddalar mavjudligi ko‘ rsatilgan. Chakandaning farmakologik potensiali bitta alohida komponent bilan emas, balki turli fizik-kimyoviy xususiyatlarga ega moddalar kompleksi bilan bog‘ liq. Bu o‘ simlikni kompleks fitokimyoviy tizim sifatida tahlil qilish zaruratini keltirib chiqaradi. Bioorganik nuqtai nazardan chakandaning eng muhim xususiyatlaridan biri gidrofil va lipofil tabiatga ega antioksidant birikmalarning bir vaqtda mavjudligidir. Bu ularning turli biologik muhitlarda faollik ko‘ rsatish imkoniyatini oshiradi.

Gidrofil antioksidant komponentlar. Flavonoidlar. Flavonoidlar *H. rhamnoides* tarkibidagi asosiy fenol metabolitlaridan biri hisoblanadi. Adabiyotlarda ular orasida kversetin, kempferol, izoramnetin va ularning turli glikozid hosilalari ko‘ p uchrashi qayd etilgan.

2021 yilda *Journal of Food Composition and Analysis*da chop etilgan tadqiqotda chakanda barglari va meva po‘ stlog‘ ida flavonollar yuqori miqdorda uchrashi, ular tarkibida kversetin, izoramnetin va kempferol hosilalarining ustunligi ko‘ rsatilgan.

Kversetin flavonollar sinfiga mansub bo‘ lib, molekulasidagi fenol gidroksil guruhlarining ko‘ pligi uning antioksidant xususiyatlarini belgilaydi. U elektron yoki vodorod atomini berish orqali reaktiv radikallarni neytrallashda ishtirok etishi mumkin. Izoramnetin kversetinning metoksillangan hosilasi hisoblanadi. Molekulada metoksil guruhining mavjudligi uning qutbliligi, lipofilligi va biologik muhitda taqsimlanish xususiyatlariga ta’sir ko‘ rsatadi [5].

Kempferol ham polifenol tabiatli flavonol bo‘ lib, uning turli glikozid hosilalari chakanda tarkibida aniqlangan. Flavonoid molekulasiga uglevod fragmentining birikishi uning suvda eruvchanligi, transport xususiyatlari va biokiraolishligiga ta’sir qilishi mumkin. Shu sababli chakanda tarkibidagi flavonoidlarni o‘ rganishda faqat umumiy

flavonoidlar miqdorini emas, balki aglikon va glikozid shakllarini ham hisobga olish zarur. Chakanda barglarining kimyoviy tarkibini baholashda HPLC va UHPLC-ESI-QTOF-MS kabi zamonaviy analitik usullar qo‘llangan. Alohida flavonoidlarning taqsimlanishi asosida turli geografik kelib chiqishga ega namunalarni farqlash mumkinligi ko‘rsatilgan. Bu natijalar flavonoidlar nafaqat biologik faol komponentlar, balki chakanda xomashyosining kimyoviy xususiyatlarini tavsiflovchi muhim ko‘rsatkichlar ekanini ham ko‘rsatadi [6].

Askorbin kislotasi. Chakanda mevasi askorbin kislotasi -C vitaminining tabiiy manbalaridan biri hisoblanadi. Askorbin kislotasi suvda eruvchan redoks-faol birikma bo‘lib, reaktiv kislorod turlarini neytrallash jarayonlarida ishtirok etadi. Uning molekular strukturasi elektron berish va qayta oksidlanish-qaytarilish reaksiyalarida ishtirok etish qobiliyatini belgilaydi. Shu bois askorbin kislotasi gidrofil antioksidant tizimning muhim komponenti hisoblanadi.

Chakanda tarkibida askorbin kislotasining flavonoidlar va fenol kislotalari bilan birgalikda mavjudligi umumiy antioksidant potensialni shakllantirishda muhim ahamiyatga ega. Shu bilan birga, C vitamini miqdori o‘simlik navi, pishish darajasi, iqlim sharoiti, saqlash va qayta ishlash texnologiyasiga qarab o‘zgarishi mumkin. Bu chakanda mahsulotlarini tayyorlashda texnologik omillarni hisobga olish zarurligini ko‘rsatadi.

Lipofil antioksidant komponentlar. Karotinoidlar. Chakanda mevasining sariq, to‘q sariq va qizg‘ish ranglari asosan karotinoidlar mavjudligi bilan bog‘liq. Karotinoidlar molekulasida uzun kon’yugirlangan qo‘shbog‘lar tizimi mavjud bo‘lgan lipofil tabiatli birikmalardir. Ushbu kon’yugirlangan elektron tizim singlet kislorod va ayrim reaktiv kislorod turlarining energiyasini qabul qilish va tarqatish imkoniyatini beradi. Shu sababli karotinoidlar lipofil antioksidant himoya tizimining muhim tarkibiy qismi hisoblanadi.

Chakanda tarkibida β-karotin, lyutein, zeaksantin va boshqa karotinoidlar aniqlangan. β-karotin provitamin A xususiyatiga ega bo‘lib, organizmda retinoidlar hosil bo‘lishida prekursor vazifasini bajaradi. Karotinoidlarning miqdori va nisbati nav, geografik kelib chiqish, pishish bosqichi va o‘simlik qismiga bog‘liq ravishda sezilarli darajada farq qilishi mumkin. Ayrim tadqiqotlarda chakanda mevalarida umumiy karotinoidlar miqdori barglarga nisbatan bir necha marta yuqori ekani ko‘rsatilgan. Bu meva va meva po‘stlog‘ini karotinoidlar olish uchun istiqbolli xomashyo sifatida baholashga asos beradi.

Tokoferollar. Tokoferollar E vitamini faolligiga ega lipofil antioksidantlar hisoblanadi. Ular hujayra membranalari va boshqa lipid tizimlarida lipid peroksidlanish jarayonlarini cheklashda muhim ahamiyatga ega. Chakanda tarkibida α-, γ- va δ-tokoferollar kabi izomerlar uchraydi. Ular orasida α-tokoferol biologik faolligi yuqori shakllardan biri hisoblanadi.

Tokoferol molekulasidagi xromanol halqasi vodorod atomini berish orqali lipid radikallarini barqarorlashtirishda ishtirok etadi. Shu yo‘l bilan lipid peroksidlanishining zanjirli reaksiyasi susayishi mumkin. Chakandaning turli organlarida tokoferollar bir xil miqdorda taqsimlanmaydi. Adabiyotlarda urug‘ va meva qismlarida ularning miqdori genotip va texnologik qayta ishlash sharoitiga bog‘liq ekani qayd etilgan. Karotinoidlar va tokoferollarning bir fitokompleksda mavjudligi chakandaning lipofil antioksidant potensialini belgilaydi.

O‘simlik organlari bo‘yicha biologik faol moddalarning taqsimlanishi. Chakanda tarkibidagi biologik faol moddalar o‘simlik organlari bo‘yicha bir xil taqsimlanmagan.

1-jadval.

Hippophae rhamnoides L. o‘simligining turli qismlaridagi asosiy biologik faol komponentlar va ulardan foydalanishning istiqbolli yo‘nalishlari

O‘simlik qismi	Asosiy biologik faol komponentlar	Istiqbolli yo‘nalish
Meva va po‘stloq	karotinoidlar, askorbin kislotasi, flavonoidlar	antioksidant va nutritsevtik mahsulotlar
Barg	kversetin, kempferol, izoramnetin hosilalari	polifenol ekstraktlari
Urug’	tokoferollar va boshqa lipofil komponentlar	funksional mahsulotlar
Shox va endokarp	flavan-3-ollar, protsianidinlar	fenol birikmalari manbai

2021-yilgi kompleks tadqiqotlarda chakandaning meva po‘stlog‘i va barglarida kversetin, izoramnetin va kempferol hosilalari, shoxlar va urug‘ endokarpida esa flavan-3-ollar va polimer protsianidinlar ustun ekani ko‘rsatilgan. Bu ma’lumotlar chakanda xomashyosini baholashda qaysi o‘simlik qismi ishlatilayotganini albatta hisobga olish zarurligini ko‘rsatadi. Masalan, flavonoidlarga boy ekstrakt olish maqsad qilinganda barglar istiqbolli bo‘lishi mumkin, karotinoidlarga boy mahsulot olishda esa meva va uning po‘stlog‘i muhim xomashyo hisoblanadi. Demak, chakandaning farmatsevtik va nutritsevtik qiymati o‘simlikning muayyan organi bilan bevosita bog‘liq.

Geografik va texnologik omillarning ta’siri. Chakandaning fitokimyoviy tarkibi genetik omillar bilan bir qatorda geografik va ekologik sharoitlarga ham bog‘liq. Turli geografik hududlarda o‘sgan chakanda namunalarini qiyosiy o‘rganishda flavonoidlar, karotinoidlar, tokoferollar va boshqa metabolitlar tarkibida farqlar aniqlangan.

Bu farqlarga tuproq tarkibi, harorat, yorug‘ lik, suv ta’minoti, balandlik va boshqa ekologik omillar ta’sir qilishi mumkin. O‘ simlikning yig‘ ib olish vaqti ham muhim ahamiyatga ega. Pishish jarayoni davomida pigmentlar, organik kislotalar, vitaminlar va polifenollar miqdori o‘ zgarishi mumkin.

Quritish, saqlash va ekstraksiya texnologiyalari ham biologik faol moddalarning saqlanishiga ta’sir ko‘ rsatadi. Ayniqsa, askorbin kislotasi va ayrim karotinoidlar tashqi muhit omillariga sezgir bo‘ lishi mumkin. Shu sababli xalqaro adabiyotlarda keltirilgan aniq miqdoriy ko‘ rsatkichlarni O‘ zbekistonda o‘ sadigan yoki yetishtiriladigan *H. rhamnoides* xomashyosiga to‘ g‘ ridan-to‘ g‘ ri ko‘ chirish ilmiy jihatdan maqsadga muvofiq emas. Mahalliy xomashyoni alohida o‘ rganish, uning flavonoid, karotinoid, tokoferol va askorbin kislotasi tarkibini aniqlash kelgusida muhim tadqiqot yo‘ nalishi bo‘ lishi mumkin.

Gidrofil va lipofil antioksidantlarning bioorganik o‘ zaro bog‘ liqligi. Chakan daning asosiy ilmiy xususiyati alohida bir antioksidant moddaning yuqori miqdorida emas, balki turli fizik-kimyoviy xususiyatlarga ega antioksidant birikmalarning bir fitokompleksda mavjudligidadir.

Flavonoidlar va askorbin kislotasi kabi gidrofil komponentlar asosan suvli biologik muhitlarda redoks jarayonlarida ishtirok etadi. Tokoferollar va karotinoidlar esa lipofil xususiyatlari tufayli biologik membranalar va boshqa lipid muhitlarida muhim antioksidant vazifa bajarishi mumkin.

Ularning molekular ta’sir mexanizmlari ham bir-biridan farq qiladi. Flavonoidlarda fenol gidroksil guruhlarining elektron yoki vodorod berish qobiliyati muhim ahamiyatga ega. Hosil bo‘ lgan fenoksil radikal kon’yugirlangan elektron tizimida barqarorlashadi. Karotinoidlarda uzun kon’yugirlangan qo‘ shbog‘ lar tizimi reaktiv kislorod turlarining energiyasini qabul qilish va so‘ ndirish imkonini beradi.

Tokoferollarda esa xromanol halqasi lipid radikallariga vodorod berib, lipid peroksidlanishining zanjirli reaksiyalarini cheklashda ishtirok etadi.

Askorbin kislotasi esa suvli fazada redoks-faol modda sifatida ishlaydi. Shu jihatdan chakanda tarkibini «bitta antioksidant -bitta biologik ta’sir» modelida baholash yetarli emas. Uni gidrofil va lipofil komponentlardan tashkil topgan ko‘ p komponentli bioorganik antioksidant tizim sifatida qarash ilmiy jihatdan asosliroq hisoblanadi.

Farmakologik va farmasevtik ahamiyati. Zamonaviy ilmiy adabiyotlarda chakanda ekstraktlari va uning ayrim biologik faol komponentlari uchun antioksidant, yallig‘ lanishga qarshi, gepatoprotektor, kardioprotektor, neyroprotektor va antimikrob xususiyatlar haqida ma’lumotlar keltirilgan. Ushbu ta’sirlarning shakllanishida flavonoidlar, askorbin kislotasi, karotinoidlar va tokoferollar kabi antioksidant komponentlar muhim o‘ rin egallashi mumkin. Farmasevtik nuqtai nazardan eng muhim vazifa chakanda tarkibidagi biologik faol moddalarni sifat va miqdor jihatdan standartlashtirish hisoblanadi.

Chunki o‘ simlikning fitokimyoviy tarkibi genotip, organ, geografik hudud va qayta ishlash texnologiyasiga bog‘ liq ravishda o‘ zgarishi mumkin. Shu sababli chakanda asosida farmasevtik yoki nutritsevtik mahsulot ishlab chiqishda faqat umumiy antioksidant faollik ko‘ rsatkichidan foydalanish yetarli emas.

Flavonoid tarkibi, karotinoidlar tarkibi, tokoferollar va askorbin kislotasi kabi asosiy komponentlarni kompleks aniqlash mahsulot sifatini to‘ liqroq baholash imkonini beradi. Flavonoidlarni HPLC yoki LC-MS, karotinoidlarni HPLC-DAD, tokoferollarni esa yuqori samarali suyuqlik xromatografiyasi kabi analitik usullarda baholash mumkin. Bunday yondashuv chakanda xomashyosining bioorganik tarkibi bilan uning biologik va farmasevtik xususiyatlari o‘ rtasidagi bog‘ liqlikni aniqlash imkonini beradi.

Xulosa. Scopus bazasida indekslangan zamonaviy ilmiy ma’lumotlar tahlili *Hippophae rhamnoides L.* ni fitokimyoviy jihatdan murakkab va biologik faol birikmalarga boy dorivor o‘ simlik sifatida tavsiflash imkonini beradi. Chakandaning muhim xususiyati uning tarkibida gidrofil va lipofil antioksidant komponentlarning bir vaqtda mavjudligidir. Gidrofil tizim flavonoidlar, fenol kislotalari va askorbin kislotasi bilan, lipofil tizim esa asosan karotinoidlar va tokoferollar bilan ifodalanadi.

Flavonoidlar orasida kversetin, kempferol va izoramnetin hosilalari muhim o‘ rin egallaydi. Ularning molekular tuzilishi, gidroksil va metoksil guruhlarining mavjudligi hamda glikozidlanish xususiyatlari biologik faolligiga ta’sir ko‘ rsatadi. Karotinoid larning kon’yugirlangan qo‘ shbog‘ lar tizimi va tokoferollarning xromanol strukturasi ularning lipofil antioksidant xususiyatlarining molekular asosini tashkil etadi. Askorbin kislotasi esa suvli muhitda redoks jarayonlarida ishtirok etuvchi muhim gidrofil komponent hisoblanadi.

Adabiyot ma’lumotlari chakandaning fitokimyoviy taxlili o‘ simlik organi, genotip, geografik sharoit, yig‘ ish vaqti va qayta ishlash texnologiyasiga bog‘ liq ravishda o‘ zgarishini ko‘ rsatadi. Shu sababli *H. rhamnoides* xomashyosini standartlashtirishda kompleks fitokimyoviy yondashuv talab etiladi.

Shu nuqtai nazardan chakanda tarkibidagi flavonoidlar, karotinoidlar, tokoferollar va askorbin kislotasini birgalikda o‘ rganish «molekular tuzilish -fizik-kimyoviy xususiyat -antioksidant faollik -farmasevtik qo‘ llanish» o‘ rtasidagi bog‘ liqlikni tushuntirish uchun muhim ilmiy yo‘ nalish hisoblanadi. *Hippophae rhamnoides L.* ning gidrofil va lipofil

antioksidantlarga boyligi uni standartlashtirilgan o‘ simlik ekstraktlari, antioksidant komplekslar, nutritsevtik va farmatsevtik mahsulotlar yaratish uchun istiqbolli tabiiy xomashyo sifatida baholashga asos beradi.

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FAOLLASHTIRILGAN VA METALL BIRIKMALARI BILAN MODIFIKATSIYALANGAN KO‘ MIRLARNI RENTGEN-DIFRAKSION TAHLIL QILISH USULLARI

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Annotatsiya: *Ushbu maqolada faollashtirilgan uglerodli materiallarni turli metall birikmalari (Fe, Cu, Zn, Mn, Al, Mg) bilan modifikatsiyalashning sirt arxitekturasi va faza tarkibiga ta’siri adabiyotlar tahlili hamda rentgen-difraksion tahlil (XRD) usullari yordamida ko‘ rib chiqilgan. Turli o‘ tish va ishqoriy-yer metallari oksidlarining uglerod matrisasida taqsimlanishi, yangi faol va katalitik markazlar hosil qilish mexanizmlari hamda ularning g‘ ovaklik tuzilishiga ta’siri tizimlashtirilgan. Modifikatsiyalash jarayonida metall miqdori va termik ishlov berish haroratini optimallashtirishning materialning yakuniy fizik-kimyoviy xossalarini belgilashdagi roli ko‘ rsatib o‘ tilgan.*

Kalit so‘ zlar: *faollashtirilgan ko‘ mir, metall birikmalari, modifikatsiyalash, rentgen-difraksion tahlil (XRD), faza tarkibi, adsorbsiya, sirt maydoni.*

X-RAY DIFFRACTION ANALYSIS METHODS FOR ACTIVATED AND METAL COMPOUND-MODIFIED CARBONS

Abstract: *In this paper, the effects of modifying activated carbon materials with various metal compounds (Fe, Cu, Zn, Mn, Al, Mg) on their surface architecture and phase composition are reviewed using literature analysis and X-ray diffraction (XRD) techniques. The distribution of various transition and alkaline-earth metal oxides within the carbon matrix, the mechanisms of generating new active and catalytic centers, and their overall impact on the porous structure are systematically classified. Furthermore, the role of optimizing metal loading and thermal treatment temperatures during the modification process in determining the final physicochemical properties of the materials is highlighted.*

Keywords: *activated carbon, metal compounds, modification, X-ray diffraction (XRD), phase composition, adsorption, surface area.*

МЕТОДЫ РЕНТГЕНОДИФРАКЦИОННОГО АНАЛИЗА АКТИВИРОВАННЫХ И МОДИФИЦИРОВАННЫХ СОЕДИНЕНИЯМИ МЕТАЛЛОВ УГЛЕЙ

Аннотация: *В данной статье с использованием анализа литературы и методов рентгеновской дифракции (РФА) рассмотрено влияние модификации активированных углеродных материалов различными металлическими соединениями (Fe, Cu, Zn, Mn, Al, Mg) на архитектуру поверхности и фазовый состав. Систематизированы распределение оксидов различных переходных и щёлочноземельных металлов в углеродной матрице, механизмы формирования новых активных и каталитических центров, а также их влияние на пористую структуру. Показана роль оптимизации количества металла и температуры термической обработки в процессе модификации при определении конечных физико-химических свойств материалов.*

Ключевые слова: *активированный уголь, металлические соединения, модификация, рентгеновская дифракция (РФА), фазовый состав, адсорбция, площадь поверхности.*

Kirish

Bugungi kunda oqova suvlarni sanoat chiqindilari, og‘ ir metallar, antibiotiklar va turli organik ekologik pollutantlardan tozalashda faollashtirilgan ko‘ mirlar eng samarali adsorbentlar hisoblanadi. Biroq, oddiy faollashtirilgan ko‘ mirlarning selektivligi va ma’lum turdagi qutbli yoki anionli birikmalarga nisbatan sig‘ imi cheklangan bo‘ lib, bu ularni kimyoviy va strukturaviy jihatdan modifikatsiyalash zaruriyatini tug‘ diradi. Uglerod sirtiga o‘ tish va ishqoriy-yer metallari birikmalarini kiritish materialning nafaqat adsorbsion, balki katalitik va magnit xossalarini ham sezilarli darajada oshirish imkonini beradi.

Adabiyotlar tahlili

Ilmiy manbalarning tahlili shuni ko‘ rsatadiki, ferrosen va temir saqlovchi birikmalar bilan modifikatsiyalangan faollashtirilgan ko‘ mirlar fenol kabi aromatik birikmalarni yutishda dastlabki ko‘ mirga qaraganda yuqoriroq sig‘ im namoyon etadi. Temir saqlovchi nanozarrachalar materialning sirt va g‘ ovak xossalarini o‘ zgartirib, qo‘ shimcha koordinatsion markazlar hosil qiladi [1]. Masalan, lignin asosidagi magnit faollashtirilgan ko‘ mir kompozitlari suv muhitidan atenolol, karbamazepin, diklofenak va sulfametoksazol kabi murakkab farmatsevtik moddalarni muvaffaqiyatli ajratishda yuqori samaradorlik ko‘ rsatgan. Xususan, Mqehe-Nedzivhe va hammualliflari mezoporoz ferrosen-modifikatsiyalangan faollashtirilgan ko‘ mirni maxsus fenolni yutish uchun moslashtirib, xuddi shunday natijani tasdiqlagan [2].

Mis birikmalari (CuO, Cu_2O yoki metall Cu fazalari shaklida) uglerod matrisasiga kiritilganda, tizimda oksidlanish-qaytarilish jarayonlari faollashadi. Mis ionlari organik adsorbentlar bilan barqaror komplekslar hosil qilish xususiyatiga ega bo‘ lganligi sababli, bunday materiallar antibiotiklar va aromatik bo‘ yoqlarni destruksiya qilishda qo‘ llaniladi. Xususan, Cu, Cu_2O va CuO faza aralashmalarini saqlovchi g‘ ovak uglerod siprofloksatsinni adsorbsiyalashda yuqori kinetik ko‘ rsatkichlar qayd etgan. Shuningdek, uglerod yuzasining oksidlanish darajasi hamda sirt funksional guruhlarining tabiati aromatik va organik moddalarning adsorbsiya mexanizmiga sezilarli ta’sir ko‘ rsatishi turli ilmiy izlanishlarda qayd etilgan [1, 3, 6].

Rux oksidi (ZnO) kiritilgan tizimlarda esa sirtda bir vaqtning o‘ zida ham adsorbsion, ham fotokatalitik markazlar shakllanadi. ZnO ning gidroksillangan sirti qutbli organik molekulalar bilan kuchli dipol-dipol ta’sirlashuviga kirishadi. Masalan, magnitli Fe_3O_4 va ZnO nanozarrachalari bilan kompleks modifikatsiyalangan o‘ simlik asosidagi ko‘ mirlar siprofloksatsin adsorbsiyasida samarali bo‘ lib, magnitli komponent materialni sarflangan eritmadan magnit separatsiya yordamida oson ajratib olish imkonini beradi. Bu o‘ rinda, $ZnCl_2$ bilan faollashtirish jarayoni (bu yerda rux tuzi g‘ ovak hosil qiluvchi agent vazifasini baja-radi) va tayyor ko‘ mir sirtiga ZnO fazasini o‘ tirish to‘ liq farqli mexanizmlar ekanligini ta’kidlash lozim. Har ikki holatda ham yakuniy material tarkibidagi qoldiq rux miqdorini rentgen-difraksion tahlil yordamida nazorat qilish talab etiladi [7].

Marganes birikmalari (MnO_2 va aralash MnO_x oksidlari) uglerod sirtida Lyuis kislotali va faol kislorodli markazlarni hosil qiladi. Ular nafaqat adsorbsiyani, balki organik moddalarning katalitik oksidlanishini (geterogen Fenton-simon jarayonlar) ham tezlashtiradi [3]. Guruch somoni asosidagi faollashtirilgan ko‘ mirga Mn va Ce oksidlari kiritilganda fenolning adsorbsiyasi va keyingi termik oksidlanish orqali materialning yuqori darajada regeneratsiyalanishi isbotlangan. Biroq, metall oksidining miqdori kritik ahamiyatga ega: kam miqdordagi MnO_2 yangi faol markazlar hosil qilsa, uning ortiqcha miqdori (1 dan 50 % gacha bo‘ lgan kompozitlarda) uglerod sirtini to‘ liq qoplab, mikrog‘ ovaklarni bloklab qo‘ yadi.

Alyuminiy (Al_2O_3, $Al(OH)_3$ yoki Al-MOF) va magniy (MgO, $Mg(OH)_2$) birikmalari sirtning elektrostatik va kislota-asos tabiatini o‘ zgartiradi. Alyuminiy sirtidagi gidroksil guruhlari anionli tabiatga ega bo‘ yoqlar (masalan, Erioxrom qora T) va gerbitsidlar (paraquat) bilan vodorod bog‘ lari hamda kuchli elektrostatik bog‘ lanishlar hosil qiladi. Magniy oksidi (MgO) esa aksincha, sirtning asoslilik xossasini (pH_{pzc}) oshirib, kislotali funksional guruhli adsorbatlar bilan faol ta’sirlashadi. Garchi MgO bilan qoplash natijasida solishtirma sirt maydoni 1540 dan 1246 m2/g gacha kamaygan bo‘ lsa-da, kimyoviy markazlarning ortishi hisobiga metilen ko‘ kini yutish sig‘ imi yaxshilangan. Metall miqdorining ortishi har doim adsorbsiyani yaxshilamaydi, shu sababli xomashyoni kimyoviy-termik ishlash bosqichlarini mukammal boshqarish talab etiladi [5].

Tadqiqot metodologiyasi

Tadqiqot doirasida dastlabki xomashyo sifatida mahalliy yog‘ och chiqindilari tanlab olindi. Karbonizatsiya va keyingi kimyoviy hamda termik ishlov berish jarayonlari yog‘ och asosidagi uglerodli materialning makromolyukulyar karkasi va g‘ ovaklik tuzilishiga bevosita ta’sir ko‘ rsatadi. Tajribalarda faollashtirish jarayonidan so‘ ng uglerod qatlamlarining tartiblanish (kristallik va amorflik) darajasi o‘ zgarishi, shuningdek, metall tuzlari bilan modifikatsiyalash bosqichida uglerod matrisasi sirtida yangi mineral faza hamda faol kristall markazlarning hosil bo‘ lish qonuniyatlari o‘ rganildi.

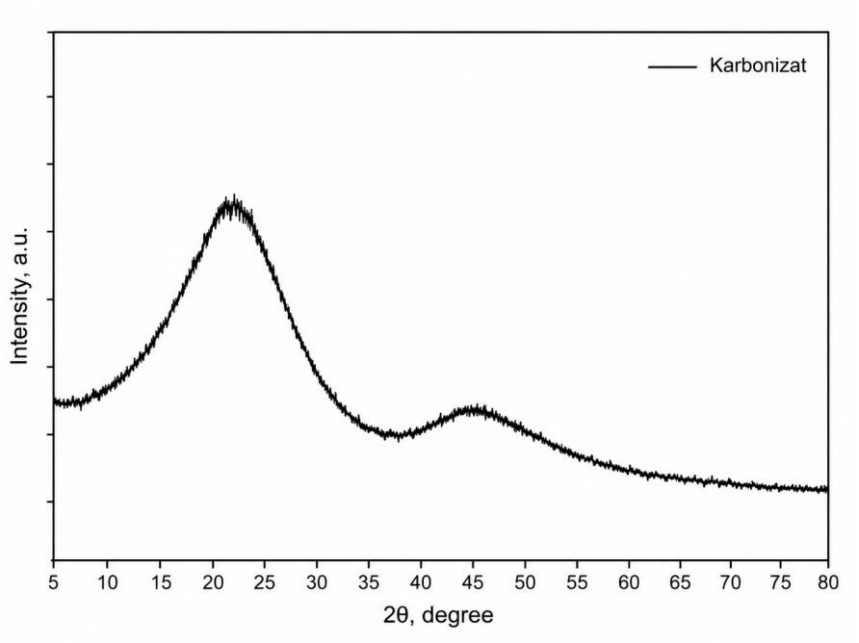
Shu maqsadda, dastlabki uglerodlangan material (karbonizat), kaliy gidroksidi (KOH) yordamida turli nisbatlarda kimyoviy faollashtirilgan ko‘ mirlar hamda temir (Fe), mis (Cu) va rux (Zn) birikmalari bilan modifikatsiyalangan kompozit namunalarining faza tarkibi rentgen-difraksion usulda tahlil qilindi. Olingan difraktogrammalar asosida uglerod fazasidagi strukturaviy o‘ zgarishlar va metall saqlovchi birikmalarning geterogen tabiati baholandi.

Rentgen-difraksion tadqiqotlar Rigaku MiniFlex 600 kukunli rentgen difraktometrida olib borildi. O‘ lchash jarayonlarida to‘ lqin uzunligi $\lambda = 1{,}5406$ Å bo‘ lgan Monoxromatik Cu-Kα nurlanishi qo‘ llanildi. Difraktogrammalar sintez qilingan namunalarning kristall va amorf fazalarini miqdoriy hamda sifat jihatidan aniqlash, shuningdek, faollashtirish va modifikatsiyalashdan keyingi panjara deformatsiyalarini baholash uchun keng burchaklar diapazonida (2θ burchagi 5°dan 80° gacha) qayd etildi.

Natijalar va ularning tahlili

Dastlabki karbonizatning strukturaviy holati

Sintez jarayonining birinchi bosqichida hosil bo‘ lgan va 500 °C haroratda olingan dastlabki karbonizat (C-500) namunasining rentgenogremmasi tahlil qilindi.

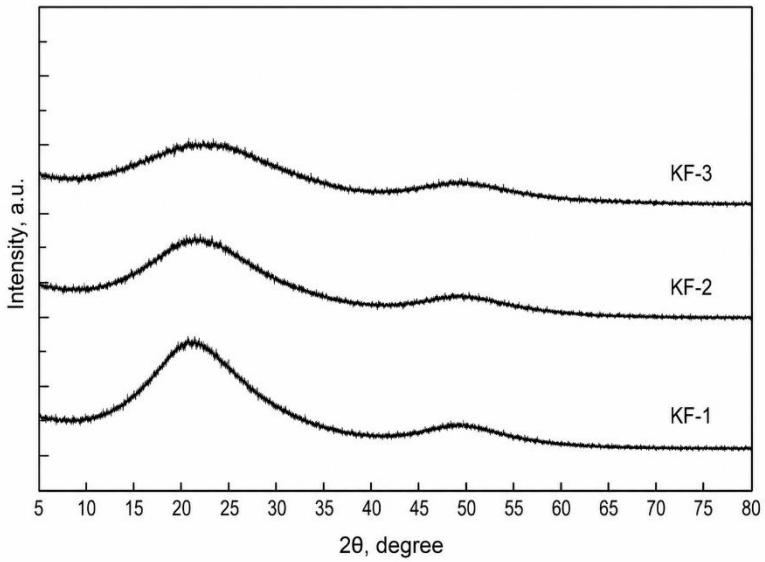


1-rasm. 500°C da olingan karbonizat (C-500) rentgenogremmasi.

1-rasmdagi C-500 karbonizat difraktogrammasida 2θ≈22–24° oralig‘ ida keng intensiv maksimum kuzatiladi. Ushbu maksimum tartibsiz joylashgan aromatik uglerod qatlamlariga xos bo‘ lib, odatda uglerodning (002) tekisligi bilan bog‘ lanadi. Maksimumning keng shaklda namoyon bo‘ lishi karbonizatda uzoq masofali kristall tartib mavjud emasligini, ya’ni material asosan amorf va turbostratik tuzilishga ega ekanligini ko‘ rsatadi.

2θ≈44–46° sohada ikkinchi, ancha kuchsiz va keng maksimum kuzatiladi. U uglerod tuzilishining (100)/(101) yo‘ nalishlariga tegishli bo‘ lib, aromatik qatlamlar ichidagi qisqa masofali tartiblanishni ifodalaydi. Ushbu refleksning past intensivligi 500 °C da karbonizatsiyalangan yog‘ och chiqindilarida uglerod karkasi hali yuqori darajada tartiblanmaganligini ko‘ rsatadi. Difraktogrammada grafitga xos tor va yuqori intensiv reflekslarning kuzatilmasligi ham C-500 namunasining grafitlashmagan, asosan tartibsiz uglerod tuzilishiga ega ekanligini tasdiqlaydi. Demak, 500 °C dagi termik ishlov yog‘ och tarkibidagi organik komponentlarning parchalanishi va aromatik uglerod karkasining shakllanishi uchun yetarli bo‘ lgan, biroq uglerod qatlamlarining yuqori darajada kristallanishiga olib kelmagan.

KOH bilan kimyoviy faollashtirishning strukturaga ta’siri



2-rasmda KOH bilan turli nisbatlarda faollashtirilgan KF-1, KF-2 va KF-3 namunalarining rentgenogrammalari keltirilgan.

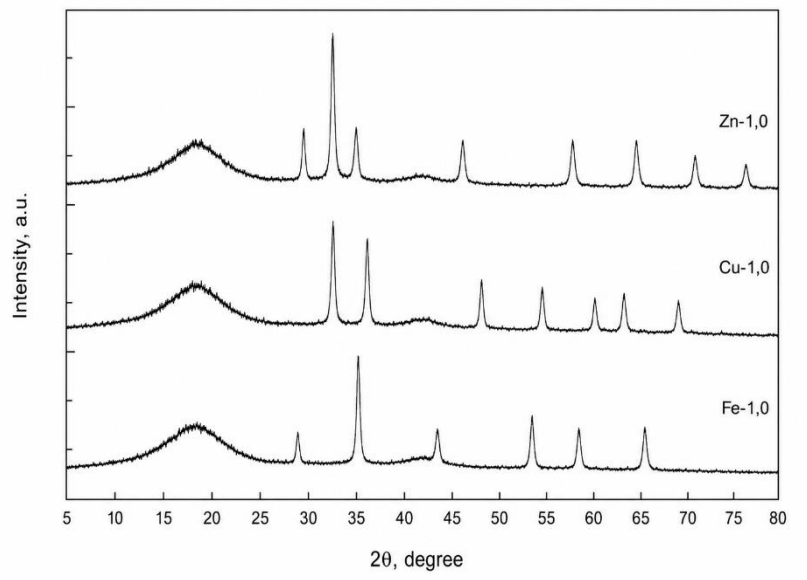
2-rasm. Kimyoviy faollantirilgan ko‘ mir namunalarining rentgenogrammalari.

Barcha namunalarda 2θ≈21–24° oralig‘ ida keng maksimum va 45–50° sohada ancha kuchsiz keng maksimum saqlanib qolgan. Bu reflekslar uglerod materiallarining tartibsiz, turbostratik tuzilishiga xos bo‘ lib, mos ravishda (002) va (100)/(101) yo‘ nalishlari bilan bog‘ lanadi. KF-1 dan KF-3 ga o‘ tganda asosiy maksimumning kengayishi va nisbatan yassilanishi kuzatiladi. KOH:karbonizat nisbatining 1:1 dan 3:1 gacha oshishi uglerod qatlamlari orasidagi tartibning yanada buzilishiga olib kelgan. Bu holat faollashtirish jarayonida KOH ning uglerod karkasi bilan ta’siri kuchayishi, yopiq g‘ ovaklarning ochilishi va yangi g‘ ovaklarning hosil bo‘ lishi bilan bog‘ liq.

KF-2 namunasida asosiy maksimum KF-1 ga nisbatan kengroq, biroq KF-3 dagidek kuchli yassilanmagan. KF-3 da esa maksimumning yanada kengayishi yuqori KOH miqdorida uglerod karkasining chuqurroq yemirilganini ko‘ rsatadi. Shu sababli KF-2 namunasi uglerod tuzilishining yetarli darajada tartibsizlanishi va karkasning haddan tashqari buzilmasligi o‘ rtasidagi nisbatan maqbul holatni namoyon etadi. Difraktogrammalarda aniq va yuqori intensivlikdagi yangi kristall reflekslarning kuzatilmasligi faollashtirishdan keyin ham namunalarning asosiy qismi amorf uglerod holatida saqlanib qolganini ko‘ rsatadi. Olingan natijalar KOH miqdorini oshirish uglerod tuzilishining tartibsizlanishini kuchaytirishini tasdiqlaydi.

Metall birikmalari bilan modifikatsiyalangan ko‘ mirlarning faza tarkibi

3-rasmda Fe-1,0, Cu-1,0 va Zn-1,0 namunalarining rentgen-difraktogrammalari keltirilgan.



3-rasm. Fe, Cu va Zn birikmalari bilan modifikatsiyalangan faollashtirilgan ko‘ mirlarning rentgen-difraktogrammalari.

Dastlabki C-500 karbonizat va KOH bilan faollashtirilgan namunalarda asosan 2θ≈22–24° hamda 43–45° sohalardagi keng maksimumlar kuzatilgan bo‘ lsa, metall tuzlari bilan ishlov berilgandan keyin ushbu fon ustida bir qator aniq reflekslar paydo bo‘ lgan. Demak, modifikatsiyalash jarayonida uglerodning amorf-turbostratik tuzilishi saqlanib qolgan, shu bilan birga metall saqlovchi kristall fazalar hosil bo‘ lgan.

Fe-1,0 namunasida 2θ≈30,2; 35,5; 43,2; 53,6; 57,1 va 62,7° atrofida reflekslar kuzatiladi. Ularning joylashishi temir oksidlaridan, avvalo Fe_3O_4 tipidagi fazaga xos reflekslarga yaqin. Ayniqsa, 35–36° sohadagi intensiv refleks Fe saqlovchi kristall fazaning hosil bo‘ lganini ko‘ rsatadi. C-500 va KF namunalarida bunday tor reflekslar kuzatilmaganligi sababli ularning paydo bo‘ lishi aynan $FeCl_3 \cdot 6H_2O$ bilan modifikatsiyalash natijasi hisoblanadi.

Cu-1,0 difraktogrammasida 35,5 va 38,7° sohalardagi reflekslar ancha yaqqol, shuningdek 48,7; 53–54; 58–62° oralig‘ ida ham qo‘ shimcha reflekslar mavjud. Bu maksimumlar CuO tipidagi mis oksid fazasiga xos qiymatlarga mos keladi. Termik ishlov jarayonida boshlang‘ ich $CuCl_2$ saqlanib qolmaydi, balki uning bir qismi uglerod yuzasida mis saqlovchi oksid fazalariga aylanadi. Shu sababli ushbu namunadagi yangi reflekslarni mis birikmalarining uglerod materialida mavjudligining rentgen-difraksion belgisi sifatida qarash mumkin.

Zn-1,0 namunasida esa 31,8; 34,4; 36,3; 47,5; 56,6; 62,9 va 67,9° atrofidagi reflekslar kuzatiladi. Ularning majmuasi ZnO ning geksagonal tuzilishiga xos difraksion maksimumlarga mos keladi. Zn qatorida reflekslarning nisbatan aniq ko‘ rinishi Zn saqlovchi fazaning ma’lum darajada kristallangan holatda shakllanganini ko‘ rsatadi.

Shu bilan birga, barcha uch namunada 20–25° oralig‘ idagi keng uglerod maksimumi saqlanib qolgan. Bu muhim holat: metall birikmalarining kiritilishi uglerod karkasini to‘ liq kristall fazaga aylantirmagan. Asosiy matritsa avvalgidek tartibsiz ugleroddan iborat, metall saqlovchi fazalar esa uning yuzasi va g‘ ovaklarida alohida kristall zarrachalar ko‘ rinishida shakllangan deb qarash mumkin. Rentgenogrammalar Fe, Cu va Zn saqlovchi yangi kristall fazalarning hosil bo‘ lganini yaxshi ko‘ rsatadi, biroq faqat XRD natijasiga asoslanib Fe^{3+}, Cu^{2+} va Zn^{2+} kationlari uglerod panjarasiga bevosita

kirgan deb aytish to‘ g‘ ri emas. Termik ishlovdan keyin ularning kimyoviy holati o‘ zgaradi. Shu sababli metallarning namunada haqiqatan saqlanib qolganini EDS yoki XRF natijalari bilan tasdiqlash, ularning tarqalishini esa SEM-EDS tasvirlari bilan ko‘ rsatish maqsadga muvofiq. XRD natijasi esa modifikatsiyadan keyin Fe-, Cu- va Zn-saqlovchi kristall fazalar hosil bo‘ lganini tasdiqlaydi.

Xulosalar

Rentgen-difraksion tahlil natijalariga ko‘ ra, C-500 karbonizat va KOH bilan faollashtirilgan KF-1, KF-2 hamda KF-3 namunalarining asosiy qismi tartibsiz, amorf-turbostratik uglerod tuzilishiga ega ekanligi aniqlandi. KOH:karbonizat nisbatining ortishi bilan $2\theta \approx 21–24°$ sohadagi asosiy maksimumning kengayishi uglerod qatlamlarining tartibsizlanishi kuchayganini ko‘ rsatdi. KF-2 namunasida uglerod karkasining yetarli darajada rivojlanishi va uning haddan tashqari yemirilmasligi o‘ rtasida nisbatan maqbul holat kuzatildi.

Fe, Cu va Zn birikmalari bilan modifikatsiyalashdan keyin uglerodning amorf asosiy tuzilishi saqlanib qolgan holda yangi metall saqlovchi kristall fazalar hosil bo‘ ldi. Fe-1,0 namunasida Fe_3O_4 tipidagi, Cu-1,0 da CuO tipidagi, Zn-1,0 da esa geksagonal ZnO fazasiga mos reflekslar aniqlandi. Bu modifikatsiyalash jarayonida metall birikmalarining uglerod yuzasida termik jihatdan barqarorroq fazalarga aylanganini ko‘ rsatadi.

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TEXTURAL CHARACTERIZATION OF A THREE-DIMENSIONAL Cu–EDTA COORDINATION FRAMEWORK BY LOW-TEMPERATURE NITROGEN SORPTION

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Abstract:*The textural properties of a three-dimensional copper(II) coordination framework built from ethylenediaminetetraacetate (Cu–EDTA–MOF) have been determined by nitrogen adsorption–desorption at 77.35 K and compared with the geometric parameters computed from its single-crystal structure. The isotherm is of type II with an H3 hysteresis loop. The specific surface area is 116.2 $m^2 \cdot g^{-1}$ (multipoint BET) and 120.7 $m^2 \cdot g^{-1}$ (de Boer t-plot slope), while the cumulative pore-wall areas are 64.1 (NLDFT), 64.2 (BJH) and 65.4 $m^2 \cdot g^{-1}$ (DH), so that about half of the accessible surface belongs to pore walls and the remainder to the external surface of the crystallites. The total pore volume is 0.5722 $cm^3 \cdot g^{-1}$ and no micropore volume is resolved. The NLDFT distribution is bimodal: 2.05–8.25 nm carries 38 % of the volume but 82 % of the surface, 27.5–35.9 nm carries 52 % of the volume and 13 % of the surface. Since the geometric pore-limiting diameter, 0.43 nm, exceeds the kinetic diameter of nitrogen by only a factor of 1.18, the intracrystalline channels are not accessible to nitrogen at 77 K, and the isotherm characterizes the textural porosity of the polycrystalline powder.*

Keywords: *metal–organic framework, Cu–EDTA, nitrogen physisorption, specific surface area, BET method, t-plot, NLDFT, pore size distribution, narrow-aperture porosity*

ТЕКСТУРНАЯ ХАРАКТЕРИСТИКА ТРЁХМЕРНОГО КООРДИНАЦИОННОГО КАРКАСА Cu–EDTA МЕТОДОМ НИЗКОТЕМПЕРАТУРНОЙ АДСОРБЦИИ АЗОТА

Аннотация. *Методом низкотемпературной адсорбции–десорбции азота при 77,35 K определены текстурные характеристики трёхмерного координационного каркаса меди(II) на основе этилендиаминтетраацетата (Cu–EDTA–MOF) и проведено их сопоставление с геометрическими параметрами, рассчитанными по данным монокристального рентгеноструктурного анализа. Изотерма относится к типу II с петлёй гистерезиса H3. Удельная поверхность составляет 116,2 $м^2 \cdot г^{-1}$ (метод БЭТ) и 120,7 $м^2 \cdot г^{-1}$ (наклон t-графика де Бура), кумулятивные площади стенок пор — 64,1 (NLDFT), 64,2 (BJH) и 65,4 $м^2 \cdot г^{-1}$ (DH); таким образом, около половины доступной поверхности приходится на стенки пор, остальное — на внешнюю поверхность кристаллитов. Суммарный объём пор равен 0,5722 $см^3 \cdot г^{-1}$, микропористый объём не разрешается. Распределение NLDFT бимодально: 2,05–8,25 нм даёт 38 % объёма и 82 % поверхности, 27,5–35,9 нм — 52 % объёма и 13 % поверхности. Поскольку геометрический лимитирующий диаметр пор, 0,43 нм, превышает кинетический диаметр азота лишь в 1,18 раза, внутрикристаллические каналы недоступны для азота при 77 K, и изотерма характеризует текстурную пористость поликристаллического порошка.*

Ключевые слова: *металл-органический каркас, Cu–EDTA, физическая адсорбция азота, удельная поверхность, метод БЭТ, t-график, NLDFT, распределение пор по размерам, узкопористые каркасы*

UCH O‘ LCHOVLI Cu–EDTA KOORDINATSION KARKASINING PAST HARORATLI AZOT SORBTSIYASI YORDAMIDA TEKSTURAVIY TAVSIFI

Annotatsiya. *Etilendiamintetraatsetat asosidagi uch o‘ lchovli mis(II) koordinatsion karkasining (Cu–EDTA–MOF) tekstura xossalari 77,35 K da azotning adsorbsiya–desorbsiya izotermasi yordamida aniqlandi va monokristall rentgenostruktura tahlilidan*

hisoblangan geometrik parametrlar bilan taqqoslandi. Izoterma H3 gisterezis halqasiga ega II tipga mansub. Solishtirma yuza BET usuli bo‘ yicha 116,2 $m^2 \cdot g^{-1}$, de Bur t-grafigining qiyaligi bo‘ yicha 120,7 $m^2 \cdot g^{-1}$; g‘ ovak devorlarining kumulyativ yuzasi 64,1 (NLDFT), 64,2 (BJH) va 65,4 $m^2 \cdot g^{-1}$ (DH), ya’ni ochiq yuzaning taxminan yarmi g‘ ovak devorlariga to‘ g‘ ri keladi. Umumiy g‘ ovak hajmi 0,5722 $sm^3 \cdot g^{-1}$, mikrog‘ ovak hajmi aniqlanmaydi. NLDFT taqsimoti bimodal: 2,05–8,25 nm hajmning 38 % ini, lekin yuzaning 82 % ini beradi; 27,5–35,9 nm hajmning 52 % ini va yuzaning 13 % ini beradi. Geometrik cheklovchi diametr 0,43 nm azotning kinetik diametridan atigi 1,18 marta katta bo‘ lgani uchun kristall ichidagi kanallar 77 K da azot uchun ochiq emas va izoterma polikristall kukunning tekstura g‘ ovakligini tavsiflaydi.

Kalit so‘ zlar: *metall-organik karkas, Cu–EDTA, azotning fizik adsorbsiyasi, solishtirma yuza, BET usuli, t-grafik, NLDFT, g‘ ovaklarning o‘ lcham bo‘ yicha taqsimoti, tor teshikli g‘ ovaklik*

Introduction

Most applications of metal–organic frameworks (MOFs) rest on their porosity, and low-temperature nitrogen physisorption is the routine method by which that porosity is quantified [1–3]. The method is not, however, universally applicable. When the apertures of a framework approach the kinetic diameter of the probe molecule, diffusion into the intracrystalline space at 77 K becomes strongly activated and does not reach equilibrium on the time scale of a volumetric measurement. The isotherm then describes the texture of the polycrystalline powder — the external surface of the crystallites and the voids between them — rather than the framework itself. Failure to distinguish these two situations is a common source of surface areas that are wrong by an order of magnitude, and the IUPAC recommendations therefore require that the applicability of each data reduction model be examined rather than assumed [2].

Ethylenediaminetetraacetic acid (EDTA) is a classical hexadentate chelating agent and is rarely employed as a framework linker, because complete chelation of a single metal centre leaves no donor atom available for bridging. A three-dimensional copper(II) framework in which EDTA acts as a μ_4-bridging linker is therefore of interest both structurally and texturally. The purpose of the present work is to characterize the porosity of this framework by nitrogen sorption at 77.35 K, to decompose the measured surface area into its pore-wall and external contributions, and to compare the result with the geometric parameters computed directly from the single-crystal structure.

Objects and methods of research

Sample. The synthesis process commenced with the utilization of a hydrothermal method for the sample. Initially, the first solution was meticulously prepared by dissolving 0.06 mmol of the disodium salt of ethylenediaminetetraacetic acid dihydrate (EDTA-$H_2Na_2.2H_2O$) ($C_{10}H_{14}N_2Na_2O_8.2H_2O$) in 0.3 mol of distilled water. Simultaneously, the second solution was created by dissolving 0.117 mmol of Copper (II) chloride dihydrate ($CuCl_2 \cdot 2H_2O$) in 0.3 mol of distilled water. Additionally, 0.145 mmol of p-nitroaniline ($C_6H_6N_2O_2$) was dissolved in 0.1 mol of ethyl alcohol (C_2H_6O).

The material crystallizes in the tetragonal space group $I4_1/a$ with a = b = 19.2145(4) Å, c = 14.3264(5) Å, V = 5289.3(3) $Å^3$ and Z = 16.

Nitrogen sorption. Measurements were carried out on an Autosorb iQ volumetric analyser (Quantachrome Instruments). The sample (0.0111 g) was ground to a fine powder and outgassed in situ at 110 °C under dynamic vacuum for 1.0 h, and the dead volume was determined by helium expansion. Adsorption–desorption isotherms were recorded at the bath temperature of liquid nitrogen, 77.35 K, over 20 adsorption and 20 desorption points in the range $p/p° = 0.0493$–0.9938. Non-ideality of the adsorptive was corrected with a second-virial coefficient of 6.58×10^{-5} $Torr^{-1}$ and thermal transpiration with an effective molecular diameter of 0.354 nm. Data were reduced with ASiQwin v5.21 using a nitrogen cross-sectional area $\sigma(N_2) = 0.162$ nm^2 and a liquid density of 0.808 $g \cdot cm^{-3}$. Amounts adsorbed are reported both as volumes at standard temperature and pressure (273.15 K, 101.325 kPa; $V_m = 22\,413.97$ $cm^3 \cdot mol^{-1}$) and as specific amounts of substance; surface areas are calculated with the SI value of the Avogadro constant, $N_A = 6.02214076 \times 10^{23}$ mol^{-1}.

Data reduction. The specific surface area was obtained by the multipoint BET method [1] over $p/p° = 0.05$–0.20 and, independently, from the slope of the de Boer t-plot [7, 8] over the thickness interval t = 0.4375–0.6464 nm. Pore-size distributions were computed by the BJH [5] and Dollimore–Heal [6] methods on both branches and by non-local density functional theory (NLDFT) [11] with a nitrogen-at-77 K carbon slit-pore equilibrium kernel. Micropore volumes were evaluated by the Horváth–Kawazoe [9] and Saito–Foley [10] treatments, and the total pore volume by the Gurvich rule at $p/p° = 0.9938$.

Geometric analysis. The framework atoms were generated from the crystallographic information file by applying the sixteen symmetry operations of $I4_1/a$, giving 288 atoms per unit cell. The solvent-accessible volume and the largest cavity diameter were obtained on a Cartesian grid of 0.12–0.15 Å spacing with Bondi van der Waals radii, and the pore-limiting diameter from a percolation analysis of the accessible region in a three-fold supercell along each crystallographic axis. The accessible surface area was computed by Monte-Carlo integration with 3000 sample points per atom [16]. The five-coordinate geometry of the metal centre was quantified by the τ_5 parameter [17].

Results and discussion

Isotherm and its classification. The nitrogen isotherm at 77.35 K (Figure 1) is of type II with an H3 hysteresis loop in the IUPAC classification [2]. Three features define the assignment. The adsorption branch rises smoothly and almost linearly between p/p° = 0.05 and 0.30, without the pronounced low-pressure knee that accompanies micropore filling. The uptake remains modest over the whole mesopore range and rises steeply only above p/p° ≈ 0.95, reaching 369.9 cm³(STP)·g⁻¹ (16.51 mmol·g⁻¹) at p/p° = 0.9938 without approaching a plateau, which is the signature of condensation in macropores and in the interparticle void of an aggregate. The loop does not close: at p/p° ≈ 0.50 the desorption branch lies at 54.81 cm³(STP)·g⁻¹ against 23.47 cm³(STP)·g⁻¹ on adsorption. Non-closure of an H3 loop is characteristic of non-rigid aggregates of plate-like particles, and the quantities derived from the desorption branch are accordingly treated below as upper bounds.

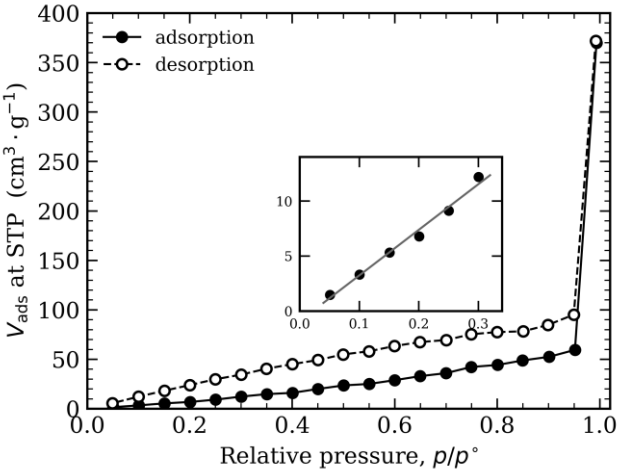


Figure 1. Nitrogen adsorption–desorption isotherm of Cu–EDTA–MOF at 77.35 K. Inset: the low-pressure region of the adsorption branch.

Specific surface area. Application of the BET equation over the monolayer–multilayer region p/p° = 0.05–0.20 (Figure 2a) gives a(BET) = 116.2 m²·g⁻¹ with a monolayer capacity of 1.192 mmol·g⁻¹. Following the recommendation that a BET area be corroborated by an independent determination [2], the same isotherm was analysed by the de Boer t-method (Figure 2b). Over t = 0.4375–0.6464 nm the adsorbed volume varies linearly with the statistical thickness, and the slope of 78.01 cm³(STP)·g⁻¹·nm⁻¹ converts to a total surface area of 120.7 m²·g⁻¹, in agreement with the BET value to within 3.8 %. Two independent treatments of the same isotherm therefore place the surface accessible to nitrogen at 116–121 m²·g⁻¹. The t-method resolves no separate micropore contribution, the external surface area returned by the data reduction being equal to the BET area (Table 2).

The cumulative surface areas obtained from the pore-size analyses are systematically lower: 64.07 m²·g⁻¹ (NLDFT), 64.20 m²·g⁻¹ (BJH, adsorption branch) and 65.38 m²·g⁻¹ (Dollimore–Heal, adsorption branch). This is not a discrepancy but a decomposition. The BJH, DH and NLDFT treatments integrate only the walls of those pores that the respective kernel resolves, whereas the BET and t-plot values additionally include the outer geometric envelope of the crystallites. Of the 116–121 m²·g⁻¹ accessible to nitrogen, therefore, 64–65 m²·g⁻¹ (53–56 %) is pore wall and the remaining 51–57 m²·g⁻¹ is external particle surface.

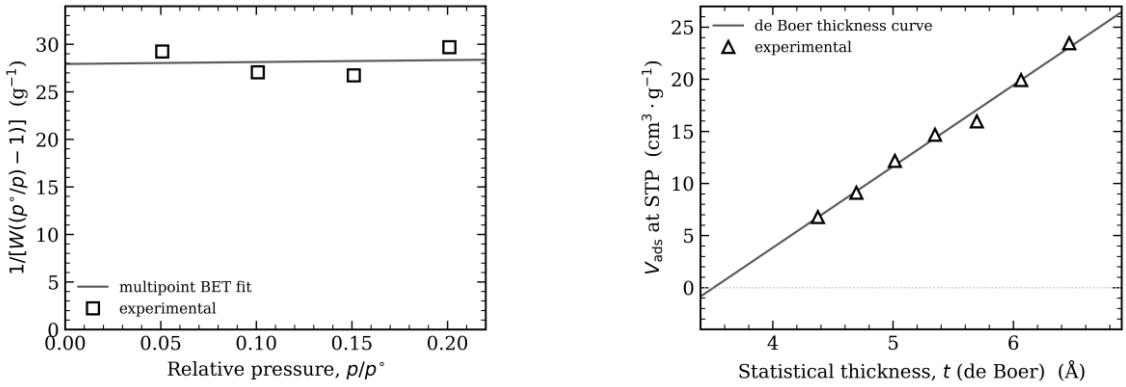


Figure 2. (a) Multipoint BET plot of Cu–EDTA–MOF over p/p° = 0.0507–0.2010; (b) de Boer t-plot of the same isotherm.

Pore volume. At p/p° = 0.9938 the Gurvich total pore volume for pores of radius below 156.19 nm is 0.5722 cm³·g⁻¹. Partitioning by BJH gives 0.5807 and 0.5458 cm³·g⁻¹ on the adsorption and desorption branches and the DH treatment 0.5627

and 0.5300 $cm^3 \cdot g^{-1}$. Micropore volumes returned by the Horváth–Kawazoe and Saito–Foley treatments are 0.008263 and 0.0006814 $cm^3 \cdot g^{-1}$, that is 1.4 % and 0.12 % of the total; together with the absence of a t-method micropore contribution these values show that no significant micropore volume is measurable with nitrogen at 77 K. The cumulative NLDFT volume, 0.2606 $cm^3 \cdot g^{-1}$, accounts for 46 % of the total, the balance residing in pores wider than the upper bound of the kernel. The mean pore radius, calculated as twice the pore volume divided by the specific surface area, is 9.85 nm, equivalent to a mean pore width of 19.69 nm.

Pore size distribution. The NLDFT analysis (Figure 3a), performed at a fitting error of 2.90 %, resolves a bimodal distribution. The principal mode lies at a pore width of 2.90 nm; the population between 2.05 and 8.25 nm carries 0.0985 $cm^3 \cdot g^{-1}$, only 38 % of the NLDFT volume, yet contributes 52.4 $m^2 \cdot g^{-1}$, fully 82 % of the NLDFT surface area. A second band between 27.5 and 35.9 nm carries 0.1344 $cm^3 \cdot g^{-1}$ (52 % of the volume) but merely 8.4 $m^2 \cdot g^{-1}$ (13 % of the area), the intervening interval from 10 to 27 nm being essentially flat. The porosity resolved by the kernel thus consists of a narrow-mesopore population that provides almost all of the internal surface and a wide-mesopore population that provides almost all of the volume. The BJH distributions (Figure 3b) place the mode at a pore radius of 1.707 nm on adsorption and 1.911 nm on desorption, in the same range as the primary NLDFT feature, and locate 86 % of the cumulative adsorption volume above a radius of 15.7 nm. It should be emphasized that the lower confidence limit of the NLDFT kernel corresponds to a pore width of 1.69 nm; the calculation is blind to anything narrower, so the absence of a micropore population in Figure 3a cannot by itself be read as evidence that micropores are absent from the solid.

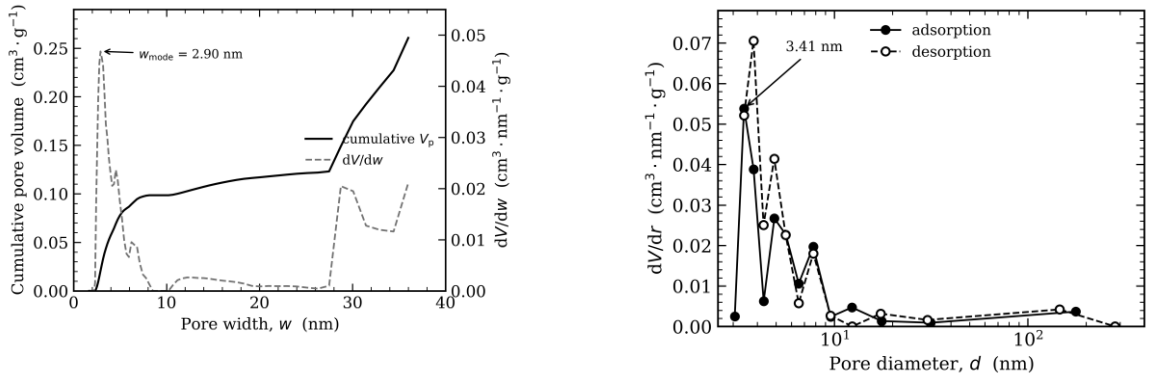


Figure 3. (a) NLDFT cumulative pore volume and differential pore-size distribution; (b) BJH pore-size distribution, adsorption and desorption branches.

Comparison with the crystal structure. Geometric analysis of the desolvated framework gives an accessible surface area of 1337 $m^2 \cdot g^{-1}$ for a probe of radius 0.186 nm matched to nitrogen, an intracrystalline pore volume of 0.169 $cm^3 \cdot g^{-1}$, a void fraction of 0.207 and a framework density of 1.221 $g \cdot cm^{-3}$; the channel system is three-dimensional, with a pore-limiting diameter of 0.43 nm and a largest cavity diameter of 0.68 nm. The measured surface area is therefore 11.5 times smaller than the geometric value, while the measured pore volume is 3.4 times larger than the crystallographic one. These two deviations point in opposite directions yet share a single origin. The ratio of the pore-limiting diameter to the kinetic diameter of nitrogen, 0.364 nm [13], is only 1.18, and diffusion through apertures this narrow is strongly activated and does not reach equilibrium on a volumetric time scale at 77 K; moreover, cavities of ≈0.7 nm are filled at $p/p^\circ \approx 10^{-5}$–$10^{-4}$, three to four orders of magnitude below the lowest relative pressure sampled here. Nitrogen at 77 K consequently did not enter the intracrystalline pore system. On this reading the excess volume, 0.5722 − 0.169 = 0.40 $cm^3 \cdot g^{-1}$, is interparticle in origin, in agreement with the H3 loop, with the wide-mesopore band at 27–36 nm and with the absence of a plateau near saturation. That the intracrystalline channels are nevertheless real and occupied is established by the structure itself, in which the solvent-accessible void amounts to 47.8 % of the unit-cell volume and accommodates 5.6 water molecules per copper atom.

Table 1

Conditions of the nitrogen sorption measurement

Parameter	Value	Parameter	Value
Adsorptive	Nitrogen	Sample mass	0.0111 g
Bath temperature	77.35 K	Outgassing	110 °C, 1.0 h
Analysis time	3 h 14 min	Cell type	9 mm, without rod
Dead volume	He expansion	Non-ideality	6.58×10^{-5} $Torr^{-1}$
Cold zone volume	2.05053 cm^3	Warm zone volume	14.9617 cm^3
$\sigma(N_2)$	0.162 nm^2	Liquid density	0.808 $g \cdot cm^{-3}$

Table 2

Textural characteristics of Cu–EDTA–MOF from nitrogen sorption at 77.35 K

Method	Surface area, $m^2 \cdot g^{-1}$	Pore volume, $cm^3 \cdot g^{-1}$	Mode pore radius, nm
Multipoint BET	116.2	–	–
t-method (de Boer), external	116.2	not resolved	–
t-plot slope	120.7	–	–
BJH, adsorption	64.20	0.5807	1.707
BJH, desorption	77.35	0.5458	1.911
DH, adsorption	65.38	0.5627	1.707
DH, desorption	79.18	0.5300	1.911
NLDFT	64.07	0.2606	1.448*
Horváth–Kawazoe	–	0.008263	0.9237*
Saito–Foley	–	0.0006814	1.642
Gurvich total (p/p° = 0.9938)	–	0.5722	9.846**

* Half pore width in the slit geometry of the corresponding model; the pore widths are 2.90 nm (NLDFT) and 1.85 nm (HK). ** Mean pore radius, calculated as 2V/a(BET).

Conclusion

Nitrogen sorption at 77.35 K characterizes Cu–EDTA–MOF as a solid with a surface of 116–121 $m^2 \cdot g^{-1}$ accessible to nitrogen, of which slightly more than one half is pore wall and the remainder external crystallite surface; a total pore volume of 0.5722 $cm^3 \cdot g^{-1}$; a narrow-mesopore population centred at 2.90 nm that carries 82 % of the internal surface; a wide-mesopore and interparticle void that carries 52 % of the volume; and no micropore volume measurable with this adsorptive. Comparison with the geometric parameters computed from the single-crystal structure — a three-dimensional channel system of 0.43 nm limiting diameter and 0.169 $cm^3 \cdot g^{-1}$ intracrystalline volume — shows that nitrogen at 77 K does not enter the framework channels, the ratio of aperture to probe diameter being only 1.18. The isotherm therefore quantifies the textural porosity of the polycrystalline powder and neither confirms nor excludes the intracrystalline porosity established crystallographically. The result illustrates a point of general importance for narrow-aperture frameworks: a surface area measured with nitrogen at 77 K must be qualified by an explicit statement of what the probe was able to reach.

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QASHQADARYO VILOYATI SHAROITIDA MEVALI DARAXTLARDA UCHRAYDIGAN *MONILINIA* (HONEY) TURLARINING TARQALISHI VA MORFOLOGIK XUSUSIYATLARI

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Annotatsiya. *Ushbu maqolada O‘ zbekistonda Monilinia (Honey) turkumiga mansub fitopatogen zamburug‘ larning o‘ rganilish tarixi, tarqalishi va xo‘ jayin o‘ simliklari tahlil qilindi. N.G. Zaprometov, P.N. Golovin, T. Karimov, M.Sh. Sag‘ dullayeva, B.A. Xasanov hamda keyingi tadqiqotchilarning Monilinia turlari bo‘ yicha ilmiy ishlari umumlashtirildi. Shuningdek, 2026-yilda Qarshi shahri sharoitida mevali daraxtlarda olib borilgan dala kuzatuvlari natijalari keltirildi. Behi namunalarida Monilinia laxa ga xos makro- va mikromorfologik belgilar, jumladan, gialin gifalar, konidioforlar va zanjirsimon joylashgan bir hujayrali konidiyalar kuzatildi. Olingan natijalar Qashqadaryo viloyatida monilioz kasalligini o‘ rganish va monitoring qilish uchun muhim ahamiyatga ega.*

Kalit so‘ zlar: *Monilinia, Monilinia laxa, Monilinia fructigena, monilioz, fitopatogen zamburug‘ lar, mevali daraxtlar, behi, konidiya, mikromorfologiya, Qashqadaryo.*

РАСПРОСТРАНЕНИЕ И МОРФОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ВИДОВ MONILINIA (МЕДОВЫЕ) НА ПЛОДОВЫХ ДЕРЕВЬЯХ В УСЛОВИЯХ КАШКАДАРЬСКОЙ ОБЛАСТИ

Аннотация*. В данной статье анализируется история изучения, распространения и растений-хозяев фитопатогенных грибов рода Monilinia (Мед) в Узбекистане. Обобщены научные работы Н.Г. Запрометова, П.Н. Головина, Т. Каримова, М.Ш. Сагдуллаевой, Б.А. Хасанова и последующих исследователей видов Monilinia. Также представлены результаты полевых наблюдений, проведенных на плодовых деревьях в городе Карши в 2026 году. В образцах айвы были обнаружены макро- и микроморфологические признаки, характерные для Monilinia laxa, включая гиалиновые гифы, конидиеносцы и одноклеточные конидии, расположенные цепочками. Полученные результаты важны для изучения и мониторинга монилиоза в Кашкадарьинской области.*

Ключевые слова: *Monilinia, Monilinia laxa, Monilinia fructigena, монилиоз, фитопатогенные грибы, плодовые деревья, конидии, микроморфология, Кашкадарья.*

DISTRIBUTION AND MORPHOLOGICAL FEATURES OF MONILINIA (HONEY) SPECIES ON FRUIT TREES IN THE KASHKADAR REGION

Abstract. *This article analyzes the history of the study, distribution, and host plants of phytopathogenic fungi of the genus Monilinia (Honey) in Uzbekistan. It summarizes the scientific works of N.G. Zaprometov, P.N. Golovin, T. Karimov, M.Sh. Sagdullaeva, B.A. Hasanov, and subsequent researchers of Monilinia species. The results of field observations conducted on fruit trees in the city of Karshi in 2026 are also presented. Macro- and micromorphological features characteristic of Monilinia laxa, including hyaline hyphae, conidiophores, and unicellular conidia arranged in chains, were detected in quince samples. The results obtained are important for the study and monitoring of moniliosis in the Kashkadarya region.*

Key words*: Monilinia, Monilinia laxa, Monilinia fructigena, moniliosis, phytopathogenic fungi, fruit trees, conidia, micromorphology, Kashkadarya.*

Kirish. *Monilinia* (Honey) turkumiga mansub fitopatogen zamburug‘ lar mevali daraxtlarda monilioz kasalligini keltirib chiqaruvchi eng muhim patogenlardan biri hisoblanadi. Ushbu turkum vakillari olma (*Malus domestica*), nok

(*Pyrus communis*), behi (*Cydonia oblonga*), o‘ rik (*Prunus armeniaca*), shaftoli (*Prunus persica*), olcha va gilos (*Prunus* spp.) kabi mevali daraxtlarni zararlab, gullarning kuyishi, yosh novdalarning qurishi hamda mevalarning qo‘ ng‘ ir chirishiga sabab bo‘ ladi. Kasallik natijasida hosildorlik va mahsulot sifati keskin pasayadi, mumiyolashgan mevalar esa keyingi vegetatsiya davrida infeksiya manbai bo‘ lib xizmat qiladi. Dunyo miqyosida ushbu kasallikni keltirib chiqaruvchi asosiy turlar sifatida *Monilinia laxa, Monilinia fructigena* va *Monilinia fructicola* qayd etilgan [11], [12].

O‘ zbekistonda *Monilinia* turkumiga mansub zamburug‘ larni o‘ rganish XX asrning 20-yillarida boshlangan. Dastlab N.G. Zaprometov (1926, 1928) [2], [3] tomonidan O‘ rta Osiyo mikoflorasini o‘ rganish jarayonida Monilinia fructigena va Monilinia laxa turlarining mevali daraxtlarda uchrashi qayd etilgan hamda ularning biologik va ekologik xususiyatlari haqida dastlabki ma’lumotlar berilgan. Keyinchalik P.N. Golovin (1949) [1] tomonidan Markaziy Osiyo mikoflorasi tizimli ravishda tadqiq qilinib, Monilinia vakillarining morfologik belgilari, ekologiyasi va tarqalish qonuniyatlari batafsil tavsiflangan.

O‘ zbekiston bog‘ larida monilioz kasalligining tarqalishi va rivojlanish xususiyatlari T. Karimov (1962) [5] tomonidan o‘ rganilib, kasallikning agroiqlim omillari bilan chambarchas bog‘ liqligi ilmiy asoslangan. Keyinchalik Moniliaceae oilasiga mansub turlar, jumladan *Monilinia* turkumining respublika hududidagi tarqalishi, xo‘ jayin o‘ simliklari va taksonomik holati bo‘ yicha muhim ilmiy ma’lumotlar umumlashtirilgan [7].

So‘ nggi yillarda B.A. Xasanov, M.A. Zuparov va N.M. Mamedov (2009) [9] tomonidan behida uchraydigan monilioz kasalligining biologiyasi va zarar keltirish xususiyatlari o‘ rganilgan. Shuningdek, B.A. Xasanov, R.O. Ochilov, E.A. Xolmurodov va R.A. Gulmurodov (2010) [10] tomonidan mevali hamda yong‘ oqmevali daraxtlar kasalliklari, ularning diagnostikasi va ularga qarshi kurash usullari keng yoritilgan. Keyinchalik A.U. Sag‘ dullayev, A. Marupov, A.A. Rahmatov va hammualliflar (2014) [8] tomonidan mevali daraxtlarni monilioz kasalligidan himoya qilish bo‘ yicha amaliy tavsiyalar ishlab chiqilgan.

So‘ nggi yillarda J. Jo‘ raqulov va hammualliflari (2024–2025) [4] tomonidan O‘ zbekiston hududida Monilinia turkumi vakillarining tarqalishi, xo‘ jayin o‘ simliklari hamda ekologik xususiyatlariga oid yangi ma’lumotlar e’lon qilinib, respublika mikobiotasiga oid ilmiy ma’lumotlar yanada boyitildi.

Shunga qaramay, Qashqadaryo viloyati sharoitida Monilinia turlarining tarqalishi, xo‘ jayin o‘ simliklari va vegetatsiya davridagi rivojlanish xususiyatlari bo‘ yicha ilmiy ma’lumotlar yetarli emas. Shu sababli ushbu tadqiqotning maqsadi O‘ zbekistonda Monilinia (Honey) turkumiga mansub turlarni o‘ rganish tarixini tahlil qilish hamda Qarshi shahri sharoitida mevali daraxtlarda uchraydigan monilioz kasalligining makromorfologik belgilari asosida olib borilgan dala kuzatuvlari natijalarini yoritishdan iborat.

Tadqiqot materiallari va usullari

Tadqiqotlar 2026-yil mart–iyul oylarida Qashqadaryo viloyati, Qarshi shahri, Bog‘ obod mahallasida joylashgan "Hosildor zamin" zamonaviy ko‘ chatchilik-ta’lim majmuasi hududida olib borildi. Tadqiqot obyekti sifatida olma (*Malus domestica* Borkh.), nok (*Pyrus communis* L.), daraxtlari tanlandi.

Dala kuzatuvlari vegetatsiya davrining turli bosqichlarida amalga oshirildi. Namunalar 2026-yil 23-mart va 5-aprel kunlari yig‘ ildi. Tadqiqot davomida daraxtlarning gullari, barglari, yosh novdalari hamda mevalarida uchraydigan monilioz kasalligiga xos tashqi simptomlar qayd etildi. Zararlangan mevalaridan gerbariy namunalar yig‘ ildi, qog‘ oz paketlarga joylashtirildi va laboratoriyaga olib kelindi.

Gerbariy namunalari QarDU mikrobiologiya va biotexnologiya kafedrasining Mikrobiotexnologiya laboratoriyasida mikologik va mikrobiologik tahlil qilindi.

O‘ simliklarning mevasida uchraydigan zamburug‘ ni aniqlash, ularning morfologik belgilarini o‘ rganishda B-382PHiALC DC6V1000 mA raqamli mikroskop yordamida va aniqlagichlardan foydalanilgan holda amalga oshirildi [6]. Zamburug‘ larni xalqaro zamonaviy nomenklaturasi http://www.indexfungorum.org, bazasi asosida berildi.

Natijalar va ularning muhokamasi

Tadqiqotlarimiz natijasida *Monilinia* turkumining 2 ta turi uchrashi kuzatildi. Olmada (*Malus domestica*) *Monilinia fructigena,* nok (*Pyrus communis*) *Monilinia laxa* zamburug‘ turlari uchrashi aniqlandi.

Monilinia fructigena zamburug‘ i olma mevasida qo‘ ng‘ ir chirish kasalligini keltirib chiqardi. Zararlangan mevalar yuzasida qo‘ ng‘ ir rangli, asta-sekin kengayib boruvchi chirish o‘ choqlari hosil bo‘ ldi. Kasallik rivojlanishi davomida meva po‘ stida oqish-krem rangli mayda konidial yostiqchalar (sporodoxiyalar) paydo bo‘ lishi kuzatildi. Ushbu yostiqchalarda patogenning konidiyalari rivojlanib, kasallikning tarqalishini ta’minladi. Kuchli zararlangan mevalar yumshab chiridi va keyinchalik qurib, mumiyalandi (1- rasm).

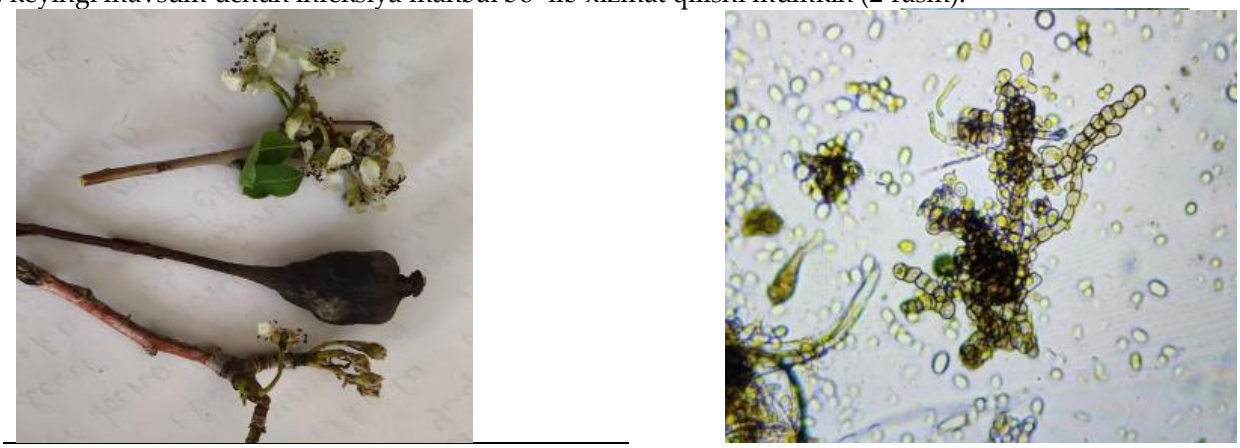


b

1- rasm. Olma (*Malus domestica* Borkh.) mevasining *Monilinia fructigena* zamburug‘ i ta’sirida zararlanishi: a — kasallangan olma mevasi; b — *Monilinia fructigena* zamburug‘ ining mikroskopik konidiyalari.

Monilinia fructigena konidiyalari mikroskopik tekshiruvda gialin (rangsiz), bir hujayrali, tuxumsimon yoki limonsimon shaklda bo‘ lib, ko‘ pincha shoxlangan zanjirlar hosil qilishi kuzatildi. Konidiyalar o‘ lchami 7–14 × 14–16 μm, boshqa morfologik tavsiflarda esa 19–20 × 12,5–14 μm atrofida bo‘ lishi aniqlandi.

Monilinia laxa bilan zararlangan nok mevalar to‘ q qo‘ ng‘ ir rangga kirib, suvsizlanadi, kichrayadi va quruq mumiyalangan meva holida shoxda osilib qoladi. *M. laxa* bunday mumiyalangan mevalarda va zararlangan novdalarda qishlab, keyingi mavsum uchun infeksiya manbai bo‘ lib xizmat qilishi mumkin (2-rasm).



a b

2-rasm. *Monilinia laxa* keltirib chiqargan qo‘ ng‘ ir chirish kasalligining mevadagi simptomlari: a- zararlangan mevalarning qurishi va mumiyalanishi;. b — *Monilinia laxa* zamburug‘ ining mikroskopik konidiyalari.

Monilinia laxa konidiyalari mikroskopik tekshiruvda gialin, bir hujayrali, ovalsimon yoki ellipssimon shaklda bo‘ lib, zanjirsimon holda joylashganligi kuzatildi. Konidiyalar konidioforlarda hosil bo‘ lib, zich konidial tuzilmalarni shakllantiradi.

Olingan natijalar yuqorida keltirilgan ma’lumotlarni to‘ ldiradi. So‘ nggi yillarda Jo‘ raqulov va Mustafayev (2025) [4] tomonidan Monilinia turkumining respublikadagi tarqalishiga oid yangi ma’lumotlar e’lon qilingan bo‘ lib, bizning dala kuzatuvlarimiz Qashqadaryo viloyatida ham monilioz kasalligi uchrashini ko‘ rsatdi.

Olingan natijalar Qashqadaryo viloyati sharoitida mevali daraxtlarda monilioz kasalligining mavjudligini ko‘ rsatdi. Dala kuzatuvlarida kasallikning asosiy tashqi belgilari — mevalarda qo‘ ng‘ ir chirish, konidial tuzilmalar hosil bo‘ lishi, mevalarning qurishi va mumiyolanishi qayd etildi.

Ushbu belgilar *Monilinia* turkumiga xos bo‘ lgan simptomlar bilan mos keladi. Moniliozning muhim epidemiologik xususiyati shundaki, zararlangan mumiyolangan mevalar patogenning saqlanishi va keyingi vegetatsiya davrida yangi infeksiya manbai sifatida xizmat qilishi mumkin.

Bizning tadqiqotimizda olma mevalarida *M. fructigena* ga xos, nok mevalarida esa *M. laxa* ga mos keluvchi morfologik belgilar kuzatildi. Bu natija *Monilinia* turkumining ayrim vakillari olma va nok kabi urug‘ li mevalarda ham uchrashi mumkinligi haqidagi adabiyot ma’lumotlariga mos keladi.

Foydalanilgan adabiyotlar.

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REGULATORY ELEMENTS GOVERNING CRISPR/CAS9 EFFICACY IN PLANT BIOTECHNOLOGY

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Annotation. *The CRISPR/Cas9 system has revolutionized plant genome engineering by enabling precise, efficient, and programmable genetic modification. However, genome-editing efficiency is strongly influenced by vector design, particularly by regulatory elements such as promoters and terminators. These elements govern transcription, RNA stability, and protein expression. This article provides a comprehensive analysis of the promoter and terminator systems in plant CRISPR/Cas9 constructs, focusing on monocot–dicot differences, transcriptional regulation, and vector optimization strategies. In this review, we discuss recent advances in synthetic promoter engineering and transcriptional control. Understanding these regulatory components is essential for maximizing editing efficiency and expanding CRISPR applications in plant biotechnology.*

Key words: *CRISPR/Cas9, plant genome editing, promoter architecture, terminator sequences, vector optimization, transcriptional regulation, monocot-dicot differences, synthetic biology*

РЕГУЛЯТОРНЫЕ ЭЛЕМЕНТЫ, ОПРЕДЕЛЯЮЩИЕ ЭФФЕКТИВНОСТЬ CRISPR/CAS9 В БИОТЕХНОЛОГИИ РАСТЕНИЙ

Аннотация. *Система CRISPR/Cas9 произвела революцию в инженерии генома растений, обеспечив точные, эффективные и программируемые генетические модификации. Тем не менее, эффективность редактирования генома во многом определяется конструкцией вектора, в частности регуляторными элементами — промоторами и терминаторами. Эти элементы управляют транскрипцией, стабильностью РНК и уровнем экспрессии белков. В данной статье представлен комплексный анализ промоторных и терминаторных систем в конструкциях CRISPR/Cas9 для растений с акцентом на различия между однодольными и двудольными растениями, транскрипционную регуляцию и стратегии оптимизации векторов. Также рассматриваются последние достижения в области инженерии синтетических промоторов и транскрипционного контроля. Понимание этих регуляторных компонентов необходимо для максимизации эффективности редактирования и расширения возможностей применения CRISPR в биотехнологии растений.*

Ключевые слова: *CRISPR/Cas9, редактирование генома растений, архитектура промотора, последовательности терминаторов, оптимизация вектора, транскрипционная регуляция, различия между однодольными и двудольными, синтетическая биология*

O‘ SIMLIKLAR BIOTEXNOLOGIYASIDA CRISPR/CAS9 SAMARADORLIGINI BOSHQARUVCHI REGULYATOR ELEMENTLAR

Annotatsiya. *CRISPR/Cas9 tizimi aniq, samarali va dasturlashtiriladigan genetik o‘ zgartirishlarni amalga oshirish imkonini berish orqali o‘ simlik genom muhandisligi sohasida inqilob yasadi. Biroq, genom tahrirlash samaradorligi vektor dizayni, xususan promotorlar va terminatorlar kabi regulyator elementlar bilan bevosita bog‘ liq. Ushbu elementlar transkripsiya, RNK barqarorligi va oqsil ekspressiyasi darajalarini boshqaradi. Ushbu maqolada o‘ simliklar uchun CRISPR/Cas9 konstruksiyalarida promotor va terminator tizimlarining keng qamrovli tahlili keltirilgan bo‘ lib, bir urug‘ pallali va ikki urug‘ pallali o‘ simliklar o‘ rtasidagi farqlar, transkripsion regulyatsiya va vektor optimallashtirish strategiyalariga e’tibor qaratilgan. Sintetik promotor muhandisligi va transkripsion nazorat sohasidagi so‘ nggi yutuqlar ham muhokama qilinadi. Ushbu regulyator komponentlarni tushunish tahrirlash samaradorligini oshirish va o‘ simlik biotexnologiyasida CRISPR imkoniyatlarini kengaytirish uchun muhim ahamiyat kasb etadi.*

Kalit so‘ zlar: *CRISPR/Cas9, o‘ simlik genomini tahrirlash, promotor dizayni, terminator ketma-ketliklari, vektor optimallashtirilishi, transkripsion regulyatsiya, bir urug‘ pallali va ikki urug‘ pallali o‘ simliklar o‘ rtasidagi farqlar, sintetik biologiya*

Introduction.

The advent of the CRISPR/Cas9 system has revolutionized genome engineering by offering unprecedented simplicity, high efficiency, and broad applicability across diverse biological systems, including plants. As a transformative tool in agricultural biotechnology, CRISPR/Cas9 holds immense potential to address global food security challenges by enabling the development of crop varieties with enhanced yields, superior quality, and robust resistance to biotic and abiotic stress [23, 24]. Mechanistically, the system relies on a Cas9 nuclease and guide RNA (gRNA), which assemble into a ribonucleoprotein (RNP) complex capable of inducing precise double-strand breaks (DSBs) at predefined genomic loci [6]. Following DSB formation, endogenous DNA repair pathways, predominantly non-homologous end joining (NHEJ) and homologous recombination (HR), are harnessed to introduce targeted genetic modifications into the genome.

While the meticulous design of single guide RNA (sgRNA) is paramount for ensuring target site specificity, emerging empirical evidence highlights the profound impact of overall vector architecture on genome-editing efficacy [1]. Specifically, the selection of regulatory elements, such as promoters and terminators, is critical for optimizing the expression of CRISPR machinery in vivo. In plant systems, the pronounced divergence in transcriptional machinery between monocotyledonous and dicotyledonous species necessitates the tailored selection and refinement of these regulatory elements. For instance, recent optimization studies have demonstrated that replacing ubiquitous promoters with species-specific endogenous ones, such as substituting the CaMV-35S promoter with the UBQ10 promoter in specific dicots or using endogenous U3/U6 promoters in target crops such as grape, can yield multiple-fold enhancements in targeted mutation frequencies [25,26]. Consequently, the strategic configuration and synergistic combination of optimal promoters and terminators are pivotal for maximizing CRISPR/Cas9-mediated editing outcomes across diverse plant platforms [2].

Promoter Systems in CRISPR/Cas9 Vectors. Promoters are regulatory DNA sequences located upstream of genes that control transcription initiation by recruiting RNA polymerases and transcription factors. They determine the timing, location, and intensity of gene expression [4]. In plant CRISPR/Cas9 vectors, promoters regulate two essential components: Cas9 nuclease expression and sgRNA transcription. The effectiveness of genome editing is therefore highly dependent on promoter strength and compatibility with host transcriptional machinery. Cas9 is a protein-coding gene transcribed by RNA polymerase II (Pol II), producing mRNA that is translated into functional Cas9 protein.

In dicot plants, the Cauliflower Mosaic Virus 35S (CaMV35S) promoter is widely used due to its strong constitutive activity (Odell et al., 1985). However, in monocots, promoters such as maize ubiquitin (ZmUbi) and rice actin are preferred because they exhibit higher transcriptional efficiency in cereal crops [3]. The selection of an appropriate promoter directly influences Cas9 expression levels and genome editing outcomes. Strong constitutive promoters typically result in higher mutation frequencies due to sustained Cas9 activity [16]. sgRNAs are short non-coding RNAs (~100–200 nucleotides) and are transcribed by RNA polymerase III (Pol III). These promoters are specialized for small RNA transcription and ensure precise transcript boundaries. Common sgRNA promoters include: arabidopsis U6/U3 promoters (dicots), rice U6/U3 promoters (monocots). Pol III promoters are essential for producing functional sgRNAs with correct 5′ and 3′ ends, which are critical for Cas9 targeting efficiency [21].

Promoters in CRISPR systems can be categorized based on expression patterns: **Constitutive promoters** drive continuous gene expression across tissues and developmental stages. They are widely used for high-efficiency genome editing [22]. **Tissue-specific promoters** enable targeted gene editing in specific organs, reducing unintended effects in

non-target tissues. **Inducible promoters** allow temporal control of gene expression in response to external stimuli such as chemicals or environmental conditions. **Synthetic promoters** engineered promoters designed to enhance expression strength, support multiplex sgRNA expression, and improve regulatory precision. These are increasingly used in advanced CRISPR applications [7].

Terminator Systems in CRISPR/Cas9 Vectors. Terminators are DNA sequences located downstream of genes that signal the end of transcription. They play a critical role in: mRNA cleavage and polyadenylation, transcript stability, prevention of transcriptional read-through. The combination of promoter and terminator sequences strongly influences gene expression levels [2]. Cas9 expression requires Pol II terminators to ensure proper mRNA processing and stability. Common terminators include: **NOS terminator** (widely used, stable across species), **OCS terminator** (reduces transcriptional read-through) **35S terminator** (often paired with CaMV35S promoter). Efficient terminators enhance mRNA stability, increase translation efficiency, and improve overall genome editing performance [8]. Pol III transcription terminates at short thymidine (poly-T) sequences, typically consisting of five consecutive thymidines (TTTTT). This mechanism ensures precise sgRNA termination and functionality. Typical sgRNA cassette: U6 promoter →sgRNA →poly-T terminator. This simple and efficient termination system is critical for accurate CRISPR activity [21].

Terminators influence genome editing efficiency through several mechanisms: **mRNA stability:** Strong terminators increase transcript half-life and protein production. **Polyadenylation efficiency:** Essential for nuclear export and translation. **Transcriptional isolation:** Prevents interference between adjacent expression cassettes. **Gene silencing reduction:** Particularly important in monocot plants. Optimized terminator selection can significantly enhance CRISPR efficiency [9].

Monocot vs Dicot Differences in CRISPR Vector Design. Promoter efficiency is highly species-dependent due to differences in transcriptional machinery. Dicots commonly use CaMV35S promoters, whereas monocots rely on ubiquitin-based promoters for optimal expression [3]. Although terminators are generally less species-specific, endogenous terminators may improve expression efficiency and reduce gene silencing in monocot systems [9]. CRISPR/Cas9 plasmid vectors are not limited to genome editing components (Cas9 and sgRNA) but also include a variety of auxiliary genetic elements that are essential for plasmid propagation, selection, expression, and intracellular targeting. These backbone components play a critical role in ensuring the stability, functionality, and efficiency of CRISPR systems in both bacterial and plant cells [12,16].

Before plant transformation, CRISPR vectors are typically constructed and amplified in bacterial systems, such as Escherichia coli. Therefore, plasmids must contain elements that allow their replication and selection in bacteria. Antibiotic resistance genes, such as the ampicillin resistance gene (AmpR), encode β-lactamase, an enzyme that degrades ampicillin and allows only transformed bacterial cells to survive in selective media. This selection system is essential for isolating plasmids carrying CRISPR constructs during cloning [17]. **Origin of Replication (Ori)** the origin of replication is a DNA sequence that enables autonomous plasmid replication within bacterial cells. Common origins such as ColE1 determine plasmid copy number, which influences DNA yield and cloning efficiency. High-copy origins produce large amounts of plasmid DNA, whereas low-copy origins improve stability for large CRISPR constructs [11]. **Rop (Repressor of Primer Protein)** the Rop protein regulates plasmid copy number by stabilizing RNA–RNA interactions involved in replication initiation. This regulation is particularly important in large CRISPR vectors, as excessive copy numbers may lead to recombination or instability [15].

Some CRISPR vectors include bacterial regulatory systems that allow the controlled expression of Cas9 or other proteins during cloning or protein production. Lac Operon Components (Lac Promoter, Lac Operator, LacI) The lac operon system provides inducible control of gene expression in bacterial cells. The lac promoter (Plac) drives transcription, whereas the lac operator (LacO) serves as a binding site for the LacI repressor protein. In the absence of an inducer, LacI binds to LacO and prevents transcription. Upon the addition of IPTG or lactose, LacI dissociates, allowing gene expression [13]. This system is useful for: Preventing toxic overexpression of Cas9 in bacteria and controlling recombinant protein production. **T7 Promoter System** the T7 promoter is a strong bacteriophage-derived promoter recognized by T7 RNA polymerase. It enables high-level transcription and is commonly used in *E. coli* strains such as BL21(DE3) for protein production [19]. Although not typically used for plant expression, the T7 system is valuable for: In vitro sgRNA synthesis, recombinant Cas9 protein purification. Efficient protein production requires proper translation initiation signals. **Ribosome Binding Site (RBS)** the RBS, also known as the Shine–Dalgarno sequence, is essential for initiating translation in prokaryotes. It aligns the ribosome with the start codon, ensuring proper translation of Cas9 or other proteins in bacterial systems [18]. Without an RBS, even correctly transcribed mRNA cannot be translated into protein, highlighting its importance in vector design. For CRISPR/Cas9 to function in plant cells, the Cas9 protein must be localized to the nucleus, where genomic DNA resides. **Nuclear Localization Signals (NLS)** nuclear localization signals, such as the SV40 NLS, are short peptide sequences rich in lysine and arginine residues that direct proteins to the nucleus via the nuclear import machinery. Cas9 is often engineered with one or two NLS sequences (NLS–Cas9–NLS) to ensure

efficient nuclear targeting [14]. Efficient nuclear localization is critical because: Genome editing occurs in the nucleus and reduced nuclear import decreases editing efficiency.

Certain CRISPR constructs include protein tags for biochemical applications. **6×His Tag (Hexahistidine Tag)** the 6×His tag is a short peptide sequence that binds to nickel or cobalt ions, allowing affinity purification of recombinant proteins. This tag is widely used for: Cas9 protein purification, western blot detection and structural and biochemical studies [10]. Although not required for genome editing in vivo, tagging is essential in experimental workflows involving protein characterization. The overall performance of CRISPR/Cas9 systems depends on the coordinated interaction between backbone elements and expression cassettes. While promoters and terminators control transcription, backbone components ensure plasmid stability, efficient cloning, and proper protein function. For example: A stable origin of replication ensures sufficient plasmid yield, antibiotic selection guarantees successful cloning, NLS sequences ensure Cas9 reaches the nucleus, regulatory systems prevent toxic expression in bacteria. Thus, backbone components indirectly but critically influence genome editing efficiency [12]. While designing CRISPR vectors, the following factors should be considered: plasmid size (larger constructs reduce transformation efficiency), copy number (must balance yield and stability), compatibility with the host system (bacterial vs. plant expression requirements), and recombination risk (minimized by controlled copy number and stable elements). Optimizing these parameters improves the cloning efficiency, vector stability, and ultimately, the genome editing performance. Successful CRISPR/Cas9 applications require careful optimization of vector components, including compatibility with plant species (monocots vs. dicots), promoter strength and specificity, sgRNA expression efficiency, target tissue specificity, multiplex editing requirements, and vector size limitations. Coordinated high-level expression of Cas9 and sgRNA is essential for achieving high mutation efficiency [7].

Conclusion. The efficiency of CRISPR/Cas9 genome editing in plants is strongly influenced by the promoter–terminator combinations. Advances in synthetic biology have enabled the development of engineered promoters and optimized terminators, which significantly improve gene expression control. Recent studies have highlighted the importance of fine-tuning transcriptional regulation to achieve precise and efficient genome editing. Future research should focus on developing species-specific regulatory elements and minimizing gene silencing effects to further enhance the performance of CRISPR. Promoters and terminators are fundamental components of CRISPR/Cas9 plant vectors that directly influence the efficiency of genome editing. Careful selection and optimization are essential for achieving reliable and high-performance gene editing. Continued advancements in regulatory element engineering will further expand the application of CRISPR technology in plant biotechnology

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QUMLI TUPROQLAR SHAROITIDA O‘ SADIGAN ODDIY PISTA (*Pistacia vera* L.) O‘ SIMLIGINING BIOGEOKIMYOVIY VA AGROEKOLOGIK TAVSIFI

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Annotatsiya. *Mazkur tadqiqotning maqsadi Qo‘ qon davlat o‘ rmon xo‘ jaligi Shoberdi o‘ rmonchilik bo‘ limida tarqalgan qumli tuproqlarning agroekologik va biogeokimyoviy xususiyatlarini baholash hamda ularning oddiy pista (*Pistacia vera *L.) o‘ simligining o‘ sishi uchun ekologik ahamiyatini aniqlashdan iborat. Tadqiqot davomida tuproq profilidan olingan namunalarda mexanik tarkib, pH, hajmiy massa, gumus miqdori, yalpi va harakatchan fosfor hamda kaliy, karbonatlar, gips va tuzlar tarkibi aniqlandi. Shuningdek, natriy, kaliy, kaltsiy va temir elementlarining tuproq profilidagi vertikal taqsimlanishi o‘ rganildi.*

Tadqiqot natijalariga ko‘ ra, Shoberdi o‘ rmonchiligi bo‘ limi tuproqlari yengil mexanik tarkibli, kuchsiz ishqoriy reaksiyali pH 7,6-7,7, kam gumusli 0,76-0,92 % hamda karbonat-gipsli qumli tuproqlar ekanligi aniqlandi. Tuproq profilida natriy va kaliyning ustki qatlamlarda, kaltsiy va temirning esa quyi qatlamlarda nisbatan ko‘ proq to‘ planishi elementlarning pedogenetik jarayonlar ta’sirida differensial taqsimlanishini ko‘ rsatdi. Harakatchan fosfor miqdorining quyi qatlamda keskin kamayishi, almashinuvchi kaliyning esa nisbatan barqaror saqlanishi tuproqning oziqa rejimida fosfor asosiy cheklovchi omillardan biri ekanligini ko‘ rsatdi.

Olingan natijalar Qo‘ qon davlat o‘ rmon xo‘ jaligi qumli tuproqlarining agroekologik va biogeokimyoviy holatini ilmiy baholash, pista plantatsiyalarida oziqa elementlarini samarali boshqarish hamda tuproq unumdorligini saqlashga qaratilgan agrotexnik tadbirlarni takomillashtirish uchun ilmiy asos bo‘ lib xizmat qiladi.

Kalit so‘ zlar: Pistacia vera *L., oddiy pista, qumli tuproq, agroekologiya, biogeokimyo, makroelementlar, tuproq unumdorligi, Qo‘ qon davlat o‘ rmon xo‘ jaligi.*

БИОГЕОХИМИЧЕСКАЯ И АГРОЭКОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА ФИСТАШКИ НАСТОЯЩЕЙ (*Pistacia vera* L.), ПРОИЗРАСТАЮЩЕЙ В УСЛОВИЯХ ПЕСЧАНЫХ ПОЧВ

Аннотация. *Целью настоящего исследования является оценка агроэкологических и биогеохимических особенностей песчаных почв, распространённых на территории Шобердинского лесничества Кокандского государственного лесного хозяйства, а также определение их экологического значения для роста фисташки настоящей (Pistacia vera L.). В ходе исследования в почвенных образцах, отобранных по почвенному профилю, были определены механический состав, pH, объёмная масса, содержание гумуса, валовые и подвижные формы фосфора и калия, а также содержание карбонатов, гипса и солей. Кроме того, изучено вертикальное распределение натрия, калия, кальция и железа в почвенном профиле.*

По результатам исследования установлено, что почвы Шобердинского лесничества относятся к лёгким по механическому составу песчаным почвам со слабощелочной реакцией среды (pH 7,6–7,7), низким содержанием гумуса (0,76–0,92 %) и карбонатно-гипсовым типом. Вертикальное распределение элементов показало относительно более высокое содержание натрия и калия в верхних горизонтах, тогда как кальций и железо преимущественно накапливались в нижних слоях, что свидетельствует об их дифференцированном распределении под влиянием педогенетических процессов. Существенное снижение содержания подвижного фосфора в нижнем горизонте при относительно стабильном уровне обменного калия свидетельствует о том, что фосфор является одним из основных лимитирующих факторов питательного режима данных почв.

Полученные результаты могут служить научной основой для оценки агроэкологического и биогеохимического состояния песчаных почв Кокандского государственного лесного хозяйства, рационального управления элементами минерального питания в фисташковых насаждениях и совершенствования агротехнических мероприятий, направленных на сохранение плодородия почв.

Ключевые слова: *Pistacia vera L., фисташка настоящая, песчаные почвы, агроэкология, биогеохимия, макроэлементы, плодородие почв, Кокандское государственное лесное хозяйство.*

BIOGEOCHEMICAL AND AGROECOLOGICAL CHARACTERIZATION OF COMMON PISTACHIO (*Pistacia vera* L.) GROWING ON SANDY SOILS

Abstract. *The aim of this study was to evaluate the agroecological and biogeochemical characteristics of sandy soils distributed in the Shoberdi Forestry Division of the Kokand State Forestry and to determine their ecological significance for the growth of common pistachio (Pistacia vera L.). Soil samples collected from different profile horizons were analyzed for particle-size distribution, pH, bulk density, humus content, total and available phosphorus and potassium, as well as carbonate, gypsum, and salt contents. In addition, the vertical distribution of sodium, potassium, calcium, and iron within the soil profile was investigated.*

The results showed that the soils of the Shoberdi Forestry Division are light-textured sandy soils characterized by a slightly alkaline reaction (pH 7.6–7.7), low humus content (0.76–0.92%), and carbonate–gypsum composition. The vertical distribution of elements revealed relatively higher concentrations of sodium and potassium in the upper soil horizon, whereas calcium and iron were more abundant in the lower horizon, indicating differential distribution under the influence of pedogenetic processes. A marked decrease in available phosphorus in the lower horizon, together with a relatively stable level of exchangeable potassium, indicates that phosphorus is one of the principal limiting factors affecting the nutrient regime of these soils.

The obtained results provide a scientific basis for assessing the agroecological and biogeochemical status of sandy soils in the Kokand State Forestry, improving nutrient management in pistachio plantations, and optimizing agronomic practices aimed at maintaining soil fertility.

Keywords: *Pistacia vera L., common pistachio, sandy soil, agroecology, biogeochemistry, macroelements, soil fertility, Kokand State Forestry.*

Kirish. Global iqlim o‘ zgarishi, atmosfera haroratining ortishi, yog‘ in miqdorining kamayishi hamda suv resurslari tanqisligi arid va yarim arid hududlarda tuproq degradatsiyasi, cho‘ llanish va agroekotizimlar barqarorligining pasayishiga olib kelmoqda. Bunday sharoitda qurg‘ oqchilikka chidamli, ekologik moslashuvchan va yuqori xo‘ jalik ahamiyatiga ega daraxt turlarini ilmiy asosda o‘ rganish muhim ilmiy-amaliy ahamiyat kasb etadi [1].

Oddiy pista (*Pistacia vera* L.) qurg‘ oqchil iqlim sharoitlariga yaxshi moslashgan, chuqur ildiz tizimiga ega bo‘ lgan va qumli hamda toshloq tuproqlarda barqaror o‘ suvchi istiqbolli mevali daraxt hisoblanadi. Respublikamizda pistachilikni rivojlantirish, plantatsiyalar tashkil etish va ko‘ chat yetishtirish texnologiyalarini takomillashtirish bo‘ yicha qator tadqiqotlar amalga oshirilgan. Yuldashov va hammualliflar [1] hamda Yormatova va Xushvaqtova [5] pista agrotexnikasi va plantatsiyalarni barpo etish masalalarini yoritgan bo‘ lsa, Kuiliboev va hammualliflar [2] ko‘ chat yetishtirishning zamonaviy usullarini ishlab chiqqan. Mardonov va hammualliflar [3] pistaning kasalliklari, Mahmarasulova va Mamadiyeva [4] esa uning biologik xususiyatlari va amaliy ahamiyatini o‘ rgangan.

Xorijiy tadqiqotlar *Pistacia vera* ning kelib chiqishi va domestikatsiyasi Markaziy Osiyo bilan chambarchas bog‘ liqligini ko‘ rsatadi [10]. Shuningdek, pista mevasi oqsillar, to‘ yinmagan yog‘ kislotalari, fenol birikmalari va mineral elementlarga boyligi sababli oziq-ovqat hamda farmatsevtika sanoatida muhim xomashyo hisoblanadi [9].

Pista plantatsiyalarining o‘ sishi va mahsuldorligi ko‘ p jihatdan tuproqning agroekologik va biogeokimyoviy xususiyatlariga bog‘ liq. Qumli tuproqlar gumus miqdorining kamligi, nam sig‘ imining pastligi va oziqa elementlarining yuviluvchanligi bilan tavsiflanadi. Shu sababli bunday tuproqlarda pH, gumus, oziqa elementlari hamda Fe, Mn, Zn, Cu, Ni, Co, Cr, Sr va Ba kabi makro va mikroelementlarning miqdoriy tarkibini baholash tuproq unumdorligini aniqlash va o‘ simliklarning mineral oziqlanishini izohlashda muhim ahamiyatga ega [6, 8].

So‘ nggi yillarda tuproq salomatligini saqlash, degradatsiyaga uchragan yerlarni tiklash va agroekotizimlarning ekologik barqarorligini ta’minlash bo‘ yicha tadqiqotlar jadallashgan bo‘ lsa-da [11,12], Qo‘ qon davlat o‘ rmon xo‘ jaligi qumli tuproqlarida o‘ sayotgan *Pistacia vera* plantatsiyalarining agroekologik va biogeokimyoviy xususiyatlari yetarli darajada o‘ rganilmagan.

Shu munosabat bilan ushbu tadqiqotning maqsadi Qo‘ qon davlat o‘ rmon xo‘ jaligi qumli tuproqlarining agroekologik va biogeokimyoviy xususiyatlarini kompleks baholash, makro va mikroelementlarning miqdoriy tarkibini aniqlash hamda ularning oddiy pista (*Pistacia vera* L.) o‘ simligining o‘ sishi va rivojlanishidagi ekologik ahamiyatini ilmiy asoslashdan iborat.

Tadqiqot obyekti va usullari. Tadqiqot obyekti sifatida Qo‘ qon davlat o‘ rmon xo‘ jaligining "Shoberdi" o‘ rmonchilik bo‘ limida tarqalgan oddiy pista (*Pistacia vera* L.) plantatsiyalari va qumli tuproqlar tanlandi. Tadqiqot hududi qurg‘ oqchil iqlimi, qumli mexanik tarkibga ega tuproqlari va pista plantatsiyalarining mavjudligi bilan tavsiflanadi. Mazkur hudud agroekologik va biogeokimyoviy tadqiqotlar olib borish uchun muhim ilmiy-amaliy ahamiyatga ega.

Tadqiqotning asosiy usuli tariqasida tuproqlardan kesmalar olishda V.V.Dokuchayevning kesma va morfogenetik usullaridan foydalanildi. Tuproq va anzur piyozni element tahlili neytron-aktivatsion usulda O‘ zFA Yadro fizikasi instituti Ekologiya va biotexnologiya laboratoriyasida olib borildi. Bunda namunalar atom reaktorida 5*1013 neytron/sm² sek. neytron oqimi bilan nurlantirilib, kimyoviy elementlarning yarim yemirilish davrlariga asoslanib ularning miqdorlari aniqlandi.

Tadqiqot natijalari. Tuproqning agroekologik va biogeokimyoviy xususiyatlari o‘ simliklarning o‘ sishi, rivojlanishi va mahsuldorligini belgilovchi asosiy omillardan biridir. Tuproq tarkibidagi makro va mikroelementlarning miqdori, ularning harakatchan shakllari hamda biologik o‘ zlashtirilish darajasi o‘ simliklarning mineral oziqlanishiga bevosita ta’sir ko‘ rsatadi. Ayniqsa, qumli tuproqlarda gumus miqdorining kamligi, nam sig‘ imining pastligi va oziqa elementlarining yuqori darajada yuvilishi mineral elementlar migratsiyasini jadallashtiradi hamda o‘ simliklarning oziqlanish rejimiga sezilarli ta’sir qiladi.

Biogeokimyoviy nuqtai nazardan tuproqdagi Na, K, Ca, Fe kabi elementlarning miqdori hamda vertikal taqsimlanishi tuproq unumdorligi va ekologik holatini tavsiflovchi muhim ko‘ rsatkichlar hisoblanadi. Ushbu elementlarning yetishmasligi yoki ortiqcha to‘ planishi o‘ simliklarning fiziologik jarayonlari, fermentativ faolligi, fotosintez intensivligi hamda stress omillariga moslashuvchanligiga ta’sir ko‘ rsatadi. Shu sababli pista plantatsiyalari joylashgan qumli tuproqlarning agroekologik va biogeokimyoviy tavsifini kompleks baholash ularning oziqlanish rejimini aniqlash hamda plantatsiyalar mahsuldorligini oshirishda muhim ilmiy-amaliy ahamiyatga ega.

Qo‘ qon davlat o‘ rmon xo‘ jaligining "Shoberdi" o‘ rmonchilik bo‘ limida o‘ tkazilgan tadqiqotlar natijasida qumli tuproqlarning asosiy agrokimyoviy ko‘ rsatkichlari hamda makro va mikroelementlar tarkibi aniqlandi va ularning oddiy pista (*Pistacia vera* L.) o‘ simligining o‘ sishi uchun ekologik ahamiyati baholandi.

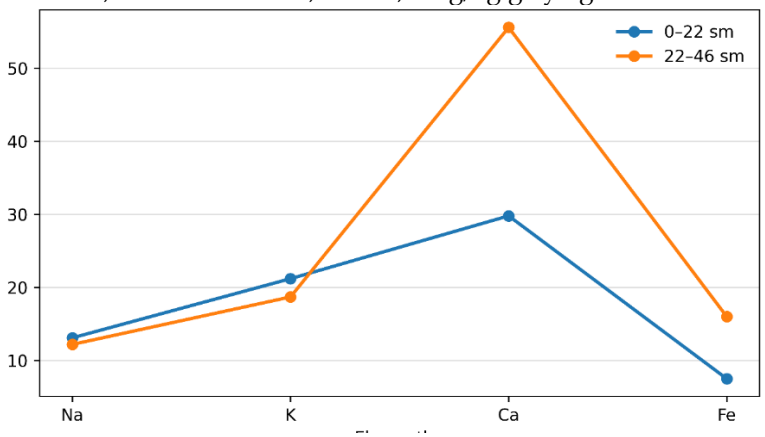
Mazkur tadqiqotda asosiy e’tibor Qo‘ qon davlat o‘ rmon xo‘ jaligining qumli tuproqlarida o‘ sayotgan oddiy pista (*Pistacia vera* L.) plantatsiyalari ostidagi tuproqlarning agroekologik va biogeokimyoviy xususiyatlarini baholashga qaratildi. Tuproqdagi elementlarning miqdoriy tarkibi hamda ularning vertikal taqsimlanishi o‘ simliklarning mineral oziqlanishi va ekologik moslashuvchanligini tavsiflovchi muhim ko‘ rsatkich hisoblanadi. Shu sababli, dastlab qumli tuproqlarning makroelementlar bilan ta’minlanganlik darajasi tahlil qilindi. Tadqiqot natijalari Qo‘ qon davlat o‘ rmon xo‘ jaligi hududidagi qumli tuproqlarda aniqlangan makroelementlarning miqdoriy tarkibi va ularning profil bo‘ yicha taqsimlanishini tavsiflaydi (1-jadval).

1-jadval

Qumli tuproqlarda makroelementlar miqdori, mg/kg (n-2)

Hudud	Chuqurligi sm	Na	K	Ca	Fe
Shoberdi o‘ rmonchilik bo‘ limi	**0-22**	13,1	21,2	29,8	7,5
	22-46	12,2	18,7	55,6	16,0

Yuqoridagi jadval ma’lumotlariga ko‘ ra, Qo‘ qon davlat o‘ rmon xo‘ jaligi "Shoberdi" o‘ rmonchilik bo‘ limining qumli tuproqlarida makroelementlarning vertikal taqsimlanishi turlicha xarakterga ega. Tuproqning 0-22 sm qatlamida natriy (Na), kaliy (K) va temir (Fe) mos ravishda 13,1; 21,2 va 7,5 mg/kg ni tashkil etgan bo‘ lsa, kaltsiy (Ca) miqdori 29,8 mg/kg ni tashkil etdi. Pastki (22–46 sm) qatlamda Na va K miqdori mos ravishda 12,2 va 18,7 mg/kg gacha kamaygan, aksincha Ca va Fe miqdori sezilarli ortib, mos ravishda 55,6 va 16,0 mg/kg ga yetgan.



1-rasm. Shoberdi o‘ rmonchilik bo‘ limi qumli tuproqlarida elementlarning vertikal taqsimlanishi

Rasm ma’lumotlariga ko‘ ra, qumli tuproqlar profilida makroelementlarning vertikal taqsimlanishi turlicha ekanligi kuzatildi. Natriy (Na) va kaliy (K) miqdori ustki (0–22 sm) qatlamda mos ravishda 13,1 va 21,2 mg/kg ni tashkil etib, quyi (22–46 sm) qatlamda biroz kamaygan. Aksincha, kaltsiy (Ca) va temir (Fe) miqdori chuqurlik bo‘ yicha ortib, mos ravishda 55,6 va 16,0 mg/kg ga yetgan. Bu holat karbonatli qumli tuproqlarda elementlarning pedogenetik

jarayonlar ta’sirida vertikal differensial taqsimlanishini ko‘ rsatadi. Ayniqsa, kaltsiyning quyi qatlamda keskin ortishi karbonat va gips birikmalarining ushbu gorizontda ko‘ proq to‘ planganligi bilan izohlanadi. Umuman olganda, rasm natijalari Shoberdi o‘ rmonchilik bo‘ limi qumli tuproqlarida makroelementlarning profil bo‘ yicha migratsiyasi va taqsimlanish xususiyatlarini yaqqol aks ettiradi.

Kuzatilgan vertikal taqsimlanish qumli tuproqlarning yengil mexanik tarkibi va yuvilish jarayonlari bilan izohlanadi. Kaliy va natriyning yuqori qatlamda nisbatan ko‘ proq uchrashi ularning o‘ simlik ildizlari faol joylashgan qatlamda to‘ planishi bilan bog‘ liq bo‘ lsa, kaltsiy va temirning pastki gorizontda ortishi karbonatli birikmalar hamda temir oksidlarining quyi qatlamlarda akkumulatsiyalanishini ko‘ rsatadi. Ushbu holat qumli tuproqlarda elementlarning vertikal migratsiyasi faol kechishini hamda pista (*Pistacia vera* L.) ning mineral oziqlanishi ko‘ p jihatdan tuproq profilidagi elementlar taqsimlanishiga bog‘ liqligini ko‘ rsatadi.

2-jadval

Oddiy pista (*Pistacia vera* L.) organlarida makro va mikroelementlar miqdori mg/kg (n-2)

Elementlar	Barg	Urug	O‘ rtacha*
Na	188	89	182.5
K	5200	7230	6215
Ca	10120	2580	6341
Fe	309	65	187

Jadval ma’lumotlari oddiy pista (*Pistacia vera* L.) organlarida mineral elementlarning taqsimlanishi organlar kesimida sezilarli farqlanishini ko‘ rsatdi. Natriy (Na) miqdori barglarda 188 mg/kg, urug‘ larda esa 89 mg/kg ni tashkil etdi. Barglarda natriyning nisbatan yuqori miqdorda aniqlanishi vegetativ organlarda suv almashinuvi va ionlar transportining faol kechishi bilan bog‘ liq bo‘ lishi mumkin.

Kaliy (K) o‘ rganilgan elementlar ichida eng yuqori konsentratsiyada qayd etildi. Uning miqdori barglarda 5200 mg/kg bo‘ lgan bo‘ lsa, urug‘ larda 7230 mg/kg ga yetdi. Urug‘ larda kaliyning yuqori miqdorda to‘ planishi ushbu elementning uglevodlar transporti, fermentativ jarayonlar, osmotik muvozanatni saqlash hamda urug‘ ning shakllanishi va zahira moddalarining to‘ planishidagi muhim fiziologik vazifalari bilan izohlanadi.

Kalsiy (Ca) miqdori, aksincha, barglarda 10120 mg/kg ni tashkil etib, urug‘ lardagi miqdoridan (2580 mg/kg) qariyb to‘ rt baravar yuqori bo‘ ldi. Bu holat kalsiyning transpiratsiya oqimi orqali asosan vegetativ organlarga transport qilinishi va hujayra devori hamda membranalarning strukturaviy barqarorligini ta’minlashdagi funksiyasi bilan bog‘ liq.

Temir (Fe) esa barglarda 309 mg/kg, urug‘ larda 65 mg/kg miqdorda aniqlandi. Temir xloroplastlarda kechadigan oksidlanish-qaytarilish reaksiyalari, elektron tashish tizimi va fotosintez bilan bog‘ liq fermentlar tarkibiga kiruvchi muhim mikroelement bo‘ lganligi sababli uning fotosintetik faol barglarda yuqori konsentratsiyada uchrashi kuzatilgan.

Tadqiqot natijalari oddiy pista (*Pistacia vera* L.) organlarida mineral elementlarning taqsimlanishi ularning fiziologik vazifalariga mos ravishda differensial xarakterga ega ekanligini ko‘ rsatdi. Bunda kaliy asosan urug‘ larda, natriy, kalsiy va temir esa barglarda nisbatan ko‘ proq to‘ planganligi aniqlandi. Ushbu taqsimlanish oddiy pistaning mineral oziqlanish xususiyatlari va organlar o‘ rtasida elementlarning qayta taqsimlanish qonuniyatlarini tavsiflaydi.

3-jadval

Shoberdi o‘ rmonchilik bo‘ limi qumli tuproqlarining agrokimyoviy xususiyatlari (n=2, 2026-yil)

Ko‘ rsatkich	Birligi	0-22 sm	22-46 sm
Mexanik tarkibi			
Qum	%	81,5	89,1
Chang	%	5,8	3,9
Loyqa	%	2,6	1,4
Fizik loy (<0,01 mm)	%	8,4	5,3
pH(H_2O)	-	7,6	7,7
Hajmiy massa	g/sm³	1,31	1,45
Gumus	%	0,92	0,76
Yalpi			
P_2O_5	%	0,20	0,09
K_2O	%	0,77	0,68
Harakatchan			
P_2O_5	mg/kg	23,1	6,8
K_2O	mg/kg	71	66
Tuzlar			

Jami	%	0,88	1,00
Zaharli	%	0,03	0,05
Gips	%	1,20	6,98
Karbonatlar	%	16,8	18,1

Jadval ma'lumotlariga ko' ra, Qo' qon davlat o' rmon xo' jaligining Shoberdi o' rmonchilik bo' limida tarqalgan tuproqlar yengil mexanik tarkibli qumli tuproqlar guruhiga mansub ekanligi aniqlandi. Tuproq profilining ustki 0-22 sm qatlamida qum fraksiyasi 81,5 % ni tashkil etgan bo' lsa, quyi 22-46 sm qatlamda uning miqdori 89,1 % gacha ortgan. Aksincha, chang va loyqa fraksiyalarining chuqurlik bo' yicha kamayishi fizik loy miqdorining 8,4 % dan 5,3 % gacha pasayishiga olib kelgan. Mazkur holat tuproqning suvni ushlab qolish qobiliyati past, aeratsiyasi esa yuqori ekanligini ko' rsatadi.

Tuproq eritmasining reaksiyasi pH bo' yicha 7,6-7,7 ni tashkil etib, kuchsiz ishqoriy muhit shakllanganligi aniqlandi. Bunday muhit karbonatli qumli tuproqlar uchun xos bo' lib, ayrim mikroelementlar, xususan Fe, Zn va Mn ning harakatchan shakllari kamayishiga hamda o' simlik tomonidan o' zlashtirilish darajasiga ta'sir ko' rsatishi mumkin.

Hajmiy massa ustki qatlamda 1,31 g/sm³, quyi qatlamda esa 1,45 g/sm³ ni tashkil etdi. Chuqurlik bo' yicha hajmiy massaning ortishi tuproqning tabiiy zichlashuvi hamda mayda fraksiyalar va karbonatli birikmalarning quyi gorizontlarda to' planishi bilan bog' liq. Biroq ushbu qiymatlar qumli tuproqlar uchun me'yoriy diapazonda bo' lib, pista ildiz tizimining rivojlanishiga sezilarli cheklov tug' dirmaydi.

Gumus miqdori tuproq profilining ustki qatlamida 0,92 % bo' lib, quyi qatlamda 0,76 % gacha kamaygan. Bu organik moddalarning asosan biologik faol ustki gorizontda to' planishini ko' rsatadi. Gumus miqdorining pastligi qumli tuproqlar uchun xos bo' lib, ularning tabiiy unumdorligi nisbatan past ekanligini tavsiflaydi.

Tuproqning oziqa elementlari bilan ta'minlanganligi ham profil bo' yicha sezilarli farq qildi. Yalpi P_2O_5 va K_2O miqdorlari mos ravishda 0,20-0,09 % hamda 0,77-0,68 % oralig' ida o' zgargan bo' lsa, harakatchan fosfor miqdori 23,1 mg/kg dan 6,8 mg/kg gacha keskin kamaygan. Harakatchan kaliy miqdori esa 71-66 mg/kg oralig' ida bo' lib, profil bo' yicha nisbatan barqaror saqlangan. Bu holat fosforning biologik aylanishi asosan ustki gorizontda kechishini, kaliyning esa profil bo' yicha nisbatan bir tekis taqsimlanganligini ko' rsatadi.

Tuproq profilida karbonatlar va gips miqdorining ortishi yaqqol kuzatildi. Karbonatlar miqdori 16,8 % dan 18,1 % gacha, gips esa 1,20 % dan 6,98 % gacha ortgan. Ushbu ko' rsatkichlar tadqiqot hududi tuproqlarining karbonat-gipsli xususiyatga ega ekanligini tasdiqlaydi. Jami tuzlar miqdori 0,88-1,00 % oralig' ida, zaharli tuzlar esa 0,03-0,05 % ni tashkil etib, tuproqning kuchli sho' rlanmaganligini ko' rsatadi.

Shoberdi o' rmonchilik bo' limi tuproqlari **kam gumusli, karbonat-gipsli, kuchsiz ishqoriy reaksiyaga ega, yengil mexanik tarkibli qumli tuproqlar** sifatida tavsiflandi. Ushbu agroekologik sharoit oddiy pista (*Pistacia vera* L.) ning chuqur ildiz tizimini shakllantirish va quyi gorizontlardan namlik hamda oziqa elementlarini o' zlashtirishiga qulay bo' lsa-da, tuproq unumdorligini saqlash uchun organik modda zaxirasini ko' paytirish hamda, ayniqsa, fosforli o' g' itlardan ilmiy asosda foydalanishni talab etadi.

Xulosa. adqiqot natijalari Shoberdi o' rmonchilik bo' limida tarqalgan qumli tuproqlar yengil mexanik tarkibli, kuchsiz ishqoriy reaksiyali, kam gumusli va karbonat-gipsli tuproqlar ekanligini ko' rsatdi. Tuproq profilida makroelementlarning differensial taqsimlanishi natriy va kaliyning ustki, kaltsiy hamda temirning esa quyi qatlamlarda nisbatan ko' proq to' planishi bilan tavsiflandi. Bu holat elementlar migratsiyasi va ularning pedogenetik jarayonlar ta'sirida qayta taqsimlanishini aks ettiradi.

Qumli tuproqlarda gumus hamda harakatchan fosfor miqdorining pastligi oddiy pista (*Pistacia vera* L.) plantatsiyalarida oziqa rejimini cheklovchi asosiy agroekologik omillardan biri ekanligi aniqlandi. Shu bilan birga, tuproqning yengil mexanik tarkibi, past sho' rlanish darajasi va yaxshi aeratsiyasi pista ildiz tizimining rivojlanishi uchun qulay sharoit yaratadi.

Olingan natijalar Qo' qon davlat o' rmon xo' jaligi qumli tuproqlarining agroekologik va biogeokimyoviy bahosini aniqlash, oziqa elementlarini ilmiy asosda boshqarish hamda pista plantatsiyalarida organik modda zaxirasini oshirish va fosforli o' g' itlardan samarali foydalanish bo' yicha amaliy tavsiyalar ishlab chiqishga asos bo' lib xizmat qiladi.

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PAQ- PAQ - *PHYSALIS ALKEKENGI* L. URUG‘ LARINING LABORATORIYA SHAROITDA UNUVCHANLIGI VA UNUSH ENERGIYASINI BAHOLASH.

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Annatatsiya. *Physalis alkekengi L. dorivor va manzarali ahamiyatga ega istiqbolli turlardan biri hisoblanadi. Physalis alkekengi yoki maydalangan gilos yoki ”xitoycha chiroq” Markaziy Amerika va Shimoliy Amerikaning janubi-sharqida o‘ sadigan o‘ tsimon o‘ simlik. Keyinchalik u Janubiy Yevropaga olib kelingan va keyin sharqqa qarab Xitoy va Yaponiyaga tarqalgan. Maydalangan gilos boshqa maydalangan gilos turlariga qaraganda sovuqqa chidamliroq va mo‘ tadil iqlim sharoitida qishlay oladigan va har yili ildizpoyalaridan qayta o‘ sadigan yagona turdir. Mazkur o‘ simlikning laboratoriya sharoitda ununchanligi standart labaratoriya usullar asosida nazorat qilingan yorug‘ lik harorat va namlik sharoitda o‘ rganildi. Olib borilgan tadqiqot davomida urug‘ larning unuvchanlik foizi, unush energiyasi va o‘ rtacha unush mudati aniqlandi. Ph.alkekengi urug‘ larni biologik hususiyatlarni aniqlash, ularni ko‘ paytirish va intraduksiya qilish uchun amaliy ahamiyatga ega.*

Kalit so‘ zlar: *unuvchanlik, physalis alkekengi, harorat, unush energiyasi, urug‘ massasi,*

ПАХ-ПАХ — ОЦЕНКА ВСХОЖЕСТИ И ЭНЕРГИИ ПРОРАСТАНИЯ СЕМЯН PHYSALIS ALKEKENGI L. В ЛАБОРАТОРНЫХ УСЛОВИЯХ

Аннотация. *Physalis alkekengi L. является одним из перспективных видов, обладающих лекарственной и декоративной ценностью. Данный вид, известный также как физалис обыкновенный или «китайский фонарик», является травянистым растением, происходящим из юго-восточных районов Северной и Центральной Америки. Впоследствии он был интродуцирован в Южную Европу, а затем распространился в Китай и Японию. По сравнению с другими видами физалиса Ph.alkekengi отличается более высокой холодостойкостью, способен зимовать в условиях умеренного климата и ежегодно возобновляется благодаря корневищам. В лабораторных условиях семена данного вида были исследованы по стандартным методикам определения посевных качеств при контролируемых условиях освещённости, температуры и влажности. В ходе исследования определены лабораторная всхожесть семян, энергия прорастания и средняя продолжительность прорастания. Полученные результаты имеют практическое значение для изучения биологических особенностей семян Ph.alkekengi, а также для их размножения и интродукции.*

Ключевые слова: *Physalis alkekengi, лабораторная всхожесть, энергия прорастания, температура, масса семян.*

PAQ-PAQ — ASSESSMENT OF SEED GERMINATION AND GERMINATION ENERGY OF PHYSALIS ALKEKENGI L. UNDER LABORATORY CONDITIONS

Abstract. *Physalis alkekengi L. is one of the promising species valued for its medicinal and ornamental properties. Also known as the Chinese lantern plant, it is a herbaceous species native to the southeastern regions of North and Central America. Subsequently, it was introduced into Southern Europe and later spread to China and Japan. Compared with other Physalis species, P. alkekengi exhibits greater cold tolerance, is capable of overwintering under temperate climatic conditions, and regenerates annually from its rhizomes. Under laboratory conditions, seed germination was evaluated using standard seed-testing methods under controlled light, temperature, and humidity regimes. The study determined seed germination percentage, germination energy, and mean germination time. The obtained results are of practical importance for understanding the biological characteristics of Ph.*

alkekengi seeds and for their propagation and introduction.

Keywords: *Physalis alkekengi, seed germination, germination energy, temperature, seed weight.*

Kirish

Physalis alkekengi L.- Solanaceae oilasiga mansub *Physalis* turkumiga mansub ko‘ p yillik o‘ simlik. Poyasi yog‘ ochsimon, balandligi 50-80 sm. *Ph.* alkekengi gulkosalari va mevalari Yevropa va Osiyoda tarqalgan. Gulkosalari yashil. Gultoji barglari oq rangda, o‘ z-o‘ zidan changlanadi, asosi biroz botiq, uzunligi 2,5–5 sm, diametri 2,5–3,5 sm, yupqa po‘ stlog‘ iga ega va pishganda to‘ q sariq-qizil yoki olov qizil rangda bo‘ ladi. Mevalari sharsimon, to‘ q sariq-qizil va diametri 10–15 mm. *Ph. alkekenge* flavonoidlar, terpenoidlar, steroidlar va polisaxaridlar kabi turli xil bioaktiv komponentlarga boy va yallig‘ lanishga qarshi antibakterial va immunomodulyator kabi farmakologik ta’sirga ega.

Ph.alkekengi nafaqat ajoyib dorivor qiymatga ega, balki ajoyib yeyish mumkin bo‘ lgan qiymat va tabiiy ozuqaviy afzalliklarni ham namoyish etadi. Uning mevasi o‘ ziga xos, yoqimli shirin-nordon ta’mga va muvozanatli ta’mga ega va turli xil vitaminlar, minerallar va tabiiy funktsional moddalarga boy. O‘ zining o‘ ziga xos hissiy xususiyatlari va mo‘ l-ko‘ l ozuqaviy tarkibiy qismlari tufayli *P. alkekengi* mevasi yangi iste’mol qilishda, qayta ishlangan gazaklarda, funktsional ichimliklarda va pishirilgan mahsulotlarda keng qo‘ llanilishi mumkin. Bu xususiyatlar iste’molchilarning tabiiy, sog‘ lom va funktsional oziq-ovqatlarga bo‘ lgan hozirgi tendentsiyasiga mos keladi, bu esa oziq-ovqat tadqiqotlari va sanoat qo‘ llanilishi uchun istiqbolli istiqbollarni ko‘ rsatadi.

Hozirgi vaqtda *P. alkekengi* dan 530 dan ortiq birikmalar ajratib olingan, ular orasida asosan steroidlar, flavonoidlar, alkaloidlar, fenilpropanoidlar, saxaroza efirlari, piperazinlar, uchuvchan yog‘ lar, polisaxaridlar, turli aminokislotalar va mikroelementlar mavjud. Zamonaviy farmakologik tadqiqotlar shuni ko‘ rsatdiki, Ph. alkekengi yallig‘ lanishga qarshi, mikroblarga qarshi, antioksidant, gipoglikemik, og‘ riq qoldiruvchi, o‘ smalarga qarshi va immunitetni tartibga soluvchi ta’sirga ega va katta ozuqaviy va dorivor ahamiyatga ega. Klinik amaliyotda *Ph.alkekengi* ko‘ pincha yo‘ tal, ortiqcha balg‘ am, faringit, tomoq og‘ rig‘ i, ekzema va sariqlikni davolash uchun boshqa Xitoy Xalq Respublikasi dorilari bilan birgalikda qo‘ llaniladi.

Adabiyotlar tahlili.

Ph.alkekenge urug‘ larini unishi uchun asosiy omil harorat hisoblanadi ko‘ pchilik olimlarning tadqiqot natijalariga ko‘ ri Physalis urug‘ larini unuvchanligi 20-25 ℃ deb belgilangan. Haroratning past yoki yuqori bo‘ lishi o‘ simlik urug‘ lari uchun noqulay omil hisoblanadi. Urug‘ larni unish energiyasi haqida malumotlar ilmiy adabiyotlarda yertarli emas, shu sababli urug‘ biologiyasi o‘ rganish ilmiy - amaliy jihatdan dolzarb hisoblanadi.

Tadqiqot metodologiyasi

Ilmiy tadqiqot *Ph.alkekenge* urug‘ lari labaratoriya shoroitda amalga oshirildi. Tadqiqot uchun biologik jihatdan yetilgan urug‘ lar ajratib olindi. Tajriba uchun dastlab har variantda 100 tadan urug‘ lar sanab olindi. Urug‘ lar strillangan petri idishlarga filtr qog‘ ozga ekildi va namlik muntazam nazorat qilindi. Olingan natijalar qayt etib borildi. Unish eneriyasi standart sharoitda unib chiqgan urug‘ lar soniga nisbatan foizlarda hisoblandi.

Natija va ularning tahlili

Ph. alkekenge urug‘ larini laboratoriya unuvchanligini aniqlash uchun avvalo 1000 ta urug‘ ni vaznini o‘ lchab olindi. 1000 ta urug‘ ning o‘ rtacha vazni 1.546 gr tashkil etdi. O‘ tkazilgan tadqiqot natijalariga ko‘ ri saralab olingan urug‘ larimizda 0℃, 5℃ va 10℃ da unuvchanlik haroratga bog‘ liq ravishda o‘ zgarish kuzatilmaganligini ko‘ rishimiz mumkun. 15℃ haroratdan boshlab P.alkekenge urug‘ larida unuvchanlik kuzatilgan. 25℃ haroratda eng yuqori ko‘ rsatgichga yetgan. 30℃ boshlab urug‘ larning unuvchanligi biroz pasayganligi qayt etilgan. 35℃ da urug‘ larning unuvchanlik foizi 12% gacha pasaygan (1-jadval). 40℃ haroratda Physalis urug‘ larida unuvchanlik kuzatilmadi.

Tadqiqot natijalariga ko‘ ri Ph. alkekenge urug‘ larining unuvchanligi 10-20 kunlar oralig‘ ida yuqori ko‘ rsatgichga yetganligini kuzatishimiz mumkun (1-rasm)

1-jadval

Turli haroratda *Ph. alkekenge* urug‘ larning unuvchanligi

℃	Kunlar, % da											%
		3	6	9	11	14	17	20	23	26	30	
0		-	-	-	-	-	-	-	-	-	-	0%
5		-	-	-	-	-	-	-	-	-	-	0%
10		-	-	-	-	-	-	-	-	-	-	0%
15		-	-	-	-	-	1	1	-	-	-	1 %

20		-		-	3	6	5	2	1	-	-	**17 %**
25		-	-	7	5	12	5	9	4	-	-	**42%**
30		-	-	5	4	7	6	2	1	-	-	**25%**
35		-	-	4	3	2	3	-	-	-	-	**12%**
40		-	-	-	-	-	-	-	-	-	-	0%

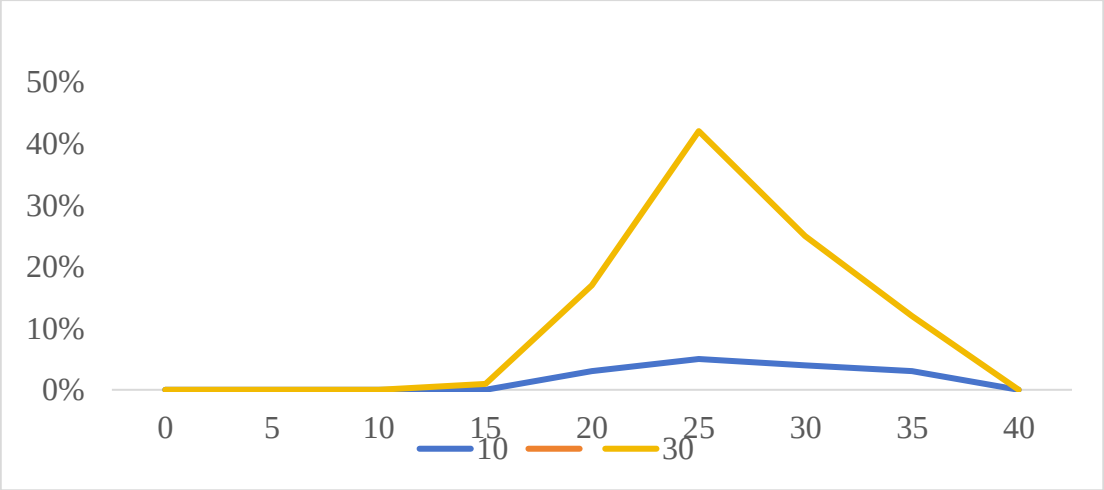
Urug‘ larning unush energiyasi - bu belgilangan qisqa muddat ichida namuna tarkibidagi normal unib chiqgan urug‘ lar sonining umumiy urug‘ lar soniga nisbatan foizlarda ifodalangan ko‘ rsatgichidir. Urug‘ larni unish eneriyasi quidagi formula yordamida ifodalanadi.

$$E = \frac{n}{N} * 100\ \%$$

E - unish energiyasi

N - undirishga qo‘ yilgan jami urug‘ lar soni.

n - belgilangan muddatda ungan urug‘ lar soni.



1-rasm. *Ph. alkekenge* urug‘ larining turli haroratda unuvchanlik ko‘ rsatgichlari

Urug‘ larni unuvchanligi va unish energiyasi ISTA (International Rules for Seed Testing, 2024) hamda AOSA (Rules for Testing Seeds, 2023) metodikasi asosida baholandi.

Tadqiqot natijasiga ko‘ ri unish energiyasi quyidagicha baholandi. Unish energiyasi Physali ISTA qoidasiga ko‘ ri asosiy mezon qilib urug‘ larni undurishga qo‘ ygandan keyin 12 - kuni o‘ tkazilish tavsiya etiladi. Ammo bizda 1, 3, 6, 9, 11, 14, 17, 20, 23, 26 va 30-kunlarda olib borilganligi sababli

12- Kunga eng yaqin kuzatuv, 11- kun ma’lumotlari asosida baholandi.

$$E = \frac{12}{100} * 100$$

Tajribada unish energiyasining foiz ko‘ rsatgichi 12 % teng ekanligi aniqlandi.

Xulosa

Olib borilgan ilmiy tadqiqot ishimizda Urug‘ larning labaratoriya sharoitida unish jarayoni bevosita haroratga bog‘ liq ekanligi aniqlandi. Eng yuqori unuvchanlik 25 ℃ haroratda qayt etildi, bu natija urug‘ larning unishu uchun optimal harorat ekanligi malum bo‘ ldi. Urug‘ larni asosiy qismi dastlabki 17 kunda unib chiqganligini, ular uchun qulay sharoit yaratilganda yuqori fiziologik faollikga ega bo‘ lishi aniqlandi.

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MENTHA PIPERITA L. DORIVOR O‘ SIMLIGINING YER USTKI QISMI TARKIBIDAGI AMINOKISLOTALAR MIQDORINI YUQORI SAMARALI SUYUQLIK XROMATOGRAFIYASI (YuSSX) USULIDA ANIQLASH.

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Annotatsiya: *Ushbu tadqiqotning maqsadi* ***Mentha piperita L.*** *(yalpiz) dorivor o‘ simligining Surxondaryo viloyatida o‘ suvchi yer ustki qismi tarkibidagi aminokislotalarning sifat va miqdor tarkibini yuqori samarali suyuqlik xromatografiyasi (YuSSX) usuli yordamida aniqlashdan iborat. Tadqiqot uchun o‘ simlik namunalari 2025-yil may oyida Surxondaryo viloyatidan yig‘ ildi. Tahlillar* ***Agilent Technologies 1200 Series*** *yuqori samarali suyuqlik xromatografi yordamida amalga oshirildi. Natijada o‘ simlik tarkibida jami* ***20 ta aminokislota*** *aniqlandi va ularning umumiy miqdori* ***45,962 mg/g*** *quruq o‘ simlik xomashyosini tashkil etdi. Aniqlangan aminokislotalar orasida* ***asparagin (11,636 mg/g), arginin (8,340 mg/g), glisin (5,164 mg/g), alanin (3,841 mg/g)*** *va* ***tirozin (3,575 mg/g)*** *ustunlik qildi. Shuningdek, serin, treonin, glutamin, sistein, fenilalanin, valin, gistidin va boshqa aminokislotalar ham aniqlandi. Olingan natijalar* ***Mentha piperita L.*** *o‘ simligining biologik faol aminokislotalarga boy tabiiy manba ekanligini hamda farmatsevtika, nutrasevtika va funksional oziq-ovqat mahsulotlari ishlab chiqarishda istiqbolli dorivor xomashyo sifatida foydalanish mumkinligini ko‘ rsatadi. Tadqiqot natijalari O‘ zbekiston hududida o‘ suvchi* ***Mentha piperita*** *L. o‘ simligining aminokislotalar tarkibi bo‘ yicha yangi ilmiy ma’lumotlarni taqdim etadi va dorivor o‘ simlik xomashyosini standartlashtirish hamda sifat nazoratini takomillashtirish uchun ilmiy asos bo‘ lib xizmat qiladi.*

Kalit so‘ zlar: *Mentha piperita L.; yalpiz; dorivor o‘ simlik; aminokislotalar; yuqori samarali suyuqlik xromatografiyasi (YuSSX); Agilent Technologies 1200 Series; fitokimyoviy tahlil; biologik faol moddalar; Surxondaryo viloyati; farmakognoziya.*

ОПРЕДЕЛЕНИЕ АМИНОКИСЛОТ В НАДЗЕМНОЙ ЧАСТИ ЛЕКАРСТВЕННОГО РАСТЕНИЯ MENTHA PIPERITA L. МЕТОДОМ ВЫСОКОЭФФЕКТИВНОЙ ЖИДКОСТНОЙ ХРОМАТОГРАФИИ (ВЭЖХ).

Аннотация: *Целью данного исследования было определение качественного и количественного состава аминокислот в надземной части лекарственного растения Mentha piperita L. (мята перечная), произрастающего в Сурхандарьинской области, с использованием метода высокоэффективной жидкостной хроматографии (ВЭЖХ). Образцы растений для исследования были собраны в Сурхандарьинской области в мае 2025 года. Анализы проводились с использованием высокоэффективной жидкостной хроматографии Agilent Technologies серии 1200. В результате в растении было идентифицировано в общей сложности 20 аминокислот, их суммарное количество составило 45,962 мг/г сухого растительного сырья. Среди идентифицированных аминокислот преобладали аспарагин (11,636 мг/г), аргинин (8,340 мг/г), глицин (5,164 мг/г), аланин (3,841 мг/г) и тирозин (3,575 мг/г). Также были обнаружены серин, треонин, глутамин, цистеин, фенилаланин, валин, гистидин и другие аминокислоты. Полученные результаты указывают на то, что Mentha piperita L. является богатым природным источником биологически активных аминокислот и может быть использована в качестве перспективного лекарственного сырья в производстве фармацевтических препаратов, нутрицевтиков и функциональных пищевых продуктов. Результаты исследования предоставляют новые научные данные об аминокислотном составе Mentha piperita L., произрастающей в Узбекистане, и служат научной основой для стандартизации и улучшения контроля качества лекарственного растительного сырья.*

Ключевые слова: *Mentha piperita L.; мята; лекарственное растение; аминокислоты; высокоэффективная жидкостная хроматография (ВЭЖХ); Agilent Technologies 1200 Series; фитохимический анализ; биологически активные вещества; Сурхандарьянская область; фармакогнозия.*

DETERMINATION OF AMINO ACIDS IN THE ABOVE-GROUND PART OF THE MEDICINAL PLANT MENTHA PIPERITA L. BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC) METHOD

Abstract: *The aim of this study was to determine the qualitative and quantitative composition of amino acids in the above-ground part of the medicinal plant Mentha piperita L. (peppermint) growing in the Surkhandarya region using the high-performance liquid chromatography (HPLC) method. Plant samples for the study were collected from the Surkhandarya region in May 2025. The analyses were carried out using Agilent Technologies 1200 Series high-performance liquid chromatography. As a result, a total of 20 amino acids were identified in the plant, and their total amount was 45.962 mg/g of dry plant raw material. Among the identified amino acids, asparagine (11.636 mg/g), arginine (8.340 mg/g), glycine (5.164 mg/g), alanine (3.841 mg/g) and tyrosine (3.575 mg/g) prevailed. Serine, threonine, glutamine, cysteine, phenylalanine, valine, histidine and other amino acids were also detected. The results obtained indicate that Mentha piperita L. is a rich natural source of biologically active amino acids and can be used as a promising medicinal raw material in the production of pharmaceuticals, nutraceuticals and functional food products. The results of the study provide new scientific data on the amino acid composition of Mentha piperita L. growing in Uzbekistan and serve as a scientific basis for standardization and improvement of quality control of medicinal plant raw materials.*

Keywords: *Mentha piperita L.; mint; medicinal plant; amino acids; high-performance liquid chromatography (HPLC); Agilent Technologies 1200 Series; phytochemical analysis; biologically active substances; Surkhandarya region; pharmacognosy.*

KIRISH: Mentha piperita L. (yalpiz) Lamiaceae (Labguldoshlar) oilasiga mansub ko‘ p yillik dorivor o‘ simlik bo‘ lib, dunyoning ko‘ plab mamlakatlarida farmatsevtika, oziq-ovqat va kosmetika sanoatida keng qo‘ llaniladi. O‘ simlik tarkibida mentol, menton, flavonoidlar, fenolik birikmalar, organik kislotalar va boshqa biologik faol moddalar mavjud bo‘ lib, ular antioksidant, yallig‘ lanishga qarshi, antimikrob va spazmolitik xususiyatlarga ega ekanligi ilmiy jihatdan isbotlangan (McKay Blumberg, 2006; Singh et al., 2011; Mahendran & Rahman, 2020).

So‘ nggi yillarda dorivor o‘ simliklarning aminokislotalar tarkibini o‘ rganishga bo‘ lgan qiziqish ortib bormoqda. Aminokislotalar oqsillarning tarkibiy qismi bo‘ lish bilan birga, o‘ simliklarda azot almashinuvi, hujayra metabolizmi, fermentlar faolligi, osmotik muvozanat va stressga moslashuv jarayonlarida muhim rol o‘ ynaydi (Hildebrandt et al., 2015; Galili et al., 2016). Ayrim aminokislotalar antioksidant himoya tizimini kuchaytirishi hamda biologik faol ikkilamchi metabolitlar biosintezida ishtirok etishi aniqlangan (Noctor et al., 2012; Szabados Savouré, 2010).

Yalpiz o‘ simligi kimyoviy tarkibi bo‘ yicha ko‘ plab tadqiqotlar amalga oshirilgan bo‘ lsa-da, ularning asosiy qismi efir moylari va fenolik birikmalarni o‘ rganishga bag‘ ishlangan (Mimica-Dukić Božin, 2008; Kamatou et al., 2013). Erkin aminokislotalarning sifat va miqdor tarkibi, ayniqsa Markaziy Osiyo sharoitida o‘ suvchi Mentha piperita namunalari uchun yetarli darajada o‘ rganilmagan.

Dorivor o‘ simliklarning kimyoviy tarkibi o‘ sish hududi, tuproq tarkibi, iqlim sharoiti, vegetatsiya davri va agroekologik omillarga bevosita bog‘ liq bo‘ lib, bu omillar biologik faol moddalarning miqdoriga sezilarli ta’sir ko‘ rsatadi (Fiehn, 2002; Weckwerth, 2003; Obata & Fernie, 2012). Shu sababli O‘ zbekiston hududida o‘ suvchi dorivor o‘ simliklarning aminokislotalar tarkibini aniqlash farmakognoziya va fitokimyo sohalari uchun dolzarb ilmiy yo‘ nalish hisoblanadi.

Mazkur tadqiqotda Surxondaryo viloyatida 2025-yil may oyida yig‘ ilgan Mentha piperita L. o‘ simligining yer ustki qismi Agilent Technologies 1200 Series YuSSX tizimida tahlil qilindi. Tadqiqot natijasida 20 ta aminokislota aniqlanib, ularning umumiy miqdori 45,962 mg/g ni tashkil etdi. Eng yuqori konsentratsiyalar asparagin (11,636 mg/g), arginin (8,340 mg/g) va glisin (5,164 mg/g) uchun qayd etildi, bu esa mazkur o‘ simlikning biologik faol aminokislotalarga boy tabiiy manba ekanligini ko‘ rsatadi.

Tadqiqotning maqsadi Mentha piperita L. o‘ simligining yer ustki qismi tarkibidagi aminokislotalarning sifat va miqdor tarkibini YuSSX usulida aniqlash hamda olingan natijalarni dorivor o‘ simliklarni standartlashtirish va farmatsevtik amaliyotda qo‘ llash nuqtai nazaridan ilmiy baholashdan iborat.

Materiallar va usullar

Tadqiqot obyekti sifatida **Mentha piperita L.** (yalpiz) o‘ simligining yer ustki qismi ishlatildi. O‘ simlik namunalari O‘ zbekiston Respublikasi **Surxondaryo viloyatidan 2025-yil may oyida**, gullash davrida yig‘ ib olindi. Botanika identifikatsiyasi o‘ simlikning morfologik va sistematik belgilari asosida amalga oshirildi hamda amaldagi farmakognoziya va botanika adabiyotlari bilan taqqoslab tasdiqlandi (WHO, 2019; European Pharmacopoeia, 2023).

Yig‘ ilgan o‘ simlik xomashyosi begona aralashmalardan tozalandi va to‘ g‘ ridan-to‘ g‘ ri quyosh nurlaridan himoyalangan, yaxshi shamollatiladigan xonada **25–30 °C** haroratda doimiy massa hosil bo‘ lguncha quritildi. Quritilgan namuna laboratoriya tegirmonida maydalanib, **1 mm** o‘ lchamli elakdan o‘ tkazildi. Tayyorlangan kukun germetik yopiladigan polietilen idishlarda laboratoriya sharoitida saqlandi.

Reaktivlar va kimyoviy moddalar

Tahlil davomida **6 M xlorid kislota (HCl), YuSSX darajasidagi metanol, atsetonitril, natriy atsetat bufer eritmasi, ortoftalaldegid (OFA)** hamda aminokislotalarning standart aralashmalari **(Sigma-Aldrich, AQSH)** qo‘llanildi. Eritmalarni tayyorlashda **Milli-Q** ultra toza suv tizimidan olingan suv ishlatildi. Barcha reaktivlar analitik tozalikka ega bo‘lib, xalqaro laboratoriya talablariga javob berdi.

Namunalarni tayyorlash

Maydalangan o‘simlik kukunidan **0,5 g** aniq tortib olinib, gidroliz naychalariga joylashtirildi. Namunalar **6 M HCl** bilan **110°C** haroratda **24 soat** davomida azot atmosferasida gidroliz qilindi. Gidroliz yakunlangach, kislota vakuum ostida rotatsion bug‘latkich yordamida bug‘latib yuborildi. Hosil bo‘lgan qoldiq **pH 2,2** bo‘lgan natriy sitrat bufer eritmasida eritildi va **0,22 mkm** membranali filtr orqali filtrlanib, YuSSX vialalariga quyildi (Henderson et al., 2000).

Aminokislotalarni YuSSX usulida aniqlash

Aminokislotalarning sifat va miqdoriy tahlili **Agilent Technologies 1200 Series High Performance Liquid Chromatography (YuSSX)** tizimida amalga oshirildi. Qurilma kvaternar nasos, avtomatik namuna yuboruvchi (autosampler), kolonka termostati va flyuoressensiya detektori bilan jihozlangan.

Xromatografik ajratish **Zorbax Eclipse AAA C18** (4,6 × 150 mm; 5 μm) kolonkasida bajarildi. Tahlildan oldin aminokislotalar **ortoftalaldegid (OFA)** yordamida derivatizatsiya qilindi. Harakatlanuvchi faza sifatida natriy atsetat bufer eritmasi (A) va atsetonitril–metanol–suv aralashmasi (B) qo‘llanildi. Gradient elyutsiya rejimida oqim tezligi **1,0 ml/min**, kolonka harorati **40 °C**, namuna yuborish hajmi esa **10 μl** etib belgilandi.

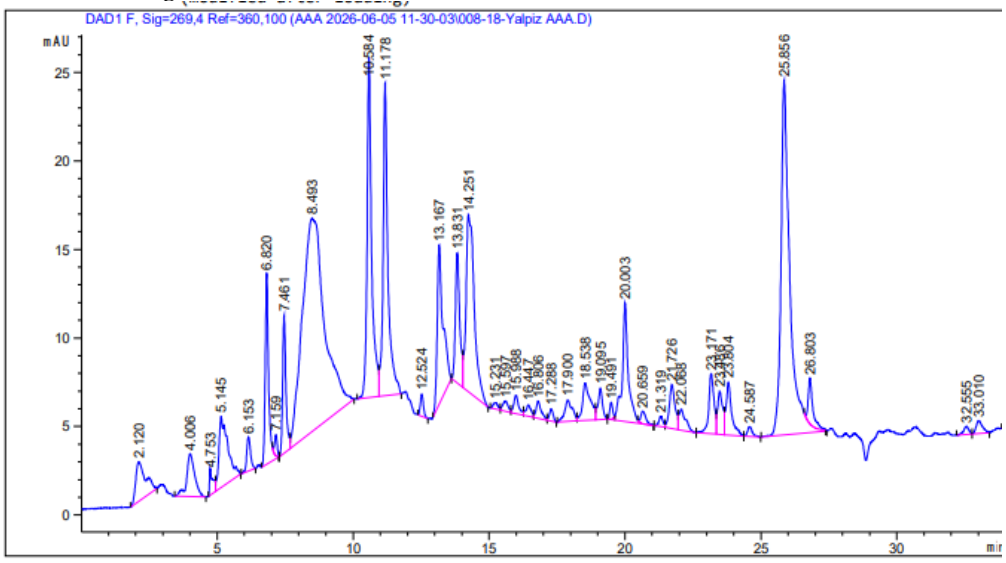
Aminokislotalar standart eritmalar bilan ushlanish vaqtlari (retention time) taqqoslanib identifikatsiya qilindi. Miqdoriy hisoblash tashqi kalibrlash egri chiziqlari yordamida amalga oshirildi va natijalar **mg/g quruq o‘simlik xomashyosi** ko‘rinishida ifodalandi.

Statistik tahlil

Barcha tajribalar uch martadan takrorlandi va natijalar **o‘rtacha qiymat ± standart og‘ish (Mean ± SD)** ko‘rinishida ifodalandi. Statistik ishlov berish **OriginPro 2024** va **Microsoft Excel 2021** dasturlari yordamida amalga oshirildi. Statistik jihatdan ishonchli farq **$p < 0,05$** darajasida baholandi.

Natijalar va muhokama

Surxondaryo viloyatida o‘suvchi *Mentha piperita* L. o‘simligining yer ustki qismi tarkibidagi aminokislotalar **Agilent Technologies 1200 Series** yuqori samarali suyuqlik xromatografiyasi (YuSSX) usuli yordamida sifat va miqdor jihatdan tahlil qilindi. *Mentha piperita* L. o‘simligining yer ustki qismi tarkibidagi aminokislotalar ekstraktining YuSSX xromatogrammasi 1-rasmda keltirilgan.



1-rasm. *Mentha piperita* L. o‘simligining yer ustki qismi tarkibidagi aminokislotalar ekstraktining YuSSX xromatogrammasi.

Tahlil natijasida **20 ta aminokislota** aniqlandi va ularning umumiy miqdori **45,962 mg/g** quruq o‘simlik xomashyosini tashkil etdi. Aniqlangan aminokislotalar orasida **asparagin (11,636 mg/g)** eng yuqori miqdorda qayd etildi. Keyingi o‘rinlarda **arginin (8,340 mg/g), glisin (5,164 mg/g), alanin (3,841 mg/g), tirozin (3,575 mg/g), treonin (1,789 mg/g), glutamin (1,667 mg/g) va sistein (1,627 mg/g)** aniqlandi. Eng kam miqdor **triptofan (0,199 mg/g), aspartat kislotasi (0,214 mg/g), izoleysin (0,223 mg/g), leysin (0,238 mg/g)** va **metionin (0,419 mg/g)** uchun kuzatildi.Natijalar 1-jadvalda keltirilgan.

1-jadval

Surxondaryo viloyatida o‘ sgan *Mentha piperita* L. o‘ simligi yer ustki qismi tarkibidagi aminokislotalar miqdori

№	Aminokislotalar nomi	*Matricaria chamomilla L* Konsentratsiya mg/gr	№	Aminokislotalar nomi	*Matricaria chamomilla L* Konsentratsiya mg/gr
1	Aspartat kislotasi	0,214	11	Prolin	0,703
2	Glutamat kislotasi	0,554	12	Tirozin	3,575
3	Serin	1,100	13	Valin	1,294
4	Glisin	5,164	14	Metionin	0,419
5	Asparagin	11,636	15	Gistidin	1,279
6	Glutamin	1,667	16	Izoleysin	0,223
7	Sistein	1,627	17	Leysin	0,238
8	Treonin	1,789	18	Triptofan	0,199
9	Arginin	8,340	19	Fenilalanin	1,390
10	Alanin	3,841	20	Lizin	0,710
Jami					**46.912**

YuSSX tahlili natijasida *Mentha piperita* L. o‘ simligining yer ustki qismida 20 ta aminokislota aniqlandi. Eng yuqori miqdor asparagin (11,636 mg/g), arginin (8,340 mg/g) va glisin (5,164 mg/g) hissasiga to‘ g‘ ri keldi.

Tadqiqot natijalariga ko‘ ra, **asparagin** yalpiz tarkibida ustun aminokislota ekanligi aniqlandi. Asparagin o‘ simliklarda azotni saqlash va tashishning asosiy shakllaridan biri bo‘ lib, hujayralarda azot almashinuvini boshqarishda muhim rol o‘ ynaydi. Shuningdek, u oqsil biosintezi, hujayra bo‘ linishi va yangi to‘ qimalarning shakllanishida faol ishtirok etadi (Hildebrandt et al., 2015; Galili et al., 2016).

Asparaginning yuqori miqdorda aniqlanishi *Mentha piperita* o‘ simligida azot almashinuvining faol kechayotganligini hamda vegetativ organlarda oziqa moddalarining intensiv to‘ planishini ko‘ rsatadi.

Ikkinchi eng yuqori ko‘ rsatkich **arginin** hissasiga to‘ g‘ ri keldi. Arginin azotga eng boy aminokislotalardan biri bo‘ lib, poliaminlar, azot oksidi va boshqa biologik faol birikmalarning biosintezida muhim prekursor hisoblanadi. Bundan tashqari, arginin o‘ simliklarning qurg‘ oqchilik, sho‘ rlanish va oksidlovchi stressga moslashishida muhim ahamiyatga ega (Winter et al., 2015). Surxondaryo viloyatining issiq va quruq iqlim sharoiti argininning nisbatan yuqori miqdorda to‘ planishiga ta’sir ko‘ rsatgan bo‘ lishi mumkin.

Glisin uchinchi o‘ rinda qayd etildi. Ushbu aminokislota xlorofill biosintezi, fotorespiratsiya va antioksidant himoyada ishtirok etuvchi glutation sintezi uchun zarur komponentlardan biridir (Noctor et al., 2012). Glisinning yuqori miqdori yalpiz o‘ simligida fotosintetik faollik va metabolik jarayonlarning yuqori darajada ekanligini ko‘ rsatadi.

Shuningdek, **alanin** va **tirozin** ham nisbatan yuqori miqdorlarda aniqlandi. Alanin uglevod va energiya almashinuvining muhim metaboliti bo‘ lsa, tirozin fenol birikmalar, flavonoidlar va boshqa ikkilamchi metabolitlarning biosintezida ishtirok etadi (Fiehn, 2002; Obata & Fernie, 2012). Bu natijalar *Mentha piperita* o‘ simligining biologik faol moddalarni sintez qilish salohiyati yuqori ekanligini ko‘ rsatadi.

Tahlil davomida **valin, treonin, metionin, fenilalanin, leysin, izoleysin, lizin va triptofan** kabi almashinmaydigan (essensial) aminokislotalar ham aniqlandi. Ularning umumiy tarkibda mavjudligi yalpizning oziqaviy va farmakologik qiymatini oshiradi. Ushbu aminokislotalar inson organizmida sintez qilinmaydi va oziq-ovqat yoki dorivor o‘ simliklar orqali qabul qilinadi. Shu sababli *Mentha piperita* biologik faol qo‘ shimchalar va fitopreparatlar ishlab chiqarishda istiqbolli tabiiy xomashyo hisoblanadi.

Olingan natijalar boshqa mamlakatlarda **YuSSX** va **LC–MS** usullarida o‘ tkazilgan tadqiqotlar bilan umumiy jihatdan mos keladi. Biroq Surxondaryo viloyatida o‘ sgan yalpiz namunalarida **asparagin** va **arginin** miqdorining yuqoriligi hududning agroiqlim sharoiti, tuproq tarkibi, namlik darajasi va vegetatsiya davrining o‘ ziga xosligi bilan

izohlanishi mumkin. Ilmiy adabiyotlarda ham dorivor o‘ simliklarning aminokislotalar tarkibi ekologik omillar ta’sirida sezilarli darajada o‘ zgarishi qayd etilgan (Weckwerth, 2003; Fernie et al., 2011).

Qiyosiy tahlil natijalariga ko‘ ra, Surxondaryo viloyatida o‘ sgan *Mentha piperita* L. namunalarida 20 ta aminokislota aniqlanib, bu ayrim ilgari e’lon qilingan tadqiqotlar bilan bir xil yoki undan kengroq aminokislotalar profilini ko‘ rsatadi. O‘ simlik tarkibida asparagin va argininning yuqori miqdorda aniqlanishi hududning agroiqlim sharoiti hamda o‘ simlikning fiziologik holati bilan bog‘ liq bo‘ lishi mumkin. Turli tadqiqotlarda *Mentha piperita* L. o‘ simligining aminokislotalar tarkibi bo‘ yicha qiyosiy tahlili 2-jadvalda keltirilgan.

2-jadval

Turli tadqiqotlarda *Mentha piperita* L. o‘ simligining aminokislotalar tarkibi bo‘ yicha qiyosiy tahlil

Muallif(lar), yil	Tadqiqot o‘ tkazilgan mamlakat	Tahlil usuli	Aniqlangan aminokislotalar soni	Ustun aminokislotalar
Khorasani va boshqalar (2018)	Eron	HPLC	17	Asparagin, glisin, arginin
El-Sayed va boshqalar (2021)	Misr	LC–MS	18	Asparagin, alanin, tirozin
Mazkur tadqiqot	O‘ zbekiston (Surxondaryo viloyati)	Agilent Technologies 1200 HPLC	20	Asparagin, arginin, glisin, alanin, tirozin

Qiyosiy tahlil natijalariga ko‘ ra, Surxondaryo viloyatida o‘ sgan *Mentha piperita* L. namunalarida 20 ta aminokislota aniqlanib, bu ayrim ilgari e’lon qilingan tadqiqotlar bilan bir xil yoki undan kengroq aminokislotalar profilini ko‘ rsatadi. O‘ simlik tarkibida asparagin va argininning yuqori miqdorda aniqlanishi hududning agroiqlim sharoiti hamda o‘ simlikning fiziologik holati bilan bog‘ liq bo‘ lishi mumkin.

Umuman olganda, ushbu tadqiqot natijalari Surxondaryo viloyatida o‘ suvchi *Mentha piperita* L. o‘ simligining yer ustki qismi aminokislotalarning boy tabiiy manbai ekanligini tasdiqladi. Ayniqsa, asparagin, arginin va glisinning yuqori miqdorda aniqlanishi ushbu o‘ simlikning farmakologik, nutrasevtik va funksional oziq-ovqat mahsulotlari ishlab chiqarish uchun istiqbolli xomashyo ekanligini ko‘ rsatadi. Mazkur natijalar dorivor o‘ simliklarni standartlashtirish, sifat nazoratini takomillashtirish hamda ularning biologik faol moddalar tarkibini chuqur o‘ rganish bo‘ yicha kelgusidagi ilmiy tadqiqotlar uchun muhim ilmiy asos bo‘ lib xizmat qiladi.

Xulosa

Ushbu tadqiqotda Surxondaryo viloyatida 2025-yil may oyida yig‘ ilgan **Mentha piperita** L. o‘ simligining yer ustki qismi tarkibidagi aminokislotalar **Agilent Technologies 1200 Series** yuqori samarali suyuqlik xromatografiyasi (YUSSX) usuli yordamida sifat va miqdor jihatdan o‘ rganildi.

Tahlil natijasida **20 ta aminokislota** aniqlanib, ularning umumiy miqdori **45,962 mg/g** quruq o‘ simlik xomashyosini tashkil etdi. Aniqlangan aminokislotalar orasida **asparagin (11,636 mg/g), arginin (8,340 mg/g), glisin (5,164 mg/g), alanin (3,841 mg/g)** va **tirozin (3,575 mg/g)** eng yuqori miqdorlarda qayd etildi. Mazkur natijalar yalpiz o‘ simligining aminokislotalarga boy tabiiy dorivor xomashyo ekanligini tasdiqlaydi.

Asparagin va argininning yuqori konsentratsiyada aniqlanishi o‘ simlikda azot almashinuvi jarayonlari faol kechayotganini hamda ushbu aminokislotalar o‘ simlikning ekologik sharoitlarga moslashishida muhim ahamiyat kasb etishini ko‘ rsatadi. Shuningdek, glisin, alanin va tirozinning nisbatan yuqori miqdorda uchrashi *Mentha piperita* L. o‘ simligining biologik faol moddalarga boyligini va uning farmakologik salohiyatini yanada oshiradi.

Olingan natijalar O‘ zbekiston sharoitida o‘ suvchi **Mentha piperita** L. o‘ simligining aminokislotalar tarkibi bo‘ yicha yangi ilmiy ma’lumotlarni taqdim etadi. Ushbu ma’lumotlar dorivor o‘ simlik xomashyosini standartlashtirish, sifat nazoratini takomillashtirish, fitopreparatlar, biologik faol qo‘ shimchalar (nutrasevtik vositalar) hamda funksional oziq-ovqat mahsulotlarini ishlab chiqishda ilmiy asos bo‘ lib xizmat qilishi mumkin.

Kelgusida **Mentha piperita** L. o‘ simligining turli vegetatsiya bosqichlari, turli ekologik hududlarda o‘ suvchi namunalari va boshqa *Mentha* turlari bilan qiyosiy metabolomik tadqiqotlarni amalga oshirish maqsadga muvofiqdir. Bunday izlanishlar aminokislotalar biosinteziga ta’sir etuvchi ekologik va fiziologik omillarni chuqurroq o‘ rganish hamda ushbu dorivor o‘ simlikning farmatsevtik qiymatini yanada to‘ liq baholash imkonini beradi.

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KUZGI YUMSHOQ BUG‘ DOYNING F_5 DURAGAY AVLODLARIDA ALBUMIN OQSILLARINING IVISH HARORATI

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Annotatsiya: *Ushbu maqolada kuzgi yumshoq bug‘ doyning Chillaki va Fortuna navlari hamda ularning T-5 (Chillaki × Fortuna) kombinatsiyasidan olingan 9 ta F_5 duragay namunalarining boshoqlash davrida barg hujayra shirasidagi suvda eruvchan albumin oqsillarining ivish (koagulyatsiya) harorati P.A. Genkel uslubi yordamida o‘ rganildi. Tadqiqot natijalariga ko‘ ra, namunalar kesimida oqsillar koagulyatsiya harorati 55,3°C dan 62,5°C gacha oraliqda o‘ zgarib, eng yuqori ko‘ rsatkich T-5/4 duragayida (62,5°C) qayd etildi. Olingan natijalar duragaylarning issiqlik stressiga chidamlilik darajasi yuqori ekanligini ko‘ rsatadi.*

Kalit so‘ zlar: *Kuzgi yumshoq bug‘ doy, nav, albumin oqsili, barg hujayra shirasi, koagulyatsiya harorati.*

ТЕМПЕРАТУРА КОАГУЛЯЦИИ АЛЬБУМИНОВЫХ БЕЛКОВ У ГИБРИДНЫХ ПОКОЛЕНИЙ F_5 ОЗИМОЙ МЯГКОЙ ПШЕНИЦЫ

Аннотация: *В данной статье с использованием метода П.А. Генкеля изучена температура коагуляции водорастворимых белков альбумина в клеточном соке листьев в период колошения у сортов мягкой озимой пшеницы Chillaki и Fortuna, а также у 9 F_5 гибридных образцов (Chillaki × Fortuna). Согласно результатам исследования, температура коагуляции белков варьировала в пределах от 55,3°C до 62,5°C, при этом наивысший показатель был отмечен у гибрида T-5/4 (62,5°C). Полученные результаты свидетельствуют о высокой степени устойчивости гибридов к тепловому стрессу.*

Ключевые слова: *Озимая мягкая пшеница, сорт, белок альбумин, клеточный сок листа, температура коагуляции.*

COAGULATION TEMPERATURE OF ALBUMIN PROTEINS IN F_5 HYBRID PROGENIES OF BREAD WHEAT

Abstract: *This article investigates the coagulation temperature of water-soluble albumin proteins in the leaf cell sap during the heading period of bread wheat varieties Chillaki and Fortuna, as well as nine F_5 hybrid samples obtained from the T-5 (Chillaki × Fortuna) combination, using the P.A. Genkel method. According to the research results, the protein coagulation temperature ranged from 55.3°C to 62.5°C across the samples, with the highest value recorded in hybrid T-5/4 (62.5°C). The obtained results indicate a high level of heat stress tolerance in the studied hybrids.*

Key words: *Bread wheat, variety, albumin protein, leaf cell sap, coagulation temperature.*

Kirish

So‘ nggi yillarda global iqlim o‘ zgarishi hamda antropogen ta’sirlarning kuchayishi natijasida atrof-muhit holatining yomonlashuvi qishloq xo‘ jaligi ishlab chiqarishi va oziq-ovqat xavfsizligiga jiddiy xavf tug‘ dirmoqda. Ekinlarning o‘ sishi, rivojlanishi va hosildorligiga salbiy ta’sir etuvchi asosiy abiotik omillar qatoriga yuqori harorat, tuproq sho‘ rlanishi hamda qurg‘ oqchilik kiradi. Ushbu omillar ta’sirida o‘ simliklarda kechadigan fiziologik va biokimyoviy jarayonlar izdan chiqib, hosildorlik hamda mahsulot sifati pasayadi. Bug‘ doyning issiqlik stressiga

chidamliligini baholashda fiziologik ko‘ rsatkichlardan foydalanish muhim ahamiyatga ega. Xususan, barg hujayra shirasidagi suvda eruvchan albumin oqsillarining ivish (koagulyatsiya) harorati hujayra oqsillarining termik barqarorligini tavsiflovchi muhim ko‘ rsatkichlardan biri hisoblanadi. Ushbu ko‘ rsatkich asosida seleksiya jarayonida istiqbolli genotiplarni saralash va issiqlikka chidamli duragaylarni aniqlash imkoniyati yaratiladi. Mazkur tadqiqotda kuzgi yumshoq bug‘ doyning Chillaki va Fortuna navlari hamda ularning T-5 (Chillaki × Fortuna) kombinatsiyasidan olingan F_5 duragay avlodlarida boshoqlash davrida barg hujayra shirasidagi suvda eruvchan albumin oqsillarining ivish harorati aniqlanib, duragaylarning issiqlik stressiga chidamliligi qiyosiy baholandi.

Adabiyotlar tahlili

Issiqlik stressi o‘ simliklar o‘ zlarining optimal o‘ sish va rivojlanish haroratidan yuqori bo‘ lgan sharoitda uzoq muddat davomida qolishi natijasida yuzaga keladigan asosiy abiotik stress omillaridan biridir. Ushbu stressning kuchayishiga issiqxona gazlari va xlorftoruglerodlar emissiyasining ortishi, atmosfera tarkibida CO_2 konsentratsiyasining oshishi hamda inson faoliyati bilan bog‘ liq antropogen ta’sirlar sabab bo‘ lmoqda. Bunday o‘ zgarishlar global iqlim tizimining izchil isishiga olib kelib, qishloq xo‘ jaligi ekinlarining o‘ sishi, rivojlanishi va hosildorligiga salbiy ta’sir ko‘ rsatadi. Shu sababli iqlim o‘ zgarishining ekinlar mahsuldorligiga ta’sirini baholash, hosildorlikdagi ehtimoliy o‘ zgarishlarni oldindan prognoz qilish hamda moslashuv strategiyalarini ishlab chiqish maqsadida turli modellashtirish yondashuvlari va prognozlash modellari keng qo‘ llanilmoqda [**1**]. Yuqori harorat o‘ simliklarning generativ rivojlanish bosqichini jadallashtirib, fotosintez mahsulotlarining meva va urug‘ hosil bo‘ lishiga yo‘ naltirilishini cheklaydi. Shuningdek, tuproq haroratining me’yoridan ortishi urug‘ larning unib chiqish jarayoniga salbiy ta’sir ko‘ rsatib, maysalarning bir tekis rivojlanishiga to‘ sqinlik qilishi mumkin. Yuqori haroratning uzoq muddat davom etishi o‘ simliklarning o‘ sishi va rivojlanishini izdan chiqaradi, fiziologik jarayonlar muvozanatini buzadi hamda suv tanqisligini yanada kuchaytiradi. Natijada qurg‘ oqchilik stressi chuqurlashib, hosildorlikning keskin pasayishiga, ayrim hollarda esa o‘ simliklarning nobud bo‘ lishiga olib kelishi mumkin [**2**]. Yuqori harorat stressining salbiy ta’siri bug‘ doy, sholi, makkajo‘ xori, marvarid tariq, jo‘ xori, arpa, *Brachypodium*, *Arabidopsis*, no‘ xat va pomidor kabi ko‘ plab madaniy o‘ simliklarda kuzatiladi. Haroratning me’yoridan ortishi o‘ simliklarning o‘ sishi va rivojlanishiga salbiy ta’sir ko‘ rsatib, hosil shakllanish jarayonini izdan chiqaradi hamda hosil yig‘ imidan oldingi va keyingi yo‘ qotishlarning ortishiga sabab bo‘ ladi. Bunday o‘ zgarishlar barglarning quyosh ta’sirida kuyishi, barg, poya, novda va shoxchalarning qurishi, ildiz tizimi rivojlanishining susayishi hamda mevalar rangining o‘ zgarishi kabi morfologik belgilar bilan namoyon bo‘ ladi. Bundan tashqari, yuqori haroratning uzoq muddat davom etishi barglarning o‘ lchami, shakli va orientatsiyasiga ham ta’sir ko‘ rsatadi. Barglar fotosintezning asosiy organi bo‘ lganligi sababli, ular issiqlik stressiga eng tez javob qaytaruvchi va stressning dastlabki tashqi belgilarini namoyon etuvchi vegetativ organlardan biri hisoblanadi. Shu bois barglarda kuzatiladigan morfologik va fiziologik o‘ zgarishlar o‘ simliklarning issiqlikka chidamliligini baholashda muhim diagnostik mezon sifatida qaraladi [**3**].

Bug‘ doy dunyo miqyosida asosiy oziq-ovqat ekinlaridan biri sifatida oziq-ovqat xavfsizligi va oqsil ta’minotida muhim rol o‘ ynaydi hamda umumiy jahon don mahsulotlarining 11,1% ini va insoniyatning umumiy oqsil ehtiyojining 20,3% ini ta’minlaydi [4]. Bug‘ doy sifati, avvalo, uning oziqaviy qiymati hamda texnologik-qayta ishlash xususiyatlari bilan tavsiflanadi. Oziqaviy sifat albumin va globulin miqdori, aminokislotalar tarkibi, ayniqsa lizin kabi muhim aminokislotalar miqdori hamda boshqa oziq moddalar tarkibi bilan bog‘ liq [5]. Bug‘ doyning sifat ko‘ rsatkichlari genetik xususiyatlar, tashqi muhit omillari va ularning o‘ zaro ta’siri bilan belgilanadi [6]. Tuproqdagi namlik darajasi, yorug‘ lik intensivligi, tuproq xususiyatlari, harorat hamda atmosferadagi CO miqdorining ortishi kabi ko‘ plab ekologik omillar bug‘ doy sifatiga ta’sir ko‘ rsatishi aniqlangan [7]. Don hosil bo‘ lishi va to‘ lishi bosqichlaridagi haroratning o‘ zgaruvchanligi bug‘ doy doni sifatiga sezilarli ta’sir ko‘ rsatib, global qishloq xo‘ jaligi uchun muhim muammolardan biri hisoblanadi. 2035-yilga borib dunyo bo‘ yicha o‘ rtacha harorat taxminan 0,35-0,70°C ga oshishi taxmin qilinmoqda [8]. Issiqlik stressi don to‘ lish davrini qisqartiradi, bu bosqich oqsil va kraxmal to‘ planishi uchun muhim bo‘ lib, natijada umumiy oqsil miqdori kamayadi hamda uning tarkibi o‘ zgaradi [9]. Bug‘ doy vegetativ bosqichlarga nisbatan reproduktiv rivojlanish davrida yuqori harorat ta’siriga ko‘ proq sezgir hisoblanadi [10].

Barg haroratining oshishi natijasida issiqlik stressiga uchragan bug‘ doy o‘ simligida barglarning suv potensiali va nisbiy suv miqdori keskin kamayadi, oqibatda fotosintez samaradorligi pasayadi [11]. Don to‘ lish davrida kuzatiladigan issiqlik stressi oziq moddalarning o‘ simlik bo‘ ylab harakatlanishini susaytiradi [12]. Barg hujayralaridagi suvda eriydigan oqsillarning koagulyatsiya harorati bilan bug‘ doyning issiqlikka chidamlilik xususiyati o‘ zaro bog‘ liq hisoblanadi [13]. O‘ simliklarning yuqori haroratga moslashuvchi himoya reaksiyalaridan biri oqsillarning koagulyatsiya haroratining oshishidir [14]. Bug‘ doy barglarining suvni yuqori darajada saqlashi muhim ahamiyatga ega. Sut-mum pishish davrida barglarda suvning 60% va undan ortig‘ ining saqlanib qolishi qurg‘ oqchil hududga moslashgan navlarga xos belgi bo‘ lib, seleksiya uchun muhim ko‘ rsatkich hisoblanadi [15].

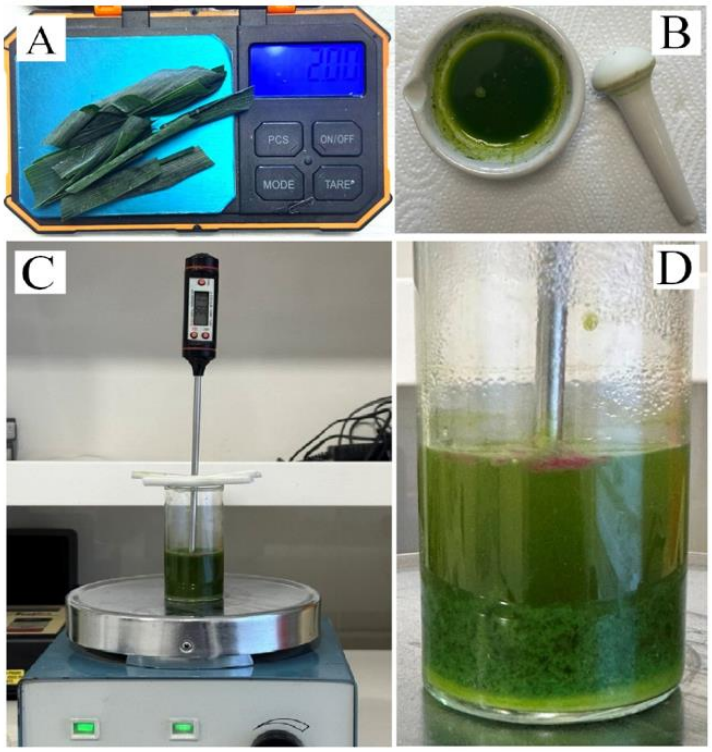
2025-2026-yillarda Xorazm viloyatida olib borilgan tadqiqotlarda ayrim navlarda bargdagi suvda eruvchan albumin oqsillarining ivish harorati aniqlangan. Unga ko‘ ra, 2025-yilda navlarning bargdagi suvda eruvchan albumin

oqsilining ivish harorati o‘ rtacha 57,9ºC dan 63,2ºC gacha oraliqda bo‘ lib, eng yuqori natija Bo‘ zqal’a (62,8ºC) va Yonbosh (63,2ºC) navlarida qayd qilingan. 2026-yilda navlarning oqsil koagulyatsiyasi aniqlanganda eng past natija Kate-A1 navida kuzatilib 56,6ºC ga teng bo‘ lgan. Qolgan navlarda Kate-A1 naviga nisbatan oqsil koagulyatsiyasi ±0,3 dan 6,9ºC gacha yuqori ko‘ rsatkichni qayd qilgan. 2026-yilda o‘ rganilgan navlar ichida eng yuqori natija Bo‘ zqal’a navida (63,5ºC) kuzatilgan [16].

Tadqiqot metodologiyasi

Tadqiqot obyekti sifatida kuzgi yumshoq bug‘ doyning Chillaki, Fortuna kabi ota-ona shakllari va T-5 (Chillaki x Fortuna) kombinatsiyasidan olingan 9 ta F_5 duragay namunalari olindi.

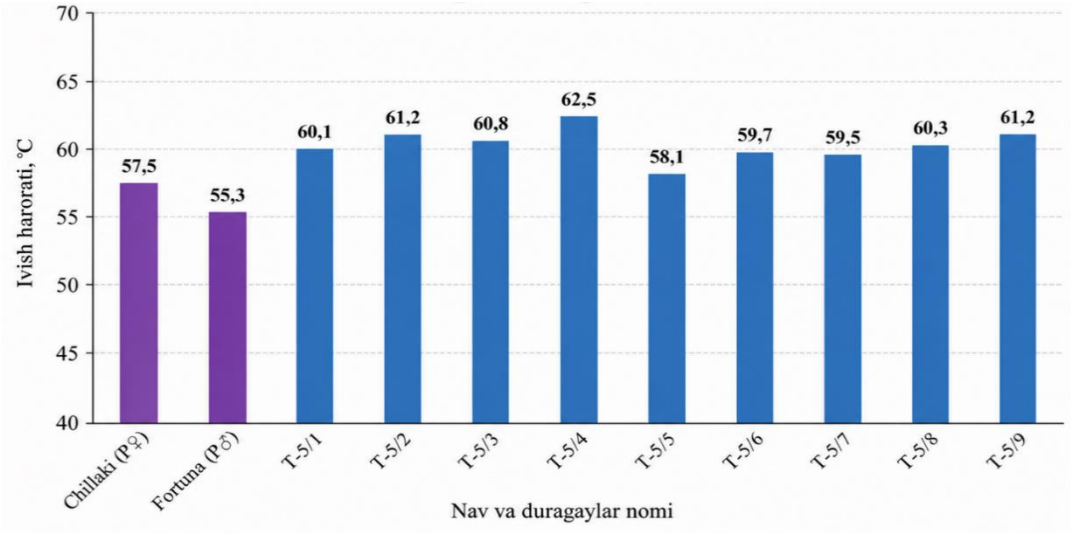
Tadqiqot uslublari. Navlar va duragaylarning boshoqlash davrida barg hujayra shirasi tarkibidagi suvda eruvchi albumin oqsillarining ivish (koagullanish) harorati P.A.Genkel uslubi yordamida o‘ rganildi. Ushbu uslub yordamida albuminlar koagulyatsiyasini aniqlash uchun 2,0 gramm barg namunasi olinib, olingan namuna ustiga 25 ml distillangan suv quyib chinni havonchada yaxshilab eziladi. Barg hujayra shirasi ajratib olinib, filtrlanadi. Filtrlangan eritma elektr plitka ustiga qo‘ yilib qizdiriladi (1-rasm). Albumin oqsillarining ivish (koagullanish) harorati aniqlanadi va natijalar qayd etiladi [17].



1-rasm. P.A.Genkel uslubi yordamida albumin oqsillarining koagullanish harorati aniqlash jarayoni. A) kerakli barg namunasini o‘ lchash, B) barg hujayra shirasi ajratib olish, C)barg shirasi ekstraktiga harorat ta’sir qildirish jarayoni, D)koagulyatsiyaga uchragan albumin oqsillari.

Natijalar va ularning tahlili

Laboratoriya sharoitida olib borilgan tadqiqotlarda Chillaki va Fortuna navlari hamda ular ishtirokida olingan duragaylarning barg hujayra shirasidagi suvda eruvchan albumin oqsillarining ivish harorati o‘ rganildi. Tadqiqot natijalariga ko‘ ra, namunalar kesimida oqsil koagulyatsiyasi harorati 55,3°C dan 62,5°C gacha oraliqda o‘ zgardi. Ota-ona shakllari orasida eng yuqori ko‘ rsatkich Chillaki navida kuzatilib, albumin oqsillarining ivish harorati 57,5°C ni tashkil etdi. Fortuna navida esa ushbu ko‘ rsatkich 55,3°C bo‘ lib, tadqiqotdagi eng past natija sifatida qayd etildi (2-rasm). Bu esa Fortuna naviga nisbatan Chillaki navining yuqori harorat ta’siriga nisbatan hujayra oqsillarini barqarorroq saqlash xususiyatiga ega ekanligini ko‘ rsatadi.



2-rasm. Navlar va duragaylar barg hujayra shirasidagi albumin oqsillarining ivish harorati, °C

Duragaylar orasida albumin oqsillarining ivish harorati ota-ona shakllariga nisbatan ancha yuqori bo‘ ldi. Eng yuqori natija T-5/4 duragayida kuzatilib, 62,5°C ni tashkil etdi. Shuningdek, T-5/2 va T-5/9 duragaylarida ham yuqori ko‘ rsatkichlar qayd etilib, bir xil ravishda 61,2°C ga teng bo‘ ldi. T-5/3 duragayida 60,8°C, T-5/8 duragayida 60,3°C va T-5/1 duragayida 60,1°C natijalar aniqlandi. Tajriba uchun olingan qolgan duragay namunalarida nisbatan pastroq ko‘ rsatkichlar kuzatilgan bo‘ lsa-da, ular ham ota-ona navlaridan yuqori natija qayd etdi.

Xulosa

Kuzgi yumshoq bug‘ doy navlari va duragaylarining barg hujayra shirasidagi albumin oqsillari koagulyatsiyasini aniqlash ularning yuqori harorat stressi hamda suv tanqisligi sharoitlariga bardoshliligini baholashda muhim fiziologik ko‘ rsatkichlardan biri hisoblanadi. Albumin oqsillarining ivish haroratining yuqori bo‘ lishi hujayra protoplazmasining termik barqarorligi yuqori ekanligini va o‘ simlikning noqulay muhit omillariga nisbatan chidamliligini tavsiflaydi.

Tadqiqot natijalariga ko‘ ra, ota-ona shakllari orasida eng yuqori ko‘ rsatkich Chillaki navida (57,5°C), eng past ko‘ rsatkich esa Fortuna navida (55,3°C) kuzatildi. Duragaylar orasida albumin oqsillarining ivish harorati 58,1–62,5°C oralig‘ ida o‘ zgarib, eng yuqori natija T-5/4 duragayida (62,5°C), undan keyingi yuqori ko‘ rsatkichlar T-5/2 va T-5/9 duragaylarida (61,2°C) qayd etildi. Mazkur duragaylarda oqsillarning yuqori haroratlarda koagulyatsiyaga uchrashi ularning issiqlik stressiga nisbatan yuqori chidamlilikka ega ekanligini ko‘ rsatadi. Shu sababli, T-5/4, T-5/2 va T-5/9 duragaylarini yuqori harorat va suv tanqisligi sharoitlariga moslashgan yangi navlarni yaratish jarayonida istiqbolli seleksiya materiali sifatida baholash mumkin.

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MALINA (*RUBUS IDAEUS* L.) GENOTIPLARINING OPTIMAL SHAROITIDA SUV SAQLASH REJIMI VA XLORAFILL INDEKSI O‘ RTASIDAGI GENOTIPIK MUNOSABATLAR TAHLILI

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Annotatsiya: *Ushbu tadqiqotda optimal dala sharoitida o‘ stirilgan 18 ta malina (Rubus idaeus L.) navlarining barglaridagi nisbiy suv miqdori (RWC) va xlorofill indeksi (SPAD) o‘ rtasidagi genotipik munosabatlar hamda navlararo farqlar tahlil qilingan. Bargning nisbiy suv miqdori Barrs va Weatherley uslubi, xlorofill miqdori esa SPAD-502Plus portativ xlorofill-metri yordamida aniqlandi. Natijalarga ko‘ ra, RWC ko‘ rsatkichi navlar kesimida 82,99% (Zyugana sariq) dan 89,69% (Enrosadira) gacha, SPAD ko‘ rsatkichi esa 35,79 (Tibetskiy) dan 46,75 (Sariq gigant) birlikgacha o‘ zgarishi aniqlandi. Tukey HSD testi har ikki ko‘ rsatkich bo‘ yicha navlararo statistik jihatdan ishonchli farqlar mavjudligini tasdiqladi. Pearson korrelyatsion tahlili normal o‘ sish sharoitida RWC va SPAD ko‘ rsatkichlari o‘ rtasida chiziqli bog‘ liqlik yo‘ qligini ko‘ rsatdi (r=−0,040, p>0,05). Bu esa optimal sharoitda suv rejimi va xlorofill to‘ planishi mustaqil genetik mexanizmlar orqali boshqarilishini anglatadi. Tadqiqot yakunida yuqori fiziologik va fotosintetik salohiyatga ega bo‘ lgan Enrosadira hamda Karamelka navlari seleksiyada boshlang‘ ich qimmatli donorlar sifatida tavsiya etildi.*

Kalit so‘zlar: *malina (Rubus idaeus L.), genotip, nisbiy suv miqdori (RWC), xlorofill indeksi (SPAD), korrelyatsiya, Tukey testi, seleksiya, donor.*

АНАЛИЗ ГЕНОТИПИЧЕСКОЙ ВЗАИМОСВЯЗИ МЕЖДУ ВОДОСБЕРЕГАЮЩИМ РЕЖИМОМ И ИНДЕКСОМ ХЛОРОФИЛЛА У ГЕНОТИПОВ МАЛИНЫ *(RUBUS IDAEUS L.)* В ОПТИМАЛЬНЫХ УСЛОВИЯХ

Аннотация: *В данной работе проведен анализ генотипических взаимосвязей и межсортовых различий между относительным содержанием воды (RWC) и индексом хлорофилла (SPAD) в листьях 18 сортов малины (Rubus idaeusL.), выращенных в оптимальных полевых условиях. Относительное содержание воды в листьях определяли по методу Баррса и Уэзерли, а содержание хлорофилла экспресс-методом с помощью портативного хлорофиллометра SPAD-502Plus. Согласно результатам, показатель RWC варьировал от 82,99% (сорт Зюгана желтая) до 89,69% (сорт Энросадира), а значения SPAD — от 35,79 (сорт Тибетский) до 46,75 единиц (сорт Сарыг гигант). Критерий Тьюки (Tukey HSD) подтвердил статистически достоверные различия между сортами по обоим параметрам. Корреляционный анализ Пирсона показал отсутствие линейной зависимости между RWC и SPAD в нормальных условиях выращивания (r=−0,040,p>0,05). Это свидетельствует о том, что при отсутствии водного стресса водный режим и накопление хлорофилла регулируются независимыми генетическими механизмами. В качестве ценных доноров для селекции рекомендованы сорта Энросадира и Карамелька, продемонстрировавшие высокий физиологический и фотосинтетический потенциал.*

Ключевые слова: *малина (Rubus idaeus L.), генотип, относительное содержание воды (RWC), индекс хлорофилла (SPAD), корреляция, тест Тьюки, селекция, донор.*

ANALYSIS OF THE GENOTYPIC CORRELATION BETWEEN WATER-USE EFFICIENCY AND CHLOROPHYLL INDEX IN RASPBERRY *(RUBUS IDAEUS L.)* GENOTYPES UNDER OPTIMAL CONDITIONS

Abstract: *This study analyzes the genotypic relationships and cultivar variations between relative water content (RWC) and chlorophyll index (SPAD) in the leaves of 18 raspberry (Rubus idaeus L.) cultivars grown under optimal field conditions. Leaf relative water content was determined using the Barrs and Weatherley method, and chlorophyll content was measured using a portable SPAD-502Plus chlorophyll meter. The results showed that RWC varied from 82.99% (Zyugana sariq) to 89.69% (Enrosadira), while SPAD values ranged from 35.79 (Tibetskiy) to 46.75 units (Sariq gigant). The Tukey HSD test confirmed statistically significant differences among the cultivars for both parameters. Pearson correlation analysis indicated no significant linear correlation between RWC and SPAD under optimal growth conditions ($r=-0.040, p>0.05$). This suggests that under non-stress conditions, water status and chlorophyll accumulation are regulated by independent genetic mechanisms. Conclusively, the cultivars Enrosadira and Karamelka, which exhibited high physiological and photosynthetic potential, are recommended as valuable starting donors for raspberry breeding programs.*

Keywords: *raspberry (Rubus idaeus L.), genotype, relative water content (RWC), chlorophyll index (SPAD), correlation, Tukey test, breeding, donor.*

Kirish

Malina (*Rubus idaeus* L.) Rosaceae oilasiga mansub ko‘p yillik rezavor meva ekini bo‘lib, yuqori biologik va oziqaviy qiymati bilan ajralib turadi. Rezavor meva tarkibidagi polifenollar, antotsianlar, fruktoza, glyukoza hamda hayotiy muhim vitaminlar (ayniqsa, C va E vitaminlari) inson organizmida antioksidantlik va immunomodulyatorlik xususiyatlarini namoyon qilishi ko‘plab tadqiqotlarda o‘z isbotini topgan [6]. So‘nggi yillarda malina seleksiyasida nafaqat hosildorlik va meva sifati, balki o‘simliklarning fiziologik xususiyatlarini baholash ham ustuvor yo‘nalishlardan biriga aylandi. Ayniqsa barglarning nisbiy suv miqdori (*Relative Water Content* – RWC) hamda xlorofill miqdorini ifodalovchi SPAD indeksi o‘simliklarning fiziologik holatini tavsiflovchi muhim indikatorlar sifatida keng qo‘llanilmoqda .

Bargning nisbiy suv miqdori - o‘simlik to‘qimalarining suv bilan ta’minlanganlik darajasini va hujayralardagi turgor bosimini xarakterlovchi asosiy gidrologik ko‘rsatkichdir [1]. Ilmiy adabiyotlarda keltirilishicha, optimal sharoitda RWC darajasi yuqori bo‘lgan genotiplar barg stomalarining o‘tkazuvchanligini yaxshiroq boshqaradi va hujayra metabolizmini barqaror ushlab turadi [3]. RWC ko‘rsatkichi nafaqat qurg‘oqchilik sharoitida o‘simlikning chidamliligini, balki normal agrotexnik sharoitda ham navlarning o‘ziga xos transpiratsiya samaradorligi va suvni tejash strategiyalarini ochib beruvchi ishonchli marker hisoblanadi [5].

Bargdagi pigmentlar tizimining faolligi va xlorofill miqdori bevosita fotosintez jarayonining jadalligi hamda birlamchi organik modda to‘planish tezligini belgilaydi. SPAD-502 portativ asbobi yordamida aniqlanadigan xlorofill indeksi barg to‘qimalariga shikast yetkazmasdan turib fotosintetik salohiyatni tezkor va aniq baholash imkonini beradi [7]. Tadqiqotlar shuni ko‘rsatadiki, xlorofill zichligi yuqori bo‘lgan genotiplar yorug‘lik energiyasidan samaraliroq foydalanadi va bu ko‘rsatkich o‘simlikning mineral oziqlanishni (ayniqsa, azotni) o‘zlashtirish darajasiga bevosita bog‘liqdir [2]. Normal o‘sish sharoitida SPAD qiymatining yuqoriligi navning yuqori biologik mahsuldorlik salohiyatiga ega ekanligidan dalolat beradi.

Material va metodlar

Ushbu tadqiqotda optimal sharoitida o‘stirilgan 18 ta malina navlarida barglarning nisbiy suv miqdori (RWC, %) ko‘rsatkichlari Barrs va Weatherley uslubi bo‘yicha aniqlandi [1]. Barglardagi xlorofill miqdorini ekspress baholash maqsadida esa Konica Minolta SPAD-502Plus (Yaponiya) portativ xlorofill-metri apparatidan foydalanildi. Shuningdek, ularning o‘zaro korrelyatsiyasi hamda navlararo farqlanish tabiati statistik tahlil qilindi.

Natijalar va ularning tahlili

Optimal sharoitda o‘simlik barglarining suv bilan to‘yinganligi - ularning genetik jihatdan belgilangan suvni saqlash hamda transpiratsiyani muvofiqlashtirish xususiyatlarini aks ettiradi.

O‘rganilgan malina navlarida barglarning nisbiy suv miqdori (RWC) 82.99% dan 89.69% gacha bo‘lgan diapazonda o‘zgarishi aniqlandi. Bu barcha navlarda barglarning suv bilan yaxshi ta’minlanganligini ko‘rsatadi.

Eng yuqori suv saqlash darajasi Enrosadira (89.69 ± 0.4%, Tukey testi bo‘yicha “a” guruhi) va Karamelka (89.37 ±1.0%, “a” guruhi) navlarida qayd etildi. Shuningdek, *Polka* va *Polonez* (88.81%, “ab” guruhi) navlari ham turgor holatini yuqori darajada ushlab tura olish darajasi qayd etildi. Ushbu natijalar mazkur navlarning barg anatomiyasi, kutikula qalinligi, mezofill tuzilishi hamda suv almashinuvining genotipik xususiyatlari bilan izohlanishi mumkin.

Shuningdek, Zvugana sariq (82,99±0,2 %), Amarant (83,04±0,5 %), Delniva (83,17±0,3 %) va Tibetskiy (83,76±0,5 %) navlarida nisbiy suv miqdori eng past qiymatlarda qayd etildi. Biroq ushbu ko‘ rsatkichlar ham fiziologik me’yor doirasida bo‘ lib, navlarning suv bilan yetarli ta’minlanganligini ko‘ rsatadi.

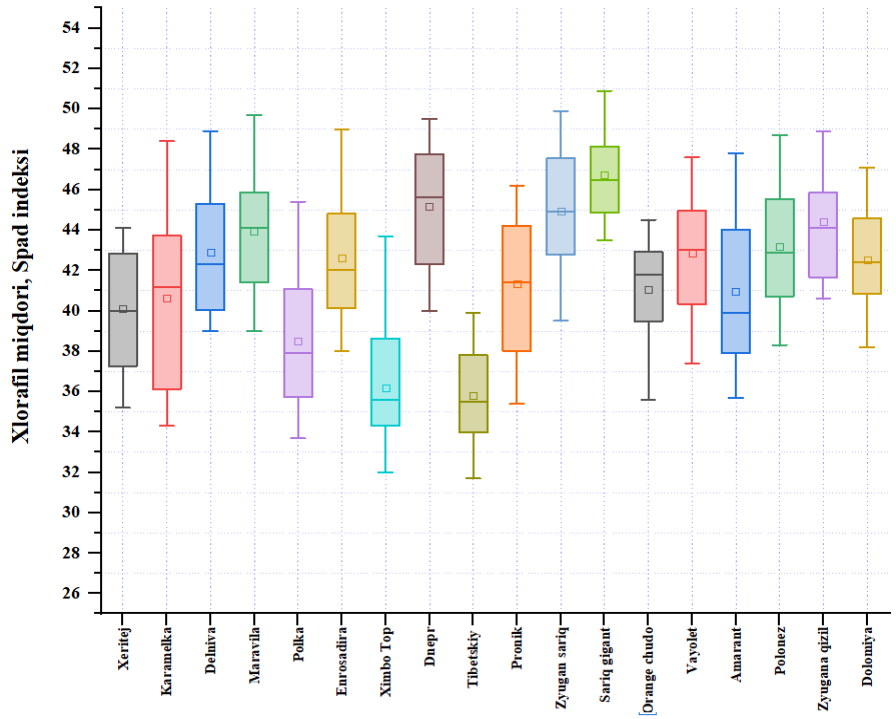
1-jadval

Malina (*Rubus idaeus* L.) navlarining barglaridagi nisbiy suv miqdori ko‘ rsatkichlari va ularning statistik tahlili. (Tukey HSD testi, α=0.05).

	Mean	Mean± SE	SD	CV, %
1	Enrosadira	89.69 ± 0.4 a	0.73	0.81
2	Karamelka	89.37 ±1.0 a	1.83	2.04
3	Polka	88.81 ± 0.7 ab	1.31	1.47
4	Polonez	88.81 ± 0.4 ab	0.76	0.85
5	Maravila	88.42 ± 0.6 abc	1.06	1.19
6	Ximbo top	88.20 ± 0.1 abcd	0.29	0.32
7	Zyugana qizil	87.55 ± 0.3 abcde	0.52	0.59
8	Dnepr	87.25 ± 0.5 abcdef	0.93	1.06
9	Pronik	87.12 ± 1.0 abcdef	1.85	2.12
10	Dolomiya	85.96 ± 0.4 bcdefg	0.83	0.96
11	Heritage	85.48 ± 0.3 cdefg	0.54	0.63
12	Sariq gigant	85.41 ± 0.4 defg	0.72	0.84
13	Violet	85.10 ± 0.5 efg	0.86	10.1
14	Orange chudo	84.40 ± 0.3 fg	0.58	0.68
15	Tibetskiy	83.76 ± 0.5 g	0.97	1.15
16	Delniva	83.17 ± 0.3 g	0.63	0.75
17	Amarant	83.04 ± 0.5 g	0.98	1.18
18	Zyugana sariq	82.99 ± 0.2 g	0.36	0.43

Jadvalda keltirilgan Tukey HSD testi natijalari navlar o‘ rtasida suv miqdori bo‘ yicha ishonchli statistik farqlar mavjudligini tasdiqlaydi (α=0,05). Demak, barglarning suv bilan ta’minlanganlik darajasi asosan navlarning genetik xususiyatlariga bog‘ liq holda shakllanadi. Variatsiya koeffitsienti (CV) barcha navlarda 0,32–2,12 % oralig‘ ida bo‘ ldi. Bunday past qiymatlar tajriba natijalarining yuqori aniqlikda olinganligini hamda biologik takrorlar orasidagi tafovut juda kam ekanligini ko‘ rsatadi.

Barglardagi xlorofill (SPAD indeksi) ko‘ rsatkichlarining navlararo farqlanishiga ko‘ ra, optimal sharoitda xlorofill miqdori cheklovchi omillardan xoli bo‘ lib, to‘ g‘ ridan-to‘ g‘ ri navning fotosintetik salohiyatini, barg mezofilli tuzilishini va mineral oziqlanishni o‘ zlashtirish tezligini ko‘ rsatadi. 2-jadval ma’lumotlari malina navlari o‘ rtasida SPAD indeksining ko‘ rsatkichlari 35,79–46,75 birlik oralig‘ ida o‘ zgardi. Bu navlar fotosintetik apparatining rivojlanish darajasi bir xil emasligini ko‘ rsatadi.



1-rasm. Malina (*Rubus idaeus* L.) navlarining barglaridagi xlorafil (SPAD indeksi) miqdori ko‘ rsatkichlari va ularning statistik tahlili

Xlorofillning eng yuqori zichligi ya’ni SPAD qiymati Sariq gigant navida (46,75±0,4) qayd etildi. Undan keyingi o‘ rinlarni Dnepr (45,18±0,6), Zvugana sariq (44,92±0,7) va Zvugana qizil (44,42±0,6) navlarida tahlil qilindi. Mazkur navlarda barglarning to‘ q yashil rangi va xlorofill pigmentlarining nisbatan yuqori miqdori kuzatilgan bo‘ lib, bu fotosintetik salohiyatning yuqoriligini ko‘ rsatadi. Bu navlar fotosintezning birlamchi jarayonlarida yuqori quyosh energiyasini yutish xususiyatiga ega.

Aksincha, Tibetskiy (35,79±0,5), Ximbo Top (36,18±0,6) hamda Polka (38,49±0,7) navlarida SPAD qiymatlari eng past bo‘ ldi. Bu navlarda barg pigmentatsiyasi boshqa navlarga nisbatan sustroq ekanligini bildiradi. SPAD ko‘ rsatkichlari bo‘ yicha ham Tukey HSD testi navlar o‘ rtasida statistik jihatdan ishonchli farqlar mavjudligini ko‘ rsatdi (α=0,05). Bu esa xlorofill biosintezi va barg pigmentlarining to‘ planishi genotipga xos belgi ekanligini tasdiqlaydi. SPAD bo‘ yicha variatsiya koeffitsienti 4,62–10,70 % oralig‘ ida bo‘ ldi. Ushbu qiymatlar RWC ga nisbatan biroz yuqori bo‘ lib, fotosintetik pigmentlar miqdori suv miqdoriga qaraganda genotiplar orasida ko‘ proq farqlanishini ko‘ rsatadi.

Muhokama

O‘ simliklar fiziologiyasi qonuniyatlariga binoan, kuchli suvsizlik stressi paydo bo‘ lgandagina hujayra turgorining yo‘ qolishi (RWC pasayishi) oqibatida bargda xlorofill apparatining parchalanishi (SPAD pasayishi) yuz beradi va ular o‘ rtasida sun’iy ijobiy korrelyatsiya shakllanadi. Biroq, bizning tadqiqotimiz normal dala sharoitida (optimumda) o‘ tkazilganligi sababli, suv tanqisligi o‘ simliklar uchun cheklovchi omil hisoblanmaydi. Bunday optimal muhitda har bir genotip o‘ zining individual anatomik va adaptiv xususiyatlarini namoyon qiladi.

Enrosadira (RWC = 89.6, SPAD = 42.63) va Karamelka (RWC = 89.37%, SPAD = 40.62) navlari normal sharoitning o‘ zidayoq har ikki muhim parametr bo‘ yicha ham eng yuqori ko‘ rsatkichlarni namoyon qildi. Bu ularning genotipi ham suv balansini yuqori turgor darajasida ushlashni, ham fotosintez faolligini bir vaqtning o‘ zida muvofiqlashtirish xususiyatiga ega ekanligini anglatadi.

Normal dala sharoitida malina genotiplarining suv rejimi va xlorofill to‘ plash ko‘ rsatkichlari bir-biriga bog‘ liq bo‘ lmagan holda, mustaqil genetik mexanizmlar orqali boshqariladi. Normal agrotexnik sharoitda ham yuqori suv tejash qobiliyati, ham faol pigment tizimining optimal muvozanatiga ega bo‘ lgan Enrosadira va Karamelka navlari eng istiqbolli genotiplar deb belgilandi hamda ulardan seleksiyada boshlang‘ ich qimmatli donorlar sifatida foydalanish tavsiya etiladi.

Pearson korrelyatsion tahlili natijasida barglarning nisbiy suv miqdori bilan SPAD indeksi o‘ rtasida r = –0,040 (p>0,05) korrelyatsiya aniqlandi. Ushbu qiymat nolga juda yaqin bo‘ lib, ikki ko‘ rsatkich o‘ rtasida statistik jihatdan ishonchli chiziqli bog‘ liqlik mavjud emasligini ko‘ rsatadi. Mazkur natija shuni anglatadiki, normal dala sharoitida malina navlarida barglarning suv bilan ta’minlanganlik darajasi fotosintetik pigmentlarning to‘ planish darajasini bevosita belgilamaydi. Boshqacha aytganda, suv almashinuvi va xlorofill biosintezi turli fiziologik mexanizmlar orqali

boshqariladi. Bu holat bir necha omillar bilan izohlanishi mumkin. Birinchidan, barglarning nisbiy suv miqdori asosan hujayra turgori, osmotik bosim va suv almashinuvi jarayonlariga bog‘ liq. Ikkinchidan, SPAD ko‘ rsatkichi bargning anatomik tuzilishi, mezofill qalinligi, xloroplastlar soni, azot bilan ta’minlanganlik va genotipga xos pigment sintezi intensivligiga bog‘ liq. Shu sababli ushbu ikki fiziologik ko‘ rsatkichning o‘ zgarishi bir xil yo‘ nalishda kechmasligi tabiiy hol hisoblanadi.

Xulosa

Tadqiqot natijalari malina navlari barglarining suv bilan ta’minlanganligi va xlorofill miqdori bo‘ yicha sezilarli genotipik farqlarga ega ekanligini ko‘ rsatdi. Enrosadira navi barglarda suvni saqlash qobiliyati bo‘ yicha, Sariq gigant navida esa fotosintetik pigmentlar miqdori bo‘ yicha yuqori natijalar qayd etildi. Maravilla, Dnepr va Zvugana qizil navlari ikkala fiziologik ko‘ rsatkich bo‘ yicha ham yuqori ko‘ rsatkichlarga ega bo‘ lib, vegetativ rivojlanish va fotosintetik salohiyatning uyg‘ un shakllanganligi bilan ajralib turdi. Pearson korrelyatsion tahlili esa RWC va SPAD o‘ rtasida ishonchli bog‘ liqlik mavjud emasligini ko‘ rsatdi. Bu normal dala sharoitida ushbu belgilar malina genotiplarida nisbatan mustaqil shakllanishini va navlarning fiziologik tavsifini kompleks baholash zarurligini tasdiqlaydi.

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SUV TEJAMKOR SUG‘ ORISH SHAROITIDA SOYA NAVLARINING O‘ SISH KO‘ RSATKICHLARI

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Annotatsiya: *Mazkur tadqiqotimizda tomchilatib va egatlab sug‘ orish usullari orqali yetishtirilgan soyaning* ***“Nafis”, “Madad”, “Orzu” va “Sevinch”*** *navlarining kunlik o‘ sish dinamikasi o‘ rganilgan. Dala tajribalarida rivojlanish fazalaring chinbarg, g‘ unchalash, gullash va dukkaklash bosqichlaridagi o‘ rtacha bo‘ yi hamda absolyut o‘ sish tezligi (AGR) aniqlandi. Tadqiqot natijalariga ko‘ ra, barcha navlarda o‘ simlik bo‘ yining eng jadal o‘ sishi gullash bosqichida kuzatildi, dukkaklash bosqichida esa kunlik o‘ sish tezligi pasayishi aniqlandi. Tomchilatib sug‘ orish sharoitida “Nafis”, “Madad” va “Sevinch” navlarida absolyut o‘ sish tezligi hamda o‘ rtacha o‘ simlik bo‘ yi egatlab sug‘ orishga nisbatan kam miqdorda yuqori ekanligi kuzatildi. Eng yuqori absolyut o‘ sish tezligi “Madad” navida gullash bosqichida* ***1,52 sm/kun,*** *eng past ko‘ rsatkich esa Orzu navining chinbarg bosqichida* ***0,43 sm/kun*** *ni tashkil etdi. Olingan natijalar tomchilatib sug‘ orish o‘ simliklarning vegetativ o‘ sishi va kunlik o‘ sish dinamikasini barqarorlashtirish hamda yuqori morfobiologik ko‘ rsatkichlarni shakllantirishda samaraliroq sug‘ orish usuli ekanligini isbotlaydi.*

Kalit so‘ zlar: *Absolyut o‘ sish tezligi (AGR),* ***“Nafis”, “Madad”, “Orzu”, “Sevinch”,*** *tomchilatib sug‘ orish, egatlab sug‘ orish, o‘ sish dinamikasi.*

РОСТОВЫЕ ПОКАЗАТЕЛИ СОРТОВ СОИ В УСЛОВИЯХ ВОДОСБЕРЕГАЮЩЕГО ОРОШЕНИЯ

Аннотация: *В данном исследовании изучена динамика суточного роста сортов сои «Нафис», «Мадад», «Орзу» и «Севинч, выращенных в условиях капельного и бороздкового орошения. В полевых опытах определяли среднюю высоту растений и абсолютную скорость роста (AGR) в фазы развития первого настоящего листа, бутонизации, цветения и формирования бобов. Результаты исследований показали, что у всех изученных сортов наиболее интенсивный рост растений наблюдался в фазу цветения, тогда как в фазу формирования бобов отмечалось снижение суточной скорости роста. В условиях капельного орошения у сортов «Нафис», «Мадад» и «Севинч» абсолютная скорость роста и средняя высота растений были несколько выше по сравнению с бороздковым орошением. Максимальная абсолютная скорость роста отмечена у сорта «Мадад» в фазу цветения и составила 1,52 см/сутки, тогда как минимальное значение (0,43 см/сутки) зарегистрировано у сорта «Орзу» в фазу первого настоящего листа. Полученные результаты свидетельствуют о том, что капельное орошение является более эффективным способом полива, обеспечивающим стабилизацию вегетативного роста, суточной динамики роста и формирование высоких морфобиологических показателей растений сои.*

Ключевые слова: *абсолютная скорость роста (AGR), сорта сои, «Нафис», «Мадад», «Орзу», «Севинч», капельное орошение, бороздковое орошение, динамика роста.*

GROWTH CHARACTERISTICS OF SOYBEAN CULTIVARS UNDER WATER-SAVING IRRIGATION

Abstract: *This study investigated the daily growth dynamics of the soybean cultivars Nafis, Madad, Orzu, and Sevinch grown under drip and furrow irrigation conditions. Field experiments were conducted to determine the average plant height and absolute growth rate (AGR) at the first trifoliate leaf, budding, flowering, and pod formation growth stages. The results showed that the highest plant growth rate in all cultivars was observed during the flowering stage, whereas the daily growth rate decreased during*

the pod formation stage. Under drip irrigation, the Nafis, Madad, and Sevinch cultivars exhibited slightly higher absolute growth rates and average plant heights than those grown under furrow irrigation. The highest absolute growth rate (1.52 cm day⁻¹) was recorded in the Madad cultivar during the flowering stage, while the lowest value (0.43 cm day⁻¹) was observed in the Orzu cultivar at the first trifoliate leaf stage. The obtained results indicate that drip irrigation is a more efficient irrigation method for promoting vegetative growth, stabilizing daily growth dynamics, and improving the morphobiological characteristics of soybean plants.

Keywords: *absolute growth rate (AGR), soybean cultivars, Nafis, Madad, Orzu, Sevinch, drip irrigation, furrow irrigation, growth dynamics.*

Kirish

Soya yuqori oqsil va yog‘ miqdoriga ega bo‘ lgan muhim dukkakli ekinlardan biri bo‘ lib, oziq-ovqat, yem-xashak va sanoat uchun qimmatli xomashyo hisoblanadi. Biroq global iqlim o‘ zgarishi va suv resurslarining cheklanishi soya yetishtirishda suvdan samarali foydalanishni taqozo etmoqda. Soya o‘ simligi suvga talabchan o‘ simlik bo‘ lib, soya yetishtirishda suv tejamkor sug‘ orish texnologiyalarini joriy etish va ularning o‘ simliklarning o‘ sishi hamda rivojlanishiga ta‘sirini baholash muhim ilmiy-amaliy ahamiyat kasb etadi. O‘ simlik bo‘ yining o‘ sish dinamikasi sug‘ orish sharoitlarining samaradorligini baholovchi muhim morfobiologik ko‘ rsatkichlardan biri hisoblanadi. Mazkur tadqiqotning maqsadi tomchilatib va egatlab sug‘ orish usullari orqali yetishtirilgan “Nafis”, “Madad”, “Orzu” va “Sevinch” soya navlarining o‘ sish dinamikasi hamda absolyut o‘ sish tezligini solishtirma tahlil qilishdan iborat.

O‘ simliklarning o‘ sish jarayonini miqdoriy baholashda absolyut o‘ sish tezligi (Absolute Growth Rate) muhim ko‘ rsatkich ekanligini qayd etilgan. Ketma-ket ikki kuzatuv oralig‘ idagi biomassa yoki o‘ simlik o‘ lchamining vaqtga nisbatan o‘ zgarishi orqali hisoblash metodikasini taklif etgan [1].

Dimov va hammualliflari sug‘ orish usuli soya o‘ simligining hosildorligi hamda sug‘ orish suvidan foydalanish samaradorligiga sezilarli ta‘sir ko‘ rsatishini aniqlagan. Mualliflar optimal sug‘ orish sharoitida o‘ simliklarning o‘ sishi va hosildorligi yaxshilanishini, turli sug‘ orish texnologiyalari esa hosil ko‘ rsatkichlarida sezilarli farqlarni yuzaga keltirishini qayd etganlar [2].

Song va boshqalar (2020) uch o‘ lchamli rekonstruksiya texnologiyasi yordamida soya o‘ simligining bo‘ yiga o‘ sish dinamikasini baholab, o‘ simlik bo‘ yi vegetatsiya davomida nav xususiyatlari va tashqi muhit omillariga bog‘ iq holda turlicha o‘ zgarishini aniqlagan. Mualliflar o‘ simlik bo‘ yining o‘ sish sur‘ati gullash davrida eng yuqori darajaga yetishini qayd etganlar [3].

Board va Kahlon (2011) soya o‘ simligining vegetativ va generativ rivojlanishi o‘ rtasidagi o‘ zaro bog‘ liqlikni tahlil qilib, gullash bosqichigacha poyaning intensiv o‘ sishi kuzatilishi, dukkak hosil bo‘ lishidan keyin esa assimilatlar asosan reproduktiv organlarga yo‘ naltirilishi sababli vegetativ o‘ sish sekinlashishini ta‘kidlaganlar [4].

Soya o‘ simligining o‘ sishi va rivojlanishi navning biologik xususiyatlari bilan bir qatorda tuproq-iqlim sharoiti hamda qo‘ llanilayotgan agrotexnik tadbirlarga bevosita bog‘ liqligi qayd etilgan. Vegetatsiya davrida o‘ simlikning morfologik ko‘ rsatkichlari, jumladan asosiy poya balandligi, barglar soni va rivojlanish bosqichlarining davomiyligi tashqi muhit omillariga qarab sezilarli darajada o‘ zgarishi aniqlangan [5]. Shu sababli soya navlarining o‘ sish dinamikasini turli yetishtirish texnologiyalari sharoitida kompleks baholash ilmiy va amaliy jihatdan muhim ahamiyatga ega.

Zhu va boshqalar (2020) soya o‘ simligining morfologik belgilarini butun vegetatsiya davri davomida tahlil qilib, V3–R3 rivojlanish bosqichlarida turli navlarning o‘ sish sur’atlari deyarli bir xil kechishini, R5 bosqichidan boshlab esa navlar o‘ rtasidagi fenotipik farqlar sezilarli ortishini aniqlagan. Mualliflarning ta’kidlashicha, aynan reproduktiv bosqichlarda o‘ simlik bo‘ yi va poya balandligi eng jadal o‘ zgaradi, bu esa sug‘ orish, oziqlantirish va boshqa agrotexnik tadbirlarni nav xususiyatlariga mos ravishda boshqarish uchun muhim ilmiy asos bo‘ lib xizmat qiladi [6].

Iminov va Bo‘ riboyev (2022) tadqiqotlarida mahalliy “Nafis” va xorijiy “Vilana” soya navlarining dukkaklash davridagi morfo-fiziologik ko‘ rsatkichlariga biostimulyatorlarning ta‘siri o‘ rganilgan. Tadqiqot natijalariga ko‘ ra, biostimulyatorlar qo‘ llanilishi o‘ simlik bo‘ yi, shoxlanish darajasi, barglar soni va dukkaklar sonining ortishiga ijobiy ta’sir ko‘ rsatgan. Mualliflar o‘ simlikning vegetativ o‘ sish ko‘ rsatkichlari yaxshilangani natijasida reproduktiv organlarning shakllanishi ham jadallashishini qayd etganlar [7].

Turli sug‘ orish usullarida yetishtirilgan soya navlarining o‘ sish dinamikasi va vegetativ rivojlanish xususiyatlarini qiyosiy baholash, o‘ simliklarning biologik salohiyatini to‘ liq namoyon etuvchi samarali sug‘ orish usullarini aniqlash hamda suv resurslaridan oqilona foydalanishning ilmiy asoslarini ishlab chiqish bugungi kunda dolzarb ilmiy-amaliy masalalardan biri hisoblanadi.

Tadqiqot materiali va uslublari

Mazkur tadqiqotlarimiz 2024–2026-yillarda Surxondaryo viloyati, Termiz tumanidagi “Ingichka tolali paxtachilik ilmiy-tadqiqot instituti” ning maydonida dala sharoitida amalga oshirildi. Soyaning mahalliy “Nafis”, “Madad”, “Orzu” va “Sevinch” navlari tomchilatib (suv tejamkor) va an’anaviy (egatlab) sug‘ orish usullarida yetishtirildi (1,2-rasmlar).



1-rasm. Egatlab sug‘ orish orqali yetishtirilayotgan soya navlari (chinbarg fazasi)



2-rasm. Tomchilatib sug‘ orish orqali yetishtirilayotgan soya navlari (chinbarg fazasi)

Soya navlarining vegetatsiya davrida fenologik kuzatuvlar olib borildi. Vegetativ o‘ sish ko‘ rsatkichlarini baholash maqsadida bo‘ yiga o‘ sish dinamikasi va barglar soni indeksi aniqlandi. O‘ simlik bo‘ yi tuproq yuzasidan asosiy poyaning o‘ sish nuqtasigacha o‘ lchandi. O‘ simliklarning bo‘ yiga o‘ sish dinamikasi – o‘ simlikning ma’lum vaqt (kun) oralig‘ ida qanchalik tez o‘ sayotganligini bildiradigan ko‘ rsatkichdir. Soya navlarining absolyut o‘ sish dinamikasini aniqlashda quyidagi formuladan foydalanildi [8,9].

$$O'sish\ tezligi = \frac{H2-H1}{T2-T1}(sm/kun)$$

Bu yerda: H_1 va H_2– mos ravishda t_1 va $t2$ vaqtidagi o‘ simlik bo‘ yi (sm), $t_2 - t_1$ – kuzatuvlar orasidagi vaqt oralig‘ i (kun).

O‘ simlikdagi barglar soni har bir kuzatuv muddatida to‘ liq shakllangan barglarni sanash orqali aniqlandi. Natijalar bitta o‘ simlikka to‘ g‘ ri keladigan barglar soni (dona/o‘ simlik) ko‘ rinishida ifodalandi.

Tadqiqot natijalari va tahlili

O‘ simlikning bo‘ yiga o‘ sish dinamikasi uning vegetativ rivojlanish darajasini tavsiflovchi asosiy morfologik ko‘ rsatkichlardan biri hisoblanadi. Turli sug‘ orish usullarida yetishtirilgan soya navlarining absolyut o‘ sish tezligini baholash natijalariga ko‘ ra, rivojalanish bosqichiga ko‘ ra o‘ sish jadalligi o‘ zgarib boradi. (1-jadval). O‘ sish jadalligi chinbarg hosil qilish bosqichida nisbatan sekin bo‘ lib, g‘ unchalash va ayniqsa gullash davrida keskin ortgan, dukkaklash bosqichida esa sekinlashishi kuzatilgan.

1-jadval

Soya navlarining kunlik o‘ sish dinamikasi (sm/kun)

Sug‘ orish usuli	Chinbarg	G‘ unchalash	Gullash	Dukkaklash
	Nafis			
Tomchilatib sug‘ orish	0,53	0,77	1,44	0,88
Egatlab sug‘ orish	0.51	0,79	1,41	0,84
Madad				
Tomchilatib sug‘ orish	0,51	0,84	1,52	0,97
Egatlab sug‘ orish	0.52	0,81	1,49	0,94
Orzu				
Tomchilatib sug‘ orish	0,43	0,62	1,24	0,71
Egatlab sug‘ orish	0,43	0,65	1,26	0,72
Sevich				
Tomchilatib sug‘ orish	0,49	0,71	1,39	0,82
Egatlab sug‘ orish	0,51	0,74	1,35	0,80

Barcha navlarda eng sekin o‘ sish tezligi chinbarg bosqichida (0,43–0,53 sm/kun^{-1}) kuzatilgan bo‘ lsa, g‘ unchalash bosqichida u 0,62–0,84 sm/kun^{-1} gacha ortdi. Absolyut o‘ sish tezligining eng yuqori qiymatlari gullash bosqichida qayd etilib, tomchilatib sug‘ orishda 1,24–1,52 sm/kun^{-1}, egatlab sug‘ orishda esa 1,26–1,49 sm/kun^{-1} oralig‘ ida o‘ zgardi. Dukkaklash bosqichida barcha navlarda o‘ sish sur’ati kamayib, mos ravishda 0,71–0,97 va 0,72–0,94 sm/kun^{-1} ni tashkil etdi.

Nafis, Madad va Sevinch navlarida tomchilatib sug‘ orish vegetatsiyaning faol bosqichlarida egatlab sug‘ orishga nisbatan yuqori absolyut o‘ sish tezligi kuzatildi. Orzu navida esa sug‘ orish usullariga bog‘ liq farq deyarli kuzatilmadi. Tadqiq etilgan navlar orasida Madad navi eng yuqori o‘ sish jadalligini namoyon etib, gullash bosqichida 1,52 sm/kun^{-1}, dukkaklash bosqichida 0,97 sm/kun^{-1} ni tashkil etdi. Eng past ko‘ rsatkichlar esa Orzu navida qayd etildi.

Soya o‘ simligida bo‘ yiga o‘ sish jadalligi vegetativ rivojlanishning dastlabki bosqichlarida asta-sekin ortib, gullash bosqichida eng yuqori darajaga yetishini, dukkaklarning shakllanish bosqichidan boshlab organik moddalar don shakllanihiga sarflanishi hisobiga o‘ sish sur’atining pasayishini aniqlandi. Shuningdek, tomchilatib sug‘ orish ko‘ pchilik navlarda vegetativ o‘ sish jarayonini faollashtirib, o‘ simliklarning chiziqli o‘ sishi uchun qulay sharoit yaratganligi aniqlandi.

Turli sug‘ orish usullarida yetishtirilgan soya navlarining o‘ rtacha bo‘ y uzunligi vegetatsiya davomida o‘ lchab borildi (2-jadval).

2-jadval

Soya navlarining o‘ rtacha bo‘ y uzunligi (smda)

Sug‘ orish usuli	Chinbarg	G‘ unchalash	Gullash	Dukkaklash
	Nafis			
Tomchilatib sug‘ orish	8,1	39,1	61,7	95,3
Egatlab sug‘ orish	9	38,4	58,5	92,6
Madad				
Tomchilatib sug‘ orish	10,3	39,3	66,6	102,3
Egatlab sug‘ orish	8,7	38,6	64,7	98,5
Orzu				
Egatlab sug‘ orish	7,9	26,7	44,5	73,5
Sevinch				
Tomchilatib sug‘ orish	8,2	36,4	58,4	91,3
Egatlab sug‘ orish	8,5	36,7	58,8	89.6

Nafis, Madad va Sevinch navlarida tomchilatib sug‘ orishda o‘ simlik bo‘ yining uzunligi kam miqdorda yuqori bo‘ ldi. Dukkaklash bosqichida Madad navining bo‘ yi tomchilatib sug‘ orishda 102,3 sm, egatlab sug ‘orishda esa 98,5 sm ni tashkil etdi. Nafis navida ushbu ko‘ rsatkichlar mos ravishda 95,3 va 92,6 sm, Sevinch navida esa 91,3 va 89,6 sm bo‘ ldi.

Orzu navida dukkaklash bosqichida o‘ simlik bo‘ yi tomchilatib sug‘ orishda 74,2 sm, egatlab sug‘ orishda esa 73,5 sm ni tashkil etdi. Ushbu nav vegetatsiyaning barcha bosqichlarida boshqa navlarga nisbatan pastroq bo‘ y ko‘ rsatkichlariga ega bo‘ ldi.

Vegetatsiya davomida barcha navlarda o‘ simlik bo‘ yining bosqichma-bosqich ortishi kuzatildi. Eng baland o‘ simlik bo‘ yi Madad navida (102,3 sm), eng past ko‘ rsatkichlar esa Orzu navida (74,2 sm) qayd etildi. Ko‘ pchilik navlarda tomchilatib sug‘ orish egatlab sug‘ orishga nisbatan o‘ simlik bo‘ yining 1,7–3,8 % ga yuqori shakllanishini ta’minladi, bu esa o‘ simliklarning suv bilan ta‘minlanishning barqarorligi vegetativ o‘ sishga ijobiy ta‘sir etganligini ko‘ rsatadi.

Turli sug‘ orish usullarida yetishtirilgan soya navlarining o‘ sish ko‘ rsatkichlari rivojlanish bosqichlariga hamda navning biologik xususiyatlariga bog‘ liq holda o‘ zgarishini ko‘ rsatdi. Barcha navlarda o‘ simlik bo‘ yi vegetatsiya davomida doimiy ortib boradi. Absolyut o‘ sish tezligi esa gullash bosqichida yuqori bo‘ lishi kuzatildi. Tomchilatib sug‘ orish egatlab sug‘ orishga nisbatan vegetativ o‘ sishni jadallashtirib, o‘ simlik bo‘ yi va absolyut o‘ sish tezligini doimiy shakllanishini ta‘minladi.

Muhokama

Tadqiqot natijalariga ko‘ ra, soya navlarida absolyut o‘ sish tezligi rivojlanish bosqichlariga qarab o‘ zgarib, eng yuqori qiymat gullash bosqichida kuzatildi. Bu holat vegetativ o‘ sishning ushbu davrda eng faol kechishi va fotosintez

jarayoninng faol kechishi bilan izohlanadi. **Board va Kahlon (2011)** tadqiqotlarida [4] ham soya o‘ simligida gullash davrida vegetativ o‘ sishning jadal kechishini qayd etganlar.

Tadqiqotimizda tomchilatib sug‘ orish sharoitida **Nafis, Madad va Sevinch** navlarida o‘ simlik bo‘ yi hamda absolyut o‘ sish tezligi egatlab sug‘ orishga nisbatan kam bo‘ lsada jadalligi aniqlandi. Bu tomchilatib sug‘ orishda ildiz zonasida namlikning barqaror saqlanishi va suvning o‘ simlik tomonidan samaraliroq o‘ zlashtirilishi bilan bog‘ liq. Mazkur natijalar **Kaur va boshq. (2022)** tadqiqotlarida [10] ham qayd etilgan.

Xulosa

Turli sug‘ orish usullari soya navlarining vegetativ o‘ sishi va absolyut o‘ sish tezligiga sezilarli ta‘sir ko‘ rsatishi aniqlandi. Barcha navlarda absolyut o‘ sish tezligining eng yuqori qiymati gullash bosqichida kuzatildi. Tomchilatib sug‘ orish sharoitida Nafis, Madad va Sevinch navlarida o‘ simlik bo‘ yi hamda absolyut o‘ sish tezligi egatlab sug‘ orishga nisbatan yuqoriroq bo‘ ldi. Tadqiq etilgan navlar orasida Madad navi eng yuqori o‘ sish jadalligini va eng yuqori o‘ simlik bo‘ yini namoyon etdi. Olingan natijalar tomchilatib sug‘ orish usuli soya navlarining vegetativ rivojlanishini jadallashtirish va o‘ sish ko‘ rsatkichlarini yaxshilashda samaraliroq ekanligini ko‘ rsatdi.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish

Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma’lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan. Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi. Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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FOREL BALIG‘ I UCHUN MAHALLIY IMPORT O‘ RNINI BOSUVCHI KOMBIKORMLAR YARATISHNING TEXNOLOGIK IMKONIYATLARI

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Annotatsiya. *Zamonaviy akvakulturada baliq mahsuloti tannarxi va ishlab chiqarish samaradorligini belgilaydigan asosiy omillardan biri yuqori sifatli kombikormlar bilan ta’minlanganlik hisoblanadi. Kamalakrang forel-Oncorhynchus mykiss (Walbaum, 1792) yuqori hazmlanuvchan protein, muhim aminokislotalar va energiyaga talabchanligi sababli uni intensiv usulda yetishtirishda maxsus kombikormlardan foydalanish talab etiladi. Mazkur tahliliy maqolada forel balig‘ i uchun import o‘ rnini bosuvchi mahalliy kombikormalar ishlab chiqarishning resurs, biologik va texnologik imkoniyatlari tahlil qilindi. Ushbu tadqiqotda kunjara, shrot, kepak, dukkakli va don mahsulotlari, shuningdek, veterinariya-sanitariya talablariga javob beradigan baliqchilik, parrandachilik va boshqa oziq-ovqat sanoati ikkilamchi mahsulotlaridan protein manbai sifatida foydalanish istiqbollari ko‘ rib chiqildi. O‘ simlik xomashyolaridan foydalanishni cheklovchi fitatlar, tanninlar, proteaza ingibitorlari, kletchatka hamda muhim aminokislotalar disbalansi kabi omillarga alohida e’tibor berildi. Ularning salbiy ta’sirini kamaytirish uchun fermentativ gidroliz, mikrobiologik fermentatsiya, termik ishlov va ekstruziyadan iborat kompleks biotexnologik yondashuv taklif etildi. Xorijiy tadqiqotlar tahlili forel rasionlarida baliq unining muayyan qismini soya, kungaboqar, raps, no‘ xat, paxta protein konsentratlari, parrandachilik, chorvachilik ikkilamchi mahsulotlari, pivo sanoati qoldiqlari, mikrosuvo‘ tlari va boshqa alternativ proteinlar bilan muvaffaqiyatli almashtirish mumkinligini ko‘ rsatdi. O‘ zbekiston sharoiti uchun «mahalliy ikkilamchi xomashyo → sanitariya va ozuqaviy skrining → biokonversiya → komplementar protein kompleksi → muvozanatlashtirilgan reseptura → ekstruziya → biologik va iqtisodiy baholash» texnologik modeli taklif qilinadi.*

Kalit so‘ zlar: *forel, Oncorhynchus mykiss, kombikorm, import o‘ rnini bosish, baliq uni, o‘ simlik proteini, hayvonot proteini, ikkilamchi xomashyo, biokonversiya, fermentatsiya, ekstruziya.*

TEXNOLOGICHYeSKIYe VOZMOJNOSTI SOZDANIYA MESTNЫX IMPORTOZAMEЩAYUЩIX KOMBIKORMOV DLYA FORELI

Annotatsiya. *V obzornoy statye proanalizirovanы resursnыye, biologicheskiye i texnologicheskiye vozmojnosti sozdaniya importozameщayuщix kombikormov dlya radujnoy foreli Oncorhynchus mykiss. Rassmotrenы perspektivы ispolzovaniya vtorichnogo rastitelnogo i jivotnogo sыrya agropromыshlennogo kompleksa v kachestve istochnikov proteina i energii. Osoboye vnimaniye udeleno ogranicheniyam primeneniya rastitelnogo belka, svyazannыm s aminokislotnыm disbalansom, kletchatkoy, fitatami, tanninami i ingibitorami proteaz. Na osnovanii sovremennыx issledovaniy pokazano, chto effektivnost mestnogo sыrya mojet bыt suщyestvenno povыshena posredstvom fermentativnogo gidroliza, mikrobnoy fermentasii, termicheskoy obrabotki i ekstruzii. Analiz zarubejnыx issledovaniy svidetelstvuyet o vozmojnosti znachitelnoy zamenы rыbnoy muki konsentratami soyevogo, rapsovogo, podsolnechnogo, goroxovogo i xlopkovogo belka, a takje pererabotannыmi produktami ptisevodstva, pivovareniya i drugimi alternativnыmi istochnikami proteina. Dlya usloviy Uzbekistana predlojena konseptualnaya texnologicheskaya sxema, ob’yedinyayuщaya skrining mestnogo sыrya, biokonversiyu, formirovaniye komplementarnogo proteinovogo kompleksa, balansirovaniye rasiona po perevarimomu proteinu i nezamenimым aminokislotam, ekstruziyu i biologicheskuyu osenku kormov.*

Klyuchevыye slova: *radujnaya forel, Oncorhynchus mykiss, kombikorm, importozameщyeniye, vtorichnoye sыryo, rastitelnыy belok, jivotnыy belok, biokonversiya, fermentatsiya, ekstruziya.*

TECHNOLOGICAL OPPORTUNITIES FOR DEVELOPING LOCAL IMPORT-SUBSTITUTING COMPOUND FEEDS FOR TROUT

Abstract. *This review analyses the resource, biological and technological potential for producing local import-substituting feeds for rainbow trout, Oncorhynchus mykiss, under the conditions of Uzbekistan. Particular attention is given to plant- and animal-derived agro-industrial by-products as potential sources of protein and energy. Major limitations associated with plant protein ingredients, including amino acid imbalance, dietary fibre, phytate, tannins and protease inhibitors, are discussed. Current evidence indicates that enzymatic hydrolysis, microbial fermentation, thermal processing and extrusion can substantially improve the nutritional value and digestibility of alternative feed ingredients. International studies demonstrate that fishmeal in rainbow trout diets can be partly and, under specific nutritional conditions, extensively replaced by soybean, rapeseed, sunflower, pea and cottonseed protein products, processed poultry by-products, brewery co-products, microalgal biomass and other alternative proteins. A technological model for Uzbekistan is proposed based on the sequence: local secondary raw materials → nutritional and sanitary screening → bioconversion → complementary protein complex → balanced formulation → extrusion → biological and economic evaluation. This approach may provide a scientific basis for reducing dependence on imported aquafeeds and developing a sustainable local feed industry for trout farming.*

Keywords: *rainbow trout, Oncorhynchus mykiss, aquafeed, fishmeal replacement, agro-industrial by-products, plant protein, animal protein, bioconversion, fermentation, extrusion.*

KIRISH

Akvakultura jahonda oziq-ovqat ishlab chiqarishning eng jadal rivojlanayotgan yo‘ nalishlaridan biri hisoblanadi. Akvakultura hajmining o‘ sishi baliqlar uchun yuqori sifatli ozuqaga bo‘ lgan talabning muttasil ortishi bilan kechmoqda. Rasion sifati nafaqat baliqning o‘ sish tezligi, balki yem konversiyasi, fiziologik holati, mahsulot sifati va ishlab chiqarishning ekologik samaradorligini ham belgilaydi [1–3].

Kamalakrang forel-*Oncorhynchus mykiss* (Walbaum, 1792) sanoat akvakulturasida muhim ob’yekt bo‘ lib, yuqori o‘ sish sur’ati, mahsulotining qimmatli ozuqaviy xususiyatlari va bozor talabining barqarorligi bilan ajralib turadi. Shu bilan birga, mazkur baliq turi protein va energiyaga boy yuqori sifatli rasion talab qiladi.

Forel kombikormlarida an’anaviy ravishda baliq uni muhim protein manbai sifatida xizmat qilgan. Uning afzalligi yuqori protein konsentratsiyasi, yaxshi hazmlanuvchanlik, muhim aminokislotalarning maqbul nisbati va ozuqaning yuqori iste’mol qilinishi bilan bog‘ liq [4]. Biroq baliq uni resurslarining cheklanganligi, uning narxi va akvakultura sanoatining o‘ sishi alternativ protein manbalarini izlashni dolzarb ilmiy masalaga aylantirdi [5].

Bugungi kundagi tadqiqotlarda alternativ protein manbalari sifatida o‘ simlik proteinlari, chorvachilik, parrandachilik mahsulotlari, mikrosuvo‘ tlar va bir hujayrali organizmlar, hasharotlar va turli agrosanoat korxonalariningikkilamchi mahsulotlari o‘ rganilmoqda [6–9].

O‘ zbekiston uchun mazkur masala ayniqsa juda ahamiyatli. Ayni paytda aytish o‘ rinliki. Respublikamizda forelchilik xo‘ jaliklarining rivojlanishi ko‘ p jihatdan ularni sifatli kombikorm bilan barqaror ta’minlashni talab etadi. Tayyor import kombikorm yoki ayrim yuqori proteinli ingrediyentlar narxining tashqi bozorga bog‘ liqligi mahalliy baliqchilik korxonalari iqtisodiy samaradorligini cheklashi mumkin.

Shu bilan birga, mamlakatda moyli va donli ekinlar, paxta, dukkakli o‘ simliklar, parrandachilik, chorvachilik, baliqchilik va oziq-ovqat sanoatining keng resurs bazasi mavjud. Ushbu tarmoqlarda hosil bo‘ ladigan ikkilamchi mahsulotlar tegishli qayta ishlash texnologiyalari qo‘ llanilganda baliqlar uchun qimmatli protein va sifatli ozuqa manbaiga aylantirilishi mumkin.

FAO ning mahalliy xomashyolar asosida forel ozuqalarini yaratishga bag‘ ishlangan tajribasida ham mahalliy qishloq xo‘ jaligi va sanoat mahsulotlarini inventarizatsiya qilish, ularning miqdori, sifati, mavsumiyligi va narxini baholash hamda mavjud mahalliy uskunalar asosida kombikorm ishlab chiqarish tavsiya etilgan [10]. FAO loyihasida forel rasioniga soya shroti, raps shroti, bug‘ doy kepagi, pivo sanoati mahsulotlari, qon uni, pat uni va go‘ sht-suyuk uni kabi turli manbalar kiritilgan.

Maqolaning maqsadi-zamonaviy ilmiy adabiyotlar va xalqaro tajribalar asosida O‘ zbekistonda forel balig‘ i uchun import o‘ rnini bosuvchi mahalliy kombikormlar ishlab chiqarishning mavjud imkoniyatlarini baholash hamda istiqbolli texnologik yechimlarni asoslashdan iborat.

Forel yirtqich oziqlanish tipiga moslashgan baliq bo‘ lib, tabiiy sharoitda hayvonot kelib chiqishidagi ozuqalarni iste’mol qiladi. Shu sababli sanoat rasionida proteinning nafaqat miqdori, balki sifati muhimdir.

FAO ma’lumotlarida forel uchun boshlang‘ ich rasionlarida protein darajasi taxminan 50%, mayda baliqlarda 47%, tovar baliqlarda esa taxminan 45% darajasidan past bo‘ lmasligi tavsiya etilgan [10]. Bundan tashqari, zamonaviy yuqori energiyali rasionlarda protein-energiya nisbati baliqning yoshi, suv harorati va ishlab chiqarish texnologiyasiga muvofiq optimallashtiriladi.

Forel organizmi proteindan samarali foydalanadi, ammo rasionda energiya yetarli bo‘ lmasa, qimmatli aminokislotalar energiya manbai sifatida sarflanadi. Shu sababli rasionda «oqsil o‘ rnini bosuvchi» effektini ta’minlaydigan yetarli darajadagi lipid va hazmlanuvchan energiya manbai bo‘ lishi juda muhim.

Zamonaviy rasion tarkibida xom proteindan ko‘ ra, yaxshi hazmlanuvchan protein, hazmlanuvchan energiya, muhim aminokislotalar nisbati muhimroq mezon sifatida qaralmoqda [1, 11].

Bugungi kunda baliq yemi tarkibidaga asosiy komponent baliq unini almashtirish bo‘ yicha ilmiy tadqiqotlar jadal olib berilmoqda (1-jadval). Xususan, o‘ simlik proteinlari bilan almashtirish bo‘ yicha eng muhim klassik ishlardan biri bu raps-no‘ xat kombinatsiyasi, soya mahsulotlari va makkajo‘ xori glyuteni kabi manbalar hisoblanadi. Masalan, baliq uni proteinining 66%ini o‘ simlik proteinlari bilan almashtirganda o‘ sish va maxsus o‘ sish tezligi nazoratdan sezilarli farq qilmaganini ko‘ rsatgan [12].

Kaushik va hammualliflar [13] 50% baliq uni proteinini soya va makkajo‘ xori proteinlari bilan almashtirish muayyan rasion sharoitlarida o‘ sish va yemdan foydalanishni yomonlashtirmaganini qayd etganlar.

Soya protein konsentratidan foydalanilgan boshqa tajribada esa 33-100% darajada baliq uni proteinini almashtirish o‘ sish va ozuqa moddalaridan foydalanishga sezilarli salbiy ta’sir ko‘ rsatmagan, ammo oddiy soya uni natijalari ancha past bo‘ lgan [14]. Bu holat xomashyoning nomi emas, balki uning qayta ishlanganlik darajasi ham muxim ekanligini ko‘ rsatadi.

Larsen va hammualliflar [15] no‘ xat, dala loviyasi va raps protein konsentratlaridan iborat aralashma baliq uni proteinining 47%ini almashtirganda forelning SGR va FCR ko‘ rsatkichlarida sezilarli yomonlashish kuzatilmaganini aniqlagan.

1-jadval

Dunyoda bo‘ yicha Forel rasionida baliq unini alternativ proteinlar bilan almashtirish bo‘ yicha o‘ tkazilgan ayrim tadqiqotlar tahlili

Alternativ manba	Baliq unini almashtirish foizi	Asosiy xulosa	Manba
Aralash o‘ simlik proteinlari	66% gacha	O‘ sishda sezilarli pasayish kuzatilmagan	[12]
Soya + makkajo‘ xori proteinlari	50%	Yemdan foydalanish saqlangan	[13]
Soya protein konsentrati	33–100%	Konsentrat oddiy soya unidan samaraliroq	[14]
No‘ xat + dala loviyasi + raps konsentrati	47%	SGR va FCR saqlangan	[15]
Kungaboqar shroti	40%	Proteindan foydalanish soyaga yaqin	[16]
Paxta protein konsentrati	75% gacha	O‘ sishga salbiy ta’sir kuzatilmagan; 100%da pasayish kuzatilgan	[17]
Parrandachilik ikkilamchi mahsuloti	yuqori darajada	Lizin va metionin balanslash talab etiladi	[18]
Pivo achitqisi va sarflangan don	20% va 15%	Forel uchun istiqbolli ikkilamchi resurs	[19]
Mikrosuvo‘ tlari ikkilamchi biomassasi	100%	Tajribada o‘ sish va FCR nazoratga yaqin	[20]

Kungaboqar shroti bo‘ yicha tadqiqotda u baliq uni proteinining 40%gacha qismini almashtirganda soya shrotiga yaqin natijalar bergan, ammo uglevod fraksiyasi sababli hazmlanuvchan energiya darajasi cheklovchi omil bo‘ lgan [16].

Farg‘ ona vodiysida mahalliy xomashyolarni tanlashda undan maksimal foydalanishda resursning faqat ozuqaviy qiymati emas, avvalo yillik hajmi, mavsumiyligi, barqaror foydalanish imkoniyati, narxi, saqlanuvchanligi; qayta ishlash imkoniyati, sanitariya-gigiyena xavfsizligi kabi ko‘ rsatkichlar ham baholanishi kerak.

O‘ zbekiston sharoitida istiqbolli komponentlar qatoriga paxta va kungaboqar kunjarasi va shroti, soya mahsulotlari, bug‘ doy kepagi, makkajo‘ xori mahsulotlari, dukkakli ekinlar, paxta sanoati proteinli mahsulotlari va boshqa mahalliy agrosanoat resurslarini kiritish mumkin (2-jadval).

Bizning mamlakatimizda paxtachilik sanoatining mavjudligi sababli paxta proteinlari alohida ilmiy qiziqish uyg‘ otadi. Oddiy paxta shroti bilan bog‘ liq asosiy cheklovlardan biri gossipol hisoblanadi. Shu sababli past gossipolli yoki chuqur qayta ishlangan paxta protein konsentratlaridan foydalanish afzal.

2022 yilda forelda o‘ tkazilgan tadqiqotda 46% xom protein va 16% lipidli rasionlarda baliq uni paxta protein konsentrati bilan 25, 50, 75 va 100% darajada almashtirilgan. 75%gacha almashtirish o‘ sish ko‘ rsatkichlarini sezilarli yomonlashtirmagan, ammo 100% variantda ozuqa iste’moli va o‘ sish pasaygan [17].

Bu natija O‘ zbekistonda paxta proteinini to‘ g‘ ridan-to‘ g‘ ri emas, balki detoksikatsiya, konsentrlash, fermentatsiya texnologiyalari asosida tadqiq qilish zarurligini ko‘ rsatadi.

O‘ simlik proteinlarining asosiy kamchiligi-muhim aminokislotalar nisbati va antinutritiv omillar bilan bog‘ liq bo‘ lsa, hayvonot proteinlarida aminokislota profili ko‘ p hollarda baliq talablariga yaqinroq bo‘ ladi.

Parrandachilik sanoati ikkilamchi mahsulotlari bunday resurslarning muhim misolidir. Fowler [18] parrandachilik ikkilamchi mahsulotlari uni forelda baliq unining qisman va yuqori darajadagi o‘ rinbosari bo‘ la olishini ko‘ rsatgan. To‘ liq almashtirishda, ayniqsa lizin va metionin bilan balanslash zarurligi ta’kidlangan.

2024 yilgi zamonaviy tadqiqotda parrandachilik ikkilamchi mahsuloti uni va gidrolizlangan pat unidan foydalanilgan rasion baliq unisiz sinovdan o‘ tkazilgan. O‘ sish, yemdan foydalanish va ichak salomatligida salbiy ta’sir qayd etilmagan [21].

2025 yilda Eronda forel uchun baliq unisiz rasionlarda parranda protein konsentrati, qon uni, past kulli parrandachilik mahsuloti uni, raps shroti va pat uni kombinatsiyalari tekshirilgan [22]. Bu natijalar yagona alternativ komponent emas, balki aralash protein tizimi istiqbolli ekanligini ko‘ rsatadi.

Mikrobiologiya sohasidagi ishlab chiqarishdan qoladigan achitqi va sarflangan don yuqori hajmda hosil bo‘ ladigan ikkilamchi resurslardan hisoblanadi. Estévez va hammualliflar [19] ushbu mahsulotlarni quritilgan va gidrolizlangan shaklda forel ozuqasida baholagan. Tadqiqot natijalari pivo sanoati ikkilamchi mahsulotlarini sirkulyar iqtisodiyot doirasida akvakultura uchun ozuqa manbaiga aylantirish mumkinligini ko‘ rsatgan.

Bu yondashuv O‘ zbekistonning oziq-ovqat sanoatidagi boshqa ikkilamchi biomassalar uchun ham qo‘ llanilishi mumkin.

O‘ simlik proteinlari arzon va keng tarqalgan bo‘ lsa-da, ularda o‘ simlik proteinlarini cheklovchi (foydalanishga to‘ sqinlik qiluvchi) antinutritiv omillar-fitatlar, tanninlar, tripsin va boshqa proteaza ingibitorlari, nokraxmal polisaxaridlar, yuqori molekulyar kletchatka, ayrim xomashyolarda gossipol yoki glikoalkaloidlar mavjud bo‘ lishi mumkin [5, 23].

Zamonaviy adabiyotlarda o‘ simlik xomashyosini termik ishlov, fermentatsiya, fermentativ qayta ishlash, ekstraksiya yoki funksional qo‘ shimchalar bilan boyitish orqali ushbu cheklovlarni sezilarli kamaytirish mumkinligini ko‘ rsatadi [5].

Kartoshka protein konsentrati misolida ham xomashyodagi glikoalkaloid miqdori uning forel uchun yaroqliligini belgilaydi. Past glikoalkaloidli komponent yuqori glikoalkaloidli variantga nisbatan xavfsizroq bo‘ lgan [24].

Shuning uchun O‘ zbekiston sharoitida mahalliy resurslardan yuqori sifatli forel ozuqasi yaratishning asosiy kaliti xomashyoni shunchaki aralashtirish emas, balki maqsadli biokonversiya qilish hisoblanadi.

Biokonversiya natijasida yirik protein molekulalari kichik peptidlar va erkin aminokislotalarga transformatsiya bo‘ lishi mumkin. Shu bilan birga o‘ simlik hujayra devori qisman parchalanadi, fitat (fitin kislotasining tuzlari) miqdori kamayadi, murakkab uglevodlar parchalanadi, proteinning fermentlarga bog‘ lanishi oshadi.

Fermentatsiya qilingan o‘ simlik proteinlari bo‘ yicha tizimli meta-tahlil bunday qayta ishlash baliqlarning o‘ sishi, hazm fermentlari faolligi va ozuqa moddalaridan foydalanishiga ijobiy ta’sir ko‘ rsatishi mumkinligini ko‘ rsatadi [25].

O‘ simliklarni fyermentativ qayta ishlashda xomashyolarning xususiyatiga qarab, masalan proteaza-proteinlarni gidroliz qilish, fitaza-fitatlarni parchalash, syellyulaza-kletchatkani qisman gidroliz qilish, ksilanaza-nokraxmal polisaxaridlarni parchalash uchun qo‘ llanilishi mumkin.

Ferment dozasi xomashyoga nisbatan belgilashda xar bir substrat uchun rN, harorat, namlik, ferment konsentratsiyasi va reaksiya davomiyligi eksperimental optimallashtirilishi zarur bo‘ ladi.

Mikrobiologik fermentatsiya natijasida xavfsiz mikroorganizmlar substrat tarkibidagi murakkab birikmalarni o‘ z fermentlari yordamida modifikatsiya qiladi. Fermentatsiya samaradorligi mikroorganizm shtammi, harorat, rN, namlik, kislorod rejimi, fermentatsiya vaqti bilan belgilanadi. Shu sababli «bir xil fermentatsiya texnologiyasi barcha xomashyolar uchun mos» degan yondashuv to‘ g‘ ri emas.

Forel uchun mahalliy kombikorm yaratishda eng istiqbolli strategiya- baliq yemi tarkibidagi bir komponent bilan baliq unini to‘ liq almashtirish emas, balki bir nechta manbaning kuchli jihatlarini komplementar birlashtirishdir. Masalan: o‘ simlik proteini, hayvonot proteini, aminokislota korreksiyasi, biokonversiya kombinatsiyasi bir manbaning aminokislota yetishmovchiligini boshqa manba hisobiga kompensatsiya qilishi mumkin.

2012 yilda alternativ protein aralashmalari bilan o‘ tkazilgan tadqiqot ham soya protein konsentrati asosidagi aralashmaning yuqori almashtirish darajalarida boshqa alternativ aralashmalardan samaraliroq bo‘ lganini ko‘ rsatgan [26].

O‘ simlik proteinlarini aralashma modeli asosida optimallashtirish bo‘ yicha tajribada no‘ xat, raps, kartoshka va soya protein konsentratlari aminokislotalar hamda taurin bilan muvozanatlashtirilib, baliq unisiz forel rasionlari ishlab chiqilgan [27].

2-jadval

Baliq yemi uchun istiqbolli mahalliy xomashyo turlari va ularni qayta ishlash

Xomashyo	Afzalligi	Asosiy cheklov	Taklif etiladigan qayta ishlash
Kungaboqar shroti/kunjarasi	Protein, mahalliy resurs	Kletchatka	Maydalash, fermentatsiya, fermentlar
Soya mahsulotlari	Yuqori protein	Ingibitorlar	Termik ishlov, fermentatsiya
Paxta proteini	Keng mahalliy baza	Gossipol	Detoksikatsiya, konsentrlash, fermentatsiya
Bug‘ doy kepagi	Arzon, keng mavjud	Kletchatka, past protein	Syellyulaza/ksilanaza, fermentatsiya
Dukkakli ekinlar	Protein va kraxmal	Antinutritiv moddalar	Termik/fermentativ ishlov
Parrandachilik mahsulotlari	Yuqori protein	Sanitariya, kul	Termik sanitarizatsiya, gidroliz
Pat	Keratinga boy protein	Past hazmlanuvchanlik	Gidroliz/fermentativ parchalash
Baliqni qayta ishlash mahsulotlari	Aminokislota va lipidlar	Oksidlanish, saqlash	Termik ishlov, gidroliz, antioksidant nazorati
Pivo achitqisi	Protein, funksional moddalar	Hujayra devori	Gidroliz
Sarflangan pivo doni	Arzon ikkilamchi resurs	Kletchatka	Fermentativ/mikrobiologik ishlov

Shuni alohida ta’kidlash kerakki, 2025 yilda *Nannochloropsis* sp. dan moy ajratilgandan keyin qolgan biomassa forelda 33, 66 va 100% baliq uni almashtirish darajasida variantida ham baliqlarda o‘ sish, FCR va tirik qolish nazorat variantidan sezilarli farq qilmagan [20]. Bu natija ikki muhim xulosani beradi. Birinchidan, «qoldiq» deb qaraladigan biomassa yuqori qiymatli ozuqa ingrediyentiga aylanishi mumkin. Ikkinchidan, xomashyoning dastlabki nomi emas, qayta ishlangan komponentning ozuqaviy sifati hal qiluvchi ahamiyatga ega.

2026 yilda o‘ tkazilgan gidrolizlangan yomg‘ ir chuvalchangi proteinini forel rasionida sinashda ham 10% almashtirish eng yaxshi o‘ sish ko‘ rsatkichlarini bergan va hazm fermentlari faolligini yaxshilagan [28].

Forel uchun yuqori sifatli kombikorm yaratishda ekstruziya muhim bosqich hisoblanadi. Ekstruziya, bu granula strukturasini shakllantiradi, kraxmal jelatinizatsiyasini ta’minlaydi, suvda barqarorlikni oshiradi, granulaning zichligi va suzish xususiyatini boshqaradi, ayrim mikroorganizmlarni kamaytiradi, moy bilan keyingi qoplash uchun qulay struktura yaratadi. Biroq ekstruziyada haroratning ortiqcha oshishi ayrim aminokislotalarning barqarorligini kamaytirishi mumkin.

Shu sababli mahalliy xomashyoga asoslangan har bir reseptura uchun namlik, harorat, bosim, vint tezligi, ushlab turish vaqti alohida optimallashtirilishi kerak.

Ilmiy adabiyotlarni o‘ rganish natijalariga asosan Namangan viloyati sharoitida boqilayotgan forel uchun mahalliy kombikorm yaratish quyidagi bosqichlarda amalga oshirilishi maqsadga muvofiq:

I- bosqich. Xomashyo resurslarini inventarizatsiya qilish

Har bir resurs uchun yillik hajm, narx, mavsumiylik, transport xarajatlari, saqlash va foydalanish imkoniyatlarini aniqlash.

II- bosqich. Kimyoviy skrining

Quyidagilar aniqlanishi lozim. Xususan, xom protein, lipid, kletchatka, kul, minerallar, aminokislotalar, antinutritiv moddalar va boshq.

III-bosqich. Xavfsizlik skriningi. Mikrobiologik va zarur toksikologik tekshiruvlarni amalga oshirish.

IV-bosqich. Biokonversiya. Fermentativ gidroliz va/yoki mikrobiologik fermentatsiyani amalga oshirish.

V bosqich. Qayta baholash

Biokonversiyadan so‘ ng protein hazmlanuvchanligi, peptidlar, erkin aminokislotalar, fitat, kletchatka, boshqa cheklovchi omillar qayta aniqlanadi.

VI-bosqich. Formulyasiya. Rasionlar xom protein bo‘ yicha emas, balki hazm bo‘ luvchi protein-muhim aminokislotalar va energiya tizimida hisoblanadi.

VII-bosqich. Ekstruziya. Granulaning texnologik va fizik ko‘ rsatkichlari optimallashtiriladi.

VIII- bosqich. Biologik sinov. Forel balig‘ idagi vazn ortishi, SGR, FCR, PER, tirik qolish va ADC aniqlanadi.

IX-bosqich. Iqtisodiy baholash

1 kg yem narxidan ko‘ ra, 1 kg baliq biomassasi o‘ sishiga sarflangan yem qiymati asosiy iqtisodiy mezon sifatida qaraladi.

3-jadval

Forel balig‘ i uchun mahalliy kombikormini ishlab chiqish bo‘ yicha taklif etilayotgan tajriba sxemasi

Guruh	Import proteinni mahalliy kompleks bilan almashtirish	Maqsad
K_0	0%	Nazorat
K_1	25%	Past almashtirish
K_2	50%	O‘ rta darajada almashtirish
K_3	75%	Yuqori almashtirish
K_4	100% yoki maksimal eksperimental	Almashtirish chegarasini aniqlash

3-jadvalda forel uchun import o‘ rnini bosuvchi mahalliy kombikormlarning samaradorligini eksperimental baholash sxemasi keltirilgan**.** Taklif etilayotgan yondashuvda nazorat rasioni (K_0) bilan bir qatorda import protein komponentining 25, 50, 75 va 100% yoki maksimal mumkin bo‘ lgan qismi mahalliy protein kompleksi bilan almashtirilgan tajriba rasionlari (K_1–K_4) ko‘ zda tutiladi. Bunday gradasion sxema mahalliy protein ulushining ortishi bilan forelning o‘ sishi, yemdan foydalanishi va fiziologik holatida yuz beradigan o‘ zgarishlarni aniqlash, shuningdek, import proteinini almashtirishning biologik va iqtisodiy jihatdan optimal chegarasini belgilash imkonini beradi.

Tajriba rasionlarini shakllantirishda ularning izoprotein va izoenergetik bo‘ lishi, shuningdek, lizin, metionin, treonin va boshqa muhim aminokislotalar bo‘ yicha imkon qadar tenglashtirilishi muhim hisoblanadi. Bu mahalliy protein kompleksining ta’sirini rasiondagi umumiy protein yoki energiya miqdori o‘ zgarishidan ajratgan holda ob’yektiv baholash imkonini beradi. Almashtirish samaradorligini baholashda baliqlarning vazn ortishi, maxsus o‘ sish tezligi (SGR), yem konversiya koeffisiyenti (FCR), protein samaradorligi koeffisiyenti (PER), tirik qolish darajasi va ozuqa moddalarining hazmlanuvchanligi asosiy mezonlar sifatida qo‘ llanilishi maqsadga muvofiq.

Bunda 100% almashtirish oldindan maqbul natija sifatida qabul qilinmasligi kerak. Aksincha, K_1-K_4 variantlarini nazorat bilan taqqoslash orqali mahalliy protein kompleksining qaysi darajasi forelning o‘ sishi va yem konversiyasini pasaytirmasdan import komponentini maksimal darajada almashtira olishi eksperimental ravishda aniqlanadi. Shu tariqa mazkur sxema import o‘ rnini bosishning nafaqat texnik imkoniyatini, balki uning biologik samarali va iqtisodiy maqbul darajasini belgilashga xizmat qiladi.

XULOSA

Adabiyotlar tahlili forel balig‘ i uchun import o‘ rnini bosuvchi mahalliy kombikormlar yaratishning yetarli ilmiy va texnologik asoslari mavjud ekanligini ko‘ rsatadi.

Birinchidan, forel rasionlarida baliq unini alternativ protein manbalari bilan sezilarli darajada almashtirish mumkinligi ko‘ plab tajribalarda isbotlangan. Ayrim o‘ simlik protein aralashmalarida 47–66% darajada almashtirish o‘ sish va yem konversiyasini jiddiy yomonlashtirmagan [12, 15]. Chuqur qayta ishlangan soya va paxta proteinlarida yana yuqori natijalarga erishilgan [14, 17].

Ikkinchidan, proteinning manbasi bilan bir qatorda uni qayta ishlash texnologiyasi hal qiluvchi ahamiyatga ega. Oddiy o‘ simlik shroti bilan protein konsentrati bir xil biologik natija bermaydi.

Uchinchidan, forel kombikormlarida mahalliy o‘ simlik va hayvonot proteinlarini komplementar birlashtirish muhim aminokislotalar disbalansini kamaytirish imkonini beradi.

To‘ rtinchidan, fermentativ gidroliz, mikrobiologik fermentatsiya va ekstruziya kabi texnologik usullar mahalliy xomashyoning protein hazmlanuvchanligi va biologik qiymatini oshirishning asosiy vositalari bo‘ lishi mumkin.

Beshinchidan, O‘ zbekistonda kungaboqar, paxtachilik, donchilik, dukkakli ekinlar, parrandachilik, baliqchilik va oziq-ovqat sanoati ikkilamchi mahsulotlaridan samarali foydalanish uchun resurs imkoniyatlari mavjud. Biroq har bir xomashyoning protein tarkibi, aminokislota profili, antinutritiv moddalari va xavfsizligi eksperimental baholanishi shart.

Shu asosda O‘ zbekiston sharoiti uchun eng maqbul ilmiy-texnologik model quyidagicha ifodalanishi mumkin: mahalliy o‘ simlik va hayvonot ikkilamchi xomashyolari →resurs va sanitariya skriningi →mexanik-termik qayta ishlash → fermentativ va/yoki mikrobiologik biokonversiya →yuqori hazmlanuvchan protein komponentlari →komplementar protein kompleksi →aminokislota va energiya bo‘ yicha muvozanatlashtirish →ekstruziya →forelda biologik sinov → iqtisodiy baholash →texnologik reglament →mahalliy sanoat ishlab chiqarishi.

Ushbu yondashuv forelchilikda import ozuqalarga qaramlikni bosqichma-bosqich kamaytirish, agrosanoat ikkilamchi resurslarini yuqori qo‘ shimcha qiymatli mahsulotga aylantirish, mahalliy kombikorm sanoatini rivojlantirish va respublikada intensiv forelchilikning barqaror ozuqa bazasini shakllantirish uchun ilmiy asos bo‘ lishi mumkin.

Maqola yakunida ta’kidlash mumkinki, O‘ zbekiston sharoitida birinchi marta mahalliy o‘ simlik va hayvon mahsulotidan bo‘ lgan ikkilamchi xomashyolarning komplementar protein potensiali kompleks baholanadi, ularni maqsadli fermentativ va mikrobiologik biokonversiya qilish asosida forel balig‘ i uchun import o‘ rnini bosuvchi yuqori hazmlanuvchan kombikormlar yaratishning ilmiy-texnologik asoslari ishlab chiqiladi va u amaliyotda, ya’ni forelchilik tarmog‘ ini barqaror rivojlantirishda muhim drayver vazifasini bajarishi mumkin.

Mazkur yondashuvda asosiy yangilik bu mahalliy xomashyo, o‘simlik va hayvonot proteinlarining komplementarligi, biokonversiya, yuqori hazmlanuvchan protein asosida formulyasiya, import o‘rnini almashtirish darajasining eksperimental aniqlash va ularni bir tizimda birlashtirilishidadir.

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ULLISHO‘ RKO‘ LDA TARQALGAN CHIPOR DO‘ NGPESHONA *(HYPOPHTHALMICHTHYS NOBILIS)*NING YOSH, VAZN VA O‘ SISH XUSUSIYATLARI.

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Annotatsiya. *Ushbu maqolada Ullisho‘ rko‘ lida tarqalgan chipor do‘ ngpeshona (Hypophthalmichthys nobilis) populyatsiyasining yosh tarkibi, tana uzunligi, vazni va o‘ sish xususiyatlari o‘ rganilgan. 1+ dan 4+ yoshgacha bo‘ lgan 30 ta baliq namunalari umumiy qabul qilingan ixtiologik metodlar asosida tahlil qilingan. Natijalarga ko‘ ra, baliqning yoshi ortishi bilan tana uzunligi va vazni izchil ravishda oshib borgan: uzunlik bo‘ yicha yillik o‘ sish sur’ati 1+/2+ yosh oralig‘ ida 242,4 mm, 2+/3+ da 172,1 mm, 3+/4+ da esa 143,9 mm ni tashkil etgan bo‘ lsa, vazn bo‘ yicha mos ravishda 1509,0 g, 2556,2 g va 4549,9 g ga teng bo‘ lgan.*

Kalit so‘ zlar. *Chipor do‘ ngpeshona, ovlanadigan tur, Hypophthalmichthys nobilis, Ullisho‘ rko‘ l, yosh tarkibi, uzunlik vazn, regressiya tahlili, o‘ sish sur’ati, Fulton koeffitsienti, ixtiologik tahlil.*

AGE, WEIGHT AND GROWTH CHARACTERISTICS OF THE BIGHEAD CARP (HYPOPHTHALMICHTHYS NOBILIS) DISTRIBUTED IN ULLISHORKOL

Abstract. *This article studies the age structure, body length, weight and growth characteristics of the bighead carp (Hypophthalmichthys nobilis) population distributed in Ullishorkol. Thirty fish samples aged from 1+ to 4+ were analysed using generally accepted ichthyological methods. According to the results, body length and weight increased consistently with age: the annual growth rate in length was 242.4 mm between ages 1+/2+, 172.1 mm between 2+/3+, and 143.9 mm between 3+/4+, while the corresponding weight increments were 1509.0 g, 2556.2 g and 4549.9 g, respectively.*

Keywords. *Bighead carp, commercial species, Hypophthalmichthys nobilis, Ullishorkol, age structure, length-weight, regression analysis, growth rate, Fulton’s condition factor, ichthyological analysis.*

ВОЗРАСТНЫЕ, ВЕСОВЫЕ И РОСТОВЫЕ ХАРАКТЕРИСТИКИ ПЕСТРОГО ТОЛСТОЛОБИКА (*HYPOPHTHALMICHTHYS NOBILIS*), ОБИТАЮЩЕГО В ОЗЕРЕ УЛЛИШОРКОЛЬ

Аннотация. *В данной статье изучены возрастной состав, длина тела, масса и особенности роста популяции пёстрого толстолобика (Hypophthalmichthys nobilis), распространённого в озере Уллишўркўл. 30 образцов рыб в возрасте от 1+ до 4+ лет проанализированы на основе общепринятых ихтиологических методов. Согласно результатам, с увеличением возраста рыбы длина тела и масса последовательно возрастали: годовой прирост по длине составил 242,4 мм в возрасте 1+/2+, 172,1 мм в 2+/3+ и 143,9 мм в 3+/4+, а по массе соответственно 1509,0 г, 2556,2 г и 4549,9 г.*

Ключевые слова. *Пёстрый толстолобик, промысловый вид, Hypophthalmichthys nobilis, Уллишўркўл, возрастной состав, длина-масса, регрессионный анализ, темп роста, коэффициент Фультона, ихтиологический анализ.*

Kirish. So‘ ngi yillarda O‘ zbekistonda baliqchilik sohasi davlat siyosatining ustuvor yo‘ nalishlaridan biriga aylanib bormoqda. Xususan, Respublikada baliqchilik tarmog‘ ini rivojlantirish, ozuqa bazasini mustahkamlash va baliq yetishtirish hajmini keskin oshirishga qaratilgan ustuvor yo‘ nalishlar belgilanmoqda. Hozirgi davrda baliqlarni ilmiy o‘ rganish, ularning biologiyasi, serpushtligi va ekologik moslashuvchanligini chuqur tadqiq qilish zarurati ortib bormoqda. Tabiiy suv havzalardagi baliq resurslarini zamonaviy usullar bilan aniqlash baliqchilikni ilmiy asosda boshqarish va barqaror rivojlanishga erishish uchun zarur ilmiy-amaliy ahamiyat kasb etadi. Shu jumladan, Ullisho‘ rko‘ lida keng tarqalgan chipor do‘ ngpeshona- *Hypophthalmichthys Nobilis*ning o‘ sish xususiyatlarini o‘ rganish muhim ahamiyatga ega hisoblanadi.

Chipor do‘ ngpeshona *(Hypophthalmichthys nobilis)* O‘ zbekistonning ko‘ plab sun‘iy va tabiiy suv havzalarida keng tarqalgan. Ushbu tur 1961 yilda respublikamiz suv havzalariga Xitoydan tasodifan keltirilgan tur hisoblanadi. (Мирабдуллаев И.М. va 2002). Chipor do‘ ngpeshona boshining yirik bo‘ lishi bilan oq do‘ ngpeshona baliq turidan

ajralib turadi. *Hypophthalmichthys nobilis* respublikamiz suv havzalarida keng tarqalgan, tez o‘ sishi va suvni filtrlab oziqlanish xususiyatiga ega bo‘ lgan, asosiy ovlanadigan tur hisoblanadi (Mirabdullayev I.M., Mirzayev U.T. va bosh. 2011). Ullisho‘ rko‘ l suv havzasida ilgari olib borilgan tadqiqotlarda ham chipor do‘ ngpeshona balig‘ i bo‘ yicha keng ma’lumotlar qayd etilgan (Б.Хакбердиев, 1983).

Material va metodika. Ushbu ilmiy tadqiqot ishida material sifatida Xorazm viloyati Yangiariq tumanida joylashgan Ullisho‘ rko‘ lidan 2026-yil iyun-iyul oylarida ovlangan chipor do‘ ngpeshona baliqlaridan foydalanildi. Ovlangan baliqlarning tur tarkibi (Mirabdullayev I.M., Mirzayev U.T. va bosh. 2011), (Mirabdullayev I.M. va bosh. 2020) qo‘ llanmalar bo‘ yicha aniqlandi. Materiallarni yig‘ ish, qayta ishlash va tahlil qilish umumiy qabul qilingan ixtiologik metodlar asosida amalga oshirildi (Правдин, 1966). Olib borilgan ilmiy tadqiqotlar natijasida ko‘ ldan ovlangan Chipor do‘ ngpeshona - (*Hypophthalmichthys nobilis)* baliq turidan 30 ta namuna yig‘ ildi.

Ushbu ilmiy tadqiqot doirasida yig‘ ilgan namunalar quyidagi aniq geografik koordinatalarga ega nuqtalardan ovlab olindi (1-jadval).

1-jadval

Chipor do‘ ngpeshona - (*Hypophthalmichthys nobilis*) baliqlarining namuna uchun ovlangan hudud koordinata nuqtalari

Turning nomi	Namuna olingan hudud	Koordinata nuqtalari
Hypophthalmichthys nobilis	Ullisho‘ rko‘ l	41°14′25.17″N 60°29′21.73″E
		41°14′35.55″N 60°29′40.39″E
		41°14′34.21″N 60°30′17.23″E
		41°14′15.76″N 60°30′11.07″E
		41°14′14.3″N 60°29′44.93″E

Bu nuqtalar bir-biriga nisbatan yaqin joylashgan bo‘ lib, ular bir xil ekologik sharoitga ega turg‘ un suv maydonini ifodalaydi. Ushbu koordinatalar asosida to‘ plangan ma’lumotlar tahlili, hududdagi ovlangan chipor do‘ ngpeshona baliqlarining yoshini aniqlash, tana uzunligi va vaznini aniqlashda muhim omil bo‘ lib xizmat qildi.

Natijalar va muhokamalar. Bizning olib bogan tadqiqot ishimizda asosan ko‘ lning turli nuqtalariudan chipor do‘ ngpeshona tiriga mansub jami 30 ta baliq namunasi o‘ rganildi. Ovlangan chipor do‘ ngpeshona balig‘ i 1+, 2+, 3+, 4+ yoshni tashkil etdi. Chipor do‘ ngpeshona (*Hypophthalmichthys nobilis*) baliqlarining (uzunlik, vazn va yosh ko‘ rsatkichlari) aiqlanadi , (2-jadval).

2-jadval

Ullisho‘ rko‘ l ko‘ lidagi *Hypophthalmichthys nobilis*ning uzunlik va og‘ irlik ko‘ rsatkichlari

Yoshi	*l, sm*	*W, gr*	*N*
1+	18-37,5	72-783	7
2+	40,2-61,2	910-2860	10
3+	62,3-73,5	2932-5324	8
4+	73,8-93,1	5402-12310	5

Har bir guruh bo‘ yicha tana uzunligi va vazniga oid statistik ko‘ rsatkichlar 3-jadvalda keltirilgan.

3-jadval

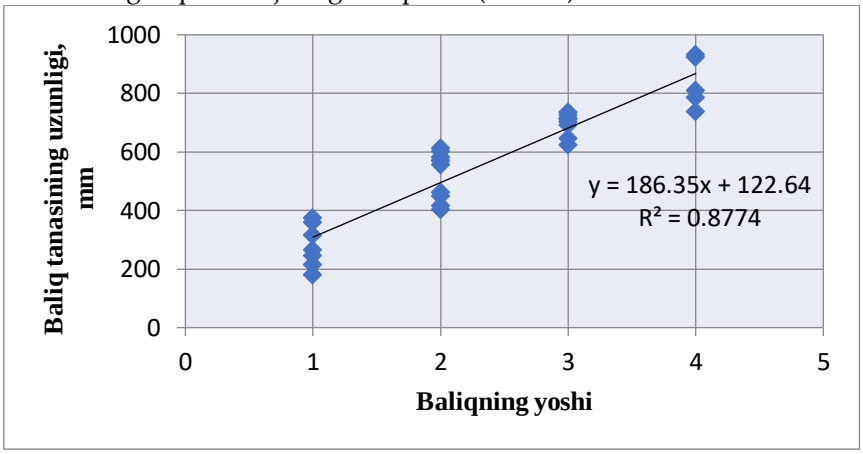
***Hypophthalmichthys nobilis*ning tana uzunligi va vazniga oid statistik ko‘ rsatkichlar**

Yosh guruhi	n	L, mm (o‘ rtacha ± SD)	L, mm (min–max)	W, g (o‘ rtacha ± SD)	W, g (min–max)	Fulton koeffitsienti (o‘ rtacha ± SD)
1+	7	279,3 ± 73,4	180–375	383,3 ± 273,1	72–783	1,48 ± 0,11
2+	10	521,7 ± 80,7	402–612	1892,3 ± 701,4	910–2860	1,29 ± 0,10
3+	8	693,8 ± 39,6	623–735	4448,5 ± 822,8	2932–5324	1,32 ± 0,06
4+	5	837,6 ± 85,7	738–931	8998,4 ± 3006,0	5402–12310	1,48 ± 0,08

Jadvaldan ko‘ rinib turibdiki, baliqning yoshi ortishi bilan tana uzunligi va vazni izchil ravishda ortib boradi. Umumiy tekshirilgan namunalarda tana uzunligi 180 mm dan 931 mm gacha, tana vazni esa 72 g dan 12310 g gacha o‘ zgarib turdi, bu esa bir yoshli yosh baliqlar bilan to‘ rt yoshli yetuk individlar o‘ rtasidagi sezilarli farqni ko‘ rsatadi.

Namunalarning yosh darajasi ko‘ rsatkichlari 1+ yoshdan 2+ yoshga o‘ tishda tana uzunligi o‘ rtacha 242,4 mm ga, 2+ dan 3+ ga o‘ tishda 172,1 mm ga, 3+ dan 4+ ga o‘ tishda esa 143,9 mm ga ortgan. Shunga mos ravishda tana vazni bo‘ yicha yillik o‘ rtacha 1+/2+ oralig‘ ida 1509,0 g ni, 2+/3+ oralig‘ ida 2556,2 g ni, 3+/4+ oralig‘ ida esa 4549,9 g ni tashkil qildi.

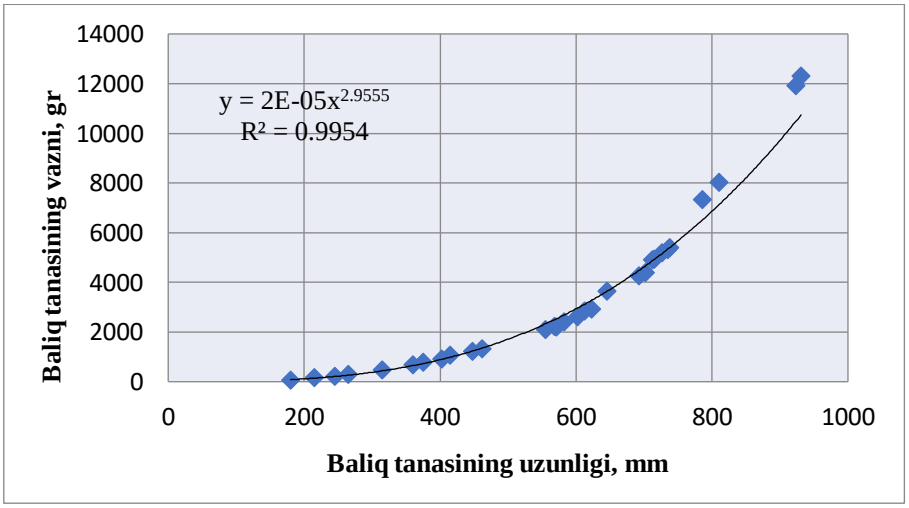
Shuningdek, ushbu ilmiy tadqiqotlar natijasida *Hypophthalmichthys nobilis* namunalarining yoshi va tanasining uzunligi o‘ rtasida o‘ zaro o‘ rtacha bog‘ liqlik mavjudligi aniqlandi (1-rasm).



1-rasm. Ullisho‘ rko‘ lida ovlangan *Hypophthalmichthys nobilis* baliqlarining yoshi va tana uzunligining o‘ zaro bog‘ liqligi.

Ushbu grafikda regressiya tenglamasi y=186.35x+122.64, R^2=0.8774 bo‘ lib, tahlil natijalariga ko‘ ra, baliq yoshi ortishi bilan tana uzunligi ham muntazam ravishda ortishi kuzatildi.

Hypophthalmichthys nobilis populyatsiyasida tana uzunligi va tana vazni o‘ rtasidagi bog‘ liqlik regressiya tahlili yordamida baholandi (2-rasm). Tahlil natijasida baliqlarning tana uzunligi va vazni o‘ rtasida kuchli musbat bog‘ liqlik mavjudligi aniqlandi.



2-rasm. Ullisho‘ rko‘ lida ovlangan *Hypophthalmichthys nobilis* baliqlarining tana uzunligi va tana vazni o‘ rtasidagi o‘ zaro bog‘ liqligi.

Ushbu grafikda regressiya tenglamasi quyidagicha keltirilgan y=2E-05$x^{2,9555}$. Bunda determinatsiya koeffitsienti R^2=0,9954 ni tashkil etdi, bu esa baliqlarning tana vaznidagi o‘ zgarishlarning 99,54 % i tana uzunligi bilan izohlanishini ko‘ rsatadi. Faqat 0,46 % o‘ zgarish boshqa biologik va ekologik omillar, jumladan oziqlanish sharoiti, individual rivojlanish xususiyatlari, va yashash muhiti ta’siri bilan bog‘ liq bo‘ lishii aniqnangan.

Bizning tadqiqotimizda olingan R^2 = 0,9954 qiymati populyatsiyada tana uzunligi va tana vazni o‘ rtasidagi bog‘ liqlik juda yuqori ekanligini ko‘ rsatadi hamda Ullisho‘ rko‘ l sharoitida *Hypophthalmichthys nobilis* populyatsiyasi barqaror o‘ sish sur’atiga ega ekanligini tasdiqlaydi.

Xulosa. Shunday qilib, Ullisho‘ rko‘ lda tarqalgan *Hypophthalmichthys nobilis* populyatsiyasining yosh tarkibi, morfometrik va uzunlik–vazn ko‘ rsatkichlari o‘ rganildi. Olib borilgan tadqiqotlar natijasida ushbu turning populyatsiyasi asosan 1+ dan 4+ yoshli bo‘ lgan individlardan tashkil topgani aniqlandi. Yosh va tana uzunligi

o‘ rtasidagi regressiya tahlili natijasida y = 186,35x + 122,64 regressiya tenglamasi hamda R^2 = 0,8774 determinatsiya koeffitsienti olindi. Bu tana uzunligidagi o‘ zgarishlarning 87,74 % i yosh omili bilan izohlanishini va yoshning ushbu turning chiziqli o‘ sishiga asosiy ta’sir etuvchi omillardan biri ekanligini ko‘ rsatadi.

Uzunlik–vazn munosabatining regressiya tahlili $W = 2\times10^{-5}L^{2.9555}$ tenglamasi bilan ifodalanib, R^2 = 0,9954 ga teng yuqori determinatsiya koeffitsienti aniqlandi. Bu natija tana uzunligi va vazni o‘ rtasida juda kuchli bog‘ liqlik mavjudligini tasdiqlaydi.

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O‘ ZBEKISTON G‘ ARBIY VA JANUBI-G‘ ARBIY VOHALARIDA TARQALGAN CATOCALINI TRIBASI TURLARINING ZOOGEOGRAFIK XUSUSIYATLARI

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Annotatsiya: *O‘ zbekistonning g‘ arbiy va janubi-g‘ arbiy vohalarida aniqlangan Catocalini tribasi vakillarining O.L. Kryzhanovskiy tasnifi bo‘ yicha 12 ta zoogeografik guruhga mansubligi aniqlandi. Tadqiqot natijasida jami 34 ta tur qayd etilgan bo‘ lib, ular quyidagicha taqsimlanadi: 9 ta tur — Turon-Markaziy Osiyo (26,5%), 2 ta tur — Turon-Qozog‘ iston (5,9%), 1 ta tur — Eron-Turon (2,9%), 3 ta tur — Turon (8,8%), 1 ta tur — Turkiston tog‘ (2,9%), 2 ta tur — Transpalearktik-transzonal (5,9%), 1 ta tur — Transzonal (2,9%), 3 ta tur — Qadimiy O‘ rta yer (8,8%), 3 ta tur — Yevropa-Skifiya-Turon (8,8%), 5 ta tur — Transpalearktika (14,7%), 2 ta tur — Palearktika (5,9%) va 2 ta tur — Turon-Markaziy Osiyo-Hind (5,9%). Shuningdek, 13 ta turning Markaziy Osiyo uchun endemik va avtoxton ekanligi ma’lum bo‘ ldi.*

Kalit so‘ zlar – *O‘ zbekiston, Xorazm, Buxoro, Qashqadaryo, tangachaqanotlilar, Catocalini, Catocala, zoogeografiya, provinsiya, Turon, transplaearktika, transzonal, endemik, avtoxton, fauna*

ЗООГЕОГРАФИЧЕСКИЕ ОСОБЕННОСТИ ВИДОВ ТРИБЫ CATOCALINI, РАСПРОСТРАНЕННЫХ В ЗАПАДНЫХ И ЮГО-ЗАПАДНЫХ ОАЗИСАХ УЗБЕКИСТАНА

Аннотация: *Представители трибы Catocalini, выявленные в западных и юго-западных оазисах Узбекистана, согласно классификации О.Л. Крыжановского, были распределены по 12 зоогеографическим группам. Исследование показало наличие 34 видов, которые распределяются следующим образом: 9 видов относятся к Туранско-Центральноазиатской группе (26,5%), 2 вида — к Туранско-Казахстанской (5,9%), 1 вид — к Ирано-Туранской (2,9%), 3 вида — к Туранской (8,8%), 1 вид — к Туркестанской горной (2,9%), 2 вида — к Транспалеарктическо-трансзональной (5,9%), 1 вид — к Трансзональной (2,9%), 3 вида — к Древнесредиземноморской (8,8%), 3 вида — к Европейско-Скифско-Туранской (8,8%), 5 видов — к Транспалеарктической (14,7%), 2 вида — к Палеарктической (5,9%) и 2 вида — к Туранско-Центральноазиатско-Индийской (5,9%). Установлено, что 13 видов являются эндемиками и автохтонами Центральной Азии.*

Ключевые слова: *Узбекистан, Хорезм, Бухара, Кашкадарья, чешуекрылые, Catocalini, Catocala, зоогеография, провинция, Туран, Транспалеарктика, трансзональный, эндемик, автохтон, фауна.*

ZOOGEOGRAPHICAL CHARACTERISTICS OF THE SPECIES OF THE TRIBE CATOCALINI DISTRIBUTED IN THE WESTERN AND SOUTH-WESTERN OASES OF UZBEKISTAN

Abstract: *The members of the tribe Catocalini identified in the western and south-western oases of Uzbekistan were classified into 12 zoogeographical groups based on the O. Kryzhanovsky classification system. The analysis of 34 identified species is as follows: 9 species belong to the Turanian-Central Asian group (26.5%), 2 species to the Turanian-Kazakhstani (5.9%), 1 species to the Irano-Turanian (2.9%), 3 species to the Turanian (8.8%), 1 species to the Turkestanian mountain (2.9%), 2 species to the Transpalearctic-transzonal (5.9%), 1 species to the Transzonal (2.9%), 3 species to the Ancient Mediterranean (8.8%), 3 species to the European-Scythian-Turanian (8.8%), 5 species to the Transpalearctic (14.7%), 2 species to the Palearctic (5.9%), and 2 species to the Turanian-Central Asian-Indian (5.9%). Furthermore, 13 species were identified as endemic and autochthonous to Central Asia.*

Keywords**:** *Uzbekistan, Khorezm, Bukhara, Kashkadarya, Lepidoptera, Catocalini, Catocala, zoogeography, province, Turan, Transpalearctic, transzonal, endemic, autochthonous, fauna.*

Kirish

Hozirgi vaqtda Yer yuzini zoogeografik rayonlashtirishing yagona umumiy sxemasi mavjud emas, chunki hayvonlarning, shu jumladan hasharotlarning, ayniqsa tangachaqanotlilarni har bir guruhi tarqalishi bo‘ yicha o‘ ziga xos xususiyatlarga ega. Ushbu holatni tangachaqanotlilarning vakili hisoblangan Catocalini tribasi turlarida ham kuzatish mumkin. Ammo umurtqasiz hayvonlarning tarqalish xususiyatlari umurtqalilarnikidan farq qilganligi bois, ularning ayrim turlari arealini asos qilib olib yagona zoogeografik sxema yaratib bo‘ lmaydi. Shu munosabat bilan har bir taksonning tarqalish qonuniyatlarini hududlar kesimida alohida o‘ rganish talab etiladi[7;9].

Boshqa hasharotlar kabi Catocalini tribasi turlarining yer yuzi bo‘ ylab tarqalishi ko‘ p vaqtlardan buyon entomolog olimlar diqqat markazida bo‘ lib kelgan. Ma’lumotlarga ko‘ ra, Catocalini tribasining eng katta avlodi hisoblangan *Catocala* avlodiga mansub tangachaqanotlilarni dunyo bo‘ yicha 268 turi aniqlangan bo‘ lib, shulardan 103 turi Nearktikada, 165 turi Palearktikada tarqalgan, bular orasida Golarktik turlar uchramaydi. Ushbu avlodning bir nechta turlari Neotropika va Hindo-Malayya biogeografik viloyatlarida qayd qilingan [2;3;5;8;10].

Yuqoridagilardan kelib chiqqan holda biz O‘ zbekistonning Xorazm, Buxoro va Qashqadaryo vohalarida olib borgan tadqiqotlarimiz davomida aniqlangan Catocalini tribasiga mansub turlarning tarqalish areallarini biogeografik va zoogeografik jihatdan o‘ rganib chiqishni o‘ z oldimizga maqsad qilib oldik.

Material va metodika

Tangachaqanotlilarning tarqalgan areallarini aniqlashda entomolog olim O.L.Krijanovskiy tomonidan Yer yuzini zoogeografik rayonlashtirishga doir klassifikatsiyasini asos qilib oldik [9]. Bunga ko‘ ra Xorazm vohasi zoogeografik jihatdan Palearktika oblastining O‘ rta Yer dengizi kichik oblasti, Turon-Qozog‘ iston tekislik provinsiyasi, Amudaryo vodiy-voha okrugi, Quyi Amudaryo kichik okrugida joylashgan bo‘ lib, Xorazm faunasida to‘ qay landshaftlari va suv-botqoq komplekslari muhim o‘ rin tutadi.

Buxoro vohasi Qizilqum zoogeografik okrugining Markaziy Qizilqum, Janubiy Qizilqum, Mirzacho‘ l, Qashqadaryo kichik okruglari, shuningdek Amudaryo vodiy-voha okrugining Zarafshon-vodiy kichik okrugiga kiruvchi hududlarda joylashgan. Zarafshon daryosining quyi qismi va uning atrofidagi cho‘ l va chalacho‘ llar, vohalararo hududlarning mavjudligi psammofil faunani shakllanishida muhim rol o‘ ynagan. Shu bilan birga sun’iy sug‘ orish tizimlari tufayli antropogen landshaftlar faunasi ham shakllangan.

Qashqadaryo vohasi hududi esa Qizilqum zoogeografik okrugining Qashqadaryo kichik okrugida joylashgan bo‘ lib, bir tomondan Qashqadaryo havzasining tekislik qismini qamrab olsa, ikkinchi tomondan G‘ uzor, Hisor tizmalarining g‘ arbiy tarmoqlari va tog‘ oldi hududlari bilan tutashib ketadi. Shu bois bu yerda ham landshaftlar xilma-xilligi seziladi [4;6].

Natijalar

O‘ zbekistonning g‘ abiy va janubi-g‘ arbiy vohalarida aniqlangan Catocalini tribasi turlarini zoogeografik jihatdan tahlil qilish natijasida quyidagi guruhlar aniqlandi:

1) Turon-Markaziy Osiyo

Ushbu guruhni *Catocala optima, C.artobolevskiji, C.desiderata, C.aestimabilis, C.juncta, C.neglecta, C.repudiata, C.timur, C.remissa* kabi turlar tashkil qiladi. Bular asosan Palearktikaning arid hamda tog‘ oldi-tekislik landshaftlariga moslashgan, Turon provinsiyasi va Markaziy Osiyo ustprovinsiyasining cho‘ l va dasht biogeosenozlarida tarqalgan endemik turlar hisoblanadi. Mazkur turlar Markaziy Osiyo hududida shakllangan avtoxton entomofaunistik kompleksining komponentlari sifatida o‘ rganilayotgan hududning zoogeografik jihatdan o‘ ziga xosligini ko‘ rsatib beruvchi hasharotlar hisoblanadi.

2) Turon-Qozog‘ iston

Mazkur guruhga *Catocala orientalis, C.detrita* mansub bo‘ lib, asosan Markaziy Osiyoning cho‘ l-tekislik zonalari, Qozog‘ istonning keng cho‘ l, chala cho‘ l va janubiy dasht hududlarini, Sharqiy Yevropaning sharqiy chekkalaridagi (Uraloldi va Janubiy Ural) quruq dasht-cho‘ l landshaftlarida tarqalgan. Zoogeografik jihatdan bu turlarni areali arid iqlimli sharoitlarga ega Turon va Qozog‘ iston provinsiyalariga mos keladi. *Catocala orientalis, C.detrita* turlarining mavjudligi hudud entomofaunasining genezisida Turon va Qozog‘ iston provinsiyalari o‘ rtasida doimiy faunistik-migratsion aloqalar rivojlanganligini, shu aloqalar orqali har ikkala provinsiyada iqlim o‘ zgarishlari bo‘ lib o‘ tayotgan hozirgi kunda ham faol ravishda faunistik almashinuv amalga oshayotganini ko‘ rsatadi. To‘ plangan ma’lumotlar Turon-Qozog‘ iston turlarini o‘ rganilayotgan vohalar uchun alloxton xarakterga ega ekanligini bildiradi.

3) Eron-Turon

Mazkur guruh faqat *Catocala lesbia* turidan iborat bo‘ lib, Eron-Turon ustprovinsiyasining o‘ ziga xos va qadimgi turlaridan biri sifatida Eron tog‘ ligi arid landshaftlari hamda Turon pasttekisligining cho‘ l va to‘ qay biogeosenozlarida tarqalgan. *C.lesbia* iqlim xususiyatlari jihatdan keskin kontinental, quruq va issiq sharoitga, xususan, Old Osiyo va Markaziy Osiyo chegaralaridagi cho‘ l, chala cho‘ l hamda daryo bo‘ ylari to‘ qay ekotizimlariga ixtisoslashgan tur sanalanadi. Fikrimizga ko‘ ra *C.lesbia* o‘ rganilayotgan vohalar uchun avtoxton yoki endemik emas, balki Eron-Turon orqali kirib kelgan alloxton tur hisoblanadi. Ushbu turni tadqiqotlar davomida qayd qilinishi esa hududimiz

entomofaunasining genezisida mahalliy va shimoliy (Qozog‘ iston-Ural) faunistik aloqalar bilan bir qatorda janubi-g‘ arbiy yo‘ nalishdagi faunistik-migratsion aloqalar ham muhim rol o‘ ynaganini isbotlaydi.

4) Turon

Mazkur guruhga *Catocala fugitiva, C.kusnezovi, C.toropovi* kabi O‘ rta Osiyoning cho‘ l va cho‘ l-to‘ qay ekotizimlarining endemik turlari tashkil etadi. Bu turlarning tarqalish areallari Turon provinsiyasi (Turon pasttekisligining Qizilqum, Qoraqum sahrolari, Qashqadaryo, Amudaryo, Sirdaryo va Zarafshon daryolari vodiylari hamda ularga tutash cho‘ l-qumliklar) landshaftlari mos keladi. Turon turlari ekologik jihatdan hududning arid iqlimga ega sharoitlariga hamda daryo bo‘ ylaridagi to‘ qaylarda daraxt formatsiyalariga ixtisoslashgan guruh sanaladi. Ushbu guruhga mansub turlar evolyutsion jihatdan Turon provinsiyasi hududida shakllangan bo‘ lib, o‘ rganilayotgan g‘ arbiy va janubi-g‘ arbiy vohalar uchun alloxton emas, balki avtoxton turlardir. *Catocala fugitiva, C.kusnezovi, C.toropovi* turlarining mavjudligi Catocalini tibasining evolyutsion taraqqiyotida Turon provinsiyasining hal qiluvchi ahamiyat kasb etganini va mazkur faunistik markazlardan biri ekanligini yaqqol ko‘ rsatadi.

5) Turkiston tog’

Bu guruhga keskin kontinental tog‘ iqlimi sharoitlariga moslashgan oreofil (tog‘ li hududda yashovchi) va endemik sifatida *Catocala hariti* turi mansub bo‘ lib, Eron-Turon ustpovinsiyasining Turkiston tog‘ provinsiyasi bo‘ ylab tarqalgan. Boshqacha aytganda, mazkur turning tarqalish areali G‘ arbiy Tyan-Shan, Turkiston, Zarafshon, Hisor tog‘ tizmalarining o‘ rta va pastki qismlaridagi quruq tog‘ yonbag‘ irlari hamda tog‘ oldi daryo vodiylari fitosenozlaridan iborat. O‘ zbekistonning janubi-g‘ arbiy vohalarida bu turning qayd qilinishi esa tog‘ oldi va tog‘ larning pastki qismlaridan tekisliklarga, voha ekotizimlariga faunistik-migratsion jarayonlar bo‘ lib turganligini, bu esa hududimiz entomofaunasi, xususan Catocalini tribasi genezisida tog‘ va voha ekotizimlari o‘ rtasidagi vertikal va zonal, faunistik aloqalar bilan birga tog‘ oldi migratsion aloqalar ham muhim o‘ rin tutishini ko‘ rsatadi.

6) Transpalearktik-transzonal

Bu guruhni *Catocala nupta, C.neonympha* turlari tashkil etadi, ular keng ekologik valentlikka ega bo‘ lgan transpalearktik va transzonal hasharotlardir. Chunki mazkur turlarning tarqalish areallari faqat cho‘ l yoki tog‘ mintaqasi bilan chegaralanib qolmaydi, balki Yevrosiyoning g‘ arbiy hududlaridan tortib Tinch okeani havzasigacha bo‘ lgan geografik zonalarni – o‘ rmon-dasht, dasht, cho‘ l va arid landshaftlarni ham egallaydi. *Catocala nupta, C.neonympha* turlari turli xil iqlim va biosenoz sharoitlariga oson moslashuvchanligi bilan ajralib turadi, ayniqsa vohalarda mavjud to‘ qay ekotizimlarining Salicaceae oilasiga mansub daraxt va buta turlariga boyligi tufayli hamma joyda boshqa turlarga nisbatan barqaror populyatsiyalar hosil qilgan. O‘ rganilayotgan vohalar landshfatlarida *C.nupta, C.neonympha* turlari ham mahalliy to‘ qay ekotizimiga xos entomofaunaning tarkibiy qismi hisoblanadi. Ushbu turlarning qayd qilinishi esa respublikamiz entomofaunasining shakllanishida transpalearktik faunistik aloqalar ham muhim ahamiyat kasb etishini ko‘ rsatadi.

7) Transzonal

Tahlillar davomida *C.deducta* transzonal tur sifatida qayd qilindi. Ushbu tur tashqi muhitning ekologik omillarini keng diapazoniga va keng tarqalish xususiyatiga ega bo‘ lgan tangachaqanotli hasharot hisoblanadi. Mazkur tur tarqalish areali jihatdan bir necha zoogeografik oblast yoki zooxoronda uchraydi, xususan cho‘ l, chala cho‘ l, tog‘ , daryo vodiylari ekotizimlariga mansub xilma-xil landshaftlar tarqalganligi bilan boshqa guruhlardan farq qiladi. Shu tufayli hozirgi vaqtda ham tekislikdagi to‘ qaylar va tog‘ li hududlarning daryo bo‘ yi landshaftlarida barqaror populyatsiyalar shaklida saqlanib qolgan. *C. deducta* turining respublikamiz vohalaridagi tekisliklar, shuningdek tog‘ li hududlarda qayd qilinganligi uning boshqa hududlarga migratsiya qilish qobiliyatidan dalolat beradi. Bu holat o‘ rganilayotgan vohalarning Catocalini faunasi genezisida tekislik va tog‘ ekotizimlari o‘ rtasidagi faunistik aloqalar, bilan bir qatorda transzonal faunistik migratsiya muhim omil bo‘ lib xizmat qilganligini ko‘ rsatadi.

8) Qadimiy O‘ rta yer

Mazkur guruhga *C.hymenaea, C.nymphaea, C.conversa* turlari mansub bo‘ lib, ular Qadimiy O‘ rta yer dengizi oblastining kserofil, shuningdek, mezofil hasharotlari hisoblanadi. Bu turlar evolyutsion jihatdan relikt va tarqalish arealiga ko‘ ra Janubiy Yevropa, O‘ rta Yer dengizi havzasi, Kichik Osiyo va Old Osiyodan iborat hududlarni egallashgan. Ushbu turlarning evolyutsion shakllanishi va areal bo‘ ylab tarqalishi ularning lichinkalarining trofik munosabatlarida muhim o‘ rin tutuvchi o‘ simliklar tarqalishi bilan uzviy ravishda bo‘ lib o‘ tgan. Shunga ko‘ ra, O‘ rta Yer dengizi havzasi va unga tutash hududlar bu guruhdagi turlarning asosiy shakllanish markazi hisoblanadi. Markaziy Osiyo, qolaversa O‘ zbekiston vohalari sharoitida mazkur tangachaqanotlilarning qayd qilinishi ularning Qadimiy O‘ rta Yer markazidan sharqqa tomon daryo vodiylari va fitosenozlar orqali migratsiya qilganidan dalolat beradi.

9) Yevropa-Skifiya-Turon

Ushbu guruhni *Catocala sponsa, C.promissa, C.lupina* turlari tashkil qilib, ular zoogeografik jihatdan Boreal oblastning Skifiya kichik oblasti, Qadimiy O‘ rta Yer oblastining Gesperiya, Yevropa kichik oblastlari hamda Turon provinsiyasiga taalluqli mezofil va mezokserofil hasharotlar hisoblanadi. Mazkur turlarning kelib chiqishi va tarqalishida

Shimoliy Afrika, Yevropa, Kavkaz hamda G‘ arbiy Sibirning janubiy hududlari landshaftlari muhim ahamiyatga ega. Bu guruhning evolyutsion shakllanishi va tarqalishi mo‘ tadil iqlim mintaqasidagi keng bargli o‘ rmon biogeosenozlarining tarqalishi bilan birgalikda kechgan. Shu boisdan Yevropa va Skifiya *Catocala sponsa, C.promissa, C.lupina* turlarini tarqalish markazi hisoblanadi. Markaziy Osiyo va Turon pasttekisligi, shuningdek, g‘ arbiy va janubi-g‘ arbiy vohalarda bu turlarning uchrashi – nam mo‘ tadil iqlim hukm surgan qadimgi davrlarda nemoral hisoblangan mazkur turlarning Skifiya orqali Turon hududiga migratsiya qilganligidan dalolat beradi. Geologik davrlar almashinuvi jarayonida bo‘ lib o‘ tgan iqlim aridizatsiyasi va o‘ rmonlarning shimol tomonga surilishi natijasida bu turlar lichinkalarining ozuqa manbasi mavjud ekologik refugiumlarda geografik to‘ siqlar tufayli alohidalashgan holda saqlanib qolgan.

10) Transpalearktika

Bu guruh *C.adultera, C.electa, C.fraxini, C.fulminea, C.pacta* kabi turlardan iborat. Ular zoogeografik jihatdan Transpalearktika kompleksiga taalluqli keng arealga ega mezofil va mezokserofil tangachaqanotlilar hisoblanadi. Mazkur turlarning tarqalish areali Yevrosiyo qit’asining Atlantika okeani sohillaridan Tinch okeani havzasigacha (Uzoq Sharq, Yaponiya) bo‘ lgan mo‘ tadil mintaqaga to‘ g‘ ri keladi. Transpalearktik turlarning evolyutsion genezisi va tarqalish xususiyati ularning ekologik valentlik diapazoni hamda lichinkalarining ozuqaviy spektri kengligi (polifag yoki oligofag) ega ekanligi bilan xarakterlanadi. Shu munosabat bilan transpalearktik turlar Yevrosiyo bo‘ ylab g‘ arbdan sharqqa tomon butun qit’a bo‘ ylab erkin migratsiya qilishiga va keng areallarni egallashga muvaffaq bo‘ lishgan. O‘ zbekistonning g‘ arbiy va janubi-g‘ arbiy vohalarida transpalearktik guruhga mansub Catocalini vakillarining qayd qilinishi mazkur vohalardagi landshaftlarning bu guruh tangachaqnotlilari uchun har tomonlama qulay ekanligini bildiradi.

11)Palearktika

Ushbu guruhni *Catocala elocata, C.puerpera* kabi turlar tashkil qilib, ular o‘ zlarining keng areallari hamda turli landshaft-iqlim sharoitlariga adaptatsiyasi bilan ajralib turadi. Turlarning tarqalish areali – Shimoliy Afrika, Sinay yarim orolining bir qismi, Yevropa, Kichik Osiyo, Kavkaz, Markaziy Osiyo, Sibir, Oltoy, Uzoq Sharq, Xitoy kabi katta hududlardan iborat. Mazkur turlarning Shimoliy Afrikada ham tarqalishi ularning transkontinental xususiyatga ega ekanligini bildiradi. Palearktik turlar ekologik valentlik diapazoni kengligi tufayli biologik progressga yuz tutgan. Shuning uchun ham mo‘ tadil mintaqalardagi daraxt-butazor formatsiyalari va arid zonalarning daryo vodiylari (Amudaryo, Sirdaryo, Zarafshon, Qashqadaryo)ning mavjud biosenozlarida mazkur turlarning barqaror populyatsiyalari shakllangan.

12) Turon-Markaziy Osiyo-Hind

Ushbu guruhning vakillari bo‘ lgan *Catocala pudica, C. afghana* turlari zoogeografik jihatdan Turon provinsiyasi, Markaziy Osiyo ustprovinsiyasi hamda Paleotropika olami tarkibiga kiruvchi Hind kichik oblastida tarqalgan hamda keskin kontinental va arid sharoitga moslashgan.

Xulosa

Tadqiqot materiallarini tahlil qilish Markaziy Osiyo uchun *Catocala optima, C.artobolevskiji, C.desiderata, C.aestimabilis, C.juncta, C.neglecta, C.repudiata, C.timur, C.remissa, C.hariti, C.fugitiva, C.kusnezovi, C.toropovi* tangachaqanotlilari endemik turlar ekanligi, Turon provinsiyasi va Markaziy Osiyo ustpovinsiyasi bo‘ ylab tarqalganligini inobatga olsak, mazkur turlarni Markaziy Osiyo uchun avtoxton turlar deb ta’riflashimizga asos bo‘ ladi. O‘ zbekiston g‘ arbiy va janubi-g‘ arbiy vohalari Catocalini tribasi faunasini shakllanishida avtoxton turlardan tashqari Palearktikaning shimoliy-boreal, sharqiy-tog‘ va janubi-g‘ arbiy-arid kabi alloxton turlari ham muhim ahamiyat kasb etgan.

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ПРОРАСТАНИЕ СЕМЯН *DOREMA MICROCARPUM* В ЛАБОРАТОРНЫХ УСЛОВИЯХ

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Аннотация. *Изучены особенности прорастания семян редкого вида Dorema microcarpum в лабораторных условиях. Целью исследования было определение всхожести семян, сроков начала и продолжительности прорастания, а также оценка влияния холодной стратификации, продолжительности хранения и температуры. Исследования проводили в лаборатории «Биотехнологии» Ташкентского ботанического сада имени академика Ф.Н. Русанова при Институте ботаники АН Республики Узбекистан Семена, хранившиеся 6 и 12 месяцев, после 45-дневной холодной стратификации проращивали при +4–+6 °C и +24–+26 °C. Наибольшая всхожесть отмечена при +4–+6 °C: 55% после 6 месяцев и 69% после 12 месяцев хранения. В контрольных вариантах показатели составили 12 и 18% соответственно. При +24–+26 °C всхожесть стратифицированных семян была значительно ниже — 4 и 6%. Установлено, что холодная стратификация и низкие положительные температуры способствуют повышению всхожести семян D. microcarpum. Полученные результаты могут быть использованы при разработке методов семенного размножения и сохранения данного редкого вида.*

Ключевые слова: *Dorema microcarpum, Apiaceae, семена, всхожесть, прорастание, холодная стратификация, температура, редкие виды.*

GERMINATION OF *DOREMA MICROCARPUM* SEEDS UNDER LABORATORY CONDITIONS

Abstract. *The germination characteristics of seeds of the rare species Dorema microcarpum were studied under laboratory conditions. The aim of the study was to determine seed germination capacity, the onset and duration of germination, and to assess the effects of cold stratification, storage duration, and temperature. Seeds stored for 6 and 12 months were subjected to 45 days of cold stratification and subsequently germinated at +4–+6 °C and +24–+26 °C. The highest germination rates were recorded at +4–+6 °C, reaching 55% after 6 months and 69% after 12 months of storage. In the control treatments, germination rates were 12% and 18%, respectively. At +24–+26 °C, the germination rates of stratified seeds were considerably lower, at 4% and 6%, respectively. The results showed that cold stratification and low positive temperatures promote seed germination in D. microcarpum. These findings can be used to develop methods for seed propagation and conservation of this rare species.*

Keywords: *Dorema microcarpum, Apiaceae, seeds, germination capacity, germination, cold stratification, temperature, rare species.*

DOREMA MICROCARPUM URUG‘ LARINING LABORATORIYA SHAROITIDA UNIB CHIQISHI

Annotatsiya. *Dorema microcarpum noyob turining urug‘ larining laboratoriya sharoitidagi unib chiqish xususiyatlari o‘ rganildi. Tadqiqotning maqsadi urug‘ larning unuvchanligini, unib chiqish boshlanishi va davomiyligini aniqlash, shuningdek, sovuq stratifikatsiya, saqlash muddati va haroratning ta’sirini baholashdan iborat bo‘ ldi. 6 va 12 oy davomida saqlangan urug‘ lar 45 kunlik sovuq stratifikatsiyadan so‘ ng +4–+6 °C va +24–+26 °C haroratlarda undirildi. Eng yuqori unuvchanlik +4–+6 °C haroratda qayd etilib, 6 oylik saqlashdan so‘ ng 55%, 12 oylik saqlashdan so‘ ng esa 69% ni tashkil etdi. Nazorat variantlarida ushbu ko‘ rsatkichlar mos ravishda 12% va 18% bo‘ ldi. +24–+26 °C haroratda stratifikatsiyalangan urug‘ larning unuvchanligi sezilarli darajada past bo‘ lib, mos ravishda 4% va 6% ni tashkil etdi. Tadqiqot natijalari sovuq stratifikatsiya va past musbat haroratlar D. microcarpum urug‘ larining unuvchanligini oshirishini ko‘ rsatdi. Olingan natijalardan ushbu turning urug‘ orqali ko‘ paytirish va saqlash usullarini ishlab chiqishda foydalanish mumkin.*

Kalit so‘ zlar: *Dorema microcarpum, Apiaceae, urug‘ lar, unuvchanlik, unib chiqish, sovuq stratifikatsiya, harorat, noyob turlar.*

Введение. Сохранение редких и исчезающих видов растений является одной из приоритетных задач современной ботаники. Особое значение при этом имеют исследования, направленные на изучение репродуктивной биологии видов, поскольку способность к семенному размножению определяет возможности их естественного восстановления и сохранения в культуре.

Изучение всхожести семян позволяет определить их репродуктивный потенциал, выявить оптимальные условия прорастания и разработать эффективные методы получения жизнеспособных проростков. Всхожесть семян определяется как их способность в течение определенного периода формировать нормальные проростки при благоприятных условиях проращивания.

Прорастание семян зависит от комплекса внутренних и внешних факторов. К ним относятся температура, влажность, световой режим, физиологическое состояние семян, наличие ингибирующих веществ, морфологические особенности плодов и продолжительность периода покоя. Существенное влияние может оказывать также положение семян на материнском растении, поскольку распределение питательных ресурсов между семенами неоднородно [4, с. 1039–1044]. Кроме того, семена могут формироваться в разные периоды, вследствие чего подвергаются воздействию различных погодных условий. При этом физиологическое и биохимическое состояние материнского растения изменяется, что может отражаться на метаболизме и последующей жизнеспособности семян [1, с. 666].

У ряда растений прорастание семян задерживается вследствие наличия физиологического покоя, ингибиторов прорастания, вторичных метаболитов и других биологически активных веществ. Период покоя представляет собой состояние, при котором семена не прорастают даже при наличии внешних условий, благоприятных для их прорастания. Глубокий покой семян связан с комплексом физиологических и биохимических механизмов, регулирующих переход семян к активному росту [5, с. 204].

Одним из методов преодоления физиологического покоя является холодная стратификация, которая широко применяется для стимуляции прорастания семян различных видов растений. Эффективность данного метода зависит от продолжительности воздействия низких температур, состояния семян и их физиологических особенностей [1, 5].

К основным показателям, характеризующим процесс прорастания, относятся время появления первых проростков и продолжительность периода прорастания [2, с. 77; 3, с. 9–22; 6, с. 230].

Род *Dorema* D.Don (Apiaceae) объединяет виды, преимущественно связанные с аридными и субаридными местообитаниями. Представители рода встречаются в сухих предгорьях, на холмистых территориях и в пустынных экосистемах; отдельные виды характеризуются выраженной экологической специализацией к определённым типам субстрата [6, 8].

D. microcarpum связан преимущественно с горными и предгорными территориями Центрального и юго-западного Тянь-Шаня, а также северо-западной частью Алайского хребта. Вид отмечается на щебнистых и гипсовых склонах гор и холмов. *D. sabulosum*, напротив, характерен преимущественно для аридных территорий Туранской провинции и связан с пустынными и полупустынными местообитаниями [7].

Несмотря на наличие исследований, посвященных сбору и хранению семян растений, сведения о лабораторной всхожести и особенностях прорастания семян *D. microcarpum* остаются ограниченными. В связи с этим изучение влияния холодной стратификации, продолжительности хранения и температурного режима на прорастание данного вида является актуальным.

Цель исследования — изучить особенности прорастания семян *D. microcarpum* в лабораторных условиях и определить наиболее благоприятные температурные условия для их прорастания.

Для достижения поставленной цели были определены следующие задачи:

1. определить лабораторную всхожесть семян *D. microcarpum*;
2. установить сроки начала прорастания после закладки семян;
3. определить продолжительность периода прорастания;
4. оценить влияние холодной стратификации на всхожесть семян;
5. изучить зависимость всхожести от продолжительности хранения семян;
6. сравнить эффективность прорастания при различных температурных режимах.

Материалы и методы

Объект исследования и место проведения работ. Объектом исследования являлись семена *Dorema microcarpum* (Apiaceae), собранные в июне в период полного созревания.

Эксперименты по изучению всхожести семян проводили в лаборатории «Биотехнологии» Ташкентского ботанического сада имени академика Ф.Н. Русанова при Институте ботаники Академии наук Республики Узбекистан, а также в лабораториях кафедры биологии Наманганского государственного университета.

Собранные семена хранили в бумажных пакетах при комнатной температуре. Для оценки влияния продолжительности хранения были сформированы две экспериментальные серии: семена после 6 месяцев хранения и семена после 12 месяцев хранения.

Подготовка семян и условия проращивания

Семена размещали в чашках Петри в трех повторностях на предварительно увлажненную фильтровальную бумагу в соответствии с общепринятой методикой. Все используемые материалы перед проведением эксперимента стерилизовали в автоклаве.

Для изучения влияния холодной стратификации семена выдерживали при низкой положительной температуре в течение 45 суток. После завершения стратификации семена помещали для дальнейшего проращивания в два температурных режима:

- +4–+6 °C — в холодильной камере;
- +24–+26 °C — в термостате.

В каждом варианте использовали стратифицированные семена и контрольный вариант без предварительной обработки.

Прорастание семян контролировали ежедневно. Датой начала прорастания считали день появления первого проросшего семени, а окончанием эксперимента — день появления последнего проросшего семени. Продолжительность прорастания определяли как период от появления первых до последних проростков.

Лабораторную всхожесть определяли как отношение количества проросших семян к общему количеству семян, заложенных на проращивание, выраженное в процентах.

Результаты и обсуждение.

Прорастание семян после 6 месяцев хранения. Первый эксперимент проводили с семенами, хранившимися в течение 6 месяцев. После хранения семена подвергали холодной стратификации продолжительностью 45 суток, после чего помещали в холодильную камеру и термостат.

В холодильной камере при температуре +4–+6 °C стратифицированные семена начали прорастать на 35-е сутки после закладки. Процесс прорастания продолжался до 50-х суток, а конечная всхожесть достигла 55% (рис. 1).

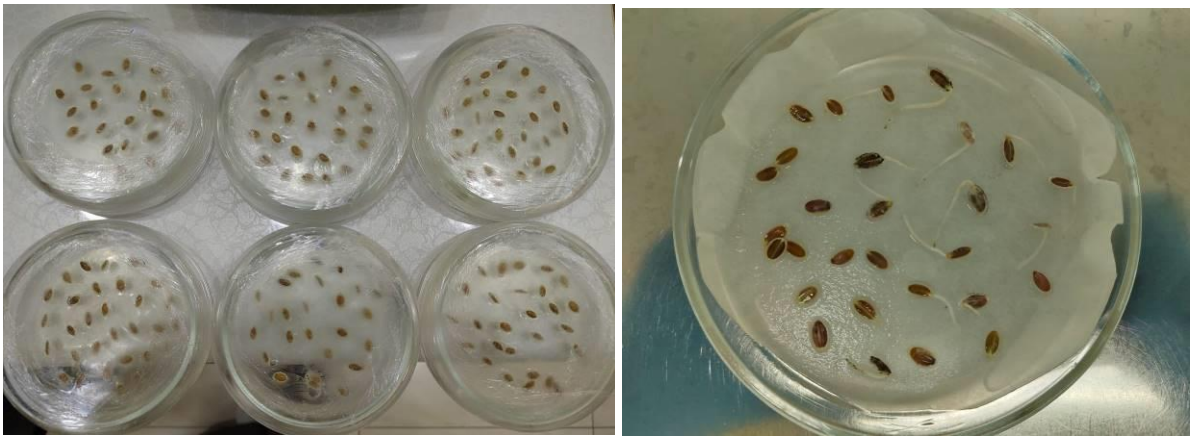


Рисунок 5.9 Всхожесть семян в холодильнике +4 - +6°C

В контрольном варианте первые проростки появились на 30-е сутки, а процесс прорастания завершился на 35-е сутки. При этом всхожесть составила лишь 12%.

Таким образом, холодная стратификация существенно повысила всхожесть семян *D. microcarpum* по сравнению с контрольным вариантом.

При температуре +24–+26 °C стратифицированные семена начали прорастать значительно раньше — на 12-е сутки. Однако конечная всхожесть оказалась очень низкой и составила всего 4%. В контрольном варианте при данной температуре прорастания не наблюдалось (рис. 2)

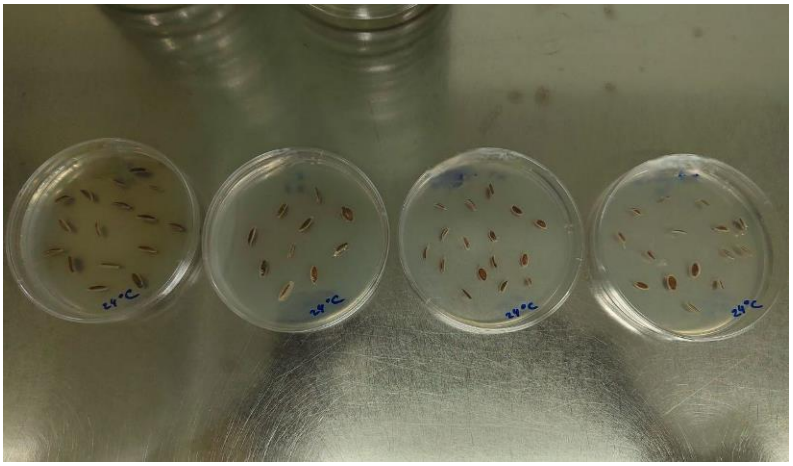


Рисунок 5.10 Всхожесть семян в термостате +24 – +26°C

Таблица 1.

***Лабораторная всхожесть семян D. microcarpum* после 6 месяцев хранения**

D. microcarpum	Вариант опыта	Всхожесть семян (%)	Длительность в днях
В холодильнике +4–+6°C	Обработанные семена	55%	35-50
	Контроль	12%	30-35
В термостате +24–+26°C	Обработанные семена	4%	12-15
	Контроль	–	–

Полученные результаты показывают, что более высокая температура ускоряла появление первых проростков у обработанных семян, однако не обеспечивала высокой конечной всхожести. Напротив, при +4–+6 °C процесс начинался позднее, но процент проросших семян был существенно выше.

Прорастание семян после 12 месяцев хранения

Второй эксперимент проводили с семенами после 12 месяцев хранения. После холодной стратификации продолжительностью 45 суток семена также проращивали при температурах +4–+6 °C и +24–+26 °C.

При температуре +4–+6 °C стратифицированные семена начали прорастать на 30-е сутки. Процесс прорастания продолжался до 45-х суток, а конечная всхожесть достигла 69%.

В контрольном варианте первые проростки появились на 25-е сутки, а процесс прорастания завершился на 30-е сутки. Всхожесть контрольных семян достигла 18%.

Таким образом, после 12 месяцев хранения показатель всхожести стратифицированных семян оказался выше, чем после 6 месяцев хранения: 69% против 55%.

При температуре +24–+26 °C стратифицированные семена начали прорастать на 10-е сутки, однако конечная всхожесть составила только 6%. В контрольном варианте прорастания не наблюдалось.

Таблица 2.

***Лабораторная всхожесть семян D. microcarpum* после 12 месяцев хранения.**

D. microcarpum	Вариант опыта	Всхожесть семян (%)	Длительность в днях
В холодильнике +4–+6°C	Обработанные семена	69%	30–45
	Контроль	18%	25–30
В термостате +24–+26°C	Обработанные семена	6%	10–12
	Контроль	–	–

Сравнение двух серий экспериментов показывает, что увеличение продолжительности хранения с 6 до 12 месяцев сопровождалось повышением всхожести семян как в стратифицированном, так и в контрольном варианте при температуре +4–+6 °C. У стратифицированных семян показатель увеличился с 55 до 69%, то есть на 14 процентных пунктов, а у контрольных — с 12 до 18%, то есть на 6 процентных пунктов.

Одновременно при температуре +24–+26 °C всхожесть оставалась крайне низкой и составляла 4–6% только у стратифицированных семян.

Влияние температурного режима и холодной стратификации

Полученные результаты свидетельствуют о выраженном влиянии температурного режима на процесс прорастания семян *D. microcarpum*. Наиболее благоприятными условиями в проведенном эксперименте оказались низкие положительные температуры +4–+6 °C.

При данном температурном режиме всхожесть стратифицированных семян составила 55% после 6 месяцев хранения и 69% после 12 месяцев хранения. В то же время при температуре +24–+26 °C эти показатели составили соответственно 4 и 6%.

Таким образом, различия между температурными режимами были значительными. В условиях низкой положительной температуры семена не только успешно прорастали, но и демонстрировали значительно более высокую конечную всхожесть.

Важную роль также сыграла холодная стратификация. В обоих экспериментах стратифицированные семена имели более высокую всхожесть по сравнению с контролем. После 6 месяцев хранения при +4–+6 °C разница составила 43 процентных пункта (55% против 12%), а после 12 месяцев — 51 процентный пункт (69% против 18%).

Это указывает на то, что холодная стратификация способствует выходу семян *D. microcarpum* из состояния покоя и повышает вероятность формирования проростков. Подобная зависимость согласуется с общими представлениями о физиологии покоя семян и значении низких температур для его преодоления [1, 5].

Низкие показатели всхожести при +24–+26 °C, вероятно, связаны не только с температурным воздействием, но и с развитием плесневых грибов на поверхности семян. В процессе эксперимента наблюдалось образование колоний плесени, после чего часть семян подвергалась загниванию. В связи с этим эксперимент при повышенной температуре был прекращен.

Следовательно, повышение температуры не всегда приводит к увеличению эффективности прорастания. Несмотря на более раннее появление первых проростков при +24–+26 °C, конечная всхожесть семян была значительно ниже, чем при +4–+6 °C.

Влияние продолжительности хранения семян

Одним из интересных результатов исследования стало повышение всхожести семян после более длительного хранения.

После 6 месяцев хранения всхожесть стратифицированных семян при +4–+6 °C составила 55%, тогда как после 12 месяцев — 69%. Аналогичная тенденция наблюдалась и в контрольном варианте: показатель увеличился с 12 до 18%.

Полученные данные позволяют предположить, что семенам *D. microcarpum* может быть свойственен определенный период физиологического покоя, продолжительность которого влияет на последующую способность к прорастанию. Возможно, длительное хранение в сочетании с последующей холодной стратификацией способствует снижению уровня физиологического покоя семян [1, 5].

Вместе с тем для подтверждения данной закономерности необходимы дополнительные эксперименты с более широким диапазоном сроков хранения, количеством повторностей и контролем влажности семян в период хранения.

Заключение. В результате проведенного исследования были изучены особенности прорастания семян *Dorema microcarpum* при различных температурных режимах, после разной продолжительности хранения и холодной стратификации.

Установлено, что наиболее благоприятным температурным режимом для прорастания семян *D. microcarpum* в условиях проведенного эксперимента является +4–+6 °C. При этих условиях всхожесть стратифицированных семян составила 55% после 6 месяцев хранения и 69% после 12 месяцев хранения.

Холодная стратификация продолжительностью 45 суток оказала положительное влияние на всхожесть семян. При +4–+6 °C она повысилась с 12 до 55% после 6 месяцев хранения и с 18 до 69% после 12 месяцев хранения по сравнению с контрольными вариантами.

При температуре +24–+26 °C, несмотря на более раннее появление первых проростков, конечная всхожесть была крайне низкой — 4% после 6 месяцев и 6% после 12 месяцев хранения. В контрольных вариантах при этой температуре прорастания не наблюдалось. Низкие показатели, вероятно, были связаны с развитием плесневых грибов и последующим загниванием семян.

Продолжительность хранения также оказала положительное влияние на показатели всхожести: после 12 месяцев хранения всхожесть стратифицированных семян при +4–+6 °C увеличилась на 14 процентных пунктов по сравнению с семенами после 6 месяцев хранения.

Таким образом, сочетание длительного хранения, холодной стратификации и последующего проращивания при +4–+6 °C может рассматриваться как перспективный подход к повышению всхожести

семян *D. microcarpum*. Полученные результаты имеют практическое значение для разработки методов семенного размножения и ex situ-сохранения данного редкого вида.

В дальнейшем целесообразно изучить влияние различных сроков холодной стратификации, влажности, светового режима, различных субстратов и продолжительности хранения, а также провести оценку жизнеспособности полученных проростков.

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FERULA FOETIDISSIMA REGEL & SCHMALH. BARGINING MORFO-ANATOMIK TUZILISHI, DORIVOR AHAMIYATI VA KSEROMORF MOSLANISH BELGILARI

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Annotatsiya. *Ushbu maqolada dorivor Ferula foetidissima Regel & Schmalh. turining bargi morfo-anatomik jihatdan o‘ rganildi. Aniqlanishicha, mazkur turning bargi kseromorf tuzilishga ega bo‘ lib, bir qatorli, tashqi devori qalinlashgan va kutikula bilan qoplangan epiderma, izolateral tipli mezofill, yaxshi rivojlangan ustunsimon va asosiy parenxima, kollateral o‘ tkazuvchi to‘ plamlar, mexanik to‘ qimalar hamda ajratma kanallar bilan tavsiflanadi. Sekretor tizim va himoya to‘ qimalarining rivojlanganligi turning qurg‘ oqchil muhitga moslashuvi bilan birga, uning dorivorlik xususiyatlari bilan ham bog‘ liq ekani ko‘ rsatildi. Aniqlangan belgilar dorivor xom-ashyoni diagnostika qilishda va turning adaptiv imkoniyatlarini baholashda qo‘ llanishi mumkin.*

Tayanch so‘ zlar: *Ferula foetidissima, adaptatsiya, ajratma kanallar, barg anatomiyasi, dorivor o‘ simlik, kseromorf belgi.*

МОРФОЛОГО-АНАТОМИЧЕСКОЕ СТРОЕНИЕ ЛИСТА *FERULA FOETIDISSIMA* REGEL & SCHMALH., ЕГО ЛЕКАРСТВЕННОЕ ЗНАЧЕНИЕ И КСЕРОМОРФНЫЕ ПРИЗНАКИ АДАПТАЦИИ

Аннотация. *В статье приведены данные по изучению морфолого-анатомического строения листа Ferula foetidissima Regel & Schmalh. — лекарственного вида рода Ferula L. Установлено, что лист данного вида характеризуется ксероморфным строением: однослойной эпидермой с утолщенной наружной стенкой, покрытой кутикулой, изолатеральным мезофиллом, хорошо развитыми палисадной и основной паренхимой, коллатеральными проводящими пучками, механическими тканями и секреторными вместилищами. Показано, что развитие секреторной системы и защитных тканей связано как с адаптацией к засушливым условиям, так и с лекарственной ценностью растения. Выявленные анатомические признаки могут быть использованы в диагностике сырья и при изучении адаптивного потенциала вида.*

Ключевые слова: *Ferula foetidissima, адаптация, анатомия листа, ксероморфность,лекарственное растение, секреторные вместилища.*

MORPHO-ANATOMICAL STRUCTURE OF THE LEAF OF *FERULA FOETIDISSIMA* REGEL & SCHMALH., ITS MEDICINAL SIGNIFICANCE AND XEROMORPHIC ADAPTIVE TRAITS

Abstract. *This article presents data on the morpho-anatomical structure of the leaf of Ferula foetidissima Regel & Schmalh., a medicinal species of the genus Ferula L. The leaf was found to possess a xeromorphic structure characterized by a single-layered epidermis with thickened outer walls covered by cuticle, isolateral mesophyll, well-developed palisade and ground parenchyma, collateral vascular bundles, mechanical tissues, and secretory ducts. It is shown that the development of the secretory system and protective tissues is related both to adaptation to arid environments and to the medicinal value of the species. The revealed anatomical characters can be used for raw material diagnostics and for assessing the adaptive potential of the species.*

Keywords: *Ferula foetidissima, adaptation, leaf anatomy, medicinal plant, secretory ducts, xeromorphy.*

Kirish.

Apiaceae Lindl. oilasi vakillari oziq-ovqat, ziravor, efir-moyli va dorivor o‘ simliklar sifatida katta ilmiy hamda amaliy ahamiyatga ega. Ushbu oilaga mansub turlarda efir moylari, smolali moddalar, flavonoidlar, kumarinlar va boshqa biologik faol birikmalar to‘ planishi ularning farmakologik qiymatini belgilaydi [4, 5, 8].

Shu jihatdan *Ferula* L. turkumi alohida o‘ rin tutadi. Mazkur turkum vakillari Sharq tabobatida qadimdan qo‘ llanib kelinib, yallig‘ lanishga qarshi, gijja haydovchi, yara bitiruvchi, hazmni yaxshilovchi hamda umumiy quvvat beruvchi vosita sifatida ishlatilgan [4, 5, 8].

Markaziy Osiyo *Ferula* turkumi vakillarining muhim tarqalish va xilma-xillik markazlaridan hisoblanadi [6, 8]. O‘ zbekiston florasida ham ushbu turkumga mansub ko‘ plab turlar uchraydi. Ular orasida dorivor va ekologik jihatdan ixtisoslashgan turlar mavjud [6]. Biroq turkum doirasida dorivor xom-ashyoni to‘ g‘ ri identifikatsiya qilish, anatomik-diagnostik belgilarini aniqlash va ayrim turlarning ekologik moslanish mexanizmlarini yoritish bilan bog‘ liq masalalar hanuz dolzarbdir [1-3].

Ma’lumki, barg o‘ simlikning asosiy assimilatsion organi bo‘ lishi bilan birga, uning ekologik moslanish strategiyalarini aks ettiruvchi muhim strukturaviy tizim hamdir. Barg anatomiyasida epiderma va kutikulaning qalinligi, trixomalarning rivojlanishi, mezofill tipi, ustunsimon va g‘ ovak parenxima nisbatlari, o‘ tkazuvchi to‘ plamlar, mexanik to‘ qimalar hamda ajratma kanallarning joylashuvi o‘ simlikning muhit omillariga moslashganlik darajasini ko‘ rsatadi [1-3]. Qurg‘ oqchil va tog‘ oldi-tog‘ li sharoitlarda o‘ suvchi turlarda ayniqsa qalin kutikula, bo‘ lingan barg plastinkasi, kuchli rivojlangan mezofill, sekretor tizim va mexanik elementlarning yaxshi ifodalanganligi kuzatiladi [2, 3].

Ferula foetidissima Regel & Schmalh. Markaziy Osiyo va unga tutash hududlarda tarqalgan dorivor tur bo‘ lib, O‘ zbekistonda Qashqadaryo, Surxondaryo va Farg‘ ona viloyatlarida uchraydi. Tur tog‘ larning quyi va o‘ rta mintaqalarida, 1200-2300 m, ayrim hollarda 2800 m gacha bo‘ lgan balandliklarda shag‘ alli-toshloq yonbag‘ irlar, surilmalar, siyrak butazorlar va archa jamoalarida o‘ sadi [6]. Bunday ekologik sharoitlar o‘ simlikda kuchli kseromorf va himoya belgilarining shakllanishini taqozo etadi. Shu bilan birga, bu tur dorivor xususiyatlari bilan ham qiziqish uyg‘ otadi. Demak, uning barg anatomiyasini o‘ rganish bir vaqtning o‘ zida ham ekologik moslanish mexanizmlarini, ham farmakognozik diagnostika uchun muhim bo‘ lgan strukturaviy belgilarni aniqlash imkonini beradi.

Adabiyotlarda *Ferula* turkumining ayrim vakillarida barg anatomiyasi va sekretor tizimi o‘ rganilgan bo‘ lsada, *Ferula foetidissima* bargining morfo-anatomik tuzilishi, ayniqsa uning dorivor ahamiyati va kseromorf moslanish belgilari bilan bog‘ liq holdagi tavsifi yetarli darajada yoritilmagan [4, 5, 7]. Shu sababli mazkur ishning maqsadi *Ferula foetidissima* bargining morfo-anatomik tuzilishini o‘ rganish, undagi sekretor tizim va himoya to‘ qimalarining rivojlanish xususiyatlarini aniqlash hamda ularni turning dorivor ahamiyati va qurg‘ oqchil muhitga adaptatsiyasi bilan bog‘ liq holda talqin qilishdan iborat.

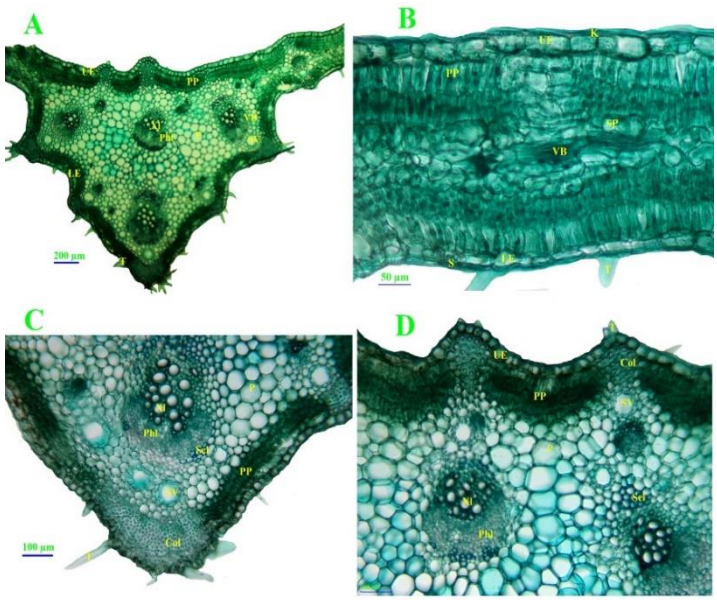
Tadqiqot metodlari. Tadqiqot obyekti sifatida *Ferula foetidissima* Regel & Schmalh. turi olindi. O‘ simlik materiali tabiiy yashash joyidan yig‘ ilib, barg namunalari 70% li etanolda fiksatsiya qilindi. Barglarning anatomik tadqiqotlari umumqabul qilingan metodika bo‘ yicha olib borildi [1]. Kesmalar qo‘ lda ustara yordamida tayyorlandi. Preparatlar metilen ko‘ k bilan bo‘ yalib, glitserin-jelatin bilan mustahkamlandi. Mikrofotosuratlar KERN OBN 1327241 axromatik mikroskop va SZM45NT-2L trinokulyar mikroskop yordamida olindi. Mikrofotolarda masshtab chiziqlari bo‘ yicha kalibrlash asosida o‘ lchovlar bajarildi. Morfometrik ko‘ rsatkichlar mikrofotolardan o‘ lchandi va natijalar o‘ rtacha qiymat ± standart og‘ ish ko‘ rinishida ifodalandi. Anatomik tavsiflashda klassik botanik terminologiyadan foydalanildi [1, 3].

Natijalar va muhokama. *Ferula foetidissima* monokarp tur bo‘ lib, areali Xitoy (Shinjon), Pamir-Oloy (Qirg‘ iziston, Tojikiston, O‘ zbekiston) hududlarini qamrab oladi. O‘ zbekistonda Qashqadaryo, Surxondaryo va Farg‘ ona viloyatlarida tarqalgan. Tog‘ larning quyi va o‘ rta mintaqalarida, asosan shag‘ alli-toshloq yonbag‘ irlar, surilmalar, siyrak butazorlar va archa jamoalarida o‘ sadi. May-iyun oylarida gullab, iyun-iyul oylarida mevalaydi [6]. Tur dorivor xususiyatlari bilan ajralib turadi va *Ferula* turkumi vakillari orasida biologik faol moddalarga boy tur sifatida qaraladi [4, 5, 8].

O‘ simlik bo‘ yi 1-1,5 m bo‘ lib, turpsimon yo‘ g‘ onlashgan ildizga ega. Barglari asosan ildizoldi to‘ pbarglaridan iborat, yirik va baquvvat. Barg plastinkasi keng, uch tomonlama bo‘ lingan, bo‘ laklari butun, uzunligi 14-16 sm, eni 3-4,5 sm ni tashkil etadi. Bargning yuza tomoni deyarli tuksiz, ostki tomoni esa bir hujayrali yumshoq tukli trixomalar bilan qoplangan. Bunday tuklanish barg sathida havo qatlamini ushlab turish, transpiratsiyani kamaytirish va bargni ortiqcha qizib ketishdan saqlashga xizmat qiladi [2, 5].

Bargning ko‘ ndalang kesimida ustki va ostki epiderma yaxshi shakllangan bo‘ lib, epiderma hujayralari tashqi tomondan qalin kutikula bilan qoplangan (1-rasm). Epiderma tashqi devori qalinligi 9,5±0,21 mkm, epiderma balandligi 33,5±0,31 mkm ni tashkil etdi. Bu ko‘ rsatkichlar bargda himoya apparati kuchli rivojlanganini ko‘ rsatadi. Qalin kutikula suv yetishmovchiligi, yuqori insolyatsiya va shamol sharoitida suv yo‘ qotilishini kamaytirishga xizmat qiluvchi tipik kseromorf belgi hisoblanadi. Demak, *F. foetidissima*da kseromorf moslanishlar avvalo epidermal himoya apparati orqali yaqqol namoyon bo‘ ladi.

Barg mezofilli yaxshi differensiyalashgan va izolateral tipda tuzilgan. Uning ikki tomonida ham ustunsimon parenxima 2-3 qatordan joylashgan. Mezofill qalinligi 305,5±2,81 mkm, ustunsimon parenxima balandligi 36,6±0,42 mkm, eni esa 14,5±0,28 mkm ni tashkil etdi. Mezofillning markaziy qismida asosiy hamda qisman g‘ ovaksimon parenxima kuzatildi, g‘ ovak parenxima diametri 20,1±0,25 mkm ga teng bo‘ ldi. Izolateral mezofill bargning har ikki tomonida ham faol fotosintez olib borishga moslashganligini ko‘ rsatadi, bu esa kuchli yorug‘ lik tushadigan ochiq tog‘ oldi va tog‘ yonbag‘ irlarida muhim ekologik ustunlik beradi [2, 3, 5].



1-rasm – *Ferula foetidissima* bargining strukturaviy tuzilishi: A, C, D – bargning asosiy o‘ tkazuvchi qismi (glavnaya jilka); B – barg mezofilli.
Shartli belgilar: Col – kollenxima, K – kutikula, LE – ostki epiderma, P – parenxima, Phl – floema, PP – ustunsimon parenxima, Scl – sklerenxima, St – barg og‘ izchasi, SV – ajratma kanal, T – trixoma, UE – ustki epiderma, VB – o‘ tkazuvchi to‘ plam, Xl – ksilema.

Bargning markaziy tomir sohasi yaxshi rivojlangan. O‘ tkazuvchi to‘ plamlar kollateral tipda bo‘ lib, ksilema va floema aniq farqlanadi. Ksilema elementlari soni 10-12 ta, diametri esa 29,2±0,21 mkm ni tashkil etdi. Yirikroq ksilema elementlari suvni nisbatan tez va hajmli o‘ tkazishga moslashgan bo‘ lib, qisqa muddatli namlik sharoitidan samarali foydalanishga xizmat qilishi mumkin. O‘ tkazuvchi to‘ plamlar atrofida sklerenxima elementlarining rivojlanganligi bargning mexanik barqarorligini oshiradi va shamolli, ochiq stansiyalarda uning strukturaviy chidamliligini ta’minlaydi.

Ferula foetidissima bargida ajratma kanallar yaxshi rivojlangan. Ular butun barg bo‘ lagi bo‘ ylab o‘ tkazuvchi to‘ plamlarning tepasida va ostida joylashgan bo‘ lib, bo‘ shlig‘ i diametri 75,7±0,81 mkm ni tashkil etdi. Ajratma kanallar ustida va epiderma ostida kollenxima hujayralari guruhlari joylashgan. *Ferula* turlarida sekretor tizimning bunday rivojlanganligi smola, efir moylari va boshqa biologik faol moddalarning sintezi hamda to‘ planishi bilan bog‘ liq bo‘ lib, turning dorivor qiymatini belgilovchi muhim anatomik asos hisoblanadi. Demak, sekretor tizimning kuchli ifodalanishi *F. foetidissima* bargida nafaqat taksonomik va anatomik, balki farmakognozik ahamiyatga ham ega.

Barg anatomiyasining kompleks tahlili *Ferula foetidissima*da adaptiv va farmakognozik jihatdan ahamiyatli belgilar majmuasi shakllanganini ko‘ rsatadi. Qalin kutikula va trixomalar bargni qurg‘ oqchil muhitda suv yo‘ qotilishidan himoya qiladi. Izolateral mezofill yuqori yorug‘ lik sharoitida fotosintez samaradorligini oshiradi. Yaxshi rivojlangan o‘ tkazuvchi va mexanik tizim suv transporti hamda strukturaviy mustahkamlikni ta’minlaydi. Ayniqsa, yirik ajratma kanallar turning dorivorlik xususiyatlari bilan bevosita bog‘ liq bo‘ lib, ular efir-moyli va smolali moddalarning to‘ planish joyi sifatida farmakognozik ahamiyatga ega. Shu bois *F. foetidissima* bargining anatomik diagnostikasi dorivor xomashyoni identifikatsiya qilishda muhim mezon bo‘ lib xizmat qilishi mumkin.

Xulosa. *Ferula foetidissima* bargining morfo-anatomik tuzilishi kseromorf xususiyatlarni yaqqol namoyon etadi. Bargning asosiy diagnostik belgilari sifatida qalin kutikulali epiderma, izolateral mezofill, 2-3 qator ustunsimon parenxima, yaxshi rivojlangan kollateral o‘ tkazuvchi to‘ plamlar, mexanik to‘ qimalar va yirik ajratma kanallar aniqlandi. Ushbu belgilar turning qurg‘ oqchil tog‘ oldi va tog‘ li muhitga moslashganligini ko‘ rsatadi. Shu bilan birga, sekretor tizimning rivojlanganligi turning dorivorlik xususiyatlari bilan chambarchas bog‘ liq bo‘ lib, bargni farmakognozik nuqtayi nazardan ham qimmatli organ sifatida tavsiflaydi. Olingan natijalar *Ferula foetidissima* dorivor xom-ashyosini

anatomik diagnostika qilish va turning ekologik moslanish strategiyalarini tushunishda muhim ilmiy asos bo‘ lib xizmat qiladi.

Mazkur tadqiqot O‘ zbekiston Respublikasi Fanlar akademiyasi Botanika institutining FL-9524115063-sonli “Respublikaning dorivor o‘ simliklari resurs salohiyatini bioiqlim va geofazoviy tahlili, moslashish va tarqalish qonuniyatlari (Ferula L. turkumi misolida)” mavzusidagi fundamental loyiha doirasida hamda 2025-2029 yillarga mo‘ ljallangan “Raqamli tabiat: Markaziy O‘ zbekiston florasining raqamli platformasini ishlab chiqish” mavzusidagi davlat dasturi doirasida amalga oshirildi.

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CLASSIFICATION AND PROPERTIES OF BIONANOPESTICIDES

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Abstract: *This article discusses the negative effects of the use of synthetic pesticides in agriculture on the environment, soil microflora, and human health, as well as the potential use of biopesticides and bionanopesticides as environmentally safe alternatives. Along with the main advantages of biopesticides, their sensitivity to ultraviolet radiation, temperature, humidity, and precipitation, slow onset of action, high specificity, and limitations associated with storage and transportation are analyzed. The article also examines the history of the development of bionanopesticides, their evolution through the integration of biotechnology and nanotechnology, and the possibilities of nanoencapsulation of biologically active substances. The importance of nanotechnology in improving the stability, bioavailability, and controlled release of active substances is highlighted. Alongside the prospects of bionanopesticides, the need to assess the environmental and toxicological safety of nanomaterials is also emphasized. This approach may contribute to improving the efficiency of pesticide use in agriculture and reducing the environmental burden.*

Keywords: *bionanopesticides, biopesticides, nanotechnology, nanoencapsulation, environmental safety, biological control, green synthesis.*

КЛАССИФИКАТСИЯ И СВОЙСТВА БИОНАНОПЕСТИТСИДОВ

Аннотация*: В данной статье освещены негативные последствия использования синтетических пестицидов в сельском хозяйстве для окружающей среды, почвенной микрофлоры и здоровья человека, а также рассмотрены возможности применения биопестицидов и бионанопестицидов в качестве экологически безопасной альтернативы. Наряду с основными преимуществами биопестицидов проанализированы их чувствительность к ультрафиолетовому излучению, температуре, влажности и осадкам, медленное проявление действия, высокая специфичность, а также ограничения, связанные с их хранением и транспортировкой. Кроме того, рассмотрены история формирования бионанопестицидов, их развитие на основе интеграции биотехнологии и нанотехнологий, а также возможности наноинкапсуляции биологически активных веществ. Показано значение нанотехнологий в повышении стабильности, биодоступности и контролируемого высвобождения активных веществ. Наряду с перспективами применения бионанопестицидов подчёркивается необходимость оценки экологической и токсикологической безопасности наноматериалов. Данный подход может способствовать повышению эффективности использования пестицидов в сельском хозяйстве и снижению экологической нагрузки.*

Ключевые слова: *бионанопестициды, биопестициды, нанотехнологии, наноинкапсуляция, экологическая безопасность, биологическая защита, зелёный синтез.*

BIONANOPESTITSIDLARNING KLASSIFIKATSIYASI VA XUSUSIYATLARI

Annotatsiya: *Mazkur maqolada qishloq xo‘ jaligida sintetik pestitsidlardan foydalanishning atrof-muhit, tuproq mikroflorasi va inson salomatligiga salbiy ta’siri hamda ularga ekologik xavfsiz muqobil sifatida biopestitsid va bionanopestitsidlardan foydalanish imkoniyatlari yoritilgan. Biopestitsidlarning asosiy afzalliklari bilan bir qatorda, ularning ultrabinafsha nurlanish, harorat, namlik va yog‘ ingarchilikka sezgirligi, ta’sirining sekin namoyon bo‘ lishi, yuqori spesifikligi hamda saqlash va tashishdagi cheklovlari tahlil qilib chiqilgan. Shuningdek, bionanopestitsidlarning shakllanish tarixi, biotexnologiya va nanotexnologiyalar integratsiyasi asosida rivojlanishi hamda biologik faol moddalarni nanoenkapsulyatsiya qilish imkoniyatlari ko‘ rib chiqilgan. Nanotexnologiyalarning faol moddalarning barqarorligi, biologik o‘ zlashtirilishi va nazorat qilinadigan ajralib chiqishini yaxshilashdagi ahamiyati ko‘ rsatib berilgan. Bionanopestitsidlarning istiqbollari bilan bir qatorda, nanomateriallarning ekologik va toksikologik xavfsizligini baholash*

zarurligi ham ta'kidlangan. Mazkur yondashuv qishloq xo' jaligida pestitsidlardan foydalanish samaradorligini oshirish va ekologik yuklamani kamaytirishga xizmat qilishi mumkin.

Kalit so' zlar: *bionanopestitsidlar, biopestitsidlar, nanotexnologiya, nanoenkapsulyatsiya, ekologik xavfsizlik, biologik himoya, yashil sintez.*

KIRISH

Ko' p yillar mobaynida kimyoviy pestitsidlar qishloq xo' jaligida hosildorlikni ta'minlash va ko' plab zararkunandalar hamda kasalliklarga qarshi kurashishda muhim o' rin tutib kelgan.

Sintetik pestitsidlarga algitsidlar, gerbitsidlar, feromonlar va boshqa turdagi pestitsidlar kiradi. Biroq pestitsidlarning me'yoridan ortiq qo' llanilishi va yomg' ir suvlari orqali ularning suv havzalariga yuvilib tushishi natijasida suv ekotizimida yashovchi ko' plab organizmlar nobud bo' lishi mumkin. Hatto bunday ta'sir organizmlarning o' limiga olib kelmagan taqdirda ham, pestitsid qoldiqlarini o' zida to' plagan suv organizmlarini iste'mol qilish insonlarda saraton, qandli diabet, jigar faoliyatining buzilishi, ekzema, shuningdek, asab va yurak-qon tomir tizimi kasalliklari kabi jiddiy xastaliklarning rivojlanishiga sabab bo' lishi mumkin.

Bundan tashqari, sintetik pestitsidlar tuproq mikroflorasi va undagi foydali mikroorganizmlarga ham katta zarar yetkazadi. Sintetik pestitsidlardan foydalanish bilan bog' liq xavf-xatarlar ularga muqobil sifatida biopestitsidlardan foydalanishga bo' lgan qiziqishni oshirdi. Biopestitsidlar nisbatan arzon, ekologik xavfsiz va atrof-muhitga kamroq zarar yetkazuvchi vositalar hisoblanadi. Ular mikroorganizmlar, o' simliklar, shuningdek, bionanozarrachalar asosida olinishi mumkin.

Nanobiopestitsidlarning oddiy biopestitsidlarga nisbatan yuqori pestitsid faolligiga ega bo' lib, faol moddaning maqsadli yoki nazorat qilinadigan tarzda ajralib chiqishini ta'minlaydi. Ular yuqori darajadagi biomoslik yani biokompatibillik va biologik parchalanish xususiyatlari bilan ajralib turadi.

Ko' plab afzalliklariga qaramay, biopestitsidlar har doim ham qishloq xo' jaligi ishlab chiqarishi sharoitida barqaror samaradorlikni ta'minlay olmaydi. Ularning amaliy qo' llanilishini cheklovchi asosiy omillardan biri biologik faol komponentlarning atrof-muhit omillari ta'siriga yuqori darajada sezgirligidir. Ultrabinafsha nurlanish, yuqori harorat, namlikning keskin o' zgarishi hamda yog' ingarchilik mikroorganizmlarning hayotchanligini pasaytirishi va tabiiy biologik faol moddalarning tez parchalanishiga olib kelishi mumkin. Natijada preparatlarning himoya samaradorligi kamayadi.

Yana shuni nazarda tutish kerakki, biopestitsidlarning samaradorligi ko' p jihatdan ularni qo' llash sharoitlariga bog' liq. Laboratoriya tajribalarida ular odatda yuqori biologik faollikni namoyon etsa-da, dala sharoitida ularning ta'siri harorat, namlik, tuproqning kislotalilik darajasi (pH), mikrob hamjamiyatining tarkibi hamda boshqa ekologik omillar ta'sirida sezilarli darajada o' zgarishi mumkin. Bu esa turli agroekotizimlarda biopestitsidlardan foydalanishda barqaror natijalarga erishishni qiyinlashtiradi.

Yana bir cheklovchi omil biopestitsidlarning biologik ta'siri nisbatan sekin rivojlanishidir. Kimyoviy pestitsidlar ko' pincha zararkunandalarning tez nobud bo' lishiga sabab bo' lsa, aksariyat biopestitsidlarning ta'siri mikroorganizmlarning ko' payishi, zararkunanda organizmiga kirib borishi yoki biologik faol metabolitlarning asta-sekin to' planishi bilan bog' liq. Shu sababli ularning himoya ta'siri darhol emas, balki ma'lum vaqt o' tgach namoyon bo' ladi.

Shuningdek, ko' plab biopestitsidlar yuqori darajadagi spesifiklikka ega bo' lib, faqat ma'lum bir guruh zararkunanda organizmlarga qarshi samarali hisoblanadi. Bir tomondan, bu foydali organizmlar va atrof-muhitga salbiy ta'sirni kamaytiradi, ikkinchi tomondan esa ularni qishloq xo' jaligida universal qo' llash imkoniyatlarini cheklaydi.

Biopestitsidlarning keng miqyosda joriy etilishiga to' sqinlik qiluvchi qo' shimcha omillar qatoriga ularning saqlash muddati nisbatan qisqaligi, tashish va saqlashda maxsus sharoitlarga rioya qilish zarurligi hamda ayrim biologik preparatlarni ishlab chiqarish xarajatlarining yuqoriligi kiradi.

Ushbu cheklovlar sababli so' nggi yillarda tadqiqotchilar e'tibori bionanopestitsidlarni yaratishga qaratilmoqda. Nanotexnologiyalarni qo' llash biologik faol moddalarning atrof-muhitning noqulay omillaridan himoyalanishini ta'minlaydi, ularning nazorat qilinadigan tarzda ajralib chiqishiga imkon yaratadi, preparatlarning barqarorligi va biologik o' zlashtirilishini oshiradi, ta'sir davomiyligini uzaytiradi hamda natijada ekologik yuklamani kamaytirgan holda qishloq xo' jaligi ekinlarini himoya qilish samaradorligini sezilarli darajada oshiradi.

ADABIYOTLAR TAXLILI

Bionanopestitsidlarning paydo bo' lish tarixi. Bionanopestitsidlar XXI asr boshlarida biotexnologiya va nanotexnologiyaning kesishgan nuqtasida an'anaviy sintetik pestitsidlarning uzoq muddat qo' llanilishi natijasida yuzaga kelgan ekologik inqirozga evolyutsion javob sifatida paydo bo' ldi. Ular o' simliklarni himoya qilish vositalarining eng yangi, to' rtinchi avlodi bo' lib, biologik faol moddalar (o' simlik ekstraktlari, mikroorganizmlar va ularning metabolitlari)ni nanostrukturali yetkazib berish tizimlari bilan uyg' unlashtiradi.

Ushbu yo‘ nalishning shakllanish tarixi to‘ rtta asosiy bosqichda rivojlandi.

1. Dastlabki bosqich: Sof biologiya davri (XIX asr – XX asr o‘ rtalari)

Kelajakdagi bionanopestitsidlar uchun asos klassik biopestitsidlar hisoblanadi. **1835-yil** – italiyalik olim **Agostino Bassi** birinchi bo‘ lib *Beauveria bassiana* zamburug‘ idan zararkunandalarga qarshi biologik kurash vositasi sifatida foydalanish mumkinligini ilmiy jihatdan isbotladi. **1901-yil** – yapon biologi **Shigetane Ishiwata** *Bacillus thuringiensis* (Bt) bakteriyasini ajratib oldi. Bugungi kunda ushbu bakteriya dunyodagi eng keng qo‘ llaniladigan biologik insektitsidlarning asosini tashkil etadi.

2. Kimyoviy rivojlanish va ekologik inqiroz davri (1940–1980-yillar)

1939-yilda **Paul Müller** tomonidan DDTning insektitsid xususiyatlari kashf etilgach, qishloq xo‘ jaligida e’tibor arzon va samarali sintetik pestitsidlarga qaratildi. Biroq 1970–1980-yillarga kelib ularning salbiy oqibatlari yaqqol namoyon bo‘ ldi. Tuproqda toksik moddalarning to‘ planishi, foydali hasharotlarning kamayishi hamda zararkunandalarning kimyoviy preparatlarga nisbatan chidamlilik (rezistentlik) hosil qilishi ekologik muammolarni keskinlashtirdi. Shu sababli ilmiy tadqiqotlar yana ekologik xavfsiz biologik himoya usullarini yaratishga yo‘ naltirildi.

3. Klassik biopreparatlarning texnologik cheklovlari (1990-yillar)

XX asr oxiriga kelib efir moylari, bakteriyalar, viruslar va zamburug‘ larga asoslangan ko‘ plab samarali biologik pestitsidlar ishlab chiqildi. Ammo ularning amaliy qo‘ llanishida muhim muammo yuzaga keldi. Tabiiy biologik faol moddalar quyoshning ultrabinafsha nurlanishi ta’sirida tez parchalanar, yog‘ ingarchilik natijasida yuvilib ketar hamda qisqa muddat ta’sir qilgani sababli tez-tez qayta qo‘ llashni talab etardi. Bu esa yirik fermer xo‘ jaliklari uchun iqtisodiy jihatdan samarasiz edi.

4. Nanotexnologik inqilob va bionanopestitsidlar konsepsiyasining shakllanishi (2000-yillar – hozirgi davr)

2000-yillarning boshlarida qishloq xo‘ jaligida nanotexnologiyalarning rivojlanishi biologik preparatlarning barqarorlik muammosini hal qilish imkonini berdi. Olimlar biologik faol moddalarni nanoo‘ lchamli tashuvchilar bilan birlashtirdilar. Natijada quyidagi afzalliklarga erishildi:

Biologik faol moddalarni nanoenkapsulyatsiya qilish. Neem (Azadirachta indica) moyi, zamburug‘ sporalari va boshqa bioaktiv moddalar xitozan, zein kabi tabiiy polimerlardan tayyorlangan nanokapsulalarga joylashtirildi. Bu ularni ultrabinafsha nurlanishidan himoya qildi hamda faol moddalarning nazorat qilinadigan va asta-sekin ajralib chiqishini ta’minladi.

Yashil sintez texnologiyasidan foydalanish. Kumush, mis va rux oksidi nanokristallari kimyoviy usullar o‘ rniga o‘ simlik ekstraktlari va mikroorganizmlar yordamida sintez qilina boshlandi. Natijada nanomateriallar ekologik jihatdan xavfsizroq va biologik mos bo‘ lib qoldi.

Hozirgi holati (2026-yil holatiga ko‘ ra). Bugungi kunda bionanopestitsidlar laboratoriya tadqiqotlari bosqichidan bosqichma-bosqich tijorat miqyosidagi ishlab chiqarishga o‘ tmoqda. Ular aniq va ekologik xavfsiz dehqonchilikning muhim tarkibiy qismi sifatida e’tirof etilmoqda. Chunki bionanopestitsidlar qo‘ llaniladigan kimyoviy pestitsidlar miqdorini bir necha o‘ n baravar kamaytirish bilan birga, zararkunandalar va kasalliklarga qarshi yuqori samaradorlikni saqlab qolish imkonini beradi.

Mazkur yo‘ nalishda olib borilayotgan tadqiqotlar nanokapsulalarning ta’sir mexanizmlarini takomillashtirish, "yashil sintez" uchun yangi biomateriallarni yaratish hamda nanomateriallarning atrof-muhitga uzoq muddatli ta’sirini baholashga qaratilgan.

Bionanopestitsidlar Yevropa Komissiyasi nanomaterialni "tabiiy, tasodifiy yoki ishlab chiqarilgan material bo‘ lib, unda zarrachalar bog‘ lanmagan holatda, agregat yoki aglomerat shaklida bo‘ lib, raqam o‘ lchami taqsimotidagi zarrachalarning 50 % yoki undan ko‘ prog‘ i uchun bir yoki bir nechta tashqi o‘ lchamlar 1 nm - 100 nm o‘ lchamda bo‘ ladi deb ta’riflagan (Nanomaterial ta’rifi bo‘ yicha tavsiya 2011/696/EU). Aniqrog‘ i, tabiat yoki tabiiy asosdagi nanopestitsidlar organik (masalan, polimerlar) yoki noorganik elementlardan iborat.

Nanotizimlar o‘ z hujayra o‘ lchami tufayli faol moddalarning biofaolligini oshirishi mumkin bo‘ lgan (yoki ba’zan faol modda sifatida ham ishlashi mumkin (Badawy va Rabea, 2016) sifatida ishlashi mumkin bo‘ lgan agentlarni tashiydi, kamaytiradi va qoplaydi, bu esa yuqori kirib borish va hujayra assimilyatsiyasini osonlashtirish hamda yanada maqsadli faoliyatni ta’minlaydi. Bundan tashqari, ular maqsadli joyda faol moddalar tarqalishini nazorat qiladi va modulyatsiya qiladi (Pavoni va boshq., 2020).

Nanopestitsidlar nanomateriallarda ishlab chiqilgan pestitsidlar bo‘ lib, qishloq xo‘ jaligi sohasida qo‘ llanilishi mumkin, maxsus gibrid substratga mahkamlangan, matritsada kapsullangan yoki tashqi stimullar yoki ferment orqali triggerlar uchun funksionallashtirilgan nanokaryerlar bo‘ lsin. Nanoo‘ lchamdagi zarralar, ularning shakli va maxsus xususiyatlari bilan birga, silika, lipidlar, polimerlar, kopolimerlar, keramika, metall, uglerod va boshqa materiallarga asoslangan nanotashuvchi innovatsion formulalarda pestitsid faoliyatini o‘ rganishi mumkin deb hisoblanadi [3].

Nanopestitsid formulalari suvda eriydiganligini, bioavailability va agrokimyoviy moddalarni atrof-muhitning buzilishidan himoya qilishi, ekinlardagi patogenlar, begona o‘ tlar va hasharotlarni nazorat qilishda inqilobiy o‘ zgarish qilishi mumkin [4]. Biroq, nanomaterial xususiyatlari sitotoksiklik va genotoksiklik chegarasida ham mavjud.

Pestitsidlarning befarq va mantiqsiz qo‘ llanilishi ekotizim muvozanatiga ta’sir qiladi va har bir inson sog‘ lig‘ ini xavf ostiga qo‘ yadi. Oziq-ovqatdan pestitsid qoldiqlarini kasbiy yoki tasodifan iste’mol qilish natijasida qisqa muddatli (keskin) va uzoq muddatli salbiy ta’sirlar — bu o‘ limga olib keladi yoki nogironlikka moslashtirilgan umr yili (DALY). Bolalar pestitsidlar ta’siriga ko‘ proq moyil bo‘ lib, doimiy to‘ qima va organlarga zarar yetkazadi. Ularning birgalikda, centra va periferik neyrotoksiklik hamda qon ivish qobiliyatining yo‘ qolishiga ta’siri xavotir uchun muhim sabablardir [5]. Darhaqiqat, nanopestitsidlarning faoliyati va toksikligiga ta’sir qiluvchi ijobiy va salbiy tomonlarni batafsil baholash qishloq xo‘ jaligida allaqachon tasdiqlangan nanopartikullardan foydalanish xavfsiz va barqaror rivojlanishi uchun juda muhimdir.

Formulalarning nanopestitsidlarning atrof-muhit, ekotizimlar, fermer ishchilari, iste’molchilar va qishloq xo‘ jaligi zanjiridagi barcha ishlab chiqarish sohalarida xatti-harakatlariga ta’siri to‘ liq ma’lum emas [4]. Biroq, nanoformulalarning faol moddaning parchalanishini kamaytirish, suvda eruvchanlik muvozanatini yaxshilash va faol moddalar biologik mavjudligini oshirishdagi muhim roli ma’lum. Xususan, zararkunandalarning endemik zararlanishi, o‘ simliklarga zarar yetkazilishi va qishloq xo‘ jaligi mahsulotlari hamda oziq-ovqatlarning sifat va miqdorini kamaytirish orqali iqtisodiy yo‘ qotishlarning oldini olish [6].

XULOSA

Xulosa qilib aytganda, bionanopestitsidlar sintetik pestitsidlarning atrof-muhit va inson salomatligiga salbiy ta’sirini kamaytirishga qaratilgan istiqbolli ekologik xavfsiz vositalardan biridir. Ular biopestitsidlarning biologik faolligini nanotexnologiyalar imkoniyatlari bilan uyg‘ unlashtirib, faol moddalarning barqarorligi, bio o‘ zlashtirilishi va maqsadli ta’sirini oshirish imkonini beradi. Ayniqsa, nanoenkapsulyatsiya va nazorat qilinadigan ajralish texnologiyalari biologik faol komponentlarni ultrabinafsha nurlanish, yuqori harorat va yog‘ ingarchilik kabi noqulay omillardan himoyalashda muhim ahamiyatga ega.

Shu bilan birga, bionanopestitsidlarning ekologik va toksikologik xavfsizligi, organizmlarga ta’siri hamda uzoq muddatli ekologik oqibatlarini chuqur o‘ rganish zarur. Kelgusidagi tadqiqotlar samaradorligi yuqori, biologik parchalanadigan va atrof-muhit uchun xavfsiz nanoformulyatsiyalarni ishlab chiqishga qaratilishi lozim.

Umuman olganda, bionanopestitsidlar barqaror qishloq xo‘ jaligi va integratsiyalashgan o‘ simliklarni himoya qilish tizimining istiqbolli yo‘ nalishlaridan biri hisoblanadi.

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HBV INFEKSIYASINING REAL VAQT PZR DIAGNOSTIKASIDA PLAZMIDAGA ASOSLANGAN EKZOGEN ICHKI NAZORATNI TANLASH VA BAHOLASH

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mukotaba uchun mas’ul muallif.

Annotatsiya: *Gepatit B virusi (HBV) DNKsini real vaqt polimeraza zanjir reaksiyasi (PZR) yordamida aniqlashda natijaning ishonchliligi butun preanalitik zanjirga bog‘ liq: nuklein kislotalarning ekstraksiya jarayonida yo‘ qolishi yoki reaksiyaning ingibirlanishi, ayniqsa past virus yuklamasida, yolg‘ on manfiy xulosaga olib kelishi mumkin. Ishning maqsadi — dupleks real vaqt PZR tizimi uchun plazmidaga asoslangan ekzogen ichki nazoratni (IN) tanlash, uning ishchi darajasini absolyut nusxa soniga keltirish va analitik parametrlarga ta’sirini baholash. HBV markerlari bo‘ yicha manfiy sog‘ lom donorlar (n = 10) va HBV infeksiyasi tasdiqlangan bemorlar (n = 350) plazmasi namunalari tahlil qilindi. IN sifatida Saccharomyces cerevisiae α-factor prepro sekretor signal hududidan kelib chiqqan geterologik ketma-ketlikni saqlovchi rekombinant pPICZα-asosli plazmida qo‘ llanildi; u lizis eritmasi qo‘ shilganidan so‘ ng, ekstraksiyadan oldin kiritilib, klinik DNK bilan birga «SOREX-DNA» to‘ plami yordamida ajratib olindi. HBV mahsuloti FAM, IN mahsuloti JOE kanalida QuantStudio 5 platformasida qayd etildi. IN ning ishchi darajasi taxminan 100 nusxa/reaksiyani tashkil etdi; valid klinik ekstraktlarda uning o‘ rtacha Cq qiymati 29,0 ± 0,4 (diapazon 28,1–29,8), validlik ko‘ rsatkichi esa 355/360 (98,6%) bo‘ ldi. HBV uchun aniqlash chegarasi IN bilan ham, INsiz ham 5,15 nusxa/reaksiya (≈ 257,5 nusxa/ml) darajasida saqlanib qoldi (ΔCq = 0,12 ± 0,08; p > 0,05). Yuqori virus yuklamasida (10^8 MB/ml) IN signali 1,1–1,8 siklga kechikdi, biroq bu HBV ning miqdoriy hisob-kitobiga ta’sir ko‘ rsatmadi. Shunday qilib, ekstraksiyadan oldin kiritilgan geterologik plazmida IN, nusxa soni to‘ g‘ ri tanlanganda, jarayon darajasidagi sifat nazoratini ta’minlaydi va asosiy nishonning analitik sezgirligini pasaytirmaydi.*

Kalit so‘ zlar: gepatit B virusi, HBV DNK, real vaqt PZR, qPCR, ichki nazorat, ekzogen nazorat, plazmida, PZR ingibitsiyasi, nuklein kislota ekstraksiyasi, molekulyar diagnostika.

ВЫБОР И ОЦЕНКА ЭКЗОГЕННОГО ВНУТРЕННЕГО КОНТРОЛЯ НА ОСНОВЕ ПЛАЗМИДЫ ДЛЯ ПЦР-ДИАГНОСТИКИ ИНФЕКЦИИ HBV В РЕАЛЬНОМ ВРЕМЕНИ

Аннотация: *Надёжность выявления ДНК вируса гепатита B (HBV) методом ПЦР в реальном времени определяется всей преаналитической цепочкой, а не только стадией амплификации: потери нуклеиновых кислот при экстракции и ингибирование реакции могут приводить к ложноотрицательным результатам, особенно при низкой вирусной нагрузке. Целью работы был подбор и оценка экзогенного внутреннего контроля (ВК) на основе плазмиды для*

дуплексной ПЦР-системы реального времени, предназначенной для выявления ДНК HBV. Исследованы образцы плазмы здоровых доноров, отрицательных по маркёрам HBV (n = 10), и пациентов с клинически и серологически подтверждённой HBV-инфекцией (n = 350). В качестве ВК использована рекомбинантная плазмида на основе pPICZα, несущая гетерологичную последовательность из области препро-секреторного сигнала α-фактора Saccharomyces cerevisiae; ВК вносили в каждый образец сразу после добавления лизирующего буфера, до стадии экстракции, и выделяли совместно с клинической ДНК с помощью сорбционного набора «SOREX-DNA» . Продукт HBV регистрировали по каналу FAM, ВК — по каналу JOE на платформе QuantStudio 5. Перевод рабочего разведения в абсолютные единицы дал уровень ВК около 100 копий на реакцию. В валидных клинических экстрактах среднее значение Cq для ВК составило 29.0 ± 0.4 (диапазон 28.1–29.8), доля валидных сигналов ВК — 355/360 (98,6%). Предел обнаружения HBV сохранялся на уровне 5,15 копий/реакцию (≈ 257,5 копий/мл) как с ВК, так и без него; различие Cq при низкоположительных концентрациях было статистически незначимым (ΔCq = 0.12 ± 0.08; p > 0.05). При высокой вирусной нагрузке (10^8 МЕ/мл) Cq для ВК запаздывал на 1.1–1.8 цикла без ущерба для количественной оценки HBV и чувствительности канала FAM.

Ключевые слова: *вирус гепатита В, ДНК HBV, ПЦР в реальном времени, qPCR, внутренний контроль, экзогенный контроль, плазмида, ингибирование ПЦР, экстракция нуклеиновых кислот, молекулярная диагностика.*

SELECTION AND EVALUATION OF A PLASMID-BASED EXOGENOUS INTERNAL CONTROL FOR REAL-TIME PCR DIAGNOSIS OF HBV INFECTION

Annotation: *Reliable detection of hepatitis B virus (HBV) DNA by real-time PCR depends on the entire pre-analytical chain: nucleic acid loss during extraction or reaction inhibition may produce false-negative results, particularly at low viral loads. This study aimed to select a plasmid-based exogenous internal control (IC) for a duplex real-time PCR assay detecting HBV DNA and to convert its working level into absolute copy numbers. Plasma samples from HBV-negative healthy donors (n = 10) and from patients with confirmed HBV infection (n = 350) were analysed. A recombinant pPICZα-based plasmid carrying a heterologous sequence derived from the Saccharomyces cerevisiae α-factor prepro secretory signal region was added to each sample immediately after the lysis solution, before extraction, and co-extracted with clinical DNA using the silica-sorption «SOREX-DNA» kit. HBV product was recorded in the FAM channel and the IC in the JOE channel on a QuantStudio 5 platform. The IC input was approximately 100 copies per reaction; in valid extracts the mean IC Cq was 29.0 ± 0.4 (range 28.1–29.8) and IC validity reached 355/360 (98.6%). The HBV limit of detection remained 5.15 copies/reaction (≈ 257.5 copies/mL) both with and without the IC (ΔCq = 0.12 ± 0.08; p > 0.05). At high viral loads (10^8 IU/mL) the IC Cq was delayed by 1.1–1.8 cycles without compromising HBV quantification. A heterologous plasmid IC added before extraction therefore provides process-level quality control without degrading analytical sensitivity.*

Key words: *hepatitis B virus, HBV DNA, real-time PCR, qPCR, internal control, exogenous control, plasmid, PCR inhibition, nucleic acid extraction, molecular diagnostics.*

Kirish

Molekulyar diagnostikada natijaning ishonchliligi ko‘ pincha amplifikatsiya bosqichining texnik sifati bilan tenglashtiriladi. Amalda esa yolg‘ on manfiy xulosaning asosiy manbalari analitik zanjirning undan oldingi bo‘ g‘ inlarida — namunani saqlash, lizis, sorbsiya va elyusiya bosqichlarida — shakllanadi. Nuklein kislotalarning qisman yo‘ qolishi yoki ajratib olish reagentlarining reaksiya aralashmasiga o‘ tishi ko‘ p hollarda hech qanday tashqi belgi bermaydi: reaksiya rasman «bajarilgan», ammo nishon signali yo‘ q. Aynan shu holat diagnostik xatoning eng xavfli ko‘ rinishidir.

Gepatit B virusi infeksiyasi bunday xatoning oqibatlari ayniqsa og‘ ir bo‘ ladigan sohalardan biridir. Jahon sog‘ liqni saqlash tashkilotining baholashiga ko‘ ra, 2022 yil holatiga dunyo bo‘ yicha 254 million kishi surunkali HBV infeksiyasi bilan yashagan; virusli gepatitlar sababli o‘ lim 2019-yildagi 1,1 milliondan 2022-yilda 1,3 millionga ko‘ tarilgan va bu o‘ limlarning 83% i aynan gepatit B hissasiga to‘ g‘ ri keladi [1, 2]. HBV DNK yuklamasi davolashni boshlash to‘ g‘ risidagi qarorda, terapiya samaradorligini kuzatishda va transmissiya xavfini baholashda markaziy laborator marker hisoblanadi [1, 3]. O‘ zbekiston tarixan HBV bo‘ yicha endemik mamlakat hisoblanadi: 2016 yil uchun surunkali HBV (HBsAg-musbat) tarqalishi 8,3% — taxminan 2,5 million kishi deb baholangan, ammo ularning atigi ~10% i tashxis olgan [15]. 2022–2024 yillarda o‘ tkazilgan milliy skrining doirasida bir milliondan ortiq kishi tekshirilib, umumiy HBsAg tarqalishi 2,89% ni tashkil etgan; vaksinatsiya dasturi qamrab olgan tug‘ ilish kogortalarida ko‘ rsatkich sezilarli pasaygan [16]. Donor qonini skrining qilishda esa bitta aniqlanmagan musbat namuna transfuziya orqali yuqish xavfini yuzaga keltiradi.

Ushbu muammoning uslubiy yechimi — namuna ichiga kiritiladigan ichki nazorat (IN). Agar nazorat ekstraksiyadan oldin qo‘ shilsa va asosiy nishon bilan birga ajratib olinib amplifikatsiya qilinsa, u faqat PZR bosqichini emas, balki lizis, nuklein kislota tiklanishi va ingibitsiyani ham qamrab oladi. Bunday nazorat mavjud bo‘ lgandagina HBV signali qayd etilmagan namuna asosli ravishda haqiqiy manfiy deb talqin qilinishi mumkin.

Shu bilan birga, ichki nazoratni dupleks formatga kiritish o‘ z-o‘ zidan yechim emas. Nazorat nishoni reaksiya komponentlari uchun asosiy nishon bilan raqobatlashadi va uning miqdori noto‘ g‘ ri tanlansa, past nusxadagi HBV DNKsining amplifikatsiyasini bostirishi mumkin. Demak, IN ni loyihalashdagi asosiy vazifa — signalni maksimal darajaga chiqarish emas, balki nazoratning barqarorligi bilan asosiy nishonning sezgirligi o‘ rtasida muvozanat topishdir.

Mazkur ishning maqsadi — HBV DNKsini aniqlashga mo‘ ljallangan dupleks real vaqt PZR tizimi uchun plazmidaga asoslangan ekzogen IN ni tanlash, uning ishchi darajasini nisbiy suyultirmadan absolyut nusxa soniga keltirish hamda ekstraksiya nazorati, ingibitsiyani aniqlash, multipleks raqobat va analitik sezgirlik nuqtai nazaridan baholashdan iborat.

Adabiyotlar tahlili

qPCR sifat standartlari va nazoratlar tizimi

qPCR natijalarining qayta ishlab chiqarilishi test dizayni, validatsiya hajmi va hisobotning shaffofligi bilan bevosita bog‘ liq. MIQE tavsiyalari va ularning 2025 yilda qayta ko‘ rib chiqilgan MIQE 2.0 tahriri namuna bilan ishlash tartibi, nuklein kislota ajratish usuli, praymer va zond ketma-ketliklari, reaksiya sharoitlari, amplifikatsiya samaradorligi, aniqlash va miqdoriy aniqlash chegaralari, shuningdek musbat, manfiy va ichki nazoratlarning to‘ liq bayonini talab qiladi [4, 5]. MIQE 2.0 klinik multipleks qPCR uchun ichki nazorat asosiy nishon bilan bir turdagi nuklein kislota (DNK nishoni uchun — DNK, RNK nishoni uchun — RNK) bo‘ lishini hamda infeksion diagnostikada imkon qadar namuna tayyorlashdan oldin kiritilishini ma’qullaydi — bu ekstraksiyadan amplifikatsiyagacha bo‘ lgan butun zanjirni qamrab olish imkonini beradi [4].

PZR ingibitsiyasi analitik xato manbai sifatida

Qon va uning komponentlarida amplifikatsiyani susaytiruvchi moddalarning mavjudligi ko‘ p yillar davomida hujjatlashtirilgan: gemoglobin va laktoferrin bevosita ingibitor xususiyatiga ega [8], kengroq sharhlarda esa geparin, immunoglobulinlar, tuzlar, spirtlar va sorbsion reagentlarning qoldiqlari ham muhim omillar sifatida qayd etiladi [7, 9]. Ingibitsiya amplifikatsiya samaradorligini pasaytiradi va Cq qiymatini kechiktiradi; aniqlash chegarasiga yaqin konsentratsiyalarda esa natijani manfiy tomonga siljitishi mumkin. Shu sababli diagnostik amplifikatsiya tizimlarida faqat tashqi seriya nazoratlari bilan cheklanish yetarli emas — namuna ichidagi jarayon nazorati zarur [6].

Endogen va ekzogen ichki nazoratlar

Ichki nazoratlar kelib chiqishiga ko‘ ra ikki turga bo‘ linadi. Endogen nazorat sifatida inson genlaridan foydalanish qo‘ shimcha shablon talab qilmaydi va namunaning hujayraviy tarkibi haqida ma’lumot beradi. Biroq plazma va zardob kabi asosan hujayrasiz matritsalarda inson genom DNKsining miqdori past va namunadan namunaga sezilarli darajada o‘ zgaruvchan bo‘ ladi, bu esa nazoratning me’yoriy diapazonini belgilashni qiyinlashtiradi. Ma’lum konsentratsiyada tashqaridan kiritiladigan ekzogen DNK nishoni bu cheklovdan xoli bo‘ lib, ekstraksiya samaradorligi va ingibitsiyani standartlashtirilgan tarzda nazorat qilish imkonini beradi [6].

Multipleks raqobat va xalqaro kalibrlash

Ekzogen IN dizaynidagi markaziy masala — dupleks reaksiyadagi raqobat. Nazorat darajasi juda past bo‘ lsa, u stoxastik tarzda aniqlanmasligi yoki qisman ingibitsiyani ishonchli ko‘ rsatmasligi mumkin; haddan tashqari yuqori bo‘ lsa, past nusxadagi HBV DNKsi bilan praymer, zond va polimeraza uchun raqobatga kirishadi. Ilgari ishlab chiqilgan HBV real vaqt PZR tizimlarida ko-ekstraksiya qilinadigan (klinik namuna bilan birga ajratib olinadigan) geterologik nazorat DNKlari ekstraksiya va amplifikatsiya nosozligini aniqlash uchun muvaffaqiyatli qo‘ llanilgan [10, 11]. Shuningdek, juda yuqori HBV yuklamasida asosiy nishonning kuchli amplifikatsiyasi IN signalini susaytirishi mumkin; bu holat aniq HBV-musbat natijani bekor qilmaydi, ammo tegishli talqin qoidasi validatsiya bosqichida oldindan belgilanishi shart [4, 10].

Miqdoriy HBV diagnostikasida metrologik izchillik ham muhim ahamiyatga ega. JSSTning HBV DNK xalqaro standartlari natijalarni MB/ml (IU/mL) da yagona shkalada ifodalash uchun asos yaratadi [14], ko‘ p markazli baholashlar esa testlarning aniqlash chegarasi, chiziqli diapazoni, takrorlanuvchanligi va laboratoriyalararo mosligini alohida ko‘ rsatish zarurligini tasdiqlaydi [12, 13]. Shunga ko‘ ra, yangi ichki nazoratni baholash uning o‘ z amplifikatsiyasi bilan cheklanmasligi, balki HBV aniqlash chegarasi va past-musbat namunalarning Cq qiymatlariga sezilarli ta’sir ko‘ rsatmasligi bilan ham isbotlanishi kerak.

Tadqiqot metodologiyasi

Tadqiqot dizayni va klinik namunalar

Ichki nazoratni baholash uchun ikki mustaqil namuna guruhi shakllantirildi. Birinchi guruh — HBV markerlari bo‘ yicha manfiy deb tasdiqlangan sog‘ lom donorlarning plazma namunalari (n =10); ular ekstraksiya jarayonining fon barqarorligini va IN signalining bazaviy taqsimotini aniqlash uchun xizmat qildi. Ikkinchi guruh — klinik va serologik jihatdan HBV infeksiyasi tasdiqlangan bemorlarning namunalari (n = 350); ular dupleks sharoitda IN va HBV signallari o‘ rtasidagi o‘ zaro ta’sirni tekshirish imkonini berdi. Namunalar tanlashda gemolizga uchragan hamda lipemik alikvotlar hisobga olinmadi.

HBV holati tijorat reaktiv to‘ plami AmpliSens® HBV-Monitor-FRT (Moskva, Rossiya) va QuantStudio 5 (Applied Biosystems, AQSh) real vaqt PZR tizimi yordamida mustaqil ravishda qayta tasdiqlandi. Plazma alikvotalari nuklein kislotalar ajratib olingunga qadar −80 °C haroratda saqlandi. Nuklein kislota degradatsiyasining oldini olish maqsadida takroriy muzlatish-eritish sikllariga yo‘ l qo‘ yilmadi (har bir alikvota uchun bir martadan oshmadi).

Barcha namunalar shaxsni identifikatsiya qiluvchi ma’lumotlarsiz, anonimlashtirilgan holda tahlil qilindi; ish Xelsinki deklaratsiyasining amaldagi tahririga va muassasa etika komissiyasi tasdiqlagan tartibga rioya qilgan holda bajarildi.

Ekzogen ichki nazorat konstruksiyasi va ishchi darajasi

Ekzogen ichki nazorat (IN)

Ekzogen ichki nazorat (IN) sifatida laboratoriya sharoitida tayyorlangan, pPICZα A vektori (umumiy uzunligi 3593 juft asos) asosida konstruksiya qilingan rekombinant plazmida qo‘ llanildi. Nishon ketma-ketlik pPICZα turidagi ekspressiya vektorlari tarkibiga kiruvchi *Saccharomyces cerevisiae* α-factor prepro sekretor signal hududidan kelib chiqqan geterologik DNK qismidan iborat. Ushbu hudud vektorning 941–1207 nukleotidlari oralig‘ ida, ya’ni 5′ *AOX1* promotori va ko‘ p sonli klonlash sayti (MCS) orasida joylashgan bo‘ lib, uzunligi 267 juft asosni, GC-tarkibi esa 42% ni tashkil etadi.

Nishon hududning HBV genomi bilan gomologiyaga ega emasligi *in silico* tekshirildi. 267 j.a. li α-factor ketma-ketligi NCBI BLASTn dasturi yordamida (megablast va blastn algoritmlari, nr/nt ma’lumotlar bazasi, qidiruv *Hepatitis B virus* [taxid:10407] bo‘ yicha cheklangan holda, tekshiruv sanasi — 2025-yil 15-yanvar solishtirildi. E-value chegarasi 10 ga teng bo‘ lganda ham ahamiyatli o‘ xshashlik aniqlanmadi ("No significant similarity found"). Bundan tashqari, tanlangan IN praymer-zond tizimi HBV-pozitiv namunalarda nospetsifik signal bermasligi, HBV praymerlari esa IN plazmidasida signal bermasligi eksperimental yo‘ l bilan tasdiqlandi.

Rekombinant plazmida *Escherichia coli* TOP10 shtammiga elektro-transformatsiya usulida kiritildi. Transformatsiya qilingan hujayralar 25 mkg/ml Zeocin™ tutgan past tuzli LB-agarda (pH 7,5) tarkibli selektiv muhitda ekilib, 37 °C haroratda 14-16 soat davomida inkubatsiya qilindi va hosil bo‘ lgan klonlarning seleksiyasi amalga oshirildi.

Plazmida DNKsi *E. coli* hujayralaridan ishqoriy lizis usuli bilan ajratib olinib, keyinchalik fenol-xloroform aralashmasi yordamida tozalandi. Olingan preparatning tozaligi va konsentratsiyasi spektrofotometrik usulda baholandi: A260/A280 nisbati 1,88 ni tashkil etdi, bu 1,8–2,0 oralig‘ idagi maqbul ko‘ rsatkichga mos keladi. Preparatning butunligi 0,7% li agaroza gelida elektroforez qilish orqali tasdiqlandi.

Tanlangan klonlarning autentikligi ikki mustaqil usulda tasdiqlandi. Birinchidan, ajratib olingan plazmida DNKsi α-factor hududiga xos praymerlar yordamida PZR da tekshirildi; kutilgan o‘ lchamdagi 200 j.a. mahsulotning hosil bo‘ lishi nishon ketma-ketlikning mavjudligini ko‘ rsatdi. Ikkinchidan, plazmidaning umumiy o‘ lchami restriksion tahlil orqali baholandi. Halqasimon plazmida agaroza gelida o‘ zining haqiqiy molekulyar o‘ lchamiga muvofiq migratsiyalanmaydi: superо‘ ralgan, bo‘ shashgan halqasimon va bir zanjiri kesilgan shakllar turlicha tezlikda harakatlanadi, shu sababli molekulyar-og‘ irlik markeriga nisbatan o‘ lchamni baholab bo‘ lmaydi. Faqat chiziqli DNK o‘ zining haqiqiy uzunligiga mos ravishda yuradi.

Shu maqsadda 1 mkg plazmidaga FastDigest EcoRI va FastDigest KpnI restriktazalari (Thermo Scientific, AQSh) bilan 37 °C haroratda 15 daqiqa davomida ishlov berildi va mahsulot 0,8% li agaroza gelida elektroforez qilindi. Asosiy fragment 3556 j.a. o‘ lchamda, ya’ni pPICZα A vektorining kutilgan uzunligiga mos holatda qayd etildi (marker: 1 kbp DNA Ladder Plus) [10]. Har ikkala restriksiya sayti MCS tarkibida joylashgani sababli nishon α-factor hududi (941–1207 n.) butunligicha saqlanadi. Shu tariqa klonlarning aynan pPICZα A asosidagi rekombinant plazmidani tutishi ham nishon ketma-ketlik darajasida (PZR), ham butun vektor o‘ lchami darajasida (restriksion tahlil) tasdiqlandi. Chiziqli shakl bir vaqtning o‘ zida ikkinchi vazifani ham bajaradi: u nusxalar sonini massadan hisoblashda barcha molekulalarning bir xil topologik shaklda bo‘ lishini ta’minlaydi va turli halqasimon shakllarning amplifikatsiyaga har xil ta’sirini bartaraf etadi. Shuning uchun keyingi barcha ishlarda aynan chiziqli preparat qo‘ llanildi — u geldan elektroelyutsiya usuli bilan ajratib olindi.

Geldan ajratib olingan chiziqli DNK preparatining konsentratsiyasi spektrofotometrik usulda o‘ lchanib, 350 ng/mkl ni tashkil etdi. Nusxalar soni quyidagi formula asosida hisoblandi:

$$\text{nusxa/mkl} = (C\ [\text{ng/mkl}] \times 6{,}022\times10^{23}) / (N\ [\text{j.a.}] \times 660 \times 10^{9}),$$

bu yerda C — DNK konsentratsiyasi, N — chiziqli molekulaning uzunligi (3556 j.a.). Hisob natijasida preparatdagi konsentratsiya $8{,}98\times10^{10}$ nusxa/mkl ga teng bo‘ ldi. Undan ketma-ket suyultirish yo‘ li bilan avval taxminan 1 : 18 000 nisbatda oraliq stok eritma ($5{,}01\times10^{6}$ nusxa/mkl, ya’ni $5{,}01\times10^{9}$ nusxa/ml) tayyorlandi, so‘ ngra undan 1 : 100 000 suyultirish yo‘ li bilan 50 nusxa/mkl konsentratsiyali ishchi eritma olindi. Eritmalar ishlatilgunga qadar –20 °C haroratda, bir martalik aliqvotlar holida saqlandi.

IN har bir namunaga nukleinlar kislotalarini ajratib olish bosqichida, lizis eritmasi qo‘ shilganidan so‘ ng darhol 10 mkl hajmda qo‘ shildi, ya’ni har bir namunaga ~500 nusxa IN to‘ g‘ ri keldi. Ekstraksiya 50 mkl elyuat hajmida yakunlanganini hisobga olganda, elyuatdagi nazariy konsentratsiya ~10 nusxa/mkl ni, PZR reaksiyasiga 10 mkl elyuat

kiritilganda esa ~100 nusxa/reaksiyani tashkil etadi (100% chiqish samaradorligi shartida). IN ni ekstraksiya bosqichida kiritish uni bir vaqtning o‘ zida ham nukleinlar kislotalarini ajratib olish samaradorligining, ham amplifikatsiya ingibirlanishining nazorati sifatida ishlatish imkonini berdi.

Validatsiyani qayta ishlab chiqarish mumkin bo‘ lishi uchun nisbiy suyultirma absolyut miqdorga keltirildi. Oraliq stok eritmaning 1 : 100 000 nisbatdagi suyultirmasidan har bir klinik namunaga lizis eritmasi qo‘ shilganidan so‘ ng 10 μL qo‘ shildi; hisob-kitob zanjiri 1-jadvalda keltirilgan. Tanlangan daraja IN ning o‘ z aniqlash chegarasidan yetarlicha yuqori, ammo HBV ning past nusxali amplifikatsiyasiga sezilarli raqobat tug‘ dirmaydigan oraliqda joylashgan.

Jadval 1

Ichki nazoratning ishchi darajasini absolyut nusxa soniga keltirish

Bosqich	Qiymat	Izoh
Chiziqli DNK preparati (o‘ lchangan)	350 ng/μL ≈ $8{,}98\times10^{10}$ nusxa/μL	Spektrofotometrik o‘ lchash; N = 3556 j.a.
Oraliq stok eritma	5.01×10^{6} nusxa/μL (5.01×10^{9} nusxa/mL)	Preparatdan ~1 : 18 000 suyultirish
Ishchi suyultirma	1 : 100 000	Nuklein kislotasiz buferda
Suyultirilgan preparat	≈ 50 nusxa/μL	—
Har bir namunaga qo‘ shilgan hajm	10 μL	Lizis eritmasidan so‘ ng
Namunaga kiritilgan umumiy nusxa	≈ 5.0×10^{2} nusxa	—
Kirish plazma hajmi / elyusiya hajmi	100 μL / 50 μL	«SOREX-DNA» to‘ plami
Elyuatdagi nazariy konsentratsiya	≈ 10 nusxa/μL	100% tiklanish sharoitida
Reaksiyaga kiritilgan elyuat hajmi	10 μL	—
Reaksiyadagi nusxalar soni	≈ 100 nusxa/reaksiya	Yakuniy ishchi daraja

Izoh: hisob-kitob 100% tiklanish sharoitiga asoslangan nazariy qiymatlarni beradi; haqiqiy nusxalar soni raqamli PZR yoki kalibrlash egri chizig‘ i yordamida tasdiqlanishi lozim.

DNK ajratib olish

Ichki nazorat qo‘ shilgan plazma namunalaridan DNK O‘ zR FA S.Yu.Yunusov nomidagi O‘ simlik moddalari kimyosi institutida ishlab chiqilgan, sorbsiya usuliga asoslangan «SOREX-DNA» tijorat to‘ plami yordamida ishlab chiqaruvchi yo‘ riqnomasiga muvofiq ajratib olindi. Kirish plazma hajmi 100 μL, elyusiya hajmi 50 μL ni tashkil etdi. Har bir ekstraksiya seriyasida ikkita musbat jarayon nazorati (PKO1, PKO2) va bitta manfiy nazorat (OKO — nuklein kislotasiz matritsa + IN) parallel ravishda olib borildi; ushbu nazorat kontaminatsiyani aniqlash bilan bir qatorda ekstraksiya samaradorligining yuqori chegarasini belgilash imkonini berdi.

Dupleks real vaqt PZR

Amplifikatsiya va fluoressent signalni qayd etish QuantStudio 5 Real-Time PCR System (Thermo Fisher Scientific, AQSh) platformasida bajarildi. HBV ga xos mahsulot FAM kanalida, ichki nazorat mahsuloti esa JOE kanalida ro‘ yxatga olindi. HBV uchun nishon sifatida Core (C) genining yuqori darajada konservativ hududi (HBV genomining 1777–2473 nukleotidlari) tanlandi. Ichki nazoratga xos praymerlar va JOE/BHQ-1 belgili zond mualliflar tomonidan loyihalangan; ular bo‘ yicha intellektual mulk hujjatlari rasmiylashtirilish bosqichida bo‘ lgani sababli ketma-ketliklar ushbu maqolada keltirilmaydi va asosli so‘ rov asosida mas’ul muallifdan olinishi mumkin. Har bir reaksiyaning umumiy hajmi 25 μL bo‘ lib, tarkibida 1× PZR buferi, 2,5–4 mM $MgCl_2$, 0,8 mM dNTP aralashmasi, har bir praymerdan 0,2–0,8 μM, zonddan 0,2 μM, 2,5 U SynTaq DNK-polimeraza, 10 μL ajratib olingan DNK va yakuniy hajmgacha nukleazasiz suv bo‘ ldi. Ichki nazorat praymerlari va zondining reaksiyadagi yakuniy konsentratsiyasi: har bir praymerdan 0,4 μM, zond 0,1 μM ni tashkil etdi. Har bir tajribada kalibrlash standartlari (KR1, KR2) va shablonsiz nazorat parallel ravishda qo‘ yildi.

Jadval 2

Dupleks real vaqt PZR termosikllash dasturi

Bosqich	Harorat, °C	Vaqt	Fluoressensiyani o‘ lchash	Sikllar soni
1. Dastlabki denaturatsiya	95	5 daqiqa	–	1
2. Dastlabki amplifikatsiya	95	10 soniya	–	5
	60	20 soniya	–	

Bosqich	Harorat, °C	Vaqt	Fluoressensiyani o‘ lchash	Sikllar soni
	72	15 soniya	–	
3. Asosiy amplifikatsiya	95	10 soniya	–	40
	60	20 soniya	Signal o‘ qiladi (FAM, JOE)	
	72	15 soniya	–	

Izoh: fluoressensiya 40 siklli asosiy bosqichning 60 °C qismida ikkala kanal bo‘ yicha o‘ qildi.

Nazoratlar va natijalarni talqin qilish

Har bir seriyada kamida to‘ rt turdagi nazorat qo‘ llanildi: shablonsiz nazorat (NTC), manfiy ekstraksiya nazorati, HBV-musbat nazorat va ichki nazorat saqlovchi matritsa nazorati. Talqin qoidasi quyidagicha belgilandi: FAM kanalida belgilangan chegaradan kechikmagan valid Cq qayd etilsa, namuna HBV-musbat; FAM signali qayd etilmasa yoki belgilangan chegaradan yuqori bo‘ lsa, ammo JOE kanalidagi IN valid diapazonda aniqlansa, namuna HBV-manfiy deb baholandi. IN signali ham, HBV signali ham qayd etilmagan namuna invalid deb hisoblanib, qayta ekstraksiyaga yuborildi. Cq chegaralari quyidagicha belgilandi: FAM kanali uchun Cq ≤ 38,0), JOE kanali (IN) uchun Cq 27,5–30,5. Atipik amplifikatsiya egri chiziqlari bazaviy chiziq va chegara qo‘ lda qayta belgilanib, natija ikki mustaqil operator tomonidan ko‘ rib chiqildi tartibida baholandi. Takrorlar qoidasi: chegaraviy natijalar Cq 36,0–38,0 oralig‘ ida ikki takrorda qayta tekshirildi va kamida bitta takrorda signal qayd etilganda musbat deb baholandi.

Analitik baholash

Ichki nazoratni baholash o‘ zaro bog‘ liq uch yo‘ nalishda amalga oshirildi: (i) turli klinik namunalarda IN Cq qiymatlari taqsimoti orqali jarayon nazoratining barqarorligi va takrorlanuvchanligi; (ii) keng HBV DNK diapazonida multipleks raqobat; (iii) bir xil matritsa va ekstraksiya sharoitida IN bilan va INsiz HBV analitik sezgirligining taqqoslanishi.

Cq qiymatlari o‘ rtacha ± standart og‘ ish ko‘ rinishida keltirildi. Takrorlanuvchanlik standart og‘ ish va variatsiya koeffitsienti (CV%) orqali ifodalandi. IN bilan va INsiz olingan juft Cq qiymatlari taqsimotga qarab juft (Shapiro–Wilk) t-test yoki Wilcoxon belgili rangli testi bilan taqqoslandi; ahamiyatlilik darajasi $\alpha = 0,05$ (ikki tomonlama) qilib belgilandi. HBV aniqlash chegarasi takrorlarning kamida 95% ida aniqlanadigan konsentratsiya sifatida belgilandi: C_{95} va uning 95% ishonch oralig‘ i probit-regressiya yordamida hisoblanib, har bir konsentratsiya darajasi uchun 20 takror qo‘ llanildi. Kalibrlash egri chizig‘ i parametrlari (R^2, qiyalik) va amplifikatsiya samaradorligi MIQE tavsiyalariga muvofiq E = 10^(−1/qiyalik) − 1 formulasi bo‘ yicha aniqlandi. Statistik tahlil Python 3.10 dasturlash tilida scipy.stats kutubxonasi yordamida bajarildi.

Natijalar va ularning tahlili

Klinik namunalar va test validligi

Jami 360 ta plazma namunasi tahlil qilindi, jumladan 10 ta sog‘ lom donor va 350 ta HBV-musbat bemor namunasi. Oldindan belgilangan seriya va namuna validligi mezonlari qo‘ llanganda birlamchi tekshiruvda 355/360 (98,6%) namuna valid natija berdi. 5 ta namuna dastlab IN signalining yo‘ qligi tufayli invalid deb baholandi; qayta ekstraksiyadan so‘ ng ham ularning barchasida IN signali tiklanmadi va namunalar yakuniy invalid deb hisobdan chiqarildi.

Ichki nazorat signalining barqarorligi va takrorlanuvchanligi

Tanlangan ishchi darajada (≈ 100 nusxa/reaksiya) valid klinik ekstraktlarda IN ning o‘ rtacha Cq qiymati 29.0 ± 0.4 ni tashkil etdi; umumiy diapazon 28.1–29.8 oralig‘ ida bo‘ ldi. Bu 1.7 siklga teng tor oraliq bo‘ lib, ekstraksiya samaradorligining namunadan namunaga sezilarli o‘ zgarmaganini ko‘ rsatadi. IN validligi 355/360 (98,6%) ni tashkil etdi. HBV-manfiy va HBV-musbat guruhlar bo‘ yicha alohida ko‘ rsatkichlar hamda seriya ichidagi va seriyalararo o‘ zgaruvchanlik 3-jadvalda keltirilgan. IN ning qabul diapazoni natijalar olingandan keyin emas, balki validatsiya rejasida oldindan belgilangan mezon asosida talqin qilindi.

Jadval 3

Ichki nazoratning validatsiya ko‘ rsatkichlari

Ko‘ rsatkich	Olingan qiymat	Qabul mezoni
IN ishchi darajasi	≈ 100 nusxa/reaksiya	IN LoD dan ≥ 10 marta yuqori
Klinik namunalarda IN Cq (o‘ rtacha ± SD)	29.0 ± 0.4	Cq 27.5–30.5
IN Cq diapazoni (min–maks)	28.1–29.8	—
Valid IN signali ulushi	355/360 (98,6%)	≥ 95%

Ko‘ rsatkich	Olingan qiymat	Qabul mezoni
HBV LoD (INsiz)	5,15 nusxa/reaksiya ≈ 257,5 nusxa/ml)	—
HBV LoD (IN bilan)	5,15 nusxa/reaksiya ≈ 257,5 nusxa/ml)	INsiz LoD dan ≤ 2 marta farq
Past-musbat namunalarda ΔCq (IN bilan − INsiz)	0.12 ± 0.08 ($p > 0.05$)	$\lvert\Delta Cq\rvert \le 0.5$
Yuqori HBV yuklamasida (10^8 MB/ml) IN Cq siljishi	1.1–1.8 sikl	IN signali yo‘ qolmasligi

Yuqori HBV DNK konsentratsiyasida multipleks raqobat

Raqobat 10^2 dan 10^8 MB/ml gacha bo‘ lgan HBV konsentratsiyalari diapazonida baholandi. Yuqori virus yuklamasida (10^8 MB/ml) IN signalining Cq ko‘ rsatkichi 1.1–1.8 siklga kechikdi, biroq signalning to‘ liq yo‘ qolishi kuzatilmadi va HBV DNKsining miqdoriy hisob-kitobiga hamda FAM kanalining analitik sezgirligiga salbiy ta’sir qayd etilmadi. Multipleks qPCR tamoyillariga muvofiq, juda yuqori nishon yuklamasida IN signalining susayishi kutiladigan hodisa bo‘ lib, aniq HBV-musbat natijani bekor qilmaydi; shunga qaramay, ushbu test uchun qabul qilinadigan qoida validatsiya natijalari asosida oldindan belgilanishi lozim [4, 10].

Ichki nazoratning HBV analitik sezgirligiga ta’siri

HBV aniqlash chegarasi ichki nazoratsiz ham, tanlangan IN darajasi bilan ham 5,15 nusxa/reaksiya (≈ 257,5 nusxa/ml) darajasida saqlanib qoldi. 10 MB/ml past-musbat darajada aniqlanish ulushi INsiz 19/20 — 95% va IN bilan 19/20 — 95% ni tashkil etdi. Past-musbat namunalarda HBV Cq qiymatlari o‘ rtasidagi farq statistik jihatdan ahamiyatsiz bo‘ ldi ($\Delta Cq = 0.12 \pm 0.08$; $p > 0.05$). Bu natijalar tanlangan IN konsentratsiyasi HBV ning klinik ahamiyatli analitik sezgirligini saqlab qolishini ko‘ rsatadi va 5.4-bo‘ limda bayon etilgan raqobat cheklovining amalda bartaraf etilganini tasdiqlaydi.

Natijalarning muhokamasi

Ekstraksiyadan oldin, lizis bosqichida kiritilgan jarayon nazorati faqat amplifikatsiyani nazorat qiluvchi yondashuvga qaraganda sezilarli darajada kuchliroq sifat kafolatini beradi, chunki u nuklein kislotalarni sorbsiya, yuvish va elyusiya bosqichlaridagi yo‘ qotishlarni ham, keyingi PZR ingibitsiyasini ham bir vaqtda qamrab oladi. Olingan natijalar zamonaviy qPCR sifat tamoyillariga hamda ilgari ichki nazorat bilan ishlab chiqilgan HBV testlarining natijalariga mos keladi [4, 10, 11]. Plazma kabi hujayrasiz matritsada standartlashtirilgan ekzogen DNK nazorati endogen inson DNKsining tabiiy o‘ zgaruvchanligidan kamroq ta’sirlanadi, bu esa qabul diapazonini torroq belgilash imkonini beradi.

Optimallashtirishning maqsadi IN signalini maksimal kuchaytirish emas, balki nazoratning barqarorligi bilan asosiy nishonning sezgirligi o‘ rtasida muvozanat yaratishdir. MIQE 2.0 namuna ichidagi nazorat miqdorini uning aniqlash chegarasidan yuqorida, biroq imkon qadar past darajada saqlashni va multipleks natijalarni tegishli singleks reaksiyalar bilan taqqoslab validatsiya qilishni tavsiya etadi [4]. Shu nuqtai nazardan, 1 : 100 000 suyultirma faqat absolyut nusxa soniga keltirilgandan va HBV aniqlash chegarasiga ta’siri amalda tekshirilgandan so‘ ng ilmiy asoslangan deb hisoblanishi mumkin — aynan shu bosqich mazkur ishda bajarildi (1- va 3-jadvallar).

pPICZα dan kelib chiqqan geterologik DNK ning amaliy afzalligi — uni ko‘ p miqdorda tayyorlash, standart tarzda suyultirish va HBV dan alohida fluoressent kanal orqali farqlash mumkinligidir. Shu bilan birga, muhim uslubiy cheklovni ochiq qayd etish zarur: plazmida DNKsi kapsidlangan HBV virionining lizis xususiyatlarini to‘ liq takrorlamaydi. Demak, mazkur nazorat plazmida namunaga kiritilgan nuqtadan boshlab nuklein kislotani ajratib olish samaradorligini (recovery) va amplifikatsiya ingibitsiyasini nazorat qiladi; alohida tajriba bilan isbotlanmagan holda uni virus zarrachasining barcha biologik parchalanish bosqichlarini nazorat qiladi deb talqin qilish *to‘ g‘ ri emas*.

HBV DNK ning klinik ahamiyati yuqoriligicha qolmoqda: JSST va EASL ning amaldagi tavsiyalarida virus yuklamasi davolashga ko‘ rsatma, monitoring va transmissiya xavfini baholashda markaziy marker hisoblanadi [1, 3]. Mahalliy diagnostik to‘ plamga validatsiyalangan jarayon nazoratini kiritish invalid va yolg‘ on manfiy natijalar ulushini kamaytiradi. Biroq diagnostik mahsulotga joriy etishdan oldin to‘ liq analitik validatsiya, JSST xalqaro standartiga metrologik izchillik, lotlararo baholash, kontaminatsiya xavfi tahlili, barqarorlik tadqiqotlari va tegishli reglament talablari bo‘ yicha sinovlar o‘ tkazilishi lozim [12–14].

Xulosalar

Plazmaga ekstraksiyadan oldin kiritiladigan geterologik plazmida ichki nazorati dupleks HBV real vaqt PZR tahlilida ekstraksiya va amplifikatsiya sifatini bir vaqtda nazorat qilish uchun ilmiy jihatdan asoslangan yondashuv hisoblanadi. Nisbiy suyultirmani absolyut miqdorga keltirish natijasida ichki nazoratning ishchi darajasi taxminan 100

nusxa/reaksiyani tashkil etdi; ushbu daraja valid klinik ekstraktlarda tor Cq oralig‘ ini (29.0 ± 0.4; 28.1–29.8) ta’minladi. Tanlangan ichki nazorat HBV ning analitik sezgirligini pasaytirmadi: aniqlash chegarasi: 5,15 nusxa/reaksiya (≈ 257,5 nusxa/ml) darajasida saqlanib qoldi, past-musbat namunalardagi Cq farqi esa statistik jihatdan ahamiyatsiz bo‘ ldi ($\Delta Cq = 0.12 \pm 0.08$; $p > 0.05$). Yuqori virus yuklamasida (10^8 MB/ml) ichki nazorat signalining 1.1–1.8 siklga kechikishi kuzatildi; bu multipleks raqobatning kutilgan ko‘ rinishi bo‘ lib, HBV natijasining ishonchliligiga ta’sir qilmadi. Mahalliy diagnostik to‘ plamga joriy etish uchun quyidagilar tavsiya etiladi: (i) ishchi suyultirmani raqamli PZR yoki kalibrlash egri chizig‘ i bilan tasdiqlash; (ii) ichki nazorat Cq ning qabul diapazonini oldindan belgilash; (iii) JSST xalqaro standartiga izchil material yordamida ichki nazorat bilan va usiz HBV aniqlash chegarasi hamda aniqligini validatsiya qilish; (iv) yuqori virus yuklamasida ichki nazorat signalini talqin qilish qoidasini rasmiylashtirish; (v) klinik ahamiyatli interferentlar va preanalitik sharoitlarni tekshirish; (vi) barcha reaksiya komponentlari va talqin qoidalarini MIQE 2.0 talablariga muvofiq hujjatlashtirish.

Mualliflar hissasi, manfaatlar to‘ qnashuvi va moliyalashtirish

Mualliflarning hissasi: O.B.Alimuhamedova — tadqiqot konsepsiyasi, ichki nazorat konstruksiyasini tayyorlash, qPCR tajribalari, qo‘ lyozmani yozish; J.M.Abduraxmonov — tadqiqot dizayni va natijalarni talqin qilish; A.B.Baymirzayev — namunalar bilan ishlash va DNK ajratib olish; S.A.Ikramov — statistik tahlil; E.G.Yusupova — qo‘ lyozmani tahrirlash; Sh.S.Azimova — umumiy ilmiy rahbarlik.

Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi.

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AEGILOPS L. TURLARINING GULLASH DINAMIKASI.

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Annotatsiya. *Maqolada Aegilops L. turlarining gullash dinamikasi tasvirlangan. Aegilops turkumi turlarini xalq xo‘ jaligida intensiv foydalanish uchun tavsiya qilishda, turlarning gullash biologiyasini ilmiy asosda o‘ rganish muhim ahamiyatga ega. Tajriba davomida turlarning gullash jarayoniga ayrim ekologik omillar (havo harorati va nisbiy namlik) ta’siri qayd etildi.*

Kalit so‘ zlar: *Aegilops triunicalis L., Aegilops cylindrica Host., Aegilops tauschii Coss., Aegilops crassa Boiss, gullash dinamikasi, ekologik omillar.*

ДИНАМИКА ЦВЕТЕНИЯ ВИДОВ *AEGILOPS* L.

Аннотация. *В статье описана динамика цветения видов рода* Aegilops *L. Научное изучение биологии цветения видов рода* Aegilops *имеет важное значение при рекомендации видов данного рода для интенсивного использования в народном хозяйстве. В ходе эксперимента было отмечено влияние некоторых экологических факторов (температуры воздуха и относительной влажности) на процесс цветения видов.*

Ключевые слова: Aegilops triunicalis *L.*, Aegilops cylindrica *Host.*, Aegilops tauschii *Coss.*, Aegilops crassa *Boiss.*, *динамика цветения, экологические факторы.*

FLOWERING DYNAMICS OF *AEGILOPS* L. SPECIES.

Annatation. *The article describes the flowering dynamics of species of the genus* Aegilops *L. The scientific study of the flowering biology of* Aegilops *species is of great importance when recommending species of this genus for intensive use in the national economy. During the experiment, the influence of certain environmental factors (air temperature and relative humidity) on the flowering process of the species was recorded.*

Keywords: Aegilops triunicalis *L.*, Aegilops cylindrica *Host.*, Aegilops tauschii *Coss.*, Aegilops crassa *Boiss.*, *flowering dynamics, environmental factors.*

Kirish. O‘ simliklarning gullash jarayonini, changlanishini o‘ rganish o‘ rganilayotgan turlarni ekologik va biologik tavsiflashga imkon beradi.

O‘ simliklarning hayotiy siklida gullash jarayoni alohida o‘ rin tutadi. Gullashning boshlanishi, davomiyligi va jadalligi o‘ simlikning biologik xususiyatlari bilan bir qatorda tashqi muhit omillariga ham bog‘ liq. Harorat, namlik, yorug‘ lik davomiyligi, tuproq sharoiti hamda agrotexnik tadbirlar gullash muddatlari va uning dinamikasiga sezilarli ta’sir ko‘ rsatishi mumkin. Shu sababli bug‘ doydoshlar oilasiga mansub o‘ simliklarda gullash jarayonining kechishi va uning o‘ zgaruvchanligini o‘ rganish o‘ simliklarning rivojlanish qonuniyatlarini aniqlashda muhim ahamiyatga ega.

R.Ye. Levina ilmiy asarlarida o‘ simliklarning gullash jarayonini changdon va urug‘ chilar yetilishi bilan boshlanishini va tugashini esa urug‘ lanish jarayoni bilan borishini asoslagan [4; 1-95-b.]. M.A. Pavlova o‘ zining ishlarida o‘ simlik turlarida gullash davomiyligi uning lateral generativ kurtaklar soniga bog‘ liq ekanligini va ular o‘ z navbatida o‘ simliklarning joylashish zichligi bilan ham belgilanishini qayd etgan [6; 1-12-b.].

Aegilops turkumi turlarini xalq xo‘ jaligida intensiv foydalanish uchun tavsiya qilishda, turlarning gullash biologiyasini ilmiy asosda o‘ rganish muhim ahamiyatga ega. Turkum vakillarini introduksiya sharoitida gullash biologiyasini o‘ rganish asosiy tadqiqot maqsadlarimizdan biridir.

O‘ simlik gullarining umr ko‘ rish muddati har xil bo‘ lib, bir necha o‘ n daqiqadan bir necha haftagacha o‘ zgarishi mumkin [8; 1-43-b.].

Tadqiqot ob’yektlari va usullari. Turlarning mavsumiy rivojlanish maromi I.V. Borisova [2; 619 - 626-b.] va I.N. Beydeman [1; 1-154-b.] usullaridan foydalanib o‘ rganildi. Bunda vegetativ (unib chiqishi, uchinchi bargning shakllanishi, tuplanish va naychalash), boshoqlanish, gullash, donning yetilishi (sut pishish, mum pishish, to‘ la pishsish) fazalari

davomiyligi o‘rganildi. O‘simliklarning gullash biologiyasi hamda ularning mavsumiy dinamikasini o‘rganishda A.N. Ponomaryov [7;115-179-b, 61;1440-b.] usullari, X.Q. Qarshiboyevning metodik tavsiyalaridan [5; 1-84 -b] foydalanildi. O‘ simliklarning urug‘ mahsuldorligi I.V. Vaynagiy tavsiyalari asosida o‘ rganildi [3; 826-831-b].

1-jadval

Introduksiya sharoitida *Aegilops* L. turlarining mavsumiy gullash davri (2022-2023 yy.) n=100.

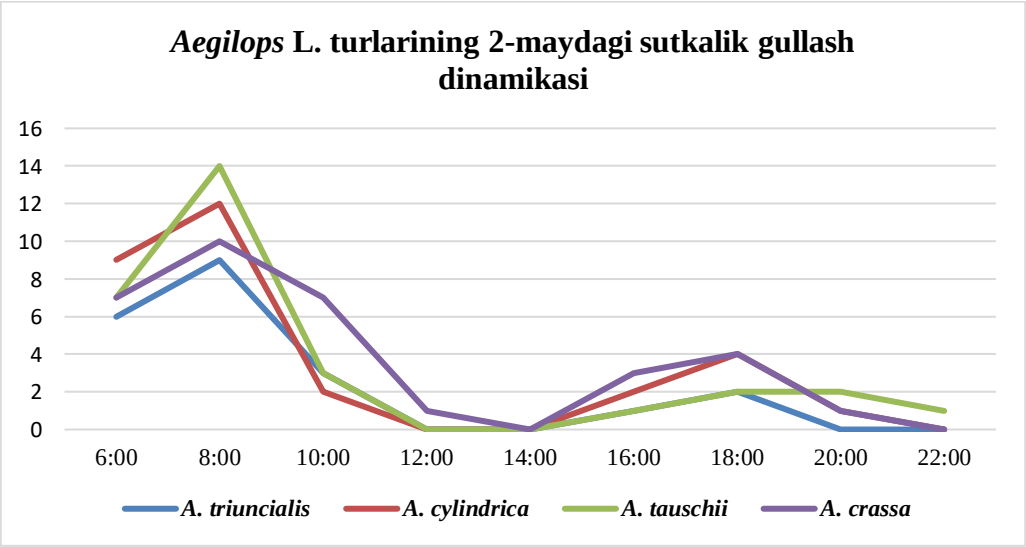
Turlarning nomi	Gullash jarayoni, kun			Gullash davomiyligi, kun
	gullashning boshlanishi	yalpi gullash	yakuniy gullash	
A. triuncialis	01.05	04.05	07.05	7
	28.04	03.05	08.05	10
A. cylindrica	30.04	04.05	08.05	9
	28.04	03.05	11.05	13
A. tauschii	25.04	01.05	06.05	11
	23.04	26.04	04.05	11
A. crassa	26.04	01.05	07.05	11
	24.04	29.04	05.05	11

Aegilops L. turkumi turlarining gullash jarayonini 2022-20223-yillar davomida introduksiya sharoitida kuzatildi. Yilning metrologik sharoitiga qarab turlarda gullash turli vaqtlarda amalga oshdi (1-jadval).

2022-2023-yillarda turlarning gullash jarayoni aprel oyining uchinchi may oyining birinchi dekadalarida amalga oshdi (1-jadvalga qarang). Yilning metrologik ko‘ rsatkichlariga qarab turlarda gullash davri bir necha kungacha o‘ zgarishi mumkin. O‘ rganilgan turlarda gullash davomiyligi 2022-yili 7 kundan (*A. triuncialis*) 11 kungacha (*A. tauschii, A. crassa*), 2023-yilda esa 10 kundan (*A. triuncialis*) 13 kunga (*A. cylindrica*) qadar davom etdi.

Tajriba davomida ayrim turlarda gullash boshoqning pastki qismidan boshlandi (*A. triuncialis*). Ba’zilarida 2-3-boshoqchalarda dastlabki gullash kuzatildi (*A. cylindrica, A. tauschii, A. crassa)*. Keyin esa yuqori qismidagi boshoqchalar gulladi. Gullashdan oldin boshoqcha qipiqlari ochildi, keyin changchi iplari tashqariga osilib chiqdi (3-rasm).

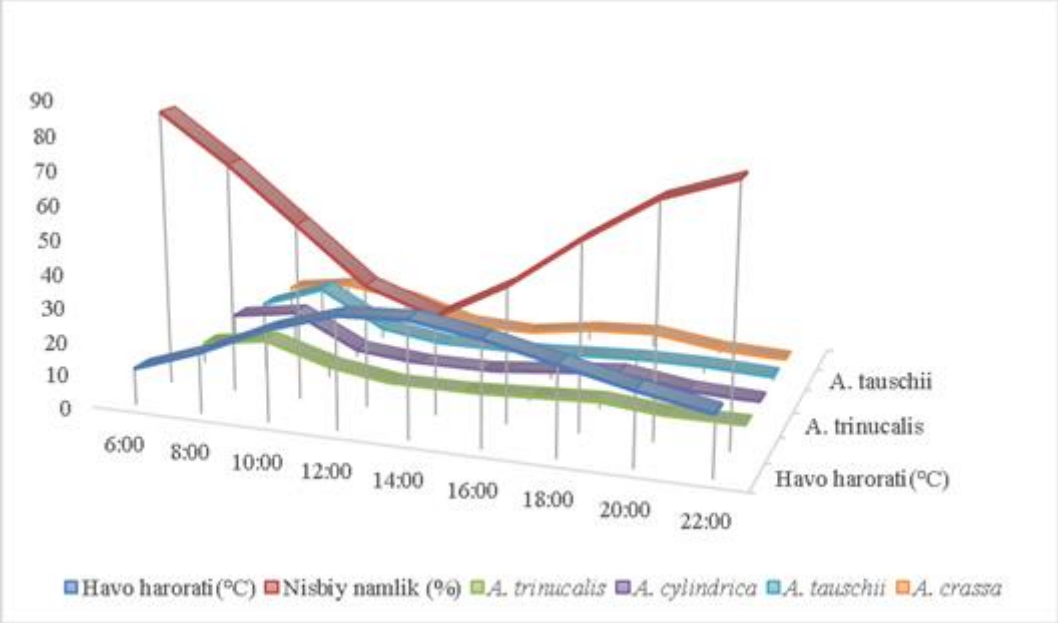
Olib borilgan tadqiqotlar davomida gullash jarayoni turlarda havo namligi yuqori, harorat past bo‘ lganda amalga oshdi (1-rasm).



1-rasm. *Aegilops* L. turlarining sutkalik gullash dinamikasi.

Sutka davomida ochilgan gullarning asosiy vaqti soat 6^{00}-10^{00} ga to‘ g‘ ri keldi (2.05.2022). Kunning o‘ rta qismida deyarli o‘ rganilgan turlarda gullash jarayoni qayd etilmadi. Soat 16:00-18:00 da ochilgan gular soni kamaydi, soat 20:00 dan boshlab ochilgan gular qayd etilmadi.

Tajriba davomida turlarning gullash jarayoniga ayrim ekologik omillar (havo harorati va nisbiy namlik) ta’siri qayd etildi (2-rasm).



2-rasm. *Aegilops* L. turlarining gullashiga havo harorati va namlikning ta'siri.

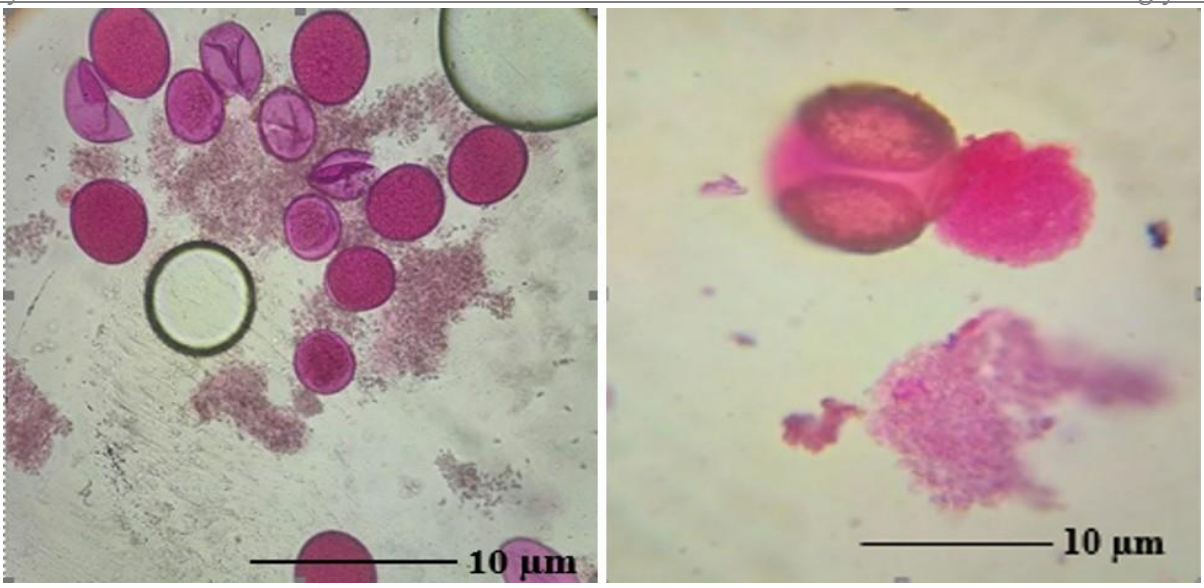
O‘ simliklarning gullash jarayoni ko‘ plab atrof-muhit omillariga ya'ni harorat, yorug‘ lik, havo namligiga, mineral moddalar bilan oziqlanish jarayonlariga chambarchas bog‘ liq [9; 7-204-b.]. Biz kuzatgan turlarning gullash jarayonida umumiy xususiyatlar mavjud bo‘ lib, ularning gullash vaqtlari boshoqdagi boshoqchalar soni bilan uzviy bog‘ liq.



3-rasm. *Aegilops* L. turlarining gullash jarayoni.

O‘ simliklarda urug‘ mahsuldorligi asosan gulchanglarning miqdori va sifati bilan bog‘ liqdir. O‘ simliklarning gullashi va changlanish jarayonlari muhim biologik jarayon bo‘ lib, katta amaliy ahamiyatga ega va o‘ simlik evolyusiyasida bir qator muammolarni hal qilishga katta xissa qo‘ shadi [8; 1-43-b.].

Anemofil o‘ simliklar odatda ko‘ p miqdorda gulchang ishlab chiqarsada, biz o‘ rganayotgan turkum vakillarining (*Aegilops* L.) chang donachalarining fertilligi haqida ma'lumotlar yetarli emas (chang donachalari 4 - rasmda berilgan). O‘ simliklarning chang fertilligi taksonomik jihatdan va nasilchilik dasturlarida muhim ahamiyatga ega.



4-rasm. *Aegilops* L. turlarining chang donachalarining ko‘ rinishi. x400. Scale bar=10 µm.

Shunigdek, chang donachalarining unumdorligi o‘ simliklar populyatsiyasida ma’lum bir turning omon qolishini ta‘minlash uchun jinsiy ko‘ payish orqali yetarli darajada regeneratsiya bo‘ ladimi yoki yo‘ qmi aniq belgilab beruvchi omil hisoblanadi [10; 30-33-b.]

2-jadval

***Aegilops* L. gullari chang donachalarining fertilligi (n=100).**

№	Tur	Chang yig‘ ilgan vaqt	Fertillik hisobida (%)
1	***Aegilops tauschii***	2022 2023	94,0 92,5
2	***Aegilops cylindrica***	2022 2023	96,6 93,4
3	***Aegilops crassa***	2022 2023	96,4 92,1
4	***Aegilops triuncialis***	2022 2023	99,1 95,2

Tadqiqotimiz davomida *Aegilops* L. turkum vakillarining chang fertilligi foizlarda ifodalandi. 2022-2023 yillar davomida kuzatilgan natijalarga ko‘ ra turkum vakillarining (*Aegilops crassa*) chang fertilligi 92,1 % dan yuqori bo‘ lib, bu turlarning umumiy barqarorligi yuqori ekanligi bilan izohlanadi (2-jadval).

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SUG‘ ORILADIGAN TIPIK BO‘ Z TUPROQLARDA TURLI O‘ SIMLIK BIOMASSALARINING GUMUSNING FRAKSION-GURUH TARKIBIGA TA’SIRI

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Annotatsiya: *Maqolada sug‘ oriladigan tipik bo‘ z tuproqlarda turli o‘ simlik biomassalarining gumusning fraksion-guruh tarkibiga ta’siri o‘ rganildi. Tuproqdagi umumiy uglerod, gumin va fulvo kislotalar, ularning nisbati hamda gidrolizlanadigan va gidrolizlanmaydigan moddalar tarkibidagi o‘ zgarishlar tahlil qilindi. Turli o‘ simlik biomassalarining tuproq organik moddasi shakllanishiga ta’siri qiyosiy baholandi. Olingan natijalar biomassaning turi gumusning guruh va fraksion tarkibiga sezilarli ta’sir ko‘ rsatishini ko‘ rsatdi.*

Kalit so‘ zlar: *sug‘ oriladigan tipik bo‘ z tuproq, o‘ simlik biomassasi, gumus, gumin kislotalar, fulvo kislotalar, organik uglerod, Cgk:Cfk, GM:GUM, gumifikatsiya.*

ВЛИЯНИЕ РАЗЛИЧНЫХ РАСТИТЕЛЬНЫХ БИОМАСС НА ФРАКЦИОННО-ГРУППОВОЙ СОСТАВ ГУМУСА ОРОШАЕМЫХ ТИПИЧНЫХ СЕРОЗЁМОВ

Аннотация *В статье изучено влияние различных растительных биомасс на фракционно-групповой состав гумуса орошаемых типичных серозёмов. Проанализированы изменения общего углерода, гуминовых и фульвокислот, их соотношения, а также гидролизуемых и негидролизуемых веществ. Проведена сравнительная оценка влияния различных видов растительной биомассы на формирование органического вещества почвы. Полученные результаты показывают, что вид растительной биомассы существенно влияет на групповое и фракционное строение гумуса.*

Ключевые слова: *орошаемый типичный серозём, растительная биомасса, гумус, гуминовые кислоты, фульвокислоты, органический углерод, Cgk:Cfk, GM:GUM.*

EFFECT OF DIFFERENT PLANT BIOMASSES ON THE FRACTIONAL-GROUP COMPOSITION OF HUMUS IN IRRIGATED TYPICAL SEROZEMS

Annotation: *The article examines the effect of different plant biomasses on the fractional-group composition of humus in irrigated typical serozems. Changes in total carbon, humic and fulvic acids, their ratio, and hydrolysable and non-hydrolysable substances were analyzed. The effects of different plant biomass types on soil organic matter formation were comparatively assessed. The results show that the type of plant biomass has a significant effect on the group and fractional composition of soil humus.*

Key words*: irrigated typical serozem, plant biomass, humus, humic acids, fulvic acids, organic carbon, Cgk:Cfk, GM:GUM.*

Kirish

Tuproq unumdorigini belgilovchi ko‘ rsatkichlardan biri bu - tuproqlarning gumusli holati bo‘ lib, tuproqlarning deyarlik barcha xossa va xususiyatlari bevosita gumus miqdori bilan bog‘ liqdir. Bugungi kunda sug‘ oriladigan tuproqlarda organik moddalar taqchilligini hisobga olgan holda, tuproq tarkibidagi organik moddalarni agrobiologik usullar yordamida oshirish muhim ahamiyat kasb etadi. Qishloq xo‘ jaligi ekinlarining vegetatsiya davri oxirida tuproqda qoldiradigan biomassalari tuproqni organik moddaga boyitishda katta ahamiyatga ega bo‘ lgan tabiiy resurslar hisoblanadi.

Xorijiy va mamlakatimiz olimlari tomonidan olib borilgan ilmiy-tadqiqot ishlarining natijalariga ko‘ ra tuproqqa qo‘ shiladigan turli organik qoldiqlarlarni, jumladan o‘ simliklar biomassasi (bargi, poyasi, ildizi) ni tuproq tarkibidagi mikroorganizmlar hamda fermentlar ta’sirida parchalanishi natijasida gumus moddalari hosil bo‘ ladi, tuproqlarning biologik faolligi ortib, fizik-kimyoviy xossa-xususiyatlari yaxshilanadi [1, 6, 11, 12, 2].

O‘ simlik qoldiqlari tarkibida asosan sellyuloza, lignin, gemitsellyuloza uglerod (C) va azot (N), fosfor (P) hamda kaliy (K) kabi muhim oziq elementlar bo‘ lib, tuproqni organik moddaga boyitishda asosiy manba bo‘ lib xizmat qiladi. O‘ simlik qoldiqlaridan tayyorlangan kompostlar tuproqda uchraydigan patogenlarni yo‘ q qilib, tuproqning strukturasini, oziq moddalar aylanishini yaxshilaydi, tuproqda mikroorganizmlar xilma-xilligini oshirib, hosildorlik oshishiga olib keladi [8].

Shu sababli turli o‘ simlik biomassalarining sug‘ oriladigan tipik bo‘ z tuproqlarda gumusning gumin va fulvo kislotalari hamda boshqa guruh tarkibiy qismlariga ta’sirini aniqlash ilmiy va amaliy jihatdan muhim hisoblanadi.

Tadqiqotning maqsadi - sug‘ oriladigan tipik bo‘ z tuproqlarga turli o‘ simlik biomassalarini qo‘ shish natijasida umumiy uglerod, gumin va fulvo kislotalar, Cgk:Cfk nisbati hamda gumusning guruh tarkibidagi o‘ zgarishlarni aniqlash.

Adabiyotlar tahlili

Dunyo bo‘ yicha oziq ovqat mahsulotlariga talab ortib borayotgan bir vaqtda intensiv dehqonchilik amaliyoti bilan o‘ simlik qoldiqlaridan foydalanish yildan-yilga ortib bormoqda. Jumladan 1960-61 yillarda ularning miqdori 1589 million tonnadan 2020-21 yillarda 5280 million tonnagacha ya’ni 3 barobarga ortgan [10].

FAO ma’lumotlariga ko‘ ra, o‘ simlik qoldiqlari va ildiz ajratmalari tuproqqa tushgach, mikroorganizmlar ishtirokida mineralizatsiyaga uchrab, yangi organik birikmalar hosil qiladi. Ushbu jarayon gumifikatsiya deb yuritiladi. Natijada hosil bo‘ lgan barqaror organik moddalar tuproq minerallari bilan birikadi yoki agregatlar tarkibida saqlanadi. Bu mexanizm tuproq organik uglerodining uzoq muddat saqlanishini ta’minlab, gumifikatsiyaning asosiy jarayoni hisoblanadi. Ushbu tashkilot hisobotiga ko‘ ra, gumifikatsiya koeffitsiyenti organik modda turiga bog‘ liq bo‘ lib, kompost uchun 0,6-0,9, go‘ ng uchun 0,3-0,5, yangi o‘ simlik qoldiqlari uchun esa 0,1-0,2 ni tashkil etadi. Tuproq agregatlari va mineral zarrachalar bilan bog‘ langan organik uglerod fraksiyalari uning uzoq muddat barqaror saqlanishini ta’minlaydi **[**3, **4, 5]**.

L.Beata va b. Karkoanze tog‘ larida gumusning fraksiyaviy guruh tarkibini o‘ rgangan bo‘ lib, subalp o‘ tloqi tuproqlarda fulvo kislotalar tuproq profilining barcha gorizontlarida gumin kislotalardan ustunlik qilishi, tuproqdagi gumus miqdoriga o‘ simliklar qoplamini ta’siri yuqori ekanligi to‘ g‘ risida ma’lumotlar bergan [1].

Y.Zheng, R.Sharma ma’lumotlariga ko‘ ra, o‘ simlik turiga qarab moddalar tarkibi sezilarli darajada o‘ zgaradi, bu esa o‘ z navbatida mineralizatsiya jarayoni tezligiga, organik moddalar hosil bo‘ lish dinamikasiga ta’sir qiladi. Misol uchun, makkajo‘ xori va bug‘ doyda sellyuloza miqdori 42,6 % va 30-39,2 % ni tashkil etsa, lignin miqdori esa 8,2 va 14-21 %ni tashkil etadi. Guruch qoldiqlarida esa lignin miqdori 18,2 %ni tashkil etadi, o‘ simlik tarkibida qanchalik sellyuloza va lignin ko‘ proq miqdorda bo‘ lsa, mineralizatsiya jarayonlari sekinroq ketadi [13, 7, 9].

Tadqiqot metodologiyasi

Tadqiqot O‘ zbekiston Milliy universitetining Botanika o‘ quv-ilmiy markazidagi Tuproqshunoslik kafedrasining statsionar dala tajriba maydonida tarqalgan sug‘ oriladigan tipik bo‘ z tuproq asosida olib borilgan. Dissertatsiyada ushbu maydon Toshkent shahrining shimoli-g‘ arbiy qismida, Chirchiq daryosining yuqori qismida joylashgani ko‘ rsatilgan. Vegetatsion tajriba aynan shu hududdagi dala tajribasidan olingan tuproq bilan tashkil etilgan.

O‘ simlik qoldiqlarining gumifikatsiya jarayonini o‘ rganish uchun 3 kg quruq tuproq sig‘ imiga ega idishlarda vegetatsion tajriba o‘ tkazilgan. Tuproq maydalangan o‘ simlik qoldiqlari bilan aralashtirilgan va ularning miqdori dala o‘ lchovlari asosida belgilangan. Tajriba 9 ta variantdan iborat bo‘ lib, nazorat bilan bir qatorda g‘ o‘ za bargi, ildizi, poyasi, bargi+ildizi, bargi+ildizi+poyasi, beda ildizi, bug‘ doy somoni va efemer o‘ simlik biomassasi qo‘ llanilgan.

Tuproqdagi gumus miqdori Tyurin usulining Nikitin modifikatsiyasi bo‘ yicha, gumusning fraksion-guruh tarkibi esa Ponomareva-Plotnikova usuli bo‘ yicha aniqlangan. Tadqiqotda tuproqshunoslikda qabul qilingan dala, laboratoriya va kameral usullar, shuningdek tegishli uslubiy qo‘ llanmalardan foydalanilgan.

Natijalar va ularning tahlili

Tadqiqotda turli o‘ simlik biomassalarining qo‘ llanilishi tuproqdagi umumiy uglerod va gumusning alohida guruh tarkibiy qismlariga turlicha ta’sir qilgani aniqlandi. Barcha biomassali variantlarda nazoratga nisbatan umumiy uglerodning oshishi kuzatildi. Gumin va fulvo kislotalar, Cgk:Cfk nisbati hamd gidrolizlanadigan moddalar miqdorida ham variantlar bo‘ yicha farqlar mavjud bo‘ ldi.

Gumus miqdoridagi bunday o‘ zgarishlar, avvalo, tuproqqa tushgan o‘ simlik biomassasining parchalanishi va mikroorganizmlar ishtirokida transformatsiyalanishi bilan bog‘ liq. O‘ simlik qoldiqlarining tuproqqa qo‘ shilishi natijasida organik uglerodning yangi manbai hosil bo‘ lib, uning bir qismi mineralizatsiyaga uchrasa, boshqa qismi murakkab organik birikmalar tarkibiga o‘ tadi. Shu jihatdan tajribada umumiy uglerod miqdorining ham barcha biomassali variantlarda nazoratga nisbatan ortishi kuzatildi. Nazorat variantida umumiy uglerod 0,644 % bo‘ lgan bo‘ lsa, g‘ o‘ za organlari qo‘ llanilgan variantlarda ushbu ko‘ rsatkich 0,651-0,673 % oralig‘ ida bo‘ ldi. G‘ o‘ zaning bargi, ildizi va poyasi birgalikda qo‘ llanilgan 6-variantda umumiy uglerod 0,673 % ga yetib, nazoratga nisbatan 0,029 foizga oshdi. Gidrolizlanadigan moddalar miqdorida ham variantlar bo‘ yicha farqlar mavjud bo‘ ldi.

1-jadval

Tajriba oxirida gumusning fraksiyon-guruh tarkibi, tuproqning umumiy uglerodiga nisbatan %

№	Variant	C, %	Gumin kislotalar				Fulvo kislotalar					$C_{gk}:C_{fk}$	Gidrolizlanadigan moddalar	GM : GUM
			1	2	3	Summa	1a	1	2	3	Summa			
1	Tuproq (nazorat)	0,644	2,18	0,94	8,21	11,33	3,88	0,47	5,89	14,10	24,34	0,47	35,67	0,56
2	tuproq+g'o'za bargi	0,655	1,05	2,84	7,61	11,50	4,18	1,20	5,23	12,83	23,44	0,49	34,94	0,54
3	tuproq+g'o'za ildizi	0,651	2,00	1,46	8,95	12,41	4,29	1,08	5,60	11,10	22,07	0,56	34,48	0,53
4	tuproq+g'o'za poyasi	0,654	1,71	1,51	8,69	11,90	4,05	0,46	5,70	11,84	22,05	0,54	33,95	0,51
5	tuproq+g'o'za bargi+ g'o'za ildizi	0,659	2,35	0,60	7,18	10,13	4,11	0,16	7,04	11,72	23,03	0,44	33,16	0,50
6	tuproq+ g'o'za bargi+ g'o'za ildizi+ g'o'za poyasi	0,673	2,53	2,42	8,82	13,76	4,15	0,15	6,08	11,80	22,18	0,62	35,94	0,56
7	tuproq+beda ildizi	0,665	1,64	2,08	8,59	12,31	3,41	1,64	4,60	11,70	21,34	0,58	33,65	0,51
8	tuproq+bug'doy somoni	0,661	1,60	2,00	8,54	12,14	3,37	1,60	4,55	11,66	21,18	0,57	33,32	0,50
9	tuproq+efemer o'simlik	0,729	0,83	3,17	11,99	16,69	4,27	01,83	8,02	13,88	27,00	0,62	43,69	0,78

G‘ o‘ za organlarining alohida va kompleks qo‘ llanilishi gumusning fraksion-guruh tarkibida ham turlicha o‘ zgarishlarni yuzaga keltirdi. Nazorat variantida umumiy uglerodga nisbatan gumin kislotalar 11,33 %, fulvo kislotalar esa 24,34 % ni tashkil etgan. G‘ o‘ za bargi qo‘ llanilganda gumin kislotalar 11,50 %, g‘ o‘ za ildizida 12,41 %, poyasida 11,90 %, bargi va ildizi birgalikda qo‘ llanilganda 10,13 % ni tashkil etdi. G‘ o‘ zaning bargi, ildizi va poyasi kompleks qo‘ llanilgan 6-variantda esa gumin kislotalar 13,76 % ga yetdi. Shu bilan birga, ushbu variantda fulvo kislotalar 22,18 % ni tashkil etdi. Natijada gumin kislotalar ulushining ortishi va fulvo kislotalar ulushining nisbatan kamayishi Cgk:Cfk nisbatining 0,47 dan 0,62 gacha oshishiga olib keld

Izoh: Cgk:Cfk — gumin kislota uglerodining fulvo kislota uglerodiga nisbati; GM:GUM — gidrolizlanadigan moddalarning gidrolizlanmaydigan moddalarga nisbati

Olingan natijalar g‘ o‘ za organlarining tarkibi va ularning parchalanish xususiyatlari gumusning shakllanish yo‘ nalishiga ta’sir qilishini ko‘ rsatadi. Ayniqsa, ildiz va poya tarkibida lignin hamda murakkab uglerodli birikmalarning mavjudligi ularning nisbatan sekin parchalanishiga va gumusning barqarorroq komponentlari shakllanishiga sharoit yaratishi mumkin. Tajribada g‘ o‘ za organlari kompleks qo‘ llanilgan variantda gumin kislotalarning 13,77 % ga yetishi va Cgk:Cfk nisbatining 0,62 bo‘ lishi ham ushbu jarayonning nisbatan faol kechganligini ko‘ rsatadi.

Biroq turli o‘ simlik biomassalari orasida eng yuqori natijalar efemer o‘ simlik qoldiqlari qo‘ llanilgan variantda kuzatildi. Mazkur variantda umumiy uglerod miqdori 0,729 % ni tashkil etib, nazoratga nisbatan 0,085 foizga oshgan. Umumiy uglerodga nisbatan gumin kislotalar 11,33 % dan 16,99 % gacha, fulvo kislotalar esa 24,34 % dan 27,00 % gacha ortgan. Bunday natijani efemer o‘ simlik biomassasi tarkibida oson parchalanadigan uglevodlar, oqsil va azotli birikmalarning mavjudligi bilan izohlash mumkin. Mazkur organik moddalar mikroorganizmlar uchun nisbatan oson o‘ zlashtiriladigan substrat bo‘ lib, ularning parchalanishi va keyingi gumifikatsiya jarayonlarini jadallashtirishi mumkin.

Beda ildizi va bug‘ doy somoni qo‘ llanilgan variantlarda ham nazoratga nisbatan umumiy uglerod hamda gumin kislotalar miqdorining ortishi kuzatildi. Beda ildizi qo‘ llanilganda umumiy uglerod 0,665%, gumin kislotalar 12,31%, fulvo kislotalar 21,35% va Cgk:Cfk nisbati 0,58 ni tashkil etdi. Bug‘ doy somoni qo‘ llanilgan variantda esa umumiy uglerod 0,661%, gumin kislotalar 12,14%, fulvo kislotalar 21,34% va Cgk:Cfk nisbati 0,58 bo‘ ldi. Bu variantlarda gumin kislotalar ulushining fulvo kislotalarga nisbatan ortishi organik qoldiqlarning parchalanishi jarayonida nisbatan barqaror gumus komponentlari shakllanganligini ko‘ rsatadi.

Shu bilan birga, efemer o‘ simlik biomassasi qo‘ llanilgan variantning natijalari boshqa biomassalardan farq qildi. Ushbu variantda gumin va fulvo kislotalarning har ikkala fraksiyasi ham ortgan bo‘ lib, gumin kislotalar 16,99%, fulvo kislotalar 27,00% ni tashkil etdi. Cgk:Cfk nisbati esa 0,62 ga teng bo‘ ldi. Demak, efemer biomassasi tuproqdagi organik uglerodning umumiy miqdorini oshirish bilan birga, gumusning ham gumin, ham fulvo fraksiyalarining shakllanishini rag‘ batlantirgan. Bunda efemer o‘ simlik qoldiqlarining tez parchalanishi natijasida mikroorganizmlar uchun mavjud bo‘ lgan organik substratlar miqdorining ortishi muhim omil bo‘ lishi mumkin. Tadqiqotning umumiy natijalarida ham

aynan 9-variantda gumin kislotalar 11,33% dan 16,99% gacha, fulvo kislotalar 24,34% dan 27,00% gacha, Cgk:Cfk esa 0,47 dan 0,62 gacha oshgani qayd etilgan.

Gumusning gidrolizlanadigan va gidrolizlanmaydigan qismlari bo‘ yicha olingan ma’lumotlar ham o‘ simlik biomassalarining organik modda tarkibiga ta’siri turlicha ekanligini ko‘ rsatdi. Nazorat variantida gidrolizlanadigan moddalar ulushi 35,67%, gidrolizlanmaydigan moddalar ulushi esa 64,33% bo‘ lgan. G‘ o‘ za bargi, ildizi va poyasi birgalikda qo‘ llanilgan variantda ushbu ko‘ rsatkichlar mos ravishda 35,94 va 64,06% ni tashkil etdi. Beda ildizida 33,65 va 66,35%, bug‘ doy somonida 33,32 va 66,68% qayd etilgan. Eng yuqori gidrolizlanadigan moddalar miqdori efemer o‘ simlik biomassasi qo‘ llanilgan 9-variantda kuzatilib, 43,69% ga yetgan, gidrolizlanmaydigan moddalar esa 59,31% ni tashkil etgan.

Mazkur o‘ zgarishlar GM:GUM nisbatida ham o‘ z aksini topdi. Ushbu ko‘ rsatkich nazorat variantida 0,56 bo‘ lgan bo‘ lsa, g‘ o‘ za organlari qo‘ llanilgan variantlarda 0,50–0,56, beda ildizi va bug‘ doy somonida mos ravishda 0,51 va 0,50 ni tashkil etdi. Efemer o‘ simlik biomassasi qo‘ llanilgan variantda esa GM:GUM nisbati 0,78 gacha oshdi. Tajriba ma’lumotlariga ko‘ ra, 9-variantda umumiy uglerod, gumin va fulvo kislotalar, shuningdek gidrolizlanadigan moddalar miqdorining bir vaqtda yuqori bo‘ lishi ushbu biomassaning tuproq organik moddasining shakllanishiga kuchliroq ta’sir ko‘ rsatganini ko‘ rsatadi.

Umuman olganda, tajriba natijalari o‘ simlik biomassasining turi va kimyoviy tarkibi tuproq gumusining nafaqat umumiy miqdoriga, balki uning fraksion-guruh tarkibiga ham sezilarli ta’sir ko‘ rsatishini ko‘ rsatdi. G‘ o‘ zaning bargi, ildizi va poyasi kompleks qo‘ llanilganda gumin kislotalar ulushi va Cgk:Cfk nisbati eng yuqori qiymatga yetgan bo‘ lsa, efemer o‘ simlik biomassasi qo‘ llanilganda umumiy uglerod, gumin va fulvo kislotalar hamda gidrolizlanadigan moddalar miqdori eng yuqori bo‘ ldi. Bu holat turli o‘ simlik qoldiqlarining parchalanish tezligi, uglerodning shakllari va mikroorganizmlar tomonidan o‘ zlashtirilish darajasi bir xil emasligi bilan izohlanadi. Shu nuqtai nazardan, o‘ simlik biomassalarini tuproqqa qaytarish sug‘ oriladigan tipik bo‘ z tuproqlarda organik modda zaxirasini ko‘ paytirish va gumusning sifat tarkibini yaxshilashga yo‘ naltirilgan samarali agrobiologik tadbirlardan biri sifatida baholanishi mumkin. Tajriba natijalarida o‘ simlik biomassasi qo‘ llanilishi tuproqning boshqa biologik ko‘ rsatkichlariga ham ijobiy ta’sir ko‘ rsatgan: masalan, turli biomassalar bilan kompostlashda ammonifikatorlar, oligotroflar va aktinomisetlar miqdorining ortishi qayd etilgan.

XULOSALAR

1. Umumiy uglerodning eng yuqori miqdori efemer o‘ simlik biomassasi qo‘ llanilgan 9-variantda 0,729 % bo‘ lib, nazoratga nisbatan 0,085 % ga yuqori bo‘ ldi. Shu variantda gumin kislotalar 16,99 % ga, fulvo kislotalar 27,00 % ga va gidrolizlanadigan moddalar 43,69% ga yetdi.

3. G‘ o‘ za bargi, ildizi va poyasi kompleks qo‘ llanilgan 6-variantda gumin kislotalar 13,76 % ni, Cgk:Cfk nisbati esa 0,62 ni tashkil etdi. Bu variantda gumus tarkibida nisbatan barqaror fraksiyalar ulushining ortishi kuzatildi.

4. O‘ simlik biomassasining turi va kimyoviy tarkibi gumifikatsiya yo‘ nalishiga ta’sir qilishi sababli sug‘ oriladigan tipik bo‘ z tuproqlarda organik qoldiqlarni tuproqqa qaytarish gumus miqdori va sifat tarkibini yaxshilashga yo‘ naltirilgan istiqbolli agrobiologik tadbir sifatida baholanishi mumkin.

MUALLIFLAR BAYONOTLARI

Muallif hissasi: tadqiqot konsepsiyasi, tajriba ma’lumotlarini tahlil qilish, natijalarni talqin qilish va maqola matnini tayyorlash muallif tomonidan amalga oshirildi.

Manfaatlar to‘ qnashuvi: muallif manfaatlar to‘ qnashuvi mavjud emasligini bildiradi.

Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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INTRODUKSIYA QILINGAN *BERBERIS THUNBERGII* DC., ENTOMOFAUNASIDA ZAYTUN QALQONDORI (*PARLATORIA OLEAE* (COLVÉE, 1880))NING TUTGAN O‘ RNI

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Annotatsiya. *Ushbu tadqiqotda Andijon shahriga introduksiya qilingan Tunberg zirki (*Berberis thunbergii *DC.) o‘ simligida yashovchi* Parlatoria oleae *(Colvée, 1880) – zaytun qalqondorining uchrash ko‘ rsatkichlari va o‘ simlik bilan trofik aloqalari hamda ekologik nisha munosabatlari o‘ rganildi. Vizual tekshirilgan 65 tup Tunberg zirki o‘ simligining 25 tupida* P.oleae turi*ga xos yosh individlari aniqlandi (Andijon sh., 2026.08). Kuzatuvlar davomida zararlangan o‘ simliklar ulushi 38,5%ni tashkil etdi. Yosh qalqondorlar barglarning ustki (adaksial) yuzasida qayd etilib, bitta bargda urg‘ ochilarning kuzatilgan eng yuqori soni 2–3 tani tashkil etdi. Olingan natijalar* P. oleae turi*ning* B. thunbergii *bilan trofik aloqalarini Andijon sharoitida miqdoriy jihatdan tavsiflaydi hamda turning hududdagi ozuqa o‘ simliklari doirasiga oid ma’lumotlarni to‘ ldiradi.*

Kalit so‘ zlar: *Berberis thunbergii, Parlatoria oleae, Diaspididae, Tunberg zirki, ozuqa o‘ simligi, Andijon.*

РОЛЬ МАСЛИННОЙ ЩИТОВКИ (*PARLATORIA OLEAE* (COLVÉE, 1880)) В ЭНТОМОФАУНЕ ИНТРОДУЦИРОВАННОГО *BERBERIS THUNBERGII* DC.

Аннотация. *В настоящем исследовании изучены показатели встречаемости маслинной щитовки Parlatoria oleae (Colvée, 1880), её трофические связи с интродуцированным в г. Андижан барбарисом Тунберга (Berberis thunbergii DC.), а также особенности экологической ниши вида. В результате визуального обследования 65 кустов B. thunbergii молодые особи, характерные для P. oleae, были обнаружены на 25 растениях (г. Андижан, август 2026 г.). Доля заселённых растений составила 38,5%. Молодые особи щитовки отмечались на верхней (адаксиальной) поверхности листьев, при этом максимальное наблюдаемое количество самок на одном листе составляло 2–3 особи. Полученные результаты количественно характеризуют трофическую связь P. oleae с B. thunbergii в условиях Андижана и дополняют сведения о спектре кормовых растений этого вида в регионе.*

Ключевые слова: *Berberis thunbergii, Parlatoria oleae, Diaspididae, барбарис Тунберга, кормовое растение, Андижан.*

THE ROLE OF THE OLIVE SCALE (*PARLATORIA OLEAE* (COLVÉE, 1880)) IN THE ENTOMOFAUNA OF INTRODUCED *BERBERIS THUNBERGII* DC.

Abstract. *This study investigated the occurrence of the olive scale, Parlatoria oleae (Colvée, 1880), its trophic association with the introduced Japanese barberry (Berberis thunbergii DC.) in Andijan, and aspects of its ecological niche. Visual examination of 65 B. thunbergii shrubs revealed juvenile individuals of P. oleae on 25 plants (Andijan, August 2026). The proportion of infested plants was 38.5%. Juvenile scale insects were recorded on the upper (adaxial) surface of the leaves, with a maximum observed density of 2–3 females per leaf. The obtained results provide a quantitative characterization of the trophic association between P. oleae and B. thunbergii under the conditions of Andijan and supplement existing information on the host-plant range of this species in the region.*

Keywords: *Berberis thunbergii, Parlatoria oleae, Diaspididae, Japanese barberry, host plant, Andijan.*

KIRISH

Manzarali o‘ simliklarning xalqaro savdosi va yangi hududlarga introduksiya qilinishi fitofag hasharotlarning hududlararo tarqalishida muhim o‘ rin tutadi. Tirik ko‘ chatlar va vegetativ ko‘ paytirish materiallari o‘ simlik

organlarida yashirin rivojlanuvchi zararkunandalarni uzoq masofalarga olib o‘tishi mumkin [11]. Diaspididae vakillarining kichik o‘lchami, urg‘ochilarining o‘simlikka harakatsiz birikib yashashi va tanasining himoya qalqoni bilan qoplanganligi ularning novda, po‘stloq, barg yoki mevada sezilmay qolishiga imkon beradi [8, 15].

Berberis thunbergii DC. Markaziy va Janubiy Yaponiyada tabiiy tarqalgan buta bo‘lib, O‘zbekistonda introduksiya qilingan o‘simlik sifatida qayd etiladi [13]. Shu jihatdan uning fitofag entomofaunasini o‘rganish introduksiya qilingan manzarali o‘simliklarda shakllangan trofik aloqalarni tavsiflashda muhim ahamiyatga ega.

Parlatoria oleae (Colvée, 1880) zamonaviy tasnifda Hemiptera: Sternorrhyncha: Coccomorpha: Diaspididae tarkibiga kiruvchi polifag turdir. U mevali, manzarali va o‘rmon o‘simliklarining novda, shox, barg hamda mevalarida oziqlanadi. Diaspididlarning oziqlanish joyida uzoq vaqt harakatsiz saqlanishi ularni oddiy ko‘zdan kechirishda o‘simlik po‘stlog‘i yoki barg rangidan ajratishni qiyinlashtiradi, shu sababli manzarali ko‘chatlardagi kam zichlikdagi zararlanish ham fitosanitar jihatdan e’tibor talab qiladi. Kuchli zararlanish o‘simlikning zaiflashishi, barglarning sarg‘ayishi, novdalarning qurishi va mevalar rangining o‘zgarishiga olib kelishi, natijada mahsulotning tovar sifatini pasaytirishi mumkin [5, 15]. ScaleNetda tur keng ozuqa doirasiga ega kosmopolit qalqondor sifatida qayd etilgan [8].

Colvée turni 1880-yilda Ispaniyadan olingan *Olea* sp. materiali asosida *Diaspis oleae* nomi bilan tavsiflagan [7, 8]. Ispaniya turning tip joyi bo‘lsa-da, bu holat uning tabiiy vatani aynan shu hudud ekanini anglatmaydi. Turning kelib chiqishi uzil-kesil aniqlanmagan. Huffaker va boshqalar ehtimoliy tabiiy areal sifatida Shimoliy Hindiston, Pokiston va Yaqin Sharqni ko‘rsatgan [9]. Watson esa uni Sharqiy O‘rta Yer dengizidan Hindistongacha cho‘zilgan hudud bilan bog‘laydi [15]. Hozirgi areal Janubiy va G‘arbiy Osiyo, O‘rta Yer dengizi mamlakatlari, Shimoliy Afrika, Yevropaning ayrim qismlari, Shimoliy va Janubiy Amerika hamda Avstraliyani qamrab oladi [5, 8, 15].

Turning ozuqa o‘simliklari doirasiga Berberidaceae oilasining ayrim vakillari ham kiradi. ScaleNet ma’lumotlarida *Parlatoria oleae Berberis thunbergii*, *B. vulgaris*, *B. veitchii* va *B. vernae* turlarida qayd etilgan [8]. Xususan, Çalışkan Keçe va Ulusoy (2017) Turkiyaning Adana shahridagi park va manzarali o‘simliklarda Diaspididae turlarini o‘rganib, 2012-yil 11-martda Çoban Dede hududidagi *B. thunbergii* turidan olingan to‘qqizta urg‘ochi *P. oleae* namunasini qayd etgan. Ushbu ma’lumot *B. thunbergii* turining *P. oleae* uchun avvaldan ma’lum ozuqa o‘simligi ekanini ko‘rsatadi [6].

Markaziy Osiyoda koksidlarni o‘rganish XX asrning birinchi yarmida boshlangan. A.D. Arxangelskaya (1937) mintaqa koksidlari faunasi va tarqalishini umumlashtirgan, Z.S. Sinelnikova (1937) esa *P. oleae*ni Markaziy Osiyo mevali o‘simliklarining zararkunandasi sifatida maxsus tadqiq etgan [2, 14]. Keyinchalik V.N. Lashin (1956) Turkmaniston, R.A. Alimjanov va T.G. Bronshtein (1956) Zarafshon havzasi koksidlarini o‘rgangan [1, 10]. G.I. Matesova, I.D. Mitiaev va L.A. Yuxnevich (1962) Qozog‘iston meva-rezavor o‘simliklari zararkunandalari to‘g‘risidagi ma’lumotlarni umumlashtirgan [12]. B.B. Bazarov (1962) hamda Bazarov va Shmelev (1971) Tojikiston va unga tutash Markaziy Osiyo hududlaridagi qalqondorlar faunasi bo‘yicha tadqiqotlarni davom ettirgan [3, 4].

Zokirov va hammualliflari (2021) keltirgan tarixiy ma’lumotga ko‘ra, *P. oleae* 1933–1935-yillardagi karantin tekshiruvlarida O‘zbekistonning deyarli barcha hududlarida aniqlangan [19]. Mazkur mualliflarning 2015–2020-yillarda Andijon, Namangan va Farg‘ona viloyatlarida olib borgan kuzatuvlarida tur bog‘lar, tomorqalar, o‘rmonlar va ko‘cha daraxtzorlarida qayd etilib, mahalliy sharoitda yiliga ikki avlod bilan rivojlanishi ko‘rsatilgan [19]. Yakhyoev va hammualliflari (2021) turni Toshkent viloyati Diaspididae faunasi tarkibida keltirgan [18]. Xusanov va boshqalar (2023) *P. oleae* turini Andijon dendroparki va istirohat bog‘laridagi ayrim manzarali daraxtlarda qayd etgan, Xafizddinov va boshqalar (2024) esa turning Andijon viloyatida keng tarqalganini hamda Rosaceae oilasi vakillarida oziqlanishini ko‘rsatgan [16, 17].

Mavjud va foydalanilgan mahalliy manbalarda *P. oleae* turining aynan *B. thunbergii* bilan trofik aloqasiga oid ma’lumot uchramadi. Shu bois Andijon shahrida introduksiya qilingan Tunberg zirkida turning uchrash ko‘rsatkichlari, o‘simlik organlari va barg yuzalari bo‘yicha joylashishini tavsiflash uning mazkur o‘simlik entomofaunasidagi o‘rni hamda ekologik nishasining ayrim jihatlarini baholash uchun muhimdir. Tadqiqotning maqsadi *P.* oleae turini *B. thunbergii* bilan trofik aloqasi, o‘simliklar bo‘yicha uchrash ulushi va o‘simlikdagi joylashish xususiyatlarini aniqlash orqali turning ekologik nishasining trofik va joylashuvga oid jihatlarini tavsiflashdan iborat.

MATERIAL VA USLUBLAR

Tadqiqot obyekti introduksiya qilingan manzarali Tunberg zirki (*Berberis thunbergii* DC.) va unda uchragan *Parlatoria oleae* (Colvée, 1880) bo‘ldi. Tekshiruv 2026-yil 28-avgustda Andijon davlat universiteti hududida (40°47′22.7″N, 72°22′19.1″E; dengiz sathidan taxminan 510 m balandlikda) o‘tkazildi. Tekshiruv vaqtida havo harorati 28 °C, nisbiy namlik 35% ni tashkil etdi.

Hududdagi 65 tup *B. thunbergii* vizual tekshirildi. Barglarning adaksial va abaksial yuzalari, barg bandlari hamda shoxlarda tur individlarining mavjudligi ko‘zdan kechirildi. Tur uchragan tuplarda individlarning shoxlar va barg plastinkasi bo‘yicha joylashishi, ko‘zdan kechirilgan barglardagi urg‘ochilarning eng yuqori soni hamda ular joylashgan nuqtalardagi rang o‘zgarishlari qayd etildi. Yaqin atrofda o‘sayotgan *Lagerstroemia indica*, *Hibiscus syriacus*, *Euonymus japonicus* va *Photinia* sp. o‘simlik turlari ham tekshirildi.

O‘ simliklar bo‘ yicha uchrash ulushi tur aniqlangan tuplar sonining tekshirilgan tuplar umumiy soniga nisbati asosida foizda hisoblandi. Turning ekologik nisha xususiyatlari uning *B. thunbergii* bilan trofik aloqasi, o‘ simlik organlari va barg yuzalari bo‘ yicha joylashishi asosida baholandi. Kuzatilgan individlarning tashqi morfologik belgilari Watson (2002) tavsifi bilan qiyoslandi [15]. Turning taksonomik holati va ozuqa o‘ simliklari doirasi ScaleNet ma’lumotlari asosida tekshirildi [8]. *B. thunbergii* bilan ilgari qayd etilgan trofik aloqa esa Çalışkan Keçe va Ulusoy (2017) ma’lumotlari bilan taqqoslandi [6].

NATIJALAR VA MUHOKAMA

Tekshirilgan 65 tup *Berberis thunbergii* o‘ simligining 25 tupida *Parlatoria oleae* aniqlandi. O‘ simliklar bo‘ yicha turning uchrash ulushi 38,5% ni tashkil etdi. Tur aniqlangan tuplarda individlar asosan 2–3 ta shoxda kuzatilib, ushbu shoxlardagi ko‘ zdan kechirilgan barcha barglarda uchradi. Barglarning har ikki yuzasi tekshirilganda individlar faqat ustki — adaksial yuzada qayd etildi, abaksial yuzada, barg bandlari va shoxlarda esa aniqlanmadi. Ular barg plastinkasining turli qismlarida bir-biridan ajralgan holda joylashgan bo‘ lib, bitta bargda ko‘ pi bilan 2–3 ta urg‘ ochi kuzatildi. Shunday qilib, turning o‘ simlikdagi tarqalishi ayrim shoxlarda jamlangan, barg plastinkasidagi urg‘ ochi individlar esa tarqoq va kam sonli bo‘ lgan. Bunda 38,5% ko‘ rsatkich o‘ simliklar bo‘ yicha uchrash ulushini ifodalaydi.

Urg‘ ochilarga xos qalqonlar oqish–och kulrang, yumaloq yoki keng oval shaklda bo‘ lib, markazdan biroz chetroqda joylashgan to‘ q rangli ekzuviy aniq ajralib turdi. Shu barglarda oqish va cho‘ ziq, bir uchida sarg‘ ish-jigarrang ekzuviy joylashgan qalqonlar ham kuzatildi. Tashqi ko‘ rinishiga ko‘ ra, ular *P. oleae* erkaklarining preimaginal bosqichlariga xos qalqonlarga mos keldi (1-rasm). Kuzatilgan belgilar Watson (2002) tomonidan keltirilgan tavsifga, ya’ni urg‘ ochi qalqonining yumaloq yoki elliptik, erkak qalqonining esa cho‘ ziq va terminal ekzuviyli bo‘ lishiga muvofiq keldi [15].

P. oleae individlari joylashgan nuqtalar atrofida barg to‘ qimasining qizg‘ ish-binafsha tusga kirishi kuzatildi. Hasharot aniqlanmagan barglarda bunday rang o‘ zgarishi qayd etilmadi. Shu sababli qalqondor atrofidagi qizg‘ ish-binafsha dog‘ lar turning oziqlanishi bilan bog‘ liq mahalliy zararlanish belgisi sifatida baholandi. Watson (2002) *P. oleae* bilan zararlangan zaytun mevalarida binafsha rang o‘ zgarishi, ayrim boshqa mevalarda esa oziqlanish nuqtasi atrofida to‘ q qizil dog‘ lar hosil bo‘ lishini ko‘ rsatgan [15]. Mazkur tadqiqotda shunga o‘ xshash rang o‘ zgarishi *B. thunbergii* barglarida kuzatildi.



1-rasm. *Berberis thunbergii* bargining adaksial yuzasidagi *Parlatoria oleae*

Yaqin atrofda o‘ sayotgan *Lagerstroemia indica*, *Hibiscus syriacus*, *Euonymus japonicus* va *Photinia* sp. o‘ simlik turlari ko‘ zdan kechirilganda ularda *P. oleae* aniqlanmadi. Demak, mazkur joy va tekshiruv vaqtida ko‘ zdan kechirilgan manzarali o‘ simliklar orasida tur faqat *B.* thunbergii turida qayd etildi. Biroq bu natija sanab o‘ tilgan o‘ simliklarni turning ozuqa doirasidan chiqarish uchun asos bo‘ lmaydi. Jumladan, *P.* oleae turining *L.* indica turida uchrashi Turkiyada qayd etilgan [6].

Çalışkan Keçe va Ulusoy (2017) 2011–2013-yillarda Adana shahridagi park va manzarali o‘ simliklardan yig‘ ilgan 180 ta namunani o‘ rganib, Diaspididae oilasiga mansub 23 turni aniqlagan [6]. Mualliflar 2012-yil mart oylarida Çoban Dede hududidagi *B. thunbergii* turidan to‘ qqizta urg‘ ochi *P. oleae*, 2012-yil avgustda esa Pınar 2 parkidagi *L.* indica turidan to‘ rtta urg‘ ochi namuna qayd etgan [6]. Mazkur maqolada *B. thunbergii* turining tekshirilgan tuplari soni, tur aniqlangan o‘ simliklar ulushi, bargdagi individlar soni va ularning barg yuzalari bo‘ yicha joylashuvi berilmagan [6]. Shu sababli ikki tadqiqot natijalarini bevosita miqdoriy taqqoslash mumkin emas. Andijonda aniqlangan 38,5% uchrash ulushi va bitta bargda ko‘ pi bilan 2–3 ta urg‘ ochining qayd etilishi mazkur trofik aloqaning mahalliy miqdoriy xususiyatlarini ifodalaydi.

ScaleNetda *B. thunbergii P. oleae* turining ozuqa o‘ simliklaridan biri sifatida keltirilgan [8]. Shu bois Andijondagi topilma dunyo miqyosida yangi ozuqa o‘ simligi qaydi hisoblanmaydi. Biroq mavjud va foydalanilgan mahalliy manbalarda mazkur trofik aloqaga oid ma’lumot uchramadi. Olingan natijalar *P. oleae* turining *B. thunbergii* entomofaunasidagi fitofag tarkibiy qismlardan biri ekanini ko‘ rsatdi. Turning ushbu o‘ simlikdagi ekologik nishasi barglar bilan trofik bog‘ liqligi, faqat adaksial yuzada uchrashi, ayrim shoxlarda jamlanishi va barg plastinkasida tarqoq joylashishi bilan tavsiflandi. Mazkur natijalar turning Andijon sharoitidagi ozuqa aloqalari va o‘ simlikda joylashish xususiyatlariga oid ma’lumotlarni to‘ ldiradi.

XULOSA

Andijon shahrida *Parlatoria oleae* turining introduksiya qilingan *Berberis thunbergii* o‘ simligi bilan trofik aloqasi qayd etildi. Mazkur topilma turning hududiy ozuqa aloqalariga doir ma’lumotlarni to‘ ldiradi hamda introduksiya qilingan manzarali o‘ simliklarda Diaspididae vakillarini muntazam monitoring qilish zarurligini ko‘ rsatadi.

MUALLIFLAR BAYONOTLARI

Mualliflar hissasi. A.K. Xusanov va S.T. Tillayeva tadqiqot natijalarini tahlil qilish, muhokama etish hamda maqola matnini tayyorlash va tahrirlashda ishtirok etdilar. Barcha mualliflar maqolaning yakuniy variantini ko‘ rib chiqdilar va ma’qulladilar.

Manfaatlar to‘ qnashuvi. Mualliflar ushbu tadqiqot bilan bog‘ liq manfaatlar to‘ qnashuvi mavjud emasligini bildiradilar.

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QISHLOQ XO‘ JALIGI MAXSULOTLARINI QAYTA ISHLASHDA BIOTEXNOLOGIK USULLARNING AHAMIYATI

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Annotatsiya: *Ushbu maqolada qishloq xo‘ jaligi xomashyosini qayta ishlashda fermentativ va mikroorganizmlar asosidagi yondashuvlardan foydalanildi. Mikroorganizmlar asosidagi biokonversiya substratning hazm bo‘ lishini yengillashtirib, mikrobiologik xavfsizlik ko‘ rsatkichlarini yaxshilanadi. Fermentativ va mikrobiologik bosqichlarni birlashtirgan texnologiya aniq ustunlik berdi. Ushbu maqolada qishloq xo‘ jaligi mahsulotlarini qayta ishlashda samarali foyda beradigan, biotexnologik usullar haqida batafsil yoritiladi. Oziq-ovqat mahsulotlarini qayta ishlashda, ishlab chiqarishda fermentlardan, mikroorganizmlardan, biologik jarayonlardan foydalanish muhokama qilindi. Bundan tashqari biotexnologik usullarning mahsulot sifatiga ta’siri hamda uning sifatini oshirishdagi roli ko‘ rib chiqildi.*

Kalit so‘ zlar: *biokonversiya, fermentativ gidroliz, mikrobiologik xavfsizlik, saqlash muddati,biotexnologik usul, qishloq xo‘ jalik mahsulotlari.*

ЗНАЧЕНИЕ БИОТЕХНОЛОГИЧЕСКИХ МЕТОДОВ В ПЕРЕРАБОТКЕ СЕЛЬСКОХОЗЯЙСТВЕННОЙ ПРОДУКЦИИ

Аннотация. *Аннотация: В статье рассматривается применение ферментативных и микробиологических методов при переработке сельскохозяйственного сырья. Биоконверсия с использованием микроорганизмов способствует повышению усвояемости субстрата и улучшению показателей микробиологической безопасности. Технология, сочетающая ферментативные и микробиологические этапы, продемонстрировала явные преимущества. В статье представлен подробный обзор биотехнологических методов, обеспечивающих значительные выгоды при переработке сельскохозяйственной продукции. Обсуждаются вопросы использования ферментов, микроорганизмов и биологических процессов в пищевой промышленности. Кроме того, анализируется влияние биотехнологических методов на качество продукции и их роль в его повышении.*

Ключевые слова: *биоконверсия, ферментативный гидролиз, микробиологическая безопасность, срок годности, биотехнологический метод, сельскохозяйственная продукция.*

THE IMPORTANCE OF BIOTECHNOLOGICAL METHODS IN THE PROCESSING OF AGRICULTURAL PRODUCTS

Abctract: *This article examines the use of enzymatic and microorganism-based approaches in the processing of agricultural raw materials. Microorganism-based bioconversion facilitates substrate digestibility and improves microbiological safety indicators. A technology combining enzymatic and microbiological stages demonstrated distinct advantages. The article provides a detailed overview of biotechnological methods that offer significant benefits in agricultural product processing. It discusses the application of enzymes, microorganisms, and biological processes in food production and processing. Furthermore, the impact of biotechnological methods on product quality and their role in enhancing quality are analyzed.*

Keywords: *bioconversion, enzymatic hydrolysis, microbiological safety, shelf life, biotechnological method, agricultural products.*

KIRISH

Zamonaviy biotexnologiya oziq-ovqat mahsulotlarini qayta ishlash sohasida, jumladan rezavor-meva va sabzavotlarni qayta ishlash, sut mahsulotlari, ishlab chiqarishda muhim rol o‘ ynaydi. Qishloq xo‘ jaligi texnologiyasi eng diqqatga sazovor xususiyati shundan iboratki, iste’mol qilinmaydigan va tez buziladigan oziq-ovqat mahsulotini qayta ishlab ta’mli va uzoqroq saqlanadigan oziq-ovqatga aylantira oladi, bu esa oziqlanish, iste’mol qilish uchun xavfsiz va sifatli bo‘ ladi. Raqamlar shuni ko‘ rsatadiki, dunyo bo‘ yicha qayta ishlangan oziq-ovqatlarning uchdan bir qismi

fermentlangan oziq-ovqatdir, bu tabiiy yoki mikroblar qo‘ shilgan ixtiyoriy fermentatsiya bilan amalga oshiriladi. Noto‘ g‘ ri fermentatsiya toksin hosil bo‘ lishiga olib kelishi mumkin. Bu esa iste’mol qiluvchi organizm uchun xavfli bo‘ lishi mumkin. Shuning uchun sifat nazorati eng muhimdir. Yuqorida ta’kidlab o‘ tilganidek tuban hamda yuksak tuzilishga ega mikroorganizmlar ferment olish uchun istiqbolli manba hisoblanadi. Bu usulga zamonaviy usul bo‘ lgan rekombinant DNK olish texnologiyasini qo‘ shib qo‘ llash sarflanayotgan mikroblarni tejamkor, sanoat miqyosida qollashga yaroqli qiladi.

Fermentlangan oziq-ovqat mahsulotlarida bakeriosin hosil qiluvchi kulturadan foydalanishga e’tibor qaratish kerak. Bakteriosin- bakterialar tomonidan ishlab chiqariladigan, boshqa bakteriyalarni o‘ sishini to‘ xtatuvchi yoki ularni o‘ ldiruvchi oqsil tabiatli modda.(Harris va boshq., 1992, Ming va Daeschel, 1993, Mazotta va boshq., 1995). [1,2,3] .Ma’lum bir oziq-ovqat mahsulotini qayta ishlash jarayonida bir yoki bir nechta bakteriosindan foydalanish mumkin. Bundan tashqar i bakteriosin hosil qiluvchi shtamlardan foydalanishni ehtiyotkorlik bilan nazorat qilish kerak. Aks holda antibacterialga qarshi mutantlar paydo bo‘ lishiga sabab bo‘ lishi mumkin.

Hozirgi XXI asrda kundalik iste’mol qilinadigan ovqatlar tarkibiga fermentlanganw oziq-ovqatlar kiradi. Sanoat, fan-texnika rivojlanishi hisobga olgan holda fermentlangan mahsulotlarni tijorat miqyosida ishlab chiqarishda asosiy manba sut, go‘ sht, bodring va karam hisoblanadi. Bir so‘ z bilan aytganda, zamonaviy hisoblangan fermentativ texnologiyalar xomashyoni qayta ishlash hamda texnologik jarayonlarni tezlashtirish imkonini beradi. . Bu 20 xil turdagi 400 dan ortiq pishloq turini (Jay, 1996) va juda keng ko‘ lamli yogurt va fermentlangan sut ichimliklari, fermentlangan kolbasa va salyami, turshilar va sauerkraut beradi. [4]

Oziq-ovqatni fermentatsiya qilish orqali saqlash shakarlar va ularning hosilalarini oksidlanish prinsipi asosida amalga oshiriladi, natijada odatda kislota, spirt va karbonat angidrid kabi oxirgi mahsulotlar hosil bo‘ ladi. Bu oxirgi mahsulotlar oziq-ovqatni buzadigan mikroorganizmlarning o‘ sishini nazorat qiladi va chunki oksidlanish faqat qisman sodir bo‘ ladi, oziq-ovqat iste’molchi uchun yetarli darajada energiya salohiyatini saqlab qoladi.

Fermentatsiya atamasi uning eng qat’iy, kimyoviy ta’rifida quyidagilarni tavsiflash uchun ishlatiladi:

Oziq-ovqatlarni biopreservatsiya qilishda ishlatiladigan laktik kislota bakteriyalarining o‘ ziga xos mikroblarga qarshi mexanizmlari organik kislotalar, gidrogen peroksid, karbonat angidrid, diatsetil, reuterin kabi keng spektrli antimikrobiyallar va bakteriosinlar ishlab chiqarishni o‘ z ichiga oladi (De Vuyst va Vandamme, 1994). Ushbu omillarning ko‘ pchiligining MicroguardR ta’sirini bostirishda rol o‘ ynashi taxmin qilinadi (Al-Zoreky va boshq., 1991, Lyon va boshq., 1993). [5,6,7,8,9]. U suvsiz sutni fermentatsiya qilish orqali ishlab chiqariladi.

Qishloq xo‘ jaligi mahsulotlarining 30–180 daqiqalik fermentativ ishlovi saqlash muddati, oziqaviy qiymat va mikrobiologik xavfsizlikni bir vaqtda belgilaydi [10]. FAO ma’ lumotlari oziq-ovqat yo‘ qotishlari va chiqindilarining katta qismi dastlabki qayta ishlash bosqichida shakllanishini ko‘ rsatadi [11]. Shuning uchun biotexnologik usullar chiqimni kamaytirish bilan birga biofaollikni saqlashga yo‘ naltirilgan texnogik zarurat sifatida baholanadi [12]. Tadqiqot ob’ ekti — don, meva-sabzavot, sut xomashyosi va moyli urug‘ lar; tadqiqot predmeti — fermentativ qayta ishlash hamda mikroorganizmlar asosidagi biokonversiyaning samaradorligi. Maqsad qishloq xo‘ jaligi mahsulotlarini qayta ishlashda biotexnologik usullarning ahamiyatini laboratoriya sharoitida baholashdan iborat bo‘ ldi.

Dunyo bo‘ ylab turli xil fermentlangan ovqatlar mavjud bo‘ lib, ularda turli mikroorganizmlar turli substratlarni metabolizatsiya qilib, hamda biotexnologiyaning yutuqlaridan foydalanib noyob mahsulotlar hosil qilinmoqda. Ko‘ plab bunday ovqatlarda fermentatsiya jarayonlarining biologik va mikrobiologik asoslari yaxshi tushunilmagan. Mavjud bo‘ lgan ozroq ma’lumot asosan tayyor mahsulotdagi asosiy mikroflora identifikatsiyasi va ehtimol dastlabki xarakteristikasini o‘ rganishga qaratilgan.

Xulosa qilib aytganda, qishloq xo‘ jalik mahsulotlarini qayta ishlashda biotexnologik usullardan oqilona foydalanish oziq-ovqat sanoatining rivojlanishiga sabab bo‘ ladi. Shuni alohida ta’kidlash kerakki, fermentatsiya texnologiyalari, fermentativ jarayonlar hamda mikroorganizmlardan foydalanib oziq-ovqat mahsulotlariga ishlov berish sifatni yaxshilashga, saqlash muddatini uzaytirishga xizmat qiladi. Kelgusida yuqoridagi barcha texnologiyalarni ilmiy izlanishlar asosida yanada takomillashtirish, fermentlar amaliyotini joriy qilish va inson hayoti uchun xavfsiz bo‘ ladigan usullarni rivojlantirish aholini sifatli oziq-ovqat mahsulotlari bilan ta’minlashga imkon beradi.

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KELIB CHIQISHI TURLICHA BO‘LGAN YUMSHOQ BUG‘DOY NAVLARINING VA MORFO-FIZIOLOGIK KO‘RSATKICHLARI O‘RTASIDAGI O‘ZARO BOG‘LIQLIK.

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Annotatsiya. *Ushbu maqolada Markaziy Osiyoning to‘rt davlatiga (O‘zbekiston, Qozog‘iston, Qirg‘iziston va Tojikiston) yumshoq bug‘doy navlarining fiziologik va morfologik xususiyatlari (barg sathi, transpiratsiya jadalligi, xlorofill miqdori, bargning umumiy suv miqdori va suv saqlash qobiliyati) o‘rtasidagi o‘zaro bog‘liqlik tahlil qilingan. Tadqiqot natijalari barg sathining kengayishi transpiratsiya intensivligi va xlorofill to‘planishiga ijobiy ta’sir etishini, qurg‘oqchilik sharoitida esa bargning suv saqlash xususiyati o‘simlik barqarorligini ta’minlovchi asosiy omil ekanini ko‘rsatdi.*

Kalit so‘zlar: *yumshoq bug‘doy, barg sathi, transpiratsiya, xlorofill, SPAD, suv saqlash xususiyati, fiziologik ko‘rsatkichlar.*

ВЗАИМОСВЯЗЬ МОРФОФИЗИОЛОГИЧЕСКИХ ПОКАЗАТЕЛЕЙ СОРТОВ МЯГКОЙ ПШЕНИЦЫ РАЗЛИЧНОГО ПРОИСХОЖДЕНИЯ.

Аннотация. *В данной статье проанализирована взаимосвязь между физиологическими и морфологическими параметрами (площадь листа, интенсивность транспирации, содержание хлорофилла, общее оводнение и водоудерживающая способность) сортов мягкой пшеницы четырех стран Центральной Азии (Узбекистан, Казахстан, Кыргызстан и Таджикистан). Результаты показали, что увеличение площади листа положительно влияет на транспирацию и накопление хлорофилла, а в условиях засухи ключевым фактором выживаемости растений является их водоудерживающая способность.*

Ключевые слова: *мягкая пшеница, площадь листа, транспирация, хлорофилл, SPAD, водоудерживающая способность, физиологические показатели.*

INTERRELATIONSHIP BETWEEN THE MORPHO-PHYSIOLOGICAL INDICATORS OF SOFT WHEAT VARIETIES OF DIVERSE ORIGINS.

Abstract. *This article analyzes the relationship between the physiological and morphological parameters (leaf area, transpiration rate, chlorophyll content, total water content, and water-holding capacity) of soft wheat varieties from four Central Asian countries (Uzbekistan, Kazakhstan, Kyrgyzstan, and Tajikistan). The results revealed that an increased leaf area positively enhances transpiration intensity and chlorophyll accumulation. However, under drought conditions, the leaf water-holding capacity serves as the primary mechanism for plant survival.*

Keywords: *soft wheat, leaf area, transpiration, chlorophyll, SPAD, water-holding capacity, physiological traits.*

Kirish. Iqlim o‘zgarishi va suv resurslari tanqisligi sharoitida qishloq xo‘jaligi ekinlari, xususan, yumshoq bug‘doy navlarining qurg‘oqchilikka va issiqlikka moslashuvchanlik mexanizmlarini o‘rganish dolzarb ahamiyat kasb etadi [2,3]. O‘simliklarning suv rejimi, fotosintetik faolligi va barg morfologiyasi bir-birini to‘ldiruvchi yagona fiziologik tizim sifatida hosildorlikni belgilab beradi [4]. Markaziy Osiyo davlatlari geo-iqlimiy sharoiti jihatidan farqlangani bois, ushbu hududlarda yaratilgan navlarning adaptiv fiziologik xususiyatlarini qiyosiy tahlil qilish seleksiya jarayonida muhim ahamiyatga ega [1].

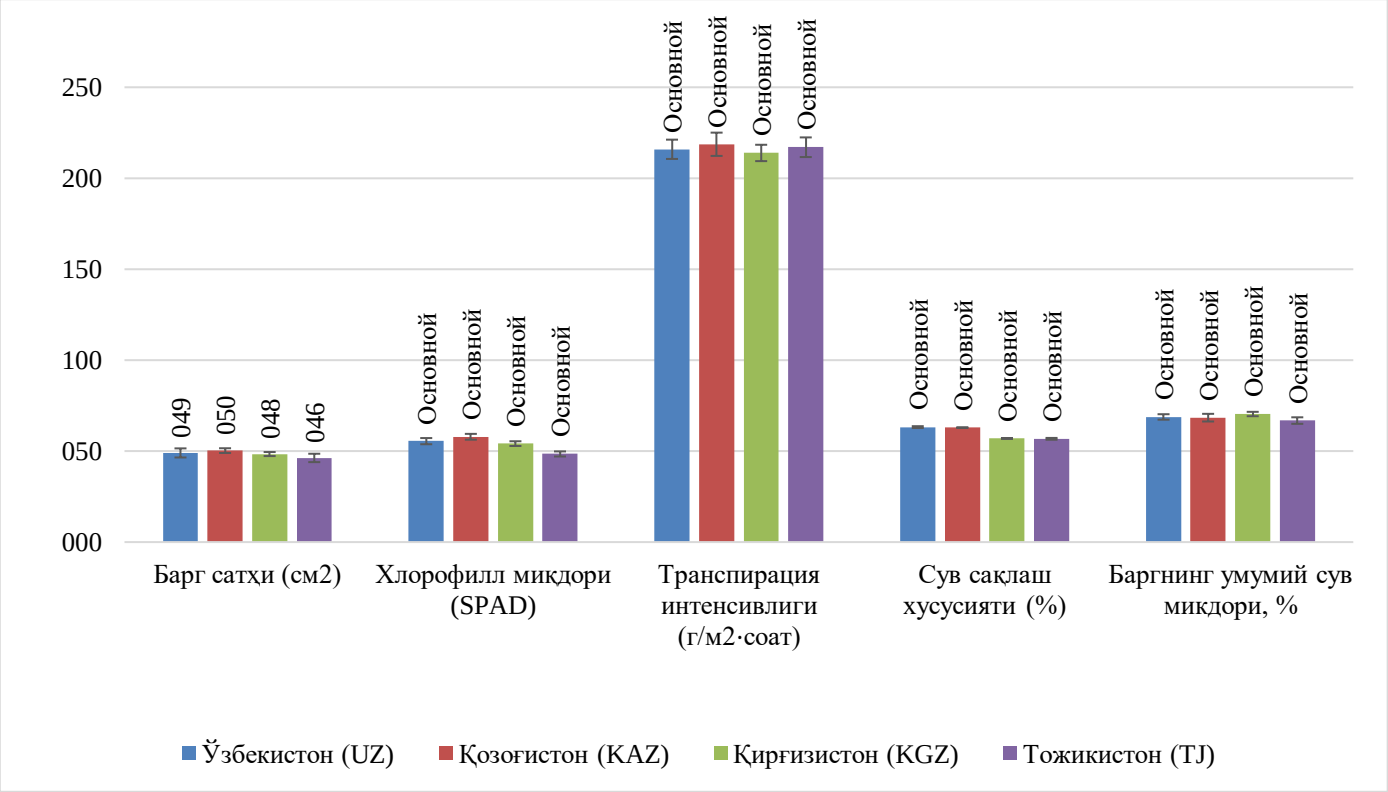
Materiallar va usullar. Tadqiqotlar davomida O‘zbekiston, Qozog‘iston, Qirg‘iziston va Tojikiston seleksiyasiga mansub yumshoq bug‘doy navlari o‘rganildi. Barg sathi (sm2), transpiratsiya jadalligi (g/m2 soat), xlorofill miqdori

(SPAD), bargning umumiy suv miqdori (%) va barglarning suv saqlash qobiliyati (%) umumiy qabul qilingan fiziologik-bioximik metodikalar va laboratoriya tahlillari asosida aniqlandi va statistik qayta ishlandi [2,4].

Natijalar va ularning muhokamasi.Tadqiqotlarimiz davomida to‘rt davlat (O‘zbekiston, Qozog‘iston, Qirg‘iziston va Tojikiston) navlarining fiziologik ko‘rsatkichlari orasida uzviy bog‘liqlik borligi aniqlandi (Rasm).

O‘simlikning suv rejimi, fotosintetik faolligi va barg morfologiyasi bir-birini to‘ldiruvchi tizim sifatida namoyon bo‘ldi. O‘tkazilgan tadqiqotlar natijalari shuni ko‘rsatadiki, barg sathining kengligi transpiratsiya intensivligi va xlorofill miqdori bilan to‘g‘ri proporsional bog‘liqlikka ega.

Xususan, barg sathi keng bo‘lgan Qozog‘iston (50,29 sm2) va O‘zbekiston (49,02 sm2) navlarida transpiratsiya jarayoni yuqori (mos ravishda 218,66 va 215,91 g/m2 soat) bo‘lishi kuzatildi. Bu barg yuzasining kengligi hisobiga o‘simlikning atrof-muhit bilan gaz va suv almashinuvi faol kechganini anglatadi. Jadal transpiratsiya xlorofill sinteziga ijobiy ta’sir ko‘rsatib, Qozog‘iston navlarida eng yuqori xlorofill miqdori (57,89 SPAD) qayd etildi, bu esa quyosh energiyasini yutish qobiliyati yuqoriligini tasdiqlaydi .



Rasm. Suv balansi ko‘rsatkichlarini o‘zaro bog‘liqligi.

O‘simliklarning issiq va qurg‘oqchil sharoitga chidamliligini belgilovchi asosiy omil suv saqlash xususiyatidir. O‘zbekiston navlarida suv saqlash qobiliyati (63,21 %) yuqori bo‘lib, umumiy suv miqdori (68,8 %) bilan mutanosiblik ko‘rsatdi. Qirg‘iziston navlarida umumiy suv miqdori eng yuqori (70,4 %) bo‘lsa-da, suv saqlash qobiliyati (56,96 %) pastroq bo‘ldi, bu esa suvni tez yo‘qotishi, ammo tuproq namligida jadal o‘zlashtirishini anglatadi. Tojikiston navlari barg sathi (46,27 sm2) va xlorofill (48,46 SPAD) bo‘yicha pastroq ko‘rsatkichga ega bo‘lgan bo‘lsa-da, transpiratsiya jadalligini (217,04 g/m2 soat) yuqori saqlab qolgan, bu esa yuqori haroratda to‘qimalarni sovutish mexanizmi sifatida xizmat qiladi.

Xulosa. Xulosa qilib aytganda, barg sathining kengayishi transpiratsiyaning kuchayishiga va natijada xlorofill miqdorining ortishiga xizmat qilgan. Biroq, suv tanqisligi va issiqlik sharoitida o‘simliklarning chidamliligi bargning suv saqlash xususiyati hamda to‘qimalardagi suv balansi barqarorligiga bevosita bog‘liqdir.

Qurg‘oqchilikka va issiqqa chidamli navlar seleksiyasida O‘zbekiston navlariga xos yuqori suv saqlash qobiliyati hamda Qozog‘iston navlariga xos fotosintetik faollik va barg yuzasi ko‘rsatkichlarini kombinatsiya qilish tavsiya etiladi.

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O‘ ZBEKISTON MILLIY GERBARIYSI (TASH) FONDIDAGI *EREMURUS* M.BIEB. (ASPHODELACEAE) KOLLEKSIYASINING TAKSONOMIK, GEOGRAFIK VA TARIXIY TAHLILI

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Annotatsiya: *Maqolada O‘ zbekiston Respublikasi Fanlar akademiyasi Botanika instituti O‘ zbekiston Milliy gerbariysi (TASH) fondida saqlanayotgan Eremurus M.Bieb. turkumiga oid raqamlashtirilgan kolleksiya taksonomik, geografik va tarixiy jihatdan kompleks tahlil qilindi. Tadqiqot doirasida 1 921 ta gerbariy yozuvi tahlil qilindi. Namuna yozuvlarining noyob identifikatorlari tekshirilib, takroriy qiymatlar aniqlanmadi. Kolleksiya 38 turdan iborat bo‘ lib, eng ko‘ p namuna E. soogdianus (291), E. olgae (209), E. regelii (171), E. fuscus (170) va E. tianschanicus (133) turlariga to‘ g‘ ri keladi. 1 920 ta georeferensiyalangan yozuv davlat chegaralari bilan fazoviy solishtirildi: 1 057 ta yozuv O‘ zbekiston, 310 tasi Qirg‘ iziston, 250 tasi Qozog‘ iston, 231 tasi Tojikiston va 66 tasi Turkmaniston hududiga to‘ g‘ ri keldi. Yig‘ imlar 1905–2021-yillarni qamrab olib, 1930-yillarda eng yuqori faollik kuzatildi (626 yozuv; 32,6%). Kollektor(lar) maydonida 497 xil kollektor yoki kollektorlar guruhi yozuvi qayd etilgan; 22 yozuvda kollektor noma’lum. Natijalar TASH fondidagi Eremurus kolleksiyasining Markaziy Osiyo floristikasi, taksonomiyasi, biogeografiyasi va tarixiy kolleksiya tadqiqotlari uchun yuqori ilmiy qiymatini ko‘ rsatadi.*

Kalit so‘ zlar: *Eremurus; Asphodelaceae; O‘ zbekiston Milliy gerbariysi; TASH; gerbariy kolleksiyasi; Markaziy Osiyo; georeferensiya; raqamlashtirish.*

ТАКСОНОМИЧЕСКИЙ, ГЕОГРАФИЧЕСКИЙ И ИСТОРИЧЕСКИЙ АНАЛИЗ КОЛЛЕКЦИИ *EREMURUS* M.BIEB. (ASPHODELACEAE) В НАЦИОНАЛЬНОМ ГЕРБАРИИ УЗБЕКИСТАНА (TASH)

Аннотация: *В статье проведён комплексный таксономический, географический и исторический анализ оцифрованной коллекции рода Eremurus M.Bieb., хранящейся в Национальном гербарии Узбекистана (TASH) Института ботаники Академии наук Республики Узбекистан. В рамках исследования проанализирована 1 921 гербарная запись. Повторяющихся значений уникальных идентификаторов записей не обнаружено. Коллекция включает 38 видов; наиболее полно представлены E. soogdianus (291 образец), E. olgae (209), E. regelii (171), E. fuscus (170) и E. tianschanicus (133). Для 1 920 георефернцированных записей определена принадлежность к государствам: 1 057 записей относятся к Узбекистану, 310 — к Кыргызстану, 250 — к Казахстану, 231 — к Таджикистану и 66 — к Туркменистану. Сборы охватывают 1905–2021 гг.; максимальная активность приходится на 1930-е годы (626 записей; 32,6%). В поле сведений о коллекторах выявлено 497 различных записей имён коллекторов или групп коллекторов, при этом в 22 случаях коллектор указан как неизвестный. Полученные результаты подтверждают высокую научную ценность коллекции Eremurus TASH для флористических, таксономических, биогеографических и историко-гербарных исследований Центральной Азии.*

Ключевые слова: *Eremurus; Asphodelaceae; Национальный гербарий Узбекистана; TASH; гербарная коллекция; Центральная Азия; георефернцирование; оцифровка.*

TAXONOMIC, GEOGRAPHIC AND HISTORICAL ANALYSIS OF THE *EREMURUS* M.BIEB. (ASPHODELACEAE) COLLECTION IN THE NATIONAL HERBARIUM OF UZBEKISTAN (TASH)

Abstract: *This study provides an integrated taxonomic, geographic and historical analysis of the digitized Eremurus M.Bieb. collection preserved in the National Herbarium of Uzbekistan (TASH), Institute of Botany, Academy of Sciences of the Republic of Uzbekistan. A total of 1,921 herbarium records were analyzed. All unique record identifiers were checked and no duplicates were detected. The collection comprises 38 species, with E. soogdianus (291 records), E. olgae (209), E. regelii (171), E. fuscus (170) and E. tianschanicus (133) being the best represented. Country assignment was performed for 1,920 georeferenced records by spatial overlay with national boundaries: 1,057 records were assigned to Uzbekistan, 310 to Kyrgyzstan, 250 to Kazakhstan, 231 to Tajikistan and 66 to Turkmenistan. Collecting dates span 1905–2021, with a pronounced maximum in the 1930s (626 records; 32.6%). The collector-information field contains 497 distinct collector or collecting-team strings, including spelling variants and multi-person entries; 22 records are marked as unknown. The results demonstrate the high value of the TASH Eremurus collection for floristic, taxonomic, biogeographic and historical collection research in Central Asia.*

Keywords: *Eremurus; Asphodelaceae; National Herbarium of Uzbekistan; TASH; herbarium collection; Central Asia; georeferencing; digitization.*

Kirish

Gerbariy fondlari o‘ simliklar xilma-xilligini hujjatlashtiruvchi eng uzoq muddatli ilmiy arxivlardan biridir. Har bir gerbariy varag‘ i ma’lum vaqt va makonda uchragan o‘ simlik individini, uning taksonomik identifikatsiyasi, yig‘ ilgan sanasi, lokaliteti va kollektori haqidagi ma’lumotlar bilan birga saqlaydi. Shu sababli gerbariy namunasi faqat taksonomik dalil emas, balki tarixiy biogeografik kuzatuv sifatida ham katta ahamiyat kasb etadi [1, 2]. So‘ nggi o‘ n yilliklarda kolleksiyalarni raqamlashtirish, yorliq ma’lumotlarini standart maydonlarga ajratish va georeferensiyalash gerbariylardan foydalanish doirasini sezilarli kengaytirdi. Raqamlashtirilgan kolleksiyalar endilikda klassik sistematika bilan bir qatorda fenologiya, tarqalish dinamikasi, global o‘ zgarish biologiyasi, konservatsiya va katta hajmdagi biodiversitet ma’lumotlarini integratsiyalashda qo‘ llanmoqda [3–7].

O‘ zbekiston Milliy gerbariysi (TASH) Markaziy Osiyodagi yirik botanika kolleksiyalaridan biri bo‘ lib, uning fondi mintaqadagi floristik tadqiqotlarning ikki asrdan ortiq tarixini aks ettiradi. TASH fondining rivojlanishi, raqamlashtirilishi va xalqaro biodiversitet infratuzilmalariga ulanishi O‘ zbekiston florasi haqidagi tarixiy ma’lumotlarni qayta tahlil qilish uchun yangi imkoniyatlar yaratmoqda [1, 14, 17]. Bunday inventarizatsion tadqiqotlar gerbariy fondining qaysi taksonlar, hududlar va tarixiy davrlar bo‘ yicha kuchli yoki sust qamrab olinganini aniqlashga yordam beradi. Bu esa kelgusidagi dala tadqiqotlari, taksonomik reviziyalar va tarqalish modellarini rejalashtirishda bevosita amaliy ahamiyatga ega.

Eremurus M.Bieb. Asphodelaceae Juss. oilasining Markaziy va Janubi-g‘ arbiy Osiyoda keng tarqalgan, ayniqsa Markaziy Osiyoda yuqori xilma-xillikka ega turkumidir. O‘ zbekiston turkumning asosiy xilma-xillik markazlaridan biri hisoblanadi. O‘ zbekiston florasidagi *Eremurus* turlarining morfologik va taksonomik tarkibi qayta ko‘ rib chiqilgan, keyingi molekulyar-filogenetik va plastom tadqiqotlari esa turkumning evolyutsion tarixida Markaziy Osiyoning markaziy rolini ko‘ rsatgan [9–12]. Shuning uchun TASH fondidagi *Eremurus* kolleksiyasini alohida tahlil qilish bir vaqtning o‘ zida ikki muhim masalani yechadi: birinchidan, mavjud taksonomik bilimlar qanday tarixiy materiallar bilan ta’minlanganini ko‘ rsatadi; ikkinchidan, Markaziy Osiyodagi turkum tarqalishining makon-vaqt bo‘ yicha gerbariy dalillarini umumlashtiradi.

Mazkur tadqiqotning maqsadi TASH fondidagi *Eremurus* M.Bieb. kolleksiyasining raqamlashtirilgan ma’lumotlari asosida uning taksonomik tarkibi, davlatlar bo‘ yicha geografik qamrovi, yig‘ imlarning yillar va o‘ n yilliklar bo‘ yicha dinamikasi hamda kollektor yozuvlari tarkibini baholashdan iborat. Tadqiqotning amaliy vazifalari noyob identifikator maydonidagi takrorlanishlarni tekshirish, har bir tur bo‘ yicha gerbariy yozuvlari sonini hisoblash, koordinatalar asosida davlatga mansublikni aniqlash, tarixiy yig‘ im intensivligini baholash, kollektor(lar) maydonidagi asosiy kollektor yoki kollektorlar guruhi yozuvlarini ajratish va natijalarni jadval, diagramma hamda xarita ko‘ rinishida ifodalashdan iborat. Ushbu yondashuv TASH *Eremurus* kolleksiyasini mustaqil ilmiy ma’lumotlar majmuasi sifatida tavsiflash va keyingi taksonomik hamda biogeografik ishlarga tayyor holga keltirishga qaratilgan.

Adabiyotlar tahlili

Gerbariy kolleksiyalarining ilmiy vazifasi tarixan turlarni tavsiflash, nomlarni tekshirish va floristik ro‘ yxatlarni asoslash bilan bog‘ liq bo‘ lgan. Kolleksiyani shakllantirish, yorliq ma’lumotlarini saqlash, nomenklaturaviy tartibga keltirish va namunalarni kuratsiya qilishning asosiy tamoyillari klassik gerbariy metodologiyasida batafsil ishlab chiqilgan [2]. Biroq raqamli texnologiyalar gerbariyning funksiyasini statik arxivdan fazoviy-vaqtli biodiversitet ma’lumotlar bazasiga aylantirdi. Soltis [3] gerbariylarni raqamlashtirish ilgari bajarilishi qiyin bo‘ lgan keng ko‘ lamli

qiyosiy tadqiqotlarni amalga oshirish imkonini berganini ta'kidlaydi. Heberling va Isaac [4] esa tarixiy namunalar zamonaviy tadqiqotlarda dastlabki yig' ish maqsadidan ancha kengroq vazifalarni bajarayotganini ko' rsatgan.

Gerbariy ma'lumotlarining qo' llanish sohalari ham sezilarli diversifikatsiyalangan. Heberling va hammualliflar [5] 13 mingdan ortiq maqola tahlili asosida gerbariyga asoslangan tadqiqotlarda klassik taksonomik mavzular bilan birga global o' zgarish biologiyasi, DNK tahlili va biodiversitet informatikasining tez o' sayotganini ko' rsatgan. Lang va hammualliflar [6] tarixiy kolleksiyalarni ekologik va evolyutsion jarayonlarning uzoq muddatli guvohi sifatida baholaydi. Lavoie [7] gerbariy namunalarining biogeografik hamda ekologik o' zgarishlarni qayta tiklashdagi imkoniyatlarini tahlil qilib, ayniqsa kompyuterlashtirilgan kolleksiyalarning tadqiqotlarda ko' proq ishlatilishini qayd etgan. Shu bilan birga, bunday ma'lumotlarning yig' imdagi notekislik, taksonomik qayta aniqlashlar, georeferensiya noaniqligi va kollektor faoliyatidagi tarixiy tarafkashlik kabi cheklovlari mavjud. Demak, gerbariy ma'lumotlarini statistik tahlil qilishda natijalarni tabiiy populyatsiyaning mutlaq ko' pligi bilan tenglashtirmaslik muhim.

Raqamli bioxilma-xillik ma'lumotlarini almashishda standartlashtirish alohida ahamiyatga ega. Darwin Core takson, uchrashuv yoki namuna yozuvi, hodisa, lokalitet, koordinata va kollektor kabi asosiy ma'lumotlarni yagona atamalar tizimida ifodalash imkonini beradi [8]. Tahlil qilingan raqamli gerbariy yozuvlaridagi noyob identifikator, ilmiy nom, yig' im sanasi va yili, kollektor(lar), o' nlik geografik kenglik hamda o' nlik geografik uzunlik maydonlari ana shu xalqaro yondashuvga mos keladi. Bunday tuzilma TASH ma'lumotlarini kelgusida GBIF tizimiga uzatish yoki boshqa gerbariy fondlari bilan birlashtirish imkoniyatini oshiradi [17].

Eremurus bo' yicha O' zbekistonda olib borilgan zamonaviy tadqiqotlar turkumning mamlakat florasidagi yuqori xilma-xilligini ko' rsatadi. Makhmudjanov va hammualliflar [9] O' zbekiston florasidagi turlarni morfologik belgilar va mavjud nomenklaturaviy ma'lumotlar asosida qayta baholagan. Plastom ma'lumotlari *Eremurus* ichidagi filogenetik munosabatlarni aniqlashtirish va potensial molekulyar markerlarni ajratish imkonini berdi [10]. Kengroq evolyutsion tahlil Markaziy Osiyo turkum diversifikatsiyasining asosiy hududi ekanini ko' rsatdi [11]. Keyingi monografik umumlashtirish turkumni global miqyosda kompleks ko' rib chiqish uchun asos yaratdi [12]. Mazkur ishlarda TASH va boshqa gerbariy fondlarining namunalari takson identifikatsiyasi, morfologik taqqoslash va tasdiqlovchi namuna sifatida muhim rol o' ynaydi. Shuning uchun kolleksiyaning o' zi haqidagi metama'lumotlarni tahlil qilish *Eremurus* bo' yicha avvalgi biologik tadqiqotlarni to' ldiruvchi, ammo ulardan metodologik jihatdan farqli yo' nalishdir.

TASH tarixiga oid ma'lumotlar uning fondida milliondan ortiq namuna saqlanishi va kolleksiyaning raqamlashtirish bosqichiga faol kirganini ko' rsatadi [1]. TASHning tip namunalari ham GBIF orqali alohida ma'lumotlar to' plami sifatida e'lon qilingan [17]. Biroq raqamlashtirishning ilmiy qiymati faqat tasvir va yorliqlarni elektron shaklga o' tkazish bilan cheklanmaydi. Kolleksiya ichidagi taksonomik, geografik va vaqt bo' yicha qamrovni miqdoriy baholash fondning kuchli va zaif tomonlarini aniqlash imkonini beradi. Shu ma'noda *Eremurus* kolleksiyasi mintaqaning bir nechta davlatlarini, yuz yildan ortiq vaqt oralig' ini va ko' plab tarixiy ekspeditsiyalarni birlashtiruvchi qulay model guruhdir.

Tadqiqot metodologiyasi

Tahlilga TASH gerbariysining 1 921 ta raqamlashtirilgan *Eremurus* gerbariy yozuvi kiritildi. Ma'lumotlar jadvali Bioxilma-xillik bo' yicha global axborot tizimida (GBIF) qo' llaniladigan Darwin Core standartining asosiy tamoyillari asosida shakllantirildi [8, 17]. Jadval tarkibida quyidagi maydonlar qo' llanildi: namuna yozuvining noyob identifikatori, olam, oila, turkum, tur epiteti, ilmiy nom muallifi, taksonomik daraja, ilmiy nom, joylashuv, joylashuvga oid izoh, yig' im raqami, yig' im sanasi, kun, oy, yil, kollektor(lar), o' nlik geografik kenglik, o' nlik geografik uzunlik, geodezik datum, yozuv turi, muassasa kodi va kolleksiya kodi. Takson nomlari POWO ma'lumotlar bazasi bilan muvofiqlashtirildi [13].

Ma'lumotlar sifatini nazorat qilishning birinchi bosqichida namuna yozuvlarining noyob identifikatorlari tekshirildi. Bo' sh identifikatorlar hamda bir xil identifikatorning ikki yoki undan ortiq marta takrorlanish holatlari alohida hisoblandi. Natijada har bir gerbariy yozuvining noyobligi baholandi. Keyin ilmiy nomlar bo' yicha guruhlash amalga oshirilib, har bir takson uchun gerbariy namunalari soni hisoblandi. Taksonomik daraja maydonidagi ma'lumotlar va POWO bo' yicha qabul qilingan nomlar o' zaro solishtirilib, standartlashtirilgan ilmiy nomlar tahlilda qo' llanildi.

Har bir koordinatali gerbariy namunasining geografik o' rni yorliqdagi lokalitet ma'lumotlari asosida Google Earth dasturida birma-bir qo' lda georeferensiyalandi. Bunda yorliqda keltirilgan davlat, ma'muriy hudud, tog' tizmasi, daryo, soy, qishloq, dovon, yo' l, vodiy va boshqa topografik belgilar zamonaviy xaritadagi mos obyektlar bilan solishtirildi. Koordinatalash avtomatik ommaviy geokodlash usuli bilan emas, har bir gerbariy namunasi uchun alohida amalga oshirildi. Aniqlangan nuqtalar WGS84 geodezik datumida o' nlik geografik kenglik va o' nlik geografik uzunlik ko' rinishida qayd etildi. Jami 1 920 ta yozuv uchun koordinata aniqlandi, bitta yozuvda esa yetarli lokalitet ma'lumoti bo' lmagani sababli koordinata kiritilmadi. Keyingi davlatlar kesimidagi tahlilda ushbu qo' lda aniqlangan koordinatalar davlat chegaralari bilan fazoviy ustma-ust joylashtirildi. Xarita va davlat chegaralari uchun Natural Earth ochiq kartografik qatlamlaridan foydalanildi [15]. Chegara yaqinidagi nuqtalarda natija lokalitet tavsifi bilan qo' shimcha ravishda tekshirildi.

Vaqt bo‘ yicha tahlilda yig‘ ilgan yil maydoni sonli ko‘ rinishga keltirildi. Har bir yil uchun gerbariy yozuvlari soni hisoblandi, so‘ ng yillar o‘ n yillik davrlarga guruhlanib, har bir davrning kolleksiyadagi ulushi aniqlandi. Yig‘ imlar sonining ko‘ payishi turning tabiatdagi ko‘ pligini bevosita anglatmaydi; u ekspeditsiya faolligi, ilmiy ustuvorlik, transport imkoniyati, kollektorlar soni va kuratsion qarorlar bilan ham bog‘ liq bo‘ lishi mumkin [5–7]. Shu sababli ushbu natijalar kolleksiyaning shakllanish tarixi sifatida talqin qilindi.

Kollektorlar bo‘ yicha tahlil kollektor(lar) maydonidagi mavjud yozuvlar asosida amalga oshirildi. Ushbu maydonda ayrim kollektorlarning ismi, bir nechta shaxsdan iborat kollektorlar guruhi, ekspeditsiya tarkibi hamda imlo va qisqartirish variantlari uchraydi. Kollektor nomlarini avtomatik ravishda bir shaxsga birlashtirish amalga oshirilmadi, chunki barcha yozuvlarni ishonchli standartlashtirish uchun qo‘ shimcha biografik va katalog tekshiruvi talab etiladi. Shu bois natijalarda “kollektor yozuvi” atamasi qo‘ llanildi. “Noma’lum” deb qayd etilgan yozuvlar eng faol kollektorlar ro‘ yxatiga kiritilmadi.

Hisob-kitoblar kompyuter dasturlari yordamida bajarildi, jadvallar elektron jadval ko‘ rinishida umumlashtirildi, diagrammalar hamda tarqalish xaritasi statistik va geografik axborot vositalari yordamida tayyorlandi. Natijalar son, foiz va turlar boyligi ko‘ rsatkichlari bilan ifodalandi. Har bir koordinata qo‘ lda georeferensiyalangan bo‘ lsa-da, tarixiy yorliqlardagi toponimlarning noaniqligi, joy nomlarining vaqt davomida o‘ zgarishi va ayrim lokalitetlarning keng hududni ifodalashi koordinata aniqligiga ta’sir qilishi mumkin; shu sababli ular dala sharoitida zamonaviy sun’iy yo‘ ldosh qabul qilgichi bilan bevosita o‘ lchangan nuqtalar sifatida talqin qilinmadi.

Natijalar va ularning tahlili

Taksonomik tarkib va ma’lumotlar yaxlitligi

Taksonomik inventarizatsiya TASH fondida *Eremurus*ga oid 1 921 ta noyob gerbariy yozuvi mavjudligini ko‘ rsatdi. Noyob identifikator maydonida bo‘ sh yoki takrorlanuvchi qiymatlar topilmadi. Bu holat raqamli yozuvlar darajasida identifikatorlar yaxlitligining yuqori ekanini ko‘ rsatadi va keyingi ma’lumotlarni birlashtirish, yangilash yoki internetda nashr qilishda muhim texnik afzallik beradi. Kolleksiyada 38 ta ilmiy nom bo‘ yicha gerbariy yozuvi mavjud.

Namunalarning turlar bo‘ yicha taqsimoti juda notekis. Eng yirik blok *Eremurus* soogdianus (Regel) Benth. & Hook.f. ga tegishli bo‘ lib, 291 ta yozuv yoki umumiy fondning 15,1% ini tashkil qiladi. Keyingi o‘ rinlarda E. olgae Regel — 209 ta (10,9%), E. regelii Vved. — 171 ta (8,9%), E. fuscus (O.Fedtsch.) Vved. — 170 ta (8,8%) va E. tianschanicus Pazij & Vved. ex Pavlov — 133 ta (6,9%) turadi. Dastlabki besh tur jami 974 ta yozuvni, ya’ni kolleksiyaning qariyb yarmidan ko‘ prog‘ ini tashkil etadi. Dastlabki 15 tur esa barcha yozuvlarning 85% dan ortig‘ ini qamrab oladi. Bunga qarama-qarshi ravishda E. chloranthus Popov, E. roseolus Vved. va E. subalbiflorus Vved. faqat bittadan yozuv bilan ifodalangan.

Bunday notekislikni ikki jihatdan baholash lozim. Bir tomondan, ko‘ p yozuvga ega turlar turli lokalitetlar, yillar va kollektorlar bilan yaxshi hujjatlashtirilgan bo‘ lib, morfologik variatsiya va areal tahlili uchun mustahkam material beradi. Ikkinchi tomondan, kam namuna bilan ifodalangan turlar TASH fondida mavjud bo‘ lsa-da, ularning ichki variatsiyasi yoki tarixiy tarqalishini faqat ushbu kolleksiya asosida to‘ liq baholash qiyin. Shu bois kolleksiya inventarizatsiyasi kelgusidagi maqsadli yig‘ imlar uchun “namuna bo‘ shliqlari”ni aniqlash imkonini beradi. TASH fondini boshqa Markaziy Osiyo va yirik xalqaro gerbariylar bilan birlashtirish kam qamrab olingan taksonlar bo‘ yicha ma’lumot yetishmovchiligini kamaytirishi mumkin.

Jadval 1

TASH fondidagi *Eremurus* turlari: gerbariy yozuvlari soni bo‘ yicha yetakchi 15 takson

Tur	Yozuvlar soni	Ulushi, %
Eremurus soogdianus (Regel) Benth. & Hook.f.	291	15.1
Eremurus olgae Regel	209	10.9
Eremurus regelii Vved.	171	8.9
Eremurus fuscus (O.Fedtsch.) Vved.	170	8.8
Eremurus tianschanicus Pazij & Vved. ex Pavlov	133	6.9
Eremurus stenophyllus (Boiss. & Buhse) Baker	109	5.7
Eremurus kaufmannii Regel	102	5.3
Eremurus inderiensis (M.Bieb.) Regel	85	4.4
Eremurus turkestanicus Regel	77	4.0
Eremurus robustus (Regel) Regel	75	3.9
Eremurus lactiflorus O.Fedtsch.	57	3.0
Eremurus altaicus (Pall.) Steven	45	2.3
Eremurus cristatus Vved.	44	2.3
Eremurus comosus O.Fedtsch.	39	2.0

Tur	Yozuvlar soni	Ulushi, %
Eremurus luteus Baker	34	1.8

Geografik qamrov

1 920 ta georeferensiyalangan yozuvning davlatlar bo‘ yicha taqsimoti kolleksiyaning aniq Markaziy Osiyo markazlashuvini ko‘ rsatdi. O‘ zbekiston 1 057 ta yozuv bilan umumiy kolleksiyaning 55,0% ini tashkil etadi. Shu nuqtalarda 29 ta *Eremurus* turi qayd etilgan bo‘ lib, bu TASH fondining o‘ z mamlakati florasini qamrab olish funksiyasi juda kuchli ekanini tasdiqlaydi. Qirg‘ izistonda 310 ta yozuv va 18 tur, Qozog‘ istonda 250 ta yozuv va 11 tur, Tojikistonda 231 ta yozuv va 17 tur, Turkmanistonda 66 ta yozuv va 11 tur qayd etildi. Afg‘ oniston besh yozuv va ikki tur, Rossiya esa bitta yozuv bilan ifodalangan. Bitta yozuv koordinatasiz bo‘ lgani sababli “Aniqlanmagan” kategoriyasida qoldirildi.

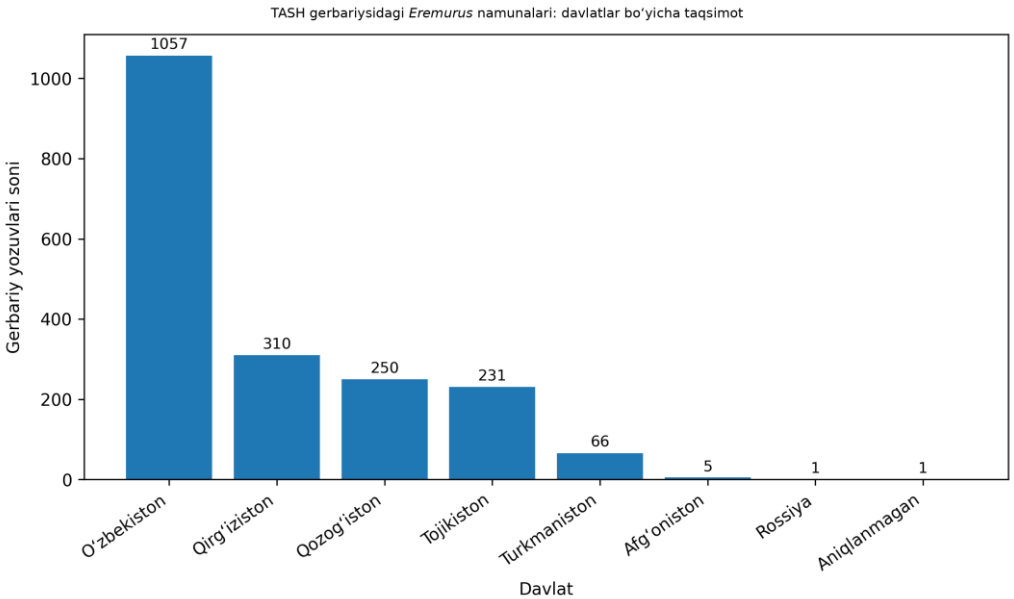
Geografik tuzilma turkumning biologik tarqalishi bilan TASH kolleksiyasining tarixiy yig‘ im geografiyasi o‘ rtasidagi birikkan natijadir. O‘ zbekistonning katta ulushi fondning institutsional vazifasi va mamlakat ichidagi dala ekspeditsiyalari bilan izohlanadi. Biroq qo‘ shni Qirg‘ iziston, Qozog‘ iston va Tojikistondan yuzlab namunalar mavjudligi kolleksiyaning faqat milliy emas, balki mintaqaviy xarakterga ega ekanini ko‘ rsatadi. TASHning tarixiy kolleksiyasi Markaziy Osiyoda siyosiy chegaralardan qat’i nazar amalga oshirilgan ekspeditsiyalar natijasini saqlab qolgan. Bu xususiyat turkum areallarini hozirgi davlat chegaralari bilan cheklab talqin qilishdan ko‘ ra, tog‘ tizmalari va tabiiy floristik hududlar kesimida keyingi tahlillarni davom ettirish zarurligini ko‘ rsatadi.

Xaritada yozuvlarning Tyanshan, Pomir-Oloy, Kopetdog‘ va ularga tutash tekislik-cho‘ l hududlari bo‘ ylab keng tarqalganligi kuzatiladi. Biroq ushbu maqoladagi davlat poligonlari umumlashtirilgan Natural Earth chegaralariga asoslangan. Shuning uchun juda yaqin chegara nuqtalari ma’muriy aniqlik bo‘ yicha alohida yuqori aniqlikdagi geografik axborot tizimi (GAT) qatlamlari bilan tekshirilishi mumkin. Shunga qaramay, mamlakat darajasidagi umumiy statistik naqsh barqaror: kolleksiyaning 96% dan ko‘ prog‘ i O‘ zbekiston, Qirg‘ iziston, Qozog‘ iston va Tojikiston hissasiga to‘ g‘ ri keladi.

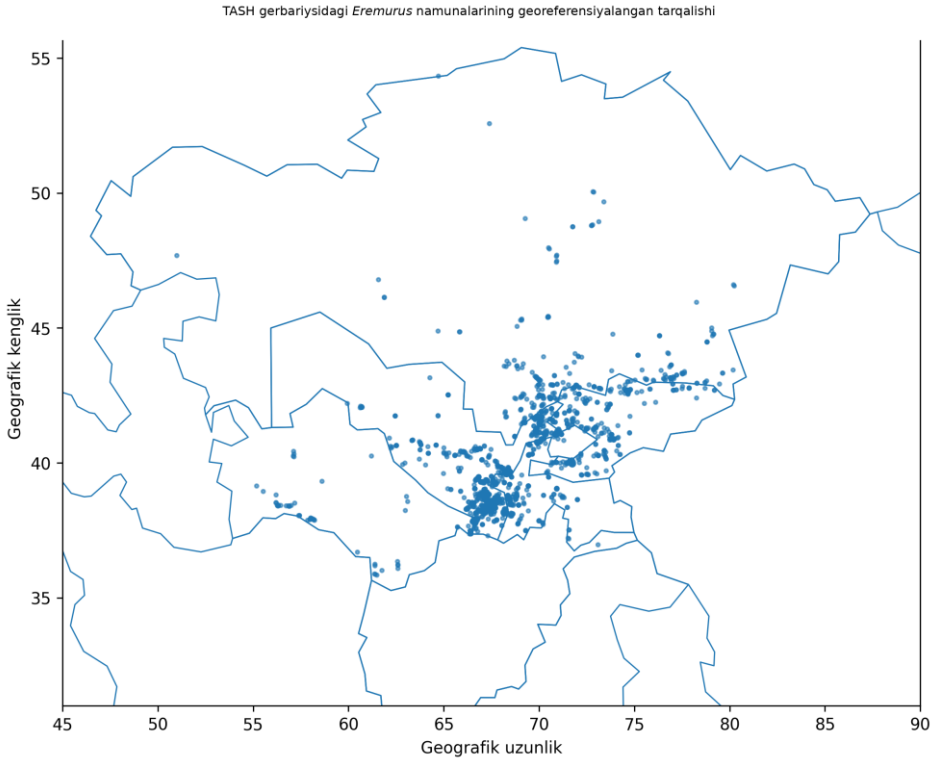
Jadval 2

Koordinatalar asosida davlatlar bo‘ yicha *Eremurus* gerbariy yozuvlarining taqsimoti

Davlat	Yozuvlar soni	Turlar soni	Ulushi, %
O‘ zbekiston	1057	29	55.0
Qirg‘ iziston	310	18	16.1
Qozog‘ iston	250	11	13.0
Tojikiston	231	17	12.0
Turkmaniston	66	11	3.4
Afg‘ oniston	5	2	0.3
Rossiya	1	1	0.1
Aniqlanmagan	1	1	0.1



1-rasm. Davlatlar bo‘ yicha *Eremurus* gerbariy yozuvlari soni.



2-rasm. TASH fondidagi georeferensiyalangan *Eremurus* yozuvlarining tarqalish xaritasi.

Yig‘ imlarning vaqt bo‘ yicha dinamikasi

Yig‘ im sanalari TASHdagi *Eremurus* fondining bir asrdan ortiq shakllanish tarixini aks ettiradi. Eng erta yozuv 1905-yilga, eng so‘ nggisi 2021-yilga tegishli. 1900-yillarda 45 ta yozuv, 1910-yillarda 169 ta, 1920-yillarda 328 ta va 1930-yillarda 626 ta yozuv yig‘ ilgan. Demak, 1920–1939-yillarning o‘ zida 954 ta namuna yoki butun kolleksiyaning deyarli yarmi shakllangan. 1930-yillar 626 yozuv bilan eng yuqori o‘ n yillik bo‘ lib, umumiy kolleksiyaning 32,6% ini tashkil qiladi. 1940-yillarda 196, 1950-yillarda 219, 1960-yillarda 124 ta yozuv qayd etilgan. 1970-yillardan boshlab intensivlik keskin pasayadi: 1970-yillarda 35, 1980-yillarda 10, 1990-yillarda to‘ rtta yozuv mavjud. 2000-yillarda 21, 2010-yillarda 100 va 2020–2021-yillarda 44 ta yozuv qayd etilishi zamonaviy yig‘ imlarning yana faollashganini ko‘ rsatadi.

Yillik kesimda 1930-yil 99 yozuv bilan birinchi o‘ rinda turadi. Keyingi maksimumlar 1936-yilda 90, 1931-yilda 82, 1937-yilda 81 va 1934-yilda 77 ta yozuvdir. 1916-yilda ham 73 ta namuna yig‘ ilgan. Bunday cho‘ qqilar tabiiy populyatsiyalar sonining o‘ zgarishini emas, balki aynan o‘ sha yillarda *Eremurus*ga boy hududlarda faol botanika ekspeditsiyalari va kolleksiya yig‘ imi olib borilganini ko‘ rsatadi. Bu farq gerbariy ma’lumotlarini talqin qilish uchun prinsipial: tarixiy gerbariy namunalari opportunistik yoki maqsadli yig‘ im natijasi bo‘ lib, ularning vaqt bo‘ yicha zichligi yig‘ im harakati bilan kuchli bog‘ langan [5–7].

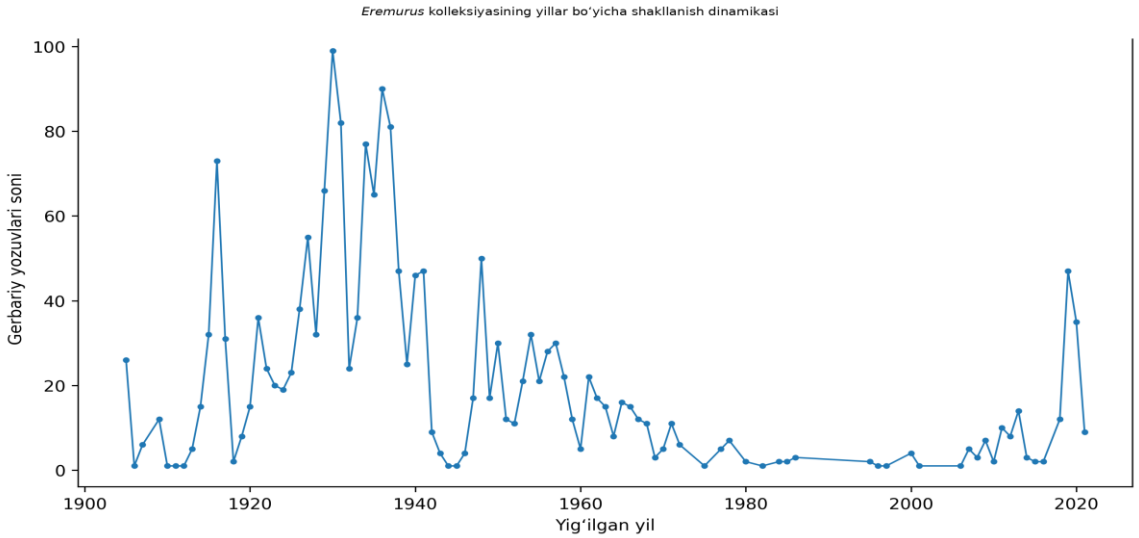
Shunga qaramay, vaqtga oid qatlam juda muhim ilmiy qiymatga ega. 1905–2021-yillar oralig‘ idagi materiallar ma’lum turlarning bir xil yoki yaqin hududlardan turli davrlarda yig‘ ilgan yozuvlarini aniqlash imkonini beradi. Kelgusida bunday takroriy lokalitetlar fenologik siljishlar, areal chegaralarining o‘ zgarishi yoki lokal populyatsiyalarning saqlanib qolishi bo‘ yicha tadqiqotlar uchun tanlanishi mumkin. Ayniqsa etiketkalardagi to‘ liq sana, balandlik va habitat ma’lumoti bilan birlashtirilganda, tarixiy TASH materiali global o‘ zgarish biologiyasida qo‘ llanadigan gerbariy vaqt qatorlariga aylanishi mumkin [6].

Jadval 3

***Eremurus* kolleksiyasining o‘ n yilliklar bo‘ yicha shakllanishi**

Davr	Yozuvlar soni	Ulushi, %
1900-yillar	45	2.3
1910-yillar	169	8.8
1920-yillar	328	17.1
1930-yillar	626	32.6
1940-yillar	196	10.2
1950-yillar	219	11.4
1960-yillar	124	6.5
1970-yillar	35	1.8
1980-yillar	10	0.5

Davr	Yozuvlar soni	Ulushi, %
1990-yillar	4	0.2
2000-yillar	21	1.1
2010-yillar	100	5.2
2020-yillar	44	2.3



3-rasm. *Eremurus* gerbariy yozuvlarining yig‘ ilgan yillar bo‘ yicha dinamikasi.

Kollektor yozuvlarining tarkibi

Kollektor(lar) ustuni kolleksiyaning insoniy va ekspeditsion tarixini aks ettiradi. Unda 497 xil matnli qiymat mavjud. Biroq bu sonni 497 alohida biologik shaxs deb talqin qilib bo‘ lmaydi: ayrim qatorlarda bir necha kollektor birgalikda yozilgan, ba’zi familiyalar turli imloda takrorlangan, shuningdek “Noma’lum” qiymati ham mavjud. Shuning uchun ushbu tahlil xom kollektor yozuvlari darajasida bajarildi. 22 ta gerbariy namunasi yozuvida kollektor “Noma’lum” sifatida qayd qilingan va eng faol kollektorlar ro‘ yxatiga kiritilmadi.

Eng ko‘ p uchraydigan yozuv “А.Пятаева” bo‘ lib, 70 ta gerbariy namunasi bilan bog‘ langan. “А.Введенский” 46, “Е.Демурина” 40, “А.Гранитов” 32, “С.Кудряшев” 29, “М.Г.Попов” 29, “Арифханова” 29 va “А.Бутков” 29 ta yozuvda qayd etilgan. “Е.П.Коровин” 28, “В.Пазий и Б.Миронов” esa 25 ta gerbariy namunasi bilan ifodalangan. Bir nechta muhim muammo ham ko‘ rinadi: masalan, “С.Кудряшев” va “С.Кудряшов”, shuningdek “А.Введенский” va “Введенский” kabi variantlar mavjud. Standartlashtirilgan nomlar nazorati jarayonida ularning haqiqiy shaxs identifikatori, ism-sharif kengaytmasi va tarixiy ekspeditsiya konteksti tekshirilsa, kollektorlar bo‘ yicha yanada aniq bibliometrik-tarixiy tahlil qilish mumkin bo‘ ladi.

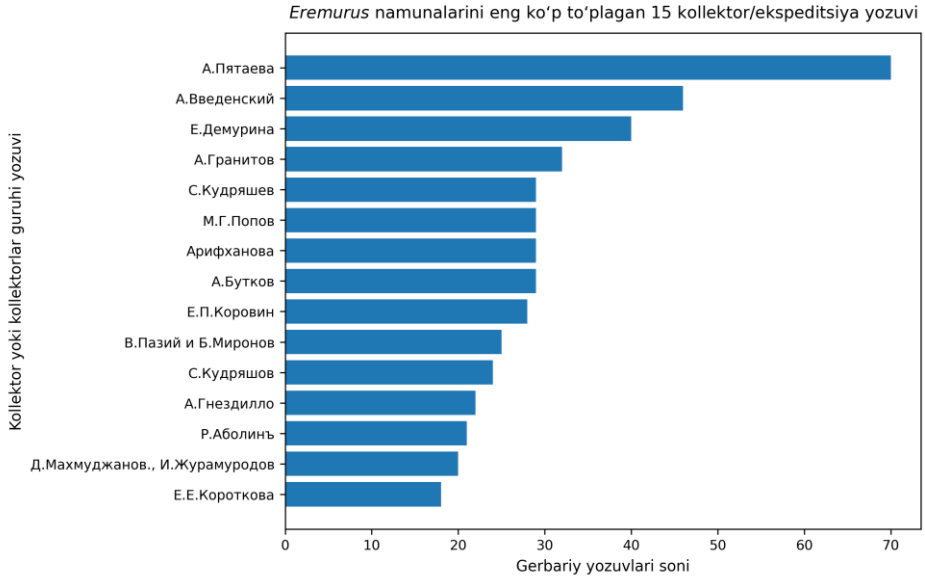
Kollektorlar tarkibining kengligi TASH *Eremurus* fondi bir yoki ikki ekspeditsiya mahsuli emasligini, balki ko‘ plab avlod botanistlari yig‘ imlari asosida shakllanganini ko‘ rsatadi. eng ko‘ p uchraydigan 15 kollektor yozuvi jami materialning taxminan chorak qismini tashkil qiladi, qolgan namunalarning katta qismi yuzlab boshqa yozuvlar o‘ rtasida taqsimlangan. Bu diversifikatsiya geografik qamrovning kengayishiga ijobiy ta’sir qilgan bo‘ lishi mumkin. Shu bilan birga, kollektorlar faoliyati turlar va hududlar bo‘ yicha tanlanma og‘ ishi hosil qiladi. Kelgusi tahlillarda kollektor × yil × tur × lokalitet matritsasini tuzish qaysi turlar ma’lum ekspeditsiyalar bilan haddan tashqari kuchli bog‘ langanini aniqlash imkonini beradi.

Jadval 4

Kollektor(lar) maydonida eng ko‘ p uchraydigan 15 kollektor yoki kollektorlar guruhi yozuvi

Kollektor yoki kollektorlar guruhi yozuvi	Yozuvlar soni	Ulushi, %
А.Пятаева	70	3.6
А.Введенский	46	2.4
Е.Демурина	40	2.1
А.Гранитов	32	1.7
С.Кудряшев	29	1.5
М.Г.Попов	29	1.5
Арифханова	29	1.5
А.Бутков	29	1.5
Е.П.Коровин	28	1.5

Kollektor yoki kollektorlar guruhi yozuvi	**Yozuvlar soni**	**Ulushi, %**
В.Пазий и Б.Миронов	25	1.3
С.Кудряшов	24	1.2
А.Гнездилло	22	1.1
Р.Аболинъ	21	1.1
Д.Махмуджанов., И.Журамуродов	20	1.0
Е.Е.Короткова	18	0.9



4-rasm. Eng ko‘ p uchraydigan 15 kollektor/ekspeditsiya yozuvi.

Umumiy muhokama

Umumiy natijalar TASHdagi *Eremurus* fondi uch asosiy qatlamga ega ekanini ko‘ rsatadi: kuchli taksonomik reprezentatsiya, Markaziy Osiyoni qamrab oluvchi mintaqaviy geografik ko‘ lam va XX asr boshlariga borib taqaladigan chuqur tarixiy vaqt qatori. Bu xususiyatlar zamonaviy gerbariy tadqiqotlarida qayd etilgan “eski kolleksiya — yangi savollar” tamoyiliga to‘ liq mos keladi [4–6]. TASH kolleksiyasining katta qismi 1930-yillarda yig‘ ilgan bo‘ lsa-da, uning ma’lumot qiymati zamonaviy namunalardan kam emas; aksincha, aynan tarixiy qatlam hozirgi tarqalish ma’lumotlari bilan taqqoslash uchun tayanch nuqta beradi.

*Eremurus*ga oid zamonaviy taksonomik va filogenetik ishlar turlar chegarasi, turkum ichki tasnif va diversifikatsiya markazlari haqida yangi ma’lumotlarni berdi [9–12]. Shu sababli tarixiy gerbariy namunalari nomlarini hozirgi qabul qilingan taksonomiya bilan muntazam qayta bog‘ lash zarur. Mazkur ma’lumotlar to‘ plamida ilmiy nomlar POWO [13] bilan standartlashtirilgani turli yillarda ishlatilgan sinonimlar sababli yuzaga keladigan sun’iy bo‘ linishlarni kamaytiradi. Biroq gerbariy namunasining qabul qilingan nom bilan yozilishi uning morfologik identifikatsiyasi mutlaq xatosiz degani emas. Kam uchraydigan yoki tarixan chalkash taksonlar keyingi reviziyada gerbariy namunasi tasviri va asl yorlig‘ i bilan qayta tekshirilishi kerak.

Geografik natijalar O‘ zbekiston va qo‘ shni davlatlar TASH *Eremurus* fondining asosiy manbasi ekanini ko‘ rsatadi. Bu turkumning Markaziy Osiyodagi tabiiy xilma-xilligi bilan ham mos keladi [11, 12]. Biroq gerbariydagi nuqtalar zichligi biologik areal ichidagi real populyatsiya zichligini ko‘ rsatmaydi. Masalan, yirik shaharlar, tarixiy ekspeditsiya marshrutlari, avtomobil yo‘ llari yoki botanika jihatdan mashhur tog‘ vodiylari ko‘ proq namuna bilan ifodalanishi mumkin. Shuning uchun kelgusidagi areal yoki ekologik nisha modellarida fazoviy siyraklashtirish, takroriy lokalitet nazorati, koordinata noaniqligi va tanlanma og‘ ishini tuzatish kabi bosqichlar zarur.

Tadqiqotning yana bir muhim natijasi fondning boshqaruv nuqtayi nazaridan qaysi ma’lumotlar keyingi kuratsiyani talab qilishini ko‘ rsatishidir. Noyob identifikatorlar to‘ liq va noyob bo‘ lishi juda yaxshi ko‘ rsatkich. Aksincha, kollektor yozuvlaridagi transliteratsiya va imlo variantlari kelajakda kollektorlar uchun standartlashtirilgan nomlar ro‘ yxatini yaratish zarurligini ko‘ rsatadi. Xuddi shunday, koordinatasiz yoki past aniqlikdagi tarixiy lokalitetlarni georeferensiyalash, ma’muriy birliklarni yagona standartga keltirish va tip holati, aniqlovchi shaxs, aniqlangan sana kabi maydonlarni to‘ ldirish ma’lumotlar to‘ plamining xalqaro tizimlararo mosligini oshiradi. Darwin Core [8] va GBIF nashriyot amaliyotlari bunday standartlashtirish uchun tayyor ramka beradi.

Shunday qilib, mazkur ish oddiy katalog sanog‘ idan ko‘ ra kengroq ma’noga ega. Kolleksiyaning strukturasini miqdoriy tavsiflash orqali taksonomik qamrov, hududiy reprezentatsiya, tarixiy yig‘ im intensivligi va kollektorlar hissasi birgalikda ko‘ rsatildi. Ushbu uyg‘ unlashtirilgan ko‘ rinish TASH *Eremurus* ma’lumotlarini keyingi bosqichda boshqa gerbariylar, dala kuzatuvlari, GBIFdagi tarqalish qaydlari va molekulyar tasdiqlovchi namunalari bilan birlashtirish uchun boshlang‘ ich tekshiruv vazifasini bajaradi. Gerbariy ma’lumotlarining kuchi aynan shunday ko‘ p manbali uyg‘ unlashtirishda namoyon bo‘ ladi [5, 16].

Ilmiy yangilik va amaliy ahamiyati

Ilmiy yangilik va amaliy ahamiyat. Mazkur tadqiqotning yangiligi TASH fondidagi *Eremurus* kolleksiyasini bitta raqamli tekshiruv sxemasi doirasida taksonomik, fazoviy va tarixiy ko‘ rsatkichlar bo‘ yicha birgalikda baholashidadir. Avvalgi ishlar TASH gerbariysining umumiy tarixi va fond holatini, shuningdek *Eremurus*ning O‘ zbekiston florasidagi taksonomiyasi hamda evolyutsiyasini yoritgan [1, 9–12], biroq mazkur tadqiqotda noyob identifikator yaxlitligi, tur bo‘ yicha gerbariy namunalari soni, koordinatalardan hosil qilingan davlat taqsimoti, yig‘ imlarning yillik va o‘ n yillik dinamikasi hamda kollektor yozuvlari bir xil ish jarayoni asosida miqdoriy tekshirildi. Bunday yondashuv kolleksiyani faqat “qancha namuna bor?” savoli bilan cheklamay, ma’lumotlarning qaysi qatlamlari kelgusidagi ilmiy qayta foydalanishga tayyor, qaysilari esa qo‘ shimcha kuratsiyani talab qilishini ko‘ rsatadi.

Amaliy nuqtayi nazardan, natijalar dala tadqiqotlari va gerbariy kuratsiyasi uchun ustuvor yo‘ nalishlarni aniqlash imkonini beradi. Bir yoki bir necha gerbariy namunasi bilan ifodalangan taksonlar maqsadli qayta yig‘ ish va boshqa gerbariylar bilan ma’lumot almashish uchun yuqori ustuvorlikka ega. Koordinatasi mavjud tarixiy namunalar zamonaviy qaydlar bilan qiyoslanib, areal chegaralari va lokal populyatsiyalarning uzoq muddatli dinamikasini tekshirishda ishlatilishi mumkin. Yirik gerbariy namunasi qatorlariga ega turlar esa morfologik o‘ zgaruvchanlik, fenologiya va geografik differensiasiya bo‘ yicha keyingi tadqiqotlar uchun yaxshi asos yaratadi. Noyob identifikatorlarning takrorlanmasligi gerbariy namunasi tasviri, molekulyar tasdiqlovchi namuna, nashr va tashqi gerbariy yozuvlarini aynan bitta fizik namunaga bog‘ lash uchun barqaror identifikator qatlamini ta’minlaydi. Shu ma’noda mazkur tekshiruv TASHdagi *Eremurus* fondini GBIF/Darwin Core tamoyillari asosida yanada boyitish va tizimlararo mos ilmiy resursga aylantirishning amaliy yo‘ l xaritasini ham beradi [8, 17].

Tadqiqot cheklovlari

Tadqiqot cheklovlari. Natijalarni talqin qilishda bir necha cheklovni hisobga olish zarur. Birinchidan, har bir koordinata yorliqdagi lokalitet ma’lumotlari asosida Google Earth dasturida birma-bir qo‘ lda georeferensiyalangan bo‘ lsa-da, tarixiy toponimlarning noaniq yozilishi, joy nomlarining vaqt davomida o‘ zgarishi, ayrim lokalitetlarning juda keng hududni ifodalashi hamda eski yorliqlarda masofa va yo‘ nalishlarning taxminiy berilishi koordinata aniqligiga ta’sir qilishi mumkin. Shu sababli ushbu koordinatalarni dala sharoitida zamonaviy sun’iy yo‘ ldosh qabul qilgichi bilan bevosita o‘ lchangan nuqtalar bilan mutlaq tenglashtirish mumkin emas. Ikkinchidan, davlatlar kesimidagi umumlashtirish koordinatalarni Natural Earth davlat chegaralari bilan fazoviy ustma-ust joylashtirish orqali bajarilganligi sababli xalqaro chegaraga juda yaqin nuqtalar yuqori aniqlikdagi ma’muriy qatlamlar bilan qayta tekshirilishi mumkin. Uchinchidan, kollektor(lar) maydonidagi 497 xil matnli yozuv hali to‘ liq standartlashtirilmagan; imlo, transliteratsiya, initsial va kollektorlar guruhi variantlari mavjudligi sababli bu sonni alohida biologik shaxslar soni deb qabul qilish mumkin emas. To‘ rtinchidan, gerbariy yig‘ imlari tabiatan notekis bo‘ lib, ekspeditsiya marshruti, transport qulayligi, ilmiy qiziqish va tarixiy sharoit ayrim hudud va turlarning ortiqcha ifodalanishiga olib kelishi mumkin. Nihoyat, ilmiy nomlarning zamonaviy nomenklaturaga moslashtirilishi gerbariy namunasining morfologik qayta aniqlanishi o‘ rnini bosa olmaydi; noyob yoki tarixan chalkash materiallar fizik namuna yoki yuqori sifatli raqamli tasvir asosida ekspert tomonidan qayta tekshirilishi zarur.

Xulosalar

O‘ zbekiston Milliy gerbariysi (TASH) fondidagi *Eremurus* kolleksiyasining raqamli inventarizatsiyasi 1 921 ta noyob gerbariy yozuvi va 38 ta ilmiy nomni qamrab olishini ko‘ rsatdi. Noyob identifikator maydonidagi identifikatorlarning takrorlanmasligi raqamli yozuvlarning texnik yaxlitligini tasdiqlaydi. Taksonomik tarkibda *E. soogdianus, E. olgae, E. regelii, E. fuscus va E. tianschanicus* eng katta ulushga ega bo‘ lib, ayrim kam uchraydigan turlar esa juda oz namuna bilan ifodalangan.

Geografik jihatdan 1 920 ta koordinatali yozuvning 55,0% O‘ zbekiston hududiga, qolgan asosiy qismi Qirg‘ iziston, Qozog‘ iston, Tojikiston va Turkmanistonga to‘ g‘ ri keladi. Bu TASH *Eremurus* fondining milliy chegaradan kengroq, Markaziy Osiyo miqyosidagi ilmiy resurs ekanini ko‘ rsatadi. Kolleksiyaning vaqt qatori 1905–2021-yillarni qamrab olib, 1930-yillarda maksimal yig‘ im faolligi kuzatilgan. Kollektor(lar) maydonidagi 497 xil yozuv esa fondning ko‘ plab botanistlar va ekspeditsiyalar hissasi bilan shakllanganini tasdiqlaydi, biroq kollektor nomlarini standartlashtirilgan nomlar nazorati asosida normallashtirish zarur.

Kelgusida TASH *Eremurus* kolleksiyasini yanada kuchaytirish uchun kam namuna bilan ifodalangan turlar bo‘ yicha maqsadli dala yig‘ imlarini rejalashtirish, tarixiy lokalitetlarni yuqori aniqlikda georeferensiyalash, kollektor va

aniqlovchi shaxslar uchun standartlashtirilgan shaxslar ro‘ yxatlarini yaratish, gerbariy namunasi tasvirlari bilan elektron yozuvlarni bog‘ lash va ma’lumotlarni GBIF/Darwin Core talablariga muvofiq to‘ liq nashr etish maqsadga muvofiq. Ushbu yondashuv TASH fondini *Eremurus* taksonomiyasi, biogeografiyasi, konservatsiyasi va umumjahon o‘ zgarish biologiyasi bo‘ yicha qayta foydalaniladigan ochiq ilmiy infratuzilmaga aylantirish imkonini beradi.

Muallif bayonotlari

Mualliflar hissasi: tadqiqot konsepsiyasi, ma’lumotlarni kuratsiya qilish va standartlashtirish, statistik va fazoviy tahlil, tasviriy ifodalash, natijalarni talqin qilish, maqolaning dastlabki matnini yozish va yakuniy tahrirlash — D.I. Maxmudjanov, I.J. Jo‘ ramurodov; standartlashtirish, statistik va fazoviy tahlil — A.N. Najmiddinov

Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi mavjud emasligini bildiradi.

Moliyalashtirish: Ushbu tadqiqot O‘ zbekiston Respublikasi Fanlar akademiyasi Botanika instituti tomonidan amalga oshirilayotgan “Raqamli tabiat: Markaziy O‘ zbekiston florasi uchun raqamli platformani ishlab chiqish” (2025–2029) davlat dasturi doirasida bajarildi. Qo‘ shimcha moliyaviy ko‘ mak “O‘ zbekiston florasidagi polimorf oilalarning taksonomik reviziyasi” (A-FA-2021-427) hamda “O‘ zbekiston florasining o‘ zbek tilidagi birinchi nashrini tayyorlash” (AL-9224104450) loyihalari tomonidan ta’minlandi. Tadqiqot, shuningdek, Namangan davlat universiteti Biologiya kafedrasida amalga oshirilayotgan 2025–2027-yillarga mo‘ ljallangan “Bioxilma-xilligi xavf ostidagi hudud sifatida Farg‘ ona vodiysi florasining raqamli platformasini ishlab chiqish” nomli amaliy tadqiqot loyihasi (AL–9224104319) tomonidan qo‘ llab-quvvatlandi.

Ma’lumotlarning mavjudligi: maqolada ishlatilgan umumlashtirilgan statistik jadvallar muallifning ishchi materiallari tarkibida saqlanadi.

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A SPECIMEN-BASED CHECKLIST AND GEOREFERENCED OCCURRENCE SYNTHESIS OF EREMURUS M.BIEB. (ASPHODELACEAE) IN TAJIKISTAN

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Annotatsiya: *Tojikiston Markaziy Osiyodagi Eremurus M.Bieb. turkumining muhim xilma-xillik markazlaridan biridir. Ushbu tadqiqotda turkumning mamlakat hududida tarqalishi gerbariy namunalari, Plantarium.ru hamda Global Biodiversity Information Facility (GBIF) ma’ lumotlari asosida qayta ko‘ rib chiqildi. Turlar ro‘ yxatini tuzishda gerbariy namunalari asosiy tekshiriladigan ilmiy dalil sifatida qabul qilindi. Asosiy ishchi ma’ lumotlar bazasidagi koordinatalarni Tojikiston davlat chegarasi bilan fazoviy solishtirish natijasida dastlab 1 510 ta yozuv ajratildi; aynan takrorlangan yozuvlar chiqarilgach, 1 286 ta noyob yozuv qoldi. GBIFning faqat tabiiy sharoitdagi qaydlarni o‘ z ichiga olgan bazasidan Tojikistonga tegishli 113 ta yozuv aniqlandi, ulardan 35 tasi asosiy bazadagi yozuvlar bilan barqaror identifikatorlar orqali o‘ zaro mos keldi. Ma’ lumotlarni ehtiyotkorlik bilan birlashtirish natijasida jami 1 364 ta tarqalish qaydi shakllantirildi. Taksonomik sifat nazoratidan so‘ ng 1 345 ta yozuv 25 ta qabul qilingan tur hamda E. stenophyllus subsp. ambigens kenja turiga biriktirildi. Biroq ushbu ko‘ rsatkich Tojikiston florasidagi Eremurus turlarining umumiy boyligini to‘ liq ifodalamaydi. Shu sababli 2025-yilda chop etilgan global monografiyada har bir turning umumiy tarqalishi haqidagi ma’ lumotlar, klassik Flora Tadzhikskoi SSR, zamonaviy ilmiy adabiyotlar hamda POWO/WCVP 2026 taksonomik ma’ lumotlar bazasi bilan qiyosiy tahlil qilindi. Natijada Tojikiston florasi uchun 33 turdan iborat zamonaviy ishchi ro‘ yxat taklif etildi; E. cristatusning mamlakat hududida tarqalishi esa qo‘ shimcha gerbariy namunalarini tekshirishni talab qiladigan muvaqqat holat sifatida baholandi. GBIFda tayyor koordinatalar bilan keltirilgan yozuvlardan tashqari, o‘ rganilgan barcha gerbariy namunalari yorliq ma’ lumotlari asosida Google Earth dasturi yordamida alohida georeferensiyalandi. Olingan natijalar Tojikistondagi Eremurus turlarining taksonomik qayta ko‘ rib chiqilishi, muhofaza holatini baholash va maqsadli dala tadqiqotlarini rejalashtirish uchun ishonchli dalilly asos yaratadi.*

Kalit so‘ zlar: *Eremurus; Asphodelaceae; Tojikiston; gerbariy specimenlari; checklist; georeferensiyalash; GBIF; Plantarium; POWO.*

ЧЕК-ЛИСТ И ГЕОРЕФЕРЕНЦИРОВАННЫЙ АНАЛИЗ РАСПРОСТРАНЕНИЯ ВИДОВ EREMURUS M.BIEB. (ASPHODELACEAE) В ТАДЖИКИСТАНЕ НА ОСНОВЕ ГЕРБАРНЫХ ОБРАЗЦОВ

Аннотация: *Таджикистан является одним из ключевых центров разнообразия рода Eremurus M.Bieb. в Центральной Азии. В настоящей работе распространение видов рода пересмотрено на основе гербарных образцов, данных Plantarium.ru и Global Biodiversity Information Facility (GBIF). Гербарные образцы рассматривались как основной проверяемый источник для формирования чек-листа. Пространственная проверка координат основной базы относительно государственной границы Таджикистана выявила 1 510 исходных записей; после удаления точных дублей осталось 1 286 уникальных записей. В очищенном наборе GBIF natural-only выявлено 113 записей из Таджикистана, 35 из*

которых были непосредственно сопоставлены с основной базой по устойчивым идентификаторам. Консервативное объединение сформировало 1 364 записи. После таксономического контроля 1 345 записей были отнесены к 25 принятым видам и E. stenophyllus subsp. ambigens. Эта цифра отражает полноту георефернцированной базы, а не полное видовое богатство флоры страны. Сопоставление видовых очерков монографии 2025 г., Flora Tadzhikskoi SSR, современной литературы и POWO/WCVP 2026 позволило предложить рабочий современный список из 33 видов для Таджикистана; присутствие E. cristatus оставлено предварительным до повторной проверки ваучерных образцов. За исключением записей GBIF с уже имеющимися координатами, исследованные гербарные образцы были индивидуально георефернцированы в Google Earth по данным этикеток. Полученный синтез создаёт воспроизводимую основу для дальнейшей таксономической ревизии, охраны и полевых исследований Eremurus в Таджикистане.

Ключевые слова: *Eremurus; Asphodelaceae; Таджикистан; гербарные образцы; чек-лист; георефернцирование; GBIF; Plantarium; POWO.*

A SPECIMEN-BASED CHECKLIST AND GEOREFERENCED OCCURRENCE SYNTHESIS OF EREMURUS M.BIEB. (ASPHODELACEAE) IN TAJIKISTAN

Abstract: *Tajikistan is one of the principal centres of diversity of Eremurus M.Bieb. in Central Asia. This study reassesses the distribution of the genus in the country using an integrated evidence base assembled from herbarium specimens, Plantarium.ru and the Global Biodiversity Information Facility (GBIF). Herbarium vouchers were treated as the primary verifiable evidence for checklist construction because their identifications, labels and geographic interpretations can be re-examined. Spatial screening of the principal working database identified 1,510 coordinate records within Tajikistan; exact duplicate removal reduced this to 1,286 unique records. The quality-controlled GBIF natural-only dataset contained 113 Tajikistan records, 35 of which matched records in the principal database through stable identifiers. Conservative integration therefore produced 1,364 occurrence records. After taxonomic quality control, 1,345 records were assignable to 25 accepted species and E. stenophyllus subsp. ambigens. This number represents direct coverage of the georeferenced occurrence dataset rather than total national richness. Examination of the "General distribution" statement for every species in the 2025 global monograph, together with Flora Tadzhikskoi SSR, recent literature and the current POWO/WCVP 2026 backbone, supports a working modern checklist of 33 species for Tajikistan; E. cristatus is retained provisionally pending renewed voucher-based confirmation. Except for GBIF records already supplied with geographic coordinates, examined herbarium specimens were individually georeferenced in Google Earth from specimen-label locality data. The resulting synthesis provides an auditable baseline for taxonomic revision, conservation assessment, historical biogeography and targeted field surveys of Eremurus in Tajikistan.*

Keywords: *Eremurus; Asphodelaceae; Tajikistan; herbarium specimens; checklist; georeferencing; GBIF; Plantarium; POWO.*

Introduction

Herbarium collections are long-term scientific archives that document the occurrence of plants in a defined place and time. A herbarium voucher can be re-examined when species concepts change, when identifications are questioned, or when historical locality information needs reinterpretation. Digitization has extended this classical taxonomic role by transforming collections into spatial and temporal biodiversity datasets that can be used for systematics, biogeography, phenology, conservation and global-change research [1–6].

For floristic checklist construction, this verifiability is particularly important. A country-level checklist should not be treated merely as a compilation of names reported in literature; ideally, the presence of each taxon should be traceable to voucher material or another critically evaluated source. Observation data are useful for extending geographic coverage, but they do not always permit the same level of taxonomic reassessment as preserved specimens.

Tajikistan is almost entirely mountainous and lies within the Pamir-Alai and adjacent Central Asian mountain systems. Its strong elevational gradients, geological heterogeneity and historical climatic dynamics have generated exceptional floristic richness and endemism. Recent analyses place the country among the major centres of plant endemism in the Mountains of Central Asia biodiversity hotspot [10, 11]. The genus *Eremurus* is one of the characteristic geophytic components of this flora.

Eremurus is distributed principally from the eastern Mediterranean and Southwest Asia through Central Asia to western China and the Himalaya. Central Asia is one of the principal centres of diversity and evolutionary history of the genus [12, 13]. The 2025 global monograph recognizes at least 61 non-hybrid species and 14 hybrid taxa worldwide and reports 52 species for Central Asia, 31 of them endemic to the region [13].

The number of *Eremurus* taxa reported for Tajikistan has varied through time because of changes in taxonomic concepts and data availability. Flora Tadzhikskoi SSR listed 28 species [8, 13]. Later biodiversity syntheses commonly referred to approximately 29 taxa, and recent work characterizes Tajikistan as a core distributional area for 29 *Eremurus*

taxa, about half of them endemic or subendemic [10]. The current study revisits this question using a combined specimen, occurrence and modern taxonomic framework.

The aims were to: (1) identify all georeferenced records attributable to Tajikistan in the supplied *Eremurus* databases; (2) remove traceable duplicate records and document data provenance; (3) evaluate taxonomic names against current accepted nomenclature; (4) compare direct occurrence evidence with the country distribution stated in the 2025 monograph and other floristic sources; (5) estimate the current working species richness of *Eremurus* in Tajikistan; and (6) provide a reproducible evidence base for future taxonomic, conservation and field studies.

Literature review

The botanical exploration of Tajikistan and the broader former Soviet Central Asian region produced extensive herbarium collections from the late nineteenth century onward. Flora Tadzhikskoi SSR remains a fundamental historical source for the flora of the country [8]. Its treatment of *Eremurus* formed the basis for many later floristic and conservation publications.

More recently, Illustrated Flora of Tajikistan and adjacent areas has provided an updated regional synthesis [9], while Plants of the World Online (POWO), using the World Checklist of Vascular Plants (WCVP), supplies a continuously updated taxonomic and country-distribution backbone [16]. These modern sources are especially valuable for reconciling historical synonyms and changing species concepts.

Tajikistan-wide biodiversity studies emphasize the country's high endemism and vulnerability to biodiversity loss [10, 11]. Raduła et al. [10] explicitly identified Tajikistan as a core distributional area for 29 *Eremurus* taxa. The Red Book of the Republic of Tajikistan (2017) lists nine *Eremurus* species of conservation concern: *E. aitchisonii*, *E. candidus*, *E. lachnostegius*, *E. micranthus*, *E. tadshikorum*, *E. hilariae*, *E. korowinii*, *E. pubescens* and *E. roseolus* [20].

Tajik research has also addressed economically and biologically important species. *Eremurus hissaricus*, for example, has been studied for root polysaccharides and traditional medicinal use, and that literature likewise notes approximately 29 *Eremurus* species in Tajikistan [15]. Such studies demonstrate that the genus is important not only for systematics and floristics but also for conservation and applied plant research.

Phylogenomic work has further reinforced the importance of Central Asia for *Eremurus* evolution. Plastome and nuclear data suggest that the traditional infrageneric classification is not fully congruent with molecular relationships and identify Central Asia as a key region in the origin and diversification of the genus [12]. This makes careful linkage between historical specimens and modern accepted names essential.

Materials and methods

Data sources

Two principal electronic datasets supplied for this study were analysed. The first, is a working compilation of historical and contemporary *Eremurus* specimen and observation records from multiple herbarium repositories and Plantarium.ru. The second, is a previously quality-controlled GBIF dataset restricted to records interpreted as belonging to natural distributions.

The principal database contains records representing LE, TAD, TASH, MW, AA and FRU, together with Plantarium.ru. These sources were integrated because a national checklist cannot be reliably reconstructed from any single herbarium alone. Importantly, the term "all herbarium data" in this paper refers to the herbarium records assembled in the supplied working database; it should not be interpreted as a claim that every physical *Eremurus* sheet preserved in every herbarium worldwide has been digitized or examined.

The GBIF quality-control workbook contains 6,420 original GBIF rows, 2,896 records with coordinates and 2,277 records retained in the global natural-only final dataset after exclusion of cultivated, botanic-garden, severe coordinate-quality and range-inconsistent records. The Tajikistan subset comprised 113 records.

Geographic screening and georeferencing

Except for GBIF occurrence records already supplied with geographic coordinates, all examined herbarium specimens represented in the working herbarium database were individually georeferenced using Google Earth. Localities were reconstructed from specimen-label information, including country, administrative unit, mountain range, river, valley, gorge, settlement, pass, road and other topographic features. Historical and variant toponyms were compared with modern geographic objects wherever possible.

Coordinates were standardized as decimal latitude and longitude in WGS84. Reconstructed historical coordinates should therefore be interpreted as georeferenced locality estimates rather than direct GPS measurements collected in the field. Border records and geographically anomalous points were checked against the locality text.

A systematic orientation problem was identified in the principal workbook: in most historical rows, the numeric values placed under the written "Longitude" and "Latitude" headers were geographically reversed. Coordinate orientation was therefore normalized from plausible Central Asian geographic ranges before spatial screening.

Duplicate control and database integration

Geographic screening of the principal database identified 1,510 raw coordinate records falling inside Tajikistan. Exact duplicate comparison across the populated record fields removed 224 repeated rows, leaving 1,286 unique records.

The GBIF natural-only subset contained 113 Tajikistan records. Catalogue numbers, occurrence identifiers, specimen/record numbers and other stable identifiers were cross-compared to reduce double counting of institutional specimens that were also exposed through GBIF. Thirty-five GBIF records matched records already represented in the principal database. The resulting conservative integrated count was therefore 1,286 + 113 − 35 = 1,364 occurrence records.

Because some duplicate digital representations may lack a shared persistent identifier, 1,364 is treated as a conservative evidence-record estimate rather than an absolute count of physically distinct herbarium sheets.

Taxonomic standardization and species-richness reconciliation

Historical names and spelling variants were standardized against POWO/WCVP 2026 and the modern *Eremurus* literature [13, 16]. Examples include *E. angustifolius* as a synonym of *E. olgae* and *E. pectiniformis* as a synonym of *E. hissaricus*. Original identifications were retained conceptually for auditability even when an accepted name was applied analytically.

The "General distribution" statement of every non-hybrid species account in The genus *Eremurus* of the world [13] was screened for Tajikistan. This produced 34 nominal species names mentioning Tajikistan when *E. alberti* is included. These names were then reconciled with the current POWO/WCVP backbone. *Eremurus ambigens* is currently treated as *E. stenophyllus subsp. ambigens* and was therefore not counted as an additional species. *Eremurus himalaicus* is accepted but its current native range in POWO is Afghanistan to the western Himalaya and does not include Tajikistan, so it was excluded pending convincing voucher evidence. Conversely, *E. zenaidae* is currently recognized by POWO as native to Kyrgyzstan, Tajikistan and Uzbekistan and was added to the national working checklist. *Eremurus cristatus* was retained provisionally because the 2025 monograph reports Tajikistan whereas the current POWO country backbone does not; voucher reassessment is required.

Accordingly, the present paper uses 33 species as the working modern checklist for Tajikistan, one of them (*E. cristatus*) distributionally provisional. A strict POWO-only interpretation would contain 32 species. *Eremurus stenophyllus subsp. ambigens* is additionally recognized at infraspecific rank.

Temporal analysis

Collection dates were standardized when interpretable. Obvious chronological anomalies and uninterpretable date fields were excluded from decade-level summaries rather than silently corrected. Approximately 1,200 reliable dated records spanning 1869–2025 were retained for temporal analysis.

Results and discussion

Structure of the integrated evidence base

The combined analysis demonstrates that the majority of the Tajikistan evidence is specimen-based and historically distributed among several major herbaria. The principal database yielded 1,286 unique Tajikistan records after exact deduplication, whereas the GBIF natural-only subset contributed 113 records. After removal of 35 directly identifiable cross-dataset overlaps, the conservative integrated dataset contained 1,364 records.

Table 1

Principal stages in constructing the Tajikistan Eremurus evidence database

Dataset / QC stage	Records
Raw principal-database coordinates inside Tajikistan	1,510
Principal database after exact duplicate removal	1,286
Exact duplicate rows removed	224
GBIF natural-only records from Tajikistan	113
GBIF records directly matched to principal database	35
Conservative integrated occurrence dataset	1,364
Records assignable to accepted taxa after taxonomic QC	1,345
Unidentified or taxonomically/geographically flagged records	19
Reliable dated records used for temporal analysis	ca. 1,200

The 1,286 unique records in the principal database were distributed among LE (664), TAD (265), TASH (249), MW (74), Plantarium.ru (29), AA (3) and FRU (2). LE therefore contributed more than half of the principal evidence base, while TAD and TASH together contributed another 514 records. This pattern shows the importance of integrating collections across national and institutional boundaries.

Table 2

Sources represented in the principal Tajikistan working database

Source	Records	Share, %
LE	664	51.6
TAD	265	20.6
TASH	249	19.4
MW	74	5.8
Plantarium.ru	29	2.3
AA	3	0.2
FRU	2	0.2
Total	1,286	100.0*

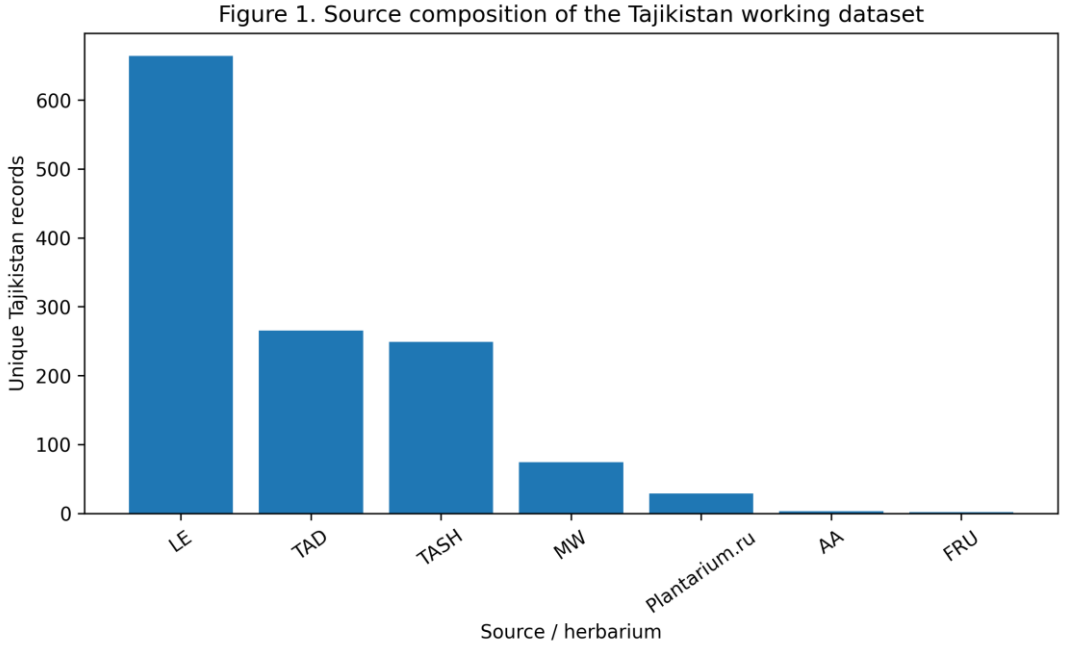


Figure 1. Source composition of the Tajikistan working dataset. Herbarium codes and Plantarium.ru refer to the sources represented in the supplied principal database.

Within the 113 Tajikistan GBIF records, 82 were PRESERVED_SPECIMEN, 27 HUMAN_OBSERVATION and four LIVING_SPECIMEN records linked to wild-source locality information. Thus, even within the GBIF layer, preserved specimens comprised the dominant evidence category.

Species richness: from occurrence coverage to a national checklist

After synonymization and quality control, 1,345 records were assignable to 25 accepted species plus *E. stenophyllus subsp. ambigens*. Nineteen records were retained outside the accepted occurrence total because they were unidentified to species or represented taxonomically/geographically questionable determinations requiring renewed examination. The occurrence-dataset richness must not be interpreted as the full flora of Tajikistan.

Table 3

Historical and current estimates of Eremurus richness in Tajikistan

Source / interpretation	Richness	Comment
Flora Tadzhikskoi SSR (1963)	28 species	Classical national flora [8, 13]
Recent biodiversity synthesis (2021)	29 taxa	Tajikistan described as a core distributional area [10]
2025 monograph species accounts	34 nominal species	Reconstructed from all “General distribution” statements mentioning Tajikistan
Current QC georeferenced database	25 species + 1 subspecies	Direct specimen/occurrence representation in the analysed databases
Present taxonomically reconciled checklist	33 species + 1 subspecies	Recommended working total; E. cristatus provisional

Strict current POWO country interpretation	32 species + 1 subspecies	Excludes provisional E. cristatus

Table 4

Working modern checklist of Eremurus species in Tajikistan

No.	Accepted species	Evidence status in this study	Notes
1	*Eremurus aitchisonii*	Database-supported	Red Book: VU
2	*Eremurus alberti*	Database-supported	Pamir-Alai; type locality near Kulob region
3	*Eremurus altaicus*	Database-supported	Widespread Central Asian mountain species
4	*Eremurus brachystemon*	Database-supported	Tajikistan endemic in 2025 monograph
5	*Eremurus buchаricus*	Database-supported	Tajikistan–N Afghanistan regional endemic
6	*Eremurus candidus*	Database-supported	Tajikistan endemic; Red Book: VU
7	*Eremurus comosus*	Database-supported	Pamir-Alai / Alay
8	*Eremurus cristatus*	Literature-supported; provisional	Voucher and country-distribution reassessment required
9	*Eremurus fuscus*	Database-supported	Pamir-Alai and Tian Shan
10	*Eremurus hilariae*	Database-supported	Red Book: CR
11	*Eremurus hissaricus*	Database-supported	Gissar–Zarafshan; E. pectiniformis synonymized
12	*Eremurus iae*	Literature-supported	Pamir-Alai; Chulbair region
13	*Eremurus inderiensis*	Literature-supported	Current POWO also includes Tajikistan
14	*Eremurus kaufmannii*	Database-supported	Pamir-Alai
15	*Eremurus korowinii*	Literature-supported	Red Book: EW
16	*Eremurus korshinskyi*	Database-supported	Afghanistan–Pakistan–Tajikistan
17	*Eremurus lachnostegius*	Literature-supported	Red Book: VU
18	*Eremurus luteus*	Literature-supported	Afghanistan–Iran–Central Asia
19	*Eremurus micranthus*	Literature-supported	Tajikistan endemic; Red Book: VU
20	*Eremurus olgae*	Database-supported	Includes historical E. angustifolius
21	*Eremurus parviflorus*	Database-supported	Pamir-Alai regional endemic
22	*Eremurus pubescens*	Database-supported	Red Book: EW
23	*Eremurus regelii*	Database-supported	Pamir-Alai / Tian Shan
24	*Eremurus robustus*	Database-supported	Mountain meadows
25	*Eremurus roseolus*	Database-supported	Red Book: CR
26	*Eremurus saprjagajevii*	Database-supported	Tajikistan endemic in 2025 monograph
27	*Eremurus soogdianus*	Database-supported	Pamir-Alai / Tian Shan
28	*Eremurus stenophyllus*	Database-supported	Accepted species; widespread in SW/Central Asia
29	*Eremurus suworowii*	Database-supported	Pamir-Alai
30	*Eremurus tadshikorum*	Database-supported	Tajikistan endemic; Red Book: VU
31	*Eremurus tianschanicus*	Database-supported	Tian Shan / Pamir-Alai

32	*Eremurus turkestanicus*	Database-supported	Central Asian mountain endemic
33	*Eremurus zenaidae*	POWO-supported	Current POWO includes Tajikistan; absent from 2025 monograph Tajik distribution

The reconciliation highlights why checklist richness and occurrence-database richness answer different questions. The national checklist summarizes critically evaluated taxonomic knowledge, whereas the occurrence database documents the individual georeferenced records presently available for analysis. Eight checklist species are currently absent from, or not reliably represented in, the accepted georeferenced occurrence subset: *E. inderiensis*, *E. micranthus*, *E. cristatus*, *E. iae*, *E. korowinii*, *E. lachnostegius*, *E. luteus* and *E. zenaidae*. Their absence from the final coordinate dataset should therefore be interpreted as a digitization, georeferencing or verification gap rather than proof of biological absence.

Table 5

Accepted taxa represented in the conservative integrated georeferenced dataset

Accepted taxon	Merged records
Eremurus stenophyllus	309
Eremurus robustus	153
Eremurus parviflorus	148
Eremurus soogdianus	148
Eremurus olgae	143
Eremurus suworowii	72
Eremurus comosus	51
Eremurus hissaricus	48
Eremurus altaicus	46
Eremurus alberti	39
Eremurus fuscus	35
Eremurus kaufmannii	31
Eremurus turkestanicus	27
Eremurus korshinskyi	16
Eremurus regelii	14
Eremurus aitchisonii	13
Eremurus stenophyllus subsp. ambigens	12
Eremurus brachystemon	10
Eremurus tianschanicus	10
Eremurus roseolus	6
Eremurus bucharicus	5
Eremurus hilariae	3
Eremurus saprjagajevii	2
Eremurus tadshikorum	2
Eremurus candidus	1
Eremurus pubescens	1

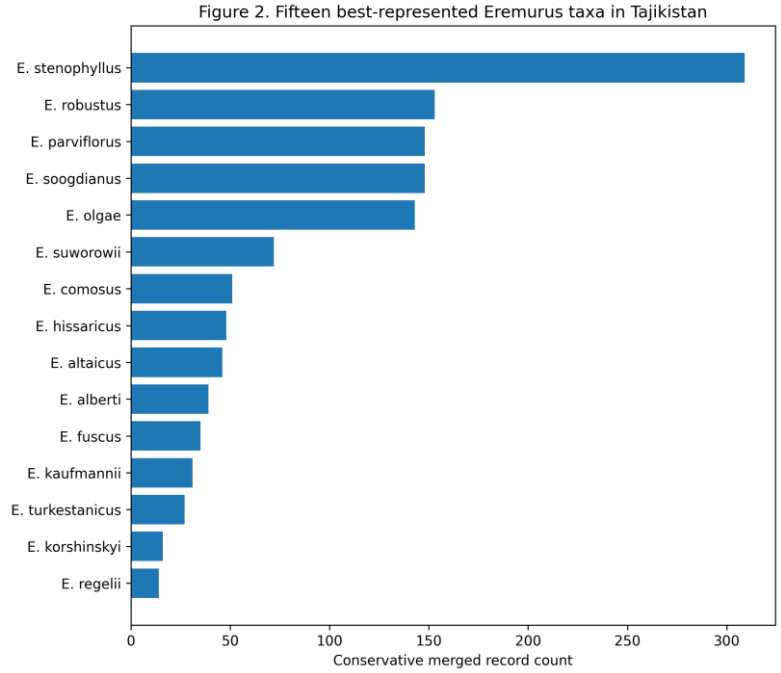


Figure 2. Fifteen best-represented *Eremurus* taxa in the conservative integrated Tajikistan dataset.

The best-represented species were *E. stenophyllus* (309 records), *E. robustus* (153), *E. parviflorus* (148), *E. soogdianus* (148) and *E. olgae* (143). These counts quantify documentary representation rather than population abundance. Collection effort, taxonomic history, accessibility and digitization intensity all influence record counts.

Geographic pattern

The 1,286 unique records in the principal herbarium/Plantarium layer form a broad spatial network across Tajikistan, with concentration in historically accessible mountain valleys and collecting routes. The distribution pattern corresponds primarily to the Pamir-Alai and associated ranges, but the point density is strongly affected by collecting history. Consequently, the map should be interpreted as a map of documented botanical evidence, not a census of population density.

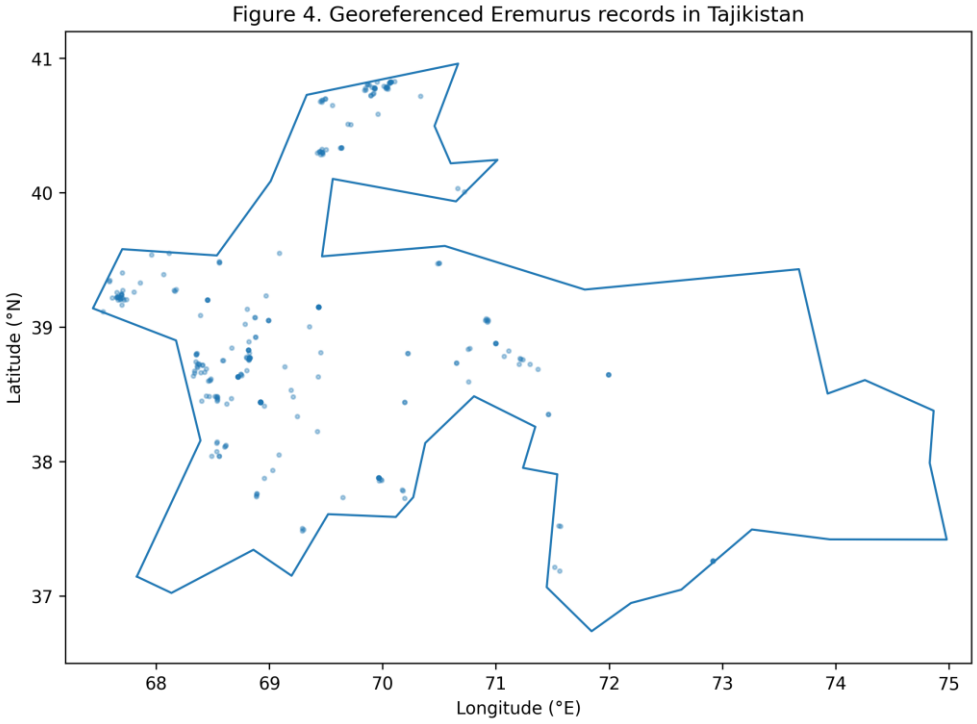


Figure 4. Georeferenced *Eremurus* records from the principal herbarium/Plantarium database falling within Tajikistan. Historical coordinates were reconstructed from specimen labels and are not equivalent to field-measured GPS points.

Historical dynamics of botanical collecting

Table 6

Dated Eremurus records by decade

Decade	Records
1860s	1
1870s	4
1880s	29
1890s	16
1900s	17
1910s	98
1920s	37
1930s	291
1940s	167
1950s	153
1960s	244
1970s	27
1980s	15
1990s	6
2000s	4
2010s	63
2020s	28

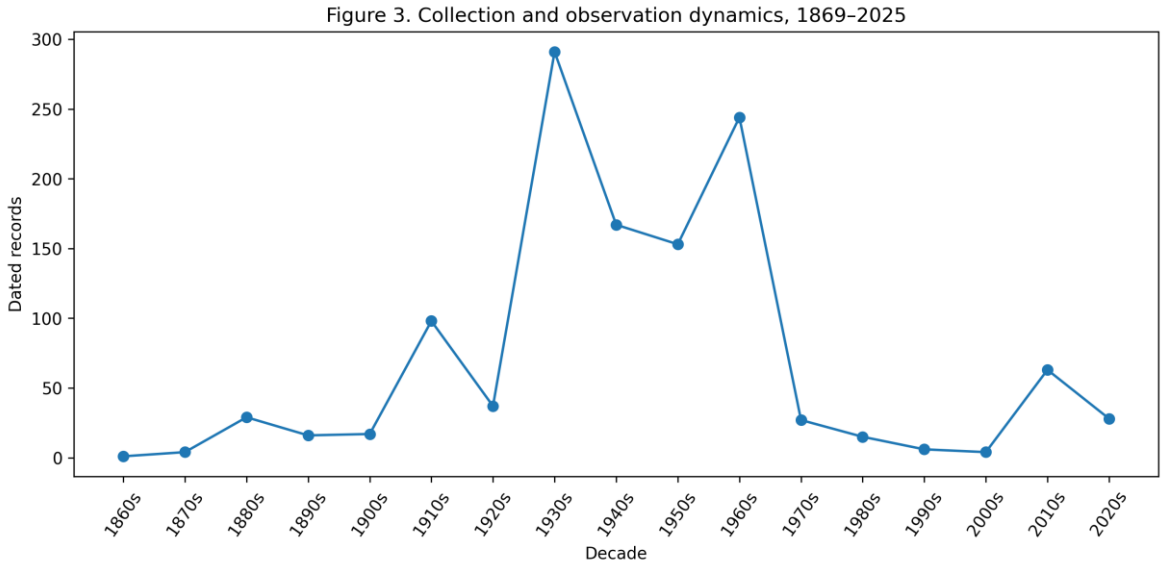


Figure 3. Collection and observation dynamics of the reliable dated Tajikistan records, 1869–2025.

The temporal series shows pronounced collecting maxima in the 1930s (291 records) and the 1960s (244 records). These peaks reflect intensified botanical exploration rather than changes in natural abundance. Historical specimens nevertheless provide an important baseline for identifying repeated localities and for future comparison with modern field observations.

Conservation implications

The Red Book of the Republic of Tajikistan (2017) lists nine *Eremurus* species: *E. aitchisonii* (VU), *E. candidus* (VU), *E. lachnostegius* (VU), *E. micranthus* (VU), *E. tadshikorum* (VU), *E. hilariae* (CR), *E. korowinii* (EW), *E. pubescens* (EW) and *E. roseolus* (CR) [20]. Historical herbarium vouchers are especially valuable for these taxa because they may preserve the only verifiable evidence for former populations or localities that have not been recently confirmed.

The occurrence gaps identified in this study provide a practical survey agenda. Literature-supported species missing from the quality-controlled coordinate dataset should be targeted first for herbarium digitization and re-georeferencing, followed by field verification of historical localities. Particular priority should be given to narrow endemics and Red Book taxa.

Scientific novelty and practical significance

The novelty of this study lies in combining several evidence layers within one quality-controlled workflow: historical herbarium records, Plantarium.ru occurrences, GBIF natural-only records, modern taxonomic reconciliation and country-level floristic literature.

The analysis independently screens coordinates against Tajikistan, documents duplicate removal, distinguishes voucher-based evidence from observations, identifies coordinate-orientation errors in the source workbook, standardizes synonyms, and explicitly separates direct occurrence coverage from national checklist richness.

Practically, the resulting framework can be used to prioritize specimen revision, direct future expeditions, identify historical localities requiring resurvey, support Red Book assessments, and prepare specimen-level supplementary data for international biodiversity infrastructures.

Study limitations

First, coordinates reconstructed from historical labels are estimates and may carry substantial uncertainty where toponyms are broad, obsolete or ambiguous. They should not be equated with GPS measurements taken at the time of collection.

Second, exact duplicate removal and stable-identifier matching cannot detect every possible duplicate. Two databases may represent the same physical sheet using different identifiers or slightly different transcriptions.

Third, occurrence density is strongly biased by expedition history, accessibility and digitization. Record counts are not a proxy for population size or abundance.

Fourth, the national checklist is constrained by the taxonomic concepts adopted. The case of *E. stenophyllus subsp. ambigens* illustrates how species-level richness changes when a taxon is treated at species versus subspecies rank.

Fifth, the status of *E. cristatus* in Tajikistan remains unresolved in the present synthesis because the 2025 monograph and current POWO country backbone are not fully concordant. The original voucher material and locality evidence should be re-examined before the record is treated as unambiguously confirmed.

Finally, the phrase “all herbarium data” is restricted to the records assembled in the supplied databases. Additional non-digitized specimens may remain in regional and international collections.

Conclusions

The integrated analysis demonstrates that Tajikistan possesses one of the richest national assemblages of *Eremurus*. The principal coordinate database yielded 1,510 raw Tajikistan records and 1,286 unique records after exact duplicate removal. Integration with 113 GBIF natural-only records, while removing 35 directly traceable overlaps, produced a conservative total of 1,364 occurrence records.

After taxonomic quality control, 1,345 records provide direct georeferenced evidence for 25 accepted species plus *E. stenophyllus subsp. ambigens*. This figure describes the present specimen/occurrence database, not total floristic richness.

Critical comparison of the 2025 global monograph, Flora Tadzhikskoi SSR, recent Tajikistan biodiversity literature and current POWO/WCVP supports a working modern checklist of 33 species for Tajikistan, with *E. cristatus* retained provisionally pending voucher confirmation. Under a strictly current POWO country assignment, 32 species are accepted, plus *E. stenophyllus subsp. ambigens*.

Except for GBIF occurrences already supplied with coordinates, examined herbarium specimens were individually georeferenced using Google Earth from specimen-label locality information. This preserves the value of historical collections while making their spatial uncertainty explicit.

Herbarium vouchers remain indispensable for checklist research because their identities, labels and geographic interpretations can be revisited. The combined specimen, literature and digital-occurrence approach used here provides a reproducible foundation for future taxonomic revision, targeted collection, conservation assessment and historical-biogeographic analysis of *Eremurus* in Tajikistan.

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РАЗРАБОТКА ТЕХНОЛОГИИ РЫБНЫХ КОРМОВ ИЗ ВТОРИЧНОГО СЫРЬЯ, БОГАТОГО БЕЛКАМИ

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Аннотация: *В статье приведен анализ образующихся вторичного животного и растительного сырья, богатого белками. Приведены анализы литературных данных о химическом составе, пищевой и биологической ценности вторичного сырья животного и растительного происхождения. Также изучены технологии переработки вторичного сырья растительного и животного происхождения. Даны методики проведения экспериментов, технологические схемы, технологические параметры, рецептуры кормов, богатых белками приготовленные из вторичного животного и растительного сырья.*

Ключевые слова: *корм для рыб, протеин, белок, клетчатка, жир, микробиологический показатель, тяжелые металлы, пестициды, вторичное сырьё, костная мука, бычья шкура.*

DEVELOPMENT OF TECHNOLOGY FOR PROTEIN-RICH FISH FEED FROM SECONDARY RAW MATERIALS

Abstract: This article analyzes protein-rich secondary raw materials of both animal and plant origin. It reviews literature regarding the chemical composition, as well as the nutritional and biological value, of these materials. Processing technologies for secondary raw materials of plant and animal origin are also examined. The paper presents experimental methodologies, process flow diagrams, processing parameters, and formulations for protein-rich fish feeds produced from these secondary raw materials.

Keywords: fish feed, protein, fiber, fat, microbiological indicators, heavy metals, pesticides, secondary raw materials, bone meal, bovine hide.

Преобразования в последние годы коснулись все отрасли экономики и сельского хозяйства. В настоящее время можно ощущать положительные сдвиги во всех сферах народного хозяйства. Наибольшие положительные результаты также получены в сфере рыбоводства. Раньше этот продукт питания практически был дефицитом и в основном потребность населения в этом пищевом сырье обеспечивалось благодаря поставкам замороженных рыб из России и Казахстана, Азербайджана, также рыбными консервами. Благодаря особому вниманию правительства пашей республики и проводимым реформам в отрасле рыбоводства расширился ассортимент рыб, улучшилась качества, снизился стоимость продукции, обеспечение стало круглогодичным.

Постановка проблемы: На основании принятых указов и решений Правительством по развитию рыбоводства были достигнуты успехи по выращиванию рыб. На основании этих указов выделяются земли, льготные кредиты, обеспечивается породистыми личинками рыб. В последнее время все шире применяют интенсивные методы выращивания рыб. Это также способствует увеличению количества выращиваемых рыб.

Все вышеуказанные позитивные работы способствует улучшению обеспечения населения рыбными продуктами. С развитием отрасли, увеличением выращиваемых рыб, образованием новых водоемов возникает другая проблема: Проблема кормов для рыб. Как общеизвестно производство кормов для рыб в нашей республике не сильно развита. Во многих фермерских хозяйствах рыб кормят комбикормами и их потеря очень велика. Корм или комбикорма выбрасывают в воду и освоение этих кормов составляет 40-50% , а остальнае часть корма загрязняет воду. И оседая на дно озер гниют. Это тоже приводит к подорожанию готовой продукции. Проведенные нами исследования показывают, что в европейских стран при потреблении кормов 1 кг привес рыб также составляет 1 кг, а потери до 10 % от объема кормов. Эти корма также не загрязняет воду и богатый

дрожжами, жирами, витаминами, минералами и другими веществами, которые необходимы для хорошего развития рыб.

Учитывая вышесказанные нами была сформулирована цель создания кормов для рыб из местного вторичного животного сырья богатого протеинами и разрабатываемый корм имел все вышесказанные характеристики.

Так нами была выбрана разработка технологии кормов богатого протеинами, нам необходимо было критически анализировать существующие технологии, их ингредиенты, основные компоненты входящих в состав рецептур.

Мы анализируя рецептуры кормов для рыб, также изучали возможности получения рецептурных компонентов непосредственно в нашей республике. Это также влияет на образование цен рыбных кормов.

Литературный обзор: Анализируя рецептурные компоненты рыбных кормов мы выявили, что основным источником протеинов является сырьё животного происхождения. Здесь необходимо учесть тот фактор, чтобы этот компонент не способствовал к подорожанию выпускаемого продукта т.к. продукты животного происхождения стоит дорого. Учитывая эти особенности мы взяли в качестве мясного компонента бычью и каровью шкуру. Нам необходимо было изучить химический состав этого сырья т.к, стоимость и распространенность приемлемое и в достаточном количестве.

Анализ литературных источников показывает, что бычья шкура один из важнейших продуктов убоя крупного рогатого скота. Она составляет около 7-8% всей убойной живой массы.(1). По данным авторов тяжелые шкуры весом 27-37,5 кг получают в 15 месячном возрасте. Данные авторов Г.Р. Залялюдинова и др (2) свидетельствует, что в химический состав шкуры входят органические и неорганические вещества. К органическим веществам относится: белки, жиры, углеводы, ферменты, гормоны, витамины.

Авторами работы (3) установлено, что у всех животных масса шкур возрастает равномерно с живой массой тела. В 6-месячном, 1,5-гадовалом и 3-годичном возрасте % выход шкур от живой массы значительно превышают аналогичные показатели чем другие животные.

Авторами (3) исследования установлено, что наиболее приемлемыми для дальнейшего использования и переработки шкуры крупного рогатого скота являются в возрасте 3-4 лет.

В указанном возрасте шкуры крупного рогатого скота достигнет наибольшего объема, и имеют наилучший химический состав.

Как мы раньше говорили, в химический состав шкуры крупного рогатого скота входят вода, белки (коллаген, эластин, ретикулин, муцины и мукоиды, альбумины и глобулины), липиды, минеральные вещества, мукополисахаридные экстрактивные вещества, гликоген, витамины. (4). Наиболее распространённым белком в шкуре, соединительной ткани является коллаген. По количеству в организме он составляет около $^1/_3$ всех белков. По данным авторов (4) содержание коллагена в различных тканях (в % к сырой ткани)

Сухожилия	25-35
Кости	10-20
Хрящи	10-15
Кожа	15-25
Стенки сосудов	5-12
Почки	0,4-0,6
Печень	0,1-1
Мозг	0,2-0,4

Коллаген характеризуется некоторыми особенностями аминокислотного состава. В нем очень мало тирозина, метионина и нет триптофана, цистеина и цистеина, поэтому этот белок неполноценный.(4). Свойства коллагена заключается в том, что он сильно набухает, причем его масса увеличивается в 1,5-2 раза. Так как мы при приготовлении кормов для рыб взяли шкуру крупного рогатого скота, анализировали способность набухания в средах при 5,0-7,0. По данным авторов она по набуханию уступает миозину (масса набухшего белка взята в % к массе сухого):

Коллаген	200
Миозин	300
Ретикулин	30
Эластин	25
Кератин	40

Фиброин	32

По литературным данным (5) содержание воды составляет 64-68%, сухое вещество 32-36%. На долю белковых веществ приходится примерно 90-95% от массы сухого вещества шкуры (5). Количество липидов в шкурах колеблется в пределах 3-10%. Углеводы содержатся в шкуре в небольших количествах 1,5-2%.(5). Минеральные вещества шкуры в основном представлены ионами калия и натрия, а также небольшими количествами ионов кальция, железа, магния, алюминия, цинка и др. Содержание минеральных веществ не превышает 0,8% от массы сухого вещества шкуры. Это компоненты шкуры играют существенную роль в физиологических процессах, ответственных за формирование морфологических структур, а также обуславливает наличие целого ряда ценных свойств шкуры. Поэтому нам необходимо анализировать работы об изменениях химического состава и свойствах в процессах первичной обработки и дальнейшего производства.

Имея некоторые представления о химическом составе шкуры крупного рогатого скота, нам необходимо изучить научные исследования по изучению изменений происходящих в процессе первичной обработки.

На качество шкуры крупного рогатого скота влияют первичная обработка. В доменных условиях (5) сырьё сначала окунают на 4 часа в чистую воду, после того на протяжении 12 часов его выдерживают в солевом растворе, что готовится из расчёта 20 гр соли на 1л воды. Здесь необходимо учесть, что шкура начнет набухать и необходимо заготовить на килограмм 8л жидкости. Потом идёт удаление жирного покрова, мойка, покалывание, дубление, жировка и другие процессы.(5). В литературных источниках отмечают, что длительность технологических операций по обработке шкурах до консервирования, включая обрядку не должна превышать для крупного рогатого скота 3 часа(6).

В промышленности в цехах по обработке шкуры крупного рогатого скота устанавливают чаны для промывки и дезинфекции шкур, барабаны для поселки, пикеливания и промывки сырья, подмостки или стеллажи, мездрильные, навалосгоночные и отжимные машины.(7). Шкуры крупного рогатого скота в промышленности консервируют мокросоленым способом. По данным авторов на 1 кг парной шкуры крупного рогатого скота идет 4 л солевого раствора длительность тузлукования в бурсаках чанов 18-20 ч, и для стекания раскола развешивают в течение 1-2 часа. В настоящее время шкуру крупного рогатого скота консервируют радиоактивным облучением.(8).

Для удаления волосяного покрова из шкуры крупного рогатого скота используют известь. Для приготовления известкового раствора берут 3 л воды на 1 кг извести.(9). Учеными ведутся разработки ферментативного обезволосывания шкур (10). Сущность данного действия заключается в том, что ферментативное обезволосывания шкур крупного рогатого скота проводят в растворе фермента коллагенолитической протеазы из гепатопанкреатина в количестве 0,001-0,005% от массы сырья, а при солении используют сульфид натрия в количестве 0,5-1,1% от массы сырья (10). По мнению авторов метод обеспечивает сокращения длительности процесса, улучшается качество, и за счет интенсификации повышается экономическая эффективность (10). В работе исследователи (11) был использовань метод обработки шкуры крупного рогатого скота используя жидкий азот в течении 3-20 мин. В работах (12,13,14,15,16) также авторами проведены исследовательские работы по интенсификации процесса обезвоживания.

Вышепреведенный анализ подготовки бычьей шкуры показывает, что оно также имеет особое значение при производстве различных видов продукции, в том числе кормовом производстве. При разработке технологии корма для рыб с использованием бычьей шкуры будем учитывать этот фактор.

Тенерь рассмотрим и анализируем технологии приготовления кормов для разных видов рыб.

Исследователи М.Д. Мукатова и др (17). Разработали рецептуру рыборастительной кормовой смеси

Таблица 1

№	Наименование ингредиента	Соотношение %
1	Измельченные рыбные отходы	41,2
2	Карбамид	0,24
3	Отходы от разделки речных раков	18,8
4	Водное растение рдест пронзеннолистный	2,94
5	Отруби пшеничные	17,0
6	Соевый изолят	2,94
7	Плотны ходок корня солодки	0,59
8	Молочная сыворотка	3,1
9	Прессованные хлебопекарное изделие	1,4
10	Вода горячая	11,8

11	Итого	100

При сравнительном анализе качественных показателей она имеет внешний вид формы гранулы цилиндрической с неравномерной поверхностью и мелкими порами, цвет темно коричневый, запах свойственный набору входящих в рецепт комбикорм компонентов, без затхлого, плесневелого и других посторонних запахов.

Авторы установили (17) возможность использования рыборастительных кормов на основе измельченных рыбных отходов с внесением сухих ингредиентов с выходом сухих гранул, содержащих воду не более 10%, в количестве 43% от массы корм смеси и в пересчете на исходную массу рыбных отходов и выявлена хорошая посдаемость опытной партии.

К использованию вторичных рыбных ресурсов рыбной промышленности как источник пищевых и биологических добавок посвящена работа авторов Самойловой Д.А, Цибизова М.Е. (18).

Ученые из Казахстана В.И.Сидорова, Н.И.Январова, С.Ж.Асылбекова и др (19) разработали новую технику и технологию для рыбных кормов. Разработанная рецептура комбикормов для форели авторами исследований включает следующие ингредиенты:

Нормы ввода компонентов в комбикорма для форели,%

Таблица 2

№	Компонент	Форел	
		сеголетки	Товарная рыба
1	Пшеница	0-20	0-30
2	Отруби пшеничные	0-5	0-7
3	Соя полно жирная	0-7	0-7
4	Шрот соевый	0-20	0-40
5	Дрожжи кормовые	0-15	0-15
6	Мука: рыбная	0-70	0-50
7	Мясокостная	0-5	0-10
8	Мука кровяная	0-10	0-5
9	Глютин кукурузный	0-15	0-30
10	Пшеничный зародыш	0-10	0-40
11	Пшеничная клейковина	0-10	0-5
12	Соевый изолят	0-10	0-5
13	Молоко сухое обезжиренное	0-10	0-5
14	Жир рыбий	0-15	0-30
15	Масло подсолнечное	0-3	0-5

Анализ состава рецептур основных компонентов показывает, что авторы выбрали богатые белками продукты, но некоторые из них являются микробнообсеменными.

Авторы (18) также исследовали физико-механические свойства комбикормов для форели.

Физико-механические свойства комбикормов для форели

Таблица 3

№	Показатель	Рецепт комбикормов для форели	
		стартовый	продукционный
1	Влажность,%	8,8	8,03
2	Цвет	Темно-коричневый	Темно-коричневый
3	Запах	Приятный рыбный	Приятный рыбный
4	Объемная масса кг/м^3	613,1±11,2	563,8±8,5
5	Размер гранул мм	2	5

6	Водостойкость, мин	825±35,5	725±35,5
7	Разбухаемость, мин	122±15	90±20
8	Крошимость, %	2,5±0,034	2,5±0,022
9	Коэффициент водопоглощения	0,83±0,002	0,73±0,002

Как показывает анализ данных табл.4. стартовый корм не уступает по всем своим показателям к продуктивным.

Авторы вышеприведенного исследования также разработали технологию экстрадированных стартовых комбикормов для молоди судака, тиляпи и кларисвого сома (20). Представленные комбикорма представляют собой крупки размером 0,2 мм, 0,5 мм, 1 мм, 2 мм. Цвет крупок варьировалось от темно коричневого до светло коричневого, значение водостойкости составляет не менее 2,5 часов, крошимость и не более разбухаемость 1,5% минут, объемная масса ниже 1000кг/м³. Эти показатели практически не уступают стартовой продукции.

В работе С.Л.Чернявская, Л.М.Есина, А.С.Виннов, О.Н.Кривонос разработали (21) технологию кормовых продуктов из мелких азово-черноморских рыб: авторы исследования исследовали химический состав сырья использованного при производстве кормов

Химический состав рыбного и растительного сырья

Таблица 5

Показатели	Хамса	Широш	Тюлька	Тщеница	Кукуруза
Белок %	14,1±0,8	13,3±0,8	15,3±0,9	10,6±0,8	9,0±0,7
Жир %	17,5±0,9	6,5±0,5	17,4±0,8	1,7±0,8	4±0,2
Зола %	1,7± 0,1	2,9±0,1	2,5±0,1	1,6±0,09	1,3±0,09
Вода %	66,7 ±2,7	76±3,3	64,8±2,2	4,4±1,0	13±0,1

Авторы доказали, что использование данных видов рыб в качестве белково жировых компонентов является целеобразным. Как видно из анализов рецептур комбикормов для рыб для обогащения их белками используют мясокостную муку, рыбные отходы, кровяную муку, рыбную муки и некоторое растительное сырьё, которое богато белками.

В исследовательской работа Н.В.Сорокиной (22) комбикорма для осетровых рыб разработали с использованием тыквенного жмыха. Авторы предложили следующий состав комбикормов:

Рецепт продукционного комбикорма для осетровых рыб

Таблица 6

Кормовые компоненты	Содержание, %
Мука рыбная	50
Тыквенный жмых	10
Витазар	20
Дрожи кормовые	10
Пшеница	3
Жир рыбий	6
Премикс ВМП ПО-1	1

По заключению авторов этот комбикорм отличается высоким содержанием протеинов и липидов, которое является важнейшим питательным продуктом при кормлении осетровых рыб. (22) Добавление в рецептуру дрожжей также способствовало обогещию протеинами, у которого количество сырого протеина составляет 45,5 %.

По утверждению авторов введения в рецептуру тыквенного жмыха способствиует обогащению витаминами, минералами, клетчаткой, что благотоверно влияет на пищеварения осетровых рыб.

Авторы также исследовали содержание в нем основных питательных веществ отдельных компонентов.

Состав продукционного комбикорма с тыквенным жмыхом и содержание в нем основных питательных веществ отдельных компонентов

Таблица 7

Показатель	Мука рыбная жирная	Дрожжи кормо	Жмых тыквенный	Жыр рыбий	Пшеница	Витазар	Прямике	Комбикорм

		вые сухие						
Содержание компонентав в состава комбикорма,	50	12	10	4	3		2	1
Сырой протеин, г/кг	267,5	54,6	36,8	-	4,0	64,9	-	428
Сырой жир,г/кг	54,0	1,8	11,3	39,2	0,6	16	-	123
Сырая клетчатка, г/кг	-	0,2	30,2	-	0,5	8,4	-	39
Безазотистые в-ва	47,5	42,1	7,7	-	19,8	76	-	193
Сырая зола, г/кг	81,0	9,2	4,9	-	0,6	14	-	110

По результатам исследований авторы достигли гарантированных величин индикаторных показателей протеиновой и липидной питательности: сырого протеина -42,8 %, сырого жира-12,3 %, клетчатки-3,9 % . Авторы указывают, что содержание сырого протеина в опытном превышает 1,18 раз чем контрольный, сырого жира 1,29 раза больше, чем в контрольном, а массовая доля клетчатки 1,77 раза выше, чем в контрольном.

В работе Габеевой А.Р., (23) исследовано возможность использование канычи для приготовления кормов зеркалного карпа. Авторы вводими в цион как источник белкововитаминной добавки при нагуле карпа и они установили и эффективности использования канычи для выращивания карпа. (23)

Кошак Ж.В., Гадлевекая Н.Н анализировали ассортимент и показатели кормов для радужной форели в республике Беларус. По заключению авторов корм для форели в основном завозят из за рубежа. Авторы указывают что свойства отечественных кормов для форели не всегда отвечает современным требованиям, что приводит к более высоким затратам кормов на килограмм прироста живой массы, загрязнению окрутающей среды и повышенным непроизводительным затратам. По нашему мнению такая же обстановка в кормо производстве для рыбы в нашей республике.

Все качественные корма рабовладельческие хозяйства завозят из-за рубежа. Они качественные, богатые, белками, жирами, витаминами, углеводами. Но их высокая стоимость влияет на стоимость готовой продукции.

Исходя из вышеприведенных можно сделат вывод о том что необходимо наладить производство отечественных комбикормов для рыб в нашей республике. Анализ существующих технологий показывает, что в нашей республике имеются все компоненты для производества рыбных кормов. Надо развивать отечественную отрасль кормопроизводства для рыб.

Мы анализируя существующие технологии пришли к выводу что на этих технологиях имеются ряд недостатков:

-используют мясокостную муку, которая значительно влияет на себестоимость кормов;

-в некоторых кормах используют кровяную муку и она имеет особый запах, что снижает качество кормов;

- многие технологии приготовления проводятся с отработкой высокой температурой, что снижает пищевую и биологическую ценность кормов.

Исходя из вышеприведенных нами была разработана технология при приготовлении рыбных кормов богатого протеинами, на основе вторичного животного сырья богатого белками. Для проведения исследований были выбраны следующие методы исследований и материалы.

Материали и методы исследований:

Материалами для проведения исследовательских работ были выбраны бычья шкура ГОСТ 28425-90 (25), мука кукурузная ГОСТ14176-69 (26), из рисовой сечки ГОСТ 6292-93 (27), мука из пшеничных отрубей ГОСТ 7169-66 (28), соевого жмыха ГОСТ 3898-56 (29), мясокостная мука ГОСТ 59296-2021 (30). Все выбранные продукты отвечали требованиям вышестоящих ГОСТов.

В работе использовали бычья шкура, полученная в убойном цехе животных города Намангана мука кукурузную, рисовую, приобрели на рынках города Намангана. Мясокостную муку получили путем нагревания костей в муфельных печах и с последующим измельчением. Соевый жмых получили с масло заводов г Учкургана.

Для приготовления кормов для рыб, из бичей шкуры удалили во лосяной покров и измельчали, после чего сушили методом атмосферной сублимационной сушки и сушеную шкуру измельчали, получали порошок.

В экспериментах использовали корм, полученный по разработанной технологии.

Для получения средней пробы кормов для рыб отбирали пробы от трёх образцов одного вида кормов, смешивали их и получали средную пробу согласно по ГОСТ 26929 в количестве 1% от массы корма, но менее 500-600г. Все эксперименты в производственных и лабораторных условиях проводили в пятикратной повторности, результаты экспериментов подвергались статистической обработке по методу наименьших квадратов (7)

Объектом исследования настоящей работы является рыбный корм полученный из вторичного животного и растительного сырья.

В лабораторных условиях кафедри Биотехнологии были разработаны рецептуры и технологические схемы кормов для рыб.

Были исследованы основы физико-химические, микробиологические показатели, а также безопасность и пригодность кормов для рыб.

Влажность рыбных кормов исследовали по ГОСТ 10385-2014 (31). Пробу рыбных кормов сушили в сушилном шкафу в течении 4 часов при 105^0С до постоянной массы. Сырой протеин определяли по ГОСТ 10385-2014 (32), сыров жир исследовали по ГОСТ 20385-2014 (33), без азотистые экстрактивные вещества по ГОСТ 10385-2014 (34), сырую клетчатку в рыбных кормах определяли по ГОСТ 10385-2014 (35), и исследовали содержание золы по ГОСТ 10358-2014 (36) в исследуемом образце. Также были исследованы содержания тяжелых металлов свинца, по ГОСТ 26932-80 (37), кадмия по ГОСТ 26932-80 (38), ртути по ГОСТ 26927-80 (39), мышьяка по ГОСТ 26930-86 (40), йода по OzDst 1091:2011 (41), содержание α, β, γ- ГХЦГ (11), метоболиты ДДТ по МУ 012-300/10 (42).

Результаты исследования и их обсуждения:

При разработке новых технологических схем и рецептур, необходимо учесть основные технологические принципы, такие как наилучшее использование сырья, сокращения времени проведения процесса, рациональное использование энергии и оборудования, оптимальный вариант. Эти принципы соблюдают с учетом фундаментальных физико-химических и биологических закономерностей а также закономерностей экономики и кибернетики. Необходимо иметь ввиду, что фундаментальные законы дают лишь качественную характеристику технологического процесса, а для эффективности нужна количественная оценка.

Необходимо ещё учесть, что стоимость готовой продукции завесить от стоимости исходного сырья. Полное использование сырья является одним из основных методов снижения удельных затрат на производство готовой продукции. При анализе и синтеза технологических схем необходимо составить материальный баланс. Он позволяет оценить степен использования исходного сырья и установить этапы процесса, на которых его используют более эффективно.

При разработке рецептур новых продуктов здесь необходимо иметь ввиду что ценообразования зависит от исходного сырья и целесообразно это учесть.

Повышенный расход сырья приводит к снижению производительности технологической линии по готовому продукту, увеличению затрат труда, топлива, электроэнергии и воды на единицу продукции.т.е.к повышению её себестоимости.

Основная задача нашей исследовательской работы заключается в снижении себестоимости, повышению пищевой и биологической ценности кормов.

Учитывая вышеизложенное нами были проанализированы рецептуры существующих кормов для рыб, а также изучены состав сырья, которое способствует увеличению и обогащению белками этих кормов, а также учитывалось себестоимость и доступность этих видов сырья.

Исходя из вышесказанных нами была изучен бычья шкура как источник белковой основы рыбных кормов.

Данные о химическом составе бычьей шкуры приведены в литературном обзор этой статьи. Технология приготовления кормов для рыб с повышенным содержанием белка заключается в очистке волосяного покрова с обработкой щелочью, выдерживанием в течении суток и последующем после очистки шкуры его выдерживают в растворе уксусной кислоты в течении суток, после чего тщательно моют в проточной холодной воде и промытая бычья шкура измельчается в измельчителе, после чего мелкоизмельченному бычье шкуре дают форму пластов толщиной 8-12 мм и замораживает при температуре -18^0 С, замороженные пласты сушат в атмосферном сублимационном сушке в течении 7-8 часов, после чего измельчают, просеивают через сито № 0,28 и в просеянный порошок бычьей шкуры добавляют просоленную муку кукурузную, просеянную муку рисовой сечки, просеянную муку из семян амаранта, просеянную муку из соевого жмыха и просеянную мясо-костную муку, смешивают, смесь вводят в экструдер при непрерывном перемешивании желатинируют крахмал и дают форму сушат и сверху обрабатывают пищевым парафином.

Рецептура рыбного корма богатого протеинами из вторичного животного и растительного сырья

№	Наименование сырья	Количество, гр		
1	Мука из шкуры крупного рогатого скота	45	50	55
2	Мука кукурузная	10	9	8
3	Мука из рисовой сечки	5	4	3
4	Мука из семян амаранта	10	9	8

5	Мука из жмыха соевого шрота	25	24	23
6	Мясо-костная мука	5	4	3
Итого		100	100	100

При разработке рецептур мы выбрали 3 варианта рецептур. Наиболее оптимальным был II-вариант рецептур.

При разработке рецептур корма для рыб мы обосновывали причинно-следственную связь между соотношениями составляющих компонентов. Одним из компонентов корма для рыб является мука из шкуры крупного рогатого скота. Использование этой муки менее 45 мас. % не приведет к обогащению.

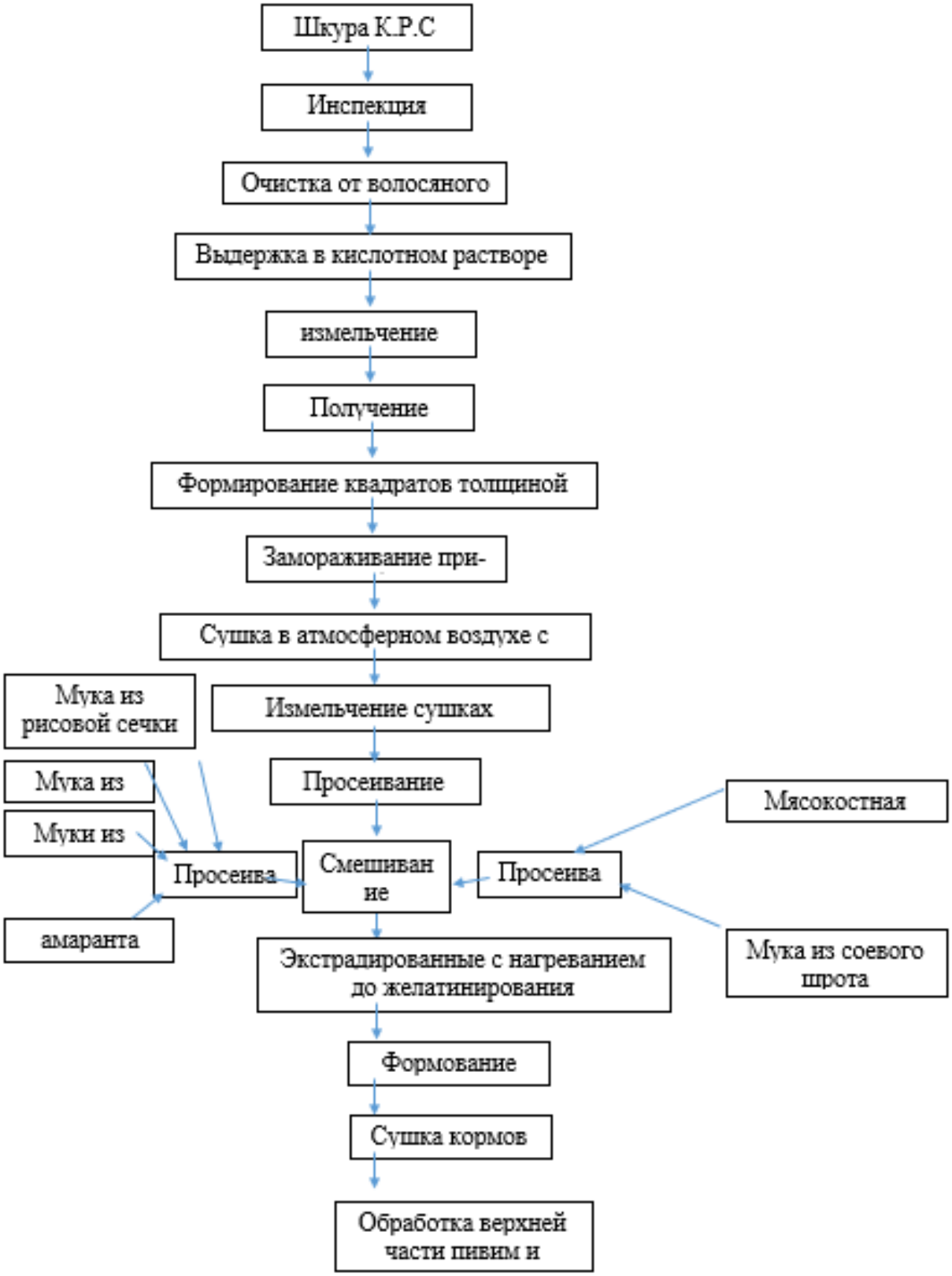
К обогащению белками и превышению этого количества более 55% масс способствует к ухудшению органолептических показателей. Только указанные количественные пределы способствуют получению корма с повышенным содержанием белка.

Использования муки из кукурузы, рисовой сечки, соевого шрота способствовало к обогащению углеводами, белками, клетчаткой и формированию вкуса корма для рыб. Только указанные пределы вышеуказанных сырьевых компонентов способствовали получению кормов для рыб с повышенным содержанием белка и высокими органолептическими показателями.

При использовании амарантовой муки, мы брали листья и корневую часть, а также семенную головку. Наиболее лучшие результаты были получены при использовании семенных головок, т. к. он богат белками, жирами, а также оно способствовало улучшению органолептических показателей, таких как цвета кормов для рыб.

Использование мясо-костной муки способствовало к обогащению корма жирами, а также минеральными веществами, повышению количества добавленной мясо-костной муки более 5 мас % приводит к ухудшению органолептических показателей, а снижению этого показателя менее 3мас% не позволяет достичь цель данной исследовательской работы.

Ниже приводим технологическую схему приготовления производства корма для рыб (рис.1).



Ы Рис.1. Технологическая схема приготовления рыбных кормов с повышенным содержанием белка из вторичного сырья животного и растительного сырья

Наиболее полного представления о пищевой ценности и безвредности мы исследовали микробиологические, органолептические и физико-химические показатели рыбного корма.

Таблица 2. Содержание тяжелых металлов и других постоянных веществ в рыбном корме

№	Показатели составных частей	Определенная концентрация	Единица измерения	Документы, использованние при исследовании	Соответсвие показателей (требований)
1	Свинец	0.00	мг/кг	ГОСТ 26932-86	Соответствует
2	Кадмий	мг/кг	мг/кг	ГОСТ 26933-86	Соответствует
3	Ртут	мг/кг	мг/кг	ГОСТ 26927-86	Соответствует
4	Мышяк	мг/кг	мг/кг	ГОСТ 26930-86	Соответствует
5	Элементарный	0.00118	мг/кг	O‘ z DST 1091-2011	Соответствует
6	α, β, γ ГХЦГ	0.00	мг/кг	МУ 012-3/0010	Соответствует
7	Метаболиты ДДТ	мг/кг	мг/кг	МУ 012-3/0020	Соответствует

Как показывает анализ данных табл.2, что соли тяжелых металлов не обнаружены в рыбном корме, полученном из вторичного животного и растительного сырья

Также были исследованы основные микробиологические показатели таблица.3.

Таблица 3. Основные микробиологические показатели рыбных кормов полученных из вторичного животного и растительного сырья

№	Наименование Исследуемого образца	Общее микроби. число КМА/КОЕ в 1,0 гр		БГКП		Возбуждение болезни Патоген микрофлора, сальмонелла		Плесень, дрожжи КОЕ, в 1,0		Saureus		L. monositigenes		В сочец ГОСТ	
		Норма	Факт. Форма	Норма	Факт. норма	Норма	Факт. норма	Норма	Факт. норма	Норма	Факт. норма	Норма	Факт. норма	Норма	Факт. норма
1	Рыбный корм	2,5x10 4	Не определено	1,0 гр	Не определено	50 гр не допуск кается	Не определено	100 г КОЕ	Отрицательный	1,0 гр не допуск кается	Отрицательный	50 гр не допуск кается		200 гр не допуск кается	Отрицательный

Анализ данных табл.3. свидетельствует что, рыбные корма отвечают всем требованиям по микробиологическим показателям, предъявляемым рыбным кормам.

Ещё основным показателем рыбных кормов является их органолептические и физико-химические показатели. Данные об этих показателях приведены в таблице 4,

№	Показатели	Определенная концентрация	Единица измерения	Документы использованние при исследовании	Соответствие показателей (требований)
1	Влажность	4,5 %	%	ГОСТ 10385-2014	Соответствует
2	Сырой протеин	17,6 %		ГОСТ 10385-2014	
3	Сырой жир	8,7 %		ГОСТ 10385-2014	
4	Без азотистые экстрактивные вещества	31,9 %		ГОСТ 10385-2014	
5	Сырая клетчатка	32,4 %		ГОСТ 10385-2014	
6	Зола	13,9 %		ГОСТ 20385-2014	
7	Внешний вид	Круглые, длиной 1-1,5-см			
8	Вкус	Приятный			

9	Запах	Приятный, без постороннего запаха
10	Цвет	Ярко желтый
11	Консистенция	Твердая

Как показывает анализ данных таблицы 4, влажность данного рыбного корма полученного из вторичного животного и растительного сырья составляет 4.5%, сырой протеин 17.6% и оно по сравнению существующим ГОСТ кормов рыбных 2.4 раза превышает , сырой жир 8.7%, без азотистые экстрактивные вещества 31.9% , сырая клетчатка 32.4%, зола 13.9%.

Использование бычьей шкуры и вторичного растительного сырья богатого белками способствовало повышению содержанию сырого протеина.

При разработке данной технологии впервые были применены атмосферная сублимационная сушка, что способствовало полному сохранению пищевых веществ, таких как белки, жиры в бычьей шкуре.

Использование вторичных сырьевых ресурсов животного и растительного сырья богатого белками привело к снижению себестоимости разрабатываемого рыбного корма

Заключение: Проведенные исследования показали , что в условиях нашей республики целесообразно использовать шкуру крупного рогатого скота для производства рыбных кормов, т.к. во первых их в достаточном количестве, во вторых стоит дёшево и ещё не нужно его переработка в крупных масштабах. Обработка шкуры крупного рогатого скота без тепловой обработки, получая из него порошка также способствует повышению пищевой и биологической ценности разрабатываемого корма Использование при производстве кормов продуктов вторичных сырьевых материалов, таких как рисовая сечка, кукурузная мука, соевого жмыха семена амаранта, а также костной муки способствует не только получению продукта с повышенным содержанием белка, жиров, углеводов, клетчатки минералов, витаминов, а также снижению себестоимости разрабатываемых рыбных кормов. Дальнейшее наши исследования будут изучение освоения рыбами этих кормов а также не быстрому оседанию данных кормов в водоемах. Освоение разработанной технологии в условиях республики Узбекистан будут способствовать увеличению переработки вторичных сырьевых ресурсов, получению качественных рыбных кормов с низкой себестоимостью, а также к снижению цен на готовую рыбную продукцию.

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YUQORI CHIRCHIQ DARYOSI SHAROITIDA QAFASLARDA YETISHTIRILAYOTGAN TRIPLOID KAMALAK GULBALIQLARINING (Oncorhynchus mykiss) BIOMETRIK KO‘ RSATKICHLARI VA OZIQLANTIRISH XUSUSIYATLARI

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Annotatsiya: *Ushbu maqolada yuqori Chirchiq daryosi sharoitida qafas usulida yetishtirilayotgan triploid kamalak gulbaliqlarining (Oncorhynchus mykiss) biometrik ko‘ rsatkichlari va oziqlantirish xususiyatlari o‘ rganildi. Tadqiqot davomida 80 ta baliqning tana uzunligi va vazni individual ravishda o‘ lchanib, ularning o‘ lcham ko‘ rsatkichlari tahlil qilindi. Baliqlarni oziqlantirishda tana kattaligiga mos granulali yemlardan foydalanildi; kichik baliqlar uchun mayda, yirik baliqlar uchun esa kattaroq granulalar tanlandi. O‘ lchangan baliqlarning umumiy tana uzunligi 15,5–45,5 sm, tana vazni 39–1420 g oralig‘ ida bo‘ ldi. O‘ rtacha tana uzunligi 30,88±9,63 sm, o‘ rtacha tana vazni 508,54±399,24 g ni tashkil etdi. Baliqlarning uzunligi ortishi bilan tana vaznining ham muntazam ortib borishi kuzatildi. O‘ lcham guruhlarini alohida ko‘ rib chiqish kichik baliqlardan yirik tovar baliqlargacha bo‘ lgan o‘ sish qatorini aniq ko‘ rsatdi. Olingan natijalar qafas sharoitida baliqlarni biometrik kuzatib borish, o‘ lchamiga mos yem granulasi tanlash va oziqlantirish jarayonini samarali tashkil etish uchun amaliy ahamiyatga ega. Tadqiqot ma’lumotlari yuqori Chirchiq daryosi sharoitida sovuq suv baliqchiligini rivojlantirish bo‘ yicha keyingi tajribalar uchun boshlang‘ ich baza bo‘ lib xizmat qiladi.*

Kalit so‘ zlar: *kamalak gulbaliq, Oncorhynchus mykiss, triploid baliq, qafas xo‘ jaligi, biometrik o‘ lchov, tana vazni, tana uzunligi, granulali yem, oziqlantirish, Chirchiq daryosi.*

БИОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ И ХАРАКТЕРИСТИКИ КОРМЛЕНИЯ ТРИПЛОДНОЙ РАДУЖНОЙ РЫБЫ (Oncorhynchus mykiss), ВЫРАЩИВАЕМОЙ В СКАДАХ В ВЕРХНЕМ РЕКЕ ЧИРЧИК

Аннотация: *В статье приведены результаты изучения биометрических показателей и особенностей кормления триплоидной радужной форели (Oncorhynchus mykiss), выращиваемой в садках в условиях верхнего течения реки Чирчик. В исследовании измерены 80 рыб. Определяли длину и массу каждой особи и сравнивали полученные показатели между размерными группами. Для кормления использовали гранулированный корм с размером гранул, соответствующим величине рыбы. Общая длина исследованных рыб составила 15,5–45,5 см, масса — 39–1420 г. Средняя длина равнялась 30,88±9,63 см, средняя масса — 508,54±399,24 г. По мере увеличения размеров рыб наблюдалось последовательное увеличение их массы. Полученные материалы могут быть использованы при организации биометрического мониторинга, подборе размера гранул и совершенствовании кормления радужной форели в садковых хозяйствах.*

Ключевые слова: *радужная форель,* Oncorhynchus mykiss, *триплоидная рыба, садковое рыбоводство, биометрические измерения, масса тела, длина тела, гранулированный корм, кормление, река Чирчик.*

BIOMETRIC INDICATORS AND FEEDING CHARACTERISTICS OF TRIPLOID RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) RAISED IN CAGES IN THE UPPER CHIRCHIK RIVER

Abstract: *The paper presents the biometric characteristics and feeding features of triploid rainbow trout (Oncorhynchus mykiss) reared in cages under the conditions of the upper Chirchiq River. Eighty fish were individually measured for body length and weight. Fish were fed with granulated feed selected according to fish size, with smaller pellets used for smaller fish and larger pellets for larger individuals. Total length ranged from 15.5 to 45.5 cm and body weight from 39 to 1420 g. Mean total length was 30.88±9.63 cm and mean body weight was 508.54±399.24 g. A clear increase in body weight with increasing fish size was observed across the measured groups. The results can be used for biometric monitoring, feed-pellet selection and improvement of feeding practices in rainbow trout cage farming under local conditions.*

Keywords: *rainbow trout,* Oncorhynchus mykiss, *triploid fish, cage aquaculture, biometric measurements, body weight, body length, pelleted feed, feeding, Chirchiq River.*

KIRISH

Kamalak gulbaliq (Oncorhynchus mykiss) sovuq suv akvakulturasida eng ko‘ p yetishtiriladigan baliq turlaridan biri bo‘ lib, uning xo‘ jalik qiymati tez o‘ sishi, intensiv oziqlantirishga moslashishi va bozorbop go‘ sht sifatiga egaligi bilan bog‘ liq. Qafas usuli tabiiy suv almashinuvidan foydalanish imkonini beradi va tog‘ oldi daryo hamda suv omborlarida forel yetishtirishni samarali tashkil etishning amaliy yo‘ llaridan hisoblanadi. Kamalak gulbaliq uchun oziqlantirishda baliq o‘ lchami va suv sharoitiga mos yem miqdori hamda pellet o‘ lchamini tanlash muhimdir. FAO ma’lumotlarida ham forel uchun yem granulasi o‘ lchami baliq massasi bilan bog‘ liq ravishda oshib borishi ko‘ rsatilgan [1].

Triploid baliqlar akvakulturada jinsiy yetilish bilan bog‘ liq ayrim muammolarni kamaytirish, mahsuldorlikni saqlash va biologik xavfsizlikni kuchaytirish maqsadida o‘ rganilmoqda. Triploid kamalak gulbaliqlarning o‘ sishi va xo‘ jalik ko‘ rsatkichlari ularni parvarishlash sharoiti, nasliy xususiyatlari va zichligiga bog‘ liq bo‘ lishi mumkin [2–4]. Shu sababli har bir hududda mahalliy sharoitga mos real biometrik ma’lumotlarni to‘ plash muhimdir.

Baliqlarning tana uzunligi va vaznini muntazam o‘ lchash amaliy monitoringning sodda, lekin juda foydali usuli hisoblanadi. Ushbu ko‘ rsatkichlar baliqlar o‘ sishining umumiy holatini, o‘ lcham guruhlari o‘ rtasidagi farqlarni va oziqlantirish jarayonining tashkiliy jihatlarini baholash imkonini beradi. Oldingi tadqiqotlarda ham kamalak gulbaliqda uzunlik, vazn va konditsiya ko‘ rsatkichi o‘ zaro bog‘ liq ekanligi ko‘ rsatilgan [5].

Tadqiqotning maqsadi —Yuqori Chirchiq daryosi sharoitida qafaslarda yetishtirilayotgan triploid kamalak gulbaliqlarning biometrik ko‘ rsatkichlarini baholash, baliqlarning o‘ lcham guruhlarini tavsiflash hamda oziqlantirishda yem granulasi o‘ lchamini tanlash amaliyotini ilmiy tavsiflash.

TADQIQOT HUDUDI, MATERIALLARI VA USULLARI

Tadqiqot yuqori Chirchiq daryosi sharoitidagi qafas xo‘ jaligida yetishtirilayotgan triploid kamalak gulbaliqlar ustida olib borildi. Tadqiqot materiali sifatida 80 ta baliq olindi. Har bir individ bo‘ yicha umumiy tana uzunligi (L, sm), tana uzunligi (l, sm) va tana vazni (Q, g) qayd etildi.

Biometrik o‘ lchovlar dala sharoitida bajarildi. Baliqlar avvalo ehtiyotkorlik bilan olinib, individual tarozida tortildi; keyin tana uzunligi o‘ lchandi va natijalar yozma qayd etilib, elektron jadvalga ko‘ chirildi. Olingan ma’lumotlar asosida o‘ rtacha ko‘ rsatkichlar, eng kichik va eng yuqori qiymatlar hamda o‘ lcham guruhlari bo‘ yicha o‘ rtacha vaznlar aniqlandi.

Oziqlantirishda Turkiyadan keltirilgan granulali yemdan foydalanildi. Kuzatuv materiallarida yem granulalari baliqlarning o‘ lchamiga qarab farqlanishi ko‘ rsatilgan: 0,8–1,2 mm, 1,2–2,0 mm, 2,0–3,0 mm, 3,0–4,5 mm va 4,5–6,0 mm. Kichik baliqlar mayda, yirik baliqlar esa kattaroq granulalar bilan oziqlantirildi. Oziqlantirish chastotasi ham baliq kattaligiga qarab o‘ zgartirildi: kichik baliqlar 4–5 mahal, o‘ rta kattalikdagilar 3 mahal, yirik baliqlar 2 mahal oziqlantirildi.

Olingan biometrik ko‘ rsatkichlar sodda variatsion-statistik usulda tahlil qilindi. Maqolaning asosiy e’tibori baliqlarning real o‘ lcham ko‘ rsatkichlari va ularning oziqlantirish jarayoni bilan bog‘ liq amaliy kuzatuvlarga qaratildi. O‘ sish sur’ati va yemdan foydalanish samaradorligini chuqurroq baholash uchun keyingi bosqichda boshlang‘ ich va yakuniy massa, tajriba davomiyligi hamda sarflangan yem miqdorini parallel qayd etish rejalashtiriladi.



1-rasm. Tajriba xo‘ jaligida foydalanilgan granulali yem va uning baliq o‘ lchamiga mos fraksiyalari.



2-rasm. Turli o‘ lchamdagi yem granulalarini o‘ lchov shkalasida taqqoslash.

TADQIQOT NATIJALARI

Tadqiqot davomida o‘ lchangan 80 ta baliqning umumiy tana uzunligi 15.5–45.5 sm, tana uzunligi 13.0–43.0 sm, tana vazni esa 39–1420 g oralig‘ ida bo‘ ldi. Umumiy tana uzunligining o‘ rtacha qiymati 30.88±9.63 sm, tana uzunligining o‘ rtacha qiymati 28.75±9.64 sm, tana vaznining o‘ rtacha qiymati esa 508.54±399.24 g ni tashkil etdi.

Tana vazni bo‘ yicha keng farq mavjudligi tanlanmada turli kattalikdagi baliqlar birgalikda mavjudligini ko‘ rsatadi. Eng kichik baliqlar 15,5 sm atrofidagi uzunlikda bo‘ lib, ularning vazni 39–60 g diapazonda qayd etilgan. Tana uzunligi 40 sm dan oshgan baliqlarda esa tana vazni odatda 700–1400 g atrofida bo‘ ldi. Bu holat baliq kattalashgani sari tana massasining tez ortishini amaliy jihatdan ham yaqqol ko‘ rsatadi.

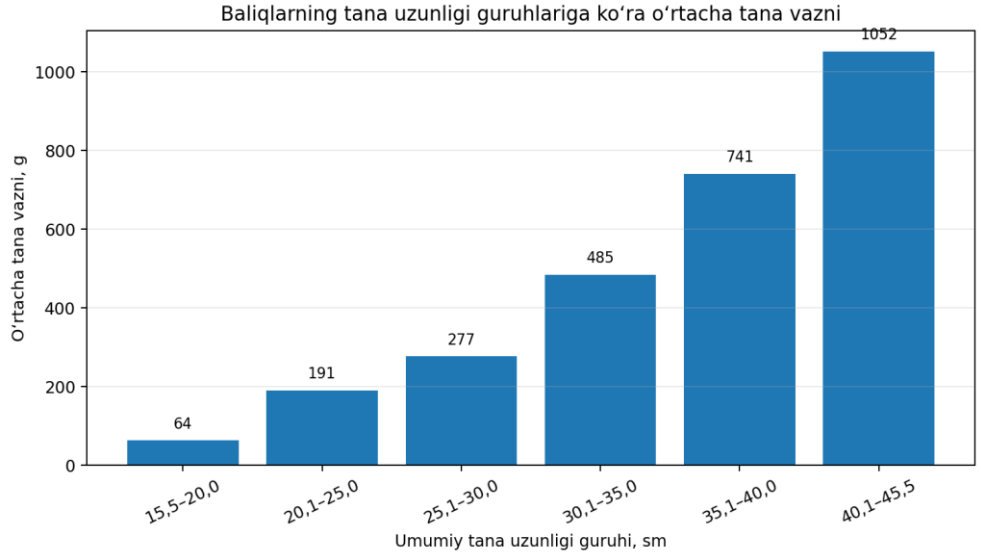
1-jadval. 80 ta kamalak gulbaliqning asosiy biometrik ko‘ rsatkichlari

Ko‘ rsatkich	n	O‘ rtacha	Min	Max	Izoh
Umumiy tana uzunligi, L (sm)	80	30.88±9.63	15.5	45.5	Baliqning umumiy o‘ lchami
Tana uzunligi, l (sm)	80	28.75±9.64	13.0	43.0	Asosiy tana uzunligi
Tana vazni, Q (g)	80	508.54±399.24	39	1420	Individual massa
Konditsiya koeffitsiyenti, K	80	1.291±0.163	0.957	1.697	Tana to‘ liqligining yordamchi ko‘ rsatkichi

2-jadval. Tana uzunligi guruhlari bo‘ yicha o‘ rtacha tana vazni

Uzunlik guruhi, sm	Baliqlar soni	O‘ rtacha uzunlik, sm	O‘ rtacha vazn, g	O‘ rtacha K
15,5–20,0	20	17.68	63.50	1.136
20,1–25,0	4	24.00	191.00	1.374
25,1–30,0	16	27.47	276.81	1.332
30,1–35,0	4	33.88	485.00	1.246
35,1–40,0	18	38.06	741.11	1.331
40,1–45,5	18	42.28	1052.22	1.380

Jadvaldan ko‘ rinib turibdiki, tana uzunligi oshgan sari o‘ rtacha tana vazni ham izchil ravishda ortib borgan. Eng kichik o‘ lcham guruhida o‘ rtacha vazn 63,5 g bo‘ lgan bo‘ lsa, 40,1–45,5 sm uzunlikdagi baliqlarda o‘ rtacha vazn 1052,2 g ga yetgan. Bu farq qafasdagi baliqlar turli yosh va o‘ lcham bosqichlarida ekanligini ko‘ rsatadi.



OZIQLANTIRISH JARAYONINING AMALIY BAHOSI

Tajriba davomida baliqlarni oziqlantirishda yem granulasi o‘ lchamini baliq kattaligiga moslashtirishga alohida e’tibor berildi. Bu usul baliqning yemni yutishi va undan foydalanishini osonlashtiradi. Kuzatilgan yem granulalari mayda yosh baliqlardan boshlab yirik tovar baliqlargacha bosqichma-bosqich kattalashib borgan. Ushbu yondashuv forelchilikda qo‘ llanadigan umumiy oziqlantirish tamoyillariga mos bo‘ lib, yem granulasi o‘ lchami baliq massasiga mos holda oshiriladi [1].

Baliq kattaligiga qarab oziqlantirish chastotasining o‘ zgarishi ham tajribaning muhim jihati bo‘ ldi. Kichik baliqlarning 4–5 mahal, o‘ rta kattalikdagi baliqlarning 3 mahal va yirik baliqlarning 2 mahal oziqlantirilishi amaliy kuzatuvlar asosida tashkil qilindi. Bunday yondashuvda asosiy maqsad baliqlarni bir vaqtning o‘ zida ortiqcha yem bilan ta’minlamaslik, yemni yaxshi qabul qilinishi va suvga tushadigan ortiqcha yem miqdorini kamaytirishdan iborat.

Baliqlarning oziqlantirish jarayoni bilan birga ularning tashqi ko‘ rinishi va xatti-harakatlarini kuzatish ham muhim bo‘ ldi. Amaliy akvakulturada qo‘ lda oziqlantirish baliqning yemga reaksiyasi, sog‘ lig‘ i va suv muhitidagi o‘ zgarishlarni bir vaqtda kuzatish imkonini berishi qayd etilgan [6].

MUHOKAMA

Tadqiqotda qayd etilgan biometrik ko‘ rsatkichlar baliqlar tarkibida o‘ lchamlar bo‘ yicha katta farq mavjudligini ko‘ rsatdi. Bunday farq qafas xo‘ jaligida baliqlarning turli yosh bosqichlarida bo‘ lishi, individual o‘ sish xususiyatlari va oziqlanish sharoitlari bilan bog‘ liq bo‘ lishi mumkin. Shu sababli biometrik o‘ lchovlarni muntazam ravishda takrorlash baliqchilik xo‘ jaligida boshqaruv qarorlarini qabul qilish uchun foydali.

Bizning tanlagan baliqlarimizda tana uzunligi va vazni o‘ rtasida aniq musbat bog‘ liqlik kuzatildi. Ushbu qonuniyat kamalak gulbaliqda boshqa xo‘ jaliklarda ham kuzatilgan bo‘ lib, uzunlik va vaznni birgalikda baholash baliqning umumiy konditsiya holati haqida qo‘ shimcha ma’lumot beradi [5]. Shuni alohida ta’kidlash kerakki, boshqa hududlardagi natijalarni bevosita tenglashtirish to‘ g‘ ri emas, chunki suv harorati, ozuqa, genotip, yosh va yetishtirish tizimi natijaga ta’sir qiladi.

Triploid kamalak gulbaliqlar bo‘ yicha olib borilgan tadqiqotlar ham ploidlik, nasliy xususiyat va yetishtirish sharoiti o‘ sish ko‘ rsatkichlariga ta’sir qilishi mumkinligini ko‘ rsatadi [2–4]. Shu jihatdan yuqori Chirchiq daryosi sharoitida to‘ plangan ushbu 80 ta baliqning biometrik ma’lumotlari keyingi mavsumiy kuzatuvlar uchun muhim boshlang‘ ich baza hisoblanadi.

Mazkur maqolada o‘ sish sur’ati (SGR), yemdan foydalanish koeffitsiyenti (FCR) va absolyut va nisbiy o‘ sish kabi vaqtga bog‘ liq ko‘ rsatkichlar kiritilmadi. Buning sababi, ularni ishonchli hisoblash uchun tajriba boshidagi va oxiridagi massa hamda tajriba davomida sarflangan yem miqdori bo‘ yicha to‘ liq, bir xil usulda yig‘ ilgan ma’lumotlar zarur. Keyingi kuzatuvlarda ushbu ko‘ rsatkichlarni qo‘ shish tavsiya etiladi.

XULOSA

Yuqori Chirchiq daryosi sharoitida qafas usulida yetishtirilayotgan 80 ta triploid kamalak gulbaliqning umumiy tana uzunligi 15.5–45.5 sm, tana vazni 39–1420 g oralig‘ ida qayd etildi.

Baliqlarning o‘ rtacha umumiy tana uzunligi 30.88 sm, o‘ rtacha tana vazni 508.54 g ni tashkil etdi. O‘ lcham guruhlari bo‘ yicha tana uzunligi oshgani sari o‘ rtacha vazn ham izchil ravishda ortdi.

Tajriba davomida baliqlarning kattaligiga mos yem granulalari tanlandi va oziqlantirish chastotasi baliq o‘ lchamiga qarab o‘ zgartirildi. Bu yondashuv qafas xo‘ jaligida oziqlantirishni tartibli tashkil etish uchun amaliy jihatdan qulay bo‘ ldi.

Biometrik o‘ lchovlarni muntazam takrorlash yuqori Chirchiq daryosi sharoitida kamalak gulbaliqning o‘ sishini baholash va oziqlantirish rejimini takomillashtirish uchun asos bo‘ la oladi.

Keyingi bosqichda tajriba davomiyligi, boshlang‘ ich va yakuniy massa, sarflangan yem miqdori, suv harorati va boshqa gidrokimyoviy ko‘ rsatkichlarni bir tizimda qayd etish maqolaning ilmiy imkoniyatlarini yanada kengaytiradi.

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РАЗРАБОТКА ИНТЕГРАЛЬНОГО ИНДЕКСА ГИДРОЭКОЛОГИЧЕСКОЙ УСТОЙЧИВОСТИ ОЗЁР АМУДАРЬИНСКОЙ ДЕЛЬТЫ

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Аннотация. *В статье предлагается новый подход к оценке гидроэкологического состояния озёр Амударьинской дельты на основе интегрального индекса гидроэкологической устойчивости (Hydroecological Stability Index – HESI). Необходимость разработки индекса обусловлена усилением антропогенного воздействия на водные экосистемы Южного Приаралья, сокращением стока Амударьи, ростом минерализации и изменением гидрологического режима озёр. Индекс объединяет гидрологические, гидрохимические, биологические и экологические показатели в единую систему оценки. Разработанная методика позволяет проводить сравнительный анализ состояния различных озёр дельты и выявлять наиболее уязвимые водоёмы.*

Ключевые слова: *гидроэкология, озёра Амударьинской дельты, устойчивость экосистем, интегральный индекс, Южное Приаралье, гидрохимия, мониторинг.*

DEVELOPMENT OF AN INTEGRATED HYDROECOLOGICAL STABILITY INDEX FOR THE LAKES OF THE AMU DARYA DELTA

Abstract. *The article proposes a new approach to assessing the hydro-ecological state of Amudarya delta lakes based on the integrated hydro-ecological stability index (Hydroecological Stability Index - HESI). The necessity of developing the index is due to the intensification of anthropogenic impact on the water ecosystems of the Southern Aral Sea region, the reduction of the Amu Darya flow, the increase in mineralization, and changes in the hydrological regime of the lakes. The index combines hydrological, hydrochemical, biological, and environmental indicators into a unified assessment system. The developed methodology allows for a comparative analysis of the condition of various lakes in the delta and the identification of the most vulnerable water bodies.*

Keywords: *hydroecology, Amudarya delta lakes, ecosystem stability, integral index, Southern Aral Sea region, hydrochemistry, monitoring.*

AMUDARYO DELTASI KO‘ LLARI GIDROEKOLOGIK BARQARORLIGINING INTEGRAL INDEKSINI ISHLAB CHIQISH

Annotatsiya. *Mazkur maqolada Amudaryo deltasidagi ko‘ llarning gidroekologik holatini baholash uchun gidroekologik barqarorlikning integral indeksiga (Hydroecological Stability Index – HESI) asoslangan yangicha yondashuv taklif etiladi. Bunday indeksni ishlab chiqish zarurati Janubiy Orolbo‘ yi suv ekotizimlariga antropogen ta’sirning kuchayishi, Amudaryo oqimining kamayishi, ko‘ llar minerallashuvining ortishi va gidrologik rejimining o‘ zgarishi bilan izohlanadi. Indeks gidrologik, gidrokimyoviy, biologik va ekologik ko‘ rsatkichlarni yagona baholash tizimiga birlashtiradi. Ishlab chiqilgan metodika delta hududidagi turli ko‘ llarning holatini qiyosiy tahlil qilish hamda eng zaif suv havzalarini aniqlash imkonini beradi.*

Kalit so‘ zlar: *gidroekologiya, Amudaryo deltasining ko‘ llari, ekotizimlar barqarorligi, integral indeks, Janubiy Orolbo‘ yi, gidrokimyo, monitoring.*

Введение

Озёра Амударьинской дельты являются уникальными природными водными экосистемами аридной зоны Центральной Азии и представляют собой важнейшие элементы экологического каркаса Южного Приаралья. На протяжении многих столетий формирование и функционирование озёрных систем дельты определялось гидрологическим режимом реки Амударьи, сезонными паводками и сложными процессами взаимодействия поверхностных и подземных вод. Благодаря этому в дельте сформировался комплекс водно-болотных угодий, имеющих исключительно важное значение для сохранения биоразнообразия, регулирования водного режима территории и поддержания экологического равновесия региона.

В современных условиях большинство озёр дельты функционируют в качественно новых природно-хозяйственных условиях. Если ранее основным источником их питания являлись воды Амударьи, то в настоящее время значительная часть водных ресурсов поступает через систему коллекторно-дренажных каналов. Подобная трансформация водопитания привела к изменению гидрохимического состава воды, увеличению минерализации, накоплению биогенных веществ и загрязняющих компонентов. Вследствие этого существенно изменились условия существования гидробионтов, структура водных экосистем и механизмы их функционирования.

Дополнительным фактором трансформации озёрных систем выступают современные климатические изменения. Согласно многочисленным исследованиям, в регионе Центральной Азии наблюдается устойчивый рост среднегодовой температуры воздуха, увеличение продолжительности засушливых периодов и повышение испаряемости. В условиях аридного климата данные процессы оказывают значительное влияние на водный баланс озёр, способствуя сокращению площади водной поверхности и увеличению концентрации растворённых солей. Изменение климатических условий усиливает антропогенную нагрузку на водные объекты и снижает устойчивость озёрных экосистем к внешним воздействиям.

Современные принципы экологического мониторинга требуют перехода от анализа отдельных параметров к комплексной оценке устойчивости природных систем. В связи с этим особую актуальность приобретает разработка интегральных индексов, позволяющих объединять различные показатели в единую систему количественной оценки. Использование подобных индексов широко применяется при исследовании речных бассейнов, водохранилищ и водно-болотных угодий, однако для озёр Амударьинской дельты такие подходы практически не разработаны.

Таким образом, разработка интегрального индекса гидроэкологической устойчивости озёр Амударьинской дельты является актуальной научной задачей, имеющей важное теоретическое и практическое значение. Результаты исследования могут быть использованы при организации системы мониторинга водных объектов, оценке эффективности природоохранных мероприятий и разработке стратегий устойчивого управления водными ресурсами Южного Приаралья.

Цель исследования

Разработка интегрального индекса гидроэкологической устойчивости озёр Амударьинской дельты и определение возможности его использования для экологического мониторинга.

Материалы и методы исследования. Объектами исследования являлись озёра Амударьинской дельты: Судочье, Жылтырбас, Машанкуль, Рыбачье и Каратерень, расположенные на территории Южного Приаралья. Выбор данных водоёмов обусловлен различиями в условиях водопитания, гидрохимическом режиме и степени антропогенного воздействия.

Для оценки гидроэкологической устойчивости озёр разработан интегральный индекс Hydroecological Stability Index (HESI), основанный на комплексном учёте гидрологических, гидрохимических, биологических и экологических показателей.

В состав индекса включены четыре блока:

- гидрологический блок (H); гидрохимический блок (C); биологический блок (B); - экологический блок (E).

Для обеспечения сопоставимости показателей выполнялось их нормирование по методу минимаксного преобразования:

$Xn=(X-Xmin)/(Xmax-Xmin)$

где Xn — нормированное значение показателя; X — фактическое значение показателя; Xmin и Xmax — минимальное и максимальное значения исследуемого параметра.

Для показателей, негативно влияющих на устойчивость экосистемы (минерализация, загрязнение, деградация земель и др.), использовалось обратное нормирование:

$Xn=(Xmax-X)/(Xmax-Xmin)$

После нормирования рассчитывались частные индексы:

H=(A+L+V+W)/4; C=(M+pH+O+S+Cl)/5;

B=(R+F+W+P)/4; E=(P+D+L+A)/4

Интегральный индекс гидроэкологической устойчивости определялся по формуле: HESI=(H+C+B+E)/4

Полученные значения интерпретировались следующим образом:

0,80–1,00 – очень высокая устойчивость; 0,60–0,79 – высокая устойчивость; 0,40–0,59 – средняя устойчивость; 0,20–0,39 – низкая устойчивость; менее 0,20 – критическое состояние.

Результаты исследования. Для формирования индекса нами предлагается использовать четыре группы показателей:

1. Гидрологический блок (H) характеризует водообеспеченность озера.

Гидрологический блок является одним из основных компонентов интегрального индекса гидроэкологической устойчивости озёр Амударьинской дельты и предназначен для оценки степени водообеспеченности и стабильности функционирования водной экосистемы. Гидрологические характеристики оказывают определяющее влияние на формирование экологического состояния озёр, поскольку именно водный режим определяет условия существования гидробионтов, особенности гидрохимических процессов и устойчивость экосистемы к внешним воздействиям.

Для оценки гидрологического состояния озёр предлагается использовать четыре основных показателя: площадь водной поверхности, уровень воды, объём водных ресурсов и коэффициент водообмена.

Площадь водной поверхности является одним из наиболее информативных показателей состояния озёрных экосистем. Изменение площади озера отражает реакцию водоёма на колебания водного баланса, климатические изменения и антропогенное воздействие. Уменьшение площади водной поверхности обычно свидетельствует о снижении водообеспеченности, усилении процессов испарения и ухудшении экологического состояния водоёма. Напротив, сохранение стабильной площади или её увеличение указывает на благоприятные гидрологические условия и достаточное водоснабжение озера.

Важным показателем является уровень воды, который характеризует динамику водного режима и отражает баланс между поступлением и расходованием водных ресурсов. Колебания уровня воды оказывают непосредственное влияние на состояние прибрежных экосистем, площадь водно-болотных угодий, условия нереста рыб и места обитания водоплавающих птиц.

Коэффициент водообмена характеризует интенсивность обновления водной массы озера и отражает степень его гидрологической связанности с внешними источниками водоснабжения. Высокий коэффициент водообмена способствует улучшению качества воды, снижению накопления загрязняющих веществ и поддержанию благоприятного гидрохимического режима.

Для обеспечения сопоставимости различных показателей все гидрологические параметры нормируются в диапазоне от 0 до 1. После нормирования рассчитывается интегральный гидрологический индекс по следующей формуле: H = (A + L + V + W) / 4 где: A – нормированная площадь озера; L – уровень воды; V – объём воды; W – коэффициент водообмена.

Полученный гидрологический индекс позволяет количественно оценить степень водообеспеченности озера и является важной составляющей интегрального индекса гидроэкологической устойчивости. Высокие значения показателя H свидетельствуют о стабильном гидрологическом режиме и благоприятных условиях функционирования экосистемы, тогда как низкие значения указывают на развитие деградационных процессов и снижение устойчивости водоёма.

Таким образом, гидрологический блок обеспечивает комплексную оценку состояния водных ресурсов озёр Амударьинской дельты и позволяет учитывать ключевые процессы, определяющие устойчивость озёрных экосистем в условиях изменения климата и антропогенной трансформации водного режима региона.

2. Гидрохимический блок (C) характеризует качество воды.

Гидрохимический блок является важнейшим элементом интегрального индекса гидроэкологической устойчивости озёр Амударьинской дельты, поскольку химический состав воды оказывает непосредственное влияние на состояние водных экосистем, биологическую продуктивность водоёмов и процессы формирования гидробиоценозов. В условиях Южного Приаралья, где большинство озёр испытывают значительное антропогенное воздействие и функционируют в условиях дефицита водных ресурсов, гидрохимические показатели выступают одними из наиболее чувствительных индикаторов экологических изменений.

В последние десятилетия в большинстве озёр дельты наблюдается тенденция к увеличению минерализации воды, изменению ионного состава и накоплению биогенных веществ. Эти процессы оказывают существенное влияние на устойчивость озёрных экосистем и требуют комплексного учёта при оценке их современного состояния.

Минерализация воды является одним из важнейших показателей гидрохимического состояния озёр. Она характеризует общее содержание растворённых солей и отражает степень засоления водоёма. Для озёр

Амударьинской дельты данный показатель имеет особое значение, поскольку именно рост минерализации является одним из основных последствий сокращения речного стока и увеличения роли коллекторно-дренажных вод. Повышение минерализации приводит к изменению условий обитания гидробионтов, снижению биологического разнообразия и ухудшению экологического состояния озёр.

Водородный показатель (pH) характеризует кислотно-щелочное состояние водной среды и является важным фактором функционирования гидробиологических процессов. Большинство гидробионтов наиболее благоприятно развивается в условиях нейтральной или слабощелочной среды. Значительные отклонения pH от оптимальных значений могут приводить к нарушению обменных процессов, изменению химической подвижности элементов и снижению экологической устойчивости водоёмов.

Содержание растворённого кислорода является одним из ключевых показателей качества воды и экологического благополучия озёрных экосистем. Кислород обеспечивает жизнедеятельность большинства водных организмов и участвует в процессах самоочищения водоёмов. Снижение концентрации растворённого кислорода свидетельствует об ухудшении экологического состояния озера, развитии процессов эвтрофикации и накоплении органических загрязнений.

Концентрация сульфатов является важным показателем гидрохимического состава воды в аридных регионах. Повышенное содержание сульфат-ионов характерно для многих водоёмов Приаралья и связано как с природными особенностями региона, так и с поступлением коллекторно-дренажных вод. Рост концентрации сульфатов может свидетельствовать об усилении процессов засоления и ухудшении качества водных ресурсов.

Для обеспечения сопоставимости различных гидрохимических показателей все параметры переводятся в безразмерную форму путём нормирования. Нормирование позволяет привести показатели, измеряемые в различных единицах, к единой шкале от 0 до 1 и использовать их в составе интегрального индекса.

Полученный гидрохимический индекс отражает степень благоприятности химического состава воды для функционирования озёрной экосистемы. Высокие значения показателя свидетельствуют о хорошем качестве воды и устойчивом гидрохимическом режиме, тогда как низкие значения указывают на ухудшение экологического состояния водоёма, усиление процессов засоления и снижение способности экосистемы к саморегуляции.

Таким образом, гидрохимический блок позволяет комплексно оценить качество водной среды озёр Амударьинской дельты и является одним из основных элементов интегрального индекса гидроэкологической устойчивости. Его использование обеспечивает возможность выявления неблагоприятных тенденций в развитии водных экосистем и разработки научно обоснованных мер по сохранению водных ресурсов Южного Приаралья.

3. Биологический блок (B) характеризует состояние экосистемы.

Биологический блок является одним из важнейших компонентов интегрального индекса гидроэкологической устойчивости озёр Амударьинской дельты, поскольку именно состояние биологических сообществ наиболее полно отражает уровень экологического благополучия водоёма. В отличие от гидрологических и гидрохимических показателей, которые характеризуют отдельные компоненты природной системы, биологические показатели позволяют оценить суммарный результат воздействия природных и антропогенных факторов на экосистему.

Озёра Амударьинской дельты представляют собой уникальные природные комплексы, выполняющие функции сохранения биоразнообразия Южного Приаралья. Они являются местом обитания многочисленных видов гидрофитов, беспозвоночных организмов, рыб, земноводных, млекопитающих и водоплавающих птиц.

Разнообразие водной растительности является важнейшим индикатором экологического состояния водоёма. В условиях устойчивого гидрологического режима формируются сложные растительные сообщества, включающие тростниковые заросли, камышовые ассоциации и разнообразные гидрофиты.

Изменение площади и видового состава растительности часто является первым признаком деградации экосистемы. Уменьшение площади тростниковых массивов, исчезновение отдельных видов гидрофитов и нарушение структуры растительных сообществ свидетельствуют о неблагоприятных экологических изменениях.

Для озёр Амударьинской дельты рыбные ресурсы имеют не только экологическое, но и социально-экономическое значение. Многие водоёмы традиционно использовались для рыболовства и обеспечения населения рыбной продукцией. Поэтому сохранение устойчивости ихтиофауны является одним из важнейших критериев оценки экологического благополучия озёр.

Сокращение площади водно-болотных угодий приводит к нарушению экологического равновесия и снижению устойчивости всей озёрной системы. В связи с этим данный показатель является важным элементом интегральной оценки гидроэкологического состояния.

Особую роль в экосистемах Южного Приаралья играет орнитофауна. Озёра Амударьинской дельты являются важнейшими пунктами остановки перелётных птиц на Центрально-Азиатском миграционном пути.

Здесь обитают десятки видов водоплавающих и околоводных птиц, многие из которых имеют международный природоохранный статус.

Численность и видовое разнообразие птиц рассматриваются как универсальные биоиндикаторы состояния окружающей среды. Изменение условий водоснабжения, сокращение площади водной поверхности и деградация водно-болотных угодий немедленно отражаются на состоянии орнитофауны.

Для интегральной оценки биологического состояния озёр все показатели переводятся в безразмерную форму путём нормирования. После нормирования рассчитывается биологический индекс устойчивости:

$B = (R + F + W + P) / 4$

где: B – биологический индекс; R – индекс разнообразия водной растительности; F – индекс состояния ихтиофауны; W – индекс состояния водно-болотных угодий; P – индекс орнитофауны.

Полученные значения позволяют количественно оценить степень сохранности биологических компонентов озёрной экосистемы. Высокие значения индекса свидетельствуют о благоприятном экологическом состоянии водоёма и высокой способности экосистемы к саморегуляции. Низкие значения указывают на деградацию биологических сообществ и снижение экологической устойчивости.

Таким образом, биологический блок является важнейшим элементом интегрального индекса гидроэкологической устойчивости, поскольку отражает конечный результат воздействия гидрологических, гидрохимических и антропогенных факторов на функционирование озёрных экосистем. Использование данного блока позволяет комплексно оценить состояние биологических ресурсов и определить степень экологической устойчивости озёр Амударьинской дельты в условиях современных климатических и антропогенных изменений.

4. Экологический блок (E) отражает антропогенную нагрузку. Экологический блок является завершающим компонентом интегрального индекса гидроэкологической устойчивости озёр Амударьинской дельты и предназначен для оценки степени антропогенного воздействия на водные экосистемы. В современных условиях именно антропогенные факторы во многом определяют направление и интенсивность трансформации озёрных систем Южного Приаралья. Поэтому учёт экологических рисков и уровня хозяйственной нагрузки является необходимым условием объективной оценки устойчивости водоёмов.

В отличие от гидрологических, гидрохимических и биологических показателей, характеризующих текущее состояние экосистемы, экологический блок позволяет оценить факторы внешнего воздействия, способные вызвать её дальнейшую деградацию или, наоборот, обеспечить сохранение экологического равновесия. Особое значение данный блок приобретает для озёр Амударьинской дельты, где процессы антропогенной трансформации природной среды продолжаются на протяжении нескольких десятилетий.

Поступление минерализованных вод приводит к изменению гидрохимического режима, росту содержания солей и ухудшению условий существования гидробионтов. В отдельных случаях наблюдается накопление токсичных соединений и усиление процессов эвтрофикации. Поэтому степень воздействия коллекторно-дренажных вод рассматривается как один из ключевых показателей экологического блока.

Важным индикатором экологического состояния является уровень загрязнения водоёма. Загрязнение может быть связано как с сельскохозяйственной деятельностью, так и с поступлением различных химических соединений через дренажную сеть.

Для условий Южного Приаралья особую актуальность имеет оценка степени антропогенной трансформации ландшафтов. Расширение сельскохозяйственного освоения, изменение структуры землепользования и строительство гидротехнических сооружений оказывают существенное влияние на процессы формирования озёрных экосистем.

Для количественной оценки экологического состояния озёр предлагается использовать следующие показатели:

– индекс загрязнения вод; индекс воздействия коллекторно-дренажных вод; индекс деградации земель; индекс антропогенной трансформации территории.

Использование экологического блока позволяет учитывать влияние хозяйственной деятельности на состояние озёрных экосистем и обеспечивает более объективную оценку их устойчивости. Это особенно важно в условиях Амударьинской дельты, где современное функционирование озёр определяется не только природными факторами, но и интенсивностью антропогенного воздействия.

Таким образом, экологический блок завершает систему оценки гидроэкологической устойчивости озёр и обеспечивает комплексный учёт факторов, определяющих современное состояние водных экосистем Южного Приаралья.

Для апробации разработанного интегрального индекса гидроэкологической устойчивости (HESI) были использованы основные гидрологические, гидрохимические, биологические и экологические показатели, характеризующие современное состояние озёр Амударьинской дельты.

Озеро Жылтырбас также сохраняет относительно устойчивое экологическое состояние, однако влияние коллекторно-дренажного водоснабжения способствует увеличению минерализации воды и снижению биологического разнообразия.

Наиболее неблагоприятные показатели зафиксированы для озера Каратерень, где наблюдаются высокая минерализация воды, сокращение площади водно-болотных угодий, уменьшение биологического разнообразия и значительная антропогенная нагрузка. Полученные данные свидетельствуют о необходимости проведения комплексной интегральной оценки устойчивости озёрных экосистем.

Наиболее высокие показатели устойчивости характерны для озера Судочье. Это связано с относительно стабильным водоснабжением, наличием развитых водно-болотных угодий и высоким уровнем биологического разнообразия. Кроме того, Судочье сохраняет важное значение как место концентрации водоплавающих птиц и один из крупнейших природных водоёмов Южного Приаралья.

Озеро Жылтырбас характеризуется несколько более низкими значениями индекса. Несмотря на удовлетворительное состояние гидрологического режима, на устойчивость водоёма оказывает влияние повышенная минерализация и зависимость от коллекторно-дренажного водоснабжения.

Наиболее низкие значения индекса зафиксированы для озера Каратерень. Это свидетельствует о высокой степени экологической трансформации водоёма и необходимости разработки специальных природоохранных мероприятий.

Особенно ярко эта зависимость проявляется в годы маловодья, когда происходит снижение площади водной поверхности, рост минерализации и ухудшение условий существования гидробионтов.

Разработанный индекс может использоваться в качестве инструмента экологического мониторинга озёрных систем Амударьинской дельты.

Особенно перспективным является использование индекса HESI совместно с данными дистанционного зондирования Земли. Это позволит проводить регулярную оценку состояния озёр и получать оперативную информацию о динамике экологических процессов.

Выводы

1. Установлено, что устойчивость озёр Амударьинской дельты определяется совокупным воздействием гидрологических, гидрохимических, биологических и антропогенных факторов.

2. Разработан интегральный индекс гидроэкологической устойчивости озёр (HESI), позволяющий комплексно оценивать современное состояние водных экосистем.

3. Предложенная методика включает четыре взаимосвязанных блока: гидрологический, гидрохимический, биологический и экологический, обеспечивающие всестороннюю характеристику функционирования озёрных систем.

4. Апробация индекса показала, что наиболее устойчивым водоёмом среди исследованных объектов является озеро Судочье, тогда как озеро Каратерень характеризуется наиболее низкими показателями устойчивости.

Заключение

Разработанный интегральный индекс гидроэкологической устойчивости HESI представляет собой новый инструмент комплексной оценки состояния озёр Амударьинской дельты. Его применение позволяет перейти от анализа отдельных параметров к системному исследованию функционирования озёрных экосистем. Использование индекса создаёт научную основу для долгосрочного мониторинга, прогнозирования экологических изменений и разработки мероприятий по сохранению водно-болотных угодий Южного Приаралья в условиях изменения климата и антропогенной трансформации водных ресурсов.

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AYRIM MAHALLIY ANOR (*Punica granatum* L.) NAVLARINING SHARBATI, MEVA PO'STI VA URUG' I EKSTRAKTLARINING GIPOGLIKEMIK FAOLLIGI TAHLILI

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Abstrakt: *Mazkur tadqiqotda O'zbekiston Respublikasi Sirdaryo viloyati tuproq-iqlim sharoitida yetishtiriluvchi ayrim mahalliy anor (Punica granatum L.) navlari sharbati, meva po'sti va urug'i ekstraktlarining eksperimental diabet sharoitida gipoglikemik faolligi tahlil qilingan. Tadqiqotlarda "Alloksan monogidrat" (150 mg/kg) in'yeksiyasi yordamida yuzaga keltirilgan eksperimental diabet modelida kalamush qonida glyukoza konsentratsiyasi 7-sutkada 27,8±0,2 mmol/l, 14-sutkada 29,5±0,3 mmol/l ga ortishi sharoitida (nazorat guruhida 7-sutka va 14-sutkalarda mos ravishda – 4,7±0,05 mmol/l va 4,8±0,04 mmol/l), anor (Punica granatum L.) navlari ekstraktlari (sharbat, po'st, urug') (150 mg/kg) sezilarli darajadagi gipoglikemik faollikka ega bo'lib, bunda qonda glyukoza konsentratsiyasi maksimal "Qizil anor" po'sti ekstrakti ta'sirida 7-sutka va 14-sutkada mos ravishda – 7,8±0,04 mmol/l va 7,6±0,02 mmol/l, urug'i ekstrakti ta'sirida mos ravishda – 8,1±0,03 mmol/l va 8,3±0,04 mmol/l gacha pasayishi aniqlangan. Anor (Punica granatum L.) navlari sharbati, meva po'sti va urug'i ekstraktining antidiabet faolligi ularning tarkibidagi polifenol birikmalar bilan bog'liqligi tahmin qilingan. Olingan natijalar anor (Punica granatum L.) ekstrakti asosida diabet terapiyasi maqsadlarida, biologik faol qo'shimcha ishlab chiqishda ilmiy asos sifatida foydalanilishi mumkinligi ta'kidlangan.*

Kalit so'zlar: *Anor (Punica granatum L.) ekstrakti, ekspermental diabet, qonda glyukoza konsentratsiyasi, gipoglikemik faollik.*

АНАЛИЗ ГИПОГЛИКЕМАТИЧЕСКОЙ АКТИВНОСТИ СОКА, ЭКСТРАКТОВ КОЧЕШКИ ПЛОДОВ И СЕМЯН НЕКОТОРЫХ МЕСТНЫХ СОРТОВ ГРАНАТА (Punica granatum L.)

Аннотация: *В данном исследовании проанализирована гипогликемическая активность сока, экстрактов кожуры и семян некоторых местных сортов граната (Punica granatum L.), выращиваемых в почвенно-климатических условиях Сырдарьинской области Республики Узбекистан, в условиях экспериментального диабета. В экспериментальной модели диабета, индуцированного инъекцией аллоксана моногидрата (150 мг/кг), концентрация глюкозы в крови крыс повышалась до 27,8±0,2 ммоль/л на 7-е сутки и до 29,5±0,3 ммоль/л на 14-е сутки (в контрольной группе — соответственно 4,7±0,05 ммоль/л и 4,8±0,04 ммоль/л). Установлено, что экстракты различных частей граната (Punica granatum L.) — сока, кожуры и семян — в дозе 150 мг/кг обладают выраженной гипогликемической активностью. Наиболее значительное снижение концентрации глюкозы в крови отмечено под влиянием экстракта кожуры сорта «Кизил анор»: до 7,8±0,04 ммоль/л на 7-е сутки и до 7,6±0,02 ммоль/л на 14-е сутки. Под действием экстракта семян данного сорта концентрация глюкозы снижалась соответственно до 8,1±0,03 ммоль/л и 8,3±0,04 ммоль/л. Предполагается, что антидиабетическая активность сока, экстрактов кожуры и семян граната (Punica granatum L.) связана с содержащимися в них полифенольными соединениями. Полученные результаты могут служить научной основой для разработки биологически активных добавок на основе экстрактов граната (Punica granatum L.) с целью их применения в комплексной терапии диабета.*

Ключевые слова: *экстракт граната (Punica granatum L.), экспериментальный диабет, концентрация глюкозы в крови, гипогликемическая активность.*

ANALYSIS OF THE HYPOGLYCEMIC ACTIVITY OF JUICE, PEEL, AND SEED EXTRACTS FROM CERTAIN LOCAL POMEGRANATE (*PUNICA GRANATUM* L.) VARIETIES

Abstract: *This study evaluated the hypoglycemic activity of juice, peel, and seed extracts from selected local pomegranate (Punica granatum L.) cultivars grown under the soil and climatic conditions of the Syrdarya Region of the Republic of Uzbekistan in*

an experimental model of diabetes. In rats with experimental diabetes induced by alloxan monohydrate injection (150 mg/kg), blood glucose concentrations increased to 27.8±0.2 mmol/L on day 7 and 29.5±0.3 mmol/L on day 14, compared with 4.7±0.05 mmol/L and 4.8±0.04 mmol/L, respectively, in the control group. Pomegranate (Punica granatum L.) juice, peel, and seed extracts administered at a dose of 150 mg/kg exhibited pronounced hypoglycemic activity. The greatest reduction in blood glucose concentration was observed with the peel extract of the "Qizil anor" cultivar, reaching 7.8±0.04 mmol/L on day 7 and 7.6±0.02 mmol/L on day 14. The seed extract reduced blood glucose levels to 8.1±0.03 mmol/L and 8.3±0.04 mmol/L on days 7 and 14, respectively. The antidiabetic activity of pomegranate (Punica granatum L.) juice, peel, and seed extracts is presumed to be associated with their polyphenolic compounds. These findings may provide a scientific basis for the development of biologically active supplements based on pomegranate (Punica granatum L.) extracts for use in diabetes therapy.

Keywords: *pomegranate (Punica granatum L.) extract, experimental diabetes, blood glucose concentration, hypoglycemic activity.*

I. KIRISH

Hozirda dunyo miqyosida qandli diabet kasalligi jiddiy tibbiy-ijtimoiy, iqtisodiy muammolardan biri bo'lib, ayrim tadqiqotchilar tomonidan kasallikning patogenez jarayoni, zamonaviy terapevtik usullar batafsil tavsiflangan [Borozdina va boshq., 2024; 412-435-b.; Elkhalifa et al., 2024; 1-21-b.].

Mazkur **tadqiqotning maqsadi** – O'zbekiston Respublikasi Sirdaryo viloyati tuproq-iqlim sharoitida yetishtiriluvchi ayrim mahalliy anor (*Punica granatum* L.) navlari sharbati, meva po'sti va urug'i ekstraktlarining eksperimental diabet sharoitida gipoglikemik faolligini tahlil qilishdan tashkil topgan.

II. TADQIQOT MATERIALLARI VA USLUBLARI

2.1. Tadqiqot materiallari va sharoiti. Tajribalarda tadqiqot ob'yekti sifatida O'zbekiston Respublikasi Fanlar akademiyasi O.S.Sodiqov nomidagi Bioorganik kimyo instituti Farmakologiya laboratoriyasi vivariyasida standart sharoitda (*t*=+20±5°S, havoning nisbiy namligi 70-75±5%, yorug'lik rejimi 12:12 soat) plastik katakchalarda, standart ozuqa (suv) bilan boqilgan, oq, zotsiz kalamushlardan (*Rattus norvegicus*; ♂, *m*=130-160 gr.) foydalanildi [Belenkiy, 1963; 146-b.; Spasov va boshq., 2012; 670-684-b.; Pourghasem et al., 2014; 11-15-b.; Balamurugan et al., 2014; S442-S448-b.; Aluwong et al., 2016; 1-15-b.; Gharib and Kouhsari, 2019; 358-368-b.][1,2].

Tadqiqotlarda tajriba hayvonlari bilan ishlashda Xalqaro tibbiy ilmiy jamiyatlar kengashi (CIOMS – *The council for international organizations of medical sciences*) tomonidan ishlab chiqilgan qoidalar (1985), Tajriba va boshqa ilmiy maqsadlarda umurtqali hayvonlardan foydalanish to'g'risida Yevropa konvensiyasi (*European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes*) (Strasburg, 1986) Xalqaro bioetika talablariga amal qilindi[3,4,5].

Tajriba guruhlari tahlil qilinayotgan ko'rsatkichlar uchun matematik-statistik jihatdan ishonchli natija olishni nazarda tutgan holda, tajriba hayvonlaridan minimal sonda foydalanish asosida tuzildi [Aluwong et al., 2016; 1-15-b.] (2.1-jadval).

2.1-jadval

Tajriba guruhlari

T/r	Tajriba guruhlari	Hayvonlar soni (*n*)
1.	Nazorat (sog'lom hayvonlar)	2
2.	Alloksan gidroxlorid (150 mg/kg)	3
3.	Alloksan gidroxlorid (150 mg/kg)+ Anor (*Punica* L.) ektrakti	45
Jami		**50**

Izoh: *Bunda, tahlil qilingan 5 ta anor navining har biri uchun 9 tadan – sharbat estrakti* (*3 ta*), *po'st* (*3 ta*), *urug' ekstrakti* (*3 ta*) *kalamushdan foydalanildi*.

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[3] CIOMS – The Council for International Organizations of Medical Sciences // [Электронный ресурс]. Режим доступа: https://cioms.ch/ Дата обращения: 06.09.2025 г.

[4] European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes // [Электронный ресурс]. Режим доступа: https://rm.coe.int/... Дата обращения: 06.09.2025 г.

[5] National Research Council of the National Academies. 2011. Guide for the Care and Use of Laboratory Animals, 8th Ed. Washington (DC): National Academies Press // [Электронный ресурс]. Режим доступа: *https://grants. nih.gov/grants/olaw/guide-for-the-care-and-use-of-laboratoryanimals.pdf* Дата обращения: 01.09.2026 г.

Tajribalar quyidagi sxema asosida amalga oshirildi (2.1-rasm).



2.1-rasm. Tajriba sxemasi. Bunda, alloksan monogidrat (150 mg/kg) kalamush qorin sohasiga in'yeksiya qilingandan keyin, 3-sutkada (eksperimental diabet modeli yuzaga kelganligiga ishonch hosil qilish maqsadida) hamda 7-sutkada, 14-sutkada ertalab ochlik holatida qon tarkibida glyukoza konsentratsiyasi (mmol/l) tahlil qilindi. Tajriba guruhida anor (*Punica* L.) ekstrakti 1-7 sutka davomida, sutkada 1 marta og'iz orqali kalamush organizmiga kiritildi (Nazorat guruhida ekvivalent miqdorda distillangan suvdan foydalanildi).

2.2. Eksperimental diabet modelini yuzaga keltirish uslubi. Tadqiqotlarda kalamushda eksperimental diabet modeli alloksan monogidrat ("Sigma-Aldrich", Germaniya) (150 mg/kg tana vazni) fiziologik eritmada (NaCl 0,9%) eritilgan shaklda qorin sohasiga bir marta in'yeksiya qilish yordamida yuzaga keltirildi [Pourghasem et al., 2014; 11-15-b.; Balamurugan et al., 2014; S442-S448-b.; Roy et al., 2015; 268-280-b.; Aluwong et al., 2016; 1-15-b.; Nawale et al., 2016; 41-46-b.; Gharib and Kouhsari, 2019; 358-368-b.; Bagheri et al., 2023; 870-878-b.].

Bunda, alloksan monogidrat in'yeksiyasi ta'sirida dastlab gipoglikemiya yuzaga kelishining oldini olish maqsadida, 60 minut davomida hayvonlarga glyukoza eritmasi (5%) berildi [Aluwong et al., 2016; 1-15-b.].

Ma'lumki, qandli diabet kasalligida diagnostikasida turli markerlar, jumladan antioksidant tizim disfunksiyasi, ayniqsa qonda glyukoza konsentratsiyasi nazorati muhim ahamiyatga ega hisoblanadi [Bavarva and Narasimhacharya, 2008; 620-626-b.; Onwuli et al., 2014; 1-4-b.; Nawale et al., 2016; 41-46-b.].[6]

2.3. Qon sinov-namunasi tarkibida glyukoza konsentratsiyasini aniqlash uslubi. Qon namunasi kalumush dum vena qon tomiridan steril holatdagi tibbiyot shprisi bilan olinib, glyukoza konsentratsiyasi hayvonlarni 12 soat davomida och qoldirilgandan keyin, ertalab soat 9:00 da (ovqatlantirishdan oldin), "Contour Plus" glyukometr asbobi ("Ascensia Diabetes Care", Shveysariya) yordamida, FAD-GDH – flavin-adenin dinukleotidga bog'liq glyukoza-degidrogenaza (*Flavin adenine dinucleotide-dependent glucose dehydrogenase*) uslubida tahlil qilindi (2.2-rasm) [Bernstein et al., 2013; 1386-1399-b.; Aluwong et al., 2016; 1-15-b.; Nyakudya et al., 2018; 1-16-b.; Klaff et al., 2021; 1382-1389-b.; Ferradj et al., 2024; 1-21-b.; Bikulciene et al., 2024; 1-13-b.].



2.2-rasm. Alloksan monogidrat (150 mg/kg) yordamida yuzaga keltirilgan eksperimental diabet sharoitida **anor (*Punica granatum* L.) navlari sharbati, meva po'sti va urug'i ekstraktining antidiabet faolligini tahlil qilish jarayoni**

O'zbekiston Respublikasi Fanlar akademiyasi O.S.Sodiqov nomidagi Biorganik kimyo instituti Farmakologiya laboratoriyasi, 2024 yil 30 oktyabr). *"Contour Plus" glyukometr asbobi test-plastinkasi (5×28 mm) bir tomoni elektrod bilan bog'lanadi, ikkinchi tomonida qon sinov-namunasi uchun kameraga ega bo'lib, uning tarkibida Aspergillus sp. asosida olingan FAD-GDH fermenti (21%), mediator (54%), stabilizator-bufer tizim (25%) joylashtirilgan. O'lchash aniqlik darajasi ISO 15197:2013 xalqaro standartiga muvofiq bo'lib, test-plastinka yordamida qon sinov-namunasida (minimal 0,6 mkl) +5...+45°S harorat sharoitida,*

[6] American diabetes association. 7. Diabetes technology: Standards of medical care in diabetes – 2020. Diabetes Care. – 2020. – V.43(Suppl 1). – P.S77-S88 // *[Электронный ресурс]. Режим доступа:* https://pubmed.ncbi.nlm. nih.gov/31862750/ *Дата обращения: 16.09.2026 г.*

glyukoza konsentratsiyasini 0,6-33,3 mmol/l diapazonda aniqlash mumkin (qurilma xotirasida 480 ta o'lchash natijalarini saqlash imkoniyati mavjud)[7].

Bunda, glyukometr test-sensor tizimida glyukozaning fermentativ oksidlanishi reaksiyasi amalga oshadi [Zafar et al., 2012; 2069-2077-b.; Adachi and Tsujimura, 2019; 189-193-b.]:

β-*D*-glyukoza + FAD-GDH → glyukono-δ-lakton + $FADH_2$-GDH

Bunda, reaksiya jarayonida β-*D*-glyukoza molekulasidan elektronning (ye^-) FAD-GDH molekulasi kofaktor qismiga (FAD) ko'chishida (elektro-kimyoviy sensor) tok o'zgarishi asosida sinov-namunasi tarkibidagi glyukoza konsentratsiyasi tahlili amalga oshiriladi (glyukoza konsentratsiyasi elektr signaliga transformatsiyasida, ya'ni kofaktordan elektrodga ye^- transportida maxsus mediator ishtirok etadi).

Alloksan monogidrat (150 mg/kg) oshqozon osti bezida β-hujayralarning struktura-funksional faolligiga salbiy ta'siri natijasida insulin orqali glyukoza konsentratsiyasi regulyasiyasi izdan chiqadi, ROS generatsiyasi ortadi, o'z navbatida giperglikemiya rivojlanadi [Szkudelski, 2001; 536-546-b.; Das et al., 2012; 296-308-b.; *Kiran et al., 2013; 20-22-b.*; Aluwong et al., 2016; 1-15-b.; Gharib and Kouhsari, 2019; 358-368-b.].

Bunda, navbadagi 7 sutka davomida qonda glyukoza konsentratsiyasi barqaror holatda oshishi kuzatilib, glyukozaning glikogenga aylanishi, shuningdek yog'lar katabolizmida insulin ishtiroki buzilishi, β-hujayralar struktura-funksiyasi izdan chiqishi orqali lipoliz jarayoni disfunksiyasi ta'sirida tana vazni kamayishi qayd qilinadi [Gillespie, 2006; 165-170-b.].

Bunda, qon tarkibida glyukoza miqdori ≥14-17 mmol/l holat diabet yuzaga kelishi sifatida baholanadi [Onwuli et al., 2014; 1-4-b.; Aluwong et al., 2016; 1-15-b.; Gharib and Kouhsari, 2019; 358-368-b.].

Tadqiqotlarda solishtirish maqsadida, klinik tibbiyot amaliyotida qandli diabet terapiyasida foydalaniluvchi – **"Asformin"** (Metformin gidroxlorid) ("Ali Raif Ilac San. A.S.", Turkiya Respublikasi), **"Ala-Diabet"** kapsulasidan ("AS-Sunna Pharmaceutical" MCHJ, O'zbekiston Respublikasi) foydalanildi.

2.4. Olingan natijalarni matematik-statistik qayta ishlash. Olingan natijalarni matematik-statistik qayta ishlashda OriginLab OriginPro v. 8.5 SR1 (EULA, Northampton, MA 01060-4401, AQSH) kompyuter dasturidan foydalanildi. Natijalar *n* marta takroriylikda amalga oshirilgan tajribalar natijalarining *M*±*m* shaklida keltirilgan bo'lib, *M* – o'rtacha arifmetik qiymat va *m* – standart xatolik qiymatini ifodalaydi. Shuningdek, tajriba natijalari va nazorat guruhi o'rtasidagi qiymatlarning statistik ishonchlilik darajasi Styudent *t*-mezoni asosida hisoblandi va $r<0,05$, $r<0,01$ qiymatlarda statistik ishonchli deb baholandi [Glans, 1999; 125-459-b.; Dospexov, 1985; 122-b.].

III. OLINGAN NATIJALAR VA ULARNING TAHLILI

Alloksan monogidrat (150 mg/kg) in'yeksiyasi yordamida yuzaga keltirilgan diabet eksperimental modelida anor (*Punica granatum* L.) mahalliy navlari meva sharbati, po'sti va urug'i ekstraktlarining (150 mg/kg) kalamush qonida glyukoza konsentratsiyasiga ta'siri quyidagi jadvalda keltirilgan (2.2-jadval).

2.2-jadval

Alloksan monogidrat (150 mg/kg) in'yeksiyasi yordamida yuzaga keltirilgan diabet eksperimental modelida anor (*Punica granatum* L.) mahalliy navlari meva sharbati, po'sti va urug'i ekstraktlarining (150 mg/kg) kalamush qonida glyukoza konsentratsiyasiga ta'siri tahlili (*M*±*m*)

T/r	Tajriba guruhlari		Qonda glyukoza konsentratsiyasi (mmol/l)	
			7-sutka	14-sutka
1.	Nazorat (sog'lom)		4,7±0,05	4,8±0,04
2.	Alloksan monogidrat (150 mg/kg)		27,8±0,2**	29,5±0,3**
3.	Alloksan monogidrat (150 mg/kg)+ "Asformin" (metformin) (150 mg/kg)		5,3±0,05##	5,1±0,04##
4.	Alloksan monogidrat (150 mg/kg)+ "Ala-Diabet" kapsula (150 mg/kg)		8,4±0,05##	7,8±0,04##
5.	Alloksan monogidrat (150 mg/kg)+ "Oq dona (Tuyatish)" ekstrakti (150 mg/kg)	Sharbat	10,6±0,07##	10,3±0,08##
		Po'st	10,1±0,07##	9,9±0,04 ##
		Urug'	9,8±0,05##	9,7±0,03##
6.	Alloksan monogidrat (150 mg/kg)+ "Qora qayin" ekstrakti (150 mg/kg)	Sharbat	9,8±0,04##	9,6±0,03##
		Po'st	8,7±0,03##	8,4±0,04##
		Urug'	8,6±0,06##	8,2±0,03##

[7] *"Contour Plus" тест-полоски, 25 шт. // [Электронный ресурс]. Режим доступа:* https://samara.uteka.ru/product/ contour-plus-test-... *Дата обращения: 16.09.2026 г.*

7.	Alloksan monogidrat (150 mg/kg)+ “Oq shirin” ekstrakti (150 mg/kg)	Sharbat	9,9±0,03##	9,7±0,05##
		Po‘st	9,4±0,06##	9,2±0,03##
		Urug‘	8,9±0,05##	8,8±0,04##
8.	Alloksan monogidrat (150 mg/kg)+ “Achchiq dona” ekstrakti (150 mg/kg)	Sharbat	11,5±0,08##	10,2±0,07##
		Po‘st	9,8±0,03##	9,7±0,04##
		Urug‘	9,6±0,05##	9,4±0,03##
9.	Alloksan monogidrat (150 mg/kg)+ “Qizil anor” ekstrakti (150 mg/kg)	Sharbat	9,5±0,03##	9,2±0,04##
		Po‘st	7,8±0,04##	7,6±0,02##
		Urug‘	8,1±0,03##	8,3±0,04##

***Izoh*:** Nazorat (sog‘lom) hayvonlar guruhiga nisbatan alloksan monogidrat (150 mg/kg) in’yeksiyasi guruhida ** – $p<0,05$; alloksan monogidrat (150 mg/kg) in’yeksiyasi guruhiga nisbatan anor ekstraktlari (150 mg/kg) guruhlarida ## – $p<0,05$; n=3-4).

Shunday qilib, nazorat (sog‘lom) kalamushlar qonida glyukoza konsentratsiyasi 3-sutkada (ertalab, ovqat berishdan oldin) 4,8±0,04 mmol/l ga teng bo‘lib, 7-sutka va 14-sutkalarda mos ravishda – 4,7±0,05 mmol/l va 4,8±0,04 mmol/l ni tashkil qilishi qayd qilindi.

Alloksan monogidrat (150 mg/kg) in’yeksiyasida kalamush qonida glyukoza konsentratsiyasi 3-sutkada (ertalab, ovqat berishdan oldin) 27,5±0,4 mmol/l ga teng bo‘lib, 7-sutka va 14-sutkalarda mos ravishda – 27,8±0,2 mmol/l va 29,5±0,3 mmol/l ga tengligi aniqlandi.

Diabet eksperimental modelida “Asformin” (metformin) (“Ali Raif Ilac San. A.S.”, Turkiya Respublikasi) preparati (150 mg/kg) kalamush qonida glyukoza konsentratsiyasini 7-sutka va 14-sutkalarda mos ravishda – 5,3±0,05 mmol/l va 5,1±0,04 mmol/l gacha kamaytirishi, shuningdek “Ala-Diabet” kapsulasi (“AS-Sunna Pharmaceutical” MCHJ, O‘zbekiston Respublikasi) (150 mg/kg) ta’sirida kalamush qonida glyukoza konsentratsiyasi 7-sutka va 14-sutkalarda mos ravishda – 8,4±0,05 mmol/l va 7,8±0,04 mmol/l gacha kamayishi kuzatildi.

Diabet eksperimental modelida “Oq dona (Tuyatish)” sharbati ekstrakti (150 mg/kg) kalamush qonida glyukoza konsentratsiyasini 7-sutkada 10,6±0,07 mmol/l, 14-sutkada 10,3±0,08 mmol/l ga tushirishi, anor po‘sti ekstrakti mos ravishda – 10,1±0,07 mmol/l, 9,9±0,04 mmol/l, urug‘i ekstrakti mos ravishda – 9,8±0,05 mmol/l, 9,7±0,03 mmol/l ga tushirishi aniqlandi. Bunda, “Qoraqayin” sharbat ekstrakti (150 mg/kg) kalamush qonida glyukoza konsentratsiyasini 7-sutkada 9,8±0,04 mmol/l, 14-sutkada 9,6±0,03 mmol/l ga tushirishi, anor po‘sti ekstrakti mos ravishda – 8,7±0,03 mmol/l, 8,4±0,04 mmol/l, urug‘i ekstrakti mos ravishda – 8,6±0,06 mmol/l, 8,2±0,03 mmol/l ga tushirishi, “Oq shirin” sharbati ekstrakti (150 mg/kg) 7-sutkada 9,9±0,03 mmol/l, 14-sutkada 9,7±0,05 mmol/l, anor po‘sti ekstrakti mos ravishda

– 9,4±0,06 mmol/l, 9,2±0,03 mmol/l, urug‘i ekstrakti mos ravishda – 8,9±0,05 mmol/l, 8,8±0,04 mmol/l ga tushirishi aniqlandi.

Shuningdek, eksperimental diabet sharoitida “Achchiq dona” sharbati ekstrakti (150 mg/kg) kalamush qonida glyukoza konsentratsiyasini 7-sutkada 11,5±0,08 mmol/l, 14-sutkada 10,2±0,07 mmol/l ga tushirishi, anor po‘sti ekstrakti mos ravishda – 9,8±0,03 mmol/l, 9,7±0,04 mmol/l, urug‘i ekstrakti mos ravishda – 9,6±0,05 mmol/l, 9,4±0,03 mmol/l, “Qizil anor” sharbati ekstrakti (150 mg/kg) kalamush qonida glyukoza konsentratsiyasini 7-sutkada 9,5±0,03 mmol/l, 14-sutkada 9,2±0,04 mmol/l ga tushirishi, anor po‘sti ekstrakti mos ravishda – 7,8±0,04 mmol/l, 7,6±0,02 mmol/l, urug‘i ekstrakti mos ravishda – 8,1±0,03 mmol/l, 8,3±0,04 mmol/l ga tushirishi aniqlandi.

XULOSALAR

Shunday qilib, amalga oshirilgan tadqiqotlarda alloksan monogidrat (150 mg/kg) in’yeksiyasi yordamida yuzaga keltirilgan eksperimental diabet modelida kalamush qonida glyukoza konsentratsiyasi 7-sutkada 27,8±0,2 mmol/l, 14-sutkada 29,5±0,3 mmol/l ga ortishi sharoitida (nazorat guruhida 7-sutka va 14-sutkalarda mos ravishda – 4,7±0,05 mmol/l va 4,8±0,04 mmol/l), anor (*Punica granatum* L.) mahalliy navlari ekstraktlari (sharbat, po‘st, urug‘) (150 mg/kg) sezilarli darajadagi gipoglikemik faollikka ega bo‘lib, bunda qonda glyukoza konsentratsiyasi “Qizil anor” po‘sti ekstrakti ta’sirida 7-sutka va 14-sutkada mos ravishda – 7,8±0,04 mmol/l va 7,6±0,02 mmol/l, urug‘i ekstrakti ta’sirida mos ravishda – 8,1±0,03 mmol/l va 8,3±0,04 mmol/l gacha pasayishi tasdiqlandi.

Anor (*Punica granatum* L.) navlari sharbati, meva po‘sti va urug‘i ekstraktining antidiabet faolli tarkibidagi polifenol birikmalar bilan bog‘liqligi tahmin qilish mumkin.

Olingan natijalar anor (*Punica granatum* L.) ekstrakti asosida diabet terapiyasi maqsadlarida, biologik faol qo‘shimcha ishlab chiqishda ilmiy asos sifatida foydalanilishi mumkin.

Foydalanilgan qisqartmalar ro‘yxati:

- FAD-GDH – flavin-adenin dinukleotidga bog‘liq glyukoza-degidrogenaza (*Flavin adenine dinucleotide-dependent glucose dehydrogenase*);
- AMPK – Adenozinmonofosfatga bog‘liq faollashuvchi proteinkinaza (AMP-*activated protein kinase*);

- $GLUT_4$ – glyukozaning insulinga bog‘liq tashilishida ishtirok etuvchi transportyor (*Glucose transporter type* 4).
- IL-6 – yallig‘lanish jarayoni regulyasiyasida ishtirok etuvchi sitokin – interleykin-6 (*interleukin*-6);
- NF-κB – yallig‘lanish jarayonida ishtirok etuvchi omillar regulyasiyasida ishtirok etuvchi yadro transkripsiya omili (*nuclear factor kappa-light-chain-enhancer of activated B cells*);
- TNF-α – o‘sma nekroz omili/yallig‘lanish sitokini (*Tumor necrosis factor alpha*);

Minnatdorchilik

Mualliflar tadqiqotlarni amalga oshirishda yaqindan yordam bergan – O‘zbekiston Respublikasi Fanlar akademiyasi O.S.Sodiqov nomidagi Biorganik kimyo instituti Farmakologiya laboratoriyasi ilmiy xodimi – Maxmudov Lazizbek Umarjonovichga minnatdorchilik bildiradi.

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BACILLUS LICHENIFORMIS SHTAMMINING FITOPATOGEN MIKROORGANIZMLARGA QARSHI ANTAGONISTIK FAOLLIGI

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Annotatsiya: *Ushbu tadqiqotda Samarqand shahridagi tarixiy obyektlar hududida o‘ suvchi asriy daraxtlar mikrobiomi MALDI-TOF mass-spektrometriya usuli yordamida o‘ rganildi. Ajratilgan mikroorganizmlar orasidan yuqori antagonistik faollikka ega* ***Bacillus licheniformis*** *shtammi tanlanib, uning fitopatogenlarga qarshi biologik faolligi baholandi. Natijalar* ***B. licheniformis*** *patogen mikroorganizmlar o‘ sishini cheklashi va aniq inhibisiya zonalari hosil qilishini ko‘ rsatdi. Dala sinovlarida 10^{-2} suyultirilgan suspenziya qo‘ llanilganda biologik himoya samaradorligi yuqori bo‘ lib, ushbu shtamm asriy daraxtlarni himoyalash uchun istiqbolli biokontrol agenti ekanligi aniqlandi.*

Kalit so‘ zlar: Bacillus licheniformis, *antagonizm, fitopatogenlar, mikrobiom, MALDI-TOF, biologik himoya, asriy daraxtlar.*

АНТАГОНИСТИЧЕСКАЯ АКТИВНОСТЬ ШТАММА *BACILLUS LICHENIFORMIS* ПРОТИВ ФИТОПАТОГЕННЫХ МИКРООРГАНИЗМОВ

Аннотация: *В данном исследовании с использованием метода MALDI-TOF масс-спектрометрии изучен микробиом вековых деревьев, произрастающих на территории исторических объектов города Самарканда. Среди выделенных микроорганизмов был отобран штамм* ***Bacillus licheniformis*** *с высокой антагонистической активностью, и проведена оценка его биологической эффективности против фитопатогенов. Результаты показали, что* ***B. licheniformis*** *эффективно подавляет рост патогенных микроорганизмов и формирует зоны ингибирования. В полевых испытаниях применение суспензии в разведении 10^{-2} обеспечило высокую эффективность биологической защиты, что подтверждает перспективность данного штамма как биоконтрольного агента для защиты вековых деревьев.*

Ключевые слова: Bacillus licheniformis, *антагонизм, фитопатогены, микробиом, MALDI-TOF, биологическая защита.*

ANTAGONISTIC ACTIVITY OF THE *BACILLUS LICHENIFORMIS* STRAIN AGAINST PHYTOPATHOGENIC MICROORGANISMS

Abstract: *This study investigated the microbiome of monumental trees growing in historical sites of Samarkand using MALDI-TOF mass spectrometry. Among the isolated microorganisms, the* ***Bacillus licheniformis*** *strain with high antagonistic activity was selected, and its biological efficacy against phytopathogens was evaluated. The results demonstrated that* ***B. licheniformis*** *effectively inhibited the growth of pathogenic microorganisms and formed distinct inhibition zones. Field trials showed high biological protection efficiency when a 10^{-2} diluted suspension was applied by spraying, confirming the potential of this strain as a biocontrol agent for protecting monumental trees.*

Keywords: Bacillus licheniformis, *antagonism, phytopathogens, microbiome, MALDI-TOF MS, biological control, monumental trees.*

Kirish.

Asriy daraxtlar shahar ekotizimi va madaniy merosning muhim tarkibiy qismi bo‘ lib, ekologik barqarorlik, biologik xilma-xillik va tarixiy landshaftni saqlashda katta ahamiyatga ega [1]. Biroq vaqt o‘ tishi bilan fitopatogen bakteriyalar va zamburug‘ lar ta’sirida daraxtlarning fiziologik holati yomonlashishi, nekroz va chirish jarayonlari rivojlanishi mumkin. Kimyoviy himoya vositalaridan foydalanish tarixiy obyektlar hududida ekologik jihatdan cheklanganligi sababli biologik himoya usullarini ishlab chiqish dolzarb hisoblanadi [2].

Adabiyotlar tahlili va Metodologiya

O‘ simlik mikrobiomi tarkibidagi **Bacillus** turkumiga mansub bakteriyalar biologik faol metabolitlar ishlab chiqarishi orqali fitopatogenlarning rivojlanishini bostiradi. Zamonaviy **MALDI-TOF mass-spektrometriya** usuli yordamida bunday mikroorganizmlar tezkor aniqlanadi [3]. Mazkur tadqiqotning maqsadi Samarqand shahri tarixiy obidalari hududida mavjud asriy daraxtlar mikrobiomidan ajratilgan ***Bacillus licheniformis*** shtammining fitopatogen mikroorganizmlarga qarshi antagonistik faolligini baholash va uni biologik himoya vositasi sifatida qo‘ llash imkoniyatlarini aniqlashdan iborat [4].

Adabiyotlar tahlili. So‘ nggi yillarda o‘ simlik mikrobiomi va uning fitopatogenlarga qarshi himoyadagi roli bo‘ yicha tadqiqotlar sezilarli darajada kengaydi. Sog‘ lom o‘ simlik mikrobiomi patogenlarning rivojlanishini cheklaydi va o‘ simlik immunitetini faollashtirishda muhim rol o‘ ynaydi [5]. Antagonistik bakteriyalar fitopatogenlar bilan raqobatlashish, antibiotik va antifungal birikmalar ishlab chiqarish hamda induksiyalangan sistemik rezistentlikni faollashtirish orqali biologik nazoratda ishtirok etadi. Ayniqsa, **Bacillus, Paenibacillus** va **Pseudomonas** avlodlari vakillari samarali biokontrol agentlari sifatida keng o‘ rganilmoqda [6]. Asriy daraxtlar mikrobiomi uzoq yillar davomida shakllangan murakkab ekologik tizim bo‘ lib, fiziologik holati va kasalliklarga chidamliligida muhim ahamiyatga ega [7].

Bacillus turkumiga mansub bakteriyalar ekologik xavfsizligi, spora hosil qilish qobiliyati va biologik faol metabolitlar sintez qilishi sababli biologik himoya vositalari orasida alohida o‘ rin egallaydi. *Bacillus subtilis*, *B. velezensis* va *B. licheniformis* ko‘ plab fitopatogenlarga qarshi yuqori antagonistik faollikka ega ekanligi aniqlangan [8]. ***Bacillus licheniformis*** iturin, surfaktin, fengitsin va boshqa lipopeptidlarni ishlab chiqarib, fitopatogenlarning hujayra membranasiga ta’sir qiladi hamda ularning rivojlanishini cheklaydi. Ushbu bakteriyaning *Fusarium oxysporum*, *Alternaria alternata*, *Botrytis cinerea* kabi patogenlarga qarshi samaradorligi ko‘ plab tadqiqotlarda tasdiqlangan. Genomik tadqiqotlar **Bacillus** vakillarida antagonistik metabolitlar sintezida ishtirok etuvchi NRPS, PKS va siderofor gen klasterlari mavjudligini ko‘ rsatgan [9]. Bu mexanizmlar bakteriyalarni fitopatogenlarga qarshi kompleks himoya ta’sirini ta’minlaydi. MALDI-TOF mass-spektrometriya mikroorganizmlarni tezkor identifikatsiya qilish imkonini beruvchi zamonaviy usul bo‘ lib, ekologik namunalardagi **Bacillus, Pantoea, Paenibacillus** va **Pseudomonas** vakillarini aniqlashda samarali qo‘ llanmoqda [10].

Bacillus licheniformis fitopatogenlarga qarshi yuqori antagonistik faollikka ega istiqbolli biokontrol agentidir. Shu bilan birga, madaniy meros obyektlaridagi asriy daraxtlar mikrobiomidan ajratilgan mahalliy shtammlarning biologik xususiyatlari yetarlicha o‘ rganilmagan. Mazkur tadqiqot asriy daraxtlar mikrobiomidan ajratilgan mahalliy antagonistik shtammlarning biologik imkoniyatlarini baholash orqali ushbu yo‘ nalishdagi tadqiqotlarni rivojlantirishga xizmat qiladi [11].

Materiallar va tadqiqot metodlari. Tadqiqot obyekti sifatida Samarqand shahridagi madaniy meros obyektlari - Go‘ ri Amir maqbarasi, Sherdor madrasasi va Ulug‘ bek rasadxonasi hududlarida o‘ suvchi **Juniperus, Thuja, Cupressus, Pinus, Morus, Platanus** va **Aesculus** turkumlariga mansub asriy daraxtlardan olingan namunalar hamda daraxtlar atrofidagi tuproq namunalari foydalanildi. Namunalar daraxt tanasi, po‘ stloq yuzasi va zararlangan to‘ qimalardan aseptik sharoitda olinib, mikrobiologik tahlillar uchun laboratoriyaga yetkazildi. Ajratib olingan mikroorganizmlar sof kultura holiga keltirilib, ularning tur tarkibi **MALDI-TOF mass-spektrometriya** usuli yordamida identifikatsiya qilindi. Olingan mass-spektrlar ma’lumotlar bazasi bilan taqqoslanib, mikroorganizmlar tur darajasida aniqlandi. Antagonistik faollik ikki kulturani birgalikda o‘ stirish usulida baholanib, patogen koloniyasi o‘ sishining cheklanishi va inhibisiya zonasi hosil bo‘ lishiga ko‘ ra yuqori faollikka ega shtamm tanlab olindi.

Laboratoriya sinovlari natijalariga ko‘ ra eng faol antagonistik shtamm sifatida ***Bacillus licheniformis*** tanlandi. Ushbu shtammning biologik samaradorligini baholash maqsadida dala sharoitida sinovlar o‘ tkazildi. Bunda bakteriya suspenziyasi **10^{-2} (1:100)** suyultirish darajasida tayyorlanib, daraxt tanasi hamda fitopatogenlar bilan zararlangan qismlariga purkash usulida qo‘ llanildi. Tajriba davomida daraxtlarning umumiy fitosanitar holati, zararlanish darajasi va biologik preparatning fitopatogen mikroflora rivojlanishiga ta’siri monitoring qilindi.

Natijalar va muhokama.

Asriy daraxtlardan ajratib olingan mikroorganizmlar MALDI-TOF mass-spektrometriya usulida identifikatsiya qilindi (1-jadval). Identifikatsiya natijalari daraxtlar mikrobiomi tarkibida antagonistik, fitopatogen va shartli patogen mikroorganizmlar birgalikda uchrashini ko‘ rsatdi [12].

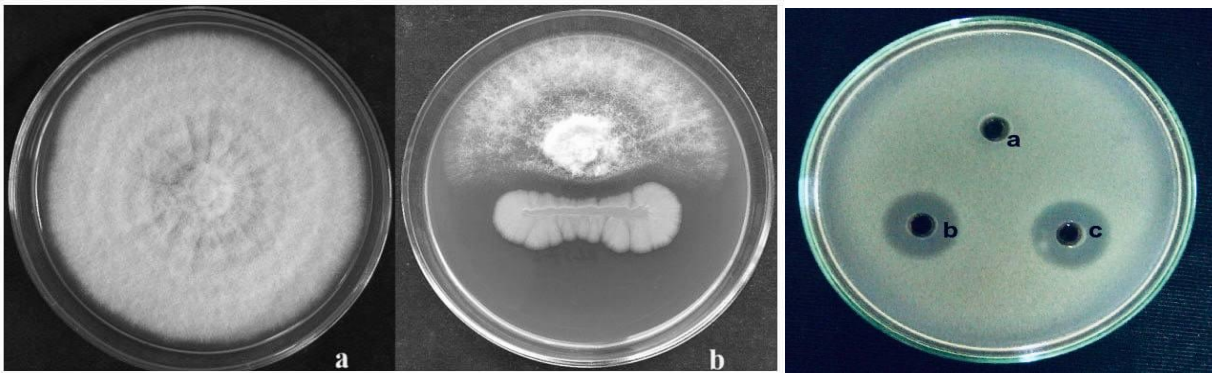
1-jadval.

Asriy daraxtlardan ajratilgan mikroorganizmlar

Obyekt	Bakteriya shtammlari	Mikromitset nomlari
Juniper Verginiana, Juniperus sp.,	*P. agglomerans, B. subtilis, B. megaterium*	*A. alternata, C. cladosporioides*
Pinus sylvestris	*B. subtilis, B. megaterium, B. pumilus, B. licheniformis, P. agglomerans*	*F. oxysporum, A. alternata, P. chrysogenum*
Thuja orientalis	*B. subtilis, B. vallismortis, P. agglomerans*	*A. niger, P. citrinum*
Morus alba	*B. vallismortis, B. subtilis A. viridans,*	*F. oxysporum, A. alternata*
Platanus orientalis	*B. subtilis, Pseudomonas syringae*	*C. herbarum, A. alternata*
Pinus eldarica	*B. subtilis, B. licheniformis*	*F. solani, P. chrysogenum*
Pinus nigra	*Pn. peoriae, Pn. polymyxa, A. baumannii, B. simplex*	*A. flavus, C. cladosporioides*
Pinus pungens	*B.licheniformis, Cutaneotrichosporon jirovecii*	*A. alternata, F. oxysporum*
Tuproq	*B. subtilis, B. megaterium, Az. chroococcum*	*P. citrinum, A. niger*

Tahlillar natijasida ***Bacillus subtilis, Bacillus licheniformis*** va ***Bacillus megaterium*** ko‘ pchilik namunalarda uchragan bo‘ lsa, ***Pseudomonas syringae*** va ***Acinetobacter baumannii*** ayrim daraxt turlarida aniqlandi. Bu esa asriy daraxtlar mikrobiomida foydali va fitopatogen mikroorganizmlar o‘ rtasida tabiiy biologik muvozanat mavjudligini ko‘ rsatadi [13].

Ajratib olingan fitopatogen mikroorganizmlar hamda Mikrobiologiya instituti kolleksiyasidagi antagonistik shtammlar o‘ rtasida skrining tadqiqotlari o‘ tkazildi. Natijada ***Bacillus licheniformis*** yuqori antagonistik faollikka ega shtamm sifatida tanlab olindi. Laboratoriya tajribalarida ushbu shtamm fitopatogen mikroorganizmlar koloniyalarining o‘ sishini sezilarli darajada cheklab, aniq inhibisiya zonalari hosil qildi (1-rasm).



A) **B)**

1-rasm. ***Bacillus licheniformis*** **shtammining fitopatogen mikroorganizmlarga nisbatan antagonistik faolligi: A-** ***Bacillus licheniformis*** **va** ***Fusarium oxysporum*** **o‘ rtasidagi o‘ zaro antagonistik munosabat; B-** ***Bacillus licheniformisning*** **patogen mikroorganizmlarga qarshi antagonizmi.**

Olingan natijalar ***Bacillus licheniformis*** shtammi madaniy meros obyektlari hududida o‘ suvchi asriy daraxtlarni fitopatogen mikroorganizmlardan biologik himoya qilishda istiqbolli biokontrol agenti ekanligini ko‘ rsatdi [14].

Tadqiqot natijalari asriy daraxtlar mikrobiomi tarkibida foydali va fitopatogen mikroorganizmlar o‘ rtasida tabiiy biologik muvozanat mavjudligini ko‘ rsatdi. MALDI-TOF tahlillari natijasida aniqlangan ***Bacillus subtilis, Bacillus licheniformis*** va ***Bacillus megaterium*** kabi bakteriyalar biologik himoyada muhim ahamiyatga ega bo‘ lsa, ***Pseudomonas syringae*** va ***Acinetobacter baumannii*** kabi mikroorganizmlar daraxtlarning fitosanitar holatiga salbiy ta’sir ko‘ rsatishi mumkin.

Skrining tadqiqotlari natijasida ***Bacillus licheniformis*** shtammining yuqori antagonistik faolligi aniqlandi. Adabiyotlarda ushbu bakteriya fitopatogen mikroorganizmlarga qarshi lipopeptid antibiotiklar va gidrolitik fermentlar ishlab chiqarishi hamda ularning rivojlanishini samarali bostirishi qayd etilgan [15].

Laboratoriya va dala sinovlari ***Bacillus licheniformis*** shtammining mahalliy sharoitda biologik himoya vositasi sifatida qo‘ llash uchun istiqbolli ekanligini tasdiqladi. Ayniqsa, mahalliy daraxt mikrobiomidan ajratib olingan shtammdan foydalanish uning ekologik moslashuvchanligini oshirib, biologik preparat samaradorligini ta’minlaydi.

Xulosa.

MALDI-TOF mass-spektrometriya usuli yordamida madaniy meros obyektlari hududida o‘ suvchi asriy daraxtlar mikrobiomining tur tarkibi aniqlandi va antagonistik hamda fitopatogen mikroorganizmlar mavjudligi qayd etildi.

Skrining tadqiqotlari natijasida ***Bacillus licheniformis*** yuqori antagonistik faollikka ega shtamm sifatida tanlandi. Laboratoriya va dala sharoitlarida o‘ tkazilgan sinovlar uning fitopatogen mikroorganizmlar rivojlanishini samarali cheklashini ko‘ rsatdi.

Olingan natijalar ***Bacillus licheniformis*** shtammi asosida biologik preparatlar yaratish va ularni madaniy meros obyektlari hududidagi asriy daraxtlarni ekologik xavfsiz usulda fitopatogen mikroorganizmlardan himoyalashda qo‘ llash istiqbolli ekanligini ko‘ rsatadi. Bu yondashuv daraxtlarning biologik barqarorligini saqlash va tarixiy landshaftlarni muhofaza qilishda muhim amaliy ahamiyatga ega.

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FARG‘ ONA VODIYSI REPTILIYALARI GELMINTOFAUNASINING TAKSONOMIK TARKIBI, HUDUDIY DIFFERENSIATSIYASI VA EKOLOGIK TUZILISHI

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Annotatsiya. *Ko‘p yillik gelmintologik materiallar hamda adabiyot ma’lumotlari asosida Farg‘ona vodiysi reptiliyalari gelmintofaunasining taksonomik tarkibi, hududiy tarqalishi va ekologik-funksional tuzilishi tahlil qilindi. Reptiliyalarning faunistik ro‘yxatidan lokalitetlarni qayta tanlab olish natijasida Farg‘ona vodiysi bilan bog‘liq 44 ta gelmint taksoni hamda mustaqil faunistik shakllar ajratib olindi. Ulardan 34 tasi Nematoda (77,27%), 7 tasi Cestoda (15,91%) va 3 tasi Acanthocephala (6,82%) guruhlariga mansub. Viloyatlar darajasida aniq lokalizatsiyaga ega 39 ta taksondan Namangan viloyatida 27 ta, Farg‘ona viloyatida 17 ta va Andijon viloyatida 7 ta takson qayd etildi. Jakkar o‘xshashlik koeffitsienti Namangan–Farg‘ona juftligi uchun J=0,158, Andijon–Farg‘ona uchun J=0,143 hamda Andijon–Namangan uchun J=0,133 ni tashkil etdi. Faunalar kesishmasi tahlili (Venn diagrammasi) natijalariga ko‘ra, 18 ta takson faqat Namangan viloyatida, 9 tasi Farg‘ona viloyatida va 1 tasi Andijon viloyatida qayd etilgan bo‘lib, uchala hudud uchun yagona umumiy komponent Tachygonetria longicollis turi hisoblanadi. Autoxton voyaga yetgan shakllar bilan bir qatorda alloxthon lichinka bosqichlarining mavjudligi Eremias, Phrynocephalus va Trapelus avlodlariga mansub kaltakesaklar parazitlarning trofik tizimlarida oraliq, rezervuar va paratenik bo‘g‘inlar vazifasini o‘tashidan dalolat beradi. Aksincha, Testudo horsfieldii gelmintofaunasida to‘g‘ri (monoksen) rivojlanish sikliga ega ichak nematodalari ustunlik qiladi. Olingan natijalar shuni ko‘rsatadiki, vodiy reptiliyalarining gelmintofaunasi hududiy jihatdan tabaqalashgan tizim bo‘lib, uning shakllanishi xo‘jayin taksonomiyasi, biotop, oziqlanish spektri, oraliq xo‘jayinlar bilan aloqalar hamda parazitlarning hayot sikllari orqali belgilanadi.*

Kalit so‘zlar: *Farg‘ona vodiysi, Reptilia, gelmintofauna, Nematoda, Cestoda, Acanthocephala, Eremias velox, Testudo horsfieldii, Jakkar indeksi, trofik aloqalar.*

ТАКСОНОМИЧЕСКИЙ СОСТАВ, ТЕРРИТОРИАЛЬНАЯ ДИФФЕРЕНЦИАЦИЯ И ЭКОЛОГИЧЕСКАЯ СТРУКТУРА ГЕЛЬМИНТОФАУНЫ РЕПТИЛИЙ ФЕРГАНСКОЙ ДОЛИНЫ

Аннотация. *Проведён анализ таксономического состава, территориального распределения и эколого-функциональной структуры гельминтофауны рептилий Ферганской долины на основе многолетних гельминтологических материалов и литературных данных. В результате повторной выборки локалитетов из фаунистического списка рептилий выделено 44 таксона гельминтов и самостоятельные фаунистические формы, связанные с Ферганской долиной. Из них 34 относятся к Nematoda (77,27%), 7 - к Cestoda (15,91%) и 3 - к Acanthocephala (6,82%). Среди 39 таксонов с точной локализацией на уровне областей в Наманганской области зарегистрировано 27, в Ферганской - 17 и в Андижанской - 7 таксонов. Коэффициент сходства Жаккара составил J=0,158 для пары Наманган–Фергана, J=0,143 для пары Андижан-Фергана и J=0,133 для пары Андижан–Наманган. Согласно результатам анализа пересечения фаун (диаграмма Венна), 18 таксонов зарегистрированы исключительно в Наманганской области, 9 — в Ферганской и 1 — в Андижанской; при этом единственным общим компонентом для всех трех регионов являлся вид Tachygonetria longicollis. Присутствие наряду с автохтонными половозрелыми формами аллохтонных личиночных стадий свидетельствует о функциях ящериц родов Eremias, Phrynocephalus и Trapelus в качестве промежуточных, резервуарных и паратенических звеньев трофических паразитарных систем. В гельминтофауне Testudo horsfieldii,*

напротив, доминируют кишечные нематоды с прямым (моноксенным) циклом развития. Полученные результаты свидетельствуют, что гельминтофауна рептилий долины представляет собой территориально дифференцированную систему, формирование которой определяется таксономией хозяина, биотопом, спектром питания, контактами с промежуточными хозяевами и жизненными циклами паразитов.

Ключевые слова: *Ферганская долина, Reptilia, гельминтофауна, Nematoda, Cestoda, Acanthocephala, Eremias velox, Testudo horsfieldii, индекс Жаккара, трофические связи.*

TAXONOMIC COMPOSITION, TERRITORIAL DIFFERENTIATION AND ECOLOGICAL STRUCTURE OF REPTILE HELMINTHOFAUNA IN THE FERGANA VALLEY

Abstract. *The taxonomic composition, territorial distribution, and ecological-functional structure of the helminth fauna of reptiles in the Fergana Valley were analyzed based on long-term helminthological materials and literature data. Reassessment of localities from the faunal records of reptiles resulted in the identification of 44 helminth taxa and independent faunal forms associated with the Fergana Valley. Of these, 34 belong to Nematoda (77.27%), 7 to Cestoda (15.91%), and 3 to Acanthocephala (6.82%). Among the 39 taxa with precise regional localization, 27 were recorded in the Namangan Region, 17 in the Fergana Region, and 7 in the Andijan Region. The Jaccard similarity coefficient was J=0.158 for the Namangan–Fergana pair, J=0.143 for Andijan–Fergana, and J=0.133 for Andijan–Namangan. According to the analysis of faunal overlap (Venn diagram), 18 taxa were recorded exclusively in the Namangan Region, 9 in the Fergana Region, and 1 in the Andijan Region; Tachygonetria longicollis was the only common component shared by all three regions. The occurrence of allochthonous larval stages alongside autochthonous adult forms indicates the roles of lizards of the genera Eremias, Phrynocephalus, and Trapelus as intermediate, reservoir, and paratenic links in trophically transmitted parasitic systems. In contrast, the helminth fauna of Testudo horsfieldii is dominated by intestinal nematodes with a direct (monoxenous) life cycle. Overall, the results demonstrate that the reptile helminth fauna of the valley represents a territorially differentiated system shaped by host taxonomy, biotope, diet composition, interactions with intermediate hosts, and parasite life cycles.*

Key words: *Fergana Valley, Reptilia, helminth fauna, Nematoda, Cestoda, Acanthocephala, Eremias velox, Testudo horsfieldii, Jaccard index, trophic relationships.*

ВВЕДЕНИЕ

Рептилии являются важным компонентом пищевых цепей наземных экосистем, а состав их гельминтофауны тесно связан с филогенетической принадлежностью хозяина, средой обитания, стратегией питания и трофическим уровнем. В жизненных циклах гельминтов рептилии выступают не только в качестве дефинитивных хозяев, но также могут выполнять функции промежуточных, дополнительных, паратенических и резервуарных хозяев. Поэтому изучение систем «рептилия-гельминт» не ограничивается фаунистической инвентаризацией, а позволяет раскрывать механизмы естественной циркуляции паразитов и их биоценотические связи [1-4].

Ферганская долина относится к экологически сложным регионам Центральной Азии и характеризуется близким соседством песчаных пустынь, полупустынь, адыров, предгорий, горных участков, речных долин и интенсивно освоенных агроэкосистем. Такое ландшафтное разнообразие формирует широкий спектр экологических ниш для рептилий и одновременно создаёт различные пути передачи гельминтов. Наземные насекомоядные ящерицы, потребляя членистоногих, включаются в жизненные циклы спируридных нематод, цестод и акантоцефалов, тогда как у черепах устойчивые комплексы образуют преимущественно кишечные нематоды с прямым циклом развития.

Специальные исследования гельминтов рептилий Ферганской долины активизировались в конце XX-начале XXI века. При обследовании представителей Testudines и Sauria в равнинных и предгорных зонах долины в 1993-2001 гг. для фауны Узбекистана было выявлено 14 новых видов гельминтов, в том числе 2 вида цестод и 12 видов нематод [5]. В последующих исследованиях были уточнены новые связи «хозяин-паразит», описаны новые виды нематод и расширены представления о функциональной роли рептилий в жизненных циклах гельминтов [6-9].

Вместе с тем значительная часть имеющихся сведений носит фрагментарный характер и ограничено отдельными видами хозяев или локалитетами. Комплексный анализ таксономического состава, межобластного фаунистического сходства и эколого-функциональной структуры гельминтофауны рептилий Ферганской долины до настоящего времени оставался недостаточно разработанным. Настоящее исследование направлено на восполнение этого пробела на основе ревизии и обобщения многолетних паразитологических сборов.

Цель исследования определить таксономический состав гельминтов, зарегистрированных у рептилий Ферганской долины, оценить их территориальное распределение в Андижанской, Наманганской и Ферганской областях на основе подхода presence-absence, определить фаунистическое сходство с использованием

коэффициента Жаккара и охарактеризовать эколого-функциональную роль рептилий в жизненных циклах паразитов.

МАТЕРИАЛЫ И МЕТОДЫ

Основу базы данных составили обобщённые фаунистические материалы, собранные в 2000–2026 гг. в различных природно-ландшафтных зонах Узбекистана. В общем диссертационном материале исследовано 3096 особей рептилий. В настоящей работе Ферганская долина рассматривалась как восточный территориально-экологический комплекс, включающий Андижанскую, Наманганскую и Ферганскую области.

Гельминтологическое исследование рептилий проводили методом полного гельминтологического вскрытия по К.И. Скрябину [10]. Паразитов собирали из органов и тканей, фиксировали и идентифицировали по морфологическим признакам. Для характеристики заражённости использовали экстенсивность инвазии (ЭИ, %), интенсивность инвазии (ИИ) и, при наличии соответствующих данных, среднюю интенсивность инвазии.

В матрице presence-absence подтверждённое присутствие таксона в конкретной области кодировали как 1, отсутствие регистрации-как 0. Фаунистическое сходство между двумя территориями рассчитывали по коэффициенту Жаккара: J=a/(a+b+c), где a - число общих для обеих территорий таксонов, b и c - число таксонов, отмеченных только на одной из сравниваемых территорий. Пересечения для трёх областей оценивали по логике диаграммы Венна с выделением семи секторов: трёх уникальных, трёх попарно общих и одного общего для всех трёх территорий.

При экологической интерпретации гельминтов подразделяли на два функциональных компонента: (1) автохтонные половозрелые формы, достигающие половой зрелости в рептилиях; (2) аллохтонные личиночные формы, циркулирующие в паразитарных системах других позвоночных и использующие рептилий как промежуточных, дополнительных или резервуарных хозяев. Такой подход позволил связать структуру гельминтофауны со спектром питания рептилий и механизмами передачи паразитов в биотопах.

РЕЗУЛЬТАТЫ

У рептилий Ферганской долины выделено 44 таксона гельминтов и самостоятельные фаунистические формы. Из них 34 относятся к Nematoda (77,27%), 7 - к Cestoda (15,91%) и 3 - к Acanthocephala (6,82%). Следовательно, гельминтофауна рептилий долины имеет отчётливо выраженный нематодный характер. Доля нематод примерно в 4,9 раза превышает долю цестод и в 11,3 раза - долю акантоцефалов.

Таблица 1

Таксономическая структура гельминтофауны рептилий Ферганской долины

Таксономическая группа	Число таксонов	Доля, %
Cestoda	7	15,91
Acanthocephala	3	6,82
Nematoda	34	77,27
Всего	44	100,00

В составе Cestoda зарегистрированы представители *Oochoristica, Mathevotaenia*, *Diplopylidium* и *Mesocestoides*. Экологически эта группа включает два различных компонента: половозрелые кишечные паразиты, такие как *Oochoristica*, и личиночные формы *Diplopylidium* и *Mesocestoides*. Несмотря на небольшое число Acanthocephala, присутствие *Macracanthorhynchus catulinus*, *Centrorhynchus scanensis* и *Plagiorhynchus (Prosthorhynchus) transversus* свидетельствует об участии рептилий в циркуляции гельминтов птиц и млекопитающих более высоких трофических уровней.

Nematoda оказались наиболее богатой группой-34 таксона, относящиеся к Physalopteridae, Spirocercidae, Pharyngodonidae, Ascarididae, Cosmocercidae, Seuratidae, Strongyloididae и Atractidae. Особенно разнообразны Pharyngodonidae, формирующие специфические комплексы у *Testudo, Eremias, Phrynocephalus* и *Trapelus.*

Таблица 2

Богатство гельминтных таксонов с точной областной локализацией

Территория	Число таксонов (S)	От 39 таксонов, %	Примечание
Наманганская область	27	69,23	наибольшее число регистраций
Ферганская область	17	43,59	среднее богатство
Андижанская область	7	17,95	наименьшее число регистраций

Высокие показатели Наманганской области обусловлены прежде всего объемами материалов из песчаного массива Мингбулак — Аккум, урочища Алами, Чуст-Наманганских и Касансай-Янгикурганских адыров, а также

Туракургана. В Ферганской области ключевыми локалитетами являлись Бувайда, Язъяван, Сох, Алтыарык и Шахимардан, а в Андижанской — Боз, Улугнор и Пахтаабад.

На основе матрицы presence–absence во всех попарных сравнениях установлено низкое сходство по Жаккару. Для пары Наманган–Фергана при 6 общих и 38 объединённых таксонах J=0,158; для Андижан–Фергана при 3 общих и 21 объединённом таксоне J=0,143; для Андижан–Наманган при 4 общих и 30 объединённых таксонах J=0,133.

Таблица 3

Сходство гельминтофауны рептилий областей Ферганской долины по Жаккару

Пара областей	Общие таксоны (a)	Объединённое число	Jaccard J
Андижан–Наманган	4	30	0,133
Андижан–Фергана	3	21	0,143
Наманган–Фергана	6	38	0,158

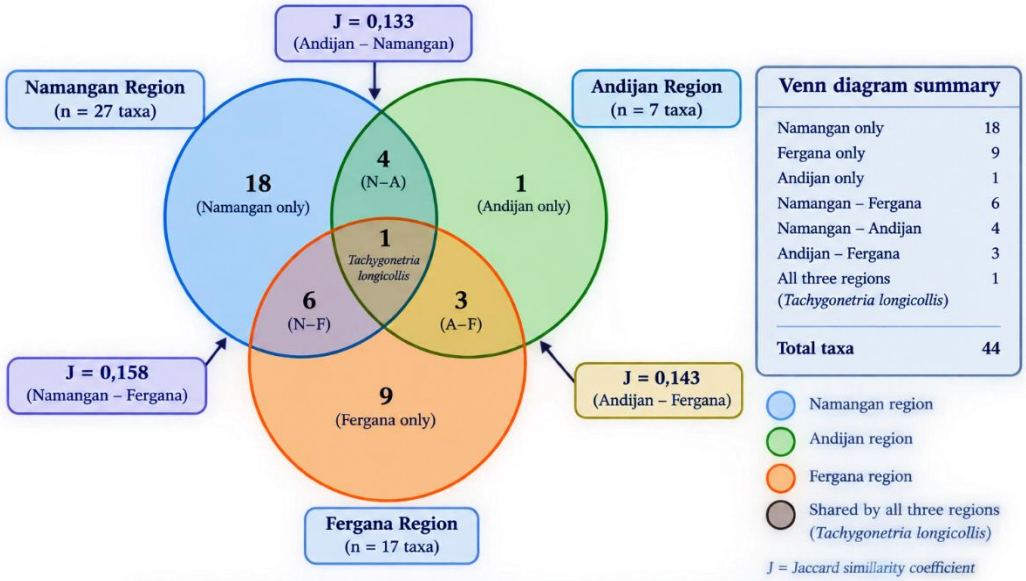


Рис. 1. Диаграмма Венна таксонов гельминтов и коэффициенты сходства Жаккара между областями.

По результатам анализа Венна 18 таксонов зарегистрированы только в Наманганской области, 9-только в Ферганской и 1-только в Андижанской. Попарно общими компонентами являлись 3 таксона для Андижанской и Наманганской областей, 2-для Андижанской и Ферганской, 5-для Наманганской и Ферганской. Единственным таксоном, зарегистрированным во всех трёх областях, был *Tachygonetria longicollis* (рисунок 1).

Эти данные свидетельствуют о высокой территориальной гетерогенности зарегистрированных комплексов гельминтов, несмотря на географическую целостность долины.

Среди исследованных рептилий *Eremias velox* является одним из ключевых связующих хозяев паразитарных систем Ферганской долины. Наряду с половозрелыми нематодами у него встречаются личиночные стадии цестод, акантоцефалов и спируридных нематод. Личинки *Plagiorhynchus (Prosthorhynchus) transversus* обнаружены у *E. velox* в Сохском районе Ферганской области; ЭИ составила 0,82%, ИИ – 2- экз. Эта находка свидетельствует о роли E. velox как нового резервуарного хозяина данного акантоцефала в Узбекистане.

Представители *Phrynocephalus* являются важным элементом циркуляции гельминтов в песчаных и полупустынных биотопах. Личинки *Diplopylidium acanthoptera* зарегистрированы у *P. helioscopus* в песках Аккум Мингбулакского района Наманганской области; ЭИ у P. helioscopus составила 6,06%, ИИ - 2-5 экз. *Abbreviata schulzi* обнаружена у *P. mystaceus* в Бувайдинском, Язъяванском и Мингбулакском районах, что указывает на устойчивую циркуляцию физалоптеридных нематод в песчано-аридных ландшафтах.

Комплекс гельминтов *Testudo horsfieldii* экологически резко отличается от комплексов насекомоядных ящериц. *Tachygonetria longicollis* зарегистрирована во всех трёх областях; ЭИ составила 24,68%, ИИ – 200-400 экз. *T. lobota* отмечена в Наманганской и Ферганской областях, *T. macrolaimus* и *T. dentata* - в Наманганской. ЭИ *Atractis dactyluris* достигала 40,25%, что свидетельствует о формировании у черепах устойчивой паразитарной системы нематод с прямым циклом развития.

Особое таксономическое значение имеет регистрация *Raillietnema uzbekistanica* у *Testudo horsfieldii* в Чуст-Наманганских адырах Наманганской области. Этот вид нематод был описан как новый для науки из северной части Ферганской долины [6], что подчёркивает значение региона не только с точки зрения фаунистического богатства, но и как территории таксономической диверсификации гельминтов.

Таблица 4

Состав гельминтофауны рептилий Ферганской долины и её территориальное распределение

№	Тип	Вид	Места обнаружения
1	Cestoda	*Oochoristica tuberculata*	Ферганская
2		*O. sobolevi*	Наманганская
3		*O. lagrangei*	Наманганская
4		*Mathevotaenia rodentium*	Андижанская, Наманганская, Ферганская
5		*Diplopylidium acanthoptera (larvae)*	Наманганская
6		*D. polyacantha (larvae)*	Ферганская, Наманганская
7		*Mesocestoides lineatus (larvae)*	Ферганская
8	Acanthocephala	*Macracanthorhynchus catulinus (cystacanth)*	Наманганская
9		*Centrorhynchus scanensis (larvae)*	Наманганская
10		*Plagiorhynchus (Prosthorhynchus) transversus (larvae)*	Ферганская
11	Nematoda	*Abbreviata uzbekistanica*	Ферганская
12		*A. kazachstanica*	Андижанская
13		*A. schulzi*	Ферганская, Наманганская
14		*A. dentata*	Наманганская
15		*Physaloptera praeputiale*	Наманганская
16		*Pseudabbreviata markovi*	Андижанская, Наманганская
17		*Pseudabbreviata sp.*	Андижанская, Наманганская, Ферганская
18		*Thubunaea schukurovi*	Наманганская
19		*Gongylonema pulchrum (larvae)*	Наманганская
20		*Physocephalus sexalatus (larvae)*	Ферганская, Наманганская
21		*Spirocerca lupi (larvae)*	Андижанская, Наманганская, Ферганская
22		*Vigisospirura potekhina (larvae)*	Ферганская
23		*Parapharyngodon szczerbaki*	Андижанская, Наманганская
24		*Pharyngodon mamillatus*	Андижанская, Наманганская
25		*P. termezensis*	Наманганская
26		*Spauligodon pseudoeremiasi*	Андижанская, Ферганская
27		*S. parasskiffi*	Наманганская
28		*S. sazicolae*	Ферганская
29		*Tachygonetria longicollis*	Андижанская, Наманганская, Ферганская
30		*T. lobota*	Наманганская,

№	Тип	Вид	Места обнаружения
			Ферганская
31		*T. macrolaimus*	Наманганская
32		*T. dentata*	Наманганская
33		*Mehdiella stylosa*	Наманганская
34		*Thaparia thapari*	Наманганская
35		*Thelandros markovi*	Ферганская
36		*T. popovi*	Ферганская
37		*Amplicaecum schikhobalovi*	Андижанская, Наманганская, Ферганская
38		*Ophidascaris* sp.	Ферганская, Наманганская
39		*Polydelphis* sp.	Ферганская
40		*Cosmocerca commutata*	Наманганская
41		*Raillietnema uzbekistanica*	Наманганская
42		*Skrjabinelazia hoffmanni*	Андижанская, Ферганская
43		*Strongyloides mirzai*	Андижанская, Наманганская, Ферганская
44		*Atractis dactyluris*	Наманганская

Обсуждение

Доля Nematoda в гельминтофауне рептилий Ферганской долины, достигающая 77,27%, отражает экологическую закономерность, характерную для паразитофауны наземных рептилий. Среди нематод представлены как формы с прямым циклом развития - прежде всего Pharyngodonidae и Atractidae, - так и виды Physalopteridae и Spirocercidae, развивающиеся с участием членистоногих. Таким образом, даже в пределах одной крупной таксономической группы реализуются различные стратегии передачи, что способствует повышению общего видового богатства.

В более раннем исследовании рептилий Ферганской долины у восьми видов хозяев было выявлено 14 видов гельминтов, новых для фауны Узбекистана [5], что уже тогда указывало на высокую перспективность региона для гельминтологических исследований. Выделение 44 таксонов в настоящем повторном анализе отражает существенное расширение фаунистических знаний вследствие многолетних сборов и увеличения круга обследованных хозяев. Однако эти показатели нельзя напрямую интерпретировать как «рост с 14 до 44 видов»: работа 2004 г. учитывала новые для фауны Узбекистана находки, тогда как настоящее исследование суммирует все фаунистические компоненты, связанные с долиной.

Низкие значения коэффициента сходства Жаккара (J=0,133-0,158) свидетельствуют о слабо выраженной фаунистической общности гельминтов между сравниваемыми областями. Относительно высокий, хотя в целом невысокий показатель установлен для пары Наманган — Фергана. Одной лишь географической близости недостаточно для объяснения выявленной картины: на дифференциацию состава гельминтов совместно влияют видовое разнообразие рептилий, соотношение песчаных и адырных биотопов, доступность промежуточных хозяев и неравномерность полноты обследования локалитетов.

По данным диаграммы Венна, только вид *T. longicollis* зарегистрирован во всех трех областях, что представляет научный интерес, однако данный результат не следует трактовать как абсолютную биогеографическую закономерность. Широкое распространение *Testudo horsfieldii* в пределах Ферганской долины и узкая хозяинная специфичность *T. longicollis* могут способствовать её регистрации во всех исследованных областях. В то же время формальная «уникальность» ряда таксонов для отдельных областей может быть связана не с истинным эндемизмом, а с различиями в полноте и объёме исследовательских сборов.

Экологическая структура гельминтофауны рептилий особенно отчётливо проявляется в соотношении автохтонного и аллохтонного компонентов. Автохтонные формы достигают половой зрелости в рептилиях и отражают длительные эволюционные связи с хозяином. Аллохтонные личинки относятся к паразитарным системам других позвоночных и превращают рептилию в биологический аккумулятор в трофической цепи

передачи. Наземные насекомоядные ящерицы, поедая жуков, прямокрылых, мокриц и других беспозвоночных, заражаются личинками цестод, спируридных нематод и акантоцефалов [2, 8, 9].

Например, в жизненном цикле *P. (P.) transversus* наземные мокрицы могут выполнять роль промежуточных хозяев, *E. velox* - резервуарного хозяина, а хищные птицы - дефинитивных хозяев. Тем самым формируется трофическая цепь «беспозвоночное →рептилия →птица». Для Spirocerca lupi и ряда других спирурид преобладает модель «членистоногое → рептилия → хищное млекопитающее». Такие связи делают рептилий одним из функционально важных звеньев наземных паразитарных систем.

У черепах наблюдается иная экологическая стратегия. Высокая интенсивность заражения представителями *Tachygonetria, Mehdiella, Thaparia, Raillietnema* и *Atractis* в популяциях *T. horsfieldii* связана с прямой передачей, контаминацией внешней среды инвазионными стадиями и длительным использованием хозяевами одних и тех же микробиотопов. Поэтому гельминтофауна черепах по сравнению с насекомоядными ящерицами характеризуется более выраженным специфическим моноксенным компонентом.

Разнообразие природных и антропогенных ландшафтов Ферганской долины также влияет на циркуляцию паразитов. В естественных песчаных, адырных и предгорных биотопах более полно сохраняются трофические связи между членистоногими, рептилиями, птицами и млекопитающими. В агроэкосистемах и урбанизированных территориях отдельные связи могут разрываться, тогда как другие, в частности связанные с синантропными и домашними животными, способны усиливаться. В исходных материалах для восточного территориально-экологического комплекса приведено 48 регистраций гельминтов рептилий в естественных экосистемах и 12 - в урбанизированных; эти величины следует рассматривать именно как записи по типам экосистем, а не как независимое число видов.

Полученные результаты можно интерпретировать в рамках интегративной экологической модели: «региональный пул гельминтов →ландшафтно-биотопический фильтр →экологическая ниша хозяина →спектр питания →контакты с промежуточными хозяевами →механизм передачи →биологическая совместимость хозяина и паразита →реально сформированное гельминтное сообщество». Такая схема позволяет объяснять различия между рептилиями не только их систематическим положением, но и трофической и пространственной экологией.

ЗАКЛЮЧЕНИЕ

С рептилиями Ферганской долины связано 44 таксона гельминтов и самостоятельные фаунистические формы. В таксономической структуре абсолютное доминирование принадлежит Nematoda - 34 таксона (77,27%); Cestoda представлены 7 таксонами (15,91%), Acanthocephala - 3 (6,82%).

На областном уровне в Наманганской области зарегистрировано 27, в Ферганской – 17 и в Андижанской – 7 таксонов. Фаунистическое сходство по Жаккару во всех попарных сравнениях было низким: Наманган–Фергана J=0,158, Андижан–Фергана J=0,143 и Андижан–Наманган J=0,133. Единственным таксоном, общим для всех трёх областей по результатам анализа Венна, являлся *Tachygonetria longicollis.*

В функциональном отношении гельминтофауна рептилий включает два основных компонента: автохтонные формы, достигающие половой зрелости в рептилиях, и аллохтонные личиночные формы, принадлежащие паразитарным системам других позвоночных. Представители *Eremias, Phrynocephalus* и *Trapelus* имеют важное значение как промежуточные и резервуарные звенья трофически передающихся гельминтов, тогда как *Testudo horsfieldii* служит дефинитивным хозяином для ряда моноксенных кишечных нематод.

Формирование гельминтных сообществ рептилий Ферганской долины определяется таксономической принадлежностью хозяина, биотопической специализацией, стратегией питания, контактами с промежуточными хозяевами и особенностями жизненных циклов паразитов. Выявленные территориальные различия могут отражать как экологическую гетерогенность, так и неравномерность выборочного охвата; поэтому дальнейшие исследования должны основываться на стандартизированном территориальном мониторинге.

Вклад авторов, конфликт интересов и финансирование

Вклад авторов: все авторы внесли равный вклад в разработку концепцию исследования, анализ данных и подготовку текста статьи. Конфликт интересов: авторы заявляют об отсутствии конфликта интересов. Финансирование: исследование выполнено без внешней финансовой поддержки.

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MARKAZIY O‘ ZBEKISTONDA *SEMENOVIANA PLOTNIKOVI* (UVAROV, 1914)NING TARQALISHI VA EKOLOGIYASI

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Annotatsiya. *Semenoviana plotnikovi (Uvarov, 1914) Markaziy Osiyo faunasiga xos Tettigoniidae vakili bo‘ lib, Markaziy O‘ zbekistondagi tarqalishi va biotop aloqalari maxsus tur darajasida yetarlicha umumlashtirilmagan. Tadqiqotning maqsadi muallifning Markaziy O‘ zbekistonda olib borgan dala izlanishlarini Buxoro–Qorovulbozor, Navoiy–Qiziltepa, Samarqand–Urgut hamda Jizzax–Zomin va Nurota hududlaridagi qaydlar asosida tizimlashtirish, turning hududiy uchrashi hamda ekologik diapazonini baholashdan iborat. Barcha asosiy hisoblarda 50 × 2 m transekt, 60 daqiqalik faol kuzatuv va 100 sweep-net zarbasidan iborat standart protokol qo‘ llangan. Markaziy O‘ zbekistonning beshta nuqtasida jami 76 individ qayd etilgan: Nurotada 24, Urgutda 22, Zominda 20, Qorovulbozor va Qiziltepada 5 tadan. Ulardan 45 tasi urg‘ ochi va 31 tasi erkak. Farg‘ ona vodiysi va Namangan bo‘ yicha jami 45 individga oid ma’lumotlar hamda Arslonbobdagi bitta fotoqayd asosiy tanlanmaga qo‘ shilmay, hududiy taqqoslash uchun ishlatildi. Bir xil protokol asosiy nuqtalardagi qayd sonlarini tavsifiy qiyoslash imkonini berdi, biroq har bir nuqta bir sana bilan ifodalanganligi sababli farqlar populyatsiya zichligining barqaror statistik ko‘ rsatkichi sifatida talqin qilinmadi. Natijalar turning Markaziy O‘ zbekistonda arid tekislik, voha, tog‘ oldi va tog‘ biotoplarini qamrab olishini ko‘ rsatdi.*

Kalit so‘ zlar: *Semenoviana plotnikovi; Tettigoniidae; Orthoptera; Markaziy O‘ zbekiston; tarqalish; biotop; tog‘ oldi hududlari; faunistika.*

РАСПРОСТРАНЕНИЕ И ЭКОЛОГИЯ *SEMENOVIANA PLOTNIKOVI* (UVAROV, 1914) В ЦЕНТРАЛЬНОМ УЗБЕКИСТАНЕ

Аннотация. *Semenoviana plotnikovi (Uvarov, 1914) — представитель семейства Tettigoniidae, характерный для фауны Центральной Азии; его распространение и биотопические связи в Центральном Узбекистане ранее не были обобщены на видовом уровне. Цель исследования — систематизировать авторские полевые данные из Караулбазара (Бухарская область), Кызылтепы (Навоийская область), Ургута (Самаркандская область), Заамина и Нуратинского государственного заповедника (Джизакская область), а также оценить региональную встречаемость и экологический диапазон вида. На основных учетных пунктах применяли стандартный протокол: трансекта 50 × 2 м, 60 минут активного наблюдения и 100 взмахов энтомологическим сачком. В пяти пунктах Центрального Узбекистана зарегистрировано 76 особей: в Нурате — 24, Ургуте — 22, Заамине — 20, Караулбазаре и Кызылтепе — по 5. Среди них отмечено 45 самок и 31 самец. Данные о 45 особях из Ферганской долины и Наманганской области, а также одна фоторегистрация из Арсланбоба использованы только для регионального сравнения. Результаты показывают, что вид встречается в аридно-равнинных, оазисных, предгорных и горных биотопах, однако единичные учеты не позволяют трактовать различия как устойчивые показатели плотности популяции.*

Ключевые слова: *Semenoviana plotnikovi; Tettigoniidae; Orthoptera; Центральный Узбекистан; распространение; биотоп; предгорные территории; фаунистика.*

DISTRIBUTION AND ECOLOGY OF *SEMENOVIANA PLOTNIKOVI* (UVAROV, 1914) IN CENTRAL UZBEKISTAN

Abstract. *Semenoviana plotnikovi (Uvarov, 1914) is a member of Tettigoniidae characteristic of the Central Asian fauna, but its distribution and biotope associations in Central Uzbekistan have not previously been synthesized at the species level. This study aimed to systematize the author’s field records from Qorovulbozor (Bukhara Region), Qiziltepa (Navoiy Region), Urgut (Samarkand Region), and Zomin and the Nurota State Nature Reserve (Jizzakh Region), and to assess the species’ regional occurrence and ecological range. A standardized protocol consisting of a 50 × 2 m transect, 60 minutes of active observation, and 100 sweep-net strokes was applied at the principal survey sites. In total, 76 individuals were recorded at five sites in Central Uzbekistan: 24 in*

Nurota, 22 in Urgut, 20 in Zomin, and five each in Qorovulbozor and Qiziltepa. The sample comprised 45 females and 31 males. Records of 45 individuals from the Fergana Valley and Namangan Region, together with one photographic record from Arslanbob, were used only for regional comparison. The findings indicate occurrence across arid plains, oases, foothills, and mountain biotopes; however, single-visit counts should not be interpreted as stable estimates of population density.

Key words: *Semenoviana plotnikovi; Tettigoniidae; Orthoptera; Central Uzbekistan; distribution; biotope; foothills; faunistics.*

KIRISH

To‘ g‘ riqanotlilar (Orthoptera) quruqlik ekotizimlarida o‘ simlik qoplami, mikroiqlim va landshaft tuzilishiga sezgir bo‘ lgan muhim faunistik komponentdir. Ensifera tarkibidagi Tettigoniidae vakillarining hududiy qaydlarini aniq koordinata, sana va tekshiriladigan dalil bilan hujjatlashtirish mintaqaviy faunani yangilash, areal chegaralarini aniqlashtirish va monitoring nuqtalarini belgilash uchun zarur [1, 10–15].

Mazkur bo‘ shliq uch ilmiy savolni yuzaga keltiradi: (1) standart hisoblar turning Markaziy O‘ zbekistondagi tarqalishini qanday tavsiflaydi; (2) qayd sonlari arid tekislik, voha, tog‘ oldi va tog‘ biotoplari bo‘ yicha qanday farqlanadi; (3) Farg‘ ona vodiysi, Namangan va Arslonbob qaydlari asosiy natijalar bilan qanday qiyoslanadi? Tadqiqotning maqsadi — muallifning Qorovulbozor, Qiziltepa, Urgut, Zomin va Nurota bo‘ yicha dala natijalarini tur darajasida yaxlit tahlil qilish, nomenklaturaviy maqomni aniqlashtirish va qolgan hududiy qaydlardan faqat qiyosiy kontekst sifatida foydalanish.

ADABIYOTLAR TAHLILI

Semenoviana plotnikovi dastlab B.P. Uvarov tomonidan 1914-yilda *Platycleis plotnikovi* nomi bilan tavsiflangan [2]. Orthoptera Species File bazasida amalda qabul qilingan kombinatsiya *Semenoviana plotnikovi* (Uvarov, 1914) shaklida beriladi; urg‘ ochi golotip Toshkentdan bo‘ lib, Rossiya Fanlar akademiyasi Zoologiya institutida saqlanadi [1]. Zeuner 1941-yilda Semenoviana guruhining taksonomik holatini qayta ko‘ rib chiqqan [3, 4]. Shu sababli ayrim ikkilamchi manbalardagi “Uvarov, 1941” yozuvi turning mualliflik sanasi emas, avlodning taksonomik qayta talqin qilingan davriga bog‘ liq xatodir.

Tur O‘ zbekiston va Janubiy Qozog‘ istondan ma’lum; tarixiy xo‘ jalik-entomologik ma’lumotlarda uning Qoratov yonbag‘ irlaridagi tau-sag‘ izning generativ qismlariga zarar yetkazgani qayd etilgan [5, 6]. Muallifning Markaziy O‘ zbekistonda olib borgan tadqiqotlari *S. plotnikovi*ning Buxoro, Navoiy, Samarqand va Jizzax hududlarida uchrashini hujjatlashtirgan [9, 10]. Farg‘ ona vodiysi va Namangan bo‘ yicha ma’lumotlar turning sharqiy hududlardagi tarqalishini qiyoslash imkonini beradi [8, 11, 16]. Biroq mazkur natijalar ilgari aynan *S. plotnikovi*ning hududiy tarqalishi, qayd soni va biotop doirasiga bag‘ ishlangan yagona tahlilda umumlashtirilmagan.

Mavjud adabiyotlarni qiyoslash turning o‘ rganilishida uch yo‘ nalish ustunligini ko‘ rsatadi. Birinchi yo‘ nalish nomenklatura va supragenerik tasnifga bag‘ ishlangan bo‘ lib, unda turning 1914-yildagi dastlabki tavsifi, keyingi kombinatsiyalari va Platycleidini tizimidagi o‘ rni aniqlashtirilgan [1–4]. Ikkinchi yo‘ nalish Janubiy Qozog‘ iston va Markaziy Osiyodagi xo‘ jalik-entomologik kuzatuvlarga tayangan; bu manbalarda turning ayrim o‘ simliklar bilan trofik aloqasi hamda arid landshaftlarda uchrashi qayd etilgan [5, 6]. Uchinchi yo‘ nalish O‘ zbekiston Orthoptera faunasining hududiy tarkibi va ekologik guruhlanishini yoritadi [7–16]. Biroq ushbu ishlarning aksariyati ko‘ p turli faunistik majmualarga bag‘ ishlanganligi sababli *S. plotnikovi*ning alohida tur sifatidagi hududiy son ko‘ rsatkichlari, jinsiy tarkibi va biotoplar bo‘ yicha qaydlari yagona standartda taqqoslanmagan.

Shu jihatdan mazkur tadqiqot avvalgi manbalarni takrorlamaydi, balki mualliflik dala qaydlarini bir tur kesimida qayta tizimlashtiradi. Tarixiy va zamonaviy manbalar turning areali uchun umumiy biogeografik fonni beradi, standartlashtirilgan mualliflik hisoblari esa Markaziy O‘ zbekiston nuqtalarini bir xil kuzatuv birligi asosida tavsiflash imkonini yaratadi. Farg‘ ona vodiysi, Namangan va Arslonbob ma’lumotlari asosiy tanlanmaga aralashtirilmay, tashqi qiyosiy qatlam sifatida ishlatilgani tahlilning hududiy chegaralarini aniq saqlaydi. Bunday ajratish tur tarqalishining geografik ko‘ lamini ko‘ rsatish bilan birga, turli metod va sanalarda olingan qaydlarni statistik jihatdan tenglashtirib yuborish xavfini kamaytiradi.

TADQIQOT METODOLOGIYASI

Tadqiqot dizayni, mualliflik materiallari va manbalarni tanlash

Tadqiqotning birlamchi ilmiy asosini muallifning Markaziy O‘ zbekiston ortopterofaunasi bo‘ yicha dala va kolleksiya izlanishlari tashkil etdi [9, 10]. Asosiy hududiy blok Buxoro viloyatining Qorovulbozor tumani, Navoiy viloyatining Qiziltepa tumani, Jizzax viloyatining Forish tumanidagi Nurota davlat qo‘ riqxonasi [18], Samarqand viloyatining Urgut tumani, Jizzax viloyatining Zomin milliy tabiat bog‘ idagi nuqtalarni qamrab oldi. Farg‘ ona viloyatining Yozyovon, Andijon viloyatining Xo‘ jaobod va Namangan viloyatining Pop tumanlaridagi qaydlar hududiy

qiyoslash guruhiga ajratildi [8, 11, 16]. Arslonbob fotoqaydi esa alohida transchegaraviy qiyosiy ma’lumot sifatida qaraldi.

O‘ zbekistondagi har bir dala hisobida 50 × 2 m transekt, 60 daqiqalik faol kuzatuv va 100 sweep-net zarbasidan iborat bir xil protokol qo‘ llangan [7, 17]. Har bir qayd uchun hudud, sana, koordinata, balandlik, jami individlar soni, jins yoki rivojlanish bosqichi, dalil turi va manba ajratildi. Qiziltepadagi barcha 5 imago jins bo‘ yicha aniqlangan: 3♀ va 2♂. Koordinatalar jadvalda standart daraja–daqiqa–soniya (DMS) shaklida berildi; manbada balandligi ko‘ rsatilmagan nuqtalar uchun qiymat taxminan tiklanmadi.

Qo‘ shimcha qiyosiy fotoqayd: Arslonbob

O‘ zbekiston materiallarining tog‘ sharoitidagi qaydlar bilan qiyoslanishi uchun 2026-yil 31-iyul kuni Qirg‘ iziston Respublikasi, Jalolobod viloyati, Bozorqo‘ rg‘ on tumani, Arslonbob atrofidagi Qorot tomonida olingan fotoqayd ham tahlilga kiritildi. Bitta individ soat 11:50 da 41.343125° N, 72.873408° E koordinatada, 1883 m balandlikda va 28 °C haroratda kuzatilgan. Bu qayd asosiy dala tanlanmasining qismi emas, balki turning baland tog‘ -o‘ rmon cheti sharoitida uchrashini ko‘ rsatuvchi qo‘ shimcha taqqoslovchi ma’lumotdir.

Fotoqayd tog‘ yonbag‘ ridagi daraxt-buta va zich o‘ t qoplami mavjud o‘ rmon cheti mikrobiotopida olingan. Individ qo‘ lda ushlab suratga olingani sababli fon o‘ simliklari oziqa o‘ simligi sifatida talqin qilinmadi; boshqa davlat hududida kuzatilgani uchun kolleksiya namunasi olinmadi. Fotosurat Andijon davlat universiteti tadqiqotchisi Turdiyev Zafarbek Salohiddin o‘ g‘ li tomonidan olingan va undan ilmiy foydalanishga ruxsat berilgan. Identifikatsiya Nukus davlat universiteti professori M.J. Medetov tomonidan foto asosida tasdiqlangan.

Identifikatsiya va tahlil chegaralari

Nomenklatura Orthoptera Species File bo‘ yicha tekshirildi [1]. Arslonbob materiali kolleksiya va voucher katalog raqamiga ega bo‘ lmagani uchun u specimen record emas, ekspert tomonidan tasdiqlangan photographic occurrence sifatida qaraldi. Fotoqaydning daliliy maqomi, namuna olinmagani va meteorologik o‘ zgaruvchilarning to‘ liq o‘ lchanmagani natijalar hamda muhokamada ochiq cheklov sifatida ko‘ rsatildi.

O‘ zbekistondagi qaydlar bir xil hisob protokolida olingani sababli har bir nuqtada qayd etilgan individlar soni tavsifiy ravishda qiyoslandi. Markaziy O‘ zbekistonning beshta nuqtasi asosiy guruh, Yozyovon, Xo‘ jaobod va Pop esa qiyosiy guruh sifatida tahlil qilindi. Jami, jins va rivojlanish bosqichi bo‘ yicha arifmetik yig‘ indilar tekshirildi. Biroq har bir nuqta faqat bitta sana va bitta hisob bilan ifodalanganligi sababli dispersiya, ishonch oralig‘ i va statistik ahamiyatlilik hisoblanmadi; qayd sonlari populyatsiya zichligining ko‘ p yillik barqaror bahosi sifatida talqin qilinmadi.

Tahlil birligi sifatida har bir hududdagi bitta standart hisob qabul qilindi. Foiz ulushlari asosiy Markaziy O‘ zbekiston guruhidagi 76 individga nisbatan hisoblandi; qiyosiy guruhdagi 45 individ va Arslonbob fotoqaydi bu maxrajga kiritilmadi. Tog‘ oldi–tog‘ guruhi Urgut, Zomin va Nurota, arid-tekislik guruhi esa Qorovulbozor va Qiziltepa qaydlaridan shakllantirildi. Hisoblar soni har bir hudud uchun bittadan bo‘ lgani sababli o‘ rtacha qiymatlar faqat tavsifiy ko‘ rsatkich sifatida berildi. Jinslar yig‘ indisi alohida tekshirildi: asosiy guruhda 45 urg‘ ochi + 31 erkak = 76 imago; qiyosiy guruhda 23 urg‘ ochi + 14 erkak + 8 nimfa = 45 individ. Bu nazorat jadval, diagramma va matndagi sonlarning o‘ zaro mosligini ta’minladi.

NATIJALAR VA ULARNING TAHLILI

Taksonomik holat

Qabul qilingan nom — *Semenoviana plotnikovi* (Uvarov, 1914); bazionimi — *Platycleis plotnikovi* Uvarov, 1914 [1, 2]. Tur Tettigoniidae oilasi Tettigoniinae kenja oilasiga mansub. Shuning uchun maqola sarlavhasi, jadval va rasm izohlarida “Uvarov, 1914” shakli izchil qo‘ llandi.

Markaziy O‘ zbekistondagi asosiy qaydlar

Markaziy O‘ zbekistonning beshta asosiy nuqtasida jami 76 individ qayd etildi (1-jadval; 1-rasm). Eng ko‘ p qayd Nurota davlat qo‘ riqxonasida — 24 individ (31,6%), keyin Urgutda — 22 (28,9%) va Zomin milliy tabiat bog‘ ida — 20 individ (26,3%) kuzatildi. Qorovulbozor va Qiziltepada 5 tadan individ (har biri 6,6%) qayd etildi. Asosiy guruhda 45 urg‘ ochi (59,2%) va 31 erkak (40,8%) mavjud. Farg‘ ona vodiysi va Namangan qiyosiy guruhida jami 45 individ qayd etilgan: Yozyovonda 15, Xo‘ jaobodda 13 va Popda 17 individ. Arslonbobdagi bitta imago O‘ zbekiston dala hisoblari yig‘ indisiga qo‘ shilmadi.

1-jadval. *Semenoviana plotnikovi* (Uvarov, 1914)ning Markaziy O‘ zbekistondagi asosiy qaydlari va hududiy qiyoslash uchun keltirilgan qo‘ shimcha ma’lumotlar. O‘ zbekistondagi dala qaydlari 50 × 2 m transekt, 60 daqiqalik kuzatuv va 100 sweep-net zarbasi asosida olingan.

Hudud	Sana	Koordinata / balandlik	Qayd	Jins/bosqich	Dalil va protokol	Ma’lumot manbasi

Hudud	Sana	Koordinata / balandlik	Qayd	Jins/bosqich	Dalil va protokol	Ma’lumot manbasi
Buxoro viloyati, Qorovulbozor tumani	07.06. 2018	39°34′01.89″ N; 64°43′31.38″ E; 191 m	5	3♀, 2♂	50 × 2 m; 60 daqiqa; 100 zarba	[9]
Navoiy viloyati, Qiziltepa tumani	08.06. 2018	41°24′59.94″ N; 64°29′57.30″ E	5	3♀, 2♂	50 × 2 m; 60 daqiqa; 100 zarba	[9]
Jizzax viloyati, Forish tumani, Nurota davlat qo‘ riqxonasi	08.06. 2018	40°25′30.42″ N; 66°00′45.55″ E; 870 m	24	15♀, 9♂	50 × 2 m; 60 daqiqa; 100 zarba	[9]
Samarqand viloyati, Urgut tumani	10.06. 2018	39°22′17.04″ N; 66°59′53.09″ E; 1062 m	22	12♀, 10♂	50 × 2 m; 60 daqiqa; 100 zarba	[9]
Jizzax viloyati, Zomin milliy tabiat bog‘ i	24.08. 2019	393538.51″N; 681903.39″ E	20	12♀, 8♂	50 × 2 m; 60 daqiqa; 100 zarba	[9, 10]
Yozyovon, Farg‘ ona viloyati	07.06. 2018	40°47′04.58″ N; 71°21′10.49″ E; 336 m	15	3♀, 4♂, 8 nimfa	50 × 2 m; 60 daqiqa; 100 zarba	[8]
Andijon viloyati, Xo‘ jaobod tumani	08.07. 2018	40°32′19.20″ N; 72°37′01.56″ E	13	8♀, 5♂	50 × 2 m; 60 daqiqa; 100 zarba	[8]
Namangan viloyati, Pop tumani	27.05. 2022	41°01′48.65″ N; 70°36′52.76″ E	17	12♀, 5♂	50 × 2 m; 60 daqiqa; 100 zarba	[16]
Arslonbob–Qorot, Qirg‘ iziston	31.07. 2026	41.343125° N; 72.873408° E; 1883 m	1	Imago; jins ehtiyotkor talqin qilinadi	Qo‘ shimcha qiyosiy fotoqayd; specimen olinmagan	Ushbu tadqiqot



1-rasm. *Semenoviana plotnikovi* (Uvarov, 1914) qaydlarining hududlar bo‘ yicha taqsimlanishi. Yashil ustunlar Markaziy O‘ zbekistonning asosiy tadqiqot nuqtalarini, kulrang ustunlar hududiy qiyosiy guruhni ko‘ rsatadi.

Diagrammada Nurota (24), Urgut (22) va Zomin (20) nuqtalaridagi qaydlar Qorovulbozor va Qiziltepadagi ko‘ rsatkichlardan (5 tadan) ancha yuqori ekani yaqqol ko‘ rinadi. Bu natija turning mazkur hisoblar doirasida tog‘ oldi–tog‘ hududlarida ko‘ proq qayd etilganini tasviriy jihatdan tasdiqlaydi; qiyosiy guruhdagi Pop (17), Yozyovon (15) va Xo‘ jaobod (13) ko‘ rsatkichlari oraliq o‘ rin egallaydi.

Arslonbob qaydining taqqoslashdagi o‘ rni

Arslonbobda foto orqali qayd etilgan bitta imago (2-rasm) O‘ zbekistondagi 121 individlik dala hisoblari yig‘ indisiga qo‘ shilmadi. Uning ilmiy vazifasi Urgut, Zomin, Nurota va Pop kabi tog‘ oldi-tog‘ qaydlari bilan ekologik qiyoslash doirasini kengaytirishdan iborat. Koordinata, sana-vaqt, balandlik, asl foto va ekspert tasdig‘ i qaydni tekshiriladigan qiladi, biroq voucher yo‘ qligi sababli u morfometrik yoki genetik xulosalar uchun asos bo‘ la olmaydi.



2-rasm. Arslonbob–Qorot hududida fotoqayd qilingan *Semenoviana plotnikovi* (Uvarov, 1914). 41.343125° N, 72.873408° E; 1883 m; 31.07.2026, 11:50. Foto: Turdiyev Zafarbek Salohiddin o‘ g‘ li, Andijon davlat universiteti; ruxsat bilan foydalanildi.

Markaziy O‘ zbekiston qaydlarining mavsumiy va ekologik diapazoni

Markaziy O‘ zbekistonning asosiy qaydlari 7-iyundan 24-avgustgacha bo‘ lgan davrni qamrab oldi. Qorovulbozor, Qiziltepa, Urgut va Nurota qaydlari iyun oyiga, Zomin qaydi esa avgust oxiriga to‘ g‘ ri keladi. Urgut, Zomin va Nurotadan iborat tog‘ oldi–tog‘ guruhida jami 66 individ, ya’ni asosiy tanlanmaning 86,8% i qayd etildi; bir nuqtaga o‘ rtacha 22 individ to‘ g‘ ri keldi. Qorovulbozor va Qiziltepadan iborat arid-tekislik guruhida jami 10 individ (13,2%), bir nuqtaga o‘ rtacha 5 individ qayd etildi. Demak, mazkur bir martalik standart hisoblar doirasida tog‘ oldi–tog‘ nuqtalaridagi o‘ rtacha qayd soni arid-tekislik nuqtalariga nisbatan 4,4 marta yuqori bo‘ lgan. Biroq bu farq takroriy hisoblar bilan tasdiqlanmagani sababli biotopning sababiy ta’siri yoki doimiy populyatsiya zichligi farqi deb talqin qilinmaydi. Yozyovon, Xo‘ jaobod va Pop qaydlari sharqiy O‘ zbekiston bilan hududiy qiyoslash uchun keltirildi; Arslonbobdagi 1883 m fotoqayd esa qo‘ shimcha transchegaraviy tog‘ kuzatuvidir.

Markaziy O‘ zbekistonning beshta hisobida 76 imago qayd etilgan: 45 urg‘ ochi (59,2%) va 31 erkak (40,8%). Qiyosiy O‘ zbekiston guruhida 45 individ mavjud bo‘ lib, ulardan 23 tasi urg‘ ochi, 14 tasi erkak va 8 tasi nimfa. Barcha sakkizta O‘ zbekiston nuqtasi bo‘ yicha jami 121 individ qayd etilgan: 68 urg‘ ochi, 45 erkak va 8 nimfa. Turli sana va yillardagi bir martalik hisoblar sababli jinsiy tarkib haqiqiy populyatsion nisbat sifatida talqin qilinmadi.

Natijalarni muhokama qilish

Mualliflik natijalarining biogeografik ahamiyati

*S. plotnikovi*ning O‘ zbekiston va Janubiy Qozog‘ istonda ma’lum bo‘ lishi taksonomik va xo‘ jalik-entomologik manbalarda ko‘ rsatilgan [1, 5, 6]. Mazkur ishning markaziy natijasi turning Markaziy O‘ zbekistondagi beshta standart hisob nuqtasini yagona tur darajasidagi tahlilda birlashtirishidir. Nurota, Urgut va Zominda 20–24 individ, Qorovulbozor va Qiziltepada esa 5 tadan individ qayd etilishi hududiy uchrash darajasining bir xil emasligini ko‘ rsatdi. Shu bilan birga, nuqtalar turli sana va yillarda bir martadan tekshirilganligi sababli kuzatilgan farqni faqat landshaft omili bilan izohlash mumkin emas. Ishning asosiy yangiligi muallifning Markaziy O‘ zbekiston bo‘ yicha standart protokolda olingan ma’lumotlarini bitta tur kesimida qayta tahlil qilish va ularni sharqiy hamda transchegaraviy qaydlar bilan aniq ajratilgan holda qiyoslashdadir.

Arslonbob fotoqaydi ushbu O‘ zbekiston markazli xulosaga qo‘ shimcha hududiy kontekst beradi: u turning Farg‘ ona tizimiga tutash tog‘ -o‘ rmon cheti sharoitida ham uchrash ehtimolini ko‘ rsatadi. Biroq u yagona individga asoslangan, voucher bilan mustahkamlanmagan va standart O‘ zbekiston dala protokolining davomi emas. Shu sababli bu qayd Qirg‘ iziston uchun birinchi mamlakat qaydi yoki maqolaning mustaqil bosh yangiligi sifatida emas, balki asosiy natijalarni ehtiyotkor qiyoslashga xizmat qiluvchi ekspert-tasdiqlangan fotoqayd sifatida baholandi.

Ekologik talqin

Turga nisbatan o‘ simlikxo‘ r xortobiont talqini Markaziy Osiyo Orthoptera ekologik tasniflari bilan mos keladi [12–15]. Tarixiy Qoratov ma’lumotlarida tau-sag‘ izning to‘ pgul, g‘ uncha va urug‘ qutichalaridan oziqlanish qayd

etilgan [6]. Ammo bunday trofik bog‘ lanishni O‘ zbekiston yoki Arslonbobdagi barcha populyatsiyalarga ko‘ chirish mumkin emas. Arslonbob individi qo‘ lda fotoqayd qilingan; uning fonidagi o‘ simliklar oziqa o‘ simligi ekanini isbotlamaydi.

Standart hisoblarda turning voha va arid tekisliklardan 1062 m balandlikdagi Urgut hamda tog‘ -tog‘ oldi hududlarigacha qayd etilishi ekologik diapazonining kengligini ko‘ rsatadi. Nurota nuqtasi 870 m, Qorovulbozor esa 191 m balandlikda joylashgan; Arslonbobdagi 1883 m fotoqayd faqat qo‘ shimcha qiyosiy kontekst beradi. O‘ simlik qoplami, namlik, ekspozitsiya va tuproq harorati barcha nuqtalarda bir xil miqdoriy o‘ lchanmagani sababli balandlik yoki landshaft qayd sonidagi farqning bevosita sababi deb xulosa qilinmadi.

Kuzatilgan 4,4 martalik tavsifiy farqni ehtiyotkor talqin qilish zarur. Bir tomondan, tog‘ oldi va tog‘ nuqtalarida murakkab o‘ simlik qoplami, mikrorelyef hamda namlik mozaikasi xortobiont Tettigoniidae vakillari uchun ko‘ proq mikrobiotop yaratishi mumkin [12–15]. Ikkinchi tomondan, hisob sanalari, fenologik bosqich va yillar bir xil emasligi kuzatilgan sonlarga ta’sir qilishi ehtimol. Shu bois natija turning tog‘ oldi–tog‘ hududlarida ko‘ proq qayd etilganini ko‘ rsatadi, ammo ushbu farqni yashash muhitini tanlash yoki doimiy zichlikning qat’iy isboti sifatida qabul qilish mumkin emas. Tadqiqotning kuchli tomoni — protokol va hisob birliklarining ochiq berilgani; asosiy cheklovi esa hududlar bo‘ yicha takroriy hisoblarning yo‘ qligidir.

Tadqiqot cheklovlari va tekshiriladigan keyingi qadamlar

Tadqiqotning uch asosiy cheklovi mavjud. Birinchidan, hisob protokoli bir xil bo‘ lsa-da, har bir nuqta bitta sana va ayrim hollarda turli yil bilan ifodalangan; shu sababli mavsumlararo va yillararo o‘ zgaruvchanlik baholanmadi. Ikkinchidan, ayrim nuqtalarda balandlik yoki mikrobiotopning miqdoriy tavsifi yetishmaydi. Uchinchidan, Arslonbob ma’lumoti voucher emas, faqat photographic occurrence bo‘ lib, O‘ zbekistonning standart dala hisoblaridan alohida qiyosiy dalil sifatida qaralishi kerak. Salbiy kuzatuv nuqtalari hujjatlashtirilmagani uchun occupancy yoki ekologik niche modeli qurilmadi.

Keyingi monitoringda may–sentabr oylarida kamida oyiga ikki marta 50 × 2 m transekt, 60 daqiqalik faol kuzatuv va 100 sweep-net zarbasi qo‘ llanishi tavsiya etiladi. Har bir qaydda GPS, balandlik, vaqt, havo va tuproq harorati, nisbiy namlik, o‘ simlik qoplami, asosiy o‘ simlik turlari, jins, bosqich, jami kuzatuv va voucherlar soni alohida qayd qilinishi kerak. Qirg‘ iziston hududidagi keyingi ishlar mahalliy ruxsatlar asosida voucher olish va kataloglashtirishni ko‘ zda tutishi lozim.

XULOSALAR

*Semenoviana plotnikovi*ning to‘ g‘ ri nomenklaturaviy nomi *Semenoviana plotnikovi* (Uvarov, 1914) bo‘ lib, “Uvarov, 1941” varianti turning dastlabki tavsif sanasini noto‘ g‘ ri ifodalaydi. Standart protokol asosidagi beshta Markaziy O‘ zbekiston hisobida jami 76 individ qayd etildi. Shundan 66 tasi (86,8%) Urgut, Zomin va Nurota tog‘ oldi–tog‘ nuqtalariga, 10 tasi (13,2%) Qorovulbozor va Qiziltepa arid-tekislik nuqtalariga to‘ g‘ ri keldi. Bir nuqtaga o‘ rtacha qayd soni tog‘ oldi–tog‘ guruhida 22 ta, arid-tekislik guruhida 5 ta bo‘ lib, kuzatilgan farq 4,4 martani tashkil etdi. Natijalar turning Markaziy O‘ zbekistonda tog‘ oldi hududlarida ko‘ proq qayd etilganini ko‘ rsatadi, ammo bir martalik hisoblar sababli bu tendensiya barqaror populyatsiya zichligi farqi deb baholanmadi. Farg‘ ona vodiysi va Namangandagi jami 45 individ hududiy qiyoslash, Arslonbobdagi bitta fotoqayd esa qo‘ shimcha transchegaraviy ekologik kontekst sifatida talqin qilindi. Takroriy standart monitoring aniqlangan tendensiyani tekshirishi lozim.

Foydalanilgan adabiyotlar

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ВЛИЯНИЕ ФЛАВАНОИДА СКУТЕЛЛАРИНА НА КОАГУЛЯЦИОННЫЙ ГЕМОСТАЗ ПЛАЗМЫ КРОВИ КРЫС *IN VITRO*

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Аннотация: *Цель исследования данного работа оценить влияние фитохимически стандартизированной скутелларин-содержащей фракции (Skutellarin), полученной из надземных частей Inula salicina L., на основные параметры коагуляционного гемостаза плазма крови крыс в условиях in vitro. В исследовании использовали Skutellarin, стандартизированную по содержанию скутелларина, а также плазму препараты крыс. Оценивали тромбиновое время (ТВ), время рекальцификации плазмы, активированное частичное тромбопластиновое время (АЧТВ), протромбиновое время (ПВ). Skutellarin вызывала дозозависимое увеличение времени свертывания в исследованных тестах, включая ТВ, время рекальцификации, АЧТВ и ПВ, что указывает на выраженный гипокоагулянтный эффект in vitro. Полученные данные подтверждают наличие комплексного влияния Skutellarin на плазменные и клеточные звенья гемостаза.*

Ключевые слова: *гемостаз, коагуляция, тромбин, АЧТВ, протромбиновое время, тромбоциты, скутелларин, Skutellarin, Inula salicina.*

IN VITRO SHAROITIDA KALAMUSH QONI PLAZMASI KOAGULYATSION GEMOSTAZIGA SKUTELLARIN FLAVONOIDINING TA’SIRI

Annotatsiya: *Mazkur tadqiqotning maqsadi Inula salicina L. o‘ simligining yer ustki qismlaridan olingan, fitokimyoviy jihatdan standartlashtirilgan skutellarin saqlovchi fraksiyaning (Skutellarin) in vitro sharoitida kalamushlar qon plazmasining koagulyatsion gemostazining asosiy ko‘ rsatkichlariga ta’sirini baholashdan iborat. Tadqiqotda skutellarin miqdori bo‘ yicha standartlashtirilgan Skutellarin hamda kalamushlarning qon plazmasi va trombotsit preparatlaridan foydalanildi. Trombin vaqti (TV), plazmani rekalsifikatsiya qilish vaqti, faollashtirilgan qisman tromboplastin vaqti (QFTV) hamda protrombin vaqti (PV) baholandi. Skutellarin o‘ rganilgan testlarning barchasida, jumladan TV, plazmani rekalsifikatsiya qilish vaqti, QFTV va PV bo‘ yicha ivish vaqtining dozaga bog‘ liq ravishda uzayishiga olib keldi. Mazkur natijalar birikmaning in vitro sharoitida yaqqol gipokoagulyant ta’sirga ega ekanligini ko‘ rsatadi. Olingan ma’lumotlar Skutellarinning gemostazning plazmatik va hujayraviy bo‘ g‘ inlariga kompleks ta’sir ko‘ rsatishi mumkinligini tasdiqlaydi.*

Kalit so‘ zlar: *gemostaz, koagulyatsiya, trombin, QFTV, protrombin vaqti, trombotsitlar, skutellarin, Skutellarin, Inula salicina.*

IN VITRO EFFECT OF THE FLAVONOID SCUTELLARIN ON THE COAGULATION HEMOSTASIS OF RAT BLOOD PLASMA

Abstract: *The aim of this study was to evaluate the effect of a phytochemically standardized scutellarin-containing fraction (Scutellarin), obtained from the aerial parts of Inula salicina L., on the main parameters of coagulation hemostasis in rat blood plasma*

in vitro. The study used Scutellarin standardized for scutellarin content, as well as rat blood plasma and platelet preparations. Thrombin time (TT), plasma recalcification time, activated partial thromboplastin time (APTT), and prothrombin time (PT) were assessed. Scutellarin caused a dose-dependent prolongation of clotting time in all tests examined, including TT, plasma recalcification time, APTT, and PT, indicating a pronounced hypocoagulant effect in vitro. The obtained findings suggest that Scutellarin may exert a complex effect on both the plasma and cellular components of the hemostatic system.

Keywords: *hemostasis, coagulation, thrombin, APTT, prothrombin time, platelets, scutellarin, Scutellarin, Inula salicina.*

Введение

Система гемостаза представляет собой высокоорганизованный физиологический механизм, обеспечивающий поддержание целостности сосудистого русла и предотвращение кровопотери при повреждении сосудистой стенки. Избыточная или неконтролируемая активация гемостатических механизмов, напротив, может приводить к патологическому тромбообразованию и развитию тромботических осложнений. Тромбоэмболические состояния, включая ишемическую болезнь сердца, ишемический инсульт, глубокий венозный тромбоз и тромбоэмболию легочной артерии, относятся к основным причинам заболеваемости и смертности во всем мире; по эпидемиологическим оценкам, тромбоэмболические состояния в совокупности были связаны примерно с одной четвертью всех случаев смерти в мире в 2010 г. [1,2].

Современная концепция гемостаза существенно расширяет классическое представление о коагуляции как о линейном каскаде реакций. В соответствии с клеточно-ориентированной моделью гемостаза коагуляция реализуется как динамическое взаимодействие клеток и плазменных факторов и включает взаимоперекрывающиеся стадии инициации, амплификации и пропагации. Существенное значение при этом имеют тканевой фактор, активированные тромбоциты и клеточные поверхности, на которых формируются комплексы, обеспечивающие генерацию тромбина [3-5].

Тромбин занимает центральное положение в регуляции гемостаза, поскольку участвует в образовании фибрина и одновременно усиливает активацию тромбоцитов и последующее формирование тромба. Поэтому изменение образования или функциональной активности тромбина может отражаться сразу на нескольких звеньях гемостаза. Оценка коагуляционного состояния в экспериментальных условиях обычно включает исследование протромбинового времени, АЧТВ, тромбинового времени и других функциональных показателей, однако эти тесты характеризуют отдельные стороны коагуляционного процесса и не позволяют самостоятельно определить конкретную молекулярную мишень исследуемого соединения [3-5].

Необходимость поиска новых регуляторов гемостаза сохраняет актуальность вследствие ограничений существующих антитромботических подходов, включая риск кровотечений, лекарственные взаимодействия и необходимость мониторинга в ряде клинических ситуаций [6,7]. В связи с этим природные биологически активные соединения представляют интерес как потенциальные источники веществ, способных модулировать несколько взаимосвязанных звеньев гемостаза.

Особый интерес представляет скутелларин — флавоноид, входящий в состав ряда лекарственно значимых растительных фракций. Для оценки потенциальных антигемостатических свойств стандартизированных фракций необходим комплексный подход, включающий как плазменные коагуляционные тесты, так и исследование функции тромбоцитов. В литературе показано, что близкое по структуре соединение скутеллареин способно подавлять активацию и агрегацию тромбоцитов, однако молекулярные механизмы антиагрегационного действия флавоноидов могут быть различными и не должны выводиться только из результатов стандартных агрегометрических тестов [8-10].

Цель исследования

Оценить влияние Scutellarina на основные параметры коагуляционного гемостаза в плазме крови крыс *in vitro*, а также определить направления дальнейшего изучения механизма её действия.

Материалы и методы

Исследуемый материал и фитохимическая стандартизация

В исследовании использовали фитохимически стандартизированную скутелларин-содержащую фракцию (Skutellarin), выделенную из надземных частей растения Inula salicina L. Растительное сырьё было собрано в период цветения в районе Бурчимулла Бостанлыкского района Ташкентской области, подвергнуто ботанической идентификации и высушено в затенённых условиях.

3,0 кг высушенного сырья многократно экстрагировали 70%-ным этанолом при комнатной температуре. Объединённые экстракты концентрировали под вакуумом при 40 °C, после чего последовательно разделяли на гексановую, хлороформную, этилацетатную и n-бутанольную фракции. Этил ацетатную фракцию

дополнительно фракционировали на силикагелевой колонке с использованием градиентной системы CHCl3–MeOH.

Химический профиль Skutellarin характеризовали с использованием HPLC/UPLC/LC–MS и данных $^{1}H/^{13}C$-NMR. По данным количественного HPLC-анализа, фракция содержала 84,0% скутелларина, 6,0% апигенин-7-О-глюкуронида, 4,0% производных лютеолина и около 6,0% других флавоноидных и фенольных компонентов. Указанный состав использовали как критерий контроля качества и стандартизации исследуемой фракции. Поскольку Skutellarin представляет собой многокомпонентную стандартизированную фракцию, наблюдаемые биологические эффекты в настоящем исследовании следует относить к Skutellarin в целом, а не исключительно к чистому скутелларину.

Животные и экспериментальный дизайн

Исследование проводили на здоровых адаптированных самцах беспородных белых крыс массой 200–250 г. Животных содержали при температуре 22±2 °C в условиях 12-часового цикла свет/темнота при свободном доступе к стандартному корму и питьевой воде. Продолжительность адаптационного периода составляла не менее 7 суток.

Работа с лабораторными животными проводилась с учетом принципов ARRIVE 2.0 и концепции 3R [11]. Институциональное биоэтическое разрешение было оформлено протоколом №4 от 17 февраля 2026 года Института биофизики и биохимии при Национальном университете Узбекистана. Все экспериментальные процедуры выполнялись в соответствии с институциональными требованиями по содержанию, обращению и обеспечению надлежащих условий для лабораторных животных.

Выделение тромбоцитов

Для выделения тромбоцитов к крови добавляли 3,8%-ный раствор цитрата натрия в соотношении 1:9. Тромбоцитсодержащую плазму получали центрифугированием при 1150 об/мин в течение 15 мин. После этого тромбоцитсодержащую плазму дополнительно центрифугировали при 3000 об/мин в течение 10 мин. Полученную суспензию тромбоцитов переводили в рабочую среду следующего состава: NaCl - 150 мМ, KCl - 2,7 мМ, NaH2PO4 - 0,37 мМ, MgCl2 - 1 мМ, CaCl2 -1 мМ, глюкоза -5 мМ, HEPES-NaOH - 10 мМ, гепарин - 50 ЕД/мл, сывороточный альбумин - 0,35% и апираза - 0,15 мг/мл; pH среды составлял 6,5. Все процедуры выделения и последующего анализа проводили при комнатной температуре (+20…+24 °C). Оптическая агрегометрия как метод оценки агрегации тромбоцитов основана на изменении светопропускания суспензии тромбоцитов [12].

Коагуляционные тесты

В цитратной плазме определяли тромбиновое время (ТВ), время рекальцификации плазмы, протромбиновое время (ПВ) и активированное частичное тромбопластиновое время (АЧТВ) [13,14]. ПВ преимущественно отражает состояние внешнего и общего путей коагуляции, АЧТВ - внутреннего и общего путей, тогда как ТВ чувствительно к этапу превращения фибриногена в фибрин под действием тромбина и последующей полимеризации фибрина. Все коагуляционные исследования выполняли в соответствии с рекомендациями производителя с использованием одноканального коагулометра CYANCoag (Бельгия; модель CY003, №5400439).

Статистический анализ

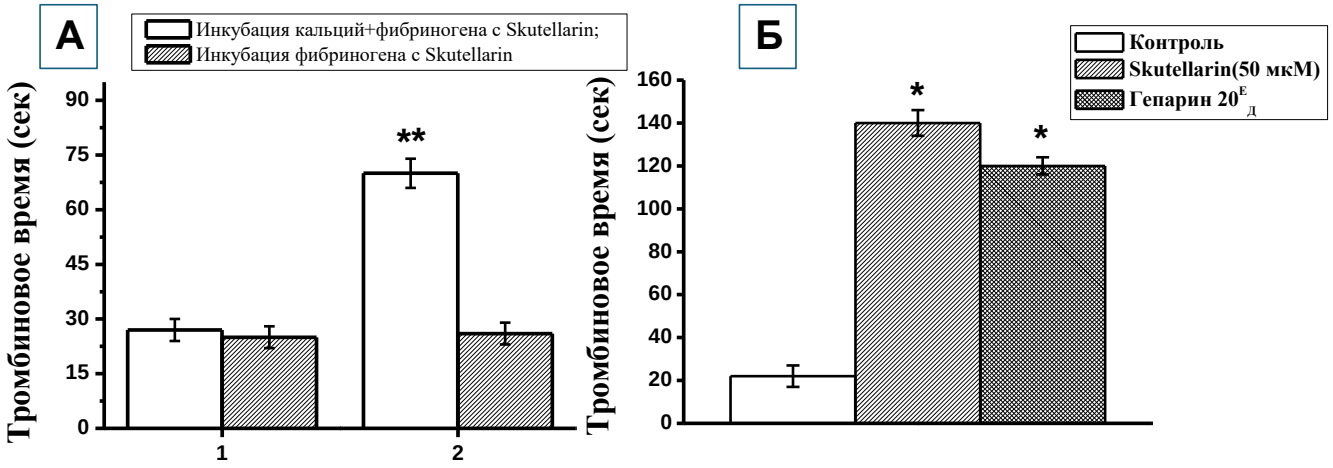
Полученные результаты были статистически обработаны с использованием специализированного программного пакета OriginPro 7.5 (OriginLab Corporation, США). Данные представлены в виде Mean ± SEM (среднее значение ± стандартная ошибка среднего). Статистически значимыми считали различия при $p < 0,05$. Для статистической обработки экспериментальных данных использовали однофакторный дисперсионный анализ (one-way ANOVA) с последующим применением критериев Dunnett или Tukey.

Результаты и их обсуждение

Влияние Skutellarin на тромбиновое время

Предыдущие исследования, проведённые нами, позволили установить некоторые механизмы ингибирующего действия различных биологически активных соединений, выделенных из местного растительного сырья, на суспензию кровяной плазмы и тромбоцитов крыс, а также на синаптосомальную суспензию головного мозга [15–24]. В настоящем исследовании целью проведённых экспериментов было оценить влияние флавоноидного соединения на систему гемостаза с использованием комплекса коагуляционных тестов.

В исследованиях на плазме крови крыс оценивали влияние различных концентраций Skutellarin на тромбиновое время. В контрольных образцах время образования сгустка после добавления тромбина составляло примерно 18–24 с. При концентрации Skutellarin 50 мкМ в одной из экспериментальных постановок выраженного удлинения ТВ не наблюдали, тогда как при предварительной инкубации фракции с плазмой в присутствии тромбина и кальция с последующим добавлением фибриногена отмечалось дозозависимое увеличение ТВ. При концентрации 50 мкМ ТВ возрастало до приблизительно 140 с (рис. 1 А, Б).

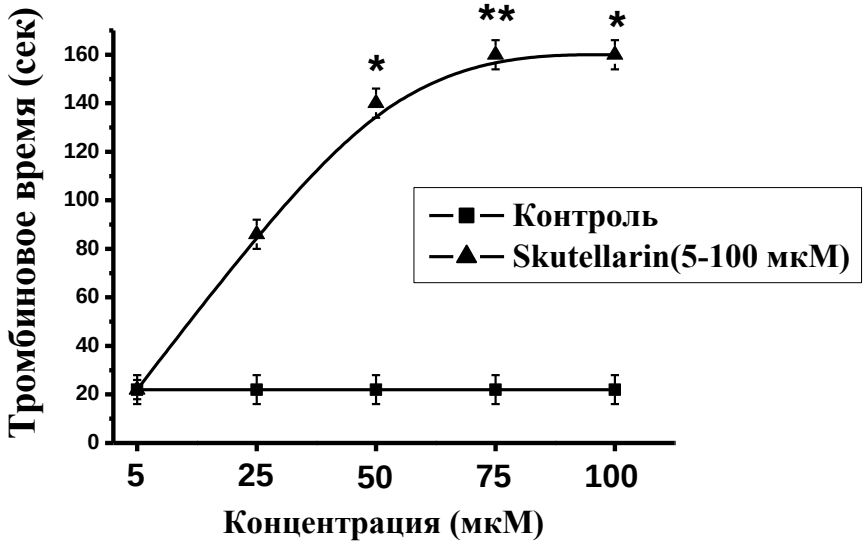


1. Рисунок. А) Влияние Skutellarina на тромбиновое время. 1 - Контроль; 2- Skutellarin (50 мкМ). Б) Исследование влияния Skutellarina на тромбиновое время. Показатель достоверности: * - P <0,05; (n = 6

Полученные данные указывают на влияние Skutellarin на конечный этап формирования фибринового сгустка. Однако изолированное удлинение ТВ не позволяет сделать вывод о прямом ингибировании превращения протромбина в тромбин. Для разграничения влияния на активность тромбина, функциональные свойства фибриногена и процессы полимеризации фибрина необходимы специализированные биохимические тесты.

Дозозависимое влияние Skutellarin на тромбиновое время

При исследовании диапазона концентраций 5–100 мкМ выявлялось дозозависимое удлинение ТВ, причем при 25 мкМ эффект был минимальным, а при повышении концентрации до 75–100 мкМ увеличение времени свертывания становилось более выраженным (рис. 2).

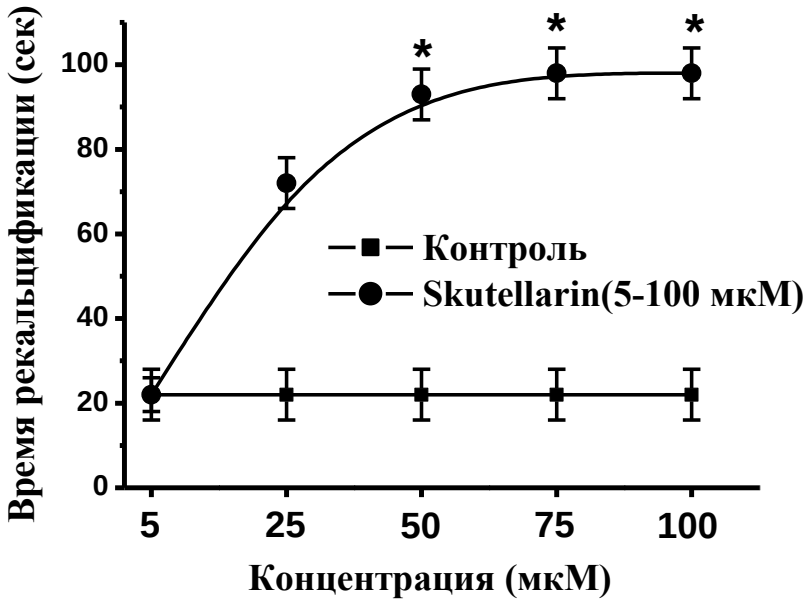


2. Рисунок. Исследование влияния Skutellarina в концентрациях (5-100 мкМ) на тромбиновое время. Показатель достоверности: * - P <0,05; ** - P <0.01; (n = 6).

Полученная зависимость указывает на наличие концентрационно-зависимого антикоагулянтного эффекта Skutellarin в использованной экспериментальной системе.

Влияние Skutellarin на время рекальцификации плазмы

Под действием Skutellarin в диапазоне 5–100 мкМ отмечалось удлинение времени рекальцификации плазмы (рис. 3). Выраженность эффекта увеличивалась по мере повышения концентрации исследуемой фракции.

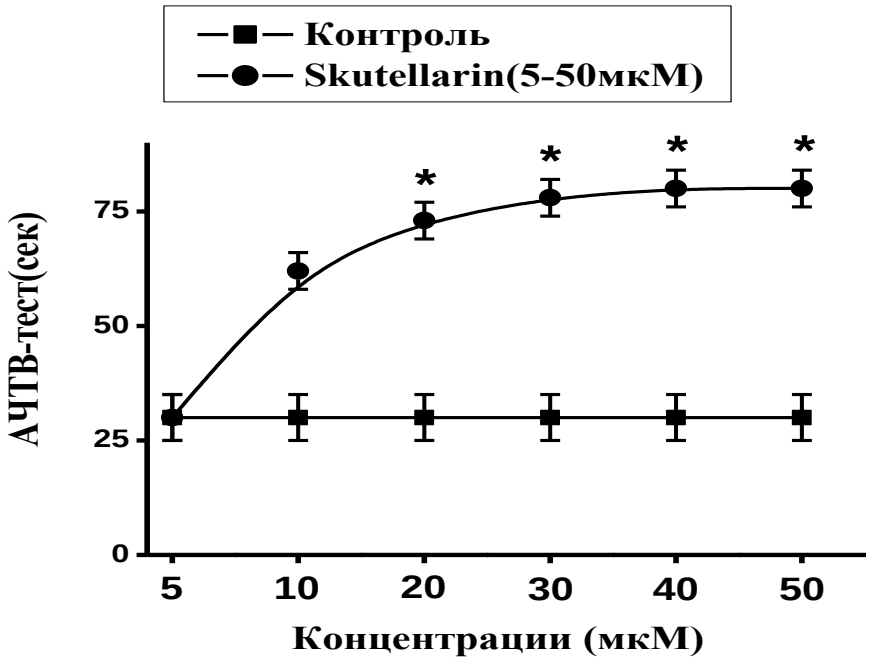


3. Рисунок. Влияние Skutellarina на активированное время рекальцификации плазмы. Показатель достоверности: * - P <0,05; (n = 6).

Полученные результаты свидетельствуют о снижении коагуляционного потенциала плазмы в условиях эксперимента. При этом изменение времени рекальцификации само по себе не позволяет установить конкретный фактор свертывания или белок-мишень.

Влияние Skutellarin на АЧТВ

Skutellarin в исследованном диапазоне (5-50 мкМ) концентраций вызывала дозозависимое удлинение АЧТВ (рис. 4). АЧТВ является интегральным функциональным тестом, чувствительным преимущественно к изменениям внутреннего и общего путей коагуляции.

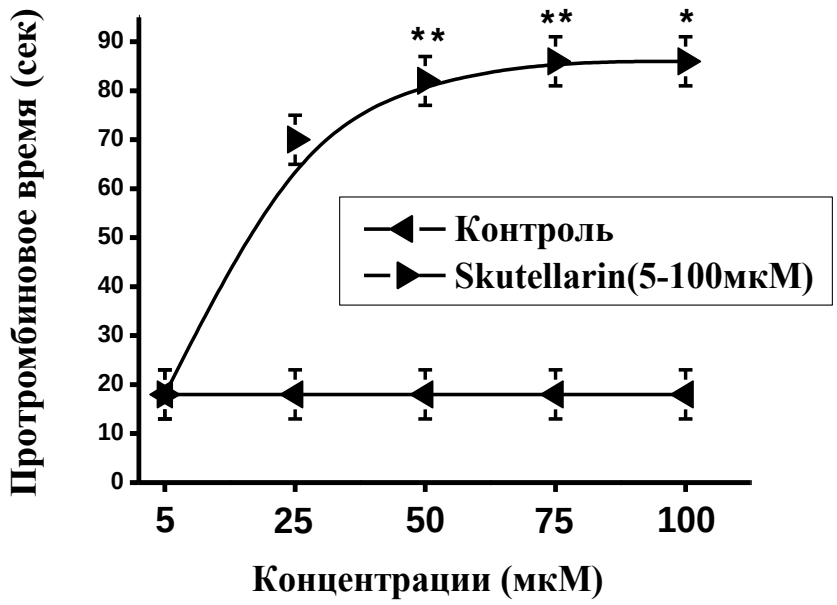


4. Рисунок. Исследование влияния Skutellarina (5-50 мкМ) на АЧТВ-тест. Показатель достоверности: * - P <0,05; (n = 6).

Поэтому полученный эффект свидетельствует об изменении коагуляционного потенциала, но не позволяет определить конкретный фактор или молекулярную мишень Skutellarin без проведения фактор-специфических исследований.

Влияние Skutellarin на протромбиновое время

В диапазоне концентраций 5–100 мкМ Skutellarin вызывала дозозависимое удлинение ПВ; максимальное значение достигало приблизительно 85 с (рис. 5).



5. Рисунок. Влияние Skutellarina на протромбиновое время. Показатель достоверности: * - P <0,05; ** - P <0.01; (n = 6).

Удлинение ПВ свидетельствует о снижении коагуляционной активности внешнего и/или общего путей свертывания. Однако данный тест не позволяет определить, какой именно фактор свертывания является непосредственной мишенью действия исследуемой фракции.

Обсуждение

Совокупность результатов демонстрирует, что Skutellarin оказывает комплексное влияние на гемостатическую систему in vitro, затрагивая как плазменный компонент коагуляции, так и функцию тромбоцитов. Удлинение ТВ, времени рекальцификации, АЧТВ и ПВ указывает на снижение коагуляционного потенциала плазмы. Вместе с тем стандартные коагуляционные тесты являются интегральными и не позволяют самостоятельно локализовать действие исследуемой фракции на уровне конкретного фактора или фермента. Такое ограничение особенно важно для многокомпонентных растительных фракций, биологический эффект которых может определяться совокупным действием нескольких компонентов.

Полученное удлинение ТВ заслуживает отдельного внимания. Поскольку в тестовой системе конечный этап формирования сгустка оценивается после добавления экзогенного тромбина, повышение ТВ можно использовать как подавления превращения протромбина в тромбин. Удлинение АЧТВ и ПВ одновременно указывает на то, что эффект Skutellarin не ограничивается одним из путей коагуляции. Возможно, Skutellarin ингибирует одного из факторов IXa, Xa, XIa, XIIa, VII или II.

Заключение

Skutellarin оказывает выраженное гипокоагулянтное и антиагрегационное действие в использованной экспериментальной системе *in vitro*. Skutellarin дозозависимо увеличивает тромбиновое время, время рекальцификации, АЧТВ и протромбиновое время. Совокупность результатов свидетельствует о влиянии Skutellarin на плазменный компоненты система гемостаза. Полученные результаты создают научно обоснованную основу для дальнейшего изучения Skutellarina в качестве перспективного соединения для разработки новых антикоагулянтных лекарственных средств.

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KALSIY GOMEOSTAZI VA GLUTAMATERGIK SIGNALIZATSIYANING ALSGEYMER KASALLIGIDAGI SINAPTIK DISFUNKSIYADAGI ROLI: POLIFENOLLARNING NEYROPROTEKTOR POTENTSIALI

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Annotatsiya: *Alsgeymer kasalligi (AK) amiloid-β (Aβ) to‘ planishi va patologik Tau o‘ zgarishlari bilan bir qatorda, erta sinaptik disfunksiya, glutamatergik neyrotransmissiya va kalsiy (Ca^{2+}) signalizatsiyasining buzilishi, mitoxondrial disfunksiya, oksidativ stress va neyroyallig‘ lanish bilan kechuvchi ko‘ p omilli neyrodegenerativ jarayondir. Ushbu obzorning maqsadi AK bilan bog‘ liq sinaptik disfunksiyada glutamatergik signalizatsiya va neyronal Ca^{2+} gomeostazining fiziologik ahamiyatini tizimlashtirish hamda polifenollarning ushbu jarayonlarni modulyatsiya qilish potentsialini baholashdan iborat. Fiziologik sharoitda AMPA va NMDA retseptorlari orqali nazoratlangan ion oqimlari, endoplazmatik retikulum va mitoxondriya bilan Ca^{2+} almashinuvi sinaptik plastiklik va neyron bioenergetikasini ta’ minlaydi. AK modellarida Aβ/Tau bilan bog‘ liq o‘ zgarishlar retseptor funksiyasi, organellalar o‘ rtasidagi Ca^{2+} almashinuvi va mitoxondrial metabolizmni izdan chiqarishi mumkin. Kalamush bosh miyasi sinaptosomalarida olingan mahalliy eksperimental ma’ lumotlar ayrim polifenollar L-glutamatga bog‘ liq Ca^{2+} javoblarini va NMDA/VGCC bilan bog‘ liq funksional jarayonlarni modulyatsiya qilishini ko‘ rsatadi. Biroq funksional Ca^{2+} o‘ zgarishlarini to‘ g‘ ridan-to‘ g‘ ri retseptor bog‘ lanishi yoki insonda terapevtik samara bilan tenglashtirish mumkin emas. Ca^{2+} disgomeostazi Aβ yoki Tau gipotezasining o‘ rnini bosuvchi emas, balki sinaptik, mitoxondrial va oksidativ mexanizmlarni o‘ zaro bog‘ lovchi muhim fiziologik-patofiziologik komponent sifatida qaralishi maqsadga muvofiq.*

Kalit so‘ zlar: *Alsgeymer kasalligi; sinaptik disfunksiya; glutamat; NMDA-retseptor; AMPA-retseptor; kalsiy gomeostazi; mitoxondriya; polifenollar; sinaptosoma.*

РОЛЬ КАЛЬЦИЕВОГО ГОМЕОСТАЗА И ГЛУТАМАТЕРГИЧЕСКОЙ СИГНАЛИЗАЦИИ В СИНАПТИЧЕСКОЙ ДИСФУНКЦИИ ПРИ БОЛЕЗНИ АЛЬЦГЕЙМЕРА: НЕЙРОПРОТЕКТОРНЫЙ ПОТЕНЦИАЛ ПОЛИФЕНОЛОВ

Аннотация: *Болезнь Альцгеймера (БА) представляет собой многофакторный нейродегенеративный процесс, протекающий наряду с накоплением амилоида-β (Aβ) и патологическими изменениями Tau, с ранней синаптической дисфункцией, нарушением глутаматергической нейротрансмиссии и кальциевой (Ca^{2+}) сигнализации, митохондриальной дисфункцией, оксидативным стрессом и нейровоспалением. Цель настоящего обзора — систематизировать физиологическое значение глутаматергической сигнализации и нейронального Ca^{2+} гомеостаза в синаптической дисфункции при БА, а также оценить потенциал полифенолов в модуляции данных процессов. В физиологических условиях контролируемые ионные потоки через AMPA- и NMDA-рецепторы, а также обмен Ca^{2+} с эндоплазматическим ретикулумом и митохондриями обеспечивают синаптическую пластичность и биоэнергетику нейрона. При моделях БА изменения, связанные с Aβ/Tau, могут нарушать функцию рецепторов, межорганелльный обмен Ca^{2+} и митохондриальный метаболизм. Локальные экспериментальные данные, полученные на синаптосомах головного мозга крыс, показывают, что отдельные полифенолы модулируют Ca^{2+}-ответы, связанные с L-глутаматом, и функциональные процессы, связанные с NMDA/VGCC. Однако функциональные изменения Ca^{2+} нельзя напрямую отождествлять со связыванием рецептора или терапевтическим эффектом у человека. Дисгомеостаз Ca^{2+} следует рассматривать не как замену амилоидной или Tau-гипотезы, а как важный физиолого-патофизиологический компонент, связывающий синаптические, митохондриальные и оксидативные механизмы.*

Ключевые слова: *болезнь Альцгеймера; синаптическая дисфункция; глутамат; NMDA-рецептор; AMPA-рецептор; кальциевый гомеостаз; митохондрия; полифенолы; синаптосома.*

CALCIUM HOMEOSTASIS AND GLUTAMATERGIC SIGNALING IN SYNAPTIC DYSFUNCTION IN ALZHEIMER'S DISEASE: NEUROPROTECTIVE POTENTIAL OF POLYPHENOLS

Annotation: *Alzheimer's disease (AD) is a multifactorial neurodegenerative process characterized, alongside amyloid-β (Aβ) accumulation and pathological Tau changes, by early synaptic dysfunction, disrupted glutamatergic neurotransmission and calcium (Ca^{2+}) signaling, mitochondrial dysfunction, oxidative stress, and neuroinflammation. This review aims to systematize the physiological relevance of glutamatergic signaling and neuronal Ca^{2+} homeostasis in AD-related synaptic dysfunction, and to evaluate the potential of polyphenols to modulate these processes. Under physiological conditions, controlled ion flux through AMPA and NMDA receptors, together with Ca^{2+} exchange with the endoplasmic reticulum and mitochondria, sustains synaptic plasticity and neuronal bioenergetics. In AD models, Aβ/Tau-related changes may disrupt receptor function, inter-organelle Ca^{2+} exchange, and mitochondrial metabolism. Local experimental data obtained on rat brain synaptosomes indicate that certain polyphenols modulate L-glutamate-dependent Ca^{2+} responses and NMDA/VGCC-related functional processes. However, functional Ca^{2+} changes cannot be directly equated with receptor binding or therapeutic efficacy in humans. Ca^{2+} dyshomeostasis should not be regarded as a substitute for the amyloid or Tau hypotheses, but as an important physiological–pathophysiological component linking synaptic, mitochondrial, and oxidative mechanisms.*

Key words: *Alzheimer's disease; synaptic dysfunction; glutamate; NMDA receptor; AMPA receptor; calcium homeostasis; mitochondria; polyphenols; synaptosome.*

Kirish

Alsgeymer kasalligi neyrodegenerativ kasalliklar orasida sinaptik funksiya va kognitiv jarayonlarning progressiv buzilishi bilan tavsiflanadi. Aβ va patologik Tau uning asosiy morfomolekulyar belgilari bo‘ lsa-da, zamonaviy qarashlar kasallikni bir yo‘ nalishli amiloid kaskad sifatida emas, balki sinaptik signalizatsiya, ion gomeostazi, organellalar funksiyasi, oksidativ stress va yallig‘ lanish o‘ zaro ta’ sir qiladigan tarmoq sifatida baholaydi [1–5].

Fiziolog nuqtai nazaridan sinaps AK patogenezini tushunish uchun qulay funksional darajadir. Neyromediator ajralishi, postsinaptik retseptorlar faolligi, membrana potensiali va Ca^{2+} signalining amplitudasi hamda davomiyligi sinaptik plastiklikni belgilaydi. Shu sabab glutamatergik signalizatsiya va Ca^{2+} gomeostazining buzilishi morfologik o‘ zgarishlar bilan funksional neyronal etishmovchilik o‘ rtasidagi muhim bog‘ lanishlardan biri hisoblanadi [6–10].

Ushbu obzor klinik davolash natijalarini emas, birinchi navbatda eksperimental neyrofiziologiyani markazga qo‘ yadi. Inson to‘ qimalari va klinik tadqiqotlardan olingan ma’ lumotlar eksperimental mexanizmlarni inson patofiziologiyasi bilan solishtirish va translyatsion chegaralarni belgilash uchun qo‘ llaniladi.

Tadqiqot metodologiyasi (adabiyotlarni tanlash tamoyillari)

Ushbu obzorda Alsgeymer kasalligida sinaptik disfunksiya, glutamatergik signalizatsiya va Ca^{2+} gomeostazining fiziologik mexanizmlarini yorituvchi ilmiy ishlarga ustuvorlik berildi. Asosiy e’ tibor eksperimental neyrofiziologik tadqiqotlar, jumladan sinaptosomalar, neyronal modellar, Ca^{2+} dinamikasini baholash va elektrofiziologik yondashuvlarga qaratildi. So‘ nggi yillardagi tadqiqotlar bilan bir qatorda AMPA/NMDA-retseptorlar, sinaptik plastiklik va Ca^{2+} signalizatsiyasi fiziologiyasini asoslovchi fundamental ishlar ham tahlil qilindi. Inson to‘ qimalariga oid tadqiqotlar eksperimental natijalarni inson patofiziologiyasi bilan qiyoslash maqsadida qo‘ llanildi.

Adabiyotlar tahlili

1. Aβ va Tau patologiyasi: sinaptik fiziologiya bilan bog‘ lanishi

Amyloid precursor protein (APP) membrana oqsili bo‘ lib, β- va γ-sekretazalar ishtirokida amiloidogen yo‘ l bilan parchalanganda Aβ peptidlari hosil bo‘ ladi. Aβ42 agregatlanishga moyilroq; ayniqsa eruvchan Aβ oligomerlari sinaptik funksiyaga ta’ sir qiluvchi biologik faol shakllar sifatida qaraladi [11–14].

Tau normal sharoitda mikrotrubochkalarni barqarorlashtirish va aksonal transportni ta’ minlashda ishtirok etadi. Patologik fosforlanish va konformatsion o‘ zgarishlar Tauning mikrotrubochkalardan ajralishi, agregatlanishi va neyron ichi transport jarayonlarining buzilishi bilan bog‘ liq [15–17]. Aβ va Tauni bir-biriga qat’ iy ketma-ket sabab sifatida emas, sinaptik va hujayraviy signal yo‘ llarida o‘ zaro ta’ sir qiluvchi patologiyalar sifatida talqin qilish maqsadga muvofiq.

Aβ oligomerlari retseptor traffigi, membrana xususiyatlari va Ca^{2+} signalizatsiyasiga ta’ sir qilishi mumkin. Eksperimental modellarda Aβ ta’ siri NMDA va AMPA retseptorlari bilan bog‘ liq Ca^{2+} kirishi, sinaptik tarmoq holati va membrana mexanikasiga bog‘ liq ekani ko‘ rsatilgan [18–20]. Bu ma’ lumotlar Aβ →NMDA giperaktivatsiyasi kabi soddalashtirilgan modeldan ko‘ ra ko‘ p komponentli fiziologik yondashuvni qo‘ llab-quvvatlaydi.

2. Sinaptik disfunksiya va glutamatergik signalizatsiya

Glutamat markaziy asab tizimining asosiy qo‘ zg‘ atuvchi neyromediatori bo‘ lib, ionotrop AMPA, NMDA va kainate retseptorlari hamda metabotrop glutamat retseptorlari orqali ta’ sir qiladi. Tez qo‘ zg‘ atuvchi postsinaptik tokning katta qismi AMPA-retseptorlar bilan bog‘ liq. AMPA orqali Na^+ kirishi postsinaptik membranani depolyarizatsiya qilib, NMDA-retseptor kanalidagi potentsialga bog‘ liq Mg^{2+} blokini yengillashtiradi (1-jadval) [21–24].

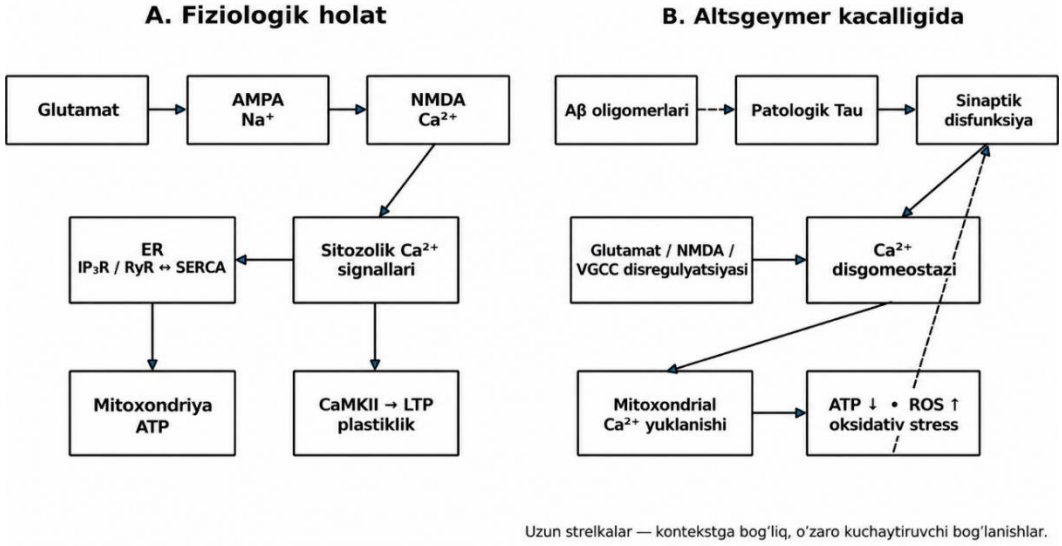
NMDA-retseptor faollashishi uchun glutamat bilan bir qatorda glitsin yoki D-serin ko-agonisti va etarli depolyarizatsiya talab etiladi. Kanal ochilganda Na^+ va Ca^{2+} kirishi, K^+ chiqishi yuz beradi. Fiziologik Ca^{2+} signali CaMKII va boshqa signal kaskadlari orqali sinaptik plastiklik, LTP va xotira mexanizmlarida ishtirok etadi [25–28]. Shu sabab NMDA-retseptorni o‘ z-o‘ zidan “toksik retseptor” sifatida ta’ riflash noto‘ g‘ ri.

Patologik sharoitda signalning joyi, davomiyligi va retseptor subtipi ahamiyat kasb etadi. Sinaptik va ekstrasinaptik NMDAR signallari turlicha hujayraviy natijalar bilan bog‘ lanishi mumkin [29–31]. Inson AD miyasi bo‘ yicha sistematik obzor va meta-tahlil glutamatergik tizimda bir xil giperfunktsiya emas, balki miya hududiga bog‘ liq geterogen o‘ zgarishlar, jumladan ayrim hududlarda glutamat, qayta qamrab olish, GluA2/3 va GluN2B ko‘ rsatkichlarining pasayishini ko‘ rsatgan [32].

Jadval 1

Glutamat retseptorlarining fiziologik roli va AK konteksti

Retseptor	Asosiy ion/signal	Fiziologik vazifa	AKdagi ahamiyati
AMPA	Na^+/K^+; GluA2 bo‘ lmasa Ca^{2+} ham	Tez EPSC, depolyarizatsiya, LTPda retseptor traffiki	Retseptor traffiki va subbirlik tarkibi o‘ zgarishi mumkin
NMDA	Ca^{2+}, Na^+/K^+; Mg^{2+} blok	Coincidence detection, LTP/LTD, Ca^{2+} signal	Sinaptik/ekstrasinaptik balans va subbirlikka bog‘ liq disregulyatsiya
Kainate	Na^+/K^+	Pre- va postsinaptik modulyatsiya	Kamroq o‘ rganilgan, tarmoq qo‘ zg‘ aluvchanligiga ta’ sir
mGluR	G-protein/ikkinchi messenjerlar	Neyromediator ajralishi va plastiklik modulyatsiyasi	Aβ va sinaptik signal yo‘ llari bilan o‘ zaro ta’ sir



1-rasm. Fiziologik sinaptik Ca^{2+} signalizatsiyasi va Alsgeymer kasalligida Ca^{2+} disgomeostazining integrativ modeli.

3. Neyronal Ca^{2+} gomeostazi

Ca^{2+} neyronda universal ikkinchi messenjer bo‘ lib, neyromediator ajralishi, gen ekspressiyasi, fermentlar faolligi, plastiklik va metabolizmni boshqaradi. Funksional natija faqat umumiy Ca^{2+} miqdoriga emas, signalning amplitudasi, davomiyligi va subhujayraviy lokalizatsiyasiga bog‘ liq [33–35].

Plazmatik membrana orqali Ca^{2+} NMDAR va potentsialga bog‘ liq Ca^{2+} kanallari (VGCC) orqali kirishi mumkin. ERdan Ca^{2+} IP_3R va RyR orqali ajraladi, SERCA esa uni ER lyumeniga qayta yig‘ adi. PMCA va NCX sitozolik Ca^{2+}ni hujayradan chiqarishda ishtirok etadi. Mitoxondriya Ca^{2+}ni MCU kompleksi orqali qabul qilib, fiziologik sharoitda metabolik talab bilan ATP ishlab chiqarishni muvofiqlashtirishga yordam beradi (2-jadval) [36–40].

AKda “Ca^{2+} doimo yuqori” degan ta’ rif etarli emas. Asosiy masala Ca^{2+} signalining fazoviy-vaqtiy nazorati va organellalar o‘ rtasidagi taqsimlanishining buzilishidir. ER–mitoxondriya kontaktlari orqali ortiqcha Ca^{2+} uzatilishi mitoxondrial yuklanish, bioenergetik disfunksiya va ROS hosil bo‘ lishi bilan bog‘ lanishi mumkin (1-rasm) [41–44].

Jadval 2

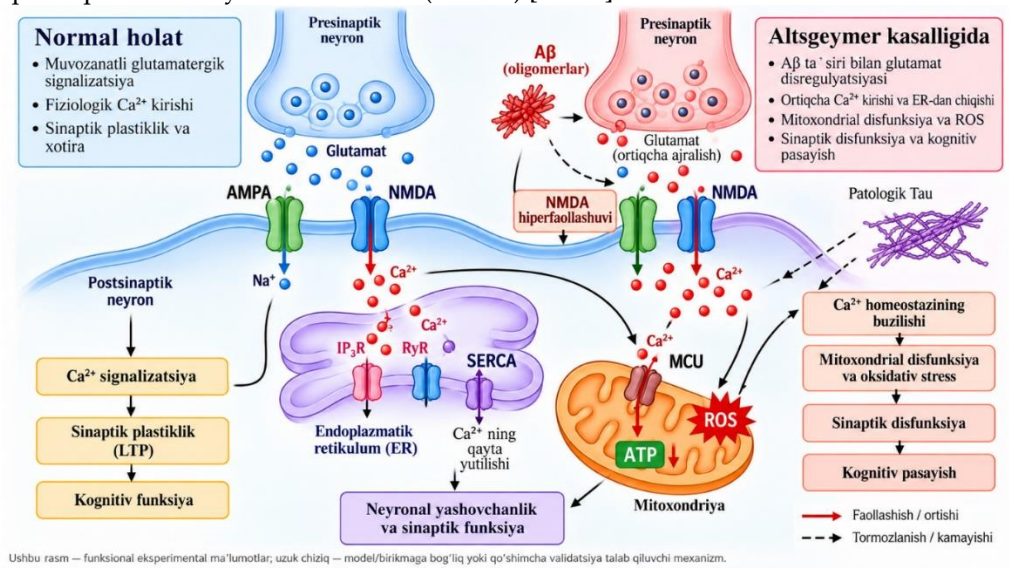
Neyronal Ca^{2+} transportining asosiy tizimlari

Tizim	Lokalizatsiya	Funksiya	Disregulyatsiyada ehtimoliy natija
NMDAR	Postsinaptik membrana	Ligand va potentsialga bog‘ liq Ca^{2+} kirishi	Ortiqcha/noto‘ g‘ ri lokal signal
VGCC	Plazmatik membrana	Depolyarizatsiyaga bog‘ liq Ca^{2+} kirishi	Qo‘ zg‘ aluvchanlik va Ca^{2+} yuklamasi o‘ zgarishi
IP_3R / RyR	ER	ERdan Ca^{2+} ajralishi	Tsitozolik va mitoxondrial signalning kuchayishi
SERCA	ER	Ca^{2+}ni ERga qaytarish	ER zaxirasi va sitozolik signal o‘ zgarishi
PMCA / NCX	Plazmatik membrana	Ca^{2+}ni hujayradan chiqarish	Ca^{2+} klirensining sekinlashishi
MCU kompleksi	Mitoxondriya ichki membranasi	Mitoxondrial Ca^{2+} qabul qilinishi	Ortiqcha yuklanish, ROS va ATP disfunktsiyasi

4. Aβ/Tau–Ca^{2+} va mitoxondriya–ROS o‘ qi

Aβ va Tau bilan bog‘ liq patologik jarayonlar Ca^{2+} signalizatsiyasi bilan ikki tomonlama o‘ zaro ta’ sir qiladi. Aβ oligomerlari membrana retseptorlari, ER Ca^{2+} chiqishi va mitoxondrial funksiyaga ta’ sir qilishi mumkin; o‘ z navbatida Ca^{2+}-bog‘ liq kinazalar, fosfatazalar va proteazalar Tau fosforlanishi, sitoskelet va sinaptik funksiyaga ta’ sir ko‘ rsatadi [45–47]. Bu munosabatni qat’ iy bir yo‘ nalishli kaskad emas, o‘ zaro kuchaytiruvchi tarmoq sifatida ko‘ rish to‘ g‘ riroq.

Mitoxondriyaga fiziologik Ca^{2+} kirishi degidrogenazalar va ATP sintezini metabolik talabga moslashtirishi mumkin. Ortiqcha yoki uzoq davom etuvchi Ca^{2+} yuklanishi esa elektron-transport zanjiri disfunksiyasi, membrana potensiali o‘ zgarishi va ROS hosil bo‘ lishi bilan bog‘ liq. ROS esa lipidlar, oqsillar va Ca^{2+} transport tizimlarini shikastlab, qaytar aloqa halqasini kuchaytirishi mumkin (3-rasm) [41–44].



3-rasm. Alsgeymer kasalligida sinaptik glutamatergik signalizatsiya, Ca^{2+} gomeostazi, ER–mitoxondriya aloqasi va Aβ/Tau patologiyasining integrativ mexanizmi.

Natijalar va ularning tahlili

1. Polifenollar va Ca^{2+} signalizatsiyasi: fiziologik yondashuv

Polifenollar an’ anaviy ravishda antioksidant xususiyatlari bilan muhokama qilingan bo‘ lsa-da, zamonaviy ma’ lumotlar ularning membrana oqsillari, kinazalar, yallig‘ lanish signallari, mitoxondriya va ion gomeostaziga ham ta’ sir qilishi mumkinligini ko‘ rsatadi [48–50]. Shu sabab ularni faqat ROSni neytrallovchi birikmalar sifatida emas, ko‘ p nishonli funktsional modulyatorlar sifatida o‘ rganish maqsadga muvofiq (2-rasm).

Kalamush bosh miyasi sinaptosomalarida Khoshimov va hammualliflar tomonidan o‘ tkazilgan ishlar polifenollar–glutamat–Ca^{2+} o‘ qini eksperimental o‘ rganishga qaratilgan. Euphorbin, PC-6, PC-7 va keyingi birikmalar ishtirokidagi

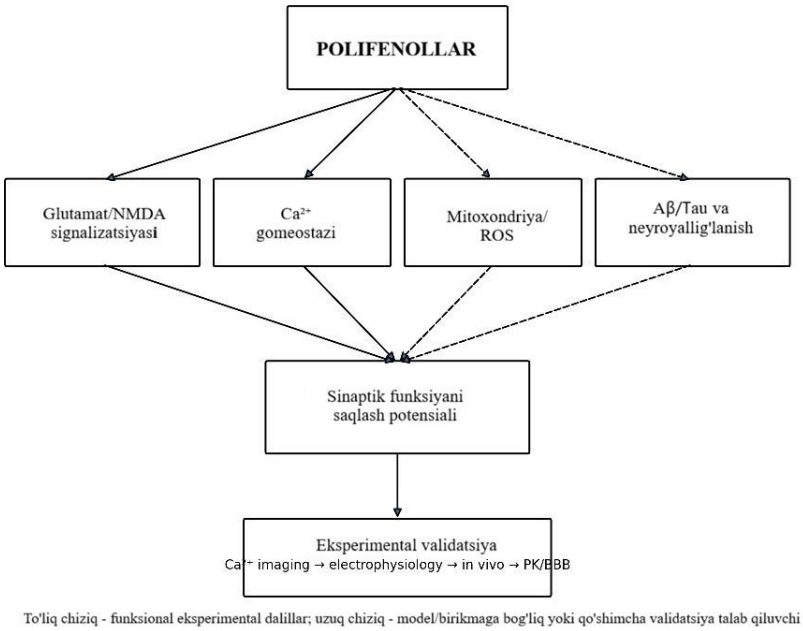
tajribalarda L-glutamatga bog‘ liq Ca^{2+} javoblari, farmakologik blokatorlar va fluoresent indikatorlar orqali funksional o‘ zgarishlar baholangan [51–56]. 2023 yilgi PC-6/PC-7 ishida mualliflar NMDA-retseptor ion kanali ochilishini regulyatsiya qilish sohasida polifenollar va glutamat o‘ rtasida “possible competition” mavjudligini taklif qilgan; obzorda bu to‘ g‘ ridan-to‘ g‘ ri molekulyar bog‘ lanish isboti emas, funksional farmakologik talqin sifatida qabul qilindi [55].

2024 yilgi modellangan AK sharoitida PC-7 bilan o‘ tkazilgan in vivo ishda xulq-atvor ko‘ rsatkichlari va keyin ajratilgan sinaptosomalarda Ca^{2+} dinamikasi birgalikda baholangan [57]. Bu ex vivo sinaptosomal natijalarni organizm darajasidagi funktsional fenotip bilan bog‘ lashga qaratilgan muhim bosqichdir. Biroq Ca^{2+} ko‘ rsatkichlaridagi o‘ zgarish kognitiv natijaning bevosita sababi ekanini aniqlash uchun elektrofiziologik va molekulyar validatsiya zarur (3-jadval).

Jadval 3

Khoshimov va hammualliflarning Ca^{2+}/glutamat yo‘ nalishidagi eksperimental ishlari

Yil/birikma	Model	Baholangan jarayon	Natijaning ehtiyotkor talqini	Obzordagi o‘ rni
2017 Cytisinum	Kalamush miyasi sinaptosomalari	Glutamatergik mediatorlar va Ca^{2+}	Ca^{2+} kanal/glutamat tizimiga funktsional ta’ sir	Metodologik boshlanish
2018 Euphorbin	Sinaptosomalar	L-glutamat va Ca^{2+} javobi	Glutamatga bog‘ liq Ca^{2+} modulyatsiyasi	Polifenol yo‘ nalishining boshlanishi
2021 PC-7	Sinaptosomalar	Sitozolik Ca^{2+} dinamikasi	VGCC/NMDA bilan bog‘ liq mexanizm taklif qilingan	Funktsional Ca^{2+} farmakologiyasi
2022 PC-6/PC-7	Sinaptosomalar	NMDA bilan bog‘ liq Ca^{2+} transporti	Glutamat bilan funktsional raqobat ehtimoli	Mexanizmni aniqlashtirish
2023 PC-6/PC-7	Sinaptosomalar	L-glutamat, Mg^{2+} va blokatorlar	NMDA kanal ochilishini regulyatsiya qilishga ta’ sir	Asosiy lokal eksperimental dalil
2024 PC-7	In vivo AK modeli + sinaptosoma	Xulq-atvor + Ca^{2+}	Organizm va sinaptik darajani bog‘ lash	*Ex vivo →in vivo* ko‘ prik



2-rasm. Polifenollarning sinaptik Ca^{2+} signalizatsiyasiga ehtimoliy ko‘ p nishonli ta’ sir nuqtalari.

2. Mavjud dalillar, hal etilmagan masalalar va istiqbolli yo‘ nalishlar

Sinaptosoma sinaptik terminalning ko‘ p funksional komponentlarini saqlab qolgani uchun neyromediator transporti, membrana retseptorlari va Ca^{2+} dinamikasini nisbatan izolyatsiyalangan sharoitda o‘ rganishda qimmatli modeldir. Biroq u butun neyron tarmog‘ i, gliya, qon–miya to‘ sig‘ i va sistemali farmakokinetikani to‘ liq aks ettirmaydi.

Shu sabab sinaptosomal natijalarni to‘ g‘ ridan-to‘ g‘ ri inson AKga ko‘ chirish emas, keyingi bosqichda validatsiya qilish kerak.

Fluoresent Ca^{2+} o‘ lchovlari birikmaning funksional ta’ sirini ko‘ rsatadi, ammo molekulaning qaysi retseptor subbirligi yoki bog‘ lanish sayti bilan to‘ g‘ ridan-to‘ g‘ ri o‘ zaro ta’ sir qilganini avtomatik ravishda isbotlamaydi. Shuning uchun istiqbolli polifenollar uchun Ca^{2+} imaging natijalarini patch-clamp elektrofiziologiyasi, retseptor subtipiga selektiv farmakologiya, bog‘ lanish/struktura-funktsional tahlil va mutatsiya eksperimentlari bilan birlashtirish maqsadga muvofiq.

Keyingi translyatsion zanjir ADga mos neyron kulturalari yoki iPSC-modellar, in vivo hayvon modellari, miya to‘ qimasida kontsentratsiyani aniqlash, farmakokinetika va qon–miya to‘ sig‘ idan o‘ tishni baholashni qamrab olishi kerak. Shunda “polifenol →retseptor/kanal →Ca^{2+} →sinaptik funksiya →kognitiv fenotip” zanjirining qaysi bo‘ g‘ inlari haqiqatan sababiy ekani aniqlanadi.

Xulosalar

Altsgeymer kasalligida sinaptik disfunksiya Aβ va Tau patologiyasi, glutamatergik signalizatsiya, Ca^{2+} gomeostazi, ER–mitoxondriya aloqasi va oksidativ stress o‘ zaro ta’ sir qiladigan ko‘ p darajali jarayon sifatida qaralishi kerak. Fiziologik NMDAR–Ca^{2+} signalizatsiyasi sinaptik plastiklik uchun zarur; patologik holatda esa signalning lokalizatsiyasi, davomiyligi va organellalar o‘ rtasida taqsimlanishining buzilishi funktsional etishmovchilikka hissa qo‘ shishi mumkin.

Ca^{2+} disgomeostazi amiloid yoki Tau gipotezasining o‘ rnini bosuvchi emas, balki ularni membrana, sinaps va mitoxondrial mexanizmlar bilan bog‘ lovchi muhim fiziologik-patofiziologik komponentdir. Polifenollar, ayniqsa sinaptosomal modellarda o‘ rganilgan PC-6, PC-7, Euphorbin va boshqa birikmalar, glutamatga bog‘ liq Ca^{2+} javoblarini modulyatsiya qilish potentsialini ko‘ rsatadi. Ularning aniq molekulyar nishonlari va translyatsion ahamiyatini elektrofiziologik, struktura-funktsional va farmakokinetik usullar bilan tasdiqlash kelgusi tadqiqotlarning mantiqiy davomidir.

Mualliflar bayonotlari

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Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi.

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GL25 POLIFENOLINING KALAMUSH BOSH MIYASI SINAPTOSOMALARIDA L-TIPLI KALSIY KANALLARI ORQALI Ca^{2+} GOMEOSTAZIGA TA'SIRI

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Annotatsiya: *Maqolada Euphorbia rigida o' simligidan ajratib olingan va shartli ravishda GL25 deb nomlangan 1-O-galloyl-6-bisgalloyl-2,4-valoneoyl-β-D-glucose polifenol birikmasining kalamush bosh miyasi sinaptosomalarida hujayra ichki Ca^{2+} gomeostaziga ta'siri tahlil qilindi. Sinaptosomalar differensial sentrifugalash usulida ajratildi, sitozolik Ca^{2+} dinamikasi esa Fluo-4 AM fluorescent zondi yordamida qayd etildi. GL25 ning 10–100 μM konsentratsiyalari fluorescent intensivlikni konsentratsiyaga bog' liq ravishda kamaytirgani aniqlandi. L-tipli Ca^{2+} kanallari blokatorlari nifedipin va sinnarizin (0,01 μM) alohida qo' llanganda ham sinaptosomal Ca^{2+} miqdori sezilarli pasaydi. Biroq blokatorlar fonida GL25 qo' shilganda fluorescent intensivlikning ortishi kuzatildi. Ushbu natija GL25 va L-tipli kanallar blokatorlari o' rtasida digidropiridin-sezgir Ca^{2+} kanallarining funksional boshqaruv uchastkalari darajasida o' zaro ta'sir mavjud bo' lishi mumkinligini ko' rsatadi. Natijalar GL25 ning presinaptik Ca^{2+} signalizatsiyasini modulyatsiya qiluvchi biologik faol birikma sifatidagi xususiyatlarini yoritadi.*

Kalit so' zlar: *GL25, polifenol, sinaptosoma, Ca^{2+} gomeostazi, Fluo-4 AM, nifedipin, sinnarizin, L-tipli kalsiy kanali.*

ВЛИЯНИЕ ПОЛИФЕНОЛА GL25 НА ГОМЕОСТАЗ Ca^{2+}, ОПОСРЕДОВАННЫЙ КАЛЬЦИЕВЫМИ КАНАЛАМИ L-ТИПА, В СИНАПТОСОМАХ ГОЛОВНОГО МОЗГА КРЫС

Аннотация: *В статье проанализировано влияние полифенольного соединения 1-O-galloyl-6-bisgalloyl-2,4-valoneoyl-β-D-glucose, выделенного из растения Euphorbia rigida и условно обозначенного как GL25, на внутриклеточный гомеостаз Ca^{2+} в синаптосомах головного мозга крыс. Синаптосомы выделяли методом дифференциального центрифугирования, а динамику цитозольного Ca^{2+} регистрировали с использованием флуоресцентного зонда Fluo-4 AM. GL25 в концентрациях 10–100 мкМ вызывал концентрационно-зависимое снижение интенсивности флуоресценции. Блокаторы L-типа Ca^{2+}-каналов нифедипин и циннаризин (0,01 мкМ) также снижали уровень внутрисинаптосомального Ca^{2+}. При добавлении GL25 на фоне блокаторов наблюдалось повышение флуоресцентной интенсивности. Полученные данные указывают на возможное функциональное взаимодействие GL25 с дигидропиридин-чувствительными участками регуляции L-типа Ca^{2+}-каналов и подтверждают способность полифенола модулировать пресинаптическую кальциевую сигнализацию.*

Ключевые слова: *GL25, полифенол, синаптосома, Ca^{2+}-гомеостаз, Fluo-4 AM, нифедипин, циннаризин, L-тип кальциевых каналов.*

EFFECT OF GL25 POLYPHENOL ON Ca^{2+} HOMEOSTASIS MEDIATED BY L-TYPE CALCIUM CHANNELS IN RAT BRAIN SYNAPTOSOMES

Abstract: *This study analyzed the effect of the polyphenolic compound 1-O-galloyl-6-bisgalloyl-2,4-valoneoyl-β-D-glucose, isolated from Euphorbia rigida and designated GL25, on intracellular Ca^{2+} homeostasis in rat brain synaptosomes. Synaptosomes were isolated by differential centrifugation, while cytosolic Ca^{2+} dynamics were monitored using the fluorescent probe Fluo-4 AM. GL25 at 10–100 μM produced a concentration-dependent decrease in fluorescence intensity. The L-type Ca^{2+} channel blockers*

nifedipine and cinnarizine (0.01 μM) also significantly reduced synaptosomal Ca^{2+} levels when applied separately. In contrast, addition of GL25 in the presence of these blockers increased fluorescence intensity. This response may indicate a functional interaction between GL25 and regulatory sites associated with dihydropyridine-sensitive Ca^{2+} channels. The findings characterize GL25 as a biologically active modulator of presynaptic Ca^{2+} signaling and provide an experimental basis for further studies of its neuroprotective potential.

Keywords: *GL25, polyphenol, synaptosome, Ca^{2+} homeostasis, Fluo-4 AM, nifedipine, cinnarizine, L-type calcium channel.*

KIRISH

Ca^{2+} ionlari neyronlarda ikkilamchi messenjer sifatida membrana qo‘ zg‘ aluvchanligi, neyromediatorlar sekretsiyasi, fermentlar faolligi, gen ekspressiyasi va sinaptik plastiklikni boshqarishda markaziy o‘ rin tutadi. Tinch holatda sitozolik Ca^{2+} miqdori hujayra tashqarisidagi konsentratsiyaga nisbatan bir necha tartib past bo‘ lib, ushbu katta elektrokimyoviy gradient ion kanallari, Ca^{2+}-ATFazalar, Na^{+}/Ca^{2+} almashinuvchisi, endoplazmatik retikulum va mitoxondriyal transport tizimlari orqali saqlanadi. Ayniqsa presinaptik terminalda harakat potensiali bilan chaqiriladigan Ca^{2+} oqimi sinaptik vezikulalarning membrana bilan qo‘ shilishi va neyromediatorlarning ajralishi uchun asosiy signal hisoblanadi [1–4].

Potensialga bog‘ liq kalsiy kanallari neyronal Ca^{2+} signalining muhim kirish yo‘ llaridan biridir. L-tipli CaV1.2 va CaV1.3 kanallari uzoq davom etuvchi depolyarizatsiyaga javob beradi va Ca^{2+} ga bog‘ liq signal kaskadlari, transkripsion jarayonlar hamda sinaptik plastiklik bilan bog‘ langan. Ca^{2+} gomeostazining buzilishi mitoxondriyal disfunksiya, oksidlovchi stress va hujayra o‘ limi yo‘ llarining faollashuvi bilan kechishi mumkin. Shu sababli L-tipli kanallarni farmakologik modulyatsiya qilish neyronal Ca^{2+} ortiqcha yuklanishini o‘ rganishda muhim eksperimental yondashuvdir [3,5,6].

Polifenollar o‘ simliklardan olinadigan biologik faol birikmalar bo‘ lib, ularning membranaviy va hujayra ichki signal tizimlariga ta’siri katta qiziqish uyg‘ otadi. Ayrim polifenollar Ca^{2+} signalizatsiyasi, glutamatergik uzatish va oksidlovchi jarayonlarni modulyatsiya qilishi ko‘ rsatilgan. Biroq Euphorbia rigida dan ajratilgan GL25 polifenolining presinaptik Ca^{2+} transportiga, xususan L-tipli kanallar bilan bog‘ liq komponentga ta’siri yetarlicha tavsiflanmagan.

Ushbu ishning maqsadi GL25 polifenolining kalamush bosh miyasi sinaptosomalarida sitozolik Ca^{2+} dinamikasiga ta’sirini aniqlash hamda nifedipin va sinnarizin yordamida uning L-tipli Ca^{2+} kanallari bilan funksional o‘ zaro ta’sirini baholashdan iborat.

ADABIYOTLAR TAHLILI

Sinaptosomalar akson uchlaridan hosil bo‘ lgan, presinaptik membrana, sinaptik vezikulalar va metabolik apparatning muhim qismini saqlab qoladigan subhujayraviy tuzilmalardir. Ular membrana depolyarizatsiyasi, ion oqimlari va Ca^{2+} ga bog‘ liq mediator ajralishini in vitro sharoitida o‘ rganish imkonini beradi [7,8]. Presinaptik terminalga Ca^{2+} ning kirishi asosan potensialga bog‘ liq kanallar orqali sodir bo‘ ladi. Kirgan Ca^{2+} mahalliy mikrodomenlar hosil qilib, vezikulyar ekzotsitozni boshlaydi; ortiqcha Ca^{2+} esa nasoslar, almashinuvchilar va hujayra ichki depolari yordamida chiqariladi yoki sekvestrlanadi [1,4].

L-tipli Ca^{2+} kanallari $\alpha 1$ subbirligida joylashgan ion o‘ tkazuvchi pora va dori moddalarini bog‘ lovchi funksional uchastkalarga ega. Digidropiridinlar guruhiga kiruvchi nifedipin kanalning depolyarizatsiya bilan bog‘ liq inaktiv holatiga yuqori moyillik ko‘ rsatib, Ca^{2+} oqimini kamaytiradi [5,9]. Natijada Ca^{2+} ga bog‘ liq ekzotsitoz va ayrim hujayra ichki signal yo‘ llari modulyatsiyalanadi. Sinaptik plastiklik bilan bog‘ liq CaMKII, PKC va CREB kabi tizimlar ham Ca^{2+} oqimining vaqt-fazoviy xususiyatlariga sezgir [3,10].

Sinnarizin ham Ca^{2+} oqimini susaytiruvchi farmakologik agent bo‘ lib, L-tipli kanallar bilan bog‘ liq jarayonlarni tormozlashi mumkin. Nifedipin va sinnarizin kabi blokatorlardan foydalanish o‘ rganilayotgan birikmaning ta’siri potensialga bog‘ liq Ca^{2+} kanallari bilan qay darajada kesishishini farmakologik profillash imkonini beradi. Bunday kombinatsion tajribada ta’sirlarning oddiy qo‘ shilishi, kuchayishi yoki aksincha yo‘ nalishda o‘ zgarishi birikmalarning bir xil yoki o‘ zaro bog‘ langan regulyator mexanizmlarga ta’sir qilishi mumkinligini ko‘ rsatadi. Biroq faqat fluorescent javob asosida to‘ g‘ ridan-to‘ g‘ ri bog‘ lanish joyini aniqlab bo‘ lmaydi; buning uchun elektrofiziologik yoki ligand-bog‘ lanish tadqiqotlari talab qilinadi.

Ish tajribalarida GL25 10–100 μM diapazonda sinaptosomal Fluo-4 AM fluorescensiyasini pasaytirgan, bu sitozolik Ca^{2+} miqdorining kamayishi bilan mos keladi. Shu bilan birga, L-tipli kanal blokatorlari fonida GL25 qo‘ shilganda aks yo‘ nalishdagi javob qayd etilgani ushbu birikmaning Ca^{2+} signaliga ta’siri bir komponentli emasligini ko‘ rsatadi. Mazkur hodisani L-tipli kanallarga bog‘ liq farmakologik o‘ zaro ta’sir, boshqa Ca^{2+} kirish/chiqish tizimlarining kompensator faollashuvi yoki sinaptosomal membrana holatining o‘ zgarishi bilan izohlash mumkin.

TADQIQOT METODOLOGIYASI

Tadqiqot obyekti sifatida kalamush bosh miyasi sinaptosomalari suspenziyasi hamda Euphorbia rigida o‘ simligidan ajratilgan 1-O-galloyl-6-bisgalloyl-2,4-valoneoyl-β-D-glucose polifenol birikmasi (GL25) qo‘ llanildi. Sinaptosomalar C.W. Cotman usuli va uning modifikatsiyalari asosida differensial sentrifugalash yo‘ li bilan ajratildi. Bosh miya to‘ qimasi muzli sharoitda 0,32 M saxaroza, 0,01 M Tris-HCl va 0,5 mM EDTA saqlagan pH 7,4 muhitda 1:10 nisbatda gomogenizatsiya qilindi [7,11].

Gomogenat 4500 ayl/min tezlikda 10 minut sentrifugalandi; supernatant 14000 ayl/min tezlikda 20 minut qayta sentrifugalandi. Keyingi bosqichlarda 11000 ayl/min da 20 minut va 14000 ayl/min da 30 minut sentrifugalash orqali sinaptosomal fraksiya olindi. Preparativ jarayonlar sovuq sharoitda bajarildi. Tajribalarda $CaCl_2$ saqlovchi va EGTA bilan Ca^{2+} dan xoli muhitlardan foydalanildi. Membranani depolyarizatsiya qilish uchun 35 mM KCl ishlatildi.

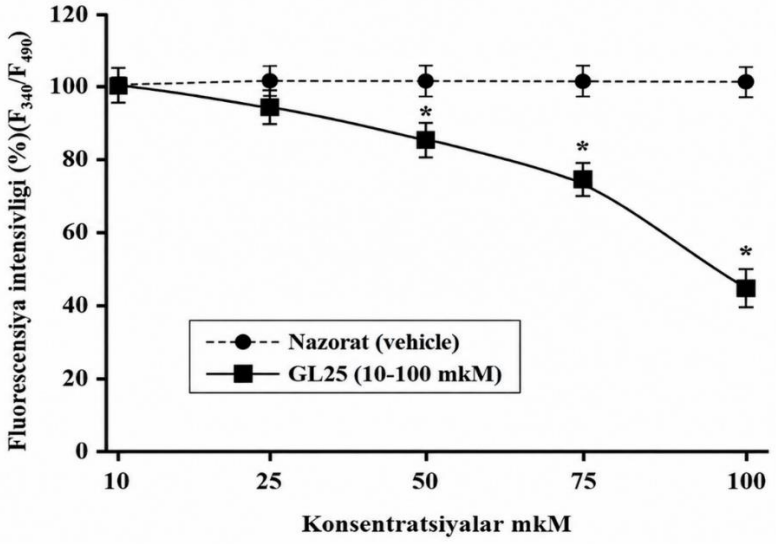
Sitozolik Ca^{2+} dinamikasi Fluo-4 AM zondi yordamida baholandi. 1 mg Fluo-4 AM 135 µl DMSO da eritilib, 1 mM boshlang‘ ich eritma tayyorlandi. 2 ml Krebs–Ringer buferiga 80 µl sinaptosoma suspenziyasi va 12 µl Fluo-4 AM qo‘ shilib, 37°C da 30 minut inkubatsiya qilindi. Inkubatsiyadan so‘ ng ortiqcha bo‘ yoq yuvish va sentrifugalash bilan chiqarildi. O‘ lchashda taxminan 5×10^6 zarracha/ml konsentratsiyadan foydalanildi. Fluorescensiya 488 nm da qo‘ zg‘ atilib, 506 nm da qayd etildi. Signal USB2000 spektrofluorimetrida (Ocean Optics, AQSh) o‘ lchandi [12].

GL25 10–100 µM konsentratsiya oralig‘ ida sinovdan o‘ tkazildi. L-tipli Ca^{2+} kanallarini farmakologik tahlil qilishda nifedipin va sinnarizin 0,01 µM konsentratsiyada qo‘ llanildi. Tajribalar blokatorlarning alohida ta’siri va blokatorlar fonida GL25 ning 10–100 µM diapazondagi ta’sirini solishtirish asosida tashkil etildi. Har bir tajriba seriyasida n=6 kuzatuv bajarilgan. Maqolada statistik ishonchlilik *P<0,05 va **P<0,01 darajalari bilan ifodalangan.

NATIJALAR VA TAHLIL

Presinaptik Ca^{2+} konsentratsiyasi neyromediator ajralish ehtimolini belgilovchi asosiy omillardan biridir. Shu sababli GL25 ning Ca^{2+} signalini pasaytirishi haddan tashqari qo‘ zg‘ alish sharoitida mediator chiqarilishini cheklovchi mexanizmga hissa qo‘ shishi mumkin. Ayni vaqtda L-tipli kanal blokadasi sharoitida javobning o‘ zgarishi GL25 ni oddiy, selektiv L-tipli kanal blokatori sifatida emas, balki Ca^{2+} gomeostazining bir nechta komponentlari bilan bog‘ liq modulyator sifatida ko‘ rib chiqish maqsadga muvofiqligini ko‘ rsatadi.

Ushbu tadqiqotning cheklovi shundaki, mavjud tajribalar fluorescensiya intensivligiga asoslangan bo‘ lib, alohida Ca^{2+} kanal oqimlarini to‘ g‘ ridan-to‘ g‘ ri elektrofiziologik qayd etmagan. Kelgusida patch-clamp usuli, selektiv CaV1.2/CaV1.3 modulyatorlari, Na^+/Ca^{2+} almashinuvchisi va hujayra ichki Ca^{2+} depolari ingibitorlari bilan kombinatsion tajribalar GL25 ning aniq molekulyar nishonini ajratishga yordam beradi



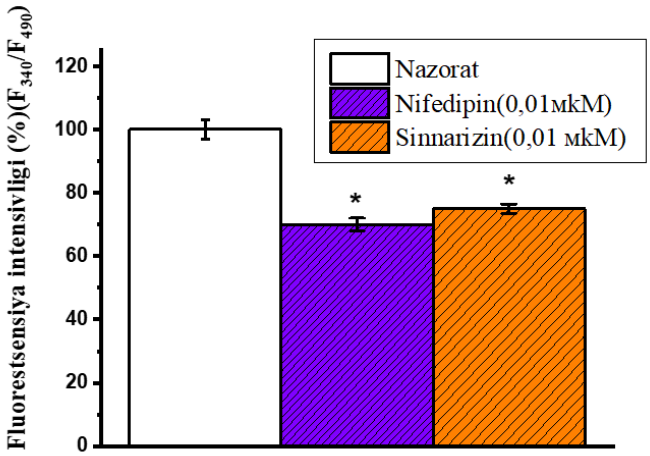
1-rasm. GL25 polifenolining 10–100 µM konsentratsiyalarda kalamush bosh miyasi Fluo-4 AM-sinaptosoma suspenziyasida fluorescensiya intensivligiga ta’siri. *P<0,05; n=6.

Tajribalarning birinchi bosqichida GL25 polifenolining 10–100 µM konsentratsiyalarda Fluo-4 AM bilan yuklangan kalamush bosh miyasi sinaptosomalariga ta’siri baholandi. Olingan natijalarda fluorescensiya intensivligi GL25 konsentratsiyasi oshishi bilan bosqichma-bosqich susayib borgan.

Fluo-4 AM hujayra ichida esterazalar ta’sirida faol fluorescent shaklga o‘ tib, erkin Ca^{2+} bilan bog‘ langanda signal intensivligini oshiradi. Shu sababli tajribada fluorescensiyaning kamayishi sinaptosomal sitozolda erkin Ca^{2+} miqdorining kamayishi bilan mos keladi. Mazkur natija GL25 ning presinaptik Ca^{2+} gomeostaziga bevosita yoki bilvosita ta’sir ko‘ rsatishini ko‘ rsatadi. Biroq ushbu tajribaning o‘ zi Ca^{2+} ning qaysi aniq transport tizimi orqali kamayganini ajratib

bermaydi. Aynan shu sababli keyingi tajribalarda selektiv va funksional Ca^{2+} kanal blokatorlari fonida GL25 ta'siri o‘ rganilgan.

Sinaptosoma modeli presinaptik terminalning membrana qo‘ zg‘ aluvchanligi, mediatorlarni qabul qilish va Ca^{2+} ga bog‘ liq sekretsiya kabi muhim xususiyatlarini saqlab qoladi. Shu nuqtai nazardan, GL25 ta'sirida $[Ca^{2+}]$in kamayishi presinaptik signal uzatilishining Ca^{2+} ga bog‘ liq bosqichlari modulyatsiya qilinayotganini ko‘ rsatishi mumkin.



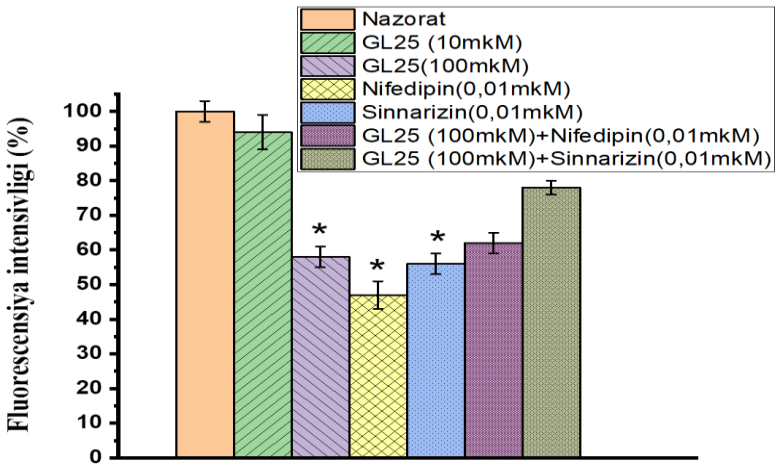
2-rasm. Nifedipin va sinnarizin (0,01 μM) bilan inkubatsiya sharoitida kalamush miyasi sinaptosomalari suspenziyasida fluorescensiya intensivligi. *P<0,05; **P<0,01; n=6.

Sinnarizin ham 0,01 μM konsentratsiyada qo‘ llanib, sinaptosoma suspenziyasida fluorescensiya intensivligini va unga mos ravishda Ca^{2+} signalini kamaytirgan..Adabiyotlarda sinnarizin L-tipli Ca^{2+} kanallari orqali ionlarning membrana bo‘ ylab translokatsiyasini susaytiruvchi blokator sifatida tavsiflangan. Nifedipin va sinnarizinning bir xil yo‘ nalishdagi javobi L-tipli kanallarni farmakologik bloklash sinaptosomal Ca^{2+} gomeostaziga sezilarli ta'sir ko‘ rsatishini tasdiqlaydi.

Keyingi tajribalarda nifedipin 0,01 μM fonida GL25 ning 10–100 μM konsentratsiyalari qo‘ llanilgan. GL25 alohida qo‘ llanganda fluorescensiya kamaygan bo‘ lsa, nifedipin fonida GL25 qo‘ shilishi Ca^{2+} miqdorining sezilarli oshishi bilan kechgan. Javob yo‘ nalishining bunday almashishi tajribaning eng muhim natijalaridan biridir, chunki u GL25 ta'siri L-tipli kanalning farmakologik holatidan mustaqil emasligini ko‘ rsatadi.

Maqolada ushbu hodisa GL25 va nifedipin o‘ rtasida digidropiridin-sezgir Ca^{2+} kanallarini boshqaruvchi uchastkalar uchun konkurensiya mavjud bo‘ lishi mumkinligi bilan izohlangan. Bunday talqinda nifedipin kanalning ma'lum funksional holatini egallaganida GL25 ning odatdagi Ca^{2+} kamaytiruvchi ta'siri o‘ zgaradi va umumiy sitozolik signal boshqa yo‘ nalishga siljiydi. Bu GL25 ning ta'siri oddiy Ca^{2+} xelatlash yoki nospetsifik fluorescent so‘ nish bilan cheklanmasligi mumkinligini ko‘ rsatadigan farmakologik dalil sifatida qaraladi.

Shu bilan birga, mavjud ma'lumotlar GL25 va nifedipin aynan bir molekulyar bog‘ lanish joyiga to‘ g‘ ridan-to‘ g‘ ri raqobatlashishini qat'iy isbotlamaydi. Fluo-4 AM yordamida o‘ lchanayotgan ko‘ rsatkich umumiy sitozolik Ca^{2+} dinamikasini aks ettiradi. Shuning uchun nifedipin fonida Ca^{2+} signalining oshishi boshqa Ca^{2+} kirish yo‘ llari, Na^{+}/Ca^{2+} almashinuvchisi, Ca^{2+}-ATFaza yoki hujayra ichki depolar bilan bog‘ liq kompensator javoblarni ham o‘ z ichiga olishi mumkin. Maqolada ushbu holatni “funksional o‘ zaro ta'sir ehtimoli” sifatida ifodalash natijalarning dalillilik darajasiga mos keladi.



3-rasm. GL25 polifenolining (10–100 μM) nifedipin va sinnarizin (0,01 μM) bilan inkubatsiya sharoitida kalamush miyasi sinaptosomalari suspenziyasida fluorescensiya intensivligiga ta'siri. *P<0,05; **P<0,01; n=6.

Ushbu natijada kombinatsion tajribaning asosiy natijasini ko‘ rsatadi. GL25 100 μM alohida qo‘ llanganda signal keskin pasaygan, nifedipin va sinnarizin alohida qo‘ llanganda ham kamayish kuzatilgan. Biroq GL25 100 μM blokatorlar fonida qo‘ llanganda fluorescent GL25 100 μM ning alohida ta'siriga nisbatan yuqoriroq bo‘ lgan; sinnarizin bilan kombinatsiyada tiklanish yanada kuchli ko‘ rinadi. Bu natija GL25 va L-tipli Ca^{2+} kanal blokatorlari o‘ rtasida oddiy additiv ingibitsiyadan farq qiladigan funksional o‘ zaro ta'sir mavjudligini ko‘ rsatadi.

GL25 ning ikki xususiyatini ajratadi: birinchidan, polifenolning o‘ zi konsentratsiyaga bog‘ liq ravishda sitozolik Ca^{2+} signalini pasaytiradi; ikkinchidan, L-tipli kanal blokadasi sharoitida uning yuqori konsentratsiyadagi javobi o‘ zgaradi. Ushbu farmakologik profil GL25 ta'sirining potensialga bog‘ liq Ca^{2+} transport tizimlari bilan bog‘ liqligini qo‘ llab-quvvatlaydi.

L-tipli Ca^{2+} kanallarining tajriba tizimidagi hissasini baholash uchun nifedipin 0,01 μM konsentratsiyada qo‘ llanilgan. Nifedipin bilan inkubatsiya sharoitida sinaptosoma suspenziyasidagi Ca^{2+} miqdori sezilarli darajada kamaygan. Ushbu yo‘ nalish nifedipinning L-tipli potensialga bog‘ liq Ca^{2+} kanallarining $\alpha 1$ subbirligi bilan bog‘ lanishi va depolyarizatsiya sharoitida Ca^{2+} ning hujayraga kirishini cheklashi haqidagi mexanizm bilan mos keladi.

Presinaptik terminalda membrana depolyarizatsiyasi Ca^{2+} kanallarining ochilishiga olib keladi. Kanal orqali kirgan Ca^{2+} sinaptik vezikulalar ekzotsitozi uchun zarur bo‘ lgan mahalliy signalni hosil qiladi. Shuning uchun nifedipin fonida fluorescensiyaning pasayishi tajriba modelida potensialga bog‘ liq Ca^{2+} oqimining muhim hissasi mavjudligini ko‘ rsatadi. Mazkur natija GL25 bilan kombinatsion tajribalarni talqin qilish uchun farmakologik nazorat vazifasini bajaradi.

Sinnarizin 0,01 μM fonida GL25 10–100 μM qo‘ llanganda ham nifedipin bilan kuzatilganiga o‘ xshash ravishda Ca^{2+} signalining oshishi aniqlangan. Demak, GL25 ning blokator fonidagi paradoksal javobi faqat nifedipinga xos bo‘ lmagan va ikkinchi Ca^{2+} kanal blokatori bilan ham qayd etilgan. Ushbu takrorlanuvchi yo‘ nalish GL25 ning L-tipli Ca^{2+} transporti bilan funksional bog‘ liqligi haqidagi xulosani kuchaytiradi.

Sinnarizin fonida GL25 javobining o‘ zgarishi sinaptosomal membranada Ca^{2+} oqimini boshqaruvchi tizimlar o‘ zaro bog‘ langan holda ishlashini ko‘ rsatadi. Bir transport yo‘ li farmakologik cheklanganda, GL25 ning boshqa membranaviy yoki hujayra ichki nishonlarga ta'siri umumiy fluorescent javobda kuchliroq namoyon bo‘ lishi mumkin. Shuning uchun kombinatsion tajriba natijasi GL25 ni faqat L-tipli kanalning klassik blokatori sifatida emas, balki Ca^{2+} gomeostazini modulyatsiya qiluvchi birikma sifatida tavsiflashga ko‘ proq mos keladi.

MUALLIFLAR HISSASI, MANFAATLAR TO‘ QNASHUVI VA MOLIYALASHTIRISH

Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasi, ma'lumotlarni tahlil qilish va maqola matnini tayyorlashda teng hissa qo‘ shgan. Manfaatlar to‘ qnashuvi: mualliflar manfaatlar to‘ qnashuvi yo‘ qligini bildiradi. Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

XULOSA

Olib borilgan tadqiqotlar GL25 polifenol birikmasining kalamush bosh miyasi sinaptosomalarida hujayra ichki Ca^{2+} gomeostaziga ta'sir ko‘ rsatishini aniqladi. GL25 ning 10–100 μM konsentratsiyalar oralig‘ ida qo‘ llanilishi Fluo-4 AM bilan yuklangan sinaptosomalarda fluorescensiya intensivligining konsentratsiyaga bog‘ liq ravishda pasayishi bilan kechdi. Bu holat sinaptosomalar sitozolidagi erkin Ca^{2+} miqdorining kamayishi bilan mos kelib, GL25 ning presinaptik Ca^{2+} signalizatsiyasini boshqaruvchi mexanizmlarga ta'sir qilishi mumkinligini ko‘ rsatdi.

GL25 ta'sirida kuzatilgan Ca^{2+} miqdorining kamayishida L-tipli potensialga bog' liq Ca^{2+} kanallarining ishtirokini aniqlash maqsadida nifedipin va sinnarizin bilan farmakologik tajribalar o' tkazildi. Ushbu blokatorlarning 0,01 μM konsentratsiyada alohida qo' llanilishi sinaptosomal fluorescensiya intensivligining sezilarli pasayishiga olib keldi. Bu natija tajriba sharoitida L-tipli Ca^{2+} kanallari sinaptosomal Ca^{2+} dinamikasining shakllanishida muhim funksional komponentlardan biri ekanligini ko' rsatdi.

Shu asosda GL25 ning ta'siri L-tipli Ca^{2+} kanallari bloklangan sharoitda baholandi. Nifedipin va sinnarizin fonida GL25 qo' shilganda fluorescensiya intensivligining GL25 alohida qo' llanilgan holatga nisbatan ortishi kuzatildi. Demak, GL25 ning Ca^{2+} gomeostaziga ta'siri kanalning farmakologik holatiga bog' liq ravishda o' zgaradi. Bunday javob GL25 ta'sir mexanizmida L-tipli, jumladan digidropiridin-sezgir Ca^{2+} transport tizimlari bilan bog' liq funksional komponent mavjud bo' lishi mumkinligini ko' rsatadi. Shu bilan birga, olingan natijalar GL25 va nifedipinning aynan bir bog' lanish markazi uchun bevosita raqobatlashishini isbotlamaydi; buning uchun qo' shimcha molekulyar va elektrofiziologik tadqiqotlar talab etiladi.

Natijalarni umumlashtirganda, GL25 ning sinaptosomal Ca^{2+} signaliga ta'siri **konsentratsiyaga bog' liq bo' lishi bilan birga, L-tipli Ca^{2+} kanallarining funksional holatiga ham bog' liq** ekanligi namoyon bo' ldi. Presinaptik Ca^{2+} dinamikasi neyromediatorlarning vezikulyar ajralishi, membrana qo' zg' aluvchanligi va sinaptik signal uzatilishining asosiy regulyatorlaridan biri bo' lganligi sababli, GL25 tomonidan ushbu jarayonning modulyatsiya qilinishi uning sinaptik faoliyatga ta'sir ko' rsatish imkoniyatini belgilaydi.

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AKUZUN ALKALOIDINING TROMBOTSITLAR AGREGATSIYASIGA TA'SIRI.

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Annotatsiya. *Mazkur tadqiqotda Akuzun alkaloidining trombotsitlar agregatsiyasiga ta'siri o' rganildi. Tadqiqotning maqsadi Akuzun alkaloidining turli agonistlar bilan chaqirilgan trombotsitlar agregatsiyasiga ta'sirini baholash va uning gemostaz tizimidagi ehtimoliy antiagregatsion xususiyatlarini aniqlashdan iborat. Olingan natijalar Akuzun alkaloidining trombotsitlar agregatsiyasini cheklovchi biologik faollikka ega ekanligini ko' rsatib, uning gemostaz tizimini modulyatsiya qiluvchi potensial vosita sifatida istiqbolli ekanligini ko' rsatadi.*

Kalit so' zlar: *Akuzun alkaloidi, trombotsitlar, trombotsitlar agregatsiyasi, adenozindifosfat, ADF, kollagen, gemostaz, antiagregatsion ta'sir, trombotsitlar faollashuvi.*

ВЛИЯНИЕ АЛКАЛОИДА АКУЗУН НА АГРЕГАЦИЮ ТРОМБОЦИТОВ.

Аннотация: *В данном исследовании изучено влияние алкалоида Акузун на агрегацию тромбоцитов. Цель исследования заключалась в оценке влияния алкалоида Акузун на агрегацию тромбоцитов, индуцированную различными агонистами, а также в определении его потенциальных антиагрегационных свойств в системе гемостаза. Полученные результаты показали, что алкалоид Акузун обладает биологической активностью, ограничивающей агрегацию тромбоцитов, что свидетельствует о его перспективности в качестве потенциального средства, модулирующего систему гемостаза.*

Ключевые слова: *алкалоид Акузун, тромбоциты, агрегация тромбоцитов, аденозиндифосфат, АДФ, коллаген, гемостаз, антиагрегационное действие, активация тромбоцитов.*

EFFECT OF AKUZUN ALKALOID ON PLATELET AGGREGATION.

Abstract: *This study investigated the effect of Akuzun alkaloid on platelet aggregation. The aim of the study was to evaluate the effect of Akuzun alkaloid on platelet aggregation induced by various agonists and to determine its potential anti-aggregatory properties in the hemostatic system. The obtained results demonstrated that Akuzun alkaloid possesses biological activity that limits platelet aggregation, indicating its potential as a promising agent for modulating the hemostatic system.*

Keywords: *Akuzun alkaloid, platelets, platelet aggregation, adenosine diphosphate, ADP, collagen, hemostasis, anti-aggregatory effect, platelet activation.*

KIRISH

Gemostaz tizimi organizmda qonning suyuq holatini saqlash, qon tomirlar shikastlanganda qon ketishini to‘xtatish hamda qon tomirlar yaxlitligini ta’minlashda muhim fiziologik mexanizm hisoblanadi. Gemostazning dastlabki bosqichida trombotsitlarning qon tomir devoriga adgeziyasi, faollashuvi va agregatsiyasi sodir bo‘lib, natijada birlamchi trombotsitar tiqin shakllanadi. Shu sababli trombotsitlarning funksional faolligini o‘rganish gemostaz holatini baholashda muhim yo‘nalishlardan biri hisoblanadi.

Gemostaz reaksiyalarini amalga oshishida tomir devori muhim rol o‘ynaydi. Tomirlarning endotelial hujayralari o‘zining yuzasida tromb hosil bo‘lishini modullovchi turli biologik faol moddalarni sintezlash va/yoki ekspressiyalash xususiyatiga ega. Ularga fon Villebrand faktori, relaksatsiyaning endotelial faktori (azot oksidi), prostasiklin, trombomodulin, endotelin, to‘qima tipidagi plazminogen aktivatori, to‘qima tipidagi plazminogen aktivatorining ingibitori, to‘qima faktori (tromboplastin), to‘qima faktori yo‘lining ingibitori va boshqalar kiradi. Bundan tashqari endoteliotsitlarning membranasida retseptorlar joylashgan bo‘lib, ular ma’lum bir sharoitda qon oqimida erkin sirkulyatsiyalanadigan molekulyar ligandlar va hujayralar bilan birikadi [12; 58-67-b.].

Trombotsitlar agregatsiyasi birlamchi gemostazning muhim bosqichi bo‘lib, uning asosida trombotsitlarning qon tomir shikastlangan sohaga adgeziyasi, faollashuvi, sekretor reaksiyasi va o‘zaro agregatsiyasi yotadi. Fiziologik sharoitda ushbu jarayon qon ketishini to‘xtatishga xizmat qilsa, trombotsitlarning ortiqcha faollashuvi arterial tromboz va aterotrombotik asoratlarning rivojlanishiga sabab bo‘lishi mumkin. Shu sababli trombotsitlar agregatsiyasini boshqaruvchi molekulyar mexanizmlarni o‘rganish va yangi antiagregatsion moddalarni izlash farmakologiya va gemostaziologiyaning dolzarb yo‘nalishlaridan hisoblanadi [4; 1537776-b.].

Trombotsitlar agregatsiyasini eksperimental baholashda adenozindifosfat (ADF/ADP) va kollagen eng ko‘p qo‘llaniladigan agonistlardan hisoblanadi. ADF trombotsitlarning $P2Y_1$ va $P2Y_{12}$ purinergik retseptorlari orqali faollashuvini chaqiradi. $P2Y_1$ retseptori trombotsit shaklining o‘zgarishi va dastlabki agregatsion javobni yuzaga keltirsa, $P2Y_{12}$ retseptori agregatsiyaning kuchayishi va barqarorlashishida muhim rol o‘ynaydi. Shuningdek, $P2X_1$ retseptori orqali Ca^{2+} oqimi ham ADFga javobning dastlabki bosqichlarida ishtirok etadi [7; 1803-b.].

ADF bilan bog‘liq signalizatsiya trombotsitlarning ichki signal yo‘llarini faollashtirib, GPIIb/IIIa (integrin αIIbβ3) retseptorlarining aktivatsiyasiga olib keladi. Ushbu retseptorlar fibrinogen bilan bog‘lanib, trombotsitlarning bir-biri bilan ko‘prik hosil qilishini ta’minlaydi. Shuning uchun ADF-induksiyalangan agregatsiyaning susayishi trombotsitlarning purinergik signalizatsiyasi, fibrinogen bilan bog‘lanishi yoki ushbu jarayonning quyi bosqichlariga ta’sir qiluvchi moddalar mavjudligini ko‘rsatishi mumkin [7; 1803-b.].

Kollagen esa qon tomir devori shikastlanganda trombotsitlar bilan bevosita o‘zaro ta’sirlashuvchi kuchli agonist hisoblanadi. Kollagenning asosiy trombotsitar retseptorlaridan biri glycoprotein VI (GPVI) bo‘lib, shuningdek α2β1 integrini ham kollagen bilan bog‘lanishda ishtirok etadi. GPVI faollashuvi tirozin-kinaza va PLCγ2 orqali signal uzatilishini kuchaytiradi, natijada hujayra ichidagi Ca^{2+} miqdori ortadi va trombotsitlarning keyingi faollashuv jarayonlari yuzaga keladi [9; 1-12-b.].

Kollagen ta’sirida yuzaga kelgan trombotsitlar faollashuvi faqat GPVI signalizatsiyasi bilan cheklanmaydi. Faollashgan trombotsitlardan ADF va tromboksan A_2 ajralishi ikkilamchi signal sifatida agregatsiyani kuchaytiradi va trombotsitar tiqinning barqarorlashishiga yordam beradi. Shu sababli kollagen bilan chaqirilgan agregatsiya natijalarini talqin qilishda kollagen retseptorlari bilan bir qatorda ADFga bog‘liq ikkilamchi signalizatsiyani ham hisobga olish zarur [9; 1-12-b.].

So‘nggi yillarda tabiiy biologik faol birikmalarning trombotsitlar faolligini modulyatsiya qilish imkoniyatlariga qiziqish ortib bormoqda. Tabiiy birikmalar trombotsitlar agregatsiyasini hujayra yuzasi retseptorlari, ikkilamchi xabarchilar, Ca^{2+} almashinuvi, fosfolipaza tizimlari, araxidon kislotasi metabolizmi va tromboksan A_2 hosil bo‘lishi kabi bir nechta mexanizmlar orqali susaytirishi mumkin [4; 1537776-b.].

Tomir devorlaridagi subendotelial komponentlarning endotelial qavat buzilganda (fibrillyar va nofibrillyar kollagen, elastin, proteoglikanlar va b.) qon bilan aloqaga kirishadi va fon Villebrand faktorini bog‘lanishi uchun yuza

hosil qiladi. Ushbu faktor faqatgina plazmada faktor VIII ni stabillashtirmasdan, balki hujayra retseptorlari bilan subendotelial strukturalarni bog‘ lab trombotsit adgeziyasida muhim rol o‘ ynaydi [2; 178-195-b.].

Qon tomir devori va endoteliyning shikastlanishi natijasida trombotsitlar faollashishi oqibatida qon laxtalari xosil bo‘ lishiga olib keladi [1; 1329-1353-b.]. Qisqacha ta’rifda, faollashish bosqichida trombotsitlar membranasi yuzasida bir nechta yopishuvchi adgeziya retseptorlari to‘ g‘ ridan-to‘ g‘ ri yoki bilvosita kollagen tolalari bilan o‘ zaro ta’sir qiladi. Yuqori darajadagi kesish tezligida Ib-IX-V glikoprotein kompleksini fon Villebrand omili (VWF) bilan bog‘ lanishi kuzatiladi [5; 869-b], natijada ushbu jarayonda glikoprotein VI retseptori (GPVI) va integrin $\alpha 2\beta 1$ retseptorlari (GPIa-IIa) kollagen bilan o‘ zaro ta’sirlanishiga olib keladi. Bir vaqtning o‘ zida bir nechta integrinlar xam kollagen, laminin, fibronektin, vironektin/vWF bilan bog‘ lanadi [6; 23-57-b.]. Ushbu jarayonlar kinaz faollashuvini va trombotsitlarning morfologik o‘ zgarishlariga olib keladi, bu esa trombotsitlarni yiriklashish bosqichiga olib keladi [1; 1329-1353-b., 8; 261-273-b.]. Keyin birikkan trombotsitlar o‘ z tarkibidan α-granulalar (AGs), δ-granulalar (DGs) va lizosoma granulalarini chiqaradi [3; 1531-1539-b.].

TADQIQOT METODOLOGIYASI.

Qon tarkibidan trombotsitlarni ajratib olish uslubi

Qon tarkibidan trombotsitlarni ajratishda qonga 1:9 nisbatda 3,8% li natriy sitrat eritmasi qo‘ shildi va trombotsitlarni 1150 aylanish/minut tezlikda 15 minut davomida sentrifugalash asosida, ishlab chiqilgan standart usulida ajratib olindi [3; 1531-1539-b.]. Sentrifugalash usuli yordamida cho‘ kmaga tushirilgan plazma tarkibidagi trombotsitlar suspenziyasi 3000 aylanish/minut tezlikda 10 minut davomida qayta sentrifugalandi va NaCl (150 mM), KCl (2,7 mM), NaH_2PO_4 (0,37 mM), $MgCl_2$ (1 mM), $CaCl_2$ (1 mM), glyukoza (5 mM), Hepes–NaOH (10 mM), geparin (50 birlik/ml), zardob albumini (0,35%) va apiraza (0,15 mg/ml) tarkibli muhitda (pH=6,5) ishchi eritma suspenziyasi xosil qilindi. Trombotsitlarni ajratib olish va spesifik testlar bo‘ yicha tahlillar xona harorati (+20...+24°C) sharoitida amalga oshirildi.

Trombotsitlar agregatsiyasi uslubi

Trombotsitlar agregatsiyasi «ALAT-2 Biola» agregometri (Rossiya) yordamida, standart uslubda [2; 178-195-b.] o‘ rganildi. Bunda induktorlar – ADF (2 mkM), adrenalin (5 mkM), FAT (0,5 birlik/ml) yordamida trombotsitlar agregatsiyasi yuzaga keltirildi va suspenziyaning optik zichligi qiymati spektrofotometr yordamida o‘ lchandi. Bu qurilma uni grafikaviy qayd qilish davomida agregatsion jarayonni dinamikasini tadqiq qilishga yordam beradi. Metodning prinsipi Trombotsitlarga boy plazmani agregatsiya induktorlarining ma’lum bir miqdorini qo‘ shguncha va qo‘ shgandan keyingi vaqtda optik zichligini o‘ zgarishini qayd qilishga asoslangan. Ko‘ rsatilgan induktorlarni trombotsitlarga boy plazmaga qo‘ shishdan oldin o‘ rganilayotgan moddani qo‘ shdik va 3 min davomida inkubatsiyaladik.

Tajribalarda foydalanilgan Hepes–NaOH, ADF, adrenalin, FAT («Sigma–Aldrich», Germaniya), NaCl, KCl, NaH_2PO_4, $MgCl_2$, $CaCl_2$, glyukoza («Ximreaktivkomplekt», Rossiya) tajribalar uchun kimyoviy tozalik kvalifikatsiyasiga ega hisoblanadi.

Shuningdek tajribalarda Ca^{2+}–kanali blokatori – nifedipin, GAMK–retseptori agonisti – diazepam va fenobarbital, GAMK–retseptor antagonisti – pikrotoksin, glutamat retseptori blokatori – memantin va argiolobatindan foydalanildi.

NATIJALAR VA ULARNING TAHLILI

Ma’lumki aIIbb3 integrin sifatida ham tanilgan GPIIb/IIIa retseptorlari trombotsitlar yuzasida joylashgan glikoprotein retseptorlari xisoblanadi. GPIIb/IIIa retseptorlari fibrinogen va boshqa ligandlar bilan bog‘ lanib, trombotsitlar faollashishida va agregatsiyasida asosiy rol o‘ ynaydi. Trombotsitlar faollashishi GPIIb/IIIa retseptorlarida konformatsion o‘ zgarishlarga olib keladi, natijada uning ligand-bog‘ lovchi bo‘ rtmasi paydo bo‘ ladi. Ushbu konformatsion o‘ zgarish retseptorlarga fibrinogenni xosil bo‘ lish imkonini beradi, trombotsitlar agregatsiyasi va laxta shakllanishiga yordam beradi.

ADF 1,0 mkM trombotsitlar yuzasidagi o‘ z retseptorlari bilan bog‘ lanadi. Dastlabki bog‘ lanishlar natijasida hujayra ichidan kalsiyni ajralib chiqishi orqali trombotsitlar shakli o‘ zgaradi, bu agregatsiyaning birlamchi to‘ lqinining shakllanishiga olib keladi. Ikkilamchi to‘ lqin trombotsitlar granulalari deposidan ADF ning chiqishini yuzaga keltiradi. ADF ning quyi dozasi faqat birlamchi agregatsiyani keltirib chiqaradi va uning ta’siri qayta tiklanish xususiyatiga ega. ADF - 2,5 -5,0 mkM ikki P2Y1 va P2Y12 retseptorlari G-oqsili bilan bog‘ lanadi. ADF ning P2Y1 retseptorlari bilan bog‘ lanishi va kalsiyni mobilizatsiya qilish orqali trombotsitlarni shakli o‘ zgarishiga agregatsiyasiga (birlamchi to‘ lqin) boshlanishiga olib keladi. P2Y12 retseptorlari asosiy ADF retseptorlari hisoblanadi va adenilatsiklazani ingibirlashi orqali trombotsitlarning to‘ liq agregatsiyasi uchun javobgar xisoblanadi. ADF - 10 mkM P2Y12 retseptorlari ham klopidogrel uchun nishon hisoblanadi. ADF tomonidan qo‘ zg‘ atilgan agregatsiyaning ikkinchi to‘ lqini aspirin tomonidan ingibirlanadi.

Adrenalin 5-10 mkM trombotsitlar yuzasida $\alpha 2$-adrenoenergik retseptorlari bilan bog‘ lanadi, bu adenilatsiklazaning ingibirlanishiga va kalsiy ionlarining chiqishiga olib keladi. Adrenalin bilan chaqirilgan trombotsitlar agregatsiyasisining dastlabki to‘ lqini vizual ravishda ADF bilan chaqirilgan agregatsiyasiga o‘ xshaydi, trombotsitlardan

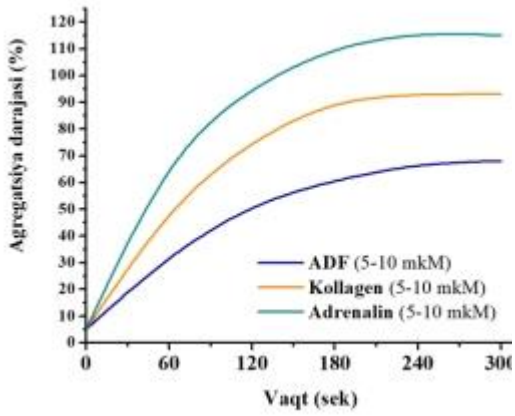
to‘ plangan ADF ajralib chiqishi va agregatsiyaning ikkinchi qaytmas to‘ lqinini xosil bo‘ lishiga olib keladi. ADF bilan bo‘ lgani kabi, agregatsiyaning bu ikkinchi to‘ lqini aspirin tomonidan ingibirlanadi. Adrenalin, ADF singari zaif agonist hisoblanadi.

Plazma tarkibiga ADF induktori qo‘ shilganida agregatsiya darajasi, (5-10 mkM) konsentratsiyalarda ikkilamchi ikki fazali egri chiziq shaklida qaytmas trombotsitlar agregatsiyasi 60-90% ekanligi kuzatildi. AK sharoitida esa ADF bilan chaqirilgan agregatsiya darajasi nazoratga nisbatan 10-15% yuqori ekanligi qayd etildi. (1-rasm)

Adrenalin induktori (5-10 mkM) konsentratsiyalarda ADF singari dozaga bog‘ liq ravishda trombotsitlar agregatsiyasini keltirib chiqaradi. Adrenalin ushbu konsentratsiyada trombotsitlarning qaytmas agregatsiyasini 45-70% keltirib chiqardi. AK sharoitida esa adrenalin bilan chaqirilgan agregatsiya darajasi nazoratga nisbatan 15-20% yuqori ekanligi qayd etildi (1-rasm).

Kollagen induktori (5-10 mkM) konsentratsiyalarda ADF singari dozaga bog‘ liq ravishda trombotsitlar agregatsiyasini 50-80% keltirib chiqaradi. Kollagen ushbu konsentratsiyada trombotsitlarning qaytmas agregatsiyasini keltirib chiqardi (1-rasm).

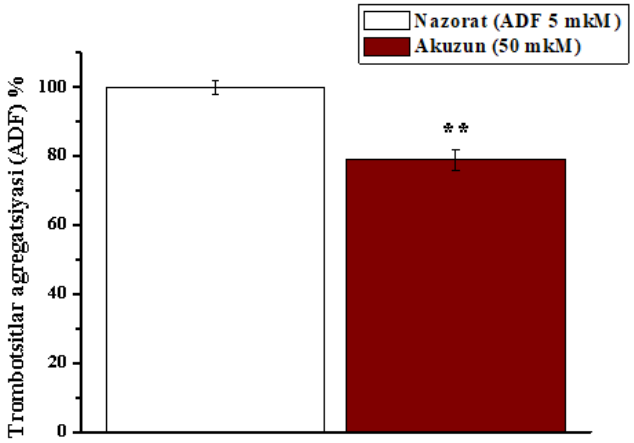
Ma’lumki kollagen 5-10 mkg/ml konsentratsiyalarda trombotsit hujayrasiga turlicha ta’sir ko‘ rsatadi. Kollagen GRVI va GRIa/IIa retseptorlari bilan bog‘ lanib, granulalar tarkibini xamda TXA2 yo‘ llarini qo‘ zg‘ atadi va keyin GPIIb-IIIa retseptorining barqaror xolatda faollashishiga olib keladi. GRIa/IIa retseptorlari trombotsitlar adgeziyasida ishtirok etadi. GRVI retseptorlari trombotsitlar signalizatsiyasi va TxA2 hosil bo‘ lishida ishtirok etadi. Kechikish bosqichi (Lag-faza) trombotsitga boy plazmaga kollagen qo‘ shilgandan so‘ ng, odatda 1 daqiqadan kamroq vaqt ichida hosil bo‘ ladi.



1-rasm. Sog‘ lom trombotsitlarining ADF, adrenalin va kollagen bilan chaqirilgan agregatsiyasining ko‘ rinishi (n=6).

Ma’lumki, trombotsitlar agregatsiyasining induktorlari (ADF, adrenalin va kollagen, trombotsitlarning faollashtiruvchi omillari) tromboksan A_2 ni hosil qilish yo‘ li bilan sitoplazmadagi Ca^{2+} miqdorini oshirib, trombotsitlarni faollashtirish xususiyatiga egadir. Xususan, ADF trombotsitlar agregatsiyasini chaqirish va erkin Ca^{2+} miqdorini oshirish xususiyatiga ega bo‘ lgan trombotsitlarning o‘ ziga xos aktivatorlaridan biri hisoblanadi.

Akuzun alkaloidi trombotsitlar agregatsiyasiga ta’sirini o‘ rganganimizda, ushbu alkaloid, trombotsitlarning agregatsiyasini qisman ingibirlashi aniqlandi (2-rasm). Rasmda ko‘ ringanidek, ADF 5 mkM bo‘ lgan sharoitda Akuzun alkaloidi 50 mkM konsentratsiyada 21%ga ADF bilan chaqirilgan trombotsitlar agregatsiyasini ingibirlashi kuzatildi (2-rasm).

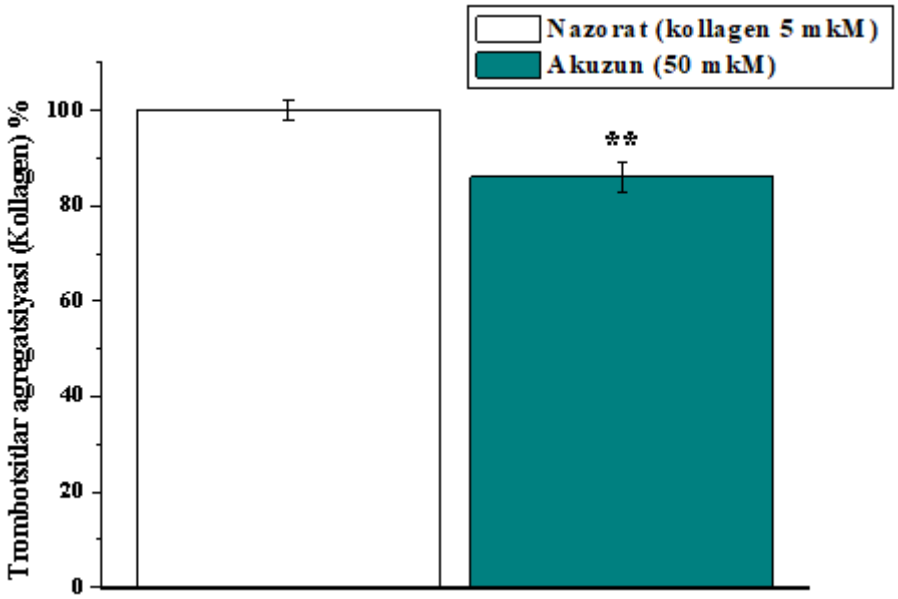


2. Rasm. Akuzun alkaloidining trombotsitlarning ADF bilan indutsirlangan agregatsiyasiga ta’siri. Natijalar nazoratga nisbatan %da keltirilgan. Ishonchlilik darajasi.*- P<0,05; **- P<0,01; (*n*=6).

Ma’lumki, ADF trombotsitlar membranasi yuzasidagi P2Y1va P2Y12 retseptorlari bilan bog‘ lanib, uning shaklini o‘ zgarishiga olib kelishi orqali trombotsitlar agregatsiyasi yuzaga keladi, balkim adenilatsiklazani ingibirlashi orqali,

sAMF miqdorini susaytirishi va ichki depodan $[Ca^{2+}]_{in}$ chiqarilishini faollashtirishi orqali ta'sirga ega. Natijada sitoplazmaga Ca^{2+} ionlari chiqariladi. Akuzun alkaloidi ushbu ADF ta'sirida yuzaga keladigan trombotsitlar agregatsiyasini ingibirlanishi orqali trombotsitlar yuzasidagi P2Y1va P2Y12 retseptorlari ingibirlashi natijasida adenilatsiklazani ingibirlashini oldini olish orqali, sAMF miqdorini oshirishi va ichki depodan $[Ca^{2+}]_{in}$ chiqarilishini bloklashi mumkinligi extimolini ilgari suradi.

Keyingi tajribalarimizda Akuzun alkaloidining trombotsitlarning kollagen bilan chaqirilgan agregatsiyasiga ta'sirini o' rganganimizda, ushbu polifenollar, trombotsitlar agregatsiyasiga turlicha ta'sir etishi aniqlandi. Tajribalar davomida kollagen 5 mkM bo' lgan sharoitda Akuzun alkaloidi 50 mkM konsentratsiyada 14%ga ADF bilan chaqirilgan trombotsitlar agregatsiyasini ingibirlashi kuzatildi (3-rasm).



3. Rasm. Akuzun alkaloidini trombotsitlarning kollagen bilan indutsirlangan agregatsiyasiga ta'siri. Natijalar nazoratga nisbatan %da keltirilgan. Ishonchlilik darajasi.*- P<0,05; **- P<0,01. (*n*=6).

Yuqoridagi ma'lumotlardan ko' rinib turibdiki foydalanilgan Akuzun alkaloidi kollagen bilan chaqirilgan trombotsitlar agregatsiyasini sezilarli ingibirlashi orqali GPIa-Iib, GPVI retseptorlari bilan bog' lanishini va GPIb-V-IX retseptorlari bilan Villebrand omili orqali trombotsitlarni jadal tarzda faollashtirishini oldini olishi orqali ta'sirga ega ekanligini taxmin qilish imkonini beradi.

Akuzun alkaloidining gemostaz tizimiga ta' sirini geparin preparati bilan solishtirib o' rganganimizda ushbu alkaloid trombinga bog' liq qon ivish vaqtini 50mkM kontsentratsiyada Geparinga 130b/k kontsentratsiyada ta' sir etuvchi ivish vaqtini samarali uzaytirishiga olib keldi (1-jadval).

1-jadval.

Akuzun alkaloidi va geparinning gemostaz tizimiga solishtirma ta'siri.

№	Modda nomi	Trombin vaqti	QFTV-testi	Texplastin test	Trombotsitlar agregatsiyasi (ADF)
1	Nazoratda	25 (sek)	30 (sek)	26 (sek)	100%
2	Akuzun (50mkM)	68±2	55±3	46±4	21%
3	Geparin (130$^{b}/_{k}$)	62±5	52±4	38±3	15%

Olingan ushbu tajriba natijalari akuzun alkaloidi gemostaz tizimga ishonchli tarzda ta'sir etishini ko' rsatadi.

XULOSA

Akuzun alkaloidi ADF va kollagen tomonidan qo' zg' atilgan trombotsitlar agregatsiyasini bloklashi orqali trombotsitlar funksiyasiga sezilarli ta'sir ko' rsatadi. Bu ingibirlanish, ehtimol, trombotsitlarsiz xam Ca^{2+} darajasining pasayishi bilan bog' liq, chunki akuzun membrana bilan bog' langan Ca^{2+} konsentratsiyasini o' zgartiradi va faollashuv vaqtida sitozolik Ca^{2+} darajasining oshishiga yo' l qo' ymaydi.

Foydalanilgan adabiyotlar

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ONALIK ILDIZMEVANI QISHGI SOVUQDAN SAQLAB QILISH VA UNING AXAMIYATI

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Namangan davlat universiteti katta o‘ qituvchisi

Annotatsiya: *Bu maqolada qand lavlagining onalik ildizmevaning yashab qolishiga qanday omillar ta’sir qilishi to‘ g‘ risida gap boradi. Qand lavlagidan urug‘ hosili olishda onalik ildizmevani ekish muddatlari va ko‘ chat qalinligiga hamda qishga tayyorgarlik ko‘ rishga bevosita bog‘ liq bo‘ ladi. Onalik materiali olish uchun urug‘ ni erta muddatlarda (20.08) ekish qishgi sovuqda nobud bo‘ lishini eng kam (0.9 %) bo‘ lishi qishda onalik ildizmeva dalada tuproq bilan yopib saqlanganda ta’minlanadi.*

Kalit so‘ zlar: *onalik ildiz meva, urug‘ , ekish muddatlari ko‘ chat qalinligi, mineral o‘ g‘ itlar, agrotexnik tadbir, o‘ sish rivojlanishi , urug‘ xosldorligi.*

ЗАЩИТА МАТЕРИНСКОГО ДЕРЕВА ОТ ЗИМНИХ ХОЛОДОВ И ЕЁ ЗНАЧЕНИЕ

Аннотация: *В статье рассматриваются факторы, влияющие на сохранность маточных корнеплодов сахарной свёклы в зимний период. Получение семенного материала сахарной свёклы непосредственно зависит от сроков посадки маточных корнеплодов, густоты стояния растений, а также от их подготовки к зимнему периоду. Установлено, что при раннем сроке посева семян (20.08) для получения маточного материала обеспечивается наиболее высокая сохранность маточных корнеплодов в условиях зимних холодов. При этом уровень гибели растений составляет всего 0,9 %, что достигается при хранении маточных корнеплодов непосредственно в поле с укрытием их почвой в зимний период.*

Ключевые слова: *маточный корнеплод, семена, сроки посева, густота стояния растений, минеральные удобрения, агротехнические мероприятия, рост и развитие, урожайность семян.*

PRESERVING MOTHER ROOT CROPS FROM WINTER COLD AND ITS IMPORTANCE

Abstract: *This article examines the factors affecting the survival and preservation of mother root crops of sugar beet during the winter period. The production of sugar beet seed yield is directly dependent on the planting time of mother root crops, plant density, and their preparation for winter conditions. It was established that early sowing of seeds (20 August) for obtaining mother planting material ensures the highest survival rate of mother root crops under winter cold conditions. In this case, the mortality rate was only 0.9%, which was achieved by storing the mother root crops directly in the field and covering them with soil during the winter period.*

Keywords: *mother root crop, seeds, sowing dates, plant density, mineral fertilizers, agrotechnical practices, growth and development, seed yield.*

Qishloq xo‘ jaligida ekinlardan yuqori va sifatli hosil olishning bosh omili urug‘ hisoblanadi. Urug‘ qanchalik sifatli bo‘ lsa hosil olish uchun o‘ tkaziladigan agrotexnik tadbirning samarasi yuqori bo‘ lishiga erishiladi. Bugungi kunda dunyo aholi sonini ortib borishi mavjud erlardan foydalanish samaradorligini oshirishni talab etadi. Buning uchun gektar hisobidan olinayotgan hosil salmog‘ ini muttasil oshirib borish, shu bilan birgalikda ularni sifatini yuqori bo‘ lishiga erishish muhimdir. Respublikamizda ham aholi soni ortib borar ekan ularni oziq-ovqat mahsulotlariga bo‘ lgan talabi ortib boradi. YUqorida keltirilgan fikrlar asosida, hozirgi kungacha dolzarb masalalardan biri bo‘ lib kelayotgan bug‘ doydan bo‘ shagan maydonlardan samarali foydalanish ya’ni, takroriy ekinlarni ekish, ekkanda ham hosili yuqori bo‘ lganini ekishga katta ahamiyat berilmoqda. Bunday ekinlar orasida qand lavlagi ham bo‘ lib, uning hosildorligi 1000 s/ga ga etadi, shuning bilan uni sanoatda qayta ishlashi bilan ham xarakterlidir.

Qand lavlagi O‘ zbekiston sharoitida birinchi marotaba o‘ tgan asrning 40-50-yillarida ekib o‘ stirilgan bo‘ lsada ilmiy-tatqiqot ishlari (Golodkovskiy va Belousovlargina) kam olib borilgan. Ammo urug‘ chilik bilan umuman shug‘ ullanilmagan. Qand lavlagini ekish kerak bo‘ lgan maydonlarga ekiladigan urug‘ lik materiallari chetdan olib kelingan. Bugungi kunda esa qand lavlagi urug‘ ini o‘ zimizni iqlimimizga mos bo‘ lgan navlari o‘ zimizda etishtirishni

yo‘ lga qo‘ yish dolzarb bo‘ lib turibdi. Alohida ta’kidlab o‘ tish kerakki, qand lavlagi ikki yillik o‘ simlik bo‘ lganligi sababli birinchi yili ildizmeva hosili olinadi, ikkinchi yili ildizmeva ekilib urug‘ hosili olinadi.

Qand lavlagidan urug‘ hosili olish uchun dunyoda ko‘ p tadqiqotlar olib borilgan va olib orilmoqda. Hozirgi davrda dunyo miqyosida ro‘ y berayotgan global o‘ zgarishlar o‘ zining yuksak taraqqiyotiga olib kelayotgan ijobiy natijalari bilan birga tabiiy jarayon va xodisalarda ham salbiy o‘ zgarishlarni keltirib chiqarmoqda. Bu esa o‘ z navbatida yana tabiatga murojaat qilishni, undan oqilona foydalanish, tabiat boyliklarini asrab-avaylash va o‘ rganishni talab qiladi [7; 129-136-b.].

Ko‘ pgina chet ellik olimlarning [8; 3-6-b., 9; 47-56-b.] ma’lumotlariga qaraganda almashlab ekishda oziqa moddalarini energetik balansini yaratishda foydalanilgan metodlarni samarasi aniqlangan. Bu balans ularning ishlarida ijobiy bo‘ lgani aniqlangan. O‘ g‘ itlardan uzoq muddat ilmiy asosda foydalanilganda ekinlar hosili ishonarli ortgan. Bunda qizil yo‘ ng‘ ichqa arpa bilan qoplama usulda ekilgan erda qoladigan ang‘ iz va ildiz qoldig‘ i har gektarda 13,1-15,4 tonnaga teng bo‘ lganligi kuzatilgan.

P.V.Prudnikov, S.P.Prudnikov tadqiqotlarida [5; 17-b.] organik o‘ g‘ itlardan foydalanmagan holda, hosildorlik 34,5 t/ga, 24 t/ga go‘ ng solinganda - 35,2 t/ga va 1 gektarga 48 t organik o‘ g‘ it-go‘ ng dozasida 37,1 t/ga ildizmeva hosili olingan. SHunday qilib, hosilning sezilarli o‘ sishi organik o‘ g‘ it me’yorini ikki marotaba oshirilgan dozada kuzatildi.

G.N.CHerkasovning [6; 10-14-b.] ma’lumotiga ko‘ ra, tuproq unumdorligi o‘ g‘ it qo‘ llamaslik hisobiga kamayishiga va aksincha azotli, fosforli va kaliyli o‘ g‘ itlarni qo‘ llash tuproq tarkibidagi oziqa moddalar miqdorini saqlab qolishga olib keladi. SHu bilan birgalikda qand lavlagini 15 t/ga ildizmeva hosili olishni ta’minlaydi.

YUqoridagilardan kelib chiqib biz tadqiqotlarni quyidagicha 1-jadvaldagidek o‘ tkazishni rejalashtirdik.

Urug‘ lik olish uchun onalik ildizmevani o‘ stirishda har bir variant eni –4,8 m, uzunligi – 50 m, umumiy maydoni – 240 m^2. Tajriba 10 variant 4 takrorlanishda bo‘ lib, har bir variantning umumiy maydoni 960 m^2, tajribaning umumiy maydoni esa 9660 m^2ni tashkil etadi.

Tajribada mineral o‘ g‘ itlardan ammiakli selitra (34% N), mochevina (46% N), superfosfat (17-20% P_2O_5) va kaliy xloridi (51-60% K_2O) qo‘ llaniladi.

Tajriba o‘ tkazish, fenologik kuzatuv, tuproq va o‘ simlik namunalari olish «Metodika polevых opытov» (Dospexov, [4; 486-b.]), «Metodika Gosudarstvennogo sorta ispытaniya selskoxozyaystvennых kultur» [2; 24-b.] va «Dala tajribalarini o‘ tkazish uslublari» [3; 147-b.] qo‘ llanmalariga asosan o‘ tkaziladi.

Biz tajribada onalik ildizmeva olish uchun ekilgan qand lavlagi urug‘ i unib chiqishi va ko‘ chat qalinligini hisobga oldik. Unga ko‘ ra urug‘ larni unib chiqishi o‘ rganilganda eng yaxshi ko‘ rsatgich birinchi muddatda (20.08) ekilgan 2-3 variantlarda kuzatildi. Bu variantlarda unib chiqish lavlagi urug‘ i ekilgan kundan keyin 4-kuni boshlangan, unib chiqish 4 kun ichida tugab, me’yordagi ko‘ chat qalinligiga erishilgan. Keyingi muddatda (30.08) ekilganda unib chiqish oldingi ekish muddatdagidan biroz farq qildi, unga ko‘ ra unib chiqishda farq sezilmagan bo‘ lsada, unib chiqish davomiyligi oldingi muddatdan bir kun ko‘ p davom etdi. 10.09 kunda (uchinchi muddatda) ekilganda unib chiqish urug‘ ekilgan kundan keyin 5-kuni unib chiqish boshlanib, 5 kunda to‘ liq unib chiqishga erishildi. Oxirgi ekish muddatida esa unib chiqishda biroz qiyinchiliklar bo‘ ldi. Havoning keskin pasayishi urug‘ ni unib chiqish muddatiga ta’sir ko‘ rsatib, u 7 kunigina dastlabki o‘ simtalarni ko‘ rinishini ta’minladi va unib chiqish davomiyligi 7 kunga etdi. Natijada olingan o‘ simliklar nimjon, bir tekis hosil bo‘ lmadi.

1-jadval

Tajriba tizimi

Var.	Ekish usuli	Ekish muddati	Ildizmevani qishda saqlash usuli
1	Oddiy (qand lavlagi onalik ildizmevasi ekiladi)		Qishda onalik ildizmeva omborda saqlanadi
2	YAngi usul (Onalik ildizmeva olish uchun urug‘ ekiladi)	20.08	Qishda onalik ildizmeva dalada saqlanadi
3			Qishda onalik ildizmeva dalada tuproq bilan yopib saqlanadi
4		30.08	2-variantdagi kabi
5			3-variantdagi kabi
6		10.09	2-variantdagi kabi
7			3-variantdagi kabi
8		20.09	2-variantdagi kabi
9			3-variantdagi kabi

Tajriba olib borishda variantlarda ko‘ chatlarning tekis bo‘ lishiga erishishiga ekish muddatlarini ta’sirini ham o‘ rgandik. SHu bilan birgalikda o‘ simtalarni qishlovdan keyin saqlanib qolganlarini aniqladik. Bunda ularni saqlab

qolish uchun o‘ tkazilgan agrotexnik tadbirni (ildizmevani usti tuproq bilan o‘ ralganini ta’siri) ta’sirini o‘ rgandik. Bu ma’lumotlarni quyidagi 2-jadvaldan ham ko‘ rishimiz mumkin.

Ekish muddatlarini erta bo‘ lishligi ko‘ chatlarni bir tekis, baquvvat bo‘ lishini ta’minlaydi. Bu qishlov davrida o‘ simliklarni nobud bo‘ lishini kamayishiga olib keladi. Bizni tajribamizda ham qand lavlagi ildizmevasi keyingi yili urug‘ olish uchun o‘ stirilganda qishlovga kirishidan oldin ko‘ chat qalinligi aniqlandi. Unga ko‘ ra ekish muddatlari erta qilib belgilangan (20.08 va 30.08) muddatlarda hosil bo‘ lgan ko‘ chat qalinliklari nisbatan yuqori ekanligi kuzatildi. Bunda 54.0 ming donadan 54.5 ming donagacha bo‘ lganligi aniqlandi. Qolgan ekish muddatlari kech (10.09 va 20.09) bo‘ lganida bu ko‘ rsatgich mos ravishda 52.4 va 53.8 ming donani tashkil etdi.

2-jadval

Tajriba variantlarida qand lavlagining xaqiqiy ko‘ chat qalinligi, ming dona hisobida

Var.	Ekish usuli	Ekish muddati	Ildizmevani qishda saqlash usuli	Qishlovdan oldingi ko‘ chat qalinligi	Qishlovdan keyingi ko‘ chat qalinligi	Nobud bo‘ lgan ko‘ chat soni
1	Oddiy (qand lavlagi onalik ildizmevasi ekiladi)		Qishda onalik ildizmeva omborda saqlanadi			
2	YAngi usul (Onalik ildizmeva olish uchun urug‘ ekiladi)	20.08	Qishda onalik ildizmeva dalada saqlanadi	54	51.2	2.8
3			Qishda onalik ildizmeva dalada tuproq bilan yopib saqlanadi	54	53.1	0.9
4		30.08	2-var. kabi	54.5	50.1	4.4
5			3-var. kabi	54.2	53.2	1.0
6		10.09	2-var. kabi	53.8	49.2	4.6
7			3-var. kabi	53.6	52.3	1.3
8		20.09	2-var. kabi	52.3	46.8	5.5
9			3-var. kabi	52.4	48.1	4.3

Erta bahorda qishlovdan keyin dalada variantlar bo‘ yicha xaqiqiy ko‘ chat qalinligini aniqlaganimizda kech muddatda ya’ni, 20.09 da ekilgan va ildizmeva dalada oddiy usulda qoldirilganda eng ko‘ p ko‘ chat nobud bo‘ lganligini kuzatamiz. Bunda oddiy usulda qoldirilganda 5.5 ming dona, usti tuproq bilan yopilganda 4.3 ming dona ko‘ chat nobud bo‘ lgan. Eng kam ko‘ chat nobud bo‘ lgan variant 20.08 va 30.08 da ekilib, usti tuproq bilan yopilgan variantlarda erishilib, bor-yo‘ g‘ i mos ravishda 0.9 va 1.0 ming dona ko‘ chatlar nobud bo‘ lgan xolos.

Xulosa qilib shuni aytish mumkinki, Farg‘ ona vodiysi sharoitida qand lavlagidan urug‘ olish uchun tayyorlanadigan onalik ildizmevani avgust oyining yigirmanchi va o‘ ttizinchi kunlarida ekish va ularga sovuq kam ta’sir qilishi uchun tuproq bilan ko‘ mib qo‘ yish lozim. Bunda ko‘ chatlarni nisbatan kam sovuq urishiga olib keladi. Bunda bir gektar maydonda o‘ rtacha 0.9-1.0 ming dona ko‘ chat nobud bo‘ lishiga olib keldi.

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TOG‘ TUPROQLARINING MIKROMORFOLOGIK TUZILISHINI SHIMOLIY VA JANUBIY QIYALIKLARI BO‘ YICHA O‘ ZGARISHI

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Annotatsiya: *Mazkur tadqiqotda xududining shimoliy va janubiy ekspozitsiyadan olingan tuproq namunalari ularning mikromorfologik xususiyatlarida o‘ xshash va farqli jihatlar mavjudligi ko‘ rsatilgan. Har ikki ekspozitsiya tuproqlarida ignasimon va radial morfologiyali mineral agregatlar, polidispers zarrachalar hamda mikroagregatli struktura shakllanganligi aniqlangan. Ekspozitsiyalarning harorat, namlik rejimi, tuproq tarkibidagi organik moddalar bilan bog‘ liq bo‘ lib, tuproq hosil bo‘ lish jarayonlarining turlicha ekanligi sababli gumusga boy bo‘ lgan shimoliy ekspozitsiya tuproqlarida agregatlarning nisbatan yaxshi rivojlanganligi, g‘ ovaklik tizimining aniq ifodalanishi va zarrachalarning bir tekis joylashganligi kuzatilgan, kamgumusli janubiy ekspozitsiya tuproqlarida mayda dispersli zarrachalar va kam agregatlangan mikrotuzilmalar ustunlik qilishi aniqlangan. Elektron mikroskopiya SEM usuli tuproqlarning mikromorfologik holatini baholashda yuqori samarali tadqiqot usuli ekanligini ko‘ rsatdi.*

Kalit so‘ zlar: *tuproq, mikromorfologiya, pedogenez, tuproq genezisi, agregat, g‘ ovaklik, mineral tarkib, gumus.*

ИЗМЕНЕНИЕ МИКРОМОРФОЛОГИЧЕСКОЙ СТРУКТУРЫ ГОРНЫХ ПОЧВ В ЗАВИСИМОСТИ ОТ СЕВЕРНОЙ И ЮЖНОЙ ЭКСПОЗИЦИИ СКЛОНОВ.

Аннотация. *В данном исследовании представлены результаты изучения почвенных образцов, отобранных на северной и южной экспозициях исследуемой территории, и выявлены как сходства, так и различия в их микроморфологических характеристиках. Установлено, что почвы обеих экспозиций характеризуются наличием минеральных агрегатов игольчатой и радиально-лучистой морфологии, полидисперсных частиц и развитой микроагрегатной структуры. Выявленные различия обусловлены особенностями температурного и водного режимов экспозиций, содержанием органического вещества в почве и спецификой процессов почвообразования. В почвах северной экспозиции, отличающихся более высоким содержанием гумуса, наблюдаются лучше развитые агрегаты, более выраженная система пор и равномерное распределение частиц. В то же время для малогумусных почв южной экспозиции характерно преобладание тонкодисперсных частиц и слабо агрегированных микроструктур. Результаты исследования показали, что метод сканирующей электронной микроскопии (SEM) является высокоэффективным инструментом для оценки микроморфологического состояния и структурных особенностей почв.*

Ключевые слова: *почва, микроморфология, педогенез, генезис почв, агрегаты, пористость, минеральный состав, гумус.*

ASSESSMENT OF MICROMORPHOLOGICAL CHARACTERISTICS OF MOUNTAIN SOILS ACROSS NORTHERN AND SOUTHERN SLOPE ASPECTS

Abstract. *This study examines soil samples collected from the northern and southern slope aspects of the study area and reveals both similarities and differences in their micromorphological characteristics. The results showed that soils from both slope aspects contain needle-shaped and radially arranged mineral aggregates, polydisperse particles, and well-developed microaggregate structures. The observed differences are associated with variations in temperature and moisture regimes, as well as the content of organic matter, which influence soil-forming processes. The humus-rich soils of the northern slope aspect exhibited relatively better-developed aggregates, a more distinct pore system, and a more uniform distribution of particles. In contrast, the humus-poor soils of*

the southern slope aspect were characterized by the predominance of fine-dispersed particles and weakly aggregated microstructures. The application of Scanning Electron Microscopy (SEM) demonstrated its high efficiency as a research tool for assessing the micromorphological properties and structural features of soils.

Keywords: *soil, micromorphology, pedogenesis, soil genesis, aggregates, porosity, mineral composition, humus.*

MAVZUNING DOLZARBLIGI.

Tuproq tabiatning muhim tarkibiy qismi hisoblanib, o‘ simliklar o‘ sishi va rivojlanishi uchun asosiy muhit hisoblanadi. Tuproqning barcha xossa va xususiyatlari uning ichki tuzilishiga bevosita bog‘ liq bo‘ ladi. Tuproq tuzilishini faqat makroskopik darajada emas, balki mikroskopik darajada ham o‘ rganish muhim ahamiyatga ega. Tuproqda mikromorfologik izlanish olib borishda tuproqning shakllanish jarayonlari, tarkibi va xususiyatlarini mikroskop yordamida tadqiq qilish imkonini beradi.

Tuproqning mikromorfologik tuzilish unda kechayotgan ichki jarayonlar va tuproq qattiq fazasining tuzilishi, mineral zarrachalar, ular orasidagi g‘ ovakliklarni tuzilishi ularni organik va mineral birikmalar bilan bog‘ liqligi ko‘ rsatadi. Shu bilan birga bu izlanish tuproqning genezisi, agrofizikasi, biologik va fizik kimyoviy xossalariga tegishli xususiyatlarini o‘ zida namayon etadi.

Tuproq mikromorfologiyasi orqali tuproqning yupqa namunalarida mikroskop yordamida uning tarkibiy elementlari va pedogen jarayonlar natijasida shakllangan belgilarini kuzatish mumkin. Mazkur usul orqali tuproq hosil bo‘ lishi qonuniyatlarini o‘ rganish unda kechadigan fizik, kimyoviy va biologik jarayonlar haqida aniq ma’lumotlar olish xossalarini baholash, tuproq genezisiga baho berish va uning agroekologik holatini o‘ rganish dolzarb hisoblanadi.

O‘ RGANILGANLIK DARAJASI.

Tuproq mikromorfologiyasini o‘ rganish bo‘ yicha ilmiy tadqiqotlar XX asrning ikkinchi yarmidan boshlab rivojlangan bo‘ lib, so‘ nggi o‘ n yilliklarda skanerlovchi elektron mikroskopiya (SEM) usuli keng qo‘ llanilmoqda.

Tuproq mikromorfologiyasi bo‘ yicha xorijiy olimlardan Georges Stoops, Eric A. FitzPatrick va boshqa tadqiqotchilar tomonidan tadqiqotlar olib borilgan. G. Stoops tomonidan fundamental tadqiqotlarini belgiyalik olim olib borgan bo‘ lib, u tuproqning yupqa kesmalarini tahlil qilish orqali pedogen jarayonlarni aniqlash metodologiyasini takomillashtirgan. Uning tadqiqotlarida tuproq strukturasi, plazma va skelet elementlari, g‘ ovaklar tizimi hamda yangi hosil bo‘ lgan mineral birikmalarning morfologik xususiyatlari batafsil yoritib berilgan.Uning «Guidelines for Analysis and Description of Soil and Regolith Thin Sections» asari tuproq yupqa kesmalarini tavsiflash va tahlil qilish bo‘ yicha xalqaro standart sifatida e’tirof etilgan.

P.Castillo, M.F.Albornoz, O.Crovo, A.Atenas, C.I.Czimczik, R.Southard, F.Aburto tadqiqotlarida Chilining janubi-markaziy hududlarida mahalliy Nothofagus o‘ rmonlarining qarag‘ ay plantatsiyalariga aylantirilishi natijasida tuproqning fizik-kimyoviy va mineralogik xususiyatlari o‘ zgarishi tahlil qilingan. Tadqiqot natijalari tuproqdagi organik moddalarning barqarorlashuvi mineral tarkib bilan chambarchas bog‘ liqligini hamda o‘ rmonlarning plantatsiyalarga aylantirilishi tuproqning chuqur qatlamlarigacha salbiy ta’sir ko‘ rsatishini tasdiqlaydi. [1]

Mahalliy Nothofagus o‘ rmonlarining qarag‘ ay plantatsiyalariga aylantirilishi natijasida tuproqning fizik-kimyoviy va mineralogik xususiyatlarida sezilarli o‘ zgarishlar kuzatilgani aniqlangan [2].

Titan eritish zavodi hududidagi tuproqlarda potentsial zaharli elementlar (PTE)ning tarqalishi va geokimyoviy xususiyatlari baholangan. Natijalar titan eritish jarayoni tuproqning kuchli kislotalanishiga (pH 2,75–5,52), mineral fazalarning parchalanishiga hamda Ti bilan bog‘ liq ilmenit, barit va gips minerallarining to‘ planishiga olib kelganini ko‘ rsatdi [3].

Namibiyaning Otavi tog‘ lari etaklaridagi yarim qurg‘ oqchil tropik hudud tuproqlarida pedoxilma-xillikning shakllanish omillarini baholashga qaratilgan ish. mineralogik, mikromorfologik va geokimyoviy tahlillar natijasida tuproq xususiyatlari asosan litologiya, pedogenez davomiyligi, mikrorelyef va gidrologik rejim bilan bog‘ liqligi aniqlangan. [4].

O‘ zbekistonda ham tuproqlarning mikromorfologik xususiyatlarini o‘ rganish bo‘ yicha qator ilmiy ishlar amalga oshirilgan. Bu yo‘ nalish asoschilari sifatida nemis olimi V.Kubiena, B.B.Polinov, O‘ zbekistonda P.A.Marozova, G.E.Pevushevskaya (1976), X.X.Tursunov (1970), D.R.Ismatov (1989) kabi olimlarning ishlari taqsinga loyiq hisoblanadi.

Adabiyotlar tahlili shuni ko‘ rsatadiki, tuproq mikromorfologiyasini SEM va EDS texnologiyalari asosida o‘ rganish tuproq hosil bo‘ lish jarayonlari, mikroagregatlar shakllanishi va elementlarning taqsimlanish qonuniyatlarini aniqlashda yuqori samaradorlikka ega. Shu bilan birga, O‘ zbekiston tuproqlarini mazkur zamonaviy usullar yordamida kompleks tadqiq qilish bo‘ yicha ilmiy tadqiqotlar yetarli emas. Bu esa ushbu yo‘ nalishda ayniqsa tog‘ va tog‘ oldi xududlarida shu kabi tadqiqotlar olib borish zarur hisoblanadi.

TADQIQOT OB’EKTI VA USULLARI.

Tuproqning mayda zarrachalari, g‘ ovaklari va agregatlarining mikroskopik darajadagi tuzilishini o‘ rganish muhim ahamiyatga ega. Tuproqlarning mikromorfologik tuzilishini o‘ rganish uchun tuproq namunalari olinadi va laboratoriyada preparatlar tayyorlanadi va Skanerlovchi elektron mikroskopiya (SEM) va energodispersion spektroskopiya (EDS) usullari asosida o‘ rganildi.

Chotqol davlat biosfera qo‘ riqxonasida tarqalgan tog‘ jigarrang tuproqlardan 2 xil bir biridan keskin farq qiluvchi shimoliy va janubiy ekspozitsiyalaridan tadqiqot uchun namunalari olindi va skanerlovchi elektron mikroskopiya (SEM) va energodispersion spektroskopiya (EDS) usullari taxlili o‘ tkazildi.

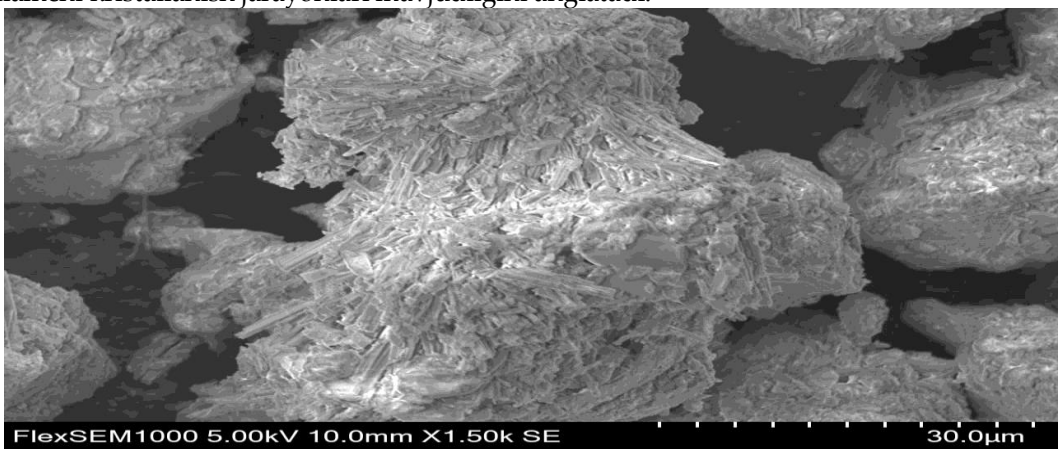
NATIJA VA MUXOKAMA.

Chotqol davlat biosfera qo‘ riqxonasinig shimoliy ekspozitsiyadan olingan tuproq namunalarida skanerlovchi elektron mikroskopiya (SEM) va energodispersion spektroskopiya (EDS) usullari yordamida morfologik va elementar tarkibi tahlil qilindi.

Olingan tasvirlar tuproq zarrachalarining yuqori darajada geterogen va agregatlangan strukturaga ega ekanligini ko‘ rsatdi. Zarrachalar turli morfologik tuzilishda — ignasimon, plastinkasimon va noaniq shaklli agregatlar ko‘ rinishida bo‘ lib, bu holat mineralogik tarkibning murakkabligini va tabiiy geologik jarayonlar ta’sirida shakllanganligini anglatadi.

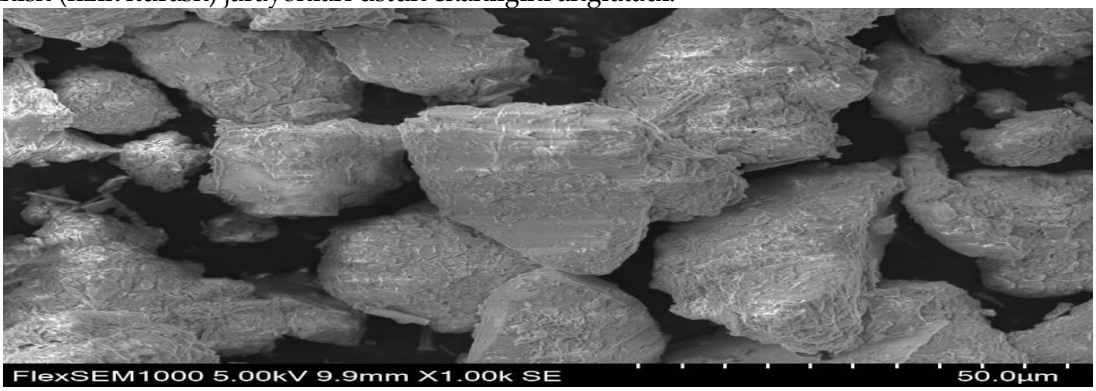
Mikromorfologik tahlil tuproqning ichki tuzilishi haqida muhim ma’lumotlar hisoblanib, tuproqning mikrostrukturasi agregatlar shakli, o‘ lchami va ularning joylashishi bilan tavsiflanadi. Agregatlarning shakllanishi gumus, loy minerallari va mikroorganizmlar faoliyati bilan bog‘ liq.

Chotqol tog‘ tizmasining shimoliy qismida olingan tuproq namunalarining SEM tahlillari ularning morfologik va geokimyoviy jihatdan murakkab, polimineral tizim ekanligini ko‘ rsatdi. SEM tasvirlarda zarrachalarning burchakli, agregatlangan va turli o‘ lchamli ekanligi aniqlanib, bu ularning asosan mexanik nurash jarayonlari ta’sirida shakllanganini tasdiqlaydi. Zarrachalar yuzasidagi yoriqlar va nohamvor tekstura tuproqning yuqori reaksion yuzaga ega ekanligini ko‘ rsatadi. Yuqori kattalashtirishda (×1.50k) kuzatilgan ignasimon va nursimon (radial) mikrostrukturalar minerallarning ikkilamchi kristallanish jarayonlari mavjudligini anglatadi.



1-rasm. Shimoliy ekspozitsiya tuproq namunasida ignasimon va radial mikrostrukturali mineral agregatlar (SEM tasvir, ×1.50k)

Chotqol tog‘ tizmasining shimoliy qismida olingan tuproq namunalarining SEM tasvirlari va EDS tahlillari ularning morfologik va geokimyoviy jihatdan ko‘ p komponentli, poligenetik tizim ekanligini ko‘ rsatdi. Turli kattalashtirishlarda olingan SEM tasvirlar zarrachalarning asosan burchakli–subburchakli, agregatlangan va nohamvor yuzali ekanligini namoyon qildi. Zarrachalar o‘ lchami keng diapazonda (taxminan 10–100 mkm) o‘ zgarib, bu tuproqda mexanik parchalanish (fizik nurash) jarayonlari ustun ekanligini anglatadi.

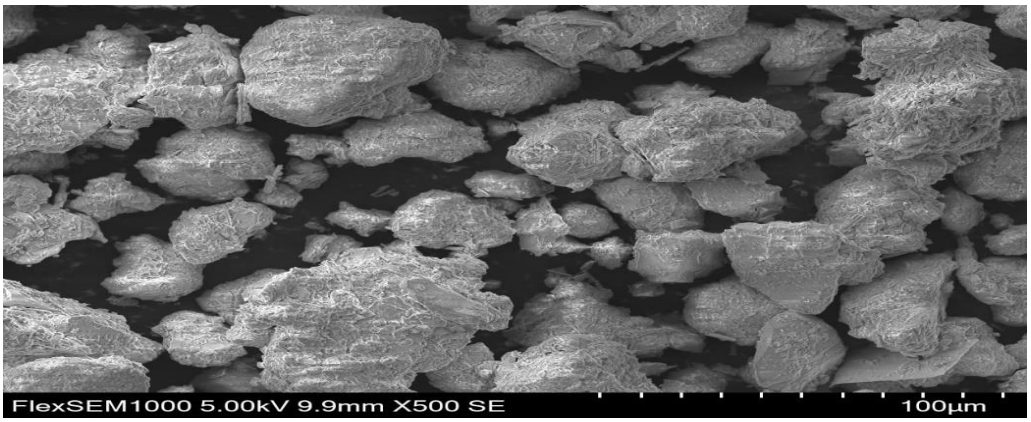


2-rasm.Shimoliy ekspozitsiya tuproq namunasida burchakli va agregatlangan zarrachalar morfologiyasi (SEM tasvir, ×1.00k)

SEM tasvirlarda zarrachalarning asosan burchakli–subburchakli, turli o‘ lchamli (10–100 mkm) va agregatlangan holatda ekanligi aniqlandi. Bu esa tuproq shakllanishida mexanik nurash jarayonlari ustunligini va materialning asosan mahalliy (avtoxton) manbaga ega ekanligini ko‘ rsatadi.

Yuqori kattalashtirishda kuzatilgan ignasimon va radial mikrostrukturalar tuproqda ikkilamchi minerallar asosan karbonat (kalsit) va ehtimolan sulfat (gips) birikmalarining shakllanganligini anglatadi. Bu holat tuproq eritmasidagi elementlarning migratsiyasi va qayta kristallanish jarayonlari mavjudligini tasdiqlaydi. Zarrachalar yuzasidagi nohamvorlik va mikroyoriqlar esa tuproqning yuqori sorbsion faolligi va reaksion yuzasi katta ekanligini ko‘ rsatadi.

Yuqori kattalashtirishda kuzatilgan ignasimon va radial mikrostrukturalar ikkilamchi minerallar (asosan kalsit va ehtimolan gips) shakllanganligini ko‘ rsatib, tuproqda qayta kristallanish va elementlar migratsiyasi jarayonlari mavjudligini anglatadi.

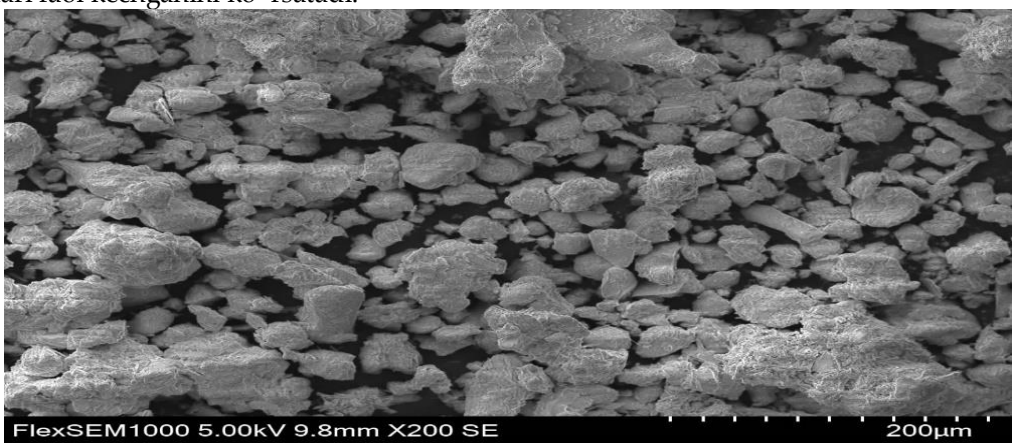


3-rasm. Shimoliy ekspozitsiya tuproq namunasida turli o‘ lchamli va geterogen agregatlar tuzilishi (SEM tasvir, ×500)

Chotqol tog‘ tizmasining shimoliy qismida olingan tuproq namunalarini SEM–EDS usullari orqali kompleks tahlil qilish natijalari ularning ko‘ p fraksiyali, polimineral va geterogen tuzilishga ega ekanligini ko‘ rsatdi. SEM tasvirlarda zarrachalarning keng o‘ lcham diapazonida (maydadan yirikkacha) tarqalgani, asosan burchakli–subburchakli shaklda va agregatlangan holatda ekanligi aniqlandi. Bu esa tuproq shakllanishida mexanik nurash jarayonlari ustunligini va materialning asosan mahalliy (avtoxton) manbaga ega ekanligini ko‘ rsatadi.

Yuqori va o‘ rta kattalashtirishlarda kuzatilgan: nohamvor va yoriqli yuzalar,

ignasimon va radial mikrostrukturalar, tuproqda ikkilamchi minerallar - asosan karbonat (kalsit) va ehtimolan sulfat (gips) birikmalarining shakllanganligini anglatadi. Bu esa tuproq eritmasida elementlar migratsiyasi va qayta kristallanish jarayonlari faol kechganini ko‘ rsatadi.



4-rasm. Shimoliy ekspozitsiya tuproq namunasida mayda fraksiyali va polidispers zarrachalar tuzilishi (SEM tasvir, ×200)

Shimoliy ekspozitsiya sharoitida namlikning nisbatan yuqori bo‘ lishi kimyoviy jarayonlarni (ayniqsa qayta kristallanish) ma’lum darajada faollashtirgan bo‘ lsada, mexanik nurash ustunligini saqlab qolgan. Natijada tuproqda: birlamchi silikat minerallar, ikkilamchi karbonat va sulfat minerallar birgalikda uchraydigan kompleks geokimyoviy tizim shakllangan. SEM tasvirlarda zarrachalarning burchakli–subburchakli, turli o‘ lchamli (maydadan yirikgacha) va agregatlangan holatda ekanligi aniqlanib, bu tuproq shakllanishida mexanik nurash jarayonlari ustunligini va

materialning avtoxton kelib chiqishga ega ekanligini tasdiqlaydi. Zarrachalar yuzasidagi nohamvorlik, mikroyoriqlar va ayrim ignasimon mikrostrukturalar ikkilamchi minerallar (asosan karbonat va ehtimolan sulfat birikmalar) shakllanganligini ko‘ rsatadi. Bu esa tuproqda qayta kristallanish va elementlar migratsiyasi jarayonlari mavjudligini anglatadi.

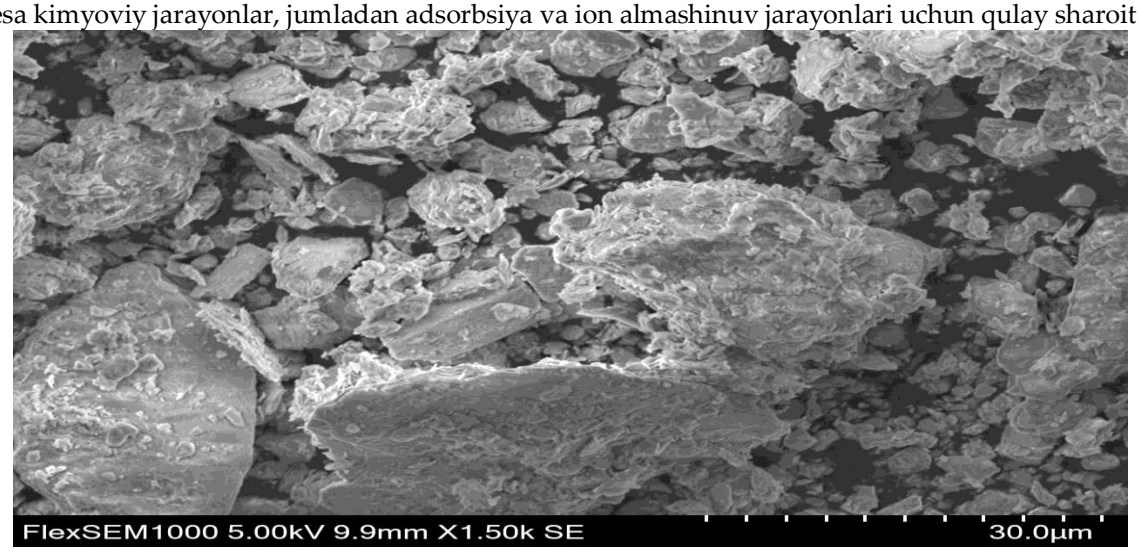
Berilgan qo‘ shimcha SEM tasvir Chotqol tog‘ tizmasining shimoliy qismidagi tuproq namunalarida kuzatilgan mikromorfologik xususiyatlarni yanada chuqurroq tasdiqlaydi. Tasvirda zich agregatlangan massa ichida keng tarqalgan ignasimon va tolasimon (fibrous) mikrostrukturalar aniq ko‘ rinadi. Bu strukturalar odatda ikkilamchi minerallar — ayniqsa karbonat (kalsit) va sulfat (gips) kristallariga xos bo‘ lib, ularning tuproq muhitida qayta kristallanish orqali shakllanganini ko‘ rsatadi

Mikrostrukturaning nursimon (radial) kristallar to‘ plami, plastinkasimon va qatlamli elementlar, hamda zich mineral matritsa bilan bog‘ langan agregatlar ko‘ rinishi tuproqda bir vaqtning o‘ zida bir necha mineralogik fazalar mavjudligini, ya’ni uning polimineral va geterogen tabiatini tasdiqlaydi. Bu holat quyidagi jarayonlarning mavjudligini ko‘ rsatadi: elementlar migratsiyasi (ayniqsa Ca, S va boshqalar), erigan moddalarning qayta cho‘ kishi (presipitatsiya), ikkilamchi minerallar kristallanishi. Shimoliy ekspozitsiya sharoitida namlikning nisbatan yuqoriligi va barqaror mikroiqlim ta’sirida ushbu kimyoviy jarayonlar faol kechadi. Shu bilan birga, avvalgi tasvirlarda kuzatilgan burchakli mineral zarrachalar mexanik nurash ustunligini ko‘ rsatgan bo‘ lsa, mazkur tasvir kimyoviy jarayonlar ham muhim rol o‘ ynayotganini aniq namoyon etadi.

Yuqoridagi natijalar asosida aytganimizda barcha SEM–EDS tahlillarini umumlashtirgan holda, Chotqol tog‘ tizmasining shimoliy qismi tuproqlari silikat–karbonat–sulfat tipga mansub, avtoxton kelib chiqishga ega, mexanik (fizik) va kimyoviy nurash jarayonlari birgalikda kechgan, ikkilamchi minerallar (kalsit, gips) faol shakllangan, yuqori sorbsion va buferlik xususiyatlarga ega.

Berilgan SEM tasvir shimoliy ekspozitsiyadan olingan tuproq namunasining morfologik xususiyatlarini aniq ifodalaydi va uning geterogen hamda agregatlangan tuzilishga ega ekanligini ko‘ rsatadi. Tasvirda zarrachalar turli o‘ lcham va shakllarda — burchakli, plastinkasimon va qisman ignasimon elementlar bilan namoyon bo‘ lib, ularning bir-biri bilan bog‘ langan holda agregatlar hosil qilgani kuzatiladi. Bu holat tuproqning asosan mexanik nurash jarayonlari ta’sirida shakllanganini, ya’ni ona jinslar parchalanishi ustun bo‘ lganini ko‘ rsatadi.

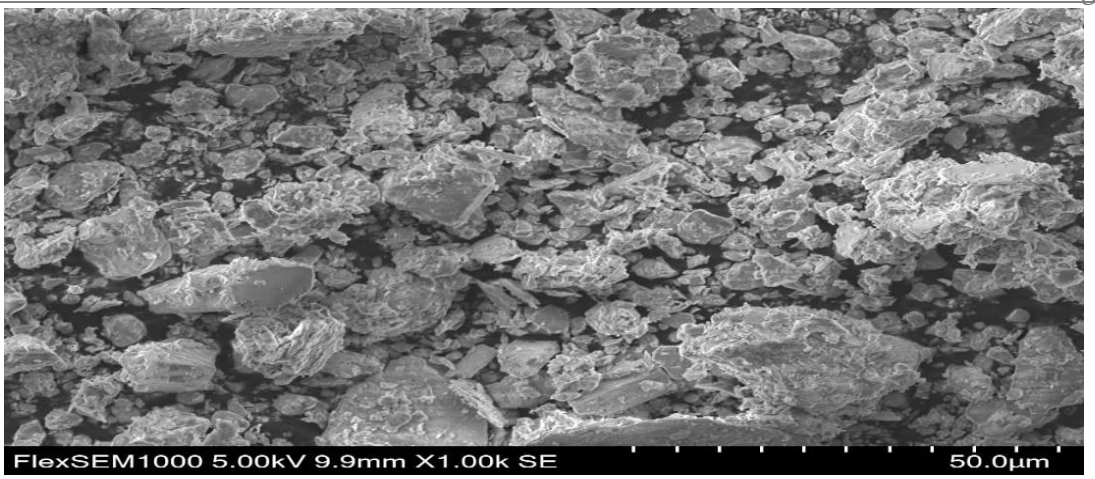
Yirik agregatlar orasida mayda dispers zarrachalarning mavjudligi tuproqning polidispers tizim ekanligini anglatadi. Zarrachalar yuzasining nohamvor va g‘ ovak tuzilishi ularning yuqori reaksion yuzaga ega ekanligini ko‘ rsatadi, bu esa kimyoviy jarayonlar, jumladan adsorbsiya va ion almashinuv jarayonlari uchun qulay sharoit yaratadi.



5-rasm. Janubiy ekspozitsiya tuproq namunasida ignasimon va radial mikrostrukturali mineral agregatlar (SEM tasvir, ×1.50k)

Ayrim joylarda kuzatiladigan plastinkasimon va qatlamli strukturalar alyumosilikat (gil) minerallar mavjudligini ko‘ rsatsa, mayda ignasimon yoki tolasimon elementlar ikkilamchi minerallar (masalan, karbonat yoki sulfat fazalar) shakllanish jarayonlari bilan bog‘ liq bo‘ lishi mumkin. Bu esa tuproqda faqat mexanik nurash emas, balki kimyoviy qayta kristallanish jarayonlari ham kechganini anglatadi.

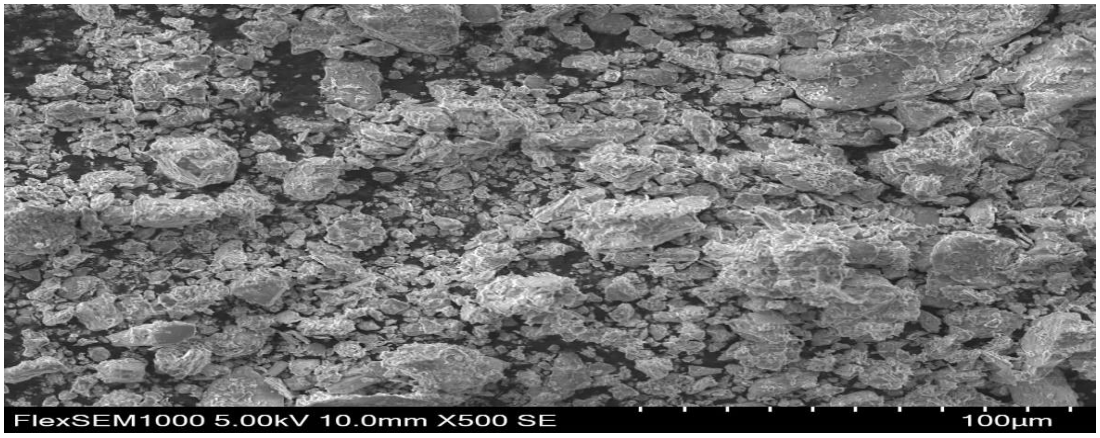
Keyingi tasvirda zarrachalar orasida turli o‘ lchamdagi fraksiyalarning mavjudligi tuproqning polidispers tizim ekanligini anglatadi. Yirik agregatlar bilan birga mayda dispers zarrachalarning ko‘ pligi tuproqning zich joylashmagan, balki g‘ ovak va ko‘ p fazali tuzilishga ega ekanligini ko‘ rsatadi. Bu esa namlikni ushlab turish, adsorbsiya va ion almashinuv jarayonlari uchun qulay sharoit yaratadi.



6-rasm. Janubiy ekspozitsiya tuproq namunasida ignasimon va radial mikrostrukturali mineral agregatlar (SEM tasvir, ×1.00k)

Ayrim zarrachalarda kuzatiladigan plastinkasimon va qatlamli strukturalar alyumosilikat (gil) minerallar mavjudligini ko‘ rsatadi. Shu bilan birga, ayrim nohamvor va notekis yuzalar kimyoviy nurash va qayta kristallanish jarayonlari natijasida hosil bo‘ lgan bo‘ lishi mumkin. Bu holat tuproqda bir vaqtning o‘ zida mexanik va kimyoviy jarayonlar kechganini tasdiqlaydi.

Keyingi SEM tasvir (×500) janubiy ekspozitsiyadan olingan tuproq namunasining umumiy mikrostrukturasini ko‘ rsatib, uning yuqori darajada geterogen va agregatlangan tuzilishga ega ekanligini tasdiqlaydi. Tasvirda zarrachalar turli o‘ lchamda — yirik agregatlardan tortib mayda dispers fraksiyalargacha — aralash holda joylashgan bo‘ lib, bu tuproqning polidispers tizim ekanligini ko‘ rsatadi. Zarrachalar shakli asosan burchakli va noaniq bo‘ lib, ularning yuzasi ko‘ p hollarda parchalangan holda namoyon bo‘ ladi. Bu holat mexanik nurash jarayonlari ustunligini, ya’ni ona jinslar fizik parchalanishi asosiy rol o‘ ynaganini ko‘ rsatadi. Shu bilan birga, ayrim agregatlar yuzasida kuzatiladigan mayda kristallik va qatlamli tuzilishlar kimyoviy jarayonlar, jumladan, qayta kristallanish va ikkilamchi minerallar hosil bo‘ lishining ham mavjudligini anglatadi.



7-rasm. Janubiy ekspozitsiya tuproq namunasida ignasimon va radial mikrostrukturali mineral agregatlar (SEM tasvir, ×500SE)

Yirik agregatlar orasidagi bo‘ shliqlar va mayda zarrachalarning to‘ planishi tuproqning g‘ ovak tuzilishga ega ekanligini ko‘ rsatadi. Bu xususiyat namlik saqlanishi, elementlar migratsiyasi va adsorbsion jarayonlar uchun muhim ahamiyatga ega. Shu bilan birga, bunday struktura tuproqda gaz almashinuvi va biogeokimyoviy jarayonlarning faol kechishiga sharoit yaratadi.

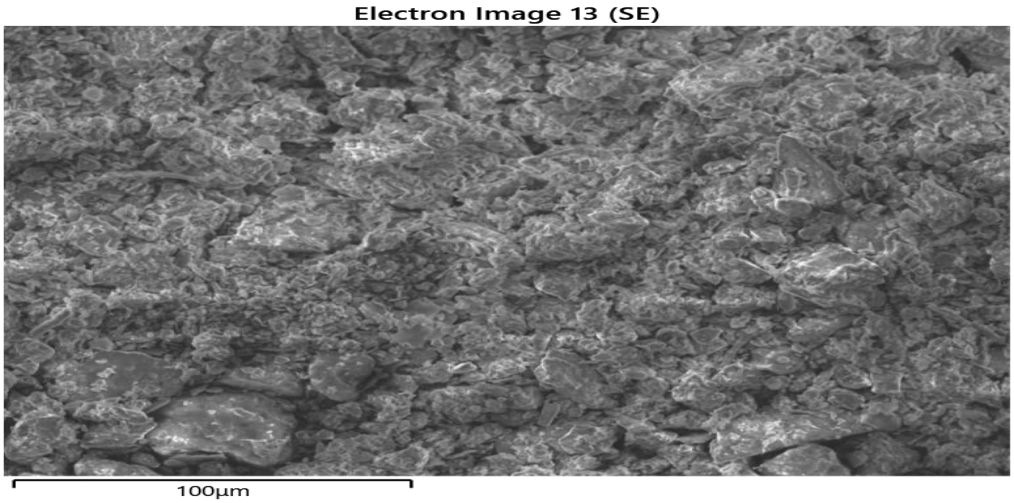
Keyingi SEM tasvir (×200) janubiy ekspozitsiyadan olingan tuproq namunasining umumiy mikrostrukturasini pastroq kattalashtirishda aks ettirib, uning makro- va mikroagregatlardan tashkil topgan geterogen tizim ekanligini ko‘ rsatadi. Tasvirda zarrachalar turli o‘ lchamda bo‘ lib, yirik agregatlar orasida juda ko‘ p miqdorda mayda dispers fraksiyalar joylashgani kuzatiladi, bu esa tuproqning polidispers tuzilishini tasdiqlaydi. Zarrachalar shakli asosan burchakli va noaniq bo‘ lib, ularning yuzasida parchalanish izlari va nohamvor tekstura yaqqol ko‘ rinadi. Bu holat mexanik nurash jarayonlari ustunligini, ya’ni ona jinslarning fizik parchalanishi asosiy rol o‘ ynaganini ko‘ rsatadi. Shu bilan birga, ayrim agregatlar yuzasida kuzatiladigan mayda kristallik va qatlamli strukturalar kimyoviy jarayonlar, xususan ikkilamchi minerallar hosil bo‘ lishi va qayta kristallanish jarayonlari ham kechganini anglatadi.



8-rasm. Janubiy ekspozitsiya tuproq namunasida ignasimon va radial mikrostrukturali mineral agregatlar (SEM tasvir, ×200 SE)

Tasvirda agregatlar orasidagi bo‘ shliqlar va g‘ ovak zonalarning mavjudligi tuproqning poroz tuzilishga ega ekanligini ko‘ rsatadi. Bu xususiyat namlikni saqlash, elementlar migratsiyasi va adsorbsiya jarayonlari uchun muhim ahamiyatga ega. Shuningdek, bunday struktura tuproqda gaz almashinuvi va biogeokimyoviy jarayonlarning faol kechishiga sharoit yaratadi.

Navbatdagi berilgan SEM tasvir janubiy ekspozitsiyadan olingan tuproq namunasining mikromorfologik tuzilishini ifodalab, uning yuqori darajada geterogen va agregatlangan strukturaga ega ekanligini ko‘ rsatadi. Tasvirda zarrachalar turli o‘ lcham va shakllarda — burchakli, mayda dispers va qisman plastinkasimon elementlar ko‘ rinishida namoyon bo‘ lib, ularning bir-biri bilan zich bog‘ langan holda agregatlar hosil qilgani kuzatiladi. Zarrachalarning nohamvor va parchalangan yuzasi mexanik nurash jarayonlari ustunligini ko‘ rsatadi, ya’ni ona jinslar asosan fizik ta’sirlar natijasida parchalangan. Shu bilan birga, ayrim agregatlar yuzasida



9-rasm. Janubiy ekspozitsiya tuproq namunasida mayda fraksiyali va polidispers zarrachalar tuzilishi (SEM tasvir, ×200)

kuzatiladigan mayda kristallik va qatlamli strukturalar kimyoviy jarayonlar, jumladan ikkilamchi minerallar shakllanishi va qayta kristallanish jarayonlari ham kechganini anglatadi. Tasvirda mayda zarrachalarning yirik agregatlar orasida to‘ planishi tuproqning polidispers tizim ekanligini tasdiqlaydi. Bunday tuzilish yuqori g‘ ovaklikni ta’minlab, namlikni ushlab turish, elementlar migratsiyasi va adsorbsiya jarayonlari uchun qulay sharoit yaratadi. Shuningdek, bu holat tuproqda gaz almashinuvi va biogeokimyoviy jarayonlarning faol kechishiga xizmat qiladi.

XULOSA VA TAVSIYALAR.

Tadqiqot natijalari SEM tahlili shuni ko‘ rsatadiki, shimoliy va janubiy ekspozitsiyadan olingan tuproq namunalari ularning mikromorfologik xususiyatlarida o‘ xshash va farqli jihatlar mavjudligini ko‘ rsatdi. Har ikki ekspozitsiya tuproqlarida ignasimon va radial morfologiyali mineral agregatlar, polidispers zarrachalar hamda mikroagregatli struktura shakllanganligi aniqlandi. Biroq shimoliy ekspozitsiya tuproqlarida agregatlarning nisbatan yaxshi rivojlanganligi, g‘ ovaklik tizimining aniq ifodalanishi va zarrachalarning bir tekis joylashganligi kuzatilgan bo‘ lsa, janubiy ekspozitsiya tuproqlarida mayda dispersli zarrachalar va kam agregatlangan mikrotuzilmalar ustunlik qildi. Bu holat ekspozitsiyalarning harorat, namlik rejimi, tuproq tarkibidagi organik moddalar bilan bog‘ liq bo‘ lib,

tuproq hosil bo‘ lish jarayonlarining turlicha kechganligini ko‘ rsatadi. SEM usuli tuproqlarning mikromorfologik holatini baholashda yuqori samarali tadqiqot usuli ekanligini ko‘ rsatdi.

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QAND LAVLAGINI TUPROQDAN FOSFORLI OZIQA MODDALARNI O‘ ZLASHTIRISHIGA AZOTLI O‘ G‘ IT SHAKL VA ME’YORLARINING TA’SIRI

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Annotatsiya: *Ushbu maqolada takroriy ekilgan qand lavlagining tuproqdan fosforli oziqa moddalarni o‘ zlashtirishiga azotli o‘ g‘ it shakli va me’yorlarining ta’siri o‘ rganildi. Ma’lumki, qand lavlagi o‘ simligi oziqa moddalarga o‘ ta talabchan ekin hisoblanadi. Lekin fosforli oziqa moddalarini boshqa oziqa elementlariga qaraganda kamroq o‘ zlashtiradi. O‘ simlikning boshlang‘ ich fazasida o‘ zlashtirgan umumiy fosforning miqdori ildizmevaga qaraganda bargida ko‘ pligi aniqlandi. Buni sababini boshlang‘ ich davrda ildizmevani hali to‘ la shakllanmaganligi bilan izohlash mumkin. Ammo rivojlanishning keyingi davrlarida ildizmevani jadal o‘ sishi boshlanganligi sababli o‘ zlashtirilgan fosfor miqdori uning bargdagi miqdordan ortiq bo‘ lganligini, shuningdek fosforni o‘ zlashtirish oldingi oydagidan 6-6,5 barobarga ortganligini ta’kidlash lozim. Bundan tashqari, fosforni o‘ zlashtirilishiga o‘ simlimlikka qo‘ llanilgan azotli o‘ g‘ itlarni turli shakllari (masalan, natriy nitrat, ammoniy nitrat, ammoniy sulfat, karbamid) va me’yorlari ham o‘ z ta’siri ko‘ rsatadi. Tajribalar natijalari shuni ko‘ rsatdiki, azotli o‘ g‘ it shakllaridan ammoniy nitrat va karbamid shaklining* N_{200} $P_{150}K_{200}$ *me’yorda qo‘ llanilishi o‘ simlik tuproqdagi fosfor ko‘ proq o‘ zlashtirishiga olib keldi.*

Kalit so‘ zlar: *qand lavlagi, mineral o‘ g‘ it, azotli o‘ g‘ it, fosforli o‘ g‘ it, harakatchan fosfor, o‘ g‘ it shakllari, natriy nitrat, ammoniy nitrat, ammoniy sulfat, karbamid, oziqa moddalar, o‘ g‘ it me’yori, tuproq, o‘ simlik, o‘ sish-rivojlanish, hosildorlik.*

ВЛИЯНИЕ ФОРМЫ И НОРМЫ ВНЕСЕНИЯ АЗОТНЫХ УДОБРЕНИЙ НА ПОГЛОЩЕНИЕ ФОСФОРНЫХ ПИТАТЕЛЬНЫХ ВЕЩЕСТВ ИЗ ПОЧВЫ САХАРНОЙ СВЕКЛОЙ.

Аннотация: *В данной статье изучается влияние форм и норм азотных удобрений на усвоение фосфорных элементов питания из почвы повторно высаженной сахарной свеклой. Известно, что сахарная свекла является очень требовательной культурой к элементам питания. Однако фосфорные элементы питания она усваивает хуже других элементов питания. Было установлено, что общее количество фосфора, усвоенного в начальной фазе развития растения, было больше в листьях, чем в корнеплоде. Это можно объяснить тем, что корнеплод в начальный период еще не был полностью сформирован. Однако следует отметить, что на более поздних стадиях развития, в связи с быстрым ростом корнеплода, количество усвоенного фосфора превышало количество в листьях, и усвоение фосфора увеличивалось в 6-6,5 раз по сравнению с предыдущим месяцем. Кроме того, на усвоение фосфора влияют также различные формы и нормы внесения азотных удобрений (например, натриевая селитра, аммиачная селитра, сульфат аммония, мочевина). Результаты опытов показали, что внесение аммиачной селитры и мочевины в дозе* $N_{200}P_{150}K_{200}$ *способствовало большему усвоению растениями фосфора из почвы.*

Ключевые слова: *сахарная свекла, минеральное удобрение, азотное удобрение, фосфорное удобрение, подвижный фосфор, формы удобрений, натриевая селитра, аммиачная селитра, сульфат аммония, мочевина, питательные вещества, норма удобрения, почва, растение, рост и развитие, урожайность.*

THE EFFECT OF NITROGEN FERTILIZER FORMS AND RATES ON PHOSPHORUS NUTRIENT UPTAKE FROM THE SOIL BY SUGAR BEET

Abctract: *This article examines the effects of nitrogen fertilizer forms and rates on the uptake of phosphorus nutrients from the soil by replanted sugar beets. Sugar beets are known to be very demanding crops when it comes to nutrients. However, it absorbs phosphorus nutrients less effectively than other nutrients. It was found that the total amount of phosphorus absorbed during the initial phase of plant development was greater in the leaves than in the roots. This can be explained by the fact that the roots were not*

yet fully formed during this initial period. However, it should be noted that at later stages of development, due to the rapid growth of the root crop, the amount of absorbed phosphorus exceeded the amount in the leaves, and phosphorus absorption increased by 6-6.5 times compared to the previous month. Furthermore, phosphorus absorption is also affected by different forms and rates of nitrogen fertilizer application (e.g., sodium nitrate, ammonium nitrate, ammonium sulfate, urea). Experimental results showed that the application of ammonium nitrate and urea at a dose of $N_{200}P_{150}K_{200}$ promoted greater phosphorus uptake from the soil by plants.

Key words: *sugar beet, mineral fertilizer, nitrogen fertilizer, fertilizer forms, phosphorus fertilizer, mobile phosphorus, sodium nitrate, ammonium nitrate, ammonium sulfate, urea, nutrients, fertilizer rate, soil, plant, growth and development, productivity.*

Kirish. Qishloq xo‘ jalik ekinlari tuproqdan oziqa moddalarini o‘ zlashtirishi uning o‘ sish-rivojlanishidan tashqari olib borilgan agrotexnik omillarga ham bog‘ liq bo‘ ladi. Ayniqsa, ular uchun berilgan o‘ g‘ itlar me’yori bilan o‘ g‘ itlar shakli ham oziqa elementlari o‘ zlashtirilishiga ta’sir ko‘ rsatadi. Ekinlar orasida oziqa elementlariga o‘ ta talabchan bo‘ lgan ekinlar qatoriga qand lavlagi ham kiradi. Uning ildizi kuchli o‘ sadi, natijada tuproqqa 2-3 metr chuqurlikkacha va yon tomonga 1-1,2 metrga ba’zan 1,5 metrgacha tarqaladi, natijada ular shu joylardagi oziqa moddalaridan foydalanish imkonini beradi.

Material va uslublar. Qand lavlagi fosforli oziqa moddalarini boshqa oziqa elementlariga qaraganda kam o‘ zlashtiradi. Tajriba uch yil davomida (2017–2019 yy) dala sharoitida olib borildi. Tajriba 11 variant, 4 qaytariqdan iborat bo‘ lib, dalada bir yarus qilib joylashtirilgan va O‘ zbekiston reestriga qiritilgan qand lavlagining «Drena» navi ekilgan. Tajriba tizimi bo‘ yicha birinchi variantda umuman mineral o‘ g‘ it berilmagan ($N_0P_0K_0$ kg/ga - bu nazorat varianti), ikkinchi va uchinchi variantlarda faqat azotli o‘ g‘ itlar berilmagan bo‘ lib, fosforli va kaliyli o‘ g‘ itlar ikki xil me’yorda qo‘ llanilgan ($N_0P_{100}K_{150}$ va $N_0P_{150}K_{200}$ - bu azotga nazorat varianti), qolgan 4, 6, 8, 10-variantlarda barcha mineral o‘ g‘ itlar $N_{150}P_{100}K_{150}$ kg/ga miqdorida, 5, 7, 9, 11-variantlarda esa ularning me’yori $N_{200}P_{150}K_{200}$ kg/ga qilib belgilangan. Lekin barcha variantlarda azotli o‘ g‘ itni turli shakllari qo‘ llanilgan. Jumladan, 4-5 varianrtda natriy nitrat ($NaNO_3$), 6-7 varianrtda ammoniy nitrat (NH_4NO_3), 8-9 varianrtda ammoniy sulfat ($(NH_4)_2SO_4$) va 10-11 varianrtda esa karbamid ($CO(NH_2)_2$) qo‘ llanilgan.

Professor S.K.Kondrashov [1. 144-b.] ma’lumot berishicha qand lavlagi uchun rejalashtirilgan mineral o‘ g‘ itlarni uch muddatda berish maqsadga muvofiqdir: kuzgi haydov ostiga fosforli (70%) va kaliyli (100%) o‘ g‘ itlarni solish, ekishdan oldin yoki ekish bilan birga (azotlilarni 20%, fosforni qolgan 30% ammafos shaklida) va o‘ simlik vegetatsiyasi davrida azotli o‘ g‘ itlar bilan oziqlantirish o‘ tkazish yaxshi samara beradi.

A.I.Oleksiyuk [2; 52-53-b.] ning ma’lumotlariga ko‘ ra, qand lavlagi vegetatsiyasining dastlabki davrida oziqa moddalaridan azotli va fosforlilarga o‘ ta talabchan bo‘ ladi. Bu oziqa moddalar o‘ simlik tanasining shakllanishiga xizmat qilishi, kaliyli oziqalar esa o‘ simlik vegetatsiyasining barcha davrlarda zarur bo‘ lishi ta’kidlangan.

I.V.Ilyushenkoning [3; 32-36-b.] ma’lumotiga ko‘ ra, tuproqda azot va fosfor miqdorini yuqori bo‘ lishi o‘ simlikning o‘ sish-rivojlanishiga kuchli ta’sir ko‘ rsatadi. Qand lavlagini yuqori ta’minlangan tuproqlarda o‘ stirish ildizmeva hosilini kam ta’minlangan tuproqlarga qaraganda ikki barobarga ortishini ta’minlaydi. Shuningdek, u yana o‘ z tadqiqotlariga asoslangan holda fosforli o‘ g‘ itlarning samaradorligi tuproqdagi mavjud harakatchan fosfor miqdoriga bog‘ liqligini aytib o‘ tadi.

Bizning dala tajribalarimizda o‘ simlikda olib borilgan fenologik kuzatishlar «Dala tajribalarini o‘ tkazish uslublari» (Методика полевого опыта) [4] uslubiyatlari bo‘ yicha o‘ tkazilgan.

Tuproq va o‘ simlik na’munalarini olish va ularning kimyoviy tahlili «O‘ rta Osiyo tuproqlari va o‘ simliklarini agrokimyoviy tahlil qilish usullari» (Методы агрохимических анализов почв и растений Средней Азии. Издание) uslubi asosida bajarilgan [5] .

Olingan natijalarning matematik tahlili B.A.Dospexov [6] (M., 1985), hisob-kitob metodi (Доспехов Б.А. Методика полевого опыта. - М. Изд-во «Агропромиздат») asosida asosida o‘ tkazildi.

Natijalar va munozara: Qand lavlagi ildizi orqali tuproqdan fosforni boshqa oziqa moddalariga qaraganda kamroq o‘ zlashrishi ma’lum bo‘ ldi. Bizning tajriba yillarida olgan ma’lumotlarimizga ko‘ ra (1-jadval) o‘ simlikning boshlang‘ ich fazasida bargda ildizmevaga qaraganda umumiy fosfor miqdori ko‘ pligi aniqlandi. Bu vaqtga kelib o‘ simlikdagi fosfor miqdori variantlar bo‘ yicha 2,6-3,2 kg/ga oralig‘ ida bo‘ lib, bargda 1,4-1,8 kg/ga ni, ildizmevada undan biroz kam 1,2-1,4 kg/ga ni tashkil etganligi aniqlandi. Bunda mineral o‘ g‘ itlar umuman berilmagan variantlarda eng kam bo‘ lgani holda, fosforli o‘ g‘ itlarni 100 kg/ga (N0K150 o‘ g‘ it fonida) berilganida 2,8 kg/ga, 150 kg/ga fosfor berilgan (N0K200 o‘ g‘ it fonida) 3-variantda esa 3,0 kg/ga, $N_{200}K_{200}$ o‘ g‘ itlar bilan 100 kg/ga fosforli o‘ g‘ itlar berilgan 4, 6, 8 va 10-variantlarda mos ravishda 2,9; 3,1; 2,9 hamda 3,0 kg/ga ga to‘ g‘ ri kelgan.

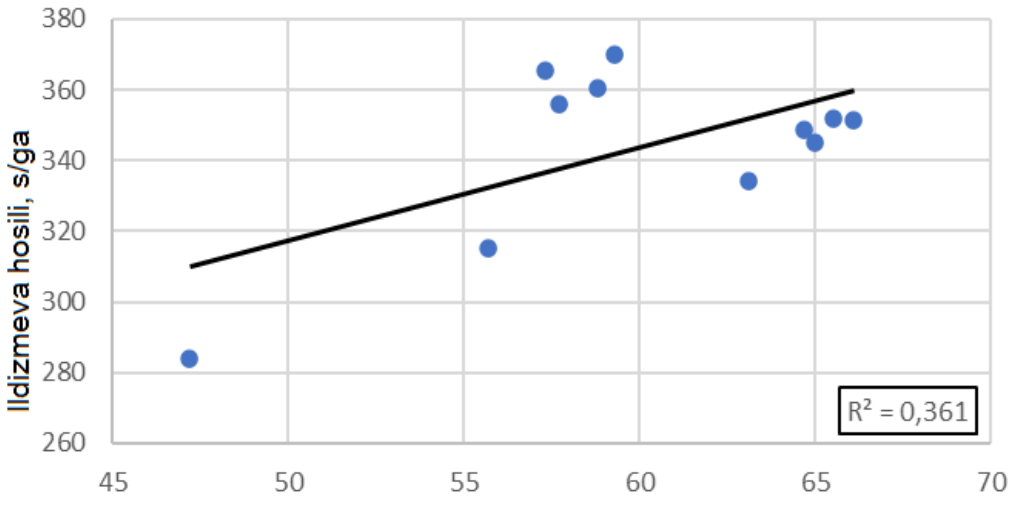
1-jadval

Azotli o‘ g‘ itlar shakl va me’yorlarini qand lavlagi tuproqdan fosforli oziqa moddalarini o‘ zlashtirishiga ta’siri, kg/ga hisobida, 2017-2019 yillar

Var.	Avgust			Sentyabr			Oktyabr		
	Barg	Ildiz meva	Jami	Barg	Ildiz meva	Jami	Barg	Ildiz meva	Jami
1	1,4	1,2	2,6	6,4	8,5	14,9	20,4	26,8	47,2
2	1,5	1,3	2,8	7,0	9,7	16,7	25,6	30,1	55,7
3	1,6	1,4	3,0	7,4	10,4	17,8	29,7	33,4	63,1
4	1,6	1,3	2,9	7,2	9,9	17,1	26,4	31,3	57,7
5	1,7	1,4	3,1	7,5	10,8	18,3	30,4	34,6	65,0
6	1,7	1,4	3,1	7,3	10,1	17,4	27,3	32,0	59,3
7	1,8	1,4	3,2	7,5	11,0	18,5	30,9	35,2	66,1
8	1,6	1,3	2,9	7,2	9,8	17,0	26,1	31,2	57,3
9	1,7	1,4	3,1	7,3	10,6	17,9	30,2	34,5	64,7
10	1,7	1,3	3,0	7,2	10,0	17,2	26,9	31,9	58,8
11	1,8	1,4	3,2	7,4	10,9	18,3	30,5	35,0	65,5

Mineral o‘ g‘ itlar me’yorini $N_{200}P_{150}K_{200}$ kg/gacha oshirish bilan fosforni 150 kg/ga qilib belgilangan variantlarda (5, 7, 9 va 11-var.) o‘ simlik o‘ zlashtirgan fosfor miqdori ham ortganligini ko‘ rishimiz mumkin va u mos holda 3,1; 3,2; 3,1 hamda 3,2 kg/ga ni tashkil etgan. Shuni ham ta’kidlash lozimki, o‘ simliklar fosforni o‘ zlashtirishiga mineral o‘ g‘ itlar me’yorlaridan tashqari qo‘ llanilgan azotli o‘ g‘ itlar shakllari ham ta’sir ko‘ rsatgan. Bunda ammoniy nitrat qo‘ llanilganda eng yaxshi samara bergan.

Kuzatishlarning keyingi sentyabrdagi olingan ma’lumotlarga ko‘ ra, ildizmevani jadal o‘ sishi boshlanganligi sababli o‘ zlashtirilgan fosfor miqdori uning bargdagi miqdordan ortiq bo‘ lganligini, shuningdek fosforni o‘ zlashtirish oldingi oydagidan 6-6,5 barobarga ortganligini ta’kidlash lozim. O‘ simlikning ildizmevani jadal o‘ sishi fazasida ham oldingi oydagi qonuniyat saqlanib qolgan bo‘ lsada, variantlar orasidagi farq yanada yaqqol ko‘ rindi. Olingan bu ma’lumotlarga asoslanib shuni aytish mumkinki, qand lavlagi o‘ simligi tarkibidagi fosfor miqdori birinchi navbatda azotli o‘ g‘ itlar shakllariga hamda mineral o‘ g‘ itlar me’yorlariga bog‘ liqdir. Ayniqsa, azotli o‘ g‘ itning ammoniy nitrat shaklidagisi $N_{200}P_{150}K_{200}$ kg/ga me’yorda berilganida 66,1 kg/ga, azotni karbomid shaklidagisi shu me’yorda berilganida esa 65,5 kg/ga o‘ zlashtirishga erishgan. Shuningdek, qand lavlagi ildizmevasi hosili va biologik fosforni o‘ simlik tomonidan o‘ zlashtirishi orasida ham korrellyasion bog‘ liqlik (r=0,60) borligi aniqlandi (1 rasmga qarang).



1-rasm. Ildizmevaning biologik hosili va tuproqdan fosforli (P) oziqa elementlarini o‘ zlashtirilishi orasidagi korrelyasion bog‘ lanish. Tuproqdan forforli (P) oziqa elementining o‘ zlashtirilishi, kg/ga

Xulosa. Tajriba natijalari shuni ko‘ rsatdiki, takroriy ekilgan qand lavlagining tuproqdan fosforli oziqa moddalarini o‘ zlashtirishi uning o‘ sish-rivojlanishiga bog‘ liq holda o‘ zgarib bordi. Rivojlanishning dastlabki fazasida fosforning miqdori ildizmevaga qaraganda bargida ko‘ p to‘ plandi, keyinchalik ildizmevani jadal rivojlanishi sababli undagi fosforning miqdori bargidagi miqdoridan ma’lum darajada ortib bordi. Shu bilan birga azotli mineral o‘ g‘ itlarning qo‘ llanilishi o‘ simlikning o‘ sish-rivojlanishi yanada jadallashtirdi. Bu esa o‘ simlikni tuproqdagi fosforli oziqa moddalarni ko‘ proq o‘ zlashtirishiga olib keldi. Azotli oziqa moddalarni eng ko‘ p o‘ zlashtirilishi mineral o‘ g‘ itlardan ammoniy nitrat qo‘ llanilgan 6-7 variantlarda hamda va karbamid qo‘ llanilgan 10-11 variantlarda kuzatildi.

Mineral o‘ g‘ itlarni $N_{150}P_{100}K_{150}$ kg/ga me’yorda va azotli o‘ g‘ itlardan ammoniy nitrat ishlatilgan 6-variantda o‘ simlikdagi jami o‘ zlashtirilgan fosfor miqdori avgustda 3,1 kg/ga ni, sentyabrda 17,4 kg/ga ni, oktyabrda esa 59,3 kg/ga ni tashkil etgan bo‘ lsa, shu o‘ g‘ itlarni $N_{200}P_{150}K_{200}$ kg/ga me’yorda qo‘ llanilgan 7-variantdagi miqdori mos ravishda 3,2; 18,5 va 66,1 kg/ga ni tashkil etdi. Shuningdek, mineral o‘ g‘ itlarni $N_{150}P_{100}K_{150}$ va azotli o‘ g‘ itlardan karbamid ishlatilgan 10-11 variantlarda o‘ simlikdagi jami o‘ zlashtirilgan fosfor miqdori oylar bo‘ yicha mos ravishda 3,0; 17,2 va 58,8 kg/ga ni (10-variantda) hamda va $N_{200}P_{150}K_{200}$ kg/ga me’yorda qo‘ llanilganda esa 3,2; 18,3 va 65,5 kg/ga ni (11-variantda) tashkil etdi. Bundan ko‘ rinib turibdiki, qand lavlagining tuproqdan fosforli oziqa moddalarni ko‘ proq o‘ zlashtirishida azotli o‘ g‘ itlarning ammoniy nitrat va karbamid shakllarining qo‘ llanilishi yuqori samaradorlikni ta’minlaydi.

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DEGRADATSIYALANGAN TUPROQLAR SHAROITIDA NOAN'ANAVIY O' SIMLIKLARNING EKOLOGIK AHAMIYATI

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Annotatsiya: *Ushbu tadqiqot degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilishda noan'anaviy o' simliklardan foydalanishning ahamiyatini baholashga qaratilgan. Tadqiqot obyekti sifatida yuqori biomassa hosil qiluvchi, ko' p yillik va ekologik moslashuvchan* Silphium perfoliatum L. *o' simligi tanlandi. Dala tajribalari 2023-2025 yillarda Samarqand va Andijon viloyatlarining agroekologik sharoitlarida olib borildi. Tadqiqotda ekish muddati, ekish chuqurligi hamda qator oralig' ining o' simliklarning unishi, vegetativ rivojlanishi, generativ ko' rsatkichlari va biomassa hosildorligiga ta'siri o' rganildi. Natijalarga ko' ra, kuzgi ekish muddatlari urug' larning unib chiqishi va dastlabki rivojlanishi uchun qulay sharoit yaratib, 75,1% gacha dala unuvchanligini ta'minladi. 1,5-2,0 sm ekish chuqurligi hamda 90 × 90 sm qator oralig' ida o' simliklarning vegetativ va generativ rivojlanishi yuqori bo' ldi. Mazkur variantda urug' hosildorligi 9,7 s/ga, yashil biomassa 1237,8 s/ga gacha yetdi. Olingan natijalar* S. perfoliatum L. *ning degradatsiyalangan tuproqlarda ekologik barqaror agrotsenozlarni shakllantirish, biologik resurslardan samarali foydalanish va fitomeliorativ tadbirlarni rivojlantirish uchun istiqbolli o' simlik ekanligini ko' rsatadi.*

Kalit so' zlar: *degradatsiyalangan tuproqlar, ekologik reabilitatsiya, noan'anaviy o' simliklar,* Silphium perfoliatum L.*, fitomelioratsiya, agroekologik moslashuv, biomassa, tuproq unumdorligi.*

ЭКОЛОГИЧЕСКОЕ ЗНАЧЕНИЕ НЕТРАДИЦИОННЫХ РАСТЕНИЙ В УСЛОВИЯХ ДЕГРАДИРОВАННЫХ ПОЧВ

Аннотация: *Целью настоящего исследования является оценка экологического значения нетрадиционных растений в реабилитации деградированных почв. В качестве объекта исследования выбрано многолетнее, высокобиомассное и экологически адаптивное растение* Silphium perfoliatum L. *Полевые эксперименты проводились в 2023-2025 годах в агроэкологических условиях Самаркандской и Андижанской областей. Изучалось влияние сроков посева, глубины заделки семян и ширины междурядий на полевую всхожесть, вегетативное развитие, генеративные показатели и продуктивность биомассы растений. Установлено, что осенние сроки посева создавали благоприятные условия для прорастания семян и начального развития растений, обеспечивая полевую всхожесть до 75,1%. Оптимальная глубина посева 1,5-2,0 см и схема размещения 90 × 90 см способствовали лучшему формированию вегетативных и генеративных органов. При данной схеме урожайность семян достигала 9,7 ц/га, а продуктивность зелёной биомассы -1237,8 ц/га. Полученные результаты свидетельствуют о перспективности* S. perfoliatum L. *для формирования экологически устойчивых агроценозов на деградированных почвах, эффективного использования биологических ресурсов и развития фитореабилитационных мероприятий.*

Ключевые слова: *деградированные почвы, экологическая реабилитация, нетрадиционные растения,* Silphium perfoliatum L.*, фитомелиорация, агроэкологическая адаптация, биомасса, плодородие почвы.*

ECOLOGICAL SIGNIFICANCE OF NON-TRADITIONAL PLANTS UNDER DEGRADED SOIL CONDITIONS

Annotation: *This study aimed to evaluate the ecological significance of non-traditional plants in the rehabilitation of degraded soils. The perennial, high-biomass-producing and ecologically adaptable species* Silphium perfoliatum L. *was selected as the study object. Field experiments were conducted during 2023-2025 under the agroecological conditions of the Samarkand and Andijan*

regions of Uzbekistan. The effects of sowing time, sowing depth, and row spacing on field germination, vegetative development, generative traits, and biomass productivity were investigated. The results showed that autumn sowing created favorable conditions for seed germination and early plant development, providing field germination rates of up to 75.1%. A sowing depth of 1,5-2,0 cm and a row spacing of 90 × 90 cm promoted better vegetative and generative development of the plants. Under this spacing, seed yield reached 9,7 q ha⁻¹, while green biomass productivity reached 1237,8 q ha⁻¹. The obtained results demonstrate that S. perfoliatum L. *has considerable potential for establishing ecologically sustainable agroecosystems on degraded soils, improving the efficient use of biological resources, and developing phytoremediation practices.*

Key words: *degraded soils, ecological rehabilitation, non-traditional plants,* Silphium perfoliatum L.*, phytoremediation, agroecological adaptation, biomass, soil fertility.*

KIRISH

Bugungi kunda tuproq degradatsiyasi qishloq xo‘jaligi ishlab chiqarishining barqarorligiga, ekotizimlarning biologik mahsuldorligiga va tabiiy resurslardan samarali foydalanishga salbiy ta’sir ko‘rsatuvchi asosiy ekologik muammolardan biridir. Iqlim o‘zgarishi, suv tanqisligi, shamol va suv eroziyasi, tuproqning zichlashuvi, organik moddalarning kamayishi hamda antropogen bosimning kuchayishi degradatsiya jarayonlarini jadallashtirmoqda. Bunday sharoitda degradatsiyaga uchragan tuproqlarni faqat agrotexnik tadbirlar orqali emas, balki biologik va ekologik yondashuvlar asosida qayta tiklash muhim ahamiyat kasb etadi.

Tuproqni ekologik reabilitatsiya qilishning istiqbolli usullaridan biri degradatsiyalangan maydonlarda o‘simlik qoplamini shakllantirish va tuproqni biologik jarayonlar orqali tiklashga qodir o‘simlik turlaridan foydalanishdir. O‘simliklar ildiz tizimi orqali tuproq agregatlarining shakllanishiga, eroziya jarayonlarining kamayishiga, organik moddalarning to‘planishiga va tuproqning biologik faolligining oshishiga xizmat qiladi. Shu bilan birga, ko‘p yillik va yuqori biomassa hosil qiluvchi o‘simliklardan foydalanish tuproq yuzasini uzoq muddat davomida himoya qilish hamda agroekotizimlarning ekologik barqarorligini oshirish imkonini beradi. Zamonaviy tadqiqotlarda o‘simliklardan foydalanish degradatsiyalangan yerlarni tiklash, tuproq sog‘lomligini yaxshilash, suvni ushlab qolish, eroziyani kamaytirish va biologik xilma-xillikni qo‘llab-quvvatlashning muhim vositasi sifatida baholanmoqda.

Shu nuqtai nazardan, an‘anaviy oziq-ovqat ekinlaridan tashqari, ekologik moslashuvchanligi, yuqori biomassadorligi, kuchli ildiz tizimi va ko‘p funksionalligi bilan ajralib turadigan noan‘anaviy o‘simlik turlarini o‘rganish dolzarb hisoblanadi. Bunday o‘simliklar degradatsiyaga uchragan yoki qishloq xo‘jaligi uchun nisbatan kam mahsuldor maydonlardan samarali foydalanish, tuproq resurslarini muhofaza qilish va ekologik xizmatlarni kuchaytirish imkonini berishi mumkin.

Shunday istiqbolli turlardan biri Asteraceae oilasiga mansub ko‘p yillik *Silphium perfoliatum L.* o‘simligidir. Mazkur tur yuqori biomassa hosil qilishi, turli agroekologik sharoitlarga moslashuvchanligi, chuqur va yaxshi rivojlangan ildiz tizimiga egaligi hamda ko‘p yillikligi bilan ajralib turadi. Ilmiy manbalarda *S. perfoliatum* ning degradatsiyalangan va marginal yerlarda yetishtirish, fitoreabilitatsiya, tuproq organik uglerodini oshirish, eroziyaning oldini olish va biologik xilma-xillikni qo‘llab-quvvatlashdagi imkoniyatlari qayd etilgan[3].

S. perfoliatum ning ekologik ahamiyati uning faqat biomassa hosildorligi bilan cheklanmaydi. Ko‘p yillik vegetatsiya davri va zich yerusti qoplami tuproq yuzasining himoyalanishiga yordam beradi, ildiz tizimi esa tuproq qatlamlaridan suv va oziqa elementlaridan samarali foydalanish imkonini yaratadi. Shuningdek, uzoq davom etadigan gullash davri changlatuvchi hasharotlar uchun nektar va chang manbai bo‘lib xizmat qiladi. Shu sababli ushbu o‘simlikni ekologik barqaror agrotsenozlarni shakllantirishda ko‘p funksiyali biologik resurs sifatida baholash mumkin[1,4].

Ayrim tadqiqotlarda *S. perfoliatum* ning og‘ir metallar bilan ifloslangan tuproqlarda fitoremediatsiya va fitostabilizatsiya imkoniyatlari ham o‘rganilgan. Biroq uning ushbu yo‘nalishdagi samaradorligi tuproqdagi ifloslantiruvchi moddalar turi va konsentratsiyasiga, o‘simlikning rivojlanish bosqichiga hamda agroekologik sharoitga bog‘liq. Shu sababli *S. perfoliatum* ni degradatsiyalangan tuproqlarni reabilitatsiya qilishda qo‘llash imkoniyatlarini mahalliy tuproq-iqlim sharoitlarida ilmiy asosda baholash zarur[6,10].

O‘zbekiston sharoitida esa suv tanqisligi, yuqori yozgi harorat, tuproq unumdorligining pasayishi va ayrim hududlarda degradatsiya jarayonlarining kuchayishi ekologik jihatdan moslashuvchan ko‘p yillik o‘simliklarni tanlash masalasini yanada dolzarb etmoqda. Shu jihatdan, mahalliy agroekologik sharoitlarda *S. perfoliatum* ning o‘sishi, rivojlanishi, biomassa hosil qilishi va turli agrotexnik omillarga javob reaksiyasini o‘rganish ushbu turning degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilishdagi istiqbollarini aniqlashga xizmat qiladi.

Mazkur tadqiqotning maqsadi -degradatsiyalangan tuproq sharoitlarida noan’anaviy o‘simliklardan foydalanishning ekologik ahamiyatini baholash hamda *Silphium perfoliatum L.* ning agroekologik moslashuvi, o‘sishi,

rivojlanishi va biomassa hosildorligini aniqlash orqali uning ekologik reabilitatsiya jarayonlaridagi istiqbolini asoslashdan iborat.

ADABIYOTLAR TAHLILI

Degradatsiyalangan tuproqlarni tiklashda ko‘ p yillik o‘ simliklardan foydalanish so‘ nggi yillarda agroekologiya va tuproq ekologiyasining muhim yo‘ nalishlaridan biriga aylanmoqda. Bunday o‘ simliklar tuproqni uzoq muddat davomida o‘ simlik qoplami bilan ta’minlab, eroziya jarayonlarini kamaytirish, organik uglerodning to‘ planishini kuchaytirish, oziqa elementlarining yuvilib ketishini cheklash va tuproq biologik faolligini qo‘ llab-quvvatlash orqali degradatsiyalangan agroekotizimlarning funksional holatini yaxshilashi mumkin. Perennial ekinlarni qishloq xo‘ jaligi tizimlariga joriy etish tuproq unumdorligini tiklash va uglerod, azot hamda fosfor aylanishini yaxshilashning istiqbolli usullaridan biri sifatida baholanadi.

Tuproq reabilitatsiyasida o‘ simliklarning samaradorligi, avvalo, ularning ildiz tizimining rivojlanish xususiyatlari, vegetatsiya davomiyligi, biomassa hosil qilish qobiliyati va mahalliy agroekologik sharoitlarga moslashuvchanligi bilan belgilanadi. Ko‘ p yillik o‘ simliklar yillik ekinlarga nisbatan tuproqni kamroq mexanik bezovta qiladi va vegetatsiya davridan tashqari vaqtlarda ham tuproq yuzasini qisman qoplab turishi mumkin. Natijada eroziya xavfi pasayadi, ildiz qoldiqlari va boshqa organik materiallarning tuproqqa qaytishi esa uglerod zaxirasining shakllanishiga xizmat qiladi.

Noan’anaviy ko‘ p yillik o‘ simliklar orasida *Silphium perfoliatum L.* alohida ekologik va xo‘ jalik ahamiyatga ega tur sifatida ko‘ rib chiqilmoqda. Mazkur o‘ simlik yuqori biomassadorligi, uzoq vegetatsiya davri, yaxshi rivojlangan ildiz tizimi va nisbatan kam agrotexnik talablar bilan ajralib turadi. Tadqiqotlarda *S. perfoliatum* ning tuproq qoplamini shakllantirishi, eroziya va oziqa elementlarining yuvilishini kamaytirishi hamda tuproq ekologik holatiga ijobiy ta’sir ko‘ rsatishi mumkinligi qayd etilgan[3].

S. perfoliatum ning ekologik afzalliklaridan yana biri uning ko‘ p yillikligi va yuqori yerusti biomassasi bilan bog‘ liq. O‘ simlikning uzoq muddat bir maydonda saqlanishi tuproqning tez-tez haydalishini kamaytiradi. Bu esa tuproq agregatlari va organik moddalarning saqlanishi uchun qulay sharoit yaratishi mumkin. 2025-yilda chop etilgan tadqiqotda *S. perfoliatum* maydonlarida yer usti qoplamining shakllanishi va ildizlardan keladigan uglerod oqimi tuproq organik uglerodining to‘ planishi bilan bog‘ liqligi ko‘ rsatilgan. Mazkur tadqiqotda ko‘ p yillik silfiy ekinlari tuproq eroziyasini kamaytirish va tuproq biologik faoliyatini qo‘ llab-quvvatlash nuqtai nazaridan ham muhim ekanligi qayd etilgan[7,9].

S. perfoliatum ning degradatsiyalangan va ifloslangan tuproqlardagi imkoniyatlari ham alohida tadqiq etilgan. Ayrim tadqiqotlarda o‘ simlikning mis, rux, xrom va qo‘ rg‘ oshin kabi og‘ ir metallarni yutish va o‘ simlik organlarida to‘ plash qobiliyati baholangan. Masalan, konchilik faoliyatidan ifloslangan tuproqda o‘ tkazilgan tajribalarda *S. perfoliatum* ning ayrim og‘ ir metallarni o‘ zlashtirishi va to‘ plashi aniqlangan. Bu natijalar mazkur turning ifloslangan maydonlarda fitoremediatsiya va fitostabilizatsiya jarayonlarida foydalanish imkoniyatini ko‘ rsatadi[8].

Biroq *S. perfoliatum* ning fitoremediatsion imkoniyatlarini umumlashtirishda ehtiyotkorlik zarur. Ilgari o‘ tkazilgan ayrim tajribalarda o‘ simlik qo‘ rg‘ oshin va kadmiyni cheklangan miqdorda o‘ zlashtirgani, shuningdek, ifloslantiruvchi moddalar konsentratsiyasi oshishi bilan biomassaning kamayishi mumkinligi aniqlangan. Shu sababli *S. perfoliatum* ni barcha turdagi degradatsiyalangan yoki ifloslangan tuproqlar uchun universal reabilitatsiya vositasi sifatida emas, balki muayyan tuproq-ekologik sharoitlarda istiqbolli biologik vosita sifatida baholash maqsadga muvofiq[1].

O‘ simlikning ekologik qiymati faqat tuproq bilan bog‘ liq jarayonlar bilan chegaralanmaydi. *S. perfoliatum* ning uzoq davom etadigan gullash davri va yuqori nektar mahsuldorligi uni changlatuvchi hasharotlar uchun muhim oziqa manbaiga aylantiradi. Shu jihatdan u qishloq xo‘ jaligi landshaftlarida biologik xilma-xillikni saqlash va ekotizim xizmatlarini kuchaytirishga hissa qo‘ shishi mumkin. Tadqiqotlarda *S. perfoliatum* ning tuproq salomatligi, biologik xilma-xillik, changlanish va suv resurslarini muhofaza qilish kabi ekologik xizmatlar bilan bog‘ liq imkoniyatlari qayd etilgan[2].

Shunday qilib, mavjud ilmiy ma’lumotlar *Silphium perfoliatum L.* ni degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilishda foydalanish mumkin bo‘ lgan ko‘ p funksiyali noan’anaviy o‘ simlik sifatida baholash imkonini beradi. Biroq uning samaradorligi tuproq turi, iqlim sharoiti, namlik ta’minoti, ekish muddati, o‘ simliklar joylashish sxemasi va agrotexnik tadbirlarga bog‘ liq. Shu sababli O‘ zbekistonning turli agroekologik sharoitlarida *S. perfoliatum* ning o‘ sishi, rivojlanishi va biomassa shakllanishini o‘ rganish muhim ilmiy-amaliy ahamiyatga ega.

Adabiyotlar tahlili shuni ko‘ rsatadiki, *S. perfoliatum* bo‘ yicha xorijiy tadqiqotlarda asosan biomassa hosildorligi, bioenergetik qiymati, tuproq ekologiyasiga ta’siri va og‘ ir metallarni o‘ zlashtirish imkoniyatlari o‘ rganilgan. Shu bilan birga, O‘ zbekiston sharoitida ushbu turning degradatsiyalangan tuproqlarga moslashuvi, optimal ekish muddatlari va o‘ simliklar joylashish sxemasining ekologik va biomassa ko‘ rsatkichlariga ta’siri yetarlicha o‘ rganilmagan. Mazkur holat tadqiqotning dolzarbligini belgilaydi va ushbu ishning ilmiy yangiligini asoslaydi.

TADQIQOT METODOLOGIYASI

Tadqiqotlar 2023-2025-yillarda O‘ zbekistonning Samarqand va Andijon viloyatlarida olib borildi. Tadqiqot obyekti sifatida Asteraceae oilasiga mansub ko‘ p yillik *Silphium perfoliatum L.* o‘ simligi tanlandi. Mazkur tur yuqori biomassa hosil qilishi, uzoq vegetatsiya davri, yaxshi rivojlangan ildiz tizimi va turli agroekologik sharoitlarga moslashuvchanligi sababli degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilishda istiqbolli noan’anaviy o‘ simlik sifatida baholandi.

Tajribalarda Yevropadan sertifikatlangan manbalardan keltirilgan *S. perfoliatum* urug‘ laridan foydalanildi. Dala tajribalariga unuvchanligi 85% dan yuqori bo‘ lgan urug‘ lar ajratib olindi. Tadqiqotlarda o‘ simliklarning unib chiqishi, vegetativ va generativ rivojlanishi, biomassa hosil bo‘ lishi hamda urug‘ mahsuldorligiga ayrim agrotexnik omillarning ta’siri o‘ rganildi.

Tadqiqotning birinchi yo‘ nalishida ekish muddatining urug‘ larning unib chiqishi va dastlabki vegetativ rivojlanishiga ta’siri baholandi. Kuzgi ekish uchun 15-oktabr va 15-noyabr, bahorgi ekish uchun 15-fevral va 20-mart muddatlari olindi. Har bir ekish muddatida to‘ liq unish sanasi, o‘ simlikdagi barglar soni hamda barglarning uzunligi va eni qayd etildi. Ushbu ko‘ rsatkichlar *S. perfoliatum* ning turli ekish muddatlaridagi dastlabki rivojlanish dinamikasini baholash imkonini berdi.

Ikkinchi yo‘ nalishda o‘ simliklarning maydondagi joylashish sxemasining vegetativ va generativ rivojlanishga ta’siri o‘ rganildi. Tajribada 90 × 60, 90 × 70 va 90 × 90 sm qator oralig‘ i variantlari taqqoslandi. Ushbu variantlarda o‘ simlik zichligi, poyalar soni, o‘ simlik balandligi, poya diametri, barg morfologiyasi, gullar soni va bir guldagi urug‘ lar soni aniqlandi.

O‘ simliklarning vegetativ rivojlanishini baholashda o‘ simlik balandligi, poya diametri, poyalar soni hamda barglarning uzunligi va eni asosiy morfometrik ko‘ rsatkichlar sifatida qabul qilindi. Generativ rivojlanishni baholashda esa bir o‘ simlikdagi gullar soni va bir guldagi urug‘ lar soni hisobga olindi. Hosildorlik ko‘ rsatkichlarini aniqlashda urug‘ hosildorligi va yashil biomassa miqdori qayd etildi.

Tadqiqot natijalarini ekologik jihatdan baholashda o‘ simliklarning joylashish zichligi bilan yorug‘ lik, suv va mineral oziqa elementlari uchun raqobat o‘ rtasidagi bog‘ liqlikka alohida e’tibor qaratildi. Qator oralig‘ ining kengayishi sharoitida o‘ simliklar uchun mavjud ekologik resurslardan foydalanish imkoniyati ortishi, vegetativ massa va generativ organlarning shakllanishi yaxshilanishi nuqtai nazaridan tahlil qilindi.

Ekish muddatlarini baholashda esa urug‘ larning tabiiy stratifikatsiyadan o‘ tishi, qishki past haroratlarning urug‘ larning tinim holatiga ta’siri, bahorgi davrdagi tuproq namligi va harorat sharoitlarining nihollarning shakllanishiga ta’siri hisobga olindi. Shu asosda *S. perfoliatum* ning dastlabki rivojlanish bosqichlari va agroekologik moslashuv xususiyatlari baholandi.

Olingan natijalar degradatsiyalangan tuproqlarda noan’anaviy o‘ simliklardan foydalanishning ekologik istiqbollarini baholash nuqtai nazaridan tahlil qilindi. Bunda o‘ simliklarning yuqori biomassa hosil qilishi, uzoq muddat davomida tuproq yuzasini o‘ simlik qoplami bilan ta’minlashi, vegetativ va generativ organlarning rivojlanishi hamda agroekologik sharoitlarga moslashuvi asosiy mezonlar sifatida qaraldi.

Tadqiqotda aniqlangan ko‘ rsatkichlar jadval va grafik materiallar yordamida umumlashtirildi. Natijalar asosida *S. perfoliatum L.* ning O‘ zbekiston sharoitida yetishtirish uchun maqbul ekish muddatlari va o‘ simliklarni joylashtirish sxemalarining agroekologik samaradorligi baholandi.

Dala tajribalari davomida *Silphium perfoliatum L.* ning ekish muddatiga bog‘ liq holda unib chiqishi va dastlabki vegetativ rivojlanishida sezilarli farqlar kuzatildi. Ekish muddatlarining o‘ zgarishi o‘ simliklarning tabiiy stratifikatsiyadan o‘ tishi, tuproq namligi va harorat sharoitlaridan foydalanish imkoniyatiga ta’sir ko‘ rsatdi.

1-jadval.

Ekish muddatining urug‘ larning unib chiqishi va barg morfologiyasiga ta’siri

Ekish muddati	To‘ liq unish sanasi	Barglar soni, dona/o‘ simlik	Barg uzunligi, sm	Barg eni, sm
15-oktabr	3-mart	35	44,3	27,0
15-noyabr	3-mart	38	44,5	27,2
15-fevral	25-mart	25	39,4	25,2
20-mart	30-aprel	23	30,1	20,3

Jadval ma’lumotlaridan ko‘ rinib turibdiki, kuzgi ekish variantlarida *S. perfoliatum* ning dastlabki vegetativ rivojlanishi bahorgi ekish variantlariga nisbatan yuqori bo‘ lgan. 15-noyabrda ekilgan o‘ simliklarda barglar soni 38 dona/o‘ simlikni, barg uzunligi 44,5 sm va eni 27,2 sm ni tashkil etgan. 15-oktabr variantida ham yaqin natijalar qayd etilib, barglar soni 35 dona/o‘ simlik, barg uzunligi 44,3 sm va eni 27,0 sm bo‘ lgan.

Bahorgi ekish variantlarida esa vegetativ rivojlanish ko‘ rsatkichlari pasaygan. 20-martda ekilgan o‘ simliklarda barglar soni 23 dona/o‘ simlik, barg uzunligi 30,1 sm va eni 20,3 sm ni tashkil etgan. Bu holat o‘ simliklarning dastlabki rivojlanish davrida tuproq namligi va harorat rejimining muhim ekologik omil ekanligini ko‘ rsatadi.

Kuzgi ekishning afzalligi urug‘ larning qish davrida tabiiy stratifikatsiya jarayonidan o‘ tishi bilan izohlanishi mumkin. Past harorat ta’sirida urug‘ larning fiziologik tinim holati susayib, bahorgi qulay sharoit yuzaga kelishi bilan bir vaqtda unish jarayoni boshlanadi. Natijada o‘ simliklar vegetatsiya davrining dastlabki bosqichidanoq nisbatan yaxshi rivojlangan ildiz va barg tizimini shakllantirish imkoniyatiga ega bo‘ ladi.

Ekologik nuqtai nazardan, bunday xususiyat degradatsiyalangan tuproqlarda muhim ahamiyatga ega. Chunki o‘ simlik qoplamining tez va bir tekis shakllanishi tuproq yuzasining ochiq qolish vaqtini qisqartiradi. Bu esa shamol va suv eroziyasi xavfini kamaytirish, tuproq namligini saqlash hamda tuproq yuzasida organik qoldiqlarning to‘ planishi uchun sharoit yaratishi mumkin.

O‘ simliklarning maydonda joylashish sxemasi ularning yorug‘ lik, suv va mineral oziqa elementlaridan foydalanish darajasini belgilovchi muhim agroekologik omillardan biridir. Tadqiqotlarda 90×60, 90×70 va 90×90 sm qator oralig‘ i variantlari taqqoslandi.

2-jadval.

Qator oralig‘ ining *Silphium perfoliatum L.* ning poya shakllanishiga ta’siri

Qator oralig‘ i, sm	O‘ simlik zichligi, dona/m²	Poya soni (2023-2024)	Poya soni (2025)
90 × 60	9,1	24,5-25,6	26,9
90 × 70	11,2	25,7-26,1	27,6
90 × 90	13,1	26,8-28,2	30,7

Tajriba natijalariga ko‘ ra, qator oralig‘ ining kengayishi bilan *S. perfoliatum* ning poya shakllanishi yaxshilangan. 90×90 sm variantida 2025-yilda poyalar soni 30,7 donaga yetgan bo‘ lsa, 90×60 sm variantida bu ko‘ rsatkich 26,9 donani tashkil etdi.Keng qator oralig‘ ida o‘ simliklar o‘ rtasidagi yorug‘ lik, suv va mineral elementlar uchun raqobatning kamayishi vegetativ organlarning faolroq shakllanishiga imkon bergan. Bu holat ayniqsa degradatsiyalangan tuproqlarda muhim, chunki bunday tuproqlarda suv va oziqa elementlaridan foydalanish imkoniyati cheklangan bo‘ lishi mumkin.

S. perfoliatum L. ning yuqori biomassali ko‘ p yillik o‘ simlik ekanligi uning tuproqni biologik himoyalash imkoniyatini ham oshiradi. Kuchli vegetativ massa tuproq yuzasini qoplab, eroziya jarayonlarini susaytirishga va organik qoldiqlarning qayta tuproqqa tushishiga xizmat qilishi mumkin.

Tadqiqotlarda qator oralig‘ ining o‘ simliklarning generativ organlari shakllanishiga ham sezilarli ta’sir ko‘ rsatishi aniqlandi.

3-jadval.

Qator oralig‘ ining *Silphium perfoliatum L.* ning generativ ko‘ rsatkichlariga ta’siri

Qator oralig‘ i, sm	Gul soni, dona/o‘ simlik	Urug‘ soni, dona/gul
90 × 60	35,5 ± 0,99	22,4 ± 0,84
90 × 70	61,7 ± 1,38	30,7 ± 1,29
90 × 90	78,7 ± 1,81	38,3 ± 1,13

90×60 sm variantida bir o‘ simlikdagi gullar soni 35,5 donani tashkil etgan bo‘ lsa, 90×90 sm variantida bu ko‘ rsatkich 78,7 donaga yetgan. Shuningdek, bir guldagi urug‘ lar soni mos ravishda 22,4 va 38,3 donani tashkil etdi.

Demak, qator oralig‘ ining kengayishi nafaqat vegetativ, balki generativ rivojlanishga ham ijobiy ta’sir ko‘ rsatgan. Bunda o‘ simlikning fotosintetik yuzasi yaxshi shakllanishi, yorug‘ likdan samarali foydalanishi va assimilatsiya mahsulotlarining generativ organlarga yetarli miqdorda yo‘ naltirilishi muhim omil bo‘ lishi mumkin.

Mazkur xususiyat *S. perfoliatum* ning ekologik qiymatini ham oshiradi. O‘ simlikning ko‘ p sonli to‘ pgullar hosil qilishi uning gullash davrida changlatuvchi hasharotlar uchun oziqa bazasini kengaytiradi. Shu sababli ushbu turni degradatsiyalangan agroekotizimlarda yetishtirish nafaqat tuproqni o‘ simlik qoplami bilan ta’minlash, balki biologik xilma-xillikni qo‘ llab-quvvatlash nuqtai nazaridan ham ahamiyatlidir.

Tadqiqotlarning eng muhim natijalaridan biri qator oralig‘ ining biomassa va urug‘ hosildorligiga ta’siri bilan bog‘ liq.

4-jadval.

Qator oralig‘ ining *Silphium perfoliatum L.* ning biomassa va hosildorlik ko‘ rsatkichlariga ta’siri

Qator oralig‘ i, sm	Urug‘ hosildorligi, s/ga	Biomassa, s/ga	Balandlik, sm

90 × 60	6,6	960,9	203,9
90 × 70	7,8	1106,2	232,3
90 × 90	9,7	1237,8	284,2

Olingan natijalar qator oralig‘ i kengayishi bilan urug‘ hosildorligi va biomassa miqdori izchil oshganligini ko‘ rsatdi. 90×60 sm variantida urug‘ hosildorligi 6,6 s/ga va biomassa 960,9 s/ga bo‘ lgan bo‘ lsa, 90×90 sm variantida bu ko‘ rsatkichlar mos ravishda 9,7 va 1237,8 s/ga ga yetgan.90×90 sm variantida o‘ simlik balandligi ham eng yuqori - 284,2 sm ni tashkil etdi. Demak, mazkur joylashtirish sxemasi o‘ simlikning vegetativ va generativ imkoniyatlaridan nisbatan to‘ liq foydalanish imkonini bergan.

Yuqori biomassa hosil qiluvchi *S. perfoliatum* ning ushbu xususiyati degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilish nuqtai nazaridan alohida ahamiyatga ega. Ko‘ p miqdordagi yerusti biomassa tuproq yuzasida himoya qatlami shakllanishiga, o‘ simlik qoldiqlarining tuproqqa qaytishiga va organik moddalarning aylanishiga yordam berishi mumkin. Shu bilan birga, rivojlangan ildiz tizimi tuproqning biologik faol qatlamini shakllantirishda muhim rol o‘ ynaydi.

Biroq ushbu tadqiqotda tuproqdagi gumus, organik uglerod, umumiy azot, fosfor, kaliy, pH va boshqa agroximik ko‘ rsatkichlarning tajribadan oldingi va keyingi qiymatlari aniqlanmagan. Shu sababli olingan natijalar *S. perfoliatum* ning tuproqni bevosita reabilitatsiya qilganini emas, balki degradatsiyalangan tuproqlarda ekologik reabilitatsiya jarayonlarini qo‘ llab-quvvatlash imkoniyatiga ega ekanligini ko‘ rsatadi.

Olingan natijalar *S. perfoliatum* ni degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilishda ko‘ p funksiyali noan’anaviy o‘ simlik sifatida baholash imkonini beradi. Uning ekologik ahamiyati quyidagi asosiy yo‘ nalishlarda namoyon bo‘ lishi mumkin:

- tuproq yuzasini uzoq muddat o‘ simlik qoplami bilan ta’minlash;
- shamol va suv eroziyasi xavfini kamaytirish;
- yuqori biomassa orqali organik moddalarning aylanishini kuchaytirish;
- rivojlangan ildiz tizimi orqali tuproqning biologik faol qatlamini qo‘ llab-quvvatlash;
- agroekotizimlarda changlatuvchi hasharotlar uchun oziqa manbaini yaratish;
- kam mahsuldor va degradatsiyalangan maydonlardan samarali foydalanish.

XULOSA

Olib borilgan dala tadqiqotlari natijalari *Silphium perfoliatum L.* ning O‘ zbekistonning Samarqand va Andijon viloyatlaridagi agroekologik sharoitlarda yetishtirishga moslashuvchan, yuqori biomassa hosil qiluvchi va ekologik jihatdan istiqbolli noan’anaviy ko‘ p yillik o‘ simlik ekanligini ko‘ rsatdi.Tadqiqot natijalariga ko‘ ra, kuzgi ekish *S. perfoliatum* ning dastlabki rivojlanishi uchun nisbatan qulay sharoit yaratib, 15-noyabr variantida 38 dona/o‘ simlik barg shakllanishi, barg uzunligi 44,5 sm va eni 27,2 sm ga yetgani aniqlandi. Bu holat kuzgi ekish sharoitida urug‘ larning tabiiy stratifikatsiyadan o‘ tishi va bahorgi vegetatsiyaning nisbatan barqaror boshlanishi bilan bog‘ liq.

Qator oralig‘ ining o‘ simliklarning vegetativ va generativ rivojlanishiga sezilarli ta’siri aniqlandi. 90×90 sm sxemasida poyalar soni 30,7 dona/o‘ simlik, gullar soni 78,7 dona/o‘ simlik va bir guldagi urug‘ lar soni 38,3 donaga yetdi. Mazkur variantda urug‘ hosildorligi 9,7 s/ga, yashil biomassa hosildorligi esa 1237,8 s/ga ni tashkil etdi.

Yuqori biomassa hosil qilishi, ko‘ p yillik hayotiy shakli va rivojlangan vegetativ organlari *S. perfoliatum* ni degradatsiyalangan tuproqlarda o‘ simlik qoplamini shakllantirish uchun istiqbolli biologik resurs sifatida tavsiflaydi. O‘ simlik qoplamining shakllanishi tuproq yuzasini eroziya ta’siridan himoyalash, organik qoldiqlarning to‘ planishi va agroekotizimlarning biologik barqarorligini qo‘ llab-quvvatlash uchun sharoit yaratishi mumkin.

Shuningdek, *S. perfoliatum* ning uzoq davom etadigan gullash davri va ko‘ p sonli to‘ pgullar hosil qilishi changlatuvchi hasharotlar uchun oziqa bazasini kengaytirish orqali agroekotizimlarning biologik xilma-xilligini saqlashga xizmat qilishi mumkin.Shunday qilib, *Silphium perfoliatum L.* ni degradatsiyalangan tuproqlarni ekologik reabilitatsiya qilish tizimlariga joriy etish istiqbolli yo‘ nalishlardan biri hisoblanadi. Biroq turning tuproq unumdorligi va tuproq ekologik holatiga bevosita ta’sirini to‘ liq baholash uchun kelgusidagi tadqiqotlarda gumus, organik uglerod, pH, umumiy azot, fosfor, kaliy, tuproq namligi va biologik faollik kabi ko‘ rsatkichlarning ekishdan oldingi va keyingi o‘ zgarishlarini kompleks o‘ rganish maqsadga muvofiq.

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FARG‘ ONA VODIYSI TOG‘ VA TOG‘ OLDI HUDUDIDAGI (COLEOPTERA, COCCINELLIDAE) KOKSINELLIDLAR FAUNASI.

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Annotatsiya: Ushbu maqolada Farg‘ ona vodiysining tog‘ oldi va tog‘ li hududlarida 5 kenja oila va 16 avlodga mansub 27 turdagi koksinellidlar tarqalgan. Jumladan, Coccinellinae kenja oilasining 16 turi: *Adalia bipunctata, Adalia desempunctata, Adalia 14punctata, Adalia fasciatopunctata, Adalia tetraspilota, Hippodamia variegata, Hippodamia tredecimpintatata, Coccinella septempunctata, Prop. quatuordecimpunctata, Psyllobora vigintiduopunctata, Calvia SP, Calvia punctata, Calvia muiri, Oenopia conglobata, Coelophora quadrivittata, Halyzia tschitscherini*; Scymnus avlodidan 5 tur: *Stethorus pusillus, Scymnus subvillosus, Scymnus rubromaculatus, Scymnus interruptus, Scymnus frontalis*; Chilocorinae kenja oilasidan 4 tur: *Chilocorus bipustulatus, Exochomus ostosignatus, Exochomus undulatus, Parexochomus nigromaculatus*; Hyperaspidinae kenja oilasidan 1 tur: *Brachiacontha ursine*, Ortaliinae kenja oilasidan 1 tur: *Novius yemenensis* qayd etilgan.

Kalit so‘ zlar: *Calvia muiri, Coelophora quadrivittata, Brachiacontha ursine, Novius yemenensis*, landshaft, biotop, kserofil.

ФАУНА БОЖЬИХ КОРОВОК (COCLEOPTERA, COCCINELLIDAE) В ГОРНЫХ И ПЕШЕХОДНЫХ РАЙОНАХ ДОЛИНЫ ФЕРГАНА.

Аннотация: *В статье описан видовой состав и территориальное распространение жуков-кокцинеллид в предгорьях, густых лугах и сухих предгорьях Ферганской долины. На территории исследований в предгорьях и горах Долины распространены 27 видов кокцинеллид, принадлежащих к 5 подсемействам и 16 родам. Включает 16 видов подсемейства Coccinellinae: Adalia bipunctata, Adalia desempunctata, Adalia 14punctata, Adalia fasciatopunctata, Adalia tetraspilota, Hippodamia variegata, Hippodamia tredecimpintatata, Coccinella septempunctata, Prop. quatuordecimpunctata, Psyllobora vigintiduopunctata, Calvia SP, Calvia punctata, Calvia muiri, Oenopia conglobata, Coelophora quadrivittata, Halyzia tschitscherini; 5 видов из подсемейства Scymninae: Stethorus pusillus, Scymnus subvillosus, Scymnus rubromaculatus, Scymnus interruptus, Scymnus frontalis; 4 вида из подсемейства Chilocorinae: Chilocorus bipustulatus, Exochomus ostosignatus, Exochomus undulatus, Parexochomus nigromaculatus; Зарегистрирован 1 вид из подсемейства Hyperaspidinae: Brachiacontha ursine, 1 вид из подсемейства Ortaliinae: Novius yemensis.*

Ключевые слова: *Calvia muiri, Coelophora quadrivittata, Brachiacontha ursine , Novius yemenensis, ландшафт, биотоп, ксерофил.*

FAUNA OF COCCINELLIDS (COLEOPTERA, COCCINELLIDAE) IN THE MOUNTAIN AND FOOTHILL AREAS OF THE FERGANA VALLEY.

Annotation. *This article describes the species composition and territorial distribution of coccinellid beetles in the foothills, dense grasslands, and dry foothills of the Fergana Valley. In the study area, 27 species of coccinellids belonging to 5 subfamilies and 16 genera are distributed in the foothills and mountains of the Valley. Including 16 species of the Coccinellinae subfamily: Adalia bipunctata, Adalia desempunctata, Adalia 14punctata, Adalia fasciatopunctata, Adalia tetraspilota, Hippodamia variegata, Hippodamia tredecimpunctata, Coccinella septempunctata, Propylaea quatuordecimpunctata, Psyllobora vigintiduopunctata, Calvia*

SP, Calvia punctata, Calvia muiri, Oenopia conglobata, Coelophora. quadrivittata, Halyzia tschitscherini; 5 species from the Scymninae subfamily: Stethorus pusillus, Scymnus subvillosus, Scymnus rubromaculatus, Scymnus interruptus, Scymnus frontalis; 4 species from the Chilocorinae subfamily: Chilocorus bipustulatus, Exochomus ostosignatus, Exochomus undulatus, Parexochomus nigromaculatus; 1 species from the Hyperaspidinae subfamily: Brachiacontha ursine, 1 species from the Ortaliinae subfamily: Novius yemensis were recorded.

Keywords: *Calvia muiri, Coelophora quadrivittata, Brachiacontha ursine, Novius yemensis, landscape, biotope, xerophile*

Kirish. Koksinellidlar butun dunyo bo‘ ylab keng tarqalgan bo‘ lib, barcha qit’alarda (Antarktidadan tashqari) yashaydi, deyarli barcha quruqlik biotoplarida uchraydi.

Koksinellidlarning aksariyat turlari ma’lum landshaft-geografik zonalar bilan chegaralangan va har bir zona maxsus turlar majmuasi bilan tavsiflanadi, ammo ba’zi turlar barcha landshaftlarda tarqalgan turlar hisoblanadi, masalan, *Coccinella septempunctata, Hippodamia variegate, Coccinella undecimpunctata,Bulaea lechatschovi.* [Xabibullin, 2004]

Farg‘ ona vodiysining atrofini G‘ arbiy Tiyon-Shon va Hisor-Oloy tog‘ sistemalari tarkibiga kiruvchi tizmalar o‘ rab olgan. Bu tog‘ larning ayrim cho‘ qqilarining balandligi 4000 m dan ortib ketadi. Tog‘ lar vodiy markaziga tomon pasayib boradi va tekisliklar bilan tutashib ketadi.

Tog‘ oldi zonasi adirlar bilan baland tog‘ lar o‘ rtasida oraliq zonani hosil qiladi. Asosan Qurama, Chotqol, Farg‘ ona, Turkiston, Oloy tizmalarning etaklarida balandligi 2000 m gacha hududlarni egallaydi. Vodiyni o‘ rab olgan baland tog‘ lar G‘ arbiy Tiyon-Shon tog‘ sistemasining tarkibiy qismlari hisoblanadi. Farg‘ ona vodiysini Qurama va Chotqol tizmalari g‘ arb va shimoli-g‘ arbdan, Farg‘ ona va Oto‘ ynoq tizmalari shimoli-sharq va sharqdan, Oloy va Turkiston tizmalari janub va janubi-g‘ arbdan o‘ rab olgan. Bu tog‘ larning o‘ rtacha balandligi 2000-3000 m, ayrim cho‘ qqilarining balandligi 4500 m dan ortadi. [Naraliyeva ,2022]

Material va metodlar: Farg‘ ona vodiysining Farg‘ ona, Andijon, Namangan viloyatlarining tog‘ hududi koksinellidlarning faunasi va bioekologiyasini o‘ rganishdagi tadqiqot kuzatuvlarimizni 2022-2025 yillarni 4 faslida ham olib borildi.

Shuningdek, marshrutlar bo‘ ylab statsiyalar yoki biotoplardan hasharot namunalari yig‘ ilib, ular entomologik usullari bilan qayta ishlandi, matrasnik (to‘ shakcha) va entomologik qutichalarga joylandi va ularning fotosuratlari olindi.

Koksinellidlarning taksonomik guruhlarga mansubligini tur tarkibini aniqlash uchun quyidagi aniqlagichlardan foydalanilgan: “Opredelitel nasekomix Yevropeyskoy chasti SSSR” (Tom 2, chast 1) (1965), “Opredelitel jukov” [Yakobson G.G. 1927], “Opredelitel Nasekomix” [Plavilshikov H. H.1994], “Opredelitel bojiix korovok (Coleoptera, Coccinellidae) yevropeyskoy chasti Rossii i Severnogo Kavkaza” [Benkovskiy A.O.2020]. Aniqlanilgan turlar O‘ zRFA Zoologiya instituti Entomologiya laboratoriyasidagi koksinellidlarga oid kolleksiya materiallari yordamida identifikatsiya qilindi.

Natijalar. Farg‘ ona vodiysining tog‘ oldi va tog‘ hududlaridagi o‘ simliklar turli xil ekologik sharoitlarga moslashgan va o‘ simliklarning ko‘ pligi bu hududning bioxilma-xilligini ta’minlaydi.

Vodiyning tog‘ hududlari koksinellid turlarining soni, tarqalishi bo‘ yicha maьlumotlar shu paytgacha tadqiq qilinmagan. Shuning uchun ham tadqiqotlarimizda Farg‘ ona vodiysining tog‘ oldi, zich o‘ tloqli va quruq tog‘ etaklari xonqizi qo‘ ng‘ izlarining tur tarkibi, hududiy tarqalishini aniqlashni maqsad qildik.

Tadqiqot natijalariga ko‘ ra Farg‘ ona vodiysining tog‘ va tog‘ etaklarida koksinellidlarning boy va noyob kserofil faunasi yashashiga guvoh bo‘ ldik.

O‘ rganilayotgan hududda Coccinellinae kenja oilasining 16 ta turi qayd etildi: *Adalia bipunctata, Adalia desempunctata, Adalia 14punctata, Adalia fasciatopunctata, Adalia tetraspilota, Hippodamia variegata, Hippodamia tredecimpunctata,Coccinella septempunctata,Propylaea quatuordecimpunctata, Psyllobora vigintiduopunctata, Calvia sp,Calvia punctata,Calvia muiri,Oenopia conglobata,Coelophora quadrivittata,Halyzia tschitscherini;* Scymninae kenja oilasidan 5 ta tur: *Stethorus pusillus, Scymnus subvillosus, Scymnus rubromaculatus, Scymnus interruptus, Scymnus frontalis;* Chilocorinae kenja oilasidan esa 4 ta tur: *Chilocorus bipustulatus, Exochomus ostosignatus, Exochomus undulatus, Parexochomus nigromaculatus;* Hyperaspidinae kenja oilasidan 1 ta tur: *Brachiacontha ursine,* Ortaliinae kenja oilasidan 1 ta tur: *Novius yemenensis* kabi turlar keng tarqalgan (1-jadval).

Olingan ma’lumotlarga ko‘ ra, koksinellidlarning 5 ta kenja oila, 16 ta avlodga mansub 27 tur Vodiyning tog‘ oldi va tog‘ hududlarida tarqalganligi aniqlandi. Tadqiqot jarayonida shu hududda uchragan turlar ichidan hududda topilgan *Calvia muiri, Coelophora quadrivittata, Brachiacontha ursine , Novius yemenensis* kabi turlar O‘ zbekiston faunasi uchun yangi turlar hisoblandi (1-rasmga qarang).

1-jadval

Farg‘ ona vodiysi koksinellidlarning umumiy tog‘ faunasi

№	Turlar	Tog‘ oldi	Zich o‘ tloqli tog′	Quruq (toshloqli) tog′
	Kenja oila – Coccinellinae			
1	*Adalia bipunctata* (L)	++	++	-
2	*Adalia desempunctata (L)*	++	++	-
3	*Adalia 14punctata (L)*	++	++	-
4	*Adalia fasciatopunctata (L)*	++	++	-
5	*Adalia tetraspilota* (Hope)	++	++	-
6	*Hippodamia variegata* (Goeze)	++	++	-
7	*Hippodamia tredecimpunctata* (L)	+	+	-
8	*Coccinella septempunctata (L)*	++	++	++
9	*Propylaea quatuordecimpunctata* (L)	+	++	-
10	*Psyllobora vigintiduopunctata* (L)	++	++	-
11	*Calvia sp*	++	++	-
12	*Calvia punctata* (Mul)	++	++	-
13	*Calvia muiri (Tim)*	++	++	-
14	*Oenopia conglobata* (L)	++	++	++
15	*Coelophora quadrivittata (Fauvel)*	++	+	-
16	*Halyzia tschitscherini* (Sem)	++	++	++
	Kenja oila - Scymninae			
17	*Stethorus pusillus (Herbst)*	++	++	-
18	*Scymnus subvillosus (Goeze)*	++	++	-
19	*Scymnus rubromaculatus(Goeze)*	++	++	-
20	*Scymnus interruptus(Goeze)*	+	+	-
21	*Scymnus frontalis (Fab)*	+	++	-
	Kenja oila - Chilocorinae			
22	*Chilocorus bipustulatus* (L)	++	++	-
23	*Exochomus ostosignatus(Gebler)*	++	++	-
24	*Exochomus undulatus* (Weise)	++	+	-
25	*Parexochomus nigromaculatus* (Goeze)	++	++	++
	Kenja oila - Hyperaspidinae			
26	*Brachiacontha ursine (Chevrolat in Dejeon)*	+	+	-
	Kenja oila - Ortaliinae			
27	Novius yemensis (Raimundo& Fursch)	++	++	-
	Jami	27	27	4

O‘ rganilgan turlardan jadvalda ko‘ rinib turganidek, *Coccinella septempunctata, Oenopia conglobata, Halyzia tschitscherini, Parexochomus nigromaculatus* kabi turlar quruq (toshloqli) tog‘ da hamda o‘ rganilgan barcha hududda tarqalganligi va bu to‘ rtta turdan boshqa turlar quruq (toshloqli) tog‘ da uchramasligi ma’lum bo‘ ldi. Tog‘ oldi va zich o‘ tloqli tog‘ hududi mo‘ tadil iqlimga ega bo‘ lib, bu hududlarda o‘ sadigan o‘ simliklarning xilma xilligi yuqori bo‘ lgani sababli koksinellidlarning umumiy tog‘ hududida tarqalgan turlarning barchasi shu hududlarda uchrashini kuzatdik.

Vodiysining tog‘ oldi hududlari bo‘ lgan Namangan viloyati Yangiqo‘ rg‘ on tumani Nanay qishlog‘ ida *Adalia bipunctata, Adalia tetraspilota, Coccinella septempunctata, Oenopia conglobata, Halyzia tschitscherini, Chilocorus bipustulatus, Exochomus undulatus* kabu turlar juda ko‘ p tarqalgan. *Brachiacontha ursine* turini esa faqat bir marotaba uchratdik xolos. 06.05.2023 yili kundagi bu hududdagi tashrifimizda *Adalia bipunctata, Oenopia conglobate* turlarini daraxtlardagi lichinkalarini, tuxumlarini, imagolarini juda ko‘ p uchratdik.

Chortoq tumani Hazratishox qishlog‘ ida tog‘ oldi hududida quyidagi koksinellid turlari yetakchilik qildi: *Adalia bipunctata, Coccinella septempunctata, Oenopia conglobata, Halyzia tschitscherini, Chilocorus bipustulatus, Calvia punctata, Adalia desempunctata* (23.04.2025).

Chust tumani G‘ ova qishlog‘ ida bir necha bor olib borgan tadqiqot ishlarimizda *Adalia bipunctata, Adalia tetraspilota, Coccinella septempunctata, Oenopia conglobata, Halyzia tschitscherini, Chilocorus bipustulatus, Calvia punctata, Adalia desempunctata, Calvia muiri, Stethorus pusillus, Hippodamia variegate, Propylaea quatuordecimpunctata, Scymnus subvillosus, Psyllobora vigintiduopunctata, kabi turlarga juda ko‘ p duch kelgan bo‘ lsak, Hippodamia tredecimpunctata va Scymnus frontalis* kabi turlarini judsa kam uchratdik. *Novius yemensis* turini esa faqatgina koksinellidlarning qishlov tiplari bo‘ yicha olib borgan tadqiqot ishimizda bu turni dengiz sathidan 925 metr balandlikdagi qari yong‘ oq va o‘ rik daraxtlarining po‘ stlog‘ I ostidan 41°07'57.19"N, 71°06'54.39"E, (25.11.2025) koordinata nuqtasidan topdik. Huddi shu turni Kosonsoy tumanida joylashgan “Nodirabegim Muhammadxon” sihatgohidan (19.06.2026) ham topildi.

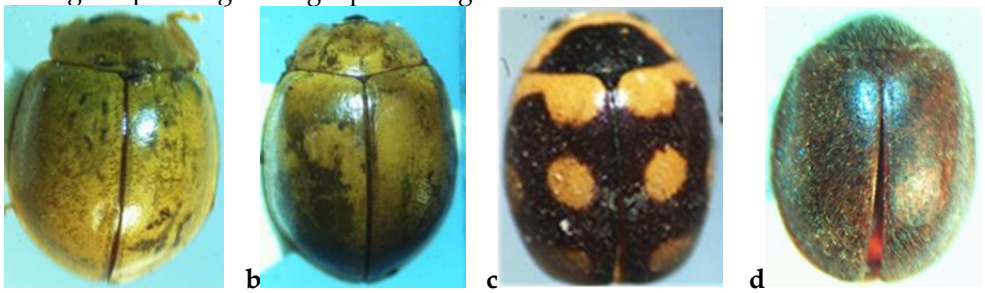
Chust tumani Chodak qishlog‘ i va Pop tumani Parda-Tursun qishlog‘ idagi tarqalgan koksinellid turlari deyarli bir xil bo‘ lib, *Adalia bipunctata, Adalia tetraspilota, Coccinella septempunctata, Oenopia conglobata, Halyzia tschitscherini, Chilocorus bipustulatus, Calvia punctata, Calvia muiri, Hippodamia variegate* kabi turlarni tashkil etdi.

Andijon viloyati Xo‘ jaobod tumanidagi tog‘ oldi hududida tarqalgan koksinellidlarning xilma-xilligini yuqori bo‘ lishi may oyining birinchi dekadasiga to‘ g‘ ri keldi, ayniqsa *Adalia bipunctata, Adalia tetraspilota, Adalia desempunctata, Adalia var 14 punctata, Adalia fasciatopunctata, Coccinella septempunctata, Psyllobora vigintiduopunctata, Calvia punctata, Oenopia conglobate* kabi turlarni juda ko‘ p marotaba uchratdik. Bu davr koksinellidlarning tuxum qo‘ yish va bir yoshli lichinkalarni uchratish holati kop kuzatildi.

01.05.2026 yil kuni Xonabod tumanidagi Imom ota qishlog‘ iga va 02.05.2026 yil kuni esa Asaka tumanidagi Manaq ota qishlog‘ iga bo‘ lgan tadqiqot bo‘ yicha tashrifimizda quyidagi koksinellid turlar yetakchilik qildi: *Adalia bipunctata, Adalia tetraspilota, Adalia desempunctata, Adalia var 14 punctata, Adalia fasciatopunctata, Coccinella septempunctata, Hippodamia variegate Psyllobora vigintiduopunctata, Calvia punctata, Oenopia conglobate.* Shu hududlarda *Exochomus ostosignatus, Scymnus interruptus, Scymnus rubromaculatus* turlari esa juda kam uchradi.

Farg‘ ona viloyatining Chimyon tumanida joylashgan “Chimyon” sihatgohida quyidagi turlarni topdik: *Adalia tetraspilota, Coccinella septempunctata, Hippodamia variegate, Psyllobora vigintiduopunctata, Calvia punctata, Oenopia conglobate, Propylaea quatuordecimpunctata, Scymnus subvillosus, Parexochomus nigromaculatus.* Bu turlarni aksariyat imago holatida uchratdik, faqatgina *Scymnus subvillosus* turini ham lichinka ham imago bosqichlariga duch keldik. *Parexochomus nigromaculatus* turi boshqa turlarga nisbatan juda ham ko‘ p uchradi, bir tup yosh oddiy qarag‘ ay daraxtidan 56 ta koksinellidni terdik. Daraxt shoxlarida esa yangi tark etilgan *Parexochomus nigromaculatus* turining g‘ umbaklari ham kuzatuvimizdan qochmadi.

Bu hududda tarqalgan koksinellidlarning voltinlik va qishlovga kirish xususiyatlari boshqa mintaqalarga nisbatan o‘ zgacha bo‘ lib, bunga asosiy sabab bu hududning o‘ ziga xos bo‘ lgan havo harorati asosiy o‘ rinni egallaydi. Masalan, barcha hududlarda tarqalgan *Coccinella septempunctata* turimiz agrolanshaftlarda yoz davomida ikki uch marotaba avlod bersa, tog‘ oldi va tog‘ hududida ikki marta yoki bir marta avlod berishi kuzatildi, *Stethorus pusillus* turimiz g‘ o‘ za maydonlari va mevali bog‘ larda yoz davomida 4 martagacha nasl bergan bo‘ lsa, tog‘ oldi hududida ikki marta avlod qoldirdi. Bu hududda tarqalgan koksinellidlarning qishlovdan chiqishi aprel oyining ikkinchi dekadasiga to‘ g‘ ri kelsa, qishlovga kirishi oktyabr oyining birinchi dekasiga to‘ g‘ ri keldi. Albatta bu holatlar haroratning keskin o‘ zgarishi va bu hududdagi koksinellidlarning oziqlarining holatiga qarab o‘ zgarishi mumkin.



a **b** **c** **d**

1-rasm. a-*Calvia muiri*, b-*Coelophora quadrivittata*, c-*Brachiacontha ursine*, d - *Novius yemensis* (original).

Xulosa: Xulosa qilib aytadigan bo‘ lsak Farg‘ ona vodiysi tog‘ oldi va tog‘ hududlaridan jami 27 tur koksinellidlar tarqalganligi ilk bor aniqlandi. Tadqiqot jarayonida shu hududda uchragan turlar ichidan hududda topilgan *Calvia muiri, Coelophora quadrivittata, Brachiacontha ursine , Novius yemenensis* kabi turlar O‘ zbekiston faunasi uchun yangi turlar hisoblandi.Ushbu turlar juda ham sonli tarqalib, muhofaza muhtoj turlar deb topildi.

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NAMANGAN VILOYATI SUV HAVZALARINING CYANOPHYTA FLORASI VA ULARNING EKOLOGIK-BIOINDIKATSION XUSUSIYATLARI

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Annotatsiya: *Ushbu maqolada Namangan viloyati suv havzalarida uchraydigan Cyanophyta florasining ekologik xususiyatlari va bioindikatsion imkoniyatlari ilmiy adabiyotlar hamda hududning tabiiy-ekologik sharoitlari asosida tahlil qilindi. Tadqiqotda Cyanophyta vakillarining suv muhitidagi tarqalishi, plankton, bentos va perifiton shakllarida rivojlanishi, harorat, yorug‘lik, pH, suv oqimi hamda azot va fosfor birikmalarining ularning rivojlanishiga ta’siri ko‘rib chiqildi. Shuningdek, sianobakteriyalar biomassasining ortishi, dominant turlarning shakllanishi va “suv gullashi” jarayonlari evtrofikatsiya holatini baholashdagi ahamiyati yoritildi. Namangan viloyatidagi daryo, kanal, suv ombori va boshqa suv obyektlarining antropogen yuklamasi qishloq xo‘jaligi faoliyati, mineral o‘g‘itlar, oqova suvlar va suv rejimining o‘zgarishi bilan bog‘liq holda baholandi. Tahlil natijasida Cyanophyta tur tarkibi, dominantlik darajasi, biomassasi va mavsumiy dinamikasidan suv havzalarining ekologik holatini kompleks monitoring qilishda foydalanish mumkinligi asoslandi. Maqolada Namangan viloyati suv havzalari uchun floristik, ekologik va bioindikatsion monitoringni birlashtiruvchi taklifiy model ishlab chiqildi.*

Kalit so‘zlar: *Cyanophyta, sianobakteriyalar, algoflora, suv havzalari, bioindikatsiya, evtrofikatsiya, ekologik monitoring, Namangan viloyati.*

ФЛОРА CYANOPHYTA ВОДОЕМОВ НАМАНГАНСКОЙ ОБЛАСТИ И ИХ ЭКОЛОГО-БИОИНДИКАЦИОННЫЕ СВОЙСТВА

Аннотация: *В статье проанализированы экологические особенности и биоиндикационные возможности представителей Cyanophyta водоемов Наманганской области на основе научной литературы и природно-экологических условий региона. Рассмотрены распространение цианобактерий в водной среде, их развитие в планктоне, бентосе и перифитоне, а также влияние температуры, освещенности, pH, скорости течения и соединений азота и фосфора. Особое внимание уделено увеличению биомассы, формированию доминирующих видов и процессам «цветения» воды как показателям эвтрофикации. Антропогенная нагрузка на реки, каналы, водохранилища и другие водные объекты региона рассмотрена в связи с сельскохозяйственной деятельностью, применением минеральных удобрений, поступлением сточных вод и изменением водного режима. Показано, что видовой состав, степень доминирования, биомасса и сезонная динамика Cyanophyta могут использоваться для комплексного мониторинга экологического состояния водоемов. Предложена модель мониторинга, объединяющая флористические, экологические и биоиндикационные показатели для водных объектов Наманганской области.*

Ключевые слова: *Cyanophyta, цианобактерии, альгофлора, водоемы, биоиндикация, эвтрофикация, экологический мониторинг, Наманганская область.*

CYANOPHYTA FLORA OF WATER BODIES OF NAMANGAN REGION AND THEIR ECOLOGICAL-BIOINDICATIVE PROPERTIES

Annotation: *The article analyzes the ecological characteristics and bioindicative potential of Cyanophyta occurring in water bodies of Namangan Region on the basis of scientific literature and the natural and ecological conditions of the region. The distribution of cyanobacteria in aquatic environments, their development as planktonic, benthic and periphytic forms, and the effects of temperature, light, pH, water flow, nitrogen and phosphorus compounds were considered. Particular attention was paid to biomass increase, dominance patterns and algal blooms as indicators of eutrophication. Anthropogenic pressure on rivers, canals, reservoirs and other water bodies was assessed in relation to agricultural activity, mineral fertilizers, wastewater inputs and changes in the hydrological regime. The analysis demonstrates that species composition, dominance, biomass and seasonal dynamics of Cyanophyta*

can be used for integrated assessment of aquatic ecosystem condition. A monitoring model combining floristic, ecological and bioindicative parameters was proposed for water bodies of Namangan Region.

Keywords: *Cyanophyta, cyanobacteria, algal flora, water bodies, bioindication, eutrophication, ecological monitoring, Namangan Region.*

KIRISH

Suv ekotizimlari biologik xilma-xillikni saqlash, moddalar aylanishi va hududlarning ekologik barqarorligini ta'minlashda muhim o' rin tutadi. Suv havzalarining ekologik holatini baholashda fizik-kimyoviy ko' rsatkichlar bilan bir qatorda biologik indikatorlardan foydalanish tobora kengayib bormoqda. Mikroalgalar va sianobakteriyalar suv muhitidagi o' zgarishlarga tez javob berishi sababli ekologik monitoring uchun muhim biologik guruhlardan hisoblanadi [1, 2].

Cyanophyta an'anaviy algologik adabiyotlarda ko' k-yashil suvo' tlar sifatida yuritilgan bo' lib, zamonaviy biologiyada ko' pincha sianobakteriyalar nomi bilan ifodalanadi. Ularning ayrim vakillari yuqori harorat, yorug' lik, ozuqa elementlari miqdori va suvning gidrologik rejimidagi o' zgarishlarga moslasha oladi. Shu sababli sianobakteriyalar jamoasining tarkibi va biomassasidagi o' zgarishlar suv ekotizimlarining trofik holati haqida muhim ma'lumot beradi [3, 4].

Namangan viloyati Farg' ona vodiysining sharqiy qismida joylashgan bo' lib, hududda daryolar, kanallar, suv omborlari, kollektor-drenaj tarmoqlari va turli sun'iy suv havzalari mavjud. Sug' orma dehqonchilikning rivojlanganligi suv obyektlariga tushadigan antropogen yuklamaning shakllanishiga sabab bo' ladi. Mazkur sharoitda Cyanophyta florasining ekologik xususiyatlarini o' rganish hudud suv havzalarining ekologik holatini baholash uchun dolzarb hisoblanadi.

Suv havzalarining ekologik holatini faqat fizik-kimyoviy parametrlar asosida baholash ayrim hollarda yetarli bo' lmasligi mumkin. Chunki biologik jamoalar muhitdagi o' zgarishlarning ma'lum vaqt davomida shakllangan integrallashgan ifodasini beradi. Shu sababli suv organizmlarining tur tarkibi, dominantlik darajasi va mavsumiy dinamikasi ekologik monitoringning muhim komponentlari hisoblanadi [1, 2].

Tadqiqotning maqsadi - Namangan viloyati suv havzalarida Cyanophyta florasining ekologik xususiyatlari va bioindikatsion ahamiyatini ilmiy adabiyotlar hamda hududning ekologik sharoitlari asosida tahlil qilish.

Tadqiqot vazifalari quyidagilardan iborat: Cyanophyta ning suv ekotizimlaridagi ekologik rolini tahlil qilish; ularning plankton, bentos va perifiton shakllarini tavsiflash; harorat, yorug' lik, pH, suv oqimi, azot va fosforning sianobakteriyalar rivojlanishiga ta'sirini yoritish; eutrofikatsiya va "suv gullashi" jarayonlarida Cyanophyta ning ahamiyatini baholash; Namangan viloyati suv havzalari uchun bioindikatsion monitoring modelini taklif etish.

ADABIYOTLAR TAHLILI

Cyanobacteria suv ekotizimlarining holatini baholashda bioindikator va bioreporter sifatida qo' llanishi mumkinligi Mateo va hammualliflar tomonidan batafsil yoritilgan. Mualliflar sianobakteriyalarning ekologik omillarga javob reaksiyasi va ayrim taksonlarning atrof-muhitdagi o' zgarishlarni aks ettirish imkoniyatlarini ko' rsatgan [1]. Daryo mikroalgalaridan biologik monitoringda foydalanish bo' yicha tadqiqotlarda esa tur tarkibi, jamoa tuzilishi va ekologik xususiyatlar suv muhitining holatini baholashda muhim indikatorlar ekanligi qayd etilgan [2].

Cyanobakterial "gullash" jarayonlari bo' yicha zamonaviy tadqiqotlar bu hodisaning ozuqa elementlari bilan boyish, suv haroratining oshishi, suvning turg' unlashuvi va iqlim omillari bilan bog' liqligini ko' rsatadi [3, 4, 9]. Evtrofikatsiya kuchaygan suv havzalarida ayrim sianobakteriyalar tez ko' payib, jamoada ustunlik qilishi mumkin [11, 12]. Bunday jarayonlar suvning shaffofligi, kislorod rejimi va ekologik sifatiga ta'sir ko' rsatadi.

O' zbekiston va Farg' ona vodiysi suv havzalari algoflorasiga oid tadqiqotlar ham Cyanophyta vakillarining mahalliy suv obyektlarida muhim guruh ekanligini ko' rsatadi. Eskiyer suv ombori algoflorasining sistematik tahlilida Cyanophyta vakillari alohida guruh sifatida ko' rib chiqilgan [5]. Katta Namangan va Katta Farg' ona kanallari algoflorasining taksonomik tarkibiga oid tadqiqotlar esa sug' orish kanallarida algalar xilma-xilligini o' rganishning ilmiy-amaliy ahamiyatini ko' rsatadi [6].

Cyanobacteria ekologiyasi bo' yicha fundamental manbalarda ularning turli ekologik sharoitlarga moslashish mexanizmlari, plankton va bentos shakllari, azot fiksatsiyasi hamda yorug' lik va haroratga munosabati batafsil yoritilgan [7, 14, 19]. Azot va fosforning ortiqcha tushishi esa sianobakterial biomassaning ko' payishi va suv "gullashi" jarayonlari bilan bog' lanadi [8, 9, 11].

Bundan tashqari, sianobakteriyalarning ekologik monitoringdagi ahamiyati ularning muayyan ekologik omillarga sezgirligi bilan ham izohlanadi. Ayrim turlar oziqa elementlari ko' paygan sharoitlarda tez rivojlanishi mumkin bo' lsa, boshqa guruhlar suv oqimi, yorug' lik yoki substrat xususiyatlariga nisbatan o' ziga xos munosabat bildiradi [7, 15].

Shuning uchun Cyanophyta jamoasining o‘ zgarishini suv havzasining ekologik sharoitlari bilan birgalikda baholash zarur.

Tadqiqot tahliliy-ekologik yondashuvga asoslandi. Unda Cyanophyta ekologiyasi, bioindikatsiya, evtrofikatsiya va chuchuk suv algoflorasi bo‘ yicha ilmiy adabiyotlar umumlashtirildi hamda Namangan viloyatining suv obyektlari uchun qo‘ llash mumkin bo‘ lgan ekologik mezonlar tizimlashtirildi. Mahalliy sharoitni tavsiflashda daryo, kanal, suv ombori va boshqa suv obyektlarining gidrologik xususiyatlari hamda antropogen yuklama omillari hisobga olindi.

Tahlilda asosiy ekologik mezonlar sifatida tur tarkibi, dominant taksonlar, rivojlanish darajasi, mavsumiy dinamika, plankton-bentos-perifiton shakllari, harorat, yorug‘ lik, pH, suv oqimi, azot va fosfor birikmalari hamda antropogen ta’sir darajasi olindi. Bioindikatsion baholashda Cyanophyta ning mavjudligi bitta ko‘ rsatkich sifatida emas, balki fizik-kimyoviy va biologik ma’lumotlar bilan birgalikda talqin qilinishi zarurligi qabul qilindi [1, 2].

Suv havzalarini ekologik jihatdan baholashda biologik indikatorlardan foydalanish uchun birinchi navbatda tur tarkibi aniqlanadi. Keyingi bosqichda dominant taksonlar, ularning rivojlanish darajasi va mavsumiy o‘ zgarishlari baholanadi. Fizik-kimyoviy ma’lumotlar ushbu biologik ko‘ rsatkichlar bilan birlashtirilganda suv havzasining ekologik holati haqida kompleks xulosa chiqarish imkoniyati oshadi.

Muhim metodologik cheklov shundan iboratki, mazkur maqolada yangi dala o‘ lchovlari asosida olingan pH, harorat, azot, fosfor yoki biomassa qiymatlari sun’iy ravishda kiritilmagan. Natijalar mavjud ilmiy manbalar va ekologik qonuniyatlarning Namangan viloyati suv havzalariga nisbatan tahliliy talqiniga asoslangan.

Namangan viloyati suv havzalari gidrologik va antropogen sharoitlarning xilma-xilligi bilan tavsiflanadi. Daryolarda oqim nisbatan faol bo‘ lsa, kanallar va ayrim suv omborlarida suv almashinuvi boshqariladigan yoki mavsumiy xususiyatga ega. Bunday farqlar algalar jamoasining tarkibi va rivojlanishiga bevosita ta’sir qiladi.

Suv oqimi pasaygan, oziqa moddalari to‘ plangan va yorug‘ lik yetarli bo‘ lgan uchastkalarda planktonik sianobakteriyalar biomassasi oshishi uchun qulay sharoit yuzaga kelishi mumkin. Aksincha, oqim tez bo‘ lgan suv obyektlarida planktonik organizmlarning uzoq vaqt davomida bir joyda to‘ planishi qiyinlashadi. Bunday sharoitlarda substratga birikuvchi bentik va perifiton shakllarining ekologik ahamiyati ortishi mumkin.

Cyanophyta ekologik jihatdan planktonik, bentik va perifiton shakllarda uchrashi mumkin. Planktonik vakillar suv qatlamida erkin rivojlanib, suvning trofik holati va mavsumiy o‘ zgarishlarini aks ettiradi. Bentik vakillar tub cho‘ kindilari yoki substrat yuzasida rivojlanib, suv havzasining lokal sharoitlarini ifodalaydi. Perifiton tarkibidagi sianobakteriyalar esa suv o‘ simliklari, toshlar va boshqa substratlarga birikkan holda yashaydi [7, 15].

1-jadval. Cyanophyta ko‘ rsatkichlarining bioindikatsion ahamiyati

Ko‘ rsatkich	Ekologik mazmuni	Bioindikatsion ahamiyati
Tur tarkibi	Sianobakteriyalar xilma-xilligi	Suv muhitining ekologik xususiyatlarini baholash
Dominant turlar	Jamoada ustunlik qiluvchi vakillar	Muayyan ekologik sharoitlarni ko‘ rsatish
Biomassa	Umumiy rivojlanish darajasi	Evtrofikatsiya va “suv gullashi”ni baholash
Mavsumiy dinamika	Yil davomida o‘ zgarish	Ekologik sharoitlar vaqt dinamikasini aniqlash
Ekologik guruhlar	Plankton, bentos, perifiton	Suv obyektining ekologik tipini tavsiflash
Fizik-kimyoviy bog‘ liqlik	pH, harorat, N, P va oqim	Kompleks ekologik monitoring

1-jadvaldan ko‘ rinib turibdiki, Cyanophyta ning bioindikatsion imkoniyatlari birgina tur mavjudligi bilan chegaralanmaydi. Tur tarkibi, dominantlik, biomassaning o‘ zgarishi va mavsumiy dinamika birgalikda baholanganda ekologik holatni ancha ishonchli tavsiflash mumkin. Bu yondashuv biologik va fizik-kimyoviy monitoringni birlashtirishga imkon beradi [1, 2].

Cyanophyta rivojlanishiga fizik-kimyoviy omillarning ta’siri.

Harorat sianobakteriyalar rivojlanishining asosiy ekologik omillaridan biridir. Ko‘ plab chuchuk suv sianobakteriyalari iliq davrda faol rivojlanadi va suv haroratining oshishi ayrim turlarning raqobatbardoshligini kuchaytirishi mumkin [3, 10]. Namangan sharoitida yozgi issiq davr va suv almashinuvi sust bo‘ lgan havzalarning mavjudligi Cyanophyta rivojlanishini monitoring qilishni ayniqsa muhim qiladi.

Yorug‘ lik suv qatlamidagi fotosintetik jarayonlarning intensivligini belgilaydi. Suvning loyqaligi, chuqurligi va suv o‘ simliklari bilan qoplanish darajasi yorug‘ likning kirib borishini o‘ zgartiradi. Suv oqimining kuchayishi esa ayrim planktonik shakllarning to‘ planishiga to‘ sqinlik qilishi mumkin. Aksincha, turg‘ un yoki sekin oqadigan suvlar sianobakterial biomassaning to‘ planishi uchun qulayroq bo‘ lishi mumkin [7, 10].

Suv reaksiyasi - pH ham Cyanophyta jamoalarining shakllanishida muhim omillardan biridir. Biroq faqat pH qiymatiga asoslanib ekologik holat haqida yakuniy xulosa chiqarish noto‘ g‘ ri bo‘ ladi. pH, harorat, oziqa elementlari va biologik ko‘ rsatkichlar birgalikda tahlil qilinishi lozim.

Suvning shaffofligi ham algalar rivojlanishiga ta’sir etuvchi muhim ko‘ rsatkichlardan biridir. Suvda muallaq zarrachalar ko‘ payishi yorug‘ likning suv qatlamlariga kirib borishini kamaytiradi. Shu sababli shaffoflikning o‘ zgarishini Cyanophyta biomassasi bilan birgalikda kuzatish suv ekotizimining ekologik holatini yaxshiroq tushunishga yordam beradi.

Azot va fosfor suv ekotizimlarida birlamchi mahsuldorlikni belgilovchi muhim biogen elementlardir. Ularning ortiqcha miqdorda suv havzalariga tushishi eutrofikatsiya jarayonini tezlashtirishi mumkin [11]. Ayrim sianobakteriyalar atmosfera azotini biologik o‘ zlashtirish imkoniyatiga ega bo‘ lib, bu xususiyat ularga ayrim ekologik sharoitlarda raqobat ustunligini beradi [16].

Qishloq xo‘ jaligi yerlaridan o‘ g‘ itlarning yuvilishi, maishiy va boshqa oqova suvlarning tushishi suv obyektlarida azot va fosfor yuklamasini oshirishi mumkin. Shu sababli Namangan viloyati suv havzalarida Cyanophyta rivojlanishini baholashda suv havzasining oziqa elementlari bilan ta’minlanganlik darajasini hisobga olish zarur.

Azot va fosfor miqdorining ortishi har doim ham sianobakteriyalar biomassasining bir xil darajada oshishiga olib kelmaydi. Chunki ularning rivojlanishi harorat, yorug‘ lik, suvning gidrodinamik holati va boshqa omillar bilan birgalikda belgilanadi. Demak, bioindikatsion baholashda ozuqa elementlarini boshqa ekologik ko‘ rsatkichlar bilan integratsiyalashgan holda tahlil qilish ilmiy jihatdan to‘ g‘ riroq yondashuv hisoblanadi.

Evtrofikatsiya - suv havzasiga biogen elementlarning ortiqcha kelishi natijasida biologik mahsuldorlikning kuchayishi bilan kechadigan ekologik jarayon. Bunday sharoitda ayrim Cyanophyta vakillari tez ko‘ payib, suv yuzasida yoki suv qatlamida ko‘ zga tashlanadigan biomassani hosil qilishi mumkin [3, 4].

Zamonaviy tadqiqotlar sianobakterial dominantlikning trofik holat bilan bog‘ liqligini ko‘ rsatadi [13]. Ayniqsa, suv almashinuvi sust bo‘ lgan va oziqa elementlari to‘ planadigan havzalarda sianobakteriyalarning rivojlanishi kuchayishi mumkin.

“Suv gullashi”ning kuchayishi suvning estetik sifatini pasaytirishdan tashqari, suvning kislorod rejimiga, shaffofligiga va boshqa organizmlar uchun yashash sharoitlariga ta’sir ko‘ rsatishi mumkin. Ayrim sianobakteriyalar biologik faol birikmalar ishlab chiqarishi mumkinligi sababli suv resurslarini boshqarishda bunday holatlarni erta aniqlash muhimdir [4, 17, 18].

Shu nuqtayi nazardan Cyanophyta biomassasining mavsumiy o‘ zgarishini kuzatish ekologik monitoringning muhim yo‘ nalishlaridan biri bo‘ lishi mumkin. Biroq suvning “gullashi”ni faqat ko‘ z bilan kuzatish asosida baholash yetarli emas. Mikroskopik identifikatsiya, biomassa yoki hujayra zichligini baholash hamda fizik-kimyoviy ko‘ rsatkichlar bilan solishtirish talab etiladi.

Namangan viloyatida suv resurslaridan sug‘ orish, maishiy ehtiyojlar va boshqa xo‘ jalik faoliyatlarida foydalanilishi suv ekotizimlariga turli darajadagi antropogen bosimni yuzaga keltiradi. Qishloq xo‘ jaligi faoliyati bilan bog‘ liq ozuqa elementlari, tuproq zarrachalari va boshqa moddalar suvga tushishi mumkin. Suv rejimining o‘ zgarishi ham algalar jamoasi tarkibiga ta’sir ko‘ rsatadi.

Bentos sianobakteriyalari antropogen bosimni baholashda alohida qiziqish uyg‘ otadi. Ularning substrat bilan bevosita aloqasi lokal ekologik sharoitni aks ettirishi mumkin [15]. Shu bilan birga, Cyanophyta mavjudligining o‘ zi suvning ifloslanganligini anglatmaydi. Bioindikatsion xulosa tur tarkibi, dominantlik, biomassasi, ekologik guruh va fizik-kimyoviy ko‘ rsatkichlar majmuasi asosida chiqarilishi kerak.

Antropogen yuklamani baholashda suv havzasining joylashuvi, unga tushuvchi oqimlarning xususiyati, qishloq xo‘ jaligi maydonlariga yaqinligi va suvdan foydalanish intensivligi ham hisobga olinishi lozim. Bunday kompleks yondashuv Cyanophyta ning ekologik ko‘ rsatkich sifatidagi imkoniyatlarini ancha to‘ liq ochib beradi.

Cyanophyta jamoalari yil davomida bir xil tarkibda saqlanib qolmaydi. Harorat, yorug‘ lik davomiyligi, yog‘ ingarchilik, suv oqimi va biogen elementlar miqdorining mavsumiy o‘ zgarishi ularning rivojlanishiga ta’sir etadi. Shu sababli bir martalik kuzatuv asosida suv havzasining ekologik holatiga yakuniy baho berish cheklangan xulosalarga olib kelishi mumkin.

Mavsumiy monitoringda bahor, yoz, kuz va zarur hollarda qish davrlarida namunalar olish maqsadga muvofiq. Bunda bir xil kuzatuv nuqtalaridan foydalanish vaqt davomida o‘ zgarishlarni solishtirish imkonini beradi. Ayniqsa yozgi davrda suv haroratining oshishi va suv almashinuvining kamayishi sianobakteriyalar rivojlanishiga qulay sharoit yaratishi mumkin [3, 10].

Mavsumiy ma’lumotlarni bir necha yil davomida yig‘ ish esa yanada muhim natijalar beradi. Chunki bir yil ichidagi o‘ zgarishlar qisqa muddatli ekologik omillar bilan bog‘ liq bo‘ lishi mumkin, uzoq muddatli kuzatuvlar esa suv havzasidagi barqaror ekologik tendensiyalarni aniqlashga yordam beradi.

Namangan viloyati suv havzalari uchun ekologik monitoringni uch yo‘ nalishda tashkil etish maqsadga muvofiq: floristik, ekologik va bioindikatsion monitoring. Floristik monitoring tur tarkibi va tarqalish xususiyatlarini qayd etishga; ekologik monitoring suv harorati, pH, suvning shaffofligi, oqim va oziqa elementlarini kuzatishga; bioindikatsion monitoring esa biologik ko‘ rsatkichlarni fizik-kimyoviy ma’lumotlar bilan bog‘ lashga qaratiladi.

Bunday tizim suv havzalarida mavsumiy o‘ zgarishlarni aniqlash, evtrofikatsiya xavfini erta baholash va ekologik boshqaruv choralarini rejalashtirish imkonini beradi. Jahon sog‘ liqni saqlash tashkiloti ham sianobakteriyalar bilan bog‘ liq xavflarni boshqarishda monitoring va boshqaruvning tizimli yondashuvini ta’kidlaydi [17, 18].

2-jadval. Namangan viloyati suv havzalari uchun taklif etilayotgan monitoring modeli

Monitoring yo‘ nalishi	Asosiy ko‘ rsatkichlar	Kuzatish davri	Kutiladigan natija
Floristik	Tur tarkibi, dominant taksonlar	Mavsumiy	Cyanophyta xilma-xilligini aniqlash
Ekologik	Harorat, pH, shaffoflik, oqim	Muntazam	Muhit omillarining dinamikasini baholash
Trofik	Azot, fosfor, biomassa	Mavsumiy va zaruratga ko‘ ra	Evtrofikatsiya xavfini baholash
Bioindikatsion	Tur tarkibi , dominantlik ,biomassa	Kompleks	Ekologik holatni integral baholash

Taklif etilayotgan modelning asosiy afzalligi shundaki, unda biologik indikatorlar fizik-kimyoviy ko‘ rsatkichlardan ajratib qo‘ yilmaydi. Masalan, sianobakteriyalar biomassasining ortishi qayd etilgan bo‘ lsa, shu davrda suv harorati, pH, azot va fosfor miqdori ham aniqlanishi lozim. Keyinchalik bu ko‘ rsatkichlar o‘ rtasidagi bog‘ liqlik statistik usullar yordamida baholanishi mumkin.

Kelgusida ushbu model asosida Namangan viloyatining alohida suv obyektlari uchun monitoring kartalari tuzish, namunalar olishning standart nuqtalarini belgilash va ma’lumotlar bazasini shakllantirish mumkin. Bu esa hududiy ekologik monitoringning ilmiy asosini mustahkamlashga xizmat qiladi.

Mazkur ishning ilmiy jihatdan muhim tomoni Namangan viloyati suv havzalarida Cyanophyta florasini ekologik-bioindikatsion yondashuv asosida baholash mezonlarini tizimlashtirishdan iborat. Hudud suv obyektlari uchun tur tarkibi, dominantlik, biomassa, mavsumiy dinamika va fizik-kimyoviy ko‘ rsatkichlarni birlashtiruvchi monitoring modeli taklif etildi.

Tadqiqotning ilmiy ahamiyati Namangan viloyati suv havzalaridagi Cyanophyta florasini ekologik yondashuv asosida baholash mezonlarini tizimlashtirish bilan belgilanadi. Mahalliy algoflora bo‘ yicha mavjud ma’lumotlarni umumlashtirish hudud suv obyektlarining biologik monitoringini rivojlantirish uchun asos bo‘ lib xizmat qiladi.

Amaliy jihatdan Cyanophyta tur tarkibi, dominantligi va biomassasini muntazam kuzatish suv havzalarida ekologik o‘ zgarishlarni erta aniqlashga yordam beradi. Natijalardan ekologik monitoring, suv resurslarini boshqarish, biologiya va ekologiya fanlarini o‘ qitish hamda keyingi dala tadqiqotlarini rejalashtirishda foydalanish mumkin.

Shuningdek, mazkur yondashuv suv havzalarida evtrofikatsiya xavfini oldindan baholash uchun dastlabki biologik mezon sifatida xizmat qilishi mumkin. Bunda Cyanophyta ko‘ rsatkichlari mustaqil diagnostika vositasi sifatida emas, balki boshqa biologik va fizik-kimyoviy ko‘ rsatkichlar bilan birgalikda qo‘ llanilishi kerak.

Ushbu maqolaning asosiy cheklovi yangi dala kuzatuvlari asosida olingan miqdoriy ma’lumotlarning maqolaga kiritilmaganidir. Shu sababli keltirilgan xulosalar ilmiy adabiyotlar va hududning ekologik xususiyatlari asosidagi tahliliy xulosalar sifatida qaralishi lozim.

Kelgusidagi dala tadqiqotlarida Namangan viloyatining tanlangan suv obyektlaridan mavsumiy ravishda suv va substrat namunalari olish, Cyanophyta vakillarini mikroskopik aniqlash, tur tarkibini shakllantirish, dominant turlarni aniqlash va biomassa yoki hujayra zichligini hisoblash muhim vazifa hisoblanadi.

Shuningdek, har bir kuzatuv nuqtasida suv harorati, pH, shaffoflik, elektr o‘ tkazuvchanlik, erigan kislorod, azot va fosfor birikmalarini aniqlash maqsadga muvofiq. Olingan ma’lumotlarni statistik jihatdan qayta ishlash orqali Cyanophyta tarkibi bilan ekologik omillar o‘ rtasidagi bog‘ liqlikni aniqlash mumkin.

Bunday tadqiqotlar natijasida Namangan viloyati suv havzalarining Cyanophyta florasiga oid haqiqiy hududiy ma’lumotlar bazasi yaratiladi. Bu esa keyinchalik hudud uchun ilmiy asoslangan bioindikatsion mezonlarni ishlab chiqish imkonini beradi.

Namangan viloyati suv havzalarida Cyanophyta florasi ekologik sharoitlarning o‘ zgarishiga sezgir biologik guruhlardan biri sifatida qaralishi mumkin. Ularning rivojlanishi harorat, yorug‘ lik, pH, suv oqimi va biogen elementlar miqdori bilan chambarchas bog‘ liq.

Cyanophyta ning tur tarkibi, dominantlik darajasi, biomassasi va mavsumiy dinamikasini o‘ rganish suv havzalarining trofik holatini va antropogen bosim darajasini baholashga qo‘ shimcha biologik mezon beradi. Biroq bioindikatsion xulosa faqat sianobakteriyalarning mavjudligiga emas, balki bir nechta ekologik ko‘ rsatkichlarning kompleks tahliliga asoslanishi lozim.

Namangan viloyati uchun floristik, ekologik va bioindikatsion monitoringni birlashtiruvchi tizimni joriy etish suv havzalarining ekologik holatini muntazam baholash, evtrofikatsiya xavfini erta aniqlash va suv resurslarini oqilona boshqarish uchun istiqbolli yo‘ nalish hisoblanadi.

Kelgusidagi dala tadqiqotlarida aniq suv obyektlari kesimida tur tarkibi, biomassa, pH, harorat, azot va fosfor miqdorlarini mavsumiy takroriy kuzatish ushbu xulosalarning empirik asosini kuchaytiradi. Ayniqsa, bir necha yil davomida olib boriladigan muntazam monitoring Cyanophyta jamoalarining hududiy va mavsumiy dinamikasini chuqurroq tushunish imkonini beradi.

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NAMANGAN VILOYATIDA KO‘ KALAMZORLASHTIRISHDA FOYDALANILAYOTGAN DARAXT VA BUTALARNING TAKSONOMIK TAHLILI

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Annotatsiya: *Ushbu maqolada Namangan viloyatida ko‘ kalamzorlashtirishda foydalanilayotgan daraxt va butalarning taksonomik tahlili o‘ rganildi. Bunda viloyatida ko‘ kalamzorlashtirishda 76 ta turkum, 131 ta tur va 5 ta formadan keng foydalanilayotgani ma’lum bo‘ ldi. Ular 41 ta oilaga mansubligi, yetakchi oilalar soni 5 ta ni tashkil qilib, bunda Rosaceae, Pinaceae, Cupressaceae, Fabaceae va Caprifoliaceae lar adaptiv imkoniyatlari yuqori, turlar xilma-xilligi ko‘ p ekanligi ma’lum bo‘ ldi. Foydalinayotgan assortimentlarning foydalanish sohalari bo‘ yicha ham tahlil amalga oshirilganda yetakchi o‘ rinni ko‘ kalamzorlashtirish va o‘ rmonchilik sohalari qamrab olgani ma’lum bo‘ ldi. Foydalanilayotgan o‘ simliklarni introduksion muvoffaqqiyati (IMI) bo‘ yicha 1 dan 5 ballik shkalada baholanganda 89 % dan ortiq turlar yuqori moslashuvchanlikka, 11 % kam moslashuvchanlikka ega bo‘ lganligi kuzatildi.*

Kalit so‘ zlar: *Introduksiya, ko‘ kalamzorlashtirish, taksonomik tahlil, Namangan, daraxt, buta, manzarali, dendrologik tahlil, yashil hudud, o‘ rmonchilik.*

ТАКСОНОМИЧЕСКИЙ АНАЛИЗ ДЕРЕВЬЕВ И КУСТОВ, ИСПОЛЬЗУЕМЫХ В Озеленении РЕГИОНА НАМАНГАН

Примечание: *В данной статье проведен таксономический анализ деревьев и кустарников, используемых в озеленении региона Наманган. Установлено, что в регионе широко используются 76 родов, 131 вид и 5 форм. Они принадлежат к 41 семейству, из которых 5 являются ведущими, причем Rosaceae, Pinaceae, Cupressaceae, Fabaceae и Caprifoliaceae обладают высоким адаптивным потенциалом и большим видовым разнообразием. При анализе используемых сортов по областям применения было установлено, что ведущее место занимают области озеленения и лесоводства. При оценке успешности интродукции (УИ) используемых растений по шкале от 1 до 5 было отмечено, что более 89% видов обладают высокой адаптивностью, а 11% — низкой.*

Ключевые слова: *Введение, озеленение, таксономический анализ, Наманган, дерево, кустарник, декоративное растение, дендрологический анализ, зеленая зона, лесное хозяйство.*

TAXONOMIC ANALYSIS OF TREES AND SHRUBS USED FOR GREENING IN THE NAMANGAN REGION

Abstract: *This article presents a taxonomic analysis of the trees and shrubs used for landscaping and greening in the Namangan region. The study revealed that 76 genera, 131 species, and 5 forms are widely utilized for this purpose. These plants belong to 41 families, with five leading families—Rosaceae, Pinaceae, Cupressaceae, Fabaceae, and Caprifoliaceae—demonstrating high adaptive capacity and significant species diversity. An analysis of the areas of application showed that landscaping and forestry are the primary sectors utilizing these plant varieties. When evaluated on a 1-to-5 scale for introduction success (IS), over 89% of the species exhibited high adaptability, while 11% showed lower adaptability.*

Keywords: *Introduction, greening, taxonomic analysis, Namangan, tree, shrub, ornamental, dendrological analysis, green space, forestry.*

KIRISH

Ma’lumki so‘nggi yillarda Respublikamizda ko‘kalamzorlashtirish, obodonlashtirish hamda yashil hududlarni kengaytirshda istiqbolli, manzarali, daraxt butalar assortimenti va introduksiya jarayonlarini yanada rivojlantirish, hamda biologik xilma-xillikni saqlashga keng e’tibor qaratilmoqda. Bu borada ko‘kalamzorlashtirishda foydalanilayotgan mahalliy introdutsent assortimentlarning biologiyasini o‘rganish muhim ahamiyat kasb etadi. Bunda keskin kontinental iqlim sharoitlarimizga chidamli bo‘lgan introdusent turlarni tadbiq etish kelgusida ulardan samarali

foydalanish imkonini beradi. Inson faoliyati o‘ simliklar bilan uzviy bog‘ liqligi juda qadimdan ma’lum. Ular dastlab oziq-ovqat sifatida keng ishlatilgan. Keyinchalik esa bu o‘ simliklarning ayrim imkoniyatlari, jumladan ko‘ kalamzorlashtirish hamda dorivor o‘ simliklar sifatida foydalanish keng tarqala boshlagan [1]. Bugungi kunga kelib bu turdagi daraxt butalardan ko‘ kalamzorlashtirish, obodonlashtirish sohalarida keng foydalanib kelinmoqda. Shuningdek, mamlakatimizda ham so‘ ngi yillarda “Yashil makon” umummilliy loyihasi doirasida birgina 2024 yil bahorgi mavsumning o‘ zida Respublika bo‘ yicha 127 million tupdan ziyod daraxt va buta ko‘ chatlar ekildi. Ekologiya, atrof-muhitni muhofaza qilish va iqlim o‘ zgarishi vazirligi ma’lumotiga ko‘ ra, har bir viloyatlarda o‘ rtacha 8–10 million tup manzarali mevali ko‘ chatlar o‘ tqazilgan. Shuningdek, Namangan viloyatida 2024 yil 9 aprel holatiga ko‘ ra 10 million 113 ming tup daraxt va buta ko‘ chatlar ekilib, loyiha doirasida hududlarni ko‘ kalamzorlashtirish bo‘ yicha yuqori ko‘ rsatkichga erishildi [2].

Mamlakatimizda ko‘ kalamzorlashtirish va manzarali bog‘ dorchilik maqsadlarida daraxt-butalar va gullovchi manzarali o‘simliklar introduksiyasi hajmi sezilarli darajada oshib bormoqda. Jumladan: Namangan viloyatida ham mahalliy ekotizimni yanada boyitish va ekologik vaziyatni barqarorlashtirish maqsadida yuqori manzarali, ko‘ kalamzorlashtirish, farmatsevtika va o‘rmon xo‘jaligida foydalanish uchun istiqbolli daraxt-buta hamda o‘t o‘simliklar turlari introduksiya qilinmoqda. Bu ishlar shahar hamda qishloq hududlarida yashil maydonlarni yanada kengaytirish, atmosferadagi havo sifatini yaxshilash va aholi uchun sog‘ lom tabiiy muhitni yaratishga xizmat qilmoqda.

ADABIYOTLAR TAHLILI VA METODLAR

Qayimov A.K., Berdiyev E.T., va boshqalar tomonidan 2012-yil berilgan ma’lumotlarida keltirilishicha qadimgi Misrda jamoat joylarida, saroy bog‘ lari va xonalarini ko‘ kalamzorlashtirishda manzarali daraxt butalardan foydalanib kelinganligi, Tel-El Amarandan topilgan qadimiy yozuvlardagi ma’lumotlarga ko‘ ra yo‘ l chetlarida manzaralari o‘ simliklar ekilgani aniqlanishi bo‘ yicha asoslar keltirilgan. Shuningdek, O‘ zbekiston respublikasida o‘ suvchi mahalliy hamda introduksiya qilingan daraxt-buta turlarining sistematikasi, biologik va ekologik xususiyatlari, tarqalish areali, ko‘ kalamzorlashtirish va o‘ rmon xo‘ jaligidagi amaliy ahamiyati bo‘ yicha asosiy jihatlar ko‘ rsatib berilgan. [3]

Namangan viloyati 1941-yil 6-martda tashkil etilgan bo‘lib, Farg‘ ona vodiysining shimoliy qismida, asosan tekislik hududda joylashgan. Iqlimi keskin kontinental, yozda issiq, qishda nisbatan sovuq. Vegetatsiya davri esa o‘ simliklarda o‘rtacha 220-240 kun. Yillik yog‘ in miqdori hududlar kesimida 90–600 mm oralig‘ ida bo‘lib, asosan bahor va kuz fasllarida kuzatiladi. Tuproqlari o‘tloq, bo‘z hamda prolyuvial turlarga mansub bo‘lib, ayrim joylarda sho‘rxok hududlar uchraydi [4,5,6,7].

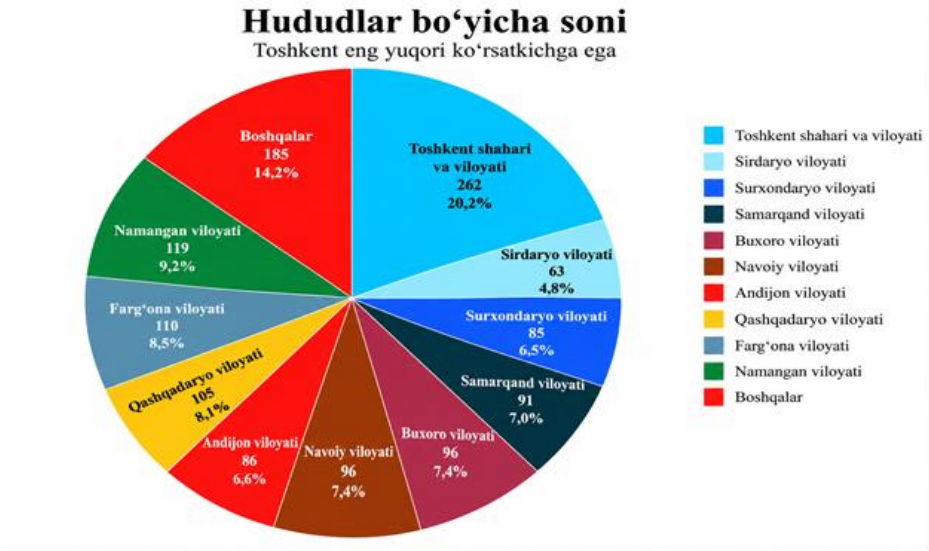
Zakirov K.Z ning 1971-yilda berilgan ma’lumotlariga ko‘ ra Namangan viloyatida daraxt butalar introduksiyasi dastlab miloddan avvalgi ilk o‘ rta asrlarda. Anjir (*Ficus carica*), anor (*Punica granatum*), zaytun (*Olea europaea*), uzum (*Vitis vinifera*), chinor (*Platanus orientalis*) kabi o‘ simliklar keltirilgan [8].

XIX asr oxiri XX asr boshlarida esa kashtan (*Aesculus hippocastanum*), oq akatsiya (*Robinia pseudoacacia*), lipa (*Tilia cordata*), yapon saforasi (*Sophora japonica*), zarang (*Acer spp.*) qizil eman (*Quercus rubra*), amerika zarangi (*Acer negundo*), pavlovniya (*Paulownia* tomentosa), terak navlari (*Populus italica*), forsitsiya (*Forsythia*), oddiy siren (*Syringa vulgaris*), Suriya gibiskusi (*Hibiscus syriacus*), shamshod (*Buxus sempervirens*), lavanda (*Lavandula*) olib kelinganligi bo‘ yicha Qodirov A va A.Fayziyevlarning ma’lumotlarida keltirilgan [9].

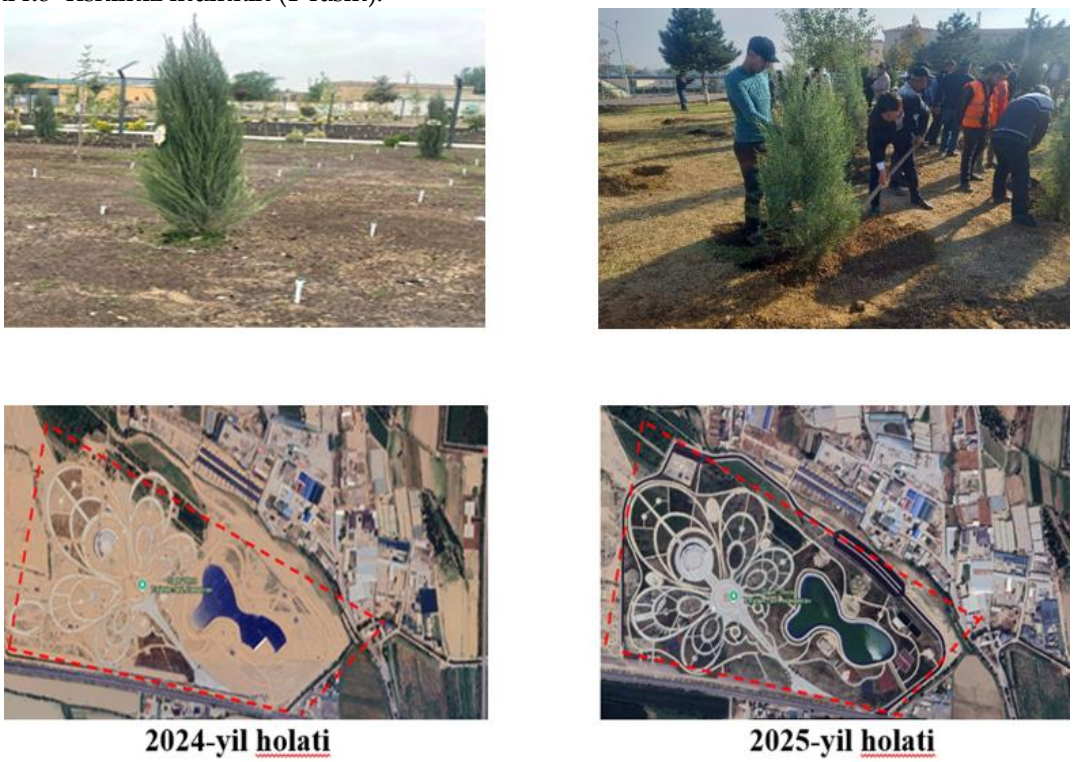
Namangan viloyati hududlarining dendrologik tahlili 2022-yilda Toshkent botanika bog‘ i dendrologlari E.Temirov va boshqalar tomonidan berilgan ma’lumotlarga ko‘ ra 119 ta turdagi ko‘ kalamzorlashtirishda foydalanilayotgan daraxt butalar assortimenti borligi aniqlangan [10].

Tadqiqot obyektlari uchun Namangan viloyati shahar, tuman markazlari bog‘ park, hiyobonlar, dam olish maskanlari, hokimlik binolari hududlari tanlab olindi. O‘ simliklarning taksonomik nomlari va sistematik mansubligini aniqlashda Plants of the World Online (POWO) xalqaro elektron ma’lumotlar bazasidan foydalanildi [11]. Manzarali daraxt-buta turlarining introduksion muvaffaqiyatlilik darajasi Lapin va Sidneva (1973) tomonidan ishlab chiqilgan 5 ballik baholash shkalasi yordamida tahlil qilindi [12]. Tadqiqot ishini xaritalash orqali o‘ rganish jarayoni A.D. Pastushenko (2023) tomonidan 2012–2021-yillar davomida Ryazan shahri dendroflorasi to‘ rtizimli xaritalash usuli asosida o‘ rganildi. Bunda daraxt va butalar tarqalishi, turlarning tarkibi hamda hududiy joylashuvini aniqlashda qo‘ llanilgan [13].

TADQIQOT NATIJALARI 2025-yilda olib borilgan tadqiqot natijalarga ko‘ ra, o‘ rganilgan hududlarda 41 ta oila, 76 ta turkumga mansub 131 ta tur va 5 ta forma shundan 9 ta maxalliy 122 ta xorijiy turlardan iborat assortimentlardan foydalanilayotganligi ma’lum bo‘ ldi. Oilalar bo‘ yicha turlar sonini notekis taqsimlanganligi kuzatildi. 2022-yil Toshkent botanika bog‘ i xodimlari tomonidan Namangan viloyatida ko‘ kalamzorlashtirishda foydalanilayotgan turlar soni 119 ta ekanligi qayd etilgan (1-diagramma).



1-diagramma Assortimentlarning yangi turlar bilan boyishiga viloyatda so‘nggi yillarda “Yashil makon” umummilliy loyihasi doirasida Yangi O‘zbekiston bog‘i, Nuroniylar bog‘i va ilmiy tadqiqotlar uchun mo‘ljallangan NamDU hududida tashkil etilgan Ekobog‘ kabi xududlarni misol qilib keltirishimiz mumkin. Buning natijasida so‘nggi uch yilda oilalar soni 37 tadan 41 taga turlar soni 119 tadan 131 taga yetdi. Assortimentlardan yangi 4 ta ***Celastraceae, Myrtaceae, Ericaceae, Garryaceae*** oilalarga mansub 5 ta tur *Callistemon, Rhododendron* sp., *Aucuba japonica, Euonymus japonicus ’Bravo‘ , E. japonicus ‘Aureomarginatus’* qolgan turlar esa avvaldan mavjud oilalar tarkibiga kiruvchi yangi tur hisoblanadi. Ko‘kalamzorlashtirish, obodonlashtirish ishlari natijasida viloyat hududida yashil xududlarning ortib borayotganligini ko‘rishimiz mumkin (1-rasm).



1-rasm Ayrim oilalar yuqori tur boyligi bilan ajralib, ko‘kalamzorlashtirishda yuqori o‘rinni egallaydi. Eng yuqori tur soni ko‘rsatkichiga ega bo‘lgan oila ***Rosaceae*** bo‘lib, jami 16 ta tur aniqlandi. Ushbu oila vakillari hududni ko‘kalamzorlashtirishda muhim tarkibiy qismini tashkil etib, ekologik moslashuvchanligi hamda xo‘jalik ahamiyati bilan ajralib turadi.

Ikkinchi o‘rinda esa *Cupressaceae* oilasi joylashgan bo‘lib, 10 ta tur bilan ifodalangan. Ushbu oila vakillari ko‘kalamzorlashtirish va landshaft dizaynida juda keng qo‘llanilishi bilan alohida ahamiyatga ega. Yuqori tur boyligiga ega bo‘lgan oilalar safiga *Pinaceae, Leguminosae (Fabaceae)* va *Caprifoliaceae* - 9 ta dan tur, *Salicaceae* - 7 ta, *Sapindaceae* - 5 ta , *Fagaceae* va *Hydrangeaceae* — har biridan 4 ta turlar mavjudligi ma’lum bo‘ldi. (1-jadval).

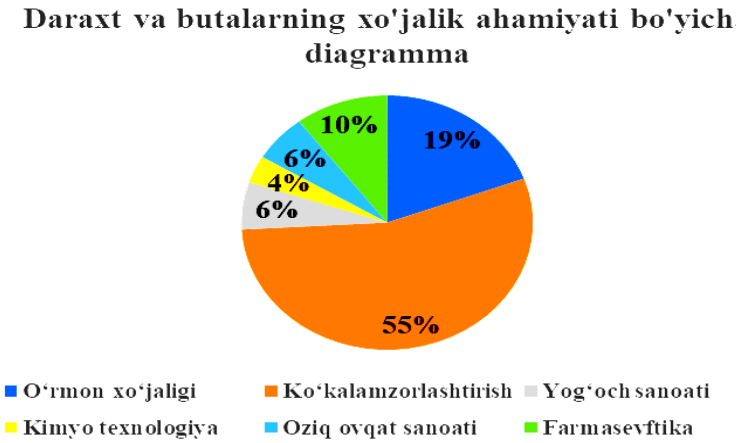
Namangan viloyatida ko‘ kalamzorlashtirishda foydalanilayotgan daraxt va butalar oilalasi va turlar soni

1-jadval

№	Oilalar nomi	Turlar soni	№	Oilalar nomi	Turlar soni
1	*Malvaceae*	1	**22**	*Magnoliaceae*	2
2	*Lythraceae*	1	**23**	*Moraceae*	4
3	*Hydrangeaceae*	4	**24**	*Platanaceae*	2
4	*Oleaceae*	10	**25**	*Apocynaceae*	1
5	*Berberidaceae*	5	**26**	*Buxaceae*	2
6	*Leguminosae Fabaceae*	9	**27**	*Asparagaceae*	1
7	*Rosaceae*	16	**28**	*Arecaceae*	1
8	*Caprifoliaceae*	9	**29**	*Ginkgoaceae*	1
9	*Fagaceae*	4	**30**	*Elaeagnaceae*	1
10	*Sapindaceae*	5	**31**	*Paeoniaceae*	1
11	*Ebenaceae*	2	**32**	*Lamiaceae*	1
12	*Tiliaceae*	2	**33**	*Meliaceae*	1
13	*Ulmaceae*	2	**34**	*Aquifoliaceae*	2
14	*Cannabaceae*	1	**35**	*Bignoniaceae*	2
15	*Simaroubaceae*	1	**36**	*Anacardiaceae*	1
16	*Juglandaceae*	2	**37**	*Scrophulariaceae*	1
17	*Salicaceae*	7	**38**	*Calycanthaceae*	1
18	*Cupressaceae*	10	**39**	*Paulowniaceae*	1
19	*Pinaceae*	9	**40**	*Myrtaceae*	1
20	*Celastraceae*	2	**41**	*Ericaceae*	1
21	*Garryaceae*	1			

Ushbu oilalar ko‘ kalamzorlashtirishda biologik xilma-xillikni oshirishda muhim ahamiyat kasb etadi. Qolgan oilalar esa aksariyati 1–2 tadan turlar bilan ifodalangan bo‘ lib, ular yashil hududda kam uchraydigan yoki tor ekologik moslashuvga ega bo‘ lgan guruhlarni tashkil etadi. Umuman olganda, tadqiqot hududimizda ***Rosaceae, Pinaceae, Cupressaceae va Fabaceae*** oilalari turlar soni jihatdan dominant hisoblanadi. Bunda oilalarning ustunligi hududning iqlim sharoiti, tuproq xususiyatlari hamda antropogen omillar bilan chambarchas bog‘ liqligini ko‘ rishimiz mumkin.

Viloyat hududida ko‘ kalamzorlashtirishda foydalanilayotgan assortimentlarning xo‘ jalik sohalarida foydalanish bo‘ yicha tahlili amalga oshirildi. Buda foydalanish sohalarini shartli ravishda oltita yo‘ nalishga bo‘ lindi. Bular quyidagi sohalar: O‘ rmon xo‘ jaligi, ko‘ kalamzorlashtirish, yog‘ och sanoati, kimyo texnologiya, oziq ovqat sanoati, va farmasevftika sohalari bo‘ yicha tahlili keltiriladi (2- diagramma)



2-diagramma Diagramma natijalari shuni ko‘ rsatadiki, o‘ rganilgan o‘ simlik turlari xo‘ jalik ahamiyatiga ko‘ ra eng yuqori ko‘ rsatkichda ko‘ kalamzorlashtirishda 127 ta tur, o‘ rmon xo‘ jaligida 45 ta, farmasevftika sohasida 24 ta, yog‘ och sanoati 14 ta, oziq ovqat sanoati 14 ta, turlardan foydalanish imkoniyati mavjud. Eng past ko‘ rsatkich kimyo texnologiyasi yo‘ nalishi bo‘ lib, 8 ta tur bilan ifodalangan. Umuman olganda, yuqoridagi natijalar yashil hududlarni ko‘ p tarmoqli xo‘ jalik ahamiyatga ega ekanligini ko‘ rsatadi.

Ko‘ kalamzorlashtirishda foydalanilayotgan o‘ simliklarni introduksion muvoffaqqiyati (IMI) bo‘ yicha 1-5 ballik shkalada ham tahlil qilindi. Bunda ularning 67 % 5 ball, 22 % 4 ball bilan baholangan, qolgan 11 % esa past ballarni tashkil etadi (2-jadval).

2-jadval

Namangan viloyati dendroflorasi introdutsentlarni muvaffaqiyatlilik moslashuv indeksi

	Oila (Familia)	**O‘ simlik nomi**	IMI	**№**	**Oila (Familia)**	**O‘ simlik nomi**	**IMI**
1	*Malvaceae*	*Hibiscus syriacus*	*5*			*Populus alba*	***5***
2	*Lythraceae*	*Lagerstroemia indica*	*5*			*Populus pruinosa*	***5***
3	*Hydrangeaceae*	*Deutzia amurensis*	*4*	***12***	*Salicaceae*	*Populus trichocarpa*	***5***
		Deutzia scabra	*4*			*Populus bachofenii*	***5***
		Deutzia mollis	*4*			*Salix babylonica*	***5***
		Hydrangea macrophylla	*3*			*Salix nigra*	***5***
4	*Oleaceae*	*Ligustrum lucidum*	*5*			*Salix alba*	***5***
		Forsythia europaea	*5*	***13***	*Cupressaceae*	*Thuja occidentalis*	***5***
		Forsythia suspensa	*5*			*Platycladus orientalis*	***5***
		Forsythia viridissima	*5*			*Platycladus orientalis f. compacta*	***5***
		Syringa vulgaris	*5*			*Juniperus virginiana*	***5***
		Fraxinus pennsylvanica	*5*			*Juniperus sabina*	***5***
		Fraxinus excelsior	*5*			*Juniperus excelsa*	***4***
		Fraxinus sogdiana	*5*			*Juniperus chinensis*	***4***
		Osmanthus fragrans	*4*			*Cupressus arizonica*	***5***
		Olea europaea	*3*			*Cupressus sempervirens*	***5***
5	*Berberidaceae*	*Berberis thunbergii*	*5*			*Metasequoia glyptostroboides*	***5***
		Berberis julianae	*5*	***14***	*Pinaceae*	*Pinus pallasiana Lamb.*	***5***
		Nandina domestica Thunb	*3*			*Pinus nigra J.F.Arnold.*	***5***
		Mahonia Nutt	*5*			*Pinus eldarica*	***5***
		Berberis thunbergii ‘Atropurpurea’	*5*			*Cedrus deodara*	***3***
6	*Fabaceae (Leguminosae)*	*Spartium junceum*	*5*			*Cedrus libani*	***2***
		Robinia pseudoacacia	*5*			*Picea pungens*	***4***
		Robinia viscosa	*5*			*Picea schrenkiana Fisch. & C.A.Mey.*	***3***
		Robinia neomexicana	*5*			*Pseudotsuga menziesii*	***2***
		Albizia julibrissin	*5*			*Pseudotsuga menziesii (Mirb.) Franco*	***2***
		Gleditsia	*5*	***15***	*Magnoli*	*Liriodendron tulipifera*	***5***

		triacanthos			*aceae*		
		Sophora japonica	*5*			*Magnolia grandiflora L*	***4***
		Caesalpinia pulcherrima	*3*			*Morus alba*	***5***
		Wisteria sinensis (Sims) Sweet	*4*	***16***	*Moraceae*	*Morus nigra*	***5***
7	*Rosaceae*	*Pyracantha coccinea*	*5*			*Broussonetia papyrifera*	***5***
		Pyracantha crenulata	*5*			*Maclura aurantiaca Nutt.*	***5***
		Crataegus turkestanica	*5*	***17***	*Platanaceae*	*Platanus orientalis*	***5***
		Cotinus coggygria	*4*			*Platanus occidentalis*	***5***
		Chaenomeles maulei	*4*	***18***	*Buxaceae*	*Buxus sempervirens*	***5***
		Chaenomeles japonica	*5*			*Buxus microphylla*	***5***
		Prunus laurocerasus	*3*	***19***	*Apocynaceae*	*Nerium oleander*	***4***
		Prunus pissardii	*5*	***20***	*Asparagaceae*	*Yucca aloifolia*	***5***
		Prunus subg. Cerasus	*5*	***21***	*Arecaceae*	*Washingtonia filifera*	***3***
		Rosa chinensis	*4*	***22***	*Ginkgoaceae*	*Ginkgo biloba*	***4***
		Spiraea cantoniensis	*4*	***23***	*Elaeagnaceae*	*Elaeagnus orientalis*	***5***
		Spiraea japonica	*4*	***24***	*Paeoniaceae*	*Paeonia suffruticosa*	***4***
		Photinia serrulate	*4*	***25***	*Lamiaceae*	*Rosmarinus officinalis*	***4***
		Physocarpus pulifolius	*4*	***26***	*Meliaceae*	*Melia azedarach*	***4***
		Photinia fraseri	*4*		*Aquifoliaceae*	*Ilex aquifolium*	***4***
		Mespilus germanica	*4*	***27***		*Ilex latifolia*	***4***
8	*Caprifoliaceae*	*Sambucus nigra*	*5*	***28***	*Calycanthaceae*	*Chimonanthus praecox*	***4***
		Lonicera microphylla	*5*	***29***	*Paulowniaceae*	*Pouwlonia tomentos*	***5***
		Lonicera maackii	*5*	***30***	*Anacardiaceae*	*Rhus coriaria*	***5***
		Lonicera korolkowii	*5*	***31***	*Scrophulariaceae*	*Buddleja davidii*	***5***
		Symphoricarpos albus	*5*	***32***	*Bignoniaceae*	*Chitalpa Taschkentense*	***4***
		Symphoricarpos orbiculatus	*5*			*Catalpa speciosa*	***5***
		Viburnum opulus	*5*	***33***	*Juglandaceae*	*Juglans nigra*	***5***
		Weigela Thunb	*4*			*Juglans regia*	***5***
		Weigela florida 'Pink Princess'	*4*	***34***	*Cannabaceae*	*Celtis caucasica*	***5***
		Quercus robur	*5*	***35***	*Simarou*	*Ailanthus altissima*	***5***

					baceae		
9	*Fagaceae*	*Quercus macrocarpa*	*5*	***36***	*Celastraceae*	*Euonymus japonicus 'Bravo'*	***5***
		Cersis Canadensis	*5*			*E. japonicus 'Aureomarginatus'*	***5***
		Cersis Chinensis	*5*	***37***	*Myrtaceae*	*Callistemon*	***3***
10	*Sapindaceae*	*Acer platanoides*	*5*	***38***	*Ericaceae*	*Rhododendrons* sp.	***2***
		Acer turkestanicum	*5*	***39***	*Garryaceae*	*Aucuba japonica*	***3***
		Acer rubrum	*5*	***40***	*Ulmaceae*	*Ulmus densa*	*5*
		Aesculus hippocastanum	*5*			*Ulmus pumila*	*5*
		Koelreuteria paniculata	*5*	***41***	*Tiliaceae*	*Tilia cordata*	*5*
11	*Ebenaceae*	*Diospyros virginiana*	*5*			*Tilia platyphyllos*	*5*
		Diospyros lotus	5				

Ushbu holatni ham ijobiy baholash mumkin, chunki assortimentning 80 % dan ortig' i yashil hududlarni kengaytirishda samarali foydalanilmoqda, bu esa ko' kalamzorlashtirish jarayonida ijobiy dinamika mavjudligini ko' rsatadi.

XULOSA

Xulosa qilib aytganda bugungi kunda Namangan viloyatida yashil hududlarni kengayib borayotganligi hamda aholi yashash sharoitini ya'ni ekologik vaziyatni yumshatish chora tadbirlari so' ngi uch yilda ortgani kuzatildi. Bu esa biologik xilma-xillikni saqlab qolishga katta xizmat qiladi. Shu o' rinda Namangan viloyatida ko' kalamzorlashtirishda 76 ta turkum 131 ta turdan keng foydalanayotgani ma'lum bo' ldi. Ular 41 ta oilaga mansubligi hamda yetakchi oilalar soni 5 ta ni tashkil qilib, bunda *Rosaceae, Pinaceae, Cupressaceae, Fabaceae va Caprifoliaceae* lar adaptiv imkoniyatlari yuqori ekanligi, turlar xilma-xilligi ko' p ekanligi ma'lum bo' ldi. Qolgan asosiy oilalarda asosiy turlar soni 1 ta dan ekanligi kuzatildi. Shuningdek, foydalinayotgan assortimentlarning xo' jalik sohalari bo' yicha ham tahlil amalga oshirilganda yetakchi o' rinni ko' kalamzorlashtirish va o' rmonchilik sohalari qamrab olingani ma'lum bo' ldi. Foydalanilayotgan o' simliklarni introduksion muvoffaqqiyati (IMI) bo' yicha baholanganda esa 80% yuqori moslashuvchanlikka, 11 % kam moslashuvchanlikka ega bo' lganligi kuzatildi. Ushbu xolatni ham ijobiy baholash mumkin chunki assortimentlarning 80 % dan foydalanilayotgani bu dinamikaning ijobiy ekanligini bildiradi.

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KLIMAT ÓZGERISI JAǴDAYÍNDA VETERINARIYALÍQ ÁHMIYETKE IYE PARAZITLERDIŃ TARQALÍW DINAMIKASÍ HÁM HAYWANLARDÍŃ DEN SAWLÍǴÍNA TÁSIRI

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Annotaciya. *Maqalada global hám regionallıq klimat ózgerisiniń veterinariyalıq áhmiyetke iye parazitlerdiń (gelmintler, iksod keneleri, qan parazitleri) tarqalıw dinamikasına hám awıl xojalıǵı haywanlarınıń den sawlıǵına tásiri tallanǵan. 2009–2025-jılları járiyalanǵan xalıqaralıq hám milliy ilimiy dereklerdi sistemalı tallaw tiykarında temperatura, jawın-shashın hám ızǵarlıq kórsetkishleriniń parazitlerdiń ómir ciklíniń sırtqı ortalıqtaǵı basqıshlarına, aralıq xojayınlar hám tasıwshılar populyaciyasına tásiri bahalanǵan. Temperatura jıyındısı (dáreje-kún) hám Ollerenshaw indeksi sıyaqlı boljaw modellerıniń qollanılıw múmkinshilikleri kórsetilgen. Ózbekstannıń agroklimatlıq aymaqları ushın parazitar qáwiptiń sapalıq boljawı usınılǵan hám beyimlesiwshi profilaktika ilajları tiykarlanǵan.*

Tayanısh sózler: *klimat ózgerisi, parazitler, gelmintozlar, fasciolyoz, gemonxoz, iksod keneleri, teylerioz, dáreje-kún modeli, epizootologiyalıq boljaw, «Birden-bir den sawlıq».*

ВЛИЯНИЕ ИЗМЕНЕНИЯ КЛИМАТА НА ДИНАМИКУ РАСПРОСТРАНЕНИЯ ВЕТЕРИНАРНЫХ ЗАБОЛЕВАНИЙ И ПАРАЗИТОВ У ЖИВОТНЫХ.

Аннотация. *В статье проанализировано влияние глобального и регионального изменения климата на динамику распространения паразитов ветеринарного значения (гельминтов, иксодовых клещей, кровепаразитов) и здоровье сельскохозяйственных животных. На основе систематического анализа источников 2009–2025 гг. оценено влияние температуры, осадков и влажности на свободноживущие стадии паразитов, популяции промежуточных хозяев и переносчиков. Предложен качественный прогноз паразитарного риска для агроклиматических зон Узбекистана и обоснованы адаптивные меры профилактики.*

Ключевые слова: *изменение климата, паразиты, гельминтозы, фасциолёз, гемонхоз, иксодовые клещи, прогнозирование.*

CLIMATE CHANGE EFFECTS OF VETERINARY AND PARASITE DISTRIBUTION DYNAMICS ON ANIMALS

Abstract. *The article analyses the impact of global and regional climate change on the distribution dynamics of parasites of veterinary importance (helminths, ixodid ticks, haemoparasites) and on livestock health. Based on a systematic review of literature published in 2009–2025, the effects of temperature, precipitation and humidity on free-living parasite stages, intermediate hosts and vectors are evaluated. A qualitative parasitic-risk forecast for the agro-climatic zones of Uzbekistan is proposed, and adaptive control measures are substantiated.*

Keywords: *climate change, parasites, helminthoses, fasciolosis, haemonchosis, ixodid ticks, forecasting.*

KIRISISH

Klimat ózgerisi XXI ásirde awıl xojalıǵı hám den sawlıqtı saqlaw sistemaları aldında turǵan eń quramalı global máselelerdiń birine aylandı. Klimat ózgerisi boyınsha Húkimetleraralıq ekspertler toparınıń (IPCC) altınshı bahalaw esabatına muwapıq, 2011–2020-jılları Jer betiniń ortasha temperaturası sanaatlasıwǵa shekemgi dáwirge salıstırǵanda shama menen 1,1 °C qa artqan, al ekstremal hawa rayı qubılısları – ıssılıq tolqınları, qurǵaqshılıq hám nóserli jawınlardıń qaytalanıwı sezilerli dárejede kóbeygen [1]. Oraylıq Aziya, sonıń ishinde Ózbekstan, jılınıw páti global ortasha kórsetkishten joqarı bolǵan aymaqlar qatarına kiredi [2].

Veterinariyalıq áhmiyetke iye parazitlerdiń kópshiligi ómir ciklíniń bir bólegin sırtqı ortalıqta (máyek, lichinka, invaziyalıq basqısh) yamasa suwıq qanlı aralıq xojayınlar hám tasıwshılar organizminde ótkeredi. Sonlıqtan olardıń rawajlanıw tezligi, tiri qalıwshańlıǵı hám máwsimlik aktivligi tikkeley temperatura hám ızǵarlıqqa baylanıslı [3]. Klimat kórsetkishleriniń salıstırmalı kishi ózgerisleri de parazitlerdiń geografiyalıq arealında, invaziya máwsiminiń dawamlılıǵında hám haywanlardıń invaziyalanıw intensivliginde sezilerli jılısıwlarǵa alıp keliwi múmkin. Bul processler sharwashılıq ónimdarlıǵınıń tómenlewi, emlew qárejetleriniń artıwı hám zoonoz keselliklerdiń qáwipiniń kúsheyiwi arqalı ekonomikalıq hám sociallıq aqıbetlerge iye [4].

Sońǵı jılları Evropa hám Arqa Amerikada *Fasciola hepatica*, *Haemonchus contortus*, *Nematodirus battus* hám iksod kenelériniń tarqalıwınıń klimat penen baylanıslı ózgerisleri boyınsha salmaqlı maǵlıwmatlar toplanǵan [5; 6]. Biraq arid hám kontinentallıq klimatlı Oraylıq Aziya aymaǵı ushın bunday tallawlar ele de jeterli emes. Ózbekstanda sharwashılıqtı rawajlandırıw hám veterinariya xızmetin reformalawǵa baǵdarlanǵan mámleketlik siyasat jaǵdayında parazitar keselliklerdiń klimatqa baylanıslı qáwipin bahalaw áhmiyetli ilimiy-ámeliy wazıypa bolıp tabıladı.

Izertlewdiń maqseti – klimat ózgerisi jaǵdayında veterinariyalıq áhmiyetke iye tiykarǵı parazitler toparlarınıń tarqalıw dinamikasın ilimiy derekler tallawı tiykarında bahalaw, olardıń haywanlar den sawlıǵına tásir etiw mexanizmlerin ashıp beriw hám Ózbekstan jaǵdayı ushın beyimlesiwshi profilaktika jantasıwların tiykarlawdan ibarat.

MATERIALLAR HÁM USÍLLAR

Izertlew sistemalı ádebiyatlar sholıwı hám analitikalıq sintez usılında orınlandı. Dereklerdi izlew PubMed, Scopus, Web of Science, ScienceDirect hám Google Scholar maǵlıwmatlar bazalarında, sonday-aq rus tilindegi basılımlar ushın eLIBRARY hám CyberLeninka platformalarında ámelge asırıldı. Izlewde tómendegi tayanısh sózler hám olardıń kombinaciyalarınan paydalanıldı: «climate change», «parasite», «helminth», «Fasciola hepatica», «Haemonchus contortus», «tick-borne disease», «degree-day model», «livestock», sonday-aq olardıń rus, ózbek hám qaraqalpaq tillerindegi sáykesleri.

Dereklerdi tańlaw kriteriyleri tómendegishe boldı: (1) 2009–2025-jılları recenziyalanatuǵın jurnallarda járiyalanǵan bolıwı; (2) awıl xojalıǵı haywanlarınıń parazitlerine tiyisli bolıwı; (3) klimat faktorları hám parazit biologiyası yamasa epidemiologiyası arasındaǵı muǵdarlıq yamasa sapalıq baylanıstı úyreniwi. Klassikalıq epizootologiyalıq boljaw modellerin sáwlelendiriw maqsetinde ayırım fundamental miynetler de tallawǵa kirgizildi. Ózbekstan klimatına tiyisli maǵlıwmatlar Jáhán banki hám Aziya rawajlanıw bankiniń klimat qáwipi profilinen hám Ózbekstannıń BMShtıń Klimat ózgerisi haqqındaǵı ramkalıq konvenciyasına usınǵan milliy xabarlamalarınan alındı [2].

Tańlanǵan dereklerden parazit túri, aralıq xojayın yamasa tasıwshı, rawajlanıwdıń temperatura shegaraları, ızǵarlıqqa bolǵan talap, baqlanǵan yamasa modellestirilgen areal ózgerisleri hám haywanlar den sawlıǵına tásir kórsetkishleri ajıratıp alındı. Maǵlıwmatlar salıstırmalı-analitikalıq usılda ulıwmalastırıldı, al regionallıq qáwip parazitlerdiń biologiyalıq talapların Ózbekstan agroklimatlıq aymaqlarınıń klimat tendenciyaları menen salıstırıw arqalı sapalıq (joqarı, orta, tómen) shkala boyınsha bahalandı.

NÁTIYJELER

1. Klimat faktorları hám parazitler biologiyası arasındaǵı baylanıs

Tallaw nátiyjeleri klimat ózgerisiniń parazitlerge úsh tiykarǵı jol menen tásir etetuǵının kórsetti: birinshiden, sırtqı ortalıqtaǵı basqıshlardıń rawajlanıw tezligi hám tiri qalıwshańlıǵın ózgertiw arqalı; ekinshiden, aralıq xojayınlar (mollyuskalar, oribatid keneler) hám tasıwshılar (iksod keneleri, qan soríwshı shıbın-shirkeyler) populyaciyası hám aktivlik máwsimine tásir etiw arqalı; úshinshiden, sharwashılıq ámeliyatı – jaylawdan paydalanıw múddetleri, suwǵarıw sistemaları hám haywanlardı kóshiriw tártibiniń ózgeriwi arqalı janapay túrde [3].

Poykiloterm organizmlerdiń rawajlanıwı ádette belgili bir tómengi temperatura shegarasınan (bazalıq temperatura) baslanadı hám effektiv temperaturalar jıyındısı – dáreje-kúnlerdiń toplanıwı menen anıqlanadı. Bul jantasıw parazitlerdiń rawajlanıwın boljawda keń qollanıladı hám tómendegi formula menen esaplanadı: $GDD = \Sigma \max(0; T_{ort} - T_{baz})$, bunda T_{ort} – kúnlik ortasha temperatura, T_{baz} – rawajlanıwdıń tómengi shegarası [7]. Klimattıń jılınıwı dáreje-kúnlerdiń tezirek toplanıwına, yaǵnıy bir máwsimde parazit áwladları sanınıń kóbeyiwine alıp keledi. Tiykarǵı parazitler toparlarınıń klimatqa baylanıslı biologiyalıq ózgeshelikleri 1-kestede ulıwmalastırılǵan.

1-keste. Veterinariyalıq áhmiyetke iye parazitlerdiń klimatqa sezgir biologiyalıq ózgeshelikleri (ádebiyat maǵlıwmatları tiykarında)

Parazit / topar	Klimatqa sezgir basqısh hám talaplar	Jılınıwdıń kútilip atırǵan tásiri	Derek
Fasciola hepatica	Mollyuska (Galba truncatula) ishindegi rawajlanıw ≈10 °C tan joqarıda; joqarı ızǵarlıq talap etiledi	Invaziya máwsiminiń uzarıwı; ızǵarlıq saqlanǵan aymaqlarda qáwiptiń artıwı	[5; 8]

Parazit / topar	Klimatqa sezgir basqısh hám talaplar	Jılınıwdıń kútilip atırǵan tásiri	Derek
Haemonchus contortus	Sırtqı ortalıqtaǵı lichinkalar ıssı hám ızǵar jaǵdayda tez rawajlanadı; suwıqqa shıdamsız	Arealdıń arqaǵa hám tawlı aymaqlarǵa keńeyiwi, jılına kóbirek áwlad	[6; 7]
Teladorsagia / Ostertagia spp.	Tómen temperaturaǵa salıstırmalı shıdamlı; qıslawda tiri qalıwı joqarı	Qıslawshı lichinkalar sanınıń artıwı, jaylaw kontaminaciyasınıń erte baslanıwı	[6]
Nematodirus battus	Máyekten shıǵıw ushın suwıq dáwir hám onnan keyingi jılıw zárúr	Máyekten shıǵıw waqtınıń jılısıwı, gúzgi invaziya jaǵdayları	[6]
Iksod keneleri (Hyalomma, Rhipicephalus, Dermacentor)	Aktivligi temperatura hám salıstırmalı ızǵarlıqqa baylanıslı; qısqı diapauza	Aktivlik dáwiriniń uzarıwı, jańa aymaqlarǵa kirip barıwı	[9]
Keneler arqalı juǵatuǵın qan parazitleri (Theileria, Babesia, Anaplasma)	Tasıwshı kene aktivligi menen anıqlanadı	Teylerioz hám babezioz máwsiminiń uzarıwı	[9]

Eskertiw: kestedegi temperatura kórsetkishleri shamalı bolıp, parazit shtammı hám mikroklimatqa baylanıslı parıq qılıwı múmkin.

2. Gelmintozlardıń tarqalıw dinamikasındaǵı ózgerisler

Fasciolyoz. F. hepatica nıń ómir cikli dushshı suw mollyuskası *Galba truncatula* arqalı ótedi, sonlıqtan bul trematodoz klimat ózgerisine eń sezgir gelmintozlardıń biri bolıp tabıladı. Ullı Britaniya jaǵdayında ótkerilgen modellestiriw nátiyjeleri jaqın on jıllıqlarda fasciolyoz qáwipiniń sezilerli artatuǵının kórsetken [5]. Mas-Coma hám birge avtorları trematodozlarǵa klimat tásiriniń quramalı hám sızıqlı emes ekenin, qurǵaqshılıq ayırım aymaqlarda mollyuskalardıń jasaw orınların qısqartıp, qáwipti azaytıwı múmkin ekenin atap ótedi [8].

Asqazan-ishek nematodozları. Kúyis qaytaratuǵın haywanlardıń strongilyataları, ásirese *H. contortus*, sırtqı ortalıqtaǵı basqıshlarınıń rawajlanıwı ushın ıssı hám ızǵar jaǵdaydı talap etedi. Orta keńliklerde jaylasqan aymaqlarda jılınıw sebepli gemonxozdıń arqa aymaqlarda kóbirek dizimge alınıwı, invaziya máwsiminiń erte baslanıp, kesh tamamlanıwı baqlanbaqta [6]. GLOWORM-FL simulyaciyalıq modeli klimat maǵlıwmatları tiykarında jaylawdaǵı invaziyalıq lichinkalar sanınıń máwsimlik dinamikasın boljawǵa múmkinshilik beredi hám jılınıw jaǵdayında ayırım nematodalar ushın juǵıwshańlıq shıńınıń jılısıwın kórsetken [7]. Áhmiyetli tárepi sonda, júdá joqarı temperatura hám qurǵaqlıq lichinkalardıń óliwin arttıradı, sonlıqtan arid aymaqlarda jazǵı invaziya azayıp, báhárgi hám gúzgi shıńlar kúsheyiwi múmkin.

3. Keneler hám olar arqalı juǵatuǵın kesellikler

Iksod keneleri ómiriniń úlken bólegin sırtqı ortalıqta ótkeredi, olardıń rawajlanıwı, xojayın izlew aktivligi hám qıslawı temperatura hám ızǵarlıqqa qatań baylanıslı [9]. Gilberttiń sholıwına muwapıq, jılınıw kenelerdiń joqarı keńlikler hám biyikliklerge tarqalıwına alıp kelmekte [9]. Oraylıq Aziya ushın ayrıqsha áhmiyetke iye *Hyalomma* áwladı keneleri tropikalıq teylerioz (*Theileria annulata*) hám Qırım-Kongo gemorragiyalıq qızbası virusınıń tasıwshısı bolıp tabıladı, olardıń arealı ıssı hám qurǵaq klimat jaǵdayında keńeyiw tendenciyasına iye.

4. Haywanlardıń den sawlıǵı hám ónimdarlıǵına tásiri

Parazitar kesellikler sharwashılıqqa keltiretuǵın ekonomikalıq zıyan júdá úlken. Charlier hám birge avtorlarınıń esaplawlarına qaraǵanda, Evropada kúyis qaytaratuǵın haywanlardıń tek úsh topar gelmintozları (asqazan-ishek nematodozları, fasciolyoz hám ókpe nematodozları) jılına shama menen 1,8 mlrd evro zıyan keltiredi, onıń tiykarǵı bólegin ónimdarlıq joǵaltıwları quraydı [4]. Klimat ózgerisi bul zıyandı eki jol menen kúsheytedi. Birinshiden, invaziya basımınıń artıwı nátiyjesinde dene salmaǵınıń ósiwi ástelenedi, sút ónimdarlıǵı hám kóbeyiw kórsetkishleri tómenleydi, bawır sıyaqlı organlardıń brakovkası kóbeyedi [4]. Ekinshiden, ıssılıq stressi haywanlardıń immunlıq juwabın hálsiretedi hám olardıń parazitlerge shıdamlılıǵın azaytadı, bul bolsa klinikalıq kesellik hám óliw jaǵdayların arttıradı [3].

Jáne bir áhmiyetli tárep – antigelmintiklerge shıdamlılıq máselesi. Invaziya máwsiminiń uzarıwı fermerlerdi antigelmintik preparatlardı jiyi qollanıwǵa iytermeleydi, bul bolsa shıdamlı parazit populyaciyalarınıń tańlanıwın tezlestiredi. Solay etip, klimat ózgerisi hám antigelmintik rezistentlik bir-birin kúsheytiwshi faktorlar sıpatında kórinedi.

5. Ózbekstan agroklimatlıq aymaqları ushın parazitar qáwiptiń sapalıq boljawı

Ózbekstanda ortasha jıllıq temperatura XX ásirdiń ortalarınan berli turaqlı túrde kóterilip barmaqta, jawın-shashınnıń máwsimlik bóliniwi ózgermekte, qurǵaqshılıq dáwirleri jiyi qaytalanbaqta [2]. Usı tendenciyalar hám 1-kestedegi biologiyalıq talaplar tiykarında mámlekettiń tiykarǵı agroklimatlıq aymaqları ushın parazitar qáwiptiń sapalıq boljawı islep shıǵıldı (2-keste).

2-keste. Ózbekstan agroklimatlıq aymaqlarında klimat ózgerisi jaǵdayında parazitar qáwiptiń sapalıq boljawı

Aymaq	Tiykarǵı klimat tendenciyası	Qáwip dárejesi	Birinshi gezektegi parazitozlar
Suwǵarılatuǵın oypatlar (Ferǵana, Zarafshan, Tashkent oazisi)	Temperaturanıń artıwı, suwǵarıw esabınan ızǵarlıqtıń saqlanıwı	Joqarı	Fasciolyoz, strongilyatozlar, teylerioz
Tómengi Ámiwdárya (Qaraqalpaqstan, Xorezm)	Jılınıw, qurǵaqshılıq, suw tanqıslıǵı, duzlanıw	Orta – joqarı	Keneler hám teylerioz; kollektor-drenaj tarmaqları átirapında fasciolyoz
Taw eteki hám taw jaylawları	Jılınıwdıń biyiklik boyınsha jılısıwı, qar qatlamınıń qısqarıwı	Orta (artıp barıwshı)	Gemonxoz, diktiokaulyoz, dikrocelioz
Shól hám yarım shól jaylawları (Qızılqum, Ústirt)	Kúshli jılınıw hám qurǵaqlıq	Tómen – orta	Hyalomma keneleri; gelmintozlar máwsimlik hám noqatlı

Eskertiw: boljaw sapalıq xarakterge iye bolıp, onı aymaqlıq dala izertlewleri hám monitoring maǵlıwmatları menen tastıyıqlaw talap etiledi.

2-kesteden kórinip turǵanınday, eń joqarı qáwip suwǵarılatuǵın oypatlarda kútilmekte. Bul aymaqlarda iri qara mal hám usaq maldıń tıǵızlıǵı joqarı, jaylawlar kóbinese suwǵarıw kanalları, zawırlar hám shalı atızlarına jaqın jaylasqan. Temperaturanıń artıwı mollyuskalardıń aktivlik dáwirin uzartsa, suwǵarıw ızǵarlıqtı turaqlı saqlap turadı; nátiyjede fasciolyoz qozdırıwshısınıń mollyuska ishindegi rawajlanıwı ushın qolaylı dáwir báhárdiń basınan kesh gúzge shekem sozıladı [5; 8]. Tómengi Ámiwdárya aymaǵında bolsa suw tanqıslıǵı hám duzlanıw tábiyiy suw háwizlerin qısqartıp, gelmintozlar ushın jaǵdaydı shekleydi, biraq kollektor-drenaj tarmaqları átirapında jergilikli «ızǵarlıq atawları» saqlanıp qaladı. Sonıń menen birge ıssı hám qurǵaq klimat *Hyalomma* keneleri ushın qolaylı bolıp, teylerioz qáwipin arttıradı [9].

Taw eteki hám taw jaylawlarında jılınıwdıń biyiklik boyınsha jılısıwı ayrıqsha itibarǵa ılayıq. Burın suwıq klimat sebepli sheklengen biyikliklerde *H. contortus* sıyaqlı ıssısúygish nematodalardıń rawajlanıwı múmkin bolǵan dáwir uzarmaqta. Máwsimlik kóshpeli sharwashılıq (jaylawǵa aydaw) jaǵdayında haywanlar parazitlerdi hár qıylı biyiklik zonaları arasında tasıp júredi, bul bolsa jańa oshaqlardıń qáliplesiwine alıp keliwi múmkin [6; 7]. Shól jaylawlarında joqarı temperatura hám qurǵaqlıq sırtqı ortalıqtaǵı lichinkalardıń óliwin arttırǵanlıqtan gelmintozlar salıstırmalı tómen dárejede saqlanadı, biraq qudıqlar hám suwatlar átirapında invaziyanıń noqatlı toplanıwı baqlanadı.

TALQÍLAW

Alınǵan nátiyjeler klimat ózgerisiniń parazitler tarqalıwına tásiriniń bir tárepleme emes ekenin kórsetedi. Temperaturanıń artıwı rawajlanıw tezligin arttırǵanı menen, ızǵarlıqtıń jetispewshiligi sırtqı ortalıqtaǵı basqıshlardıń tiri qalıwshańlıǵın shekleydi. Sonlıqtan Ózbekstan sıyaqlı arid klimatlı mámleketlerde parazitar qáwiptiń tiykarǵı «ıssı noqatları» tábiyiy klimatqa qaraǵanda kóbirek antropogenlik ızǵarlıq derekleri – suwǵarıw kanalları, kollektor-drenaj tarmaqları, shalı atızları hám suw háwizleri átirapında qáliplesedi. Bul juwmaq Mas-Coma hám birge avtorlarınıń trematodozlar boyınsha pikirlerine [8] sáykes keledi.

Morgan hám Wall atap ótkenindey, klimat ózgerisiniń parazitar keselliklerge tásiri kóp jaǵdaylarda fermerlerdiń beyimlesiwshi sheshimleri – jaylawlardan almaslap paydalanıw, emlew múddetleri hám haywanlardı satıp alıw ámeliyatı arqalı ózgeriwi múmkin [3]. Basqasha aytqanda, klimat qáwipti belgileydi, biraq onıń ámelge asıwı kóp tárepten basqarıw sheshimlerine baylanıslı. Sonlıqtan dástúriy kalendar tiykarındaǵı profilaktikalıq degelmintizaciya sxemaları klimat jaǵdayı ózgeriwshi bolǵan dáwirde óz nátiyjeliligin joǵaltadı hám olardı hawa rayı maǵlıwmatlarına tiykarlanǵan beyimlesiwshi sistemalar menen almastırıw zárúr [7].

Ámeliy kóz qarastan tómendegi jantasıwlar birinshi gezektegi bolıp esaplanadı: (1) dáreje-kún hám Ollerenshaw indeksi sıyaqlı ápiwayı klimat-epizootologiyalıq modellerdi aymaqlıq veterinariya xızmetleri ámeliyatına engiziw; (2) nıshanalı selektiv emlew principin (targeted selective treatment) qollanıp, antigelmintiklerden paydalanıwdı optimallastırıw hám refugiyanı saqlaw; (3) shıdamlılıqtı anıqlaw ushın tezektegi máyekler sanınıń azayıw testin (FECRT) xalıqaralıq usınıslarǵa muwapıq turaqlı ótkeriw [10]; (4) kenelerge qarsı gúresti tasıwshılardıń máwsimlik aktivligi

boljawı tiykarında rejelestiriw; (5) «Birden-bir den sawlıq» (One Health) koncepciyası sheńberinde veterinariya, medicina hám gidrometeorologiya xızmetleri arasında maǵlıwmat almasıwdı jolǵa qoyıw.

Klimatqa beyimlesken monitoring sisteması ushın ápiwayı hám ólshenetuǵın kórsetkishler tańlanıwı tiyis. Olardıń qatarına hár bir rayon boyınsha aylıq dáreje-kúnler jıyındısı hám jawın-shashın muǵdarı, qadaǵalaw xojalıqlarında tezektegi máyekler sanınıń máwsimlik dinamikası, soyıw punktlerinde bawır fasciolyozı boyınsha brakovka kórsetkishleri, báhár hám gúzde kenelerdiń tıǵızlıǵı hám antigelmintiklerdiń nátiyjeliligin bahalaytuǵın FECRT nátiyjeleri kiredi [3; 10]. Bul maǵlıwmatlar gidrometeorologiya xızmetiniń maǵlıwmatları menen biriktirilse, aymaqlıq veterinariya xızmetleri degelmintizaciya hám akaricid islewlerin kalendar boyınsha emes, al haqıyqıy qáwip dárejesine qarap rejelestiriw múmkinshiligine iye boladı. Ekonomikalıq kóz qarastan bunday jantasıw artıqsha islewlerdi azaytadı hám rezistentliktiń rawajlanıwın ásteletedi [4].

Izertlewdiń sheklewleri de bar. Birinshiden, xalıqaralıq dereklerdiń kópshiligi orta keńliklerdegi mámleketlerde orınlanǵan hám olardıń nátiyjelerin arid jaǵdayǵa tikkeley kóshiriw abaylılıqtı talap etedi. Ekinshiden, Ózbekstanda parazitozlar boyınsha uzaq múddetli, keńisliklik anıqlıqqa iye monitoring maǵlıwmatları sheklengen. Sonlıqtan usınılǵan boljaw dáslepki xarakterge iye hám keyingi dala izertlewleri menen tastıyıqlanıwı tiyis.

JUWMAQ

1. Klimat ózgerisi veterinariyalıq áhmiyetke iye parazitlerdiń tarqalıw dinamikasına olardıń sırtqı ortalıqtaǵı rawajlanıw basqıshları, aralıq xojayınlar hám tasıwshılar arqalı sezilerli tásir kórsetedi; tásir sızıqlı emes bolıp, temperatura hám ızǵarlıqtıń birgeliktegi tásiri menen anıqlanadı.

2. Jılınıw nátiyjesinde gemonxoz, fasciolyoz hám keneler arqalı juǵatuǵın keselliklerdiń invaziya máwsiminiń uzarıwı, areallarınıń joqarı keńlikler hám biyiklikler tárepke keńeyiwi kútiledi; arid aymaqlarda bolsa qáwip tiykarınan antropogenlik ızǵarlıq derekleri átirapında toplanadı.

3. Parazitar invaziya basımınıń artıwı ıssılıq stressi hám antigelmintik rezistentlik penen birgelikte haywanlardıń den sawlıǵına hám sharwashılıq ónimdarlıǵına kompleksli unamsız tásir kórsetedi.

4. Ózbekstan jaǵdayında suwǵarılatuǵın oypatlar hám taw eteki jaylawları parazitar qáwip artıp baratuǵın birinshi gezektegi aymaqlar bolıp esaplanadı; olar ushın klimat maǵlıwmatlarına tiykarlanǵan epizootologiyalıq monitoring hám boljaw sistemasın islep shıǵıw usınıs etiledi.

5. Profilaktika strategiyası kalendar tiykarındaǵı jantasıwdan klimat-model tiykarındaǵı beyimlesiwshi, nıshanalı emlew hám «Birden-bir den sawlıq» principlerine tiykarlanǵan sistemaǵa ótiwi tiyis.

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МОЛЕКУЛЯРНО-ГЕНЕТИЧЕСКАЯ ХАРАКТЕРИСТИКА И ФИЛОГЕНЕТИЧЕСКИЙ АНАЛИЗ ИЗОЛЯТОВ FUSARIUM ACUMINATUM И FUSARIUM EQUISETI, ВЫДЕЛЕННЫХ С ОЗИМОЙ ПШЕНИЦЫ В УЗБЕКИСТАНЕ

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Аннотация: *Грибы рода Fusarium являются опасными фитопатогенами, вызывающими корневые гнили и фузариоз колоса зерновых культур, а также продуцирующими опасные микотоксины. Точная видовая идентификация и филогенетическая характеристика локальных штаммов необходимы для фитосанитарного контроля и селекции на устойчивость. В статье приведены результаты молекулярно-генетической идентификации и филогенетического анализа изолятов грибов Fusarium acuminatum и Fusarium equiseti, выделенных из пораженных растений озимой пшеницы в Узбекистане. На основе ПЦР-амплификации и секвенирования вариабельных участков генов ITS и TEF1-α были определены нуклеотидные последовательности штаммов и депонированы в международную базу данных NCBI GenBank (акцессионные номера PZ194281, PZ194410, PZ194414, PZ194422, PZ194660). Филогенетический анализ, проведенный методом Maximum Likelihood в программе MEGA 12, подтвердил высокую гомологию (98–100%) узбекских изолятов с референсными мировыми штаммами.*

Ключевые слова: *Fusarium acuminatum, Fusarium equiseti, озимая пшеница, ПЦР, ITS-регион, TEF1-α, GenBank, MEGA* 12, Maximum Likelihood, филогенетический анализ, Узбекистан.

MOLECULAR-GENETIC CHARACTERIZATION AND PHYLOGENETIC ANALYSIS OF *FUSARIUM ACUMINATUM* AND *FUSARIUM EQUISETI* ISOLATES RECOVERED FROM WINTER WHEAT IN UZBEKISTAN

Abstract: *Fungi of the genus Fusarium are dangerous phytopathogens causing root rot and head blight in cereal crops, as well as producing hazardous mycotoxins. Accurate species identification and phylogenetic characterization of local strains are essential for phytosanitary monitoring and breeding for resistance. The article presents the results of molecular-genetic identification and phylogenetic analysis of Fusarium acuminatum and Fusarium equiseti isolates obtained from infected winter wheat plants in Uzbekistan. Based on PCR amplification and sequencing of variable regions of the ITS and TEF1-α genes, nucleotide sequences were determined and deposited into the NCBI GenBank database (accession numbers PZ194281, PZ194410, PZ194414, PZ194422, PZ194660). Phylogenetic analysis performed using the Maximum Likelihood method in MEGA 12 confirmed high sequence identity (98–100%) between the Uzbek isolates and global reference strains.*

Keywords: *Fusarium acuminatum, Fusarium equiseti, winter wheat, PCR, ITS region, TEF1-α, GenBank, MEGA 12, Maximum Likelihood, phylogenetic analysis, Uzbekistan.*

O‘ ZBEKISTONDA QISHKI BUG‘ DOYDAN AYRILGAN FUSARIUM ACUMINATUM VA FUSARIUM EQUISETI IZOLATLARINING MOLEKULYAR GENETIK XUSUSIYATLARI VA FILOGENETIK TAHLIL

Annotatsiya: *Fusarium turkumiga mansub zamburug‘ lar don ekinlarining ildiz chirishi va boshoq fuzariozini keltirib chiqaradigan hamda xavfli mikotoksinlar ishlab chiqaradigan fitopatogenlar hisoblanadi. Mahalliy shtammlarni aniq tur darajasida identifikatsiya qilish va filogenetik tavsiflash fitosanitariya nazorati hamda chidamlilikka erishish selektsiyasi uchun muhim ahamiyatga ega. Maqolada O‘ zbekistonning kuzgi bug‘ doyzorlaridan ajratib olingan Fusarium acuminatum va Fusarium equiseti zamburug‘ izolyatlarining molekulyar-genetik identifikatsiyasi va filogenetik tahlili natijalari keltirilgan. ITS va TEF1-α genlarining o‘ zgaruvchan ketma-ketliklarini PZR-amplifikatsiya qilish va sekvenirlash asosida nukleotid ketma-ketliklari aniqlandi hamda NCBI GenBank xalqaro ma’lumotlar bazasiga joylashtirildi (aktsessiya raqamlari PZ194281, PZ194410, PZ194414,*

PZ194422, PZ194660). MEGA 12 dasturida Maximum Likelihood usuli yordamida o‘ tkazilgan filogenetik tahlil O‘ zbekiston izolyatlarining jahon etalon shtammlari bilan yuqori darajadagi gomologiyasini (98–100%) tasdiqladi.

Kalit so‘ zlar: *Fusarium acuminatum, Fusarium equiseti, kuzgi bug‘ doy, PZR, ITS-region, TEF1-α, GenBank, MEGA 12, Maximum Likelihood, filogenetik tahlil, O‘ zbekiston.*

Введение: Озимая пшеница (*Triticum aestivum* L.) является ключевой продовольственной культурой Узбекистана, обеспечение стабильного урожая которой напрямую связано с продовольственной безопасностью страны. Среди широкого спектра фитопатогенов, поражающих посевы пшеницы, особую опасность представляют грибы рода *Fusarium*, вызывающие корневые и прикоренневые гнили, а также фузариоз колоса. Инфицирование данными микроорганизмами приводит не только к существенным потерям урожая, но и к накоплению в зерне вторичных метаболитов — микотоксинов (трихотецены, зеараленон и др.), представляющих прямую угрозу здоровью человека и сельскохозяйственных животных. Среди большого видового разнообразия рода особое место занимают виды *Fusarium acuminatum* и *Fusarium equiseti*, входящие в сложные видовые комплексы. Традиционные методы их идентификации, основанные на морфолого-культуральных признаках (строение макро- и микроконидий, скорость роста колоний, пигментация), часто оказываются неэффективными. Это обусловлено высокой фенотипической изменчивостью патогенов, зависимостью от условий культивирования и давлением факторов окружающей среды.

Для преодоления ограничений классической микологии в практику фитопатологического мониторинга активно внедряются молекулярно-генетические методы. Разделительный потенциал универсального маркерного региона ITS (Internal Transcribed Spacer) рДНК часто оказывается недостаточным для точной межвидовой дифференциации внутри рода *Fusarium*. В связи с этим современные филогенетические исследования опираются на белок-кодирующие гены, среди которых ген фактора элонгации трансляции 1-альфа (TEF1-*α*) признан наиболее информативным маркером благодаря высокой скорости накопления нуклеотидных замен и наличию вариабельных интронных участков.

Несмотря на активное изучение фузариозов в мире, молекулярно-генетическая структура популяций *F. acuminatum* и *F. equiseti*, циркулирующих на пшеничных полях Узбекистана, остаётся недостаточно изученной. Отсутствие зарегистрированных в международных базах данных локальных штаммов затрудняет проведение сравнительного эволюционного анализа и разработку специфичных диагностических тест-систем.

Целью данного исследования являлась молекулярно-генетическая идентификация, филогенетический анализ и депонирование в базу данных NCBI GenBank нуклеотидных последовательностей изолятов *Fusarium acuminatum* и *Fusarium equiseti*, выделенных из пораженных растений озимой пшеницы в Узбекистане.

Методы исследования.

Выделение и культивирование фитопатогенов.

Объектами исследования послужили изоляты грибов рода *Fusarium*, выделенные из пораженных прикоренневых частей стебля и колоса озимой пшеницы (*Triticum aestivum* L.), отобранных в ходе фитосанитарного мониторинга посевов в Узбекистане. Выделение чистых культур проводили путем высева фрагментов пораженных тканей на картофельно-декстрозный агар (PDA). Для исключения гетерокариоза и получения чистых генетических линий получение моноспоровых культур осуществляли методом предельных разведений микроконидий.

Экстракция геномной ДНК.

Экстракцию геномной ДНК выполняли из свежевыращенного мицелия 5-суточных моноспоровых культур. Навеску мицелия растирали в жидком азоте с использованием стерильной ступки и пестика. Выделение ДНК проводили с использованием коммерческого набора *GeneJET Genomic DNA Purification Kit* (Thermo Fisher Scientific) в соответствии с протоколом производителя. Концентрацию и чистоту выделенной ДНК оценивали на спектрофотометре NanoDrop по соотношению оптической плотности A_{260}/A_{280}.

ПЦР-амплификация маркерных генов.

Для молекулярно-генетической идентификации использовали два маркерных локуса:

1. Вариабельный участок гена фактора элонгации трансляции 1-альфа (**TEF1-*α***) с использованием специфичных праймеров EF1-1 и EF1-2.
2. Внутренний транскрибируемый спейсер рибосомальной ДНК (**ITS-регион**).

Реакцию проводили в объеме 25 мкл, содержащем:

- 12,5 мкл 2 × DreamTaq PCR Master Mix (Thermo Fisher Scientific);
- по 1 мкл каждого праймера (10 пмоль/мкл);
- 1,8 мМ $MgCl_2$ (оптимизированная концентрация для устранения неспецифического связывания);

• 4 мкл матрицы ДНК (~50 нг);

• 6,5 мкл ddH_2O, свободной от нуклеаз.

Амплификацию выполняли в термоциклере по следующей программе: первичная денатурация при 94 °C (5 мин); 35 циклов: денатурация при 94 °C (30 сек), отжиг праймеров при 59 °C для TEF1-*α* / 53 °C для ITS (40 сек), элонгация при 72 °C (1 мин); финальная элонгация при 72 °C (7 мин). Визуализацию продуктов ПЦР осуществлили методом гель-электрофореза в 1,8% агарозном геле с окрашиванием бромистым этидием.

Секвенирование и филогенетический анализ.

Очистку ПЦР-продуктов и их двунаправленное секвенирование по методу Сенгера проводили на автоматическом анализаторе. Полученные хроматограммы проанализированы и отредактированы. Поиск гомологичных последовательностей выполняли с помощью алгоритма **BLASTn** в международной базе данных NCBI GenBank.

Аннотированные нуклеотидные последовательности были зарегистрированы и депонированы в базы данных GenBank (NCBI). Множественное выравнивание нуклеотидных последовательностей узбекских изолятов и референсных штаммов из GenBank проводили с помощью алгоритма Muscle. Филогенетическое древо строили в программе **MEGA 12** с использованием метода максимального правдоподобия (**Maximum Likelihood**). Эволюционные расстояния рассчитывали на основе модели замен Tamura-Nei. Надежность топологии филогенетического древа оценивали с помощью бутстреп-анализа (Bootstrap test) с 1000 повторностей.

Результаты исследования.

Идентификация и депонирование нуклеотидных последовательностей.

В результате ПЦР-амплификации и последующего секвенирования вариабельных участков генов **ITS** и **TEF1-*α*** была проведена точная видовая идентификация исследуемых изолятов грибов рода *Fusarium*. Проведенный BLAST-анализ показал высокую степень гомологии (98–100%) полученных нуклеотидных последовательностей с референсными штаммами из базы данных NCBI.

Определенные последовательности были успешно аннотированы и депонированы в международную базу данных **NCBI GenBank** под соответствующими акцессионными номерами:

• **PZ194281** — *Fusarium acuminatum* (изолят F-12);

• **PZ194410** — *Fusarium acuminatum* (изолят F-13);

• **PZ194414** — *Fusarium acuminatum* (изолят F-14);

• **PZ194422** — *Fusarium equiseti* (изолят F-15);

• **PZ194660** — *Fusarium equiseti* (изолят F-16).

Таблица 1

Молекулярно-генетическая характеристика и номера доступа в GenBank изолятов грибов рода *Fusarium*, выделенных из озимой пшеницы

№	Вид гриба (Organism)	Шифр изолята	Регион сбора (Район)	Количество нуклеотидов (п.о.)	Номер доступа (Accession number)
1	*Fusarium acuminatum*	T-12	Ташкентская обл., Янгибазар	585	PZ194281
2	*Fusarium acuminatum*	T-13	Ташкентская обл., Паркент	585	PZ194410
3	*Fusarium acuminatum*	T-14	Ташкентская обл., Янгибазар	585	PZ194414
4	*Fusarium equiseti*	T-15	Бухарская обл.	584	PZ194422
5	*Fusarium equiseti*	T-16	Ташкентская обл., Янгибазар	605	PZ194660

Филогенетический анализ

На основе выровненных последовательностей гена TEF1-*α* с использованием программы **MEGA 12** методом **Maximum Likelihood** (Максимального правдоподобия) было сконструировано филогенетическое древо.

Топология полученного древа позволила чётко разделить исследуемые изоляты на две основные клады:

1. **Клада *Fusarium acuminatum*:** Изоляты с акцессионными номерами PZ194281, PZ194410 и PZ194414 сгруппировались в единый монофилетический кластер с эталонными мировыми штаммами *F. acuminatum*. Высокий уровень бутстреп-поддержки (>90%) подтверждает их генетическую идентичность и стабильность маркерного локуса TEF1-α.

2. **Клада *Fusarium equiseti*:** Изоляты PZ194660 и PZ19422 сформировали обособленную ветвь внутри комплекса видов *Fusarium incarnatum-equiseti* (FIESC), проявив 99–100% сходство с референсными изолятами *F. equiseti*.

Сравнительный филогенетический анализ подтвердил высокую разрешающую способность гена TEF1-α для видовой дифференциации грибов рода *Fusarium* по сравнению с ITS-регионом, позволив достоверно разграничить близкородственные виды.

Заключение

В ходе проведенных молекулярно-генетических исследований осуществлена точная видовая идентификация и филогенетическая характеристика локальных изолятов фитопатогенных грибов *Fusarium acuminatum* и *Fusarium equiseti*, выделенных с пораженных растений озимой пшеницы в Узбекистане. Впервые нуклеотидные последовательности маркерного локуса исследуемых штаммов были аннотированы и депонированы в международную базу данных NCBI GenBank под номерами PZ194281, PZ194410, PZ194414, PZ194422 и PZ194660. Филогенетический анализ, выполненный методом Maximum Likelihood в программе MEGA 12, подтвердил высокую степень эволюционной гомологии (98–100%) узбекских изолятов с референсными мировыми штаммами *F. acuminatum* и *F. equiseti*. Полученные результаты подтверждают высокую информативность и дискриминационную способность гена TEF1-α для дифференциации видов *Fusarium*. Депонированные последовательности формируют фундаментальную базу для фитосанитарного мониторинга, разработки высокоточных диагностических ПЦР-тест-систем и селекции пшеницы на устойчивость к фузариозам.

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ATRAPHAXIS SPINOSA L., MELISSA OFFICINALIS L, MENTHA LONGIFOLIA L. O‘ SIMLIKLARI ASOSIDA TAYYORLANGAN “OS-SHIFO” SHIFOBAXSH OZIQ- OVQAT QO‘ SHIMCHASI TARKIBIDAGI AMINOKISLOTALAR MIQDORINI YUSSX USULIDA ANIQLASH VA XALQ TABOBATIDAGI AHAMIYATI

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Annotatsiya.*Ushbu maqolada “OS-SHIFO” shifobaxsh oziq-ovqat qo‘ shimchasi tarkibidagi aminokislotalar miqdori yuqori samarali suyuqlik xromatografiyasi (YuSSX) usulida aniqlangan. Mazkur oziq-ovqat qo‘ shimchasi tarkibiga kiruvchi tikanli tuyasingren (Atraphaxis spinosa L.), limono‘ ti (Melissa officinalis L.) va tog‘ yalpizi (Mentha longifolia L.) o‘ simliklarining xalq tabobatida qo‘ llanilishi va ahamiyati haqida ma’lumotlar keltirilgan.Tadqiqot natijasida oziq-ovqat qo‘ shimchasi tarkibidagi aminokislotalar tarkibi va miqdoriy ko‘ rsatkichlari aniqlangan.*

Kalit so‘ zlar: *Atraphaxis spinosa L., Melissa officinalis L., Mentha longifolia L., ”OS-SHIFO” shifobaxsh oziq-ovqat qo‘ shilmasi, aminokislotalar, YuSSX, o‘ simlik xomashyosi, xalq tabobati*

ОПРЕДЕЛЕНИЕ СОДЕРЖАНИЯ АМИНОКИСЛОТ В ЛЕКАРСТВЕННОЙ ПИЩЕВОЙ ДОБАВКЕ «ОС-ШИФО», ПРИГОТОВЛЕННОЙ НА ОСНОВЕ ATRAPHAXIS SPINOSA L., MELISSA OFFICINALIS L., MENTHA LONGIFOLIA L., МЕТОДОМ ЮССХ И ЕГО ЗНАЧЕНИЕ В НАРОДНОЙ МЕДИЦИНЕ.

Аннотация*. В данной статье содержание аминокислот в лечебной пищевой добавке ”OS-SHIFO” определено методом высокоэффективной жидкостной хроматографии (ВЭЖХ). Приведены сведения о применении и значении в народной медицине растений курчавка колючая (Atraphaxis spinosa L.), мелисса (Melissa officinalis L.) и горной мяты (Mentha longifolia L.), входящих в состав данной пищевой добавки. В результате исследования определены состав и количественные показатели аминокислот в пищевом добавке.*

Ключевые слова*: Atraphaxis spinosa L., Melissa officinalis L., Mentha longifolia L. Лечебная пищевая добавка ”OS-SHIFO”, аминокислоты, ВЭЖХ, растительное сырье, народная медицина*

DETERMINATION OF AMINO ACID CONTENT IN THE “OS-SHIFO” THERAPEUTIC FOOD SUPPLEMENT (BASED ON *ATRAPHAXIS SPINOSA* L., *MELISSA OFFICINALIS* L., AND *MENTHA LONGIFOLIA* L.) USING THE YUSSX METHOD AND ITS SIGNIFICANCE IN FOLK MEDICINE

Abstract*. In this article, the amount of amino acids in the ”OS-SHIFO” medicinal food supplement was determined by high-performance liquid chromatography (HPLC). Information is provided on the use and significance in folk medicine of the thorny camelthorn (Atraphaxis spinosa L.), lemon balm (Melissa officinalis L.), and mountain mint (Mentha longifolia L.) plants included in this food supplement. As a result of the research, the composition and quantitative indicators of amino acids in the plants raw materials were determined.*

Keywords: *Atraphaxis spinosa L., Melissa officinalis L., Mentha longifolia L., "OS-SHIFO" medicinal food supplement, amino acids, HPLC, plant raw materials, folk medicine*

Kirish

Bugungi kunda aholi salomatligini saqlash, organizmning fiziologik ehtiyojlarini ta'minlash va biologik faol moddalarga boy mahsulotlardan samarali foydalanishga alohida e'tibor qaratilmoqda. Shu nuqtai nazardan, dorivor o‘ simliklar asosida tayyorlangan biologik faol mahsulotlar, jumladan oziq-ovqat qo‘ shimchalarining kimyoviy tarkibini o‘ rganish muhim ilmiy ahamiyat kasb etadi.

Qadimdan shifobaxsh o‘ simliklar xalq tabobatida turli kasalliklarni oldini olish va davolashda asosiy vosita hisoblangan. Xususan, Markaziy Osiyo xalq tabobati tajribasida hamda Abu Ali ibn Sino ta'limotida o‘ simlik xomashyolaridan tayyorlangan damlama va qaynatmalar keng qo‘ llanilgan. Tadqiqotda foydalanilgan *Atraphaxis spinosa L.* xalq tabobatida me'da ichak kasalliklari, diareya va yallig‘ lanish jarayonlarini davolashda, *Melissa officianalis L.* asab tizimini tinchlantirish, uyqusizlik va yurak spazmlarini bartaraf etishda, *Mentha longifolia L.* esa nafas yo‘ llari va ovqat hazm qilish tizimi buzilishlarida, shamollashga qarshi hamda spazmolitik vosita sifatida ishlatilgan. Asrlar davomida xalq tabobatida o‘ z isbotini topgan ushbu o‘ simliklarning shifobaxsh xususiyatlarini zamonaviy fizik kimyoviy usullar yordamida tadqiq etish va ular asosida ko‘ p komponentli "OS-SHIFO" oziq-ovqat qo‘ shimchasining biokimyoviy tarkibini asoslab berish alohida ilmiy va amaliy ahamiyatga ega.

O‘ simliklar tarkibidagi oqsillar, aminokislotalar, fenol birikmalar, flavonoidlar, vitaminlar, mineral moddalar va boshqa biologik faol birikmalar ularning oziqaviy va fiziologik- farmakologik qiymatini belgilashda muhim o‘ rin tutadi. Xususan, aminokislotalar organizmda oqsillar sintezi, fermentlar va boshqa biologik muhim birikmalar hosil bo‘ lishida ishtirok etadi. Shu sababli o‘ simlik xomashyosi va ular asosida tayyorlangan mahsulotlarning aminokislotalar tarkibini aniqlash ularning biologik va oziqaviy qiymatini baholashning muhim ko‘ rsatkichlaridan biri hisoblanadi.

Aminokislotalarning sifat va miqdor jihatdan aniqlashda zamonaviy xromatografik usullar, jumladan, yuqori samarali suyuqlik xromatografiyasi (YuSSX) samarali analitik usullardan hisoblanadi.

Adabiyotlar tahlili

Aminokislotalar tirik organizmlar metabolizmida muhim o‘ rin tutuvchi organik birikmalar bo‘ lib, oqsillar va peptidlarning asosiy tarkibiy qismlarini tashkil etadi. Shu bilan birga, aminokislotalar azot almashinuvi, energiya metabolizmi, hujayra signalizatsiyasi va organizmning turli tashqi ta'sirlarga moslashuv jarayonlarida ishtirok etadi. O‘ simliklarda aminokislotalar oqsil biosintezi bilan bir qatorda azotni tashish va saqlash, stressga javob reaksiyalari hamda ikkilamchi metabolitlar sintezida muhim rol o‘ ynaydi. O‘ simliklarda aminokislotalar metabolizmi energetik tanqislik va stress sharoitida sezilarli darjada o‘ zgarishi, ayrim aminokislotalar esa signal molekulalari sifatida ishtirok etishi mumkin [1].

O‘ simlik xomashyosini oziqaviy qiymatini baholashda aminokislotalar tarkibi muhim ko‘ rsatkichlardan biri hisoblanadi. Tadqiqotchilar tomonidan iqtisodiy ahamiyatga ega bo‘ lgan 142 ta o‘ simlik turning aminokislota tarkibi tahlil qilinib, o‘ simliklarda aminokislotalar miqdori turga qarab sezilarli darajada farq qilishi ko‘ rsatilgan, o‘ simliklar tarkibida almashinmaydigan aminokislotalarning mavjudligi ularning oziqaviy ahamiyatini baholashda muhim ekanligini qayd etilgan [2].

Aminokislotalar orasida inson organizmida sintezlanmaydigan yoki yetarli darajada hosil bo‘ lmaydigan lizin, metionin, treonin, fenilalanin, triptofan, valin, izoleysin, leysin va gistidin almashinmaydigan aminokislotalar sifatida qaraladi. Tadqiqotlarda o‘ simliklarda ushbu aminokislotalarning sintezi va to‘ planishi, ayniqsa ularning oziqaviy qiymatini oshirishdagi ahamiyati keng o‘ rganilgan [3]. Shu nuqtai nazardan, o‘ simliklarning aminokislota tarkibini o‘ rganish nafaqat biokimyoviy jihatdan, balki ulardan oziq-ovqat mahsulotlari va biologik faol qo‘ shimchalar tayyorlash imkoniyatlarini baholashda ham muhimdir. Turli botanik xomashyolar va ulardan tayyorlangan preparatlarda erkin aminokislotalar tarkibi o‘ rganilib, o‘ simlik turlari o‘ rtasida erkin aminokislotalarning umumiy miqdori va nisbati keskin farq qilishi aniqlagan. Tadqiq etilgan o‘ simliklarning bir qismida arginin, asparagin, glutamin, prolin nisbatan yuqori miqdorda uchrashi ko‘ rsatilgan [4]. Erkin aminokislotalar o‘ simliklarning nafaqat oziqaviy, balki fiziologik hususiyatlarini shakllantirishda ham ishtirok etadi. Xususan, prolin o‘ simliklarning qurg‘ oqchilik, sho‘ rlanish va oksidlovchi stressga moslashuvida muhim rol o‘ ynashi, glutamin esa signal uzatish jarayonlarida ishtirok etishi qayd etilgan.

Zamonaviy tadqiqotlarda aminokislotalarning o‘ simliklarda signal molekulalari, osmoprotektorlar va stressga qarshi himoya mexanizmlarining komponentlari sifatidagi vazifalariga alohida e'tibor qaratilmoqda. O‘ simlik xomashyosidagi aminokislotalarni miqdoriy va sifat jihatidan aniqlashda yuqori samarali suyuqlik xromatografiyasi keng qo‘ llaniladi. Aminokislotalarni fenilizotiosianat bilan oldindan derivatizatsiya qilishga asoslangan yuqori samarali suyuqlik xromatografiya (YuSSX) usulini ishlab chiqilqan. Ushbu yondashuvda aminokislotalarning feniltiokarbamil

hosilalari hosil qilinib, ularni xromatografik ajratish va miqdoriy aniqlash imkoniyati yaratiladi. Mazkur usul murakkab biologik matrisalarda aminokislotalarni aniqlash uchun yuqori sezgirlik va takrorlanuvchanlikka ega [5].

Xalq tabobatida *Atraphaxis spinosa L.(tikanli tuyasingren*) o‘ simligining ildizi, poyasi va barglari turli kasalliklarni davolashda, xususan me’da-ichak tizimi kasalliklari (diareya, dizenteriya), yallig‘ lanish jarayonlari hamda isitmani tushirishda damalamalar va qaynatmalar holida tavsiya etiladi. Bu o‘ simlik flavonoid va oshlovchi moddalarga boy bo‘ lgani uchun mikroblarga qarshi, yaralarni tuzatuvchi va qon to‘ htatuvchi ta’sirga ega [6].

Markaziy Osiyo va Evropa xalq tabobatida *Melissa officinalis (limono‘ ti)* asosan asab tizimi va yurak-qon tomir faoliyatini yaxshilashda foydalanib kelingan. Shuningdek, tinchlantiruvchi sifatida, uyqusizlik, xafaqon, bosh og‘ rig‘ i, spazmlar va yurak urishi tezlashganda qo‘ llaniladi [7].

Mentha longifolia L. Sharq tabobatida, jumladan Abu Ali ibn Sino asarlarida keng yoritilgan. Nafas yo‘ llari kasalliklarida (shamollash, yo‘ tal), me’da ichak buzilishlari (ko‘ ngil aynishi, ovqat xazm bo‘ lmasligi) va o‘ t haydovchi vosita sifatida ishlatiladi. Tarkibidagi efir moylari (mentol) hisobiga og‘ riq qoldiruvchi, antiseptik, shamollashga qarshi va spazmolitik ta’sirga ega [8].

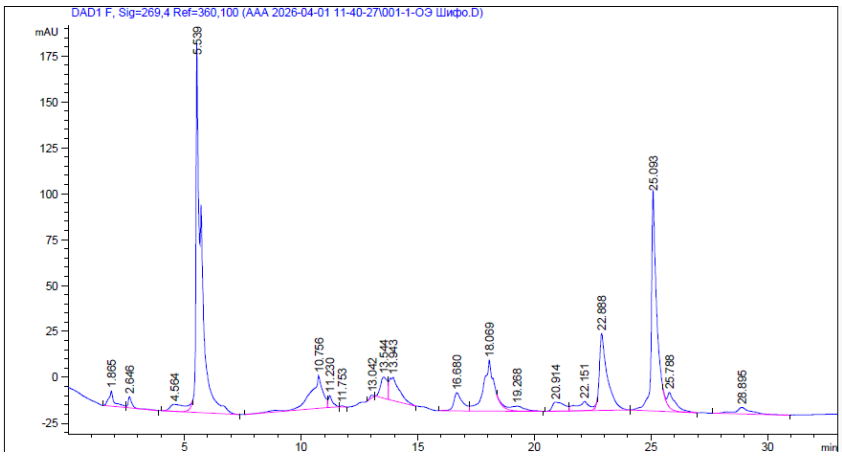
Shunday qilib, adabiyotlarda aminokislotalar o‘ simliklarning o‘ sishi, rivojlanishi, stressga chidamliligi va oziqaviy qiymatini shakllantirishdagi ahamiyati keng yoritilgan. Biroq *Atraphaxis spinose* L. o‘ simligi tarkibidagi erkin aminokilslotalarning sifat va miqdoriy tarkibi, ularning o‘ zaro nisbati hamda mazkur ko‘ rsatkichlarning o‘ simlik xomashyosini biologik va oziqaviy qiymati bilan bog‘ liqligi yetarlicha o‘ rganilmagan. Shu sababli *Atraphaxis spinosa L., Melissa officinalis L., Mentha longifolia L* o‘ simliklari asosida tayyorlangan “OS-SHIFO” oziq-ovqat qo‘ simchasi tarkibidagi erkin aminokislotalarni YuSSX usulida aniqlash va ularning miqdoriy tarkibini baholash dolzarb ilmiy vazifalardan biri hisoblanadi.

Tadqiqot metodologiyasi

Erkin aminokislotalarni ajratish. O‘ simlik namunasi tarkibidagi erkin aminokislotalarni ajratish uchun suvli ekstraktlardan foydalanildi. Namunalar tarkibidagi oqsil va peptidlarni cho‘ ktirish sentrifuga stakanlarida amalga oshirildi. Buning uchun tekshirilayotgan namunadan 1 ml olinib, unga 1ml 20% li trixlorsirka kislotasi (TXSK) qo‘ shildi. Aralashma 10 daqiqa davomida saqlangandan so‘ ng 8000 ayl/min tezlikda 15 daqiqa sentrifugalandi. Hosil bo‘ lgan cho‘ kma ajratilib, uning ustidagi suyuqlik qismi olib tashlandi. Cho‘ kma liofil quritish usulida quritildi. Quruq qoldiq trietilamin-atsetonitril-suv aralashmasida 1:7:1 nisbatda eritildi. Kislotali muhitni neytrallash va namunani tayyorlash maqsadida ushbu operasiya ikki marta takrorlandi. Aminokislotalarni xromatografik tahlilga tayyorlashda ular feniltioizotsianat bilan derivatizasiya qilinib, aminokislotalarning feniltiokarbamil hosilalari olindi. Derivatizasiya jarayoni Stiven A.Koen va Daniel usuli asosida amalga oshirildi [9].

Olingan aminokislotalar hosilalarini identifikatsiya qilish yuqori samarali suyuqlik xromatografiyasi usulida amalga oshirildi. Xromatografik tahlil Agilent Technologies 1200 xromatografida, AD detektori va Discovery HS C18 (75×4,6mm) kolonkasida bajarildi. Xromatografik ajratishda B elyuent sifatida atsetonitrildan foydalanildi. Oqim tezligi 1,2 ml/min, deteksiya to‘ lqin uzunligi 269 nm ni tashkil etdi. Gradiyent elyusiya rejimi quyidagicha olib borildi:0-2,5 daqiqa-1-6% B; 2,51-40 daqiqa-6-30%B; 40,1-45 daqiqa -30-60% B; 45,1-50 daqiqa-60%B; 50-daqiqadan so‘ ng-60-0% B.

1-rasm



Aminokislotalarni identifikatsiya qilish ularning xromatografik ushlanish vaqtlarini standart namunalarning ushlanish vaqtlari bilan solishtirish asosida amalga oshirildi.

Natijalar va ularning tahlili

“OS-SHIFO” oziq-ovqat qo‘ shimchasi tarkibidagi erkin aminokislotalar miqdori YuSSX usulida tahlil qilindi.

Aminokislotalarning nomi	OS-SHIFO

	Konsentratsiya mg/g
Asparagin kislota	0.461
Glutamin kislota	0.297
Serin	0.346
Glitsin	0.334
Asparagin	0.657
Glutamin	1.867
Sistein	4.187
Treonin	1.452
Arginin	0.191
Alanin	0.483
Prolin	1.055
Tirozin	0.193
Valin	0.397
Metionin	0.804
Gistidin	0.309
Izoleysin	0.224
Leysin	0.173
Triptofan	0.627
Fenilalanin	0.025
Lizin	0.038
Jami	**14.122**

1-jadval

1-jadval natijalariga ko‘ ra, oziq-ovqat qo‘ shimchasi tarkibida jami 20 ta erkin aminokislota aniqlandi. Ularning umumiy miqdori 14,122 mg/g ni tashkil etdi. Aniqlangan aminokisllotalar tarkibi o‘ simliklarda almashinadigan, shartli almashinmaydigan hamda almashinmaydigan aminokislotalar mavjudligini ko‘ rsatadi.

Miqdoriy jihatdan sistein- 4,187 mg/g bilan eng yuqori ko‘ rsatkichni namoyon qildi. Bu umumiy aminokislotalar miqdorining taxminan 29,7% ini tashkil etadi. Keyingi yuqori ko‘ rsatkichlar glutamin-1,867 mg/g (13.2%), treonin-1,452 mg/g (10,3%) va prolin-1,055mg/g (7,5%) xissasiga to‘ g‘ ri keladi. Mazkur aminokislotalarning nisbatan yuqori miqdorda bo‘ lishi “OS-SHIFO” oziq-ovqat qo‘ shimchasini biologik qiymatini baholashda muhim ahamiyatga ega.

Almashinmaydigan aminokislotalar sifatida treonin, valin, metionin, gistidin, izoleysin, leysin, triptofan, fenilalanin va lizin aniqlangan. Ularning jami miqdori hisob-kitob bo‘ yicha taxminan 4,049mg/g ni tashkil etadi. Demak, aniqlangan erkin aminokislotalarning taxminan 28,7% qismi almashinmaydigan aminokislotalar xissasiga to‘ g‘ ri keladi. Shuningdek, metionin (0,804mg/g), asparagin (0,657mg/g), triptofan (0,627mg/g), alanin (0,483mg/g), asparagin kislotasi (0,461mg/g) va valin (0,397mg/g) kabi aminokislotalarni aniqlanganligi o‘ simliklarda azot almashinuvi va oqsil biosintezi bilan bog‘ liq metabolik jarayonlar faol kechishini ko‘ rsatuvchi muhim kimyoviy ko‘ rsatkichlardan biri hisoblanadi.

Eng kam miqdordagi aminokislotalar fenilalanin- 0,025mg/g, lizin-0,038 mg/g, leysin-0,173 mg/g, arginin-0,191mg/g va tirozin-0,193 ekanligi ma’lum bo‘ ldi.

Xulosa

Olib borilgan tadqiqotlar va yuqori samarali suyuqlik xromatografiyasi tahlillari natijasida *Atraphaxis spinosa L., Melissa officinalis L. va Mentha longifolia L.* o‘ simliklari xomashyolari asosida yaratilgan “OS-SHIFO” shifobaxsh oziq-ovqat qo‘ shimchasining ozuqaviy va biologik qiymati yuqori ekanligi ilmiy jihatdan o‘ z tasdig‘ ini topdi.Tahlillar shuni ko‘ rsatadiki, ushbu qo‘ shimcha tarkibida inson organizmi uchun muhim bo‘ lgan jami 20 xil aminokislota mavjud bo‘ lib, ularning umumiy miqdori 14,122 mg/g ni tashkil etadi. Aminokislotalar tarkibida sistein, glutamin, treonin va prolinning nisbatan yuqori miqdorda uchrashi qayd etildi. Almashinmaydigan aminokislotalarning aniqlanishi mazkur o‘ simlik xomashyosining oziqaviy va biologik qiymatlarini baholashda muhim ahamiyatga ega. Asrlar davomida xalq tabobatida tinchlantiruvchi, yallig‘ lanishga qarshi va xazm qilishni yaxshilovchi vosita sifatida qo‘ llanib kelingan ushbu

uchta o‘ simlikning terapevtik xususiyatlari ularning boy aminokislota tarkibi bilan bevosita bog‘ liqligi bilan namoyon bo‘ ldi. Xususan, asab tizimini tinchlantiruvchi xususiyatlari tarkibidagi triptofan, glutamin va glitsin kabi neyromediatorlar sintezida qatnashuvchi aminokislotalar bilan ilmiy jihatdan asoslanadi.

Demak,”OS-SHIFO” oziq-ovqat qo‘ shimchasi nafaqat xalq tabobati an’analariga asoslangan shifobaxsh vosita, balki zamonaviy biokimyoviy tahlillar bilan tasdiqlangan, inson organizmini zarur oqsillar qurilish ashyolari bilan ta’minlovchi samarali biologik faol mahsulot hisoblanadi. Uni aholi salomatligini mustahkamlash, kasalliklarning oldini olish va kundalik ratsionni foydali moddalar bilan boyitish maqsadida amaliyotga joriy etish tavsiya etiladi.

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ЭТНОГЕОГРАФИЧЕСКИЕ ОСОБЕННОСТИ РАСПРЕДЕЛЕНИЯ МИКРОДЕЛЕЦИЙ ЛОКУСА AZF Y-ХРОМОСОМЫ У МУЖЧИН С БЕСПЛОДИЕМ В РЕГИОНАХ РЕСПУБЛИКИ УЗБЕКИСТАН

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Аннотация: *Введение. Республика Узбекистан характеризуется выраженным этногеографическим и демографическим многообразием субпопуляций, что теоретически способно влиять на частоту и структуру генетически детерминированных форм мужского бесплодия. Систематизированные данные о региональном распределении микроделеций AZF-региона Y-хромосомы на территории страны ранее отсутствовали. Цель исследования — оценить особенности регионального (этногеографического) распределения частоты и спектра микроделеций локусов AZFa, AZFb и AZFc Y-хромосомы у мужчин 18 лет и старше с бесплодием в 14 административно-территориальных единицах Республики Узбекистан. Материалы и методы. Обследовано 626 мужчин 18 лет и старше с клинически верифицированным диагнозом мужского бесплодия (необструктивная азооспермия и тяжёлая олигозооспермия), постоянно проживающих в 14 регионах Республики Узбекистан (от n=7 в Республике Каракалпакстан до n=113 в г. Ташкенте). Микроделеции AZFa, AZFb, AZFc определяли методом мультиплексной ПЦР в реальном времени по 13 STS-маркерам с использованием сертифицированной тест-системы. Для повышения статистической мощности регионы были дополнительно объединены в три укрупнённые экономико-географические зоны. Результаты и их обсуждение. Микроделеции AZF выявлены у 93 из 626 пациентов (14,86%); частота варьировала от 13,27% (г. Ташкент) до 16,67% (Сурхандарьинская область) без статистически значимых межрегиональных различий (χ^2=0,002–0,190; p=0,663–0,969). Сравнение трёх укрупнённых зон (Ташкентская агломерация, Ферганская долина, остальные регионы) также не выявило значимых различий (χ^2=0,195; df=2; p=0,907). Во всех без исключения регионах абсолютно доминировали делеции AZFc (58,33–100% структуры выявленных нарушений). Заключение. Установленная однородность регионального распределения микроделеций AZF свидетельствует о преимущественно спонтанном, не зависящем от территориальной и этнической принадлежности механизме их формирования и обосновывает применение единого общенационального диагностического алгоритма без необходимости регион-специфической адаптации, при обязательном учёте азиат-специфичного полиморфизма rs72609647 в сайте связывания праймера sY84.*

Ключевые слова: *мужское бесплодие; Y-хромосома; микроделеции AZF; этногеографическое распределение; регионы Узбекистана; консангвинность; sY84; азооспермия.*

ETHNOGEOGRAPHIC DISTRIBUTION OF Y-CHROMOSOME AZF LOCUS MICRODELETIONS IN INFERTILE MEN ACROSS REGIONS OF THE REPUBLIC OF UZBEKISTAN

Abstract*.Introduction. The Republic of Uzbekistan is characterized by pronounced ethnogeographic and demographic diversity of subpopulations, which could theoretically influence the frequency and structure of genetically determined forms of male infertility. Systematic data on the regional distribution of Y-chromosome AZF microdeletions across the country had not previously been available. The aim of the study was to assess the regional (ethnogeographic) distribution of the frequency and spectrum of AZFa,*

AZFb and AZFc microdeletions in infertile men aged 18 years and older across 14 administrative-territorial units of the Republic of Uzbekistan. Materials and methods. A total of 626 men aged 18 years and older with a clinically verified diagnosis of male infertility (non-obstructive azoospermia and severe oligozoospermia), permanently residing in 14 regions of Uzbekistan (from n=7 in the Republic of Karakalpakstan to n=113 in Tashkent city), were examined. AZFa, AZFb and AZFc microdeletions were detected by real-time multiplex PCR using 13 STS markers with a certified test system. To increase statistical power, the regions were additionally pooled into three enlarged economic-geographic zones. Results and discussion. AZF microdeletions were detected in 93 of 626 patients (14.86%); the frequency ranged from 13.27% (Tashkent city) to 16.67% (Surkhandarya region) with no statistically significant inter-regional differences (χ^2=0.002–0.190; p=0.663–0.969). Comparison of three pooled zones (Tashkent metropolitan zone, Fergana Valley, other regions) likewise showed no significant differences (χ^2=0.195; df=2; p=0.907). AZFc deletions predominated in every region examined (58.33–100% of the deletion structure). Conclusion. The demonstrated homogeneity of the regional distribution of AZF microdeletions indicates a predominantly spontaneous mechanism of their formation, independent of territorial or ethnic affiliation, and supports the use of a single unified national diagnostic algorithm without the need for region-specific adaptation, while requiring the mandatory use of primer systems accounting for the Asian-specific rs72609647 polymorphism at the sY84 primer binding site.

Keywords: *male infertility; Y chromosome; AZF microdeletions; ethnogeographic distribution; regions of Uzbekistan; consanguinity; sY84; azoospermia.*

Введение

Мужское бесплодие остаётся одной из наиболее социально значимых медицинских проблем современности, а генетические факторы ответственны за 15–30% его случаев [1, 3, 4]. Среди верифицированных генетических причин второе место после синдрома Клайнфельтера занимают микроделеции региона AZF (azoospermia factor) длинного плеча Y-хромосомы, подразделяющегося на три субрегиона — AZFa, AZFb и AZFc [6]. Частота и спектр AZF-микроделеций демонстрируют значительную межпопуляционную вариабельность в масштабах планеты [3, 4], что закономерно ставит вопрос о наличии подобной вариабельности и внутри отдельно взятой страны.

Республика Узбекистан представляет собой уникальный ареал с точки зрения этногенеза и популяционной генетики. Формирование современного населения страны происходило под влиянием масштабных исторических миграционных процессов, контактов различных этнических групп и сохранения в ряде регионов традиций эндогамных (близкородственных) браков [13, 14]. Отдельные наблюдения свидетельствуют о повышенной частоте кровнородственных браков в некоторых субпопуляциях Узбекистана и сопредельных стран Центральной Азии [15, 16], что теоретически могло бы способствовать локальному накоплению редких генетических вариантов по механизму эффекта основателя. Вместе с тем систематизированные данные о том, распределены ли AZF-микроделеции по территории Узбекистана равномерно либо демонстрируют региональную кластеризацию, в литературе отсутствовали.

Дополнительную актуальность региональному анализу придаёт описанный в литературе технический артефакт молекулярной диагностики AZFa: однонуклеотидный полиморфизм rs72609647 в сайте связывания обратного праймера STS-маркера sY84, распространённый преимущественно у лиц азиатского происхождения и способный имитировать истинную микроделецию AZFa при использовании устаревших диагностических панелей [11, 12]. Поскольку население Узбекистана этногенетически относится к азиатскому макрорегиону, оценка регионального распределения делеций AZFa приобретает не только эпидемиологическое, но и методологическое значение.

Цель исследования — оценить особенности регионального (этногеографического) распределения частоты и спектра микроделеций локусов AZFa, AZFb и AZFc Y-хромосомы у мужчин 18 лет и старше с бесплодием в 14 административно-территориальных единицах Республики Узбекистан.

Материал и методы исследования

Исследование выполнено в формате обсервационного аналитического исследования на базе клиники «Доктор Д» (г. Ташкент). В анализ включены 626 мужчин 18 лет и старше с клинически верифицированным диагнозом мужского бесплодия (медиана возраста 30,80±5,33 года), из которых 352 (56,2%) пациента с необструктивной азооспермией и 274 (43,8%) пациента с тяжёлой олигозооспермией (концентрация сперматозоидов менее 5 млн/мл). Оценку эякулята проводили дважды в соответствии с руководством Всемирной организации здравоохранения по лабораторному исследованию и обработке эякулята человека (6-е издание, 2021 г.) [5]; азооспермию верифицировали с обязательным исследованием осадка эякулята после центрифугирования.

Каждый пациент был отнесён к одному из 14 регионов Республики Узбекистан (г. Ташкент, Андижанская, Бухарская, Джизакская, Кашкадарьинская, Навоийская, Наманганская, Самаркандская, Сурхандарьинская,

Сырдарьинская, Ташкентская, Ферганская, Хорезмская области, Республика Каракалпакстан) на основании постоянного места жительства на момент включения в исследование. Ввиду выраженной неравномерности объёма выборки по регионам (от n=7 до n=113) для повышения статистической мощности сравнения регионы были дополнительно объединены в три укрупнённые экономико-географические зоны: Ташкентская агломерация (г. Ташкент и Ташкентская область), Ферганская долина (Андижанская, Наманганская и Ферганская области) и остальные регионы Республики (Бухарская, Джизакская, Кашкадарьинская, Навоийская, Самаркандская, Сурхандарьинская, Сырдарьинская, Хорезмская области, Республика Каракалпакстан).

Биологическим материалом служила периферическая венозная кровь, взятая в вакуумные пробирки с антикоагулянтом ЭДТА. Выделение геномной ДНК проводили с использованием комплекта «ПРОБА-РАПИД-ГЕНЕТИКА» (Р-021/4). Детекцию микроделеций AZFa, AZFb и AZFc выполняли методом качественной мультиплексной полимеразной цепной реакции с флуоресцентной детекцией в режиме реального времени с использованием сертифицированной тест-системы «Делеции локуса AZF» (регистрационное удостоверение РЗН № 2014/2078, производство НПО «ДНК-Технология», Россия) на амплификаторе ДТпрайм. Аналитическая панель включала 13 неполиморфных STS-маркеров (sY84, sY86, sY615 — AZFa; sY127, sY134, sY142 — AZFb; sY254, sY255, sY1197, sY1125, sY1206, sY242, sY1291 — AZFc), а также маркер гена SRY и внутренний контроль амплификации. Каждый запуск сопровождался положительным и отрицательным контролями.

Статистическую обработку данных выполняли в пакете IBM SPSS Statistics 26.0 и OpenEpi 3.01. Качественные признаки представлены абсолютными и относительными частотами (n, %). Сравнение частот между регионами и между укрупнёнными зонами проводили с использованием критерия χ^2 Пирсона; при ожидаемых частотах менее 5 применяли точный критерий Фишера. Критический уровень значимости принят равным 0,05.

Результаты исследования и их обсуждение

Из 626 обследованных пациентов 18 лет и старше микроделеции локуса AZF выявлены у 93 человек, что составило 14,86% (табл. 1). При распределении по 14 регионам Республики Узбекистан частота выявления делеций варьировала в узком диапазоне — от минимального значения 13,27% в г. Ташкенте (n=15 из 113) до максимальных 16,67% в Сурхандарьинской области (n=8 из 48) и 16,33% в Наманганской области (n=8 из 49). В среднем по всем исследованным регионам показатель стабильно удерживался на уровне 14–16%.

Таблица 1

Частота и структура микроделеций AZF у пациентов с мужским бесплодием (18 лет и старше) по регионам Республики Узбекистан

Регион	AZFa n	AZFa %	AZFb n	AZFb %	AZFc n	AZFc %	Всего n	Всего %	χ^2	p
г. Ташкент (n=113)	2	11,11	3	16,67	13	72,22	15	13,27	0,190	0,663
Андижанская обл. (n=21)	0	0,00	1	25,00	3	75,00	3	14,29	0,005	0,946
Бухарская обл. (n=62)	0	0,00	2	20,00	8	80,00	9	14,52	0,005	0,945
Джизакская обл. (n=29)	1	20,00	1	20,00	3	60,00	4	13,79	0,022	0,882
Кашкадарьинская обл. (n=62)	1	10,00	2	20,00	7	70,00	9	14,52	0,005	0,945
Навоийская обл. (n=15)	0	0,00	1	33,33	2	66,67	2	13,33	0,023	0,878
Наманганская обл. (n=49)	2	16,67	3	25,00	7	58,33	8	16,33	0,071	0,789
Самаркандская обл. (n=105)	1	5,00	4	20,00	15	75,00	17	16,19	0,126	0,723
Сурхандарьинская обл. (n=48)	0	0,00	3	30,00	7	70,00	8	16,67	0,106	0,745
Сырдарьинская обл.	0	0,00	1	25,00	3	75,00	3	13,64	0,022	0,882

Регион	AZFa n	AZFa %	AZFb n	AZFb %	AZFc n	AZFc %	Всего n	Всего %	χ^2	p
(n=22)										
Ташкентская обл. (n=53)	1	10,00	3	30,00	6	60,00	8	15,09	0,002	0,964
Ферганская обл. (n=26)	0	0,00	1	20,00	4	80,00	4	15,38	0,005	0,944
Хорезмская обл. (n=14)	0	0,00	0	0,00	2	100,00	2	14,29	0,003	0,956
Респ. Каракалпакстан (n=7)	0	0,00	0	0,00	1	100,00	1	14,29	0,002	0,969
Итого (n=626)	**8**	**1,28***	**25**	**3,99***	**81**	**12,94***	**93**	**14,86**	**24,83**	**<0,001**

Примечание: составлена автором на основе полученных данных в ходе исследования.

* Доля от общего числа обследованных мужчин 18 лет и старше по республике (n=626); в остальных столбцах таблицы — доля от числа выявленных делеций внутри региона.

При детализации структуры генетических нарушений по субрегионам установлено абсолютное преобладание повреждений локуса AZFc во всех без исключения анализируемых регионах — от 58,33% (Наманганская область) до 100% (Хорезмская область и Республика Каракалпакстан) структуры выявленных делеций. Делеции субрегионов AZFa и AZFb регистрировались значительно реже; в ряде регионов (Андижанская, Бухарская, Навоийская, Сурхандарьинская, Сырдарьинская, Ферганская, Хорезмская области и Республика Каракалпакстан) изолированные делеции AZFa не выявлены вовсе. Значения критерия χ^2 для всех сравниваемых территорий находились в диапазоне от 0,002 до 0,190, соответствующие уровни значимости (p) — от 0,663 до 0,969, что не позволяет отвергнуть нулевую гипотезу об отсутствии статистически значимых различий в частоте встречаемости микроделеций AZF в зависимости от региона проживания пациента.

Учитывая малый объём отдельных региональных выборок (n=7–15 в Республике Каракалпакстан, Навоийской и Хорезмской областях), с целью повышения статистической мощности сравнения регионы были объединены в три укрупнённые экономико-географические зоны (табл. 2).

Таблица 2

Сравнительный анализ частоты микроделеций AZF в укрупнённых экономико-географических зонах Республики Узбекистан

Укрупнённая зона	n	Пациенты с делециями n	%	χ^2	df	p
Ташкентская агломерация (г. Ташкент + Ташкентская обл.)	166	23	13,86			
Ферганская долина (Андижанская, Наманганская, Ферганская обл.)	96	15	15,63			
Остальные регионы Республики	364	55	15,11			
Итого	**626**	**93**	**14,86**	**0,195**	**2**	**0,907**

Примечание: составлена автором на основе полученных данных в ходе исследования.

Сопоставление трёх укрупнённых зон подтвердило результаты регионального анализа: частота выявления AZF-микроделеций составила 13,86% в Ташкентской агломерации, 15,63% в Ферганской долине и 15,11% в остальных регионах республики, статистически значимых различий между зонами не установлено (χ^2=0,195; df=2; p=0,907). Таким образом, ни укрупнение выборки, ни детализация по отдельным регионам не выявили территориальной кластеризации частоты AZF-микроделеций на территории Республики Узбекистан.

Анализ структуры выявленных нарушений по укрупнённым зонам (табл. 3) показал, что во всех трёх зонах доминирующим типом перестройки закономерно оставалась делеция AZFc, доля которой варьировала от 66,67% (Ферганская долина) до 73,85% (прочие регионы) от суммарного числа зарегистрированных инцидентов делеций внутри зоны, что демонстрирует однородность молекулярного профиля AZF-микроделеций вне зависимости от географического положения и этнического состава населения.

Таблица 3

Структура микроделеций AZF по субрегионам в укрупнённых экономико-географических зонах

Укрупнённая зона AZFa, доля от делеций зоны, % AZFb, доля от делеций зоны, % AZFc, доля от делеций зоны, % Всего инцидентов делеций, n

Укрупнённая зона	**AZFa, доля от делеций зоны, %**	**AZFb, доля от делеций зоны, %**	**AZFc, доля от делеций зоны, %**	**Всего инцидентов делеций, n**
Ташкентская агломерация	10,71	21,43	67,86	28
Ферганская долина	9,52	23,81	66,67	21
Остальные регионы	4,62	21,54	73,85	65

Примечание: составлена автором на основе полученных данных в ходе исследования.

Полученные результаты имеют принципиальное значение для интерпретации гипотезы об этногенетической детерминированности AZF-микроделеций. Несмотря на описанную в литературе повышенную частоту кровнородственных браков в отдельных субпопуляциях Центральной Азии, в том числе Узбекистана [15, 16], настоящее исследование не выявило накопления AZF-делеций в регионах с традиционно более высоким уровнем эндогамии по сравнению с крупными городскими агломерациями. Поскольку подавляющее большинство микроделеций AZF, в отличие от классических аутосомно-рецессивных заболеваний, возникает de novo вследствие внутрихромосомной неаллельной гомологичной рекомбинации между палиндромными и ампликонными структурами мужского специфичного региона Y-хромосомы [7, 8, 9], а не наследуется по рецессивному типу от гетерозиготных носителей, эффект близкородственных браков, характерный для аутосомных рецессивных мутаций, на частоту данной патологии закономерно не распространяется. Это согласуется с полученными данными о территориальной однородности показателя и подтверждает универсальность молекулярного механизма нестабильности Y-хромосомы независимо от степени эндогамии популяции.

Этногеографическая однородность распределения имеет и важное практическое следствие в отношении интерпретации результатов молекулярной диагностики. Население Узбекистана этногенетически относится к азиатскому макрорегиону, для которого характерно широкое распространение однонуклеотидного полиморфизма rs72609647, локализованного в пятом нуклеотиде сайта связывания обратного праймера STS-маркера sY84 [11]. Присутствие данного SNP приводит к отсутствию амплификации маркера sY84 независимо от истинного генетического статуса AZFa и в устаревших диагностических алгоритмах способно ложно интерпретироваться как микроделеция [11, 12]. Поскольку в настоящем исследовании частота изолированных делеций AZFa во всех регионах оставалась низкой (0,73–1,28% от общей выборки) и не демонстрировала неожиданных региональных всплесков, которые могли бы указывать на неучтённый технический артефакт, можно заключить, что применённая мультиплексная панель адекватно учитывала азиат-специфичный полиморфизм sY84. Тем не менее, с учётом обновлённых рекомендаций EAA/EMQN 2023 г. [12], использование адаптированной последовательности обратного праймера sY84 должно оставаться обязательным элементом лабораторного алгоритма во всех регионах страны.

Ограничениями настоящего этапа исследования являются значительная неравномерность объёма выборки по отдельным регионам (от n=7 до n=113), что снижает статистическую мощность анализа для малочисленных территорий, а также ретроспективный характер учёта места постоянного проживания пациентов без верификации этнической принадлежности и семейного анамнеза кровнородственных браков. Дальнейшие проспективные многоцентровые исследования с включением данных об этнической принадлежности и коэффициенте инбридинга позволят более детально оценить вклад отдельных субпопуляционных факторов в формирование генетического профиля мужского бесплодия в Узбекистане.

Выводы

1. Частота микроделеций локуса AZF Y-хромосомы среди мужчин 18 лет и старше с бесплодием в обследованной узбекской когорте составила 14,86% (93 из 626) и варьировала по 14 регионам страны в узком диапазоне — от 13,27% (г. Ташкент) до 16,67% (Сурхандарьинская область) — без статистически значимых межрегиональных различий (χ^2=0,002–0,190; p=0,663–0,969).

2. Сравнение трёх укрупнённых экономико-географических зон (Ташкентская агломерация — 13,86%, Ферганская долина — 15,63%, остальные регионы — 15,11%) подтвердило отсутствие статистически значимой территориальной гетерогенности частоты AZF-микроделеций (χ^2=0,195; df=2; p=0,907).

3. Во всех без исключения регионах Республики Узбекистан в структуре выявленных нарушений абсолютно доминировали делеции AZFc (от 58,33% в Наманганской области до 100% в Хорезмской области и Республике Каракалпакстан), что подтверждает единство молекулярного механизма формирования данного типа перестроек на всей территории страны.

4. Отсутствие накопления AZF-микроделеций в регионах с традиционно более высоким уровнем эндогамии свидетельствует о преимущественно спонтанном (de novo) механизме их формирования, не подчиняющемся закономерностям наследования классических аутосомно-рецессивных заболеваний.

5. Установленная региональная однородность обосновывает применение единого общенационального диагностического алгоритма молекулярно-генетического скрининга AZF-региона в Республике Узбекистан без необходимости регион-специфической адаптации, при обязательном сохранении в составе мультиплексной панели праймерной системы, учитывающей азиат-специфичный полиморфизм rs72609647 маркера sY84.

Заключение

Проведённое исследование впервые предоставляет систематизированные данные о региональном (этногеографическом) распределении микроделеций AZF-региона Y-хромосомы у мужчин с бесплодием на всей территории Республики Узбекистан. Установленная территориальная однородность частоты (14,86%) и структуры выявленных нарушений с абсолютным преобладанием делеций AZFc отражает универсальный, преимущественно спонтанный молекулярный механизм нестабильности мужского специфичного региона Y-хромосомы, не зависящий от этногеографических и демографических особенностей отдельных субпопуляций страны. Полученные результаты формируют доказательную основу для внедрения единого общенационального алгоритма молекулярно-генетического скрининга мужского бесплодия в Узбекистане, а также подчёркивают необходимость обязательного учёта азиат-специфичного полиморфизма сайта связывания праймера sY84 при интерпретации результатов диагностики делеций AZFa.

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PLOCAMA VASSILCZENKOI (LINCZ.) M. BACKLUND & THULIN TURINING FARG‘ ONA VODIYSIDAGI MORFOLOGIK, FITOGEOGRAFIK XUSUSIYATLARI VA MUHOFAZA MUAMMOLARI

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Annotatsiya: *Mazkur maqolada Rubiaceae Juss. oilasiga mansub, Farg‘ ona vodiysining tor arealli endem turi hisoblangan Plocama vassilczenkoi (Lincz.) M. Backlund & Thulin turining morfologik, fitogeografik va ekologik xususiyatlari hamda muhofaza masalalari kompleks yoritilgan. 2024–2026-yillarda Namangan va Farg‘ ona viloyatlarining adir va tog‘ oldi hududlarida o‘ tkazilgan dala tadqiqotlari, TASH va FRU gerbariy fondlari materiallari, shuningdek GBIF, POWO va IPNI xalqaro elektron ma’lumotlar bazalari asosida turning 1915–2025-yillarga oid 34 ta uchrash nuqtasi tahlil qilindi. Tadqiqot natijalariga ko‘ ra, tur asosan Chorkesar (58,8%), Janubiy Chotqol (35,3%) va Sharqiy Oloy (5,9%) botanik-geografik rayonlarida, dengiz sathidan 406–1221 m balandlik oralig‘ ida, skeletli va gipslashgan bo‘ z tuproqlarda tarqalgan bo‘ lib, uning ekologik optimumi 500–800 m balandlikka to‘ g‘ ri keladi. BIOMOD2 platformasida amalga oshirilgan ensemble bioiqlimiy modellashtirish SSP245 iqlim ssenariysi bo‘ yicha 2080–2100-yillarga kelib turning tarqalish areali (EOO) 27–38%, egallanish maydoni (AOO) esa 39–53% ga qisqarishini bashorat qildi. GeoCAT vositasi yordamida hisoblangan EOO (≈12 932 km²) va AOO (≈120 km²) ko‘ rsatkichlari hamda populyatsiyalarning kichik va parchalanganligi asosida tur IUCN mezonlariga ko‘ ra EN (Endangered – Xavf ostida) kategoriyasiga kiritildi. Tadqiqot natijalari asosida in-situ va ex-situ muhofaza chora-tadbirlari, jumladan yangi muhofaza hududlarini tashkil etish, yaylov boshqaruvi, urug‘ bankini yaratish va reintroduksiya dasturi ishlab chiqildi.*

Kalit so‘ zlar: *Plocama vassilczenkoi, Rubiaceae, endem tur, Farg‘ ona vodiysi, fitogeografiya, bioiqlimiy modellashtirish, IUCN, muhofaza.*

МОРФОЛОГИЧЕСКИЕ, ФИТОГЕОГРАФИЧЕСКИЕ ОСОБЕННОСТИ И ПРОБЛЕМЫ ОХРАНЫ ВИДА *PLOCAMA VASSILCZENKOI* (LINCZ.) M. BACKLUND & THULIN В ФЕРГАНСКОЙ ДОЛИНЕ

Аннотация: *В статье комплексно освещены морфологические, фитогеографические и экологические особенности, а также вопросы охраны Plocama vassilczenkoi (Lincz.) M. Backlund & Thulin — узкоареального эндемичного вида Ферганской долины из семейства Rubiaceae Juss. На основе полевых исследований, проведённых в 2024–2026 гг. в адырных и предгорных районах Наманганской и Ферганской областей, материалов гербарных фондов TASH и FRU, а также международных электронных баз данных GBIF, POWO и IPNI проанализированы 34 точки встречаемости вида за 1915–2025 гг. Согласно результатам исследования, вид распространён преимущественно в Чоркесарском (58,8%), Южно-Чаткальском (35,3%) и Восточно-Алайском (5,9%) ботанико-географических районах, на высотах 406–1221 м над уровнем моря, на скелетных и гипсоносных сероземах; его экологический оптимум приходится на высоты 500–800 м. Ансамблевое биоклиматическое моделирование, выполненное на платформе BIOMOD2, прогнозирует к 2080–2100 гг. при климатическом сценарии SSP245 сокращение площади распространения вида (EOO) на 27–38%, а площади обитания (AOO) — на 39–53%. На основании показателей EOO (≈12 932 км²) и AOO (≈120 км²), рассчитанных с помощью инструмента GeoCAT, а также малочисленности и фрагментированности популяций вид отнесён по критериям МСОП (IUCN) к категории EN (Endangered — находящийся под угрозой исчезновения). По результатам исследования разработаны меры охраны in-situ и ex-situ, включая создание новых охраняемых территорий, регулирование выпаса, создание банка семян и программу реинтродукции.*

Ключевые слова: *Plocama vassilczenkoi, Rubiaceae, эндемичный вид, Ферганская долина, фитогеография, биоклиматическое моделирование, МСОП (IUCN), охрана.*

MORPHOLOGICAL AND PHYTOGEOGRAPHICAL CHARACTERISTICS AND CONSERVATION PROBLEMS OF *PLOCAMA VASSILCZENKOI* (LINCZ.) M. BACKLUND & THULIN IN THE FERGANA VALLEY

Abstract: *This article presents a comprehensive analysis of the morphological, phytogeographical, and ecological characteristics, as well as the conservation status, of Plocama vassilczenkoi (Lincz.) M. Backlund & Thulin (Rubiaceae), a narrow-range endemic species of the Fergana Valley. Based on field surveys conducted in the Namangan and Fergana regions during 2024–*

2026, herbarium materials from the TASH and FRU collections, and data from the GBIF, POWO, and IPNI international databases, 34 occurrence records spanning 1915–2025 were analyzed. The results show that the species is distributed mainly within the Chorkesar (58.8%), South Chatkal (35.3%), and East Alai (5.9%) botanical-geographical districts at elevations of 406–1221 m, occurring predominantly on skeletal and gypsiferous grey soils, with an ecological optimum at 500–800 m. Ensemble species distribution modeling performed in BIOMOD2 predicted, under the SSP245 climate scenario, a 27–38% reduction in the extent of occurrence (EOO) and a 39–53% reduction in the area of occupancy (AOO) by 2080–2100. Based on EOO (~12,932 km²) and AOO (~120 km²) values calculated using GeoCAT, together with the small and fragmented nature of the populations, the species was assigned to the IUCN category Endangered (EN). A set of in-situ and ex-situ conservation measures, including the establishment of new protected areas, grazing management, seed banking, and a reintroduction program, was developed on the basis of the study results.

Keywords: *Plocama vassilczenkoi, Rubiaceae, endemic species, Fergana Valley, phytogeography, species distribution modeling, IUCN, plant conservation.*

KIRISH

Markaziy Osiyo florasi yuqori endemizm darajasi va tor arealli noyob taksonlarga boyligi bilan jahon botanik-geografik rayonlashtirish tizimida alohida o‘ rin egallaydi. Ushbu mintaqada, xususan Farg‘ ona vodiysining adir va tog‘ oldi zonalarida shakllangan endemik flora elementlari nafaqat mahalliy, balki global biologik xilma-xillik nuqtai nazaridan ham muhim ilmiy ahamiyat kasb etadi. Rubiaceae Juss. oilasiga mansub *Plocama Aiton* turkumi (jahon florasida 36, O‘ zbekiston florasida 7 tur) geografik jihatdan tor arealga ega, antropogen ta’sirlarga yuqori darajada sezgir turlarni birlashtiradi, shu sababli ularni muhofaza qilish maqsadli va kompleks tadqiqotlarni talab qiladi [1, 20].

Plocama vassilczenkoi (Lincz.) M. Backlund & Thulin – Farg‘ ona vodiysining tor arealli endem turi bo‘ lib, murakkab va uzoq nomenklaturaviy tarixga ega. Tur 1915-yilda V. Drobov tomonidan ilk bor yig‘ ib olingandan so‘ ng, XX asr davomida Gaillonia A.Rich. ex DC. va Neogaillonia Lincz. turkumlari tarkibida bir necha bor qayta nomlangan, faqat 2007-yilda M. Backlund va M. Thulin tomonidan o‘ tkazilgan molekulyar-filogenetik tahlillar natijasida hozirgi sistematik holatiga ega bo‘ lgan [2, 3, 24]. Bu murakkab taksonomik tarix ko‘ plab adabiy manbalarda eskirgan nomenklaturaning saqlanib qolishiga sabab bo‘ lgan.

Tur bo‘ yicha olib borilgan adabiyotlar tahlili [20, 38, 39, 45] shuni ko‘ rsatadiki, turning Farg‘ ona vodiysi botanik-geografik rayonlari bo‘ yicha tarqalishi tizimli tahlil qilinmagan, barcha ma’lum uchrash nuqtalari (1915–2025) to‘ liq tizimlashtirilmagan, tuproq tiplari va balandlik mintaqalari bo‘ yicha miqdoriy ekologik tahlil yetarli emas, muhofaza holati turli manbalarda turlicha (VU, EN, CR) baholangan bo‘ lib, yagona va hujjatlashtirilgan baholash amalga oshirilmagan. Bundan tashqari, turning iqlim o‘ zgarishiga nisbatan sezgirligi bioiqlimiy modellashtirish usullari yordamida hali baholanmagan.

O‘ zbekiston Respublikasida biologik xilma-xillikni saqlash davlat siyosati darajasidagi muhim vazifalardan biri hisoblanadi, bu O‘ zbekiston Respublikasining “O‘ simlik dunyosini muhofaza qilish va undan foydalanish to‘ g‘ risida”gi Qonuni (2016), Prezidentning atrof-muhitni muhofaza qilish konsepsiyasi (2019), biologik xilma-xillikni saqlash strategiyasi (2019) va boshqa me’yoriy-huquqiy hujjatlarda o‘ z aksini topgan.

Tadqiqotning maqsadi – *Plocama vassilczenkoi* (Lincz.) turining morfologiyasi, fitogeografiyasi va muhofaza masalalarini kompleks o‘ rganishdan iborat. Ushbu maqsadga erishish uchun quyidagi vazifalar belgilandi: turning tirik namunalar asosidagi morfologik tahlilini amalga oshirish; botanik-geografik rayonlar bo‘ yicha tarqalishini tahlil qilish; tuproq tiplari va balandlik mintaqalari bo‘ yicha ekologik xususiyatlarini aniqlash; turni bioiqlimiy modellashtirish; IUCN kategoriyalari bo‘ yicha baholash; muhofaza qilish choralarini ishlab chiqish.

Tadqiqotning ilmiy yangiligi shundan iboratki, ilk bor turning ekologik nishi BIOMOD2 platformasida ensemble modellashtirish usuli yordamida baholandi, turning Farg‘ ona vodiysidagi barcha ma’lum uchrash nuqtalari (1915–2025) tizimlashtirilib, botanik-geografik rayonlar kesimida tahlil qilindi, tuproq tiplari va balandlik mintaqalari bo‘ yicha miqdoriy ekologik tahlil o‘ tkazildi hamda IUCN mezonlari asosida yagona, hujjatlashtirilgan muhofaza baholashi amalga oshirildi.

TADQIQOT MATERIALLARI VA USULLARI

Tadqiqot obyekti va hududi. Tadqiqot obyekti sifatida Rubiaceae Juss. oilasiga mansub, Farg‘ ona vodiysi endemigi hisoblangan *Plocama vassilczenkoi* (Lincz.) M. Backlund & Thulin turi tanlab olindi. Tadqiqot hududi sifatida Farg‘ ona vodiysining shimoliy va shimoli-sharqiy qismlarida joylashgan Namangan viloyati (Namangan, Chust, Pop, Chortoq, To‘ raqo‘ rg‘ on, Uychi, Yangiqo‘ rg‘ on tumanlari) hamda Farg‘ ona viloyatining (Oltiariq, Quvasoy, Beshariq tumanlari) adir hududlari xizmat qildi. Tadqiqot hududlari dengiz sathidan 406–1221 m balandlikda joylashgan bo‘ lib, chala cho‘ l va adir mintaqalariga xos quruq kontinental iqlim, bo‘ z va gipslashgan tuproqlar bilan tavsiflanadi [13, 46].

Dala tadqiqotlari va gerbariy materiallari

2024–2026-yillarning mart–avgust oylarida A.I. Tolmachev (1974) hamda A.V. Shcherbakov va S.R. Mayorov (2006) metodikalari asosida maqsadli dala tadqiqotlari olib borildi. Marshrutlar oldingi adabiyot va gerbariy ma'lumotlari asosida rejalashtirilib, populyatsiyalarning GPS-koordinatalari, balandligi, o' sish sharoiti va fenologik holati qayd etildi. Tadqiqot materiallari TASH (26 namuna) va FRU (4 namuna) gerbariy fondlari, shuningdek GBIF, POWO va IPNI xalqaro elektron ma'lumotlar bazalaridan olingan ma'lumotlar bilan to' ldirildi. Natijada 1915–2025-yillar (110 yillik davr) oralig' ini qamrab olgan jami 34 ta uchrash yozuvi tizimlashtirildi.

Morfologik tahlil

Turning vegetativ (poya, barg) va generativ (gul, meva) organlarining morfometrik ko' rsatkichlari 8 ta populyatsiyada o' tkazilgan o' lchashlar asosida aniqlandi. Olingan ma'lumotlar O' zbekiston florasi uchun endem bo' lgan yaqin turlar – *Plocama botschantzevii* va *Plocama bucharica* – bilan qiyosiy tahlil qilindi.

Botanik-geografik rayonlashtirish

Turning tarqalishini tahlil qilishda R.V. Kamelin (1973) tomonidan ishlab chiqilgan va K.Sh. Tojibaev va boshq. (2016) tomonidan yangilangan Farg' ona vodiysining botanik-geografik rayonlashtirish sxemasi qo' llanildi [37]. Ushbu sxema bo' yicha vodiy hududi Tog' li O' rta Osiyo va Turon provinsiyalariga, ular esa o' z navbatida G' arbiy Tyanshan, Farg' ona, Farg' ona-Oloy va Markaziy Farg' ona okruglariga mansub 7 botanik-geografik rayonga bo' linadi. Barcha uchrash nuqtalari ushbu rayonlar chegaralari bo' yicha taqsimlanib, Google Earth Pro 7.1 dasturi yordamida xaritalashtirildi [15].

Tuproq tiplari va balandlik mintaqalari bo' yicha tahlil

Adir mintaqasi chegaralarini belgilashda Q.Z. Zokirov (1955, 1961) ma'lumotlariga asoslanildi [47]. O' zbekiston o' simliklarini balandlik zonalari bo' yicha tasniflashda Zokirov (1955) taklif etgan to' rt mintaqali sxema (cho' l – 450–500 m gacha; adir – 500–1450 m; tog' – 1450–2800 m; yaylov – 2800–4600 m) qo' llanildi. Turning o' sish nuqtalaridagi tuproq tiplari dala kuzatuvlari, adabiyot ma'lumotlari va gerbariy etiketkalari tavsiflari asosida aniqlandi. Balandlik va tuproq tiplari bo' yicha to' plangan ma'lumotlar Microsoft Excel dasturida qayta ishlanib, o' rtacha qiymat, minimal-maksimal ko' rsatkichlar, standart og' ish va variatsiya koeffitsienti hisoblandi.

Bioiqlimiy modellashtirish

Turning potensial tarqalish arealini bashoratlash uchun Species Distribution Modeling (SDM) usuli, xususan BIOMOD2 platformasi (R dasturlash muhiti) qo' llanildi [26]. Bir nechta algoritmlar (GLM, RF, FDA, MAXENT.Phillips.2) asosida jami 10 ta RUN va 40 ta individual model yaratilib, ularning natijalari TSS og' irligi bo' yicha o' rtacha (EMmeanByTSS va EMwmeanByTSS) ensemble modellashtirish usulida umumlashtirildi. Modellashtirish uchun WorldClim 2.1 versiyasidagi 19 ta bioiqlimiy o' zgaruvchidan Pearson korrelyatsion tahlili ($|r| > 0,8$) asosida oltitasi (Bio2, Bio3, Bio4, Bio5, Bio8, Bio15) tanlab olindi hamda turning stenoedafik xususiyatini aks ettirish maqsadida oltita tuproq o' zgaruvchisi (soil_cn, soil_cec, soil_n, soil_oc, soil_ph, soil_silt) qo' shildi – jami 12 ta o' zgaruvchi modelga kiritildi. Kelajakdagi iqlim o' zgarishini bashoratlash uchun SSP245 (Shared Socioeconomic Pathway 2–4.5) – o' rta yo' l ssenariysi, proyeksiya davri sifatida 2080–2100-yillar tanlandi [17, 31]. Model sifati TSS (True Skill Statistic) ko' rsatkichi orqali baholandi (0,7–1,0 oralig' i – yaxshi va a'lo daraja) [47].

IUCN kategoriyalari bo' yicha baholash

Turning muhofaza holatini baholashda IUCN Qizil ro' yxatining 3.1 versiyasi mezonlaridan foydalanildi. Turning EOO (Extent of Occurrence – tarqalish areali) va AOO (Area of Occupancy – egallanish maydoni) ko' rsatkichlari GeoCAT (Geospatial Conservation Assessment Tool) onlayn vositasi yordamida hisoblandi. EOO barcha ma'lum uchrash nuqtalarini o' rab turgan minimal qavariq poligon (minimum convex polygon) maydoni sifatida, AOO esa 2×2 km o' lchamdagi grid hujayralari asosida aniqlandi. Baholash B mezoni (EOO, AOO va subpopulyatsiyalar soni) hamda C mezoni (populyatsiya hajmi va uning kamayishi) bo' yicha, global va mahalliy darajada amalga oshirildi.

NATIJALAR VA MUHOKAMA

1. Taksonomik holat va morfologik xususiyatlar

Plocama vassilczenkoi (Lincz.) M. Backlund & Thulin turi Taxon jurnalining 56-jildida (2007) tavsiflangan bo' lib, uning sinonimlariga *Neogaillonia vassilczenkoi* Lincz. (1973) va Gaillonia vassilczenkoi (Lincz.) Ehrend. & Schönb.-Tem. (2005) kiradi [2, 3, 7, 24]. Tur bo' yi 15–40 sm bo' lgan ko' p yillik, past bo' yli, shoxlangan yarim buta bo' lib, yaxshi rivojlangan o' q ildiz tizimiga ega (50–70 sm chuqurlik). Poyasi tik, silindrsimon, oq yoki kulrang-yashil rangda, pastki qismi yog' ochlashgan. Barglari oddiy, qarama-qarshi joylashgan, nashtarsimon, uzunligi 8–20 mm, eni 3–8 mm. Gullari ikki jinsli, 2–4 gulli dixaziy to' pgulda joylashgan, gultoji 4–6 mm, pushti-oqish sariq rangda. Mevasi quruq sxizokarp, 3–4 mm, och jigarrang. Tur may–iyun oylarida gullab, iyul–avgustda mevalaydi [12].

8 populyatsiyada o' tkazilgan morfometrik o' lchashlar natijalari 1-jadvalda keltirilgan.

1-jadval. P. vassilczenkoi ning asosiy morfometrik ko‘ rsatkichlari

Belgilar	Minimal	Maksimal	O‘ rtacha	Standart og‘ ish
Poya balandligi (sm)	15	40	24,6	±5,2
Barg uzunligi (mm)	8	20	14,1	±3,0
Barg eni (mm)	3	8	5,3	±1,2
Gulpoya uzunligi (mm)	10	25	16,8	±3,5
Gultoji uzunligi (mm)	4	6	5,1	±0,5
Meva uzunligi (mm)	2,5	4,5	3,6	±0,4

O‘ zbekiston florasi uchun endem bo‘ lgan yaqin turlar – *Plocama botschantzevii* (Surxondaryo viloyati) va Plocama bucharica (Qashqadaryo, Samarqand viloyatlari) – bilan o‘ tkazilgan qiyosiy tahlil (2-jadval) turlarni hayotiy shakli, barg joylashishi va shakli, to‘ pgul tipi, gultoji rangi hamda geografik tarqalishi bo‘ yicha ishonchli farqlash mumkinligini ko‘ rsatdi [25, 39].

2-jadval. P. vassilczenkoi va yaqin turlarning qiyosiy morfologik tahlili

Belgilar	P. vassilczenkoi	P. botschantzevii	P. bucharica
Hayotiy shakli	Yarim buta, 15–40 sm	Buta, 30–60 sm	Yarim buta, 20–50 sm
Barg joylashishi	Qarama-qarshi	Qarama-qarshi	G‘ alvirsimon
Barg shakli	Nashtarsimon, 8–20 mm	Elliptik, 10–25 mm	Tuxumsimon, 12–30 mm
To‘ pgul tipi	2–4 gulli dixaziy	Ko‘ p gulli shingil	1–2 gulli
Gultoji rangi	Oqish–och sariq	Sariq	Oq
Meva	Sxizokarp, 3–4 mm	Sxizokarp, 4–5 mm	Sxizokarp, 3–4 mm
Areali	Farg‘ ona vodiysi (tor)	Surxondaryo viloyati	Qashqadaryo, Samarqand

Tadqiqot davomida turning morfometrik ko‘ rsatkichlari balandlik gradienti bo‘ yicha izchil o‘ zgarishi aniqlandi: 450–550 m balandlikda poya balandligi 15–20 sm ni tashkil etsa, 700–850 m balandlikda bu ko‘ rsatkich 25–40 sm gacha oshgan; xuddi shunday tendensiya barg, gul va meva o‘ lchamlarida ham kuzatildi. Bu natijalar turda ekologik omillarga, xususan balandlik bilan bog‘ liq iqlim va edafik sharoitlarga nisbatan morfologik plastiklik mavjudligini tasdiqlaydi.

2. Botanik-geografik tarqalish

Farg‘ ona vodiysining R.V. Kamelin (1973) va K.Sh. Tojibaev (2016) sxemalari bo‘ yicha 7 botanik-geografik rayonga bo‘ linishi fonida, P. vassilczenkoi faqat uchtasida – Chorkesar, Janubiy Chotqol va Sharqiy Oloy rayonlarida – qayd etildi (3-jadval).

3-jadval. P. vassilczenkoi turining botanik-geografik rayonlar bo‘ yicha taqsimlanishi

Okrug	Botanik-geografik rayon	Uchrashlar soni	Ulushi (%)	Balandlik diapazoni (m)
G‘ arbiy Tyanshan	Chorkesar	20	58,8	550–820
Farg‘ ona	Janubiy Chotqol	12	35,3	430–650
Farg‘ ona-Oloy	Sharqiy Oloy	2	5,9	997–1200
Jami	–	34	100	–

Chorkesar botanik-geografik rayoni (G‘ arbiy Tyanshan okrugi) turning asosiy areali va tip areali hisoblanadi: barcha uchrashlarning 58,8% (20 ta yozuv) shu yerda qayd etilgan, balandlik diapazoni 550–820 m (o‘ rtacha 658±79 m) ni tashkil etadi. Aynan shu rayonda, xususan Chust tumanining Baymoq, To‘ ymas va Mashat hududlarida hamda Pop tumani chap adirliklarida turning eng zich va barqaror populyatsiyalari (30–50 individ, tabiiy yangilanish 8–15%) joylashgan. Janubiy Chotqol rayoni (Farg‘ ona okrugi) ikkinchi darajali areal bo‘ lib, uchrashlarning 35,3% (12 ta yozuv) shu yerga to‘ g‘ ri keladi; bu yerda populyatsiyalar kichikroq (10–20 individ) va yuqori antropogen bosim ostida – ba’zi tarixiy lokalitetlar (masalan, Vladikino, 413 m) so‘ nggi yillarda butunlay yo‘ qolib ketgan. Sharqiy Oloy rayonida (Farg‘ ona-Oloy okrugi) tur kam va refugial xarakterda uchraydi (5,9%; 2 ta yozuv), bu yerdagi populyatsiyalar turning yuqori balandlik chegarasini (997–1221 m) ifodalaydi hamda genetik jihatdan izolyatsiyalangan [37, 39].

Turning notekis tarqalishi antropogen bosim (yaylov chorvachiligi, qurilish, yer o‘ zlashtirish), ekologik ixtisoslashuv (stenoedafik xususiyat), balandlik chegaralanishi, tarixiy-geografik omillar (Chorkesar rayonining refugium sifatidagi roli) hamda ayrim rayonlarning (G‘ arbiy Oloy, Qayraqum-Yozyovon) yetarli darajada o‘ rganilmaganligi bilan izohlanadi. Xronologik tahlil shuni ko‘ rsatdiki, eng ko‘ p yozuvlar (38,9%) 1935–1954-yillarga – Farg‘ ona vodiysining intensiv floristik o‘ rganilish davriga – to‘ g‘ ri kelsa, zamonaviy dala tadqiqotlari (2020–2025; 22,2%) turning Chust–Pop adirliklari va Namangan viloyati Axcha qishlog‘ i atrofida hali ham faol populyatsiyalarga ega ekanligini tasdiqladi [20, 38].

3. Tuproq tiplari va balandlik mintaqalari bo‘ yicha ekologik tahlil

Turning substrat spektri yetti kategoriyaga ajratildi (4-jadval). Dominant substrat – adir va chap adirlik biotopi (36,1%) bo‘ lib, undan keyin tog‘ oldi/yonbag‘ ir skeletli tuproqlar (19,4%) va shag‘ alli substratlar (13,9%) keladi. Skeletli substratlar (shag‘ alli, petrofil va yuvilma konus) jami uchrashlarning 33,3% ini tashkil etib, turning quruq, yaxshi drenajlangan va toshloq muhitlarga yuqori darajada moslashganligini tasdiqlaydi.

4-jadval. P. vassilczenkoi turining substrat tiplari bo‘ yicha ekologik tavsifi

Substrat tipi	n	Foiz	O‘ rtacha balandlik (m±SD)
Adir/chap adirlik biotopi	13	36,1	658±79
Tog‘ oldi/yonbag‘ ir skeletli tuproqlar	7	19,4	826±112
Shag‘ alli substratlar	5	13,9	525±63
Toshloq tik yonbag‘ ir	4	11,1	642±89
Yuvilma konus	3	8,3	689±358
Lalmi hududlar	3	8,3	1224±52
Mayda toshli tuproq	1	2,8	680
Jami	34	100	–

Q.Z. Zokirov (1955) balandlik mintaqalanishi tasnifi bo‘ yicha turning uchrash balandligi 406–1221 m ni qamrab oladi (M=790 m; SD=277 m). Turning asosiy ekologik optimumi adir mintaqasining quyi qismida – 500–800 m balandlikda (45,5%; n=15) joylashgan bo‘ lib, umuman olganda uchrashlarning 75,8% i (n=25) 500–1200 m adir mintaqasi doirasida qayd etilgan (5-jadval).

5-jadval. Q.Z. Zokirov balandlik mintaqalari asosida uchrash taqsimoti

Hudud	Balandlik (m)	n	Foiz	O‘ rtacha balandlik
Cho‘ l mintaqasi	<500	5	15,2	438±32
Adir quyi qismi	500–800	15	45,5	658±79
Adir yuqori qismi	800–1200	10	30,3	1004±141
Tog‘ mintaqasi	≥1200	3	9,1	1318±144

Turning tor ekologik amplitudaga ega bo‘ lishi – stenoedafik xususiyati, ya’ni faqat skeletli, gipslashgan va yaxshi drenajlangan bo‘ z tuproqlarga moslashuvi – uning tarqalishidagi asosiy chegaralovchi omillardan biri hisoblanadi [21, 44].

4. Bioiqlimiy modellashtirish natijalari

BIOMOD2 platformasida amalga oshirilgan ensemble modellashtirish natijalariga ko‘ ra, turning yuqori yaroqlilikdagi hozirgi potensial hududlari asosan Farg‘ ona vodiysining sharqiy sektorida – vodiyga tutash tog‘ oldi hududlarida (Chatqol tizmasi janubiy yonbag‘ irlari, Pop–Chust tog‘ etaklari) saqlanib qoladi, markaziy O‘ zbekiston hamda Qozog‘ iston janubi turning yashashi uchun mutlaqo yaroqsiz hudud sifatida baholandi.

SSP245 iqlim ssenariysi bo‘ yicha 2080–2100-yillarga kelib turning potensial tarqalish areali (EOO) hozirgi ~8 200 km² dan 5 100–6 000 km² gacha (27–38% qisqarish), egallanish maydoni (AOO) esa ~180 km² dan 85–110 km² gacha (39–53% qisqarish) kamayishi prognoz qilindi (6-jadval). Shu bilan birga, haroratning +2,0–2,7°C ga oshishi hisobiga turning optimal yashash balandligi hozirgi 450–750 m dan kelajakda 750–1100 m gacha yuqoriga siljishi aniqlandi.

6-jadval. Iqlim o‘ zgarishi (SSP245) sharoitida turning EOO va AOO ko‘ rsatkichlari dinamikasi

Ko‘ rsatkich	Hozirgi holat (2020–2025)	SSP245 (2080–2100)	Qisqarish (%)
EOO (tarqalish hududi)	~8 200 km²	~5 100–6 000 km²	27–38
AOO (egallanish hududi)	~180 km²	~85–110 km²	39–53

Modelda eng muhim ekologik omil sifatida yog‘ ingarchilik mavsumiyligi (Bio15) namoyon bo‘ lib, u turning quruq yoz va nisbatan nam bahor sharoitlariga moslashganligini aks ettiradi; tuproq o‘ zgaruvchilaridan esa soil_ph, soil_cn va soil_oc turning ishqoriy (pH 7,5–8,5), organik moddaga kambag‘ al tuproqlarga bog‘ liqligini tasdiqladi. Olingan natijalar AOO ning EOO ga nisbatan tezroq qisqarishini ko‘ rsatib, bu turning yashash joylari parchalanishi va populyatsiyalar zichligi pasayishi xavfining ortib borishidan dalolat beradi [22, 43].

5. IUCN kategoriyalari bo‘ yicha baholash

GeoCAT vositasi yordamida hisoblangan ko‘ rsatkichlarga ko‘ ra, turning tarqalish areali (EOO) ~12 932 km², egallanish maydoni (AOO) esa ~120 km² ni tashkil etdi (7-jadval). Har ikkala ko‘ rsatkich ham IUCN B mezoni bo‘ yicha EN (Xavf ostida) chegaralaridan (EOO<5000 km², AOO<500 km²) past bo‘ lib chiqdi.

7-jadval. P. vassilczenkoi turini IUCN mezonlari bo‘ yicha baholash natijalari

Mezon	Tavsif	Qiymat	Kategoriya
B1	Tarqalish areali (EOO)	~12 932 km²	EN
B2	Turar joy maydoni (AOO)	~120 km²	EN
C1	Populyatsiya kamayishi	>20% (10 yil)	EN
C2a	Yetuk individlar soni	<2 500	EN
D	Juda kichik populyatsiya	<250	VU–EN

Dala tadqiqotlari natijalariga ko‘ ra, turning taxminiy umumiy populyatsiya hajmi 2000–2500 yetuk individni tashkil etadi; populyatsiyalar odatda kichik (10–50 individ) va bir-biridan geografik jihatdan izolyatsiyalangan. Generativ individlar ulushi 40–60% ni tashkil etsa, ko‘ chatlar ulushi atigi 8–15% ni tashkil etib, tabiiy yangilanishning zaifligidan dalolat beradi. Barcha mavjud mezonlar (B1ab(iii)+B2ab(iii); C1+C2a(i)) asosida Plocama vassilczenkoi turi IUCN Qizil ro‘ yxati bo‘ yicha EN (Endangered – Xavf ostida) kategoriyasiga kiritilishi to‘ liq asoslandi.

6. Tahdid omillari va muhofaza chora-tadbirlari

Turning tabiiy populyatsiyalariga ta’sir etuvchi asosiy tahdid omillari sifatida quyidagilar aniqlandi: adirlarning qishloq xo‘ jaligi maqsadlarida o‘ zlashtirilishi (1990–2023-yillarda yashash maydonining 22–28% ga qisqarishi), chorva boqish bosimining intensivlashuvi (populyatsiyalarning 68–72% ida haddan ortiq o‘ tlatish belgilari), yo‘ l va infratuzilma qurilishi, tuproq eroziyasi hamda iqlimning qurg‘ oqlashuvi (yozgi quruq davrning 12–18 kunga uzayishi) (8-jadval).

8-jadval. P. vassilczenkoi populyatsiyalariga ta’sir etuvchi tahdid omillari

Tahdid omili	Ta’sir darajasi	Qamrovi
Adirlarning qishloq xo‘ jaligi uchun o‘ zlashtirilishi	Yuqori	22–28% maydon qisqarishi (1990–2023)
Chorva boqish intensivligining ortishi	Yuqori	68–72% lokuslarda kuzatilgan
Yo‘ l va infratuzilma qurilishi	O‘ rtacha	Namangan, Chust, Pop tumanlari
Tuproq eroziyasi	O‘ rtacha	Toshloq yonbag‘ irlar
Iqlimning qurg‘ oqlashuvi	Yuqori	Yozgi quruqchilik 12–18 kunga uzaygan

Aniqlangan tahdidlar asosida kompleks muhofaza strategiyasi ishlab chiqildi: (1) in-situ muhofaza – turning eng yirik va barqaror populyatsiyasi joylashgan Arbag‘ ish (Chortoq tumani) hududida “Chortoq adirlari” tabiat yodgorligini tashkil etish, kam sonli populyatsiyalar (Qizilqiya, Imomota, Qorabog‘ atrofi) uchun 10–50 ga hajmdagi mikroqo‘ riqxonalar ajratish; (2) yaylov boshqaruvi – turning gullash va urug‘ lanish davrida (mart–may) chorva o‘ tlatishni vaqtincha cheklash, yaylov yuklamasini 5–7 bosh/gadan 2–3 bosh/gagacha kamaytirish va rotatsion tizim joriy

etish; (3) ex-situ saqlash – urug‘ larni qisqa muddatli (+4°C, 15–20% namlik, 1–3 yil) va uzoq muddatli (–20°C, 5–10% namlik, 10–20 yil) sharoitda saqlash rejimlarini joriy etish; (4) reintroduksiya dasturi – donor populyatsiyalarni tanlash, urug‘ yig‘ ish, ko‘ chat yetishtirish va tarixiy arealga qayta ekishdan iborat 5 bosqichli dastur; (5) monitoring tizimi – populyatsiya hisobi, fenologik kuzatuv, yaylov bosimi, tuproq holati va EOO/AOO ko‘ rsatkichlarini muntazam yangilab borish.

O‘ tkazilgan tadqiqot natijalari shuni ko‘ rsatdiki, Plocama vassilczenkoi bo‘ yi 15–40 sm gacha yetadigan ko‘ p yillik yarim buta bo‘ lib, yaqin turlardan (P. botschantzevii, P. bucharica) hayotiy shakli, barg morfologiyasi, to‘ pgul tipi, gultoji rangi va areali bo‘ yicha ishonchli farqlanadi; balandlik ortishi bilan morfometrik ko‘ rsatkichlarning izchil o‘ sishi turda ekologik plastiklik mavjudligini tasdiqlaydi. Turning 1915–2025-yillarga oid 34 ta uchrash nuqtasi birinchi marta tizimli tahlil qilinib, u Farg‘ ona vodiysining faqat uch botanik-geografik rayonida – Chorkesar (58,8%), Janubiy Chotqol (35,3%) va Sharqiy Oloy (5,9%) – tarqalganligi aniqlandi, Chorkesar rayoni esa turning asosiy areali va refugial markazi sifatida belgilandi. Tur asosan adir mintaqasining 500–800 m balandlik oralig‘ idagi skeletli, toshloq-shag‘ alli va gipslashgan bo‘ z tuproqlarda (dominant substrat – 36,1%) tarqalgan bo‘ lib, stenoedafik ekologik xususiyatga ega. BIOMOD2 platformasida o‘ tkazilgan bioiqlimiy modellashtirish SSP245 ssenariysi bo‘ yicha 2080–2100-yillarga kelib turning tarqalish areali (EOO) 27–38%, egallanish maydoni (AOO) 39–53% ga qisqarishini va ekologik optimal balandlikning 450–750 m dan 750–1100 m gacha yuqoriga siljishini bashorat qildi. GeoCAT vositasi asosida hisoblangan EOO (~12 932 km²) va AOO (~120 km²) ko‘ rsatkichlari, populyatsiyalarning kichik (10–50 individ) va parchalanganligi hamda zaif tabiiy yangilanishi (ko‘ chatlar ulushi 8–15%) asosida tur IUCN mezonlariga ko‘ ra EN (Xavf ostida) kategoriyasiga kiritildi (B1ab(iii)+B2ab(iii); C1+C2a(i)). Turning asosiy tahdidlari – qishloq xo‘ jaligi uchun yer o‘ zlashtirish (22–28% maydon qisqarishi), yaylov bosimi (68–72% lokuslarda) va iqlimning qurg‘ oqlashuvi – aniqlanib, ularga qarshi kompleks in-situ va ex-situ muhofaza strategiyasi (tabiat yodgorligi va mikroqo‘ riqxonalar tashkil etish, yaylov boshqaruvi, urug‘ banki, reintroduksiya dasturi, monitoring tizimi) ishlab chiqildi. Yakun sifatida ta’kidlash joizki, tadqiqot natijalari Rubiaceae oilasining endem turlarini o‘ rganish, Farg‘ ona vodiysi florasining bioxilma-xilligini saqlash hamda O‘ zbekiston Respublikasining biologik xilma-xillikni saqlash strategiyasiga ilmiy-amaliy hissa qo‘ shadi va turning Qizil kitobning navbatdagi nashriga EN kategoriyasida kiritilishi tavsiya etiladi.

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ASTRAGALUS NAMANGANICUS POPOV TURINING FARG‘ONA VODIYSIDAGI MORFOLOGIK, FITOGEOGRAFIK XUSUSIYATLARI VA MUHOFAZA MUAMMOLARI

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Annotatsiya: *Mazkur maqolada Fabaceae Lindl. oilasiga mansub, Farg‘ona vodiysining mintaqaviy endem turi hisoblangan Astragalus namanganicus Popov turining morfologik, fitogeografik va ekologik xususiyatlari hamda muhofaza masalalari kompleks yoritilgan. 2022–2026-yillarda Namangan, Andijon va Farg‘ona viloyatlarining adir va tog‘oldi hududlarida o‘tkazilgan dala tadqiqotlari, TASH, LE, FRU va MW gerbariy fondlari materiallari (70 dan ortiq namuna), shuningdek GBIF, POWO va Plantarium ma’lumotlar bazalari asosida turning 1925–2026-yillarga oid 250 dan ortiq uchrash nuqtasi tahlil qilindi. Tadqiqot natijalariga ko‘ra, tur Farg‘ona vodiysining to‘rt botanik-geografik rayonida – Janubiy Chotqol (51,2%), Sharqiy Oloy (25,6%), Chorkesar (19,2%) va Qayroqqum–Yozyovon (4,0%) – dengiz sathidan 430–1130 m balandlik oralig‘ida, tosh-shag‘alli va gipsli bo‘z tuproqlarda tarqalgan bo‘lib, ekologik optimumi 550–750 m balandlikka to‘g‘ri keladi. 2022–2026-yillarda aniqlangan yangi o‘sish nuqtalari asosida turning ma’lum tarqalish maydoni sezilarli darajada kengaytirilib, EOO ko‘rsatkichi 4 099 km² dan 13 561 km² gacha, AOO ko‘rsatkichi esa 52 km² dan 264 km² gacha oshirildi. BIOMOD2 platformasida amalga oshirilgan ensemble bioiqlimiy modellashtirish SSP245 iqlim ssenariysi bo‘yicha 2080–2100-yillarga kelib turning potensial areali 27–37% ga qisqarishini va optimal balandlik zonasining 550–800 m dan 900–1300 m gacha yuqoriga siljishini bashorat qildi. GeoCAT vositasi yordamida hisoblangan ko‘rsatkichlar, populyatsiyalarning kuchli fragmentatsiyasi va doimiy qisqarish tendensiyasi asosida tur IUCN mezonlariga ko‘ra EN (Endangered – Xavf ostida) kategoriyasiga kiritildi. Tadqiqot natijalari asosida in-situ va ex-situ muhofaza chora-tadbirlari, jumladan yangi muhofaza hududlarini tashkil etish, yaylov boshqaruvi, urug‘ bankini yaratish, reintroduksiya dasturi hamda O‘zbekiston–Qirg‘iziston transchegaraviy hamkorlik mexanizmi ishlab chiqildi.*

Kalit so‘zlar: *Astragalus namanganicus, Fabaceae, endemik tur, Farg‘ona vodiysi, fitogeografiya, bioiqlimiy modellashtirish, BIOMOD2, IUCN, EOO, AOO, muhofaza biologiyasi.*

МОРФОЛОГИЧЕСКИЕ, ФИТОГЕОГРАФИЧЕСКИЕ ОСОБЕННОСТИ И ПРОБЛЕМЫ ОХРАНЫ ВИДА *ASTRAGALUS NAMANGANICUS* POPOV В ФЕРГАНСКОЙ ДОЛИНЕ

Аннотация: *В статье комплексно освещены морфологические, фитогеографические и экологические особенности, а также вопросы охраны Astragalus namanganicus Popov — регионального эндемичного вида Ферганской долины из семейства Fabaceae Lindl. На основе полевых исследований, проведённых в 2022–2026 гг. в адырных и предгорных районах Наманганской, Андижанской и Ферганской областей, материалов гербарных фондов TASH, LE, FRU и MW (более 70 образцов), а также баз данных GBIF, POWO и Plantarium проанализировано более 250 точек встречаемости вида за 1925–2026 гг. Согласно результатам исследования, вид распространён в четырёх ботанико-географических районах Ферганской долины — Южно-Чаткальском (51,2%), Восточно-Алайском (25,6%), Чоркесарском (19,2%) и Кайраккум–Язъяванском (4,0%) — на высотах 430–1130 м над уровнем моря, на каменисто-щебнистых и гипсоносных сероземах; экологический оптимум приходится на высоты 550–750 м. На основе новых точек произрастания, выявленных в 2022–2026 гг., известная площадь распространения вида существенно расширена: показатель EOO увеличен с 4 099 км² до 13 561 км², показатель AOO — с 52 км² до 264 км². Ансамблевое биоклиматическое моделирование на платформе BIOMOD2 прогнозирует к 2080–2100 гг. при климатическом сценарии SSP245 сокращение потенциального ареала на 27–37% и смещение оптимальной высотной зоны вверх — с 550–800 м до 900–1300 м. На основании показателей, рассчитанных с помощью GeoCAT, сильной фрагментации популяций и устойчивой тенденции к сокращению вид отнесён по критериям МСОП (IUCN) к категории EN (Endangered — находящийся под угрозой исчезновения). По результатам исследования разработаны меры охраны in-situ и ex-situ, включая создание новых охраняемых территорий, регулирование выпаса, создание банка семян, программу реинтродукции, а также механизм узбекско-кыргызского трансграничного сотрудничества.*

Ключевые слова: *Astragalus namanganicus, Fabaceae, эндемичный вид, Ферганская долина, фитогеография, биоклиматическое моделирование, BIOMOD2, МСОП (IUCN), EOO, AOO, биология охраны.*

MORPHOLOGICAL AND PHYTOGEOGRAPHICAL CHARACTERISTICS AND CONSERVATION PROBLEMS OF *ASTRAGALUS NAMANGANICUS* POPOV IN THE FERGANA VALLEY

Abstract: *This article presents a comprehensive analysis of the morphological, phytogeographical, and ecological characteristics, as well as the conservation status, of Astragalus namanganicus Popov (Fabaceae), a regional endemic species of the Fergana Valley. Based on field surveys conducted in the Namangan, Andijan, and Fergana regions during 2022–2026, more than 70 herbarium specimens from the TASH, LE, FRU, and MW collections, and data from the GBIF, POWO, and Plantarium databases, more than 250 occurrence records spanning 1925–2026 were analyzed. The results show that the species is distributed across four botanical-geographical districts of the Fergana Valley – South Chatkal (51.2%), East Alai (25.6%), Chorkesar (19.2%), and Kayrakkum–Yazyavan (4.0%) – at elevations of 430–1130 m, occurring predominantly on stony-gravelly and gypsiferous grey soils, with an ecological optimum at 550–750 m. Based on newly discovered occurrence points recorded in 2022–2026, the known distribution area was substantially expanded, increasing the extent of occurrence (EOO) from 4,099 km² to 13,561 km² and the area of occupancy (AOO) from 52 km² to 264 km². Ensemble species distribution modeling performed in BIOMOD2 predicted, under the SSP245 climate scenario, a 27–37% reduction in the potential range and an upward shift of the optimal elevation zone from 550–800 m to 900–1300 m by 2080–2100. Based on GeoCAT-derived indices, strong population fragmentation, and an ongoing decline trend, the species was assigned to the IUCN category Endangered (EN). A set of in-situ and ex-situ conservation measures, including the establishment of new protected areas, grazing management, seed banking, a reintroduction program, and an Uzbekistan–Kyrgyzstan transboundary cooperation mechanism, was developed on the basis of the study results.*

Keywords: *Astragalus namanganicus, Fabaceae, endemic species, Fergana Valley, phytogeography, species distribution modeling, BIOMOD2, IUCN, EOO, AOO, conservation biology.*

KIRISH

Astragalus L. turkumi Fabaceae Lindl. oilasining eng yirik va murakkab taksonlaridan biri boʻlib, dunyo florasida 3000 dan ortiq turni oʻz ichiga oladi. Oʻrta Osiyo hududi, xususan Oʻzbekiston va unga tutash togʻli mintaqalar Astragalus turkumining turlarga eng boy markazlaridan biri hisoblanadi, bu yerda koʻplab tor arealli, endemik va relikt turlar shakllangan boʻlib, ularning sistematik oʻrni, morfologik chegaralari va ekologik moslashuvlari hali ham ilmiy munozaralar markazida qolmoqda [3, 19].

Astragalus namanganicus Popov – Fargʻona vodiysining mintaqaviy endem turi boʻlib, uning oʻrganilish tarixi 100 yildan ortiq davrni qamrab oladi. Tur ilk bor 1925-yil 4-mayda Fargʻona viloyati (hozirgi Namangan viloyati), Namangan tumani, Taxtakoʻl yaqinidagi tepalikdan Soikina tomonidan yigʻib olingan, tip namunasi Oʻzbekiston Milliy gerbariysi (TASH) fondida saqlanadi. Tur haqidagi dastlabki ma'lumotlar 1926-yilda M.F. Popov tomonidan chop etilgan. XX asr davomida turning tarqalishi va ekologik xususiyatlari S.N. Kudryashev (1933–1935), A.G. Borisova (1946), M. Nabiyev (1951–1953), N.F. Goncharov (1955), E.V. Nikitina (1957), R.V. Kamelin (1981), R.S. Vernik va T. Raximova (1982) kabi olimlar tomonidan qisman yoritilgan, biroq bu manbalarda turning ekologik ixtisoslashuvi, populyatsion strukturasi va areal dinamikasi chuqur tahlil qilinmagan [11].

Soʻnggi yillarda G.A. Lazkov (2005), F. Hassanov va boshq. (2015), K.Sh. Tojibaev va boshq. (2022) hamda X.R. Xoshimov (2021–2023) tomonidan olib borilgan tadqiqotlar turning yangi oʻsish nuqtalarini aniqlashga xizmat qilgan boʻlsa-da, adabiyotlar tahlili quyidagi ilmiy boʻshliqlarni koʻrsatadi: turning morfologik tavsifi turli manbalarda qisman tafovutlar bilan keltirilgan va morfometrik koʻrsatkichlari zamonaviy talablar darajasida toʻliq oʻrganilmagan; turning tarqalishi Fargʻona vodiysining Oʻzbekiston va Qirgʻiziston hududlarini qamrab olishiga qaramay, uni mintaqaviy endemik tur sifatida baholovchi kompleks tahlil amalga oshirilmagan; turning ekologik talablari (tuproq tiplari, balandlik mintaqalari, ekologik optimumi) boʻyicha miqdoriy ma'lumotlar yetarli emas; turning iqlim oʻzgarishi sharoitidagi istiqboldagi arealini bioiqlimiy modellashtirish boʻyicha tadqiqotlar deyarli amalga oshirilmagan; muhofaza holati turli manbalarda turlicha (yagona, hujjatlashtirilmagan) baholangan.

Antropogen omillarning kuchayishi, tabiiy landshaftlarning oʻzlashtirilishi, yaylovlardan notoʻgʻri foydalanish va iqlim oʻzgarishi natijasida koʻplab Astragalus turlari, jumladan A. namanganicus populyatsiyalarining qisqarib borishi kuzatilmoqda. Oʻzbekiston Respublikasida biologik xilma-xillikni saqlash davlat siyosati darajasidagi muhim vazifalardan biri hisoblanadi, bu Oʻzbekiston Respublikasining "Oʻsimlik dunyosini muhofaza qilish va undan foydalanish toʻgʻrisida"gi Qonuni (2016), Prezidentning atrof-muhitni muhofaza qilish konsepsiyasi (2019) va biologik xilma-xillikni saqlash strategiyasi (2019) kabi me'yoriy-huquqiy hujjatlarda oʻz aksini topgan.

Tadqiqotning maqsadi – Astragalus namanganicus Popov turining morfologiyasi, fitogeografiyasi va muhofaza masalalarini kompleks oʻrganishdan iborat. Ushbu maqsadga erishish uchun quyidagi vazifalar belgilandi: turning tirik namunalar asosidagi morfologik tahlilini amalga oshirish; botanik-geografik rayonlar boʻyicha tarqalishini tahlil qilish;

tuproq tiplari va balandlik mintaqalari bo‘yicha ekologik xususiyatlarini aniqlash; turni bioiqlimiy modellashtirish; IUCN kategoriyalari bo‘yicha baholash; muhofaza qilish choralarini ishlab chiqish.

Tadqiqotning ilmiy yangiligi shundan iboratki, turning morfologik tavsifi zamonaviy talablar asosida aniqlashtirilib, Astragalus brachyrachis Bunge bilan qiyosiy tahlil qilindi; 1925–2026-yillarga oid barcha ma’lum uchrash nuqtalari birinchi marta tizimlashtirilib, botanik-geografik rayonlar kesimida tahlil qilindi va tarqalish xaritasi yaratildi; tuproq tiplari va balandlik mintaqalari bo‘yicha miqdoriy ekologik tahlil o‘tkazildi; ilk bor turning ekologik nishi BIOMOD2 platformasida ensemble modellashtirish usuli yordamida baholandi; IUCN mezonlari asosida global va mahalliy darajada yagona, hujjatlashtirilgan muhofaza baholashi amalga oshirildi.

TADQIQOT MATERIALLARI VA USULLARI

Tadqiqot obyekti va hududi. Tadqiqot obyekti sifatida Fabaceae Lindl. oilasiga mansub, Farg‘ona vodiysi endemigi hisoblangan Astragalus namanganicus Popov turi tanlab olindi. Tadqiqot ishlari Farg‘ona vodiysining shimoliy va sharqiy qismlarida joylashgan Namangan viloyati (Namangan, Chust, Pop, Chortoq, Kosonsoy, To‘raqo‘rg‘on, Uychi, Yangiqo‘rg‘on), Andijon viloyati (Andijon, Jalaquduq, Xo‘jaobod, Marxamat, Xonobod) va Farg‘ona viloyati (Oltiariq, Quvasoy, Beshariq tumanlari) hududlarida olib borildi. Tadqiqot hududlari dengiz sathidan 430–1130 m balandlikda joylashgan bo‘lib, chala cho‘l va adir mintaqalariga xos quruq kontinental iqlim, bo‘z va gipslashgan tuproqlar bilan tavsiflanadi.

Dala tadqiqotlari va gerbariy materiallari

2022–2026-yillarning mart–avgust oylarida A.I. Tolmachev (1974) hamda A.V. Shcherbakov va S.R. Mayorov (2006) metodikalari asosida maqsadli dala tadqiqotlari olib borildi. Marshrutlar adabiyot ma’lumotlari, gerbariy fondlaridagi namunalarning geografik koordinatalari hamda oldingi tadqiqotchilarning (Soikina, 1925; Ioffe, 1928; Kudryashev, 1933; Nabiyev, 1951; Pavlov, 1965; Vernik va Raximova, 1971; Xoshimov, 2021–2022; Sharipov, Sheraliyev, 2024) ma’lumotlari asosida belgilandi. Dala tadqiqotlari davomida turning 10 dan ortiq gerbariy namunasi yig‘ilib, Namangan davlat universiteti Biologik tadqiqotlar markazi gerbariy fondiga topshirildi. Tadqiqot materiallari O‘zbekiston Milliy gerbariysi (TASH), V.L. Komarov nomidagi Rossiya Botanika instituti gerbariysi (LE), Qirg‘iziston Fanlar akademiyasi gerbariysi (FRU) va Moskva davlat universiteti gerbariysi (MW) fondlaridan olingan jami 70 dan ortiq namuna, shuningdek GBIF va Plantarium onlayn platformalari ma’lumotlari bilan to‘ldirildi. Natijada 1925–2026-yillarni qamrab olgan jami 250 dan ortiq uchrash yozuvi tizimlashtirildi.

Morfologik va morfometrik tahlil

Morfologik tavsif tirik o‘simlik namunalari va gerbariy materiallari asosida amalga oshirildi. Vegetativ organlardan ildiz tizimi, poya, barg va bargchalar, generativ organlardan gulpoya, to‘pgul, gulyonbarglari, gulkosacha, gultoji va dukkak diagnostik belgilari o‘rganildi. Morfometrik o‘lchashlar 10 ta populyatsiyadan 30 tadan individda amalga oshirilib, har bir belgi bo‘yicha minimal, maksimal va o‘rtacha qiymatlar hisoblandi. Olingan ma’lumotlar turning ekologik moslanish xususiyatlarini aniqlash hamda Astragalus brachyrachis Bunge bilan qiyosiy tahlil qilish uchun foydalanildi.

Botanik-geografik rayonlashtirish

Turning Farg‘ona vodiysidagi tarqalishini tahlil qilishda R.V. Kamelin (1973) tomonidan taklif etilgan va K.Sh. Tojibaev va boshqalar (2016) tomonidan ishlab chiqilgan zamonaviy botanik-geografik rayonlashtirish sxemasi asos qilib olindi. Ushbu sxemaga muvofiq hudud Tog‘li O‘rta Osiyo va Turon provinsiyalarini o‘z ichiga oladi. Barcha uchrash nuqtalari botanik-geografik rayonlar bo‘yicha taqsimlanib, ArcGIS 10.6.1 dasturida (WGS 1984 proyeksiyasida) xaritalashtirildi.

Tuproq tiplari va balandlik mintaqalari bo‘yicha tahlil

Adir mintaqasi chegaralarini belgilashda Q.Z. Zokirov (1955, 1961) ma’lumotlariga asoslanildi. O‘zbekiston o‘simliklarini balandlik zonalari bo‘yicha tasniflashda Zokirov (1955) taklif etgan to‘rt mintaqali sxema (cho‘l – 450–500 m gacha; adir – 500–1450 m; tog‘ – 1450–2800 m; yaylov – 2800–4600 m) qo‘llanildi. Turning o‘sish nuqtalaridagi tuproq tiplari dala kuzatuvlari, adabiyot ma’lumotlari va gerbariy etiketkalari tavsiflari asosida aniqlandi. Balandlik va tuproq tiplari bo‘yicha to‘plangan ma’lumotlar Microsoft Excel dasturida qayta ishlanib, o‘rtacha qiymat, minimal-maksimal ko‘rsatkichlar, standart og‘ish va variatsiya koeffitsienti hisoblandi; populyatsiya zichligi va hayotiylik darajasi o‘rtasidagi bog‘liqlik korrelyatsion tahlil yordamida baholandi.

Bioiqlimiy modellashtirish

Turning potensial tarqalish arealini bashoratlash uchun Species Distribution Modeling (SDM) usuli, xususan BIOMOD2 platformasi (R dasturlash muhiti) qo‘llanildi. To‘rt algoritm (GLM, RF, FDA, MAXENT.Phillips.2) asosida jami 10 ta RUN va 40 ta individual model yaratilib, ularning natijalari TSS og‘irligi bo‘yicha o‘rtacha (EMmeanByTSS va EMwmeanByTSS) ensemble modellashtirish usulida umumlashtirildi. Modellashtirish uchun WorldClim 2.1 versiyasidagi 19 ta bioiqlimiy o‘zgaruvchidan Pearson korrelyatsion tahlili ($|r| > 0,8$) asosida oltitasi (Bio2, Bio3, Bio4, Bio5, Bio8, Bio15) tanlab olindi hamda turning stenoedafik xususiyatini aks ettirish maqsadida oltita tuproq o‘zgaruvchisi

(soil_cn, soil_cec, soil_n, soil_oc, soil_ph, soil_silt) qo‘shildi – jami 12 ta o‘zgaruvchi modelga kiritildi. Kelajakdagi iqlim o‘zgarishini bashoratlash uchun SSP245 (Shared Socioeconomic Pathway 2–4.5) – o‘rta yo‘l ssenariysi, proyeksiya davri sifatida 2080–2100-yillar tanlandi; qiyoslash uchun SSP126 va SSP585 ssenariylari adabiyot ma’lumotlari asosida jalb qilindi. Model sifati TSS (True Skill Statistic) ko‘rsatkichi orqali baholandi (0,7–1,0 oralig‘i – yaxshi va a’lo daraja).

IUCN kategoriyalari bo‘yicha baholash

Turning muhofaza holatini baholashda IUCN Qizil ro‘yxatining 3.1 versiyasi mezonlaridan foydalanildi. Turning EOO (Extent of Occurrence) va AOO (Area of Occupancy) ko‘rsatkichlari GeoCAT (Geospatial Conservation Assessment Tool) onlayn vositasi yordamida hisoblandi. EOO barcha ma’lum uchrash nuqtalarini o‘rab turgan minimal qavariq poligon maydoni sifatida, AOO esa 2×2 km o‘lchamdagi grid hujayralari asosida aniqlandi. Baholash B mezoni (EOO, AOO, subpopulyatsiyalar soni va fragmentatsiya) bo‘yicha, global (O‘zbekiston va Qirg‘iziston) hamda mahalliy (O‘zbekiston qismi) darajada amalga oshirildi.

NATIJALAR VA MUHOKAMA

1. Morfologik xususiyatlar va yaqin tur bilan qiyosiy tahlil

Astragalus namanganicus Popov – shoxlangan o‘q ildiz tizimiga ega ko‘p yillik o‘t o‘simlik (yarim buta), ildiz bo‘g‘zi qisman yog‘ochlashgan. Poyaning balandligi 17 smdan 60 sm gacha o‘zgaradi (o‘rtacha 20–35 sm), kalta, yog‘ochlashgan, zich yotiq oq tukli. Barglari murakkab, patsimon, uzunligi 6–20 sm, bargchalari 4–8 juft, keng teskari tuxumsimon-yumaloq shaklda. Gulpoyasi 13–30 sm, barglariga nisbatan 1,5–3 marta uzun. To‘pguli siyrak shingilsimon, uzunligi 12–25 sm, bir to‘pgulda 8–15 ta gul joylashgan. Gultoji sariq rangda, yelkanchasi 26–30 mm. Dukkagi biroz egilgan, cho‘ziq, 10–15 mm uzunlikda, ikki uyali, qalin oq momiq tukli – bu belgi turning A. brachyrachis dan farqli asosiy diagnostik belgilaridan biridir. Tur aprel–may oylarida gullab, iyun–iyul oylarida urug‘ beradi.

10 ta populyatsiyadan 30 tadan individda o‘tkazilgan morfometrik o‘lchashlar natijalari 1-jadvalda keltirilgan.

1-jadval. A. namanganicus turining asosiy morfometrik ko‘rsatkichlari

Belgilar	Minimal	Maksimal	O‘rtacha	Standart og‘ish
Poya balandligi (sm)	17	60	28,4	±8,7
Barg uzunligi (sm)	6	20	13,2	±3,4
Bargchalar soni (juft)	4	6	5,1	±0,7
Bargcha uzunligi (mm)	6	15	10,3	±2,1
Gulpoya uzunligi (sm)	13	30	18,6	±3,2
To‘pgul uzunligi (sm)	12	25	19,4	±3,5
Gullar soni	8	15	11,2	±2,1
Gulkosacha uzunligi (mm)	14	18	16,1	±1,2
Yelkancha uzunligi (mm)	26	30	28,1	±1,1
Dukkak uzunligi (mm)	10	15	12,4	±1,3
Dukkak eni (mm)	3	5	4,1	±0,5

Popov (1926) turning dastlabki tavsifida uning Astragalus brachyrachis Bunge turiga eng yaqin ekanligini, ammo bargchalarining ko‘pligi, shingilining siyrakligi va dukkagining qisqa hamda tukli bo‘lishi bilan ajralib turishini ta’kidlagan. D.R. Axmatova (2025) ma’lumotlari va dala kuzatuvlari asosida o‘tkazilgan qiyosiy tahlil (2-jadval) ikki turni bir qator ishonchli diagnostik belgilar bo‘yicha farqlash mumkinligini ko‘rsatdi.

2-jadval. A. namanganicus va A. brachyrachis turlarining qiyosiy tahlili

Belgilar	A. namanganicus	A. brachyrachis
Poya balandligi	17–60 sm, o‘zgaruvchan	15–30 sm, barqaror
Barg uzunligi	6–20 sm	10–15 sm
Bargchalar soni	4–8 juft	5–8 juft
Tuklanish	O‘rtacha darajada	Zich
Gul uzunligi	26–30 mm	20–25 mm

Belgilar	A. namanganicus	A. brachyrachis
Dukkak	Ikki uyali, qalin oq tukli	Bir uyali, siyrak tukli
Dukkak uzunligi	10–15 mm	8–12 mm
Areali	Tor, Farg‘ona vodiysi	Keng ekologik amplitudali

Generativ organlar tahlili A. namanganicus ning gulpoyasi, guli va gulkosachasi A. brachyrachis ga nisbatan yirikroq ekanligini ko‘rsatadi. Dukkak tuzilishi ikki turni farqlovchi asosiy diagnostik belgi bo‘lib, A. namanganicus ikki uyali va qalin oq tuklar bilan qoplangan dukkakka ega. Ekologik nuqtai nazardan, A. namanganicus ning areali Farg‘ona vodiysi bilan chegaralangan tor tarqalish hududini egallaydi, bu uning ekologik ixtisoslashgan va endemik xususiyatga ega ekanligini tasdiqlaydi; A. brachyrachis esa keng ekologik amplitudaga ega. Balandlik gradienti bo‘yicha morfometrik ko‘rsatkichlar ham izchil o‘sish tendensiyasini namoyon etdi: 450–700 m mintaqasida poya balandligi 17–25 sm bo‘lsa, 1000–1200 m mintaqasida bu ko‘rsatkich 25–60 sm gacha yetdi, bu turda ekologik plastiklik mavjudligidan dalolat beradi.

2. Botanik-geografik tarqalish

Farg‘ona vodiysining R.V. Kamelin (1973) va K.Sh. Tojibaev (2016) sxemalari bo‘yicha rayonlashtirilishi fonida, A. namanganicus to‘rtta botanik-geografik rayonda – Chorkesar, Janubiy Chotqol, Sharqiy Oloy va Qayroqqum–Yozyovon rayonlarida – qayd etildi (3-jadval).

3-jadval. A. namanganicus turining botanik-geografik rayonlar bo‘yicha taqsimlanishi

Okrug	Botanik-geografik rayon	Uchrashlar soni	Ulushi (%)	Balandlik diapazoni (m)
Farg‘ona	Janubiy Chotqol	128	51,2	430–807
Farg‘ona-Oloy	Sharqiy Oloy	64	25,6	542–1128
G‘arbiy Tyanshan	Chorkesar	48	19,2	–
Markaziy Farg‘ona	Qayroqqum-Yozyovon	10	4,0	430–480
Jami	–	250	100	430–1130

Janubiy Chotqol rayoni (Farg‘ona okrugi) turning asosiy areali bo‘lib, uchrashlarning 51,2% (128 ta yozuv) shu yerda qayd etilgan; asosiy topilmalar Namangan shahri atrofi, Chortoq tumani (Qorabog‘, Kuchon, Arbag‘ish), Uychi tumani (G‘ayrat), Yangiqo‘rg‘on va Kosonsoy tumanlarida joylashgan. Sharqiy Oloy rayoni (Farg‘ona-Oloy okrugi) ikkinchi darajali areal (25,6%; 64 ta yozuv) bo‘lib, eng keng balandlik diapazoniga (542–1128 m) ega; so‘nggi yillarda (2022–2024) Andijon viloyati Jalaquduq, Xo‘jaobod va Marxamat tumanlarida ko‘plab yangi populyatsiyalar aniqlangan, jumladan Xo‘jaobod tumani Imomota qishlog‘i atrofida turning eng baland (1105–1128 m) populyatsiyalari qayd etilgan. Chorkesar rayoni (G‘arbiy Tyanshan okrugi) turning tip areali hisoblanadi (19,2%; 48 ta yozuv), bu yerda turning eng zich va barqaror populyatsiyalari tosh-shag‘alli va gipsli bo‘z tuproqlarda joylashgan. Qayroqqum–Yozyovon rayoni (Markaziy Farg‘ona okrugi) periferik areal bo‘lib (4,0%; 10 ta yozuv), turning eng past balandlikdagi (430–480 m) populyatsiyalarini o‘z ichiga oladi.

Bu holat Astragalus L. turkumiga mansub ko‘plab endemik turlar uchun xos bo‘lgan qonuniyatlarga to‘liq mos keladi va Farg‘ona vodiysida endemizm markazlarining asosan adir va tog‘oldi hududlariga to‘g‘ri kelishini yana bir bor tasdiqlaydi. 2022–2026-yillardagi dala tadqiqotlari natijasida aniqlangan yangi o‘sish nuqtalari turning ma’lum arealini sezilarli darajada kengaytirdi, biroq populyatsiyalarning fragmentatsiyalangan holda, tarixiy tip areal doirasida saqlanib qolganligi ham aniqlandi.

3. Tuproq tiplari va balandlik mintaqalari bo‘yicha ekologik tahlil

1925–2025-yillar oralig‘ida to‘plangan 250 dan ortiq gerbariy va dala kuzatuvlari ma’lumotlarining tahlili turning dengiz sathidan 430 m dan 1130 m gacha bo‘lgan balandlik oralig‘ida tarqalganligini ko‘rsatdi (4-jadval).

4-jadval. Turning balandlik mintaqalari bo‘yicha taqsimlanishi

Balandlik oralig‘i	Mintaqa	Uchrash nuqtalari soni	Foizi (%)
430–500 m	Quyi adir	22	8,8
500–600 m	Quyi adir	54	21,6
600–700 m	O‘rta adir	82	32,8
700–800 m	O‘rta adir	60	24,0

Balandlik oralig‘i	Mintaqa	Uchrash nuqtalari soni	Foizi (%)
800–900 m	Yuqori adir	24	9,6
900–1130 m	Yuqori adir / tog‘ etagi	8	3,2
Jami	–	250	100

Balandlik gradienti bo‘ylab populyatsiyalarning taqsimlanishi tahlil qilinganda, tur uchun optimal balandlik oralig‘i 550–750 m ekanligi aniqlandi; ushbu oralikda turning eng yuqori hayotiylik ko‘rsatkichlari, eng zich populyatsiyalari va eng ko‘p uchrash nuqtalari (56,4%) kuzatildi, ayniqsa 600–700 m oralig‘ida turning eng barqaror populyatsiyalari (zichligi 8–12 individ/100 m², hayotiylik darajasi 5 ball) shakllangan bo‘lib, bu balandlikda namlik rejimi (250–400 mm yog‘in) va harorat sharoitlari turning talablariga to‘liq javob beradi.

Tuproq tiplari bo‘yicha tahlil (5-jadval) turning tipik bo‘z va toshloq-shag‘alli substratlarda eng yuqori uchrash chastotasi va eng yaxshi populyatsiya holatiga ega ekanligini ko‘rsatdi.

5-jadval. Turning tuproq tiplari bo‘yicha taqsimlanishi

Tuproq tipi	Substrat xususiyati	Uchrash chastotasi	Populyatsiya holati
Tipik bo‘z tuproq	Shag‘alli, skeletli	Yuqori (45–50%)	Yaxshi
Toshloq-shag‘alli substrat	Skeletli, chaqir toshli	Yuqori (40–45%)	Eng yaxshi
Gipsli tuproq	Gips qatlamli	O‘rtacha (15–20%)	Yaxshi
Och bo‘z tuproq	Yengil mexanik tarkibli	O‘rtacha (20–25%)	O‘rtacha
Gil-qumoq tuproq	Mayin dispersli	Past (5–8%)	Past
Sho‘rlangan tuproq	Tarkibida tuzlar	Past (2–3%)	Past

Tur stenoedafik (tor tuproq talablariga ega) xususiyatga ega bo‘lib, eng yaxshi populyatsiyalari tarkibida 30–45% gacha skeletli elementlar bo‘lgan tuproqlarda shakllangan hamda gipsli substratlarga nisbatan tolerantlik namoyon etadi. Shu bilan birga, Uychi tumanidagi (G‘ayrat qishlog‘i atrofi) sug‘oriladigan hududlar ta’sirida bo‘lgan sho‘rxok tuproqlarda turning populyatsiyalari degradatsiyaga uchraganligi aniqlanib, bu turning sho‘rlanish darajasiga nisbatan yuqori sezgirligidan dalolat beradi. Ekologik valentlik tahlili turni balandlik omiliga nisbatan mezostenobiont, tuproq omiliga nisbatan stenoedafik, iqlim omiliga nisbatan esa kseromezofil sifatida tavsiflash imkonini berdi.

4. Bioiqlimiy modellashtirish natijalari

BIOMOD2 platformasida amalga oshirilgan ensemble modellashtirish natijalariga ko‘ra, turning yuqori yaroqlilikdagi hozirgi potensial hududlari Farg‘ona vodiysining shimoliy va sharqiy tog‘li hududlarida (Janubiy Chatqol, Sharqiy Oloy, Oloy tizmalari) kuzatiladi, quyi adir hududlari (Beshariq, Oltiariq, Namangan atrofi, Toshko‘mir) past yaroqlilik zonasiga kiradi, Qozog‘istonning janubiy tekisliklari va Turon pasttekisligi esa turning yashashi uchun mutlaqo yaroqsiz hudud sifatida baholandi.

SSP245 iqlim ssenariysi bo‘yicha 2080–2100-yillarga kelib turning potensial tarqalish areali (EOO) hozirgi 13 561 km² dan 8 500–9 800 km² gacha (27–37% qisqarish), egallanish maydoni (AOO) esa 264 km² dan 130–160 km² gacha (40–50% qisqarish) kamayishi prognoz qilindi (6-jadval). Shu bilan birga, turning optimal balandlik oralig‘i hozirgi 550–800 m dan kelajakda 900–1300 m gacha yuqoriga siljishi aniqlandi, bu SSP245 ssenariysi bo‘yicha Markaziy Osiyoda kutilayotgan +2,0–2,7°C harorat oshishiga mos keladi.

6-jadval. Iqlim o‘zgarishi (SSP245) sharoitida turning EOO va AOO ko‘rsatkichlari dinamikasi

Ko‘rsatkich	Hozirgi holat (2020–2025)	SSP245 (2080–2100)	Qisqarish (%)
EOO (tarqalish hududi)	13 561 km²	8 500–9 800 km²	27–37
AOO (egallanish hududi)	264 km²	130–160 km²	40–50

Boshqa iqlim ssenariylari (SSP126, SSP585) bilan qiyosiy tahlil shuni ko‘rsatdiki, optimistik SSP126 ssenariysida EOO 15–25%, AOO 25–35% ga qisqarishi, pessimistik SSP585 ssenariysida esa mos ravishda 50–60% va 60–75% ga qisqarishi kutilmoqda, optimal balandlik esa 700–1600 m oralig‘ida joylashadi. Bioiqlim omillaridan Bio5 (eng issiq oyning maksimal harorati, 34,8% hissa) va Bio15 (yog‘ingarchilik mavsumiyligi, 22,5% hissa) eng muhim omillar sifatida ajralib chiqdi, tuproq omillaridan esa soil_cec va soil_ph turning bo‘z tuproqlarga bog‘liqligini tasdiqladi. Sharqiy Oloy

tizmasining 1000–1300 m oralig‘i (Xo‘jaobod–Imomota, Quvasoy–Log‘on) hamda Oloy va Chatqol tizmalarining yuqori qismlari asosiy iqlim refugiumlari sifatida aniqlandi, bu hududlar turning 2050–2100-yillardagi omon qolish ehtimolini belgilaydi.

5. IUCN kategoriyalari bo‘yicha baholash

GeoCAT vositasi yordamida hisoblangan ko‘rsatkichlarga ko‘ra, 2022–2026-yillarda aniqlangan yangi o‘sish nuqtalari hisobiga turning EOO ko‘rsatkichi 4 099,75 km² dan 13 560,97 km² gacha, AOO ko‘rsatkichi esa 52 km² dan 264 km² gacha oshdi. IUCN B mezoni bo‘yicha EOO ko‘rsatkichi VU chegarasiga (<20 000 km²) to‘g‘ri kelsa-da, AOO ko‘rsatkichi (264 km²) EN chegarasidan (<500 km²) past bo‘lib chiqdi (7-jadval); IUCN qoidalariga ko‘ra, mezonlardan biri bajarilgan taqdirda eng yuqori xavf darajasi qabul qilinadi, shu sababli tur EN toifasida baholandi.

7-jadval. A. namanganicus turini IUCN mezonlari bo‘yicha baholash natijalari

Daraja	EOO (km²)	AOO (km²)	Kategoriya	Mezonlar
Global (O‘zbekiston + Qirg‘iziston)	13 560,97	264	EN	B1ab(i,ii,iii)+B2ab(i,ii,iii)
Mahalliy (O‘zbekiston)	443,97	28	EN	B1ab(i)+B2ab(i,ii)

B mezonining “b” bandi (fragmentatsiya va qisqarish) bo‘yicha o‘tkazilgan tahlil populyatsiyalar orasidagi o‘rtacha masofa 35–50 km ni tashkil etishini, ayrim hududlarda (Namangan va Andijon viloyatlari o‘rtasida) ekologik koridorlarning mavjud emasligini hamda so‘nggi 30 yil ichida populyatsiyalar sonining 30–40% ga qisqarganligini ko‘rsatdi. Tur 7 ta asosiy subpopulyatsiyaga (Chust-Pop, Namangan atrofi, Chortoq, Uychi, Jalaquduq, Xo‘jaobod, Beshariq) ega bo‘lib, ularning ko‘pchiligi kuchli izolyatsiyalangan. Ushbu ma’lumotlar asosida Astragalus namanganicus Popov turi IUCN Qizil ro‘yxati bo‘yicha EN B1ab(i,ii,iii)+B2ab(i,ii,iii) (Endangered – Xavf ostida) kategoriyasiga kiritilishi to‘liq asoslandi.

6. Tahdid omillari va muhofaza chora-tadbirlari

Dala tadqiqotlari natijasida aniqlangan 250 dan ortiq uchrash nuqtasining 200 dan ortig‘i (80% dan ko‘prog‘i) hech qanday muhofaza rejimiga ega bo‘lmagan hududlarda joylashganligi aniqlandi. Turning tabiiy populyatsiyalariga eng katta tahdid mayda shoxli hayvonlarning tartibsiz boqilishi, yerlarni qishloq xo‘jaligi uchun o‘zlashtirish, qurilish ishlari hamda iqlim o‘zgarishi hisoblanadi; bu omillar ayniqsa Uychi tumani G‘ayrat qishlog‘i atrofida va Chortoq tumanining ayrim hududlarida keskin namoyon bo‘lmoqda (8-jadval).

8-jadval. A. namanganicus turining asosiy populyatsiyalari va tavsiya etiladigan muhofaza choralari

Hudud	Tuman (viloyat)	Balandlik (m)	Tavsiya etiladigan muhofaza chorasi
“Chap” trakti (Uyg‘ursoy)	Pop (Namangan)	594–718	Mavjud o‘rmon fondi doirasida qat’iy muhofaza zonasi
Arbag‘ish va Kuchon adirlari	Chortoq (Namangan)	624–807	Mahalliy ahamiyatdagi tabiat yodgorligi
Imomota qishlog‘i atrofi	Xo‘jaobod (Andijon)	1105–1128	IPA tarkibida muhofaza zonasi
G‘ayrat qishlog‘i atrofi	Uychi (Namangan)	549–646	Yaylovlardan foydalanishni tartibga solish
Qorabog‘ suv ombori atrofi	Chortoq (Namangan)	677–762	Suv ombori qirg‘og‘i bo‘ylab muhofaza chizig‘i

Aniqlangan tahdidlar asosida kompleks muhofaza strategiyasi ishlab chiqildi: (1) in-situ muhofaza – “Chap” trakti (Pop tumani) hududida mavjud O‘rmon fondi yerlarida qat’iy muhofaza rejimini o‘rnatish, Chortoq tumani Arbag‘ish va Kuchon adirlarida “Chortoq adirlari” mahalliy ahamiyatdagi tabiat yodgorligini tashkil etish, Xo‘jaobod tumani Imomota qishlog‘i atrofini IPA tarkibiga kiritish; (2) yaylov boshqaruvi – populyatsiyalar joylashgan hududlarda yaylov yuklamasini 1 ga maydonga 2–3 boshdan oshirmaslik, o‘tlatish mavsumini (mart–aprel, gullash va erta vegetatsiya davri) cheklash hamda mahalliy chorvadorlar bilan o‘tlatish jadvallari bo‘yicha shartnomalar tuzish; (3) qonunchilik choralari – turni O‘zbekiston Respublikasi Qizil kitobining navbatdagi nashriga EN toifasida kiritish hamda O‘zbekiston–Qirg‘iziston transchegaraviy muhofaza ro‘yxatiga kiritish; (4) ex-situ saqlash – urug‘lik banki tashkil etish, Toshkent Botanika bog‘i va Namangan davlat universitetida tirik kolleksiya yaratish; (5) reintroduksiya dasturi – donor populyatsiyani (masalan, Chortoq Arbag‘ish) tanlash, urug‘ yig‘ish, botanika bog‘ida ko‘chat yetishtirish, tarixiy arealga qayta ekish va kamida 3 yillik monitoring; (6) monitoring tizimi – populyatsiyalar hisobini har 3 yilda, fenologik

kuzatuvlarni har yili, yashash joyi holatini har 5 yilda baholash hamda GeoCAT tizimi yordamida EOO/AOO koʻrsatkichlarini muntazam yangilab borish; (7) xalqaro hamkorlik – Oʻzbekiston–Qirgʻiziston qoʻshma monitoring guruhini (Namangan–Jalolobod transchegaraviy hududi) tashkil etish hamda Kew Qirollik botanika bogʻi, GBIF va Plantlife International bilan hamkorlikni yoʻlga qoʻyish.

XULOSA

Oʻtkazilgan tadqiqot natijalari asosida quyidagi umumlashtirilgan xulosaga kelindi: Astragalus namanganicus Popov – poya balandligi 17–60 sm gacha yetadigan koʻp yillik oʻt oʻsimlik boʻlib, yaqin tur Astragalus brachyrachis Bunge dan dukkagining ikki uyali va qalin tukli boʻlishi, toʻpgulining siyrakligi hamda generativ organlarining yiriklashishi bilan ishonchli farqlanadi. Turning 1925–2026-yillarga oid 250 dan ortiq uchrash nuqtasi birinchi marta toʻliq tizimli tahlil qilinib, u Fargʻona vodiysining toʻrt botanik-geografik rayonida – Janubiy Chotqol (51,2%), Sharqiy Oloy (25,6%), Chorkesar (19,2%) va Qayroqqum–Yozyovon (4,0%) – dengiz sathidan 430–1130 m balandlik oraligʻida, ekologik optimumi esa 550–750 m da (ayniqsa 600–700 m) joylashgan holda tarqalganligi aniqlandi; tur asosan tosh-shagʻalli va gipsli boʻz tuproqlarda oʻsib, shoʻrlangan tuproqlarga yuqori sezgirlik namoyon etadi. 2022–2026-yillarda aniqlangan yangi oʻsish nuqtalari hisobiga turning maʼlum tarqalish maydoni sezilarli darajada kengaytirilib, EOO koʻrsatkichi 4 099 km² dan 13 561 km² gacha, AOO koʻrsatkichi esa 52 km² dan 264 km² gacha oshirildi. BIOMOD2 platformasida oʻtkazilgan bioiqlimiy modellashtirish SSP245 ssenariysi boʻyicha 2080–2100-yillarga kelib turning potensial areali 27–37% ga qisqarishini va optimal balandlik zonasining 550–800 m dan 900–1300 m gacha yuqoriga siljishini bashorat qildi, bunda Sharqiy Oloy va Oloy tizmalarining yuqori qismlari asosiy iqlim refugiumlari sifatida belgilandi. GeoCAT koʻrsatkichlari, populyatsiyalarning kuchli fragmentatsiyasi (oʻrtacha masofa 35–50 km), soʻnggi 30 yilda 30–40% ga qisqarishi hamda uchrash nuqtalarining 80% dan ortigʻi hech qanday muhofaza rejimiga ega emasligi asosida tur IUCN mezonlariga koʻra global va mahalliy darajada EN B1ab(i,ii,iii)+B2ab(i,ii,iii) (Xavf ostida) kategoriyasiga kiritildi. Aniqlangan asosiy tahdidlarga – yaylov bosimi, yerlarni oʻzlashtirish, qurilish ishlari va iqlim oʻzgarishi – qarshi kompleks in-situ va ex-situ muhofaza strategiyasi (tabiat yodgorliklari va IPA zonalarini tashkil etish, yaylov boshqaruvi, urugʻ banki, reintroduksiya dasturi, monitoring tizimi va Oʻzbekiston–Qirgʻiziston transchegaraviy hamkorlik) ishlab chiqildi. Yakun sifatida taʼkidlash joizki, tadqiqot natijalari Fabaceae oilasining endem turlarini oʻrganish, Fargʻona vodiysi florasining bioxilma-xilligini saqlash hamda Oʻzbekiston Respublikasining biologik xilma-xillikni saqlash strategiyasiga ilmiy-amaliy hissa qoʻshadi va turning Qizil kitobning navbatdagi nashriga EN kategoriyasida kiritilishi tavsiya etiladi.

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HISTORICAL

XX ASRNING 80-90-YILLARIDA FARG‘ ONA VODIYSIDA MILLATLARARO TOTUVLIK TARIXI

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Annotatsiya: *Mazkur maqolada XX asrning 80-90-yillarida Farg‘ ona vodiysida millatlararo totuvlikning tarixiy rivojlanish jarayonlari tarixiy-etnologik nuqtai nazardan tahlil qilingan. Tadqiqotda tarixiy-genetik, qiyosiy-tarixiy va statistik tahlil usullari asosida aholi tarkibi, migratsiya jarayonlari hamda etnik munosabatlarning o‘ ziga xos jihatlari o‘ rganilgan. 1989-yilgi Farg‘ ona voqealarining yuzaga kelishiga ta’sir etgan ijtimoiy-iqtisodiy va demografik omillar ilmiy manbalar asosida yoritilgan. Mahalliy tarixchi va etnolog olimlarning ilmiy xulosalari asosida vodiyda bag‘ rikenglik va etnomadaniy hamkorlikning tarixiy ildizlari ochib berilgan. Tadqiqot natijalari mustaqillik yillarida amalga oshirilgan millatlararo totuvlik siyosati hududda ijtimoiy barqarorlik va fuqarolar hamjihatligini mustahkamlashga xizmat qilganligini ko‘ rsatadi.*

Kalit so‘ zlar: *Farg‘ ona vodiysi, demografik jarayonlar, millatlararo munosabatlar, etnik jarayonlar, 1989-yil Farg‘ ona voqealari, etnomadaniy hamkorlik, bag‘ rikenglik, etnik barqarorlik, migratsiya omillari, millatlararo totuvlik siyosati.*

ИСТОРИЯ МЕЖНАЦИОНАЛЬНОГО СОГЛАСИЯ В ФЕРГАНСКОЙ ДОЛИНЕ В 80-90-Е ГОДЫ XX ВЕКА

Аннотация: *В данной статье с историко-этнологической точки зрения проанализированы процессы исторического развития межнационального согласия в Ферганской долине в 80-90-е годы XX века. В исследовании на основе историко-генетического, сравнительно-исторического и статистического методов анализа изучены состав населения, миграционные процессы, а также своеобразные аспекты межэтнических отношений. На основе научных источников освещены социально-экономические и демографические факторы, повлиявшие на возникновение Ферганских событий 1989 года. На основе научных выводов местных историков и этнологов раскрыты исторические корни толерантности и этнокультурного сотрудничества в долине. Результаты исследования показывают, что политика межнационального согласия, осуществлённая в годы независимости, служила укреплению социальной стабильности и гражданского единства в регионе.*

Ключевые слова: *Ферганская долина, демографические процессы, межнациональные отношения, этнические процессы, Ферганские события 1989 года, этнокультурное сотрудничество, толерантность, этническая стабильность, факторы миграции, политика межнационального согласия.*

THE HISTORY OF INTERETHNIC HARMONY IN THE FERGANA VALLEY IN THE 1980S–1990S

Abstract: *This article analyses, from a historical and ethnological perspective, the processes of the historical development of interethnic harmony in the Fergana Valley in the 1980s and 1990s. Using historical-genetic, comparative-historical and statistical methods of analysis, the study examines the composition of the population, migration processes and the distinctive features of interethnic relations. The socio-economic and demographic factors that influenced the emergence of the Fergana events of 1989 are discussed on the basis of scholarly sources. Drawing on the scholarly conclusions of local historians and ethnologists, the historical roots of tolerance and ethnocultural cooperation in the valley are revealed. The findings of the study show that the policy of interethnic harmony implemented during the years of independence has served to strengthen social stability and civic solidarity in the region.*

Keywords: *Fergana Valley, demographic processes, interethnic relations, ethnic processes, Fergana events of 1989, ethnocultural cooperation, tolerance, ethnic stability, migration factors, policy of interethnic harmony.*

Kirish

XX asrning 80-90-yillari Farg‘ ona vodiysi tarixida murakkab siyosiy, ijtimoiy va etnodemografik jarayonlar bilan tavsiflanadi. Ushbu davr sobiq SSSRning inqirozi, iqtisodiy tanglikning kuchayishi, migratsiya jarayonlarining faollashuvi va milliy o‘ zlikni anglash jarayonlarining jadallashuvi bilan xarakterlanadi. Mazkur omillar Farg‘ ona vodiysidagi millatlararo munosabatlarga bevosita ta’sir ko‘ rsatgan.

1980-yillarning o‘ rtalariga kelib Farg‘ ona vodiysi sobiq Ittifoqdagi aholi eng zich joylashgan hududlardan biriga aylandi. 1989-yilgi aholini ro‘ yxatga olish ma’lumotlariga ko‘ ra, Andijon viloyatida 1,9 mln, Namangan viloyatida 1,6 mln

va Farg‘ ona viloyatida 2,1 mln aholi istiqomat qilgan. Natijada vodiy aholisi 5,6 million kishidan oshib, O‘ zbekiston SSR aholisining qariyb 28 foizini tashkil etgan [1].

Mazkur davrda Farg‘ ona vodiysida o‘ zbeklar bilan bir qatorda tojiklar, qirg‘ izlar, ruslar, tatarlar, koreyslar, mesxeti turklari va boshqa millat vakillari yashagan. Ko‘ p millatli tarkibning shakllanishi tarixiy jarayon bo‘ lib, u uzoq davr davomida iqtisodiy va madaniy integratsiyani yuzaga keltirgan.

Tadqiqotning maqsadi XX asrning 80-90-yillarida Farg‘ ona vodiysidagi millatlararo totuvlik tarixini, uning saqlanishi va ayrim davrlarda yuzaga kelgan murakkab jarayonlarni tarixiy-etnologik nuqtai nazardan tahlil qilishdan iborat. Tadqiqot natijalari bugungi kunda millatlararo hamjihatlik siyosatining tarixiy ildizlarini tushunishga xizmat qiladi.

Tadqiqot metodologiyasi va o‘ rganilganlik darajasi:

Tadqiqotda tarixiylik va xolislik tamoyillari asosiy metodologik mezon sifatida qo‘ llanildi. Tarixiy-genetik usul yordamida 1980-1990-yillardagi etnik munosabatlarning shakllanish omillari va rivojlanish bosqichlari o‘ rganildi.

Qiyosiy-tarixiy usul orqali Farg‘ ona vodiysidagi etnik jarayonlar sobiq SSSRning boshqa ko‘ p millatli hududlari bilan taqqoslandi. Ushbu metod etnik ziddiyatlarning umumiy va o‘ ziga xos jihatlarini aniqlash imkonini berdi.

Statistik tahlil usuli asosida 1979 va 1989-yillardagi aholini ro‘ yxatga olish materiallari, O‘ zbekiston SSR Davlat statistika qo‘ mitasi ma’lumotlari hamda demografik ko‘ rsatkichlar o‘ rganildi. Mazkur metod yordamida aholi soni, migratsiya va etnik tarkibdagi o‘ zgarishlar aniqlashtirildi.

Milliy identiklik va etnik munosabatlar nazariyasini ishlab chiqishda Ernest Gellner, Benedik Anderson hamda Antony D. Smithning ilmiy qarashlari alohida ahamiyatga ega. Ernest Gellner millatchilikni industrial jamiyat mahsuli sifatida baholab, zamonaviy davlatlarning iqtisodiy va madaniy jihatdan bir xil kommunikativ makonga ehtiyoj sezishi natijasida milliy identiklik shakllanishini ta’kidlaydi. Uning fikricha, millatchilik millatlarni yaratadi, millatlar esa millatchilikning mahsuli hisoblanadi[2]. Gellner nazariyasi Farg‘ ona vodiysida XX asrning 80-yillarida demografik o‘ sish, urbanizatsiya va iqtisodiy transformatsiyalar etnik jarayonlarga qanday ta’sir ko‘ rsatganini tahlil qilishda muhim metodologik asos bo‘ lib xizmat qiladi.

B. Anderson esa millatni “tasavvur qilingan siyosiy hamjamiyat” sifatida izohlaydi. Olimning ta’kidlashicha, bir millat vakillari bir-birlarini shaxsan tanimasalar ham, o‘ zlarini yagona jamoa sifatida tasavvur qiladilar. Anderson milliy ongning shakllanishida matbuot, ommaviy axborot vositalari va umumiy axborot makonining rolini alohida ko‘ rsatadi [3]. Ushbu yondashuv Farg‘ ona vodiysida sovet davrida shakllangan umumiy siyosiy-madaniy makon hamda etnik guruhlar o‘ rtasidagi o‘ zaro munosabatlarni tahlil qilish imkonini beradi.

A. Smith etnosimvolizm nazariyasi orqali zamonaviy millatlar tarixiy xotira, umumiy afsonalar, ramzlar, an’analar va etnik meros asosida shakllanishini asoslab bergan. Uning fikricha, milliy identiklikni faqat zamonaviy siyosiy jarayonlar bilan izohlash yetarli emas, balki tarixiy-etnik meros ham muhim omil hisoblanadi [4]. Smitning konsepsiyasi Farg‘ ona vodiysidagi o‘ zbeklar, tojiklar, qirg‘ izlar va boshqa etnik guruhlar o‘ rtasida asrlar davomida shakllangan madaniy yaqinlik, tarixiy xotira va qo‘ shnichilik munosabatlarini o‘ rganishda muhim nazariy asos vazifasini bajaradi.

Shunday qilib, Gellnerning modernistik yondashuvi, Andersonning “tasavvur qilingan hamjamiyat” konsepsiyasi va Smithning etnosimvolizm nazariyasi Farg‘ ona vodiysidagi millatlararo munosabatlarni tarixiy-etnologik nuqtai nazardan kompleks tahlil qilish imkonini beradi. Ushbu nazariyalar yordamida 1980-1990-yillardagi etnik jarayonlar, identiklik masalalari va millatlararo totuvlik omillari ilmiy jihatdan izohlandi.

MDH olimlari orasida Markaziy Osiyodagi etnik jarayonlar va millatlararo munosabatlarni tadqiq etishda V.A. Tishkov, S.N. Abashin, V.I. Bushkov hamda D.V. Mikulskiylarning ilmiy ishlari alohida ahamiyat kasb etadi. V.A. Tishkov etnik ziddiyatlarni faqat milliy qarama-qarshilik mahsuli sifatida emas, balki ijtimoiy, iqtisodiy va siyosiy omillar bilan bog‘ liq murakkab jarayon sifatida baholaydi. Uning fikricha, postsovet hududidagi ko‘ plab etnik mojarolar aslida resurslar taqsimoti, migratsiya va siyosiy boshqaruv inqirozi bilan chambarchas bog‘ liq bo‘ lgan. Shu sababli Farg‘ ona vodiysidagi 1989-yil voqealarini ham faqat etnik omillar orqali izohlash ilmiy jihatdan yetarli emas.

Jumladan, S.N. Abashin Farg‘ ona vodiysida olib borgan etnografik tadqiqotlari asosida vodiy aholisining kundalik hayotida etnik mansublikdan ko‘ ra mahalliylik (mahalla, qishloq, hududiy identiklik) omili ko‘ proq ahamiyat kasb etishini ta’kidlaydi. Olimning fikricha, vodiyda o‘ zbeklar, tojiklar, qirg‘ izlar va boshqa etnik guruhlar o‘ rtasida uzoq tarixiy davr davomida shakllangan qo‘ shnichilik, qarindoshlik va xo‘ jalik aloqalari mavjud bo‘ lib, ular millatlararo totuvlikning muhim omili hisoblanadi [5]. Abashin etnik munosabatlarni o‘ rganishda mikroetnografik kuzatuv usulidan foydalanib, kundalik hayotdagi hamkorlik etnik tafovutlardan ustun turishini ilmiy asoslagan.

V.I. Bushkov va D.V. Mikulskiy esa Markaziy Osiyoda yuz bergan etnosiyosiy jarayonlarni tadqiq qilib, mintaqadagi keskinliklarning asosiy sabablaridan biri sifatida demografik o‘ sish, yer-suv resurslari taqchilligi va migratsion bosimni ko‘ rsatadilar. Ularning tadqiqotlarida Farg‘ ona vodiysi aholisi zich joylashgan hudud sifatida tavsiflanib, 1980-yillarda aholi sonining tez o‘ sishi ijtimoiy infratuzilmaga sezilarli bosim o‘ tkazgani qayd etiladi [6, 7]. Olimlarning xulosasiga ko‘ ra, etnik tus olgan ayrim mojarolar aslida uzoq vaqt davomida to‘ planib kelgan ijtimoiy-iqtisodiy muammolarning namoyon bo‘ lish shakli bo‘ lgan.

Shunday qilib, Tishkovning etnik konfliktlar nazariyasi, Abashinning Farg‘ ona vodiysidagi etnografik kuzatuvlari hamda Bushkov va Mikulskiyning migratsion-demografik jarayonlarga oid tadqiqotlari XX asrning 80-90-yillarida Farg‘ ona vodiysidagi millatlararo munosabatlarni kompleks tarixiy-etnologik tahlil qilish uchun muhim nazariy va metodologik asos bo‘ lib xizmat qiladi.

Mahalliy tarixchi va etnolog olimlar K. Shoniyozov, A.Asqarov, A.. Ashirov, D. Alimova, A. Sagdullaev hamda Ravshan Abdullaevlarning tadqiqotlari Farg‘ ona vodiysidagi etnik jarayonlarni tarixiy-etnologik jihatdan o‘ rganishda muhim ilmiy asos bo‘ lib xizmat qiladi. Karim Shoniyozov o‘ zining “O‘ zbek xalqining shakllanish jarayoni” monografiyasida Movarounnahr va Farg‘ ona hududlarida qadimdan yashab kelgan turkiy va eroniy etnik guruhlarning uzoq davom etgan iqtisodiy, madaniy hamda etnik aloqalari natijasida umumiy etnomadaniy makon shakllanganligini asoslaydi. Olimning xulosasiga ko‘ ra, o‘ zbek xalqining etnik taraqqiyoti mahalliy etnik negiz asosida kechgan bo‘ lib, qo‘ shni xalqlar bilan muntazam madaniy aloqalar etnik bag‘ rikenglikning tarixiy ildizlarini yaratgan [8].

A. Ashirovning etnologik tadqiqotlarida Farg‘ ona vodiysi aholisi orasida shakllangan qo‘ shnichilik, qarindoshlik va xo‘ jalik hamkorligi an’analari millatlararo munosabatlarning barqaror rivojlanishida muhim omil sifatida baholanadi. Uning fikricha, etnik guruhlar o‘ rtasidagi kundalik ijtimoiy munosabatlar, ayniqsa qishloq jamoalaridagi o‘ zaro yordam va hamkorlik tizimi etnik tafovutlarni yumshatib, umumiy hududiy identiklikning shakllanishiga xizmat qilgan [9].

D. Alimova Markaziy Osiyo xalqlari tarixiga bag‘ ishlangan tadqiqotlarida mintaqadagi etnik jarayonlarni tarixiy integratsiya va madaniy almashinuv mahsuli sifatida talqin qiladi. Tadqiqotchining ta’kidlashicha, Farg‘ ona vodiysi Buyuk Ipak yo‘ lining muhim markazlaridan biri sifatida turli etnoslar va madaniyatlarning uzluksiz muloqot maydoniga aylangan. Shu bois hududda etnik xilma-xillik bilan bir qatorda bag‘ rikenglik va madaniy moslashuv an’analari ham shakllangan [10].

A. Sagdullaevning ilmiy xulosalariga ko‘ ra, Farg‘ ona vodiysida etnik jarayonlarning shakllanishida geografik yaqinlik, sug‘ orma dehqonchilik tizimi va umumiy xo‘ jalik makoni muhim rol o‘ ynagan. Olim iqtisodiy hamkorlikning kuchli bo‘ lishi turli etnik guruhlarning bir hududda uzoq muddat tinch-totuv yashashiga zamin yaratganligini qayd etadi [11].

Tadqiqot natijalari:

1930-1940-yillarda Sovet Ittifoqi tomonidan amalga oshirilgan deportatsiya siyosati natijasida O‘ zbekiston, jumladan Farg‘ ona vodiysi ko‘ plab surgun qilingan xalqlarni qabul qilgan hududlardan biriga aylandi. Arxiv ma’lumotlariga ko‘ ra, 1937-yil oktabr-noyabr oylarida Uzoq Sharqdan O‘ zbekistonga 16 307 koreys oilasi yoki 74 500 kishi ko‘ chirildi. Ularning bir qismi Farg‘ ona vodiysi viloyatlariga joylashtirildi. 1938-yil 15-noyabr holatiga ko‘ ra Farg‘ ona viloyatining 64 ta kolxozida 1 130 ta koreys xo‘ jaligi joylashtirilgan bo‘ lib, 1939-yilgi aholini ro‘ yxatga olishda viloyatda 10 572 nafar koreys istiqomat qilgani qayd etilgan [12].

Ikkinchi jahon urushi yillarida deportatsiya siyosati yanada kengaydi. 1944-yilda Qrimdan ko‘ chirib keltirilgan aholi orasida qrim tatarlari, greklar, armanlar va bolgarlar ham bo‘ lgan. Arxiv hujjatlariga ko‘ ra, 1944-yil iyun holatida Farg‘ ona viloyatiga Qrimdan deportatsiya qilingan 3 958 oila yoki 16 175 kishi joylashtirilgan. Ularning 2 594 nafari erkaklar, 5 406 nafari ayollar va 8 175 nafari 16 yoshgacha bo‘ lgan bolalardan iborat edi. Bu aholi viloyatning 13 ta tumaniga taqsimlangan [13].

1944-yil noyabr oyida Stalinning qarori bilan Gruziyaning Mesxeti hududidan 115 mingdan ortiq mesxeti turklari, kurdlar va hamshinlar Markaziy Osiyoga deportatsiya qilindi. Ularning katta qismi O‘ zbekiston SSRga, ayniqsa Farg‘ ona vodiysi hududlariga joylashtirildi. 1989-yilgi Butunittifoq aholini ro‘ yxatga olish ma’lumotlariga ko‘ ra, SSSRdagi 207,5 ming mesxeti turkining 51 foizdan ortig‘ i O‘ zbekistonda yashagan va ularning asosiy qismi Farg‘ ona vodiysida istiqomat qilgan [14].

R.T. Shamsutdinov hamda D.A. Alimova deportatsiya qilingan xalqlarni joylashtirishda Farg‘ ona vodiysi iqtisodiy salohiyati va sug‘ orma dehqonchilik imkoniyatlari muhim omil bo‘ lganligi qayd etiladi. Tadqiqotchilar fikricha, mehnat resurslariga ehtiyoj mavjudligi sababli ko‘ chirib keltirilgan aholi asosan paxtachilik va qishloq xo‘ jaligi tarmoqlariga jalb qilingan [13].

V.A. Tishkov esa Sovet davridagi deportatsiyalarni etnik muhandislik siyosatining bir ko‘ rinishi sifatida baholaydi. Uning fikricha, deportatsiya qilingan xalqlar yashash joylaridan majburan uzib qo‘ yilgan bo‘ lsa-da, yangi hududlarda iqtisodiy faoliyatga jalb qilinishi natijasida mahalliy jamiyat bilan integratsiyalashuv jarayoni yuz bergan. Tishkov 1989-yilgi Farg‘ ona voqealarini tahlil qilib, ularning asosiy sabablari etnik ziddiyatdan ko‘ ra demografik bosim, iqtisodiy tanglik va resurslar taqsimotidagi muammolar bilan bog‘ liq ekanligini ta’kidlaydi [6].

Farg‘ ona vodiysida deportatsiya qilingan xalqlarning mahalliy aholi bilan uzoq muddatli iqtisodiy hamkorligi natijasida o‘ ziga xos etnomadaniy muhit shakllanganligini qayd etadilar. Ularning fikricha, XX asrning ikkinchi yarmida koreyslar va mesxeti turklari vodiyning qishloq xo‘ jaligi, savdo va xizmat ko‘ rsatish sohalarida faol ishtirok etib, mintaqaning ijtimoiy-iqtisodiy rivojlanishiga muhim hissa qo‘ shganlar.

1979-yilgi Butunittifoq aholini ro‘ yxatga olish ma’lumotlariga ko‘ ra, Farg‘ ona vodiysi viloyatlarida aholining yillik o‘ sish sur’ati 2,8-3,1 foizni tashkil etgan. Bu ko‘ rsatkich SSSR o‘ rtacha darajasidan deyarli ikki baravar yuqori bo‘ lgan. Natijada yer va ish o‘ rinlariga bo‘ lgan talab ortib bordi [15]. 1980-1988-yillarda vodiyning qishloq tumanlarida aholi zichligi ayrim hududlarda 1 km² ga 450-600 kishigacha yetgan. Demografik bosim iqtisodiy resurslardan foydalanishda muayyan qiyinchiliklarni yuzaga keltirgan bo‘ lsa-da, kundalik hayotda millatlararo hamkorlik saqlanib qolgan.

1989-yilgi aholini ro‘ yxatga olish natijalariga ko‘ ra, Farg‘ ona viloyatida o‘ zbeklar 82 foizdan ortiq, ruslar 7 foizga yaqin, tojiklar 4 foiz atrofida bo‘ lgan. Andijon va Namangan viloyatlarida ham o‘ zbeklar mutlaq ko‘ pchilikni tashkil etgan, biroq ko‘ plab boshqa etnik guruhlar ham yashagan.

1989-yil may-iyun oylarida Farg‘ ona viloyatida mesxeti turklari bilan bog‘ liq voqealar yuz berdi. Rasmiy ma’lumotlarga ko‘ ra, voqealar oqibatida 100 dan ortiq kishi halok bo‘ lgan, 1000 dan ortiq kishi turli darajada jarohatlangan va minglab oilalar vaqtinchalik ko‘ chirilgan. Tarixchilar ushbu voqealarning sabablarini faqat etnik omillar bilan emas, balki iqtisodiy va ijtimoiy tanglik bilan ham bog‘ laydilar.

Ixtilofni o‘ rganish komissiyasi tarkibida bo‘ lgan Akademik B. Axmedovning xulosalariga ko‘ ra, voqealar butun vodiy aholisi uchun xos bo‘ lgan etnik qarama-qarshilik emas, balki muayyan siyosiy va ijtimoiy sharoit mahsuli bo‘ lgan. Chunki voqealardan keyin ham aholining asosiy qismi o‘ zaro qo‘ shnichilik va xo‘ jalik aloqalarini saqlab qolgan. Akademik E. Yusupov: O‘ sha paytda O‘ zbekiston Fanlar akademiyasi vitse-prezidenti bo‘ lgan olim voqealarni joyiga borib o‘ rgangan va tahliliy maqolalar yozgan. U iqtisodiy inqiroz va ishsizlik bu fojeaning asosiy portlovchi kuchi bo‘ lganini ilmiy asoslab bergan [16].

1991-yilda O‘ zbekiston mustaqillikka erishgach, millatlararo totuvlik davlat siyosatining ustuvor yo‘ nalishiga aylandi. Konstitutsiyaning 18-moddasida barcha fuqarolarning millatidan qat’i nazar teng huquqliligi mustahkamlandi.

1990-yillar oxiriga kelib milliy madaniy markazlar faoliyatining rivojlanishi va davlat tomonidan qo‘ llab-quvvatlanishi natijasida vodiyda etnik hamkorlikning yangi institutsional shakllari vujudga keldi. Bu esa millatlararo munosabatlarning barqarorlashuviga xizmat qildi.

Muhokama:

Farg‘ ona vodiysidagi millatlararo totuvlik uzoq tarixiy taraqqiyot mahsuli ekanligini ko‘ rsatadi. XX asrning 80-yillarida yuzaga kelgan ayrim keskinliklar umumiy tarixiy tendensiyani inkor etmaydi. Statistik ma’lumotlar aholi sonining tez sur’atlarda o‘ sishi iqtisodiy infratuzilmaga katta bosim o‘ tkazganligini ko‘ rsatadi. Shu sababli etnik tus olgan ayrim mojarolarning ildizlari iqtisodiy muammolar bilan chambarchas bog‘ liq bo‘ lgan.

S.N. Abashinning fikricha, Farg‘ ona vodiysidagi etnik munosabatlarni faqat millatchilik nuqtai nazaridan izohlash ilmiy jihatdan to‘ liq emas. Chunki etnik guruhlar o‘ rtasidagi kundalik aloqalar va xo‘ jalik hamkorligi yuqori darajada saqlanib qolgan [17].

A. Ashirov etnografik materiallar asosida vodiy aholisi orasida qo‘ shnichilik, qarindoshlik va savdo aloqalari etnik chegaralardan ustun bo‘ lganligini ta’kidlaydi. Bu holat totuvlikning muhim omili sifatida namoyon bo‘ lgan [9].

Farg‘ ona vodiysidagi vaziyatning Kavkaz yoki boshqa hududlardagi etnik mojarolardan sezilarli farq qilganligini ko‘ rsatadi. Chunki mojaro uzoq davom etuvchi etnik qarama-qarshilikka aylanmagan. Mustaqillikdan keyingi siyosiy-huquqiy islohotlar va milliy madaniy markazlarning faoliyati tarixiy tajribadan to‘ g‘ ri xulosa chiqarilganligini ko‘ rsatadi. Natijada millatlararo munosabatlarning institutsional asoslari mustahkamlandi.

Xulosalar:

Birinchidan, XX asrning 80-90-yillarida Farg‘ ona vodiysi aholisi sonining keskin o‘ sishi va yuqori demografik bosim hududdagi ijtimoiy jarayonlarga sezilarli ta’sir ko‘ rsatgan. Aholi zichligining ortishi natijasida yer, uy-joy, ish o‘ rinlari va boshqa ijtimoiy-iqtisodiy resurslarga bo‘ lgan talab keskin kuchaydi. Ayniqsa, yoshlar sonining ko‘ payishi mehnat bozoridagi raqobatni yanada kuchaytirib, ayrim ijtimoiy muammolarning yuzaga kelishiga zamin yaratdi. Shu sababli mazkur davrda kuzatilgan ayrim ijtimoiy tangliklarni faqat etnik omillar bilan emas, balki murakkab demografik va iqtisodiy jarayonlar bilan ham izohlash zarur.

Ikkinchidan, tahlillar etnik munosabatlardagi ayrim murakkabliklarning asosiy sabablari iqtisodiy va demografik omillar bilan chambarchas bog‘ liq ekanligini ko‘ rsatdi. Tadqiqotlar natijalariga ko‘ ra, millatlararo munosabatlarda yuzaga kelgan ayrim ziddiyatlar ko‘ proq resurslar taqsimoti, bandlik masalalari, migratsiya jarayonlari hamda aholi sonining tez o‘ sishi bilan izohlanadi. Shuningdek, hududning ko‘ p millatli tarkibi va turli etnik guruhlarning tarixiy shakllanish jarayonlari ham mazkur munosabatlarning murakkab xususiyatlarini belgilagan. Shu bois etnik jarayonlarni baholashda ularni kengroq ijtimoiy-iqtisodiy kontekstda tahlil qilish muhim ahamiyat kasb etadi.

Uchinchidan, 1989-yilgi Farg‘ ona voqealari hududdagi millatlararo munosabatlarning umumiy holatini emas, balki muayyan davrdagi ijtimoiy-siyosiy tanglik va murakkab sharoitlarning natijasini aks ettirgan. Mazkur voqealar sobiq ittifoq davrining so‘ nggi bosqichida yuzaga kelgan siyosiy beqarorlik, iqtisodiy qiyinchiliklar hamda boshqaruv tizimidagi muammolar fonida sodir bo‘ lgan. Shu bilan birga, ayrim tashqi va ichki omillar ham vaziyatning keskinlashishiga ta’sir

koʻ rsatgan. Shuning uchun ushbu hodisalarni butun Fargʻ ona vodiysi aholisining millatlararo munosabatlariga xos doimiy holat sifatida emas, balki tarixiy sharoit bilan bogʻ liq istisnoiy voqea sifatida baholash maqsadga muvofiqdir.

Toʻ rtinchidan, mahalliy tarixchi va etnolog olimlarning ilmiy xulosalari Fargʻ ona vodiysida bagʻ rikenglik va etnomadaniy hamkorlik tarixiy an'ana sifatida shakllanganligini tasdiqlaydi. Asrlar davomida hududda turli millat va elatlar vakillari yonma-yon yashab, oʻ zaro iqtisodiy, madaniy va ma'naviy aloqalarni rivojlantirib kelgan. Buyuk Ipak yoʻ li chorrahasida joylashgan Fargʻ ona vodiysi xalqlar va madaniyatlar uchrashgan makon sifatida etnomadaniy xilma-xillikning shakllanishiga xizmat qilgan. Natijada hududda oʻ zaro hurmat, hamjihatlik va madaniy almashinuvga asoslangan munosabatlar tizimi vujudga kelgan boʻ lib, bu an'analar bugungi kunda ham oʻ z ahamiyatini saqlab qolmoqda.

Beshinchidan, mustaqillik yillarida amalga oshirilgan millatlararo totuvlik siyosati 1990-yillarning ikkinchi yarmidan boshlab hududda barqaror etnik munosabatlarning shakllanishiga xizmat qilgan. Davlat tomonidan barcha millat va elatlarning huquq hamda manfaatlarini ta'minlashga qaratilgan huquqiy-me'yoriy asoslar yaratildi, milliy madaniy markazlar faoliyati qoʻ llab-quvvatlandi va fuqarolar oʻ rtasida oʻ zaro hurmat tamoyillari mustahkamlandi. Shuningdek, ta'lim, madaniyat va jamoatchilik institutlari orqali bagʻ rikenglik gʻ oyalari keng targʻ ib qilindi. Natijada Fargʻ ona vodiysida turli etnik guruhlar oʻ rtasidagi hamkorlik va oʻ zaro ishonch kuchayib, hududning ijtimoiy-siyosiy barqarorligi ta'minlanishiga muhim hissa qoʻ shildi.

Foydalanilgan adabiyotlar:

1. 1989-yilgi Butunittifoq aholini roʻ yxatga olish ma'lumotlariga koʻ ra, Fargʻ ona vodiysida 5,48 mln aholi istiqomat qilgan boʻ lib, shundan 1,728 mln kishi Andijon, 1,602 mln kishi Namangan va 2,153 mln kishi Fargʻ ona viloyati hissasiga toʻ gʻ ri kelgan (Всесоюзная перепись населения 1989 года. Том 1. Часть 1. - Москва, 1990. - С. 22-25).

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TILAB MAHMUDOV ILMIY MEROSINING PEDAGOGIK TAFAKKUR VA YOSHLAR TARBIYASIDAGI AHAMIYATI

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Annotatsiya: *Ushbu maqolada Tilab Mahmudovning ilmiy merosi, uning pedagogik tafakkur rivojidagi o‘rni hamda yoshlar tarbiyasiga ko‘rsatgan ta’siri tahlil qilinadi. Muallifning ta’lim, ma’naviyat va estetik tarbiya haqidagi qarashlari zamonaviy pedagogik yondashuvlar bilan uyg‘un holda yoritiladi. Shuningdek, yosh avlodning ma’naviy-axloqiy kamolotida ilmiy merosning ahamiyati ochib beriladi.*

Kalit so‘zlar: *Tilab Mahmudov, pedagogik tafakkur, yoshlar tarbiyasi, ilmiy meros, ma’naviyat, estetik tarbiya, ta’lim, axloqiy kamolot.*

ЗНАЧЕНИЕ НАУЧНОГО НАСЛЕДИЯ ТИЛАБА МАХМУДОВА В ПЕДАГОГИЧЕСКОМ МЫШЛЕНИИ И ВОСПИТАНИИ МОЛОДЕЖИ

Аннотация: *В данной статье анализируется научное наследие Тилаба Махмудова, его роль в развитии педагогического мышления и влияние на воспитание молодежи. Освещаются взгляды ученого на образование, духовность и эстетическое воспитание в контексте современных педагогических подходов. Также раскрывается значение научного наследия в духовно-нравственном становлении молодого поколения.*

Ключевые слова: *Тилаб Махмудов, педагогическое мышление, воспитание молодежи, научное наследие, духовность, эстетическое воспитание, образование, нравственное развитие.*

THE IMPORTANCE OF TILAB MAHMUDOV’S SCIENTIFIC HERITAGE IN PEDAGOGICAL THINKING AND YOUTH EDUCATION

Abstract: *This article analyzes the scientific heritage of Tilab Mahmudov, his contribution to the development of pedagogical thinking, and his influence on youth education. The scholar’s views on education, spirituality, and aesthetic upbringing are highlighted in connection with modern pedagogical approaches. The article also reveals the importance of scientific heritage in the spiritual and moral development of the younger generation.*

Keywords: *Tilab Mahmudov, pedagogical thinking, youth education, scientific heritage, spirituality, aesthetic upbringing, education, moral development.*

KIRISH

“O‘z oldimizga qo‘ygan ulkan maqsadlarga erishish uchun biz tarbiya va ta’lim masalasini hech qachon e’tibordan chetda qoldirmasligimiz zarur. Chunki ma’naviy barkamol, mustaqil fikrlaydigan yosh avlod — Yangi O‘zbekiston poydevoridir”, — deb ta’kidlaydi Shavkat Mirziyoyev. Ushbu fikr zamonaviy pedagogik tafakkur va yoshlar tarbiyasi masalalarining naqadar dolzarb ekanini yaqqol ifodalaydi[1].

Zamonaviy ta’lim tizimida pedagogik tafakkur va ma’naviy tarbiya masalalari muhim ahamiyat kasb etmoqda. Yosh avlodni barkamol inson sifatida voyaga yetkazishda pedagogik qarashlar, milliy qadriyatlar va ma’naviy meros muhim o‘rin tutadi. Shu nuqtai nazardan, o‘zbek ilmiy-pedagogik tafakkuri rivojiga katta hissa qo‘shgan olimlardan biri Tilab Mahmudov hisoblanadi. Uning ilmiy merosi bugungi pedagogik qarashlar bilan uzviy bog‘liq bo‘lib, yoshlarning ma’naviy-axloqiy tarbiyasini shakllantirishda muhim nazariy asos vazifasini bajaradi[2].

Tilab Mahmudov o‘z ilmiy izlanishlarida ta’lim va tarbiyani inson kamolotining asosiy omili sifatida talqin qiladi. Unga ko‘ra, pedagogikaning bosh maqsadi — yosh avlodni nafaqat bilimli, balki ma’naviy yetuk va estetik didli inson

sifatida tarbiyalashdir[3]. Olimning pedagogik qarashlari markazida inson kamoloti, ma’naviy barkamollik hamda estetik tafakkurni rivojlantirish g‘oyalari turadi. Uning fikricha, haqiqiy pedagogika insonni faqat bilim bilan qurollantirish emas, balki uning qalbi, dunyoqarashi, axloqiy fazilatlari va go‘zallikni anglash qobiliyatini shakllantirishga xizmat qilishi kerak.

Mahmudov pedagogikani inson tafakkuri va ma’naviyati bilan chambarchas bog‘liq holda ko‘radi. Uning nazarida ta’lim inson ongini rivojlantiruvchi vosita bo‘lsa, tarbiya shaxsning axloqiy va ma’naviy qiyofasini shakllantiruvchi jarayondir. San’at va adabiyot esa yoshlarning estetik didini tarbiyalovchi muhim omil sifatida talqin qilinadi[4]. Bu qarashlar Sharq mutafakkirlari — Abu Nasr Forobiy va Ibn Sino pedagogik-falsafiy g‘oyalari bilan hamohangdir[5].

Adabiyotlar tahlili va metodologiya

Pedagogik tafakkur va ma’naviy tarbiya masalalari Sharq va G‘arb mutafakkirlari tomonidan keng tadqiq etilgan. Xususan, Abu Nasr Forobiy “Fozil odamlar shahri” asarida inson kamolotida ta’lim va tarbiyaning o‘rnini yoritgan bo‘lsa, Ibn Sino “Donishnoma” asarida axloqiy kamolot va ilmning uyg‘unligini asoslab beradi[5].

Zamonaviy o‘zbek pedagogik tafakkurida esa Tilab Mahmudovning ilmiy ishlari alohida o‘rin egallaydi. Uning “Estetika va tafakkur masalalari”, “Go‘zallik falsafasi” kabi asarlarida estetik ong, ma’naviy madaniyat va yoshlar tarbiyasining nazariy asoslari tahlil etilgan[3]. Shuningdek, pedagogik jarayonda san’at, musiqa va adabiyotning tarbiyaviy imkoniyatlari haqida muhim ilmiy qarashlar ilgari surilgan.

Bugungi kunda pedagogik tafakkur masalalari innovatsion texnologiyalar, interfaol metodlar va raqamli ta’lim vositalari bilan bog‘liq holda ham o‘rganilmoqda. Zamonaviy tadqiqotlarda yoshlarning mustaqil fikrlashi, kreativ tafakkuri va ma’naviy dunyosini rivojlantirish muhim pedagogik vazifa sifatida talqin qilinmoqda[6]. Pedagogik tafakkur va ma’naviy tarbiya masalalari Sharq va G‘arb mutafakkirlari tomonidan keng tadqiq etilgan. Xususan, Abu Nasr Forobiy “Fozil odamlar shahri” asarida inson kamolotida ta’lim va tarbiyaning o‘rnini yoritgan bo‘lsa, Ibn Sino “Donishnoma” asarida axloqiy kamolot va ilmning uyg‘unligini asoslab beradi[5]. Shuningdek, Sharq pedagogik tafakkurida insonni komil shaxs sifatida shakllantirish, uning ma’naviy va axloqiy kamolotini ta’minlash masalalari muhim o‘rin egallaydi. Mutafakkirlar ilm-ma’rifatni insonni yuksaltiruvchi asosiy kuch deb bilganlar hamda yosh avlodni tarbiyalashda odob, axloq, go‘zallik va ezgulik tushunchalariga alohida e’tibor qaratganlar.

G‘arb pedagogik tafakkurida ham inson kamoloti, estetik tarbiya va ta’limning ijtimoiy ahamiyati masalalari chuqur o‘rganilgan. Jumladan, Immanuel Kant insonning axloqiy ongini shakllantirishda estetik tafakkurning rolini yoritgan bo‘lsa, Georg Wilhelm Friedrich Hegel san’at va go‘zallikni inson ruhiy taraqqiyotining muhim omili sifatida talqin etadi. Bu qarashlar pedagogik tafakkurning nafaqat bilim berish, balki insonning ichki dunyosini boyitishga xizmat qiluvchi jarayon ekanini ko‘rsatadi.

Zamonaviy o‘zbek pedagogik tafakkurida esa Tilab Mahmudovning ilmiy ishlari alohida o‘rin egallaydi. Uning “Estetika va tafakkur masalalari”, “Go‘zallik falsafasi” kabi asarlarida estetik ong, ma’naviy madaniyat va yoshlar tarbiyasining nazariy asoslari tahlil etilgan[3]. Shuningdek, pedagogik jarayonda san’at, musiqa va adabiyotning tarbiyaviy imkoniyatlari haqida muhim ilmiy qarashlar ilgari surilgan. Olim yoshlar tarbiyasida milliy qadriyatlar va estetik madaniyat uyg‘unligini muhim omil sifatida baholaydi. Uning fikricha, san’at inson qalbini noziklashtiradi, ma’naviy olamini boyitadi hamda yoshlarning go‘zallikni his etish qobiliyatini shakllantiradi. Shu bois pedagogik faoliyatda musiqa, adabiyot va san’at vositalaridan samarali foydalanish yoshlarning ma’naviy barkamolligini ta’minlashda katta ahamiyat kasb etadi.

Tilab Mahmudov ilmiy merosida ustoz va shogird munosabatlari ham muhim pedagogik qadriyat sifatida talqin qilinadi. Olimning fikricha, ustoz shaxsiy namunasi, axloqiy fazilatlari va ma’naviy dunyosi bilan o‘quvchilar uchun ibrat bo‘lishi kerak. Chunki pedagogning ma’naviy qiyofasi yoshlarning tafakkuri va dunyoqarashi shakllanishiga bevosita ta’sir ko‘rsatadi. Bu qarashlar bugungi zamonaviy ta’lim tizimida ham dolzarb ahamiyat kasb etmoqda.

Bugungi kunda pedagogik tafakkur masalalari innovatsion texnologiyalar, interfaol metodlar va raqamli ta’lim vositalari bilan bog‘liq holda ham o‘rganilmoqda. Zamonaviy tadqiqotlarda yoshlarning mustaqil fikrlashi, kreativ tafakkuri va ma’naviy dunyosini rivojlantirish muhim pedagogik vazifa sifatida talqin qilinmoqda[6]. Ayniqsa, raqamli texnologiyalar va sun’iy intellekt vositalarining ta’lim tizimiga kirib kelishi pedagogik faoliyat mazmunini yangicha shakllantirmoqda. Endilikda pedagogdan nafaqat bilim berish, balki yoshlarni axborot oqimidan to‘g‘ri foydalanishga, mustaqil tahlil qilishga va kreativ fikrlashga yo‘naltirish talab etilmoqda.

Shuningdek, zamonaviy pedagogik tadqiqotlarda milliy va umuminsoniy qadriyatlar uyg‘unligini ta’minlash masalasi ham muhim o‘rin tutmoqda. Chunki globallashuv jarayonida yoshlarning ma’naviy immunitetini mustahkamlash, ularda milliy o‘zlikni anglash hissini rivojlantirish ta’lim tizimining ustuvor vazifalaridan biridir. Shu nuqtai nazardan, Tilab Mahmudovning pedagogik qarashlari va ilmiy merosi bugungi zamonaviy pedagogik konsepsiyalar bilan uyg‘unlashib, yoshlar tarbiyasida muhim nazariy va amaliy manba sifatida xizmat qilmoqda.

Mazkur maqolada Tilab Mahmudovning ilmiy merosini o‘rganishda tarixiylik, tizimli tahlil, qiyosiy-falsafiy va pedagogik yondashuv metodlaridan foydalanildi. Tadqiqot davomida olimning pedagogik qarashlari Sharq mutafakkirlari g‘oyalari hamda zamonaviy pedagogik konsepsiyalar bilan qiyosiy tahlil qilindi. Xususan, uning ta’lim, tarbiya,

ma’naviyat va estetik madaniyat haqidagi qarashlari Abu Nasr Forobiy, Ibn Sino kabi mutafakkirlarning ilmiy-falsafiy merosi bilan uyg‘unlikda tadqiq etildi.

Tadqiqotning metodologik asosini pedagogik tafakkur va ma’naviy tarbiya masalalariga oid ilmiy-nazariy qarashlar tashkil etdi. Shu bilan birga, zamonaviy ta’lim tizimida yoshlar ma’naviyatini shakllantirish, estetik ongni rivojlantirish hamda kreativ fikrlashni qo‘llab-quvvatlashga doir konseptual yondashuvlar ham tahlil qilindi. Tadqiqot jarayonida pedagogik tafakkurning yoshlar ma’naviyati va estetik madaniyatiga ta’siri nazariy jihatdan o‘rganildi.

Maqolada ilmiy bilishning analiz va sintez, induktiv va deduktiv, qiyoslash hamda umumlashtirish metodlaridan ham foydalanildi. Analiz usuli orqali Tilab Mahmudovning pedagogik qarashlari tarkibiy jihatdan tahlil qilinib, uning ta’lim va tarbiyaga oid asosiy g‘oyalari ajratib olindi. Sintez metodi yordamida esa ushbu qarashlarning zamonaviy pedagogik jarayon bilan bog‘liqligi umumlashtirildi.

Qiyosiy-falsafiy yondashuv asosida Sharq va G‘arb pedagogik tafakkurining o‘zaro uyg‘un hamda farqli jihatlari tahlil qilindi. Jumladan, estetik tarbiya, ma’naviy barkamollik va komil inson g‘oyalarining turli pedagogik maktablarda qanday talqin etilgani o‘rganildi. Bu esa Tilab Mahmudov ilmiy merosining universal pedagogik ahamiyatini ochib berishga xizmat qildi.

Tadqiqot davomida pedagogik adabiyotlar, ilmiy maqolalar, monografiyalar va falsafiy manbalar asosida manbashunoslik tahlili amalga oshirildi. Shuningdek, zamonaviy pedagogik texnologiyalar, innovatsion ta’lim usullari hamda raqamli ta’lim muhiti bilan bog‘liq ilmiy qarashlar o‘rganilib, ularning Tilab Mahmudov pedagogik qarashlari bilan bog‘liqligi yoritildi.

Mazkur metodologik yondashuvlar maqolaning ilmiy-nazariy asoslarini mustahkamlashga, Tilab Mahmudov merosining pedagogik tafakkur va yoshlar tarbiyasidagi ahamiyatini kengroq ochib berishga xizmat qildi.

Natijalar va muhokama

Tilab Mahmudovning ilmiy-falsafiy, estetik va badiiy merosi kompleks tahlil qilinib, uning pedagogik qarashlari inson ma’naviy kamoloti, estetik tarbiya va milliy qadriyatlar uyg‘unligiga asoslangan yaxlit pedagogik konsepsiyani tashkil etishi aniqlandi. Mazkur konsepsiyaning asosiy yo‘nalishlari quyidagilardan iborat:

- ta’lim va tarbiya uyg‘unligini ta’minlash;
- yoshlarning estetik didini rivojlantirish;
- milliy qadriyatlar asosida ma’naviy tarbiya berish;
- ijodiy va mustaqil fikrlashni shakllantirish;
- san’at va adabiyotning pedagogik imkoniyatlaridan foydalanish.

Tilab Mahmudovning pedagogik qarashlari nafaqat ilmiy-falsafiy asarlarida, balki badiiy ijodida ham o‘zining yorqin ifodasini topgan. Olimning “Go‘zallik va hayot” risolasida go‘zallik inson ma’naviy kamolotining muhim mezoni sifatida talqin qilinadi. Muallif estetik tarbiya insonning ruhiy olamini boyitishi, unda ezgulik, mehr-oqibat va insonparvarlik tuyg‘ularini shakllantirishini ta’kidlaydi. Ushbu qarashlar pedagogik nuqtai nazardan yosh avlodda estetik ong va didni rivojlantirish zarurligini asoslaydi.

“Mustaqillik va ma’naviyat” asarida esa Mahmudov yoshlarni milliy qadriyatlarga sodiq, vatanparvar va ma’naviy barkamol insonlar qilib tarbiyalash masalalariga alohida e’tibor qaratadi. Muallif mustaqillikni faqat siyosiy hodisa sifatida emas, balki inson tafakkuri va ma’naviy dunyosining erkinlashuvi sifatida talqin etadi. Bu esa ta’lim jarayonida milliy o‘zlikni anglash va ma’naviy mas’uliyat hissini shakllantirishning muhim pedagogik omili ekanligini ko‘rsatadi.

Olimning “Avesto”ga bag‘ishlangan tadqiqotlarida qadimgi ma’naviy meros, ezgulik va adolat g‘oyalari tahlil qilinadi. Mahmudov “ezgu fikr, ezgu so‘z va ezgu amal” tamoyillarini zamonaviy tarbiya tizimi uchun ham muhim metodologik asos sifatida baholaydi. Ushbu yondashuv yoshlarning axloqiy madaniyatini shakllantirishda muhim ahamiyat kasb etadi.

Tilab Mahmudovning badiiy ijodida ham kuchli pedagogik mazmun mujassam. Xususan, “Qaldirg‘och” she’rida inson va tabiat uyg‘unligi, mehr-muhabbat hamda sadoqat g‘oyalari ulug‘lanadi. Asarda yosh avlodni tabiatga ehtiyotkorona munosabatda bo‘lishga, go‘zallikni his etishga undovchi estetik-tarbiyaviy fikrlar ilgari suriladi.

“Abadiy do‘stlik” hikoyasida insoniy sadoqat, do‘stlik va o‘zaro hurmat qadriyatlari badiiy obrazlar orqali yoritiladi. Hikoya mazmuni yoshlarni halollik, ishonch va insoniy munosabatlarga hurmat ruhida tarbiyalashga xizmat qiladi. “Adolat” hikoyasida esa haqqoniylik, rostgo‘ylik va vijdon masalalari markaziy o‘rin egallaydi. Muallif adolatni inson kamolotining asosiy mezonlaridan biri sifatida talqin etadi.

“Oqar daryo oqmasmidi jimgina” hamda “Tanish odam” kabi asarlarida insonning ichki kechinmalari, hayotiy tajribasi va axloqiy tanlovlari tasvirlanadi. Ushbu asarlar yoshlarni mushohada qilishga, hayot hodisalariga mustaqil baho berishga va ma’naviy xulosalar chiqarishga undashi bilan pedagogik ahamiyat kasb etadi.

Tahlillar shuni ko‘rsatadiki, Tilab Mahmudov pedagogikasida ta’lim jarayoni faqat bilim berish bilan cheklanmaydi. U insonning ma’naviy dunyosini boyitish, estetik tafakkurini rivojlantirish va axloqiy fazilatlarini shakllantirishga

qaratilgan yaxlit tizim sifatida talqin qilinadi. Bu jihatdan uning qarashlari Abu Nasr Forobiy va Ibn Sinoning komil inson haqidagi g‘oyalari bilan uyg‘unlashadi.

Shuningdek, Mahmudov san’at va adabiyotni tarbiyaning kuchli vositasi sifatida baholaydi. Uning ilmiy va badiiy merosida go‘zallik, ezgulik, adolat, vatanparvarlik va ma’naviy barkamollik g‘oyalari yetakchi o‘rin tutadi. Shu bois olimning asarlari zamonaviy ta’lim tizimida yoshlar estetik madaniyatini yuksaltirish, mustaqil fikrlashni rivojlantirish hamda ma’naviy barkamol shaxsni tarbiyalashda muhim pedagogik manba sifatida xizmat qiladi.

Umuman olganda, Tilab Mahmudovning ilmiy va badiiy merosi pedagogik tafakkur, estetik tarbiya hamda ma’naviy kamolot masalalarini o‘zida mujassam etgan yaxlit konsepsiyani tashkil etadi. Bu konsepsiya bugungi ta’lim tizimini takomillashtirish va yosh avlodni komil inson ruhida tarbiyalashda muhim nazariy-amaliy ahamiyatga ega.

Xulosa.

Tilab Mahmudov merosi o‘zbek pedagogik tafakkurining muhim bosqichini tashkil etadi. Uning ta’lim, tarbiya va ma’naviy kamolot haqidagi qarashlari bugungi zamonaviy pedagogik konsepsiyalar bilan uyg‘unlashadi. Olimning ilmiy merosi yosh avlodning pedagogik ongini rivojlantirish, estetik didini shakllantirish hamda ularni ma’naviy barkamol inson etib tarbiyalashda muhim nazariy va amaliy ahamiyat kasb etadi.

Shuningdek, Mahmudovning pedagogik qarashlari yoshlarning ijodiy tafakkurini rivojlantirish, milliy qadriyatlarga hurmat ruhida tarbiyalash va zamonaviy ta’lim tizimini takomillashtirishda muhim ilmiy manba bo‘lib xizmat qiladi.

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TURKISTONNING OZODLIGI VA MA'RIFATI UCHUN KURASH TARIXIDA MAHMUDXO'JA BEHBUDIYNING O'RNI HAQIDA

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Annotatsiya: *Ushbu maqolada Mahmudxo'ja Behbudiyning hayoti, adabiyotimiz tarixidagi tutgan o'rni, jadid hikoyachiligining yo'nalishini belgilashda, milliy dramaturgiyamiz asoschisi sifatida tahlil etilgan.*

Kalit so'zlar: *Turkiston, mudarris, Darg'om, qori, "Mehrobdan chayon" gazetasi, mirzo, tarjimon, adabiyot, Xoji Muin, hikoya, dramaturgiya, ozodlik, muharrir, jurnal, Fitrat, teatr, Samarqand.*

О МЕСТЕ МАХМУДХОДЖИ БЕХБУДИ В ИСТОРИИ БОРЬБЫ ЗА СВОБОДУ И ПРОСВЕЩЕНИЕ ТУРКЕСТАНА

Аннотация: *В данной статье анализируются жизненный путь Махмудходжи Бехбуди и его роль в истории нашей литературы — как основоположника национальной драматургии, определившего вектор развития современной повествовательной традиции.*

Ключевые слова: *Туркестан, мударрис, Даргом, кори, газета «Мехробдан чаён», мирза, переводчик, литература, Ходжи Муин, рассказ, драматургия, свобода, редактор, журнал, Фитрат, театр, Самарканд.*

ON THE PLACE OF MAHMUDKHOJ BEHBUDI IN THE HISTORY OF THE STRUGGLE FOR THE FREEDOM AND ENLIGHTENMENT OF TURKESTAN

Abstract: *This article analyzes the life of Mahmudhoja Behbudi, his role in the history of our literature, as the founder of our national dramaturgy in determining the direction of modern storytelling.*

Keywords: *Turkestan, mudarris, Dargom, qori, Mehrobdan Chayan newspaper, mirza, translator, literature, Khoji Muin, story, dramaturgy, freedom, editor, magazine, Fitrat, theater, Samarkand.*

Turkistonning ozodligi uchun kurash tarixida unutilmas sahifalarni ochgan ajdodlarimizdan biri, millat karvonboshisi, ulug' ma'rifatparvar, betakror salohiyat va taqdir sohibi Mahmudxuja Behbudiydir. U tug'ilgan paytda yurt chor Rossiyasi mustamlakasiga aylangan edi. Samarqand madrasalarida tolibi ilmlarga tahlil berib kelgan mudarrislar va ularning oila a'zolarini bosqinchilar qirg'in-qatag'onidan asrash maqsadida Zarafshon daryosi va uning irmoqlari hisoblangan Siyob hamda Darg'om kanallari bo'ylaridagi vaqf yerlarga ko'chiradilar.

Behbudiy afandi 6-7 yoshta kirgach, o'zining katta tog'asi Muhammad Siddiq huzurida o'qub xat va savodini chiqardi. So'ngra o'zining otasi Behbudxo'ja qori qildurmok, maqsadi bilan unga oz-oz Qur'on o'rgatib yodlata boshladi. 3-4 yil ichida Behbudiy afandi Qur'onni butun yodladi va ramazon kechalarida xatmlarta o'tub yurdi. Behbudiy afandi uch kechalik bir xatmda yolg'uz birgina xato qilton, derlar. Bu esa uning kuvvai hofizasi na darajada ekanligini ko'rsatadi.

Behbudiy afandi yolg'uz qorilik, bilan «qanoatlanmay, 15 yoshlarida o'zining tog'asi mufti mulla Odil huzurida dars o'qurga kirishdi. Arabiy sarfu nahvdan "Qofiya" va "Sharhi mullo"ni, mantiqdan "Shamsiya"ni, fiqhdan "Muxtasar ul-viqoya"ning birinchi daftarini va bir oz "Hoshiya"ni mazkur zotning halqai tadrisida o'qudi. Hisob ilmini ham (masohattacha) shul kishidan o'rgandi".[1] Behbudiyning o'zi Samarqand va Buxoro madrasalarida tahsil olganligini "Turkestanskiye vedomosti" gazetasi muxbiriga bergan intervyusida ta'kidlaydi. Bugungi nuqtai nazar bilan qaraganda, u oliy ta'- lim sistemasining kamida bakalavr va magistr darajasini yoqlagan. "Ustozi mufti mulla Odilning so'ziga ko'ra, Behbudiy afandi yoshlik, chog'ida o'tkur zehnlik va o'qushta juda havasliq bo'lg'on. Ustozining bir qatla o'rgatishi bilan saboqini o'rgana ekan. O'zi g'oyat halim, adablik, oz so'zlik va o'yin-kulguni sevmayturg'on bo'lg'on".[2]

[1] Ҳожи Муин. Маҳмудхўжа Беҳбудий//Учқун. Самарқанд. 1923;1-сон.
[2] Юқоридаги асар.

Abdulla Qodiriyning “Mehrobdan chayon” asari qahramoni Anvar mirzolik vazifasida ishlardi. Fitrat, Ayniy, Qodiriy, Choʻlpon singari yoshlar ustozi Mahmudxoʻja Behbudiy ham ish faoliyatini mirzolikdan boshlagan. Oʻqib-oʻrganishga boʻlgan iqtidori tufayli oʻz davrining yuksak eʼtiborli lavozimi - muftilik rutbasiga erishdi. Unga munosib koʻrilgan muftilik musulmonlarda oliy lavozimli ruhoniy hisoblanib, diniy-huquqiy masalalarni izohlash, talqin etish borasida hal qiluvchi huquqqa egadir.

Albatta, bunday lavozim sohibi oʻz faoliyati davomida xalqning barcha qatlamlari vakillari bilan muloqotda boʻladi, demakki, kichik masalalardan yirik muammolargacha duch keladi, ularni qiyoslash, xulosa chiqarish va masalalarning yechimi nimada ekanligi toʻgʻrisida fikrlash imkoniga ega edi.

Albatta, mirzolik paytidan boshlab, Rossiyaning mahalliy xalq uchun yoʻriqnomasi - "Turkiston viloyatining gazeti"ni oʻqib borar, oqposhsho va uning siyosatini kuzatardi. Lekin dunyoqarashining kengayishida Rossiya hududida jadidchilik harakatiga asos solgan mashhur maʼrifatparvar Ismoilbek Gaspirali muharrirligida chop etilgan "Tarjimon" gazetasining oʻrni alohida ekanligini Behbudiy ham, uni bilgan insonlar ham taʼ- kidlashgan. Hoji Muin tili bilan aytganda, "Turkiston" gazetasining musulmonlarni atfol etish maqdadi bilan yozaturton soʻzlarini tushuna boshlaydi va oʻzigʻa uchragʻon yoru doʻstlarini mustabid hukumatning buzuq maqsadidan ogohlanturadi".[3]

Xalqimizda dunyoni anglash uchun koʻp oʻqish yoki dunyo kezish kerakligi haqida naql bor. Behbudiy faqat oʻqibgina qolmadi, balki ikkisini-da amalga oshirdi. “1318 sanai hijriyasi tavofi Baytulloga Kafkaz yoʻli ila Istanbul va Misr al-Qohira vositasila borib edim. Muddati safarim sakkiz oydan ziyoda choʻzilub edi”.[4]

Bugungi dorilamon kunlarda "Adabiyot yashasa — millat yashar" degan gaplar koʻpchilikning tiliga tushib, ixlosmandlarning diliga jo boʻldi. XX asr boshlarida esa adiblarni toʻgʻri tarbiyalab, ularning qoʻliga qalam tutqazish, adabiyot orqali oʻzlikni anglashga va oqibat xalqni ozod boʻlishga daʼvat etish jadidlarning orzularidan edi.

Adabiyotshunoslar Behbudiyni milliy dramaturgiyamiz asoschisi deb biladilar. Biroq uning jadid hikoyachiligining yoʻnalishini belgilashda ham ilk mashqi bilan yosh adiblarga namuna boʻlgani, ularga murojaat qilganiga tarix guvohlik bermoqda. Mazkur hikoya “Oq yelpogʻichli chinli xotun” deb nomlanadi. Adib unga “Tasodif” degan kirish soʻzi va soʻngsoʻz oʻrnida “Intiho” deb nomlangan izoh yozgan. Behbudiyning publisistik va muharrirlik faoliyati bilan shugʻullanib, uning maqolalaridan ozodlikka erishish gʻoyalarini, aniqrogʻi, jiddiy, siyosiy daʼvatu harakatlarni aniqlab, taʼqib va tahqirlarga qaramasdan kurashgani, hayotining ayanchli yakunidan qaygʻuga tushib yurgan kezlarimizda eski gazeta taxlamlaridan (“TVG”, 1909 yil, 12-son) shu ajib asarga, bir qarashda Behbudiyga xos boʻlmagan faoliyatga duch kelib, hayratda qolgandik. Oʻshanda adabiyot taratadigan nurafshon ruh, ato etadigan betakror zavqni tuyganmiz. Hikoya asosini dunyo kezayotgan faylasufning qabristondagi hali tuprogʻi qurimagan yangi qabrni oq yelpigʻichi bilan yelpiyotgan juvonni uchratishi va bu notabiiy harakat sinoatini topishga harakat tashkil etadi. Bu goʻzal hikoyani siz ham bir bor oʻqishingizni istadik.

Behbudiy hikoyaga yozgan “Tasodif” deb nomlangan kirish soʻzida oʻgʻli Masʼudxoʻja bilan turli darsliklar va boshqa badiiy adabiyotlar mutolaa qilayotganda ushbu hikoyaga duch kelganini aytadi. Atoqli adabiyotshunos olim Begali Qosimov ana shu fikrlarga asosan “Behbudiy asli xitoy adabiyotidan olingan ushbu hikoyani oʻz qalbi va qalami bilan oʻzbek oʻquvchisiga taqdim etmoqchi boʻladi”, deb yozadi. Shundan boʻlsa kerak, asar jadid hikoyachiligida asosiy oʻrinda tilga olinmaydi. Holbuki, xorijiy ellar, elatlarni tasvirlash usulidan jadidlar koʻp bora foydalanishgan. Masalan, Fitratning “Sayyohi hindi” asari fikrimizga dalil boʻla oladi.

Xulosa shulki, Behbudiyning “Ok, yelpogʻichli chinli xotun” hikoyasi jadid hikoyachiligining boshlanishidir.[5]

Sadriddin Ayniy “1908 ynchi yildan oʻz idorasinda biron gazeta chiqarmok, fikrigʻa tushub, 1913 inchi yil aprel oyinda bu maqsadiga yetishub “Samarqand” gazetasining bir necha raqamini chiqarishga muvaffaq boʻlgʻon” (Mahmudxoʻja Behbudiy hazratlarining qisqacha tarjimai holi // «Mehnat- kashlar tovushi» gazetasi, 1920 yil, 8 aprel) deb yozadi, arxivdagi (Oʻzbekiston Respublikasi Markaziy davlat arxivi, 18-fond, 1-roʻyxat, 8752-ish) maʼlumotlar ham bu fikrlarni isbotlaydi. Shu oʻrinda yozilgan arizalarda Mahmudxoʻja Behbudiyning imzolari saqlanganligini taʼkidlash joiz.

Abdulla Avloniyning kichik sarlavhadagi fikriga kyelsak, darha- qiqat, “Samarqand” oʻzidan avval chiqqan nashrlardan farq qiladi. Bunda Behbudiyning matbuot sohasidagi toʻplagan tajribalari qoʻl kelgan. Gazetaning oʻzgachaligiga birinchi dalil shuki, bu kungacha hech bir nashr uch tilda chiqqan emas. Oʻz davrining taraqqiyparvari va donishmandi boʻlgan Behbudiy gazetani faqatgina oʻzbek tilida chiqarib, forscha soʻzlashadigan xalqlarni ham eʼtibordan chetda qoldira olmasdi. Noshir va muharrir “Samarqand”ning 36-sonidagi maqolasida gazetani nega uch tilda chop etayotganini shunday izohlagan: “Samarqand jaridasi oʻzbekiy, forsiy va rusiy tillarida va Turkistonning oʻrta shevasinda taʼsis etilib turib edi. Mundan maqsad shul ediki, Bahri Hazardan boshlab janubdagi Afgʻoniston fasili, Amu nahri oʻrtasindaki vaseʼ arosigʻa sokin turk va tojik birodarlarimizgʻa bir qadar toqat hidmat etmak va alarni holigʻa va ijobati

[3] Ҳожи Муин. Маҳмудхўжа Беҳбудий//Учқун.Самарқанд. 1923;1-сон.

[4] Маҳмудхужа Беҳбудий, 1914: 31-сон. Қасди сафар. Ойина.

[5] Ҳалим Саидов. Улуғ устоз маърифати. Олтин битиклар. 2018-1. Б.: 80

asriya, vaqoyi' zamoniyada va Russiya kulturi, ilmi, hunari va sanoatga oshino bo'lishlarig'a ojizona tashviq etmoqdin iborat edi. Maktab bo'lsun, Madrasa bo'lsun, isloh va taraqqiysiga yordam uchun xalqni da'vat etmoq edi. Fosid urf va botil rasmlarni, yomon odatlarni shar'an islohiga qo'shish etmoq, edi".[6]

Muharrir istilohi Navoiy asarlari lug'atida "yozuvchi, tahrir qiluvchi" ma'nosini berishi ta'qiqlanadi. Biroq XX asr boshiga kelib muharrir faqat yozib, tahrir qiladigan emas, balki tahrirdan o'tgan xabar va maqolalarning gazetada berilishini boshqaradigan, muallif jalb etadigan, yana bir qancha vazifalarni bajaradigan mas'ul shaxs darajasiga chiqqandi. Mahmudxo'ja Behbudiy esa Sharqu G'arb tushunchasidagi muharrirning vazi- fasini bemalol bajara oladigan inson edi. Ayniqsa, o'zining qalamiga mansub maqolalarda muharrir nuqtai nazari bilan qarab, qisqa va lo'nda shaklda yozganligini ko'ramiz. "Tahlil oyi", "Millatlar qanday taraqqiy etarlar?", "Ehtiyoji millat" kabi ko'pgina maqolalari fikrimizga dalildir.

"Samarqand"da Munavvar qori Abdurashidxonov, Abdurauf Fitrat, Hoji Muin singari yana ko'plab zamonasining yetuk ma'rifatparvarlari o'z ijodlari bilan ishtirok etgan.[7]

Jurnal sahifalari davrning yangicha yashashga ishtiyoqmand, ozodlik orzusida ziyolilar uchun fikr aytish maydoniga aylanadi. Abdurauf Fitrat, Saidrizo Alizoda, Tavallo, Siddiqiy-Ajziy, Hoji Muin, Mahmud Tarziy (Afg'aniston), Sadriddin Ayniy singari ko'plab ijodkorlar qalamlari shu nashrda sayqal topdi.

Jurnalning dovrug'i yetti iqlimga yetmagan bo'lsa-da, uni Rossiya va yaqin Sharq davlatlari musulmonlari mutolaa qilishgani to'g'risida ma'lumot bizgacha yetib kelgan. "Oyina" Turkistondan boshqa Totoriston, Kofkoz, Afg'anistan, Eron, Turkiya va Misrgacha tarqalar va har yerda suyib o'qilur edi".[8]

1918 yilda Toshkentda Fitrat tashabbusi bilan "Chig'atoy gurungi" adabiy-madaniy uyushmasi maydonga keldi va Cho'lpon, Botu, Elbek, G'ozi Yunus, G'ulom Zafariy, Mannon Uyg'ur, Qayum Ramazon kabi fan va madaniyatimizning yorqin iste'dodlarini o'z atrofiga to'pladi. Bor-yo'g'i bir yarim yilcha faoliyat ko'rsatgan ushbu uyushma-jamiyat til-imlo qoidalarini ishlab chiqishda, adabiyot tarixini o'rganish, sistemalashtirishda, teatrchilikni yuksaktirishda katta ishlar qildi. Biroq, bunday milliy-madaniy tiklanish yo'llari tobora yopila bordi. Va madaniy-adabiy hayot ham sekin-asta siyosat izmiga tushib qoldi.

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[6] На учун илтифот этмайдурлар // "Самарқанд" газетаси, 1913 йил, 16 август.

[7] Ҳалим Саидов. Улуғ устоз маърифати. Олтин битиклар. 2018-1. Б.:82

[8] Ҳожи Муин. Самарқанд матбуотининг тарихи // "Зарафшон" газетаси, 1923 йил, 23 июн.

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MANFAATLAR DIALEKTIKASI VA IJTIMOIY ZIDDIYATLAR FENOMENI

Islomov Sharof Abdurahmonovich
Namangan davlat universiteti tadqiqotchisi

Annotatsiya: *Maqolada zamonaviy raqamli-kommunikativ sharoitda kuzatilayotgan ijtimoiy ziddiyatlarning kelib chiqish sabablari, ularni tadqiq etishning falsafiy-metodologik asoslari tahlil etiladi. Ish doirasida M.N. Rutkevichning subyektlarga asoslangan tipologik modeli ko‘rib chiqiladi, E. Dyurkgeym, G. Zimmel, P. Blau va M. Mossning ijtimoiy o‘zaro ta’sirga oid klassik nazariyalari qiyoslanadi, shuningdek muallifning “manfaatlar → ziddiyat → taraqqiyot” konseptual modeli SMART mezonlari orqali sinovdan o‘tkaziladi. A.Ya. Antsupov va S.B. Davletchinaning axborotiy ziddiyatga oid ta’riflari o‘zaro solishtirilib, zamonaviy jamiyatda ziddiyatlarning yetti pog‘onali (individual, shaxslararo, guruhiy, jamiyat miqyosidagi, ijtimoiy-siyosiy, axborot makoni va global) tizimi ishlab chiqiladi. Xulosada ta’kidlanishicha, mazkur ziddiyatlar mintaqaviy hamkorlik va barqaror taraqqiyot masalalaridan izolyatsiyalangan holda o‘rganilishi mumkin emas.*

Kalit so‘zlar: *ijtimoiy ziddiyat; konfliktologiya; manfaatlar dialektikasi; axborotiy ziddiyat; SMART-model; tarmoq jamiyati; geosiyosat; mintaqaviy xavfsizlik.*

ДИАЛЕКТИКА ИНТЕРЕСОВ И ФЕНОМЕН СОЦИАЛЬНЫХ КОНФЛИКТОВ

Аннотация: *В статье анализируются причины возникновения социальных конфликтов в современных условиях цифровой коммуникации, а также философско-методологические основы их исследования. Рассматривается типологическая модель М.Н. Руткевича, сопоставляются классические теории социального взаимодействия Э. Дюркгейма, Г. Зиммеля, П. Блау и М. Мосса, а также апробируется авторская модель “интересы → конфликт → развитие” посредством критериев SMART. Сравниваются определения информационного конфликта А.Я. Анцупова и С.Б. Давлетчиной, разрабатывается семиуровневая система конфликтов в современном обществе.*

Ключевые слова: *социальный конфликт; конфликтология; диалектика интересов; информационный конфликт; SMART-модель; сетевое общество; геополитика; региональная безопасность.*

THE DIALECTIC OF INTERESTS AND THE PHENOMENON OF SOCIAL CONFLICTS

Abstract: *The article examines the causes underlying social conflicts under contemporary digital-communicative conditions, together with the philosophical-methodological foundations for their study. It considers M.N. Rutkevich’s subject-based typological model, compares the classical social-interaction theories of E. Durkheim, G. Simmel, P. Blau, and M. Mauss, and tests the author’s “interests → conflict → development” model against SMART criteria. The definitions of information conflict offered by A.Ya. Antsupov and S.B. Davletchina are compared, and a seven-level system of conflicts in contemporary society is developed. The conclusion holds that such conflicts cannot be studied in isolation from questions of regional cooperation and sustainable development.*

Keywords: *social conflict; conflictology; dialectic of interests; information conflict; SMART model; network society; geopolitics; regional security.*

KIRISH

Jamiyat a’zolarini bog‘lovchi ijtimoiy munosabatlar tizimi qanday tartibga solinishidan qat’i nazar, bu tizim tegishli institutlarsiz o‘z-o‘zidan mavjud bo‘la olmaydi; institutlar esa, o‘z navbatida, aynan mana shu munosabatlarni tartibga solish orqali ijtimoiy boshqaruvning bosh vazifasini bajaradi. Har bir shaxs va guruh o‘ziga xos manfaatlar tashuvchisi sifatida ijtimoiy aloqalarga kirishar ekan, mazkur manfaatlarning xilma-xilligi — ziddiyatlarning tabiiy manbai sifatida — ijtimoiy hayotning ajralmas tarkibiy unsuriga aylanadi. Demak, ziddiyatlarning ildizini izlash uchun, avvalo, jamiyatning institutsional-normativ tuzilishiga va unda kechayotgan manfaatlar kurashiga murojaat etish lozim.

Mavzuning ilmiy dolzarbligi shu bilan izohlanadiki, zamonaviy raqamli-axborot muhiti sharoitida ijtimoiy ziddiyatlarning ichki tabiati tubdan yangilanmoqda: axborot oqimlarining tezlashuvi, raqamli vositalarning ommalashuvi va ijtimoiy aloqalarning transmilliylashuvi ziddiyatlarga xos yangi ko‘rinishlarni keltirib chiqarmoqda. An’anaviy konfliktologik nazariyalarning izohlash salohiyati bunday yangi ko‘rinishlarni to‘liq qamrab olishga yetarli emas, shu

sababli axborotiy omillarni ham hisobga oluvchi yangicha kontseptual apparat zarur bo‘lib qolmoqda. Shundan kelib chiqib, mazkur maqolaning maqsadi quyidagilardan iborat: ziddiyatlarni tasniflashning mavjud yondashuvlarini tanqidiy ko‘rib chiqish; “manfaatlar → ziddiyat → taraqqiyot” nomli original modelni SMART mezonlari yordamida asoslash; axborotiy ziddiyat tushunchasining tarixiy-nazariy evolyutsiyasini kuzatish; hamda zamonaviy jamiyatda ziddiyatlarning ko‘p pog‘onali tizimini ishlab chiqish.

TADQIQOT METODOLOGIYASI

Ishda quyidagi metodologik vositalar qo‘llanildi: tizimli-strukturaviy tahlil, tipologik-qiyosiy usul va SMART-baholash metodikasi. Nazariy poydevorni M.N. Rutkevichning subyektlar mezoniga asoslangan tasnifi, klassik sotsiologlar (E. Dyurkgeym, G. Zimmel, P. Blau, M. Mauss) va zamonaviy konfliktolog-mutaxassislar (A.Ya. Antsupov, S.B. Davletchina, A.A. Plotnikov, E.G. Solovyov, S.A. Danilov, V.N. Porus) asarlari tashkil etdi. Bundan tashqari, mahalliy ilmiy maktab vakillarining dissertatsion ishlari (R.Z. Jumayev, U.A. Ubaydullayev, B.A. Xo‘janov, Q.P. Qabulov, Sh. Hasanov, O. Toshev, B.I. Nazaraliyev, K.A. Yuldashev, F.T. Xoldarova, B.T. Kuyliev, M.Sh. Boymirzayeva, G.S. Ro‘ziyeva, N. Zikirova) kontent-tahlil yordamida umumlashtirildi. Muallif ishlab chiqqan “manfaatlar → ziddiyat → taraqqiyot” modelining ilmiy-amaliy salohiyatini tekshirish uchun SMART (Specific — aniqlik, Measurable — o‘lchovlilik, Achievable — erishiluvchanlik, Relevant — dolzarblik, Time-bound — vaqt chegarasi) mezonlari tizimi qo‘llanildi.

NATIJALAR VA MUHOKAMA

Ziddiyatlarni tasniflashning tipologik va strukturaviy asoslari

Ilmiy adabiyotda ziddiyatlarni tasniflash mezonlari bo‘yicha yagona pozitsiya mavjud emas. M.N. Rutkevich tomonidan ishlab chiqilgan tipologiya subyektlar tarkibini asosiy mezon sifatida oladi va shu asosda to‘rt turni farqlaydi: jamiyat miqyosidagi subyektlar o‘rtasidagi ziddiyatlar, etnik guruhlararo ziddiyatlar, ijtimoiy guruhlar o‘rtasidagi ziddiyatlar hamda jamiyat ichki tarkibidagi turli subyektlar o‘rtasidagi qarama-qarshiliklar. Ushbu yondashuvning afzalligi shundaki, u tahlilni subyektlararo aloqadorlik nuqtai nazaridan tizimlashtiradi; ammo shu bilan birga, ziddiyat kelib chiqishining chuqur mexanizmlarini — ijtimoiy vaziyat, tomonlarning maqsad-manfaatlari va boshqa ko‘p sonli o‘zgaruvchilarni — to‘liq izohlay olmaydi.

Shu sababdan ziddiyat hodisasini subyekt bilan subyekt o‘rtasidagi munosabatning alohida shakli sifatida qarab, strukturaviy tahlil metodini qo‘llash muhim ahamiyat kasb etadi: bunda ziddiyat sub’ektlari, ziddiyat predmeti (obyekti), tomonlarning foydalanadigan vositalari va yakuniy natija kabi tarkibiy unsurlar alohida-alohida o‘rganiladi. Etimologik jihatdan arab tilidan kirib kelgan “ziddiyat” so‘zi o‘zbek tilining izohli lug‘atida dushmanlik, qarshi chiqish, o‘zaro xiloflik va fikriy qarama-qarshilik ma’nolarini ifodalaydi — bu esa hodisaning nafaqat ochiq to‘qnashuv, balki nozik fikriy-ma’naviy farqlanish shaklida ham namoyon bo‘lishi mumkinligini ko‘rsatadi.

Muallif modeli: “manfaatlar → ziddiyat → taraqqiyot” va uning SMART-asoslanganligi

Ijtimoiy ziddiyat — bu jamiyat holatini ifodalovchi tushuncha bo‘lib, uning mohiyati turli subyektlarning manfaatlar to‘qnashuvida namoyon bo‘ladi. Faraz qilaylik, jamiyatdagi barcha guruhlarning manfaati bir-biriga to‘liq mos kelsa — bunday holatda “ziddiyat” kategoriyasi o‘z ilmiy mazmunini yo‘qotgan bo‘lardi; biroq amaliyotda bunday ideal muvofiqlik kuzatilmaydi. Muallif nazdida, “manfaatlar → ziddiyat → taraqqiyot” ketma-ketligi jamiyat evolyutsiyasini chiziqli emas, balki dialektik jarayon sifatida talqin qilishga xizmat qiladi, va aynan zamonaviy axborot-kommunikatsiya sharoitida manfaatlarning tez o‘zgaruvchanligi hamda ziddiyatlarning raqamli makonda tezlashib ketishi ushbu modelning amaliy qiymatini yanada oshiradi.

1-jadval. Muallifning “manfaatlar → ziddiyat → taraqqiyot” modeliga nisbatan SMART-baholash

Mezon	Manfaatlar bosqichi	Ziddiyat bosqichi	Taraqqiyot bosqichi
Aniqlik (S)	Subyektlarning moddiy, ma’naviy va axborotiy ehtiyojlari namoyon bo‘ladi	Ehtiyojlar nomutanosibligi asosida qarama-qarshilik shakllanadi	Qarama-qarshilikni tartibga solish yangilanishga xizmat qiladi
O‘lchovlilik (M)	Manfaatlar tafovuti resurs, mavqe va axborot ko‘rsatkichlari orqali baholanadi	Norozilik va to‘qnashuv darajasi kuzatiladi	Islohotlar va barqarorlik ko‘rsatkichlari orqali o‘lchanadi
Erishiluvchanlik (A)	Manfaatlar xilma-xilligi har qanday jamiyat uchun tabiiy holat	Ziddiyat ijtimoiy tizim uchun muqarrar bosqich	Konstruktiv boshqaruv orqali taraqqiyot mumkin bo‘ladi

Dolzarblik (R)	Manfaatlar raqamli sharoitda tez o‘zgaradi	Axborot muhiti ziddiyatni tezlashtiradi	Barqaror taraqqiyot strategik zarurat sifatida namoyon bo‘ladi
Vaqt omili (T)	Manfaatlar tarixiy sharoitga ko‘ra uzluksiz yangilanadi	Ziddiyat muddati qisqa yoki uzoq bo‘lishi mumkin	Taraqqiyot bosqichma-bosqich, davomiy jarayondir

Keltirilgan SMART-baholash “manfaatlar → ziddiyat → taraqqiyot” ketma-ketligini bashorat qilinishi mumkin bo‘lgan, tizimli ijtimoiy jarayon sifatida talqin qilish imkonini beradi. Muhim jihati shundaki, manfaatlar murosasi ularning yo‘qolishini emas, balki ziddiyatlarning oldini olish va tomonlar o‘z manfaatini saqlagan holda barqarorlikka erishishni anglatadi.

Klassik konfliktologiyaning nazariy merosi: Dyurkgeym, Zimmel, Blau, Mauss

Jamiyat va shaxs o‘rtasidagi bog‘liqlikni ilmiy asoslashda klassik sotsiologiya maktabi muhim rol o‘ynagan, bunda E. Dyurkgeymning hissasi alohida ajralib turadi: u jamiyatni ijtimoiy birdamlikka asoslangan, o‘zaro ta’sir mexanizmi orqali funksiyalashuvchi tizim sifatida talqin qildi. Ushbu o‘zaro ta’sir, tabiiyki, muayyan keskinlikdan xoli bo‘lmaydi — unda subyektiv huquqlarni himoya qilish, raqobat va bellashuv unsurlari doimiy ravishda mavjud bo‘ladi. Xuddi shunday, “raqobatlashgan” ijtimoiy o‘zaro ta’sir mexanizmi G. Zimmel, P. Blau va M. Mauss tomonidan ham chuqur o‘rganilgan bo‘lib, ularning umumiy xulosasi shundan iboratki, bunday o‘zaro ta’sir mohiyat e’tibori bilan almashinuv munosabatlariga asoslanadi.

Axborotiy ziddiyat kontseptiga oid tor va keng talqinlar

Zamonaviy konfliktologik lug‘atlarda “axborotiy ziddiyat” atamasi turlicha talqin etiladi. A.Ya. Antsupov bu hodisani axborotni ishlab chiqarish va tarqatish jarayonida yuzaga keladigan, subyektlaridan biri jurnalist yoki OAV bo‘lgan ijtimoiy ziddiyat sifatida belgilaydi — bunday ta’rif faqat kasbiy-media doirasi bilan chegaralanganligi tufayli nisbatan tor xarakterga ega. Bundan farqli o‘laroq, S.B. Davletchina kengroq talqinni taklif etadi: uning fikricha, axborotiy ziddiyat — axborot oqimlarini nazorat qilish, axborot makonini egallash va undan shaxsiy manfaat yo‘lida foydalanishga, shuningdek raqib tomonning axborotiy manfaatlarini cheklashga qaratilgan qarama-qarshilik shaklidir.

Davletchinaning ushbu talqini zamonaviy sharoitda ziddiyatning sifat jihatdan yangi bosqichga ko‘tarilganini ko‘rsatadi: axborot endi oddiy muloqot vositasi emas, balki strategik ahamiyatga ega resurs bo‘lib, u ustidan nazorat o‘rnatish uchun kurash ziddiyatlarning yetakchi manbalaridan biriga aylanmoqda. E.G. Solovyov shaxslararo aloqalar tabiatining o‘zgarishini qayd etib, qisqa muddatli kontaktlarning uzoq muddatli qarindoshlik-do‘stlik aloqalarini siqib chiqarayotganini ta’kidlaydi. S.A. Danilov ijtimoiy tarmoqlardagi jamoalarning shunchaki muloqot maydoni emas, balki norozilik kayfiyati va norasmiy safarbarlik o‘chog‘iga aylanib borayotganini ko‘rsatadi, V.N. Porus esa axborot hajmi ortishi bilan parallel kechayotgan ma’naviy qashshoqlanishning yangi axloqiy ziddiyatlarni tug‘dirishini ta’kidlaydi.

Zamonaviy jamiyatda ziddiyatlarning ko‘p pog‘onali arxitekturasi

O‘tkazilgan tahlil shuni ko‘rsatadiki, hozirgi sharoitda ziddiyatlar shaxsiy-psixologik darajadan tortib global miqyosgacha bo‘lgan keng diapazonni qamrab oladigan, ko‘p qatlamli tizim shaklida namoyon bo‘ladi.

2-jadval. Zamonaviy jamiyatda ziddiyat darajalari va ularni yuzaga keltiruvchi omillar

Shaxsiy	Axborot ortiqchaligi	Uzluksiz axborot oqimi tanqidiy fikrlashni susaytiradi	Ichki taranglik, psixologik beqarorlik
Shaxslararo	Jonli muloqotning kamayishi	Virtual aloqa real muloqotni siqib chiqarmoqda	Avlodlar o‘rtasidagi begonalashuv
Guruhiy	Raqamli tafovut	Raqamli resurslarga notekis kirish imkoniyati	Adolatsizlik hissi, ijtimoiy norozilik
Jamiyat miqyosida	Qadriyatlar to‘qnashuvi	Mahalliy va global qadriyatlar o‘rtasidagi ziddiyat	Ijtimoiy qutblanish
Ijtimoiy-siyosiy	Dezinformatsiya	Ommaviy ongni boshqarish maqsadida axborotdan foydalanish	Ishonchsizlik, siyosiy beqarorlik
Axborot makoni	Nazorat uchun raqobat	Axborot makonini egallashga yo‘naltirilgan kurash	Konfliktogen muhitning kuchayishi

Global	Notekis raqamlashuv	Rivojlangan va rivojlanayotgan jamiyatlar orasidagi tafovut	Transmilliy qarama-qarshiliklar

Jadval ma’lumotlaridan ko‘rinib turibdiki, barcha darajadagi ziddiyatlarning umumiy konfliktogen negizini uchta omil tashkil etadi: manfaatlarning farqlanishi, resurslarga notekis kirish imkoniyati va qadriyatlar tizimidagi transformatsiya.

Postmodern geosiyosat konteksti va mintaqaviy xavfsizlik masalasi

Zamonaviy axborot inqilobi sharoitida geosiyosiy qarama-qarshiliklar tobora tarmoqli, nolinear va bashorat qilib bo‘lmaydigan xususiyat kasb etmoqda. Internetning ochiq tabiati radikal g‘oyalarning qonuniy kanallar orqali tarqalishini osonlashtirsa, ekstremistik tuzilmalar esa yopiq raqamli kanallardan foydalanib, yangi tarafdorlarni jalb qilish imkoniyatiga ega bo‘lmoqda. Shu asosda “rangli inqilob”, “gibrid urush” va “kiberurush” kabi yangi geosiyosiy tushunchalar ilmiy muomalaga kirib keldi, bular esa geosiyosatning axborotiy paradigmasini shakllantirdi.

Shunga qaramasdan, mintaqaviy hamkorlik jahon miqyosida umuminsoniy qadriyat maqomini saqlab qolmoqda. Bu qarash O‘zbekiston Respublikasining rivojlanish strategiyasida ham mustahkam o‘rin egallagan bo‘lib, unda ikki va ko‘p tomonlama tashabbuslarni, jumladan mintaqaviy xavfsizlik masalalarini ilgari surish ustuvor yo‘nalish sifatida belgilangan. Markaziy Osiyoning geografik-geosiyosiy o‘rni, madaniy-tarixiy rang-barangligi, migratsion jarayonlarning intensivligi va aholining yoshlar ulushi yuqoriligi mintaqa axborot makonini ziddiyatlarga nisbatan sezgir qiladi, bu esa “kiberjihod” singari hodisalarning bilvosita namoyon bo‘lish ehtimolini kuchaytiradi. Shu bois axborot xavfsizligini ta’minlash faqat texnik-huquqiy tadbirlar bilan emas, balki ma’naviy-ma’rifiy siyosat, tanqidiy tafakkurni rivojlantirish hamda diniy-milliy bag‘rikenglikni mustahkamlash orqali amalga oshirilishi lozim.

XULOSA

O‘tkazilgan tadqiqot bir necha muhim xulosaga olib keldi. Birinchidan, ziddiyatlarni faqat subyektlar tarkibiga (Rutkevich bo‘yicha) qarab emas, balki to‘liq strukturaviy sxema (subyekt–obyekt–vosita–natija) asosida tahlil qilish ularning ko‘p qirrali tabiatini yanada chuqurroq ochib beradi. Ikkinchidan, “manfaatlar → ziddiyat → taraqqiyot” modeli SMART mezonlari nuqtai nazaridan yuqori darajada asoslangan bo‘lib, ziddiyatlarni buzg‘unchi emas, balki boshqariladigan va rivojlanishga xizmat qiluvchi omil sifatida qarash imkonini yaratadi.

Uchinchidan, axborotiy ziddiyat kontsepti Antsupovning tor, media-markazli talqinidan Davletchinaning keng, hokimiyat-markazli talqiniga qarab evolyutsiyalashgan bo‘lib, bu evolyutsiya zamonaviy voqelikka ko‘proq mos keladi. To‘rtinchidan, ziddiyatlar yetti bosqichli (shaxsiy, shaxslararo, guruhiy, jamiyat miqyosidagi, ijtimoiy-siyosiy, axborot makoni, global) arxitekturaga ega bo‘lib, bu bosqichlarning barchasi manfaatlar farqlanishi, resurs taqsimotidagi nomutanosiblik va qadriyatlar transformatsiyasi bilan bog‘liq. Beshinchidan, O‘zbekiston va Markaziy Osiyo sharoitida mintaqaviy hamkorlik hamda axborot xavfsizligi siyosati ziddiyatlarning oldini olishning strategik vositasi sifatida ko‘rilishi zarur.

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ISHLAB CHIQARISH TA'LIMI SHARTNOMASINI HUQUQIY TARTIBGA SOLISHNING AYRIM MASALALARI

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Annotatsiya: *Mazkur maqolada ishlab chiqarish ta'limi shartnomasining huquqiy mohiyati, kasbiy ta'lim tizimidagi o'rni hamda uni qo'llashning amaliy ahamiyati tahlil qilinadi. Ishlab chiqarish ta'limi shartnomasi ta'lim tashkiloti, ish beruvchi va ta'lim oluvchi o'rtasidagi huquqiy munosabatlarni tartibga soluvchi muhim institutlardan biri sifatida baholanadi. Maqolada amaldagi qonunchilikning umumiy tavsifi berilib, ishlab chiqarish ta'limini tashkil etish amaliyotida uchrayotgan ayrim tashkiliy va huquqiy masalalar yoritiladi. Shuningdek, ishlab chiqarish ta'limi shartnomalarini qo'llash samaradorligini oshirish, ularni zamonaviy talablar asosida takomillashtirish hamda ta'lim va ishlab chiqarish integratsiyasini yanada mustahkamlash yuzasidan muallifning ayrim takliflari bayon etilgan.*

Kalit so'zlar: *ishlab chiqarish ta'limi, ishlab chiqarish ta'limi shartnomasi, dual ta'lim, kasbiy ta'lim, mehnat huquqi, ish beruvchi, mehnat bozori, amaliy tayyorgarlik.*

НЕКОТОРЫЕ ВОПРОСЫ ПРАВОВОГО РЕГУЛИРОВАНИЯ ДОГОВОРА О ПРОИЗВОДСТВЕННОМ ОБУЧЕНИИ

Аннотация: *В статье анализируются правовая сущность договора о производственном обучении, его место в системе профессионального образования, а также практическое значение его применения. Договор о производственном обучении оценивается как один из важных институтов, регулирующих правовые отношения между образовательной организацией, работодателем и обучающимся. Дана общая характеристика действующего законодательства и освещены отдельные организационные и правовые вопросы, возникающие в практике организации производственного обучения. Кроме того, изложены отдельные предложения автора по повышению эффективности применения договоров о производственном обучении, их совершенствованию в соответствии с современными требованиями, а также по дальнейшему укреплению интеграции образования и производства.*

Ключевые слова: *производственное обучение, договор о производственном обучении, дуальное образование, профессиональное образование, трудовое право, работодатель, рынок труда, практическая подготовка.*

SOME ISSUES OF THE LEGAL REGULATION OF THE PRODUCTION TRAINING CONTRACT

Abstract: *The article analyses the legal essence of the production training contract, its place within the vocational education system and the practical significance of its application. The production training contract is assessed as one of the important institutions regulating the legal relations between an educational institution, an employer and a learner. A general description of the legislation in force is given, and certain organisational and legal issues arising in the practice of organising production training are examined. The article also sets out a number of the author's proposals for raising the effectiveness of production training contracts, improving them in line with modern requirements and further strengthening the integration of education and industry.*

Keywords: *production training, production training contract, dual education, vocational education, labour law, employer, labour market, practical training.*

Kirish

Xalqaro mehnat tashkiloti (ILO) ta'kidlaganidek, "sifatli shogirdlik (apprenticeship) tizimi yoshlarning mehnat bozoriga muvaffaqiyatli kirib borishini ta'minlaydigan eng samarali mexanizmlardan biridir." Mazkur yondashuv ishlab chiqarish ta'limining nafaqat kasbiy kompetensiyalarni shakllantirish, balki barqaror bandlikni ta'minlashdagi ahamiyatini ham ko'rsatadi *(International Labour Organization, Quality Apprenticeships: A Guide for Policy Makers, 2023)*.

Bugungi kunda iqtisodiyotning jadal rivojlanishi, yangi ishlab chiqarish texnologiyalarining keng joriy etilishi hamda mehnat bozori talablarining o'zgarib borishi kasbiy ta'lim tizimi oldiga yangi vazifalarni qo'ymoqda. Zamonaviy

korxonalar nafaqat nazariy bilimga ega, balki amaliy faoliyatni mustaqil amalga oshira oladigan, ishlab chiqarish jarayonlariga tez moslashadigan hamda zamonaviy texnologiyalar bilan ishlash koʻnikmalariga ega mutaxassislarga ehtiyoj sezmoqda. Shu sababli ta'lim va ishlab chiqarish integratsiyasini kuchaytirish bugungi kunning eng muhim yoʻnalishlaridan biri hisoblanadi.

Oʻzbekiston Respublikasida ham kasbiy ta'lim tizimini rivojlantirish, uning mazmunini mehnat bozori ehtiyojlariga moslashtirish va bitiruvchilar bandligini ta'minlash davlat siyosatining ustuvor yoʻnalishlari qatoridan oʻrin olgan. Soʻnggi yillarda dual ta'limni rivojlantirish, ish beruvchilarni ta'lim jarayoniga keng jalb etish, oʻquvchilarning amaliy mashgʻulotlarini bevosita korxonalarda tashkil etish boʻyicha muhim islohotlar amalga oshirilmoqda. Mazkur islohotlar natijasida ishlab chiqarish ta'limining sifati oshib, ta'lim tashkilotlari hamda ish beruvchilar oʻrtasidagi hamkorlik yangi bosqichga koʻtarilmoqda.

Ishlab chiqarish ta'limi mazkur tizimning ajralmas qismi boʻlib, oʻquvchilarda nazariy bilimlarni amaliy koʻnikmalar bilan mustahkamlash, kasbiy kompetensiyalarni shakllantirish va kelgusida mehnat faoliyatiga tayyorlashga xizmat qiladi. Aynan shu jarayonni huquqiy jihatdan tartibga soluvchi asosiy vositalardan biri ishlab chiqarish ta'limi shartnomasi hisoblanadi. Ushbu shartnoma orqali ishlab chiqarish ta'limining maqsadi, muddati, mazmuni, taraflarning huquq va majburiyatlari hamda oʻzaro javobgarligi belgilanadi.

Mamlakatimizda ishlab chiqarish ta'limi shartnomasining huquqiy asoslari Oʻzbekiston Respublikasi Mehnat kodeksining ishlab chiqarish ta'limi shartnomasiga bagʻishlangan normalarida belgilangan. Xususan, Kodeksning 373-moddasida ishlab chiqarish ta'limi shartnomasining tushunchasi hamda uni tuzishning umumiy qoidalari mustahkamlangan boʻlib, mazkur norma ishlab chiqarish ta'limi sohasidagi huquqiy munosabatlarning asosini tashkil etadi. Bundan tashqari, "Ta'lim toʻgʻrisida"gi Qonun hamda kasbiy ta'lim sohasiga oid boshqa normativ-huquqiy hujjatlar ishlab chiqarish ta'limini tashkil etishning huquqiy asoslarini belgilaydi. Mazkur huquqiy baza ishlab chiqarish ta'limining samarali tashkil etilishi uchun zarur sharoit yaratgan boʻlsa-da, amaliyotda ayrim masalalar uchrab turadi. Xususan, ishlab chiqarish ta'limini tashkil etish jarayonida korxonalar va ta'lim tashkilotlari oʻrtasidagi hamkorlik mexanizmlarini takomillashtirish, shartnomalarni qoʻllash amaliyotini yanada bir xillashtirish hamda monitoring tizimini rivojlantirish masalalari dolzarbligicha qolmoqda.

Mazkur maqolaning maqsadi ishlab chiqarish ta'limi shartnomasining huquqiy mohiyatini yoritish, uning amaldagi huquqiy tartibga solinishini umumiy tahlil qilish, amaliyotda uchrayotgan ayrim masalalarni koʻrsatish hamda ularni bartaraf etish yuzasidan takliflar ishlab chiqishdan iborat.

Ishlab chiqarish ta'limi shartnomasining huquqiy mohiyati

Ishlab chiqarish ta'limi shartnomasi mehnat huquqining oʻziga xos institutlaridan biri boʻlib, u shaxsning muayyan kasb, mutaxassislik yoki lavozim boʻyicha amaliy tayyorgarligini tashkil etishga qaratilgan huquqiy munosabatlarni tartibga soladi. Mazkur shartnomaning asosiy maqsadi ta'lim oluvchiga ishlab chiqarish jarayonida bevosita ishtirok etish orqali kasbiy bilim va amaliy koʻnikmalarni egallash imkoniyatini yaratishdan iborat.

Nemis olimi Feliks Raunerning fikricha, "shogirdlik – bu shunchaki ishlab turib oʻrganish emas, balki haqiqiy kasbiy hamjamiyat faoliyatida ishtirok etish orqali oʻrganishdir" *(Rauner F., Smith E. (eds.). Rediscovering Apprenticeship, Springer, 2010)*.

Mazkur yondashuv ishlab chiqarish ta'limi shartnomasining asosiy vazifasi faqat amaliyotni tashkil etish emas, balki ta'lim oluvchini haqiqiy kasbiy muhitga integratsiya qilishdan iborat ekanligini koʻrsatadi.

Ushbu shartnoma oʻzining huquqiy tabiatiga koʻra mehnat shartnomasidan farq qiladi. Mehnat shartnomasining asosiy maqsadi xodim tomonidan muayyan mehnat funksiyasini bajarish va buning evaziga ish haqi olishdan iborat boʻlsa, ishlab chiqarish ta'limi shartnomasida ustuvor maqsad kasbiy tayyorgarlikni ta'minlash hisoblanadi. Oʻquvchining ishlab chiqarish jarayonida ishtirok etishi mehnat natijasini yaratishdan koʻra koʻproq ta'limiy maqsadga xizmat qiladi. Shu jihatdan mazkur shartnoma ta'lim va mehnat munosabatlarining oʻzaro uygʻunlashgan shakli sifatida namoyon boʻladi.

Ishlab chiqarish ta'limi shartnomasining yana bir muhim xususiyati shundaki, unda taraflarning oʻzaro manfaatdorligi yaqqol namoyon boʻladi. Ta'lim oluvchi zamonaviy ishlab chiqarish sharoitida kasbiy tajriba orttiradi, ish beruvchi oʻz korxonasining ehtiyojlariga mos boʻlgan boʻlajak mutaxassisni tayyorlash imkoniyatiga ega boʻladi, ta'lim tashkiloti esa oʻquv dasturlarining amaliy qismini sifatli tashkil etadi. Natijada uchala tomon manfaatlari oʻzaro uygʻunlashadi.

Soʻnggi yillarda dual ta'lim shaklining keng joriy etilishi ishlab chiqarish ta'limi shartnomasining amaliy ahamiyatini yanada oshirdi. Chunki dual ta'limda korxona ta'lim jarayonining toʻlaqonli ishtirokchisiga aylanadi. Korxona mutaxassislari oʻquvchilarga amaliy mashgʻulotlar oʻtadi, ishlab chiqarish ustalari ularning kasbiy tayyorgarligini baholashda ishtirok etadi hamda ayrim hollarda ta'lim dasturlarini takomillashtirish boʻyicha ham oʻz takliflarini bildiradi. Bunday sharoitda ishlab chiqarish ta'limi shartnomasi nafaqat huquqiy hujjat, balki ta'lim va ishlab chiqarish hamkorligini ta'minlovchi amaliy mexanizm sifatida ham xizmat qiladi.

Mehnat kodeksining 373-moddasiga muvofiq, ishlab chiqarish ta’limi shartnomasi ish beruvchi va o‘quvchi o‘rtasida kasbiy bilim, malaka va ko‘nikmalarni egallash yoki qayta tayyorlash maqsadida tuziladigan kelishuv hisoblanadi. Mazkur norma ishlab chiqarish ta’limi shartnomasining asosiy maqsadi mehnat faoliyatini emas, balki kasbiy tayyorgarlikni ta’minlashdan iborat ekanligini ko‘rsatadi

Ishlab chiqarish ta’limi shartnomasi orqali o‘quvchilarning ishlab chiqarishdagi huquqiy maqomi ham belgilanadi. O‘quvchi korxonada bo‘lgan davrida ichki mehnat tartib-qoidalariga, mehnatni muhofaza qilish hamda texnika xavfsizligi talablariga rioya qilishi zarur. O‘z navbatida, ish beruvchi o‘quvchi uchun xavfsiz mehnat sharoitlarini yaratishi, unga malakali ustoz biriktirishi hamda ta’lim dasturida nazarda tutilgan amaliy mashg‘ulotlarni to‘liq tashkil etishi lozim. Mazkur talablarning bajarilishi ishlab chiqarish ta’limining sifati va samaradorligiga bevosita ta’sir ko‘rsatadi.

Ishlab chiqarish ta’limi shartnomasining amalda huquqiy tartibga solinishi

O‘zbekiston Respublikasida ishlab chiqarish ta’limi shartnomasi bilan bog‘liq munosabatlar, avvalo, O‘zbekiston Respublikasi Mehnat kodeksi bilan tartibga solinadi. Kodeksda ishlab chiqarish ta’limi shartnomasiga alohida bob ajratilgan bo‘lib, unda mazkur shartnomaning tushunchasi, uni tuzish tartibi, taraflarning huquq va majburiyatlari, ishlab chiqarish ta’limini tashkil etishning asosiy qoidalari hamda shartnomani bekor qilish bilan bog‘liq masalalar belgilangan. Bu ishlab chiqarish ta’limi shartnomasining mehnat huquqidagi mustaqil institut sifatida e’tirof etilganligini ko‘rsatadi.

Shu bilan birga, ishlab chiqarish ta’limini tashkil etishda “Ta’lim to‘g‘risida”gi Qonun, kasbiy ta’limni rivojlantirishga oid Prezident Farmon va qarorlari, Vazirlar Mahkamasining qarorlari hamda vakolatli davlat organlari tomonidan tasdiqlangan normativ hujjatlar ham muhim ahamiyat kasb etadi. Mazkur hujjatlar ishlab chiqarish ta’limini tashkil etishning tashkiliy asoslarini, ta’lim tashkilotlari hamda ish beruvchilarning o‘zaro hamkorlik mexanizmlarini belgilab beradi.

Kasbiy ta’lim tizimida amalga oshirilayotgan islohotlar natijasida ishlab chiqarish ta’limining mazmuni sezilarli darajada o‘zgardi. Ilgari ishlab chiqarish amaliyoti, asosan, o‘quv rejasining majburiy qismi sifatida qaralgan bo‘lsa, bugungi kunda u mehnat bozorining real ehtiyojlari bilan uzviy bog‘langan ta’lim jarayoniga aylanmoqda. Korxonalarning ta’lim jarayonidagi ishtiroki kengaymoqda, ishlab chiqarish ustalari o‘quvchilarni tayyorlashda faol qatnashmoqda, ayrim ta’lim dasturlari esa ish beruvchilar ishtirokida takomillashtirilmoqda.

Ayniqsa, dual ta’lim tizimining rivojlanishi ishlab chiqarish ta’limi shartnomasining amaliy ahamiyatini yanada oshirdi. Dual ta’lim nazariy bilimlarni ta’lim tashkilotida, amaliy tayyorgarlikni esa ishlab chiqarish korxonalarida tashkil etishga asoslanadi. Natijada o‘quvchi o‘qish davridayoq zamonaviy ishlab chiqarish muhiti bilan tanishadi, texnologik jarayonlarda ishtirok etadi hamda kelgusidagi mehnat faoliyati uchun zarur bo‘lgan ko‘nikmalarni egallaydi. Bu esa bitiruvchilarning ishga moslashish davrini qisqartirish va ularning bandligini ta’minlashga ijobiy ta’sir ko‘rsatmoqda.

Shu bilan birga, ishlab chiqarish ta’limi shartnomasining amaliy qo‘llanilishi faqat normativ-huquqiy hujjatlar mavjudligi bilangina emas, balki ularning to‘g‘ri ijro etilishi bilan ham chambarchas bog‘liq. Huquqiy normalarning amaliyotda bir xilda qo‘llanilishi ishlab chiqarish ta’limining sifatini ta’minlashning muhim omillaridan biri hisoblanadi.

Ishlab chiqarish ta’limi shartnomasini qo‘llash amaliyotidagi ayrim masalalar

UNESCO ekspertlari fikricha, kasbiy ta’lim tizimining muvaffaqiyati normativ-huquqiy hujjatlar soni bilan emas, balki ularning amaliy ijrosi va mehnat bozori bilan uzviy bog‘liqligi orqali belgilanadi *(UNESCO. Strategy for Technical and Vocational Education and Training)*.

Mazkur fikr ishlab chiqarish ta’limi shartnomasining amaliy qo‘llanilishi sifatini muntazam monitoring qilish zarurligini tasdiqlaydi.

Mamlakatimizda ishlab chiqarish ta’limi tizimini rivojlantirish bo‘yicha amalga oshirilayotgan islohotlar ijobiy natijalar bermoqda. Biroq amaliyot tahlili shuni ko‘rsatadiki, ishlab chiqarish ta’limi shartnomasini qo‘llash jarayonida ayrim masalalar mavjud bo‘lib, ular qonunchilikni tubdan o‘zgartirishni emas, balki mavjud mexanizmlarni yanada takomillashtirishni talab etadi.

Birinchi masala ishlab chiqarish ta’limi shartnomalarini rasmiylashtirish amaliyoti bilan bog‘liq. Amaldagi qonunchilik ishlab chiqarish ta’limi shartnomasining asosiy talablarini belgilab bergan bo‘lsa-da, amaliyotda ayrim korxonalarda shartnoma mazmuniga yondashuv turlicha bo‘lishi kuzatiladi. Ayrim hollarda shartnomalarda ishlab chiqarish ta’limining maqsadi, o‘quvchi egallashi lozim bo‘lgan kompetensiyalar, ustozning vazifalari yoki baholash mezonlari umumiy tarzda bayon qilinadi. Bu esa ishlab chiqarish ta’limi yakunida erishilishi lozim bo‘lgan natijalarni aniq baholashni murakkablashtirishi mumkin.

Ikkinchi masala ishlab chiqarish ta’limi natijalarini baholash bilan bog‘liq. Bugungi kunda o‘quvchilarning amaliy tayyorgarligini baholashning umumiy mezonlari mavjud bo‘lsa-da, ayrim korxonalarda baholash uslublari o‘ziga xos tarzda qo‘llaniladi. Bu esa bir xil kasb bo‘yicha tahsil olayotgan o‘quvchilarning kompetensiyalarini baholashda ayrim farqlarni yuzaga keltirishi mumkin. Aslida esa ishlab chiqarish ta’limining yakuniy natijasi, avvalo, o‘quvchi egallagan kasbiy kompetensiyalar orqali baholanishi maqsadga muvofiq.

Uchinchi masala ishlab chiqarish ta'limi jarayonida ta'lim tashkiloti va korxona o'rtasidagi muntazam hamkorlik bilan bog'liq. Ishlab chiqarish ta'limi faqat o'quvchini korxonaga yuborish bilangina cheklanib qolmasligi kerak. Ta'lim tashkiloti mutaxassislari va korxona vakillari ishlab chiqarish ta'limi davomida o'quvchilarning o'zlashtirish darajasini birgalikda tahlil qilib borishi, yuzaga kelayotgan muammolarni o'z vaqtida bartaraf etishi maqsadga muvofiq. Bunday yondashuv ishlab chiqarish ta'limining sifatini oshirish bilan birga, ish beruvchilarning ta'lim jarayoniga bo'lgan qiziqishini ham kuchaytiradi.

To'rtinchi masala ishlab chiqarish ta'limi jarayonini monitoring qilish bilan bog'liq. Hozirgi kunda raqamli texnologiyalar davlat boshqaruvi va ta'lim tizimining barcha yo'nalishlariga jadal kirib kelmoqda. Shu nuqtai nazardan ishlab chiqarish ta'limi shartnomalarining bajarilishi, o'quvchilarning davomatini yuritish, amaliy mashg'ulotlar natijalarini baholash hamda korxonalar faoliyatini monitoring qilish jarayonlarini bosqichma-bosqich raqamlashtirish maqsadga muvofiq hisoblanadi. Bu, o'z navbatida, shaffoflikni ta'minlash, tahliliy ma'lumotlarni tezkor shakllantirish hamda boshqaruv qarorlarini qabul qilish samaradorligini oshirishga xizmat qiladi.

Shuni alohida ta'kidlash joizki, yuqorida qayd etilgan masalalar ishlab chiqarish ta'limi shartnomasining huquqiy asoslari yetarli emasligini anglatmaydi. Aksincha, ular mavjud huquqiy mexanizmlarni amaliyot ehtiyojlaridan kelib chiqib yanada takomillashtirish zarurligini ko'rsatadi. Kasbiy ta'lim tizimida amalga oshirilayotgan izchil islohotlar aynan ushbu yo'nalishlarda tizimli ishlarni davom ettirish uchun mustahkam zamin yaratmoqda.

Germaniya, Shveysariya va Avstriya tajribasi: qiyosiy-huquqiy tahlil

Stephen Billett kasbiy ta'limni tavsiflar ekan, "samarali kasbiy ta'lim ta'lim muassasalari va ish joylari bir-birini to'ldiruvchi ta'lim muhiti sifatida faoliyat yuritganda yuzaga keladi" deb ta'kidlaydi *(Billett S. Vocational Education: Purposes, Traditions and Prospects, Springer, 2011)*.

Kasbiy ta'lim va ishlab chiqarish integratsiyasini samarali tashkil etish bo'yicha Germaniya, Shveysariya hamda Avstriya jahondagi eng ilg'or davlatlar qatoriga kiradi. Ushbu mamlakatlarda dual ta'lim tizimi uzoq yillik tajriba asosida shakllangan bo'lib, ishlab chiqarish ta'limi shartnomasi mazkur tizimning asosiy huquqiy instrumentlaridan biri hisoblanadi. Barcha uch davlatda o'quvchi, ish beruvchi va kasb-hunar ta'limi muassasasi o'rtasidagi hamkorlik qonunchilik bilan tartibga solinadi, biroq ushbu munosabatlarni tashkil etish mexanizmlarida ayrim farqlar mavjud.

Germaniya tajribasi

Germaniyada dual ta'lim tizimining huquqiy asosi Kasbiy ta'lim to'g'risidagi qonun (Berufsbildungsgesetz – BBiG) bilan belgilanadi. Mazkur qonun korxonalarda tashkil etiladigan kasbiy tayyorgarlik, o'quvchilar bilan tuziladigan ta'lim shartnomalari, ish beruvchilarning majburiyatlari, ustozlarning malaka talablari hamda savdo-sanoat palatalarining vakolatlarini batafsil tartibga soladi. Korxona o'quvchini ishlab chiqarish jarayoniga jalb etish bilan bir qatorda, tasdiqlangan o'quv dasturiga muvofiq kasbiy tayyorgarlikni ta'minlash majburiyatini ham oladi. Shuningdek, o'quvchilarga o'qish davrida qonunchilik asosida haq to'lanadi hamda ular ijtimoiy sug'urta tizimi bilan qamrab olinadi.

Germaniya tajribasining yana bir muhim jihati shundaki, ishlab chiqarish ta'limi sifati davlat organlari emas, balki ish beruvchilar uyushmalari va savdo-sanoat palatalari ishtirokida muntazam nazorat qilinadi. Bu esa kasbiy tayyorgarlikning mehnat bozori talablariga mosligini ta'minlashga xizmat qiladi.

Shveysariya tajribasi

Shveysariyada ishlab chiqarish ta'limi shartnomasi fuqarolik-huquqiy shartnomaning alohida turi sifatida e'tirof etilgan bo'lib, u Shveysariya Majburiyatlar kodeksining (Swiss Code of Obligations) 344–346a-moddalari bilan tartibga solinadi. Shartnoma yozma shaklda tuziladi va u kuchga kirishi uchun Shveysariyaning kasbiy ta'lim bo'yicha vakolatli davlat organi tomonidan tasdiqlanishi shart. Shartnomada kasb nomi, o'qish muddati, ish vaqti, ta'til, stipendiya (yoki ish haqi), sinov muddati hamda boshqa asosiy shartlar majburiy ravishda ko'rsatiladi.

Shveysariya tajribasining o'ziga xos jihati shundaki, ishlab chiqarish ta'limi sifati kasbiy ta'lim bo'yicha vakolatli davlat organi tomonidan muntazam monitoring qilinadi. Ta'lim dasturlarining mazmuni iqtisodiyot tarmoqlari vakillari ishtirokida muntazam yangilanib boradi. Bu esa kasbiy ta'limning mehnat bozori ehtiyojlariga tez moslashishini ta'minlaydi.

Avstriya tajribasi

Avstriyada ham dual kasbiy ta'lim tizimi iqtisodiyotning muhim tarkibiy qismi hisoblanadi. Ishlab chiqarish ta'limi korxonalarda olib boriladi, nazariy tayyorgarlik esa kasb-hunar maktablarida tashkil etiladi. O'quvchilar bilan tuziladigan shartnomalar davlat tomonidan belgilangan yagona talablar asosida rasmiylashtiriladi. Korxonalarning o'quvchi tayyorlash faoliyati iqtisodiyot palatalari hamda vakolatli davlat organlari tomonidan nazorat qilinadi. O'quv dasturlari ish beruvchilar, kasaba uyushmalari va davlat organlarining hamkorligida ishlab chiqiladi hamda muntazam ravishda yangilanadi.

O'zbekiston uchun ayrim xulosalar

Qiyosiy tahlil shuni ko'rsatadiki, Germaniya, Shveysariya va Avstriya tajribasida ishlab chiqarish ta'limi shartnomasining muvaffaqiyatli amal qilishi, eng avvalo, uchta omil bilan bog'liq. Birinchidan, ish beruvchilarning kasbiy

ta’lim jarayonidagi mas’uliyati aniq huquqiy normalar bilan mustahkamlangan. Ikkinchidan, ishlab chiqarish ta’limi sifati doimiy monitoring qilinadi va mustaqil institutlar tomonidan baholanadi. Uchinchidan, ta’lim dasturlari mehnat bozori ehtiyojlaridan kelib chiqib muntazam yangilanadi.

O‘zbekistonda ham so‘nggi yillarda dual ta’limni rivojlantirish, ish beruvchilar ishtirokini kengaytirish hamda ishlab chiqarish ta’limining huquqiy asoslarini mustahkamlash borasida muhim islohotlar amalga oshirilmoqda. Xorijiy tajriba shuni ko‘rsatadiki, mavjud huquqiy bazani samarali qo‘llash, monitoring tizimini rivojlantirish, korxonalarda ustozlik institutini metodik jihatdan qo‘llab-quvvatlash hamda ishlab chiqarish ta’limi natijalarini kompetensiyaga asoslangan mezonlar orqali baholash ushbu institut samaradorligini yanada oshirishga xizmat qilishi mumkin.

Ishlab chiqarish ta’limi shartnomasini takomillashtirish yo‘nalishlari

Shu bois ishlab chiqarish ta’limi shartnomasini amalga oshirish jarayonida ish beruvchilarning mas’uliyatini yanada kuchaytirish maqsadga muvofiq hisoblanadi.

Ishlab chiqarish ta’limi shartnomasining amaliy samaradorligini oshirish, avvalo, ta’lim tashkilotlari va ish beruvchilar o‘rtasidagi hamkorlikni yanada mustahkamlash bilan chambarchas bog‘liq. So‘nggi yillarda bu borada muhim islohotlar amalga oshirilayotgan bo‘lsa-da, ishlab chiqarish ta’limining sifati ko‘p jihatdan korxonaning ushbu jarayondagi ishtirokiga bog‘liq bo‘lib qolmoqda. Shu sababli ishlab chiqarish ta’limini tashkil etishda barcha ishtirokchilarning mas’uliyatini oshirish, o‘zaro hamkorlikni yanada tizimlashtirish maqsadga muvofiq hisoblanadi.

Birinchi navbatda, ishlab chiqarish ta’limi shartnomalarining namunaviy shaklini zamonaviy yondashuvlar asosida muntazam takomillashtirib borish lozim. Bugungi kunda amaldagi namunaviy hujjatlar ishlab chiqarish ta’limini tashkil etish uchun yetarli asos yaratmoqda. Biroq iqtisodiyotning rivojlanishi, yangi kasblarning paydo bo‘lishi hamda kompetensiyaga asoslangan ta’lim modelining keng joriy etilishi shartnoma mazmunini ham doimiy ravishda yangilab borishni talab qiladi. Xususan, shartnomada o‘quvchi egallashi lozim bo‘lgan kasbiy kompetensiyalar, amaliy mashg‘ulotlarning natijalari, ustozning vazifalari hamda baholash mezonlarini yanada aniqroq ifodalash ishlab chiqarish ta’limining sifatiga ijobiy ta’sir ko‘rsatadi.

Ikkinchidan, ishlab chiqarish ta’limi jarayonini raqamlashtirish masalasiga alohida e’tibor qaratish lozim. Bugungi kunda ko‘plab davlat xizmatlari va ta’lim jarayonlari elektron platformalar orqali amalga oshirilmoqda. Shu nuqtai nazardan ishlab chiqarish ta’limi shartnomalarini elektron shaklda rasmiylashtirish, ularning ijrosini onlayn monitoring qilish hamda o‘quvchilarning amaliy mashg‘ulotlari natijalarini elektron tizim orqali baholash istiqbolda muhim yo‘nalishlardan biri bo‘lishi mumkin. Bunday tizim nafaqat hujjat aylanishini soddalashtiradi, balki ishlab chiqarish ta’limi sifati bo‘yicha tahliliy ma’lumotlarni shakllantirish imkonini ham yaratadi.

Uchinchidan, ishlab chiqarish ta’limini tashkil etishda korxonalardagi ustozlar faoliyatini metodik jihatdan qo‘llab-quvvatlash maqsadga muvofiq. Amaliyot shuni ko‘rsatadiki, yuqori malakali mutaxassis har doim ham samarali pedagog bo‘lavermaydi. Shu sababli ishlab chiqarish ta’limiga mas’ul xodimlar uchun qisqa muddatli metodik seminarlar, o‘quv kurslari va malaka oshirish dasturlarini tashkil etish ishlab chiqarish ta’limining sifatini oshirishga xizmat qiladi. Natijada o‘quvchilarga kasbiy bilimlarni tizimli va izchil yetkazish imkoniyati kengayadi.

To‘rtinchidan, ishlab chiqarish ta’limi natijalarini baholashda yagona kompetensiyaviy yondashuvni qo‘llash maqsadga muvofiq. O‘quvchining ishlab chiqarish ta’limini muvaffaqiyatli tamomlaganligi faqat amaliyot davrini o‘taganligi bilan emas, balki egallagan kasbiy kompetensiyalari orqali baholanishi lozim. Bunda korxona mutaxassislari, ta’lim tashkiloti pedagoglari hamda zarur hollarda mustaqil ekspertlarning ishtiroki baholashning xolisligi va shaffofligini ta’minlashga xizmat qiladi.

Beshinchidan, ishlab chiqarish ta’limi yakunlari bo‘yicha muntazam tahliliy ishlarni yo‘lga qo‘yish foydali bo‘ladi. Har bir o‘quv yili yakunida ta’lim tashkilotlari va hamkor korxonalar tomonidan ishlab chiqarish ta’limi natijalari muhokama qilinishi, o‘quvchilar va ustozlarning fikr-mulohazalari o‘rganilishi hamda keyingi o‘quv yilida ularni inobatga olgan holda ishlab chiqarish ta’limini tashkil etish mexanizmlari takomillashtirilishi maqsadga muvofiqdir. Bunday yondashuv ishlab chiqarish ta’limining uzluksiz rivojlanishini ta’minlaydi.

Yana bir muhim jihat sifatida ishlab chiqarish ta’limini tashkil etishda ta’lim tashkilotlari va ish beruvchilar o‘rtasidagi ijtimoiy sheriklikni yanada rivojlantirishni ko‘rsatish mumkin. Ishlab chiqarish ta’limi faqat o‘quv jarayonining tarkibiy qismi emas, balki mehnat bozorining ehtiyojlarini qondirishga xizmat qiluvchi muhim mexanizm hamdir. Shu bois ish beruvchilarning ta’lim dasturlarini ishlab chiqish, malaka talablarini belgilash hamda bitiruvchilarni ishga joylashtirish jarayonlaridagi ishtirokini yanada kengaytirish kasbiy ta’lim tizimining samaradorligini oshirishga xizmat qiladi.

Xulosa

Ishlab chiqarish ta’limi shartnomasi kasbiy ta’lim tizimida nazariy bilimlar bilan amaliy ko‘nikmalar o‘rtasidagi uzviy bog‘liqlikni ta’minlaydigan muhim huquqiy institut hisoblanadi. Mazkur shartnoma ta’lim oluvchi, ta’lim tashkiloti va ish beruvchi manfaatlarini o‘zaro uyg‘unlashtirish orqali malakali kadrlar tayyorlashga xizmat qiladi. O‘zbekiston Respublikasida ushbu institutni huquqiy tartibga solish bo‘yicha zarur normativ asoslar shakllantirilgan bo‘lib, so‘nggi

yillarda amalga oshirilayotgan islohotlar ishlab chiqarish ta’limining sifatini yanada oshirish uchun qulay sharoit yaratmoqda.

Shu bilan birga, amaliyot tahlili ishlab chiqarish ta’limi shartnomasining huquqiy asoslarini tubdan qayta ko‘rib chiqish zaruriyatini emas, balki uni qo‘llash mexanizmlarini takomillashtirish muhimligini ko‘rsatadi. Xususan, shartnomalarni rasmiylashtirish amaliyotini yanada bir xillashtirish, baholash mezonlarini takomillashtirish, monitoring jarayonlarini raqamlashtirish hamda ta’lim tashkilotlari va ish beruvchilar o‘rtasidagi hamkorlikni rivojlantirish ishlab chiqarish ta’limi samaradorligini oshirishga xizmat qiladi.

Muallifning fikricha, ishlab chiqarish ta’limi shartnomasini takomillashtirishning asosiy yo‘nalishi yangi huquqiy normalarni ko‘paytirishdan ko‘ra mavjud huquqiy mexanizmlarning amaliy ijrosini kuchaytirish, zamonaviy boshqaruv va raqamli texnologiyalarni keng joriy etish bilan bog‘liq bo‘lishi lozim. Aynan shu yondashuv kasbiy ta’lim tizimining mehnat bozori ehtiyojlariga yanada moslashishiga, bitiruvchilarning bandligini oshirishga hamda ish beruvchilarning ta’lim jarayonidagi ishtirokini kengaytirishga xizmat qiladi.

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VAKILLIK HOKIMIYATI — IJTIMOIY O‘ZGARISHLARNING FALSAFIY MOHIYATI

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Annotatsiya: *Ushbu maqolada vakillik hokimiyati fenomenining ijtimoiy-falsafiy mohiyati, uning nazariy-metodologik manbalari hamda jamiyat va davlat munosabatlaridagi fundamental o‘rni tahlil qilinadi. Tadqiqotning maqsadi — O‘zbekistonda mahalliy vakillik hokimiyatini transformatsiya qilishning ijtimoiy-falsafiy zaruriyatini, uning funksiyalarini hamda transformatsiya jarayonining nazariy-metodologik negizlarini ochib berishdan iborat. Tadqiqotda dialektik, aksiologik, sinergetik va germenevtik yondashuvlar metodologik asos sifatida qo‘llanildi. Natijalar shuni ko‘rsatadiki, mahalliy vakillik organlarining kommunikativ, integrasion, nazorat va legitimlashtiruvchi funksiyalarini ijtimoiy-falsafiy jihatdan qayta anglash ularning aholi manfaatlarini ifodalovchi faol institutga aylanishiga xizmat qiladi. Xulosa qilib aytganda, mahalliy vakillik hokimiyatini transformatsiya qilish nafaqat institusional, balki ong va qadriyatlar darajasidagi chuqur ijtimoiy-falsafiy jarayon sifatida baholanishi lozim.*

Kalit so‘zlar: *vakillik hokimiyati, ijtimoiy-falsafiy transformatsiya, mahalliy Kengashlar, legitimlik, ijtimoiy shartnoma, ishtirokchi demokratiya, institusional ishonch, aksiologik yondashuv*

ПРЕДСТАВИТЕЛЬНАЯ ВЛАСТЬ — ФИЛОСОФСКАЯ СУЩНОСТЬ СОЦИАЛЬНЫХ ИЗМЕНЕНИЙ

Аннотация: *В статье анализируется социально-философская сущность феномена представительной власти, его теоретико-методологические источники, а также фундаментальная роль в отношениях между обществом и государством. Цель исследования — раскрыть социально-философскую необходимость трансформации местной представительной власти в Узбекистане, её функции и теоретико-методологические основы процесса трансформации. В качестве методологической основы использованы диалектический, аксиологический, синергетический и герменевтический подходы. Результаты показывают, что переосмысление коммуникативной, интеграционной, контрольной и легитимирующей функций местных представительных органов способствует их превращению в активный институт, выражающий интересы населения. Сделан вывод, что трансформация местной представительной власти должна оцениваться не только как институциональный, но и как глубокий социально-философский процесс на уровне сознания и ценностей.*

Ключевые слова: *представительная власть, социально-философская трансформация, местные Кенгаши, легитимность, общественный договор, партисипативная демократия, институциональное доверие, аксиологический подход*

REPRESENTATIVE AUTHORITY — THE PHILOSOPHICAL ESSENCE OF SOCIAL TRANSFORMATION

Abstract: *The article analyses the socio-philosophical essence of the phenomenon of representative authority, its theoretical and methodological sources, and its fundamental role in the relationship between society and the state. The aim of the study is to reveal the socio-philosophical necessity of transforming local representative authority in Uzbekistan, its functions, and the theoretical and methodological foundations of the transformation process. Dialectical, axiological, synergetic and hermeneutic approaches were applied as the methodological basis. The results show that rethinking the communicative, integrative, control and legitimising functions of local representative bodies contributes to their transformation into an active institution expressing the interests of the population. It is concluded that the transformation of local representative authority should be assessed not only as an institutional process but also as a profound socio-philosophical process at the level of consciousness and values.*

Keywords: *representative authority, socio-philosophical transformation, local Kengashes, legitimacy, social contract, participatory democracy, institutional trust, axiological approach*

Kirish: Vakillik hokimiyati fenomenining ijtimoiy-falsafiy mohiyati, uning nazariy-metodologik manbalari hamda jamiyat va davlat munosabatlaridagi fundamental o‘rni atroflicha tahlil qilinishni talab etuvchi dolzarb masalalardan biri hisoblanadi. Zamonaviy vakillik tizimi shunchaki siyosiy-huquqiy institut bo‘lmay, balki insoniyatning ijtimoiy boshqaruv borasidagi uzoq yillik falsafiy izlanishlari va amaliy tajribasi mahsuli sifatida namoyon bo‘ladi. Jamiyat taraqqiyotining muayyan bosqichida hokimiyatning manbai bo‘lmish xalq va qaror qabul qiluvchi tuzilmalar o‘rtasidagi aloqadorlikni ta’minlash zaruriyati vakillik fenomenining yuzaga kelishiga zamin yaratdi.

“Vakillik hokimiyati” fenomeni, uning ilmiy-nazariy va metodologik asoslari tadqiq etilib, ontologik va gnoseologik mohiyati ochib beriladi. Vakillik tushunchasining mohiyati insonning o‘z suveren huquqlari va irodasini ma’lum bir vakolatli vakilga ishonib topshirish akti orqali shakllanishi ko‘rsatib o‘tiladi. Bu jarayonda hokimiyat va jamiyat o‘rtasidagi legitimlik fenomeni alohida ijtimoiy-falsafiy kategorial tahlil markaziga qo‘yiladi. Vakillik hokimiyati nafaqat davlat boshqaruv mexanizmining tarkibiy qismi, balki jamiyatning o‘z-o‘zini tashkillashtirish va ijtimoiy integratsiyasini ta’minlovchi omil sifatida asoslanadi.

Mavzuning dolzarbligi quyidagi omillar bilan belgilanadi. Birinchidan, global miqyosda boshqaruv tizimlarining demokratlashuvi va nomarkazlashtirilishi jarayonlari kuchaymoqda, bu esa vakillik institutlarining falsafiy-konseptual negizlarini qayta anglashni taqozo etadi. Ikkinchidan, O‘zbekistonda amalga oshirilayotgan davlat boshqaruvi islohotlari, xususan, mahalliy Kengashlar maqomi va vakolatlarini kengaytirishga qaratilgan chora-tadbirlar nazariy asoslanishni talab qiladi. Uchinchidan, raqamli transformatsiya sharoitida fuqarolar va hokimiyat o‘rtasidagi muloqot shakllari tubdan o‘zgarmoqda, bu esa vakillik fenomenining yangi falsafiy talqinini zaruratga aylantirmoqda.

Tadqiqotning ilmiy muammosi shundan iboratki, vakillik hokimiyati ko‘pincha faqat huquqiy-institusional nuqtai nazardan o‘rganiladi, uning ijtimoiy-falsafiy, aksiologik va ontologik qirralari esa yetarlicha tadqiq etilmagan. Mazkur maqolaning maqsadi — vakillik hokimiyati fenomenining falsafiy mohiyatini, uning funksiyalarini hamda O‘zbekistonda mazkur institutni transformatsiya qilishning ijtimoiy-falsafiy zaruriyatini kompleks tarzda tahlil qilishdan iborat. Maqsadga erishish uchun quyidagi vazifalar belgilandi: vakillik hokimiyatining falsafiy-tarixiy genezisini ochib berish; uning asosiy funksiyalarini ijtimoiy-falsafiy nuqtai nazardan tasniflash; mazkur sohadagi tadqiqot metodologiyasini asoslash; O‘zbekiston misolida transformatsiya jarayonining natijalarini tahlil qilish va tegishli xulosalar shakllantirish.

Tadqiqotning ob’yekti sifatida O‘zbekistonda mahalliy vakillik hokimiyati tizimi, predmeti sifatida esa ushbu tizimning transformatsiya jarayonidagi ijtimoiy-falsafiy qonuniyatlari belgilandi. Tadqiqotning ilmiy yangiligi shundan iboratki, unda vakillik hokimiyati funksiyalari birinchi marta aksiologik va sinergetik yondashuvlar prizmasi orqali yaxlit tarzda tahlil qilindi hamda mazkur funksiyalarning o‘zaro uyg‘unligi milliy sharoit misolida ko‘rsatib berildi. Shuningdek, vakillik hokimiyatini baholashning sifatiy mezonlar tizimi ilk bor ijtimoiy-falsafiy nuqtai nazardan tizimlashtirildi.

Maqola quyidagi tuzilishga ega: avvalo vakillik hokimiyati tushunchasining falsafiy-tarixiy genezisiga bag‘ishlangan adabiyotlar tahlili keltiriladi; so‘ngra tadqiqotda qo‘llanilgan metodologik yondashuvlar bayon etiladi; keyingi bo‘limda O‘zbekistonda mahalliy vakillik hokimiyatini transformatsiya qilish zaruriyati, uning funksiyalari va amaliy ahamiyati jadvallar hamda sxema orqali tahlil qilinadi; yakunida esa tadqiqot natijalari umumlashtirilib, nazariy va amaliy xulosalar taqdim etiladi.

Tadqiqotning nazariy ahamiyati shundaki, u vakillik hokimiyati fenomenini ijtimoiy-falsafiy kategoriya sifatida tizimli tahlil qilish orqali mazkur sohadagi mavjud bilimlar bazasini boyitadi. Amaliy ahamiyati esa tadqiqot natijalarining mahalliy davlat hokimiyati organlari faoliyatini takomillashtirish, deputatlarni tayyorlash dasturlarini ishlab chiqish hamda fuqarolik jamiyati institutlari bilan hamkorlik mexanizmlarini mustahkamlashda amaliy qo‘llanma sifatida foydalanilishi mumkinligidan iborat.

ADABIYOTLAR TAHLILI

Ilmiy-nazariy jihatdan qaralganda, vakillik hokimiyati tushunchasi ilk bor antik davr falsafasida shakllana boshlagan. Qadimgi yunon mutafakkirlari, jumladan, Aristotel [1] davlat boshqaruvi shakllarini tahlil qilar ekan, jamiyat manfaatlarini ifoda etuvchi institutlar zarurligini ta’kidlagan. Uning fikricha, davlatning asosiy vazifasi umumiy farovonlikni ta’minlash bo‘lib, bu esa faqat jamiyatning turli qatlamlari manfaatlari hisobga olingan holda amalga oshirilishi mumkin. Aristotelning «politik hayvon» (zoon politikon) konsepsiyasi insonning tabiatan ijtimoiy-siyosiy mavjudot ekanligini asoslab, keyinchalik vakillik hokimiyati konsepsiyasining nazariy poydevoriga aylandi.

Yangi davr falsafasida vakillik hokimiyati masalasi yanada chuqurroq ishlab chiqildi. Xususan, Jon Lokk [2, 3] ijtimoiy shartnoma nazariyasi orqali hokimiyatning manbai xalq ekanligini, davlatning vazifasi esa fuqarolarning tabiiy huquqlarini — hayot, erkinlik va mulkni — himoya qilishdan iborat ekanligini asoslab berdi. Lokkning fikricha, agar hokimiyat ushbu ishonchni oqlamasa, xalq uni almashtirish huquqiga ega, bu esa vakillik institutining hisobdorlik tamoyiliga poydevor yaratdi. Sharl Lui Monteskьyo [4] esa hokimiyatlar bo‘linishi nazariyasi orqali qonunchilik, ijro va sud hokimiyatlari o‘rtasidagi muvozanatni asoslab, vakillik organlarining mustaqil va nazorat qiluvchi maqomini ilmiy jihatdan mustahkamladi. Mazkur g‘oya zamonaviy parlamentarizm va mahalliy o‘zini-o‘zi boshqarish tizimlarining konseptual negiziga aylandi.

Keyingi davr ijtimoiy-falsafiy tadqiqotlarida vakillik hokimiyati masalasi legitimlik nazariyasi doirasida ham keng yoritilgan. Legitimlik — hokimiyatning xalq tomonidan tan olinishi va unga ishonch bildirilishi jarayoni sifatida, vakillik institutlarining faoliyat yuritishi uchun zaruriy shart hisoblanadi. Shuningdek, demokratiya nazariyasi doirasida «ishtirokchi demokratiya» konsepsiyasi alohida ahamiyatga ega. Bu konsepsiyaga koʻra, fuqarolar faqat saylovlarda ishtirok etib qolmasdan, balki doimiy ravishda qaror qabul qilish jarayonlarida qatnashishi kerak. Ushbu yondashuv mahalliy darajadagi vakillik organlarining rolini alohida kuchaytiradi, chunki aynan shu darajada fuqarolar bilan bevosita muloqot imkoniyati eng yuqori boʻladi.

Jan-Jak Russo [6] ijtimoiy shartnoma nazariyasini yanada rivojlantirib, «umumiy iroda» (volonté générale) tushunchasini ilgari surdi va xalq suvereniteti hokimiyatning yagona legitim manbai ekanligini asosladi. Russoning fikricha, vakillik hokimiyati samarali boʻlishi uchun u xalq irodasidan uzilib qolmasligi, aksincha uning uzluksiz ifodasi boʻlib qolishi lozim — bu gʻoya zamonaviy ishtirokchi demokratiya konsepsiyasining falsafiy ildizlaridan birini tashkil etadi. XX asrda Yurgen Xabermas [7] kommunikativ harakat nazariyasi orqali hokimiyatning legitimligini jamoat maydonidagi ochiq, erkin va rasional muloqot jarayoni bilan bogʻladi. Xabermas talqinida vakillik institutlari fuqarolar bilan doimiy dialog yuritish orqaligina oʻz legitimligini saqlab qola oladi, aks holda «legitimlik inqirozi» yuzaga kelishi mumkin. Ushbu gʻoya mazkur tadqiqotda mahalliy vakillik organlarining kommunikativ funksiyasini tahlil qilishda nazariy asos sifatida foydalanildi.

Prezidentimiz Sh.M.Mirziyoyev ushbu masalaga doir oʻz nutqlarida quyidagilarni ta’kidlagan: “Xalq hokimiyatchiligi haqidagi konstitutsiyaviy tamoyilning asl mohiyatini barchamiz chuqur anglab yetishimiz zarur. Buning uchun turli darajadagi ijro hokimiyati organlarining xalq vakillari — parlament va mahalliy kengashlar oldida hisobot berish amaliyotini keng joriy qilish kerak. Parlament, vakillik va jamoatchilik nazorati mexanizmlarini yanada rivojlantirishimiz zarur. Har bir davlat xizmatchisi xalq oldida mas’ul ekanini hech qachon unutmasligi lozim” [5]. Mazkur fikr klassik vakillik nazariyalari bilan uzviy bogʻliq boʻlib, hisobdorlik va legitimlik tamoyillarining milliy boshqaruv amaliyotidagi davomiyligini koʻrsatadi.

Umumlashtirib aytganda, adabiyotlar tahlili shuni koʻrsatadiki, vakillik hokimiyati tushunchasi uch bosqichli evolyusion yoʻlni bosib oʻtgan: antik davrda — jamoat manfaatini ifodalovchi institut sifatida; yangi davrda — ijtimoiy shartnoma va hokimiyatlar boʻlinishi nazariyalari orqali huquqiy-falsafiy asoslangan institut sifatida; zamonaviy davrda esa — ishtirokchi demokratiya va raqamli boshqaruv kontekstida doimiy muloqot va hisobdorlikka asoslangan dinamik institut sifatida. Mazkur evolyusion yoʻl maqolaning keyingi boʻlimlarida tahlil qilinadigan metodologik va amaliy masalalarga nazariy asos yaratadi.

Zamonaviy ijtimoiy-falsafiy adabiyotlarda vakillik institutlarini tahlil qilishda «yangi institusionalizm» nazariyasi ham keng qoʻllaniladi. Ushbu nazariyaga koʻra, institutlar nafaqat rasmiy qoidalar majmui, balki jamiyatda shakllangan norasmiy me’yorlar, an’analar va ishonch munosabatlari bilan ham belgilanadi. Mazkur nuqtai nazardan, mahalliy vakillik hokimiyatining samaradorligi faqat qonunchilik bazasining takomillashuvi bilan emas, balki jamiyatda shakllangan siyosiy madaniyat, oʻzaro ishonch va fuqarolik mas’uliyati darajasi bilan ham chambarchas bogʻliq. Shu sababli, institusional islohotlar madaniy-ma’rifiy ishlar bilan uygʻunlikda olib borilishi tavsiya etiladi.

Shuni alohida ta’kidlash lozimki, mavjud adabiyotlarda vakillik hokimiyati koʻpincha konstitutsiyaviy huquq yoki siyosatshunoslik nuqtai nazaridan oʻrganilgan, ijtimoiy-falsafiy, xususan aksiologik tahlil esa nisbatan kam uchraydi. Mazkur maqola aynan ushbu boʻshliqni toʻldirishga, ya’ni vakillik hokimiyatini qadriyatlar va ijtimoiy madaniyat prizmasi orqali tadqiq etishga qaratilgan.

TADQIQOT METODOLOGIYASI

Vakillik hokimiyati fenomeni va uning funksiyalarini muvaffaqiyatli tadqiq etish uchun faqat huquqiy yoki siyosiy yondashuvlar yetarli emas, balki kompleks va sistematik ijtimoiy-falsafiy metodologiya talab etiladi. Ushbu tadqiqotda dialektik, aksiologik, sinergetik va germenevtik yondashuvlarning integratsiyasidan foydalanildi. Mazkur metodologik plyuralizm tadqiqot ob’yektining — vakillik hokimiyatining — koʻp qirrali tabiatini, ya’ni uning bir vaqtning oʻzida ham huquqiy, ham ijtimoiy, ham aksiologik, ham kommunikativ hodisa ekanligini inobatga olgan holda tanlandi.

Dialektik yondashuv vakillik hokimiyatini statik hodisa emas, balki ob’yektiv va sub’yektiv omillar ta’sirida doimiy rivojlanuvchi, ichki ziddiyatlar orqali takomillashuvchi jarayon sifatida koʻrib chiqish imkonini berdi. Bu yondashuv asosida markazlashgan va nomarkazlashgan boshqaruv modellari oʻrtasidagi ziddiyatlar, shuningdek an’anaviy va raqamli muloqot shakllari oʻrtasidagi oʻzaro ta’sir tahlil qilindi.

Aksiologik yondashuv vakillik hokimiyatini inson qadri, adolat va tenglik kabi fundamental qadriyatlar prizmasi orqali baholashga imkon berdi. Ushbu yondashuv doirasida vakillik institutlarining samaradorligi nafaqat miqdoriy koʻrsatkichlar (masalan, qabul qilingan qarorlar soni), balki sifatiy mezonlar — fuqarolar ishonchi, ijtimoiy adolat darajasi, inson manfaatlarining himoyalanganligi — asosida baholandi.

Sinergetik yondashuv vakillik hokimiyatini oʻz-oʻzini tashkillashtiruvchi va rivojlantiruvchi murakkab ijtimoiy tizim sifatida tahlil qilish imkonini berdi. Bu nuqtai nazardan, mahalliy vakillik organlarining transformatsiyasi chiziqli emas,

balki turli ijtimoiy, iqtisodiy va texnologik omillarning o‘zaro ta’siri natijasida yuzaga keladigan noaniq (nomuvozanat) jarayon sifatida baholandi.

Germenevtik yondashuv esa me’yoriy-huquqiy hujjatlar, rasmiy nutqlar va statistik ma’lumotlarni izohlash va ularning ijtimoiy-falsafiy mazmunini ochib berishda qo‘llanildi. Tadqiqot jarayonida qiyosiy tahlil, mazmuniy tahlil (kontent-tahlil) va tizimli tahlil usullaridan foydalanildi. Ma’lumotlar manbai sifatida falsafiy-nazariy adabiyotlar, me’yoriy-huquqiy hujjatlar (O‘zbekiston Respublikasi Konstitutsiyasi, tegishli qonunlar), Prezident Sh.M.Mirziyoyevning rasmiy nutqlari hamda mahalliy vakillik organlari faoliyatiga oid rasmiy statistik ma’lumotlar qo‘llanildi.

Tadqiqotning cheklovlari haqida ham aytib o‘tish lozim: mazkur maqola asosan falsafiy-nazariy tahlilga asoslangan bo‘lib, keng ko‘lamli sosiologik so‘rovnoma ma’lumotlarini o‘z ichiga olmaydi. Shu bois, tadqiqot natijalari umumnazariy xulosalar darajasida shakllantirilgan bo‘lib, ularni empirik jihatdan tasdiqlash kelgusi tadqiqotlarning vazifasi hisoblanadi. Shunga qaramay, qo‘llanilgan germenevtik va qiyosiy tahlil usullari mavjud nazariy va me’yoriy manbalar asosida ishonchli xulosalar chiqarish imkonini berdi.

NATIJALAR VA ULARNING TAHLILI

O‘zbekistonda mahalliy vakillik hokimiyatini transformatsiya qilishning ijtimoiy-falsafiy zaruriyati milliy va global jarayonlar kontekstida chuqur tahlil qilinadi. Davlat va jamiyat hayotini modernizatsiya qilish sharoitida eskirgan markazlashgan boshqaruv modelidan samarali va nomarkazlashgan boshqaruv tizimiga o‘tish ob’yektiv zaruriyatga aylandi. Ijtimoiy transformatsiyaning falsafiy mohiyati shundaki, u mahalliy Kengashlarni rahbariyat buyrug‘ini ijro etuvchi organ emas, balki aholining haqiqiy manfaatlarini himoya qiluvchi mustaqil vakillik institutiga aylantiradi. Mahalliy darajada vakillik hokimiyatining kuchaytirilishi jamiyatda ijtimoiy adolat, oshkoralik va fuqarolarning siyosiy-huquqiy faolligini oshirishga xizmat qiladi. Transformatsiya jarayonining ob’yektiv va sub’yektiv omillari, tizimdagi ijtimoiy ziddiyatlar va ularni bartaraf etishning falsafiy asoslari quyida batafsil ko‘rib chiqiladi. Bu esa Yangi O‘zbekistonning strategik taraqqiyot maqsadlariga to‘liq mos keladi.

Mazkur tadqiqot vakillik hokimiyati funksiyalarining falsafiy talqiniga bag‘ishlangan bo‘lib, unda mahalliy vakillik organlari bajaradigan ijtimoiy, siyosiy va ma’naviy vazifalar tasniflanadi. Vakillik hokimiyatining funksiyalari shunchaki qonunchilikda belgilangan vakolatlar to‘plami bo‘lmay, balki jamiyat va davlat munosabatlaridagi muvozanatni ta’minlovchi ijtimoiy mexanizmdir. Bunda kommunikativ, integrasion, nazorat va legitimlashtiruvchi funksiyalarning ijtimoiy-falsafiy mohiyati ochib beriladi. Mazkur to‘rt funksiya o‘zaro uzviy bog‘liq bo‘lib, ularning har biri vakillik institutining umumiy samaradorligiga ta’sir ko‘rsatadi (1-jadvalga qarang).

1-jadval. Vakillik hokimiyatining ijtimoiy-falsafiy funksiyalari

№	Funksiya	Mazmuni
1	Kommunikativ	Aholi bilan uzluksiz muloqot yuritish, fikr-mulohazalarni qaror qabul qilish jarayonida inobatga olish.
2	Integrasion	Jamiyatdagi turli ijtimoiy guruhlar manfaatlarini muvofiqlashtirish va yagona siyosiy-huquqiy maydonga birlashtirish.
3	Nazorat	Ijro hokimiyati faoliyati ustidan jamoatchilik nazoratini amalga oshirish, suiste’molliklarning oldini olish.
4	Legitimlashtiruvchi	Hokimiyatning xalq tomonidan tan olinishi va unga nisbatan ishonch shakllanishini ta’minlash.

Funksiyalarning har birini alohida ko‘rib chiqadigan bo‘lsak, kommunikativ funksiya vakillik organlarining aholi bilan uzluksiz muloqot yuritish, ularning fikr-mulohazalarini qabul qilish va qaror qabul qilish jarayonida inobatga olish vazifasini anglatadi. Integrasion funksiya esa jamiyatdagi turli ijtimoiy guruhlar, etnik va ijtimoiy qatlamlar manfaatlarini muvofiqlashtirish va ularni yagona siyosiy-huquqiy maydonga birlashtirishga xizmat qiladi. Nazorat funksiyasi ijro hokimiyati organlarining faoliyati ustidan jamoatchilik nazoratini amalga oshirish, korrupsiya va suiste’molchilikning oldini olishga qaratilgan. Legitimlashtiruvchi funksiya esa hokimiyatning xalq tomonidan tan olinishi va unga ishonch bildirilishini ta’minlaydigan eng muhim vazifa hisoblanadi. Mazkur to‘rt funksiyaning har biri alohida emas, balki bir-birini to‘ldiruvchi yaxlit tizim sifatida faoliyat yuritgandagina, vakillik hokimiyati o‘z mohiyatini to‘liq namoyon qila oladi.

1-jadvalda keltirilgan funksiyalarning amaliy ifodasini deputatlarning kundalik faoliyatida kuzatish mumkin. Deputatlar saylovchilar bilan uchrashuvlar o‘tkazib, ularning muammolarini o‘rganadilar va tegishli organlarga yetkazadilar. Mahalliy Kengashlarning ijtimoiy nazorat qilish funksiyasi hokimiyat suiste’molliklarining oldini oluvchi hamda ijtimoiy barqarorlikni saqlovchi vosita sifatida talqin etiladi. Shu o‘rinda, vakillik hokimiyatining transformatsiyasi

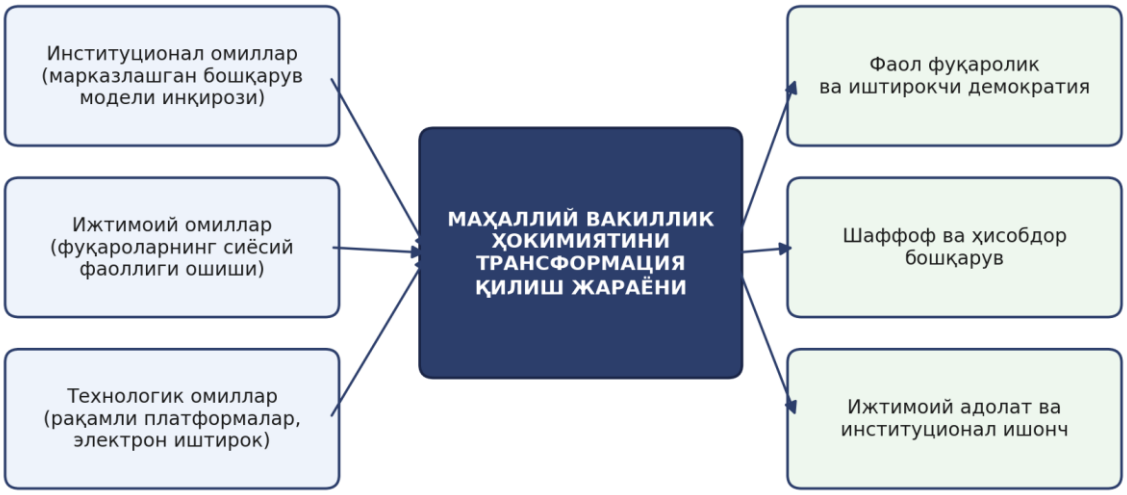
masalasiga ham alohida e’tibor qaratish zarur, chunki zamonaviy globallashuv sharoitida bu institut yangi chaqiriqlar va vazifalarga duch kelmoqda.

Axborot texnologiyalarining rivojlanishi, ijtimoiy tarmoqlarning keng tarqalishi fuqarolarning siyosiy faolligini oshirmoqda. Bu esa vakillik hokimiyatidan yanada ochiqlik va hisobdorlikni talab qiladi. Onlayn petisiyalar, elektron saylov tizimlari va raqamli platformalar orqali fuqarolar davlat boshqaruvida bevosita ishtirok eta boshladilar. O‘zbekiston sharoitida mazkur transformatsiyaning zaruriyati bir nechta omillar bilan izohlanadi — bu omillar institusional, ijtimoiy, iqtisodiy va texnologik tavsifga ega bo‘lib, 2-jadvalda umumlashtirilgan.

2-jadval. Mahalliy vakillik hokimiyatini transformatsiya qilish zaruriyatining omillari

№	Omil turi	Tavsifi
1	Institusional omillar	Markazlashgan va ijro hokimiyatiga qaram boshqaruv modelining zamonaviy talablarga javob bermay qolishi.
2	Ijtimoiy omillar	Fuqarolarning siyosiy-huquqiy ongi va ijtimoiy faolligining ortib borishi.
3	Iqtisodiy omillar	Mahalliy darajada resurslarni samarali taqsimlash va ijtimoiy-iqtisodiy rivojlanishni ta’minlash ehtiyoji.
4	Texnologik omillar	Raqamli platformalar, elektron xizmatlar va onlayn ishtirok vositalarining rivojlanishi.

2-jadvalda keltirilgan omillarning o‘zaro ta’siri natijasida yuzaga keladigan transformatsiya jarayonining umumiy modeli 1-rasmda tasvirlangan. Ko‘rinib turibdiki, institusional, ijtimoiy va texnologik omillar mahalliy vakillik hokimiyatining transformatsiya jarayoniga bevosita ta’sir ko‘rsatadi, bu jarayon o‘z navbatida faol fuqarolik, shaffof boshqaruv va ijtimoiy adolatning qaror topishiga olib keladi.



1-rasm. Mahalliy vakillik hokimiyatini transformatsiya qilish modeli

Xalqaro tajribaga nazar tashlasak, mahalliy vakillik organlarining raqamli transformatsiyasi turli mamlakatlarda turlicha modellar orqali amalga oshirilmoqda. Xususan, Estoniya tajribasida elektron hukumat tizimi orqali fuqarolar mahalliy byudjet taqsimotida bevosita ishtirok etish imkoniga ega bo‘lgan, bu esa fuqarolar ishonchini sezilarli darajada oshirgan. Finlyandiya va Skandinaviya davlatlarida qo‘llanilayotgan «ishtirokchi byudjetlashtirish» (participatory budgeting) amaliyoti esa aholining mahalliy darajadagi qarorlar qabul qilish jarayoniga bevosita jalb etilishining samarali modelini namoyish etadi. Mazkur tajribalar shuni ko‘rsatadiki, vakillik hokimiyatining transformatsiyasi universal sxema bo‘yicha emas, balki har bir mamlakatning milliy-madaniy xususiyatlarini hisobga olgan holda amalga oshirilishi lozim. O‘zbekiston sharoitida bu borada mahalla institutining an’anaviy roli, oshkoralik va jamoatchilik nazorati mexanizmlarining milliy xususiyatlari alohida ahamiyat kasb etadi.

Mahalliy vakillik organlari faoliyatining samaradorligini baholash uchun ilmiy jihatdan asoslangan mezonlar tizimini ishlab chiqish zarur. Mazkur tadqiqot doirasida ijtimoiy-falsafiy tahlil asosida quyidagi baholash mezonlari taklif etiladi: deputatlarning saylovchilar bilan muloqot chastotasi va sifati; qabul qilingan qarorlarning amaliyotga tatbiq etilish

darajasi; aholining mahalliy Kengash faoliyatidan qoniqish darajasi; oshkoralik va axborot ochiqligi ko‘rsatkichlari; raqamli xizmatlardan foydalanish ko‘lami. Ushbu mezonlar 3-jadvalda umumlashtirilgan.

3-jadval. Mahalliy vakillik organlari faoliyatini baholash mezonlari

№	Mezon	Tavsifi
1	Muloqot chastotasi va sifati	Deputatlarning saylovchilar bilan uchrashuvlari soni va ularning natijadorligi.
2	Qarorlarning tatbiq etilishi	Qabul qilingan qarorlarning amaliyotga to‘liq joriy etilish darajasi.
3	Aholi qoniqishi	Fuqarolarning mahalliy Kengash faoliyatidan qoniqish darajasi (so‘rovnoma asosida).
4	Oshkoralik	Byudjet va qarorlar to‘g‘risidagi axborotning ochiqligi hamda foydalanuvchanligi.
5	Raqamli qamrov	Elektron xizmatlar va onlayn platformalardan foydalanuvchilar ulushi.

Mazkur jarayonning ilmiy-nazariy asoslari bir nechta fundamental konsepsiyalarga tayanadi. Jumladan, ijtimoiy shartnoma nazariyasiga ko‘ra, davlat hokimiyati xalq irodasiga asoslanishi kerak. Bu esa vakillik institutlarining rivojlanishini taqozo etadi. Mahalliy vakillik organlari esa ushbu irodaning eng quyi, ya’ni fuqaroga eng yaqin darajadagi ifodasi hisoblanadi. Shuningdek, demokratiya nazariyasi doirasida «ishtirokchi demokratiya» konsepsiyasi alohida ahamiyatga ega. Bu konsepsiyaga ko‘ra, fuqarolar faqat saylovlarda ishtirok etib qolmasdan, balki doimiy ravishda qaror qabul qilish jarayonlarida qatnashishi kerak. O‘zbekistonda mahalliy kengashlar faoliyatini kuchaytirish orqali aynan shu maqsadga erishish ko‘zda tutilmoqda.

Mazkur jarayonni chuqurroq anglash uchun, mahalliy vakillik hokimiyati transformatsiyasining ijtimoiy-falsafiy zaruriyatini faqat institusional o‘zgarishlar bilan cheklab qo‘ymasdan, balki uning ong, qadriyatlar va ijtimoiy munosabatlar tizimidagi o‘zgarishlar bilan uzviy bog‘liqligini ham ko‘rib chiqish lozim. Chunki har qanday institusional islohot, agar u jamiyat a’zolarining dunyoqarashi va siyosiy madaniyatida aks etmasa, samarali natija bermasligi mumkin. Shu nuqtai nazardan, O‘zbekistonda mahalliy vakillik hokimiyatini transformatsiya qilish jarayoni, avvalo, fuqarolarning siyosiy ongi va faolligini oshirish bilan bog‘liq. Ilgari ko‘p hollarda aholi davlat boshqaruvida passiv ishtirok etgan bo‘lsa, bugungi kunda fuqarolar o‘z manfaatlarini himoya qilishda faol pozisiyani egallamoqda. Bu esa mahalliy vakillik organlaridan faqat rasmiy funksiyalarni bajarishni emas, balki haqiqiy muloqot maydoniga aylanishni talab etadi.

Transformatsiya jarayonida institusional xotira va vorisiylik masalasiga ham e’tibor qaratish lozim. Ya’ni, yangi islohotlar amalga oshirilayotganda, avvalgi tajribalar va erishilgan natijalar inobatga olinishi kerak. Bu esa xatolarni takrorlamaslik va samarali yo‘lni tanlash imkonini beradi. Amaliy jihatdan qaraganda, mahalliy vakillik organlarining faoliyatini baholash mezonlarini ishlab chiqish ham muhim vazifa hisoblanadi. Deputatlarning faolligi, qabul qilingan qarorlarning samaradorligi, aholi qoniqish darajasi kabi ko‘rsatkichlar asosida tahlil olib borish mumkin. Bu esa boshqaruv sifatini oshirishga xizmat qiladi.

Vakillik hokimiyati fenomeni jamiyat rivojining muayyan bosqichida yuzaga keladigan, davlat va fuqaro o‘rtasidagi ijtimoiy munosabatlarni tartibga soluvchi muhim ijtimoiy-ontologik hodisadir. Uning fundamental metodologik asosi insonning o‘z suveren huquqlarini jamoaviy manfaatlar yo‘lida muayyan vakillik tuzilmalariga ishonib topshirishi (delegat qilishi) tamoyiliga tayanadi. Mahalliy darajada vakillik hokimiyati fuqarolarning davlat boshqaruvidagi bevosita va bilvosita ishtirokini muvofiqlashtiruvchi markaziy bo‘g‘in bo‘lib, u hokimiyat legitimligining birlamchi va asosiy manbai hisoblanadi. Bu esa vakillik fenomenini faqat yuridik nuqtai nazardan emas, balki aholining ongli ishtirokini ta’minlovchi ijtimoiy-falsafiy hodisa sifatida qabul qilishni talab etadi.

Mahalliy vakillik hokimiyatining nazariy-metodologik negizlarini tadqiq etish shuni ko‘rsatadiki, klassik falsafiy konsepsiyalar, xususan, ijtimoiy shartnoma va xalq suvereniteti nazariyalari bugungi kunda ham o‘z dolzarbligini yo‘qotgani yo‘q. Fuqarolar va mahalliy vakillik organlari o‘rtasidagi munosabatlar aslida o‘zaro mas’uliyat va majburiyatlarga asoslangan ijtimoiy shartnomaning mahalliy darajadagi ko‘rinishidir. Ijtimoiy shartnoma mexanizmining mahalliy darajada to‘g‘ri yo‘lga qo‘yilishi fuqarolarning hokimiyatga bo‘lgan ishonchini orttiradi va byurokratik aynishni oldini oluvchi eng muhim falsafiy-huquqiy kafolatga aylanadi.

Shu bilan birga, transformatsiya jarayonida yuzaga kelishi mumkin bo‘lgan xavf va to‘siqlarni ham e’tibordan chetda qoldirmaslik lozim. Birinchi xavf — byurokratik inersiya va ma’muriy qarshilik bo‘lib, u eskirgan boshqaruv uslublariga o‘rganib qolgan mansabdor shaxslarning yangi, ochiq va hisobdor modelga o‘tishga bo‘lgan ichki qarshiligida namoyon

bo‘ladi. Ikkinchi xavf — raqamli tafovut (digital divide) muammosi, ya’ni aholining turli qatlamlari, ayniqsa qishloq joylarida yashovchi va yoshi katta fuqarolar o‘rtasida raqamli platformalardan foydalanish imkoniyatlarining notekis taqsimlanishidir. Agar vakillik hokimiyatining raqamli transformatsiyasi faqat texnologik jihatdan ko‘rib chiqilib, ijtimoiy-madaniy omillar inobatga olinmasa, bu yangi turdagi ijtimoiy cheklanishni — «raqamli notenglikni» — yuzaga keltirishi mumkin. Uchinchi xavf — mintaqaviy tafovutlar bo‘lib, yirik shaharlar bilan chekka tumanlar o‘rtasida infratuzilma va kadrlar salohiyati borasidagi farq transformatsiya jarayonining bir tekis bormasligiga olib kelishi mumkin. Ushbu xavflarni bartaraf etish uchun differensiallashgan, har bir hududning o‘ziga xos xususiyatlarini hisobga oluvchi yondashuv zarur.

Vakillik hokimiyatining ijtimoiy-falsafiy transformatsiyasi doirasida yoshlar va ayollarning siyosiy ishtiroki masalasi alohida ahamiyat kasb etadi. Jamiyatning turli ijtimoiy-demografik guruhlari manfaatlarini teng darajada ifoda etish vakillik institutining legitimligini mustahkamlovchi muhim omildir. Agar mahalliy Kengashlar tarkibida yoshlar va ayollarning ishtiroki cheklangan bo‘lsa, bu vakillik tamoyilining to‘liq amalga oshmasligidan dalolat beradi. Shu bois, nomzodlarni tanlash va tayyorlash jarayonlarida gender va yosh mutanosibligini ta’minlash, shuningdek yoshlar parlamenti va maslahat kengashlari kabi qo‘shimcha ishtirok mexanizmlarini rivojlantirish vakillik hokimiyatining insonparvarlik mazmunini chuqurlashtirishga xizmat qiladi.

Tadqiqot natijalarini nazariy adabiyotlar bilan qiyoslaganda, bir qator mos keluvchi jihatlarni kuzatish mumkin. Xabermasning kommunikativ legitimlik konsepsiyasi mazkur tadqiqotda aniqlangan kommunikativ funksiyaning markaziy ahamiyatini tasdiqlaydi — fuqarolar bilan doimiy va ochiq muloqot yurita olmagan vakillik organi o‘z legitimligini asta-sekin yo‘qota boradi. Shu bilan birga, Russoning «umumiy iroda» konsepsiyasi bilan taqqoslaganda, tadqiqot natijalari shuni ko‘rsatadiki, zamonaviy sharoitda «umumiy iroda»ni aniqlashning yagona to‘g‘ri yo‘li mavjud emas — bu jarayon doimiy ravishda sosiologik monitoring, jamoatchilik eshituvlari va raqamli platformalar orqali qayta-qayta aniqlashtirilishi lozim bo‘lgan dinamik hodisadir. Mazkur xulosa klassik ijtimoiy shartnoma nazariyasini zamonaviy institusional amaliyot bilan boyitadi va vakillik hokimiyati nazariyasiga methodologik hissa qo‘shadi.

Ushbu konseptual model, aslida, vakillik hokimiyatining klassik nazariy negizlari bilan zamonaviy boshqaruv amaliyoti o‘rtasidagi ko‘prik vazifasini o‘taydi. U bir tomondan Aristotel, Lokk, Monteskьyo va Russoning falsafiy merosiga tayansa, ikkinchi tomondan O‘zbekistonning o‘ziga xos ijtimoiy-madaniy va institusional sharoitlarini hisobga oladi. Aynan shu uyg‘unlik — universal falsafiy negiz va milliy kontekstning birlashuvi — mazkur tadqiqotning metodologik o‘ziga xosligini belgilaydi hamda uning natijalarini boshqa mintaqaviy tadqiqotlar uchun ham qo‘llaniladigan nazariy asos sifatida ko‘rib chiqish imkonini beradi.

XULOSALAR

O‘tkazilgan tadqiqot yakunida quyidagi xulosalarga kelish mumkin. Birinchidan, vakillik hokimiyati fenomeni faqat huquqiy-institusional hodisa emas, balki antik davr falsafasidan boshlab shakllanib kelgan, ijtimoiy shartnoma, legitimlik va ishtirokchi demokratiya nazariyalari bilan uzviy bog‘liq bo‘lgan kompleks ijtimoiy-falsafiy kategoriyadir.

Ikkinchidan, vakillik hokimiyatining kommunikativ, integrasion, nazorat va legitimlashtiruvchi funksiyalari o‘zaro uyg‘unlikda amalga oshirilgandagina, mazkur institut jamiyat va davlat o‘rtasidagi muvozanatni ta’minlovchi samarali mexanizmga aylanadi. Ushbu funksiyalarni faqat rasmiy-huquqiy emas, balki aksiologik prizma orqali qayta anglash vakillik organlarining ijtimoiy mas’uliyatini oshiradi.

Uchinchidan, O‘zbekistonda mahalliy vakillik hokimiyatini transformatsiya qilish jarayoni institusional, ijtimoiy va texnologik omillarning o‘zaro ta’siri natijasida yuzaga kelgan ob’yektiv zaruriyatdir. Bu jarayon muvaffaqiyatli amalga oshishi uchun nafaqat qonunchilik va tashkiliy o‘zgarishlar, balki fuqarolarning siyosiy ongi, madaniyati va faolligini oshirish ham zarur shart hisoblanadi.

To‘rtinchidan, dialektik, aksiologik, sinergetik va germenevtik yondashuvlarning integratsiyasiga asoslangan metodologiya vakillik hokimiyati transformatsiyasining murakkab va ko‘p qirrali tabiatini ochib berishda samarali natija beradi hamda kelgusi tadqiqotlar uchun metodologik asos bo‘lib xizmat qilishi mumkin.

Amaliy ahamiyati nuqtai nazaridan, tadqiqot natijalari mahalliy vakillik organlari faoliyatini baholash mezonlarini ishlab chiqishda, deputatlarning vakolatlari va mas’uliyatini aniqlashtirishda, shuningdek raqamli boshqaruv vositalarini joriy etish strategiyasini takomillashtirishda qo‘llanilishi mumkin. Kelgusi tadqiqotlarda mazkur masalani sosiologik so‘rovlar va empirik ma’lumotlar asosida chuqurlashtirish, shuningdek xorijiy davlatlarning mahalliy boshqaruv tajribasini qiyosiy tahlil qilish istiqbolli yo‘nalish bo‘lishi mumkin.

Shuningdek, tadqiqot davomida aniqlangan xavf va to‘siqlar — byurokratik inersiya, raqamli tafovut va mintaqaviy nomutanosiblik — transformatsiya strategiyasini ishlab chiqishda alohida e’tiborga olinishi lozim bo‘lgan omillar sifatida baholandi. Yoshlar va ayollarning vakillik organlaridagi ishtirokini kengaytirish esa institutning ijtimoiy vakillik tamoyilini to‘laqonli amalga oshirishning zaruriy sharti hisoblanadi.

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RAHBAR KADRLAR AXLOQIY MAS'ULIYATI — DAVLAT BOSHQARUVIDA IJTIMOIY-MA'NAVIY BARQARORLIK OMILI

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Annotatsiya: *Mazkur maqolada davlat boshqaruvidagi ijtimoiy-ma'naviy muammolar va ularning kelib chiqish omillari, rahbar kadrlar axloqiy mas'uliyatining mazmun-mohiyati hamda uni rivojlantirishning davlat boshqaruvi samaradorligi va jamiyat ijtimoiy-ma'naviy barqarorligini ta'minlashdagi ahamiyati tahlil qilinadi. Shuningdek, rahbar kadrlarda axloqiy mas'uliyatni yuksaltirishning ustuvor yo'nalishlari va istiqbollari yuzasidan ilmiy-nazariy xulosa va takliflar ishlab chiqishga e'tibor qaratiladi.*

Kalit so'zlar: *globallashuv, raqamlashuv sharoiti, ijtimoiy-siyosiy transformatsiyalar, davlat boshqaruvi, boshqaruv mexanizmlari, rahbar kadrlar, axloqiy-ma'naviy fazilatlar, axloqiy mas'uliyat, adolatparvarlik, halollik, manfaatlar to'qnashuvi, korrupsiyaviy holatlar.*

ЭТИЧЕСКАЯ ОТВЕТСТВЕННОСТЬ РУКОВОДЯЩИХ КАДРОВ — ФАКТОР СОЦИАЛЬНО-ДУХОВНОЙ СТАБИЛЬНОСТИ В ГОСУДАРСТВЕННОМ УПРАВЛЕНИИ

Аннотация: *В данной статье анализируются социально-духовные проблемы в системе государственного управления и факторы их возникновения, сущность и содержание этической ответственности руководящих кадров, а также значение её развития в обеспечении эффективности государственного управления и социально-духовной стабильности общества. Особое внимание уделяется разработке научно-теоретических выводов и предложений относительно приоритетных направлений и перспектив повышения уровня этической ответственности руководящих кадров.*

Ключевые слова: *глобализация, условия цифровизации, социально-политические трансформации, государственное управление, механизмы управления, руководящие кадры, нравственно-этические качества, этическая ответственность, справедливость, честность, конфликт интересов, коррупционные проявления.*

ETHICAL RESPONSIBILITY OF MANAGERIAL PERSONNEL AS A FACTOR OF SOCIO-SPIRITUAL STABILITY IN PUBLIC ADMINISTRATION

Abstract: *This article analyzes the socio-spiritual problems in public administration and the factors contributing to their emergence, the essence and content of the ethical responsibility of managerial personnel, as well as the importance of developing such responsibility in ensuring the effectiveness of public administration and the socio-spiritual stability of society. Particular attention is paid to developing theoretical and research-based conclusions and proposals concerning the priority areas and prospects for enhancing the ethical responsibility of managerial personnel.*

Keywords: *globalization, digitalization, socio-political transformations, public administration, governance mechanisms, managerial personnel, moral and ethical qualities, ethical responsibility, commitment to justice, integrity, conflict of interest, manifestations of corruption.*

Bugungi globallashuv, raqamlashuv va ijtimoiy-siyosiy transformatsiyalar sharoitida davlat boshqaruvi tizimi oldida turgan vazifalar nafaqat boshqaruv mexanizmlarini takomillashtirish, balki rahbar kadrlarning axloqiy-ma'naviy fazilatlarini yuksaltirishni ham taqozo etmoqda. Jamiyat taraqqiyotining barqarorligi, davlat institutlariga bo'lgan ishonch va ijtimoiy hamjihatlik ko'p jihatdan davlat boshqaruvida qaror qabul qiluvchi shaxslarning kasbiy salohiyati bilan bir qatorda, ularning axloqiy mas'uliyati, adolatparvarligi, halolligi va jamoat manfaatlariga sadoqatiga bog'liq. Shu nuqtai nazardan, rahbar kadrlarning axloqiy mas'uliyatini davlat boshqaruvi samaradorligini ta'minlovchi muhim ijtimoiy-ma'naviy omil sifatida tadqiq etish dolzarb ilmiy masalalardan biri hisoblanadi.

Zamonaviy davlat boshqaruvida byurokratik yondashuv, manfaatlar to'qnashuvi, korrupsiyaviy holatlar, shaxsiy manfaatlarni jamoat manfaatlaridan ustun qo'yish, mas'uliyatsizlik va qarorlar qabul qilishda adolat mezonlarining buzilishi kabi ijtimoiy-ma'naviy muammolar boshqaruv samaradorligiga salbiy ta'sir ko'rsatishi mumkin. Bunday holatlar

nafaqat davlat organlarining faoliyatiga, balki fuqarolarning davlat institutlariga bo‘lgan ishonchi, jamiyatdagi ijtimoiy adolat va ma’naviy muhitga ham ta’sir etadi. Shu bois rahbar kadrlarning axloqiy mas’uliyatini shakllantirish va rivojlantirish davlat boshqaruvida salbiy tendensiyalarning oldini olish, boshqaruv madaniyatini yuksaltirish hamda ijtimoiy-ma’naviy barqarorlikni ta’minlashning muhim sharti sifatida namoyon bo‘ladi. Axloqiy mas’uliyat rahbarning o‘z xizmat vazifalarini faqat huquqiy me’yorlar doirasida bajarishi bilan cheklanmay, qabul qilayotgan qarorlarining ijtimoiy oqibatlarini anglashi, jamoat manfaatlarini ustuvor qo‘yishi, adolat va halollik tamoyillariga amal qilishi, o‘z faoliyati uchun jamiyat va davlat oldida ma’naviy javobgarlikni his etishini ham nazarda tutadi. Shu ma’noda, rahbar kadrning axloqiy mas’uliyati huquqiy mas’uliyatni to‘ldiruvchi va uning mazmun-mohiyatini boyituvchi ijtimoiy-ma’naviy kategoriya sifatida namoyon bo‘ladi.

ADABIYOTLAR TAHLILI VA METODLAR

Rahbar kadrlar axloqiy mas’uliyati, davlat boshqaruvi madaniyati va jamiyatning ijtimoiy-ma’naviy taraqqiyoti bilan bog‘liq masalalarni o‘rganishda Sh.M. Mirziyoyev [1], «Yangi O‘zbekiston gazetasi» 2023 yil 22 fevral, 36-son [2, 5, 6], Berdiev B. [3, 4] kabi mualliflarning ilmiy va nazariy qarashlaridan foydalanildi. Mazkur manbalarda insonning ma’naviy dunyosi, ijtimoiy munosabatlar, boshqaruv jarayonlari, zamonaviy jamiyat transformatsiyasi va shaxs mas’uliyati bilan bog‘liq masalalar turli nuqtai nazarlardan yoritilgan.

Tadqiqotning metodologik asosini tizimlilik, tarixiylik va umumiy o‘zaro aloqadorlik tamoyillari tashkil etadi. Shuningdek, tahlil va sintez, umumlashtirish, qiyosiy yondashuv kabi umumilmiy usullardan foydalanildi.

NATIJALAR VA MUHOKAMA

Davlat boshqaruvi jamiyatning siyosiy, iqtisodiy va ma’naviy taraqqiyotini ta’minlovchi murakkab ijtimoiy tizim hisoblanadi. Uning samaradorligi nafaqat institutsional mexanizmlar va huquqiy me’yorlarga, balki ushbu tizimni amalga oshiruvchi rahbar kadrlarning kasbiy va axloqiy salohiyatiga ham bog‘liq. Shu ma’noda, rahbar kadrning axloqiy mas’uliyati davlat boshqaruvi samaradorligini ta’minlovchi muhim ijtimoiy-ma’naviy omil sifatida namoyon bo‘ladi. Zero, davlatimiz rahbari Sh.Mirziyoyev ta’kidlaganidek, “Eng asosiysi, islohotlarimiz natijasini yurtimizda yashayotgan har bir inson, har bir oila o‘z kundalik hayotida his etishi kerak. Biz barcha bo‘g‘indagi rahbarlar qog‘ozdagi hisobotlar, foiz va raqamlar ortidan quvmasdan, har qaysi fuqaro uchun, uning hayotiy ehtiyoj va orzu-umidlarini ro‘yobga chiqarish uchun ishlaydigan boshqaruv tizimini yaratishimiz kerak” [1, 30]. Bu yondashuv rahbar mas’uliyatining mohiyatini aniq ifodalaydi: rahbarlik lavozimi avvalo imtiyoz yoki maqom emas, balki jamiyat va inson oldidagi mas’uliyatdir.

Rahbar shaxsning axloqiy mas’uliyatini oshirish istiqbollari yosh avlodni ma’naviy yetuk qilib tarbiyalash, inson kapitaliga sarmoya kiritish bilan ham chambarchas bog‘liq. Zero, kelajak rahbarlari bugungi yoshlar orasidan yetishib chiqadi. Ularni halollik, vatanparvarlik, adolatparvarlik, mas’uliyatlilik ruhida tarbiyalash - ertangi kun uchun eng katta investitsiyadir. Yoshlarni ma’rifatli, bilimli, ijtimoiy faolligi yuqori, vijdonli kishilar sifatida shakllantirish orqali davlat boshqaruvidagi ma’naviy muammolarni ildizidan bartaraf etish mumkin. Shu bilan birga, davlat boshqaruvida ijtimoiy-ma’naviy muammolarni bartaraf etishning eng samarali yo‘li - rahbar kadrlarning axloqiy mas’uliyatini mustahkamlashdir. Vijdoni uyg‘oq, halol, mas’uliyatli rahbar - jamiyatning eng katta kapitali, taraqqiyotning bosh manbai hisoblanadi. Shunday rahbarlar ko‘paygani sari davlat boshqaruvi yanada adolatli, shaffof va samarali bo‘ladi, millatning ma’naviy qudrati ortadi, jamiyatning davlatga bo‘lgan ishonchi mustahkamlanadi. Axloqiy mas’uliyatni yuksaltirish - kelajakning chinakam barqarorligi va taraqqiyoti uchun poydevordir.

Ayni vaqtda, rahbar doimo sezgir va hushyor bo‘lib, qabul qilayotgan har qanday qarorini yetti marta o‘lchab, bir marta kesib, ularning oqibatini o‘ziga puxta tasavvur qilishi, shu yurtni, shu tuproqni asrab-avaylab yashashi shart. Buning uchun esa rahbarning aql-zakovati, bilimi va tajribasi yetarli, fikrlash doirasi albatta keng bo‘lishi lozim. Boshlagan ishlarini oxiriga yetkazish, o‘ziga ishonch bildirgan odamlarning orzu-umidlarini ruyobga chiqarishda qat’iyatliligini namoyon etishi, irodasi baquvvat, e’tiqodi butun bo‘lishi kerak.

Yaxshi niyat bilan mehnat qilayotgan odamlarning boshini qovushtirish, ko‘nglini ko‘tarish, ishni oqilona tashkil qilish, bir so‘z bilan aytganda, qiyinchiliklarda toblangan va suyagi qotgan, or-nomusli o‘zbek xalqi oldiga amaliy rejalar va katta marralarni qo‘yib, ularni shu maqsad sari boshlash avvalo rahbarning vazifasi bo‘lishi kerak. Ana shunday mas’uliyatni o‘z zimmasiga oladigan, o‘zi yashayotgan hududni obod qilishga bel bog‘lagan, shu yurt mening, oilamning, bolalarimning vatani degan fikr bilan yashaydigan odamlarni aynan yetakchi ruhlantirishi, zarur bo‘lganda, ularni himoyalashi kerak. Bu vazifalarning amalga oshirilishi, avvalo, jamiyatimizda tinchlik, ijtimoiy-siyosiy barqarorlik, xavfsizlikning ta’minlanishi bilan bog‘liqdir. “Bunday vaziyatda har bir rahbardan ogohlik, o‘ta hushyorlik, aholining turmush darajasidan tortib ma’naviy holatini xolis baholab, ularni yaxshilash va sog‘lomlashtirish bo‘yicha tegishli chora-tadbirlarni ko‘rish talab etiladi. Bu barqaror taraqqiyotni, milliy xavfsizlikni ta’minlashning eng muhim sharti ekanini aslo unutmasligimiz kerak” [2, 36-son].

Rahbar mas’uliyati, rahbar va fuqaro o‘rtasidagi munosabatlar Sharqda yuksak madaniyat, o‘zaro hamkorlik va hamjihatlikning uyg‘unlashgan shaklida vujudga kelgan. Xalqimizdagi sharqona mentalitetning o‘ziga xos xususiyatlaridan biri – rahbarga nisbatan alohida hurmat bilan munosabatda bo‘lishda namoyon bo‘ladi. Rahbar kadrlar

to‘g‘risida fikr yuritganda, avvalo, uning ishga mas’uliyat bilan yondashayotgani, boshqaruv salohiyati va albatta, madaniy qiyofasi xususida so‘z boradi. Zotan, insoniy fazilatlarga ega bo‘lish har bir rahbarning ziynatidir. Rahbarning ichki dunyosi, hayotiy tamoyillari jamiyat siyosiy hayotiga bevosita ta’sir ko‘rsatishi mumkinligi tarixdan ma’lum. Uning xulq-atvori, yurish-turishi, kayfiyatiga qarab, halqimiz azal-azaldan o‘zi yashayotgan jamiyat haqida xulosa chiqargan, uni qo‘llab-quvvatlagan yoki aksincha, o‘z noroziligini bildirgan. Xalqimizga xos bu xususiyatni e’tiborga olmagan rahbar-xodim, bilib-bilmay, ichki tahdid omilini yuzaga keltirishi mumkin.

Yurtimizda olib borilayotgan tadrijiy islohotlar jarayonida ayrim rahbarlarning o‘z hayotiy pozitsiyasiga ega emasligi tufayli islohotlarga munosabati va mas’uliyatida xato-kamchiliklar ko‘zga tashlanmoqda. Chindan ham, islohotlar jarayonining boshida o‘zi turmagan, iroda va matonat bilan ko‘zlangan maqsad sari boshqalarni ortidan ergashtira olmagan odamni rahbarlik lavozimiga munosib deyish mumkinmi? Shu bois kishilar ongi va ruhiyatidagi eski aqidalardan qutulib, yangicha mafkura shakllanayotgan hozirgi davrda bilimdon, Vatanga sadoqatli, fidoyi rahbarlar zahirasini tashkil qilish, ularning jamiyat hayotini isloh etishda faol ishtirokini ta’minlash uchun zarur shart-sharoit yaratish muhim ahamiyat kasb etadi.

Boshqaruv potensiali – rahbarning o‘z imkoniyatlarini doimo yangilab, boyitib borishidir. Rahbarning ta’lim olishi, o‘z malakasini oshirishga intilishi, o‘z intilish darajasini o‘stirib borishi uning akmeologik jihatdan yetukligini ifodalaydi va professionalizm darajasida turganligini bildiradi. Shunday hollarni ham kuzatish mumkinki, rahbar, yangi tashkilotga kelar ekan, dastlabki vaqtda, shijoat va ma’suliyat bilan kirishgan harakati asta-sekin so‘nib boradi, talabchanligi kamayib, avvalgi shijoat va g‘ayrat pastga qarab ketadi. Yangi vaziyat va sharoit insondan doimo o‘z potensialining yuksak bosqichida turishni, yuksak shijoat va g‘ayratni uyg‘otadi. Rahbar mahoratining professionalizm darajasiga ko‘tarilgan holati ko‘pincha yangi va notanish vaziyat bilan chaqiriladi. Yangi va noma’lum vaziyatda organizm potensialining mobilizatsiyalashuvi biologik qonuniyatlarga asoslanadi. Aynan shu sababli, kundalik hayotiga yangi mazmun kiritib boradigan rahbar doimo cho‘qqilarga intiladi, mahoratning yanada yuksakroq pog‘onalariga ko‘tarilmoqchi bo‘ladi. Demak, rahbarning, o‘z-o‘zini tahlil qilish orqali mukammallikka intilishi muhim ko‘rsatkichlardan biridir.

Davlat tomonidan ishlab chiqiladigan, juda katta umidlar bilan qaraladigan megaloyihalar barbod bo‘lishining asosiy sababi ham aynan rahbar kadrlarni tanlash va ular bajara olmaydigan vazifalarni yuklashdir. Afsuski, uchinchi darajali kadrlarga birinchi darajadagi vazifalar, birinchi darajadagi kadrlarga esa uchinchi darajadagi vazifalar yuklanmoqda. Bu masalalarni chuqur o‘rganmasak, tahlil qilmasak va xatolarni tuzatmasak, dunyoning qoloq davlatlari safida o‘rnimiz “mustahkamlanib” boraveradi. Demak, rahbarlarda boshqaruv salohiyatini rivojlantirish, donolar ta’biri bilan aytganda, “o‘zida bor” mukammal kadrlarni avvalo, yetishtirish va ma’lum bir sinovlardan so‘nggina, mas’uliyatli lavozimlarga tayinlash masalasi davlatimizning strategik vazifasidir [3]. To‘g‘ri, kadr tanlash masalasi juda murakkab jarayon va ulkan mas’uliyat. Lekin murakkabligi yoki qiyinligi uchun salohiyatli kadrlarni tanlash borasida xatolarga yo‘l qo‘yish – bu millat va xalq uchun halokat hamdir.

So‘nggi yillarda O‘zbekistonning dunyo bilan integratsiyalashuvi va o‘z taraqqiyotida turli xalqaro reytinglarni hamda inson resurslarini rivojlantirish indikatorlarini joriy qilayotganligi e’tirofga loyiq masala. Lekin bunda raqamlarga emas, ushbu faoliyatni bevosita aks ettiradigan natijaga e’tiborni qaratish muhim. Rahbarlarning nafaqat saviyasi, balki ishonib topshirilgan tarmoq yoki sohada yangilik qila olish salohiyati, tarmoqni rivojlantira olish qobiliyati, muammolarni hal qila olish borasidagi qisqa muddatli, o‘rta muddatli va uzoq muddatli strategik rejalar belgilashi va uni amalga oshira olishi asosiy mezon bo‘lmog‘i kerak.

Professional rahbar kadrlarni, salohiyatli boshqaruvchilarni tayyorlash va tanlash, ularni o‘z o‘rniga qo‘ya olish jarayoni mamlakat hayotining eng dolzarb masalasi ekan, bu borada doimiy o‘zgarishlar, doimiy yangiliklar va takomillashuv bo‘lishi kerak. Rahbar kadrlarni tanlashning eng oliy mezonlari, lavozimga tayinlashning tajribadan o‘tgan sinovlari qo‘llanilishigina bu borada strategik burilishni, sakrashni ta’minlash mumkin. Ma’lumki, bugungi kun rahbar kadrlarini lavozimlarga tayinlashdan oldin maxsus tizimni, metodologiyani ishlab chiqish va joriy qilish, har qanday tashkilotning yoki tarmoqning faoliyat yo‘nalishiga mos kadrlarni topish, ularning ishchanlik, tashkilotchilik, ma’naviy sifatlarini sinovdan o‘tkazish, ularning qaysi sohaga layoqati mavjud ekanligiga qarab lavozimga tayinlash masalalarini chuqur o‘rganish talab etiladi. Rahbar kadrlarni tanlashning metodologiyasiga esa rahbarning sifatlarini hisobga olish, ya’ni sohani hamda qo‘l ostidagi xodimlarini rivojlantirishi, o‘zining ustida doimiy ishlashi, ijtimoiy-ma’naviy muhitdan xabardorlik singari xususiyatlarni albatta kiritish lozim. Bugungi kun davlat va jamiyat boshqaruvi sohasida faqatgina buyruqni bajaradigan robot mexanizm kadrlardan voz kechib, mustaqil fikrlaydigan, masalaning echimi bo‘yicha puxta va aniq qarorlar qabul qiladigan, ularning ijrosini ta’minlay oladigan kadrlar kerakligini tushunib yetish lozim.

Bu muammolarni hal qilish uchun rahbar kadrlarda avvalo, ish jarayonini tashkil qilish, nostandart qarorlar qabul qilish, turli an’anaviy uslublardan voz kechib, kreativ ishlash mexanizmlarini, ko‘nikmalarini amaliy shakllantirish masalalariga e’tibor qaratish kerak. Eng muhimi, ularning ma’lum bir lavozimlarga tayinlangandan so‘ng, olgan bilimlarini nechog‘li qo‘llayotganligini monitoring yoki tahlil qilishdir. Chunki, zamonaviy bilimlarni olgan kadrlar ko‘pincha o‘z ish idorasiga qaytib borishi bilan yana o‘sha eski byurokratik ish tizimiga asoslangan uslubda davom ettirishga majbur bo‘ladi.

Shuning uchun ham masalaning yana bir muhim jihatini, ya'ni ularga faqatgina zamonaviy va kreativ ish uslubinigina emas, balki o'sha byurokratik ish tizimini o'zgartirish strategiyasini o'rgatishdir.

Bugungi kunda rahbar kadrlar faoliyatida kuzatiladigan eng katta va murakkab muammolardan biri – bu o'z tashkiloti va tarmog'i uchun kadr tanlay olish va ularni boshqarish layoqatining yetishmasligidir. Bu borada afsuski, rahbarlarda HR (inson resurslarini rivojlantirish) borasidagi bilimlarning pastligi saqlanib qolmoqda. Inson huquqlariga zid ravishda, shuningdek, inson resurslari mamlakatning milliy boyligiga aylanishi sharoitida tashkilotga kelgan yangi rahbar tomonidan oldindan ishlaydigan xodimlarga nisbatan "butunlay tozalash" operatsiyasiga moyillikning mavjudligi [4] va bu jamiyatda katta noroziliklarga sabab bo'lishini esa ming afsuski, ko'plab rahbar anglab yetmagan va bunday nomaqbul ishlarni amalga oshirmoqdalar.

"Bugun rahbar bo'lish og'ir, shu bilan birga, sharafli mas'uliyat. Demokratik jamiyatda davlat boshqaruvida xalq rahbarlarni, rahbarlar xalqni qo'llab-quvvatlamas ekan, asl maqsad, mamlakat tinchligi, xalq farovonligi, ertangi kunga ishonch bilan yashashga erishish muammoligicha qolaveradi. Tahlikali, atrofdagi mamlakatlarda sodir bo'layotgan murakkab, notinch holatlarni ko'rib turgan davrimizda rahbarlikni oqilona, mohirona olib borish masalasi juda dolzarb bo'lib qolmoqda" [5, 36-son]. Yana muhim muammolar ichida rahbar kadrlarning himoyasi, huquqlari, manfaati, mavqei, mas'uliyati va burchi kabilar alohida va muhim ahamiyatga ega mavzudir. "Shu o'rinda savol tug'iladi: bugungi kunning, Yangi O'zbekistonning rahbar kadrlari qanday sifatlarga ega bo'lishi kerak? Javob u qadar murakkab emas. Prezidentimiz chorlovi bilan aytganda, bugun rahbarlar o'zini qiynashi kerak. Chunki jamiyat xavfsizligini ta'minlash vazifasi barcha rahbarlarning burchidir" [6, 36-son].

Demak, sodiq, mas'uliyatli, xalq manfaati va tinchligini, farovonligini o'ylaydigan, uning g'amini eydigan, ishning ko'zini biladigan, zamonaviy fikrlash va ishlash qobiliyatiga ega, munosib rahbarlarni topish, tarbiyalash, mas'ul lavozimlarga tayinlash, faoliyatini doimiy monitoring qilish singari vazifalarni davlat siyosatining strategik vazifasi sifatida belgilab olinsa, oldinga qo'yilgan maqsadlarimizga erishamiz. Chunki, zamonning o'zi, bizni taraqqiyot yo'lida yo'qotilgan vaqt o'rnini to'ldirishga, xalqimizning dardu-tashvishlarini bartaraf qilishga, ertangi kunning munosib avlodlarini tayyorlashga va ular oldida mas'uliyatni yanada chuqur his qilishga undamoqda.

XULOSA

Tadqiqot natijalari davlat boshqaruvidagi ijtimoiy-ma'naviy barqarorlikni ta'minlashda rahbar kadrlarning axloqiy mas'uliyati strategik ahamiyatga ega ekanini ko'rsatdi. Axloqiy mas'uliyatni faqat rahbarning shaxsiy fazilati sifatida emas, balki davlat boshqaruvining samaradorligi, jamoat ishonchi va ijtimoiy barqarorlikni ta'minlovchi muhim ijtimoiy-institutsional omil sifatida baholash maqsadga muvofiq. Rahbar kadrning kasbiy salohiyati va axloqiy mas'uliyati o'zaro uyg'un bo'lgandagina boshqaruv qarorlarining ijtimoiy samaradorligi ta'minlanadi. Shuning uchun rahbarlarni tanlash va tayyorlashda kasbiy bilim bilan bir qatorda axloqiy ong, adolatparvarlik, halollik, mas'uliyat, inson qadriga hurmat va jamoat manfaatlariga sadoqat kabi mezonlarni kuchaytirish zarur. Shuningdek, rahbar kadrlar axloqiy mas'uliyatini rivojlantirishni faqat ma'naviy-ma'rifiy tadbirlar bilan cheklab qo'ymasdan, uni kadrlar siyosati, xizmat etikasi, rahbarlar faoliyatini baholash, ochiqlik va hisobdorlik mexanizmlari bilan uzviy bog'lash lozim.

Eng muhimi, davlat boshqaruvida axloqiy mas'uliyatning yuksalishi jamiyatda adolat, ishonch va ijtimoiy hamjihatlik muhitini mustahkamlashga xizmat qiladi. Shu ma'noda, rahbar kadrlar axloqiy mas'uliyatini rivojlantirish davlat boshqaruvining ichki ma'naviy resursi va ijtimoiy-ma'naviy barqarorlikning muhim sharti sifatida namoyon bo'ladi.

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AXLOQIY KAPITALNING BOSHQA KAPITAL TURLARI BILAN O‘ZARO ALOQADORLIGI

Sultanova Aziza Rixsivaevna
Toshkent davlat iqtisodiyot universiteti mustaqil izlanuvchi

Annotatsiya: *Maqolada axloqiy kapitalning zamonaviy jamiyat taraqqiyotidagi ijtimoiy-falsafiy mohiyati hamda uning iqtisodiy, ijtimoiy va madaniy kapital bilan dialektik aloqadorligi tahlil qilinadi. Axloqiy kapitalning ishonch, halollik, adolat, mas’uliyat va hamkorlikni shakllantiruvchi aksiologik resurs sifatidagi xususiyatlari asoslanadi. Kapital shakllarining o‘zaro konvertatsiyasi, axloqiy kapitalning integrativ, regulyativ va legitimlashtiruvchi funksiyalari ochib beriladi. Shuningdek, uning iqtisodiy samaradorlik, ijtimoiy barqarorlik va madaniy qadriyatlarni uyg‘unlashtirishdagi o‘rni aniqlanib, barqaror jamiyat taraqqiyotini ta’minlovchi strategik nomoddiy resurs ekanligi ilmiy jihatdan asoslanadi.*

Kalit so‘zlar: *axloqiy kapital, iqtisodiy kapital, ijtimoiy kapital, madaniy kapital, ishonch, halollik, adolat, mas’uliyat, qadriyat, hamkorlik, aksiologiya, konvertatsiya, taraqqiyot.*

ВЗАИМОСВЯЗЬ ЭТИЧЕСКОГО КАПИТАЛА С ДРУГИМИ ВИДАМИ КАПИТАЛА

Аннотация: *В статье анализируется социально-философская сущность нравственного капитала в развитии современного общества и его диалектическая связь с экономическим, социальным и культурным капиталом. Обоснованы характеристики нравственного капитала как аксиологического ресурса, формирующего доверие, честность, справедливость, ответственность и сотрудничество. Раскрываются взаимная конверсия форм капитала, интегративные, регулятивные и легитимизирующие функции нравственного капитала. Также определена его роль в гармонизации экономической эффективности, социальной стабильности и культурных ценностей, научно обосновано, что он является стратегическим нематериальным ресурсом, обеспечивающим устойчивое развитие общества.*

Ключевые слова: *нравственный капитал, экономический капитал, социальный капитал, культурный капитал, доверие, честность, справедливость, ответственность, ценность, сотрудничество, аксиология, конвертация, развитие.*

THE INTERRELATIONSHIP OF ETHICAL CAPITAL WITH OTHER TYPES OF CAPITAL

Abstract: *The article analyzes the socio-philosophical essence of moral capital in the development of modern society and its dialectical connection with economic, social, and cultural capital. The characteristics of moral capital as an axiological resource that forms trust, honesty, justice, responsibility, and cooperation are substantiated. Mutual conversion of forms of capital, integrative, regulatory and legitimating functions of moral capital are revealed. Furthermore, its role in harmonizing economic efficiency, social stability, and cultural values has been identified, and it is scientifically substantiated that it is a strategic intangible resource that ensures the development of a sustainable society.*

Keywords: *moral capital, economic capital, social capital, cultural capital, trust, honesty, justice, responsibility, value, cooperation, axiology, conversion, development.*

Zamonaviy jamiyat taraqqiyotini faqat moddiy resurslar, ishlab chiqarish imkoniyatlari yoki iqtisodiy o‘sish ko‘rsatkichlari orqali tushuntirish yetarli emas. Globallashuv, raqamlashtirish, ijtimoiy munosabatlarning murakkablashuvi va inson omilining ahamiyati oshib borayotgan bir sharoitda jamiyatning taraqqiyot salohiyati uning tasarrufidagi nomoddiy resurslar – bilim, madaniyat, ijtimoiy aloqalar, ishonch, qadriyatlar, axloqiy me’yorlar va mas’uliyat bilan ham belgilanadi. Shu ma’noda, zamonaviy ijtimoiy-falsafiy tafakkurda “kapital” tushunchasining mazmuni an’anaviy iqtisodiy doiradan chiqib, inson va jamiyatning turli nomoddiy resurslarini ifodalovchi keng metodologik kategoriyaga aylanib bormoqda.

XX–XXI asrlar chegarasida iqtisodiy kapital bilan bir qatorda inson kapitali, ijtimoiy kapital, madaniy kapital, intellektual kapital, ramziy kapital singari tushunchalarning faol ilmiy muomalaga kirishi aynan mazkur metodologik o‘zgarishning ifodasidir. Ijtimoiy kapital bo‘yicha zamonaviy tadqiqotlarda mazkur kategoriya ijtimoiy tarmoqlar, ishonch, o‘zaro yordam va umumiy maqsadlarga erishishni ta’minlovchi munosabatlar resursi sifatida izohlanadi. 2000-yildayoq S. Baron, J. Field va T. Schuller tahriri ostidagi fundamental tadqiqotda ijtimoiy kapital ijtimoiy tarmoqlar, o‘zaro

munosabatlar va ular orqali yuzaga keladigan umumiy manfaatlarni amalga oshirish imkoniyatlari bilan bog‘langan edi [1]. Zamonaviy tadqiqotlar ham ijtimoiy kapitalni yagona, qat’iy chegaralangan tushuncha sifatida emas, balki munosabatlar, ishonch va hamkorlikni birlashtiruvchi ko‘p o‘lchovli fenomen sifatida baholamoqda. Bunday nazariy evolyutsiya “axloqiy kapital” tushunchasining shakllanishi uchun ham metodologik sharoit yaratdi. Chunki agar bilim inson faoliyatida resurs sifatida namoyon bo‘lsa, ijtimoiy aloqalar maqsadga erishish vositasiga aylansa, madaniy kompetensiyalar shaxsning ijtimoiy mavqei va imkoniyatlarini belgilasa, shunga o‘xshash tarzda halollik, adolat, mas’uliyat, vijdonlilik, ishonchlilik, burchga sadoqat va umumiy manfaatni e’tirof etish singari axloqiy sifatlar ham shaxs va jamiyat uchun ma’lum ijtimoiy natijalarni yuzaga keltiruvchi resurs sifatida namoyon bo‘lishi mumkin.

J. Kane 2001-yilda nashr etilgan “The Politics of Moral Capital” asarida “moral capital” tushunchasini nazariy jihatdan tizimlashtirib, ijobiy axloqiy baho siyosiy subyektlar va institutlar uchun legitimlik, qo‘llab-quvvatlash va safarbarlik imkoniyatlarini yuzaga keltiradigan resurs ekanligini asoslaydi [2]. Kane konsepsiyasining muhim jihati shundaki, axloq shaxsning ichki fazilati doirasidan chiqarilib, uning ijtimoiy natija tug‘dirish xususiyati ko‘rsatib beriladi. Axloqiy obro‘ to‘planishi, saqlanishi va ayrim xatti-harakatlar natijasida kamayishi mumkinligi “kapital” metaforasining axloq sohasida qo‘llanishi uchun nazariy asos yaratadi. Keyinchalik X. Wang axloqiy kapital tushunchasini iqtisodiy faoliyat bilan bog‘lab yanada kengaytirdi. Uning konsepsiyasida axloq va iqtisod, axloq va foyda o‘rtasidagi munosabat qarama-qarshi emas, balki muayyan sharoitlarda o‘zaro bir-birini kuchaytiruvchi jarayonlar sifatida izohlanadi. Axloqiy kapital iqtisodiy faoliyatda qiymat yaratishi, iqtisodiy subyektning barqaror hamkorlik imkoniyatini oshirishi va uzoq muddatli manfaat uchun sharoit yaratishi mumkin [3]. Shundan kelib chiqib, “axloqiy kapitalni shaxs, ijtimoiy guruh yoki jamiyat tomonidan o‘zlashtirilgan va amaliy xulq-atvorda barqaror namoyon bo‘ladigan, o‘zaro ishonch, mas’uliyat, adolat, halollik va hamkorlikni yuzaga keltirish orqali individual hamda umumijtimoiy maqsadlarga erishish imkoniyatini kengaytiruvchi aksiologik-ma’naviy resurs sifatida ta’riflash mumkin”. Bunday yondashuv axloqiy kapitalning iqtisodiy, ijtimoiy va madaniy kapitaldan mutlaq ajralgan holda mavjud bo‘lmasligini, aksincha, ular o‘rtasidagi murakkab dialektik aloqadorlik orqali shakllanishini ko‘rsatadi. Bu o‘rinda axloqiy va iqtisodiy kapitalning dialektik munosabati masalasini o‘rganish lozim bo‘ladi. Kapitalning klassik iqtisodiy mazmunida u yangi qiymat yaratish imkoniyatiga ega bo‘lgan iqtisodiy resursni anglatadi. Biroq jamiyat taraqqiyotining zamonaviy bosqichi iqtisodiy samaradorlik faqat moddiy resurslar miqdori bilan emas, balki iqtisodiy munosabatlarning qanday axloqiy me’yorlar asosida tashkil etilishi bilan ham bog‘liq ekanligini ko‘rsatmoqda. Ishonch, shartnomalarga rioya qilish, mas’uliyat, halollik va adolat iqtisodiy faoliyatning tashqi bezagi emas, balki uning barqaror ishlashiga ta’sir qiluvchi ijtimoiy omillardir.

P. Bourdieu iqtisodiy, madaniy va ijtimoiy resurslarning jamiyatdagi o‘zaro aylanishi masalasini nazariy jihatdan yoritgan olimlardan hisoblanadi. Uning keyingi davrda qayta nashr etilgan va rivojlantirilgan konsepsiyalarida iqtisodiy munosabatlar sof iqtisodiy mantiq doirasida mavjud emasligi, ular ijtimoiy maydonlar, hokimiyat, madaniy dispozitsiyalar va boshqa kapital shakllari bilan bog‘liqligi ko‘rsatiladi. Bourdieu iqtisodiyotning o‘zini ham ijtimoiy tuzilmalarga singdirilgan hodisa sifatida tahlil qilgan [4]. Axloqiy kapital nuqtayi nazaridan mazkur fikr yanada keng ma’no kasb etadi.

Jahon bankining 2015-yilgi “World Development Report: Mind, Society, and Behavior” hisobotida ham inson xatti-harakatlarini faqat iqtisodiy manfaat bilan tushuntirish yetarli emasligi, qarorlar jamiyatdagi normalar, ijtimoiy tasavvurlar va jamoaviy xulq modellari ta’sirida shakllanishi qayd etiladi [5]. Ijtimoiy normalar odamlarning nima qilishlari va nima qilishlari lozimligi haqidagi umumiy tasavvurlar sifatida norasmiy boshqaruv mexanizmi vazifasini bajarishi alohida ko‘rsatilgan. Shu sababli iqtisodiy kapitalning samarali ishlashi ma’lum darajada axloqiy kapital zaxirasiga bog‘liq. Halol tadbirkor, mas’uliyatli ish beruvchi, o‘z majburiyatiga sodiq xodim va iste’molchiga nisbatan adolat tamoyiliga amal qiluvchi korxona bozordagi faoliyatida nafaqat iqtisodiy, balki axloqiy obro‘ ham to‘playdi. Bunday obro‘ vaqt o‘tishi bilan iqtisodiy natijaga – barqaror mijozlar, hamkorlarning ishonchi, reputatsiya va institutsional barqarorlikka aylanishi mumkin. Bu o‘rinda axloqiy kapitalning iqtisodiy kapitalga “konvertatsiyasi” yuz beradi. Lekin jarayon bir yo‘nalishli emas. Iqtisodiy kapital ham axloqiy kapital rivojlanishi uchun muayyan obyektiv shart-sharoitlarni yaratadi. Yetarli iqtisodiy resurslar oilaning farzand tarbiyasi va ta’limiga investitsiya kiritish imkoniyatini oshiradi, davlatning ta’lim, madaniyat, fuqarolik institutlari va ijtimoiy himoyaga mablag‘ yo‘naltirish salohiyatini kengaytiradi.

E. Dal Bó va hammualliflarning iqtisodiy xulq doirasidagi tadqiqotida “moral capital” shaxsning yaxshilik qilishga nisbatan ichki dispozitsiyasi va o‘z xatti-harakatlariga axloqiy baho berishi bilan bog‘lanadi. Mualliflar yaxshi xatti-harakatlar axloqiy kapitalni mustahkamlashi, noto‘g‘ri xatti-harakatlar esa uni yemirishi mumkinligini modellashtirganlar [6]. Bu yondashuv axloqiy kapitalning iqtisodiy xulqda ham jamg‘ariluvchi yoki kamayuvchi resurs sifatida namoyon bo‘lishini ko‘rsatadi. Shunday qilib, iqtisodiy va axloqiy kapital o‘rtasidagi bog‘lanishni quyidagi dialektik munosabatda ifodalash mumkin: “Axloqiy me’yor → ishonch → iqtisodiy hamkorlik → iqtisodiy samaradorlik → ijtimoiy farovonlik → axloqiy kapitalni qayta ishlab chiqarish uchun imkoniyat.” Mazkur zanjirning biror bo‘g‘inida axloqiy me’yorlar zaiflashsa, kapitalning iqtisodiy ko‘payishi har doim ham umumijtimoiy taraqqiyotga aylanmaydi.

Endi axloqiy kapital va ijtimoiy kapitalning o‘zaro aloqadorligini ko‘rib chiqamiz. Axloqiy kapitalning eng yaqin kategoriyalaridan biri ijtimoiy kapital hisoblanadi. R. Putnam ijtimoiy kapitalni jamoaviy faoliyatni muvofiqlashtirish

imkonini beruvchi ijtimoiy aloqalar, normalar va ishonch bilan bog‘laydi. Uning “Bowling Alone” asari XX asr oxiri va XXI asr boshidagi ijtimoiy kapital konsepsiyasining eng ta’sirchan nazariy manbalaridan biriga aylandi [7]. Keyingi ilmiy adabiyotlarda ham Putnamning ishonch, o‘zaro yordam va fuqarolik ishtiroki haqidagi yondashuvi ijtimoiy kapital tadqiqotlarining asosiy nazariy yo‘nalishlaridan biri sifatida davom etmoqda.

Bu o‘rinda axloqiy va madaniy kapitalning aksiologik munosabatini o‘rganish tadqiqot ishimiz uchun muhim. Axloqiy kapitalning shakllanishida madaniy kapital alohida ahamiyatga ega. Madaniy kapital shaxsning bilimlari, kompetensiyalari, didi, madaniy amaliyotlari, til va ramziy kodlarni o‘zlashtirish darajasi orqali uning jamiyatdagi faoliyat imkoniyatlariga ta’sir qiladi. Bourdieu merosiga bag‘ishlangan zamonaviy tadqiqotlar uning kapital konsepsiyalari ichida aynan madaniy kapital eng ko‘p qo‘llanadigan kategoriyalardan biri bo‘lib qolayotganini ko‘rsatadi [8]. Madaniyat shaxsga nafaqat bilim, balki “nima yaxshi?”, “nima yomon?”, “nimani qadrlash kerak?”, “boshqalarga nisbatan qanday munosabatda bo‘lish lozim?” degan fundamental aksiologik mezonlarni ham yetkazadi. Oila, ta’lim, adabiyot, san’at, din, mahalla, ommaviy kommunikatsiya va tarixiy xotira orqali avloddan-avlodga o‘tadigan mazkur me’yorlar shaxsning axloqiy dispozitsiyalarini shakllantiradi.

D.C. Rose madaniyatning jamiyatdagi rolini tahlil qilar ekan, axloqiy e’tiqodlar va madaniy uzatish mexanizmlari individual manfaatni umumiy manfaat bilan muvofiqlashtirishga xizmat qilishini ko‘rsatadi [9]. Bu holat madaniy kapitalning axloqiy kapital shakllanishidagi generativ ahamiyatini ochib beradi. Bu jarayonni quyidagi mantiqiy zanjir orqali ifodalash mumkin: “madaniy meros → qadriyat → axloqiy me’yor → ichki e’tiqod → xulq-atvor → axloqiy kapital”. Madaniy kapital shaxsga axloqiy xatti-harakat uchun ma’naviy material va ramziy mezonlar beradi. Ammo madaniy kapital ham axloqiy kapital bilan aynan bir hodisa emas. Oila doirasida axloqiy kapitalning avlodlararo uzatilishiga bag‘ishlangan tadqiqotlarda ham chuqur qaror topgan ijtimoiy normalarning avloddan-avlodga o‘tishi va mas’uliyat hissini shakllantirishi “moral capital” konsepsiyasi orqali tushuntiriladi [10]. Mazkur holatdan muhim ijtimoiy-falsafiy xulosa kelib chiqadi: “axloqiy kapital biologik yoki individual tarzda tayyor holda mavjud bo‘lmaydi; u madaniy tajribaning axloqiy o‘zlashtirilishi jarayonida ijtimoiy ravishda ishlab chiqariladi.

Kapital shakllarining o‘zaro konvertatsiyasi va axloqiy kapitalning o‘rni mavzusi bugungi tadqiqotchilarni mushohadaga chorlaydi. Kapital shakllarining alohida-alohida mavjudligi haqidagi qarash ularning jamiyatdagi real harakatini to‘liq tushuntira olmaydi. Iqtisodiy, madaniy, ijtimoiy va axloqiy kapital muntazam ravishda bir-biriga ta’sir etadi hamda muayyan sharoitlarda boshqa kapital turining o‘sishi yoki kamayishiga olib keladi. Masalan:

iqtisodiy kapital → ta’lim imkoniyatlari → madaniy kapital;

madaniy kapital → qadriyat va me’yorlar → axloqiy kapital;

axloqiy kapital → ishonch va hamkorlik → ijtimoiy kapital;

ijtimoiy kapital → samarali hamkorlik → iqtisodiy kapital.

Bunda jarayon yopiq va mexanik aylanishdan iborat emas. Har bir bosqichda institutsional muhit, tarixiy tajriba, siyosiy boshqaruv, tenglik darajasi va jamiyatdagi ustuvor qadriyatlar konvertatsiya yo‘nalishiga ta’sir qiladi.

2024-yilda P. Bartosch va hammualliflar tomonidan sog‘liqni saqlash tizimlari misolida olib borilgan tadqiqotda axloqiy kapital normalar, qadriyatlar va fazilatlarga nisbatan kutilmalar shaklida almashinadigan resurs sifatida talqin qilinib, u Bourdieuning ramziy va madaniy kapital nazariyalari bilan bog‘langan [11]. 2021-yilgi boshqa bir tadqiqotda ham tashkilot doirasidagi axloqiy kapital yig‘ilishi, sarflanishi va almashinishi mumkin bo‘lgan resurs sifatida talqin etilgan [12]. Bu tadqiqotlar “kapital” tushunchasini axloq sohasida qo‘llash oddiy metafora emasligini ko‘rsatadi. Axloqiy sifatlar ijtimoiy munosabatlarda tan olinib, ishonch yoki legitimlik kabi ijtimoiy natijalarga aylangandagina axloqiy kapital funksiyasini bajaradi. J. Kane tomonidan siyosiy institutlarga nisbatan ishlab chiqilgan moral kapital konsepsiyasida aynan legitimlik muhim o‘rin egallaydi. Uning fikriy modeli axloqiy kapitalning siyosiy subyektlar tomonidan to‘planishi va yo‘qotilishi mumkinligini ko‘rsatadi [13]. Mazkur holatni jamiyatning boshqa sohalariga ham tatbiq etish mumkin. Oila ota-onaning axloqiy namunasiga nisbatan ishonchni yo‘qotsa, tarbiyaviy ta’sir zaiflashadi. Ta’lim muassasasida adolat va xolislik buzilsa, uning axloqiy nufuzi kamayadi.

OECDning ishonchga oid tadqiqotlari ham institutsional va interpersonal ishonchni jamiyat farovonligining muhim tarkibiy qismlaridan biri sifatida ko‘rsatmoqda [8]. 2025-yilda e’lon qilingan OECD tadqiqotlarida ham ijtimoiy aloqalar va ularni qo‘llab-quvvatlovchi infratuzilmalar jamiyat farovonligi bilan bog‘liq holda tahlil qilinmoqda [14]. Endi axloqiy kapitalning boshqa kapital turlari bilan o‘zaro ta’sirining konseptual modelini shakllantirish kerak bo‘ladi. Yuqoridagi nazariy tahlillarga asoslangan holda, axloqiy kapitalning boshqa kapital turlari bilan aloqadorligini quyidagi mualliflik modeli orqali tushuntirish mumkin:

Shu o‘rinda axloqiy kapital va jamiyat taraqqiyotining o‘zaro bog‘liqligini taqqoslash lozim bo‘ladi. Jamiyat taraqqiyotining mohiyati faqat iqtisodiy imkoniyatlarning kengayishi bilan chegaralanmaydi. Agar iqtisodiy o‘sish ishonch inqirozi, ijtimoiy begonalashuv, qadriyatlarning yemirilishi va institutlarning axloqiy legitimligi pasayishi bilan birga kechsa, bunday jarayonni to‘laqonli ijtimoiy taraqqiyot deb baholash qiyin. 2023-yilda M. Mladjan tomonidan axloqiy kapitalning iqtisodiy va siyosiy transformatsiyalar bilan bog‘liqligi tahlil qilinib, uning jamiyatning iqtisodiy hamda

noiqtisodiy farovonligi uchun ahamiyatli resurs ekanligi, keskin transformatsiyalar davrida esa u yemirilishi mumkinligi ko‘rsatilgan [15]. 2025-yilda ijtimoiy kapitalga bag‘ishlangan yangi nazariy sharhda ham tushunchani tarmoqlar bilangina cheklamasdan, resurslar va munosabatlar o‘rtasidagi integratsiyalashgan bog‘liqlik sifatida qayta konseptuallashtirishga intilish kuzatilmoqda [16]. Bu holat kapital shakllarini bir-biridan uzilgan kategoriyalar sifatida emas, balki o‘zaro ta’sirlanuvchi tizim sifatida tadqiq etish zaruratini yanada kuchaytiradi. Shu nuqtayi nazardan, jamiyat taraqqiyoti uchun kapitalning miqdori bilan birga uning axloqiy sifati ham muhimdir. Iqtisodiy resursning qanday yo‘l bilan qo‘lga kiritilgani, ijtimoiy tarmoqning qanday maqsadga xizmat qilayotgani, madaniy bilimning qanday qadriyatlarga yo‘naltirilgani jamiyat rivojlanishining axloqiy mazmunini belgilaydi. Bundan kelib chiqib, jamiyat taraqqiyotini kapital shakllarining oddiy yig‘indisi emas, balki ularning axloqiy mezonlar asosida o‘zaro muvofiqlashgan harakati sifatida tushunish maqsadga muvofiq.

Yuqoridagi tahlillar asosida bir qator ilmiy xulosalarni ilgari surish mumkin.

Birinchidan, zamonaviy ijtimoiy taraqqiyot sharoitida “kapital” tushunchasi sof iqtisodiy mazmundan chiqib, moddiy va nomoddiy resurslarni qamrab oluvchi fanlararo kategoriyaga aylangan. Shu jihatdan axloqiy kapital ham jamiyatda qiymat, imkoniyat va ijtimoiy samaradorlik yaratadigan nomoddiy resurs sifatida mazkur konseptual taraqqiyotning mantiqiy davomi hisoblanadi.

Ikkinchidan, axloqiy kapital iqtisodiy, ijtimoiy va madaniy kapitaldan mutlaq ajralgan holda mavjud bo‘lmaydi, balki ular bilan o‘zaro ta’sir va konvertatsiya jarayonida shakllanadi. U boshqa kapital shakllarining ijtimoiy mazmuni va samaradorligiga ta’sir ko‘rsatuvchi aksiologik-regulyativ resurs vazifasini bajaradi.

Uchinchidan, axloqiy va ijtimoiy kapital o‘rtasidagi asosiy bog‘lovchi mexanizm ishonchdir. Ijtimoiy kapital ijtimoiy aloqalar, tarmoqlar va hamkorlik imkoniyatlarini ifodalasa, axloqiy kapital ushbu munosabatlarning adolat, halollik, mas’uliyat va o‘zaro hurmat kabi normativ-aksiologik asoslarini belgilaydi.

Demak, axloqiy kapitalning jamiyat taraqqiyotidagi ahamiyati uning alohida kapital turi ekanligidangina iborat emas. Uning fundamental ijtimoiy-falsafiy mohiyati boshqa kapital shakllariga axloqiy mazmun va ijtimoiy yo‘nalish berish, ular o‘rtasidagi o‘zaro konvertatsiyani tartibga solish hamda iqtisodiy o‘sishni insonparvar va barqaror ijtimoiy taraqqiyotga aylantirish imkoniyatida namoyon bo‘ladi. Aynan shu jihat axloqiy kapitalni jamiyat taraqqiyotini tushuntiruvchi mustaqil ijtimoiy-falsafiy kategoriya sifatida tadqiq etish uchun konseptual asos yaratadi.

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OILAVIY MUNOSABATLARDA OTA TARBIYASINING O‘RNI

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Annotatsiya: *Maqolada otaning tarbiyaviy ishtiroki bola bilan muloqot, kundalik mas’uliyat va ota-onaning hamkorligi birligida tahlil qilinadi. Ilmiy manbalarni qiyoslash asosida otalik ishtirokining mavjudlik, muntazamlik va munosabat sifati jihatlari farqlanadi. Oilaviy vaziyatlar uchun pedagogik tavsiyalar va kuzatish mezonlari taklif etiladi. Xulosalar nazariy tahlilga asoslangan bo‘lib, mahalliy oilalar bo‘yicha empirik natija sifatida talqin qilinmaydi.*

Kalit so‘zlar: *oilaviy tarbiya, otalik ishtiroki, ota-ona hamkorligi, hissiy qo‘llab-quvvatlash, mas’uliyat, bola mustaqilligi.*

РОЛЬ ОТЦОВСКОГО ВОСПИТАНИЯ В СЕМЕЙНЫХ ОТНОШЕНИЯХ

Аннотация: *Участие отца в воспитании рассматривается во взаимосвязи общения с ребёнком, повседневной ответственности и сотрудничества родителей. На основе сопоставления научных источников разграничиваются присутствие отца, регулярность его участия и качество отношений. Предлагаются педагогические рекомендации и ориентиры наблюдения. Выводы имеют теоретический характер и не представляют результаты эмпирического исследования местных семей.*

Ключевые слова: *семейное воспитание, участие отца, сотрудничество родителей, эмоциональная поддержка, ответственность, самостоятельность ребёнка.*

THE ROLE OF PATERNAL PARENTING IN FAMILY RELATIONSHIPS

Abstract: *This conceptual article examines paternal parenting through communication, everyday responsibility and coparenting. A comparative reading of research distinguishes a father’s presence, the regularity of his involvement and relationship quality. Practical recommendations and observation criteria are proposed for family education. The conclusions derive from theoretical analysis and do not constitute empirical findings about local families.*

Keywords: *family education, father involvement, coparenting, emotional support, responsibility, child autonomy.*

KIRISH

Otaning tarbiyadagi o‘rni ko‘pincha oilani moddiy ta’minlash, tartib o‘rnatish yoki farzandning kelajak kasbini belgilash bilan izohlanadi. Bu vazifalar oilaviy hayotning muayyan tomonlarini ifodalasa-da, bolaning kundalik tajribasidagi otalik munosabatini to‘liq ochmaydi. Farzand uchun otaning va’dasini bajarishi, savolini jiddiy qabul qilishi, xatoga qanday munosabat bildirishi va boshqa oila a’zolari bilan qanday gaplashishi ham tarbiyaviy mazmun kasb etadi.

Maqolaning maqsadi ota tarbiyasini oiladagi alohida hukmronlik mavqeyi sifatida emas, bolaning rivojlanishiga yo‘naltirilgan munosabat va mas’uliyatlar tizimi sifatida tahlil qilishdir. Asosiy savol quyidagicha qo‘yiladi: otaning ishtiroki qaysi pedagogik shartlarda farzandning mustaqilligi, ishonchi va mas’uliyatini qo‘llab-quvvatlaydi? Muhokama asosan maktab yoshidagi farzandlar tarbiyasiga qaratiladi; turli yosh va oilaviy sharoitlar uchun bir xil talab belgilashdan saqlaniladi.

ADABIYOTLAR TAHLILI

A. Sarkadi va hammualliflarning longitudinal tadqiqotlar sharhida otaning faol, muntazam ishtiroki bilan bolalar rivojlanishining qator ijobiy ko‘rsatkichlari o‘rtasida bog‘liqlik qayd etilgan [1]. Mualliflar ishtirokni birga yashash, bevosita muloqot va mas’uliyat kabi o‘lchovlarda ko‘rib chiqadilar. Sharh xulosasi otaning bola bilan aloqasiga e’tiborni kuchaytiradi, biroq alohida oilada kuzatilgan natijani faqat ota ta’siri bilan tushuntirishga asos bermaydi.

N. Cabrera, H. Fitzgerald, R. Bradley va L. Roggman otalik munosabatlarini bolaning xususiyatlari, ota-onaning tarixi va kengroq ijtimoiy sharoitlar bilan bog‘liq dinamik tizim sifatida talqin qiladilar [2]. Bunda ta’sir bir yo‘nalishli emas: ota bolaga munosabat bildirganidek, bolaning yoshi, ehtiyoji va xulqi ham otaning tutumini o‘zgartiradi. Bu yondashuv oilaviy tarbiyani tayyor fazilatlar ro‘yxatiga qisqartirmaslikka imkon beradi.

M. Feinberg ota-onaning birgalikda tarbiyalash munosabatini vazifalarni bo‘lishish, tarbiya yuzasidan kelishuv, o‘zaro qo‘llab-quvvatlash yoki bir-birining mavqeyini susaytirish hamda oilaviy aloqalarni boshqarish orqali tahlil qiladi [3]. N. Cabrera, B. Volling va R. Barr esa otalarni tarbiya tadqiqotlarida mustaqil ishtirokchi sifatida o‘rganish, birga va alohida yashaydigan otalarning vaziyatlarini farqlash zarurligini ko‘rsatadilar [4].

Ushbu manbalar birgalikda ikki xulosaga olib keladi. Birinchidan, otaning mavjudligi bilan uning tarbiyaviy ishtiroki bir tushuncha emas. Ikkinchidan, bu ishtirokni onaning faoliyatidan va oilaning sharoitidan ajratib baholash yetarli bo‘lmaydi. Maqolada shu nazariy asoslar kundalik oilaviy vaziyatlar uchun pedagogik tavsiyalarga aylantiriladi. Xorijiy manbalardagi bog‘liqliklar O‘zbekiston oilalariga tekshirmasdan ko‘chirilmaydi.

TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-tahliliy xususiyatga ega. Ota ishtiroki va birgalikdagi tarbiyaga bevosita oid to‘rtta ilmiy ish maqsadli tanlanib, tushunchaviy va qiyosiy tahlil qilindi. Bu manbalar majmui tizimli sharhning to‘liq qidiruv protokoliga da’vo qilmaydi. Tahlilda ishtirokning shakli, munosabatning sifati, oila a’zolari o‘rtasidagi kelishuv va kontekstual cheklovlar ajratildi.

Tahlil natijalari asosida pedagogik vaziyatlar modellashtirildi va kuzatish uchun savollar tuzildi. Keltirilgan oilaviy misollar shartli bo‘lib, intervyu yoki kuzatuvdan olingan dalil emas. So‘rovnoma, tajriba va statistik hisob-kitob bajarilmagan. Shuning uchun takliflarning amaliy foydasi kelgusida alohida tekshirilishi lozim; mazkur ish ularni asoslash va chegaralarini belgilash bilan cheklanadi.

TAHLIL VA NATIJALAR

Ota tarbiyasini tavsiflashda uch jihatni farqlash taklif etiladi: bola uchun murojaat qilish imkoniyati, tarbiyaviy ishtirokning muntazamligi va munosabat sifati. Bir uyda yashash birinchi jihatning ham to‘liq kafolati emas: doim band yoki faqat tanbeh beradigan kattaga bola muammosini aytmasligi mumkin. Aksincha, boshqa hududda ishlaydigan ota kelishilgan muloqot va bajariladigan majburiyatlar orqali aloqani saqlashga intilishi mumkin. Bunda masofa va imkoniyatlar baribir hisobga olinadi.

Birinchi pedagogik yo‘nalish — tinglash va hissiy javob qaytarish. Farzand maktabdagi kelishmovchilik haqida gapirganda darhol aybdorni aniqlashga o‘tish suhbatni qisqartirishi mumkin. Dastlab nima sodir bo‘lgani, bola vaziyatni qanday tushungani va undan nima kutayotganini aniqlash maqsadga muvofiq. «Seni tushundim» deyishning o‘zi yetarli emas; ota bolaning gapini mazmunan qaytarib, to‘g‘ri tushunganini tekshirishi mumkin. Tinglash xatti-harakatning har qanday ko‘rinishini ma’qullash degani emas.

Ikkinchi yo‘nalish — talabning izchilligi. Qoidaning ma’nosi tushuntirilganda farzand faqat kattadan qo‘rqib emas, xatti-harakat oqibatini anglab qaror qilishga o‘rganishi uchun sharoit yaratiladi. Masalan, uy vazifasi bajarilmaganda bolaning shaxsini kamsitish o‘rniga nima to‘sqinlik qilgani aniqlanadi va keyingi ish rejasi kelishiladi. Ota bolaning o‘rniga topshiriqni bajarib bermaydi, ammo ishni qismlarga ajratishda yordam beradi. Talab va yordam bir-birini to‘ldiradi.

Uchinchi yo‘nalish — kundalik mas’uliyatga qo‘shilish. Farzand bilan suhbatlashish, uning o‘qishidagi qiyinchilikni bilish, uy yumushini birgalikda bajarish va berilgan va’dani eslab qolish tarbiyaning oddiy, ammo kuzatiladigan ko‘rinishlaridir. Bu ishlar faqat onaning eslatmasidan keyin bajarilsa, rejalashtirish yuki baribir bir kishida qoladi. Ota o‘z zimmasidagi vazifani belgilash, bajarish va natijasini kuzatishning butun jarayonida ishtirok etishi maqsadga muvofiq.

To‘rtinchi yo‘nalish — ota-onaning tarbiyaviy kelishuvi. Bir kattaga ma’qul bo‘lgan qoida ikkinchisi tomonidan bola oldida doim bekor qilinsa, talabning mazmuni noaniqlashadi. Kelishuv barcha fikrlarning bir xil bo‘lishini anglatmaydi. Masalan, telefon ishlatish vaqti yuzasidan turli qarashlar mavjud bo‘lsa, ota-ona avval o‘zaro muhokama qiladi, so‘ng bolaga tushunarli tartibni bayon etadi. Vaziyat o‘zgarsa, qoida ham asosli ravishda qayta ko‘rib chiqiladi.

Beshinchi yo‘nalish — mustaqillikka joy qoldirish. Ota farzandning har bir qarorini oldindan hal qilsa, mas’uliyat haqida ko‘p gapirgan taqdirda ham uni mashq qilish imkoniyati qisqaradi. Yoshiga mos tanlovlar, masalan, vazifalarni bajarish ketma-ketligi yoki bo‘sh vaqt mashg‘ulotini kelishish, qaror va oqibat orasidagi aloqani tushunishga xizmat qilishi mumkin. Xavfsizlik va oilaning real imkoniyatlari bilan bog‘liq chegaralar esa kattalar tomonidan aniq belgilanadi.

Shartli vaziyatni ko‘rib chiqaylik: farzand uyda zimmasiga olgan ishni unutdi. Faqat tanbeh berish suhbatni aybni isbotlashga aylantiradi; kattalarning ishni indamay bajarib qo‘yishi esa majburiyatni noaniq qoldiradi. Pedagogik yechim sifatida kelishuvni eslatish, unutish sababini aniqlash va ishni qachon tugatishni bolaning o‘zi bilan belgilash taklif etiladi. Keyingi safar eslatma vositasi kerakmi, degan savol ham muhokama qilinadi. Bu algoritm universal natija va’da qilmaydi, lekin tarbiyaviy harakatning maqsadini aniq qiladi.

Otaning shaxsiy namunasi faqat mehnatsevarlik yoki qat’iyat bilan cheklanmaydi. Xatosini tan olish, uzr so‘rash, uy mehnatini adolatli taqsimlash va suhbatdoshni bo‘lmasdan tinglash ham tarbiyaviy mazmunga ega. Bunday sifatlarni faqat otaga yoki faqat onaga xos deb belgilash asosli emas. Ota tarbiyasining ahamiyati boshqa tarbiyachilar hissasini kamaytirish orqali emas, uning o‘z mas’uliyatini to‘liq bajarishi orqali ochiladi.

Kuzatish uchun to‘rtta amaliy savol taklif etiladi: bola savol bilan murojaat qila oldimi; kelishilgan vazifa bajarildimi; nizoda bolaning fikri eshitildimi; keyingi qarorda unga yoshiga mos ishtirok berildimi? Javoblar umumiy «yaxshi ota»

bahosi shaklida emas, aniq vaziyat qaydi bilan yoziladi. Masalan, «suhbat yaxshi o‘tdi» o‘rniga «bola voqeani tugatguncha tinglandi va keyingi qadam birga belgilandi» deyiladi. Ushbu savollar diagnostik test yoki oilalarni reytinglash vositasi emas.

Maktabning oilalar bilan ishlashida ham topshiriqlar otaning real imkoniyatiga mos tuzilishi lozim. Faqat kunduzgi yig‘ilishga kelishni faollik belgisi deb olish ish jadvali og‘ir otalarni chetda qoldiradi. Qisqa individual suhbat, kelishilgan vaqtdagi aloqa yoki farzand bilan bajariladigan kichik o‘quv vazifasi muqobil shakl bo‘lishi mumkin. Bunda oilaning shaxsiy hayotini oshkor qilish yoki bolaning otasi haqidagi ma’lumotni sinf oldida solishtirish talab etilmaydi.

Takliflar oila tarkibidagi farqlarga sezgir bo‘lishi kerak. Ota bilan yashamaydigan bolaga nisbatan kamchilik haqidagi tayyor hukm chiqarish noto‘g‘ri. Tarbiyaviy yordam bolaning amaldagi ishonchli kattalari va xavfsiz munosabatlariga tayangan holda tashkil etiladi. Ota bilan aloqani muhokama qilishda uning shunchaki mavjudligi emas, bolaning manfaatiga xizmat qilishi asosiy mezon bo‘lib qoladi. Oilaning daromadi, mehnat sharoiti va qo‘llab-quvvatlash imkoniyatlari ham chetda qoldirilmaydi.

XULOSALAR

Ota tarbiyasining oilaviy munosabatlardagi o‘rni muntazam muloqot, izchil talab, kundalik mas’uliyat va ota-onaning kelishuvi orqali namoyon bo‘ladi. Ota obro‘sini qo‘rquvga tayanadigan nazorat bilan tenglashtirish tarbiyaning muloqot va namuna ko‘rsatish tomonlarini toraytiradi. Taklif etilgan yondashuv otaning ishtirokini aniq kundalik harakatlar orqali tavsiflashga imkon beradi.

Kelgusidagi empirik tadqiqotda otalar bilan suhbat, bolalarning yoshiga mos fikrlari va oilaviy vaziyatlar haqidagi qaydlarni o‘zaro solishtirish maqsadga muvofiq. Ishtirok ixtiyoriyligi va ma’lumotlar maxfiyligi ta’minlanishi kerak. Oila tarkibi, ish jadvali va resurslaridagi farqlar hisobga olingandagina mahalliy sharoitga mos tavsiyalarni aniqlashtirish mumkin.

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YOSHLAR EKOLOGIK MADANIYATI – O‘ZIGA XOS ZAMONAVIY FALSAFIY FENOMEN SIFATIDA

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Annotatsiya: *Ushbu maqolada ekologik madaniyatni yoshlar, hamda jamiyat ijtimoiy hayotida o‘ziga xos doimiy e’tibor talab qiluvchi noyob hodisa ekanligi falsafiy jihatdan olib borilayotgan tadqiqotlar asosida tahlil qilib berilgan. Ko‘plab avvalgi mavjud adabiyotlarni tilga olingan holda keyingi davrda davom ettirilayotgan izlanishlardagi o‘ziga xos yondashuvlarni nazariy jihatdan qiyosan olib tahlil qilishga harakat qilingan. Muallif ekologik madaniyat borasida yoshlar axloqining zaruriy darajadagi tarbiyasi - ijtimoiy taraqqiyotni yuksaltirishning muhim hal qiluvchi yetakchi omillardan biri ekanligiga alohida e’tibor qaratgan.*

Kalit so‘zlar: *fenomen, antropologiya, ekotsentrizm, ekologik etika, ekologik falsafa, ekolofgik madaniyat, maqsadli o‘qitish, ekologik faoliyat, ekologik ehtiyoj, ekologik qadriyat.*

ЭКОЛОГИЧЕСКАЯ КУЛЬТУРА МОЛОДЕЖИ КАК САМОБЫТНЫЙ СОВРЕМЕННЫЙ ФИЛОСОФСКИЙ ФЕНОМЕН

Аннотация: *В данной статье анализируются философские основы исследования экологической культуры как уникального явления в социальной жизни молодежи и общества, требующего постоянного внимания. Опираясь на многочисленные существующие ранее исследования, автор предпринимает попытку теоретического анализа уникальных подходов к исследованию, продолжающемуся в последующий период. Особое внимание уделяется тому факту, что необходимый уровень нравственного воспитания молодежи в области экологической культуры является одним из важных решающих факторов улучшения социального прогресса.*

Ключевые слова: *явление, антропология, экоцентризм, экологическая этика, экологическая философия, экологическая культура, целенаправленное воспитание, экологическая деятельность, экологическая потребность, экологическая ценность.*

YOUTH ENVIRONMENTAL CULTURE AS A DISTINCTIVE MODERN PHILOSOPHICAL PHENOMENON

Abstract: *This article analyzes the philosophical foundations of environmental culture research as a unique phenomenon in the social life of society that requires ongoing attention. Drawing on numerous existing studies, the author undertakes a theoretical analysis of unique approaches to ongoing research. Particular attention is given to the fact that the necessary level of moral education of young people in the area of environmental culture is one of the most important decisive factors in improving social progress.*

Keywords: *phenomenon, anthropology, ecocentrism, environmental ethics, environmental philosophy, environmental culture, purposeful education, environmental activity, environmental need, environmental value.*

KIRISH. Yurtimizda o‘ttiz besh yildan buyon amalga oshirilayotgan islohotlar jamiyatimizni o‘ziga xos yangi rivojlanish bosqichga olib chiqdi. Hozirgi globallashuv va texnologik taraqqiyot sharoitida ekologik muammolar insoniyat oldida turgan eng dolzarb masalalardan biriga aylandi. Iqlim o‘zgarishi, atmosfera havosining ifloslanishi, suv resurslarining kamayishi, biologik xilma-xillikning qisqarishi va chiqindilar muammosi nafaqat tabiiy muhitga, balki jamiyatning ijtimoiy-iqtisodiy barqarorligiga ham jiddiy ta’sir ko‘rsatmoqda [7].

Sog‘lom tafakkurli insonlar olamni yaxlit, bir butun ekanligini anglagan holda, tabiat va jamiyatni bir-biridan ajratib bo‘lmaydigan, tabiiy muhitning bo‘lishligi ijtimoiy muhit mavjud bo‘lishligi sharti ekanligi bois uni birlamchi muhim asos sifatida qadrlab kelganlar.

Ilm-fan tarixiga e’tibor qaratilsa, inson va tabiat o‘rtasida oqilona munosabatlarni qaror toptirish zaruriy va qonuniy muhim jarayon ekanligi uzoq davrlardan boshlab qayta-qayta ta’kidlab kelinadi. Shunday bo‘lsa-da tabiatdagi obyektiv sabablarga qaramay jamiyat a’zolari tomonidan subyektiv ravishda o‘zaro mutanosiblik aloqalari ko‘p vaziyatlarda buzib kelinmoqda.

Hozirgi vaqtda tub o‘zgarish jarayonlari nafaqat ekologik sohaga, balki madaniy sohalarga ham faol ta’sir ko‘rsatmoqda. Ekologik madaniyatni shakllantirish muammosini o‘z vaqtida qayta ko‘rib chiqish so‘nggi yillarda dunyo miqyosida ham, sodir bo‘layotgan ma’naviy, ijtimoiy-siyosiy va iqtisodiy jarayonlar majmuasi bilan bevosita bog‘liq.

ADABIYOTLAR TAHLILI VA METODLARI. Yoshlar ekologik madaniyati fenomen sifatida o‘rganilganda ijtimoiy falsafiy jihatlariga ham e’tibor berish lozim. Bugungi kunda ekologik madaniyat ko‘plab olimlar tomonidan yangi gumanistik nazariya sifatida qaraladi. O‘zgarish nuqtai nazaridan “yangi gumanizm” nazariyasi antropologikdan ekotsentrikgacha bo‘lgan tadqiqotlarda E.V.Girusov, D.S.Lixachev, N.N.Moiseyev, N.N.Marfenin tadqiqotlarida ishlab chiqilgan. Muammoga aksiologik yondashuv esa A.N.Zaxlebniy, Ye.Yu. Nail, V.I.Leshchinskiy asarlarida ham o‘rganilgan. Aksiologik yondashuv, birinchi navbatda, ta’lim va tarbiya sohasidagi ijtimoiy-madaniy o‘zgarishlar jarayonlarini o‘rganuvchi tadqiqotchilarning ishi uchun xarakterlidir. Yangi ekologik madaniyatni shakllantirishning axloqiy asoslari N.N.Moiseyev, P.N.Andreyeva, V.E.Boreyko asarlarida asoslab berilgan. Ekologik etikaning uchinchi ming yillikdagi ko‘zga ko‘ringan xorijiy asoschilaridan: P.Tayler “Tabiatga hurmat”(1986), B.Kollikot “Yer etikasini himoya qilish” (1989), R.Attfild “Ekologik javobgarlik etikasi” (1990), H. Rolston “Ekologik etika mavjudmi?” (1990), Y.Xaggrov “Atrof-muhit munosabatlar asoslari etikasi” (1990), kabilar asarlari ham muhim ahamiyatga egadir. X.Rolston yangi vujudga kelgan Ekologik axloq fanining asoschisi bo‘lishi bilan birga, A.Shveyser, D.Radyar, B.Kallikot, B.Divol, D.Sessionlar qatorida ekologik falsafaning ko‘zga ko‘ringan namoyondasiga aylandi. Uning yana bir muhim xizmati shundaki, axloq, tabiatshunoslik va insoniy qiziqishlarni birlashtirib, ekologik axloqning ilmiy tizimini yaratdi.

Hozirgi vaqtga kelib ekologik muammolarning ortib borishi, yangidan-yangi tabiat bilan bog‘liq tahdidlarni keltirib chiqarib, xalqaro hamjamiyatning diqqat e’tiborini ana shu ekologiyani saqlab qolish zaruriyatini keltirib chiqarmoqda. Hozirgi davrda olib borilayotgan izlanishlarga e’tibor qaratsak o‘ziga xoslikni kuzatish mumkin. Jumladan, yosh tadqiqotchi olima G.Obidovaning talabalarda ekologik madaniyatni rivojlantirish mavzusida olib borgan tadqiqot ishida ekologik madaniyat tushunchasiga quyidagicha ta’rif beradi: “...ekologik madaniyat - umuminsoniy madaniyatning ajralmas qismi bo‘lib, u moddiy va ma’naviy mehnat mahsulining yig‘indisida taqdim qilingan; madaniyatning rivojlanishi kasbiy ekologik ta’limning rivojlanishi bilan o‘zaro bog‘liq”[9].

Madaniyat va ekologiyaning umumiy birligini ifoda etgan ushbu konsepsiya atrof-muhitni saqlash, tiklash va ulardan oqilona foydalanishga qaratilgan ekologik xabardorlikka asoslangan aniq ijtimoiy faoliyatni tavsiflaydi. Hozirgi vaqtda “ekologik madaniyat” tushunchasi munozarali va tadqiqot ishlari davom etmoqda. Bu bir tomondan, ushbu muammo bo‘yicha ko‘plab nuqtai nazarlarning mavjudligini anglatadi va boshqa tomondan, keyingi yo‘naltirilgan tadqiqot ishlarini yanada davom ettirish zarurligini ta’kidlaydi. Ekologik madaniyat va zamonaviy sivilizatsiyaning barqaror rivojlanishi o‘rtasidagi aloqalar bo‘yicha mahalliy tadqiqotlarning hozirgi holatini tavsiflab, shuni ta’kidlash kerakki, yurtimizdagi ko‘plab soha olimlarining ushbu muammoga qiziqishi yanada ortib bormoqda, eng muhimi, falsafa (A.B.G‘ulomov[10]), tarix (D.R.Norqo‘ziyev[11], B.B.Isxakov[12]), madaniyatshunoslik (Z.Sh.Yazdonov) va ko‘proq pedagogika (N.J.Isaqulova[13]) nazariyasi nuqtai nazaridan turib tahlil qilingan yangi ilmiy tadqiqot ishlari yaratildi.

Yuzaga kelgan va kelayotgan yangi-yangi ekologik muammolarning ijobiy yechimi sifatida hozirgi davrga kelib shunday xulosa qilish mumkin-ki, aholining ekologik madaniyati saviyasini rivojlantirishga ko‘proq e’tibor berish lozimligi, ayniqsa, o‘sib voyaga yetayotgan yoshlarga ekologik ta’lim-tarbiyaning serqirra usullari asosida zaruriy zamonaviy bilim va ko‘nikmalarni berib borishdan to‘xtamaslik zarur.

Yoshlar — jamiyatning asosiy tayanchi va kelajagidir. Keng ko‘lamli islohotlarimizni samarali amalga oshirishda ular hal qiluvchi kuch bo‘lib maydonga chiqmoqda. Aynan zamonaviy bilim olgan, ilg‘or kasb-hunarlarni, innovatsion texnologiyalarni, xorijiy tillarni puxta egallagan o‘g‘il-qizlarimiz mamlakatimizni yanada taraqqiy ettirishda yetakchi o‘rinlarni egallamoqdalar.

Endi, uchinchi ming yillik ostonasida, jamiyat bir qator misli ko‘rilmagan global o‘zgarishlarga duch kelgan kezda, yosh avlodni maqsadli o‘qitish zarurati yaqqol namoyon bo‘ldi. Ta’lim mazmuni – yuqori darajadagi insonparvarlik mazmunidagi, texnologik va ekologik madaniyatga ega bo‘lgan axborotlashgan jamiyatni barqaror shakllantirishni ta’minlashi kerak. Buning uchun, shubhasiz, fikrlash va xulq-atvorning turli xil stereotiplariga ega bo‘lgan yangi har tomonlama ma’lumotli, bilimli odamlar kerak. Aytish mumkinki, ta’limning eng muhim maqsadlaridan biri inson

[9] Обидова Г.К. Комплекс ёндашув асосида талабаларда экологик маданиятни ривожлантириш технологияси. (Техника олий ўқув юртларида инглиз тили ўқитиш методикаси). Автореф. дисс. (PhD)., Наманган: 2024. –Б.13.

[10] А.Б.Ғуломов. Жадид мутафаккирларининг экологик маданиятга доир қарашлари: тарихий-фалсафий таҳлил. (09.00.03-фалсафа тарихи). Фалсафа фанлари бўйича фалсафа доктори (PhD) диссертацияси автореферати. 2021.

[11] Д.Р.Норқўзиев. Фарғона водийси экологияси ҳолати ва унинг ижтимоий муаммолари (1991-2021 йиллар). (07.00.01-Ўзбекистон тарихи). Тарих фанлари бўйича фалсафа доктори (PhD) диссертацияси автореферати. 2023.

[12] Б.Б.Исхаков. Фарғона водийси ўзбекларининг анъанавий экологик маданияти (тарихий-этнологик тадқиқот). (07.00.07 – Этнография, этнология ва антропология). Тарих фанлари бўйича фалсафа доктори (PhD) диссертацияси автореферати. 2023.

[13] Н.Ж.Исақулова. Ўқувчиларга экологик тарбия бериш назарияси ва амалиёти. “Фан”нашриёти, Тошкент-2011.

taraqqiyoti muammolari, uning ijtimoiy va tabiiy muhit bilan aloqasi bo‘yicha zarur bilimlar majmuasini shakllantirishdir. Bu shaxsga o‘z tarixining turli bosqichlarida jamiyatni bilishga, madaniyat fenomeni, o‘zi, hamda insoniyatning mavjudligini tushunishga yordam berishi kerak. Tarixiy jihatdan ijtimoiy tizim va jamiyatning siyosiy tizimi doimo ta’limning xususiyatlariga, uning maqsadlari va mazmuniga ta’sir ko‘rsatib kelgan. Demokratik o‘zgarishlar ham ta’lim jarayoniga tubdan yangi imkoniyatlarni olib kelmoqda. Davlat ta’limni rivojlantirishni targ‘ib qiladi, shuningdek uni tashkil etishda yakkahukmron bo‘lishlikni asta-sekin to‘xtatadi. Demokratik munosabatlar keng quloch yozgan sari jamiyatda faol shaxslar, ayrim institutlar mustaqil bo‘lib, xususiy ta’lim muassasalarini tashkil etishlari mumkin.

Xorijlik tadqiqotchi olima Nafiset Asxadovna fikricha “yoshlar ekologik madaniyatining yangi paradigmasini shakllantirish nafaqat zamonaviy ekologik vaziyatni yaxshilashning ajralmas, sog‘lomlashtiruvchi, balki, zamonaviy jamiyatning umumiy mafkuraviy inqirozini bartaraf etish shartlaridan”[3] biri hisoblanadi. Nafiset Asxadovnaning qarashlari bizningcha ham muhim va dolzarbdir. Boisi, yoshlar ekologik madaniyati jamiyatdagi mafkuraning mazmuni, mohiyatini qay ko‘rinishida bo‘lishidan qat’iy nazar uni doimo o‘zida aks ettiradi.

MUHOKAMA. Ma’lumki, yoshlar yangicha fikrlashga, yangi-yangi g‘oyalarni dadil o‘rtaga tashlab, ularni amalga oshirishga, muammolarni ijodiy va nostandart yondashuvlar asosida hal etishga moyil bo‘ladi. Shuning uchun hozirgi kunda yosh avlod vakillarining bilim olishlari, ilm-fan, innovatsiyalar, adabiyot, sport, san’at sohasidagi iste’dod va salohiyatlarini yuzaga chiqarish, ularni jamiyatimizning ijtimoiy-siyosiy hayotida faol ishtirok etishlari uchun barcha sharoitlarni yaratishga ustuvor ahamiyat berilmoqda. Imom Buxoriy hadislaridan birida: “Yoshlikda o‘rganilgan ilm toshga o‘yilgan naqsh kabidir”[14], deyilgan. Buyuk allomalarimiz ana shunday hikmatlarga amal qilib, ilm-fan sohasida buyuk kashfiyotlarni amalga oshirganlari va umumbashariy tafakkur rivojiga beqiyos hissa qo‘shganlari tarixdan yaxshi ma’lum. Ana shunday qutlug‘ an’analarni davom ettirib, yurtimizda yangi Xorazmiylar, Farg‘oniylar, Beruniylar, Ibn Sinolar, Mirzo Ulug‘beklar, Navoiylarni tarbiyalab yetkazish – nafaqat vazifamiz, balki tarix va kelajak oldidagi muqaddas burchimizdir. Biz bu yo‘lda katta ishlarni boshladik. Mamlakatimizda yuqori bilim, malakaga ega bo‘lgan raqobatdosh kadrlar tayyorlash oliygohlari va xorijiy oliy ta’lim muassasalarining filiallari ochildi.

Yoshlarning ekologik madaniyatini oshirib borish doimo dolzarb ahamiyatga ega. Atrof-muhitni muhofaza qilish, ona tabiatni asrash, unga daxldor muammolarni bartaraf etish har bir kishining insoniy vazifasidir. Bugungi kunda ekologik vaziyat bu boradagi muammolarga e’tiborsizlikni xushlamaydi. Yoshlarning mas’uliyatini oshirish, ekologik muammolarni bartaraf etishda shaxsiy daxldorlik hissini oshirish, har bir fuqaro mas’uliyatni his qilgan holda yon-atrofga bee’tibor bo‘lmasligi juda ham muhim.

Ekologik madaniyat namoyon bo‘lishining murakkabligi va nomuvofiqligi, uning ijtimoiy-madaniy omillar ta’sirida o‘zgarishi ushbu hodisani jahon va mahalliy gumanitar fanlarda o‘rganishning oldingi tajribasini hisobga olgan holda yangi bosqichda nazariy tushunishni talab qildi.

NATIJA. Ontologik nuqtai nazardan yondashilganda ekologik madaniyat subyekti – inson bo‘lib, uning obyekti esa – biosferadir. U kompleks tushuncha bo‘lib, mavjud strukturasiga – inson va biosfera orasidagi dialektik munosabatlardan tashkil topgan ekologik borliq, ekologik ong, ekologik faoliyat, ekologik ehtiyoj, ekologik qadriyatlar tizimi, ekologik dunyoqarashlarni qamrab oladi. Ushbu tadqiq etilayotgan muammoni dialektik bir butunlik yoki yaxlitlik paradigmasidan kelib chiqib ijtimoiy falsafiy tahlilni ham tizimli tarzda davom ettirish lozim.

Shuningdek, gnoseologik ma’noda ekologik madaniyat insonlarning empirik darajasi bilan bevosita bog‘liq bo‘lgan-sezish, idrok etish, tasavvur va hissiy qabul qilishlardan (ekologik ma’noda) tashkil topib, uning epistemologik aspektlarini vujudga keltiradi.

Muammoning aksiologik aspekti esa, uni koevolyutsion tadrijiy taraqqiyot jarayonida tabiat va tabiiy jarayonlar bilangina inson o‘zini, yaxlit borliqning ajralmas qismi sifatida haqiqiy qadrli ekanligini, ya’nikim o‘zini baxtli his etishi mumkinligiga e’tibor qaratiladi.

Ekologik madaniyatning prognostik aspekti esa ekzistensial mazmunga ega bo‘lib, mavjudlik va kelajak ko‘proq inson aqli va faoliyatiga aloqador masala sifatida o‘rganiladi.

Muammoning nazariy metodologik darajasi esa-fundamental bilimlarning integratsiyasi asosida shakllanishini, jamiyatning yangi taraqqiyot bosqichida ijtimoiy falsafiy jihatdan tahlil albatta davom ettiriladi.

XULOSA. Shunday qilib, dunyoda sodir bo‘layotgan global o‘zgarishlar sharoitida, atrof-muhitning buzilishi fonida, ekologik madaniyatni shakllantirish va uning voqelikni real jarayonlarida namoyon bo‘lishi muammosi hozirgi paytda alohida ahamiyat kasb etmoqda va falsafiy aks ettirishni, bu haqda to‘plangan g‘oyalarni tizimlashtirishni talab qiladi. Mamlakatimizda barqaror bo‘lgan ekologik vaziyatni, tabiiy atrof-muhit musaffoligini saqlash, himoya qilish va tabiiy zaxiralardan oqilona foydalanishni to‘g‘ri yo‘lda rivojlantirishning muhim subyektiv omili bo‘lgan, voyaga yetib shaxs sifatida shakllanayotgan yoshlarda ekologik ong va madaniyatni yanada yuksaltirishga bo‘lgan e’tibor kuchaytirilmoqda.

[14] https: //www.dkm.gov.uz/uz/islom-dini-insonlarga-zamiatga-xizmat-kiluvchi-kandaj-angilik-va-kasfietni-kadrlaydi

Endilikka kelib, har bir muayyan jamiyat tabiatga nisbatan o‘zining ijobiy munosabatlarini qaror toptirish borasida tabiiy-ilmiy qarashlar tizimini ishlab chiqib uni rivojlantirishga intilmoqdalar. Shu bois mamlakatimizda ekologik madaniyatni yuksaltirishni yuqori bosqichlarga olib chiqish uchun ta’lim va tarbiyaga yanada yangicha zamonaviy mazmun berib, targ‘ibot ishlariga ijodiy yondashib borilsa, hamda oilaviy, milliy, umuminsoniy ekologik qadriyatlar borasida ijtimoiy hamkorlik va o‘zaro tajriba almashinishlarni yo‘lga qo‘yib faollashtirish lozim.

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YOSHLAR MA'NAVIYATINI SHAKLLANTIRISHDA FALSAFIY BILIMLARNING O'RNI

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Annotatsiya: *Ushbu maqolada, yoshlar ma'naviyatini shakllantirishda falsafiy bilimlarning o'rni haqida fikr va mulohazalar yuritiladi. Globallashuv, raqamli transformatsiya va ijtimoiy-madaniy paradigmalar o'zgarayotgan zamonaviy davrda yosh avlodning ma'naviy va intellektual rivojlanishi jamiyat taraqqiyotini belgilovchi eng muhim omil hisoblanadi. Ontologiya, epistemologiya, aksiologiya va ekzistensial izlanishlar kesishmasini o'rganish orqali falsafiy ta'limning mustaqil fikrlash, mafkuraviy immunitet va fuqarolik mas'uliyatini yuksaltirishdagi muhim mexanizm ekanligi ko'rsatib berilgan.*

Kalit so'zlar: *yoshlar ma'naviyati, falsafiy bilimlar, ratsional dunyoqarash, mafkuraviy immunitet, globallashuv, milliy va umuminsoniy qadriyatlar.*

РОЛЬ ФИЛОСОФСКИХ ЗНАНИЙ В ФОРМИРОВАНИИ ДУХОВНОСТИ МОЛОДЕЖИ

Аннотация: *В данной статье рассматривается роль философских знаний в формировании духовности молодежи. В современную эпоху глобализации, цифровой трансформации и меняющихся социокультурных парадигм духовное и интеллектуальное развитие молодого поколения является важнейшим фактором, определяющим развитие общества. Изучение взаимосвязи онтологии, эпистемологии, аксиологии и экзистенциальных исследований показывает, что философское образование является важным механизмом повышения самостоятельности мышления, идеологической невосприимчивости и гражданской ответственности.*

Ключевые слова: *духовность молодежи, философские знания, рациональное мировоззрение, идеологическая невосприимчивость, глобализация, национальные и универсальные ценности.*

THE ROLE OF PHILOSOPHICAL KNOWLEDGE IN SHAPING THE SPIRITUALITY OF YOUNG PEOPLE

Abstract: *This article discusses the role of philosophical knowledge in shaping the spirituality of young people. In the modern era—characterized by globalization, digital transformation, and shifting socio-cultural paradigms—the spiritual and intellectual development of the younger generation is a crucial factor determining societal progress. By examining the intersection of ontology, epistemology, axiology, and existential inquiry, the article demonstrates that philosophical education serves as a vital mechanism for fostering independent thinking, ideological immunity, and civic responsibility.*

Keywords: *youth spirituality, philosophical knowledge, rational worldview, ideological immunity, globalization, national and universal values.*

Kirish. Bugungi kunda jahon ta'lim makonida kechayotgan integratsiya jarayonlari talabalarning mafkuraviy kompetentligini yuksaltirish, bozor iqtisodiyoti talablariga javob bera oladigan raqobatbardosh mutaxassislarni tayyorlash metodikasini tubdan yangilashni taqozo etmoqda. Zamonaviy pedagogik tizimlar va o'qitish modellari texnologik taraqqiyot natijalari bilan uyg'unlashgan holda, ta'lim jarayoniga interfaol dasturlar va innovatsion yondashuvlarni keng joriy etishga tayanmoqda.

Xalqaro miqyosda oliy ta'lim tizimining bosh maqsadi yoshlarni kasbiy ijtimoiylashtirish bilan birga, ularda ma'naviy-axloqiy barqarorlik va mafkuraviy immunitetni shakllantirishdan iboratdir. AQSh, Germaniya, Fransiya, Xitoy, Janubiy Koreya va Rossiya kabi yetakchi davlatlar tajribasi shuni ko'rsatadiki, talabalar tafakkurini o'stirish va ularning yashirin qobiliyatlarini yuzaga chiqarishda muammoli hamda modulli o'qitish, aralash ta'lim, mahorat darslari, vebinarlar hamda virtual ta'lim texnologiyalari hal qiluvchi ahamiyatga ega. Ushbu omillar yosh avlodni global g'oyaviy tahdidlardan himoya qilishning pedagogik asosi bo'lib xizmat qilmoqda.

Globallashuv sharoitida turli yot g'oyalar va mafkuraviy poligonlar kurashi faollashgan bir davrda har bir shaxs voqelikka nisbatan mustaqil va mustahkam dunyoqarashiga ega bo'lishi shart. O'zbekiston Respublikasi Prezidenti

Shavkat Mirziyoyev ta’kidlaganidek, agar jamiyat hayotining tanasi iqtisodiyot bo‘lsa, uning joni va ruhi ma’naviyatdir. Yangi O‘zbekistonni barpo etishda bozor tamoyillariga asoslangan kuchli iqtisodiyot bilan bir qatorda, ajdodlarimizning boy merosi va milliy qadriyatlarga asoslangan kuchli ma’naviyat asosiy ustun hisoblanadi.

Ushbu konseptual yondashuv milliy va umuminsoniy qadriyatlar mutanosibligini ta’minlashning bosh mezoni sanaladi. Shu nuqtayi nazardan, ijtimoiy-pedagogik jarayonlarning asosini tashkil etuvchi uchta tayanch tushunchaning mazmun-mohiyatini aniqlashtirib olish o‘rinlidir. Birinchidan, mafkura muayyan ijtimoiy guruh, millat yoki davlatning maqsad-muddaolari, hayotiy manfaatlari va istiqbol rejalari ifodalangan tizimli qarashlar majmui bo‘lib, u jamiyatni jipslashtiruvchi kuch vazifasini o‘taydi.

Belgilangan strategik maqsadlarga erishish oliy ta’lim tizimida dars mashg‘ulotlarini an’anaviy qoliplardan voz kechgan holda, ilg‘or pedagogik texnologiyalar asosida tashkil etishni talab qiladi. Bugungi kun o‘qituvchisi va ta’lim muassasasi rahbari eski andozalardan butunlay voz kechishi, ta’limning bozor iqtisodiyoti talablariga moslashuvchanligini ta’minlashi shart. Islohotlar natijasida mamlakatimiz iqtisodiy va ijtimoiy jihatdan jadal rivojlanmoqda, biroq kelgusi taraqqiyot jahon ta’lim amaliyotidagi yangi fan yutuqlaridan keng foydalanishni taqozo etadi. Zero, zamonaviy texnologiyalar ta’lim oluvchilarning intellektual, ijodiy va axloqiy kamolotining zaruriy shartidir. Jahon ta’lim amaliyoti va mamlakatimizda o‘tkazilgan tahlillar shuni ko‘rsatadiki, ta’lim tizimidagi eng og‘riqli nuqta - talabalarning nazariy bilimlarni amaliyotda qo‘llay olmasligi hamda murakkab hayotiy vaziyatlarda mustaqil qaror qabul qilishga qiynalishidir.

Ushbu muammoni bartaraf etish hamda talabalarda mafkuraviy immunitetni mustahkamlashda dars va ma’naviy-ma’rifiy tadbirlar jarayonida to‘rtta asosiy pedagogik texnologiyadan foydalanish yuqori samara beradi. Bular: katta hajmdagi ma’lumotlar oqimi bilan ishlash va argumentlangan tahlil ko‘nikmasini hosil qiluvchi axborot-rivojlantiruvchi texnologiyalar, talabalarni mustaqil va tanqidiy fikrlashga o‘rgatuvchi muammoli ta’lim texnologiyalari, kasbiy ko‘nikmalarni bevosita amaliy faoliyat orqali o‘zlashtirishga qaratilgan faoliyat texnologiyalari hamda ta’lim oluvchining individual qobiliyatlarini va ijtimoiy-ma’naviy faolligini shakllantiruvchi shaxsga yo‘naltirilgan texnologiyalardir. Zamonaviy axborot va kompyuter texnologiyalari ushbu pedagogik yondashuvlarning ta’sir kuchini bir necha barobarga oshirib, ta’lim tizimini avtoritar metodlardan voz kechib, shaxs manfaatlariga xizmat qiluvchi insonparvarlik pedagogikasiga o‘tishiga xizmat qiladi.

Bunday ko‘p qirrali ma’naviyatni shakllantirishga faqat passiv sotsializatsiya yoki madaniy kodlarni mexanik ravishda o‘zlashtirish orqali erishib bo‘lmaydi. Bu jarayon maqsadli va ichki darajada chuqur anglangan kognitiv faoliyatni talab qiladi. Falsafiy bilimlar ushbu konseptual o‘zgarishlar uchun zarur bo‘lgan tizimli asosni taqdim etadi. Borliq, bilish va qadriyatlar haqidagi tizimli fan sifatida falsafa yoshlarga intellektual mo‘ljal beradi, ularning tashqi axborotni shunchaki qabul qilishdan avtonom axloqiy va ekzistensial o‘z-o‘zini belgilash darajasiga o‘tishini ta’minlaydi.

O‘smirlik davridan yetuklikka o‘tish bosqichi mohiyatan o‘zlikni anglash, izchillik va voqelikning tarkibiy mohiyatini tushunishga intilish davridir. Mustahkam falsafiy poydevor bo‘lmasa, bu intilish ko‘pincha ekzistensial tarqoqlikka, kognitiv dissonansga yoki yuzaki va iste’molchilik qadriyatlarini tanqidiy tahlilsiz qabul qilishga olib keladi. Falsafiy bilimlar inson tajribasini g‘oyalar tarixining keng kontekstiga joylashtirish orqali mukammal dunyoqarash me’mori vazifasini o‘taydi.

Falsafaning ontologik va epistemologik jihatlarini o‘rganish orqali yoshlar dunyoni betartib voqealar ketma-ketligi sifatida emas, balki o‘zaro bog‘langan va qonuniyatlarga asoslangan tizim sifatida ko‘rishni o‘rganadilar. Tarixiy va zamonaviy falsafiy paradigmalarni tadqiq etish yoshlarning kognitiv ufqlarini kengaytiradi, ularni mahalliy ijtimoiy va shaxsiy muammolarga universal prizma orqali qarashga undaydi. Ushbu yaxlit yondashuv intellektual cheklanganlikning oldini oladi hamda shaxsiy hayotda ham, ijtimoiy faoliyatda ham uyg‘unlik, tizimli chuqurlik va uzoq muddatli oqibatlarni ko‘ra bilish qobiliyatini shakllantiradi.

Zamonaviy jamiyatda falsafiy bilimlarning eng muhim funksiyalaridan biri bu dialektik fikrlash va qat’iy intellektual tanqid madaniyatini tarbiyalashdir. Bugungi axborot ekotizimi yoshlarni doimiy ravishda manipulyativ media oqimlari, siyosiy tashviqotlar va buzg‘unchi mafkuraviy tendensiyalarga duchor qilmoqda. Falsafa mantiq, konseptual tahlil va Sokrat metodini qo‘llash orqali insonlarni murakkab argumentlarni qismlarga ajratishga, mantiqiy xatolarni aniqlashga va yashirin mafkuraviy maqsadlarni ochib berishga o‘rgatadi.

Ushbu kognitiv salohiyat zamonaviy ijtimoiy faylasuflar tomonidan “mafkuraviy immunitet” deb ta’riflangan xususiyatni yuzaga keltiradi. Mukammal falsafiy tayyorgarlikka ega bo‘lgan yoshlar axborotni shunchaki yutib yubormaydilar; ular ma’lumotlarning tub mohiyati va axloqiy asoslarini shubha ostiga olib, ob’ektiv tahlil qiladilar. Bunday tahliliy barqarorlik ularni radikalizm, ekstremizm va populistik ritorika ta’siridan himoya qiladi. Binobarin, ularning ma’naviy e’tiqodlari tashqi psixologik manipulyatsiyalar natijasi emas, balki haqiqiy, chuqur o‘ylangan va barqaror qadriyatga aylanadi.

Qadriyatlar haqidagi falsafiy ta’limot - aksiologiya ma’naviy tarbiyaning o‘zagini tashkil etadi. Zamonaviy yoshlar duch kelayotgan axloqiy manzara o‘ta plyuralistik va ko‘pincha qarama-qarshiliklarga boy. Falsafa bu murakkablikni

qat’iy dogmalarni majburlab tiqishtirish orqali emas, balki yoshlarni adolat, fazilat, burch, inson qadr-qimmati va umumiy farovonlik kabi tushunchalarni oqilona tadqiq qilishga jalb etish orqali hal qiladi.

Aristotel va Abu Nasr Forobiyning fazilatlar axloqidan tortib, Immanuel Kantning deontologik tamoyillari va zamonaviy gumanitar axloqgacha bo‘lgan klassik axloqiy tizimlarni o‘rganish orqali yoshlar axloq shunchaki sun’iy cheklovlar to‘plami emas, balki inson baxt-saodati va ijtimoiy jipslik uchun ratsional zaruriyat ekanini anglab yetadilar. Yoshlar ushbu aksiologik tamoyillarni o‘zlashtirganlarida, ularning ma’naviy diqqat-e’tibori xudbinona moddiyatchilikdan altruizm, ijtimoiy empatiya va ongli fuqarolik pozitsiyasiga tomon buriladi.

Yoshlik davri tabiatan chuqur ekzistensial tahlillar davridir. Shaxsiy o‘zlik, chekish va azob-uqubatlarning ma’nosi, erkinlik tabiati va hayotning o‘tkinchiligi haqidagi savollar ruhiy va ma’naviy yetuklik jarayonining ajralmas qismidir. Falsafiy yo‘l-yo‘riq bo‘lmagan taqdirda, bunday keskin ichki savollar kuchli ekzistensial xavotir, loqaydlik, begonalashish yoki nigilizmga olib kelishi mumkin.

Zamonaviy o‘quv dasturlarida falsafiy ta’lim sifatini oshirish va uning integratsiyasini kuchaytirish shunchaki akademik talab emas, balki jamiyatning strategik zaruriyatidir. Faqat falsafiy jihatdan asoslangan, ma’naviy jihatdan barqaror shaxslarni tarbiyalash orqali jamiyat donolik, o‘zaro hurmat va barqaror axloqiy taraqqiyotga asoslangan kelajakni kafolatlashi mumkin.

Xulosa. Yosh avlodning ma’naviy shakllanishini o‘zibo‘larchilik ijtimoiy oqimlarga yoki passiv media ta’siriga tashlab qo‘yish mumkin emas; u tizimli, maqsadli va yuqori darajadagi intellektual tarbiyani talab qiladi. Falsafiy bilimlar ushbu rivojlanish jarayonida ajralmas poydevor bo‘lib xizmat qiladi. Ratsional dunyoqarashni shakllantirish, tanqidiy va dialektik qobiliyatlarni charxlash, mustahkam axloqiy qadriyatlarni singdirish hamda ekzistensial muammolarga chuqur tushunchalar berish orqali falsafa yoshlik salohiyatini yetuk, ma’rifatli ma’naviyatga aylantiradi.

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YOSHLAR IDENTIKLIGI VA ZAMONAVIY JAMIYAT TRANSFORMATSIYASI: IJTIMOIY-FALSAFIY TAHLIL

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Annotatsiya: *Mazkur maqolada yoshlar identikligining zamonaviy jamiyat transformatsiyasi jarayonidagi ijtimoiy-falsafiy mohiyati tahlil qilinadi. Yoshlar identikligi shaxsning o‘zini muayyan ijtimoiy, madaniy, milliy va fuqarolik makoniga mansub deb anglashi bilan birga, uning jamiyatdagi o‘rni, qadriyatlari, dunyoqarashi va ijtimoiy mas’uliyatini belgilovchi murakkab fenomen sifatida talqin etiladi. Tadqiqotda globallashuv, raqamlashtirish, ommaviy kommunikatsiya, qadriyatlar transformatsiyasi, an’anaviylik va zamonaviylik dialektikasi yoshlar identikligiga ta’sir etuvchi asosiy omillar sifatida ko‘rib chiqiladi. Shuningdek, yoshlarning innovatsion tafakkuri, ijtimoiy faolligi va fuqarolik pozitsiyasi jamiyatning o‘zini o‘zi yangilash mexanizmlari bilan bog‘liq holda tahlil qilinadi. Maqolada yoshlar identikligi “ijtimoiy muhit → identiklik → faoliyat va mas’uliyat → yangi ijtimoiy muhit” tamoyili asosida jamiyat transformatsiyasining subyektiv va aksiologik omili sifatida asoslanadi.*

Kalit so‘zlar: *yoshlar, identiklik, ijtimoiy identiklik, milliy identitet, ijtimoiy ong, qadriyat, globallashuv, raqamli transformatsiya, innovatsion tafakkur, fuqarolik pozitsiyasi, modernizatsiya, ijtimoiy-falsafiy tahlil.*

ИДЕНТИЧНОСТЬ МОЛОДЕЖИ И ТРАНСФОРМАЦИЯ СОВРЕМЕННОГО ОБЩЕСТВА: СОЦИАЛЬНО-ФИЛОСОФСКИЙ АНАЛИЗ

Аннотация: *В статье анализируется социально-философская сущность идентичности молодежи в процессе трансформации современного общества. Идентичность молодежи трактуется как сложный феномен, который наряду с осознанием личностью своей принадлежности к определенному социальному, культурному, национальному и гражданскому пространству определяет ее место в обществе, ее ценности, мировоззрение и социальную ответственность. В исследовании в качестве основных факторов, влияющих на идентичность молодежи, рассматриваются глобализация, цифровизация, массовая коммуникация, трансформация ценностей, а также диалектика традиционности и современности. Кроме того, инновационное мышление, социальная активность и гражданская позиция молодежи анализируются в связи с механизмами самообновления общества. В статье идентичность молодежи обосновывается как субъективный и аксиологический фактор трансформации общества на основе принципа «социальная среда → идентичность → деятельность и ответственность → новая социальная среда».*

Ключевые слова: *молодежь, идентичность, социальная идентичность, национальная идентичность, общественное сознание, ценность, глобализация, цифровая трансформация, инновационное мышление, гражданская позиция, модернизация, социально-философский анализ.*

YOUTH IDENTITY AND THE TRANSFORMATION OF CONTEMPORARY SOCIETY: A SOCIO-PHILOSOPHICAL ANALYSIS

Abstract: *This article analyzes the socio-philosophical essence of youth identity within the process of contemporary societal transformation. Youth identity is interpreted as a complex phenomenon which, together with the individual’s awareness of belonging to a particular social, cultural, national and civic space, also determines their place in society, their values, worldview and social responsibility. The study considers globalization, digitalization, mass communication, the transformation of values and the dialectic of tradition and modernity as the principal factors influencing youth identity. In addition, the innovative thinking, social activity and civic stance of young people are analyzed in connection with society’s mechanisms of self-renewal. The article substantiates youth identity as a subjective and axiological factor of societal transformation on the basis of the principle “social environment → identity → activity and responsibility → new social environment”.*

Keywords: *youth, identity, social identity, national identity, social consciousness, value, globalization, digital transformation, innovative thinking, civic stance, modernization, socio-philosophical analysis.*

KIRISH. Yoshlar identikligi va zamonaviy jamiyat transformatsiyasi masalasi bugungi ijtimoiy-falsafiy tafakkurning inson, jamiyat va tarixiy taraqqiyot munosabatlarini qayta idrok etishni taqozo etayotgan eng murakkab nazariy muammolaridan biridir. Zero, zamonaviy jamiyatning transformatsiyasi faqat iqtisodiy, siyosiy yoki texnologik tizimlarning yangilanishi bilan belgilanmaydi; uning tub mohiyati, avvalo, insonning o‘zini, o‘z ijtimoiy mansubligini, qadriyatlarini, tarixiy xotirasini va kelajak oldidagi mas’uliyatini anglash shakllarining o‘zgarishida namoyon bo‘ladi. Ayniqsa, yoshlar ushbu jarayonning oddiy kuzatuvchisi yoki tashqi ta’sirlarni qabul qiluvchi obyekti emas, balki yangi ijtimoiy-madaniy voqelikni yaratishga qodir faol subyekt sifatida maydonga chiqadi. Shu ma’noda yoshlar identikligini tadqiq etish zamonaviy jamiyat transformatsiyasining insoniy o‘lchamini, uning aksiologik mazmunini va ijtimoiy-madaniy mexanizmlarini anglashning metodologik kaliti sifatida namoyon bo‘ladi.

Identiklik tushunchasining nazariy mazmuni shaxsning o‘zligini anglash jarayonidan ancha keng bo‘lib, u “Men kimman?” degan ekzistensial savol bilan bir qatorda “Men kimlar bilan birgaman?”, “Qaysi qadriyatlarni o‘zimniki deb bilaman?”, “Jamiyatdagi o‘rnim va mas’uliyatim nimadan iborat?” kabi ijtimoiy-falsafiy savollarni ham qamrab oladi. Shu nuqtayi nazardan identiklikni tayyor va o‘zgarmas holat sifatida emas, balki shaxs va ijtimoiy muhitning uzluksiz o‘zaro ta’siri natijasida vujudga keladigan dinamik jarayon sifatida tushunish maqsadga muvofiq. Bu borada Ch. Taylorning dialogik identiklik konsepsiyasi alohida metodologik ahamiyatga ega. Faylasuf insonning o‘zligini mutlaq individual va monologik tarzda yaratishini rad etib, shaxsning identikligi boshqalar bilan munosabat va muloqot jarayonida shakllanishini asoslaydi: “inson o‘zligini aniqlash uchun zarur bo‘lgan ifoda tillarini boshqalar bilan almashinuv orqali egallaydi” [1, 32-b.]. Taylorning mazkur pozitsiyasi yoshlar identikligini tushunishda, avvalo, uning ijtimoiy-muloqotiy tabiatini ochib beradi. Ya’ni yosh insonning “men”i oiladan, ta’lim muhitidan, tengdoshlar guruhidan, milliy-madaniy makondan, ommaviy kommunikatsiyadan va bugungi kunda raqamli tarmoqlardan tashqarida shakllanmaydi. Demak, yoshlar identikligi individual psixologik hodisa emas, balki ijtimoiy munosabatlar, madaniy kodlar va tan olinishi mexanizmlarining kesishish nuqtasida vujudga keladigan ijtimoiy-ontologik hodisadir. Taylorning kuchli jihati shundaki, u identiklikni shaxsning ichki “tayyor mohiyati” sifatida emas, balki dialog, e’tirof va ijtimoiy munosabatlar orqali doimiy ravishda shakllanadigan hodisa sifatida talqin qiladi. Biroq ushbu konsepsiyani zamonaviy raqamli jamiyat sharoitida rivojlantirish zarur: bugungi yoshning “muhim boshqalari” faqat real ijtimoiy muhit bilan chegaralanmaydi, balki algoritmik platformalar, virtual jamoalar va transmilliy kommunikativ makon bilan ham belgilanadi. Shunday ekan, yoshlar identikligi tobora ko‘proq real ijtimoiylik va virtual ijtimoiylikning sintezidan tarkib topayotgan gibrid identiklik xususiyatini kasb etmoqda.

Mazkur jarayonni globallashuvdan ajratib tasavvur qilish mumkin emas. Globallashuv insonning ijtimoiy makonini kengaytirib, mahalliy va global qadriyatlar, milliy va transmilliy identikliklar, an’anaviy va postindustrial hayot tarzlari o‘rtasidagi munosabatni murakkablashtirmoqda. O‘zbekiston ijtimoiy-falsafiy tadqiqotlarida ham mazkur muammo milliy va umuminsoniy qadriyatlar dialektikasi bilan uzviy bog‘langan holda talqin qilinmoqda. Jumladan, A. Erkayevning qarashlari mazkur masalaning aksiologik mohiyatini ochishda muhimdir. Unga ko‘ra, “milliy qadriyatlar umuminsoniy qadriyatlarga zid emas, aksincha, ularning milliy shakldagi ifodasidir” [2, 61-b.]. Mazkur fikrning nazariy qimmati shundaki, u milliylik va umuminsoniylikni o‘zaro inkor qiluvchi ikki qarama-qarshi qutb sifatida emas, balki mazmun va shaklning dialektik birligi sifatida tushunishga imkon beradi. Yoshlar identikligi nuqtayi nazaridan bu juda muhim: milliy identiklikning barqarorligi global ochiqlikni inkor etish bilan emas, balki umuminsoniy qadriyatlarni milliy-madaniy tajriba orqali o‘zlashtirish va qayta talqin qilish bilan ta’minlanadi. Shu bilan birga, Erkayevning yondashuvini faqat qadriyatlarni saqlash paradigmasi bilan chegaralab qo‘yish ham metodologik jihatdan yetarli emas. Chunki transformatsiyalanuvchi jamiyatda qadriyatning hayotiyligi uning o‘zgarmasligida emas, balki yangi tarixiy sharoitlarda o‘z mazmunini saqlagan holda yangi shakllarda namoyon bo‘la olish qobiliyatidadir. Shuning uchun milliy identiklikni “muzlatilgan madaniy xotira” emas, balki tarixiy xotira, zamonaviy tajriba va kelajak tasavvurining dinamik sintezi sifatida baholash lozim.

Mazkur fikrni N. Jo‘rayevning milliy qadriyatlar haqidagi qarashlari yanada chuqurlashtiradi. U “milliy urf-odatlar jamiyatning ma’naviy immuniteti bo‘lib, umuminsoniy qadriyatlar bilan uyg‘unlashgan taqdirdagina barqaror taraqqiyotga xizmat qiladi” [3, 88-b.], deya ta’kidlaydi. Ushbu yondashuvning muhim tomoni shundaki, unda qadriyatlar faqat o‘tmishdan meros bo‘lib qolgan madaniy shakl sifatida emas, balki jamiyatning ijtimoiy barqarorligini ta’minlovchi faol mexanizm sifatida talqin qilinadi. Biroq “ma’naviy immunitet” kategoriyasini ilmiy jihatdan qo‘llashda uning mazmunini aniq belgilash talab etiladi. Aks holda mazkur tushuncha tashqi ta’sirlarning barchasini rad etuvchi konservativ himoya mexanizmiga aylanishi mumkin. Bizningcha, zamonaviy jamiyat sharoitida ma’naviy immunitetning adekvat shakli tashqi ta’sirni mutlaq inkor etish emas, balki uni tanqidiy saralash, aksiologik baholash va konstruktiv

o‘zlashtirish qobiliyati bilan belgilanadi. Aynan shu nuqtada yoshlar identikligi transformatsiyasining eng muhim falsafiy paradoksi yuzaga keladi: identiklikni saqlab qolish uchun uni o‘zgartirish, uni rivojlantirish uchun esa uning tarixiy ildizlarini saqlash zarur. Demak, identiklikning barqarorligi statiklik emas, balki dinamik barqarorlik hodisasidir.

Zamonaviy jamiyatning mazkur dinamik tabiatini Z. Bauman “suyuqlashgan zamonaviylik” konsepsiyasi orqali o‘ziga xos tarzda ifodalaydi. Tadqiqotlarda Bauman qarashlari yoshlar qadriyatlarining o‘zgarishi kontekstida sharhlanib, “an’analar yoshlar uchun qat’iy buyruqdan ko‘ra, tanlab olinadigan ma’naviy resursga aylanadi” [4, 89-b.] degan fikr ilgari suriladi. Bu yondashuv yoshlar identikligining zamonaviy transformatsiyasini tushuntirish uchun nihoyatda muhimdir. Chunki bugungi yosh avlod an’anani shunchaki meros qilib olmaydi; u uni tanlaydi, qayta talqin qiladi, ayrim unsurlarini qabul qiladi, ayrimlarini esa zamonaviy hayot talablari bilan mos kelmagani uchun qayta ko‘rib chiqadi. Demak, an’anaviylikning reproduktiv mexanizmi asta-sekin refleksiv mexanizmga aylanmoqda. Biroq Baumanning “suyuqlik” metaforasi bilan izohlanadigan haddan tashqari o‘zgaruvchanlikni identiklikning barcha shakllariga universal tavsif sifatida tatbiq etish ehtiyotkorlikni talab qiladi. Chunki insonning ijtimoiy mavjudligi nafaqat o‘zgarish, balki davomiylik, xotira, mansublik va ma’naviy tayanchlarga bo‘lgan ehtiyojni ham o‘z ichiga oladi. Shu sababli yoshlar identikligining zamonaviy transformatsiyasi “an’anadan voz kechish” emas, balki an’ananing refleksiv modernizatsiyasi sifatida talqin qilinishi maqsadga muvofiq.

Aynan shu nuqtada A. Giddensning refleksiv modernlik konsepsiyasi alohida nazariy ahamiyat kasb etadi. Giddensning yondashuvida zamonaviylik insonning o‘z “Men”ini qayta-qayta tahlil qilishi va hayotiy tanlovlarini refleksiv ravishda tashkil etishi bilan tavsiflanadi. Tadqiqotlarda uning qarashlari “zamonaviy sharoitda an’analar tanqidiy tanlov obyektiga aylanadi” degan mazmunda ifodalangan [5, 38-b.]. Mazkur qarash yoshlar identikligini jamiyat transformatsiyasining faol subyekti sifatida tushunish uchun metodologik asos beradi: yosh inson tayyor ijtimoiy rolni shunchaki egallamaydi, balki o‘z hayot strategiyasini tanlash, asoslash va qayta ko‘rib chiqish orqali identikligini yaratadi. Bu jarayonning ijodiy jihati shundaki, yoshlar an’anaviy tajriba bilan zamonaviy imkoniyatlar o‘rtasida yangi ma’no va yangi ijtimoiy pozitsiyalarni shakllantiradi. Demak, identiklikning transformatsiyasi jamiyatdagi umumiy modernizatsiyaning inson ongidagi individual aks-sadosigina emas, balki uning faol davom ettirilish mexanizmidir.

M. Castellsning tarmoq jamiyati va identiklik haqidagi konsepsiyasi esa ushbu masalaga yangi — kommunikativ va texnologik o‘lcham qo‘shadi. U axborot jamiyati sharoitida “madaniy identitetlar global axborot oqimlari bilan to‘qnashuvda qayta shakllanadi” [6, 253-b.]. Ushbu fikr bugungi yoshlar identikligini anglash uchun ayniqsa dolzarbdir, chunki raqamli makon yoshlar ijtimoiylashuvining oddiy vositasi emas, balki identiklik ishlab chiqariladigan alohida ijtimoiy makonga aylanmoqda. Yosh inson endilikda o‘zligini faqat oila, mahalla yoki milliy madaniyat doirasida emas, balki global axborot oqimlari, virtual jamoalar, ijtimoiy tarmoqlar va transmilliy madaniy kodlar bilan munosabatda shakllantiradi. Castells yondashuvining kuchli jihati shundaki, u identiklikning axborot-kommunikatsion infratuzilma bilan bog‘liqligini ko‘rsatadi. Shu bilan birga, mazkur konsepsiyani yoshlar masalasiga tatbiq etishda lokal madaniyatlarning qarshilik, moslashish va qayta kodlash salohiyatini ham hisobga olish lozim. Chunki global axborot oqimi mahalliy identiklikni avtomatik ravishda yo‘q qilmaydi; aksincha, ayrim hollarda u milliy o‘zlikning yanada faol anglanishiga ham sabab bo‘lishi mumkin. Demak, raqamlashtirishning identiklikka ta’siri bir yo‘nalishli emas, balki dekonstruksiya va rekonstruksiyaning bir vaqtda kechishi bilan tavsiflanadi.

Yoshlar identikligi transformatsiyasining mazkur jihati zamonaviy ilmiy tadqiqotlarda ham tasdiqlanmoqda. Raqamli globallashuv yosh avlodning identiklik shakllanishiga global va lokal madaniy ta’sirlarning birgalikda kirib kelishiga olib kelayotgani, buning natijasida gibrid identiklik shakllari yuzaga kelayotgani qayd etilgan (Lusianawati, 2025). Bu holat yuqorida qayd etilgan dialektik yondashuvni empirik jihatdan ham mustahkamlaydi: zamonaviy yosh o‘z milliy mansubligini global madaniy tajribadan ajratib emas, balki u bilan o‘zaro aloqada qayta anglamoqda. Shunday qilib, bugungi yoshlar identikligi monolit emas, balki ko‘p qatlamli, kontekstual va refleksiv xarakterga ega bo‘lib bormoqda.

Yoshlar identikligining jamiyat transformatsiyasidagi subyektiv omil sifatidagi mohiyatini X. I. Abduraxmonovning innovatsion tafakkur va yoshlar tashabbuskorligiga bag‘ishlangan tadqiqotlari bilan ham bog‘lash mumkin. Uning ilmiy konsepsiyasida yoshlarning innovatsion tafakkuri faqat texnologik yangilik yaratish qobiliyati emas, balki insonning jamiyat va kelajak haqidagi tasavvurlarini yangilashga qodir ijtimoiy-falsafiy salohiyat sifatida qaraladi. Muallif tadqiqotida “innovatsion tafakkur va faoliyat o‘rtasidagi o‘zaro bog‘liqlik” asosida “bilim–qadriyat–amaliyot” dialektikasi ishlab chiqilgan hamda ta’lim, raqamli kommunikatsiya, fuqarolik faolligi va ma’naviy tarbiya yoshlar tashabbuskorligini shakllantiruvchi o‘zaro bog‘liq ijtimoiy-madaniy omillar sifatida asoslangan [7, 13–14-b.]. Mazkur konsepsiyaning mavzuimiz uchun alohida ahamiyati shundaki, u identiklikni faqat ongdagi mansublik hissi bilan chegaralab qo‘ymasdan, uni faoliyat bilan bog‘laydi. Ya’ni yoshning “men kimman?” degan savoliga javobi uning “men nima qilaman?” degan savoliga javobida konkretlashadi. Shu nuqtayi nazardan identiklik — bu faqat ong holati emas, balki ijtimoiy amaliyotga aylangan o‘zlikdir. Yosh o‘zini innovator, fuqaro, tadqiqotchi, tadbirkor yoki ijodkor sifatida anglashi bilan bir qatorda, ushbu identiklikni real faoliyatda namoyon qilgan taqdirdagina jamiyat transformatsiyasining haqiqiy subyektiga aylanadi. Abduraxmonov tadqiqotining yana bir muhim jihati shundaki, unda yoshlarning innovatsion tashabbuskorligi

an’anaviylik va zamonaviylik o‘rtasidagi dialektik munosabatdan tashqarida emas, balki aynan shu munosabat ichida qaraladi. Shu bois innovatsiya va an’ana qarama-qarshi tushunchalar emas; innovatsion yangilanishning ijtimoiy barqarorligi ko‘pincha tarixiy-madaniy xotira bilan konstruktiv aloqaga bog‘liqdir.

O‘zbek ijtimoiy-falsafiy tafakkurida yoshlar identikligi masalasining yana bir muhim qirrasi urf-odat, an’ana va qadriyatlarning yoshlar ongini transformatsiyalashdagi rolidir. O. Yusupaliyevning tadqiqotida ushbu jarayon “urf-odat, an’ana va qadriyatlarning ijtimoiy-madaniy regulyativ funksiyasi hamda mafkuraviy ongning aksiologik-integrativ tabiati” bilan bog‘liq holda tahlil qilinib, ularning yoshlar ongidagi transformatsiyasi dialektik jarayon sifatida asoslangan [8]. Mazkur yondashuvni identiklik muammosiga tatbiq etganimizda, an’ana va qadriyatlar yoshlar identikligini faqat saqlab qoluvchi mexanizm emas, balki uni qayta ishlab chiqaruvchi va yangi tarixiy sharoitga moslashtiruvchi vosita ekanini ko‘ramiz. Ayniqsa, muallifning “yosh avlod an’analarni to‘liq rad etmaydi, balki ularni zamon talablari asosida qayta mazmun bilan boyitadi” degan N. Jo‘rayev qarashiga murojaati [9, 119-b.] an’ana va transformatsiya o‘rtasidagi munosabatni statik emas, dinamik jarayon sifatida talqin qilish imkonini beradi. Bu yerda ilmiy jihatdan muhim nuqta shundaki, identiklikning davomiyligi aynan uning o‘zgarishga qodirligi bilan ta’minlanadi. Agar an’ana mutlaq o‘zgarmas shakl sifatida qaralsa, u yoshlar uchun begona va faqat tashqi normativ bosim sifatida namoyon bo‘lishi mumkin; agar u refleksiv ravishda qayta talqin qilinsa, an’ana yoshlar identikligining ichki ma’naviy resursiga aylanadi.

Yoshlar identikligi va jamiyat transformatsiyasi munosabatining yana bir fundamental jihati — ijtimoiy e’tirof va kommunikativ legitimlik masalasidir. J. Habermasning kommunikativ ratsionallik konsepsiyasi asosida tadqiqotlarda “qadriyatlar ochiq muloqot va dalillashuv orqali legitimlik kasb etgandagina barqaror bo‘ladi” degan fikr ilgari suriladi [10, 457-b.]. Mazkur yondashuv yoshlar identikligi uchun alohida ahamiyatga ega, chunki yoshlar ongiga qadriyatlarni mexanik singdirish ularning ichki e’tiqodini shakllantirish uchun yetarli emas. Qadriyat shaxs tomonidan anglanishi, muhokama qilinishi, savol ostiga qo‘yilishi va asoslangan holda qabul qilinishi kerak. Shunday sharoitdagina identiklik tashqi ijtimoiy nazorat mahsuli emas, balki refleksiv ravishda o‘zlashtirilgan ijtimoiy pozitsiyaga aylanadi. Demak, zamonaviy jamiyatda yoshlar identikligini shakllantirishning samarali mexanizmi buyruqbozlik yoki biryoqlama targ‘ibot emas, balki dialog, munozara, tanqidiy tafakkur va ijtimoiy e’tirofning birligidir.

Shu o‘rinda yoshlar identikligi masalasining zamonaviy jamiyat transformatsiyasidagi fundamental paradoksi namoyon bo‘ladi: jamiyat bir tomondan yoshlarni mavjud ijtimoiy-madaniy tartibga integratsiya qilishga intiladi, ikkinchi tomondan esa aynan yoshlarning mavjud tartibni yangilashiga ehtiyoj sezadi. Demak, ijtimoiylashuv va innovatsiya o‘rtasidagi qarama-qarshilik aslida absolyut qarama-qarshilik emas. Haqiqiy ijtimoiy taraqqiyot yoshlarni mavjud qadriyatlarni shunchaki takrorlovchi avlod sifatida emas, balki ularni tarixiy tajriba bilan uyg‘unlashtirib, yangi sharoitlarda qayta ma’nolantiruvchi subyekt sifatida shakllantirishni talab qiladi. Shu ma’noda yoshlar identikligi jamiyat transformatsiyasining aksiologik, subyektiv va institutsional kesishuv nuqtasi hisoblanadi.

Mazkur metodologik yondashuvdan kelib chiqib, yoshlar identikligini zamonaviy jamiyat transformatsiyasining uch o‘zaro bog‘liq darajasida tasavvur qilish mumkin: birinchisi — ontologik daraja, bunda yosh inson o‘zining jamiyatdagi mavjudlik shaklini anglaydi; ikkinchisi — aksiologik daraja, bunda u qaysi qadriyatlarni o‘zining ma’naviy tayanchi sifatida qabul qilishini belgilaydi; uchinchisi — praxeologik daraja, bunda identiklik amaliy faoliyat, fuqarolik pozitsiyasi, innovatsion tashabbus va ijtimoiy mas’uliyat orqali real ijtimoiy kuchga aylanadi. Ushbu uchlikning birortasi mavjud bo‘lmasa, identiklik to‘laqonli ijtimoiy hodisaga aylana olmaydi. Faqat mansublik hissi mavjud bo‘lib, faoliyat bo‘lmasa, identiklik passiv xarakter kasb etadi; qadriyatlar mavjud bo‘lib, refleksiya bo‘lmasa, ular dogmatik shaklga tushishi mumkin; innovatsion faoliyat mavjud bo‘lib, aksiologik asos bo‘lmasa, u ijtimoiy jihatdan destruktiv oqibatlarni ham keltirib chiqarishi ehtimoldan xoli emas.

Shu sababli zamonaviy jamiyat transformatsiyasi sharoitida yoshlar identikligini shakllantirish masalasi faqat ma’naviy-tarbiyaviy vazifa emas, balki jamiyatning kelajakdagi ijtimoiy barqarorligi, innovatsion salohiyati va madaniy davomiyligini belgilovchi strategik ilmiy muammo sifatida namoyon bo‘ladi. Yoshlar identikligining konstruktiv modeli milliy va umuminsoniy qadriyatlarning uyg‘unligi, an’ana va innovatsiyaning dialektik birligi, individual erkinlik va ijtimoiy mas’uliyatning muvozanati, real va raqamli ijtimoiy makonlarning o‘zaro integratsiyasi hamda tanqidiy-refleksiv tafakkurga asoslanishi lozim. Aynan shunday identiklik shaxsni jamiyatga moslashuvchi passiv mavjudotdan uni o‘zgartiruvchi faol subyektga aylantiradi. Shunday ekan, mazkur tadqiqotning konseptual asosini “jamiyat yoshlar identikligini shakllantiradi, yoshlar esa o‘z identikligi, qadriyatlari va faoliyati orqali jamiyatning keyingi transformatsiyasini amalga oshiradi” degan dialektik tamoyil tashkil etadi. Bu tamoyil yoshlar identikligini zamonaviy jamiyat taraqqiyotining oddiy natijasi emas, balki uning ichki harakatlantiruvchi kuchlaridan biri sifatida talqin qilish imkonini beradi.

Mavzuga oid adabiyotlar tahlili. Yoshlar identikligi va zamonaviy jamiyat transformatsiyasi muammosi O‘zbekistonda so‘nggi yillarda ijtimoiy-falsafiy tadqiqotlarning muhim yo‘nalishlaridan biriga aylanmoqda. Mavzuga bevosita yaqin tadqiqotlardan biri O. O. Yusupaliyevning “Yoshlar mafkuraviy ongi transformatsiyalashuvida urf-odatlar, an’analar va qadriyatlar o‘rni” nomli falsafa fanlari bo‘yicha PhD dissertatsiyasidir. Muallif yoshlar ongidagi o‘zgarishlarni

urf-odat, an’ana va qadriyatlarning transformatsiyasi bilan uzviy bog‘liq jarayon sifatida talqin qilib, ularning “ijtimoiy-madaniy regulyativ funksiyasi” va mafkuraviy ongning “aksiologik-integrativ tabiati” o‘rtasidagi dialektik aloqani asoslaydi. Ushbu tadqiqotning mavzuimiz uchun muhim jihati shundaki, unda yoshlar ongining transformatsiyasi faqat tashqi mafkuraviy ta’sirlar natijasi emas, balki milliy va umuminsoniy qadriyatlarning o‘zaro ta’siri asosida kechadigan murakkab ijtimoiy-madaniy jarayon sifatida ko‘rsatiladi.

Mazkur dissertatsiyada globallashuv va raqamli kommunikatsiyalar sharoitida yoshlar dunyoqarashining o‘zgarishi ham alohida tahlil qilingan. Muallif yoshlar ongidagi transformatsiyani “milliy qadriyatlar va umuminsoniy tamoyillar uyg‘unligi asosida faol, ongli va maqsadli qayta qurilish jarayoni” sifatida baholaydi. Bu yondashuv yoshlar identikligini zamonaviy jamiyatdagi o‘zgarishlarning passiv mahsuli emas, balki ularni anglash, saralash va qayta talqin qilishga qodir faol subyekt sifatida ko‘rish imkonini beradi.

X. I. Abduraxmonovning “Yoshlarda innovatsion tashabbuskorlikni rivojlantirishning falsafiy-konseptual asoslari” mavzusidagi falsafa fanlari doktori (DSc) dissertatsiyasi avtoreferati ham mavzuning ilmiy asoslarini kengaytiradi. Muallif yoshlarning innovatsion tashabbusini “insonning yaratuvchan tabiatini ijtimoiy reallikka tatbiq etuvchi subyektiv-ijodiy jarayon” sifatida talqin qiladi va uni yoshlarni ijtimoiy taraqqiyotning faol subyektiga aylantiruvchi mexanizm sifatida asoslaydi. Ushbu qarash yoshlar identikligi masalasini faqat mansublik va qadriyatlar doirasida emas, balki ijodkorlik, tashabbuskorlik va ijtimoiy faoliyat bilan bog‘liq holda tadqiq etish zarurligini ko‘rsatadi.

Shuningdek, Abduraxmonov tadqiqotida zamonaviy fan, raqamli tafakkur va ijtimoiy ongning o‘zaro aloqasi hamda an’anaviylik va zamonaviylik dialektikasi yoshlar innovatsion faolligini shakllantiruvchi omillar sifatida ko‘rsatilgan. Bu yondashuvdan kelib chiqib, zamonaviy yoshlar identikligi milliy-madaniy merosni saqlash bilan bir qatorda, yangi bilim, texnologiya va innovatsiyalarni o‘zlashtirish qobiliyati bilan ham tavsiflanishini qayd etish mumkin.

Umuman, tahlil qilingan adabiyotlar yoshlar identikligi va jamiyat transformatsiyasi o‘rtasidagi munosabatni qadriyatlar, milliy o‘zlik, mafkuraviy ong, raqamli muhit va innovatsion tafakkurning o‘zaro ta’siri orqali tushuntirish imkonini beradi. Shu bilan birga, mavjud tadqiqotlarda ushbu omillarning aksariyati alohida yo‘nalishlarda o‘rganilgan. Shuning uchun yoshlar identikligini milliy va umuminsoniy qadriyatlar, raqamli transformatsiya hamda innovatsion faollikning yagona tizimidagi hodisa sifatida kompleks ijtimoiy-falsafiy tadqiq etish dolzarb ilmiy vazifa bo‘lib qolmoqda.

Tadqiqot metodologiyasi. Mazkur tadqiqotning metodologik asosini yoshlar identikligi va zamonaviy jamiyat transformatsiyasini o‘zaro bog‘liq, dinamik va ko‘p omilli ijtimoiy-falsafiy hodisalar sifatida o‘rganish tamoyili tashkil etadi. Tadqiqotda dialektik, tizimli, qiyosiy, strukturaviy-funksional, fenomenologik va konstruktivistik yondashuvlar uyg‘unlashtirildi. Dialektik yondashuv orqali yoshlar identikligining an’ana va zamonaviylik, milliylik va umuminsoniylik, barqarorlik va o‘zgaruvchanlik o‘rtasidagi ziddiyatli, biroq o‘zaro ta’sirchan munosabatlari tahlil qilindi. Tizimli yondashuv identiklikni qadriyat, ijtimoiy mansublik, fuqarolik pozitsiyasi, tarixiy xotira, raqamli muhit va innovatsion faollik kabi tarkibiy qismlarning yaxlit tizimi sifatida ko‘rib chiqishga imkon berdi. Qiyosiy yondashuv asosida turli ilmiy tadqiqotlarda yoshlar identikligining globallashuv, raqamlashtirish va ijtimoiy-madaniy o‘zgarishlar sharoitidagi namoyon bo‘lish xususiyatlari solishtirildi. Xususan, zamonaviy tadqiqotlarda fuqarolik identikligi yoshlarning qadriyatlari, ijtimoiy rollari va mas’uliyatini belgilovchi hamda jamiyatning ijtimoiy-madaniy transformatsiyasiga ta’sir qiluvchi omil sifatida baholanadi. Shuningdek, raqamli globallashuv sharoitida yoshlar identikligi global va mahalliy madaniy ta’sirlarning uyg‘unlashuvi natijasida shakllanishi mumkinligi haqidagi ilmiy xulosalar metodologik jihatdan hisobga olindi. Tadqiqotda analiz va sintez, induksiya va deduksiya, umumlashtirish va tizimlashtirish kabi umumilmiy usullardan foydalanilib, mavjud ilmiy qarashlar asosida yoshlar identikligining zamonaviy jamiyat transformatsiyasidagi o‘rni konseptual jihatdan asoslandi. Shu bilan birga, raqamli makonning identiklik shakllanishiga ta’sirini aniqlashda onlayn va oflayn ijtimoiy tajribaning o‘zaro aloqadorligi ham metodologik mezon sifatida olindi; tadqiqotlar raqamli muhit yoshlarning ijtimoiy va madaniy identikligini qayta qurish uchun yangi kommunikativ makon yaratishini ko‘rsatadi. Natijada mazkur tadqiqotda yoshlar identikligi jamiyat transformatsiyasining faqat natijasi emas, balki uning ijtimoiy, aksiologik va innovatsion subyekti sifatida metodologik jihatdan talqin qilindi.

Natija va muhokamalar. Tadqiqot natijalari yoshlar identikligi va zamonaviy jamiyat transformatsiyasi o‘rtasidagi munosabat ikki tomonlama va dialektik xarakterga ega ekanini ko‘rsatadi. Bir tomondan, ijtimoiy, madaniy va texnologik o‘zgarishlar yoshlarning o‘zligini anglash, qadriyatlarni tanlash va jamiyatdagi mavqeini belgilash jarayonlariga bevosita ta’sir ko‘rsatadi; ikkinchi tomondan, yoshlarning shakllangan identikligi ularning ijtimoiy faolligi, fuqarolik pozitsiyasi va innovatsion tashabbuslari orqali jamiyatning keyingi transformatsiyasiga ta’sir qiladi. Yoshlarning fuqarolik identikligi ularning qadriyatlari, ijtimoiy mas’uliyati va jamiyatdagi rollarini belgilovchi muhim omil bo‘lib, ijtimoiy transformatsiya davrlarida uning mazmuni ham o‘zgarib boradi.

Tahlil natijalari, avvalo, qadriyatlar tizimidagi o‘zgarishlar yoshlar identikligining asosiy tarkibiy omillaridan biri ekanini ko‘rsatadi. Globallashuv, modernizatsiya va axborot oqimlarining kuchayishi an’anaviy qadriyatlarni yo‘q qilib yubormaydi, balki ularning mazmuni va qo‘llanish shakllarini qayta talqin qilishga olib keladi. O‘zbekistondagi yoshlar va qadriyatlar transformatsiyasiga bag‘ishlangan tadqiqot ham yoshlar qadriyatlar tizimining jamiyat modernizatsiyasi

jarayonida o‘zgarib borishini ko‘rsatadi (Ergashev, 2022). Shu jihatdan yoshlar identikligi an’anaviy va zamonaviy qadriyatlarning oddiy qarama-qarshiligi emas, balki ularning yangi ijtimoiy sharoitda qayta uyg‘unlashuvi sifatida namoyon bo‘ladi.

Muhim natijalardan yana biri shundaki, raqamli muhit yoshlar identikligini shakllantiruvchi mustaqil ijtimoiy makonga aylanmoqda. Ijtimoiy tarmoqlar yoshlarning o‘zini namoyon qilishi, boshqa guruhlar bilan muloqot qilishi va o‘z ijtimoiy mavqeini belgilashi uchun yangi imkoniyatlar yaratadi. Biroq bu jarayon identiklikning beqarorlashuvi, stereotiplarning kuchayishi va virtual hamda real “Men” o‘rtasidagi tafovutning yuzaga kelishi kabi xavflarni ham keltirib chiqarishi mumkin. Demak, raqamli transformatsiyani yoshlar identikligi uchun faqat imkoniyat yoki xavf sifatida emas, balki ikki tomonlama ta’sirga ega ijtimoiy-madaniy jarayon sifatida baholash lozim.

Tadqiqotlar shuni ham ko‘rsatadiki, global raqamli madaniyatning kirib kelishi yoshlarning milliy va mahalliy identikligini mutlaq ravishda zaiflashtirmaydi. Aksincha, yoshlarning faol va tanqidiy ishtiroki mavjud bo‘lgan sharoitda global madaniy unsurlar mahalliy qadriyatlar bilan uyg‘unlashib, gibrid identiklikni shakllantirishi mumkin. Bu holat zamonaviy yoshlar identikligining eng muhim xususiyatlaridan biri — tanlovchanlik va refleksivlik kuchayayotganini ko‘rsatadi. Yoshlar global madaniy tajribani tayyor shaklda qabul qilish o‘rniga uni o‘zining milliy-madaniy tajribasi bilan uyg‘unlashtirishi mumkin.

Shuningdek, natijalar yoshlar identikligining fuqarolik faolligi bilan bevosita bog‘liqligini ko‘rsatadi. Fuqarolik identikligi kuchli bo‘lgan yoshlarning jamiyatdagi ijtimoiy rollar, mas’uliyat va umumiy qadriyatlarga munosabati faolroq shakllanadi. Shu sababli yoshlar identikligini rivojlantirish faqat ma’naviy-tarbiyaviy vazifa emas, balki jamiyatning ijtimoiy birdamligi va transformatsion salohiyatini kuchaytiruvchi omil sifatida qaralishi lozim. Tadqiqot natijalari yoshlar identikligini “merosni o‘zlashtirish – tanqidiy qayta anglash – yangi ijtimoiy tajribani yaratish” jarayonlarining uzviy birligi sifatida tavsiflash imkonini beradi. Zamonaviy jamiyatning transformatsiyasi yoshlar identikligini o‘zgartiradi, yoshlarning yangilanayotgan identikligi esa o‘z navbatida jamiyatning qadriyatlari, ijtimoiy munosabatlari va madaniy rivojlanish yo‘nalishlariga ta’sir ko‘rsatadi. Shu bois yoshlar identikligini mustahkamlashning eng maqbul modeli milliy-madaniy ildizlarni saqlagan holda global va raqamli muhit bilan tanqidiy muloqot qila oladigan, fuqarolik mas’uliyati va innovatsion faollikka ega shaxsni shakllantirishga yo‘naltirilishi lozim.

Xulosa va takliflar. Yoshlar identikligi zamonaviy jamiyat transformatsiyasining muhim ijtimoiy-falsafiy omili bo‘lib, u milliy qadriyatlar, globallashuv, raqamli muhit va innovatsion jarayonlar ta’sirida doimiy ravishda shakllanib va yangilanib boradi. Tadqiqot natijalari yoshlar identikligini mustahkamlashda milliy va umuminsoniy qadriyatlar uyg‘unligi, tanqidiy tafakkur, fuqarolik mas’uliyati va innovatsion faollik muhim ahamiyatga ega ekanini ko‘rsatdi. Shu bois yoshlarni jamiyatdagi o‘zgarishlarning passiv ishtirokchisi emas, balki uning faol va ijodiy subyekti sifatida shakllantirish zamonaviy taraqqiyotning muhim shartidir.

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GLOBALLASHUV SHAROITIDA FUQAROLIK JAMIYATI INSTITUTLARINING O‘ZIGA XOS O‘RNI

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Annotatsiya: *Ushbu maqolada globallashuv sharoitida fuqarolik jamiyati institutlarining jamiyat taraqqiyotidagi o‘rni va roli tadqiq etilgan. Fuqarolarning jamiyatda ijtimoiy-siyosiy faolligini yanada oshirish, ularni qonuniy manfaatlarini himoya qilish va davlat organlari hamda jamoatchilik o‘rtasidagi hamkorliklarni yanada mustahkamlashda fuqarolik jamiyati institutlarining ahamiyati tadqiq qilingan. Bundan tashqari, hozirgi globallashuv davrida ommaviy axborot vositalari, jamoatchilik tuzilmalari va nodavlat notijorat tashkilotlarining faoliyatlariga ta’sir qiluvchi omillar ijtimoiy-falsafiy jihatdan tahlil qilindi. Olib borgan tadqiqotimiz natijasida, fuqarolik jamiyati institutlari jamiyatimizda demokratik qadriyatlarni shakllantirish va qaror toptirish hamda barqaror rivojlanishda katta ahamiyat kasb etishi aniqlangan.*

Kalit so‘zlar: *fuqarolik jamiyati, globallashuv, fuqarolik institutlari, jamoatchilik nazorati, demokratik taraqqiyot, fuqarolik faolligi, ijtimoiy hamkorlik, ommaviy axborot vositalari, nodavlat notijorat tashkilotlari, huquqiy davlat*

ОСОБАЯ РОЛЬ ИНСТИТУТОВ ГРАЖДАНСКОГО ОБЩЕСТВА В КОНТЕКСТЕ ГЛОБАЛИЗАЦИИ

Аннотация: *В данной статье рассматривается роль и место институтов гражданского общества в развитии общества в контексте глобализации. Анализируется важность институтов гражданского общества в дальнейшем повышении социально-политической активности граждан в обществе, защите их законных интересов и дальнейшем укреплении сотрудничества между государственными органами и общественностью. Кроме того, с социально-философской точки зрения анализируются факторы, влияющие на деятельность средств массовой информации, государственных структур и неправительственных некоммерческих организаций в современную эпоху глобализации. В результате исследования установлено, что институты гражданского общества играют значительную роль в формировании и принятии демократических ценностей в нашем обществе, а также в устойчивом развитии.*

Ключевые слова: *гражданское общество, глобализация, гражданские институты, общественный контроль, демократическое развитие, гражданский активизм, социальное сотрудничество, СМИ, неправительственные организации, верховенство права*

THE SPECIAL ROLE OF CIVIL SOCIETY INSTITUTIONS IN THE CONTEXT OF GLOBALIZATION

Abstract: *This article examines the role and place of civil society institutions in the development of society in the context of globalization. The importance of civil society institutions in further increasing the socio-political activity of citizens in society, protecting their legitimate interests, and further strengthening cooperation between state bodies and the public is examined. In addition, the factors influencing the activities of the media, public structures, and non-governmental non-profit organizations in the current era of globalization are analyzed from a socio-philosophical perspective. As a result of our research, it was determined that civil society institutions play a significant role in the formation and adoption of democratic values in our society, as well as in sustainable development.*

Keywords: *civil society, globalization, civic institutions, public oversight, democratic development, civic activism, social cooperation, media, non-governmental organizations, rule of law*

Kirish (Introduction). Fuqarolik jamiyati borasidagi qarashlar qadimgi falsafiy maktablarda boshlangan bo‘lib, hozirgi zamonaviy siyosiy va huquqiy konsepsiyalargacha bo‘lgan ko‘p asrlik rivojlanish yo‘lini bosib o‘tgan. Qadimgi davrlarda yashab o‘tgan mutafakkir va olimlar insonlarning jamiyat hayotidagi o‘rni, erkinligi va adolatli jamiyat haqida turli-xil g‘oyalarni ilgari surganlar. Ushbu fikrlar asosida fuqarolik jamiyati to‘g‘risida tushunchalar sekin-asta shakllandi va rivojlanishning turli davrlarida o‘ziga xos mazmun kasb etdi.

Mamlakatimiz taraqqiyoti va xalqimiz farovonligini ta’minlash maqsadida chiqarilayotgan Prezident Farmonlari va hukumatimiz qarorlari bu borada faoliyatimizning asosiy dasturilamali bo‘lishi zarur. Vatanimiz ozod, mamlakatimiz obod va erkin hamda farovon hayot asosiy yo‘limiz ekanligi, mamlakatimiz taraqqiyoti va xalqimizning hayot darajasini yuksaltirish – barcha demokratik yangilanish va iqtisodiy islohotlarimizdan ko‘zlangan asosiy maqsad eng avvalo xalq manfaati va yoshlarimiz kelajagi uchun qaratilmog‘i joiz.

Yangi O‘zbekistonda o‘ziga hos o‘rin tutayotgan mahallalarimiz ijtimoiy va madaniy-ma’naviy hayotida tub o‘zgarishlar ro‘y bermoqda. Mahalla faoliyatiga doir bir nechta qonun va qarorlar qabul qilindi, uning vakolatlari kengaytirildi, jamiyatimiz islohotlarini amalga oshirishning ishonchli tayanchi va ta’sirchan vositasi sifatida shakllana boshladi.

Mavzuga oid adabiyotlarning taxlili (Literature revitw). Maqola yuzasidan xorijda va yurtimizning faoliyat yuritgan olimlarining ilmiy tadqiqotlarida fuqarolik jamiyatini rivojlantirishning ijtimoiy falsafiy tahlili va bu bo‘yicha ularning fikrlari, shuningdek, bir qator olimlarning fuqarolik jamiyatini rivojlanish bo‘yicha tadqiqotlar olib borishgan.

Jumladan: G‘arbning buyuk mutafakkirlari hisoblangan – Platon, Aristotel, Plutarx, N. Makiavelli, G. Gegel, Sh. Montesk’e, A. Tokvil hamda F. Nitshening bir qator asarlarida fuqarolik jamiyati va kishilarning jamoaviy yashash tarziga bag‘ishlangan fundamental falsafiy ma’lumotlar aks etgan[15].

Keyingi davrlarda esa, bu borada M. Veber, R. Taker, T. Karleyl, K. Yaspers, J. Blondel, A. Bodalev, L. Rutkevich, E. Abashkin, Y. Kosolapova, G. Avsinova, D. Adair, G. Avsinova, G. Ashin, I. Graus, I. Dubov, R. Krichevskiy, S. Maletin, J. Maksvell, N. Pishulin, D. Slizovskiy[16] va boshqa olimlarning tadqiqotlarida fuqarolik jamiyatini rivojlantirishning ilmiy nazariyalari, siyosiy, falsafiy hamda sotsiologik ta’limotlari mavjud.

Bundan tashqari, yurtimiz tarixi haqidagi qimmatli manba hisoblangan “Avesto”, Imom al-Buxoriy, Abu Nasr Forobiy, Abu Rayhon Beruniy, Abu Ali ibn Sino, Nizomulmulk, Husayn Voiz Koshifiy, Abu Xomid G‘azoli, Yusuf Xos Hojib, Alisher Navoiy va Zahiriddin Muhammad Bobur[17] singari mutafakkirlarimizning asarlarida adolatli boshqaruv, fuqarolik jamiyati haqidagi sharqona qarashlar, mahalla va uning tarixiy rivojlanish bosqichlari, urf-odat hamda marosimlar haqidagi qimmatli ma’lumotlar keltirilgan.

Shuning uchun ham mamlakatimiz o‘z mustaqilligini qo‘lga kiritgandan so‘ng xalqimizning urf-odat, an’ana, qadriyat va udumlarini tiklash hamda mamlakatimizda demokratik jamiyat qurishning asosiy omillaridan biri sifatida “mahalla” institutini tiklash, rivojlantirish va uning faoliyatini izchillik bilan amalga oshirishga katta e’tibor qaratildi va hozirgi kunda bu soha borasida keng ko‘lamli ishlar amalga oshirilmoqda.

Tadqiqot metodologiyasi (Research Methodology). Tadqiqotni olib borishda tarixiylik, mantiqiylik, qiyosiylik, kuzatish, o‘zaro aloqadorlik ilmiy tadqiqot tamoyillaridan kelib chiqqan holda qiyosiy tahlil kabi tadqiqot usullaridan foydalanildi.

- **Tahlil va natijalar (Analysis and results).** Tadqiqotimiz davomida shunga amin bo‘ldikki, globallashuv davrida fuqarolik jamiyati institutlarining ahamiyati katta hisoblanadi. Umuman olganda, Fuqarolik jamiyati tushunchasi antik davrdan g‘arb ma’rifatchilarigacha bo‘lgan uzoq davr mobaynida turlicha ko‘rinishlarda namoyon bo‘lgan[18].

Fuqarolik jamiyatining paydo bo‘lishiga qadar aksariyat mamlakatlarda mutlaq monarxiya tizimlari amalda bo‘lgan. Davlat shaxs hayotini sinfiy tizim qoidalari asosida qattiq chegaralar edi. Davlat birgina monarx timsolida ba’zi sinflarga

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keng imtiyozlar bersa, boshqalarini barcha imkoniyatlardan mahrum qilar edi[19]. Albatda, bundey jamiyat bilan uzoqqa borib bo‘lmasligini tarix bizga ko‘rsatdi. Chunki, qadimdan insonning manfaatlari himoyasi, huquqlari va erkinliklari bo‘yicha o‘sha davr xurfikrlari ommani ruxlantirish va xaq xuquqlarini bilib olishlari uchun turli-xil asarlar va nutqlar so‘zlab kelishgan.

Jamiyatning ijtimoiy-iqtisodiy taraqqiyotni ta’minlash va har jihatdan barkamol avlod va komil inson tarbiyasiga bog‘liqdir. Bugungi globallashuv davrida yoshlarimizni ma’naviy tahdidlardan himoya etishda ularni milliy ma’naviy qadriyatlarimizni va sharqona madaniyat asosida tarbiyalash muhim ahamiyat kasb etadi va shu bilan birga yurtimizda qadim zamonlardan buyon tarbiya maskani sifatida oilani muqaddas hisoblab kelgan. O‘zbek oilalarida bolalarni faqat ota-onagina emas, balki qarindosh urug‘lar, qo‘ni-qo‘shnilar, mahalla-ko‘y tarbiyalaydi, degan gap bor[20]. Shuning uchun ham hozirgi kunda jamoatchilik nazorati kabi xalqimizning eng faol qatlamlari uyushmasiga keng imkoniyat va vakolatlar berilmoqda. Chunki, xalqimizda bir gap bor bir bolaga yetti mahalla ota-ona degan. Shularni inobatga olgan holda yoshlarimizga bo‘sh vaqtlarini mazmunli tashkil etish va ish bilan ta’minlash davlat siyosati darajasiga ko‘tarilmoqda.

Bugungi dunyodagi globallashuv muhiti kechayotgan davrda aholi faolligini oshirishining samarali tizimini yaratish zamon talabiga aylandi. Fuqarolarimizning jamoatchilik nazorati natijasida “Harakatlar strategiyasidan – Taraqqiyot strategiyasi sari[21]” tamoyiliga, asosan, ishlab chiqilgan yettita ustuvor yo‘nalishdan iborat 2022–2026-yillarga mo‘ljallangan Yangi O‘zbekistonning taraqqiyot strategiyasi qabul qilinishi asosida 2022-yil O‘zbekistonda “Inson qadrini ulug‘lash va faol mahalla yili”[22], deb e’lon qilindi. Inson manfaatlari va uning qadri ustuvorligiga asoslangan xalqchil siyosat mamlakatimizda xalqimizning noyob an’ana va qadriyatlari, shaxsning jamiyat oldidagi majburiyatlari bajarilishini kafolatlaydigan, o‘zini o‘zi boshqarish institutining o‘ziga xos ko‘rinishi bo‘lgan mahalla institutining rivojlantirilishi asosida fuqarolik jamiyatini shakllantirishga xizmat qilmoqda.

Keyingi paytlarda mamlakatimizda ushbu bo‘g‘inning nufuzini oshirish va unga qo‘shimcha vakolatlar berish borasida qator me’yoriy hujjatlar qabul qilinib, tizimning yangicha ishlash mexanizmlari yaratilmoqda.

Jumladan, fuqarolik jamiyati institutlarini faoliyatini demokratlashtirish va erkinlashtirish, ularning ijtimoiy-siyosiy va ijtimoiy-iqtisodiy islohotlarni chuqurlashtirish jarayonidagi keng ishtirokini ta’minlashda salmoqli ishlar amalga oshirildi. Xususan, ushbu institutlar faoliyatining huquqiy asoslarini yaratishda alohida e’tibor qaratildi[23].

Fuqarolik jamiyatida demokratik tuzimning mavjudligi va uning mustahkamlanib borishi fuqarolarda siyosiy-huquqiy madaniyatni shakllantirish va rivojlantirishning asosiy shartidir. Bunday siyosiy tizim shaxs siyosiy – huquqiy ongi va faoliyatining rivojlanishiga keng imkoniyatlar yaratadi, uni rag‘batlantiradi. Jamiyat siyosiy tizimi qanchalik demokratik bo‘lsa, inson siyosiy hayotda shunchalik faol ishtirok etadi. Bu – aksiomadir[24]. Mamlakatimizda ro‘y berayotgan ijobiy o‘zgarishlar va erishilayotgan yutuqlarda fuqarolik jamiyati institutlarining munosib hissasi bor. Fuqarolarga huquqiy yordam ko‘rsatish, ularning siyosiy ongi va tafakkurini yuksaltirish, yoshlar va xotin-qizlar bilan ishlash, ularni ishga joylashtirish, aholining yordamga muhtoj qatlamlarini qo‘llab-quvvatlash va boshqa sohalarda fuqarolik jamiyati institutlarining roli oshib borayotgani buning isbotidir. Bunda ularni davlat tomonidan qo‘llab-quvvatlash bo‘yicha samarali tizim yaratilgani muhim ahamiyat kasb etmoqda.

O‘zbekistonda fuqarolik jamiyatini rivojlantirish globallashuv davri salbiy hodisalari xavfini kamaytirish va yoshlarni ma’naviy yetuk shaxslar etib tarbiyalash uchun ularda faol fuqarolik pozitsiyasini shakllantirish zarur. Zero, fuqarolik pozitsiyasiga ega bo‘lgan yoshlargina jamiyatning asosiy maqsadlari nimadan iboratligini tushunib, xalq va jamiyat oldidagi mas’uliyatini chuqur anglaydi[25]. Hozirgi vaqtda ko‘plab davlatlarda yoshlarning buzg‘unchi g‘oyalarga uchib yo‘ldan adashib qolganlari ham kam emas albatta. Shuning uchun mahalla faollari va oila boshliqlari farzand tarbiyasi bilan shug‘ullanishi va ularni bo‘sh vaqtlarida kitob o‘qishni targ‘ib qilishlari va ular bilan do‘stona munosabatda bo‘lishlari talab etiladi.

Globallashuv vositalari – ommaviy madaniyatni keng yoyilishiga imkoniyat yaratayotgan ayni bir paytda, ayniqsa dunyo yoshlarining soni ikki milliarddan oshib ketgani, xalqaro terrorizm va ekstremizm shiddat bilan o‘sib borayotganligi va ularning kelajagi uchun himoya zarurligi muhim masaladir. Ommaviy madaniyat o‘zbek xalqining tafakkuriga, musiqasi, kiyinishi, o‘zaro muomalasi, oilasi, oilaviy munosabatlariga, hatto orzulariga ham chang solmoqda[26]. Bunday

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[25] Nazirov M. Yoshlarda faol fuqarolik pozitsiyasini shakllantirish. O‘quv-uslubiy qo‘llanma. – Toshkent, 2021. –B. 12.

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illatlardan yoshlarimizni asrash uchun milliyligimizni targ‘ib qiluvchi madaniy tadbirlarni ommalashtirish muhim hisoblanadi.

Xulosa va takliflar (Conclusion/Recommendations). Xulosa qilib aytganda, globallashuv jarayonlari jamiyatning deyarli barcha jabhalariga o‘z ta’sirini ko‘rsatib, fuqarolik jamiyati institutlarining qanchalik ahamiyatli ekanligini ko‘rsatib bermoqda. Avvalo, fuqarolik jamiyati institutlarining asosiy vazifa fuqarolarning huquq va erkinliklarini birinchi o‘ringa qo‘yish, ularni ijtimoiy-siyosiy faolliklarini doimiy qo‘llab-quvvatlash hamda davlat va jamiyat o‘rtasida o‘zaro muloqotni samarali ta’minlashda muhim ahamiyat kasb etadi. Hozirgi globallashuv sharoitida ommaviy axborot vositalari, nodavlat notijorat tashkilotlari va boshqa jamoatchilik tuzilmalari demokratik qadriyatlarning saqlab qolish va rivojlantirishda hamda fuqarolik madaniyati shakllantirshda ahamiyati ortib bormoqda.

Takliflar:

1. Fuqarolik jamiyati institutlarining huquqiy asoslarini yanada takomillashtirish,
2. Nodavlat notijorat tashkilotlarining ijtimoiy loyihalarini moliyaviy va tashkiliy jihatdan qo‘llab-quvvatlash mexanizmlarini kengaytirish,
3. Fuqarolarning ijtimoiy-siyosiy faolligini oshirishga qaratilgan targ‘ibot ishlarini kengaytirish
4. Zamonaviy texnologiyalar yordamida jamoatchilik nazorati va fuqarolar ishtirokini yanada kengaytirish
5. Davlat organlari va fuqarolik jamiyati institutlari o‘rtasidagi ochiq muloqot mexanizmlarini takomillashtirish

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OLIY TA'LIM TALABALARINING RAQAMLI JAMIYATDAGI IJTIMOIY MOSLASHUVI: MILLIY MENTALITET VA GLOBAL TA'LIM QADRYATLARI O'RTASIDAGI O'ZARO TA'SIRI

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Annotatsiya: *Raqamli texnologiyalarning tez rivojlanishi butun dunyo bo'ylab oliy ta'lim tizimlarini tubdan o'zgartirdi. Universitet talabalaridan nafaqat yangi raqamli o'quv muhitlariga moslashish, balki ularning milliy mentaliteti va madaniy an'analari bilan farq qilishi mumkin bo'lgan global ta'lim qadriyatlariga ham moslashish talab qilinmoqda. Ushbu maqola universitet talabalarining raqamli jamiyatda ijtimoiy moslashuvini milliy mentalitet va global ta'lim qadriyatlari o'rtasidagi o'zaro ta'sir orqali tahlil qiladi. So'rov ma'lumotlari va sifatli tahlilni birlashtirgan aralash metodlar yondashuvidan foydalanib, tadqiqot talabalarining moslashuvchan qobiliyatlariga ta'sir qiluvchi asosiy omillarni aniqlaydi, jumladan raqamli kompetentsiya, madaniy identitet va qadriyat orientatsiyasi. Natijalar shuni ko'rsatadiki, muvaffaqiyatli ijtimoiy moslashuv milliy mentalitetni saqlash va global akademik normalarni integratsiya qilish o'rtasidagi muvozanatga bog'liq. Tadqiqot talabalarning raqamli jamiyatda moslashuvini konseptual modelini taklif qilish orqali ijtimoiy falsafa va ta'lim fanlariga hissa qo'shadi va oliy ta'lim muassasalari uchun amaliy tavsiyalarni beradi.*

Kalit so'zlar: *raqamli texnalogiyalar, ijtimoiylashuv, milliy mentaalitet, global ta'lim, qadriyatlar, raqamli jamiyat, oliy ta'lim talabalari, raqamli kompitensiya.*

СОЦИАЛЬНАЯ АДАПТАЦИЯ СТУДЕНТОВ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ В УСЛОВИЯХ ЦИФРОВОГО ОБЩЕСТВА: ВЗАИМОДЕЙСТВИЕ НАЦИОНАЛЬНОГО МЕНТАЛИТЕТА И ГЛОБАЛЬНЫХ ОБРАЗОВАТЕЛЬНЫХ ЦЕННОСТЕЙ

Аннотация: *Стремительное развитие цифровых технологий коренным образом изменило системы высшего образования во всем мире. От студентов университетов требуется не только адаптация к новым цифровым образовательным средам, но и освоение глобальных образовательных ценностей, которые могут отличаться от их национального менталитета и культурных традиций. В данной статье анализируется социальная адаптация студентов университетов в условиях цифрового общества через взаимодействие национального менталитета и глобальных образовательных ценностей. Используя смешанный методологический подход, сочетающий данные опросов и качественный анализ, исследование выявляет основные факторы, влияющие на адаптационные способности студентов, включая цифровую компетентность, культурную идентичность и ценностные ориентации. Результаты показывают, что успешная социальная адаптация зависит от достижения баланса между сохранением национального менталитета и интеграцией глобальных академических норм. Исследование вносит вклад в социальную философию и педагогические науки, предлагая концептуальную модель адаптации студентов к цифровому обществу, а также практические рекомендации для учреждений высшего образования.*

Ключевые слова: *цифровые технологии, социализация, национальный менталитет, глобальное образование, ценности, цифровое общество, студенты высших учебных заведений, цифровая компетентность*

SOCIAL ADAPTATION OF HIGHER EDUCATION STUDENTS IN THE DIGITAL SOCIETY: THE INTERACTION BETWEEN NATIONAL MENTALITY AND GLOBAL EDUCATIONAL VALUES

Abstract: *The rapid development of digital technologies has fundamentally transformed higher education systems worldwide. University students are required not only to adapt to new digital learning environments but also to align themselves with global educational values that may differ from their national mentality and cultural traisions. This article analyzes the social adaptation of university students in a digital society through the interaction between national mentality and global educational values. Using a mixed-methods approach that combines survey data and qualitative analysis, the study identifies key factors influencing students'*

adaptive capacities, including digital competence, cultural identity, and value orientation. The findings indicate that successful social adaptation depends on achieving a balance between preserving national mentality and integrating global academic norms. The study contributes to social philosophy and educational sciences by proposing a conceptual model of students' adaptation to the digital society and offers practical recommendations for higher education institutions.

Keywords: *digital technologies, socialization, national mentality, global education, values, digital society, higher education students, digital competence.*

KIRISH

Raqamli jamiyatning shakllanishi oliy ta'lim tizimida nafaqat texnologik, balki chuqur ijtimoiy-falsafiy o'zgarishlarni yuzaga keltirmoqda. Ta'lim jarayonining raqamlashtirilishi bilimga kirish imkoniyatlarini kengaytirar ekan, ayni paytda talabalar ijtimoiy moslashuvining yangi shakllarini ham talab qilmoqda. Bu jarayonda talaba endilikda faqat akademik muhitga emas, balki global miqyosda shakllanayotgan ta'limiy qadriyatlar tizimiga moslashishga majbur bo'lmoqda.[1.34]

Zamonaviy ilmiy adabiyotlarda raqamli jamiyat tushunchasi ko'pincha tarmoq texnologiyalari, axborot oqimlari va ijtimoiy institutlarning transformatsiyasi bilan izohlanadi. M. Kastels raqamli jamiyatni "ijtimoiy tuzilmalarning axborot tarmoqlari orqali qayta tashkil etilishi" sifatida talqin qiladi.[2.246] Ushbu sharoitda oliy ta'lim muassasalari global akademik makonning faol subyektiga aylanib, universal standartlar, kompetensiyalar va qadriyatlarni ilgari surmoqda.

Biroq global ta'limiy qadriyatlarning joriy etilishi milliy mentalitetga ega jamiyatlarda muayyan ijtimoiy-psixologik ziddiyatlarni yuzaga keltirishi mumkin. Milliy mentalitet — bu jamiyat a'zolarining tarixiy tajribasi, madaniy an'analari va kollektiv qadriyatlari asosida shakllangan barqaror dunyoqarash tizimidir.[3.9]

So'nggi yillarda olib borilgan tadqiqotlar talabalar ijtimoiy moslashuvida raqamli kompetensiya muhim omil ekanini ko'rsatmoqda.[4.41] Shu bilan birga, faqat texnik ko'nikmalarning rivojlanishi moslashuvning barqarorligini ta'minlamaydi. Tadqiqotchilar talabaning madaniy identiteti va qadriyatlar tizimi bilan global akademik talablar o'rtasidagi muvozanatni moslashuv jarayonining hal qiluvchi sharti sifatida qayd etmoqda.[5.88]

Ijtimoiy-falsafiy nuqtayi nazardan qaralganda, moslashuv jarayoni global va milliy omillar o'rtasidagi dialektik munosabat sifatida namoyon bo'ladi. A. Giddens ta'kidlaganidek, zamonaviylik sharoitida an'anaviy ijtimoiy tuzilmalar yo'qolmaydi, balki yangi kontekstda qayta talqin qilinadi. [6.54] Demak, raqamli jamiyat sharoitida talabalar moslashuvi milliy mentalitetni inkor etish emas, balki uni global ta'limiy qadriyatlar bilan uyg'unlashtirish jarayoni sifatida tushunilishi lozim.

ADABIYOTLAR TAHLILI METADOLOGIYASI

Talabalarning ijtimoiy moslashuvi masalasi sotsiologiya, ijtimoiy falsafa va ta'limshunoslik doirasida turli nazariy yondashuvlar asosida talqin qilingan. Klassik yondashuvlarda moslashuv individning mavjud ijtimoiy normalar va institutlarga moslashish jarayoni sifatida qaraladi. J. Berry ushbu jarayonni madaniyatlararo kontekstda tahlil qilib, moslashuvni integratsiya, assimilyatsiya, ajralish va marginalizatsiya strategiyalariga ajratadi.[7.698] Ushbu tasnif raqamli jamiyat sharoitida ham o'z dolzarbligini saqlab qolmoqda.

Raqamli jamiyat nazariyasi doirasida ijtimoiy moslashuv masalasi axborot texnologiyalarining kundalik hayot va institutlarga chuqur kirib borishi bilan izohlanadi. M. Kastels tarmoq jamiyati sharoitida shaxsning ijtimoiy mavqei va identiteti axborot oqimlarida ishtirok etish darajasi bilan belgilanishini ta'kidlaydi.[8.247] Bu holat oliy ta'lim talabalarining raqamli muhitga moslashuvini faqat texnik kompetensiya bilan cheklab bo'lmasligini ko'rsatadi.

So'nggi tadqiqotlarda raqamli kompetensiya talabalarning akademik muvaffaqiyati va ijtimoiy integratsiyasida muhim omil sifatida e'tirof etiladi. OECD ma'lumotlariga ko'ra, raqamli ko'nikmalari rivojlangan talabalar masofaviy va gibrid ta'lim sharoitida o'zlarini ijtimoiy jihatdan barqarorroq his qiladilar.[9.39] Biroq mazkur yondashuvning cheklangan tomoni shundaki, u madaniy va qadriyatlar omilini ikkinchi darajaga tushirib qo'yadi.

Milliy mentalitet masalasi madaniyatlararo tadqiqotlarda alohida e'tiborga ega. G. Hofstede milliy mentalitetni jamiyat a'zolarining kollektiv xulq-atvori va qadriyatlarini belgilovchi omil sifatida tahlil qiladi.[10.8] Uning fikricha, individualistik va kollektivistik madaniyatlar global institutlarga, jumladan ta'lim tizimiga moslashishda turlicha strategiyalarni namoyon etadi. Shu jihatdan, global akademik qadriyatlar milliy mentalitet bilan to'qnash kelganida moslashuv jarayoni murakkablashadi.

Z. Bauman zamonaviy jamiyatni "suyuq modernlik" tushunchasi orqali izohlab, ijtimoiy barqarorlikning susayishi shaxs identitetini doimiy qayta qurishga majbur etishini ta'kidlaydi.[11.19] Raqamli ta'lim muhitida talabalar ko'pincha tezkor moslashuvga majbur bo'lib, bu holat chuqur ichki qabul qilish emas, balki yuzaki moslashuv shakllarini keltirib chiqarishi mumkin.

Ta'limning globallashuvi masalasini tahlil qilgan S. Marginson global ta'limiy qadriyatlar — akademik erkinlik, tanqidiy fikrlash va raqobatbardoshlik — milliy kontekstda qayta talqin qilinmasa, ijtimoiy ziddiyatlarni kuchaytirishini

qayd etadi.[12.86] Shu sababli zamonaviy tadqiqotlarda moslashuv jarayoni global integratsiya va milliy identitet o‘rtasidagi muvozanat nuqtai nazaridan tahlil qilinmoqda.

Shu bilan birga, mavjud adabiyotlar tahlili shuni ko‘rsatadiki, raqamli jamiyat sharoitida talabalar ijtimoiy moslashuvida milliy mentalitet va global ta’limiy qadriyatlarning o‘zaro ta’siri yetarlicha kompleks tarzda o‘rganilmagan. Aksariyat tadqiqotlar texnologik yoki psixologik omillarga urg‘u berib, ijtimoiy-falsafiy yondashuvni cheklangan holda qo‘llaydi. Mazkur holat ushbu maqolada integrativ nazariy model ishlab chiqish zaruratini yuzaga keltiradi.

Mazkur tadqiqot raqamli jamiyat sharoitida oliy ta’lim talabalari ijtimoiy moslashuvining murakkab tabiatini aniqlashga qaratilgan bo‘lib, aralash metodologiya (mixed-methods) yondashuvi asosida olib borildi. Ushbu yondashuv miqdoriy va sifat tahlilining o‘zaro uyg‘unligini ta’minlab, moslashuv jarayonining nafaqat tashqi ko‘rsatkichlarini, balki qadriyatlar va identitet bilan bog‘liq ichki mexanizmlarini ham chuqurroq ochib berishga imkon yaratadi.[13.214]

Aralash metodologiya tanlanishining asosiy sababi shundaki, talabalar ijtimoiy moslashuvi faqat statistik ko‘rsatkichlar bilan cheklanmay, ijtimoiy-falsafiy mazmunga ega bo‘lgan subyektiv tajribalarni ham o‘z ichiga oladi. Shu bois tadqiqotda ketma-ket izohlovchi dizayn (sequential explanatory design) qo‘llanildi, ya’ni dastlab miqdoriy ma’lumotlar yig‘ilib tahlil qilindi, so‘ngra sifatli ma’lumotlar orqali ularning mazmuniy talqini berildi.[14.99]

3.2. Tanlanma va tadqiqot ishtirokchilari

Tadqiqotning miqdoriy bosqichida 320 nafar oliy ta’lim talabalari ishtirok etdi. Respondentlar turli akademik yo‘nalishlar bo‘yicha tahsil olayotgan bo‘lib, ularning barchasi raqamli ta’lim elementlari joriy etilgan ta’lim muassasalarida o‘qiydi. Tanlanma tasodifiy-klaster usuli asosida shakllantirildi, bu esa ma’lumotlarning umumlashtirilish imkoniyatini oshirdi.[15.155]

Sifatli bosqichda esa 20 nafar talaba bilan yarim tuzilmali intervyular o‘tkazildi. Intervyu ishtirokchilari miqdoriy tadqiqot natijalari asosida, ya’ni moslashuv darajasi yuqori, o‘rtacha va past bo‘lgan guruhlardan tanlab olindi. Bu yondashuv moslashuv strategiyalarining farqli jihatlarini aniqlashga xizmat qildi.

Miqdoriy ma’lumotlar tuzilmaviy so‘rovnoma orqali yig‘ildi. So‘rovnoma quyidagi asosiy bloklardan iborat bo‘ldi:

1. raqamli kompetensiya darajasi;
2. ijtimoiy moslashuv ko‘rsatkichlari;
3. milliy qadriyatlarga orientatsiya;
4. global ta’limiy qadriyatlarni qabul qilish darajasi.

So‘rovnoma bandlari oldin sinovdan o‘gan xalqaro tadqiqotlarga tayangan holda moslashtirildi. Instrumentning ichki ishonchliligi Cronbach’s alpha (α = 0.81) ko‘rsatkichi orqali tasdiqlandi, bu esa o‘lchov vositasining metodologik barqarorligini ko‘rsatadi.[16.789]

Sifatli bosqichda qo‘llanilgan yarim tuzilmali intervyular talabalar tomonidan raqamli ta’lim muhitida boshdan kechirilgan moslashuv tajribalarini, qadriyatlar ziddiyatini va identitetga oid qarashlarni aniqlashga qaratildi.

3.4. Ma’lumotlarni tahlil qilish usullari

Miqdoriy ma’lumotlar deskriptiv va korrelyatsion tahlil usullari yordamida qayta ishlanib, raqamli kompetensiya, ijtimoiy moslashuv va qadriyatlar orientatsiyasi o‘rtasidagi bog‘liqliklar aniqlashtirildi. Natijalar statistik ahamiyatlilik darajasi $p < 0.05$ mezoni asosida baholandi.

Sifatli ma’lumotlar esa tematik tahlil asosida kodlanib, talabalar moslashuvining asosiy strategiyalari va semantik modellari aniqlandi. Ushbu yondashuv individual tajribalarni umumiy nazariy xulosalar bilan bog‘lash imkonini berdi.[17.71]

Tadqiqot jarayonida barcha ishtirokchilarning ixtiyoriy roziligi olindi hamda ularning shaxsiy ma’lumotlari maxfiyligi ta’minlandi. Tadqiqot xalqaro ilmiy etik me’yorlarga muvofiq amalga oshirildi.

Modelning asosiy nazariy farazi shundan iboratki, raqamli jamiyat sharoitida talabaning muvaffaqiyatli ijtimoiy moslashuvi global akademik talablarga bir tomonlama moslashish orqali emas, balki milliy qadriyatlar va madaniy identitetni saqlagan holda global ta’limiy normalarni ichki qabul qilish orqali yuzaga keladi. Ushbu yondashuv J. Berry tomonidan taklif etilgan integrativ moslashuv konsepsiyasining raqamli ta’lim kontekstidagi kengaytirilgan talqiniga asoslanadi.[18.701]

Konseptual modelda milliy mentalitet talabaning qadriyatlar tizimi va ijtimoiy xulq-atvorini belgilovchi barqaror omil sifatida ko‘riladi. Milliy qadriyatlar ta’lim jarayonida talabaning o‘zini identifikatsiya qilishi, ijtimoiy barqarorligi va motivatsiyasiga bevosita ta’sir ko‘rsatadi. G. Hofstede ta’kidlaganidek, kollektivistik qadriyatlar ustuvor bo‘lgan jamiyatlarda ta’lim jarayoni ijtimoiy mas’uliyat va hamkorlik orqali anglanadi.[19.11] Shu sababli milliy mentalitetni inkor etuvchi global ta’lim modellarining joriy etilishi moslashuvning yuzaki shakllariga olib kelishi mumkin.

Global ta’limiy qadriyatlar mazkur modelda talabaning akademik avtonomiyasi, tanqidiy fikrlashi va raqobatbardoshligini shakllantiruvchi omil sifatida namoyon bo‘ladi. Ta’limning globallashuvi jarayonida ushbu qadriyatlar oliy ta’lim muassasalari orqali universal me’yor sifatida ilgari surilmoqda. S. Marginsonning fikricha, global

akademik qadriyatlar milliy kontekstga moslashtirilmagan holatda joriy etilganda, ular ijtimoiy begonalashuv va identitet ziddiyatini kuchaytiradi.[20.93]

Modelning markaziy elementi sifatida raqamli kompetensiya qaraladi. Raqamli kompetensiya nafaqat texnik ko‘nikmalar majmuasi, balki axborotni tanqidiy tahlil qilish, raqamli muhitda muloqot qilish va o‘z-o‘zini boshqarish qobiliyatlarini ham o‘z ichiga oladi. OECD tadqiqotlariga ko‘ra, raqamli kompetensiya global akademik qadriyatlarni amaliy jihatdan o‘zlashtirishda vositachi (mediator) rolini bajaradi.[21.49]

Ijtimoiy-falsafiy nuqtayi nazardan, mazkur model global va milliy omillar o‘rtasidagi dialektik munosabatni aks ettiradi. A. Giddensning zamonaviylik haqidagi qarashlariga tayangan holda, model milliy qadriyatlarning yo‘qolishini emas, balki ularning global raqamli kontekstda qayta talqin qilinishini asoslaydi.[22.55] Shu jihatdan, taklif etilayotgan konseptual model raqamli jamiyat sharoitida talabalar ijtimoiy moslashuvining nazariy asoslarini kengaytirib, oliy ta’lim tadqiqotlariga yangi yondashuvni taklif etadi.

5. NATIJALAR VA MUHOKAMA

Miqdoriy tahlil natijalari raqamli jamiyat sharoitida talabalar ijtimoiy moslashuvi ko‘p omilli jarayon ekanini tasdiqladi. Deskriptiv statistik tahlil respondentlarning katta qismi raqamli ta’lim muhitida o‘zini qisman moslashgan deb baholashini ko‘rsatdi, biroq to‘liq ijtimoiy integratsiya darajasi nisbatan past bo‘lib qoldi. Bu holat moslashuvning faqat texnologik omillar bilan cheklanmasligini anglatadi.

Korrelyatsion tahlil natijalariga ko‘ra, raqamli kompetensiya va ijtimoiy moslashuv darajasi o‘rtasida ijobiy va statistik ahamiyatli bog‘liqlik aniqlandi ($r > 0.45$, $p < 0.05$). Ushbu natija raqamli ko‘nikmalarga ega talabalar akademik jarayonda o‘zlarini ishonchliroq his qilishini va ijtimoiy aloqalarni faolroq shakllantirishini ko‘rsatadi. Shu bilan birga, global ta’limiy qadriyatlarni yuqori darajada qabul qilish, agar u milliy mentalitet bilan uyg‘unlashmagan bo‘lsa, moslashuv darajasining pasayishi bilan bog‘liq ekani kuzatildi.

Mazkur holat milliy qadriyatlarga orientatsiya va global ta’limiy talablar o‘rtasidagi nomuvofiqlik talabalar orasida identitet ziddiyatini yuzaga keltirishi mumkinligini ko‘rsatadi. Bu esa moslashuvning barqaror emas, balki vaziyatga moslashish (situational adaptation) shaklida kechishiga olib keladi.

Yarim tuzilmali intervyular asosida olib borilgan tematik tahlil talabalar ijtimoiy moslashuvining uchta asosiy strategiyasini aniqlash imkonini berdi: integrativ, selektiv va konformal moslashuv. Ushbu strategiyalar ilgari ishlab chiqilgan konseptual modelning empirik tasdig‘i sifatida namoyon bo‘ldi.

Integrativ moslashuv strategiyasini namoyon etgan talabalar milliy qadriyatlarni saqlagan holda global akademik me’yorlarni ongli ravishda qabul qilishga moyillik bildirdilar. Ular raqamli ta’lim muhitini shaxsiy va kasbiy rivojlanish imkoniyati sifatida baholab, ijtimoiy barqarorlik va akademik qoniqish darajasi yuqori ekanini ta’kidlashdi.

Konformal moslashuv strategiyasiga ega talabalar esa global ta’lim talablariga tashqi moslashuvni namoyon etib, ichki qabul qilishning yetishmasligini qayd etdilar. Intervyu natijalariga ko‘ra, mazkur guruhda akademik stress va ijtimoiy begonalashuv hissi kuchliroq kuzatildi.

Tadqiqot natijalari oliy ta’limda ijtimoiy moslashuv masalasini faqat pedagogik yoki texnologik muammo sifatida emas, balki ijtimoiy-falsafiy jarayon sifatida talqin qilish zarurligini ko‘rsatadi. Taklif etilgan konseptual model raqamli jamiyat sharoitida talabalar moslashuvini tahlil qilishda yangi nazariy ramka vazifasini bajarishi mumkin.

6. XULOSA

Mazkur tadqiqot raqamli jamiyat sharoitida oliy ta’lim talabalari ijtimoiy moslashuvini ijtimoiy-falsafiy nuqtayi nazardan tahlil qilib, ushbu jarayonning faqat texnologik moslashuv bilan cheklanmasligini asoslab berdi. Tadqiqot natijalari talabalar moslashuvi milliy mentalitet, global ta’limiy qadriyatlar va raqamli kompetensiya o‘rtasidagi murakkab o‘zaro ta’sir mahsuli ekanini ko‘rsatdi..

Mazkur tadqiqot ayrim cheklovlarga ega. Birinchidan, empirik ma’lumotlar ma’lum bir ijtimoiy-madaniy kontekst bilan chegaralangan bo‘lib, natijalarni barcha ta’lim tizimlariga to‘liq umumlashtirish imkonini cheklaydi. Ikkinchidan, tadqiqotda asosan korrelyatsion tahlil qo‘llanilganligi sababli sabab-oqibat munosabatlarini aniqlash imkoniyati cheklangan.

Kelajakdagi tadqiqotlarda raqamli jamiyat sharoitida talabalar moslashuvini qiyosiy (cross-national) tadqiqotlar orqali o‘rganish, shuningdek, uzoq muddatli (longitudinal) yondashuv asosida milliy mentalitet va global qadriyatlar o‘rtasidagi munosabatlarning dinamikasini tahlil qilish maqsadga muvofiqdir. Bundan tashqari, raqamli ta’lim siyosati va institutsional omillarning moslashuv jarayoniga ta’sirini chuqurroq o‘rganish ilmiy jihatdan muhim yo‘nalishlardan biri bo‘lib qoladi.

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THE CASE OF THE CHINA-KYRGYZSTAN-UZBEKISTAN RAILWAY: THE BELT AND ROAD INITIATIVE AND UZBEKISTAN'S MULTI-VECTOR DIPLOMACY STRATEGY

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Abstract: *This article examines Uzbekistan's multi-vector diplomacy strategy through the case of the China-Kyrgyzstan-Uzbekistan (CKU) railway, a flagship project of China's Belt and Road Initiative (BRI). The study traces the project's historical evolution, economic indicators and geopolitical significance, and reviews the "debt-trap diplomacy" debate in light of Uzbekistan's experience. It concludes that Uzbekistan pursues a strategic balancing policy typical of small and middle powers by simultaneously engaging China, Russia and Western partners.*

Keywords: *Belt and Road Initiative, multi-vector diplomacy, Central Asia, China-Kyrgyzstan-Uzbekistan railway, debt-trap diplomacy, strategic balancing.*

XITOY-QIRG'IZISTON-O'ZBEKISTON TEMIR YO'LI MISOLIDA: "BIR KAMAR, BIR YO'L" TASHABBUSI VA O'ZBEKISTONNING MULTI-VEKTORLI DIPLOMATIYA STRATEGIYASI

Annotatsiya: *Mazkur maqolada Xitoyning "Bir kamar, bir yo'l" (Belt and Road Initiative, BRI) global tashabbusi doirasida amalga oshirilayotgan Xitoy-Qirg'iziston-O'zbekiston (XQO) temir yo'li loyihasi misolida O'zbekistonning multi-vektorli diplomatiya strategiyasi tahlil qilinadi. Ishda loyihaning tarixiy evolyutsiyasi, iqtisodiy ko'rsatkichlari va geosiyosiy ahamiyati, shuningdek BRI atrofidagi "qarz tuzog'i diplomatiyasi" munozarasi O'zbekiston tajribasi asosida ko'rib chiqiladi. Xulosa qilinadiki, O'zbekiston yirik davlatlar (Xitoy, Rossiya, G'arb) bilan bir vaqtning o'zida hamkorlik qilish orqali kichik va o'rta davlatlarga xos strategik muvozanat siyosatini amalga oshirmoqda.*

Kalit so'zlar: *"Bir kamar, bir yo'l" tashabbusi, multi-vektorli diplomatiya, Markaziy Osiyo, Xitoy-Qirg'iziston-O'zbekiston temir yo'li, qarz tuzog'i diplomatiyasi, strategik muvozanat.*

НА ПРИМЕРЕ ЖЕЛЕЗНОЙ ДОРОГИ КИТАЙ-КЫРГЫЗСТАН-УЗБЕКИСТАН: ИНИЦИАТИВА «ОДИН ПОЯС, ОДИН ПУТЬ» И СТРАТЕГИЯ МНОГОВЕКТОРНОЙ ДИПЛОМАТИИ УЗБЕКИСТАНА

Аннотация: *В статье на примере железной дороги Китай-Кыргызстан-Узбекистан, флагманского проекта китайской инициативы «Один пояс, один путь» (BRI), анализируется стратегия многовекторной дипломатии Узбекистана. Рассматриваются историческая эволюция проекта, экономические показатели и геополитическое значение, а также дискуссия о «дипломатии долговой ловушки» применительно к опыту Узбекистана. Делается вывод, что Узбекистан проводит политику стратегического балансирования, характерную для малых и средних государств, одновременно развивая отношения с Китаем, Россией и Западом.*

Ключевые слова: *инициатива «Один пояс, один путь», многовекторная дипломатия, Центральная Азия, железная дорога Китай-Кыргызстан-Узбекистан, дипломатия долговой ловушки, стратегическое балансирование.*

Introduction

The Belt and Road Initiative (BRI), announced by the leadership of the People's Republic of China in 2013, has become one of the largest geo-economic projects of the past decade, encompassing more than 140 countries [18]. Central Asia, including Uzbekistan, lies at the geographic center of this initiative; alongside expanding infrastructure, trade and investment opportunities for the region, it also raises the risk of growing economic dependence on major powers.

At the same time, since 2016, under President Shavkat Mirziyoyev, Uzbekistan has been consistently pursuing a new foreign-policy course based on the principle of "multi-vectorism" — described in the scholarly literature as a strategy of balanced cooperation with China, Russia, the United States, the European Union and neighboring states simultaneously [10; 12; 16]. The purpose of this article is to show, through the case of the China-Kyrgyzstan-Uzbekistan (CKU) railway project, how Uzbekistan's participation in the BRI has become a practical illustration of its multi-vector diplomacy.

1. The Belt and Road Initiative and Central Asia: Conceptual Foundations

The BRI comprises two main directions — the overland "Silk Road Economic Belt" and the maritime "21st Century Maritime Silk Road." Scholarly interpretations of the BRI vary: some researchers treat it as a purely economic and infrastructural project, while others regard it as an ideologically driven undertaking of the Chinese Communist Party with clear geopolitical dimensions [19]. For the landlocked states of Central Asia, the BRI is, above all, significant as a means of connecting the region to global trade networks.

2. The China-Kyrgyzstan-Uzbekistan Railway: From Vision to Reality

Although the idea of the CKU railway was first discussed in Paris as early as 1997, the project remained unrealized for nearly thirty years [7]. Real momentum came at the Shanghai Cooperation Organisation summit held in Samarkand in September 2022, followed by documents on the financing model signed at the China–Central Asia Summit in Xi'an in May 2023 [8]. On June 6, 2024, the governments of China, Kyrgyzstan and Uzbekistan signed a trilateral intergovernmental agreement on the railway's construction in Beijing; the agreement was signed by Zheng Shanjie, Chairman of China's National Development and Reform Commission, Tilek Kydyrmaevich Tekebaev, Kyrgyzstan's Minister of Transport and Communications, and Ilkhom Mahkamov, Uzbekistan's Minister of Transport [1; 3].

The 523-kilometre line begins in Kashgar, China, and passes through Torugart, Kosh-Dobo and Kazarman in Kyrgyzstan before terminating in Andijan, Uzbekistan [1; 5]. Construction was ceremonially launched on December 27, 2024, in Kyrgyzstan's Jalal-Abad region, while the financing arrangement — estimated at roughly US$4.7 billion — was finalized in December 2025 [6]. According to the South China Morning Post, the line's ultimate freight capacity could reach up to 15 million tons annually, more than doubling Kyrgyzstan's 2025 capacity [7].

Uzbek officials have repeatedly stressed the project's strategic significance: President Shavkat Mirziyoyev has described the CKU railway as the shortest overland route linking China with Central Asia, one that would eventually open access, via the Trans-Afghan corridor, to the markets of South Asia and the Middle East [3; 9]. This illustrates Uzbekistan's strategy of diversifying transport and trade routes rather than tying itself to a single direction, such as Russia or China alone.

3. Uzbekistan's Multi-Vector Diplomacy: Theory and Practice

In the scholarly literature, Uzbekistan's foreign policy has been described in various ways — as a "geopolitical pendulum," a "regionalist chameleon," a "zigzag policy," and so on [12]. Following the leadership transition from Islam Karimov to Shavkat Mirziyoyev in 2016, researchers note a departure from isolationism toward active regional engagement [12; 16]. At the same time, core principles of the 2012 Foreign Policy Concept — such as military neutrality and the rejection of foreign military bases — remain in place; what has changed is the scale and intensity with which these principles are implemented [10; 13].

Scholars often compare Uzbekistan's strategy with Kazakhstan's self-styled role as a "Eurasian Bridge": whereas Kazakhstan emphasizes multilateralism and mediation, Uzbekistan projects more of an "independent actor" posture, prioritizing sovereignty and regime security through selective and cautious institutional commitments [14]. Economically, Uzbekistan seeks to address domestic challenges — poverty and scarcity of arable land and water resources — by simultaneously developing trade and economic ties with China, the United States, the European Union, Turkey, South Korea and the member states of the Eurasian Economic Union [11].

4. The "Debt-Trap Diplomacy" Debate and Uzbekistan's Experience

The most widely discussed critique surrounding BRI projects is the concept of "debt-trap diplomacy," first proposed by Indian scholar Brahma Chellaney in 2017 [16; 22]. According to this theory, China extends loans to developing countries on onerous terms with a view to acquiring control of strategic infrastructure — ports, mines and the like — should the borrower default. However, a number of researchers, notably Deborah Brautigam, argue that this narrative, while widespread in media and policy circles, lacks robust empirical grounding and functions more as a "meme" than a documented strategy [17; 19].

Analyses focused on Central Asia show that the debt burden owed to China varies sharply by country: Kazakhstan's debt is considered relatively manageable, Uzbekistan and Turkmenistan — buoyed respectively by economic growth and gas exports — face no serious difficulties, while Kyrgyzstan and Tajikistan are regarded as the most vulnerable in the region [16]. This divergence can be read as a consequence of Uzbekistan's cautious economic policy of drawing on diverse financing sources rather than relying on China alone.

5. Economic Indicators: Opportunities and Risks

Recent statistics point to rapidly deepening economic ties between Uzbekistan and China. Official data show that bilateral trade reached US$17.2 billion in 2025, accounting for 21.2 percent of Uzbekistan's total foreign trade turnover and making China the country's leading trade partner [21; 22]. At the same time, the trade balance has tilted markedly in China's favor — a pattern that reflects a structural vulnerability in the Uzbek economy and its growing dependence on imports of technological and chemical goods [20].

Uzbekistan continues to diversify its trading partners: in 2025, trade with Russia stood at US$13 billion, with Kazakhstan at US$5 billion, and with Turkey at US$3 billion [21]. These figures confirm that, even as it deepens cooperation with China, Uzbekistan is actively developing other directions to avoid excessive economic dependence on a single partner — the economic dimension of multi-vector diplomacy in practice.

Conclusion

Analysis of the China-Kyrgyzstan-Uzbekistan railway project shows that Uzbekistan treats its participation in the BRI not as an attachment to a single geopolitical direction but as a means of leveraging available strategic opportunities. While expanding infrastructure and trade cooperation with China, the country's leadership is simultaneously developing active ties with Russia, the European Union, the United States and neighboring states — a pattern that fits the "strategic balancing" model described in the literature for small and middle powers [12; 14]. Once construction of the CKU railway is complete, a quantitative assessment of its impact on the structure of Uzbekistan's foreign trade and on the regional transport-logistics architecture remains a promising direction for future research.

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SOG‘LOM TURMUSH TARZINI SHAKLLANTIRISHNING IJTIMOIY-FALSAFIY ASOSLARI VA UNING INSON HAYOT SIFATIGA TA’SIRI

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Annotatsiya: *Mazkur maqolada sog‘lom turmush tarzining mazmun-mohiyati, uni shakllantiruvchi asosiy omillar hamda inson salomatligi va hayot sifatiga ta’siri ijtimoiy-falsafiy nuqtayi nazardan tahlil qilinadi. Tadqiqotda sog‘lom turmush tarzi faqat kasalliklarning oldini olishga qaratilgan xulq-atvor tizimi sifatida emas, balki insonning jismoniy, ruhiy, ma’naviy va ijtimoiy imkoniyatlarini uyg‘un rivojlantirishga xizmat qiluvchi qadriyatli hayot modeli sifatida talqin etiladi.*

Kalit so‘zlar: *sog‘lom turmush tarzi, hayot sifati, salomatlik, aksiologiya, gumanizm, jismoniy faollik, sog‘lom ovqatlanish, ruhiy osoyishtalik, ijtimoiy muhit, salomatlik madaniyati.*

СОЦИАЛЬНО-ФИЛОСОФСКИЕ ОСНОВЫ ФОРМИРОВАНИЯ ЗДОРОВОГО ОБРАЗА ЖИЗНИ И ЕГО ВЛИЯНИЕ НА КАЧЕСТВО ЖИЗНИ ЧЕЛОВЕКА

Аннотация: *В данной статье с социально-философской точки зрения анализируются сущность здорового образа жизни, основные факторы его формирования и его влияние на здоровье и качество жизни человека. Здоровый образ жизни рассматривается не только как система поведения, направленная на профилактику заболеваний, но и как ценностная модель жизни, обеспечивающая гармоничное развитие физических, психических, духовно-нравственных и социальных возможностей личности.*

Ключевые слова: *здоровый образ жизни, качество жизни, здоровье, аксиология, гуманизм, физическая активность, здоровое питание, психологическое благополучие, социальная среда, культура здоровья.*

SOCIO-PHILOSOPHICAL FOUNDATIONS OF FORMING A HEALTHY LIFESTYLE AND ITS IMPACT ON HUMAN QUALITY OF LIFE

Abstract: *This article analyzes the essence of a healthy lifestyle, its major determinants, and its impact on human health and quality of life from a socio-philosophical perspective. A healthy lifestyle is interpreted not merely as a system of behaviours aimed at preventing diseases but as a value-based model of life that promotes the harmonious development of physical, psychological, spiritual, and social capacities.*

Keywords: *healthy lifestyle, quality of life, health, axiology, humanism, physical activity, healthy nutrition, psychological well-being, social environment, health culture.*

KIRISH

Zamonaviy jamiyat taraqqiyoti inson salomatligi va hayot sifatini ta’minlash masalasini eng muhim ijtimoiy muammolardan biriga aylantirdi. Inson salomatligi faqat tibbiy yoki biologik hodisa bo‘lib qolmay, balki uning turmush tarzi, qadriyatlari, kundalik faoliyati, ijtimoiy muhiti va o‘z hayotiga bo‘lgan munosabati bilan belgilanadigan murakkab ijtimoiy-falsafiy hodisadir.

Sog‘lom turmush tarzining mohiyati insonning jismoniy imkoniyatlarini saqlash bilangina cheklanmaydi. U shaxsning ruhiy osoyishtaligi, ijtimoiy faolligi, ma’naviy dunyosi va hayotdan qoniqish darajasi bilan ham bog‘liqdir. Shu bois sog‘lom turmush tarzini inson hayotining alohida bir sohasi sifatida emas, balki uning kundalik hayotini tashkil etuvchi yaxlit tizim sifatida o‘rganish muhimdir.

Bugungi kunda sog‘lom turmush tarzi tushunchasi ovqatlanish, jismoniy harakat, uyqu, dam olish va zararli odatlardan voz kechish kabi xatti-harakatlar majmui bilan izohlanadi. Biroq ijtimoiy-falsafiy nuqtayi nazardan qaraganda,

mazkur omillar insonning hayotiy qadriyatlari va ongli tanlovi bilan bog‘liqdir. Inson nima uchun sog‘lom yashashni tanlaydi, salomatlikni qanday qadriyat sifatida qabul qiladi va sog‘lom hayot tarzini kundalik hayotiga qanday singdiradi — ana shu masalalar sog‘lom turmush tarzining ijtimoiy-falsafiy mohiyatini belgilaydi.

MAVZUGA OID ADABIYOTLARNING TAHLILI

Sog‘lom turmush tarziga oid zamonaviy tadqiqotlarda uning bir nechta asosiy tarkibiy omillari ajratib ko‘rsatiladi. Jumladan, ratsional ovqatlanish, jismoniy faollik, tamakidan voz kechish, me’yoriy tana vaznini saqlash va alkogol iste’molini cheklash sog‘lom xulq-atvorning muhim ko‘rsatkichlari sifatida talqin qilinadi. Butunjahon sog‘liqni saqlash tashkiloti o‘zining 1948-yildagi asosiy Nizomida salomatlikni nafaqat kasallik yoki nogironlikning yo‘qligi, balki to‘liq jismoniy, ruhiy va ijtimoiy farovonlik holati sifatida ta’riflagan — bu ta’rif sog‘lom turmush tarzini sof tibbiy emas, balki kompleks ijtimoiy hodisa sifatida qarash zaruriyatining ilk rasmiy asosini yaratdi.

Yevropa va Amerika tadqiqotlarida bir nechta sog‘lom xulq-atvor omillarini birgalikda amalga oshirish inson salomatligi uchun alohida ahamiyatga ega ekanligi qayd etiladi. Xususan, Buyuk Britaniyada o‘tkazilgan EPIC-Norfolk aholi tadqiqotida chekmaslik, jismoniy faollik, mikdorli alkogol iste’moli va yetarli sabzavot-meva iste’moli kabi to‘rtta sog‘lom xulq-atvor omilining birgalikdagi ta’siri o‘lim xavfini sezilarli darajada — yoshni o‘rtacha 14 yilga "yoshartirish"ga teng darajada — kamaytirishi aniqlangan. Shunga o‘xshash tarzda, 11 ta Yevropa davlatida o‘tkazilgan tadqiqotda o‘rtacha va yuqori yoshdagi aholi orasida O‘rta dengiz tipidagi ovqatlanish, mikdorli alkogol iste’moli, jismoniy faollik va chekmaslikning birgalikdagi ta’siri o‘lim ko‘rsatkichini uch baravar kamaytirishi qayd etilgan. Bu yondashuv sog‘lom turmush tarzini alohida-alohida odatlar yig‘indisi sifatida emas, balki kompleks hayotiy tizim sifatida baholash imkonini beradi.

Sog‘liqni mustahkamlashga bag‘ishlangan tadqiqotlarda insonning xulq-atvori yashayotgan muhitdan ajratib o‘rganilmasligi kerakligi ta’kidlanadi. Oila, ta’lim tizimi, mehnat sharoiti, iqtisodiy imkoniyatlar va madaniy qadriyatlar insonning sog‘lom yoki nosog‘lom hayot tarzini tanlashiga bevosita ta’sir ko‘rsatadi.

Shuningdek, bio-psixo-ijtimoiy yondashuv salomatlikning jismoniy, ruhiy va ijtimoiy jihatlari o‘zaro uzviy bog‘langanligini ko‘rsatadi. Ushbu yondashuv sog‘lom turmush tarzini o‘rganishda bir yoqlama biologik qarashdan voz kechib, insonni yaxlit mavjudot sifatida tushunishga imkon beradi.

TADQIQOT METODOLOGIYASI

Mazkur maqolada tizimli, qiyosiy, aksiologik, ijtimoiy-falsafiy va umumlashtirish metodlaridan foydalanildi.

Tizimli yondashuv sog‘lom turmush tarzini o‘zaro bog‘langan xulq-atvor va hayotiy qadriyatlar tizimi sifatida tahlil qilish imkonini berdi.

Aksiologik yondashuv salomatlikning inson va jamiyat hayotidagi qadriyat sifatidagi o‘rnini aniqlashga xizmat qildi.

Ijtimoiy-falsafiy yondashuv orqali sog‘lom turmush tarzining shaxs, oila, ijtimoiy guruh va jamiyat taraqqiyoti bilan aloqadorligi tahlil qilindi.

Qiyosiy tahlil metodi turli tadqiqotlarda ilgari surilgan sog‘lom xulq-atvor omillarini umumlashtirish imkonini berdi.

Tadqiqotning metodologik asosini salomatlikning biologik, psixologik va ijtimoiy jihatlari birligiga asoslangan yondashuv tashkil etadi.

TAHLIL VA NATIJALAR

Sog‘lom turmush tarzi yaxlit qadriyatlar tizimi sifatida

Tadqiqotlar asosida sog‘lom turmush tarzining quyidagi asosiy xulosasi ilgari surilishi mumkin: inson salomatligi bitta xatti-harakat natijasi emas, balki kundalik hayotda amalga oshiriladigan bir nechta omillarning o‘zaro uyg‘unligidir.

Masalan, inson muntazam jismoniy faoliyat bilan shug‘ullansa-yu, zararli odatlardan voz kechmasa yoki doimiy ruhiy zo‘riqish holatida yashasa, uning hayot tarzini to‘liq sog‘lom deb baholash qiyin. Shu sababli sog‘lom turmush tarzining asosiy xususiyati uning kompleksligi va tizimliligi bilan belgilanadi.

Sog‘lom turmush tarzining asosiy tarkibiy yo‘nalishlari:

Sog‘lom va muvozanatli ovqatlanish.

Doimiy jismoniy faollik.

Biologik ritmga mos mehnat va dam olish tartibi.

Ruhiy va emotsional osoyishtalik.

Zararli odatlardan voz kechish.

Ijtimoiy munosabatlar va sog‘lom muhitni shakllantirish.

Mazkur olti yo‘nalish inson hayotining bir-biridan ajralmagan tomonlarini tashkil etadi.

Sog‘lom turmush tarzi va hayot sifati

Sog‘lom turmush tarzining asosiy natijalaridan biri hayot sifatining yaxshilanishidir. Hayot sifati faqat uzoq umr ko‘rish bilan belgilanmaydi. U insonning o‘zini jismonan tetik, ruhan xotirjam, ijtimoiy jihatdan faol va hayotidan qoniqqan holda his etishi bilan bog‘liq.

Shu nuqtayi nazardan sog‘lom turmush tarzi:

insonning jismoniy imkoniyatlarini kengaytiradi;

kundalik faoliyat sifatini oshiradi;

yordam ruhiy zo‘riqishni kamaytirishga beradi;

ijtimoiy faollikni kuchaytiradi;

o‘z salomatligi uchun shaxsiy mas’uliyatni shakllantiradi.

Demak, sog‘lom turmush tarzi inson hayotining davomiyligigina emas, balki mazmuni va sifatiga ham ta’sir ko‘rsatadi.

Sog‘lom turmush tarzini shakllantirishda ijtimoiy muhitning o‘rni

Sog‘lom turmush tarzi faqat individual tanlov mahsuli emas. Insonning kundalik xatti-harakati uning yashash sharoiti va ijtimoiy muhiti bilan chambarchas bog‘liq.

Oila sog‘lom odatlarning dastlabki maktabidir. Bolaning ovqatlanish madaniyati, jismoniy faollikka munosabati, dam olish va mehnat tartibi avvalo oilada shakllanadi.

Ta’lim muassasalari esa sog‘lom turmush tarzi haqidagi bilimlarni kundalik amaliyotga aylantirishda muhim ijtimoiy institut hisoblanadi. Bunda faqat nazariy targ‘ibot bilan cheklanmasdan, ta’lim muassasasining o‘zida sog‘lom muhit yaratish muhimdir.

Mehnat jamoalari ham xodimlarning salomatligiga ta’sir ko‘rsatuvchi ijtimoiy makon sifatida qaralishi lozim.

Shu asosda quyidagi ijtimoiy-falsafiy xulosani ilgari surish mumkin: sog‘lom turmush tarzi shaxsning individual tanlovi va jamiyat tomonidan yaratilgan sog‘lom muhitning dialektik birligi mahsulidir.

Sog‘lom turmush tarzining aksiologik mohiyati

Sog‘lom turmush tarzining barqaror shakllanishi, avvalo, salomatlikning inson ongida qadriyat sifatida qaror topishiga bog‘liq. Agar salomatlik inson uchun oliy hayotiy qadriyatlardan biri sifatida qabul qilinsa, u kundalik hayotida sog‘lom tanlovlarni ongli ravishda amalga oshirishga intiladi.

Shu sababli sog‘lom turmush tarzini shakllantirishda faqat "bunday qil", "bunday qilma" kabi ko‘rsatmalar yetarli emas. Insonda quyidagi ichki qadriyatlar shakllanishi lozim:

-salomatlik qadriyati;

-o‘z hayotiga mas’uliyat;

-tana va ruh uyg‘unligini saqlash;

-kelajak oldidagi javobgarlik;

-oila va jamiyat salomatligi uchun mas’uliyat.

MUALLIFLIK TAKLIFI: "SOG‘LOM HAYOT TARZI PIRAMIDASI"

Mazkur maqola doirasida sog‘lom turmush tarzini tizimli ifodalash uchun "Sog‘lom hayot tarzi piramidasi" konseptual modelini taklif etish mumkin.

Piramidaning asosi: Salomatlikni qadriyat sifatida anglash.

Ikkinchi bosqich — Kundalik sog‘lom odatlar:

ovqatlanish;

jismoniy harakat;

uyqu va dam olish;

zararli odatlardan voz kechish.

Uchinchi bosqich — Ruhiy va ma’naviy barqarorlik:

stressni boshqarish;

ijobiy fikrlash;

ruhiy osoyishtalik;

o‘zini anglash.

To‘rtinchi bosqich — Sog‘lom ijtimoiy muhit:

sog‘lom oila;

sog‘lom ta’lim muhiti;

sog‘lom mehnat jamoasi.

Piramidaning cho‘qqisi: Yuqori hayot sifati va inson farovonligi.

Mazkur modelning asosiy g‘oyasi shundan iboratki, yuqori hayot sifatiga faqat bitta sog‘lom odat orqali erishib bo‘lmaydi. Hayot sifati salomatlik qadriyatiga asoslangan individual xulq-atvor, ruhiy barqarorlik va sog‘lom ijtimoiy muhitning birligi orqali shakllanadi.

XULOSA VA TAKLIFLAR

O‘tkazilgan ijtimoiy-falsafiy tahlil asosida quyidagi xulosalarga kelindi.

Birinchidan, sog‘lom turmush tarzi insonning jismoniy holati bilan cheklanadigan biologik tushuncha emas, balki uning jismoniy, ruhiy, ma’naviy va ijtimoiy hayotini qamrab oluvchi kompleks hayotiy tizimdir.

Ikkinchidan, sog‘lom turmush tarzining samaradorligi alohida sog‘lom odatlar soni bilangina emas, balki ushbu odatlarning bir-birini to‘ldiruvchi yaxlit tizimga aylanishi bilan belgilanadi.

Uchinchidan, salomatlikni mustahkamlash shaxsning individual mas’uliyati bilan bir qatorda jamiyatning sog‘lom ijtimoiy muhit yaratishdagi mas’uliyatini ham talab qiladi.

To‘rtinchidan, sog‘lom turmush tarzini shakllantirishning barqaror asosi salomatlikni insonning muhim aksiologik qadriyatlaridan biri sifatida shakllantirishdir.

Amaliy takliflar:

Oliy ta’lim muassasalarida "Sog‘lom hayot tarzi va hayot sifati" mavzusida muntazam ma’rifiy mashg‘ulotlarni yo‘lga qo‘yish.

Sog‘lom turmush tarzini faqat tibbiy targ‘ibot sifatida emas, balki qadriyat va madaniyat sifatida targ‘ib qilish.

Ta’lim va mehnat jamoalarida jismoniy faollikni rag‘batlantiruvchi sharoitlarni yaratish.

Sog‘lom ovqatlanish, ruhiy salomatlik va jismoniy faollikni yagona dastur doirasida birlashtirish.

Shaxsning sog‘lom hayot tarziga tayyorgarligini aniqlashda motivatsion suhbat va bosqichma-bosqich qo‘llab-quvvatlash mexanizmlaridan foydalanish.

Taklif etilgan "Sog‘lom hayot tarzi piramidasi" modelidan sog‘lom turmush tarziga oid targ‘ibot va ta’lim dasturlarini ishlab chiqishda foydalanish.

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TALABA YOSHLARNING MUSTAQIL FIKRLASHI VA AXBOROTNI BAHOLASH MADANIYATINING HOZIRGI HOLATI

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Annotatsiya: *Ushbu maqolada zamonaviy oliy ta’lim muhitida talaba yoshlarning mustaqil fikrlash qobiliyati ilmiy-nazariy jihatdan tahlil qilinadi. Shuningdek, ularning axborotni izlash, saralash, tekshirish, tahlil qilish hamda undan mas’uliyatli foydalanish madaniyatining hozirgi holati yoritib beriladi. Raqamli texnologiyalar, internet tarmoqlari, ijtimoiy media va sun’iy intellekt vositalarining ta’lim jarayoniga jadal kirib kelishi yoshlarning axborot bilan ishlash imkoniyatlarini sezilarli darajada kengaytirmoqda. Shu bilan birga, axborotning ishonchliligini aniqlash hamda manipulyativ mazmunni ajratish ko‘nikmalariga bo‘lgan ehtiyoj tobora ortib bormoqda. Turli manbalarni qiyoslash, dalil va fikrni farqlash kabi kompetensiyalar esa zamonaviy talabalar uchun muhim intellektual ko‘nikmalardan biriga aylanmoqda. Maqolada mustaqil fikrlash va axborot madaniyati o‘zaro bog‘liq pedagogik hodisa sifatida talqin qilinib, talabalarning tayyor axborotni qabul qilmasdan, uni izchil tahlil qiluvchi, baholovchi yangi bilimga aylantiruvchi subyekt sifatidagi mavqei asoslab beriladi. Ta’lim tizimida yaratilayotgan raqamli ta’lim muhiti, mustaqil ta’limga qo‘yilayotgan talablar, media savodxonlik va axborot madaniyatiga oid mahalliy ilmiy-metodik ma’lumotlar asosida mavjud muammolarni bartaraf etish yo‘llari yoritiladi. Shuningdek, talabalarning mustaqil fikrlashini rivojlantirishda muammoli ta’lim, manbalarni qiyosiy tahlil qilish, dalillash, refleksiya, loyiha va tadqiqot faoliyatining pedagogik imkoniyatlari ochib beriladi.*

Kalit so‘zlar: *mustaqil fikrlash, talaba yoshlar, axborot madaniyati, axborotni baholash, media savodxonlik, tanqidiy tafakkur, raqamli ta’lim, axborot savodxonligi, internet, raqamli kompetensiya, mustaqil ta’lim, axborot xavfsizligi.*

СОВРЕМЕННОЕ СОСТОЯНИЕ САМОСТОЯТЕЛЬНОГО МЫШЛЕНИЯ СТУДЕНЧЕСКОЙ МОЛОДЕЖИ И КУЛЬТУРЫ ОЦЕНКИ ИНФОРМАЦИИ

Аннотация: *В данной статье в научно-теоретическом аспекте анализируется способность студенческой молодежи к самостоятельному мышлению в условиях современного высшего образования. Также рассматривается современное состояние культуры поиска, отбора, проверки, анализа и ответственного использования информации студентами. Стремительное внедрение цифровых технологий, интернет-сетей, социальных медиа и инструментов искусственного интеллекта в образовательный процесс значительно расширяет возможности молодежи по работе с информацией. Вместе с тем возрастает потребность в развитии навыков определения достоверности информации и выявления манипулятивного содержания. Умение сопоставлять различные источники, различать факты и мнения становится одной из важных интеллектуальных компетенций современного студента. В статье самостоятельное мышление и информационная культура рассматриваются как взаимосвязанные педагогические явления. Обосновывается позиция студента как активного субъекта образовательного процесса, который не просто воспринимает готовую информацию, а последовательно анализирует, оценивает ее и преобразует в новые знания. На основе отечественных научно-методических материалов, посвященных цифровой образовательной среде, требованиям к самостоятельному обучению, медиаграмотности и информационной культуре, освещаются существующие проблемы и пути их решения. Кроме того, раскрываются педагогические возможности проблемного обучения, сравнительного анализа источников, аргументации, рефлексии, проектной и исследовательской деятельности в развитии самостоятельного мышления студентов.*

Ключевые слова: *самостоятельное мышление, студенческая молодежь, информационная культура, оценка информации, медиаграмотность, критическое мышление, цифровое образование, информационная грамотность, цифровая компетентность, самостоятельное обучение, информационная безопасность.*

THE CURRENT STATE OF INDEPENDENT THINKING AND THE INFORMATION EVALUATION CULTURE OF UNIVERSITY STUDENTS

Abstract: *This article provides a scientific and theoretical analysis of students' ability to think independently in the context of modern higher education. It also examines the current state of students' information culture, including their ability to search for, select, verify, analyze, and use information responsibly. The rapid integration of digital technologies, Internet networks, social media, and artificial intelligence tools into the educational process has significantly expanded young people's opportunities to work with information. At the same time, the need to develop skills for determining the reliability of information and identifying manipulative content is becoming increasingly important. The ability to compare different sources and distinguish facts from opinions is becoming one of the essential intellectual competencies of modern students. The article considers independent thinking and information culture as interconnected pedagogical phenomena. It substantiates the role of students as active subjects of the educational process who do not simply receive ready-made information but consistently analyze, evaluate, and transform it into new knowledge. Based on local scientific and methodological materials related to the digital educational environment, requirements for independent learning, media literacy, and information culture, the article highlights existing challenges and possible ways to address them. Furthermore, it explores the pedagogical potential of problem-based learning, comparative analysis of information sources, argumentation, reflection, project-based learning, and research activities in developing students' independent thinking.*

Keywords: *independent thinking, university students, information culture, information evaluation, media literacy, critical thinking, digital education, information literacy, digital competence, independent learning, information security.*

Bugungi globallashuv va raqamlashtirish jarayonlari insonning bilim olish, axborot izlash va uni qayta ishlash faoliyatiga tub o‘zgarishlar olib keldi. Avvalgi ta’lim modelida bilimning asosiy manbai darslik, o‘qituvchi ma’ruzasi, kutubxona va ilmiy adabiyotlar hisoblangan. Zamonaviy talabalarda esa bir vaqtning o‘zida minglab, hatto millionlab axborot birliklariga murojaat qilish imkoniyatiga egadir. Bu kabi muhitda ta’limning asosiy muammosi axborotning yetishmasligidan iborat emas. Aksincha uning haddan tashqari ko‘pligi, sifat jihatidan turlicha ekanligi va ishonchlilik darajasining bir xil emasligidir. Shu bois ham zamonaviy talabalar uchun “axborotni topish” ko‘nikmasining o‘zi yetarli emas. Undan axborotning ma’lumotni aniqlash, mualliflik pozitsiyasini anglash, faktlarni tekshirish, qarama-qarshi fikrlarni taqqoslashtirish, xulosa chiqarish hamda olingan ma’lumotni yangi bilimga aylantirish qobiliyati talab qilinadi.

Oliy ta’lim muassasalari tizimida ham mustaqil ta’lim, kreativ va tanqidiy fikrlash, raqamli kompetensiyalar hamda axborot resurslaridan samarali foydalanish masalalariga tobora ko‘proq e’tibor qaratilmoqda. Tadqiqotchilarni metodik manbalarda mustaqil ta’lim talabalarning o‘z bilimini mustaqil ravishda kengaytirishi, kerakli ma’lumotlarni izlab topishi, ularni tahlil qilishi, muammoni aniqlashi va yechimlarni ishlab chiqishi bilan bog‘liq faoliyat sifatida talqin etiladi[27]. Bunday yondashuv mustaqil fikrlashni faqat psixologik qobiliyat bo‘lmasdan, undan ta’lim jarayonida rivojlantiriladigan kompetensiya sifatida ko‘rish imkoniyatini beradi.

Talaba-yoshlarning mustaqil fikrlashi, avvalo, uning tayyor xulosani qabul qilish bilan cheklanmasligi, muayyan masala yuzasidan o‘z savolini qo‘ya olishi, turli qarashlarni qiyoslashi va asoslangan xulosaga kelishi bilan bevosida belgilanadi. Xususan fikrlash jarayoni shunchaki ko‘p ma’lumotga ega bo‘lish bilan belgilanmaydi. Balki, olingan bilimning xaddan ortiq ko‘pligi uning mazmuniy qayta ishlanishi bilan uyg‘unlashgandagina intellektual salohiyatga aylanadi. Pedagogik ma’lumotlarda ham fikrlash murakkab va faol jarayon sifatida izohlanib, talabalarning o‘qigan yoki eshitgan ma’lumotiga o‘z munosabatini bildira olishi kerakligi ta’kidlanadi[28]. Jumladan, mustaqil fikrlashning asosiy belgisi axborotni takrorlashdan iborat bo‘lmasdan, unga nisbatan shaxsiy, mantiqiy va dalillangan munosabatni rivojlantirishdir.

Mustaqil ravishda fikrlashning takomillanishi talabalarning o‘quv faoliyatidagi subyektlik darajasi bilan o‘zaro bog‘liqdir. Mabodo talaba-yoshlar faqat o‘qituvchi bergan savollarga javob berish yoki tayyor matnni yodlash bilan cheklansa, bu faoliyat mustaqil fikrlashning shakillantirish imkoniyatini pasaytiradi. Shuningdek, internetdan topilgan ma’lumotlarni mazmunan o‘zlashtirmasdan ko‘chirib olish ham talabaning tahliliy va ijodiy fikrlash ko‘nikmalarining shakllanishiga salbiy ta’sir ko‘rsatadi.

Bundan tashqari, talabalar muammoni o‘zi aniqlasa, ma’lumot manbalarini tanlasa, faktlarni solishtirsa, qarama-qarshi nuqtayi nazarlarni ko‘rib chiqsa va o‘z pozitsiyasini asoslashga harakat qilsa, uning analitik faoliyati faollashadi.

Ko‘pgina tadqiqotlarni metodik adabiyotlarda talabaning mustaqil ish faoliyati bilimlarni chuqurlashtirish hamda kengaytirish, ijodiy faoliyatga qiziqish uyg‘otish, ta’lim olish usullarini egallash, fikrlash qobiliyatini rivojlantirish va mustaqil xulosa chiqarish ko‘nikmasini shakllantirishga xizmat qilishi qayd etilgan[29]. Bunday fikrlar hozirgi raqamli sharoitda yanada muhim ahamiyat kasb etadi. Sababi internet talabalarning oldiga juda katta hajmdagi ma’lumotni olib keladi. Ammo bu ma’lumotning ilmiy qiymatini aniqlash uchun insonning o‘z intellektual mezonlari bo‘lishi lozim.

[27] O‘zbekiston Respublikasi oliy ta’lim tizimida talabalar mustaqil ta’limini tashkil etish bo‘yicha o‘quv-uslubiy materiallar. Talabalar mustaqil ishlari. — Toshkent: ZiyoNET elektron kutubxonasi. Ziyonet

[28] Namangan davlat universiteti elektron kutubxonasi. Bo‘lajak o‘qituvchilarda o‘z-o‘zini identifikatsiya qilish va mustaqil fikrlash masalalariga oid ilmiy-uslubiy materiallar. — Namangan, 2025. www.namdu.uz

[29] Talabalarning mustaqil ishlarini bajarishi uchun uslubiy ko‘rsatma. — Toshkent: ZiyoNET, 2023. ZiyoNET

Bugungi talaba-yoshlarning axborot bilan munosabatida ikki xil tendensiya ko‘zga tashlanadi. Birinchi tendensiya axborot resurslaridan foydalanish imkoniyatlarining nihoyatda kengayganidir. Bunda elektron kutubxonalar, ilmiy ma’lumotlar bazalari, elektron darsliklar, ta’lim platformalari, videodarslar, ochiq kurslar va raqamli ilmiy resurslar bilim olish imkoniyatlarini sezilarli darajada oshirmoqda. Ikkinchi tendensiya bo‘lsa, axborotning ishonchliligi va sifatini aniqlash muammosining kuchayishidir. Talaba bir xil mavzu bo‘yicha bir-biriga zid bo‘lgan ma’lumotlarni uchratishi mumkin. Ularning ayrimlari ilmiy ma’lumotga, boshqalari shaxsiy fikrga, yana bir qismi esa reklama yoki manipulyativ maqsadga asoslangan bo‘lishi ehtimoldan xoli emas.

Mazkur nuqtayi nazardan axborot madaniyati tushunchasini faqat kompyuter va internetdan foydalana olish ko‘nikmasi sifatida talqin qilish ilmiy jihatdan tor yondashuv hisoblanadi. Axborot madaniyati insonning axborotni izlash, olish, tushunish, tasniflash, tekshirish, saqlash, qayta ishlash, undan foydalanish va uni boshqalarga yetkazish jarayonidagi bilim, ko‘nikma, qadriyat hamda mas’uliyatlar tizimidir. Manbalarda axborot madaniyatini rivojlantirish masalasida axborotga mas’uliyatli munosabat, zamonaviy axborot texnologiyalaridan foydalanish, mustaqil nazorat va o‘z-o‘zini boshqarish ko‘nikmalariga alohida e’tibor beriladi[30].

Talaba-yoshlarning axborot madaniyatini baholashda birinchi muhim mezon manba bilan ishlash qobiliyati hisoblanadi. Har qanday internet sahifasida berilgan ma’lumotni ilmiy haqiqat sifatida qabul qilish to‘g‘ri bo‘lmaydi. Ya’ni talaba, eng avvalo, Bu ma’lumotni kim taqdim etgan?, Muallifning ilmiy yoki kasbiy vakolati qanday?, Ushbu fikr qanday dalillar bilan asoslangan?, Ma’lumot qachon e’lon qilingan?, Boshqa ishonchli manbalarda ham shu xulosa tasdiqlanganmi? kabi savollarni bera olishi lozim. Aynan shu kabi savollar axborot iste’molini passiv jarayondan faol tahliliy faoliyatga aylantiradi.

Xususan bu jarayonda mustaqil fikrlash bilan axborot madaniyati o‘rtasidagi uzviy aloqani ko‘rish mumkin. Mustaqil fikrlash axborotni tahlil qilishning intellektual mexanizmini ta’minlasa, axborot madaniyati mazkur holatning amaliy, texnologik va axloqiy asoslarini belgilaydi. Bir tomondan, mustaqil fikrlash rivojlanmagan talaba-yosh turli axborotlarni tanqidiy tekshirishda qiyinchilikka duch keladi. Ikkinchi tomondan bo‘lsa, axborot bilan ishlash madaniyati yetarli bo‘lmagan insonning mustaqil fikri ishonchsiz yoki tasodifiy ma’lumotlarga asoslanib qolishi mumkin.

Oliy ta’lim tizimida media savodxonlik va axborot madaniyatiga oid o‘quv-metodik materiallarning ko‘payib borayotgani ushbu muammoning ta’limiy ahamiyati oshganidan dalolat beradi. Shuningdek, olim Z.Sh.Nurmamatov tomonidan tayyorlangan Media savodxonlik va axborot madaniyati o‘quv-uslubiy majmuasida mazkur yo‘nalish oliy ta’lim uchun alohida o‘quv mazmuni sifatida yoritilgan[31]. Bu esa talaba-yoshlarning raqamli axborot davrida ongli tafakkur yuritishi bugungi mutaxassis tayyorlash jarayonining muhim komponentiga aylanayotganini ko‘rsatadi. Umuman olganda axborotni baholash madaniyati, ayniqsa, ijtimoiy tarmoqlardan foydalanish muhitida alohida ahamiyat kasb etadi. Xususan ijtimoiy tarmoqlarda ma’lumotlarning tez tarqalishi ularning haqiqatga mosligini avtomatik tarzda kafolatlamaydi. Balki, emotsional mazmun, shov-shuvli sarlavha, qisqa va ta’sirchan videolar ko‘pincha foydalanuvchini chuqur tahlildan ko‘ra tezkor reaksiyaga undaydi. Buning natijada talabalar ma’lumotning mazmunidan ko‘ra uning ko‘rilishlar soni, layklar yoki repostlar miqdoriga asoslanib xulosa chiqarishi lozim. Ilmiy nuqtayi nazardan bo‘lsa ommaviylik va ishonchlilik bir xil tushuncha bo‘lmaydi.

Shu sababli Oliy ta’lim tizimida “ko‘p axborot bilish”dan ko‘ra “axborotni to‘g‘ri baholash” kompetensiyasiga urg‘u berish kerak. Misol uchun, talabalar ilmiy maqola, blog posti, reklama materiali, yangilik xabari hamda ijtimoiy tarmoqdagi shaxsiy fikr o‘rtasidagi farqni aniqlay olishi lozim. Bu kabi farqlash qobiliyati shakllanmagan inson ilmiy manba bilan subyektiv fikrni tenglashtirib qo‘yishi mumkin. Talaba-yoshlarning axborotni baholash madaniyatini shakillantirishda ma’lumotlarni solishtirish usuli yuqori pedagogik samaradorlikka egadir. Biror bir mavzu bo‘yicha ikki yoki uch xil ma’lumotni taqdim etadi. Ularning muallifi, maqsadi, faktlari, foydalanilgan statistikasi, xulosalari va uslubini taqqoslash topshirig‘i talabaning analitik tafakkurini faollashtiradi. Bunda asosan o‘qituvchi tayyor to‘g‘ri javobni bermasdan, talabani xulosaga mustaqil ravishda kelishi maqsadga muvofiqdir. Shu boisham talabalar nafaqat ma’lumot oladi, balki undan bilimning qanday hosil bo‘lishini ham anglay boshlaydi.

Shu bilan birga mustaqil fikrlashning hozirgi holatini baholashda yana bir muhim jihat reproduktiv va produktiv faoliyat o‘rtasidagi nisbatdir. Xususan reproduktiv faoliyatda talaba o‘zlashtirilgan ma’lumotni qayta bayon qiladi. Produktiv faoliyatda bo‘lsa, u mavjud bilimlardan yangi vaziyatda foydalanadi, muammoni yechadi, gipoteza ilgari suradi yoki o‘z nuqtayi nazarini ishlab chiqadi. Shuningdek zamonaviy oliy ta’limning maqsadi aynan ikkinchi turdagi faoliyatni kengaytirishga qaratilishi kerak. Olib borilgan tadqiqotlarda ham mustaqil fikrlash madaniyatini rivojlantirish shaxsning ijtimoiy faolligi, kasbiy layoqati va o‘zini takomillashtirib borishi bilan bog‘lanadi[32]. Mustaqil bilim olish tamoyili masalani yechish yo‘lini izlash, maqsadni aniqlash va mustaqil xulosa chiqarishga intilish bilan tavsiflanadi. Bunday yondashuvdan

[30] Oliy ta’limda axborot madaniyatini shakllantirishga oid o‘quv- Toshkent: ZiyoNET elektron kutubxonasi. Ziyonet

[31] Nurmamatov Z.Sh. **Media savodxonlik va axborot madaniyati**: o‘quv-uslubiy majmua. — 2023. ZiyoNET

[32] **Mustaqil fikrlash madaniyatini rivojlantirish**ga oid ilmiy-metodik materiallar. — “Xalq ta’limi” ilmiy-metodik jurnali materiallari, 2015.

kelib chiqib, talabaning mustaqil fikrlashini faqat auditoriyadagi savol-javoblar bilan emas. Aksincha uning ilmiy izlanishi, mustaqil o‘qishi va axborot bilan ishlash faoliyati orqali ham baholash mumkin. Talaba yoshlarning axborot madaniyatida kuzatiladigan muammolardan biri bu tayyor materialni o‘zlashtirmasdan ko‘chirishdir. Internetdagi referat, maqola yoki boshqa materialdan foydalanishning o‘zi salbiy holat hisoblanmaydi. Muammo materialning mazmunini anglamasdan, ma’lumotga havola bermasdan yoki o‘z fikri bilan ajratmasdan foydalanilganda yuzaga keladi. Ilmiy madaniyatning asosiy talablaridan biri axborotning kelib chiqishini ko‘rsatish va boshqa muallifning g‘oyasini o‘z fikridan farqlash hisoblanadi.

Mazkur jihatdan akademik halollik axborot madaniyatining tarkibiy qismi sifatida qaralishi lozim. Talaba-yoshlar ma’lumotdan foydalanishni bilishi bilan birga undan qanday foydalanish mumkinligini ham tushunishi kerak. Iqtibos keltirish, parafraz qilish, bibliografik ma’lumotlarni to‘g‘ri rasmiylashtirishdir, shu bilan birga mualliflik huquqiga rioya qilish kabi ko‘nikmalar ilmiy faoliyatning tashqi texnik talablari bo‘libgina qolmay, intellektual mas’uliyatni shakllantirish vositasi hamdir. Talabalarning mustaqil fikrlashini shakillantirishda mustaqil ta’limning o‘rni nihoyatda katta. Mustaqil ta’lim talaba-yoshlarning o‘qituvchi ishtirokisiz faoliyat yuritishi degani emas. Balki, u maqsadli tashkil etilgan, metodik jihatdan qo‘llab-quvvatlangan va natijasi baholangan faoliyat bo‘lishi kerak. Mahalliy manbalarda talabaning mustaqil ishlarini tashkil etishda topshiriqlarni tizimlashtirish, ularning bosqichma-bosqich murakkablashishini ta’minlash va bajarilish sifatini nazorat qilish zarurligi ko‘rsatilgan[33].

Raqamli muhit mustaqil ta’lim uchun katta imkoniyatlar yaratadi. Talaba elektron kutubxonalardan ilmiy adabiyotlarni izlash, ochiq ma’lumotlar bazalaridan foydalanish lozim. Shuningdek, videoma’ruzalarni ko‘rish, masofaviy kurslarda qatnashish, turli elektron platformalar orqali topshiriqlarni bajarish imkoniyatiga ega. Ammo texnologik imkoniyatning mavjudligi avtomatik ravishda yuqori darajadagi mustaqil ta’limni ta’minlamaydi. Agar talabalar raqamli vositalardan faqat tayyor javobni topish uchun foydalansa, texnologiya uning fikrlashini shakillantirish o‘rniga passivlikni kuchaytirishi mumkin.

O‘quv-uslubiy materiallarda ham raqamli ta’lim jarayonida mustaqil faoliyatga tayyorgarlikni shakilllashtirish, axborot ta’minotini integratsiyalash va talabaning mustaqil faoliyatini rivojlantirish masalalari tadqiq etilmoqda. Bu holat raqamli davrda talabalarning mustaqil faoliyatini tashkil etish alohida metodik yo‘nalishga aylanayotganini ko‘rsatadi. Hozirgi muhitda axborot madaniyatining yana bir muhim komponenti media savodxonlikdir. Media savodxonlik insonning media mahsulotlarini tushunishi, ularning yaratilish maqsadini anglay olishdir. Shu bilan birga mazmunni tahlil qilishi va axborotning auditoriyaga qanday ta’sir ko‘rsatishini baholay olish qobiliyatini qamrab oladi. Media savodxon talabalar xabarning sarlavhasi va mazmuni o‘rtasidagi farqni, fakt va sharhning tafovutini, reklama hamda axborot o‘rtasidagi chegarani, tasvir va kontekstning o‘zaro munosabatini anglaydi.

O‘quv dasturlarida media savodxonlik va axborot madaniyati fanining mazmuniga zamonaviy axborot makoni, media, raqamli davr, ommaviy madaniyat va axborotni tanqidiy qabul qilish masalalari kiritilayotgani kuzatiladi[34]. Xususan, Termiz davlat universiteti o‘quv-uslubiy materiallarida “Media savodxonlik va axborot madaniyati” fanining mazmunida global axborot makonida qabul qilinayotgan axborotni tushunish, baholash va tanqidiy tafakkurni shakllantirish vazifalari qayd etilgan. Axborot oqimining jadallashuvi talabalarning psixologik holatiga ham ta’sir ko‘rsatadi. Bir vaqtning o‘zida ko‘plab ma’lumotlardan manba olish diqqatning bo‘linishiga, yuzaki o‘qishga va tezkor xulosalarga olib kelishi mumkin. Bunday vaziyatda talaba-yoshlar matnni chuqur o‘rganishdan ko‘ra uning qisqa mazmuni yoki tayyor xulosasini izlashga moyil bo‘ladi. Shuning uchun oliy ta’lim muassasalarda “chuqur o‘qish” madaniyatini shakillantirish ham axborot madaniyatining muhim yo‘nalishidir.

Bunday yondashuv o‘qituvchining rolini ham o‘zgartiradi. O‘qituvchi faqat bilim beruvchi hisoblanmaydi. Aksincha axborot makonida yo‘l ko‘rsatuvchi, manbalarni tanlash mezonlarini tushuntiruvchi, munozarani boshqaruvchi va talabaning intellektual mustaqilligini rag‘batlantiruvchi pedagog sifatida namoyon bo‘ladi. Tadqiqotlarda ham ta’lim jarayonida o‘qituvchi va talaba munosabatlarini o‘zgartirish, bilim oluvchini ta’lim jarayonining faol ishtirokchisiga aylantirish mustaqil fikrlashni rivojlantirishning muhim sharti sifatida ko‘rsatiladi[35].

Talabaning axborotni baholash madaniyatini takomillantirishda muammoli ta’lim texnologiyalaridan foydalanish samarali natija beradi. Muammoli topshiriqda talaba tayyor javob bilan ta’minlanmaydi. U mavjud axborotlardan foydalanib muammoni mustaqil tahlil qilishi, ehtimoliy yechimlarni ilgari surishi va ulardan eng asoslisini tanlashi kerak. Bu jarayon fikrlashning tahlil, sintez, taqqoslash, umumlashtirish va baholash kabi operatsiyalarini faollashtiradi. Munozara va debatlar ham mustaqil fikrlashning muhim vositalaridan biridir. Talaba o‘z pozitsiyasini himoya qilishi uchun dalil keltirishi, boshqa fikrni tinglashi va uning kuchli yoki zaif tomonlarini ko‘rsatishi lozim. Eng muhimi,

[33] Adinayev Sh.Sh. Raqamli ta’lim muhitida talabalarning mustaqil faoliyatga tayyorgarligini integrativ axborot ta’minoti vositasida takomillashtirish metodikasi. — avtoreferat, 2025.

[34] **Media savodxonlik va axborot madaniyati** fani bo‘yicha o‘quv dasturi va metodik materiallar. — Termiz, 2023. Ziyonet

[35] **Psixologiya**: oliy ta’lim uchun o‘quv materiallari. — Namangan davlat universiteti elektron kutubxonasi, 2024. www.namdu.uz

munozara talabaning “men shunday deb o‘ylayman” darajasidan “mening fikrim quyidagi dalillarga asoslanadi” darajasiga ko‘tarilishiga yordam beradi.

Axborotni baholash madaniyatida faktcheking ko‘nikmasi ham alohida o‘rin tutadi. Talabalar internetdagi xabarni qabul qilishdan oldin uning boshqa mustaqil manbalarda qay darajada tasdiqlanganini tekshirishi lozim. Ayniqsa statistik ma’lumotlar, ilmiy natijalar, ijtimoiy hodisalar, tarixiy faktlar va jamoatchilikka ta’sir qiluvchi xabarlar bir nechta ishonchli manba asosida qiyoslanishi maqsadga muvofiqdir. Bu jarayonda talabaning shubha qilish qobiliyati inkor qilish emas, balki ilmiy tekshiruv vositasi sifatida shakllantiriladi. Talabalarning hozirgi axborot madaniyatini tahlil qilganda, ularning texnologik savodxonligi bilan axborot-analitik savodxonligini farqlash zarur. Xususan smartfon, kompyuter yoki turli dasturlardan foydalana olish texnik ko‘nikmani bildiradi. Ammo texnik jihatdan faol foydalanuvchi ham yolg‘on axborotni haqiqiy deb qabul qilishi mumkin. Demak, raqamli kompetensiyaning yuqori darajasi faqat texnik operatsiyalarni bajarish hisoblanmaydi. Aksincha axborotning mazmuniy va ijtimoiy qiymatini baholash bilan belgilanadi.

Hozirgi kunda sun’iy intellekt texnologiyalarining ta’limga kirib kelishi ushbu masalani yanada dolzarb qilmoqda. Talaba sun’iy intellekt vositalaridan ma’lumot izlash, matnni tahlil qilish, g‘oyalar ishlab chiqish yoki dastlabki reja tuzishda foydalanishi mumkin. Natijada sun’iy intellekt tomonidan berilgan javob ham tekshirilishi, ishonchli manbalar bilan taqqoslashtirilishi va insonning mustaqil fikri bilan qayta ishlanishi lozim. Shuning uchun yangi texnologiyalar davrida axborot madaniyati tushunchasi yanada kengayib, raqamli natijalarni tekshirish va ularning ilmiy asoslanganligini aniqlash kompetensiyasini ham o‘z ichiga oladi. Oliy ta’limda mustaqil fikrlash va axborot madaniyatini shakillantirishning yana bir samarali yo‘nalishi tadqiqot topshiriqlaridir. Talabaga kichik ilmiy muammo berilib, u muammo bo‘yicha adabiyotlar sharhini tuzish, manbalarni tasniflash, asosiy qarashlarni solishtirish lozim. Mavjud bo‘shliqni aniqlash va o‘z xulosasini ishlab chiqish talab etilsa, uning axborot bilan ishlash kompetensiyasi tabiiy ravishda rivojlanadi.

Shuningdek, talabalarga axborot ma’lumotlarining anglatish muhim. Darslik, monografiya, ilmiy maqola, dissertatsiya, rasmiy statistika, qonunchilik hujjati, ilmiy konferensiya materiali, ommaviy axborot vositasi va ijtimoiy tarmoq posti bir xil ilmiy maqomga ega emas. Ularning har biridan foydalanish maqsadi va ishonchlilik mezoni turlichadir. Talaba buni tushunib yetganida uning ilmiy izlanishlari ham mazmunan, ham metodologik jihatdan takomillashadi. Ilmiy-uslubiy manbalarda ham mustaqil ta’lim jarayonida darslik, o‘quv qo‘llanma, metodik adabiyotlar, ilmiy va davriy nashrlar, internet resurslaridan foydalanish zarurligi qayd etilgan[36]. Demak, zamonaviy talabaning axborot makoni faqat internet bilan chegaralanmaydi. Raqamli manbalarni an’anaviy ilmiy adabiyotlar bilan birlashtirish bilimning ishonchliligini oshiradi. Talaba-yoshlarning mustaqil fikrlashini shakllantirishda milliy-ma’naviy omillar ham muhim ahamiyatga egadir. Mustaqil fikr shaxsning ijtimoiy mas’uliyatidan ajralgan holda rivojlanmasligi kerak. Talaba o‘z fikrini erkin ifodalashi bilan birga, boshqa insonlarning huquqi, sha’ni, qadr-qimmati va fikriga hurmat bilan munosabatda bo‘lishi lozim. Shu sababli axborot madaniyati texnik va intellektual kompetensiyalardan tashqari axloqiy mas’uliyatni ham qamrab oladi.

Ilmiy-pedagogik adabiyotlarida ta’lim va madaniyatning uzviyligi, ta’lim jarayonida milliy-ma’naviy qadriyatlarning ahamiyati ham qayd etilgan[37]. Talabaning zamonaviy axborot muhitida faol ishtirok etishi uning milliy va umuminsoniy qadriyatlar asosidagi ijtimoiy mas’uliyatini kamaytirmasligi, aksincha, kuchaytirishi lozim

Hozirgi holatning yana bir jihati shundaki, talabalar o‘rtasidagi axborot bilan ishlash darajasi bir xil emas. Ayrim yoshlar ilmiy ma’lumotlar bazalari, elektron kutubxonalar va akademik resurslardan samarali foydalanadi. Boshqalar esa qidiruv tizimining dastlabki natijalari yoki ijtimoiy tarmoqdagi ommabop materiallar bilan cheklanib qolishi mumkin. Shu bois oliy ta’lim muassasalarida axborot madaniyatini rivojlantirish barcha talabalar uchun bir xil yondashuv asosida emas, balki ularning boshlang‘ich kompetensiyalarini hisobga olgan differensial metodika asosida tashkil etilishi maqsadga muvofiqdir. Bunday metodikada talabalarning axborot bilan ishlash darajasini aniqlash uchun diagnostik topshiriqlardan foydalanish mumkin. Masalan, ularga bir mavzuga oid beshta manba berilib, ularni ishonchlilik darajasiga ko‘ra tartiblash, tanlovini asoslash, bir manbadagi ma’lumotni boshqa manbalar bilan tekshirish va yakuniy xulosa yozish topshiriladi. Buning natijasida orqali talabaning qidirish, saralash, tekshirish, tahlil qilish va xulosa chiqarish bosqichlaridagi kompetensiyasi aniqlanadi.

Shuningdek, axborot madaniyatini rivojlantirishni alohida bitta fan bilan cheklash to‘g‘ri emas. Ushbu kompetensiya barcha fanlar mazmuniga integratsiya qilinishi lozim. Tarix fanida tarixiy manbalarni taqqoslash, huquqda qonunchilik hujjatlarini tahlil qilish, iqtisodiyotda statistik ma’lumotlarning ishonchliligini baholash, pedagogikada ilmiy maqolalarni qiyoslash, tibbiyotda klinik ma’lumotlarning manbasini tekshirish kabi topshiriqlar orqali axborot madaniyati kasbiy

[36] **O‘zbekiston tarixi** fanidan talabalar mustaqil ishlarini bajarish uchun uslubiy ko‘rsatma. — ZiyoNET elektron kutubxonasi, 2023. ZiyoNET

[37] Jumanazarova A., Tursunov L.E. Talabalarda ta’lim madaniyatini shakllantirishning ijtimoiy-falsafiy muammolari // Research Focus. — 2023. — Vol. 2, Issue 7. КиберЛенинка

tayyorgarlik bilan birlashtirilishi mumkin. Bunday tashqari, talaba yoshlarning mustaqil fikrlashi va axborotni baholash madaniyatining hozirgi holatini bir tomonlama “yaxshi” yoki “yomon” tarzda baholash ilmiy jihatdan yetarli emas. Zamonaviy talaba avvalgi avlodlarga nisbatan axborotga kirish imkoniyatlari jihatidan ancha katta resurslarga egadir. Shu bilan birga, axborot hajmining ortishi uning ishonchliligini aniqlash, tanqidiy saralash va ilmiy jihatdan qayta ishlash masalasini murakkablashtirmoqda. Shuning uchun hozirgi ta’limning asosiy vazifalaridan biri talabani shunchaki axborot bilan ta’minlash emas, balki uni axborot ustidan fikrlashga o‘rgatishdan iborat.

Umuman olganda, mustaqil fikrlash va axborotni baholash madaniyati bir-birini to‘ldiruvchi ikki muhim kompetensiyadir. Mustaqil fikrlash talabaga o‘z pozitsiyasini shakllantirish imkonini bersa, axborot madaniyati ushbu pozitsiyaning ishonchli dalillar va sifatli manbalarga asoslanishini ta’minlaydi. Ularning uyg‘unligi natijasida talaba tayyor bilimni o‘zlashtiruvchi subyektdan bilimni izlovchi, tekshiruvchi, tahlil qiluvchi va yaratuvchi shaxsga aylanadi. Bundan tashqari, talabalarning mustaqil fikrlashini baholashda faqat yakuniy javob emas, balki javobga olib kelgan fikrlash jarayoni ham hisobga olinishi lozim. Talaba qanday manbalarni tanladi, nima uchun aynan shu manbalarga tayandi, qarama-qarshi fikrlarni qanday ko‘rib chiqdi. Xulosasini qanday dalillar bilan asoslay oldi. Mana shu mezonlar uning intellektual mustaqilligi haqida ancha aniq tasavvur beradi.

Shuningdek, oliy ta’lim muassasalarida axborot madaniyatini shakllantirish bo‘yicha amaliy laboratoriyalar, “fact-checking” mashg‘ulotlari, manbalar bilan ishlash seminarlar, ilmiy munozaralar, talabalar tadqiqot loyihalari va media tahlil mashg‘ulotlarini yo‘lga qo‘yish mumkin. Bunday faoliyatlar talabaning real axborot muhitida qaror qabul qilish qobiliyatini mustahkamlaydi.

Xulosa qilib aytganda, zamonaviy talaba uchun mustaqil fikrlash shaxsiy fikrga ega bo‘lishning o‘zi emas. Ushbu fikrni bilim, dalil, mantiq va ilmiy manbalar asosida shakllantira olish qobiliyatidir. Axborotni baholash madaniyati esa ma’lumotni shunchaki qabul qilish emas, uning kelib chiqishi, maqsadi, mazmuni, dalillari va ishonchlilik darajasini tahlil qilishni nazarda tutadi. Raqamli jamiyat sharoitida mazkur ikki kompetensiyaning rivojlanganligi talabaning nafaqat akademik muvaffaqiyatini, balki uning kelajakdagi kasbiy faoliyati, ijtimoiy mas’uliyati va intellektual mustaqilligini ham belgilaydi.

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KICHIK OILA MODELI TUSHUNCHASINING MOHIYATI VA EVOLYUTSION RIVOJLANISHI

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Annotatsiya: *Ushbu maqolada kichik oila modeli tushunchasining mazmun-mohiyati, shakllanishi va evolyutsion rivojlanish xususiyatlari ijtimoiy-falsafiy nuqtayi nazardan tahlil qilinadi. Kichik oilaning asosiy belgilari, tarkibiy tuzilishi, shaxs va jamiyat hayotidagi o‘rni yoritiladi. Shuningdek, urbanizatsiya, modernizatsiya, globallashuv va ijtimoiy-iqtisodiy o‘zgarishlarning oilaviy munosabatlar hamda oilaviy qadriyatlar transformatsiyasiga ta’siri ochib beriladi. Tadqiqotda kichik oila modelining afzalliklari, mavjud cheklovlari va zamonaviy jamiyat sharoitidagi rivojlanish tendensiyalari ilmiy-nazariy jihatdan asoslanadi.*

Kalit so‘zlar: *Kichik oila, oila modeli, evolyutsiya, modernizatsiya, globallashuv, qadriyat, jamiyat, transformatsiya.*

СУТЬ И ЭВОЛЮЦИОННОЕ РАЗВИТИЕ КОНЦЕПЦИИ МОДЕЛИ МАЛОЙ СЕМЬИ

Аннотация: *В данной статье анализируется сущность, формирование и эволюционное развитие концепции модели малой семьи с социально-философской точки зрения. Выделены основные особенности малой семьи, её структурная структура и роль в жизни индивида и общества. Также раскрывается влияние урбанизации, модернизации, глобализации и социально-экономических изменений на трансформацию семейных отношений и семейных ценностей. Исследование предоставляет научно-теоретическую основу для преимуществ, существующих ограничений и тенденций развития модели малой семьи в современном обществе.*

Ключевые слова: *Малая семья, модель семьи, эволюция, модернизация, глобализация, ценности, общество, трансформация.*

THE ESSENCE AND EVOLUTIONARY DEVELOPMENT OF THE CONCEPT OF THE SMALL FAMILY MODEL

Abstract: *This article analyzes the essence, formation and evolutionary development of the concept of a small family model from a socio-philosophical point of view. The main features of a small family, its structural structure, and its role in the life of an individual and society are highlighted. The impact of urbanization, modernization, globalization, and socio-economic changes on the transformation of family relations and family values is also revealed. The study provides a scientific and theoretical basis for the advantages, existing limitations, and development trends of the small family model in modern society.*

Keywords: *Small family, family model, evolution, modernization, globalization, value, society, transformation.*

KIRISH. Kichik oila modeli zamonaviy jamiyatda nikohda bo‘lgan er-xotin va ularning bir yoki ikki farzandidan tashkil topadigan, avlodlararo tarkibi nisbatan ixcham bo‘lgan oilaviy tuzilmani anglatadi. Mazkur modelni faqat farzandlar sonining kamayishi bilan izohlash yetarli emas. U oilaning ijtimoiy vazifalari, iqtisodiy faoliyati, gender munosabatlari, tarbiya usullari, shaxsiy tanlov erkinligi va jamiyatning demografik qadriyatlaridagi o‘zgarishlarni ham ifodalaydi. Shu sababli kichik oila modeli tarixiy jihatdan jamiyatning ijtimoiy-iqtisodiy va ma’naviy-madaniy transformatsiyasi bilan uzviy bog‘liq holda shakllangan. Kichik oilaning ildizlarini insoniyat tarixining dastlabki davrlaridan izlash mumkin bo‘lsa-da, qadimgi va an’anaviy jamiyatlarda asosiy oila modeli, odatda, kengaygan yoki ko‘p avlodli oila shaklida mavjud bo‘lgan. Agrar jamiyatda oila nafaqat biologik va tarbiyaviy, balki ishlab chiqarish birligi sifatida ham faoliyat yuritgan. Ko‘p farzandlilik mehnat resurslarini ko‘paytirgan, keksalarni qo‘llab-quvvatlash va xo‘jalikni davom ettirish imkoniyatini yaratgan. Shuning uchun ko‘p farzandli oila iqtisodiy jihatdan ham, ijtimoiy jihatdan ham muhim qadriyat hisoblangan.

ADABIYOTLAR SHARHI. Kichik oila modeli tushunchasining mohiyati va evolyutsion rivojlanishi masalasi demografiya, sotsiologiya, oilashunoslik va ijtimoiy falsafa doirasida keng tadqiq etilgan. Mazkur yo‘nalishdagi tadqiqotlarda oilaning tarkibiy tuzilishi, farzandlar sonining kamayishi, urbanizatsiya, modernizatsiya, iqtisodiy omillar hamda individualizmning kuchayishi kichik oilaning shakllanishiga ta’sir etuvchi omillar sifatida tahlil qilinadi. Shuningdek, zamonaviy tadqiqotlarda kichik oilaning shaxs tarbiyasi, gender munosabatlari va ijtimoiylashuv jarayonlariga ta’siri yoritilgan. Mazkur tadqiqotning birinchi farqli jihati – kichik oila modeli faqat demografik hodisa emas,

balki ijtimoiy transformatsiya sifatida izohlanadi. Ikkinchi farqli jihati – uning tarixiy-evolyutsion rivojlanishi an'anaviy oiladan zamonaviy kichik oilaga o'tish jarayoni hamda globallashuv va modernizatsiya ta'siri bilan uzviy bog'liq holda kompleks tahlil qilinadi.

TADQIQOT METODOLOGIYASI. Tadqiqotda kichik oila modeli tushunchasining mohiyati va evolyutsion rivojlanishini ochib berish uchun tizimli, tarixiy-qiyosiy, dialektik va ijtimoiy-falsafiy yondashuvlardan foydalanildi. Tarixiy-qiyosiy metod orqali oilaning an'anaviy, industrial va zamonaviy shakllari o'zaro taqqoslandi. Tizimli yondashuv kichik oilaning demografik, iqtisodiy, ma'naviy-axloqiy va ijtimoiy omillar bilan bog'liqligini aniqlashga xizmat qildi. Dialektik yondashuv asosida kichik oila shakllanishidagi imkoniyat va ziddiyatlar tahlil qilindi. Shuningdek, analiz, sintez, induksiya, deduksiya va ilmiy abstraksiyalash usullaridan foydalanildi.

MUHOKAMA VA NATIJALAR. Kichik oila modelining shakllanishidagi birinchi muhim evolyutsion bosqichni **an'anaviy oiladan yadroviy oilaga o'tish jarayoni** bilan bog'lanadi. Yadroviy oila er-xotin va ularning farzandlaridan iborat bo'lib, ota-ona, aka-uka, buva-buvi kabi qarindoshlarning bir xo'jalik doirasida yashash zaruriyati asta-sekin kamaygan. Bu jarayon, ayniqsa, sanoatlashuvning kuchayishi bilan tezlashdi. XIX–XX asrlarda sanoat korxonalarining rivojlanishi, urbanizatsiya, mehnat bozorining kengayishi va aholining qishloqlardan shaharlarga ko'chishi oilaning ishlab chiqarish funksiyasini qisqartirdi. Kichik oila modeli bo'yicha dastlabki tipologik yondashuvlar va uning tuzilishini ilmiy tasniflashga birinchi jiddiy urinishlardan biri fransuz ijtimoiy muhandisi va sotsiologi Frederik Le Play tomonidan amalga oshirilgan. U o'zining 1871-yilda yozilgan "Oilaning tashkil etilishi" asarida "Yevropa oilalarini uch turga ajratadi: patriarxal oila, tayanch-o'zak oila va "kichik oila" deb ham ataydi. Uning fikricha, bu tur – er-xotin va ularning farzandlaridan iborat, mulkning teng taqsimlanishiga asoslangan, kattalar avlodi bilan doimiy birga yashamaydigan oila shakli – sanoat jamiyatiga xos beqaror, ammo erkinlik va tenglik g'oyalariga mos keluvchi model"[1] sifatida shakllangan deb hisoblaydi. Shunday qilib, "kichik oila" atamasining ilmiy muomalaga kiritilishi bevosita Le Playning XIX asr o'rtalaridagi tadqiqotlariga borib taqaladi.

Ikkinchi bosqich – industrial jamiyat sharoitida kichik oilaning institutsional shakllanishidir. Shaharlashuv natijasida uy-joy, daromad, farzand tarbiyasi va ta'lim xarajatlari oilaning reproduktiv xatti-harakatlariga ta'sir ko'rsata boshladi. Bolalar sonining ko'pligi avvalgi agrar jamiyatdagi kabi iqtisodiy ustunlik emas, aksincha, oilaning moddiy va vaqt resurslariga qo'shimcha yuk sifatida namoyon bo'ldi. XIX asr oxirida oila tarixiyligi masalasi boshqa nuqtai nazardan evolyutsion antropologiya orqali ko'rib chiqila boshlandi. Fridrix Engels o'zining "Oila, xususiy mulk va davlatning kelib chiqishi" asaridagi "Oila" deb nomlangan II bobini Lyuis Morganning 1877-yilda yozilgan "Ancient Society" (Qadimgi jamiyat) asaridagi materiallarga tayanib, oila taraqqiyotining bosqichma-bosqich rivojlanish sxemasini taklif qiladi: qarindosh oila (consanguine family), juftlashgan oila (pairing family) va nihoyat monogam oila ko'rinishidagi modelni taklif qiladi. Fridrix Engels "aynan juftlashgan oiladan monogam oilaga o'tishni mulkchilik munosabatlarining o'zgarishi bilan bog'laydi. Bu yondashuvda kichik (monogam) oila tarixiy taraqqiyotning natijasi, xususan xususiy mulk va meros huquqining paydo bo'lishi bilan bog'liq ijtimoiy-iqtisodiy hodisa sifatida talqin qilinadi"[2] bu Le Playning tipologik – tavsifiy yondashuvidan farqli, sabab-oqibat munosabatlariga asoslangan nazariy modelga aylanadi. Aynan F.Engels tomonidan taklif qilingan modelni evolyutsionistik-marksistik bosqich deb ham atash mumkin. Bu kichik oila modelining demografik asoslarini mustahkamlanishiga zamin yaratdi.

Uchinchi bosqich – XX asrning ikkinchi yarmida reproduktiv xulq-atvorning modernizatsiyalashuvi bilan tavsiflanadi. Bu davrda ta'lim darajasining oshishi, ayollarning ijtimoiy va iqtisodiy faolligining kuchayishi, sog'liqni saqlash tizimining rivojlanishi hamda oilani rejalashtirish imkoniyatlarining kengayishi farzandlar soniga bo'lgan munosabatni o'zgartirdi. XX asrning o'rtalarida amerikalik antropolog Jorj Piter Merdok kichik oilaning shakllanishida funksionalistik-universalistik bosqichga o'tish modelini taklif qilib, kichik oila kontseptsiyasini yangi – kross-madaniy statistik asos sifatida izohlaydi. U 250 ta jamiyatni qiyosiy tahlil qilib, o'zining "Ijtimoiy tuzilma" asarini yozib, "oilaga quyidagi klassik ta'rifni beradi: oila – umumiy turar joy, iqtisodiy hamkorlik va reproduksiya bilan tavsiflanuvchi ijtimoiy guruh bo'lib, kamida ikkita jinsiy hamkor va ularning bir yoki bir nechta farzandidan iborat bo'lib, kichik (nuklear) oilani jamiyatning universal, ya'ni barcha madaniyatlarda uchraydigan asosiy birligi bo'lib, o'zida to'rtta jinsiy, reproduktiv, ta'lim-tarbiyaviy va iqtisodiy funksiyalarni birlashtiradi"[3]. Bu bilan "kichik oila" tushunchasi endi tarixiy-o'tkinchi hodisa emas, balki insoniyat jamiyatining tabiiy-universal birligi sifatida talqin qilina boshlanadi. Natijada, oila qurish va farzand ko'rish masalalari tobora ko'proq shaxsiy tanlov, iqtisodiy imkoniyat va hayotiy strategiya bilan bog'lana boshladi. Shu tariqa "ko'p farzandlilik – oilaning iqtisodiy zaruriyati" paradigmasi o'rnini "kam farzandli, lekin sifatli tarbiyaga yo'naltirilgan oila" paradigmasi egallay boshladi.

1949–1950-yillarda amerikalik sotsiolog Talkott Parsons kichik oila kontseptsiyasini sanoatlashuv jarayonining mahsuli ekanligi bilan bog'laydi. Uning "izolyatsiyalashgan kichik oila" (isolated nuclear family) tushunchasi ilgari suriladi: sanoat jamiyatida oila kengaygan qarindoshlik tarmog'idan ajralib, mustaqil iqtisodiy-ijtimoiy birlikka aylanadi. Kichik oilaning ikkita "qisqarmas" funksiyasi – bolalarning birlamchi sotsializatsiyasi va kattalar shaxsining barqarorlashtirilishi asoslab beriladi"[4]. Parsonsning "izolyatsiyalashgan kichik oila" tezisi tez orada empirik tanqidga

uchraydi. Marvin Sussman o‘zining tadqiqotlarida “amerika oilalari o‘rtasida qarindoshlik aloqalari sanoatlashuvdan keyin ham saqlanib qolganini ko‘rsatuvchi dalillarni keltiradi va kichik oilaning to‘liq izolyatsiyalashgan holati ko‘p jihatdan nazariy mif ekanligini isbotlaydi”[5]. Bu tanqid kichik oila modelining bir xilda universal emasligini, balki madaniy-tarixiy kontekstga bog‘liq holda turlicha shakllanishini ko‘rsatdi.

XXI asrga kelib oila tuzilishiga raqamlashtirish, globallashuv, individualizatsiya, ta’lim va professional karyeraga bo‘lgan ehtiyoj kuchli ta’sir ko‘rsatmoqda**. Postindustrial va axborot jamiyati sharoitidagi kichik oila modeli bu z**amonaviy shaxs uchun hayot sifati, kasbiy rivojlanish, iqtisodiy mustaqillik, shaxsiy erkinlik va farzand tarbiyasining sifati tobora muhim qadriyatlarga aylanmoqda. Bir yoki ikki farzandli oilalar ko‘plab jamiyatlarda keng tarqalgan demografik modelni vujudga kelishiga turtki berdi. Biroq kichik oila modelini faqat demografik hodisa sifatida baholash mumkin emas. Uning **ma’naviy-axloqiy mazmuni** ham mavjud bo‘lib, kichik oilada ota-onaning har bir farzandga ajratadigan vaqti, ta’lim va tarbiya resurslari nisbatan ko‘proq ahamiyatlidir. Bu holat farzandda mas’uliyat, mustaqillik, o‘zini boshqarish, hamkorlik va ijtimoiy moslashuv kabi sifatlarning rivojlanishiga imkon yaratadi. Shu bilan birga, kichik oilaning ayrim cheklovlari ham mavjud: avlodlararo aloqalarning zaiflashishi, qarindoshlik munosabatlarining qisqarishi, yolg‘izlik xavfi va individualizmning kuchayishi shular jumlasidandir.

O‘zbekiston sharoitida kichik oila modelining shakllanishi o‘ziga xos xususiyatga ega. An’anaviy o‘zbek oilasida ko‘p avlodlilik, qarindoshlik rishtalari, kattalarga hurmat, o‘zaro yordam muhim qadriyatlar hisoblangan. Mustaqillikdan keyingi davrda urbanizatsiya, ta’lim darajasining oshishi, ayollarning mehnat bozoridagi ishtiroki, uy-joy va iqtisodiy sharoitlarning o‘zgarishi natijasida oilaning hajmi va reproduktiv xulq-atvorida ham transformatsion jarayonlarining jadallashishiga olib keldi. Shu bilan birga, kichik oila modeli milliy oilaviy qadriyatlarni to‘liq inkor etmaydi; aksincha, an’anaviy qadriyatlarning yangi ijtimoiy sharoitga moslashuvi asosida shakllanib boradi. Evolyutsion nuqtayi nazardan kichik oila modelini **an’anaviy ko‘p avlodli oila → yadroviy oila → kam farzandli oila → ongli rejalashtiriladigan kichik oila → individuallashgan va sifatga yo‘naltirilgan zamonaviy oila** tarzidagi jarayon sifatida tavsiflash mumkin. Bunda har bir bosqich oldingisini to‘liq inkor etmaydi, balki uning ayrim elementlarini saqlagan holda yangi ijtimoiy sharoitga moslashtiradi.

Umuman, kichik oila modelining tarixiy shakllanishi jamiyatning modernizatsiyasi, urbanizatsiyasi, iqtisodiy munosabatlarning o‘zgarishi, ta’lim va tibbiyotning rivojlanishi, gender rollarining transformatsiyasi hamda individual qadriyatlarning kuchayishi bilan bog‘liq murakkab ijtimoiy jarayondir. Uning asosiy xususiyati oilaning miqdoriy jihatdan kichrayishi bilangina emas, balki **oilaviy hayotning mazmuni, funksiyalari va qadriyatlar tizimining sifat jihatidan transformatsiyalanishi** bilan belgilanadi. Shu nuqtayi nazardan, kichik oila modeli shaxsning ma’naviy-axloqiy kapitalini shakllantirish uchun yangi imkoniyatlar yaratishi bilan birga, avlodlararo uzviylik va ijtimoiy birdamlikni saqlash masalasida muayyan cheklovlarni ham yuzaga keltiruvchi zamonaviy ijtimoiy institut sifatida namoyon bo‘ladi.

“Kichik oila modeli zamonaviy jamiyatda oilaning demografik, ijtimoiy, iqtisodiy, ma’naviy-axloqiy va tarbiyaviy funksiyalarining transformatsiyasi natijasida shakllangan ijtimoiy institut sifatida namoyon bo‘ladi. Uni faqat oiladagi farzandlar sonining kamligi bilan tavsiflash metodologik jihatdan yetarli emas”[6]. Chunki kichik oila modeli oilaning ichki tuzilishi, a’zolar o‘rtasidagi munosabatlar, reproduktiv qarorlarni qabul qilish mexanizmlari, tarbiyaviy strategiyalar, iqtisodiy resurslarning taqsimlanishi va shaxsning individual rivojlanishiga yaratiladigan imkoniyatlarni ham qamrab oladi. Shu jihatdan kichik oila modeli shaxs va jamiyat o‘rtasidagi munosabatlarning muhim vositachisi bo‘lib, uning mazmunini kompleks ijtimoiy-falsafiy tahlil qilish talab etiladi.

“Kichik oila modelining birinchi asosiy belgisi – oilaning nisbatan kam sonli tarkibga egaligidir. Odatda bunday oila er-xotin va ularning bir yoki ikki farzandidan tashkil topgan yadroviy oila shaklida namoyon bo‘ladi. Biroq “kichik oila” tushunchasini faqat qat’iy statistik mezon bilan chegaralash maqsadga muvofiq emas”[7]. Chunki oilaning kichik yoki katta ekanligi jamiyatning demografik holati, tarixiy-madaniy an’analari va oilaviy me’yorlariga nisbatan belgilanadi. Muhimi, kichik oila modelida oilaviy resurslar nisbatan kam sonli a’zolar o‘rtasida taqsimlanadi. Ikkinchi belgi – reproduktiv xulq-atvorning ongli va rejalashtirilganligi bo‘lib, an’anaviy jamiyatlarda farzandlar soni ko‘pincha iqtisodiy, diniy, urf-odat va qarindoshlik omillari bilan belgilangani holda, zamonaviy kichik oilada farzand ko‘rish masalasi tobora ko‘proq er-xotinning ongli qaroriga aylanmoqda. Ota-onalar farzandlar sonini oilaning moddiy imkoniyatlari, uy-joy sharoiti, ta’lim va tarbiya imkoniyatlari hamda kelajakdagi hayotiy rejalar bilan bog‘lab belgilaydi. Demak, reproduktiv tanlov kichik oila modelining muhim tarkibiy xususiyatlaridan biridir.

Uchinchi belgi – oilaviy resurslarning sifatga yo‘naltirilishidir. Kichik oilada vaqt, mablag‘, e’tibor, ta’limiy imkoniyat va boshqa resurslar kamroq farzandlar o‘rtasida taqsimlanadi. Bu esa har bir farzandning individual ehtiyojlarini hisobga olish imkoniyatini oshiradi. Xususan, ta’lim olish, kasbiy rivojlanish, qo‘shimcha bilim va ko‘nikmalarni egallash hamda shaxsiy qobiliyatlarni rivojlantirish uchun ko‘proq sharoit yaratilishi mumkin. Shu nuqtayi nazardan kichik oila modelida “farzandlar soni”dan ko‘ra “farzandlar rivojlanishining sifati” muhimroq mezonga aylanadi.

To‘rtinchi belgi – ota-ona va farzandlar o‘rtasidagi individual muloqotning kuchayishidir. Oila a’zolari sonining nisbatan kamligi ota-onaga har bir farzandning qiziqishi, qobiliyati, hissiy holati va ehtiyojlarini yaxshiroq anglash imkonini beradi. Tarbiya jarayoni umumiy talablar asosida emas, balki individual yondashuv asosida tashkil etilishi mumkin. Bu jarayon bolaning o‘z fikrini erkin ifodalashi, mustaqil qaror qabul qilishi va shaxsiy mas’uliyatini rivojlantirishga ijobiy ta’sir ko‘rsatadi.

Kichik oila modelining beshinchi tarkibiy xususiyati – oilaviy rollarning transformatsiyasi hisoblanib, zamonaviy kichik oilada ota faqat moddiy ta’minotchi, ona esa faqat uy-ro‘zg‘or va tarbiya uchun mas’ul shaxs sifatida qaraladigan an’anaviy rollar nisbatan o‘zgarib bormoqda. Er-xotin o‘rtasida iqtisodiy, maishiy, tarbiyaviy va emotsional mas’uliyatni taqsimlashning yangi shakllari paydo bo‘lmoqda. Bu esa oiladagi sheriklik, o‘zaro hurmat va kelishuv tamoyillarining kuchayishiga olib keladi.

Oltinchi belgi – iqtisodiy ratsionallik va oilaviy farovonlikka intilishdir. Kichik oila modelida oilaning daromadi va xarajatlarini rejalashtirish, farzandlarning ta’limi va kelajagiga investitsiya qilish, uy-joy va boshqa ehtiyojlarni hisobga olish muhim ahamiyat kasb etadi. Farzandlar sonining nisbatan kamligi oilaning mavjud iqtisodiy resurslarini har bir a’zoning ehtiyojlariga mos ravishda taqsimlash imkonini beradi. Shu bilan birga, kichik oila modeli iqtisodiy barqarorlikni avtomatik ravishda ta’minlamaydi; uning natijasi oilaning daromad darajasi, bandlik imkoniyatlari va ijtimoiy himoya tizimiga ham bog‘liq.

Yettinchi xususiyat – ma’naviy-axloqiy tarbiyaning individuallashuvi bo‘lib, oila shaxsning dastlabki ijtimoiylashuv muhiti bo‘lib, unda halollik, vijdon, adolat, mas’uliyat, hurmat, mehr-oqibat, sadoqat va hamjihatlik kabi qadriyatlar shakllanadi. Kichik oilada ota-onaning farzand bilan bevosita muloqoti kuchaygani sababli ushbu qadriyatlarni kundalik xatti-harakatlar orqali singdirish imkoniyati ortishi mumkin. Shu ma’noda kichik oila modeli shaxsning ma’naviy-axloqiy kapitalini shakllantirish uchun mikroijtimoiy muhit vazifasini bajaradi. Biroq kichik oila modelining cheklovlari ham mavjud. Aka-uka va opa-singillar sonining kamayishi bolaning tengdoshlar bilan kundalik oilaviy muloqot tajribasini qisqartirishi mumkin. Shuningdek, avlodlararo aloqalarning zaiflashuvi natijasida oilaviy xotira, urf-odat va an’analarni uzatish mexanizmlari o‘zgarishi ehtimoli mavjud. Ayrim holatlarda ota-onaning farzandga haddan tashqari individual e’tibori ortiqcha himoyachilik yoki individualizmning kuchayishiga olib kelishi mumkin. Demak, kichik oila modeli imkoniyatlar bilan birga muayyan ijtimoiy-pedagogik va ma’naviy cheklovlarni ham o‘zida mujassam etadi.

“Kichik oila modeli zamonaviy jamiyatda er-xotin va ularning farzandlaridan iborat nisbatan ixcham oilaviy tuzilmani anglatib, demografik, iqtisodiy, ijtimoiy va ma’naviy jarayonlarning o‘zgarishi bilan bog‘liq holda shakllangan. Mazkur modelning rivojlanishi urbanizatsiya, mehnat migratsiyasi, ayollarning ijtimoiy faolligi, ta’lim darajasining oshishi, individual tanlov va turmush tarzining diversifikatsiyasi kabi omillar bilan chambarchas bog‘liq. Kichik oila modeli jamiyat va shaxs taraqqiyoti uchun muayyan imkoniyatlar yaratishi bilan birga, ayrim ijtimoiy va ma’naviy cheklovlarni ham yuzaga keltiradi”[8]. Avvalo, kichik oilaning shaxs rivoji uchun muhim imkoniyati oiladagi resurslarning nisbatan kam sonli a’zolar o‘rtasida taqsimlanishidir. Farzandlar sonining kamligi ota-onaga har bir bolaning ta’limi, sog‘lom rivojlanishi, qiziqishlari va individual ehtiyojlariga ko‘proq e’tibor qaratish imkonini beradi. Natijada bolaning intellektual salohiyati, mustaqil fikrlashi, kasbiy yo‘nalishi va ijtimoiy kompetensiyalarini rivojlantirish uchun qulay sharoit shakllanishi mumkin. Shuningdek, ota-onalar farzand tarbiyasida zamonaviy pedagogik va psixologik yondashuvlardan foydalanishga ko‘proq vaqt va imkoniyat topadilar.

Kichik oila iqtisodiy jihatdan ham muayyan afzalliklarga ega. Oilaning daromadlari kamroq a’zolar o‘rtasida taqsimlanganligi sababli uy-joy, ta’lim, sog‘liqni saqlash, madaniy hordiq va boshqa ehtiyojlarga ko‘proq mablag‘ yo‘naltirish imkoniyati paydo bo‘ladi. Bu esa oilaning moddiy barqarorligini mustahkamlab, uning inson kapitaliga investitsiya qilish salohiyatini oshiradi. Jamiyat miqyosida esa kichik oila modeli aholi soni o‘sishining nisbatan muvozanatli kechishiga, mehnat resurslari va ijtimoiy infratuzilmaga tushadigan bosimni boshqarishga yordam berishi mumkin. Bundan tashqari, kichik oila shaxsiy erkinlik va individual rivojlanish uchun kengroq imkoniyat yaratadi. Oila a’zolari kasbiy faoliyat, ta’lim, ijod, tadbirkorlik va ijtimoiy faoliyat bilan shug‘ullanishga ko‘proq vaqt ajratishi mumkin. Ayniqsa, ayollarning ta’lim olishi va mehnat bozoridagi ishtiroki uchun kichik oila modeli qo‘shimcha imkoniyatlar yaratadi.

Biroq ushbu modelning cheklovlari ham mavjud. Eng avvalo, farzandlar sonining kamligi oiladagi avlodlararo munosabatlarning torayishiga olib kelishi mumkin. Bola aka-uka yoki opa-singillar bilan doimiy muloqot qilish imkoniyatidan mahrum bo‘lsa, hamkorlik, murosa, o‘zaro yordam va jamoaviy mas’uliyat kabi ijtimoiy ko‘nikmalarni shakllantirish asosan tashqi ijtimoiy muhitga bog‘liq bo‘lib qoladi. Shuningdek, kichik oilada ota-onaning farzandga haddan tashqari e’tibori uning mustaqilligi va mas’uliyatini rivojlantirishga salbiy ta’sir ko‘rsatishi mumkin. Jamiyat nuqtayi nazaridan esa kichik oilalarning keng tarqalishi tug‘ilish darajasining pasayishi va aholining qarishi kabi demografik muammolarni kuchaytirishi mumkin. Keksalarni parvarish qilish yukining kam sonli farzandlar zimmasiga tushishi, avlodlar o‘rtasidagi ijtimoiy aloqalarning zaiflashishi ham ehtimoliy cheklovlardan biridir. Shunday qilib, kichik oila modeli o‘z mohiyatiga ko‘ra na mutlaq ijobiy, na mutlaq salbiy hodisadir. Uning samaradorligi oiladagi tarbiya sifati,

ma’naviy-axloqiy qadriyatlar, davlatning ijtimoiy siyosati va jamiyatdagi avlodlararo hamkorlik tizimiga bog‘liq. Asosiy vazifa kichik oilaning iqtisodiy va shaxsiy rivojlanish imkoniyatlarini saqlagan holda, uning ma’naviy, ijtimoiy va demografik cheklovlarini kamaytirishdan iborat.

“Globallashuv va modernizatsiya jarayonlari zamonaviy jamiyatning ijtimoiy tuzilmasi, qadriyatlar tizimi, turmush tarzi hamda shaxslararo munosabatlariga sezilarli ta’sir ko‘rsatmoqda. Mazkur jarayonlar ta’sirida oilaning an’anaviy shakllari ham transformatsiyaga uchrab, kichik oila modeli tobora keng tarqalgan ijtimoiy hodisaga aylandi. Ushbu transformatsiya faqat oila a’zolari sonining kamayishi bilan emas, balki oilaning funksiyalari, ichki munosabatlari, gender rollari, farzand tarbiyasi va ma’naviy-axloqiy qadriyatlarining yangicha mazmun kasb etishi bilan ham tavsiflanadi”[9]. Modernizatsiya, avvalo, urbanizatsiya, sanoatlashuv, ta’limning ommalashuvi va mehnat bozorining diversifikatsiyasi orqali kichik oila modelining shakllanishiga ta’sir ko‘rsatadi. Shaharlashuv sharoitida uy-joy, bandlik va iqtisodiy xarajatlarning ortishi ko‘p farzandli oilaga nisbatan kichik oilani iqtisodiy jihatdan qulayroq model sifatida namoyon etadi. Shu bilan birga, ota-onalarning farzandlar sonidan ko‘ra ularning ta’limi, sog‘lom rivojlanishi va kelajakdagi ijtimoiy mavqeiga ko‘proq e’tibor qaratishi kuzatiladi.

“Globallashuv esa oilaviy qadriyatlarning madaniy almashinuv va axborot-kommunikatsiya texnologiyalari orqali transformatsiyasini jadallashtirmoqda. Internet, ijtimoiy tarmoqlar va ommaviy madaniyat turli jamiyatlardagi oilaviy hayot shakllarini keng namoyish etib, shaxslarning nikoh, farzandlik, gender tengligi va shaxsiy erkinlik haqidagi tasavvurlarini o‘zgartirmoqda. Oilada an’anaviy ierarxik munosabatlardan sheriklik, o‘zaro kelishuv va individual mas’uliyatga asoslangan munosabatlarga o‘tish kuchayishiga olib keldi”[10]. Kichik oila transformatsiyasining muhim jihatlaridan biri gender rollarining qayta taqsimlanishidir. Zamonaviy sharoitda ayollarning oliy ta’lim olishi, kasbiy faoliyat va tadbirkorlikdagi ishtiroki ortib, oilaviy vazifalarni faqat bir jins zimmasiga yuklash o‘rniga er-xotin o‘rtasida hamkorlik tamoyili rivojlanadi. Biroq transformatsiya ayrim xavflarni ham yuzaga keltiradi. Individualizmning kuchayishi, iste’molchilik qadriyatlarining ustuvorligi, avlodlararo aloqalarning susayishi va raqamli muhitning oilaviy muloqotga ta’siri oilaning ma’naviy-axloqiy barqarorligiga muayyan bosim yaratadi. Shunday qilib, globallashuv va modernizatsiya sharoitida kichik oila modeli an’anaviylik va zamonaviylik, jamoaviylik va individualizm, moddiy manfaat va ma’naviy mas’uliyat o‘rtasidagi muvozanat izlash jarayonida transformatsiyalanmoqda. Mazkur jarayonning ijobiy natijasi oilaning moslashuvchanligi va shaxs rivoji imkoniyatlarini kengaytirish bilan belgilanadi.

XULOSA. Kichik oila modeli zamonaviy jamiyatning demografik, iqtisodiy, ijtimoiy va ma’naviy o‘zgarishlari ta’sirida shakllangan murakkab ijtimoiy hodisa hisoblanadi. Tadqiqot natijalari shuni ko‘rsatadiki, kichik oilaning rivojlanishi faqat farzandlar sonining kamayishi bilan cheklanmay, balki oilaviy qadriyatlar, nikoh munosabatlari, ota-onalik mas’uliyati, gender rollari va shaxsning ijtimoiylashuvi mazmunidagi o‘zgarishlarni ham ifodalaydi. Uning evolyutsiyasi an’anaviy ko‘p avlodli oiladan zamonaviy, nisbatan ixcham va individual ehtiyojlarga yo‘naltirilgan oilaviy modelga o‘tish jarayonini aks ettiradi. Shu bilan birga, kichik oila modeli shaxsga ta’lim, tarbiya va individual rivojlanish uchun qo‘shimcha imkoniyatlar yaratishi bilan bir qatorda, avlodlararo aloqalarning zaiflashuvi, demografik muvozanat va ijtimoiy qo‘llab-quvvatlash bilan bog‘liq ayrim cheklovlarni ham yuzaga keltiradi. Demak, kichik oila modelini jamiyat taraqqiyotining obyektiv tendensiyasi sifatida baholash bilan birga, uning ijtimoiy-ma’naviy barqarorligini ta’minlash muhim ahamiyat kasb etadi.

AMALIY TAKLIFLAR. Oilaviy-ma’rifiy dasturlarni takomillashtirish orqali, yoshlarni kichik oila sharoitida mas’uliyatli nikoh, ongli ota-onalik, farzand tarbiyasi va oilaviy qadriyatlar masalalariga tayyorlashga yo‘naltirilgan maxsus ma’rifiy dasturlarni ishlab chiqish.

- Avlodlararo munosabatlarni mustahkamlash natijasida, kichik oilalarda katta avlod tajribasi va zamonaviy yoshlar qarashlarini uyg‘unlashtiruvchi “avlodlar muloqoti” loyihalarini joriy etish hamda oilaviy an’analarni davom ettirish mexanizmlarini rivojlantirish.

- Oilalarni ijtimoiy qo‘llab-quvvatlashni kuchaytirish. Yosh oilalarning uy-joy, bandlik, ta’lim, tibbiy xizmat va bolalar tarbiyasi bilan bog‘liq ehtiyojlarini hisobga olgan holda kompleks ijtimoiy-iqtisodiy qo‘llab-quvvatlash choralarini takomillashtirish.

- Kichik oilaning ijtimoiy-ma’naviy monitoringini yo‘lga qo‘yish. Kichik oila modelining shaxs ma’naviy-axloqiy rivoji, farzand tarbiyasi, ijtimoiylashuv va avlodlararo munosabatlarga ta’sirini muntazam o‘rganish uchun sotsiologik monitoring tizimini shakllantirish.

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KORRUPSIYAGA MUNOSABATDA INSONNING AXLOQIY POZITSIYASI: ONG, IRODA VA MAS'ULIYAT MUAMMOSI

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Annotatsiya: *Mazkur maqolada korrupsiyaga munosabatning inson axloqiy pozitsiyasi bilan bog'liq ijtimoiy-falsafiy jihatlari tahlil qilinadi. Korrupsion xatti-harakatning shakllanishida inson ongi, axloqiy tanlovi, irodasi va mas'uliyatining o'zaro dialektik aloqasi ochib beriladi. Korrupsiyaga qarshi kurashni faqat huquqiy va institutsional mexanizmlar bilan cheklab qo'yish yetarli emasligi, uning barqaror samaradorligi shaxsda halollik, adolat, vijdon, burch va fuqarolik mas'uliyati kabi qadriyatlarning ichki e'tiqodga aylanishiga bog'liqligi asoslanadi.*

Kalit so'zlar: *korrupsiya, axloqiy pozitsiya, ong, iroda, mas'uliyat, axloqiy tanlov, halollik, adolat, vijdon, fuqarolik mas'uliyati, antikorrupsiya madaniyati, ma'naviy immunitet.*

КОРРУПЦИЯ И НРАВСТВЕННАЯ ПОЗИЦИЯ ЧЕЛОВЕКА: ПРОБЛЕМА СОЗНАНИЯ, ВОЛИ И ОТВЕТСТВЕННОСТИ

Аннотация: *В статье анализируются социально-философские аспекты отношения к коррупции во взаимосвязи с нравственной позицией человека. Раскрывается диалектическая взаимосвязь сознания, нравственного выбора, воли и ответственности человека в формировании коррупционного поведения. Обосновывается, что ограничение борьбы с коррупцией исключительно правовыми и институциональными механизмами недостаточно; её устойчивая эффективность во многом зависит от превращения таких ценностей, как честность, справедливость, совесть, долг и гражданская ответственность, во внутренние убеждения личности.*

Ключевые слова: *коррупция, нравственная позиция, сознание, воля, ответственность, нравственный выбор, честность, справедливость, совесть, гражданская ответственность, антикоррупционная культура, духовный иммунитет.*

THE MORAL POSITION OF THE INDIVIDUAL TOWARDS CORRUPTION: THE PROBLEM OF CONSCIOUSNESS, WILL AND RESPONSIBILITY

Abstract: *This article analyzes the socio-philosophical aspects of attitudes toward corruption in relation to the moral position of the individual. It reveals the dialectical interrelationship of human consciousness, moral choice, will, and responsibility in the formation of corrupt behavior. The study substantiates that limiting the fight against corruption solely to legal and institutional mechanisms is insufficient; its sustainable effectiveness largely depends on transforming such values as honesty, justice, conscience, duty, and civic responsibility into the individual's internal convictions.*

Keywords: *corruption, moral position, consciousness, will, responsibility, moral choice, honesty, justice, conscience, civic responsibility, anti-corruption culture, moral immunity.*

Kirish. Globallashuv, raqamlashtirish, institutsional transformatsiya va ijtimoiy munosabatlarning tobora murakkablashib borishi sharoitida korrupsiya fenomeni zamonaviy jamiyat taraqqiyotining barqarorligiga tahdid soluvchi ko'p qatlamli ijtimoiy hodisa sifatida namoyon bo'lmoqda. Uning xavfliligi faqat davlat yoki xo'jalik boshqaruvida vakolatlarning suiiste'mol qilinishi, moddiy manfaatlarning noqonuniy tarzda o'zlashtirilishi yoxud huquqiy normalarning buzilishi bilan cheklanmaydi; korrupsiya, eng avvalo, jamiyatning axloqiy me'yorlari, adolat haqidagi tasavvurlari, fuqarolik mas'uliyati, institutsional ishonch va shaxsning o'z xatti-harakatlariga bergan ichki bahosi bilan bog'liq bo'lgan murakkab ma'naviy-ijtimoiy deformatsiya sifatida qaralishi lozim. Shu ma'noda korrupsiyaga munosabat masalasini insonning axloqiy pozitsiyasi, uning ongi, irodasi, erkin tanlovi va mas'uliyati bilan uzviy aloqadorlikda tadqiq etish masalaning huquqiy yoki iqtisodiy doirasidan chiqib, uni ijtimoiy falsafa va etikaning fundamental muammolaridan

biri sifatida talqin qilish imkonini beradi. Isomiddinovning korrupsiyaga qarshi kurashish madaniyatiga bag‘ishlangan doktorlik tadqiqotida mazkur hodisa “postmodern sotsiumning eng global destruktiv muammolaridan biri” sifatida baholanib, korrupsiyaning nafaqat iqtisodiy, balki ijtimoiy, siyosiy va ma’naviy hayotga destruktiv ta’sir ko‘rsatishi alohida ta’kidlanadi [1, 5–7-b.]. Mazkur fikrning e’tiborga molik jihati shundaki, muallif korrupsiyani alohida huquqbuzarliklar yig‘indisi tarzida emas, balki jamiyatning ichki institutsional va qadriyaviy muvozanatini izdan chiqaruvchi tizimli hodisa sifatida ko‘radi. Professorlik nuqtayi nazaridan qaralganda, aynan shu metodologik yondashuv korrupsiyaga munosabatning subyektiv-axloqiy tomonini tadqiq etish uchun nazariy poydevor yaratadi: agar korrupsiya jamiyatning axloqiy va institutsional negizlarini yemiruvchi hodisa bo‘lsa, unga qarshi immunitetni faqat tashqi nazorat va jazo vositalari bilan emas, balki shaxsning ichki axloqiy mezonlari orqali ham shakllantirish zarur bo‘ladi. Isomiddinov tadqiqotida O‘zbekistonda korrupsiyaga qarshi kurashning huquqiy-institutsional mexanizmlari bilan bir qatorda “inson qadr-qimmatini e’zozlaydigan ijtimoiy boshqaruv mexanizmlari”ni qaror toptirish zarurligi qayd etiladi [1, 5–6-b.]. Bu yondashuv korrupsiyaga qarshi siyosatning antropotsentrik mohiyatini ochib beradi: davlat boshqaruvi samaradorligi oxir-oqibat uni amalga oshirayotgan insonning axloqiy sifati, mas’uliyat hissi va jamoat manfaatiga munosabati bilan belgilanadi. Demak, korrupsiyaga qarshi kurashning strategik markazida “korrupsiyani qanday jazolash kerak?” degan savol bilan bir qatorda “inson nima sababdan korrupsion tanlovni amalga oshiradi yoki undan voz kechadi?” degan etik-falsafiy savol ham turishi lozim. Mazkur masalaning dolzarbligi O‘zbekiston Respublikasining korrupsiyaga qarshi siyosatida ham yaqqol namoyon bo‘ladi. “Korrupsiyaga qarshi kurashish to‘g‘risida”gi O‘RQ–419-son Qonunda korrupsiyaga qarshi kurashishning asosiy yo‘nalishlari sifatida qonuniylik, fuqarolar huquq va manfaatlarining ustuvorligi, ochiqlik va shaffoflik, davlat va fuqarolik jamiyati hamkorligi, korrupsiyaning oldini olishga doir chora-tadbirlarning ustuvorligi hamda javobgarlikning muqarrarligi kabi prinsiplar belgilangan. Biroq mazkur prinsiplarning amaliy samaradorligi ularning faqat normativ-huquqiy hujjatlarda mavjudligi bilan emas, balki shaxs ongida axloqiy e’tiqodga aylanish darajasi bilan belgilanadi. Chunki qonun tashqi xatti-harakat chegarasini belgilashi mumkin, biroq insonning ichki motivini, manfaatlar to‘qnashuvi sharoitida qiladigan tanlovini va vijdoniy qarorini to‘liq boshqara olmaydi. Shu nuqtayi nazardan korrupsiyaga qarshi barqaror pozitsiyaning shakllanishi “qonuniy talab”dan “axloqiy e’tiqod”ga, “tashqi nazorat”dan “ichki o‘zini nazorat qilish”ga, “jazodan qo‘rqish”dan “adolatsizlikni rad etish”ga o‘tish jarayonini anglatadi. Aynan mana shu o‘tish korrupsiyaga munosabatda insonning axloqiy pozitsiyasi shakllanganligini ko‘rsatuvchi eng muhim mezondir.

Mazkur nazariy muammoning yana bir muhim jihati shundan iboratki, korrupsiyaga qarshi ongni oddiy huquqiy bilim bilan tenglashtirish ilmiy jihatdan yetarli emas. Inson korrupsiyaning qonunga zid ekanligini bilishi mumkin, biroq shaxsiy manfaat, ijtimoiy bosim, qarindoshlik munosabatlari, tanish-bilishchilik, moddiy ehtiyoj yoki lavozimiy manfaat ta’sirida ushbu bilimga zid qaror qabul qilishi ehtimoli mavjud. Demak, bilim va xatti-harakat o‘rtasida axloqiy baholash hamda iroda vositachilik qiladi. B. Abdullayevning O‘zbekiston yoshlarining korrupsiyaga munosabatiga bag‘ishlangan ijtimoiy-falsafiy tadqiqotida aynan shu masala alohida konseptual darajada qo‘yilgan bo‘lib, muallif korrupsiyaga munosabatni “inson ongi, erk va axloqiy mas’uliyat kategoriyalari uyg‘unligida” tahlil qiladi [4, 8–9-b.]. Muallifning mazkur yondashuvida e’tiborga molik jihat shundaki, korrupsion xatti-harakat shaxsdan tashqarida sodir bo‘ladigan mexanik jarayon emas, balki insonning qadriyatlar tizimi, erkinligi va axloqiy tanlovi bilan bog‘liq individual qaror sifatida talqin qilinadi. Tadqiqotda “korrupsiyaga munosabat shakllanishi” uch bosqichli jarayon — ijtimoiy me’yorni anglash, uni axloqiy baholash va amaliy qaror qabul qilish — tarzida izohlanadi [4, 13-b.]. Muallifning “axloqiy baholash — korrupsiyaga qarshi ichki qarshilikni belgilaydigan hal qiluvchi omil” degan xulosasi ayniqsa muhimdir [4, 13-b.]. Ushbu fikrni rivojlantirib aytish mumkinki, korrupsiyaga qarshi axloqiy pozitsiya insonning shunchaki “nima to‘g‘ri?” degan savolga javob topishi bilan emas, balki “men uchun foydali bo‘lgan, biroq jamiyat uchun adolatsiz bo‘lgan harakatni amalga oshirishdan voz kecha olamanmi?” degan real axloqiy vaziyatdagi tanlovi bilan namoyon bo‘ladi. Shuning uchun korrupsiyaga qarshi kurashning eng chuqur darajasi huquqiy bilimni oshirish emas, balki shaxsning axloqiy refleksiyasi va irodaviy barqarorligini rivojlantirish bilan belgilanadi.

Bu jihatni Immanuil Kantning axloqiy falsafasi bilan bog‘lash ham metodologik jihatdan asosli. Abdullayev Kantning qarashlarini sharhlar ekan, insonni “maqsad sifatida mavjud bo‘lgan subyekt” sifatida talqin qiladi va shaxsiy manfaatni umumiy axloqiy qonundan ustun qo‘yish inson qadrini inkor etishga olib kelishini ta’kidlaydi [4, 13-b.]. Ushbu fikr korrupsiyaning axloqiy mohiyatini ochishda nihoyatda muhim nazariy imkoniyat beradi: korrupsion xatti-harakatda boshqa inson, jamiyat yoki davlat manfaatlari shaxsiy manfaatga bo‘ysundiriladi, ya’ni insonning universal axloqiy maqomi vositaga aylantiriladi. Shu sababli korrupsiyani faqat “qonun buzilishi” sifatida emas, balki inson qadrini instrumentalizatsiya qilish, umumiy manfaatni xususiy manfaatga bo‘ysundirish va adolatning universal mezonini shaxsiy foyda mezoniga almashtirish sifatida baholash mumkin. Bu esa mavzuni bevosita etikaning burch, vijdon, adolat, erkinlik va mas’uliyat kategoriyalari bilan bog‘laydi.

Korrupsiyaga munosabatning axloqiy tabiatini tushuntirishda Habibullayevning tadqiqoti ham alohida ilmiy ahamiyatga ega. Ma’rufjon Habibullayevning “Yangi O‘zbekistonda korrupsiyaga qarshi kurashning ma’naviy-ma’rifiy

omillari: ijtimoiy-falsafiy tahlil” nomli PhD avtoreferatida korrupsiya muammosi ma’naviy-ma’rifiy omillar bilan bog‘liq holda tadqiq etilgan [2, 3–6-b.]. Ushbu tadqiqotning mavzuga bevosita aloqador jihati shundaki, muallif korrupsiyaga qarshi kurashni ma’naviy tarbiya, ta’lim, axloqiy qadriyatlar va ijtimoiy ong transformatsiyasi bilan bog‘laydi. Tadqiqotda korrupsiyaning “buzish, pora evaziga og‘dirish” ma’nosini anglatadigan *corruptio* tushunchasidan kelib chiqishi qayd etiladi va uning tizimli xarakteri alohida tahlil qilinadi [2, 12-b.]. Habibullayev A.I. Kirpichnikovning korrupsiyaga bergan “korrupsiya — hokimiyatning chirishi” degan axloqiy-falsafiy ta’rifini keltiradi [2, 12-b.]. Mazkur metaforaning ilmiy ahamiyati nihoyatda yuqori: “chirishi” tushunchasi korrupsiyani bir martalik huquqbuzarlik emas, balki hokimiyat instituti va jamiyatning axloqiy to‘qimalarini asta-sekin yemiruvchi jarayon sifatida anglash imkonini beradi. Metallning zanglashi qanday qilib tashqi ko‘rinishda kichik nuqta sifatida boshlanib, keyinchalik butun konstruksiyaning mustahkamligini yemirsa, korrupsion amaliyot ham dastlab “kichik imtiyoz”, “tanish orqali hal qilish”, “ishga kirishga yordam”, “sovg‘a” yoki “xizmat uchun minnatdorchilik” kabi ijtimoiy jihatdan yumshatilgan shakllarda namoyon bo‘lib, vaqt o‘tishi bilan noqonuniy xatti-harakatni normal holat sifatida qabul qiluvchi axloqiy muhitni vujudga keltirishi mumkin. Shu nuqtayi nazardan korrupsiyaga qarshi kurashning asosiy vazifasi faqat uning jinoyat shakllarini aniqlash emas, balki korrupsion xatti-harakatni ijtimoiy jihatdan oqlovchi va legitimlashtiruvchi axloqiy stereotiplarni bartaraf etishdan ham iboratdir. Habibullayevning tadqiqoti aynan shu ma’naviy-ma’rifiy profilaktika zaruratini asoslash bilan mavzuning nazariy chegaralarini kengaytiradi.

Soxibovning “Jamiyatda korrupsiya xavfsizligi: ijtimoiy-falsafiy tahlil” mavzusidagi PhD tadqiqoti esa masalaga shaxsiy axloqiy pozitsiya bilan bir qatorda ijtimoiy xavfsizlik va institutsional muhit nuqtayi nazaridan yondashish imkonini beradi [3, 3–6-b.]. Mazkur tadqiqot Farg‘ona davlat universitetida bajarilgan va PhD.03/30.04.2021.F.76.06 ilmiy kengashida himoya uchun tayyorlangan avtoreferat sifatida rasmiylashtirilgan [3, 3–4-b.]. Soxibovning e’tiborga molik xulosalaridan biri shundaki, korrupsiyaga qarshi kurashda rahbar kadrlar va davlat xizmatchilarida “halollik, vijdonlilik va mas’uliyat” kabi yuksak axloqiy fazilatlarni rivojlantirish zarur [3, 18-b.]. Bu fikr mavzuning “mas’uliyat” komponentini konkretlashtiradi. Mas’uliyat bu yerda faqat huquqiy javobgarlikning sinonimi emas; u vakolatni qabul qilgan shaxsning o‘z lavozimi, jamiyat, fuqarolar va davlat manfaatlari oldidagi axloqiy burchini anglashini bildiradi. Professorlik darajasidagi nazariy umumlashtirish shuni ko‘rsatadiki, mansab va vakolatning kengayishi bilan shaxsning axloqiy mas’uliyati ham mutanosib ravishda ortishi kerak. Chunki vakolat qanchalik katta bo‘lsa, shaxsning birgina noto‘g‘ri qarori shunchalik keng ijtimoiy oqibatlarni yuzaga keltirishi mumkin. Demak, korrupsiyaga qarshi siyosatda “mas’uliyatli shaxs” modelini shakllantirish huquqiy nazoratdan kam bo‘lmagan darajada muhimdir.

Soxibovning yana bir muhim ilmiy jihati korrupsiyaga qarshi kurashni faqat individual xulq-atvor masalasi sifatida emas, balki ijtimoiy institutlar faoliyati, manfaatlar to‘qnashuvi, ta’lim, huquqiy madaniyat va jamoatchilik nazorati bilan bog‘lashidadir. Tadqiqot natijalarida uzluksiz ta’lim tizimida huquqiy madaniyatni rivojlantirish, huquqiy ta’lim va tarbiya samaradorligini oshirish orqali jamiyatda korrupsiyaga nisbatan murosasiz munosabatni shakllantirish mumkinligi asoslanadi [3, 18-b.]. Bu yerda individual axloq va institutsional muhit o‘rtasidagi dialektik bog‘liqlik namoyon bo‘ladi: halol shaxs sog‘lom institutsional muhitni yaratadi, sog‘lom institutsional muhit esa halol xatti-harakatni rag‘batlantiradi. Aksincha, korrupsion munosabatlar normalizatsiyalashgan muhitda halol pozitsiyani egallash shaxs uchun ijtimoiy va psixologik jihatdan murakkablashadi. Shuning uchun korrupsiyaga qarshi axloqiy pozitsiyani shakllantirishni faqat shaxsni tarbiyalashga yuklash ham metodologik jihatdan biryoqlama bo‘ladi; bunda shaxs — ijtimoiy muhit — institut — qadriyatlar tizimining o‘zaro ta’sirini hisobga olish zarur.

Mazkur fikr Isomiddinovning korrupsiyaga qarshi kurashish madaniyati haqidagi konsepsiyasi bilan hamohangdir. U korrupsiyaga qarshi kurashning samaradorligini fuqarolik jamiyati, ochiqlik, jamoatchilik nazorati va ma’naviy qadriyatlar bilan bog‘laydi hamda korrupsiyaning oldini olishda profilaktik yondashuvning ahamiyatini asoslaydi [1, 5–7-b.]. Isomiddinov tomonidan ishlab chiqilgan yondashuvning muhim tomoni shundaki, korrupsiyaga qarshi kurashni “korrupsiya sodir bo‘lgandan keyingi javob reaksiyasi” darajasidan “korrupsiyani yuzaga keltiruvchi ijtimoiy-ma’naviy shart-sharoitlarni oldindan bartaraf etish” darajasiga ko‘taradi. Bunday yondashuv mavzudagi insonning axloqiy pozitsiyasi bilan bevosita tutashadi: agar korrupsiyaning ildizlaridan biri qadriyatlar deformatsiyasi bo‘lsa, unda korrupsiyaga qarshi strategiyaning asosiy obyekti faqat korrupsion akt emas, balki ushbu aktni axloqan maqbul deb ko‘rsatuvchi ong va ijtimoiy muhit ham bo‘lishi kerak.

Shaxsning axloqiy pozitsiyasi masalasida vijdon kategoriyasining o‘rni ham alohida ta’kidlanishi lozim. Vijdon insonning tashqi nazorat mavjud bo‘lmagan sharoitda ham o‘z xatti-harakatlarini ichki axloqiy mezon asosida baholash imkonini beruvchi ma’naviy mexanizmdir. Agar qonun “mumkin” va “mumkin emas”ning tashqi chegarasini belgilasa, vijdon “men buni qilishim kerakmi?” degan ichki savolni qo‘yadi. Shu sababli korrupsiyaga qarshi haqiqiy axloqiy immunitet qonuniy jazodan qo‘rqishdan yuqoriroq darajada — insonning o‘z qadrini, kasbiy sha’nini va jamiyat oldidagi burchini anglashida shakllanadi. Abdullayevning tadqiqotida V.V. Kiselevga tayanib, korrupsion qarorlarning “ichki axloqiy nazorat mexanizmlari zaifligi” bilan bog‘liqligi qayd etiladi [4, 13-b.]. Ushbu qarash mavzuning markaziy ilmiy g‘oyasini kuchaytiradi: korrupsiyaga qarshi kurashda huquqiy savodxonlik zarur, biroq u yetarli shart emas; huquqiy

bilimni axloqiy e'tiqodga aylantiruvchi ichki nazorat mexanizmlari — vijdon, burch, mas'uliyat, adolat hissi va iroda — mavjud bo'lmasa, bilim real xulq-atvorga transformatsiyalanmasligi mumkin.

Shu nuqtayi nazardan iroda korrupsiyaga qarshi axloqiy pozitsiyaning faol komponenti sifatida namoyon bo'ladi. Inson korrupsiyani axloqan noto'g'ri deb bilishi, uning jamiyatga zararini anglashi va hatto uni qoralashi mumkin; biroq real manfaatlar to'qnashuvi yuzaga kelgan vaziyatda ana shu bilimni amaliy qarorga aylantirish uchun iroda talab etiladi. Iroda insonning tashqi bosim, moddiy manfaat, guruhiy talab yoki mansabiy manfaatga qaramay, o'zining axloqiy e'tiqodiga muvofiq qaror qabul qilish qobiliyatidir. Shuning uchun korrupsiyaga qarshi tarbiya faqat axborot beruvchi xarakterda emas, balki shaxsni axloqiy dilemmalar sharoitida mustaqil qaror qabul qilishga tayyorlovchi xarakterda bo'lishi lozim. Bu jihat ayniqsa yoshlar tarbiyasida muhimdir. Abdullayev tadqiqotida yoshlarning korrupsiyaga munosabati milliy qadriyatlar, ta'lim muhiti, ommaviy axborot vositalari va virtual muhitning o'zaro ta'siri bilan bog'liq holda tahlil qilinib, mazkur omillarning yoshlar dunyoqarashini shakllantirishdagi roli asoslanadi [4, 17-b.]. Demak, axloqiy pozitsiya individual psixologik hodisa bo'lish bilan birga, ijtimoiylashuv jarayonida shakllanadigan qadriyaviy konstruktsiya hamdir.

Bu jihatdan ta'lim tizimining roli alohida strategik ahamiyat kasb etadi. Habibullayevning tadqiqotida ma'naviy-ma'rifiy omillar korrupsiyaga qarshi kurashning profilaktik resursi sifatida ko'riladi [2, 5–6-b.]. Uning yondashuvida ta'limning vazifasi faqat korrupsiya to'g'risidagi huquqiy bilimlarni yetkazishdan iborat emas; u shaxsda halollik, adolat, vijdon, burch, mas'uliyat va fuqarolik pozitsiyasini shakllantiradigan ma'naviy muhitni yaratishi kerak. Shu nuqtayi nazardan "antikorrupsiya ta'limi" tushunchasini kengaytirib, uni axloqiy tafakkurni shakllantirish instituti sifatida talqin qilish maqsadga muvofiq. Ya'ni talaba korrupsiyaning huquqiy oqibatlarini bilishi bilan birga, nima sababdan korrupsiya adolatga zid, nima sababdan shaxsiy manfaatni jamoat manfaatidan ustun qo'yish axloqiy jihatdan nomaqbul, nima sababdan korrupsion amaliyotga befarq qolish ham fuqarolik mas'uliyati nuqtayi nazaridan muammoli ekanligini mustaqil ravishda anglay olishi zarur. Shundagina axloqiy bilim ijtimoiy e'tiqodga, e'tiqod esa barqaror xulq-atvorga aylanadi.

Korrupsiyaga munosabatning shakllanishida zamonaviy axborot va virtual muhitning ta'siri ham tobora kuchayib bormoqda. Tadqiqotimizda ta'lim, ommaviy axborot vositalari va virtual makon yoshlar axloqiy pozitsiyasini shakllantiruvchi o'zaro bog'liq institutsional omillar sifatida ko'rsatiladi [4, 19-b.]. Virtual muhitning ikkiyoqlama xususiyati shundaki, u bir tomondan ochiqlik, shaffoflik, jamoatchilik nazorati va korrupsion holatlarni fosh etish imkoniyatlarini kengaytirsa, ikkinchi tomondan anonimlik va mas'uliyatning nisbatan susayishi kabi xavflarni ham yuzaga chiqarishi mumkin [4, 19-b.]. Shu sababli raqamli makonni faqat texnologik vosita sifatida emas, balki zamonaviy axloqiy ijtimoiylashuv makoni sifatida baholash zarur. Bugungi yosh inson korrupsiya, halollik, adolat va fuqarolik mas'uliyati haqidagi tasavvurlarni nafaqat oila va ta'lim muassasasidan, balki ijtimoiy tarmoqlar, bloglar, videoplatformalar va virtual jamoalardan ham oladi. Demak, antikorrupsiya madaniyatining zamonaviy modeli raqamli kommunikatsiya muhitining axloqiy salohiyatini ham hisobga olishi kerak.

Umuman, mavjud ilmiy manbalar tahlili shuni ko'rsatadiki, korrupsiyaga qarshi kurashning samaradorligi uch o'zaro bog'liq darajaning birligiga tayanadi: institutsional daraja — qonun, nazorat, ochiqlik va javobgarlik mexanizmlari; ijtimoiy-ma'naviy daraja — ta'lim, qadriyatlar, jamoatchilik fikri va ijtimoiy muhit; individual-axloqiy daraja — ong, vijdon, iroda, axloqiy tanlov va mas'uliyat. Mazkur uchlikdan birortasining zaifligi umumiy antikorrupsiya strategiyasining samaradorligini pasaytiradi. Faqat jazoga asoslangan tizim insonning ichki axloqiy motivlarini shakllantira olmaydi; faqat ma'naviy targ'ibotga asoslangan yondashuv esa institutsional nazoratning zarurligini inkor eta olmaydi. Shuning uchun korrupsiyaga qarshi kurashning optimal modeli tashqi va ichki nazoratning, huquq va axloqning, institut va shaxsning, jazo va profilaktikaning dialektik birligiga asoslanishi lozim. Aynan shu nuqtada insonning axloqiy pozitsiyasi korrupsiyaga qarshi siyosatning yakuniy maqsadi sifatida emas, balki uning barqaror ijtimoiy natijasini ta'minlovchi ichki mexanizm sifatida namoyon bo'ladi. Boshqacha aytganda, korrupsiyasiz jamiyatni faqat korrupsion xatti-harakatlarni aniqlash va jazolash orqali barpo etib bo'lmaydi; bunday jamiyatni shakllantirish uchun halollikni tashqi majburiyat emas, ichki e'tiqod; adolatni abstrakt tamoyil emas, kundalik xulq-atvor mezoni; mas'uliyatni jazodan qochish vositasi emas, insonning o'z erkinligi va tanlovining tabiiy oqibati sifatida anglaydigan shaxsni tarbiyalash zarur. Shu ma'noda korrupsiyaga munosabatda insonning axloqiy pozitsiyasi ongda anglangan qadriyatning iroda orqali tanlovga, tanlovning esa mas'uliyatli xatti-harakatga aylanish jarayoni sifatida talqin qilinishi mumkin. Mazkur konseptual yondashuv korrupsiyaga qarshi kurashni faqat huquqiy yoki boshqaruv muammosi sifatida emas, balki insonning ma'naviy kamoloti, axloqiy erkinligi va jamiyat oldidagi mas'uliyatini namoyon etuvchi fundamental ijtimoiy-falsafiy muammo sifatida tadqiq etish zaruratini belgilaydi.

Mavzuga oid adabiyotlarning tahlili (Literature review). Korrupsiya fenomeni, uning ijtimoiy-falsafiy mohiyati va unga nisbatan shaxsning axloqiy munosabati masalalari mahalliy va xorijiy tadqiqotchilar tomonidan turli metodologik yondashuvlar asosida o'rganilgan. Xususan, Yu.Yu. Isomiddinov tadqiqotlarida korrupsiyaga qarshi kurashish madaniyati, uning ijtimoiy-ma'naviy asoslari hamda jamiyatda korrupsiyaga nisbatan murosasiz munosabatni

shakllantirish masalalari yoritilgan. Muallif korrupsiyaga qarshi kurashni faqat huquqiy choralar bilan cheklamasdan, jamiyatning ma'naviy-axloqiy madaniyati va fuqarolik mas'uliyatini yuksaltirish bilan bog'laydi.

M.O. Habibullayevning tadqiqotlarida korrupsiyaga qarshi kurashning ma'naviy-ma'rifiy omillari, ta'lim-tarbiya jarayoni hamda shaxsning axloqiy fazilatlarini rivojlantirish masalalariga alohida e'tibor qaratilgan. S.A. Soxibov esa korrupsiyani ijtimoiy xavfsizlik va jamiyat barqarorligiga tahdid soluvchi tizimli hodisa sifatida tahlil qilib, halollik, vijdonlilik va mas'uliyat kabi fazilatlarning korrupsiyaga qarshi immunitetni shakllantirishdagi ahamiyatini asoslaydi. O'zbekiston yoshlarining korrupsiyaga munosabati inson ongi, axloqiy mas'uliyat, erkin tanlov, milliy qadriyatlar, ta'lim va axborot muhiti bilan bog'liq holda tahlil qilingan. Muallifning yondashuvida korrupsiyaga munosabatning shakllanishi shaxsning ijtimoiy me'yorni anglashi, uni axloqiy baholashi va tegishli amaliy qaror qabul qilishi bilan izohlanadi. Mazkur yondashuv mavzuning insonning axloqiy pozitsiyasi bilan bog'liq jihatlarini ochib berishda muhim nazariy asos bo'lib xizmat qiladi.

Umuman, mavjud adabiyotlar tahlili korrupsiyaga qarshi kurashni faqat huquqiy yoki institutsional muammo sifatida emas, balki insonning axloqiy ongi, qadriyatlari, vijdoni, mas'uliyati va fuqarolik pozitsiyasi bilan bog'liq kompleks ijtimoiy-falsafiy hodisa sifatida o'rganish zarurligini ko'rsatadi. Biroq insonning axloqiy pozitsiyasi, ichki e'tiqodi va korrupsion vaziyatdagi axloqiy tanlovining o'zaro bog'liqligini yaxlit konseptual tizim sifatida tadqiq etish masalasi yanada chuqur ilmiy tahlilni talab etadi.

Tadqiqot metodologiyasi (Research Methodology). Tadqiqotda korrupsiyaga munosabatda insonning axloqiy pozitsiyasini ochib berish uchun dialektik, tizimli, aksiologik, ijtimoiy-falsafiy va qiyosiy tahlil metodlaridan foydalanildi. Shuningdek, ong, iroda, vijdon, mas'uliyat, axloqiy tanlov va fuqarolik pozitsiyasi tushunchalarining o'zaro bog'liqligi tahlil qilindi. Tadqiqotning metodologik asosini shaxsning axloqiy qarorlari bilan uning ijtimoiy muhiti, qadriyatlari va mas'uliyati o'rtasidagi dialektik munosabatni aniqlash tashkil etdi.

Tahlil va natijalar. (Analysis and results). Tadqiqot natijalari shuni ko'rsatadiki, korrupsiyaga munosabat insonning huquqiy bilimidan tashqari, uning axloqiy ongi, irodasi, vijdoni va mas'uliyat hissi bilan ham bevosita bog'liq. Shaxs korrupsion holatni anglash, unga axloqiy baho berish va undan voz kechish jarayonida o'zining ichki e'tiqodi hamda qadriyatlariga tayanadi.

Tahlil jarayonida ong korrupsiyaning mohiyati va oqibatlarini anglash, iroda noqonuniy manfaatdan voz kechish va to'g'ri tanlov qilish, mas'uliyat esa o'z xatti-harakatlarining ijtimoiy oqibatlarini anglash mexanizmi sifatida namoyon bo'lishi aniqlandi. Shu jihatdan korrupsiyaga qarshi barqaror pozitsiya shaxsning halollik, adolat, vijdon va qonuniylik kabi qadriyatlarni ichki e'tiqod darajasida qabul qilishi bilan shakllanadi.

Natijalar korrupsiyaning oldini olishda faqat jazolash va nazorat mexanizmlariga tayanish yetarli emasligini ko'rsatadi. Axloqiy tarbiya, huquqiy madaniyat, fuqarolik mas'uliyati va halollik qadriyatlarini mustahkamlash korrupsiyaga qarshi ongni shakllantirishning muhim shartlaridir. Shu asosda insonning axloqiy pozitsiyasi korrupsiyaga qarshi kurashning individual-axloqiy poydevori sifatida baholanishi mumkin.

Xulosa va takliflar (Conclusion/Recommendation). Xulosa qilib aytganda, korrupsiyaga qarshi kurash samaradorligi nafaqat huquqiy va institutsional mexanizmlarga, balki insonning axloqiy ongi, irodasi va mas'uliyatiga ham bevosita bog'liq. Korrupsiyaga nisbatan barqaror axloqiy pozitsiya halollik, adolat, vijdon, qonuniylik va fuqarolik mas'uliyati kabi qadriyatlarning shaxs ongida mustahkam qaror topishi asosida shakllanadi.

Inson korrupsion xatti-harakatning salbiy oqibatlarini anglab, manfaat va axloqiy burch o'rtasida to'g'ri tanlov qila olishi uning axloqiy yetukligining muhim ko'rsatkichidir. Shu sababli korrupsiyaning oldini olishda huquqiy choralar bilan bir qatorda axloqiy tarbiya, ma'naviy-ma'rifiy ta'lim va fuqarolik mas'uliyatini kuchaytirish muhim ahamiyat kasb etadi. Bunday yondashuv jamiyatda korrupsiyaga nisbatan murosasiz munosabatni shakllantirish va halollik tamoyillarini qaror toptirishning muhim sharti hisoblanadi.

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YOSHLARNING IJTIMOIYLASHUVIGA SUBMADANIYATLARNING TA'SIRI

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Annotatsiya: *Mazkur maqolada submadaniyatlarning yoshlar ijtimoiylashuviga ta'siri ijtimoiy-falsafiy jihatdan tahlil qilinadi. Unda submadaniyatlarning yoshlar dunyoqarashi, qadriyatlari, xulq-atvori, ijtimoiy identifikatsiyasi va muloqot madaniyatini shakllantirishdagi o'rni yoritiladi. Shuningdek, yoshlarning submadaniy guruhlarga qo'shilish motivlari, ijtimoiy tajribani o'zlashtirish jarayoni hamda jamiyatdagi faolligiga ta'sir etuvchi omillar ochib beriladi. Raqamli muhitda shakllanayotgan virtual submadaniyatlarning ijobiy imkoniyatlari va salbiy ta'sirlari ham tahlil qilinadi. Tadqiqotda yoshlarning konstruktiv ijtimoiylashuvini ta'minlashda milliy va umuminsoniy qadriyatlar uyg'unligining ahamiyati asoslanadi.*

Kalit so'zlar: *submadaniyat, yoshlar, ijtimoiylashuv, qadriyat, identifikatsiya, xulq-atvor, muloqot, raqamli muhit, ijtimoiy faollik, moslashuv.*

ВЛИЯНИЕ СУБКУЛЬТУР НА СОЦИАЛИЗАЦИЮ МОЛОДЕЖИ

Аннотация: *В данной статье анализируется влияние субкультур на социализацию молодежи с социально-философской точки зрения. Подчеркивается роль субкультур в формировании мировоззрения, ценностей, поведения, социальной идентификации и культуры общения молодежи. Также раскрываются мотивы вступления молодых людей в субкультурные группы, процесс ассимиляции социального опыта и факторы, влияющие на их активность в обществе. Анализируются как позитивный потенциал, так и негативные последствия формирования виртуальных субкультур в цифровой среде. Исследование обосновывает важность гармонии национальных и универсальных ценностей в обеспечении конструктивной социализации молодежи.*

Ключевые слова: *субкультура, молодежь, социализация, ценности, идентификация, поведение, общение, цифровая среда, социальная активность, адаптация.*

THE INFLUENCE OF SUBCULTURES ON THE SOCIALIZATION OF YOUTH

Abstract: *This article analyzes the influence of subcultures on the socialization of youth from a socio-philosophical perspective. It highlights the role of subcultures in the formation of youth's worldview, values, behavior, social identification and culture of communication. It also reveals the motives of young people joining subcultural groups, the process of assimilating social experience and factors affecting their activity in society. The positive potential and negative effects of virtual subcultures forming in the digital environment are also analyzed. The study substantiates the importance of the harmony of national and universal values in ensuring the constructive socialization of youth.*

Keywords: *subculture, youth, socialization, values, identification, behavior, communication, digital environment, social activity, adaptation.*

KIRISH. Yoshlar submadaniyatlarining xilma-xilligi o'smirlar dunyoqarashini shakllantiruvchi ijtimoiy-madaniy muhit bo'lib, ushbu jarayonni chuqur o'rganish muhim ahamiyatga ega. O'smirlarning norasmiy guruhlarga qo'shilishi oiladagi nosog'lom muhit, o'qishdagi muvaffaqiyatsizliklar, o'zligini anglash ehtiyoji hamda ommaviy madaniyatning tashqi ta'siri kabi belgilovchi omillar bilan izohlanadi. Shuningdek, mazmunli dam olish imkoniyatlarining cheklanganligi va jamiyatdagi mavjud tartiblarga nisbatan norozilik kayfiyati yoshlarning bunday guruhlardagi faolligini oshiruvchi asosiy turtki sifatida baholanadi. Yoshlar submadaniyati tarqalishi ijtimoiy muhit, texnologik rivojlanish va yoshlar guruhlarining qiziqishlari bilan bog'liqdir. Internet va yangi media platformalari yoshlar submadaniyatining jamiyat bilan aloqasini kuchaytirib, innovatsion g'oyalar orqali ijtimoiy-madaniy taraqqiyotga hissa qo'shadi. Shu bilan birga, virtual makon yoshlarni erkin fikr bildirish imkoniyati bilan ta'minlasa-da, submadaniyatning haddan tashqari mantiqsiz tarqalishi ma'naviy inersiya va yangi, barqaror bo'lmagan qadriyatlarning paydo bo'lishiga olib kelishi mumkin. Shuning uchun yoshlar submadaniyatining foydali jihatlarini o'rganish, innovatsion g'oyalarni ijtimoiy hayotga tadbiq etish va

submadaniyat bilan ma'naviy qadriyatlar o'rtasida samarali muloqot o'rnatish muhim ahamiyatga ega. Shunday qilib, yoshlar submadaniyati yashash uslubi, xulq-atvor, guruh normalari, qadriyatlari va stereotiplarining umumiyligiga ega ma'lum yosh avlodning madaniyat hisoblanadi. Kattalarning yoshlar submadaniyati bilan samarali ish olib borish uchun tegishli psixologik-pedagogik shartlar yaratish zarur.

ADABIYOTLAR SHARHI. Yoshlarning ijtimoiylashuviga submadaniyatlarning ta'siri xorijiy va mahalliy ilmiy adabiyotlarda turli nazariy yondashuvlar asosida tadqiq etilgan. Xususan, E. Erikson yoshlarning identifikatsiya va ijtimoiy o'zlikni anglash jarayonlarini, P. Bourdieu madaniy kapital va ijtimoiy muhitning shaxs shakllanishiga ta'sirini yoritgan. D. Hebdige submadaniyatni yoshlarning dominant madaniyatga munosabati va o'ziga xos madaniy ifoda shakli sifatida talqin qilgan. S. Hall esa identifikatsiya, madaniyat va ijtimoiy munosabatlarning o'zaro bog'liqligini tahlil qilgan. Zamonaviy tadqiqotlarda raqamli submadaniyatlar, virtual hamjamiyatlar va ijtimoiy tarmoqlarning yoshlar dunyoqarashi hamda xulq-atvoriga ta'siri alohida o'rganilmoqda. Mavjud tadqiqotlar submadaniyatlarning ijtimoiylashuvdagi ijobiy va salbiy jihatlarini ko'rsatib, yoshlarning qadriyatlari, ijtimoiy faolligi va moslashuviga ta'sirini kompleks o'rganish zarurligini asoslaydi.

TADQIQOT METODOLOGIYASI. Mazkur tadqiqotda yoshlarning ijtimoiylashuviga submadaniyatlarning ta'sirini o'rganishda kompleks ijtimoiy-falsafiy metodologiyadan foydalaniladi. Tadqiqotning nazariy-metodologik asosini tizimli, dialektik, aksiologik, antropologik va qiyosiy yondashuvlar tashkil etadi. Tahlil va sintez, induksiya va deduksiya, abstraktlashtirish hamda umumlashtirish metodlari orqali submadaniyat va ijtimoiylashuv tushunchalarining mazmun-mohiyati ochib beriladi. Shuningdek, yoshlarning submadaniy guruhlardagi ishtiroki, qadriyatlarni o'zlashtirishi, ijtimoiy identifikatsiyasi va xulq-atvoridagi o'zgarishlarni aniqlash maqsadida sotsiologik so'rov, kuzatish va qiyosiy tahlil usullaridan foydalaniladi. Raqamli submadaniyatlarning ta'sirini baholashda kontent-tahlil va tizimli monitoring yondashuvlari qo'llanilib, ularning yoshlar ijtimoiylashuviga ko'rsatadigan konstruktiv va destruktiv ta'siri aniqlanadi. Olingan natijalar asosida yoshlarning ijtimoiylashuvini takomillashtirishga qaratilgan ilmiy-amaliy xulosalar ishlab chiqiladi.

MUHOKAMA VA NATIJALAR. «Jamiyat rivojlanishi bilan "yoshlar" tushunchasi o'zgardi va aniqroq bo'ldi. Yoshlarning maxsus ijtimoiy guruh sifatida ta'rifi haqida munozaralar juda uzoq vaqtdan beri davom etmoqda. Ilmiy adabiyotlarda ushbu tushunchaning ko'plab talqinlarini topishimiz mumkin. Yoshlar va ularning muammolari turli gumanitar fanlar: demografiya, psixologiya, tarix, falsafa va boshqalarda o'rganiladi»[1]. Yoshlarni tushunishga yondashuvlarning eng istiqbolli tasniflaridan biri mashhur rus sotsiologi V.I.Chuprov tomonidan taklif qilingan. U ijtimoiy va gumanitar fanlarda paydo bo'lgan barcha turdagi yoshlar ta'riflarini uchta asosiy yo'nalishga bo'lishni taklif qildi: «psixoanalitik, tarkibiy-funksional va madaniy»[2]. Zamonaviy ijtimoiy va gumanitar fanlarda yoshlarning yosh intervallarini aniqlashda o'ziga xoslik mavjud. Dastlabki savolning murakkabligi shundaki, ijtimoiy va gumanitar fanlarda yoshlarning yosh cheklovlarining o'ziga xos xususiyatlari haqidagi g'oyalar juda xilma-xil va ilmiy nutqning kun tartibidir. «Yosh chegaralarini aniqlash muammosi sotsiologiyada ancha oldin paydo bo'lgan va uning paydo bo'lishi bevosita ushbu guruh tahliliga sotsiologik yondashuvning mohiyati bilan bog'liq. Aniq fanlarda, masalan, demografiya yoki statistikada yoshlarning yosh chegaralari u yoki bu darajada qat'iy belgilangan va asosan 14-15 yoshdan 29-30 yoshgacha bo'lgan davr sifatida belgilanadi»[3]. Ijtimoiylashuv – bu, birinchi navbatda, insonning ijtimoiy ahamiyatga ega ijtimoiy rollarni, xatti-harakatlar normalarini, madaniy va tarixiy an'analarni va boshqalarni o'zlashtirish jarayoni va natijasi. Aksincha, ijtimoiylashuv buzilishlari antisotsial xulq-atvor bilan bog'liq: deviatsiya, huquqbuzarlik va boshqalar va resosializatsiya tushunchasi ijtimoiy me'yorlarni o'rganishning takroriy jarayonini tasvirlash uchun ishlatiladi, ular erta buzilganda. Shunday qilib, ijtimoiylashuvni ko'rib chiqishning eng muhim jihati uning sifat jihati - muvaffaqiyat - muvaffaqiyatsizlik nuqtai nazaridan ifodalanishi mumkin bo'lgan ijtimoiylashuv natijalarini baholashdir. Ya'ni, natijalarga qarab, yoshning ijtimoiy ma'qullangan rollarini o'zlashtirganda muvaffaqiyatli yoki normal deb hisoblanishi mumkin yoki jamiyatda ma'qullanmagan va noqonuniy deb hisoblangan ijtimoiy rollarni o'zlashtirganda muvaffaqiyatsiz, g'ayritabiiy deb hisoblanadi»[4].

I.Xakimova fikricha, "ijtimoiy qarovsizlikda asotsial axloq bilan bir qatorda qimmatli-me'yoriy tasavvurlar, qimmatli yo'nalishlar, ijtimoiy hukmron g'oyalar tizimi keskin deformatsiyalanadi, mehnatga salbiy munosabat, tirikchilik uchun shubhali va noqonuniy vositalar hisobiga mehnatsiz daromad topish va "chiroyli hayotga" erishish maqsadi hamda unga intilish istagi shakllanadi. Bunday shaxslarning referent munosabatlari va qimmatli yo'nalishlari pozitiv yo'nalishli ijtimoiy aloqalar va ijtimoiy institutlarning shaxslardan anchagina begonalashishi bilan tavsiflanadi"[5].

S.Roslaykova, «zamonaviy ijtimoiy muhitning o'ziga xos xususiyati shundaki, bugungi kunda bizda zamonaviy inson mavjud bo'lgan ikkita makon - real va virtual mavjud. Hozirgi vaqtda ular endi qarama-qarshi voqelik sifatida emas, balki zamonaviy insonning mavjudligi, shakllanishi va rivojlanishining yagona, butun muhitini ifodalaydi. Aynan shu omil zamonaviy o'smirlarning ijtimoiylashuv jarayonining murakkabligini aniqlay oladi, chunki ular o'zlarining shaxsiy va yosh rivojlanishini bir vaqtning o'zida ikkita makonda amalga oshiradilar va ikkalasi ham ta'sir qiladi»[6] deb hisoblaydi.

O‘smirlik davrida ijtimoiylashuv tananing jismoniy va ruhiy qayta tuzilishi tufayli turli qiyinchiliklarga duch keladi. Tashqi ko‘rinishdagi nomutanosibliklar, tengdoshlar bilan munosabatlarni o‘rnatishdagi psixologik muammolar axloqiy tamoyillar va ijtimoiy mas’uliyatni egallash jarayoniga ta’sir qiladi. Shu davrda shaxsiy xatti-harakatlar va xarakter shakllanadi, bunda eng muhim rolni oila o‘ynaydi.

O‘smir shaxsini rivojlantirishning eng muhim elementi bu oila bo‘lib, unga ijtimoiy tajriba to‘plashda yordam beradi. S.A.Ambalovaning fikricha, «oila muloqot, o‘z a’zolariga alohida g‘amxo‘rlik muhiti, kundalik foydali faoliyati orqali o‘smirda axloqiy qadriyatlar va ideallar, dunyoqarash, ijtimoiy kamolotni shakllantirish uchun imkoniyatlar yaratadi. Zamonaviy oilalar tuzilishi, turmush tarzi, ota-ona va bola munosabatlarining turi, ta’lim usullari va ijtimoiylashuv mazmuni va ushbu jarayonning natijalari bog‘liq bo‘lgan boshqa mezonlar bo‘yicha farqlanadi»[7].

«Misol uchun, TikTok-da video suratga olish uchun fotosuratlar va videolarni qayta ishlash uchun bir nechta ilovalarni o‘zlashtirish va kosplay festivali uchun kostyumlar tayyorlash uchun tikishni va trikotajni o‘rganish kerak. Atrof-muhitni saqlash, chiqindilarni saralash va suv havzalari qirg‘oqlarini tozalashni maqsad qilgan ijobiy uyushmalar ham mavjud. Bunday jamoalar o‘smirda faol fuqarolik pozitsiyasini shakllantirishga xizmat qiladi. Ammo o‘smir submadaniyatga qanchalik ishtiyoqli ekanligini, yoshlar uyushmasi qanday madaniy kodlar va ijtimoiy xulq-atvorni olib kelishini anglashi lozim. Tengdoshlarning bolaga ta’sir doirasini baholash muhimdir. Hech bir jamoa oilaning o‘rnini bosmasligi kerak»[8].

«Yoshlar submadaniyatlari yoshlarni ijtimoiylashuvining muhim institutlari (oila, ta’lim tizimi) qarama-qarshi va nomuvofiq xulq-atvor namunalari va normalari tufayli o‘z ta’sirini zaiflashtirganda ayniqsa ahamiyatli bo‘ladi, bu esa yoshlarning o‘z-o‘zini anglashi va hayotda o‘z o‘rnini topishini qiyinlashtiradi»[9]. Yoshlar submadaniyati yoshlarning o‘zini namoyon qilish, jamiyatda o‘rnini topish va ijtimoiy-madaniy muhitga moslashish jarayonida tez tarqaladi. U yosh avlod ijtimoiylashuvining muhim bosqichi bo‘lib, Margaret Midning prefigurativ madaniyat tushunchasiga mos ravishda, bolalar va ota-onalar o‘zaro o‘rganish jarayonida faol ishtirok etadi. Submadaniyatlar musiqiy uslubdan tortib shaxsiy munosabatlargacha turli qiziqishlarni aks ettiradi va fendomlar ta’sirida vujudga kelishi mumkin. Ko‘pchilik uchun notanish va yopiqligi sababli submadaniyatlar jamoatchilik tomonidan qarshiliklarga duch keladi, bu esa ba’zan ziddiyatlarni keltirib chiqaradi va aksilmadaniyat shakllanishiga olib keladi. Submadaniyatlar yoshlar uchun norozilik va eskapizm vositasi bo‘lib, ular o‘ziga xos til va sleng elementlari orqali o‘z madaniy identifikatsiyasini ifodalaydi.

Globallashuv sharoitida axborot texnologiyalari va yangi media-platformalar yoshlar hayotiga chuqur kirib, ularning submadaniy makonini shakllantirmoqda. Virtual muhit yoshlar submadaniyatining yangi shakllarini yaratish, keng tarqatish va interfaol muloqot orqali rivojlantirishga imkon beradi. Media makon jins, yosh va ijtimoiy kelib chiqish farqlarini kamaytirib, turli submadaniyat guruhlarini birlashtiradi, ularni o‘ziga xos kontent yaratish va baham ko‘rishga yo‘naltiradi. Shu orqali yoshlar submadaniyati nafaqat o‘zini namoyon qilish vositasi, balki jamiyatga integratsiya va ijtimoiy rivojlanish omiliga aylanadi, yangi media makon esa uning tez tarqalishi va diversifikatsiyasini ta’minlaydi.

Yoshlar submadaniyatining paydo bo‘lishi ko‘ngilxushlik ruhiyati bilan bog‘liq bo‘lgan. Aloqa vositalarining diversifikatsiyasi yoshlar guruhlariga ko‘ngilxushlik uchun turli xil tanlov imkoniyatini bermoqda. Bunda yoshlar axborot makonidagi kontentni hazil va istehzo ko‘rinishida buzib talqin qiladi va o‘zgartiradi, qiziqarli onlayn ijod namunalarini yaratadi hamda shu orqali o‘z-o‘zini namoyon qiladi. Bugungi kunda hazil-mutoyiba yoshlar submadaniyatining o‘ziga xos xususiyatiga aylandi. Misol uchun, “yoshlar tomonidan yaratilgan Internet-buzwords (Internetdagi moda jargon so‘zlar) mavjud og‘zaki va yozma nutqdan farq qiladi, lekin ko‘ngilxushlik ruhiyatini ijtimoiy muhit bilan yaqinlashtirishga xizmat qiladi. Yoshlar virtual makonda moda bo‘lgan jargon so‘zlar orqali o‘z tilak va istaklarini bildirishadi hamda jamoatchilik fikrining ma’lum bir ko‘rinishini ifodalaydi. O‘z navbatida Internetdagi jargon so‘zlar madaniy tashuvchi vazifasini ham bajaradi”[10]. Bu nafaqat ko‘ngilxushlik uchun, balki qadriyatni baholash vazifasini ham bajarib, individual yutuqqa erishish va oqilona fikr yuritish orqali yoshlar guruhlarini birlashtiradi hamda ularni masofaviy muloqotda yaqinlashtiradi. Bu esa o‘z navbatida onlayn platformalar orqali yoshlar submadaniyatini ko‘proq ko‘pchilikka tanitish imkonini beradi.

XULOSA. Xulosa qilib aytganda, submadaniyatlar yoshlarning ijtimoiylashuv jarayonida muhim ijtimoiy-madaniy omil sifatida namoyon bo‘ladi. Ular yoshlarning dunyoqarashi, qadriyatlari, xulq-atvori, muloqot uslubi va ijtimoiy identifikatsiyasining shakllanishiga bevosita ta’sir ko‘rsatadi. Submadaniy guruhlarda ishtirok etish yoshlarning o‘zaro muloqot qilishi, ijtimoiy tajriba almashishi, jamoaviy faoliyatga moslashishi va mustaqil fikrlash ko‘nikmalarini rivojlantirish imkonini beradi. Shu bilan birga, ayrim submadaniyatlarda mavjud bo‘lgan destruktiv qarashlar yoshlarning ijtimoiy me’yorlardan uzoqlashishi, begonalashuvi yoki salbiy xulq-atvor shakllarini egallashiga sabab bo‘lishi mumkin. Ayniqsa, raqamli texnologiyalar rivojlanishi virtual submadaniyatlarning yoshlar hayotidagi ta’sirini kuchaytirmoqda. Shuning uchun yoshlar submadaniyatini o‘rganishda uning ijobiy imkoniyatlari bilan bir qatorda mavjud xavf va cheklovlarni ham hisobga olish zarur. Yoshlarning konstruktiv ijtimoiylashuvini ta’minlash uchun milliy va umuminsoniy qadriyatlarni uyg‘unlashtirish, media savodxonlikni rivojlantirish hamda ijtimoiy faollikni qo‘llab-quvvatlash muhim ahamiyatga ega.

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YANGI TARAQQIYOT BOSQICHIDAGI O‘ZBEKISTONDA IJTIMOIY KAPITAL – IJTIMOIY DAVLATNING STRATEGIK RESURSI

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Annotatsiya: *Ushbu maqolada Yangi O‘zbekistonning taraqqiyot strategiyasida ijtimoiy kapitalning tutgan o‘rni tahlil qilinib, unda jamiyatda ishonch, hamkorlik, faol fuqarolik, o‘zaro mas’uliyat kabi qadriyatlar majmui sifatida talqin etiladigan ijtimoiy kapitalning barqaror rivojlanish, inson qadri, ijtimoiy adolat va farovonlikni ta’minlashdagi ahamiyati ochib beriladi.*

Maqolada ijtimoiy davlat tamoyillarini ro‘yobga chiqarishda inson omilining ustuvorligi, mahalla institutining kuchayishi, fuqarolik jamiyati tashkilotlarining rivoji, manfaatlar muvozanatini ta’minlash kabi jarayonlar tahlil qilinadi. Shuningdek, ijtimoiy kapitalni mustahkamlashning Yangi O‘zbekiston sharoitidagi mexanizmlari — raqamlashtirish, ijtimoiy himoya tizimini modernizatsiya qilish, ta’lim va madaniyatning strategik roliga alohida e’tibor qaratiladi.

Kalit so‘zlar: *Yangi O‘zbekiston, ijtimoiy kapital, ijtimoiy davlat, strategik resurs, fuqarolik jamiyati, ishonch, hamkorlik, ijtimoiy adolat, barqaror rivojlanish, inson omili, mahalla instituti, raqamlashtirish, ijtimoiy himoya, modernizatsiya, ijtimoiy institutlar, manfaatlar muvozanati.*

СОЦИАЛЬНЫЙ КАПИТАЛ УЗБЕКИСТАНА НА НОВОМ ЭТАПЕ РАЗВИТИЯ ЯВЛЯЕТСЯ СТРАТЕГИЧЕСКИМ РЕСУРСОМ СОЦИАЛЬНОГО ГОСУДАРСТВА

Аннотация: *В данной статье анализируется роль социального капитала в стратегии развития Нового Узбекистана и раскрывается важность социального капитала, понимаемого как совокупность ценностей в обществе, таких как доверие, сотрудничество, гражданская активность и взаимная ответственность, в обеспечении устойчивого развития, человеческого достоинства, социальной справедливости и благополучия. В исследовании анализируются такие процессы, как приоритет человеческого фактора в реализации принципов социального государства, укрепление института махалли, развитие организаций гражданского общества и обеспечение баланса интересов. Особое внимание уделяется также механизмам укрепления социального капитала в условиях Нового Узбекистана – цифровизации, модернизации системы социальной защиты и стратегической роли образования и культуры.*

Ключевые слова: *Новый Узбекистан, социальный капитал, социальное государство, стратегический ресурс, гражданское общество, доверие, сотрудничество, социальная справедливость, устойчивое развитие, человеческий фактор, институты соседства, цифровизация, социальная защита, модернизация, социальные институты, баланс интересов.*

SOCIAL CAPITAL IN UZBEKISTAN AT A NEW STAGE OF DEVELOPMENT IS A STRATEGIC RESOURCE OF THE SOCIAL STATE

Abstract: *This article analyzes the role of social capital in the development strategy of New Uzbekistan, and reveals the importance of social capital, which is interpreted as a set of values in society, such as trust, cooperation, civic activity, and mutual responsibility, in ensuring sustainable development, human dignity, social justice, and well-being. The study analyzes processes such as the priority of the human factor in implementing the principles of the social state, the strengthening of the mahalla institution, the development of civil society organizations, and ensuring a balance of interests. Special attention is also paid to the mechanisms for strengthening social capital in the conditions of New Uzbekistan - digitalization, modernization of the social protection system, and the strategic role of education and culture.*

Keywords: *New Uzbekistan, social capital, social state, strategic resource, civil society, trust, cooperation, social justice, sustainable development, human factor, neighborhood institution, digitalization, social protection, modernization, social institutions, balance of interests.*

Kirish.

Bugungi globallashuv va axborotlashuv jarayonlari jadal kechayotgan sharoitda jamiyat taraqqiyotining asosiy omillaridan biri sifatida ijtimoiy kapitalning ahamiyati tobora ortib bormoqda. Ijtimoiy kapital – bu insonlar o‘rtasidagi ishonch, hamkorlik, o‘zaro yordam, jamoaviylik, fuqarolik faolligi va ijtimoiy institutlarning barqaror faoliyatini ta’minlovchi munosabatlar majmuasidir. Rivojlangan davlatlar tajribasi shuni ko‘rsatadiki, iqtisodiy resurslar, texnologik imkoniyatlar va moddiy boyliklarning o‘zi jamiyat taraqqiyoti uchun yetarli emasligini inobatga olib fuqarolar bilan davlat va jamiyat o‘rtasida mustahkam ishonch munosabatlari mavjud bo‘lishi zarurligini ko‘rsatmoqda.

Yangi O‘zbekiston taraqqiyot strategiyasida ham ijtimoiy kapitalni mustahkamlash eng ustuvor vazifalardan biri sifatida qaraladi. Zero, “inson qadri”ni ulug‘lash, fuqarolarni davlat boshqaruvida faol ishtirokchi sifatida shakllantirish, ochiqlik va shaffoflik tamoyillariga asoslangan ijtimoiy davlat qurish ijtimoiy kapitalning rivojlanishini talab etadi. Mamlakatda olib borilayotgan keng ko‘lamli siyosiy, huquqiy va ijtimoiy-iqtisodiy islohotlar ham aynan fuqarolar o‘rtasidagi ishonchni oshirish, jamiyatdagi birdamlik va hamjihatlikni kuchaytirish, davlat va xalq o‘rtasidagi muloqotni mustahkamlashga qaratilgan.

Bundan tashqari, mahalla institutining modernizatsiya qilinishi, fuqarolik jamiyati tashkilotlari faoliyatining kengayishi, korrupsiyaga qarshi tizimning kuchaytirilishi, sud-huquq tizimidagi adolat va ochiqlik barchasi siyosati Yangi O‘zbekiston sharoitida ijtimoiy kapitalning o‘sishiga xizmat qilmoqda. Shu ma’noda, ijtimoiy kapital ijtimoiy davlatning poydevori, jamiyat barqarorligi va taraqqiyotining bosh strategik resursi sifatida namoyon bo‘lmoqda.

Mazkur mavzuni o‘rganishning dolzarbligi shundaki, Yangi O‘zbekistonning taraqqiyot modeli ijtimoiy kapitalning barcha shakllarini – jamiyatdagi ishonch, totuvlik, fuqarolik faolligi, mahalla institutlari, ijtimoiy hamkorlik va o‘zaro yordam tizimini rivojlantirishni nazarda tutadi. Shu bois ijtimoiy kapitalning mazmuni, uning ijtimoiy davlat barpo etishdagi o‘rni va strategik ahamiyatini tahlil qilish bugungi davrning eng muhim ilmiy-amaliy masalalaridan biri hisoblanadi.

Adabiyotlar tahlili.

Ijtimoiy kapitalning nazariy va amaliy tomonlarini tadqiq etishga, eng avvalo, uning yangiligi, bu boradagi tushunchalarning xilma-xilligi ko‘p tarmoqliligini inobatga olgan holda dunyoning turli mintaqalarida asosiy tadqiqot sohasi sifatida qaralib, ko‘plab izlanuvchilarning diqqat markazida bo‘lib kelgan.

Ijtimoiy kapitalga oid falsafiy bilimlarning tegishli sohalari fanlararo yo‘nalish sifatida siyosiy, sotsiologik nuqtayi nazardan qisman tadqiq etilgan. Mavjud izlanishlar esa G‘arb olimlaridan L.J.Hanifan, P.Burdyo, J.Koulman, V.L.Tammy, E.Dyurkgeym, F.Fukuyama[6] kabi tadqiqotchi olimlar izlanishlarida ko‘rinadi.

Jamiyat barqarorligini ta’minlashda ijtimoiy kapital fenomenining rolini aniqlashga doir tadqiqotlar S.Ponomar, S.Yegorova, A.Kiykov, A.Konkov, O.Polyakovalar ishlarida; ijtimoiy kapitalning kishilar o‘rtasidagi o‘zaro birdamlikni ta’minlashga doir vazifalarini belgilash S.Veronika, E.Bondar, B.Stolyarlar; ijtimoiy kapital va ijtimoiy davlatning siyosiy taraqqiyotdagi o‘rni M.Melanin, M.Korniychuk kabi olimlar tomonidan o‘rganilgan. Ishonch kategoriyasining ijtimoiy kapitalni rivojlantirishdagi o‘rni esa O.Taxanova, Sargolzai Ali Rizo Muxammad, S.Svetlana asarlarida; globallashuv sharoitida ijtimoiy kapitalning o‘zgarishlar tendensiyalarini ochib berish I.E.Diskin, V.V.Radaev, V.Stepanenko, L.V.Strelnikova, F.G.Karasev, N.N.Lebedeva, O.A.Lomovtseva[5] kabi tadqiqotchilar ilmiy izlanishlarida o‘z ifodasini topgan.

So‘nggi vaqtlarda yurtimizda iqtisodchilar, sotsiologlar, siyosatshunoslar va faylasuflar “Inson” va “Ijtimoiy kapital” tushunchalarining ilmiy-nazariy jihatlarini tadqiq etishmoqda. Iqtisodchi olimlardan Q.Abdurahmonov, J.Ataniyazov,

T.Jalilov, D.Rahmonov hamda B.Usmonovlar mazkur yo‘nalishda keng ko‘lamli ishlar olib bormoqdalar. Inson kapitali va ijtimoiy kapitalning sotsiologik jihatlari M.Sodirjonov, X.Akramov, E.Abdullayev, F.Qosimov, M.Muxammedovlar tomonidan tadqiq etilgan. Jamiyatda ijtimoiy kapitalning o‘rni va ahamiyati, uning zamonaviy mexanizmlari va jamiyat taraqqiyotiga ta’siriga doir masalalarning falsafiy va siyosiy jihatlari M.Norqobilov, S.Saidov, D.Ernazarov[7] lar tomonidan tahlil qilingan.

Tadqiqot metodologiyasi.

Maqolada Empirik tadqiqot, mantiqiylik, tizimlilik, analiz, sintez, o‘zaro aloqadorlik ilmiy tadqiqot tamoyillaridan kelib chiqqan holda qiyosiy tahlil kabi tadqiqot usullaridan foydalanildi.

Tahlillar va natijalar.

Bugungi kunda mamlakatimiz yangi taraqqiyot bosqichiga qadam qo‘yib, davlat va jamiyat hayotining barcha sohalarida keng ko‘lamli islohotlar amalga oshirilmoqda. Ushbu jarayonning asosiy maqsadi demokratik tamoyillarga asoslangan, fuqarolarning huquq va erkinliklarini ta’minlaydigan hamda ijtimoiy adolatni qaror toptiradigan ijtimoiy davlatni shakllantirishdan iboratdir. Bunday sharoitda jamiyat taraqqiyotining muhim omillaridan biri sifatida ijtimoiy kapital tushunchasi alohida ahamiyat kasb etmoqda.

Ijtimoiy kapital jamiyat a’zolari o‘rtasidagi o‘zaro ishonch, ijtimoiy aloqalar, hamkorlik, birdamlik hamda umumiy qadriyatlar tizimini ifodalovchi muhim ijtimoiy resurs hisoblanadi. Mazkur tushuncha ilmiy adabiyotlarda turli olimlar

tomonidan tadqiq qilingan bo‘lib, amerikalik sotsiolog Robert Putnam ijtimoiy kapitalni jamiyat a’zolari o‘rtasidagi hamkorlikni rivojlantiruvchi ijtimoiy tarmoqlar va o‘zaro ishonch tizimi sifatida talqin qiladi [8]. Shuningdek, fransuz sotsiologi Pyer Burdye ijtimoiy kapitalni insonlarning ijtimoiy aloqalari orqali yuzaga keladigan resurslar majmui sifatida izohlaydi [9]. Ushbu yondashuvlar ijtimoiy kapitalning jamiyat rivojlanishidagi muhim strategik ahamiyatga ega ekanligini ko‘rsatadi.

Yangi taraqqiyot bosqichidagi O‘zbekistonda amalga oshirilayotgan islohotlar jarayonida ham ijtimoiy kapitalning roli tobora ortib bormoqda. Chunki jamiyatda o‘zaro ishonch, hamkorlik va ijtimoiy hamjihatlik mavjud bo‘lmas ekan, har qanday islohotlarning samaradorligini ta’minlash qiyin kechadi. Shu bois mamlakatda fuqarolik jamiyati institutlarini rivojlantirish, jamoatchilik nazoratini kuchaytirish, aholining ijtimoiy faolligini oshirish orqali ijtimoiy kapitalni mustahkamlashga alohida e’tibor qaratilmoqda.

O‘zbekiston sharoitida ijtimoiy kapitalni rivojlantirishda mahalla instituti alohida ahamiyatga ega. Mahalla nafaqat an’anaviy ijtimoiy institut sifatida, balki fuqarolarning o‘zaro hamkorligi, ijtimoiy birdamligi va jamoaviy mas’uliyatini shakllantiruvchi muhim omil sifatida namoyon bo‘ladi. Mahalla tizimi orqali aholining ijtimoiy muammolarini hal etish, ijtimoiy yordam ko‘rsatish hamda jamiyatda barqaror ijtimoiy muhitni ta’minlash imkoniyati kengaymoqda. Bu esa ijtimoiy kapitalning amaliy namoyon bo‘lishini ta’minlaydi.

Bundan tashqari, nodavlat notijorat tashkilotlari, jamoat birlashmalari va fuqarolik jamiyati institutlari ham ijtimoiy kapitalni rivojlantirishda muhim rol o‘ynaydi. Ular jamiyatda fuqarolik faolligini oshirish, ijtimoiy muammolarni hal etishda jamoatchilik ishtirokini kengaytirish hamda davlat va jamiyat o‘rtasidagi samarali muloqotni ta’minlashga xizmat qiladi. Shu jihatdan ijtimoiy kapital jamiyatning ijtimoiy barqarorligini ta’minlash, ijtimoiy ziddiyatlarning oldini olish va ijtimoiy adolat tamoyillarini mustahkamlashda muhim omil hisoblanadi.

Hozirda jamiyatimizning barcha sohalarida sezilarli o‘zgarishlar ro‘y berayotganligini ko‘rish mumkin jumladan yurtimizda yangi ta’lim standartlarining joriy etilishi, rivojlangan mamlakatlar ilg‘or texnologiyalarining ta’lim tizimimizga moslashtirilishi, ushbu tizimga tobora ko‘proq axborot-kommunikatsiya texnologiyalarining jalb qilinayotgani shular jumlasidandir. Bugun dunyo hamjamiyatiga nazar tashlaydigan bo‘lsak, qaysiki davlat rivojlanish cho‘qqilarini egallayotgan bo‘lsa, albatta, ta’lim tizimidagi islohotlar orqali erishayotganini ko‘rmoqdamiz. Shu bilan birga, rivojlangan mamlakatlar ta’lim tizimining qiyosiy tahlili shuni ko‘rsatadiki, ta’lim standartlarining yangi avlodiga o‘tish shartlari ta’lim dargohlaridagi paradigmalarni o‘zgartirishni talab qiladi. Bu esa ta’lim tizimini to‘laligicha jamoaviy harakatlar natijasida yangi bosqichga ko‘tarishimizni taqozo etadi. Yangi zamonaviy standartlarda ta’lim natijalariga qo‘yiladigan talablar quyidagi usullar orqali o‘z aksini topadi:

– o‘qitishda o‘yin usullaridan foydalanish texnologiyasi: biznes, rolli va boshqa turdagi o‘quv o‘yinlari;
– “tanqidiy fikrlash”ni rivojlantirish texnologiyalari;
– masofaviy ta’lim texnologiyalari va boshqalar;
– jamoaviy ta’lim tizimi (CSE);
– tadqiqot muammolarini hal qilish texnologiyasi (TRIZ);
– universal o‘quv faoliyati;
– ta’lim faoliyati natijalari;
– portfolio tizimi shakllanishi;
– ilmiy salohiyatni oshirish;
– “uztoz-shogird” an’analarini takomillashtirish.

Yuqoridagi usullar bugungi kunda ta’limdagi ko‘plab islohotlarning yaratilishiga zamin bo‘ladi. Yangi standartlar joriy etilishining asosiy talablaridan yana biri o‘quvchi-talabalarning hamkorlikda ishlash usullarini ishlab chiqishdir. Shu sababli ta’lim dargohlarini jamiyatning ijtimoiy kapitali manbayi deb hisoblashimiz mumkin. Biz ta’limni rivojlantirish mexanizmlarini mamlakatimiz pedagoglari salohiyatini oshirishda odamlarning umumiy maqsadga erishish uchun birlasha olish qobiliyati bilan bog‘liq bo‘lgan aloqalarni yo‘lga qo‘yishini taqozo etmoqda, bu esa pirovardida, sifatli ta’lim taraqqiyoti poydevori sifatida ijtimoiy munosabatlarning takomillashuviga olib kelib, kapital va ta’lim tashkilotining rivojlanishini ta’minlaydi.

O‘zbekiston taraqqiyotining yangi bosqichida jamiyatni har jihatdan transformatsiyalash hamda uni ijtimoiy-madaniy texnologiyalar asosida yuksaltirish taraqqiyot darajasini belgilab bermoqda. Xususan, O‘zbekiston Respublikasi Prezidentining 2020-yil 18-fevraldagi “Jamiyatda ijtimoiy-ma’naviy muhitni sog‘lomlashtirish, mahalla institutini yanada qo‘llab-quvvatlash hamda oila va xotin-qizlar bilan ishlash tizimini yangi darajaga olib chiqish chora-tadbirlari to‘g‘risida”gi PF-5938-son Farmonida[2] belgilanganidek, “...mahalla - sektor - xalq qabulxonasi – mahalla” tamoyili asosida samarali hamkorlik tizimini joriy etish, mahallani xalq bilan davlat o‘rtasida ishonchli “ko‘prik” bo‘lishini amalda ta’minlash, oila va xotin-qizlarni qo‘llab-quvvatlash borasida kompleks chora-tadbirlar amalga oshirish”[1] belgilandi. Shuningdek, “Manzilli chora-tadbirlar dasturi” hamda O‘zbekiston Respublikasi Prezidentining “Iqtisodiy taraqqiyot va

kambag‘allikni qisqartirish vazirligi huzuridagi Mahallabay ishlash va tadbirkorlikni rivojlantirish agentligi faoliyatini tashkil etish chora-tadbirlari to‘g‘risida”gi 2021-yil 24-dekabrdagi PQ-62-son qarori ishlab chiqilgan.[4]

“Eng quyi bo‘g‘in – mahalla darajasiga tushgan holda kambag‘allikni qisqartirish bo‘yicha O‘zbekiston tajribasini yaratdik”[3], – dedi prezident Shavkat Mirziyoyev Samarqand shahrida o‘tayotgan Osiyo infratuzilmaviy investitsiyalar banki boshqaruvchilari kengashining to‘qqizinchi yillik yig‘ilishidagi nutqida.

Albatta, mahallaning ijtimoiy kapitalni shakllantirish va rivojlantirishda muhim ijtimoiy-madaniy omil bo‘lib xizmat qilishi barchamizga ayon. Qadimdan har bir oila o‘zining ijtimoiy aloqa va munosabatlarida yuzaga keladigan natijalari va muammolarini dastlab mahalla bilan yechishga harakat qilgan. Mahalla ijtimoiy birdamlik, hamjihatlik, bag‘rikenglik, do‘stlik, yaqinlik va o‘zaro bahamjihatlik bilan faoliyat tashkil etib, ijtimoiy-madaniy mexanizm vazifasini bajarib keladi.

Bizning jamiyatdagi mahallalarda ijtimoiy kapitalning sifati va takomillashishi qanday kechishiga e’tibor qaratamiz. Masalan, azaldan “o‘zbek mahallasidagi xonadonlarga qulf osilmasligi ijtimoiy ishonchning mavjudligidan dalolatdir. Mahalladagi bemor insonlardan boxabar bo‘lish, kambag‘allarga hayr-saxovat ko‘rsatish ham ijtimoiy kapitalga misol bo‘la oladi. Abdulla Qahhorning “O‘g‘ri” hikoyasi yoki “Suyunchi” kinofilmidagi darvozaga osilgan qulf bilan bog‘liq sahnani eslagandayoq o‘zbek jamiyatida ishonch mustahkam ekanligiga guvoh bo‘lish mumkin”.

Olib borilgan tadqiqotlardan shuni xulosa qilish mumkinki, imkoniyatlar tengligining kamayishi bilan yoshlar o‘rtasida ta’lim olish, mutaxassislik bo‘yicha ishga joylashish, mavjud ish joyini yo‘qatishdan qo‘rqish muammolari, ayniqsa, keskinlashmoqda. Mehnat bozoridagi talab va bugungi kunda mamlakatimiz oliy o‘quv yurtlari tomonidan oliy ma’lumotli mutaxassislar tayyorlanayotgan mutaxassisliklar o‘rtasida mutanosiblik mavjud emasligi sababli yoshlar bandligini ta’minlash masalalari keskinlashmoqda.

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FUQAROLIK JAMIYATI TUSHUNCHASI, UNING MAZMUN-MOHIYATI VA GENEZISI

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Annotatsiya: *Jadidchilik harakati XIX asr oxiri va XX asr boshlarida O‘rta Osiyo, xususan, Turkiston hududida ijtimoiy, ma’naviy va siyosiy islohotlarning muhim harakatkor kuchi sifatida maydonga chiqdi. Jadidlar milliy birlik va siyosiy hokimiyat masalalariga o‘ziga xos yondashuvlari bilan jamiyatning ma’rifiy va ijtimoiy-falsafiy rivojlanishiga katta hissa qo‘shdilar. Ularning qarashlari nafaqat o‘sha davrning ijtimoiy-siyosiy muammolariga javob berishga xizmat qilgan, balki hozirgi kunda ham milliy birlik va davlat boshqaruvi masalalarida dolzarb sanaladi. Ushbu maqola jadidlarning milliy birlik va siyosiy hokimiyatga oid qarashlarini ijtimoiy-falsafiy nuqtai nazardan tahlil qilishga bag‘ishlanadi.*

Kalit so‘zlar: *Jadidchilik, milliy birlik, siyosiy hokimiyat, ijtimoiy-falsafiy ahamiyat, ma’rifat, ta’lim, adolatli boshqaruv, ijtimoiy uyg‘unlik, legitimlik, insonparvarlik, axloqiy qadriyatlar, mahalliy boshqaruv, taraqqiyot, zamonaviy O‘zbekiston, ijtimoiy konsensus, vatanparvarlik, mustaqillik.*

ПОНЯТИЕ ГРАЖДАНСКОГО ОБЩЕСТВА, ЕГО СУЩНОСТЬ И ГЕНЕЗИС

Аннотация: *Движение джадидов стало важной движущей силой социальных, духовных и политических реформ в Центральной Азии, особенно в Туркестане, в конце XIX – начале XX веков. Джадиды внесли большой вклад в образовательное и социально-философское развитие общества благодаря своим уникальным подходам к вопросам национального единства и политической власти. Их взгляды не только служили ответом на социально-политические проблемы того времени, но и актуальны сегодня в вопросах национального единства и государственного управления. Данная статья посвящена анализу взглядов джадидов на национальное единство и политическую власть с социально-философской точки зрения.*

Ключевые слова: *джадидизм, национальное единство, политическая власть, социально-философское значение, просвещение, образование, справедливое управление, социальная гармония, легитимность, гуманизм, моральные ценности, местное самоуправление, развитие, современный Узбекистан, общественный консенсус, патриотизм, независимость.*

THE CONCEPT OF CIVIL SOCIETY, ITS ESSENCE AND GENESIS

Abstract: *The Jadid movement emerged as an important driving force of social, spiritual and political reforms in Central Asia, particularly in Turkestan, at the end of the 19th and beginning of the 20th centuries. The Jadids made a great contribution to the educational and socio-philosophical development of society with their unique approaches to the issues of national unity and political power. Their views not only served to respond to the socio-political problems of that time, but are also relevant today in matters of national unity and state governance. This article is devoted to the analysis of the Jadids’ views on national unity and political power from a socio-philosophical perspective.*

Keywords: *Jadidism, national unity, political power, socio-philosophical significance, enlightenment, education, fair governance, social harmony, legitimacy, humanity, moral values, local government, development, modern Uzbekistan, social consensus, patriotism, independence.*

Kishilik jamiyati paydo bo‘libdiki, azaldan jamoaviylik, birlik va hamjihatlik alohida hamiyat berib kelgan. Inson yer yuzida yashay boshlagan davrlardan beri necha ming yillar o‘tdi, ammo jamoaviylik birdamlik g‘oyalari o‘z ahamiyatini yo‘qotmadi. Nega? Inson jamoaviylikdan yakkalik sari va aksincha yakkalikdan jamoaviylik sari harakat qilib hamjihatlikda yashashni istaydi. Boisi, tarixning ilk davrlarida inson tabiat oldidagi ojizligi uning jamoa bo‘lib birlashishiga zamin yaratgan va ushbu jarayon tadrijiy taraqqiyot natijasida matriarhat va keyinchalik patriarhat tuzumlarini vujudga keltirdi. Bundan keyingi bosqichda patriarhal oila, urug‘, qabila, qabilalar ittifoqi, xududiy qo‘shnichilik jamoalari va davlatchilik shakllandi. Davlat va jamiyat shu tariqa rivojlandi. O‘zbekiston Respublikasi Prezidenti Shavkat Mirziyoev “mamlakatimizda demokratik islohotlarni yanada chuqurlashtirish va fuqarolik jamiyatini rivojlantirish konsepsiyasi hokimiyat institutlarini shakllantirilishi va ularning to‘laqonli faoliyat ko‘rsatishi, fuqarolarning huquq va erkinliklarini

himoya qilish, mulkchilikning barcha turlarini, fuqarolarning davlat boshqaruvidagi faol ishtirokini ta'minladi"[38] degan qarashlari davlatchiligimiz tarixi va asosida fuqarolik jamiyatining ko'plab o'ziga xos xususiyatlari asrlar davomida yashab kelganligini ko'rsatadi. Bugungi globallashuv sharoitida O'zbekistonning strategik maqsadi, ijtimoiy hayotni demokratik qadriyatlar asosida yangilash va rivojlantirish orqali ijtimoiy davlatni barpo etishga erishidir.

Prezident Sh.M.Mirziyoev davlat rahbari sifatida Fuqarolik jamiyati barpo etish borasida shunday deydi "yurtdoshlarimizning erkinlik va tashabbuslarini, mamlakatimiz ijtimoiy hayotidagi ishtirokini kengaytirish kelgusida ham O'zbekiston siyosiy tizimini rivojlantirishning muhim yo'nalishi bo'lib qoladi"[39]. Darhaqiqat hozirgi axborotlashish va globallashuv jarayonlarining ortib borishi, mafkuraviy va g'oyaviy kurashlarning avj olishi barobarida jamiyat va davlatchilikning mustahkamlash va saqlab qolish kafolati bu demokratik boshqaruvni takomillashtirish va qonun ustivorligini ta'minlashdir. Shundagina ijtimoiy adolat mezonlari barqarorlikni ta'minlaydi.

Adabiyotlarda fuqarolik jamiyatining quyidagi xususiyatlari keltirib o'tiladi "plyuralizm, erkinlik, ochiqlik, o'zini o'zi boshqarish va qonuniylik[40]. Erk ozodlik qadim-qadimdan insoniyatning oliy mezoni bo'lgan bo'lsa, hurfikrlilik va qonuniylik barqarorlik va tenglikning tayanchi hisoblangan.

Jamiyatlar davlat boshqaruviga doir ilk qarashlar miloddan avvalgi VI-V- asrlarda paydo bo'la boshladi.

Fuqarolik jamiyati haqidagi ilk qarashlar bugungi kundagi yoki o'rta asrlardagi qarashlardan ma'lum ma'noda farq qilardi. Boisi, eramizdan oldingi davr davlatchiliklari dastlab Osiyo va Afrika hududlarida shakllangan va ushbu davlatchiliklar yakka shaxs tomonidan idora etiladigan, avloddan-avlodga meros bo'lib o'tadigan, despotik quldorlik jamiyatlari edi. Bunday jamiyatlarda inson xuquqlari, boshqaruvning ijtimoiy barqarorligi, qonunlarning ustivorli va shunga o'hshash masalalar o'ziga xos tarzda amalga oshirilardi. Va bu jarayonlar hozirgi kunda ham Osiyo va Afrikaning ko'plab davlatlari boshqaruv tizimlarini tashkil etadi. Milliy va mental xususiyatlar ming yillar davomida shakllanib, ming yillar davomida yashab qoladi. Eramizdan avvalgi VI–V asrlar g'arb bugungi yevropa qit'asidagi davlatchiliklarda esa boshqaruvning demokratik va jamoaviylik shakllari paydo bo'ldi. Bunda aholining erkinlik va xuquqlar uchun kurash xususiyatlari muhim o'rin tutgan. Masalan, eramizdan avvalgi 510-509-yillarda Rimning yettinchi xukmdori tarkviniy hokimiyatni oqsoqollar kengashi bilan emas o'zi idora etishni istan qoladi. Aholi esa o'sha zahoti unga qarshi kurashib uni tahtdan ag'darishadi va mamlakatdan haydab yuborishadi. Bu bilan biz g'arb davlatchiligida demokratik tafakkur va erkinlik dunyoqarashi eradan avvalgi davrlardan shakllanganligi aytmoqchimiz.

To'g'ri Afina demokratiyasi va Rim respublikasida ham quldorlik tuzumi o'zining klassik cho'qqisiga chiqqan bo'lishiga qaramay, fuqarolikka ega qatlam katta imtiyozlarga ega bo'lgan. Fuqarolik jamiyati to'g'risidagi ilk belgilarini dastlab Mesopotamiz xususan Xammurapi boshqaruvi davrlarida ko'rishimiz mumkin. Hukmdor Hammurapi o'z davrida va dunyo tarixida birinchi bo'lib mamlakatda asosiy qonun "Hammurapi qonunlar to'plami" ni ishlab chiqdi va joriy etdi. Bu esa mamlakatda turli ko'rinishdagi kengashlar, jamoaviy boshqaruvlarni shakllanishiga olib keldi. Shu bilan birga Qadimgi Misr, Qadimgi Xindiston hududlarida ham ilk fuqarolik jamiyatlari elementlarini ko'rishimiz mumkin. Masalan, diniy jamoalarning mamlakat boshqaruvidagi roli, jamoatchilik vakillari, aholining turli kasb birlashmalari, ijtimoiy adolat mezonlarining diniy va ma'naviy ahamiyatiga doir narrativlar (turli xalq eposlari, rivoyat va asotirlar) ni keltirishimiz mumkin.

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SHAXS VA JAMIYAT UYG‘UNLIGIDA SADOQATNING BARQAROR QADRIYAT SIFATIDA SHAKLLANISHI

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Annotatsiya: *Maqolada shaxs va jamiyat o‘rtasidagi axloqiy munosabatlarni uyg‘unlashtirishda sadoqatning barqaror qadriyat sifatida shakllanishi tahlil qilinadi. Sadoqatning hissiy bog‘lanish, ongli axloqiy tanlov, mas’uliyat, ishonch, identifikatsiya va ijtimoiy daxldorlik bilan aloqasi ochib beriladi. Uning ko‘r-ko‘rona itoatkorlik va konformizmdan farqi asoslanib, konstruktiv tanqid bilan uyg‘un refleksiv sadoqat konsepsiyasi ilgari suriladi. Oila, ta’lim, mahalla, fuqarolik jamiyati, davlat va raqamli axborot muhiti sadoqatni shakllantiruvchi institutlar sifatida baholanadi. Muallif tomonidan barqaror sadoqatning aksiologik-kognitiv, emotsional-identifikatsion, normativ-mas’uliy, faoliyatli va refleksiv komponentlardan iborat modeli taklif qilinadi. Shuningdek, institutlararo aksiologik muvofiqlik, ishonch va adolat sadoqatning barqarorligini belgilovchi asosiy shartlar sifatida ko‘rsatiladi.*

Kalit so‘zlar: *sadoqat, shaxs, jamiyat, axloqiy qadriyat, ijtimoiy uyg‘unlik, ishonch, mas’uliyat, identifikatsiya, refleksiv sadoqat, ijtimoiy institut, aksiologik muvofiqlik, fuqarolik fazilati.*

ФОРМИРОВАНИЕ ЛОЯЛЬНОСТИ КАК УСТОЙЧИВОЙ ЦЕННОСТИ В ГАРМОНИИ ЛИЧНОСТИ И ОБЩЕСТВА

Аннотация: *В статье социально-философски анализируется формирование лояльности как устойчивой ценности в гармонизации нравственных отношений личности и общества. Раскрывается связь лояльности с осознанным моральным выбором, доверием, ответственностью, идентификацией и социальной сопричастностью. Обосновывается различие между зрелой лояльностью, слепым подчинением и конформизмом. Предлагается модель устойчивой лояльности, включающая аксиологико-когнитивный, эмоционально-идентификационный, нормативно-ответственный, деятельностный и рефлексивный компоненты.*

Ключевые слова: *лояльность, личность, общество, нравственная ценность, социальная гармония, доверие, ответственность, идентификация, рефлексивная лояльность, социальный институт.*

FORMATION OF LOYALTY AS A SUSTAINABLE VALUE IN THE HARMONY OF THE INDIVIDUAL AND SOCIETY

Abstract: *The article provides a socio-philosophical analysis of loyalty as a sustainable value in harmonizing moral relations between the individual and society. Loyalty is examined in relation to conscious moral choice, trust, responsibility, identification and social belonging. Mature loyalty is distinguished from blind obedience and conformism, and the concept of reflective loyalty compatible with constructive criticism is advanced. A model of sustainable loyalty comprising axiological-cognitive, emotional-identificational, normative-responsible, behavioral and reflective components is proposed.*

Keywords: *loyalty, individual, society, moral value, social harmony, trust, responsibility, identification, reflective loyalty, social institution.*

Kirish. Globallashuv, raqamli kommunikatsiyalar va ijtimoiy mobillik jadallashgan hozirgi sharoitda shaxsning turli guruhlar, institutlar va qadriyatlar tizimiga mansubligi tobora murakkablashmoqda. Inson bir vaqtning o‘zida oila a’zosi, kasbiy jamoa vakili, mahalla va fuqarolik jamiyati subyekti, davlat fuqarosi hamda global axborot makonining ishtirokchisi sifatida turli normativ talablar bilan yuzlashadi. Bunday ko‘p qatlamli identifikatsiya sharoitida shaxs va jamiyat o‘rtasidagi axloqiy munosabatlarni barqarorlashtiruvchi qadriyatlar masalasi alohida ilmiy ahamiyat kasb etadi. Sadoqat ana shunday qadriyatlardan biri bo‘lib, u shaxsning muayyan munosabat, jamoa, tamoyil yoki umumiy maqsad bilan uzoq muddatli va mas’uliyatli bog‘lanishini ifodalaydi [1]. Sadoqat erkinlikning inkori emas, balki erkinlikning mas’uliyat bilan uyg‘unlashgan shaklidir. J. Royce sadoqatni shaxsning o‘zidan kattaroq maqsadga amaliy va izchil bag‘ishlanishi bilan

bog‘lagan bo‘lsa [2], zamonaviy tadqiqotlarda uning identifikatsiya, ishonch, hamkorlik va ijtimoiy kapital bilan aloqasi ko‘proq ta’kidlanadi [3; 4]. Muammoning dolzarbligi shundaki, zamonaviy jamiyatda sadoqatning obyektlari ko‘paygani sari ular o‘rtasida ziddiyatlar ham yuzaga keladi. Oilaga sadoqat kasbiy burch bilan, guruh manfaatiga sadoqat umumjamiyat manfaatlari bilan, tashkilotga sadoqat esa adolat yoki qonuniylik tamoyillari bilan to‘qnashadi. Bunday holatda sadoqatning axloqiy qiymati uning mavjudligining o‘zi bilan emas, balki qaysi obyektga, qanday asosda va qanday chegaralarda yo‘naltirilgani bilan belgilanadi. Demak, sadoqatni barqaror qadriyat sifatida tadqiq etish uning mazmuni bilan birga me’yoriy chegaralarini ham aniqlashni talab qiladi.

Maqsadimiz shaxs va jamiyat uyg‘unligida sadoqatning barqaror qadriyat sifatida shakllanish qonuniyatlarini ochib berish, uning strukturaviy komponentlari va institutsional shartlarini aniqlash hamda zamonaviy sharoitga mos refleksiv sadoqat modelini asoslashdan iborat.

Adabiyotlar tahlili. Sadoqat muammosi falsafa tarixida turli tushunchalar - vafodorlik, vafo, burch, do‘stlik, fuqarolik fazilati, e’tiqodga sodiqlik va jamoaga mansublik doirasida yoritilgan. Aristotel do‘stlik va polis hayotini fazilatli hayotning muhim sharti sifatida ko‘rib, barqaror munosabatlar o‘zaro ezgulik istagi va adolat bilan mustahkamlanishini ko‘rsatadi [5]. Sharq axloqiy tafakkurida esa vafo, ahdga sodiqlik, do‘stlik va jamoa farovonligi komil insonning asosiy fazilatlari qatorida talqin qilingan. Abu Nasr Forobiyning fozil jamiyat konsepsiyasida shaxsiy kamolot umumiy saodatga yo‘naltirilgan hamkorlik bilan bog‘lanadi [6]. Bu yondashuv sadoqatni alohida hissiyot emas, balki umumiy ezgulikni ro‘yobga chiqaruvchi ijtimoiy-axloqiy munosabat sifatida anglash imkonini beradi. Alisher Navoiy merosida vafo insoniy munosabatlarning axloqiy mezoni sifatida ko‘rinadi. Uning asarlarida ahdga sodiqlik, do‘stga vafo, saxovat va adolat insonning ma’naviy qiyofasini belgilovchi fazilatlar sifatida talqin etiladi [7]. Mazkur an’ana sadoqatning Sharq tafakkuridagi muhim xususiyatini - uning axloqiy komillik, or-nomus va ijtimoiy mas’uliyat bilan birligini ko‘rsatadi. G‘arb falsafasida sadoqatni mustaqil axloqiy kategoriya darajasida tizimli ishlab chiqqan mutafakkirlardan biri Josiah Royce hisoblanadi. U sadoqatni insonning o‘z hayotiga yaxlit ma’no beradigan sabab yoki maqsadga ongli, amaliy va davomli bag‘ishlanishi sifatida izohlaydi [2]. Royce uchun haqiqiy sadoqat boshqa insonlarning sadoqat qobiliyatini buzmasligi, aksincha uni qo‘llab-quvvatlashi lozim. “Loyalty to loyalty” g‘oyasi sadoqatning axloqiy chegarasini belgilovchi meta-mezon vazifasini bajaradi. Bu g‘oya bugungi pluralistik jamiyatda ham ahamiyatli: shaxsning bir guruhga sadoqati boshqa guruhlarning insoniy qadr-qimmatini inkor etishga aylanmasligi kerak. J. Kleinig sadoqatni munosabatlar va identifikatsiya bilan bog‘liq murakkab axloqiy hodisa sifatida tahlil qilib, uning obyektlari va chegaralari masalasiga alohida e’tibor beradi [1]. Sadoqatning barqarorligi “har qanday sharoitda qolish” bilan emas, balki munosabatning axloqiy asoslarini saqlash bilan o‘lchanadi. A. Hirschmanning “exit, voice and loyalty” modeli tashkilot va institutlar bilan munosabatda sadoqatning faol xususiyatini tushunishda muhimdir [8]. Muallifga ko‘ra, tashkilot faoliyatidan norozilik paydo bo‘lganda shaxs chiqib ketishi yoki o‘z fikrini bildirib, uni yaxshilashga harakat qiladi. Sadoqat “voice” imkoniyatini kuchaytirib, muammolarni ichkaridan konstruktiv tuzatishga undaydi. Bundan sadoqat tanqidning aksi emasligi, aksincha, mas’uliyatli tanqidning motivatsion manbai bo‘lishi mumkinligi kelib chiqadi. E. Durkheim jamiyatning axloqiy yaxlitligini umumiy me’yorlar, kollektiv tasavvurlar va ijtimoiy birdamlik orqali tushuntiradi [9]. P. Berger va T. Luckmann esa ijtimoiy voqelikning kundalik interaksiyalar, institutlashuv va interiorizatsiya jarayonlari orqali shakllanishini ko‘rsatadi [10]. Ushbu nazariyalar sadoqatning shaxs ongida tayyor holda paydo bo‘lmasligini, balki ijtimoiy tajriba, takroriy amaliyot, ramzlar va normativ kutishlar vositasida o‘zlashtirilishini asoslash imkonini beradi. F. Fukuyama va R. Putnam tadqiqotlarida ishonch hamda ijtimoiy kapital jamiyatdagi hamkorlikning asosiy resurslari sifatida talqin qilinadi [3; 4]. Sadoqat ishonchdan farqli kategoriya bo‘lsa-da, ular o‘zaro chambarchas bog‘langan: ishonch sadoqatning shakllanishiga sharoit yaratadi, sadoqat esa barqaror hamkorlik orqali ishonchni qayta ishlab chiqaradi. Institutlar adolatli va prognoz qilinadigan tarzda ishlaganida shaxsning ularga nisbatan sadoqati kuchayadi; normativ va amaliy faoliyat o‘rtasidagi tafovut esa ishonch eroziyasiga olib keladi. A. Giddens va

M. Castellsning zamonaviy jamiyat haqidagi qarashlari identifikatsiya va ijtimoiy munosabatlarning refleksivlashuvi hamda tarmoqlashuvini ko‘rsatadi [11; 12]. Raqamli makonda shaxsning mansubliklari tez o‘zgaradi, turli jamoalar bilan aloqalar bir vaqtning o‘zida mavjud bo‘ladi. Bu sharoit sadoqatni meros qilib olinadigan yoki avtomatik qabul qilinadigan munosabatdan ko‘ra ongli ravishda qayta baholanadigan qadriyatga aylantiradi. Shu sababli zamonaviy sadoqatning refleksiv komponentini alohida ajratish nazariy jihatdan asosli hisoblanadi.

Tadqiqot metodologiyasi. Tadqiqotda dialektik, tizimli, aksiologik, germenevtik, qiyosiy va institutsional yondashuvlar o‘zaro integratsiyada qo‘llanildi. Dialektik yondashuv sadoqatdagi barqarorlik va o‘zgaruvchanlik, shaxsiy manfaat va ijtimoiy burch, erkinlik va mas’uliyat, tanqid va sodiqlik kabi qarama-qarshi jihatlarning o‘zaro birligini ochishga xizmat qildi. Tizimli yondashuv esa sadoqatni alohida fazilat emas, balki ishonch, identifikatsiya, mas’uliyat, qadriyat, xulq va institutsional tajriba o‘rtasidagi aloqalar tizimi sifatida ko‘rib chiqish imkonini berdi. Aksiologik tahlil orqali sadoqatning qadriyat sifatidagi maqomi, uning adolat, inson qadr-qimmati, erkinlik, burch va umumiy manfaat bilan nisbatlari baholandi. Germenevtik yondashuv klassik Sharq va G‘arb manbalaridagi vafo, burch va sadoqat mazmunlarini zamonaviy kontekstda talqin etishda qo‘llanildi. Qiyosiy tahlil sadoqatning an’anaviy va zamonaviy,

shaxslararo va institutsional, hissiy va refleksiv shakllari o‘rtasidagi umumiy va farqli jihatlarni aniqlashga yordam berdi. Institutsional yondashuv asosida oila, ta’lim, mahalla va fuqarolik jamiyati, davlat hamda axborot muhiti sadoqatni shakllantiruvchi ijtimoiy makonlar sifatida tahlil qilindi.

Tahlillar va natijalar. Barqaror qadriyat deganda shaxsning vaqtinchalik vaziyat yoki tashqi bosim ta’sirida emas, balki o‘z e’tiqodi va hayotiy pozitsiyasi asosida muntazam ravishda amal qiladigan axloqiy orientiri tushuniladi. Sadoqat shu maqomga erishishi uchun u uch shartni qanoatlantirishi lozim: birinchidan, shaxs tomonidan anglangan bo‘lishi; ikkinchidan, boshqa fundamental qadriyatlar bilan muvofiqlashgan bo‘lishi; uchinchidan, vaziyat o‘zgarganda ham xulqiy izchillikni ta’minlay olishi kerak. Demak, sadoqatning barqarorligi o‘zgarmaslik emas. Aksincha, u o‘z axloqiy yadrosini saqlagan holda yangi sharoitlarda oqilona ifoda topa olish qobiliyatidir. Sadoqatning ikkinchi mezoni erkin tanlovdir. Majburlash, qo‘rquv yoki manfaat evaziga namoyon bo‘lgan tashqi “sodiqlik” barqaror qadriyat darajasiga ko‘tarilmaydi. Axloqiy sadoqat shaxsning “nega men bu munosabatni davom ettiryapman?” degan savolga asosli javob bera olishi bilan bog‘liq. Bunda shaxs o‘zining aloqadorligi, burchi va mas’uliyatini tan oladi. Uchinchi mezon - davomiylik. Bir martalik yordam yoki hissiy ko‘tarinkilik sadoqatning to‘liq ifodasi emas. Sadoqat vaqt davomida sinovdan o‘tadi: manfaatlar o‘zgarganda, qiyinchilik paydo bo‘lganda yoki muqobil tanlovlar jozibador bo‘lganida shaxs o‘z axloqiy majburiyatiga qanday munosabat bildirishi uning sadoqat darajasini ko‘rsatadi. Biroq davomiylik ham mutlaq emas: obyekt o‘zining axloqiy legitimligini yo‘qotsa, sadoqatni qayta ko‘rib chiqish axloqiy jihatdan zarur [1].

Sadoqatning barqarorligi eng avvalo ishonch bilan bog‘liq. Ishonch - boshqa tomonning xatti-harakatini to‘liq nazorat qilmasdan turib, uning muayyan me’yorlarga rioya etishiga ijobiy kutish bildirishdir. Ishonch mavjud bo‘lmagan muhitda sadoqat ko‘proq nazorat, qo‘rquv yoki manfaatga tayanadi va shu sababli mo‘rt bo‘ladi. Fukuyama ishonchni hamkorlikni yengillashtiruvchi madaniy resurs sifatida ko‘rsatadi [3]; Putnam esa o‘zaro ishonch va tarmoqlarni ijtimoiy kapitalning asosiy elementlari qatoriga kiritadi [4]. Identifikatsiya sadoqatning ikkinchi tayanchidir. Shaxs “bu mening oilam”, “bu mening jamoam”, “bu mening jamiyatim” degan mansublik tuyg‘usiga ega bo‘lganida mazkur birlikning muvaffaqiyati va muammolarini o‘ziga aloqador deb qabul qiladi. Biroq identifikatsiya yopiq guruhiy egoizmga aylanmasligi kerak. Barqaror sadoqat ko‘p darajali identifikatsiyani tan oladi: inson oilasiga, mahallasiga, kasbiy jamoasiga va Vataniga bir vaqtning o‘zida sodiq bo‘ladi. Ularning o‘zaro muvofiqligi umumiy axloqiy mezonlar orqali ta’minlanadi. Mas’uliyat uchinchi tayanch sifatida sadoqatni amaliy xulqqa aylantiradi. Faqat “men sodiqman” degan hissiy e’tirof yetarli emas; sadoqat va’daga amal qilish, vazifani vijdonan bajarish, qiyin vaziyatda hamkorlikni tark etmaslik, umumiy mulk va obro‘ga ehtiyotkor munosabatda bo‘lish kabi harakatlarda namoyon bo‘ladi. Mas’uliyat sadoqatni tekshiriladigan axloqiy pozitsiyaga aylantiradi. Ishonch, identifikatsiya va mas’uliyat o‘zaro aylana hosil qiladi: ishonch identifikatsiyani chuqurlashtiradi, identifikatsiya mas’uliyatni kuchaytiradi, mas’uliyatli xulq esa yangi ishonch hosil qiladi. Aksincha, adolatsizlik ishonchni pasaytiradi, ishonchning pasayishi identifikatsiyani zaiflashtiradi, natijada mas’uliyat tashqi majburiyat sifatida qabul qilina boshlaydi. Shu bois sadoqatning barqarorligini alohida shaxs xususiyati bilan izohlash yetarli emas; u munosabatlar sifatining natijasidir.

Oila sadoqatning birlamchi maktabidir. Bola o‘zaro g‘amxo‘rlik, va’daga amal qilish, ishonch, kattalarga hurmat va kichiklarga mas’uliyat kabi tajribalarni avvalo oilada o‘zlashtiradi. Oilaviy sadoqatning sog‘lom shakli shaxsning individualligini bostirish emas, balki xavfsiz mansublik va o‘zaro yordam tuyg‘usini shakllantirishdir. Oiladagi so‘z va amal birligi bolada axloqiy izchillik modelini hosil qiladi; doimiy ikkiyuzlamachilik esa sadoqatning o‘rniga moslashuvchan konformizmni kuchaytiradi. Ta’lim instituti sadoqatni refleksiv darajaga olib chiqadi. Maktab va oliy ta’limda shaxs nafaqat qoidaga amal qilishni, balki uning ma’nosini tushunish, dalil bilan fikr yuritish, boshqa nuqtai nazarni hurmat qilish va umumiy faoliyat uchun javobgarlikni o‘rganadi. UNESCOning ijtimoiy-emotsional ta’lim bo‘yicha zamonaviy yondashuvlari ham munosabat qurish, mas’ul qaror qabul qilish va boshqalarga g‘amxo‘rlikni ta’limning muhim kompetensiyalari sifatida ko‘rsatadi [13]. Bu kompetensiyalar sadoqatning hissiy va kognitiv asoslarini birlashtiradi. Mahalla va fuqarolik jamiyati shaxsning “yaqin doira”dan kengroq ijtimoiy hamjamiyatga o‘tishini ta’minlaydi. Ko‘ngillilik, o‘zaro yordam, jamoat muammolarini muhokama qilish, qo‘shnichilik mas’uliyati va umumiy tashabbuslarda ishtirok etish orqali sadoqat ijtimoiy daxldorlikka aylanadi. Bunda shaxs jamiyatni mavhum tuzilma sifatida emas, o‘z harakati ta’sir qiladigan hamjamiyat sifatida his etadi.

Davlat va huquqiy institutlar sadoqatning fuqarolik o‘lchovini shakllantiradi. Fuqarolik sadoqati muayyan mansabdor yoki siyosiy vaziyatga shartsiz bog‘lanish emas, balki Konstitutsiya, qonun ustuvorligi, inson qadr-qimmati, Vatan ravnaqi va umumiy manfaat kabi barqaror tamoyillarga mas’uliyatli munosabatdir. O‘zbekiston Respublikasi Konstitutsiyasida insonning sha’ni va qadr-qimmati, huquq va erkinliklari hamda fuqarolarning jamiyat va davlat oldidagi burchlari normativ jihatdan mustahkamlangan [14]. Shu nuqtai nazardan, fuqarolik sadoqati huquq va burchning birligini anglashga tayanadi.

Raqamli kommunikatsiyalar sadoqatning shakllanish muhitini tubdan o‘zgartirdi. Ilgari shaxsning asosiy mansubliklari ko‘proq hududiy va institutsional bo‘lgan bo‘lsa, bugun virtual hamjamiyatlar, professional tarmoqlar, kontent yaratuvchilar atrofidagi auditoriyalar va transmilliy guruhlar ham identifikatsiya manbaiga aylanmoqda [12].

Bunday sharoitda sadoqat tez shakllanishi, tez almashishi va algoritmik axborot oqimlari ta’sirida kuchayadi. Raqamli muhitning ijobiy tomoni shundaki, u shaxsga turli nuqtai nazarlarni ko‘rish, o‘z mansubligini ongli tanlash va fuqarolik tashabbuslarida ishtirok etish imkonini kengaytiradi. Biroq fragmentlangan axborot makoni “echo chamber”, dezinformatsiya va guruhiy qutblashuv orqali ko‘r-ko‘rona sadoqatni ham kuchaytiradi. Shu sababli media va axborot savodxonligi sadoqat tarbiyasining yordamchi emas, balki tarkibiy elementi sifatida qaralishi lozim. Refleksiv sadoqat - shaxsning o‘z sadoqat obyektini, uning qadriyatlari va talablarini muntazam axloqiy baholay olgan holda munosabatni ongli ravishda davom ettirishidir. Refleksiv sadoqat shubhani sadoqatsizlik deb qabul qilmaydi. Aksincha, asosli savol berish, xatoni tan olish va munosabatni yaxshilashga intilish sadoqatning yetuk shaklidir. Bu jihat Hirschmanning “voice” konsepsiyasi bilan uyg‘unlashadi [8].

Refleksiv sadoqatning mezonlari sifatida quyidagilarni ajratadi: axborotni tekshirish; guruh fikridan mustaqil axloqiy baho bera olish; sadoqat obyektining xatosini oqlamaslik; tanqidni buzish emas, takomillashtirish maqsadida bildirish; inson qadr-qimmati va adolatni sadoqatdan yuqori meta-mezon sifatida tan olish. Ushbu mezonlar raqamli jamiyatda sadoqatning barqaror, lekin dogmatik bo‘lmagan shaklini ta’minlaydi.

Sadoqatni ko‘r-ko‘rona itoatkorlik bilan aynanlashtirish nazariy jihatdan xato. Konformizmda shaxs ko‘pincha guruh bosimi yoki qabul qilinish istagi tufayli o‘z fikrini moslashtiradi. Sadoqatda esa munosabatning qadri tan olinadi va uni saqlashga mas’uliyatli intilish mavjud. Konformist guruh xatosini takrorlaydi; sodiq shaxs esa aynan munosabat kelajagi uchun xatoni ko‘rsatishga majbur bo‘ladi. Konstruktiv tanqid sadoqatning faol shaklidir, agar u uch shartga javob bersa: fakt va dalilga tayanishi; shaxsni emas, muammo yoki qarorni nishonga olishi; takomillashtirishga qaratilgan muqobil yechim taklif qilishi. Bunday tanqid institutning legitimligini yemirmaydi, aksincha uning o‘z qadriyatlariga qaytishiga yordam beradi. Shuning uchun demokratik va ochiq institutlarda “tanqidga chidamlilik” sadoqatni mustahkamlovchi omillardan biri hisoblanadi. Bu nuqtada sadoqatning paradoksal xususiyati namoyon bo‘ladi: ba’zan tashqi jihatdan “qarshi chiqish” munosabatni buzish emas, uni axloqiy asosda saqlab qolishning yagona yo‘li bo‘ladi. Agar xodim tashkilotdagi jiddiy adolatsizlikni qonuniy tartibda ko‘tarib chiqsa yoki fuqaro jamoat muammosini asosli tanqid qilsa, bu holat avtomatik ravishda sadoqatsizlik sifatida talqin qilinmasligi kerak. Sadoqatning obyektini uning vaqtinchalik xatosidan farqlash refleksiv sadoqatning muhim belgisi hisoblanadi.

Barqaror sadoqatni darajalar bo‘yicha tahlil qilish uning shaxs va jamiyat uyg‘unligidagi o‘rnini aniqroq ko‘rsatadi. Mikrodarajada sadoqat shaxslararo munosabatlar - oila, do‘stlik, yaqin hamkorlik va kundalik va’dalarga amal qilishda namoyon bo‘ladi. Bu darajada ishonch va emotsional bog‘lanish yetakchi ahamiyatga ega. Mikrodarajadagi tajriba keyingi ijtimoiy munosabatlar uchun axloqiy “skript” vazifasini bajaradi. Makrodarajada sadoqat ta’lim muassasasi, kasbiy jamoa, mahalla, nodavlat tashkilot va boshqa institutlarga mansublikda namoyon bo‘ladi. Bu darajada shaxsning rol va majburiyatlari aniqroq normativ shaklga ega. Sadoqatning barqarorligi tashkilotning adolatli boshqaruvi, ishtirok imkoniyati, tan olinish va o‘zaro ishonchga bog‘liq. Hirschmanning “voice” mexanizmi ayniqsa mezodarajada muhim [8]. Megadarajada sadoqat fuqarolik mas’uliyati, Vatanga daxldorlik, konstitutsiyaviy qadriyatlarga hurmat va umumjamiyat manfaatlarini e’tirof etishda ifodalanadi. Makrodarajadagi sadoqat faqat ramziy his-tuyg‘u emas; qonunlarga ongli rioya qilish, jamoat mulkiga mas’uliyat, soliqlar va fuqarolik burchlariga munosabat, jamiyat ravnaqi uchun bilim va mehnat bilan hissa qo‘shish kabi amaliy shakllarda ko‘rinadi. Uch darajaning o‘zaro uzviyligi “barqaror sadoqatning institutsional-ma’naviy vertikali”ni hosil qiladi. Oilada ishonchni boshdan kechirgan, ta’limda adolatni ko‘rgan, jamoada ishtirok etish tajribasiga ega bo‘lgan shaxsning umumjamiyat qadriyatlariga sadoqati mazmunliroq bo‘lish ehtimoli yuqori. Aksincha, mikro va mezodarajadagi doimiy adolatsizlik makrodarajadagi deklarativ chaqiriqlarning ta’sirini susaytiradi.

Sadoqatni ilmiy tadqiq etishda uni faqat “bor” yoki “yo‘q” tarzida baholash yetarli emas. Barqarorlikni aniqlash uchun bir qator sifat mezonlari taklif etiladi: qadriyatni anglash darajasi; sadoqat obyektiga ishonch; mansublik va identifikatsiya; majburiyatni ixtiyoriy qabul qilish; qiyin vaziyatda xulqiy izchillik; konstruktiv tanqid qobiliyati; boshqa qadriyatlar bilan muvofiqlik; sadoqat obyektining axloqiy legitimligini baholay olish. Mazkur mezonlar asosida kelgusida Likert shkalalari, yarim strukturali intervyular va vaziyatli axloqiy dilemmalar yordamida empirik indikatorlar ishlab chiqsak bo‘ladi. Masalan, “institut xato qilganda uni tark etish yoki yaxshilashga urinish”, “guruh manfaati adolat tamoyiliga zid bo‘lganda tanlov”, “shaxsiy manfaat bilan umumiy burch to‘qnashganda qaror” kabi vaziyatlar refleksiv sadoqatni o‘lchashga yordam beradi. Bunda tadqiqot etikasi va respondentning erkin fikr bildirish huquqi qat’iy ta’minlanishi kerak.

Sadoqatni rivojlantirishning birinchi strategik yo‘nalishi - qadriyatlar ta’limini dialogik shaklga o‘tkazish. Tayyor shiorlarni takrorlash o‘rniga real axloqiy dilemmalarni muhokama qilish, tarixiy va zamonaviy misollarni qiyoslash, “nima uchun?” savoliga javob izlash sadoqatning kognitiv va refleksiv asoslarini kuchaytiradi. Ikkinchi yo‘nalish - institutlarda so‘z va amal birligini ta’minlash. Adolatli baholash, ochiq muloqot, hisobdorlik va va’daga amal qilish tarbiyaviy nutqdan ko‘ra kuchliroq ta’sir ko‘rsatadi. Uchinchi yo‘nalish - ijtimoiy ishtirokni kengaytirish. Yoshlar va fuqarolar umumiy muammolarni hal etish, ko‘ngillilik, mahalliy tashabbus va jamoaviy loyihalarda real mas’uliyat olganida sadoqat passiv hissiyotdan faol daxldorlikka o‘tadi. To‘rtinchi yo‘nalish - media savodxonlik va tanqidiy tafakkurni rivojlantirish. Bu

raqamli guruhiy bosim, dezinformatsiya va manipulyativ “sadoqat” chaqiriqlaridan himoyalanish uchun zarur. Beshinchi yo‘nalish - institutlararo aksiologik muvofiqlikni kuchaytirish. Oila, ta’lim, mahalla, davlat va media makonidagi asosiy axloqiy signallar bir-birini inkor etmasligi lozim. Bunda barcha institutlarning bir xil fikrni takrorlashi emas, balki inson qadr-qimmati, adolat, halollik, mas’uliyat va qonuniylik kabi fundamental mezonlarda uyg‘unligi nazarda tutiladi. Aynan shu muvofiqlik sadoqatni uzoq muddatli va barqaror qadriyatga aylantiradi.

Sadoqatning barqaror qadriyatga aylanishida tarixiy xotira muhim vositachilik vazifasini bajaradi. Shaxs o‘zini faqat hozirgi ijtimoiy vaziyatning ishtirokchisi sifatida emas, balki muayyan tarixiy-madaniy davomiylikning vakili sifatida anglaganida uning mansublik hissi chuqurlashadi. Tarixiy xotira ajdodlar tajribasini mutlaq ideallashtirish emas; u o‘tmishdagi axloqiy tanlovlar, muvaffaqiyat va xatolarni anglash orqali bugungi mas’uliyatni shakllantirishdir. Shu ma’noda sadoqat avlodlar o‘rtasidagi ma’naviy ko‘prik vazifasini bajaradi. Avlodlararo sadoqatning mazmuni merosni aynan takrorlashdan iborat emas. Har bir avlod mavjud qadriyatlarni yangi sharoitda qayta talqin qiladi. Agar sadoqat faqat o‘tmish shakllarini o‘zgartirmasdan saqlash talabi sifatida qo‘yilsa, u ijtimoiy yangilanishga to‘sqinlik qiladi. Aksincha, merosning axloqiy yadrosini - halollik, vafo, adolat, ilmga hurmat, jamoaga mas’uliyat kabi tamoyillarni zamonaviy institutlar va turmush shakllariga mos ifodalash sadoqatning ijodiy xususiyatini ko‘rsatadi. Tarixiy xotira bilan bog‘langan sadoqat shaxsning Vatanga munosabatida ham namoyon bo‘ladi. Vatanga sadoqat hududga nisbatan hissiy bog‘lanish bilangina cheklanmaydi; u tarixiy merosni bilish, jamiyatning bugungi muammolariga befarq bo‘lmaslik va kelajak avlodlar uchun ijtimoiy sharoitni yaxshilashga intilishni ham qamrab oladi. Bunday yondashuvda vatanparvarlik retrospektiv faxr va prospektiv mas’uliyat birligiga aylanadi. Avlodlararo davomiylikning yana bir jihati - axloqiy namuna mexanizmidir. Banduraning ijtimoiy-kognitiv nazariyasida xulqning kuzatish va model orqali o‘zlashtirilishi muhim o‘rin tutadi [18]. Shaxs sadoqat haqida eshitganidan ko‘ra, uni ota-ona, ustoz, rahbar va jamoat vakillarining amaliy xulqida ko‘rganida qadriyatning hayotiy mazmunini chuqurroq o‘zlashtiradi. Shu sababli sadoqat tarbiyasida namuna va institutsional amaliyot verbal targ‘ibotdan kam bo‘lmagan ahamiyatga ega.

Sadoqatning jamiyat miqyosidagi funksiyalaridan biri ijtimoiy munosabatlarda prognoz qilinuvchanlikni oshirishdir. Insonlar va institutlar o‘zaro majburiyatlarga ma’lum darajada sodiq bo‘lganda hamkorlik xarajatlari kamayadi: har bir harakatni doimiy nazorat qilish, barcha ehtimollarni shartnoma bilan qamrab olish yoki majburlash vositalariga tayanish zarurati pasayadi. Shu ma’noda sadoqat ishonch bilan birga ijtimoiy koordinatsiyaning ma’naviy resursidir [3; 4]. Ikkinchi funksiya - inqiroz sharoitida birdamlikni saqlash. Oddiy vaziyatda hamkorlik manfaatlar mosligi bilan ham davom etadi, biroq qiyinchilik paytida munosabatning qadriy asosi sinovdan o‘tadi. Oila, kasbiy jamoa yoki fuqarolik hamjamiyatida sadoqat mavjud bo‘lsa, ishtirokchilar qisqa muddatli noqulaylikka qaramay umumiy maqsadni qo‘llab-quvvatlashga moyil bo‘ladi. Bunda sadoqat ijtimoiy tizimning rezilyentlik qobiliyatini oshiradi. Uchinchi funksiya - axloqiy identitetni mustahkamlash. Inson o‘zini kim deb bilishi ko‘p jihatdan qaysi munosabat va qadriyatlarga sodiqligi bilan belgilanadi. Kasbiga sodiq shifokor, ilmga sodiq tadqiqotchi, oilasiga mas’ul ota-ona yoki fuqarolik burchiga sodiq shaxs o‘z identitetini muayyan axloqiy majburiyatlar orqali ifodalaydi. Sadoqat shu tariqa “men kimman?” savolini “men nimaga va kimga nisbatan mas’ulman?” savoli bilan bog‘laydi. To‘rtinchi funksiya - ijtimoiy kapitalni qayta ishlab chiqarish. Sodiq va mas’uliyatli hamkorlik tajribasi keyingi hamkorlik uchun ijobiy kutish hosil qiladi. Bu jarayon jamoada o‘zaro yordam, ko‘ngillilik va fuqarolik ishtirokini rag‘batlantiradi. Biroq yopiq guruh ichidagi kuchli sadoqat tashqi guruhlarga ishonchsizlik bilan birlashsa, “bog‘lovchi” kapital kuchayib, “ko‘prik” kapital zaiflashishi ehtimoli bor. Shuning uchun sadoqatni umumiy insoniy va fuqarolik qadriyatlari bilan muvozanatlash muhim [4]. Beshinchi funksiya - ma’naviy xavfsizlikni ta’minlash. Qadriy orientirlari beqaror, mansubliklari faqat vaziyatga qarab almashadigan shaxs manipulyativ axborot va guruhiy bosimga nisbatan zaifroq bo‘ladi. Biroq ma’naviy xavfsizlik dogmatik yopilish degani emas. Refleksiv sadoqat shaxsga barqaror axloqiy tayanch beradi, ayni vaqtda yangi axborotni baholash va zarur bo‘lsa o‘z pozitsiyasini asosli ravishda qayta ko‘rib chiqish imkonini saqlaydi.

Sadoqatning shakllanishida “qadriyat - ishonch - identifikatsiya - mas’uliyat - xulq - refleksiya” zanjiri konseptual ahamiyatga ega. Qadriyat sadoqatning nima uchun zarurligini tushuntiradi; ishonch munosabatning xavfsizligini ta’minlaydi; identifikatsiya obyektni “o‘ziniki” sifatida qabul qilishga yordam beradi; mas’uliyat sadoqatni majburiyatga aylantiradi; xulq uning amaliy tasdig‘i bo‘ladi; refleksiya esa butun zanjirning axloqiy yo‘nalishini tekshiradi. Ushbu elementlardan birining uzoq muddat zaiflashishi sadoqatning umumiy barqarorligiga ta’sir ko‘rsatadi. Shu nuqtai nazardan sadoqatni rivojlantirish strategiyasi faqat hissiy ta’sirga yoki faqat normativ talabga tayanmasligi kerak. Hissiy bog‘lanish tanqidiy anglashsiz fanatizmga, normativ talab ishonchsiz muhitda formalizmga, faqat bilim esa amaliy tajribasiz deklarativ munosabatga aylanadi. Barqaror sadoqat ushbu omillarning muvozanatini talab qiladi. Aynan shuning uchun sadoqatni shakllantirish masalasi falsafa, axloqshunoslik, sotsiologiya, pedagogika va ijtimoiy psixologiya kesishmasidagi kompleks tadqiqot obyektidir. Natijada shaxs va jamiyat uyg‘unligida sadoqatning eng maqbul shakli “ongli-barqaror sadoqat” sifatida tavsiflanadi. Uning mazmunida mansublik va mustaqillik, davomiylik va yangilanish, burch va erkinlik, ishonch va tanqid bir-birini inkor etmaydi. Bunday sadoqat shaxsni jamiyatga singdirib yubormaydi va

jamiyatni shaxsiy manfaatlarning oddiy yig‘indisiga aylantirmaydi; aksincha, ikki tomon o‘rtasida mas’uliyatli axloqiy hamkorlik maydonini yaratadi.

O‘zbekiston sharoitida mazkur yondashuvning amaliy ahamiyati oila, mahalla, ta’lim va fuqarolik institutlarining kuchli ijtimoiy roliga bog‘liq. Ushbu institutlar o‘rtasidagi hamkorlik sadoqatni shiori emas, kundalik tajribaga asoslangan qadriyat sifatida shakllantirish imkonini beradi. Ayniqsa, yoshlarning mustaqil fikrlashi bilan Vatanga daxldorligini qarama-qarshi qo‘ymaslik muhim: tanqidiy fikrlash va fuqarolik sadoqati bir-birini inkor etmaydi, aksincha, qonuniy va konstruktiv shaklda bir-birini mustahkamlaydi. Tadqiqotimizning nazariy cheklovi shundaki, taklif etilgan “institutlararo aksiologik rezonans” va besh komponentli model empirik sinovdan o‘tkazilmagan. Shu sababli keyingi izlanishlarda turli yosh, kasb va hududiy guruhlarda sadoqatning kognitiv, emotsional, normativ, xulqiy va refleksiv komponentlarini o‘lchash, institutlarga ishonch bilan ularning o‘zaro bog‘liqligini tekshirish maqsadga muvofiq. Bunday empirik verifikatsiya konseptual modelning tushuntirish imkoniyatlarini aniqlashtiradi.

Xulosa. Birinchidan, sadoqat shaxs va jamiyat o‘rtasidagi axloqiy aloqalarni barqarorlashtiruvchi, mansublikni mas’uliyat bilan birlashtiruvchi murakkab aksiologik hodisadir.

Ikkinchidan, sadoqatning axloqiy maqomi uning obyektiga va chegaralariga bog‘liq. Inson qadr-qimmati, adolat va qonuniylikka zid talablarni bajarish sadoqatning yetuk shakli sifatida baholanmaydi.

Uchinchidan, oila, ta’lim, mahalla, fuqarolik jamiyati, davlat va axborot muhiti sadoqatning turli komponentlarini shakllantiradi. Ularning e’lon qilgan qadriyatlari va real amaliyoti o‘rtasidagi muvofiqlik “institutlararo aksiologik rezonans”ni yuzaga keltirib, sadoqatning barqarorligini oshiradi.

To‘rtinchidan, raqamli jamiyat sharoitida refleksiv sadoqat alohida ahamiyat kasb etadi. U mustaqil fikrlash, media savodxonlik, konstruktiv tanqid va mas’ul fuqarolik bilan uyg‘unlashadi. Shuning uchun sadoqatni konformizm bilan emas, qadriyatga asoslangan ongli daxldorlik bilan bog‘lash maqsadga muvofiq.

Beshinchidan, maqolada barqaror sadoqatning aksiologik-kognitiv, emotsional-identifikatsion, normativ-mas’uliy, faoliyatli-xulqiy va refleksiv-kritik komponentlardan iborat konseptual modeli taklif etildi. Model sadoqatni mikro-, mezo- va makrodarajalarda o‘zaro bog‘langan holda o‘rganish hamda keyingi empirik tadqiqotlar uchun indikatorlar ishlab chiqishga metodologik asos bo‘la oladi.

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BERUNIY ILMIY MEROSIDA EMPIRIK BILIMLARNING SHAKLLANISHIGA TA'SIR QILGAN TARIXIY MUHIT

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Annotatsiya: *Maqolada Abu Rayhon Beruniy ilmiy merosida empirik bilimlarning shakllanishiga ta'sir ko'rsatgan tarixiy, siyosiy, madaniy va intellektual muhit tahlil qilinadi. Beruniy ilmiy tafakkuri alohida shaxsiy iste'dod mahsuli sifatida emas, balki Xorazm ilmiy muhiti, musulmon Sharqidagi tarjima va ilmiy meros an'analari, G'aznaviylar davri, Hindiston bilan bevosita tanishuv, astronomiya, geografiya, mineralogiya va tarixiy-etnografik tadqiqotlarga bo'lgan amaliy ehtiyojlar bilan bog'liq holda yoritiladi. Tadqiqot natijalari Beruniy merosida empirik bilim kuzatuv, tajriba, o'lchov, qiyosiy tahlil va manbalarni tekshirish tizimi sifatida shakllanganini ko'rsatadi.*

Kalit so'zlar: *Beruniy, empirik bilim, Xorazm, Ma'mun akademiyasi, G'aznaviylar, Hindiston, astronomiya, geografiya, mineralogiya, manbashunoslik*

ИСТОРИЧЕСКАЯ СРЕДА, ПОВЛИЯВШАЯ НА ФОРМИРОВАНИЕ ЭМПИРИЧЕСКОГО ЗНАНИЯ В НАУЧНОМ НАСЛЕДИИ БИРУНИ

Аннотация: *В статье анализируется историческая, политическая, культурная и интеллектуальная среда, повлиявшая на формирование эмпирического знания в научном наследии Абу Райхана Бируни. Научное мышление Бируни рассматривается не только как результат личного таланта, но и как явление, связанное с хорезмской научной средой, традициями перевода и научного наследия мусульманского Востока, эпохой Газневидов, непосредственным знакомством с Индией, а также практическими потребностями астрономии, географии, минералогии и историко-этнографических исследований. Результаты показывают, что эмпирическое знание у Бируни формировалось как система наблюдения, опыта, измерения, сравнительного анализа и проверки источников.*

Ключевые слова: *Бируни, эмпирическое знание, Хорезм, Академия Мамуна, Газневиды, Индия, астрономия, география, минералогия, источниковедение*

THE HISTORICAL ENVIRONMENT THAT INFLUENCED THE FORMATION OF EMPIRICAL KNOWLEDGE IN AL-BIRUNI'S SCIENTIFIC LEGACY

Abstract: *The article examines the historical, political, cultural, and intellectual environment that influenced the formation of empirical knowledge in the scientific legacy of Abu Rayhan al-Biruni. His scientific thought is interpreted not merely as the product of individual genius, but as a phenomenon shaped by the Khwarazmian scholarly milieu, the translation and intellectual traditions of the Muslim East, the Ghaznavid period, direct contact with India, and the practical needs of astronomy, geography, mineralogy, and historical-ethnographic inquiry. The study shows that empirical knowledge in al-Biruni's legacy developed as a system of observation, experience, measurement, comparative analysis, and source verification.*

Keywords: *al-Biruni, empirical knowledge, Khwarazm, Ma'mun Academy, Ghaznavids, India, astronomy, geography, mineralogy, source studies.*

KIRISH. Abu Rayhon Beruniy ilmiy merosida empirik bilimlarning shakllanishi o'rta asr Markaziy Osiyo ilm-fani tarixidagi muhim tadqiqot muammolaridan biridir. Beruniy asarlarida kuzatuv, tajriba, o'lchov, qiyoslash va dalilni tekshirish usullari tasodifiy tarzda paydo bo'lmagan. Ular Xorazm ilmiy muhiti, musulmon Sharqidagi tarjima harakati, qadimgi yunon, fors, hind va arab ilmiy an'analari, G'aznaviylar davridagi siyosiy jarayonlar hamda amaliy ehtiyojlar bilan bog'liq tarixiy sharoitda shakllangan. Shu sababli Beruniy empirizmini faqat individual daholik belgisi sifatida emas, balki aniq tarixiy-intellektual muhit mahsuli sifatida talqin qilish lozim.

Mavzu bo‘yicha jalb etilgan manba va adabiyotlarda Beruniy yashagan davr chuqur geosiyosiy va madaniy o‘zgarishlar bilan belgilangani ko‘rsatiladi. Arab xalifaligi istilosidan avval Movarounnahrda Sug‘d konfederatsiyasi Zarafshon va Qashqadaryo vohalarini siyosiy jihatdan birlashtirgan, G‘arbiy Turk xoqonligidagi ichki beqarorlik esa mintaqadagi siyosiy muvozanatga kuchli ta’sir ko‘rsatgan [Ungalov, 2020, p. 668]. Bu tarixiy fon keyinchalik arab tili, islom sivilizatsiyasi, tarjima an’analari va ilmiy markazlarning mintaqaga kirib kelishi uchun murakkab, lekin mahsuldor asos yaratdi.

Beruniy ilmiy merosidagi empirik bilim tushunchasi zamonaviy laboratoriya tajribasi bilan aynanlashtirilmasligi kerak. Uning davrida empirik bilim, avvalo, tabiat va jamiyat hodisalarini bevosita kuzatish, o‘lchash, turli manbalarni solishtirish, matematik hisob-kitob qilish va ma’lumotni mantiqiy tekshirish bilan bog‘liq edi. Beruniy qibla yo‘nalishini, geografik koordinatalarni, Yer radiusini, minerallar xossalarini, hind jamiyatining diniy-falsafiy qarashlarini va qadimgi xalqlar taqvimlarini o‘rganishda aynan shu yondashuvdan foydalangan. Maqolaning asosiy ilmiy savoli quyidagicha qo‘yiladi: Beruniy ilmiy merosida empirik bilimlarning shakllanishiga qanday tarixiy muhit, ilmiy maktablar, madaniyatlararo aloqalar va amaliy ehtiyojlar ta’sir ko‘rsatgan?

METODLAR. Tadqiqot tarixiy-tahliliy, qiyosiy, manbashunoslik, kontekstual va konseptual tahlil usullari asosida olib borildi. Tarixiy-tahliliy metod Beruniy empirik tafakkurining Xorazm, G‘azna, Hindiston va musulmon Sharqi ilmiy markazlari bilan aloqasini ochish uchun qo‘llandi. Qiyosiy metod orqali Beruniy merosida astronomik kuzatuv, geografik o‘lchov, mineralogik tajriba, etnografik kuzatuv, dinshunoslik tahlili va xronologik hisoblarning umumiy metodologik jihatlari solishtirildi.

Manbashunoslik yondashuvi Beruniy haqidagi zamonaviy tadqiqotlarda keltirilgan dalillarni sahifa aniqligi, bibliografik ishonchlilik va mavzuga aloqadorlik mezonlari asosida saralashga xizmat qildi. Maqolada “tarixiy muhit”, “empirik bilim”, “ilmiy kuzatuv”, “tajriba”, “o‘lchov”, “madaniyatlararo ilmiy almashinuv”, “manbashunoslik dalili”, “ilmiy maktab” va “amaliy ehtiyoj” tushunchalari tahliliy birlik sifatida belgilandi.

Beruniy ilmiy merosida empirik bilimlarning shakllanishiga ta’sir qilgan omillar quyidagicha tasniflandi: Xorazm ilmiy muhiti; Ma’muniylar davri ilmiy doiralari; qadimgi yunon, hind, fors va arab ilmiy merosi; G‘aznaviylar davri va Hindiston bilan bevosita aloqalar; astronomiya va geografiyadagi amaliy ehtiyojlar; mineralogiya, farmakologiya va tabiiy-ilmiy kuzatuvlar; tarixiy-etnografik ma’lumotlarni qiyoslash zarurati. Manba tanlashda sahifa aniqligi va bibliografik ehtiyotkorlik asosiy talab sifatida saqlandi.

NATIJALAR. Tadqiqotga jalb etilgan materiallar asosida aniqlanishicha, Beruniy empirik bilimlarining shakllanishida Xorazm ilmiy muhiti birlamchi ahamiyatga ega bo‘lgan. Kohar ma’lumotlariga ko‘ra, Beruniy shakllangan davrda Xorazmning ilmiy-madaniy tafakkuri uning tanqidiy fikrlashiga ta’sir ko‘rsatgan; u matematika, falsafa, geografiya va ayniqsa astronomiyaga alohida qiziqqan [Kohar, 2025, p. 258]. Xorazm, Kyat, Urganch, Samarqand va Buxoro kabi shaharlarda astronomlar uchun maktablar tashkil etilgani va rasadxonalar qurilgani Markaziy Osiyoda amaliy kuzatuvga asoslangan ilmiy infratuzilma mavjud bo‘lganini ko‘rsatadi [Kohar, 2025, p. 259].

Bu muhitda ilmiy bilim faqat kitobiy nazariya sifatida emas, amaliy kuzatuv va hisoblash madaniyati sifatida rivojlangan. Beruniy Abu Nasr Mansur orqali Yevklid geometriyasi va Ptolemey astronomiyasi elementlari bilan tanishgan, bu esa uning keyingi geodezik va astronomik izlanishlariga nazariy asos bergan [Kohar, 2025, p. 260]. Shu bilan birga, Beruniy antik avtoritetlarga ko‘r-ko‘rona ergashmagan. Kohar keltirgan misolda u Ray shahrida mashhur astronom bilan bahsga kirishib, nazariy da’voga “voqelik buni tasdiqlamaydi” mazmunida e’tiroz bildirgan [Kohar, 2025, p. 259]. Bu holat Beruniy tafakkurida empirik fakt nazariy avtoritetdan ustun qo‘yilganini ko‘rsatadi.

G‘aznaviylar davri Beruniy empirizmining shakllanishida murakkab, ikki tomonlama rol o‘ynagan. Bir tomondan, Mahmud G‘aznaviy yurishlari siyosiy zo‘ravonlik va majburiy ko‘chishlar bilan bog‘liq edi. Boshqa tomondan, aynan Hindistonga harbiy yurishlar Beruniyga Shimoliy Hindistonning ichki hududlariga kirish, hind madaniyati, dini, fani va urf-odatlarini bevosita kuzatish imkonini bergan. Xoldarov Beruniyning Hindistonda uzoq muddat bo‘lishi uning immersiv tadqiqotga sadoqatini ko‘rsatishini, bu davrda u hind urf-odatlari, an’analari va amaliyotlarini diqqat bilan kuzatib, ularni aniq qayd etganini ta’kidlaydi [Xoldarov, 2024, p. 237].

Hindiston bilan bevosita tanishuv Beruniy empirik metodini madaniyatlararo manbashunoslik darajasiga olib chiqdi. U hind matnlariga vositasiz kirish uchun sanskrit tilini o‘rgandi, bu esa boshqa madaniyatni o‘z tili va ichki nuqtayi nazari orqali tushunishga intilganini ko‘rsatadi [Xoldarov, 2024, p. 237]. Al Masud va Abdullah ham Beruniy hind ilohiyoti va falsafasini asl tildagi matnlar orqali tekshirganini, hind diniy qarashlarini ilmiy va empirik yondashuv bilan xolis taqdim etganini qayd etadi [Al Masud, Abdullah, 2021, p. 116]. Demak, Beruniyda empirik bilim faqat tabiiy hodisani ko‘rish emas, balki madaniy matn, til, guvohlik va amaliy hayotni solishtirish orqali ham shakllangan.

Beruniy empirik merosida qadimgi yunon, hind, fors va arab ilmiy an’analarining sintezi ham muhim omil bo‘lgan. “Qadimgi xalqlardan qolgan yodgorliklar” asari keng madaniy almashinuv va islom olamidagi intellektual yuksalish davrida yaratilgan bo‘lib, Beruniy yunon, fors va hind matnlariga murojaat qilish imkoniga ega edi [Beknazarov, 2025, p. 14]. Ushbu asarning asosiy maqsadi yunonlar, forslar, hindlar va arablar kabi turli sivilizatsiyalarning kalendar tizimlarini

hujjatlashtirish va qiyoslashdan iborat bo‘lgan [Beknazarov, 2025, p. 14]. Bu holat empirik bilimning tarixiy-xronologik shakli Beruniyda hisob-kitob va qiyosiy manbashunoslik bilan tutashganini ko‘rsatadi.

Astronomiya va geografiyadagi amaliy ehtiyojlar ham Beruniy empirik tafakkurini shakllantirgan muhim omillardan biridir. Islomiy amaliyotda qibla yo‘nalishini aniqlash, namoz vaqtlari, taqvimlar, safar masofalari va shaharlar koordinatalarini belgilash ehtiyoji matematik astronomiya va geodeziyaga kuchli turtki bergan. Kohar tadqiqotida Beruniy qibla yo‘nalishini aniqlashda astronomik va matematik hisoblarni birlashtirgani, “Al-Qonun al-Mas‘udiy”da bu masalani sferik trigonometriya orqali izohlashga intilgani ko‘rsatiladi [Kohar, 2025, p. 253–254]. Bu yerda diniy ehtiyoj ilmiy kuzatuv va matematik aniqlikni rivojlantiruvchi omilga aylangan.

Geografik o‘lchovlarda Beruniy empirik bilimni masofa, burchak va koordinata bilan bog‘ladi. Bakhromzod ma’lumotlariga ko‘ra, Bag‘dod va Xorazm orasidagi uzunlik farqini aniqlash uchun 997-yil 24-maydagi Oy tutilishidan foydalangan sinxron kuzatuv tajribasi Beruniy va Abu al-Vafo al-Buzjoniy nomi bilan bog‘lanadi [Bakhromzod, p. 7]. Shuningdek, Beruniy joylar koordinatalarini aniqlash va aholi punktlari orasidagi masofalarni tuzatishga bag‘ishlangan risolasida kenglik va uzunlikni hisoblash usullarini tizimlashtirgan [Bakhromzod, p. 2–3]. Bunday tajribalar empirik bilimlarning transhududiy hamkorlik, astronomik hodisa va matematik hisob asosida shakllanganini ko‘rsatadi.

Mineralogiya va tabiiy-ilmiy kuzatuvlar Beruniy empirizmining yana bir tayanch yo‘nalishidir. Ganiyev ma’lumotlariga ko‘ra, Beruniy mineralogiyada qattiq va suyuq jismlarning solishtirma og‘irligini o‘z asbobi yordamida o‘lchagan, minerallar tasnifini taklif qilgan [Ganiyev, 2023, p. 356]. Uning Amudaryo vodiysi geologik o‘tmishi va Orol dengizi shakllanishi haqidagi xulosalari o‘z davri uchun muvaffaqiyatli geologik tahlil sifatida baholanadi [Ganiyev, 2023, p. 356–357]. Bu dalillar Beruniy empirik bilimlarining faqat astronomiya va geografiyaga emas, balki geologiya, mineralogiya va tabiiy jarayonlarni uzoq muddatli kuzatishga ham tayanganini bildiradi.

Beruniy merosida farmakologik va tibbiy-amaliy ehtiyojlar ham ilmiy ixtisoslashuvga turtki bergan. Roohnavaz va hammualliflar Beruniy farmatsiyani tibbiyotdan ajratilgan mustaqil soha sifatida ko‘rsatgan ilk olimlardan biri bo‘lganini qayd etadi [Roohnavaz et al., 2022, p. 357]. Bu holat o‘rta asr ilmiy muhitida amaliy ehtiyojlar, xususan dori moddalari, ularning nomlari, xossalari va qo‘llanishini aniq tasniflash zarurati empirik bilimlarni sohaga ajratish va ixtisoslashtirishga olib kelganini ko‘rsatadi.

Muhokama

Beruniy empirik bilimlarini faqat individual daholik mahsuli sifatida talqin qilish yetarli emas. Albatta, uning shaxsiy qobiliyati, til bilimi, matematik tafakkuri va tanqidiy zakovati beqiyos edi. Biroq bu qobiliyatlar aniq tarixiy muhitda shakllandi: Xorazm ilmiy maktablari unga dastlabki nazariy va amaliy poydevor berdi; musulmon Sharqi tarjima an’analari antik va hind bilimlariga yo‘l ochdi; G‘aznaviylar davri uni Hindiston bilan bevosita yuzlashtirdi; amaliy diniy, geografik va davlat boshqaruvi ehtiyojlari esa kuzatuv va o‘lchovning ahamiyatini oshirdi.

Xorazm ilmiy muhiti Beruniy tafakkurida nazariya va amaliyotning uzviy birligini shakllantirdi. Astronomlar maktablari, rasadxonalar, ustoz-shogird an’analari, geometriya va astronomiya ta’limi uning keyingi asarlarida ko‘rinadigan o‘lchovga asoslangan yondashuvni tayyorladi [Kohar, 2025, p. 258–260]. Bu muhitda ilmiy savol ko‘pincha amaliy masala bilan bog‘liq edi: qibla qayerda, shaharlar orasidagi masofa qancha, vaqt qanday hisoblanadi, osmon hodisasi qachon yuz beradi? Shunday savollar empirik bilimni ijtimoiy ehtiyoj bilan bog‘ladi.

G‘azna va Hindiston tajribasi esa Beruniy metodologiyasini kengaytirdi. Hindistonni o‘rganishda u boshqa madaniyatni tashqi mezon bilan hukm qilishdan ko‘ra, uning matnlari, tili, marosimlari, urf-odatlari va ilmiy qarashlarini ichki mantiqi bilan tushunishga urindi. Xoldarov Beruniy metodologiyasida empirik kuzatuv, lingvistik mahorat va qiyosiy istiqbol birlashganini ko‘rsatadi [Xoldarov, 2024, p. 236]. Bu yondashuv Beruniy empirik bilimlarini tabiiy fanlardan tashqari etnografiya, dinshunoslik va qiyosiy madaniyatshunoslik maydoniga olib chiqdi.

Beruniy ilmiy uslubida kuzatuv, hisob-kitob va manbalarni solishtirish bir-biridan ajralmaydi. “Qadimgi xalqlardan qolgan yodgorliklar”da kalendarlar va bayramlar qiyoslanadi; qibla masalasida astronomiya va matematika ishlatiladi; mineralogiyada moddalarning fizik xossalari o‘lchanadi; Hindiston haqidagi tadqiqotlarda esa yozma matn, til, urf-odat va bevosita kuzatuv birlashtiriladi. Syukur va hammualliflar Beruniy spekulyatsiya va xurofotni rad etib, kuzatuv hamda tajribaga asoslangan ma’lumotlarni ilgari surganini qayd etadi [Syukur et al., 2025, p. 54]. Bu jihat Beruniy empirizmini o‘z davri uchun metodologik jihatdan kuchli qiladi.

Shu bilan birga, Beruniy empirizmini zamonaviy eksperimental fan bilan to‘liq aynanlashtirish ilmiy ehtiyotkorlikka zid bo‘ladi. Uning tajribasi hozirgi laboratoriya standarti, statistik protokol yoki zamonaviy ilmiy institut shakliga ega emas edi. U o‘z davrining qo‘lyozma madaniyati, diniy-falsafiy tili, saroy homiyligi va siyosiy beqarorligi ichida faoliyat yuritdi. Shu bois Beruniy merosini o‘rganishda qo‘lyozma nusxalari, tarjimalar, keyingi tahrirlar, terminologik tafovutlar va zamonaviy talqinlardagi ortiqcha modernizatsiya xavfi hisobga olinishi kerak.

Beruniy empirik bilimlari bugungi tarixchi uchun bir necha muhim imkoniyat yaratadi. Birinchidan, ular o‘rta asr Markaziy Osiyo ilmiy muhitining amaliy va ko‘p madaniyatli xarakterini o‘rganishga yordam beradi. Ikkinchidan, Xorazm va G‘aznaviylar davri ilmiy aloqalarini aniq tarixiy jarayonlar bilan bog‘lash imkonini beradi. Uchinchidan, Hindiston

haqidagi musulmon Sharqi tasavvurlarini manbashunoslik nuqtayi nazaridan tahlil qilish uchun muhim asos yaratadi. To‘rtinchidan, astronomiya, geografiya, mineralogiya va etnografiya tarixida kuzatuv, o‘lchov va qiyosiy tahlilning shakllanishini ko‘rsatadi. Atapour va hammualliflar Web of Science ma’lumotlariga tayangan holda Beruniy islom oltin asri olimlari orasida yuqori iqtibos ko‘rsatkichiga ega ekanini qayd etadi [Atapour et al., 2025, p. 110]. Bu holat uning merosi zamonaviy fan tarixi tadqiqotlarida ham faol muhokama qilinayotganini tasdiqlaydi.

XULOSA. Beruniy ilmiy merosida empirik bilimlarning shakllanishi Xorazm ilmiy muhiti, musulmon Sharqi tarjima an’analari, madaniyatlararo aloqalar, G‘aznaviylar davri va amaliy ilmiy ehtiyojlar bilan uzviy bog‘liq bo‘lgan; ayni shu sababli uning empirizmini faqat shaxsiy iste’dod mahsuli sifatida talqin qilish biryoqlama yondashuv bo‘lardi. Olim tafakkurida kuzatuv va matematik hisobning dastlabki poydevorini Xorazm ilmiy maktablari, astronomlar doiralari hamda geometriya va astronomiya ta’limi yaratgan bo‘lib, bu muhit nazariy bilimni amaliy o‘lchov va dalil bilan bog‘lashga xizmat qildi. G‘aznaviylar davri va Hindiston bilan bevosita tanishuv esa uning empirik metodini etnografik, dinshunoslik va qiyosiy manbashunoslik darajasiga ko‘tardi; sanskrit tilini o‘rganishi, hind matnlarini ularning ichki mantiqi bilan tushunishga intilishi va bevosita kuzatuvga tayanishi ilmiy xolisligini yanada kuchaytirdi. Bu empirik bilimlar Beruniy merosida astronomik kuzatuv, geografik o‘lchov, qibla va koordinatalarni aniqlash, Yer radiusi hamda masofalarni hisoblash, minerallar xossalarini o‘rganish, kalendarlarni qiyoslash va tarixiy-etnografik ma’lumotlarni tekshirish shakllarida namoyon bo‘ladi. Garchi Beruniy empirizmi zamonaviy laboratoriya fani bilan aynan bir xil bo‘lmasa-da, kuzatuv, tajriba, o‘lchov, qiyosiy tahlil va dalilni tekshirishga tayangan jihatlari bilan u keyingi ilmiy tafakkur tarixida muhim poydevor vazifasini bajargan; shu bois kelgusi tadqiqotlarda uning asarlarini qo‘lyozma an’anasi, tarjima tarixi va aniq ilmiy terminologiya bilan bog‘liq holda yanada chuqurroq o‘rganish maqsadga muvofiqdir.

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РОЛЬ ЧТЕНИЯ ХУДОЖЕСТВЕННОЙ ЛИТЕРАТУРЫ В НАКОПЛЕНИИ ЧЕЛОВЕЧЕСКОГО КАПИТАЛА

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Аннотация: *В статье рассматривается роль чтения художественной литературы в процессе формирования и накопления человеческого капитала. Актуальность исследования обусловлена тем, что в современной экономике человеческий капитал рассматривается как один из ключевых факторов индивидуальной производительности, социальной мобильности и экономического развития. При этом традиционные подходы к его накоплению преимущественно связывают данный процесс с формальным образованием, профессиональной подготовкой и приобретением специальных навыков. Чтение художественной литературы представляет собой менее формализованный, но потенциально значимый механизм развития когнитивных, коммуникативных и социально-эмоциональных компетенций. Цель статьи заключается в систематизации теоретических и эмпирических аргументов относительно влияния художественного чтения на компоненты человеческого капитала. Методологическую основу исследования составили анализ и обобщение научной литературы, сравнительный анализ результатов эмпирических исследований и концептуальный синтез. Показано, что регулярное чтение художественных произведений связано с развитием читательской грамотности, словарного запаса, способности к интерпретации сложных текстов, воображения, рефлексии и социального понимания.*

Ключевые слова: *человеческий капитал, художественная литература, чтение, читательская грамотность, когнитивные навыки, социальные навыки, эмпатия, образование, человеческий потенциал.*

INSON KAPITALINI JAMG‘ARISHDA BADIIY ADABIYOTNI MUTOLAA QILISHNING ROLI

Annotatsiya: *Ushbu maqolada badiiy adabiyot o‘qishning inson kapitalini shakllantirish va to‘plashdagi roli o‘rganiladi. Tadqiqotning dolzarbligi shundaki, zamonaviy iqtisodiyotda inson kapitali individual unumdorlik, ijtimoiy harakatchanlik va iqtisodiy rivojlanishning asosiy omili hisoblanadi. Uni to‘plashga an’anaviy yondashuvlar asosan bu jarayonni rasmiy ta’lim, kasbiy tayyorgarlik va ixtisoslashgan ko‘nikmalarni egallash bilan bog‘laydi. Badiiy adabiyot o‘qish kognitiv, kommunikativ va ijtimoiy-emotsional kompetentsiyalarni rivojlantirishning kamroq rasmiylashtirilgan, ammo potentsial jihatdan ahamiyatli mexanizmini ifodalaydi. Ushbu maqolaning maqsadi badiiy adabiyot o‘qishning inson kapitalining tarkibiy qismlariga ta’siri haqidagi nazariy va empirik dalillarni tizimlashtirishdir. Tadqiqotning metodologik asosi ilmiy adabiyotlarni tahlil qilish va sintez qilish, empirik tadqiqot natijalarini qiyosiy tahlil qilish va kontseptual sintezdan iborat. Badiiy adabiyotni muntazam o‘qish o‘qish savodxonligi, so‘z boyligi, murakkab matnlarni talqin qilish qobiliyati, tasavvur, mulohaza va ijtimoiy tushunishni rivojlantirish bilan bog‘liqligi ko‘rsatilgan.*

Kalit so‘zlar: *inson kapitali, badiiy adabiyot, o‘qish, o‘qish savodxonligi, kognitiv ko‘nikmalar, ijtimoiy ko‘nikmalar, empatiya, ta’lim, inson salohiyati.*

THE ROLE OF READING FICTION IN ACCUMULATING HUMAN CAPITAL

Abstract: *This article examines the role of fiction reading in the formation and accumulation of human capital. The relevance of the study lies in the fact that in the modern economy, human capital is considered a key factor in individual productivity, social mobility, and economic development. Traditional approaches to its accumulation primarily associate this process with formal education, professional training, and the acquisition of specialized skills. Reading fiction represents a less formalized, yet potentially significant, mechanism for developing cognitive, communicative, and socio-emotional competencies. The purpose of this article is to systematize theoretical and empirical arguments regarding the influence of fiction reading on the components of human capital. The methodological basis of the study consists of an analysis and synthesis of scientific literature, a comparative analysis of empirical research results, and a conceptual synthesis. It is shown that regular reading of fiction is associated with the development of reading literacy, vocabulary, the ability to interpret complex texts, imagination, reflection, and social understanding.*

Keywords: *human capital, fiction, reading, reading literacy, cognitive skills, social skills, empathy, education, human potential.*

Введение. Концепция человеческого капитала занимает центральное место в современной экономической теории образования и развития. В классической экономической традиции человеческий капитал рассматривается как совокупность знаний, навыков и способностей, которые формируются в процессе инвестиций в человека и впоследствии повышают его производительность и экономические возможности. Г. Беккер показал, что инвестиции в образование и профессиональную подготовку могут рассматриваться как форма вложений в человеческий капитал, поскольку они способны увеличивать производительность труда и доходы человека [1]. В современной трактовке Всемирного банка человеческий капитал включает знания, навыки и здоровье, которые человек накапливает в течение жизни и которые позволяют ему реализовывать производительный потенциал [2].

В условиях перехода к экономике знаний значение человеческого капитала постоянно возрастает. Работник современного общества должен обладать не только профессиональными знаниями, но и широким комплексом универсальных компетенций: способностью анализировать информацию, критически мыслить, эффективно взаимодействовать с другими людьми, адаптироваться к изменениям, самостоятельно обучаться и принимать решения в условиях неопределённости. Следовательно, процесс накопления человеческого капитала не ограничивается периодом получения формального образования. Он продолжается на протяжении всей жизни посредством различных форм обучения и самообразования.

Одним из доступных механизмов такого самообразования является чтение. При этом особое место занимает художественная литература, поскольку она отличается от учебной и специализированной литературы характером когнитивного взаимодействия читателя с текстом.

Исследования в области образования подтверждают наличие связи между практиками чтения и образовательными результатами. OECD(Организация экономического сотрудничества и развития (сокр. ОЭСР; англ. Organisation for Economic Co-operation and Development,OECD;) указывает, что читательская грамотность включает способность понимать, использовать, оценивать и осмысливать тексты для достижения личных целей, развития знаний и участия в жизни общества [3]. Данные PISA также свидетельствуют о положительной связи между удовольствием от чтения и результатами по читательской грамотности после учёта социально-экономических характеристик учащихся и пола [4].Особый интерес представляет вопрос о том, какие именно компоненты человеческого капитала могут развиваться посредством художественного чтения. В данном случае можно выделить как минимум четыре взаимосвязанных направления. Во-первых, чтение способствует накоплению когнитивного капитала: расширяет словарный запас, тренирует понимание сложных текстов, развивает способность концентрировать внимание, анализировать информацию и строить смысловые связи. Во-вторых, художественная литература может способствовать формированию социально-коммуникативных компетенций. В процессе чтения человек знакомится с различными моделями поведения, социальными ролями и жизненными ситуациями, что потенциально расширяет его представления о других людях и социальных отношениях. В-третьих, чтение связано с развитием эмоционально-рефлексивных навыков. Переживание сюжетов и идентификация с персонажами могут стимулировать осмысление собственных эмоций и мотивов поведения других людей. В-четвёртых, художественная литература представляет собой элемент культурного капитала. Она знакомит человека с языком, историческими контекстами, культурными кодами и социальными нормами, что может повышать его способность ориентироваться в культурной и профессиональной среде. Таким образом, исследовательская проблема заключается в определении места художественного чтения в более широкой системе факторов накопления человеческого капитала.

Методы исследования и анализ литературы. Исследование носит теоретико-аналитический характер и основано на систематизации существующих научных представлений о человеческом капитале и результатах эмпирических исследований чтения.В качестве теоретической основы использована экономическая концепция человеческого капитала Г. Беккера, согласно которой образование, обучение и другие формы инвестиций в человека формируют продуктивные характеристики личности [1]. Дополнительно используется современный подход Всемирного банка, в соответствии с которым человеческий капитал представляет собой накопленные человеком знания, навыки и другие характеристики, определяющие его способность к продуктивной деятельности [2].

Методологически исследование опирается на следующие методы:

1.т**еоретический анализ.** Изучались основные положения теории человеческого капитала и современные подходы к определению образовательных и когнитивных компетенций.

2.Анализ научной литературы. Рассматривались результаты исследований, посвящённых связи между чтением, грамотностью, когнитивными способностями, эмпатией и социальным пониманием [5–9].

3. Сравнительный анализ. Сопоставлялись данные о чтении для удовольствия, чтении художественной литературы и результатах выполнения когнитивных и социальных тестов.**4. Концептуальный синтез.** На основе

рассмотренных источников была сформирована модель потенциального влияния художественного чтения на накопление человеческого капитала.

В рамках исследования под **чтением художественной литературы** понимается добровольное или образовательное обращение к романам, повестям, рассказам и другим литературным произведениям, в которых существенную роль играют повествование, персонажи, художественные образы и интерпретация человеческого опыта. Под **человеческим капиталом** понимается совокупность накопленных человеком знаний, навыков, когнитивных и социально-коммуникативных характеристик, которые могут повышать его способность к обучению, труду, взаимодействию с другими людьми и адаптации к социально-экономическим изменениям. Важно подчеркнуть, что в исследовании не предполагается наличие простой причинно-следственной зависимости вида «больше книг — выше человеческий капитал». Чтение является одним из элементов сложной системы факторов, включающей качество образования, семейную среду, социально-экономическое положение, индивидуальные способности, мотивацию и доступ к культурным ресурсам. Результаты исследования.Чтение как механизм накопления когнитивного капитала. **Первым и наиболее очевидным направлением** влияния художественной литературы является развитие когнитивных ресурсов личности. Чтение сложного текста требует активной интеллектуальной деятельности. В отличие от пассивного потребления коротких информационных сообщений, чтение романа предполагает удержание в памяти большого количества персонажей, событий, временных периодов и причинно-следственных связей. Читатель должен сопоставлять информацию, полученную в различных частях произведения, интерпретировать контекст и делать выводы на основании непосредственно не выраженных в тексте смыслов.Особое значение имеет развитие словарного запаса и языковой компетентности. Метаанализ S. Mol и A. Bus показал устойчивую связь между количеством контактов с печатными текстами и развитием языковых и читательских навыков в период от младенчества до ранней взрослости [5]. Это позволяет рассматривать регулярное чтение как накопительный процесс: каждая новая встреча с текстом расширяет языковой опыт человека, а накопленный опыт облегчает последующее восприятие более сложных текстов.

Следовательно, возникает механизм положительной обратной связи:

чтение → расширение словарного запаса → повышение качества понимания текста → снижение когнитивных затрат при чтении → возможность обращения к более сложным текстам → дальнейшее накопление знаний и навыков.

Именно этот механизм имеет непосредственное значение для человеческого капитала. Современный специалист практически в любой профессиональной сфере должен уметь работать с информацией: читать инструкции, научные публикации, нормативные документы, аналитические материалы, деловую переписку и цифровой контент. Поэтому высокий уровень читательской грамотности становится универсальным ресурсом, который переносится из образовательной сферы в профессиональную.

Данные OECD подтверждают важность данного положения. Читательская грамотность определяется как способность понимать, использовать, оценивать, осмысливать и взаимодействовать с текстами для достижения целей, развития знаний и участия в обществе [3]. Таким образом, чтение представляет собой не только культурную практику, но и базовую компетенцию человеческого капитала.

Художественная литература и способность к длительной концентрации.

Ещё одним потенциальным механизмом является развитие устойчивого внимания.Современная информационная среда характеризуется высокой скоростью смены сообщений и значительным объёмом кратких цифровых стимулов. В этих условиях способность длительное время работать с одним сложным объектом становится ценным когнитивным ресурсом.

Чтение художественного произведения требует продолжительного внимания. Для понимания сюжета недостаточно воспринимать отдельные предложения изолированно: необходимо удерживать общую структуру повествования. Особенно это характерно для романов с несколькими сюжетными линиями, ретроспективами, ненадёжным повествователем или сложной системой персонажей.В результате регулярное чтение может создавать условия для тренировки когнитивной выносливости. Хотя прямое отождествление чтения художественной литературы с тренировкой внимания было бы методологически некорректным, сама структура продолжительного чтения требует последовательного удержания цели и контроля понимания.С точки зрения человеческого капитала данный эффект важен потому, что способность концентрироваться связана с успешностью обучения. OECD отмечает, что учащиеся, активно вовлечённые в разнообразные формы чтения, с большей вероятностью являются эффективными обучающимися и демонстрируют более высокие образовательные результаты [6].Таким образом, художественное чтение может рассматриваться как один из элементов формирования привычки к самостоятельному и продолжительному интеллектуальному труду.

Чтение художественной литературы и социальное понимание

Особенность художественного текста заключается в том, что он предоставляет читателю доступ к внутреннему миру персонажей. В литературном произведении человек может наблюдать не только внешнее действие, но и мысли, эмоции, сомнения, намерения и противоречия героя.

Именно это обстоятельство стало основанием для гипотезы о влиянии художественной литературы на социальное познание.

D. Kidd и E. Castano в экспериментальном исследовании обнаружили, что чтение литературной художественной прозы было связано с более высокими результатами в заданиях, оценивающих способность понимать психические состояния других людей — так называемую Theory of Mind [7]. Авторы предположили, что сложная литературная проза может временно стимулировать процессы, связанные с пониманием перспективы другого человека.

Дополнительные исследования также обнаруживали связь между чтением художественных текстов, эмоциональным вовлечением и эмпатией. Например, P. M. Bal и M. Veltkamp показали в экспериментальных исследованиях, что влияние художественного текста на эмпатию зависело от степени эмоционального погружения читателя в историю [8].

Если рассматривать данные результаты через призму человеческого капитала, возникает следующий механизм: **литературный сюжет → моделирование чужого опыта → анализ мотивов и эмоций персонажей → развитие способности принимать альтернативную перспективу → улучшение социального взаимодействия.**

Однако данный вывод необходимо воспринимать с осторожностью.

Последующие попытки воспроизвести результаты Kidd и Castano дали смешанные результаты. В исследовании трёх предварительно зарегистрированных репликаций были получены неоднозначные результаты: две попытки не дали убедительного воспроизведения первоначального эффекта, тогда как одна репликация дала результат в ожидаемом направлении [9]. Следовательно, утверждение о том, что художественная литература автоматически повышает эмпатию или Theory of Mind, является чрезмерно сильным.Более корректным является вывод о потенциальном механизме: **определённые виды литературного чтения при определённых условиях могут создавать когнитивную среду для развития социального понимания**, однако величина и устойчивость такого эффекта зависят от типа текста, особенностей читателя и характера взаимодействия с произведением.

Чтение и культурный капитал. Художественная литература обладает также значением для формирования культурного капитала личности.

Человек, регулярно читающий литературу разных эпох и культур, получает возможность знакомиться с различными системами ценностей, социальными нормами, историческими обстоятельствами и способами интерпретации мира.

В данном контексте человеческий капитал пересекается с понятием культурного капитала. Литературная компетентность может облегчать коммуникацию в образовательной и профессиональной среде, поскольку человек приобретает более широкий набор культурных ориентиров и символических ресурсов.

Культурный капитал не сводится непосредственно к производительности труда. Однако он может косвенно воздействовать на неё посредством расширения социальных и коммуникативных возможностей личности.Например, человек, знакомый с различными культурными контекстами, может легче интерпретировать высказывания собеседника, понимать исторические и культурные отсылки, формулировать сложные мысли и адаптироваться к разнообразной социальной среде.Таким образом, художественная литература способствует накоплению не только «знаний о книгах», но и более широкого фонда культурных схем, которые могут использоваться в социальных взаимодействиях. Чтение для удовольствия как фактор образовательной траектории. Особое значение имеет мотивационная сторона чтения.

Исследования OECD показывают положительную связь между удовольствием от чтения и результатами читательской грамотности в странах и экономиках, участвовавших в PISA 2018 [4]. При этом характер взаимосвязи может быть двусторонним: хорошие читатели получают больше удовольствия от чтения, а удовольствие стимулирует дополнительную практику, которая, в свою очередь, способствует развитию навыков [4].

Возникает эффект накопления:интерес к чтению → увеличение объёма чтения → развитие навыков → повышение уверенности → ещё больший интерес к чтению.Данная закономерность имеет существенное значение для человеческого капитала, поскольку инвестиции в него являются не одноразовым событием, а продолжающимся процессом.

Если человек сохраняет привычку читать после завершения формального образования, он получает возможность самостоятельно приобретать новые знания и расширять интеллектуальный кругозор. В этом

отношении художественная литература может выполнять функцию «входной точки» в культуру постоянного самообразования.

Обсуждение. Полученные результаты позволяют предложить концептуальную модель роли художественного чтения в накоплении человеческого капитала.

Условно данную модель можно представить следующим образом:

а).Регулярное чтение художественной литературы

б).Языковое развитие и читательская грамотность

в).Когнитивные навыки: анализ, интерпретация, концентрация, формирование выводов.

Социально-эмоциональные процессы: перспектива другого, рефлексия, эмоциональное понимание

а).Культурная компетентность и коммуникативные возможности

б).Повышение способности к обучению и адаптации

в).Накопление человеческого капитала.

При этом необходимо разграничивать прямые и косвенные эффекты.

Наиболее убедительно подтверждается связь чтения с развитием грамотности и языковых навыков. Исследования показывают, что объём контакта с печатным текстом связан с развитием читательских и языковых компетенций [5], а OECD фиксирует положительную связь между удовольствием от чтения и результатами читательской грамотности [4].

Гораздо сложнее доказать непосредственное воздействие художественной литературы на экономические показатели человеческого капитала, например заработную плату или производительность труда. В отличие от формального образования, которое можно относительно легко сопоставить с годами обучения и экономическими результатами, эффект чтения трудно отделить от других факторов. Например, человек, который много читает, может одновременно иметь более высокий уровень образования, более обеспеченную семью, широкий доступ к культурным ресурсам и более высокую исходную мотивацию к обучению. Поэтому корреляция между чтением и успехом не означает автоматически, что именно чтение является единственной причиной наблюдаемого результата. Это особенно важно при анализе социально-эмоциональных эффектов. Первоначальное исследование Kidd и Castano получило заметный научный резонанс [7], однако последующие репликации показали смешанные результаты [9]. Поэтому научно обоснованной является не категоричная позиция о гарантированном развитии эмпатии посредством художественной литературы, а более осторожная гипотеза о том, что эмоционально и интеллектуально сложное чтение может создавать условия для тренировки перспективного мышления.С экономической точки зрения важен также вопрос об эффективности инвестиций. Чтение художественной литературы требует сравнительно небольших материальных ресурсов по сравнению с формальным образованием. При наличии библиотек, электронных каталогов и открытых образовательных ресурсов доступ к литературе может быть относительно дешёвым. При этом потенциальные эффекты чтения накапливаются во времени. Однако сама доступность книг ещё не гарантирует накопления человеческого капитала. Необходимо учитывать качество чтения. Поверхностное пролистывание текста, отсутствие понимания и низкая мотивация существенно отличаются от внимательного и рефлексивного чтения.

Следовательно, важным фактором является **читательская вовлечённость**. OECD подчёркивает значение не только способности читать, но и мотивации к чтению [6]. Поэтому образовательная политика должна стремиться не просто увеличивать количество обязательных литературных произведений, а формировать устойчивую внутреннюю мотивацию к чтению.

Особое значение это приобретает в детском и подростковом возрасте. Именно в этот период формируются привычки, которые могут сохраняться во взрослом возрасте. Если чтение воспринимается исключительно как обязательное школьное задание, его потенциал как самостоятельной формы обучения может снижаться. Напротив, сочетание обязательного знакомства с литературным каноном и возможности самостоятельного выбора произведений способно поддерживать читательскую мотивацию.С позиции накопления человеческого капитала целесообразно также расширять само понятие «результата чтения». Речь должна идти не только о количестве прочитанных книг. Более важными показателями могут выступать:

- способность понимать сложные тексты;
- способность аргументировать собственную позицию;
- богатство словарного запаса;
- способность интерпретировать неоднозначную информацию;
- умение рассматривать ситуацию с разных точек зрения;
- способность самостоятельно формулировать вопросы;
- интерес к дальнейшему обучению.

Таким образом, художественное чтение представляет собой не конечный продукт образования, а один из механизмов формирования способности к дальнейшему обучению.

Выводы. Проведённый анализ позволяет сделать вывод о том, что чтение художественной литературы может рассматриваться как значимый, хотя и косвенный, фактор накопления человеческого капитала.

Во-первых, регулярное чтение способствует развитию языковых и читательских компетенций. Расширение словарного запаса, совершенствование понимания текста и повышение способности работать со сложной информацией создают фундамент для последующего образования и профессиональной деятельности.

Во-вторых, художественная литература предоставляет возможности для развития когнитивных навыков. Работа с длительным и сложным повествованием требует концентрации внимания, удержания информации, установления причинно-следственных связей и интерпретации скрытых смыслов.

В-третьих, литературное чтение потенциально способствует развитию социального понимания. Погружение во внутренний мир персонажей может стимулировать способность рассматривать альтернативные точки зрения. Однако имеющиеся исследования социально-эмоциональных эффектов дают неоднозначные результаты, поэтому утверждать о гарантированном повышении эмпатии исключительно вследствие чтения художественной литературы преждевременно.

В-четвёртых, чтение способствует формированию культурной компетентности. Знакомство с различными историческими эпохами, социальными группами и культурными контекстами расширяет систему представлений человека о мире и может повышать качество его социальных коммуникаций.

В-пятых, художественная литература способна выполнять мотивационную функцию. Сформированная привычка читать для удовольствия может поддерживать непрерывное самообразование после завершения формального обучения. В условиях экономики знаний именно способность постоянно приобретать новые знания становится одним из важнейших элементов человеческого капитала.Таким образом, художественную литературу следует рассматривать не как альтернативу школьному или профессиональному образованию, а как его важное дополнение. Если формальное образование обеспечивает систематизированное приобретение знаний и профессиональных навыков, то художественное чтение создаёт пространство для развития языковой, когнитивной, культурной и социально-рефлексивной составляющих человеческого потенциала. Практическое значение данного вывода заключается в необходимости поддерживать культуру чтения в образовательных организациях, развивать библиотеки, обеспечивать широкий доступ к качественной литературе и создавать условия для самостоятельного выбора книг. При этом эффективность подобных мер следует оценивать не только по количеству прочитанных произведений, но и по изменениям в читательской грамотности, мотивации к обучению, способности работать с информацией и коммуникативных компетенциях. Перспективным направлением дальнейших исследований является проведение долгосрочных количественных исследований, позволяющих отделить эффект чтения от влияния семейного происхождения, уровня образования, социально-экономического статуса и индивидуальных способностей. Особенно важны лонгитюдные исследования, которые могли бы проследить, каким образом привычка к чтению художественной литературы в детстве и подростковом возрасте связана с образовательными и профессиональными результатами во взрослом возрасте.

В целом художественное чтение можно определить как форму относительно доступной инвестиции в человеческий капитал, эффект которой проявляется преимущественно через накопление когнитивных, языковых, культурных и социально-коммуникативных ресурсов личности.

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QORAQALPOQ XALQI BADIIY MEROSI HAMDA UNING YOSHLAR TAFAKKURI SHAKLLANISHI VA RIVOJLANISHIGA TA'SIR ETISHINING AMAL QILISH TENDENTSIYALARI

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Annotatsiya: *Maqolada qoraqalpoq xalqi badiiy adabiyotining bugungi taraqqiyot darajasini belgilaydigan qator omillar tahlil qilindi. Qoraqalpoq klassik adabiyoti vakillarining ijodida mehnatkash xalq orzu-istaklari, dardlari, hayot darajasi ochib berildi. Shuningdek, yoshlar tafakkuri shakllanishi va rivojlanishiga mutafakkir shoirlarning chuqur falsafiy fikrlar va ilmiy qarashlari tahlil qilindi.*

Kalit so'zlar: *Qoraqalpoq xalqi, badiiy meros, og'zaki ijod, din, Berdaq, Ajiniyoz, vatanparvarlik, mardlik, insonparvarlik, axloq.*

ТЕНДЕНЦИИ РЕАЛИЗАЦИИ ХУДОЖЕСТВЕННОГО НАСЛЕДИЯ КАРАКАЛПАКСКОГО НАРОДА И ЕГО ВЛИЯНИЯ НА ФОРМИРОВАНИЕ И РАЗВИТИЕ МЫШЛЕНИЯ МОЛОДЕЖИ

Аннотация: *В статье был проанализирован ряд факторов, определяющих современный уровень развития художественной литературы каракалпакского народа. В произведениях творческих деятелей каракалпакской классической литературы раскрывались чаяния, заботы и жизненный уровень трудящегося населения. Также были тщательно изучены глубокие философские мысли и научные взгляды поэтов-мыслителей на формирование и развитие мышления молодежи.*

Ключевые слова: *Каракалпакский народ, художественное наследие, фольклор, религия, Бердах, Ажинияз, патриотизм, мужество, гуманизм, мораль.*

TRENDS IN THE REALIZATION OF THE ARTISTIC HERITAGE OF THE KARAKALPAK POPULATION AND ITS INFLUENCE ON THE FORMATION AND DEVELOPMENT OF YOUTH THINKING

Abstract: *The article analyzed several factors that determine the current level of development of Karakalpak literature. In the works of creative figures of Karakalpak classical literature, the aspirations, concerns, and living standards of the working population were revealed. The profound philosophical thoughts and scholarly views of thinker-poets on the formation and development of young people's thinking were also thoroughly studied.*

Keywords: *Karakalpak people, artistic heritage, folklore, religion, Berdakh, Ajiniyaz, patriotism, courage, humanism, morality.*

KIRISH.

Qoraqalpoq xalqining badiiy merosi yoshlar tafakkurini shakllantirish va rivojlantirishda eng muhim ma'naviy manbalardan biri bo'lib xizmat qiladi. Bu meros yosh avlodda vatanparvarlik, mardlik, insonparvarlik va yuksak axloq tuyg'ularini uyg'otishda beqiyos kuchga ega.

Qoraqalpoq xalq og'zaki ijodiyotida inson-tabiat, inson-jamiyat munosabatlarining barcha qir-sirlari, ilm-fan, texnika taraqqiyotini belgilab bergan gipotezalar, xayol-orzulari, jamiyatda qabul qilingan axloqiy talablari yorqin aks ettirilgan. Maqol-matallar, xalq qo'shiqlari, ertaklar, tez aytishlar, dostonlar, qahramonlik dostonlari, aytishmoq, jumboqlar, termalar ajdoddan-avlodga o'tib kelgan. Har bir kelgusi avlod uning mazmuni na, turlariga o'z hissasini qo'shib, boyitib borgan. Shuning uchun ham biz xalq og'zaki ijodiyoti har bir xalqning mentalitetini, qadriyatlarini aks ettiradigan manba deb bilamiz.

Har bir xalqning badiiy merosi avvalo o'z milliy ildizlariga yani tili, urf-odat va an'analariga ega bo'ladi. Lekin u yuksalgani sari butun insoniyat uchun qadrli bo'lgan ezgulik, sevgi, adolat kabi mavzularni ifodalaydi.

Qoraqalpoq xalqi badiiy adabiyotining bugungi taraqqiyot darajasini belgilaydigan qator omillar mavjuddir. Bu omillardan biri qoraqalpoq xalqining adabiy merosidir. Ma'lumki, qoraqalpoq klassik adabiyoti vakillarining ijodida mehnatkash xalq orzu-istaklari, dardlari, hayot darajasi aks etdi.

XIX asrda dongi chiqqan shoir, yozuvchilari shu xildagi xalq ijodidan bahramand bo‘lganlar va ular traditsiyalari asosida ijodga birinchi qadam qo‘yganlar. Qoraqalpoq xalqi klassik adabiyotining vakillari Jiyen jirov, Kunxo‘ja, Berdaq va Ajiniyoz ijodining bir qirrasi bilan o‘tmish yozma adabiyoti traditsiyalari zamirida tursa, ikkinchi bir qirrasi bilan xalq og‘zaki ijodi an’analari zaminida turdi.

ADABIYOTLAR TAHLILI.

Taniqli rus yozuvchisi M.Gorkiy o‘z maqolalarining birida shunday deydi: «xalq faqatgina barcha moddiy boyliklarni yaratuvchi kuch bo‘lib qolmasdan, u – ma’naviy boyliklarning yagona va tuganmas manbai, vaqt bo‘yicha ham birinchi, ijodining go‘zalligi va donoligi bo‘yicha – faylasuf va shoir, barcha buyuk poemalarni, erning barcha tragediyalarini va ularning eng buyugi – butun dunyo madaniyati tarixini yaratgan ham o‘sha» [2, 48].

Qoraqalpoq xalqining buyuk shoiri Berdaq baxshi va shoir jo‘da ko‘p dostonlarni yod bilganlar va ularni katta to‘y-yig‘inlarda ijro qilganlar. Bu dostonlarning aksariyati qahramonlik, odamiylik ruhida yaratilgan bo‘lib, xalq ommasini vatanparvarlik, insonparvarlik, gumanistik ruhda tarbiyalashda katta ahamiyatga ega bo‘lgan.

Halq qo‘shiqlar, ertaklar, maqol-matallar, «Qirq qiz», «Qo‘blan», «Alpomish» kabi xalq dostonlari – bularning aksariyati asosan xalqning donoligini, istak orzularini ko‘rsatadigan xalq ijodining boy xazinasi. «Masalan, Berdaq o‘zining eng yaxshi poemalari: «Ahmoq podsho», «Aydos biy», «Shajara» va boshqalarini fol’klordan foydalanib yaratganlar» [1, 10].

Qoraqalpoq xalq dostoni «Qirq qiz» da qizlarning nafaqat go‘zal va oqila, balki yurt himoyasiga tayyor mard qahramonlar bo‘la olishini ko‘rsatadi. U yoshlarda milliy g‘urur va jasoratni shakllantiradi. Qoraqalpoq xalqi or-nomus tushunchasini juda yuksak baholaydi. Odamgarchilikning asosiy xususiyatlaridan biri – oriyatiga dog‘ tushirmaslik. Berdaq hech vaqt og‘ir turmush azobiga, qayg‘usiga berilib, mung‘aymaydi. «Shayır oylan hár sóz ushın, sárdar bolǵıl mártler ushın» (Shoir o‘yla har so‘z uchun, sardor bo‘lgil mardlar uchun), deb eli uchun joni fido mard yigitlarning ko‘p bo‘lishini orzu qiladi va buni yoshlarga maslahat beradi.

Shoirning «Aydos baba» dostonida ham mardlikni, va’daga vafodorlikni, to‘g‘ri so‘zli bo‘lishni qo‘llab, «Márt bolǵan wádede turar, Sózin buzǵandı ant urar» (Mard bo‘lgan va’dada turar, so‘zini buzganni ont urar), deya yaxshilarning o‘z so‘zida turishini, va’da bersa bajarishini, shundagina obro‘ga ega bo‘lishini ko‘rsatib, mardlikka chaqirganini ko‘ramiz» [3, 116].

Shoir asarlarida botirlarni xalqimizning og‘zaki ijodiyotidagi dostonlarda kuylagan mardlarga taqabbil ta’riflangan «Góruǵlı bektey er edi, Qatarda qosa nar edi, Tolı jurtqa dárkar edi» (Go‘ro‘g‘li bekdek er edi, qatorda qo‘sha nor edi, to‘la yurtga darkor edi), deb ko‘rsatib o‘tadi» [3, 126].

Maqol va matallar ajdodlarning ko‘p yillik hayotiy tajribasini qisqa va lo‘nda shaklda yetkazadi. Ular yoshlarning nutqini boyitadi va tezkor qaror qabul qilishda mantiqiy asos bo‘ladi.

Berdaq xalq orasida sevimli qo‘shiqlaridek tarqab ketgan Jirenshe chechan meroslarini asl marjondek qadrlab o‘rgangan, o‘zlashtirgan. Berdaq uchun notiqlik, gapdonlik, gapga chechanlik yuksak fazilat bo‘lib, u «jaqsını pám áyle sóylegen sózden» (yaxshini fahmla so‘zlagan so‘zidan), aqlni shakllantirishda hayot donoliklarini katta ahamiyatga molik deb hisoblanadi.

Shoir odamning aqlliligini uning bilimliligi bilan bog‘lab, «Oylı jigit jaqsı bilimpaz keler, aytqan gáplerińe túsimpaz keler» (Uyli yigit yaxshi bilimpoz kelar, aytgan gaplaringa tushunuchan kelar), deb ta’kidlaydi. Shoir to‘g‘ri dialektik tafakkurning rolini tegishli darajada yuqori qo‘yadi. «Jaqsıraq» degan qo‘shig‘ida aql va o‘yning ahamiyatini «Tereń aqıl kerek sózin dizbege, tınıq qıyal kerek bárin sezbege» (Teran aql kerak so‘zini tizmaga, tiniq xayol kerak barchasini sezmaga), deb tasdiqlaydi. [4, 53].

Berdaq poeziyasi ilm-ma’rifat, insoniylik va go‘zallikni kuylaydi. Uning she’rlari yoshlarni ilm olishga va ichki dunyosini boyitishga undaydi.

Shunday qilib, Berdaqning falsafiy, ijtimoiy, siyosiy, axloqiy va estetik qarashlarina e’tibor qaratsak, XIX asrdagi qoraqalpoq badiiy adabiyotini ilmiy va ijtimoiy-falsafiy tafakkurning cho‘qqisi bo‘lgan uning ijodi katta ahamiyatga molik ekanligini ko‘rsatadi.

Xalqning dini, e’tiqodi bilan qarashlari uning tarixiga, ma’naviy, madaniy, siyosiy hayotiga katta ta’sir qiladigan omildir. Din tarixini bilmaguncha muayyan hududning, xalqlarning hayotini, turmushini, madaniy borlig‘ining sirlarini chuqur anglab etish mumkin emas. Ya’ni, milliy madaniyatning, uning mentaliteti bilan dunyoqarashini bilish uchun diniy e’tiqodlarini chuqur tadqiq qilish zarur.

Xalqimiz tarixida uning dunyoqarashi va madaniy mentaliteti shakllanishida islom dinining roli juda yuqori bo‘ldi. O‘tmishdagi qaysi shoirni olmaylik uning ijodida diniy qarashlar hukmronlik qildi. Bu ularning bilimdonligini ko‘rsatdi va xalqning ongiga mos kelib, uning uzoq saqlanib qolishiga asos bo‘ldi. Bu masalada Ajiniyoz etuk ilohiyotchi - oxun sifatida xizmat etdi. Masalan, u odamning paydo bo‘lishi haqida:

Qudrat kuchlidir, nima qilsa Subxon?

Ko‘kdan so‘ng yaratdi tuproqdan inson.

deb ko‘rsatadi.

Insonning insonga ibrati, tarbiyadagi ta’sirini uning o‘zi baholay olmaydi, balki boshqa inson baholaydi. Demak, qadriyat sifatidagi inson ta’sirida uning qadri, ahamiyati namoyon bo‘ladi, boshqa kishi esa ana shu bevosita ta’sir natijasida uning ahamiyatini baholaydi. Qadriga baho beradi [5, 707].

Ajiniyoz o‘z asarlarida inson qadr-qimmatini yuqori cho‘qqiga ko‘targan. Ajiniyozning she’rlarida chuqur falsafiy fikrlar va ilmiy qarashlar ustuvorlik qiladi.

Vatan tuyg‘usini xalqning an’analaridan, ruhiy xususiyatlaridan kelib chiqqan mentalitetiga bog‘liq bo‘lib, bunga Ajiniyoz shoir: «Har kim o‘z yurtida tengi tusda, Yigit qadri bo‘lmas eldan ayrilsa», - degan oqilona xulosa chiqaradi.

Qoraqalpoq xalqi nodonlikni qoralab, o‘z-o‘zini bilishni, egallashni, ma’noli bo‘lishni, mazmunli gapirishni asosiy muhim masala sifatida ko‘tarib, nasihat berib, «haddingdan oshma», «haddinga boq», deb o‘rgatib, o‘zingni bil, «ko‘rpanga qarab oyoq uzat» degan talablarni kundalikli tarbiyada foydalanib o‘tirgan. «Ayoz holingni bil, qumursqa yo‘lingni bil» degan shundan kelib chiqqan.

Ajiniyoz shoir ham manmanlikni qoralaydi. Uni fikricha manmanlik -odamni qadrsizlantiradi. U qadr-qimmatni unuttiradi va kulfatga olib kelishini quydagicha tushuntiradi:

«Qasqaldaqqa bir aǵarı may pitse,
Ǵarqıldasıp qonar kólin tanımas.
Patshanıń dáwleti qaytayın dese,
Kózine may pitip elin tanımas» [6, 52].
(«Qashqaldoqqa bir og‘ari yog‘ bitsa,
G‘arqillashib qo‘nar ko‘lin tanimas.
Podshoning davlati qaytay desa,
Ko‘ziga yog‘ bitib elin tanimas»).

TAHLIL VA NATIJALAR. Demak, yuqorida keltirilgan ta’riflardan kelib chiqib fikr yuritadigan bo‘lsak, «Alpomish» va «Qo‘blan» dostonlari yosh yigitlarni el-yurtga sodiqlik, do‘stlikka vafodorlik va adolat uchun kurashish ruhida tarbiyalaydi. Natijada yoshlar bu qahramonlardan o‘rnak olib, hayotdagi qiyinchiliklardan qo‘rqmaslikni va mas’uliyatni o‘z zimmasiga olishni o‘rganadilar.

Qoraqalpoq xalq og‘zaki adabiyoti bilan o‘tmishdagi yozma yodgorliklaridan sug‘orilgan ilg‘or xalq an’analari va Sharq mutafakkirlarining tanlangan asarlaridan tasirlangan Ajiniyoz va Berdaqning asarlari nafaqat qoraqalpoq xalqi madaniyatida, balki butun Markaziy Osiyo xalqlari madaniyatida muhim bo‘lib, yoshlarning falsafiy dunyosini boyitishga katta hissa qo‘shadi.

XULOSA

Qoraqalpoq badiiy merosi shunchaki o‘tmish yodgorligi emas. U bugungi kunda yoshlarni yot g‘oyalar va «ommaviy madaniyat»ning salbiy ta’siridan himoya qiluvchi kuchli ma’naviy qalqondir. Bu merosni o‘rganish orqali yoshlar mustaqil fikrlaydigan, o‘zining o‘tmish tarixini qadrlaydigan va kelajakka sog‘lom dunyoqarash bilan qaraydigan shaxslar bo‘lib etishadi.

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IJTIMOIY RIVOJLANISH KONSEPSIYALARINI TAHLIL QILISHDA XOLISTIK VA INTEGRATIV YONDASHUVLAR

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Annotatsiya: *Mazkur maqolada ijtimoiy rivojlanish konsepsiyalarini tahlil qilishda xolistik, parsial va integrativ yondashuvlarning metodologik imkoniyatlari o‘rganiladi. Butun va qism munosabati, ijtimoiy tizimning ko‘p qatlamli tuzilishi, alohida sohalar dinamikasi hamda ularni yagona konseptual modelda sintezlash masalalari tahlil qilinadi. Postindustrial jamiyat va ma’naviy-ekologik sivilizatsiyaga oid qarashlar integrativ yondashuvning amaliy-nazariy ifodasi sifatida ko‘rib chiqiladi. Tahlillar asosida ijtimoiy rivojlanishni bir sohaning ustuvorligi orqali emas, iqtisodiy, texnologik, ijtimoiy, ma’naviy va ekologik omillarning o‘zaro ta’siri asosida anglash metodologik jihatdan samarali ekani asoslanadi.*

Kalit so‘zlar: *Ijtimoiy rivojlanish, xolizm, parsializm, integrativ yondashuv, butun va qism, postindustrial jamiyat, axborot jamiyati, ma’naviy-ekologik sivilizatsiya, ijtimoiy tizim, metodologiya.*

ХОЛИСТИЧЕСКИЙ И ИНТЕГРАТИВНЫЙ ПОДХОДЫ В АНАЛИЗЕ КОНЦЕПЦИЙ СОЦИАЛЬНОГО РАЗВИТИЯ

Аннотация: *В данной статье исследуются методологические возможности холистического, парциального и интегративного подходов в анализе концепций социального развития. Анализируются соотношение целого и части, многоуровневая структура социальной системы, динамика отдельных сфер, а также вопросы их синтеза в единой концептуальной модели. Представления о постиндустриальном обществе и духовно-экологической цивилизации рассматриваются как практико-теоретическое выражение интегративного подхода. На основе проведенного анализа обосновывается методологическая эффективность понимания социального развития не через приоритет одной сферы, а через взаимодействие экономических, технологических, социальных, духовных и экологических факторов.*

Ключевые слова: *социальное развитие, холизм, парциализм, интегративный подход, целое и часть, постиндустриальное общество, информационное общество, духовно-экологическая цивилизация, социальная система, методология.*

HOLISTIC AND INTEGRATIVE APPROACHES IN THE ANALYSIS OF SOCIAL DEVELOPMENT CONCEPTS

Abstract: *This article examines the methodological potential of holistic, partial and integrative approaches in the analysis of social development concepts. It considers the relationship between the whole and its parts, the multi-layered structure of the social system, the dynamics of particular spheres, and the problem of synthesising them within a single conceptual model. Views on post-industrial society and on spiritual-ecological civilisation are treated as a practical and theoretical expression of the integrative approach. On the basis of the analysis, it is argued that it is methodologically more effective to understand social development not through the primacy of a single sphere, but through the interaction of economic, technological, social, spiritual and ecological factors.*

Keywords: *social development, holism, partialism, integrative approach, whole and part, post-industrial society, information society, spiritual-ecological civilisation, social system, methodology.*

Kirish va mavzuning dolzarbligi. Ijtimoiy rivojlanish konsepsiyalarini baholashda jamiyatni qanday metodologik birlik sifatida tasavvur qilish masalasi hal qiluvchi ahamiyatga ega. Agar ijtimoiy voqelik faqat alohida sohalar yig‘indisi sifatida qaralsa, iqtisodiy, siyosiy, texnologik va ma’naviy o‘zgarishlar o‘rtasidagi murakkab bog‘lanishlar yetarlicha ochilmay qoladi. Rivojlanish kategoriyasining o‘zi ham dinamik jarayonlarni yo‘nalgan va qonuniyatli o‘zgarish sifatida ko‘rishni talab qiladi. Shu nuqtai nazardan, xolistik va integrativ yondashuvlar zamonaviy ijtimoiy rivojlanish konsepsiyalarining ichki mantig‘ini, ularning elementlari o‘rtasidagi munosabatni va konsepsiyaning umumiy

metodologik imkoniyatlarini aniqlash uchun alohida ahamiyat kasb etadi. Ayniqsa, postindustrial va ma'naviy-ekologik modellarda turli sohalarning o'zaro ta'siri kuchayishi integrativ tahlilning dolzarbligini yanada oshiradi[41].

Mavzuga oid adabiyotlarning tahlili. Xolizm va parsializm munosabati ijtimoiy-falsafiy metodologiyada butun va qism muammosi bilan uzviy bog'liq. 1973 yilda D. Bell postindustrial jamiyat nazariyasida bilim va axborotning ishlab chiqarish hamda ijtimoiy boshqaruvdagi rolini yangi bosqichda talqin qildi. 1991 yilgi «Sovremennaya zapadnaya filosofiya» nashrida yaxlitlik va differensiatsiya munosabati ijtimoiy tizimlarni tushuntirishning muhim metodologik sharti sifatida ko'rib chiqiladi. 1993 yilda L. P. Karsavin va 1995 yilda G. S. Pomerans rivojlanishni potensial mazmunning ochilishi, yangi shakllarning yuzaga kelishi va jarayonning ichki ko'p qatlamliligi bilan bog'laydilar. 1994 yilgi L. V. Fasenkova tadqiqoti hamda 1999 yilgi G. Spenser nashri ijtimoiy tizimlarda differensiatsiya va integratsiyaning o'zaro aloqasini tushunish uchun nazariy asos beradi. 1999 yilda O. S. Razumovskiy optimologiya doirasida xolizmning nisbiy, organizmik va agnostik ko'rinishlarini ajratib, butunlikni anglashda turli metodologik pozisiyalarni tavsiflaydi. 2001 yilda V. T. Pulyayev va N. V. Shelepin ijtimoiy qadriyatlarni jamiyatning g'oyaviy va ijtimoiy tuzilmalari bilan aloqadorlikda tahlil qildilar. Shu yilda A. Zinovyev axborot va mantiqiy-sosiologik munosabatlarni zamonaviy jamiyat dinamikasi bilan bog'ladi. A. V. Ivanov, I. V. Fotiyeva va M. Yu. Shishin esa ma'naviy-ekologik sivilizatsiya konsepsiyasi orqali ijtimoiy, ma'naviy va ekologik omillarni yaxlit modelda birlashtirishga intildilar. Mazkur manbalarning xronologik tahlili ijtimoiy rivojlanish konsepsiyalarini tadqiq qilishda alohida omillar ahamiyatini inkor etmagan holda, ularning umumiy tizimdagi o'rni va o'zaro ta'sirini birgalikda ko'rib chiqish zaruratini ko'rsatadi.

Tadqiqot metodologiyasi. Tadqiqotda tizimli va kompleks yondashuv, analiz va sintez, qiyosiy tahlil, tuzilmaviy-funksional yondashuv hamda konseptual umumlashtirish usullaridan foydalanildi. Xolistik va parsial yondashuvlar butun va qism munosabati, ijtimoiy sohalar mustaqilligi va o'zaro bog'liqligi, rivojlanish omillarining iyerarxiyasi hamda konsepsiya elementlarini integratsiyalash imkoniyati asosida qiyoslandi.

Tahlil va natijalar.

Ma'lumki, ijtimoiy rivojlanish masalasi kishilik sivilizatsiyasi taraqqiyotining dastlabki bosqichlaridanoq falsafiy mushohada markazida turgan. Mazkur masala dunyoqarashning turli tarixiy shakllarida ijtimoiy rivojlanish qonuniyatlarini aniqlash, taraqqiyotni davrlashtirish, kishilik jamiyatining istiqbol mo'ljallarini belgilash va kelajakni prognozlashga da'vo qiluvchi konsepsiyalar doirasida ko'rib chiqilgan. Bunday konsepsiyalar yaratishga urinishlarni mifologik dunyoqarashdan tortib bugungi ssiyentistik tafakkur paradigmasigacha bo'lgan uzoq tarixiy jarayonning deyarli har bir bosqichida kuzatish mumkin. Garchi mazkur konsepsiyalar nazariy-metodologik jihatdan universallik, yaxlitlik, ko'p yoqlamalik va tugallanganlikka da'vo qilsa-da, tarixiy tajriba ularning har biri muayyan davrdan so'ng o'z o'rnini muqobil yondashuvlarga bo'shatib berganini ko'rsatadi. Gesiodning «Siklik taraqqiyot» nazariyasi, Geraklit va Empedoklning siklik qarashlari, Ibn Xaldun qarashlari, Patrisiy va Polibiy nazariyalari, Gegel dialektikasi, Marksning formasion yondashuvi, F. Fukuyamaning tarix intihosi konsepsiyasi, Xantingtonning «Sivilizatsiyalar to'qnashuvi» konsepsiyasi, modernizatsiyaning turli nazariyalari, virtual jamiyat, postmodernizm va globalizm nazariyalari shular jumlasidandir. Ijtimoiy rivojlanish fenomenini tushuntirishga qaratilgan konsepsiyalar metodologik bazasining mustahkamligi, nazariy izchilligi va ta'limot sifatida yaxlit tuzilma hosil qilganiga qaramay, real voqelikda makon va zamon nuqtai nazaridan cheklanganlikni namoyon qilishi tabiiy hol. Nazariya va amaliyot o'rtasidagi bunday nomutanosiblikni turli sabablar bilan izohlash mumkin. Biroq muayyan tarixiy davr va sosio-madaniy muhit doirasida yaratilgan konsepsiyalarning makon va zamon nuqtai nazaridan universallikka da'vo qilishi mazkur nomutanosiblikni keltirib chiqaruvchi muhim omillardan biri hisoblanadi. Qolaversa, istiqbol taraqqiyot mo'ljallarini belgilashda faqat o'tmishning empirik faktlariga tayanish ham hal qiluvchi sabablardan biri sanaladi. Shundan kelib chiqqan holda, ijtimoiy rivojlanishning zamonaviy konsepsiyalarini nazariy jihatdan ishlab chiqish va joriy qilishda universalizm va differensializm tamoyillariga tayanish, shuningdek, xronologik va lokal xususiyatlarni hisobga olish zarur.

Yuqoridagi mulohazalar tahlilidan kelib chiqqan holda sosiogenezni yaxlit holda tushuntirishga qaratilgan ijtimoiy rivojlanish konsepsiyalari hamda bunday konsepsiyalarni ishlab chiqishda integrativ va differensial yondashuvni qo'llash borasidagi metodologik imkoniyatlarni ko'rib chiqish zarurati yuzaga chiqadi.

Ijtimoiy rivojlanish konsepsiyalarini tahlil qilishga qaratilgan tadqiqotlarda kategoriyaviy jihatdan yaxlitlik, ko'p yoqlamalik xususiyatlari xolizm tamoyili, bo'lak va biryoqlamalik xususiyatlari esa parsializm tamoyilining mazmuniga kiruvchi belgilar sifatida ko'rsatiladi. Shu ma'noda ular mos ravishda mazmunan ayniy tushunchalar sifatida qo'llaniladi.

Xolizm (yunoncha «holos» — yaxlit, butun) metodologik yondashuv sifatida olamni uning barcha aloqalari, sifatlari va tashkillanish dinamikasi, shuningdek, yuqori psixologik-kognitiv darajadan tortib quyi fizik-kimyoviy darajalargacha bo'lgan tuzilishi bilan birgalikda yagona, yaxlit tarzda ko'rib chiqishga urinishni anglatadi. Xolizm tamoyilining keng iste'molga kirib kelishi tabiiy ravishda nazariy bilish sohasida qism va butunning o'zaro munosabatini, butunni qismlarga ajratish hamda qismlarni butunga birlashtirishni tushuntiruvchi analiz va sintez singari metodologik konsepsiyalarning

[41] Абушенко В. Л. Развитие // Новейший философский словарь / Сост. А. А. Грицанов. - Мн.: Изд. В. М. Скакун, 1998. С. 562;

shakllanishiga olib keldi. Parsializm ana shunday metodologik konsepsiyalardan biri bo‘lib, unda qismning hal qiluvchi roliga alohida urg‘u beriladi. Vujudga kelishiga ko‘ra, parsializm atomizm va elyementarizm, shuningdek, olamning diskretligi g‘oyasi bilan uzviy aloqadorlik kasb etadi. Huquqshunoslik metodologiyasi nuqtai nazaridan esa parsializm tushunchasi o‘z mazmunida xususiy holatni bo‘rttirib ko‘rsatish, noto‘liqlik, masalani bir yoqlama ko‘rib chiqish kabi belgilarni aks ettiradi. Ijtimoiy rivojlanish konsepsiyalari tahlili nuqtai nazaridan parsializm xususiylikni bo‘rttirish, biryoqlamalik va noob’yektivlik, xolizm esa yaxlitlik, ko‘p yoqlamalik va ob’yektivlik ma’nolarida tavsiflanadi[42].

Qism va butun, mos ravishda, xolizm va parsializmning o‘zaro mutanosibligi masalasi V.S.Barulin, M.Ya.Bobrov, M.A.Kuznesova, I.I.Prigojin, O.S.Razumovskiy, V.N.Filippov singari olimlarning tadqiqotlarida alohida ko‘rib chiqilgan. Jumladan, O.S.Razumovskiy ijtimoiy rivojlanish konsepsiyalari tahlili nuqtai nazaridan birmuncha samarador bo‘lgan xolizmning uch turini ajratib ko‘rsatadi[43].

Parsializm bilan aloqador tarzda qaraluvchi nisbiy xolizm. Unga ko‘ra, butun qismlar yig‘indisi sifatida namoyon bo‘ladi.

Organizmik talqindagi mutlaq xolizm. Unga ko‘ra, butun qismlar yig‘indisidan kattaroq bo‘lib, qismlar yig‘indisi butun bilan aynanlashtirilmasligi lozim.

Agnostik, personalistik va mistik xolizm. Unga ko‘ra, yaxlitlikni bilish imkonsiz bo‘lib, inson shaxsiyati organik yaxlitlikning eng yuqori shakli hisoblanadi[44].

Ijtimoiy rivojlanish konsepsiyalari tahlilida xolizmning ikkinchi turini qo‘llash metodologik jihatdan birmuncha samarador hisoblanadi. Ammo mazkur tahlil jarayonida xolizmning nisbiy xarakteri hamda butun va qismning o‘zaro mutanosibligi masalalarini nazardan soqit qilish ham metodologik yanglishishlarni yuzaga keltirishi mumkin.

Organizmik talqindagi mutlaq xolizmni ijtimoiy rivojlanish konsepsiyalarini tushuntirish metodologiyasi sifatida baholash aslo olam yaxlitligini unga nisbatan zaifroq deb qaraluvchi qismlari, aloqalari, darajalari dinamikasiga nisbatan mutlaqlashtirish hisobiga amalga oshirilmasligi lozim. Organizmik xolizmga ko‘ra, metodologik soddalashtirish nuqtai nazaridangina, yaxlit olamga nisbatan uning qismlari, aloqalari darajalari va dinamikasi ikkilamchi xarakter kasb etadi deb qaraladi. Agar mazkur metodologik yondashuv mantig‘iga tayanilsa, inson olamning boshqa qismlariga nisbatan birmuncha murakkab va ko‘p qirrali tizim bo‘lishiga qaramay, u ham ayni yaxlitlikning qismi sifatida tushuntiriladi.

Ijtimoiy rivojlanish konsepsiyalariga tatbiqan integrativ yondashuvga ko‘ra, «ijtimoiy soha o‘zining ijtimoiy munosabatlar, ularning tuzilmasi va dinamikasi, ijtimoiy taraqqiyot hamda uning istiqbollari, insonning jamiyat hamda atrof-muhitga munosabati kabi ko‘plab aspektlari bilan birgalikda tahlil etilishi» lozim[45].

Integrativ yondashuv nuqtai nazaridan tahlil qilinganda, ijtimoiy rivojlanish konsepsiyalarining yaxlitlik va alohidalik xususiyatlari yaqqol namoyon bo‘lib, ularning elementlarini o‘zaro uyg‘un tarzda sinkretlash imkoniyati yuzaga keladi. Ana shunday konsepsiyalardan biri sifatida postindustrial nazariyani keltirib o‘tish mumkin.

Postindustrial jamiyat tushunchasi dastlab D.Bell tomonidan ilmiy iste’molga kiritilgan bo‘lsa-da, keyinchalik jahon va yurtimizning yetakchi tadqiqotchilari tomonidan ko‘plab marta tadqiq etilgan. Mazkur konsepsiya borasidagi tadqiqotlar natijalarini umumlashtirib, soddaroq qilib aytganda, postindustrial jamiyatning genezisi undan avval amal qilgan industrial jamiyatning sifatiy jihatdan transformatsiyasi oqibatida ro‘y bergan. Mazkur paradigma asosida ilgari surilgan nazariyalarda sanoatlashgan jamiyat fenomenining shakllanish jarayonlarini tushuntirishda ilmiy-texnik yutuqlarning keskin sakrashlar asosidagi taraqqiyoti, bunday yutuqlarning ijtimoiy hayot sohasiga implementatsiyasining lokal tamaddunlar sosio-madaniy muhitlariga transferlanishi kabi tushuntirish omillari determinantlar sifatida belgilab olinadi. Shuningdek, texnik inqilob natijasida saqlash va qayta ishlash vositalari tobora arzonlashib boradigan axborot mazkur jamiyatdagi eng qimmat tovarga aylanib borgani uchun ham u axborot jamiyati deb ham ataladi[46].

Industrial jamiyatda ishlab chiqarishning moddiy-texnik vositalari iqtisodiyotning asosini tashkil qilgan bo‘lsa, postindustrial jamiyatda ayni vazifani axborot va axborot texnologiyalari bajaradi.

Axborot jamiyatida bilim shaklidagi axborot nafaqat iqtisodiy va texnik innovatsiyalar uchun, balki siyosiy shakllanish uchun ham poydevor bo‘lib xizmat qiladi. Bu tendensiya iqtisodiy sohada sanoat ishlab chiqarishning asosiy iqtisodiy faoliyat turi sifatida hal qiluvchi ahamiyatini yo‘qotib borishida namoyon bo‘ladi. Zero, axborotlashgan jamiyat hayotida xizmat ko‘rsatish va axborot ishlab chiqarish sohalarining jadallik bilan taraqqiy etishi sanoat ishlab chiqarish sohasining ikkinchi darajali pozisiya kasb etishiga sabab bo‘ladi. Jamiyatda deindustrializatsiya tendensiyasining kuchayishi tabiiy ravishda ommaviy iste’molchilik jamiyati shakllanishiga olib keladi.

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[42] Разумовский О.С. Оптимология. 4.1. Общенаучные и философско-методологические основы. - Новосибирск: ИФП СО РАН, 1999. – 86-87 с.

[43] Современная западная философия. -М.: Политиздат, 1991.-428 с.

[44] Разумовский О.С. Оптимология. 4.1. Общенаучные и философско-методологические основы. - Новосибирск: ИФП СО РАН, 1999. - 88 с.

[45] Разумовский О.С. Оптимология. 4.1. Общенаучные и философско-методологические основы. - Новосибирск: ИФП СО РАН, 1999. - 88 с.

[46] Bell D. The Coming of Post-Industrial Society. - N.Y.:Doubleday, 1973. -344 p.

Ilmiy faoliyat bilan shug‘ullanish imkoniyatlarining ortishi texnik taraqqiyotni yanada kuchaytirib, yashash sharoitlarini qulaylashtirgan holda kishilarda bo‘sh vaqtning ko‘payishiga sabab bo‘ladi. Postindustrial jamiyatning industrial jamiyatga nisbatan yuqorida sanab o‘tilgan qulayliklariga qaramay u birmuncha shartli xarakter kasb etadi. Uning muammoli jihatlaridan biri shundaki, axborotlashgan jamiyat afzalliklaridan faqatgina uni boshdan kechirayotgan jamiyatlar a’zolarigina bahramand bo‘lishlari mumkin. Dunyodagi joriy geopolitik manzaradagi notekis taraqqiyot tendensiyalariga diqqat qaratilsa, axborotlashgan jamiyat umumsayyora miqyosida keng joriy etilmaganiga osongina guvoh bo‘lish mumkin. Qolaversa, rivojlangan mamlakatlar ekologik muammolar bilan kurashayotganini iddao qilganliklari holda o‘zlarining eskirgan zararli ishlab chiqarish vositalarini boshqa kam taraqqiy etgan mamlakatlarga ko‘chiradilar yoki ularga tayyor texnologiya va patentlarini eksport qiladilar. Yuqoridagilardan tashqari ekologizm tamoyiliga alohida diqqat qaratish ham postindustrial jamiyatning ustuvor tendensiyalaridan sanaladi. Shuningdek, industrial jamiyatda ekologik imperativga ma’naviy-axloqiy tus berilib, «o‘zingga qanday munosabatda bo‘lishlarini xohlasang, tabiatga shunday munosabatda bo‘l» ko‘rinishidagi g‘oyalar keng tarqaladi. Ekologiyaga munosabat hamda axborot texnologiyalariga egalik qilish nuqtai nazardan yer sayyorasidagi barcha aholi ob’yektiv teng imkoniyatlarga ega deb bo‘lmaydi. Zamonaviy muammolarga yaxlit integrativ yondashuvning mavjud emasligi, ularning tobora parsial noob’yektiv xususiyat kasb etib borishiga olib keladi. A. Zinovyevning «...axborot jamiyatining barcha ta’riflari gipertrofik ravishda ko‘tarilgan detallarga taalluqlidir. Sosiologik ahamiyatga ega hodisalar esa butunlay e’tibordan chetda qoladi yoki eng yaxshi holatda aprior tushunchalar foydasiga soxtalashtiriladi» degan fikriga qo‘shilmay bo‘lmaydi[47][48].

Ma’naviy-ekologik sivilizatsiya konsepsiyasi ham ijtimoiy rivojlanishning zamonaviy konsepsiyalaridan biri hisoblanadi. Ushbu konsepsiya A.V.Ivanov, I.V.Fotiyeva, M.Y.Shishinning «Ma’naviy-ekologik konsepsiya — asoslar va istiqbollar» asarida batafsil tahlil qilinadi. Mazkur konsepsiya noosfera sivilizatsiyasi g‘oyasini, insoniyatning tabiat bilan oqilona va mas’uliyatli birlashuvini, unga sezuvchi jonli organizm sifatida sog‘lom munosabatda bo‘lish g‘oyalarini qamrab oladi. G‘oyaviy ildizlari XIX–XX asr falsafasiga borib taqaluvchi ushbu konsepsiyaning asosida sog‘lom jamiyatning tayanchini tabiatga sog‘lom munosabat tashkil etadi degan qarash yotadi. Konsepsiya tarafdorlarining fikriga ko‘ra, sivilizasion taraqqiyotning yangi davriga kelib moddiy boyliklar va moliyaviy imkoniyatlar emas, balki shaxsning yuksak darajadagi ma’naviy-axloqiy fazilatlari, uning tabiat bilan o‘zaro uyg‘un munosabatlari asosiy qadriyatga aylanadi. Konsepsiya tarafdorlari tamaddunning ma’naviy-ekologik sivilizatsiyaga transformatsiyasi jarayonida insoniyat qadriyatlari va ongdagi g‘oyaviy ustanovkalarning almashinuvi hal qiluvchi omil vazifasini bajarishiga e’tibor qaratadilar. «Tabiat va insonning garmonik yaxlitligi», «qalb», «haqiqat», «oqilonalik», «tolerant hamkorlik» kategoriyalari ma’naviy-ekologik sivilizatsiya dunyoqarashining fundamental asoslarini tashkil qilishi lozim. Ma’naviy-ekologik sivilizatsiyaning fundamental qadriyatlarini keng yoyish, eng avvalo, butun boshli ijtimoiy munosabatlar tizimi va tasavvurlaridagi zo‘ravonlikka asoslanmagan tadrijiy tub o‘zgarishlarni taqozo qiladi. Mazkur konsepsiya mualliflari ma’naviy-ekologik sivilizatsiya dunyoqarashini shakllantirishda ustuvorlik kasb etishi lozim bo‘lgan ko‘plab g‘oyalarni ilgari suradilar. Unga ko‘ra, millatlararo munosabatlar va madaniyatlararo muloqot sohalarida irqiy, milliy va diniy toqatsizlik o‘rnini o‘zaro bag‘rikenglikka tayanuvchi konstruktiv hamkorlik egallashi lozim. Axboriy-mafkuraviy sohadagi dunyo mamlakatlari siyosatida axloqsizlik va tiyiqsiz ko‘ngilxushlik o‘rniga noosferaga asoslangan hayot tarzi targ‘ib qilinishi lozim. Ishlab chiqarish sohasida esa biosentrik va tabiatni qayta tiklovchi texnologiyalarni qo‘llagan holda resurslarni isrof qilishga chek qo‘yish talab qilinadi. Iqtisodiy-moliyaviy sohada esa iqtisodiyotni merkantilistik tushunishga tayanuvchi yondashuvdan chekingan holda tabiatni muhofaza qilish va madaniyat bilan bog‘liq faoliyatlarga nisbatan xarajatni oshirish g‘oyasi ilgari suriladi. Mazkur nazariy konsepsiyaning mualliflari tomonidan ilgari surilgan asosiy g‘oyalarni tahlil va umumlashtirish natijasida shunday xulosaga kelish mumkin. Iqtisodiy yoki siyosiy qarorlarni ishlab chiqish va hayotga tatbiq etish jarayoni davlatning madaniy-axboriy siyosatini belgilab beruvchi institutlar hamda huquqiy mexanizmlar bilan o‘zaro uyg‘unlikda amalga oshirilishi lozim. Shu bilan birga, bu institutlar faoliyati bevosita ma’naviy hamda ekologik imperativlarga tayanishi, ya’ni jamiyat taraqqiyotida axloqiy mas’uliyat va ekologik barqarorlikni muhim mezon sifatida qo‘llashi zarur. Bu yondashuv ijtimoiy barqarorlik va ongli taraqqiyotning asosiy sharti sifatida namoyon bo‘ladi[49][50].

Ma’naviy-ekologik sivilizatsiya nazariyasi ijtimoiy rivojlanish konsepsiyasi sifatida yaxlitlik xususiyatiga ega bo‘lib, unda jamiyat hayotining deyarli barcha sohalari uzviy aloqadorlik va kompleks birlikda tahlil qilinadi. Bunday yondashuv ijtimoiy-falsafiy nuqtai nazardan qaralganda, rivojlanishning asosiy omillarini alohida ko‘rinishda emas, balki ularning o‘zaro bog‘liqligi, madaniy, ma’naviy va ekologik mezonlar bilan uzviy uyg‘unligida ko‘rib chiqishga intiladi. Umumiy taraqqiyot konturlari, ongli munosabat tizimi elementlari va ularning evrilishlari, jamoaviy ong o‘zgarishlari singari

[47] Зиновьев А. *Логическая социология. Материальная культура* // Социально-гуманитарные знания-2001.-№5.-С. 174.

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tarkibiy qismlardan tashkil topuvchi hosila sifatida namoyon bo‘ladi. Mazkur konsepsiyaning o‘ziga xos jihati shundaki, unda ijtimoiy rivojlanish jarayoni bugungi global dunyo sharoitida o‘ta dolzarb bo‘lgan ma’naviy-ekologik tendensiyalar bilan aloqador tarzda tushuntiriladi. Bundan tashqari ayni konsepsiya doirasida ijtimoiy rivojlanishning nafaqat nazariy jihatlari, balki ma’naviy-ekologik tendensiyalar bilan bog‘liq amaliy takliflarda ifodalanuvchi jihatlari ham muhokama qilinadi. Ijtimoiy rivojlanish jarayonini tushuntirish, uning istiqbol mo‘ljallarini prognozlashga qaratilgan konsepsiyalarga nisbatan integrasion va differensiasion yondashuvlarning qiyosiy tahlili natijalaridan ma’lum bo‘ladiki, sosiogenez va uning taraqqiyoti parsial tarzda olib qaralsa, metodologik jihatdan biryoqlamalik yuzaga keladi. Bu esa, o‘z navbatida, amaliy jihatdan inson-jamiyat va tabiat o‘rtasidagi muvozanatning buzilishiga va turli xil inqirozlarga olib kelishi mumkin. Rivojlanish konsepsiyalarini yaratishda integrasion yondashuvga tayanish lokal nuqtai nazaridan biror-bir hududdagi sosiumning barcha muammolarini qamrab olish, global nuqtai nazardan esa ularni umumjahon tendensiyalari bilan aloqador tarzda ko‘rib chiqish, shunga ko‘ra, yechimlar izlab topish imkonini beradi.

Yuqoridagi tahlillardan kelib chiqqan holda shuni aytish mumkinki, ijtimoiy rivojlanish konsepsiyalarini ishlab chiqishda parsial-differensiasion yondashuvdan ko‘ra, integrativ-yaxlit yondashuv metodologik jihatdan samarador hisoblanadi. Negaki, integrativ yondashuv ijtimoiy taraqqiyot istiqbollarini yaxlit holda olib qarash hamda shunga mos ravishda konseptual g‘oyalar ishlab chiqish zaruratini o‘zida namoyon qiladi. Albatta, integrativ yondashuvni qo‘llashda alohida jihatlarning o‘zaro uyg‘un aloqasini ham nazardan chetda qoldirib bo‘lmaydi. Mazkur metodologik mexanizm esa tabiiy ravishda optimologik yondashuvga bo‘lgan zaruratni yuzaga chiqaradi. Soddaroq qilib aytganda, rivojlanish jarayoni umumiy hodisa sifatida olib qaralib, dastlab u qismlarga ajratilishi, keyin esa eng birlamchi umumlashtiruvchi jihatlar yaxlit holda sintezlanishi lozim.

Keltirilgan tahlillar xolistik yondashuv ijtimoiy rivojlanish konsepsiyasining umumiy tuzilmasi va sohalararo bog‘lanishlarini ochishda, parsial yondashuv esa alohida sohalarda kechayotgan jarayonlarni chuqur o‘rganishda muhim ekanini ko‘rsatadi. Integrativ yondashuv ushbu ikki pozisiyaning samarali jihatlarini birlashtirib, ijtimoiy tizimni yaxlit holda ko‘rish bilan birga uning tarkibiy elementlari avtonomiyasini ham hisobga olish imkonini beradi. Postindustrial jamiyat va ma’naviy-ekologik sivilizatsiya konsepsiyalari aynan shu jihatdan ahamiyatli bo‘lib, ularda texnologiya, bilim, axborot, qadriyat va ekologik muvozanat ijtimoiy taraqqiyotning o‘zaro bog‘langan omillari sifatida namoyon bo‘ladi.

Xulosa va takliflar

1. Ijtimoiy rivojlanish konsepsiyalarini tahlil qilishda xolistik yondashuv jamiyatning sohalararo aloqalari va umumiy dinamikasini ochib berishga xizmat qiladi.

2. Parsial yondashuv alohida iqtisodiy, siyosiy, texnologik, ma’naviy yoki ekologik jarayonlarni chuqur tahlil qilish imkonini beradi, biroq uning natijalari umumiy ijtimoiy tizim bilan bog‘langanda to‘liqroq mazmun kasb etadi.

3. Integrativ yondashuv butun va qism o‘rtasidagi mutanosiblikni saqlagan holda ijtimoiy rivojlanish konsepsiyalarining tarkibiy elementlarini yagona metodologik maydonda tahlil qilish imkoniyatini yaratadi.

4. Postindustrial jamiyat konsepsiyasida bilim, axborot va texnologiya iqtisodiy hamda ijtimoiy munosabatlarni o‘zgartiruvchi kompleks omillar sifatida namoyon bo‘ladi.

5. Ma’naviy-ekologik sivilizatsiya konsepsiyasi ijtimoiy taraqqiyotni tabiiy muhit, ma’naviy qadriyatlar va ijtimoiy institutlar o‘rtasidagi o‘zaro muvofiqlik asosida tushuntirishi bilan integrativ metodologiyaning muhim namunasini tashkil qiladi.

6. Raqamli iqtisodiyot, ekologik siyosat va ijtimoiy himoya dasturlarini baholashda sohalararo ko‘rsatkichlarni yagona tahlil modelida uyg‘unlashtirish maqsadga muvofiq.

7. Hududiy rivojlanish rejalarini ishlab chiqishda iqtisodiy samara, ijtimoiy ehtiyoj va ekologik barqarorlikni o‘zaro bog‘liq mezonlar asosida baholash zarur.

8. Axborot texnologiyalarini joriy etishda inson kapitali, ma’naviy qadriyatlar va atrof-muhitga ta’sirni birgalikda hisobga olish lozim.

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MANIPULYATIV HIYLALAR HAQIDAGI QARASHLARNING TARIXIY-RITORIK VA FALSAFIY SHAKLLANISH XUSUSIYATLARI

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Annotatsiya: *Mazkur maqolada manipulyativ hiylalarning qadimgi ritorik an’analardan yangi davr falsafasigacha bo‘lgan shakllanish jarayoni, ularning mantiqiy, psixologik va lingvistik belgilarining bosqichma-bosqich namoyon bo‘lishi tahlil qilinadi. Antik eristika va sofistika, Aristotelning sofistik raddiyalar tasnifi, qadimgi Xitoy stratagemalari, F. Bekon va J. Lokning tildagi noaniqliklarga oid qarashlari hamda A. Shopengauerning eristik dialektika haqidagi mulohazalari o‘zaro aloqadorlikda ko‘rib chiqiladi. Tahlil natijasida manipulyativ hiylalarning asosiy tamoyillari mantiqiy qoidalarni ataylab buzish, psixologik ta’sir o‘tkazish va til imkoniyatlaridan maqsadli foydalanish bilan bog‘liq ekani asoslanadi.*

Kalit so‘zlar: *Manipulyativ hiylalar, ritorika, eristika, sofistika, sofistik raddiya, stratagema, mantiqiy xato, psixologik ta’sir, lingvistik noaniqlik, eristik dialektika.*

ИСТОРИКО-РИТОРИЧЕСКИЕ И ФИЛОСОФСКИЕ ОСОБЕННОСТИ ФОРМИРОВАНИЯ ПРЕДСТАВЛЕНИЙ О МАНИПУЛЯТИВНЫХ УЛОВКАХ

Аннотация: *В данной статье анализируется процесс формирования манипулятивных уловок — от античных риторических традиций до философии Нового времени, а также поэтапное проявление их логических, психологических и лингвистических признаков. Во взаимосвязи рассматриваются античная эристика и софистика, аристотелевская классификация софистических опровержений, древнекитайские стратагемы, взгляды Ф. Бэкона и Дж. Локка на неопределенность языка, а также рассуждения А. Шопенгауэра об эристической диалектике. В результате анализа обосновывается, что основные принципы манипулятивных уловок связаны с преднамеренным нарушением логических правил, оказанием психологического воздействия и целенаправленным использованием возможностей языка.*

Ключевые слова: *манипулятивные уловки, риторика, эристика, софистика, софистическое опровержение, стратагема, логическая ошибка, психологическое воздействие, лингвистическая неопределенность, эристическая диалектика.*

HISTORICAL-RHETORICAL AND PHILOSOPHICAL FEATURES OF THE FORMATION OF VIEWS ON MANIPULATIVE TRICKS

Abstract: *This article analyses the formation of manipulative tricks from the ancient rhetorical traditions to the philosophy of the modern era, together with the gradual manifestation of their logical, psychological and linguistic features. Ancient eristics and sophistry, Aristotle’s classification of sophistical refutations, the stratagems of ancient China, the views of F. Bacon and J. Locke on the ambiguity of language and A. Schopenhauer’s reflections on eristic dialectic are examined in their interrelation. The analysis substantiates that the basic principles of manipulative tricks are connected with the deliberate violation of logical rules, the exertion of psychological pressure and the purposeful exploitation of the resources of language.*

Keywords: *manipulative tricks, rhetoric, eristics, sophistry, sophistical refutation, stratagem, logical fallacy, psychological influence, linguistic ambiguity, eristic dialectic.*

Kirish va mavzuning dolzarbligi. G‘arb ritorik va argumentlash sohasidagi tadqiqotlar an’anasida hiylalar keng tadqiq etiladigan masala sanaladi. Argumentlash jarayonida qo‘llaniladigan hiylalar ilmiy, xususan, ingliz tilidagi adabiyotlarda keng o‘rganilganligiga qaramay, postsovet makoni, jumladan, O‘zbekistonda ayni yo‘nalishdagi izlanishlar birmuncha kam uchraydi. Ayniqsa, mantiq, ritorika, argumentlash nazariyasi va amaliyoti singari sohalarda bu masala tahliliga jiddiy e’tibor qaratiladi.

Ammo argumentlashda qo‘llaniladigan hiylalar qadimgi yunon ritorik an’analaridayoq tadqiqotchilar diqqat markazida turgan. Masalan, qadimgi yunon mutafakkiri Zenon ritorikani ochiq kaft va mushtdan iborat ikki turga ajratgan. Birinchi ritorika turida adresant adresatni argumentlash qoidalariga rioya qilib, mantiqiy asoslar va izchillikka asoslanib, savolni to‘g‘ri muhokama qilgan holda ishontirishga intiladi. Ikkinchi turda esa psixologik bosim, majburlash, qo‘pol va provokatsion bahs usullaridan foydalangan holda bahsda g‘alabaga erishishni nazarda tutadi.

“Hiylalar deganda kommunikativ vaziyatda ustunlikka erishish, o‘z manfaatlarini maksimal darajada qondirish, bahsda g‘alaba qozonish va qarama-qarshi tomonning pozitsiyasini zaiflashtirish uchun mo‘ljallangan noto‘g‘ri va ruxsat etilmagan usullar tushuniladi”[51].

“Mantiqiy hiylalar bu — o‘z pozitsiyasi ustunligini kuchaytirish va raqib pozitsiyasini zaiflashtirish maqsadida mantiq va argumentlash qoidalarini ataylab buzishni anglatadi”[52].

Yuqoridagi mulohazalar tahlillaridan ko‘rinib turibdiki, mantiqiy hiylalar mantiq va argumentlash qoidalarining buzilishi, aniqrog‘i, mantiqiy xatolar natijasida yuzaga keladi. Agar qoidalar anglanmagan tarzda (masalan, shoshqoloqlik yoki argumentlash borasidagi savodxonlikning pastligi natijasida) buzilsa, bunday holda ular mantiqiy xatolar yoki paralogizmlar, agar qasddan buzilsa sofizmlar yoki mantiqiy hiylalar deb ataladi. Argumentlash sohasiga oid ilmiy tadqiqotlarda keng tarqalgan yondashuvga ko‘ra mantiqiy xatolar odatda ularning argumentlash tuzilmasidagi muayyan element doirasida amal qilishiga qarab tasniflanadi. Soddaroq qilib aytganda, mantiqiy xatolar hamda ularga ataylab yo‘l qo‘yilganda yuzaga keladigan mantiqiy hiylalarni tezisga aloqador, argumentga aloqador hamda demonstratsiya, kelib chiqish sabab-oqibatga, mantiqiy izchillikka yoki xulosa chiqarishga aloqador hiylalar ko‘rinishida tasniflash mumkin.

Mavzuga oid adabiyotlarning tahlili. Manipulyativ hiylalarning nazariy talqini mantiq, ritorika va argumentlash sohalarida turli davrlarda shakllangan. Aristotel sofistik raddiyalarni nutqiy vositalarga aloqador va nutqiy vositalarga aloqador bo‘lmagan shakllarda ko‘rib chiqqan. F. Bekon asarlarida bilish jarayonida til imkoniyatlarining noto‘g‘ri qo‘llanilishi natijasida yuzaga keladigan chalkashliklarga e’tibor qaratilgan. R. Dekart esa kishilarni adashtirishga olib keluvchi noto‘g‘ri mushohada usullari va bilish jarayonidagi xatolar masalasini tahlil qilgan. A. Shopengauer bahsda haqiqatdan ko‘ra ustunlikka intilish motivlarini eristik dialektika doirasida ko‘rib chiqqan. Harro fon Zenger tahlillarida qadimgi Xitoy stratagemalarining psixologik ta’sir, yashirin maqsad va vaziyatdan ustunlikka erishish bilan bog‘liq jihatlari yoritilgan. Nikita Nepryaxin va V. P. Moskvin ishlarida hiyla hamda mantiqiy hiyla tushunchalarining kommunikativ va argumentatsion belgilari ajratib ko‘rsatilgan. Mazkur yondashuvlar hiylalarning mantiqiy, psixologik va lingvistik unsurlari tarixiy jihatdan uzviy shakllanganini ko‘rsatadi.

Tadqiqot metodologiyasi. Tadqiqot olib borish davomida tizimlilik, nazariy-deduktiv xulosa chiqarish, analiz va sintez, tarixiylik va mantiqiylik, qiyosiy tahlil hamda manbalardagi tasniflarni o‘zaro taqqoslash tamoyillaridan foydalanildi.

Tahlil va natijalar.

Manipulyativ hiylalarni tarixiy-ritorik nuqtai nazardan tahlil qilish ularning bir paytning o‘zida bir necha funksiyani bajarishini ko‘rsatadi. Bir tomondan, hiyla bahsning formal tuzilmasiga ta’sir qilib, tezis, dalil yoki xulosa o‘rtasidagi izchillikni buzadi. Ikkinchi tomondan, u adresatning psixologik holatiga ta’sir o‘tkazib, masalaning asl mohiyatidan chalg‘itish, shoshiltirish yoki muayyan pozitsiyani qabul qilishga moyillik hosil qiladi. Shu sababli tarixiy qarashlarda bir xil hodisaning mantiqiy xato, sofistik usul, eristik texnika yoki stratagema ko‘rinishida tavsiflanishi tabiiy holat sanaladi.

Ijtimoiy munosabatlarga kirishishda muayyan ustunlikka erishish bo‘yicha samarador mexanizmlar qadim sivilizatsiyalar davridan buyon amaliyotda faol qo‘llanilib kelingan. Shunga mos ravishda ularni tadqiq etish masalasi tarixi ham birmuncha qadim davrlarga borib taqaladi. Jumladan, turli xalqlar afsonalari, rivoyatlari hamda ertak va dostonlarida bunday mexanizmlarni samarador qo‘llash orqali o‘z maqsadiga erishadigan kishilar obrazlarini ko‘plab uchratish mumkin. Xususan, sharq xalqlari folklorida uchraydigan tulki, ilon kabi obrazlar buning yaqqol misoli bo‘la oladi. Qadimgi hind durdonalaridan sanaluvchi “Kalila va Dimna” asarida bunday obrazlarni ko‘plab uchratish mumkin.

Qadimgi g‘arb sivilizatsiyasi haqida gap ketganda esa Yunon mifologiyasidagi Germes ma’budi ana shunday obrazlardan biri sifatida namoyon bo‘ladi.

Ammo shaxslararo va ijtimoiy kommunikatsiya jarayonlarida taraflardan biriga ustunlik olib keluvchi hiylalardan foydalanish, bunday hiylalarni tasniflash, ularning axloqiy, mantiqiy, ritorik, psixologik, lingvistik jihatlarini ilmiy asosda tadqiq etish antik davrda boshlanganligi borasida tarixiy ma’lumotlar mavjud.

Antik davr tafakkurining eristik va sofistik falsafiy mushohadalash usullari shakllangan paytlarida ayni masalaga bo‘lgan qiziqish yanada ortdi. Eristika (yunoncha, eristikos — bahslashuvchi) degan ma’noni anglatib, raqibni yengishda

[51] Я манипулирую тобой — Методы противодействия скрытому влиянию / Никита Непряхин. — М. — Альпина Паблишер, 2018.

[52] Риторика и теория аргументации — учебник для вузов / В. П. Москвин. — 3-е изд., перераб. и доп. — Москва — Издательство Юрайт, 2022. — 725 с.

ko‘maklashuvchi istalgan usulni qo‘llash orqali bahslashish san’atini anglatadi.[53] Sofistika esa (yunoncha, sofisma — donolik, ayyorlik, hiyla) istalgan usulni qo‘llagan holda atrofdagilarni o‘z fikrlariga ishontirish, bunda yolg‘on ishlatish, mantiq qoidalarini ataylab buzish kabi usullardan keng foydalanish nazarda tutiladi.[54]

Qadimgi Yunonistonning siyosiy tizimida sudlar va xalq yig‘ilishida ustunlik qilgan tendensiya sanaluvchi raqibning fikrini rad etish va o‘z fikrining chinligiga ishontirish qobiliyati inson taqdirini belgilovchi omil sanalgan. Bu esa o‘z navbatida ishontirish san’atidan ta’lim beruvchi o‘qituvchilarga bo‘lgan ehtiyoj va ijtimoiy buyurtmaning oshishiga olib kelgan. Qadimgi Yunon falsafasining yorqin namunalaridan biri hisoblanuvchi sofistlar maktabi vakillari ayni ijtimoiy buyurtma talablarini bajarishda faollik ko‘rsatganlar. Ular o‘zlarining ta’limotlarida inson bilimlarining shartli va ishonchining beqaror ekanligi g‘oyasini ilgari surganlar. Sofistlar maktabi vakillari istalgan, hatto o‘zaro zidlik munosabatida bo‘lgan mulohazalarda aks etuvchi tezislarning ham bir paytning o‘zida chin bo‘la olishini isbotlashga intilgan holda, mazkur g‘oyani amalga oshirishni nazarda tutuvchi turli usullarni ham ishlab chiqqanlar. Sofistlar tomonidan ishlab chiqilgan turli ishontirish usullari, ularni amaliyotda qo‘llay olish qobiliyatini shakllantirishga qaratilgan metodikalar, tabiiyki, qadimgi Yunon falsafasida mantiq, argumentlash nazariyasi, ritorika singari sohalarga nisbatan qiziqishning kuchayishiga olib keldi. Jumladan, Platon dialoglarining bosh qahramoni sanaluvchi Suqrot tomonidan mayevtika usulining ishlab chiqilishi bu boradagi ilk urinishlardan biri sifatida baholanishi mumkin.

Ammo qadimgi Yunon mutafakkirlari orasida birinchilardan bo‘lib, Aristotel Mil. avv. (384–322 yillar) sofistik ishontirish usullarini ilmiy metodologiya asosida tadqiq etgan. U ilk bor eristika va sofistikani dialektikaga qarama-qarshi qo‘yadi. Uning ta’kidlashicha, “Sinov san’ati — bu dialektikaning bir turi bo‘lib, u biladigan odamga emas, balki bilmaydigan, lekin o‘zini biluvchi sifatida ko‘rsatadigan kishiga murojaat qiladi. Sofistika soxta donolik yordamida tirikchilik qilish san’ati sifatida talqin etiladi. Hamma narsaning asosini o‘rganadigan kishi dialektik, o‘zini ana shunday qilayotgandek ko‘rsatadigan odam esa sofist sifatida namoyon bo‘ladi. Sofistlar bahslashish va unda g‘alaba qozonish uchungina mushohada yuritadilar, soxta dalillarga intilgan holda, o‘z manfaatlarini haqiqiy donolikdan emas, aksincha, soxta donolikdan izlaydilar. Eristika bahsda nomaqbul usullar bilan kurashishni anglatib, eristlar esa bahslashishni yoqtiruvchi va janjalga moyil kishilar bo‘ladilar”[55].

Aristotelning fikriga ko‘ra, sofistlar va eristlar ayyorliklarining tabiatini eng avvalo, ularga qarshi tura olish zarurati tufayli ham bilish talab qilinadi. Bunday usullar ko‘pincha og‘zaki iboralarga asoslanadi. “Shuning uchun ular tufayli biror narsa haqida gapirilayotganda nechta ma’no nazarda tutilayotganligini hamda narsalar va ularning nomlari o‘rtasidagi umumiy, shuningdek, farqli jihatlarni yaxshi ajratish mumkin”[56].

Aristotel eristlar ham sofistlar ham bunday hiylalarni qo‘llashda bir xil dalillardan foydalanishlari, ammo ular tomonidan amalga oshiriladigan norelevant argumentlash aktlari intensional tarzda farq qilishiga diqqat qaratadi. Unga ko‘ra, eristlar soxta g‘alabani maqsad qilsalar, sofistlar soxta donishmandlik namoyon etishni ko‘zlaydilar. Ko‘pincha sofistlar rad etayotgandek taassurot uyg‘otib, suhbatdosh yolg‘on gapirgan holda, umume’tirof etilgan qoidalar bilan nomuvofiq pozitsiyada ekanligini ko‘rsatishga intiladilar. Ular raqibni nutqda xato qilishga undab, bir narsani qayta-qayta takrorlashga majbur qiladilar. Bunday manipulyativ maqsadlar turli usullar yordamida amalga oshirilishi mumkin. “Sofistlar tomonidan bahsda eng ko‘p rad etish maqsadida eng ko‘p qo‘llaniladigan usul nomlardan kelib chiqish hisoblanadi. Xuddi bilguvchilar hisoblash toshlarini ishlatishni bilmaydiganlarni aldaganlari singari so‘zlar ma’nosini tushunmaydiganlar ham argumentlar keltirishda ana shunday xatoga yo‘l qo‘yadilar”.[57] Aristotel ikkita soxta rad etish usulini keltirib o‘tadi.

1. Nutqiy vositalarga aloqador soxta rad etish usullari. A) bir xil nomlanish (omonimiya); B) gaplarning ikki ma’nolilik kasb etishi (amfiboliya); C) birikish (synthesis) — aniqrog‘i, sintaktik jihatdan to‘g‘ri, ammo semantik nuqtai nazardan noto‘g‘ri qurilgan so‘z birikmasi; D) ajratish (diaresis), aniqrog‘i, “va” biriktiruvchi bog‘lamasining ikki ma’noda qo‘llanilishi; E) urg‘u yoki talaffuz bilan aloqador hiyla (prosodia), aniqrog‘i, matnda yozilganlarni talaffuz yoki urg‘uning noto‘g‘ri qo‘yilishi natijasida buzib talqin etilishi.

2. Nutqiy vositalarga aloqador bo‘lmagan hiylalar. A) o‘tkinchilik paralogizmi (biror narsaga xos xususiyatlar unga nisbatan o‘tkinchi bo‘lgan narsalarda ham uchraydi); B) aytilganlar paralogizmi (aytilganlar umuman aytilganlar shaklida talqin etiladi); C) kelib chiqish (izchillikni) rad etish (teskari kelib chiqish yoki izchillik); D) sabab bo‘lmagan narsani sabab sifatida qabul qilishni rad etish; E) ikki savolni bittaga birlashtirish dalillari[58].

Aristotel nafaqat birinchilardan bo‘lib mantiq qoidalarini buzish va tilning o‘ziga xos xususiyatlarini suiiste’mol qilish sofistik xulosa chiqarishning asosiy tamoyillari ekanligini ta’kidladi, balki ularni fosh etishning bosh tamoyilini ham

[53] Логический словарь-справочник / Под ред. Н. И. Кондакова. М. — Наука, 1975. 658 с.
[54] Эффективная коммуникация — история, теория, практика. Словарь-справочник. М. — Олимп, 2005. 952 с.
[55] Аристотель. Риторика // Античные риторики. М. — Издательство Московского университета, 1978. С. 15–164.
[56] O‘sha yerda — 565-b.
[57] Аристотель. Риторика // Античные риторики. М. — Издательство Московского университета, 1978. С. 536.
[58] Аристотель. Риторика // Античные риторики. М. — Издательство Московского университета, 1978. С. 536.

ko‘rsatib berdi. “Ba’zan chin xulosadan ko‘ra haqiqatga o‘xshash xulosani afzal ko‘rishga to‘g‘ri kelgani kabi sofistik raddiyalarni fosh etish haqiqatga o‘xshab tuyulganda ham ularni haqiqat sifatida qabul qilishga to‘g‘ri keladi”[59].

Aristotelning bu boradagi qarashlari keyingi davr mantiqiy ta’limotlariga transformatsiyalangan bo‘lib, u tomonidan ishlab chiqilgan paralogizmlar tasnifi keyinchalik ham an’anaviy, xususan, formal mantiq paradigmasi doirasida amalga oshirilgan tadqiqotlarning mantiqiy xatolar tahlil etiladigan bo‘limlarida deyarli to‘liq qamralgan. Argumentlashning mohiyati haqidagi mulohazalar tahlillari shuni ko‘rsatadiki, og‘zaki ta’sir ko‘rsatish shakllarining o‘zgarganligi va vositalarining takomillashganligi omilini hisobga olmaganda bizning zamonimizda ham bundan 2000 yillar avvallar oldin foydalanilgan fikrlash usullari hamda adashtirish texnikalari qo‘llanilmoqda[60].

Ongni manipulyatsiyalashning argumentatsion mexanizmi vazifasini bajaruvchi hiylalarning g‘alaba qozonish va ustunlikka erishish usuli sifatida tadqiq etilishini qadimgi sivilizatsiyaning birgina antik dunyosi bilan cheklash to‘g‘ri emas. Jumladan, harbiy va siyosiy qarama-qarshilik vaziyatlarida raqibga nisbatan ustunlikka erishish usullari qadimgi xitoy falsafasida stratagemalar deb atalgan. Mazkur atama yunoncha stratagema so‘zidan olingan bo‘lib, “harb ishi, harbiy ayyorlik” degan ma’noni anglatadi. Xitoychada esa “chjimou” — “zukkolik, topqirlik” degan ma’nolarni anglatib, dushmanga qo‘yilgan tuzoqni qamrab oluvchi strategik reja tushunilgan[61].

Psixologik ta’sirga qarab yo‘nalganlik stratagemalarning asosiy tamoyili hisoblanadi.

Qadimgi Xitoy ritorik an’analarida ruhni boshqarish psixologik jang san’atining hal qiluvchi jihati sanaladi. “Ruh sust bo‘lganda zarba berish, uning tetik paytida qochish, qalbni boshqarish (tartibli bo‘lib, tartibsizlikni kutish, xotirjam bo‘lib, hayajonlanishni kutish), kuchni boshqarish (yaqin bo‘lib, uzoqdagini kutish, kuchga to‘la bo‘lib, charchaganlarni kutish, to‘q bo‘lib, ochlarni kutish) zarur”[62].

Dastlab stratagemalar harbiy va siyosiy qarama-qarshiliklar yuzaga kelgan vaziyatlarda qo‘llanilgan bo‘lsa, keyinchalik ularning tatbiq qilish sohalari ham kengayib bordi. Bu esa tabiiy ravishda ayni kategoriyaning mazmuni va hajmi ham kengayib, u istalgan ishni noan’anaviy usullar bilan hal qilishni anglatuvchi tushunchaga aylanib bordi.

Mazkur kategoriyaning mazmunida qamralgan belgilarni aniqroq tasavvur qilish uchun ularning eng keng tarqalgan turlarini ko‘rib chiqish talab qilinadi.

Stratagemalarning metaforik mazmuni ularning maqsadga erishishdagi manipulyativ hiyla sifatidagi tavsifiy belgilarini ajratib ko‘rsatishga imkon beradi. Ularda sahnalashtirish, aylanma yo‘l, yolg‘on manyovr, aldash kabi nomlarning qo‘llanishi stratagemalarning yashirin maqsadga egalik, kutish pozitsiyasi, zaif nuqtaga bosim o‘tkazish, ihotalash, provokatsiya kabilarning tatbiq etilishi esa xitoycha manipulyativ hiylalar psixologik ta’sir ko‘rsatish belgisini ham namoyon etishidan dalolat beradi.

Mantiqiy tadqiqotlar taraqqiyoti natijasida hiylalar tushunchasining tavsifiy belgilari ham transformatsiyaga uchrab bordi. Jumladan, u yangi davr falsafasi doirasida amalga oshirilgan tadqiqotlarda kishilarni adashtirish maqsadida argumentlash qoidalarini ataylab buzish ma’nosida talqin etila boshlandi[63]. Qolaversa, ayni davr falsafiy ta’limotlarining gnosiologik konsepsiyalarida insonning bilish jarayonida lingvistik omillar ta’sirida ham chalkashliklar ro‘y berishi mumkinligiga alohida diqqat qaratildi. Jumladan, F. Bekon tomonidan keltirilgan “bozor sanami” so‘zlar va narsalarni aynanlashtirish oqibatida namoyon bo‘ladi.[64] Qolaversa, J. Lok ham so‘zni suiiste’mol qilish oqibatida ro‘y beradigan xatolarga diqqat qaratib quyidagilarni sanab o‘tadi.

1. Muayyan (masalan, diniy yoki falsafiy) g‘oyalarga mos kelmaydigan yoki muhim g‘oyalarga mos kelsa ham, mazmuni noaniq, har kim o‘zicha tushunishi va talqin etishi mumkin bo‘lgan so‘zlardan foydalanish;

2. Noodatiy ma’nodagi so‘zlarni qo‘llash, ataylab ikki ma’nolilikni keltirib chiqarish, so‘zlarni nostandart shaklda birlashtirish orqali ataylab noaniqlikka yo‘l qo‘yish;

3. So‘zlarni ular ifoda eta olmaydigan ma’noda qo‘llash;

4. So‘zlarning ko‘p ma’nolilik va mazmunining chalkashligiga qaramay, ularga ishonish;

5. Nutqning me’yoridan ortiq majoziy xususiyat kasb etishi.

Shu tariqa hiylalarning maqsadga erishishda norelevant usullarni qo‘llash vositasi ekanligi g‘oyasi falsafiy tadqiqotlarda ham jiddiy tahlil etila boshladi. Manipulyativ hiylalarning yuqorida keltirib o‘tilgan izlanishlarda amalga oshirilgan dastlabki tipologiyasi va tasniflari tahlillari natijalari shuni ko‘rsatib turibdiki, mantiqiy mushohada qoidalarini ataylab buzish, psixologik ta’sir o‘tkazish hamda til imkoniyatlarini suiiste’mol qilish ularning asosiy tamoyillari hisoblanadi.

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[59] Аристотель. Риторика // Античные риторики. М. — Издательство Московского университета, 1978. С. 536.

[60] Аристотель. Риторика // Античные риторики. М. — Издательство Московского университета, 1978. С. 536.

[61] Зенгер Харро фон Стратагемы — О китайском искусстве жить и выживать / Под ред. В. С. Мясникова. М. — ЭКСМО, 2004. 379 с.

[62] O‘sha yerda — 25.

[63] Декарт Р. О методе для правильного развития разума и для изыскания истины в науках / Пер. с фр. М. Скиада, Воронеж, 1873. 67 с.

[64] Бэкон Ф. Новый органон — Пер. с латин. и англ. Рига — Звайгзне, 1989. 315 с.

Garchi falsafiy fikr taraqqiyotining dastlabki bosqichlarida paralogizmlar va sofizmlar keng tadqiq etilgan bo‘lsada, aynan “hiyla” tushunchasi birinchi bo‘lib A. Shopengauer (1788 — 1860) ishlarida ilmiy iste’molga kiritiladi. Mutafakkir “Eristika yoki bahslashish san’ati”da bunday irrelevant argumentlash usullarini qo‘llash motivlari tahliliga alohida diqqat qaratadi. Jumladan, mutafakkirning fikriga ko‘ra, “o‘zaro birgalikda mushohada yuritish jarayonida har qanday insonga o‘zaro fikrlar almashinuvi orqali muayyan predmetga nisbatan o‘zi va sherigi qarashlari o‘rtasidagi farqni bilib olish xususiyati xos bo‘lib, u shaxsiy qarashlarini tekshirib ko‘rish o‘rniga boshqaning fikrlaridan xato izlashni afzal ko‘radi. Boshqacha qilib aytganda, har qanday odam tabiatan hamisha haq bo‘lib chiqishni istaydi”[65].

Agar inson tabiatida yovuzlik mavjud bo‘lmaganda kishilar kimning qarashlari adolatli ekanligi borasida bahslashmas va raqib pozitsiyasiga ham katta ma’no yuklamas edilar, deb hisoblaydi faylasuf. Ammo uning fikriga ko‘ra, bu birinchi darajali muhimlik kasb etadi. Chunki insoniy ruh “intellektual kuchlarga oid unsurlarga nisbatan ta’sirchan bo‘lgani holda, biz dastlab aytgan mulohazalarimizning (suhbat avvalidagi tezis va uni qo‘llab-quvvatlovchi argumentlar nazarda tutilmoqda) xato, aksincha, raqibning fikrlari adolatli bo‘lib chiqishini yoqtirmaydi”[66].

A. Shopengauer bahsning bosh maqsadi haqiqatga erishish ekanligini tan olgan holda, “chin mulohazalar degan tushuncha birmuncha shubhali narsa bo‘lib, ularning o‘zlaridan bunday mulohazalarning xatoligini tasdiqlovchi asoslarni keltirib chiqarish mumkin, dastlab tezisni qo‘yishga turtki vazifasini bajargan haqiqatga muhabbat tuyg‘usi o‘z o‘rnini shaxsiy fikrga muhabbat hissiga bo‘shatib berganligi bois, haqiqat yolg‘onga, aksincha, yolg‘onning haqiqatga aylanishiga zamin hozirlashini…, qolaversa, bahs yetakchisi haqiqatdan ko‘ra ko‘proq o‘z tezisi uchun kurashishini”[67], — ta’kidlaydi.

Mutafakkir o‘zining mantiqiy hiylalar genezisining motivlarini tahlil qilishga qaratilgan izlanishlarida ularni qo‘llashga turtki bo‘luvchi omillar sifatida yuqorida ta’kidlangan inson tabiatiga xos nomukammallik va chin mulohazalardan irrelevant foydalanish imkoniyatining mavjudligi kabilarni ko‘rsatadi. Shopengauer obyektiv haqiqatdan qat’iy nazar ustunlikka erishish va ko‘pchilik oldida haqdek taassurot uyg‘otishni o‘rgatuvchi fan sohasini eristik dialektika, bunday hiylalarning o‘zini esa eristik dialektika texnikalari deb ataydi. Mutafakkir eristik dialektikani qilichbozlik bilan analogiya qilgan holda, uni ham aqliy qilichbozlik ekanligini ta’kidlab, xuddi qilichbozlik muallimi kim haqligidan qat’iy nazar raqibga zarba berishni o‘rgatgani singari eristik dialektika ham sun’iy usullarni to‘g‘ri birlashtirib qo‘llash orqali adolatsiz hujumlardan himoyalanish hamda raqibni o‘z quroli bilan yengishni o‘rgatishini aytib o‘tadi.

Shu tariqa, A. Shopengauerning eristik dialektika haqidagi qarashlari manipulyativ hiylalarning mantiqiy tuzilishi, bahsdagi ustunlikka intilish va ularni qo‘llashga turtki bo‘luvchi psixologik motivlarni o‘zaro bog‘liq holda yoritadi.

Xulosa va takliflar

1. Manipulyativ hiylalarni ilmiy tahlil qilish an’anasi antik ritorika va sofistika doirasida shakllangan bo‘lib, bahsda ustunlikka erishish bilan mantiqiy qoidalarga rioya qilish o‘rtasidagi farq qadimgi qarashlardayoq ajratib ko‘rsatilgan.

2. Aristotelning sofistik rad etish usullariga oid tasnifi tilning ko‘p ma’noliligi, sintaktik qurilish va sabab-oqibat aloqalaridan noto‘g‘ri foydalanish mantiqiy hiylalarning muhim manbalari ekanini ko‘rsatadi.

3. Qadimgi Xitoy stratagemalari manipulyativ ta’sirning faqat mantiqiy emas, balki kutish, yashirin maqsad, zaif nuqtaga bosim o‘tkazish va psixologik holatni boshqarish kabi jihatlarini ham qamrab oladi.

4. Yangi davr falsafasida til va bilish o‘rtasidagi munosabatga qaratilgan tahlillar hamda A. Shopengauerning eristik dialektikaga oid qarashlari hiylalarning lingvistik va motivatsion asoslarini yanada kengroq tushuntirish imkonini beradi.

5. Tarixiy-qiyosiy tahlil mantiqiy qoidalarni ataylab buzish, psixologik bosim va til imkoniyatlaridan maqsadli foydalanish manipulyativ hiylalarning barqaror tamoyillari sifatida shakllanganini ko‘rsatadi.

6. Zamonaviy shaxslararo va kasbiy kommunikatsiyada manipulyativ hiylalarni aniqlash uchun tezis, dalil va xulosa o‘rtasidagi mantiqiy izchillikni tekshirishga qaratilgan qisqa tahlil algoritmlaridan foydalanish maqsadga muvofiq.

7. Raqamli kommunikatsiyada ijtimoiy tarmoqlar, messenjerlar va onlayn taqdimotlarda uchraydigan ko‘p ma’noli, hissiy bosimga asoslangan yoki chalg‘ituvchi ifodalarni belgilashga xizmat qiluvchi avtomatlashtirilgan matn tahlili vositalaridan foydalanish mumkin.

8. Ta’lim va korporativ muloqot amaliyotida tarixiy ritorik hiylalarni zamonaviy kommunikativ vaziyatlar bilan qiyoslashga asoslangan kazuslar, munozara mashqlari va tanqidiy fikrlash topshiriqlarini tizimli qo‘llash samarali natija beradi.

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JALOLIDDIN MANGUBERDI FENOMENINI TADQIQ ETISHNING GERMENEVTIK VA RETROSPEKTIV XUSUSIYATLARI (BIRLAMCHI MANBALAR TAHLILI MISOLIDA)

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Annotatsiya*: Ushbu maqolada XIII asrdagi mo‘g‘ullar istilosi davrida Sulton Jaloliddin Manguberdi fenomenini tadqiq etishning germenevtik va retrospektiv metodologik xususiyatlari ijtimoiy-falsafiy jihatdan tahlil qilinadi. Tadqiqotda an’anaviy xronologik va bayoniy tarixchilik qoliplaridan chekingan holda, o‘rta asr birlamchi manbalari – Shihobiddin an-Nasaviy, Alouddin Juvayniy, Ibn al-Asir, Rashiduddin va Mirzo Ulug‘bek asarlaridagi matn qatlamlarini falsafiy dekonstruksiya qilish maqsad qilingan. V. Diltey, F. Shleyermaxer, X.-G. Gadamer va M. Blok nazariyalari vositasida tarixiy manbalardagi sub’yektlik, ekzistensial tanlov, institusional vakuum va transgressiya hodisalari o‘rtasidagi dialektik bog‘liqlik yoritilgan. Manbalarni germenevtik qayta o‘qish orqali Sulton Jaloliddin kurashining ichki ontologik va ma’naviy-axloqiy mohiyati aniqlanib, uning milliy o‘zlik va davlatchilik suverenitetini saqlashdagi o‘rni fundamental asoslangan.*

Kalit so‘zlar: *Jaloliddin Manguberdi, germenevtika, retrospeksiya, birlamchi manbalar, tarixiy dekonstruksiya, ekzistensial tanlov, institusional vakuum, transgressiya, milliy o‘zlik, narrativ tahlil.*

ГЕРМЕНЕВТИЧЕСКИЕ И РЕТРОСПЕКТИВНЫЕ ОСОБЕННОСТИ ИССЛЕДОВАНИЯ ФЕНОМЕНА ДЖАЛАЛ АД-ДИНА МАНКБУРНЫ (НА ПРИМЕРЕ АНАЛИЗА ПЕРВОИСТОЧНИКОВ)

Аннотация: *В данной статье с социально-философской точки зрения анализируются герменевтические и ретроспективные методологические особенности исследования феномена Султана Джалал ад-Дина Манкбурны в эпоху монгольского нашествия XIII века. Отходя от традиционных хронологических и описательных историографических рамок, исследование направлено на философскую деконструкцию текстовых слоев средневековых первоисточников – трудов Шихаб ад-Дина ан-Насави, Ала ад-Дина Джувейни, Ибн ал-Асира, Рашид ад-Дина и Мирзо Улугбека. Посредством теорий В. Дильтея, Ф. Шлейермахера, Х.-Г. Гадамера и М. Блока освещается диалектическая взаимосвязь между субъектностью, экзистенциальным выбором, институциональным вакуумом и явлениями трансгрессии в исторических текстах. Герменевтическое переосмысление источников позволило выявить внутреннюю онтологическую и духовно-нравственную сущность борьбы Султана Джалал ад-Дина и фундаментально обосновать его роль в сохранении национальной идентичности и государственного суверенитета.*

Ключевые слова: *Джалал ад-Дин Манкбурны, герменевтика, ретроспектива, первоисточники, историческая деконструкция, экзистенциальный выбор, институциональный вакуум, трансгрессия, национальная идентичность, нарративный анализ.*

HERMENEUTIC AND RETROSPECTIVE FEATURES OF STUDYING THE PHENOMENON OF JALAL AD-DIN MANGBURNI (ON THE EXAMPLE OF PRIMARY SOURCE ANALYSIS)

Abstract: *This article provides a socio-philosophical analysis of the hermeneutic and retrospective methodological features of studying the phenomenon of Sultan Jalal ad-Din Mangburni during the 13th-century Mongol invasion. Moving away from traditional chronological and descriptive historiographical frameworks, the study aims to philosophically deconstruct the textual layers of medieval primary sources—namely, the works of Shihab al-Din an-Nasawi, Ala al-Din Juwayni, Ibn al-Athir, Rashid al-Din, and Mirzo Ulugh Beg. Utilizing the theories of W. Dilthey, F. Schleiermacher, H.-G. Gadamer, and M. Bloch, the dialectical relationship between subjectivity, existential choice, institutional vacuum, and transgressive phenomena in historical texts is elucidated. Through a hermeneutic re-reading of the sources, the internal ontological and spiritual-ethical essence of Sultan Jalal ad-Din’s struggle is uncovered, and his foundational role in preserving national identity and state sovereignty is scientifically substantiated.*

Keywords: *Jalal ad-Din Mangburni, hermeneutics, retrospect, primary sources, historical deconstruction, existential choice, institutional vacuum, transgression, national identity, narrative analysis.*

Kirish (Introduction). Zamonaviy ijtimoiy-falsafiy fanlar va tarixiy metodologiya paradigmasida ulkan tarixiy shaxslar fenomenini tadqiq etish tub burilish bosqichini boshdan kechirmoqda. Uzoq yillar davomida ustuvorlik qilgan sof pozitivistik, bayoniy-xronologik va deskriptiv tarixchilik yondashuvlari chuqur ijtimoiy inqirozlar, sivilizasion to‘qnashuvlar hamda tizimli parchalanishlar davrida shaxs irodasi va jamiyat ongidagi ekzistensial transformatsiyalarni mukammal tushuntirib berishda o‘z cheklanganligini ko‘rsatdi. Shu sababli, tarixiy sub’yektning xarizmatik faoliyatini va uning ijtimoiy-siyosiy maydondagi qarorlarini falsafiy dekonstruksiya qilish hamda germenevtik-retrospektiv usullar vositasida qayta mushohada etish oliy akademik zaruratga aylandi.

Markaziy Osiyo davlatchiligi tarixida, xususan XIII asr boshlarida geosiyosiy va ijtimoiy-madaniy landshaftni tubdan o‘zgartirib yuborgan mo‘g‘ullar istilosi sharoitida Sulton Jaloliddin Manguberdi fenomeni alohida ontologik va madaniy-tarixiy maqomga egadir. Davlatning ma’muriy-institusional apparati yemirilgan, oliy boshqaruv tizimi falajlangan va jamiyat ommaviy anomiya (umidsizlik va me’yorsizlik) girdobiga tushgan lahzalarda, alohida shaxsning suveren irodasi va yagona qarshilik markaziga aylanish mexanizmini o‘rganish sof harbiy yilnomalar chegarasidan chiqadi. Bu o‘rinda tadqiqot ob’yekti shunchaki muayyan tarixiy voqealar tizmasi emas, balki tarixiy matnlarda, she’riy va nasriy yilnomalarda muhrlangan ma’no qatlamlaridir.

Ushbu metodologik vazifani amalga oshirishda germenevtika va retrospeksiya usullari bir-birini to‘ldiruvchi fundamental gnoseologik qurol sifatida maydonga chiqadi. Retrospektiv yondashuv bugungi ijtimoiy-falsafiy va metodologik bilimlar balandligidan turib o‘tmishga nazar solish, natijalardan sababga qarab mantiqiy zanjir tiklash imkonini bersa, germenevtik yondashuv birlamchi manbalar mualliflarining (Shihobiddin an-Nasaviy, Alouddin Juvayniy, Ibn al-Asir va boshqalar) ijtimoiy-psixologik holati, ongi va kontekstiga kirib borish orqali matnning yashirin substansional mazmunini anglashga xizmat qiladi. Tadqiqotning markaziy ilmiy muammosi – o‘rta asr birlamchi manbalarini germenevtik qayta o‘qish va retrospektiv tahlil qilish vositasida Jaloliddin Manguberdi fenomenining ijtimoiy-falsafiy, ontologik hamda axloqiy-siyosiy mohiyatini ochib berishdan iboratdir.

Adabiyotlar tahlili (Literature review). Tarixiy manbalarni va tarixiy shaxs fenomenini germenevtik hamda retrospektiv tahlil qilishning nazariy-metodologik poydevori G‘arb va Sharq falsafiy an’analarida turli bosqichlarda shakllanib kelgan. G‘arb falsafiy tafakkurida germenevtika dastlab muqaddas matnlarni sharhlash san’ati sifatida paydo bo‘lgan bo‘lsa, XIX-XX asrlarga kelib V. Diltey, F. Shleyermaxer, X.-G. Gadamer va P. Rikyor tadqiqotlari sharofati bilan umumbashariy va ijtimoiy-insonshiylik fanlarining markaziy metodologiyasiga aylandi [4; 5].

Xususan, Fridrix Shleyermaxer germenevtikani “tushunish san’ati” sifatida talqin etib, tadqiqotchi oldiga matn muallifining psixologik va intellektual dunyosiga qayta kirib borish (rekonstruksiya) va matnni muallifning o‘zidan ham yaxshiroq anglash vazifasini qo‘yadi [4]. Bu yondashuv XIII asr muarrixlari tomonidan yozilgan yilnomalarni o‘rganishda juda muhimdir, chunki Shihobiddin an-Nasaviy yoki Alouddin Juvayniy kabi mualliflarning matnlari ortida ular yashagan davrning psixologik bosimi, e’tiqodiy qarashlari va shaxsiy kechinmalari yashiringan [1; 6].

Vilgelm Diltey esa o‘zining “Ruhiy-ma’naviy fanlarga kirish” va “Germenevtika paydo bo‘lishi” asarlarida tabiiy fanlarga xos bo‘lgan “tushuntirish” metodologiyasiga qarama-qarshi o‘laroq, ijtimoiy va tarixiy fanlar uchun “tushunish” tamoyilini ilgari suradi [4]. Diltey konsepsiyasiga ko‘ra, tarixiy hodisa yoki shaxsni shunchaki tashqi sabab-oqibat zanjiri orqali tushuntirib bo‘lmaydi; tadqiqotchi o‘sha tarixiy sub’yektning ichki kechinmalarini o‘z ongida qayta boshdan kechirishi va uning ekzistensial holatiga sherik bo‘lishi lozim [4]. Jaloliddin Manguberdining Sind daryosi bo‘yidagi yoki Parvon jangidagi qarorlarini tahlil qilishda aynan shunday “ichki kechinmaga sherik bo‘lish va tushunish” metodologiyasi suv va havoday zarurdir.

Xans-Georg Gadamer o‘zining “Haqiqat va metod” fundamental asarida germenevtikani ontologik darajaga ko‘tardi [5]. Gadamer “ufqlar qo‘shilishi” konsepsiyasini ilgari suradi. Bunga ko‘ra, o‘tmish matnini tadqiq qilayotgan bugungi tadqiqotchining madaniy-metodologik ufqi bilan tarixiy matnda muhrlangan o‘tmish ufqi bir-biriga to‘qnashadi va sintezlashadi. Bu jarayonda tarixiy manba shunchaki o‘lik ob’yekt emas, balki tadqiqotchi bilan tirik muloqotga kirishuvchi sub’yektga aylanadi [5].

Tarixiy retrospeksiya usuli esa “Annallar maktabi” vakillari Mark Blok va Lyusyen Fevr tomonidan chuqur asoslangan [2]. M. Blok o‘zining “Tarixning hunarmandchiligi yoki tarixchi kasbi” asarida “hozirgi kunni o‘tmish orqali, o‘tmishni esa hozirgi kun orqali anglash” tamoyilini ko‘rsatib o‘tadi [2]. Retrospektiv metodologiya bugungi kundagi inqirozli ijtimoiy jarayonlar va yetakchilik fenomenining tayyor model va oqibatlaridan turib, XIII asrdagi Xorazmshohlar davlatining institusional parchalanishi va Manguberdi faoliyatini qayta tiklash imkonini beradi.

Sharq tarixnavisligi va falsafasida Jaloliddin Manguberdi davriga oid manbaviy baza V.V. Bartold [2], Z.M. Buniyotov [3], T.I. Sultanov [7], J. Rahimov va I. Sayfnazarov kabi yirik olimlar tomonidan manbashunoslik va tarixnavislik

nuqtai nazaridan atroflicha o‘rganilgan. Ammo ushbu manbalardagi ma’lumotlarni germenevtik dekonstruksiya qilish, ya’ni matn ichidagi ramzlar, psixologik kontekst, “ontologik mas’uliyat” va “transgressiya” konseptlarini falsafiy jihatdan umumlashtirish ijtimoiy falsafa oldida turgan muhim vazifaligicha qolmoqda.

Tadqiqot metodologiyasi (Research methodology). Jaloliddin Manguberdi faoliyatini va uning tarixiy-ma’naviy merosini tadqiq etishda sof faktlarni sanashdan iborat bo‘lgan pozitivistik yondashuvlardan farqli ravishda, voqelikning ichki ontologik va ijtimoiy-psixologik qatlamlarini ochib beruvchi integrasialashgan metodologik apparat qo‘llanildi. Tadqiqotning nazariy-metodologik asosini tizimlilik, tarixiylik, mantiqiylik, germenevtik qayta o‘qish va retrospektiv dekonstruksiya tamoyillari tashkil etadi.

Tadqiqot jarayonida quyidagi maxsus va fundamental ijtimoiy-falsafiy metodlar majmuasidan foydalanildi:

Germenevtik metod va narrativ tahlil: Birlamchi tarixiy manbalar - Shihobiddin an-Nasaviyning “Sirat as-sulton Jalal ad-Din Mankburni”, Alouddin Juvayniyning “Tarixi jahongushoy”, Ibn al-Asirning “Al-komil fi-t-tarix”, Rashiduddinning “Jome at-tavorix” hamda Mirzo Ulug‘bekning “To‘rt ulus tarixi” asarlari matni tahlil qilindi [1; 6; 8]. Matnlardagi til birliklari, ramzlar va mualliflarning ijtimoiy-psixologik kayfiyati qayta tahlil qilinib, manba ortidagi yashirin ma’nolar va ekzistensial holatlar yuzaga chiqarildi.

Retrospektiv metod: Bugungi davlatchilik suvereniteti, milliy o‘zlikni anglash va global tahdidlar sharoitidagi rahbarlik fenomeni haqidagi zamonaviy falsafiy konsepsiyalardan turib XIII asrdagi institusional vakuum hamda madaniy-ijtimoiy inqiroz jarayonlarining sabab-oqibat aloqadorligi qayta tiklandi [2].

Tizimli-strukturaviy tahlil: Xorazmshohlar imperiyasining so‘nggi davridagi boshqaruv tizimi, harbiy elita va ijtimoiy anomiya holati yagona destruktiv tizim sifatida, Jaloliddin Manguberdi faoliyati esa ushbu tizim ichida yuzaga kelgan avtonom va qayta tiklanuvchi sinergetik markaz sifatida tadqiq etildi.

Transgressiya va ekzistensial tanlov konsepsiyasi: J.-P. Sartr va M. Fuko falsafasidagi tushunchalar asosida Sultonning Sind (Hind) daryosi bo‘yidagi xatti-harakati tabiiy, siyosiy va harbiy chegaralardan chiqish, mutlaq suveren irodani namoyish etish hodisasi sifatida baholandi.

Natijalar va muhokama (Results and discussion). Tarixiy manbani germenevtik tahlil qilish eng avvalo muallifning ijtimoiy pozisiyasi va psixologik holatini aniqlashni talab etadi. Sulton Jaloliddin haqida axborot beruvchi asosiy o‘rta asr muarrixlari bir-biridan keskin farq qiluvchi ijtimoiy-madaniy va siyosiy muhitda ijod qilganlar. Bu esa ularning matnlarida manbaviy rang-baranglikni va turli darajadagi sub’yektivlikni keltirib chiqargan (1-jadval).

1-jadval.

Jaloliddin Manguberdi fenomeni aks etgan asosiy birlamchi manbalarning germenevtik va retrospektiv tahlili

Manba nomi va muallifi	Muallifning ijtimoiy-siyosiy pozisiyasi	Matndagi markaziy konsept va falsafiy mazmun	Germenevtik tahlil xulosasi
“Sirat as-sulton Jalal ad-Din Mankburni” (Shihobiddin an-Nasaviy) [1]	Sultonning shaxsiy kotibi, voqealarning bevosita ishtirokchisi va guvohi	Institusional vakuum va shaxsiy tragediya: Shaxsiy fidokorlik, yolg‘izlik va mas’uliyat	Guvohlik germenevtikasi: Matn Sultonning ichki psixologik kechinmalari va suveren irodasini xolis ochib beradi
“Tarixi jahongushoy” (Alouddin Atamalik Juvayniy) [6]	Mo‘g‘ullar saroyida xizmat qilgan olim va davlat arbobi	Dushman e’tirofi va xarizma: Chingizxon va mo‘g‘ul elitasining Sultonga bo‘lgan hayrati	Muqobil germenevtika: Dushman matnida qahramon obrazining tan olinishi orqali fenomenning universalligi asoslanadi
“Al-komil fi-t-tarix” (Ibn al-Asir) [9]	Mustaqil arab tarixchisi, inqirozni tashqaridan kuzatuvchi	Ijtimoiy anomiya va sivilizasion inqiroz: Ummatning mag‘lubiyati va umidsizlik muhiti	Retrospektiv tanqid: Voqealarga umum-islom sivilizatsiyasi inqirozi va fojiasi nuqtai nazaridan baho beriladi
“To‘rt ulus tarixi” (Mirzo Ulug‘bek) [8]	Temuriylar davri hukmdori va mutafakkiri, retrospektiv tadqiqotchi	Meta-tarixiy ko‘prik va milliy o‘zlik: Davlatchilik an’anasi va ozodlik ruhi	Tarixiy retrospeksiya: Jaloliddin kurashi kelajak avlodlar uchun davlatchilik va mardlik modeli sifatida mazmunlanadi

Shihobiddin an-Nasaviyning asari germenevtik jihatdan eng yuqori qimmatga ega, chunki muallif Sulton bilan birga barcha harbiy yurishlarda, fojiali chekinishlarda va ichki siyosiy ziddiyatlarda bevosita ishtirok etgan [1]. Nasaviy

matnlarida Jaloliddin shunchaki afsonaviy qahramon emas, balki atrofidagi xoinliklar, elitalarning tarqoqligi va resursning yo‘qligi sharoitida oliy ontologik mas’uliyatni bo‘yniga olgan real inson sifatida gavdalanadi [1]. Alouddin Juvayniy matnini germenevtik dekonstruksiya qilish esa o‘ziga xos metodologik paradoksni yuzaga chiqaradi: Mo‘g‘ul hukmdorlariga xizmat qilgan muarrix Jaloliddinning mardligini va Chingizxonning unga bo‘lgan cheksiz hayratini yashira olmaydi [6]. Chingizxonning Sind daryosi bo‘yidagi “Otaning mana shunday o‘g‘li bo‘lsin...” degan mashhur xitobi Juvayniy asarlari orqali bizgacha yetib kelgan [6]. Bu germenevtikada “dushman narrativida haqiqatning namoyon bo‘lishi” deb ataladi. Sultonning irodasi va jasorati hatto bosqinchilar va jahonni titratgan mo‘g‘ul xoni tomonidan ham mutlaq qadriyat sifatida tan olingan.

1221 yilning kuzida sodir bo‘lgan Sind (Hind) daryosi bo‘yidagi tarixiy voqelik Sulton Jaloliddin faoliyatining markaziy ontologik nuqtasidir. Nasaviy va Juvayniy guvohlik berishicha, mo‘g‘ul qo‘shinlari Sulton kuchlarini daryo qirg‘og‘iga qisib qo‘yadi va atrof to‘liq qurshovga olinadi [1; 6]. Mavjud geosiyosiy va harbiy sharoit nuqtai nazaridan mag‘lubiyat va asirlik muqarrar edi. Ushbu vaziyatni J.-P. Sartrning “ekzistensial tanlov” va M. Fuko hamda J. Batayning “transgressiya” konsepsiyalari orqali falsafiy dekonstruksiya qilish quyidagi xulosalarni beradi:

Asirga tushish yoki mo‘g‘ullarga taslim bo‘lish tirik qolish imkonini berar edi, ammo bu suveren maqomdan, shaxsiy va milliy sha’ndan voz kechish - ekzistensializm tilida “soxta borliq”ga rozi bo‘lishni anglatar edi.

Sulton Jaloliddin o‘z otini, qurol-aslahalari va sovuti bilan birga, 8-10 metrlik balandlikdan vahshirayotgan suv girdobiga otadi [1]. Bu shunchaki jismoniy jon saqlash harakati emas, balki inson ongi va irodasining mavjud tabiiy va geosiyosiy chegaralarni (limitlarni) yorib o‘tishi - chinakam transgressiya hodisasidir [6].

Sulton suvdan sog‘-omon chiqib, narigi qirg‘oqda mo‘g‘ullarga qarab qilich o‘qtaladi [1]. Bu harakat orqali u davlat apparati to‘liq vayron bo‘lgan sharoitda ham shaxsning avtonom irodasi va suvereniteti aslo yengilmasligini, tana va ruhning oxirgi qal’a sifatida saqlanib qolishini isbotladi.

Jaloliddin Manguberdi fenomenini faqat XIII asr matnlari doirasida o‘rganish to‘liq manzarani ko‘rish uchun yetarli emas. Bu o‘rinda tarixiy retrospeksiya usuli vositasida kelajak davr mutafakkirlarining ushbu fenomenga bergan bahosini tahlil qilish muhim metodologik ahamiyatga ega.

Temuriylar davrining yirik davlat arbobi va mutafakkiri Mirzo Ulug‘bek o‘zining “To‘rt ulus tarixi” asarida Sulton Jaloliddin faoliyatiga alohida to‘xtalib o‘tadi [8]. Mirzo Ulug‘bek retrospeksiyasining asosiy xususiyatlari quyidagilardan iborat:

Ulug‘bek Sulton Jaloliddin kurashini shunchaki bir sulolaning omon qalish harakati emas, balki Markaziy Osiyo davlatchiligi va harbiy san’atining uzilmas rishtasi sifatida talqin etadi [8].

Temuriylar retrospeksiyasida Jaloliddin siymosi Amir Temur va uning avlodlari uchun milliy ozodlik, mardlik va tizimli tahdidlarga qarshi turk-islom dunyosining integrasion ramzi sifatida gavdalanadi [8].

Retrospektiv yondashuv shuni ko‘rsatadiki, Sulton Jaloliddinning mo‘g‘ul bosqinchilariga qarshi 11 yillik beamon kurashi Markaziy Osiyo xalqlarining milliy-madaniy va davlatchilik ongi butunlay so‘nib ketmasligini ta’minlagan va kelajakda Temuriylar renessansi uchun ma’naviy poydevor xizmatini o‘tagan.

Xulosa (Conclusion). Sulton Jaloliddin Manguberdi fenomenini birlamchi manbalar asosida germenevtik va retrospektiv tadqiq etish quyidagi fundamental ijtimoiy-falsafiy xulosalarni chiqarish imkonini beradi:

XIII asr birlamchi manbalari (Nasaviy, Juvayniy, Ibn al-Asir va boshqalar) sof xronologik faktlar yig‘indisi emas, balki og‘ir ijtimoiy-madaniy inqiroz davrining ekzistensial va psixologik holatini aks ettiruvchi murakkab metaforik va semiotik tizimdir [1; 6.]. Germenevtik metod ushbu manbalar ortidagi “avtonom suveren iroda” va “institusional vakuum” konseptlarini yuzaga chiqaradi.

Sulton Jaloliddinning Sind daryosi bo‘yidagi xatti-harakati va keyingi kurashlari ijtimoiy falsafa nuqtai nazaridan inson irodasining mavjud cheklovlar (limitlar) va muqarrar mag‘lubiyat konsepsiyasidan chiqishi - transgressiv sakrashidir. Davlat apparati to‘liq vayron bo‘lgan sharoitda shaxsning o‘zi davlatchilik va suverenitetning yagona substansional manbaiga aylanadi.

Mirzo Ulug‘bek va undan keyingi davr tarixnavisligi retrospeksiyasi Jaloliddin Manguberdi fenomenining meta-tarixiy ahamiyatini tasdiqlaydi [8]. Sultonning kurashi Markaziy Osiyo davlatchilik an’anasining uzviyligini va xalqning ma’naviy immunitetini saqlab qolgan fundamental omil sifatida maydonga chiqadi.

Zamonaviy globallashuv va geopolitik beqarorlik sharoitida Jaloliddin Manguberdi fenomenini germenevtik tahlil qilish yoshlar ongida milliy o‘zlikni, vatanparvarlikni hamda tizimli inqirozlarga qarshi ichki ma’naviy-axloqiy bardoshlilikni shakllantirishda muhim nazariy-metodologik manba bo‘lib xizmat qiladi.

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SOG‘LOM TURMUSH TARZI MADANIYATINI RIVOJLANTIRISHDA TIBBIY-EKOLOGIK VA IJTIMOIY LOYIHALAR

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Annotatsiya: *Maqolada zamonaviy jamiyatda sog‘lom turmush tarzi madaniyatini rivojlantirishda tibbiy-ekologik va ijtimoiy loyihalarning o‘rni tahlil qilingan. Unda tibbiy profilaktika, ekologik xavfsiz muhitni shakllantirish, sog‘lom ovqatlanish, jismoniy faollik va psixo-emotsional salomatlikni ta’minlashga qaratilgan loyihalarning ahamiyati yoritilgan. Shuningdek, ijtimoiy loyihalar orqali yoshlarda sog‘lom turmush ko‘nikmalarini shakllantirish, ularning ijtimoiy faolligini oshirish va sog‘lom hayot tarziga mas’uliyatli munosabatini kuchaytirish masalalari ko‘rib chiqilgan.*

Kalit so‘zlar: *sog‘lom turmush tarzi, sog‘lom turmush madaniyati, tibbiy-ekologik loyihalar, ijtimoiy loyihalar, yoshlar salomatligi, jismoniy faollik, ekologik madaniyat, ijtimoiy sheriklik, raqamli texnologiyalar. ‘*

МЕДИКО-ЭКОЛОГИЧЕСКИЕ И СОЦИАЛЬНЫЕ ПРОЕКТЫ В РАЗВИТИИ КУЛЬТУРЫ ЗДОРОВОГО ОБРАЗА ЖИЗНИ

Аннотация: *В статье анализируется роль медико-экологических и социальных проектов в развитии культуры здорового образа жизни в современном обществе. Раскрывается значение проектов, направленных на медицинскую профилактику, формирование экологически безопасной среды, здоровое питание, физическую активность и обеспечение психоэмоционального здоровья. Особое внимание уделяется формированию у молодежи навыков здорового образа жизни посредством социальных проектов, повышению ее социальной активности и развитию ответственного отношения к собственному здоровью.*

Ключевые слова: *здоровый образ жизни, культура здорового образа жизни, медико-экологические проекты, социальные проекты, здоровье молодежи, физическая активность, экологическая культура, социальное партнерство, цифровые технологии.*

MEDICAL-ECOLOGICAL AND SOCIAL PROJECTS IN DEVELOPING A HEALTHY LIFESTYLE CULTURE

Abstract: *The article analyzes the role of medical-ecological and social projects in developing a healthy lifestyle culture in modern society. It highlights the importance of projects aimed at medical prevention, the formation of an environmentally safe environment, healthy nutrition, physical activity, and the promotion of psycho-emotional well-being. Particular attention is paid to developing healthy lifestyle skills among young people through social projects, increasing their social activity, and strengthening their responsible attitude toward personal health.*

Keywords: *healthy lifestyle, healthy lifestyle culture, medical-ecological projects, social projects, youth health, physical activity, ecological culture, social partnership, digital technologies.*

Zamonaviy jamiyatda sog‘lom turmush tarzi madaniyatini rivojlantirish nafaqat individual salomatlikni saqlash, balki ijtimoiy farovonlik va barqaror rivojlanishni ta’minlovchi murakkab jarayon sifatida namoyon bo‘lmoqda. Bugungi kunda globallashuv, shaharlashuv va ekologik tahdidlar inson salomatligiga turli yo‘nalishlarda ta’sir ko‘rsatmoqda, shuning uchun sog‘lom turmush tarziga yo‘naltirilgan tadbirlar va loyihalarning ahamiyati ortib bormoqda. Bu jarayonda tibbiy-ekologik va ijtimoiy loyihalar o‘zining nazariy va amaliy ahamiyati bilan ustunlik qiladi.

Tibbiy-ekologik loyihalar inson salomatligini muhofaza qilish va kasalliklarni profilaktika qilish sohasida markaziy ahamiyatga ega. Bunday loyihalarga ommaviy skrininglar, vaksinatsiya dasturlari, sog‘lom ovqatlanish va nutritsiologiya yo‘nalishlari, shahar va qishloq hududlarida ekologik toza muhitni saqlash va yanada yaxshilashga qaratilgan tadbirlar kiradi. Tibbiy-ekologik loyihalar nafaqat individual salomatlikni yaxshilash, balki barqaror sog‘lom muhitni tashkil etish orqali jamiyatning umumiy immuniteti va farovonligini oshirish imkonini beradi. Masalan, shaharlarda havo sifati monitoringi va qishloq hududlarida suv va mahsulotlarning ekologik nazorati sog‘lom turmush tarzini amaliyotda

rivojlantirishda muhim rol o‘ynaydi. Ikkinchidan, ijtimoiy loyihalar sog‘lom turmush tarzi madaniyatini shakllantirishda insonlarning hayotiy odatlarini o‘zgartirish va ularda mas’uliyatli munosabatni uyg‘unlashtirishga xizmat qiladi. Bu loyihalar orasida sog‘lom hayot tarzini targ‘ib qilish kompaniyalari, sport va jismoniy tarbiya dasturlari, psixo-emotsional sog‘liqni saqlashga yo‘naltirilgan treninglar, oilaviy va yoshlar tarbiyasiga bag‘ishlangan tadbirlar alohida ahamiyatga ega. Ijtimoiy loyihalar orqali sog‘lom hayot tarzi madaniyati nafaqat individual, balki jamoat miqyosida ham keng targ‘ib qilinadi, ijtimoiy barqarorlik va solidarlik hissini mustahkamlaydi.

Tibbiy-ekologik va ijtimoiy loyihalarning hamohangligi sog‘lom turmush tarzi madaniyatini rivojlantirishda eng samarali mexanizm hisoblanadi. Masalan, shaharlardagi sport maydonlari va fitnes-klublar, ekologik toza parklar, velosiped yo‘laklari va yurish trassalari faqat jismoniy faollik uchun sharoit yaratadi, balki ekologiya va ijtimoiy tarbiyani ham uyg‘unlashtiradi [1, 128]. Shu bois, loyihalarning integratsiyalangan amalga oshirilishi salomatlikni muhofaza qilish, ekologik madaniyatni yuksaltirish va sog‘lom ijtimoiy muhitni shakllantirishda hal qiluvchi ahamiyatga ega. Shuningdek, zamonaviy loyihalarda raqamlashuv va axborot texnologiyalaridan foydalanish imkoniyatlari ham katta ahamiyatga ega. Mobil ilovalar, onlayn platforma va elektron sog‘liqni saqlash tizimlari orqali aholi sog‘lom turmush tarzi haqida ma’lumot olish, individual faollik va ovqatlanishni nazorat qilish, psixologik maslahatlar va sport dasturlariga kirish imkoniyati paydo bo‘lmoqda. Bu holat tibbiy-ekologik va ijtimoiy loyihalarning samaradorligini oshirishga xizmat qiladi.

ADABIYOTLAR TAHLILI VA METODLAR

Sog‘lom turmush tarzi madaniyatini rivojlantirishda tibbiy-ekologik va ijtimoiy loyihalar bilan bog‘liq masalalarni o‘rganishda Аллаёров Ю.Н. [1], Георгиевский А.Ф. [2], Bunton R, Macdonald G. [3], http://en.wikipedia.org/wiki/Californian_Journal_of_Health_Promotion [4], Karimov I.A. [5], O‘zbekiston Respublikasining «Ijtimoiy sheriklik to‘g‘risida» gi Qonuni [6], Gaipnazarov R. [7], Davletshin M.G., Shoumarov G‘.B. [8], Дубачай А.Д. [9] kabi mualliflarning ilmiy va nazariy qarashlaridan foydalanildi.

Mazkur muammoni o‘rganish jarayonida umumiy aloqadorlik, tarixiylik va tizimlilik tamoyillari, shuningdek, umumlashtirish usulidan foydalanildi.

NATIJALAR VA MUHOKAMA

Bugungi kunga kelib rivojlangan tibbiyot fani sog‘liqni saqlash, mustahkamlash va yaxshilashning ishonchli metodlarini tavsiya qilmoqda. Bu metod har bir insonning sog‘lom turmush tarziga qattiq rioya qilishi va aholida sog‘lom turmush tarzini rivojlantirishdan iborat. Mazkur maqsadga esa faqat insonning sog‘lom turmush madaniyatini rivojlantirish va unga rioya etish orqaligina erishish mumkin bo‘ladi. Bu nafaqat inson sog‘ligini saqlashga olib keladi, balki ishchanlik faoliyatini oshiradi, turli kasalliklardan asraydi, shuningdek, erta qarilikning oldini oladi.

Millatimiz tarixiy-ijtimoiy qadriyatlari tizimida har vaqt sog‘lom yashash va uzoq umr ko‘rish aqidalari mavjud bo‘lgan va nasl sog‘lomligiga alohida e’tibor bilan qaralgan. Nasl sog‘lomligi tushunchasi esa, eng avvalo, yoshlar salomatligi masalalarida sa’y-harakat qilish zarurligini bildirgan. Shu bilan birga, o‘zbek millati qadriyatlari tizimiga sog‘lomlik tushunchasi doirasida nafaqat tibbiy yoki jismoniy salomatlik, balki ruxiy, ma’naviy sog‘lomlik asoslari kiritilgan. Ayniqsa, inson salomatligi asosida ma’naviy salomatlik alohida ta’kidlangan. Bugungi kunda ham sog‘lomlik tushunchasi tarkibiy jihatdan o‘zining murakkabligi va serqirraligini yorqin namoyon etadi. Uning murakkabligi tarkibidagi har bir bo‘lim, aslida yana bir necha o‘z mazmuniga ega bo‘lgan tarkibiy qismlarga bo‘linib ketishida ko‘rinadi [2, 143].

Xorijiy G‘arb davlatlarida sog‘lom turmush tarzi g‘oyalari asosida “Health promotion”, ya’ni salomatlikni mustahkamlash istilohi keng qo‘llaniladi. Salomatlikni mustahkamlash g‘oyasi asosida faoliyat olib borish majburiyati Butunjahon sog‘liqni saqlash tashkilotining Bangkok (2005) konferensiyasida qabul qilingan. Mazkur hujjatda qayd etilishicha, mamlakatlarda “insonlarga o‘z salomatliklarini muhofaza qilish, sog‘liqni mustahkamlash uchun barcha zarur chora va shart-sharoitlarni” yaratish lozim. Chunki sog‘likni mustahkamlash insonlar imon-e’tiqodi, ular xohish-istagidan tashqari mavjud hokimiyatlar siyosiy irodasiga ham bog‘liqdir. Mazkur hujjatda aytilishicha, ba’zi rivojlangan va liberal davlatlarda sog‘liqni saqlashga yo‘naltirilgan mablag‘lar hajmi kundan-kun qisqarib bormoqda. Bu esa istiqbolda fuqarolar salomatligiga salbiy ta’sir etuvchi omil hisoblanadi.

G‘arb davlatlari olimlaridan R.Banton, G.Makdonald, K.Tons, S.Tilfold, A.Skriven, S.Garmann kabilarning so‘nggi o‘n yilliklarda nashr etilgan tadqiqotlarini ta’kidlab o‘tish joiz [3]. Shu bilan birga, AQShda “Salomatlikni asrash bo‘yicha Amerika jurnali”, “Salomatlik qadriyatlarining Amerika jurnali” hamda “Salomatlik muhofazasi bo‘yicha Kaliforniya jurnali” [4] kabi maxsus ilmiy-nazariy va ommabop nashrlarda sog‘lom turmush tarzi va salomatlikni asrash texnologiyalari bo‘yicha yangi materiallar chop qilinadi. 1997 yilda AQShda Salomatlikni muhofaza qilish bo‘yicha Amerika Akademiyasi tuzilgan bo‘lib, uning bosh vazifasi sifatida salomatlikni muhofaza qilish pedagogikasini keng targ‘ib qilish, uning targ‘ibotini nazariy-amaliy xulosalar va bilimlar asosiga qurilishini ta’minlash, shuningdek, mavjud sog‘liqni saqlash tizimini rivojlantirish belgilangan.

Sog‘lom turmush madaniyatini rivojlantirish muammolarini ochib beruvchi va shu muammoga e’tibor qaratuvchi uslubiy va ilmiy adabiyotlarning tahlili shuni ko‘rsatadiki, sog‘lom hayot, turmush tarzi madaniyati komponentlari tarkibini va mohiyatini aniqlashda turli, bir-biridan farq qiluvchi yondashuvlar mavjud.

Fuqarolik institutlari, nodavlat notijorat tashkilotlar hozirgi kunda demokratik qadriyatlar, inson huquq va erkinliklari hamda qonuniy manfaatlarini himoya qilishning muhim omiliga aylanmoqda, fuqarolarning o‘z salohiyatlarini ro‘yobga chiqarishi, ularning ijtimoiy, sotsial-iqtisodiy faolligi va huquqiy madaniyatini oshirish uchun sharoit yaratmoqda, jamiyatda manfaatlar muvozanatini ta’minlashga ko‘maklashmoqda” [5, 42]. Darhaqiqat, mamlakatimizda Yoshlar ishlari agentligi yoshlarga oid davlat siyosatining bosh sub’ekti hisoblanib, yurtimiz aholisining 64 foizini tashkil qilgan yoshlarni birlashtirish, ularning huquq va manfaatlarini himoya qilish borasida faoliyat olib boradi.

Yoshlar sog‘lom turmush madaniyatini rivojlantirishda uzviylik va uzluksizlik tamoyillari amal qilishining pedagogik mexanizmlarini takomillashtirishda davlat organlarining nodavlat notijorat tashkilotlar va fuqarolik jamiyatining boshqa institutlari bilan ijtimoiy sherikligini ta’minlash borasida olib borgan tadqiqotlarimiz O‘zbekiston Respublikasining «Ijtimoiy sheriklik to‘g‘risida»gi Qonunida belgilangan vazifalarning ijrosini ta’minlashga xizmat qiladi. Zero, O‘zbekiston Respublikasining «Ijtimoiy sheriklik to‘g‘risida»gi Qonunida «...atrof-muhitni, aholining sog‘ligini muhofaza qilish va sog‘lom turmush tarzini qaror toptirish, har tomonlama barkamol va sog‘lom yosh avlodni shakllantirish, yoshlarga bilim berish, ularni ma’naviy-axloqiy jihatdan tarbiyalash va kasbga yo‘naltirish» sohalarida davlat organlarining nodavlat notijorat tashkilotlar va fuqarolik jamiyatining boshqa institutlari bilan ijtimoiy sherikligini amalga oshirishning huquqiy asoslari belgilab qo‘yilgan. Shuningdek, ijtimoiy sheriklik sub’ektlari tomonidan birgalikda tadbirlar, maslahatlashuvlar va muzokaralar o‘tkazish, bitimlar va shartnomalar tuzish, birgalikda loyihalar va rejalarni ishlab chiqish hamda amalga oshirish, ular o‘rtasida o‘zaro qo‘llab-quvvatlash va axborot almashishni tashkil etish mumkinligi belgilangan [6, № 9].

Tadqiqotlarimiz davomida yoshlar sog‘lom turmush madaniyatini rivojlantirishga yo‘naltirilgan ijtimoiy loyihalar mazmunini ishlab chiqish va samaradorligini baholashga asosiy e’tibor qaratildi va ijtimoiy loyihalarning yoshlar sog‘lom turmush madaniyatini rivojlantirishdagi o‘rni va roli ilk bor ilmiy-pedagogik nuqtai nazardan tadqiq etildi. Zero, ijtimoiy loyihalar bugungi kunda dunyoning barcha mamlakatlarida turli qatlam vakillari o‘rtasida, turli maqsad va yo‘nalishlarda tashkil etiladi. Jamiyatning turli sohalari taraqqiyotiga ta’sir ko‘rsatuvchi ijtimoiy, investitsion, innovatsion, biznes loyihalar keng qo‘llanilmoqda.

Loyiha (projekt) – tushunchasi kengroq ifodalanib, ma’lum natija (loyihaning beqiyos mahsuli)ga erishish uchun maqsadli tashkil etiladiganfaoliyat, loyihalashtirish esa - («loyiha» so‘zidan olingan bo‘lib) – real natijaga olib keluvchi, qat’iy tartibga solingan harakatlar izchilligini o‘z ichiga oluvchi muammoni hal etuvchi faoliyatni anglatadi.

Loyiha (design - dizayn) – ba’zi murakkab ishlanmalarni yaratish bo‘yicha hujjatlar yig‘indisi. G. Vereщaginning fikricha, ijtimoiy loyiha daromad olishni maqsad qilmagan, balki jamiyat uchun foydali ish (faoliyat) yoki ijtimoiy loyiha –jamiyatni tarbiyalashning eng samarli usuli demakdir. Ijtimoiy loyiha ijtimoiy natija olish uchun yaratiladi. Ijtimoiy loyihalar jamiyatning dolzarb muammolariga e’tibor qaratish, rivojlangan fuqarolik jamiyati barpo etishda ishtirok etish imkonini beradi. Ijtimoiy loyiha muammoning avval bo‘lmagan yechimini topishga qaratiladi. Shuni alohida ta’kidlash joizki, ijtimoiy loyihalarning jamiyat va inson hayotida tutgan o‘rni hali ilmiy-pedagogik jihatdan umuman o‘rganilmagan.

Tadqiqotlar davomida asosiy e’tibor respublikamizdagi davlat organlarining nodavlat notijorat tashkilotlar va fuqarolik jamiyatining boshqa institutlari bilan ijtimoiy sheriklik g‘oyalarini amalga oshirishda ularning kuchlarini birlashtirish orqali yoshlar sog‘lom turmush madaniyatini rivojlantirish bo‘yicha uzviylik va uzluksizlik tamoyillari amal qilishining pedagogik mexanizmlarini takomillashtirishga qaratildi.

O‘zbekiston Yoshlar ishlari agentligining “Yoshlarda sog‘lom turmush tarzini shakllantirish” bo‘limi faoliyati orqali yoshlar sog‘lom turmush tarzini rivojlantirishga yo‘naltirilgan “Baxtli bolalik”, “Yozni Kamalak bilan”, “Qadriyat, urf-odat, an’ana va yoshlar”, “Biz buyuk yurt farzandlarimiz”, “Biz yoshlar sog‘lom turmush tarafdorimiz”, “Yoshlar chekish, OIV/OITS va giyohvandlikka qarshi”, “Tarbiya va sog‘lomlashtirish oromgohi”, “Kamolot shaxmat taxtasi”, “Kamolot-tur”, “Yoshlar ijtimoiy xizmat markazlari” kabi ijtimoiy loyihalar tanlab olindi va ularning Nizomi, o‘tkazish algoritmi, amalga oshirish texnologiyasi aniqlanib, 2008-2012 yillarda respublikamiz yoshlari o‘rtasida tajriba-sinovdan o‘tkazildi [7, 62].

Ijtimoiy loyiha yoshlarning muammoni aniqlash va uni hal etish bo‘yicha faoliyatini rejalashtirish hamda tashkil etishdan to uni hal etish yo‘lini taqdim etishgacha mustaqil harakat qilishini ta’minlovchi maxsus tashkil etilgan maqsadli jarayondir. Loyihaviy faoliyat quyidagicha tuziladi: loyiha konsepsiyasini ishlab chiqish, loyihaviy faoliyatni rejalashtirish, loyihaviy vazifalarni hal etish, mahsulotni rasmiylashtirish, loyiha taqdimoti, himoyasi bilan faoliyatni tashkil etish, loyiha mazmunini ommaviy axborot vositalarida yoritish; hisobot va natijalar taqdimotini tayyorlash, loyihani baholash, o‘tgan yillardagi holati bilan solishtirma tahlil qilish va monitoring olib borish.

Ijtimoiy loyihalarni yoshlar hayotiga tatbiq etishda ta’lim-tarbiyaning ilmiylik, tizimlilik, izchillik; integratsiya; insonparvarlik; maqsadga yo‘naltirilganlik, yoshlarning shaxsiy va psixologik xususiyatlarini hisobga olish; faoliyatga

tarbiyalash; nazariyaning amaliyot bilan bog‘liqligi; shaxslararo munosabatlarning birligi; faoliyat va munosabat uzviyligi; jamoada o‘ziga xos shaxsiy sifatlarni namoyon etish vaboshqara olish, tarbiyada ijtimoiy sheriklik, natijani oldindan ko‘ra olish kabi pedagogik tamoyillariga asoslangan holda yoshlar ongiga sog‘lom turmush madaniyati singdirildi.

Yoshlar o‘rtasida sog‘lom turmush madaniyatini rivojlantirishga yo‘naltirilgan ijtimoiy loyihalarni amalga oshirishda konferensiya, festival, ko‘rik tanlov, davra suhbatlari, seminar-trening, sotsiologik so‘rovlar, turnirlar, aksiya, hashar kabi tarbiyaviy shakllardan foydalanish tadqiqotlarning samaradorligini ta’minlashga xizmat qildi. Turli toifadagi yoshlarning o‘ziga xos xususiyatlari, qiziqishlarini inobatga olgan holda yoshlar o‘rtasida ijtimoiy so‘rovlar o‘tkazish, bahs va munozaralar, seminarlar, uchrashuvlar, anjumanlar tashkil etish, ommaviy axborot vositalaridan, axborot-kommunikatsiya texnologiyalaridan keng foydalanishga asosiy e’tibor qaratildi [8, 62]. Shuningdek, ijtimoiy loyihalar davomida yoshlarning sog‘lom turmush madaniyati haqidagi bilimlardan xabardorlik darajasini oshirishda ta’limning yozma, elektron va og‘zaki shakllaridan foydalanildi.

Yoshlar o‘rtasida olib borilgan ma’ruza, suhbat, namoyish qilish, kuzatish, tajriba, adabiyotlarni o‘rganish, rolli o‘yinlar, o‘quv musobaqalari, didaktik masalalarni yechish, loyiha tayyorlash va himoya qilish, test nazorati, intervyu, pedagogik rag‘batlantirish, xulq-atvor va faoliyatni tashkil etish, nazorat va o‘z-o‘zini nazorat qilish kabi ta’lim-tarbiya metodlari ijtimoiy loyihalar davomida ularning sog‘lom turmush madaniyatiga oid nazariy bilim, ko‘nikma va malakalarini rivojlantirish imkonini berdi.

Tadqiqotlarimiz davomida yoshlarning sog‘lom turmush madaniyatini rivojlantirishga qaratilgan ijtimoiy loyihalarni quyidagicha guruhlashtirdik: sog‘lom hayot va sog‘lom turmush tarzi g‘oyalarini yoshlar ongiga singdirish; narkomaniya, giyohvandlik va ichkilikbozlikning oldini olish; yoshlarni ommaviy sportga jalb qilish; imkoniyati cheklangan, nogiron yoshlarning jamiyatga ijtimoiylashuvini ta’minlash; ijtimoiy-huquqiy xatarli guruhga mansub o‘smirlar bilan profilaktik ishlarni olib borish; ularning turli yo‘nalishdagi iste’dodini ro‘yobga chiqarish; yoshlarning reproduktiv salomatligi va sog‘lom oilani shakllantirish, ekologik muammolarning oldini olishga qaratilgan loyihalar [9, 20]. Shuningdek, yosh avlodni istiqlol g‘oyalariga cheksiz sadoqat ruhida tarbiyalash, ona yurtga muhabbat tuyg‘usini, jasorat va fidokorlik fazilatlarini tarbiyalash, milliy va umuminsoniy qadriyatlarga nisbatan hurmat, buyuk ajdodlarimiz merosini chuqur o‘rganishga qiziqish, ularning ongi va dunyoqarashini shakllantirish, turli hududlarning o‘ziga xos jihatlarini, turli qatlamdagi yoshlarning ehtiyoj va qiziqishlarini qo‘llab-quvvatlashga yo‘naltirilgan ijtimoiy loyihalar amaliyotga joriy etildi.

XULOSA

Ijtimoiy loyihalar yoshlarda sog‘lom turmush madaniyatining jismoniy salomatlik, tibbiy salomatlik, ma’naviy salomatlik, salomatlikka ta’sir etuvchi turli illatlarga nisbatan kurashuvchanlik, sog‘lom tafakkur, sog‘lom dunyoqarash, maishiy turmush odobi, ovqatlanish odobi, kiyinish tartib-qoidalari, shaxsiy gigiena qoidalariga amal qilish, atrof-muhit va ekologik qadriyatlarga hurmat kabi tarkibiy qismlarini rivojlantirishga asosiy e’tibor qaratildi va hududning geografik joylashuvi, demografik xususiyati, yoshlar masalalariga bog‘liq muammolar hisobga olindi hamda tabaqalashtirilgan yondashuv asosida amalga oshirildi. Tadqiqotda ko‘rib chiqilgan yondashuvlar asosida ijtimoiy loyihalarning samaradorligini ta’minlovchi muhim shartlar sifatida maqsadli yo‘naltirilganlik, tizimlilik, uzviylik va uzluksizlik, yoshlarning faol ishtirokini ta’minlash, hududiy va ijtimoiy xususiyatlarni hisobga olish, davlat va fuqarolik jamiyati institutlari o‘rtasidagi ijtimoiy sheriklikni kuchaytirish hamda zamonaviy axborot-kommunikatsiya texnologiyalaridan foydalanishni qayd etish mumkin.

Ayniqsa, yoshlar muhitida sog‘lom turmush tarzi madaniyatini shakllantirish uzoq muddatli ijtimoiy investitsiya sifatida baholanishi lozim. Chunki yoshlarda shakllangan sog‘lom hayot ko‘nikmalari nafaqat ularning shaxsiy salomatligi va hayot sifatini belgilaydi, balki kelgusida oila, mehnat jamoasi va jamiyatda sog‘lom ijtimoiy muhitni qaror toptirishga ta’sir ko‘rsatadi.

Shunday qilib, sog‘lom turmush tarzi madaniyatini rivojlantirishning eng samarali modeli tibbiy profilaktika, ekologik xavfsizlik, ijtimoiy sheriklik, ma’naviy-ma’rifiy tarbiya va faol fuqarolik ishtiroki elementlarini yagona tizimga birlashtirishga asoslanadi. Bunday integratsiyalashgan yondashuv inson salomatligini muhofaza qilish bilan cheklanib qolmay, sog‘lom, faol va ijtimoiy mas’uliyatli shaxsni shakllantirish hamda barqaror va sog‘lom jamiyatni rivojlantirish uchun zarur ijtimoiy shart-sharoitlarni yaratadi.

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QORAQALPOQ, TURKMAN VA INGLIZ BOLALAR QO‘SHIQLARIDA TOVUSH UYG‘UNLIGI VA HARAKATNING FONOSEMANTIK IFODASI

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Annotatsiya: *Maqolada qoraqalpoq, turkman va ingliz bolalar qo‘shiqlarida alliteratsiya, reduplikatsiya, paronimiya va taqlidiy tovushlarning poetik vazifalari qiyosiy tahlil qilindi. Tovush takrorining harakat ovozini qayta yaratishi, talaffuz sur’atini belgilashi va bolaning diqqatini so‘zning ma’nosidan uning akustik shakliga yo‘naltirishi asoslandi. Uch xalq folklorida tovush, so‘z va harakat uyg‘unligi umumiy tipologik hodisa bo‘lsa-da, uning milliy ifodasi har bir tilning fonetik va morfologik imkoniyatlari bilan belgilanishi ko‘rsatildi.*

Kalit so‘zlar: *tovush uyg‘unligi, alliteratsiya, reduplikatsiya, fonosemantika, taqlidiy so‘z, paronimiya, bolalar folklori, harakat obrazi.*

ЗВУКОВАЯ ГАРМОНИЯ И ФОНОСЕМАНТИЧЕСКОЕ ВЫРАЖЕНИЕ ДЕЙСТВИЯ В КАРАКАЛПАКСКИХ, ТУРКМЕНСКИХ И АНГЛИЙСКИХ ДЕТСКИХ ПЕСНЯХ

Аннотация: *В статье проведен сравнительный анализ поэтических функций аллитерации, редупликации, паронимии и звукоподражаний в каракалпакских, туркменских и английских детских песнях. Обосновано, что повторение звуков воссоздает звук движения, определяет темп произношения и направляет внимание ребенка со значения слова на его акустическую форму. Показано, что хотя гармония звука, слова и движения является общим типологическим явлением в фольклоре трех народов, ее национальное выражение определяется фонетическими и морфологическими возможностями каждого языка.*

Ключевые слова: *гармония звуков, аллитерация, редупликация, фоно семантика, звукоподражательное слово, паронимия, детский фольклор, образ движения.*

SOUND HARMONY AND PHONOSEMANTICAL EXPRESSION OF ACTION IN KARAKALPAK, TURKMEN, AND ENGLISH CHILDREN’S SONGS

Abstract: *The article provides a comparative analysis of the poetic functions of alliteration, reduplication, paronyms, and onomatopoeia in Karakalpak, Turkmen, and English children’s songs. It is substantiated that sound repetition recreates the sound of movement, determines the pace of pronunciation, and directs the child’s attention from the meaning of the word to its acoustic form. It is shown that although the harmony of sound, word, and movement is a common typological phenomenon in the folklore of the three nations, its national expression is determined by the phonetic and morphological capabilities of each language.*

Keywords: *sound harmony, alliteration, reduplication, phonosemantics, onomatopoeia, paronyms, children’s folklore, image of movement.*

Kirish. Bolalar qo‘shiqlarida tovush shakli mazmunni ifodalovchi passiv vosita emas. Tovush takrori harakatning sur’ati va akustik xususiyatini qayta yaratadi, ijrochilarni bir xil talaffuz qolipiga moslashtiradi va matnni xotirada saqlashni osonlashtiradi. Ayrim namunalarda ma’no ikkinchi darajaga o‘tib, tovush uyini asosiy estetik va ijroviy vazifani bajaradi.

Olim S.M. Loyter bolalar she’riyatida tovush obrazlari, ritmik-intonatsion shakl va so‘z o‘yinining kattalar poeziyasiga nisbatan zichroq mujassamlashishini ta’kidlaydi [1, 45-46-b.]. Bu holat bolalarning so‘zni faqat ma’no tashuvchi birlik emas, talaffuz va eshitish ob’ekti sifatida ham qabul qilishi bilan bog‘liq.

Tovush bilan ma’no yoki harakat o‘rtasidagi munosabatni tahlil qilishda quyidagi hodisalar muhim: a) alliteratsiya - undosh tovushlarning takrori; b) assonans - unli tovushlarning uyg‘unligi; v) reduplikatsiya - so‘z yoki bo‘g‘inning

takrorlanishi; g) paronimiya - tovush jihatdan yaqin so‘zlarning yonma-yon kelishi; d) fonemik almashuv - bir tovush o‘zgarishi orqali yangi variant yaratish; e) tovushga taqlid - harakat yoki predmet ovozini nutqda qayta ifodalash.

«Qoraqalpoq folklori» kitobining «Uyinlar» qismida «Qamshılaq» o‘yinidagi:

Shırw-shırow, Shırmawıq, Shırıldawıq... [2, 517-b.] birliklarida sh-shır-shırw tovush majmuasi muntazam takrorlanadi. Sirg‘aluvchi sh va titroq r tovushlari qamchining havoda aylanishi, shildirashi va keskin harakatini akustik jihatdan gavdalantiradi.

Bu erda alliteratsiya uch vazifani bajaradi: a) misralarni yagona tovush qatoriga birlashtiradi; b) qamchi harakatining eshitiladigan obrazini yaratadi; v) talaffuzni o‘yin harakati sur’atiga moslashtiradi.

Tovush va harakat o‘rtasidagi bunday munosabatni fonoharakat uyg‘unligi, ya’ni harakatning tovush vositasida ifodalanishi deb atash mumkin. Bu atama fono-motor tushunchasining soddaroq ilmiy muqobili sifatida qo‘llanishi mumkin.

«Arpa-tyrpe» o‘yinida ma’nodan ko‘ra tovush variantlari ustuvor:

Arpa-túrpe, Gúrpe-gúrpe, Arqa-túrpe, Úrpe-úrpe... [2, 520-b.]

Túrpe - gúrpe - úrpe qatorlarida bir tovushning tushishi yoki almashishi orqali yangi akustik variantlar paydo bo‘ladi. So‘zlarning lug‘aviy ma’nosi barqaror bo‘lmasa ham, ularning tovush qurilishi matnni birlashtirib turadi.

Bunday minimal fonemik almashuv bolaning diqqatini so‘zning predmetiy ma’nosidan tovush qobig‘iga ko‘chiradi. Bola yaqin tovushlarni farqlash, tez talaffuz qilish va o‘z nutqini jamoa sur’atiga moslashtirishga o‘rganadi.

«Attım-battım» birikmasida ham paronimik yaqinlik mavjud:

Attım-battım... [2, 515-516-b.]

Ikki so‘z bir xil ritmik-morfologik qolipda keladi, ammo boshlang‘ich undosh bilan farqlanadi. Bu tovush almashuvi qo‘shiqqa o‘yinboplik bag‘ishlab, harakatning tez va qat’iy boshlanishini ta’minlaydi.

Turkman qo‘shiqlarida Çapak-çapak birligida tovush, ma’no va harakat birlashadi:

Çapak-çapak elleri, Agyrmasyn gollary... [3, 42-b.]

Çapak so‘zi chapak harakatini nomlaydi, uning ikki marta takrori esa ikki harakat zarbini belgilaydi. So‘z tarkibidagi ç-p-k jarangsiz undoshlari qisqa va keskin talaffuz qilinib, qo‘llarning to‘qnashuvidan hosil bo‘lgan zarbga akustik jihatdan yaqinlashadi.

Turkman folkloridagi ikkinchi variantida:

Çapak-çapak elleri, Agyrmasyn gollary, Daýysynyň toýunda Çelpek ýaýsyn elleri [3, 42-b.] çapak - çelpek so‘zlari paronimik munosabat hosil qiladi. Ikkala so‘zda ham ç-p-k undoshlari saqlangan, ammo ularning ma’nosi turlicha: birinchisi chapak harakatini, ikkinchisi to‘yda tayyorlanadigan taomni bildiradi.

Tovush yaqinligi bu ikki tushunchani poetik jihatdan bog‘laydi: bolaning hozirgi o‘yin harakati kelajakdagi oilaviy va marosimiy mehnat bilan uyg‘unlashadi. Demak, paronimiya faqat ovoz o‘yini emas, ma’noviy ko‘prik vazifasini ham bajaradi.

Barmoq sanamashida alliteratsiya barmoq nomi va unga yuklangan harakatni birlashtiradi:

Başam barmak - baş getir, Süýem barmak - süýt getir, Orta barmak - ot getir [3, 41-42-b.].

Başam - baş, süýem - süýt birikmalarida dastlabki tovushlar takrorlanadi. Bolaning barmoq nomini keyingi so‘z bilan bog‘lab eslab qolishida ana shu tovush yaqinligi muhim vazifa bajaradi. Alliteratsiya nom va harakat o‘rtasida mnemonik aloqa hosil qiladi.

Turkman erkalamasida tovush takrori sakratish harakatiga moslashadi:

Jigim-jigim jigirdek, Ýaga bişen gowurdak, Gowurdagy kim iýjek, Kim göterse, şol iýjek [4].

Birinchi misradagi jigim-jigim-jigirdek qatori ikki qisqa va bir uzunroq tovush birligidan iborat. Bu tuzilish bolani tizzada engil sakratish harakatining ikki mayda va bir kuchliroq bosqichiga mos kelishi mumkin.

Jigim - jigirdek birliklarida j-g tovushlari takrorlanadi; jigirdek - gowurdak so‘zlaridagi -dek/-dak yaqinligi ichki qofiyani shakllantiradi. Iýjek - iýjek epiforasi esa savol-javobning akustik yakunini ta’minlaydi.

Ingliz harakat qo‘shiqlarida ingliz tilidagi clap, tap, stamp fe’llari qisqa, bir bo‘g‘inli va harakatning akustik xususiyatiga yaqin birliklardir:

Clap your hands, clap your hands, Clap them just like me. Touch your shoulders, touch your shoulders, Touch them just like me. Tap your knees, tap your knees, Tap them just like me [5].

Clap so‘zidagi oxirgi [p] tovushi qo‘llarning keskin to‘qnashuvini, tapdagi [t] va [p] esa engil zarbning qisqa tugallanishini ifodalaydi. Fe’llarning takrori harakatning bir marta emas, bir necha marta bajarilishini belgilaydi.

Turkmancha çapak-çapak va inglizcha clap-clap o‘rtasida tipologik yaqinlik mavjud: a) ikkalasi ham chapak harakatini nomlaydi; b) takror harakat miqdorini ko‘rsatadi; v) portlovchi undoshlar zarbning akustik xususiyatini kuchaytiradi; g) so‘zning talaffuzi harakat bilan bir vaqtda amalga oshadi.

Farq shundaki, turkman çapak so‘zi ikki bo‘g‘inli bo‘lib, harakatga nisbatan kengroq ritmik oraliq beradi; inglizcha clap bir bo‘g‘inliligi sababli qisqa va keskin zarb hosil qiladi.

«I Have a Body» qo‘shig‘ida taqlidiy-harakat fe’llari ritmik o‘sish asosida takrorlanadi:

And I sniff, sniff here, sniff, sniff there, Sniff, sniff, sniff, sniff everywhere.

And I clap, clap here, Clap, clap there, Clap, clap, clap, clap everywhere.

And I stamp, stamp here, Stamp, stamp there, Stamp, stamp, stamp, stamp everywhere [6, 13-b.].

Sniff burun bilan hidlashni, clap qo‘l chapagini, stamp esa oyoqni erga do‘pillatishni ifodalaydi. Har bir fe’lning tovush tarkibi harakat xususiyatiga muvofiq: sniff - havoni qisqa tortish; clap - keskin qo‘l zarbi; stamp - og‘irroq oyoq zarbi.

Ikkilik takror harakatni boshlaydi, to‘rtlik takror esa uni kuchaytiradi: clap-clap - clap-clap-clap-clap; stamp-stamp - stamp-stamp-stamp-stamp.

Shu tariqa tovush takrori harakatning faqat mavjudligini emas, uning kuchayib borishini ham ifodalaydi.

Here - there - everywhere qatorida tovush va makon parallelligi mavjud. Harakat «bu er»dan «u er»ga, keyin «hamma joy»ga tarqaladi. Takroriy fe’llar bilan kengayib boruvchi makon birgalikda dinamik kompozitsiya hosil qiladi.

Qoraqalpoq, turkman va ingliz bolalar qo‘shiqlarida reduplikatsiya bir nechta umumiy vazifani bajaradi: a) harakat miqdorini belgilaydi; b) ijro sur’atini bir maromda saqlaydi; v) so‘zni eslab qolishni osonlashtiradi; g) talaffuz a’zolarini mashq qildiradi; d) jamoaviy ovozni muvofiqlashtiradi; e) harakat ovozini shartli ravishda qayta yaratadi.

Qoraqalpoqcha shıro’-shıroo’, turkmancha çapak-çapak va inglizcha clap-clap birliklari vazifaviy jihatdan yaqin. Biroq ularning akustik obrazi turlicha: birinchisi sirg‘alish va aylanishni, ikkinchi va uchinchisi esa zarbni ifodalaydi.

Shu asosda harakatli qo‘shiqlardagi tovush takrorlarini ikki guruhga ajratish mumkin: davomli harakatni ifodalovchi tovushlar: shırw-shırow; zarbli harakatni ifodalovchi tovushlar: çapak-çapak, clap-clap, stamp-stamp.

Davomli tovushlarda sirg‘aluvchi va titroq undoshlar, zarbli harakatlarda esa portlovchi undoshlar faollashadi.

«Arpa-túrpe»dagi túrpe-gúrpe-úrpe qatorlari bolaga so‘zning tovush tarkibi bilan erkin munosabatda bo‘lish imkonini beradi. Bunda bir fonemaning qo‘shilishi yoki tushirilishi natijasida yangi akustik shakl hosil bo‘ladi. So‘zning aniq lug‘aviy ma’nosidan ko‘ra uning talaffuzi va ritmi muhimlashadi.

Bunday matnlar bolada: yaqin fonemalarni farqlash; tovush almashuvini sezish; tez talaffuz qilish; ritmni saqlash; yangi tovush birikmalarini yaratish ko‘nikmalarini rivojlantiradi.

Turkman başam-baş, süýem-süýt hamda ingliz clap-tap-stamp qatorlarida ham tovush yaqinligi so‘zlarni xotirada guruhlash imkonini beradi. Demak, tovush uyg‘unligi estetik zavq bilan birga fonologik anglashning boshlang‘ich shaklini yuzaga keltiradi.

Uch an’anada tovush uyg‘unligining umumiy poetik qonuniyatlari quyidagilardan iborat: a) takroriy tovush harakatning davomiyligini belgilaydi; b) portlovchi undoshlar zarb harakatini kuchaytiradi; v) sirg‘aluvchi va titroq undoshlar aylanish yoki shovqinni ifodalaydi; g) paronimiya ma’nosi turlicha so‘zlarni bir kompozitsion qatorga birlashtiradi; d) fonemik almashuv bolaning diqqatini so‘zning tovush shakliga yo‘naltiradi; e) alliteratsiya matnni yodlashni engillashtiradi.

Milliy farqlar til tizimi va madaniy obrazlarda ko‘rinadi. Qoraqalpoq namunalarida qamchi va jamoaviy o‘yin harakatiga xos tovushlar, turkman qo‘shiqlarida chapak, barmoq, tayoq va to‘y mehnatiga oid birliklar, ingliz namunalarida esa tana harakatini bildiruvchi bir bo‘g‘inli buyruq fe’llari ustuvor.

Umuman olganda, qoraqalpoq, turkman va ingliz bolalar qo‘shiqlarida tovush uyg‘unligi harakat obrazini yaratish, ijro sur’atini belgilash va matnni eslab qolishga xizmat qiladi. Alliteratsiya, reduplikatsiya, paronimiya va tovushga taqlid harakatning akustik xususiyatlarini she’riy nutqda qayta ifodalaydi.

Qoraqalpoq shıro’-shıroo’ formulasi davomli aylanish va shildirashni, turkman çapak-çapak hamda ingliz clap-clap birliklari zarbli harakatni tovush vositasida gavdalantiradi. Shuning uchun bolalar qo‘shiqlarida fonika ma’nodan ajralgan bezak emas, balki so‘z, eshitish va harakatni birlashtiruvchi fonosemantik tizimdir.

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A COMPARATIVE STUDY OF BRAVERY IN BEOWULF AND ALPOMISH

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Abstract: *This article presents a comparative analysis of Beowulf, the central hero of the Old English epic Beowulf and Alpomish, the main hero of the Uzbek heroic epic Alpomish, with particular attention to the concept of bravery. Both heroes represent important ideals of courage, strength, loyalty, perseverance, and self-sacrifice. Beowulf demonstrates bravery by confronting supernatural enemies, including Grendel, Grendel's mother and the dragon. His courage is closely connected with warrior honor, personal reputation, responsibility, and the protection of his people. Alpomish demonstrates bravery through battles, difficult trials, captivity, and his struggle to protect his family, beloved Barchin, homeland, and social community.*

Keywords: *Beowulf, Alpomish, bravery, heroism, courage, epic literature, Uzbek folklore, Anglo-Saxon literature, comparative literature, warrior, loyalty, self-sacrifice.*

"BEOVULF" VA "ALPOMISH" DOSTONLARIDA JASORATNING QIYOSIY TAHLILI

Annotatsiya: *Ushbu maqolada qadimgi ingliz epik dostoni «Beowulf»ning bosh qahramoni Beovulf hamda o'zbek xalq qahramonlik dostoni «Alpomish»ning bosh qahramoni Alpomish jasorat tushunchasi nuqtayi nazaridan qiyosiy tahlil qilinadi. Har ikkala qahramon ham mardlik, kuch, sadoqat, matonat va fidoyilik kabi muhim fazilatlarni namoyon etadi. Beovulf Grendel, Grendelning onasi va ajdar kabi g'ayritabiiy kuchlarga qarshi kurashib, o'z jasoratini namoyish etadi. Uning jasorati jangovar sharaf, shaxsiy obro', burch va xalqini himoya qilish bilan bog'liq. Alpomish esa janglar, og'ir sinovlar va uzoq muddatli asirlik jarayonida o'z jasoratini namoyon qiladi. U oilasi, Barchin, vatani va xalqining manfaatlarini himoya qilishga intiladi.*

Kalit so'zlar: *Beovulf, Alpomish, jasorat, qahramonlik, mardlik, epik adabiyot, o'zbek folklori, qadimgi ingliz adabiyoti, qiyosiy adabiyotshunoslik, jangchi, sadoqat, fidoyilik.*

СРАВНИТЕЛЬНОЕ ИССЛЕДОВАНИЕ КОНЦЕПТА ХРАБРОСТИ В ЭПОСАХ «БЕОВУЛЬФ» И «АЛПОМИШ»

Аннотация: *В статье проводится сравнительный анализ Беовульфа, главного героя древнеанглийского эпоса «Беовульф», и Алпомиша, центрального героя узбекского героического эпоса «Алпомиш», с особым вниманием к понятию храбрости. Оба героя воплощают такие важные качества, как мужество, сила, верность, стойкость и самопожертвование. Беовульф проявляет храбрость в борьбе с такими сверхъестественными противниками, как Грендель, мать Гренделя и дракон. Его мужество связано с воинской честью, личной славой, чувством долга и защитой своего народа. Алпомиш проявляет храбрость в сражениях, испытаниях и длительном плену, стремясь защитить свою семью, возлюбленную Барчин, родную землю и общество*

Ключевые слова: *Беовульф, Алпомиш, храбрость, героизм, мужество, эпическая литература, узбекский фольклор, древнеанглийская литература, сравнительное литературоведение, воин, верность, самопожертвование.*

Introduction

Heroic epics occupy an important place in the literary and cultural heritage of different nations, reflecting their historical experience, moral values, social ideals, and concepts of heroism. Among the most significant examples of epic literature are *Beowulf*, one of the earliest and most influential works of Old English literature, and *Alpomish*, a major heroic epic of the Uzbek and broader Turkic oral tradition. Although these epics emerged in different geographical, historical, and cultural environments, both place bravery at the center of the heroic ideal. The protagonists, Beowulf and Alpomish, demonstrate courage not only through physical strength and military ability but also through loyalty, responsibility, perseverance, and readiness to protect their communities.

In *Beowulf*, bravery is closely connected with the Anglo-Saxon heroic code, which emphasizes loyalty to one's lord and people, personal honor, reputation, physical courage, and willingness to confront danger. Beowulf's battles against

Grendel, Grendel's mother, and the dragon demonstrate different dimensions of heroic courage. His bravery gradually develops from the youthful desire to prove his strength and gain fame into the mature responsibility of a ruler who is prepared to sacrifice his life for the safety of his people. Thus, bravery in the epic functions both as an individual virtue and as a social obligation.

In *Alpomish*, courage is similarly represented as a fundamental characteristic of the ideal hero. However, it is strongly associated with loyalty to family, love, homeland, community, and traditional values. Alpomish faces physical challenges, rivalry, separation, captivity, and various social obstacles. His heroic identity is revealed not merely through victory over opponents but also through his endurance, faithfulness to Barchin, devotion to his relatives, and determination to restore justice and social order. Therefore, the concept of bravery in *Alpomish* combines physical heroism with moral strength and social responsibility.

A comparative examination of these two epics provides an opportunity to identify both universal and culturally specific representations of bravery. In both works, the hero is expected to overcome fear, protect others, remain loyal to important moral principles, and prove himself through difficult trials. At the same time, the cultural meanings attached to these actions differ according to the social structures, traditions, and ethical systems represented in each epic.

Literature review and Methodology

Heroism is one of the most important concepts in world epic literature. Different peoples have created heroic characters who embody the moral and social ideals of their communities. Beowulf and Alpomish are particularly significant examples because they belong to different literary and cultural traditions but demonstrate several universal qualities of the epic hero. *Beowulf* is an Old English heroic poem centered on a warrior who confronts supernatural and mortal dangers. Alpomish is a major Uzbek heroic epic that celebrates manliness, unity, love, faithfulness, and the strength of family. The Uzbek version associated with Fozil Yo'ldosh o'g'li includes Alpomish's contests with Kalmak warriors, his struggle to win Barchin, seven years of captivity, his return, and his victory over the usurper Ulton.

Beowulf's Bravery

Beowulf's bravery is first demonstrated through his willingness to confront Grendel. He travels to Heorot knowing that Grendel is a powerful and deadly enemy. Rather than avoiding the monster, Beowulf deliberately accepts the challenge.

His bravery becomes particularly significant because he chooses to confront Grendel without relying on weapons. This action presents courage as confidence in one's own strength and willingness to face danger directly.

Alpomish's Bravery

Alpomish's bravery is expressed through physical strength, endurance, loyalty, and determination. His heroic identity is established through contests and struggles with powerful opponents. His courage is particularly evident in the difficulties he faces while trying to protect his relationships and social community.

Comparative Analysis of Bravery

Aspect	Beowulf	Alpomish
Main form of bravery	Fighting monsters and enemies	Fighting enemies and overcoming prolonged trials
Major motivation	Protection, duty, honor and reputation	Family, love, homeland, justice and social unity
Physical courage	Very strong	Very strong
Psychological endurance	Demonstrated through dangerous battles and old age	Especially demonstrated through captivity and suffering
Self-sacrifice	Central to his final battle	Present through risks taken for family and community
Cultural ideal	Warrior and king	Warrior, family protector and social leader
Final heroic meaning	Sacrifice and heroic legacy	Restoration, justice and unity

The study uses a comparative literary method. The analysis is based on close reading and comparison of the heroic actions, conflicts, motivations, and moral values associated with Beowulf and Alpomish.

The following approaches are used:

1.Comparative analysis – similarities and differences between the two heroes are identified.

2.Character analysis – the heroes' actions and decisions are examined as expressions of bravery.

3.Cultural-historical approach – the relationship between heroism and the social values of Anglo-Saxon and Uzbek epic traditions is considered.

4.Textual analysis – important episodes involving battles, danger, sacrifice, loyalty, and endurance are analyzed.

5.Interpretive approach – bravery is considered not only as physical courage but also as moral and psychological strength.

Results and Discussion

The comparative analysis produces the following results:

1.Both Beowulf and Alpomish are fearless heroes. They willingly confront powerful enemies and dangerous situations.

2.Physical courage is fundamental to both characters. Their heroic status is demonstrated through battles and difficult challenges.

3.Beowulf's bravery is strongly associated with honor, reputation, leadership, and sacrifice.

4.Alpomish's bravery is strongly associated with family, love, loyalty, justice, and the unity of the community.

5.Both heroes demonstrate perseverance, but Alpomish's prolonged captivity particularly emphasizes endurance.

6.Their bravery reflects their cultural traditions. Comparative scholarship likewise identifies courage, loyalty, and honor as shared heroic qualities while noting differences in their social roles.

7.The two epics demonstrate that bravery is a universal heroic value, although its meaning changes according to cultural and social context.

Beowulf and Alpomish are powerful examples of heroic bravery in world literature. Both heroes demonstrate courage by confronting danger, protecting others, enduring suffering, and accepting responsibility. Their bravery, however, has different emphases. Beowulf's courage is primarily represented through heroic combat, honor, leadership, and the willingness to sacrifice his life for his people. Alpomish's bravery combines physical courage with endurance, loyalty, love, family responsibility, and the restoration of justice.

The comparative analysis of *Beowulf* and *Alpomish* demonstrates that bravery is a central element in the construction of the heroic ideal in both epics. Despite their different historical and cultural backgrounds, the two works present courage as a multidimensional quality that combines physical strength, psychological endurance, loyalty, responsibility, and moral commitment. Both Beowulf and Alpomish prove their heroic status through trials that require them to overcome danger and place collective interests above personal comfort.

Conclusion

At the same time, the representation of bravery reflects the specific cultural values of each epic tradition. In *Beowulf*, courage is closely related to the Anglo-Saxon ideals of honor, reputation, loyalty, warrior ethics, and heroic sacrifice. Beowulf's willingness to confront powerful enemies establishes his reputation as a warrior, while his final struggle with the dragon transforms personal bravery into the self-sacrificing responsibility of a king. In this sense, the epic presents courage as both a means of achieving individual glory and a duty toward society.

In *Alpomish*, bravery is more strongly integrated with devotion to family, love, homeland, community, and the restoration of justice. Alpomish's heroism is demonstrated not only through physical confrontations but also through patience, endurance, loyalty, and his ability to remain faithful to his moral commitments despite prolonged hardship. His courage therefore represents a synthesis of physical power and spiritual steadfastness.

The comparison also reveals an important universal feature of epic heroism: true bravery is not simply the absence of fear or the possession of extraordinary physical strength; it is the ability to act responsibly in the face of danger for the protection of values greater than oneself. Both epics use the figure of the hero to preserve and transmit socially significant ideals from one generation to another.

Thus, *Beowulf* and *Alpomish* demonstrate how geographically distant literary traditions can develop comparable heroic concepts while preserving their distinctive cultural characteristics. Their similarities point to universal human ideals of courage, loyalty, perseverance, and responsibility, whereas their differences reveal the particular historical and ethical values of Anglo-Saxon and Uzbek-Turkic societies. A comparative study of these epics therefore contributes not only to literary analysis but also to a broader understanding of intercultural connections and the universal foundations of heroic thought.

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QADIMGI TURKIY YOZMA YODGORLIKLAR TARJIMASIDA EKVIVALENTLIK VA INTERPRETATIV REKONSTRUKSIYA MUAMMOSI

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Annotatsiya: *Mazkur maqolada qadimgi turkiy yozma yodgorliklarni zamonaviy tillarga tarjima qilishda ekvivalentlik va interpretativ rekonstruksiya muammolari tadqiq etilgan. “Qutadg‘u bilig” va “Devonu lug‘at-it turk” asarlaridagi tarixiy-semantik hamda lingvomadaniy xususiyatga ega birliklarni tarjimada qayta ifodalash masalalari tahlil qilingan. Tarixiy matn bilan zamonaviy o‘quvchi o‘rtasidagi temporal-semantik distansiya tarjimada mazmunning barcha qatlamlarini to‘liq saqlash imkoniyatini cheklashi asoslangan. “Qut”, “törü”, “el”, “alp” kabi birliklar misolida lug‘aviy muqobil tarixiy birlikning semantik va madaniy mazmunini har doim ham to‘liq qamrab olmasligi ko‘rsatilgan. Tadqiqotda ekvivalentlikning formal, semantik, pragmatik va lingvomadaniy qatlamlari o‘zaro bog‘liq holda ko‘rib chiqilgan. Tahlil natijasida qadimgi turkiy matn tarjimasida ushbu qatlamlarni muvozanatli qayta tiklashga asoslangan kompleks interpretativ ekvivalentlik tamoyilining metodologik ahamiyati yoritilgan. Tarjimon faoliyati tarixiy shakl, konseptual mazmun, kommunikativ vazifa va madaniy kodni zamonaviy idrok maydonida qayta tiklashga qaratilgan interpretativ-rekonstruktiv jarayon sifatida tavsiflangan.*

Kalit so‘zlar: *qadimgi turkiy yozma yodgorliklar, tarjima, ekvivalentlik, interpretativ rekonstruksiya, temporal-semantik distansiya, pragmatik ekvivalentlik, lingvomadaniy ekvivalentlik, kompleks interpretativ ekvivalentlik.*

ПРОБЛЕМА ЭКВИВАЛЕНТНОСТИ И ИНТЕРПРЕТАТИВНОЙ РЕКОНСТРУКЦИИ В ПЕРЕВОДЕ ДРЕВНЕТЮРКСКИХ ПИСЬМЕННЫХ ПАМЯТНИКОВ

Аннотация: *В статье исследуются проблемы эквивалентности и интерпретативной реконструкции при переводе древнетюркских письменных памятников на современные языки. Анализируются вопросы передачи в переводе единиц с историко-семантическими и лингвокультурными особенностями, представленных в произведениях «Кутадгу билиг» и «Дивану лугат ат-турк». Обосновывается положение о том, что темпорально-семантическая дистанция между историческим текстом и современным читателем ограничивает возможность полного сохранения всех содержательных слоёв оригинала в переводе. На примере таких единиц, как «qut», «törü», «el», «alp», показано, что лексический эквивалент не всегда способен в полной мере передать их историко-семантическое и культурное содержание. Формальный, семантический, прагматический и лингвокультурный уровни эквивалентности рассматриваются во взаимосвязи. В результате анализа раскрывается методологическое значение принципа комплексной интерпретативной эквивалентности, основанного на сбалансированной реконструкции данных уровней при переводе древнетюркских текстов. Деятельность переводчика характеризуется как интерпретативно-реконструктивный процесс, направленный на воссоздание исторической формы, концептуального содержания, коммуникативной функции и культурного кода в пространстве современного восприятия.*

Ключевые слова: *древнетюркские письменные памятники, перевод, эквивалентность, интерпретативная реконструкция, темпорально-семантическая дистанция, прагматическая эквивалентность, лингвокультурная эквивалентность, комплексная интерпретативная эквивалентность.*

THE PROBLEM OF EQUIVALENCE AND INTERPRETATIVE RECONSTRUCTION IN THE TRANSLATION OF OLD TURKIC WRITTEN MONUMENTS

Abstract: *This article examines the problems of equivalence and interpretative reconstruction in the translation of Old Turkic written monuments into modern languages. It analyzes the representation in translation of units characterized by historical-semantic and linguocultural features in Kutadgu Bilig and Dīwān Lughāt al-Turk. The study argues that the temporal-semantic distance between a historical text and the modern reader limits the possibility of fully preserving all layers of meaning in translation. Using such units*

as qut, törü, el, and alp as examples, it demonstrates that a lexical equivalent does not always fully convey their historical-semantic and cultural content. Formal, semantic, pragmatic, and linguocultural levels of equivalence are considered in their interrelation. The analysis reveals the methodological significance of the principle of complex interpretative equivalence, which is based on the balanced reconstruction of these levels in translating Old Turkic texts. The translator's activity is characterized as an interpretative-reconstructive process aimed at reconstructing historical form, conceptual content, communicative function, and cultural code within the framework of modern perception.

Keywords: *Old Turkic written monuments, translation, equivalence, interpretative reconstruction, temporal-semantic distance, pragmatic equivalence, linguocultural equivalence, complex interpretative equivalence.*

Kirish

Tarjimashunoslikda tarixiy matnlar tarjimasi murakkab ilmiy muammolardan biri hisoblanadi. Bunday matnlarni tarjima qilishda leksik va grammatik birliklarning muqobilini topish bilan birga, muayyan davrga xos tarixiy tafakkur, madaniy muhit, kommunikativ vaziyat va semantik mazmunni qayta tiklash zarurati yuzaga keladi. Shu jihatdan tarixiy matn tarjimasi oddiy lingvistik transfer emas, balki koʻp qatlamli interpretativ-rekonstruktiv jarayon sifatida namoyon boʻladi.

"Qutadgʻu bilig" va "Devonu lugʻat-it turk" kabi qadimgi turkiy yozma yodgorliklarda qoʻllangan "qut", "törü", "el", "alp", "bilig" singari birliklar oddiy lugʻaviy ma'no bilan chegaralanmay, tarixiy, siyosiy, falsafiy va lingvomadaniy mazmunni ham ifodalaydi. Tarixiy matn bilan zamonaviy oʻquvchi oʻrtasidagi temporal-semantik distansiya esa ushbu mazmun qatlamlarini tarjimada toʻliq qayta tiklashni murakkablashtiradi. Natijada qadimgi turkiy matnlar tarjimasida ekvivalentlik masalasi formal muqobillikdan tashqari semantik, pragmatik va lingvomadaniy omillarni ham hisobga olishni talab etadi.

Tarjima nazariyasida R. Yakobson, E. Nida, P. Newmark, V. Komissarov singari olimlarning ekvivalentlik va interpretatsiyaga oid qarashlari tarixiy matn tarjimasini oʻrganish uchun muhim nazariy asos yaratgan. Biroq qadimgi turkiy yozma yodgorliklarning arxaik semantikasi, tarixiy-madaniy kodi va kommunikativ muhiti ularning tarjimasida ekvivalentlikni koʻp qatlamli hodisa sifatida tadqiq etishni taqozo etadi.

Mazkur tadqiqotning maqsadi qadimgi turkiy yozma yodgorliklar tarjimasida formal, semantik, pragmatik va lingvomadaniy ekvivalentlik oʻrtasidagi munosabatni aniqlash hamda interpretativ rekonstruksiyaning metodologik ahamiyatini ochib berishdan iborat. Tadqiqotda qadimgi turkiy matnlar tarjimasida mutlaq ekvivalentlikdan koʻra, tarixiy matnning turli mazmuniy qatlamlarini muvozanatli qayta tiklashga asoslangan kompleks interpretativ ekvivalentlik tamoyili samarali metodologik yondashuv sifatida qaraladi.

Adabiyotlar tahlili

Tarjimashunoslikda ekvivalentlik va interpretatsiya masalalari turli nazariy yondashuvlar asosida tadqiq etilgan. E. Nida formal va dinamik ekvivalentlikni farqlab, tarjimada shakliy muvofiqlik hamda kommunikativ ta'sir masalasiga e'tibor qaratadi [1, 159–167]. R. Yakobson tarjimani bir tildagi verbal belgilarni boshqa til vositalari orqali interpretatsiya qilish jarayoni sifatida izohlaydi [2, 232–239]. P. Newmark esa semantik va kommunikativ tarjima tamoyillarini ajratib, asliyat mazmunini saqlash bilan qabul qiluvchi uchun tushunarlilik oʻrtasidagi munosabatni yoritadi [3, 45–48]. V.N. Komissarov ekvivalentlikni asliyat va tarjima oʻrtasidagi mazmuniy umumiylikning turli darajalarda namoyon boʻlishi bilan bogʻlaydi [4, 48–53].

Tarixiy matnlarni talqin qilishda H.-G. Gadamerning tarixiy masofa haqidagi qarashlari muhim boʻlib, matnni tushunish uning yaratilgan davri bilan zamonaviy talqin muhiti oʻrtasidagi farqni hisobga olishni talab etadi [7, 305–390]. Qadimgi turkiy yozma yodgorliklarni tarixiy-filologik oʻrganishda R.R. Arat va T. Tekin tadqiqotlari muhim oʻrin tutadi [8, VII; 9, 17–22]. G. Clauson qadimgi turkiy birliklarning tarixiy semantikasini yoritib, xususan, "qut" leksemasining "fortune", "divine favour", "majesty" kabi ma'nolarini qayd etadi [5, 594–595]. Q. Sodiqov esa turkiy yozma yodgorliklar tilini tarixiy taraqqiyot va yozma adabiy til bilan bogʻliq holda tadqiq etadi [10, 41–47].

Mazkur tadqiqotlarda ekvivalentlik, interpretatsiya va qadimgi turkiy birliklarning tarixiy-semantik xususiyatlari turli jihatlardan yoritilgan. Ushbu nazariy qarashlarga tayangan holda, mazkur maqolada qadimgi turkiy yozma yodgorliklar tarjimasidagi formal, semantik, pragmatik va lingvomadaniy ekvivalentlik oʻzaro bogʻliq tizim sifatida koʻrib chiqilib, ularni birlashtiruvchi kompleks interpretativ ekvivalentlik tamoyili asosida tahlil qilinadi.

Tadqiqot metodologiya

Tadqiqot materiali sifatida "Devonu lugʻat-it turk" va "Qutadgʻu bilig" asarlaridagi tarixiy-semantik hamda lingvomadaniy xususiyatga ega birliklar, shuningdek, ularning zamonaviy tillardagi tarjima talqinlari asos qilib olindi. Xususan, "qut", "törü", "el", "alp" kabi birliklarning asliyatdagi mazmuni va tarjimada qayta ifodalanish xususiyatlari ekvivalentlik muammosi nuqtai nazaridan koʻrib chiqildi.

Tadqiqotda tarixiy-filologik, qiyosiy, semantik, lingvopragmatik va lingvomadaniy tahlil usullaridan kompleks foydalanildi. Tarixiy-filologik yondashuv birliklarning qadimgi turkiy til tizimidagi shakli va tarixiy ma’nosini aniqlashga, semantik tahlil ularning mazmun qatlamlarini ochishga, qiyosiy tahlil esa asliyat va tarjima oʻrtasidagi muvofiqliklarni belgilashga xizmat qildi. Lingvopragmatik va lingvomadaniy tahlil orqali birliklarning kommunikativ vazifasi hamda tarixiy-madaniy mazmunining tarjimada saqlanish darajasi kuzatildi.

Tahlil jarayonida ekvivalentlik formal, semantik, pragmatik va lingvomadaniy qatlamlar asosida oʻrganildi. Ushbu qatlamlarning oʻzaro munosabati qadimgi turkiy matnni zamonaviy tilga koʻchirishda tarixiy shakl, konseptual mazmun, kommunikativ ta’sir va madaniy kodning qay darajada qayta tiklanishini aniqlash mezoni sifatida qoʻllanildi. Shu asosda tarjimada alohida ekvivalentlik turini ustuvorlashtirishdan koʻra, ularni oʻzaro bogʻliq holda talqin qilishga asoslangan kompleks interpretativ yondashuv qoʻllandi.

Natijalar va ularning tahlili

Tahlil natijalari qadimgi turkiy yozma yodgorliklar tarjimasida ekvivalentlik bir qatlamli hodisa emasligini koʻrsatdi. Tarixiy birlikning shakliy muqobilini saqlash uning semantik, pragmatik va lingvomadaniy mazmunini toʻliq qayta ifodalash uchun yetarli emas. Shu bois tadqiqotda ekvivalentlik formal, semantik, pragmatik va lingvomadaniy qatlamlarning oʻzaro aloqasi asosida namoyon boʻlishi aniqlandi.

Formal ekvivalentlik tarixiy birlikning shakliy xususiyatlarini imkon qadar saqlashga xizmat qilsa, semantik ekvivalentlik uning mazmuniy va konseptual qatlamlarini qayta tiklashni talab qiladi. Bu holat, ayniqsa, “qut” birligi misolida yaqqol koʻrinadi. Mazkur leksemaning semantik maydoni “baxt” yoki “saodat” ma’nolari bilan cheklanmay, ilohiy inoyat, hukmdorlik mavqei va siyosiy hokimiyat bilan bogʻliq tarixiy mazmunlarni ham qamrab oladi. Shu sababli uni bitta zamonaviy leksik muqobil orqali ifodalash asliyatdagi semantik koʻlamning torayishiga olib kelishi mumkin.

Lingvomadaniy ekvivalentlikda esa tarixiy birlik ortida turgan madaniy kodni saqlash muhimligi kuzatildi. Jumladan, “törü” birlik sifatida faqat “qonun” tushunchasini emas, balki urf-odat, ijtimoiy tartib va davlat boshqaruviga daxldor tarixiy-madaniy mazmunni ham ifodalaydi. “Alp”, “beg”, “er”, “el” kabi birliklarda ham lugʻaviy ma’no bilan tarixiy-madaniy mazmun oʻrtasidagi uzviy bogʻliqlik mavjud. Shuning uchun ularning tarjimasida faqat lugʻaviy muqobilga tayanish mazmunning ayrim qatlamlari yoʻqolishiga sabab boʻlishi mumkin.

Pragmatik ekvivalentlik nuqtai nazaridan “Qutadgʻu bilig”dagi pand-nasihat, murojaat va didaktik fikrlar hamda “Devonu lugʻat-it turk”dagi maqol va hikmatli birliklarning kommunikativ vazifasini saqlash muhim hisoblanadi. Bunda tarjimada birlikning lugʻaviy mazmuni bilan bir qatorda uning muayyan kommunikativ vaziyatdagi ta’siri ham hisobga olinadi.

Olingan natijalar asosida qadimgi turkiy matnlar tarjimasida kompleks interpretativ ekvivalentlik tamoyili asoslandi. Mazkur modelda formal ekvivalentlik tarixiy shaklni, semantik ekvivalentlik konseptual mazmunni, pragmatik ekvivalentlik kommunikativ ta’sirni, lingvomadaniy ekvivalentlik esa madaniy kod va tarixiy xotirani qayta tiklashga xizmat qiladi. Ushbu qatlamlar alohida emas, balki oʻzaro bogʻliq holda amal qilgandagina tarixiy matn mazmunini tarjimada nisbatan yaxlit rekonstruksiya qilish imkoniyati yuzaga keladi.

Shunday qilib, qadimgi turkiy yozma yodgorliklar tarjimasida mutlaq ekvivalentlikdan koʻra, matnning tarixiy-semantik, pragmatik va lingvomadaniy xususiyatlarini muvozanatli qayta tiklash ustuvor ahamiyat kasb etishi aniqlandi. Bu esa tarjimon faoliyatini tayyor lugʻaviy muqobillarni tanlash bilangina cheklamay, tarixiy matnning koʻp qatlamli mazmunini interpretatsiya va rekonstruksiya qilish jarayoni sifatida baholash zarurligini koʻrsatadi.

Olingan natijalar qadimgi turkiy yozma yodgorliklar tarjimasida ekvivalentlikni faqat shakliy yoki lugʻaviy muvofiqlik asosida belgilash yetarli emasligini koʻrsatadi. E. Nidaning formal va dinamik ekvivalentlik haqidagi qarashlarida tarjimada asliyat shaklini saqlash hamda qabul qiluvchi auditoriyaga koʻrsatiladigan kommunikativ ta’sir oʻrtasidagi farq alohida ajratiladi [1, 159–167]. Mazkur yondashuv tarixiy matnlar tarjimasida muhim boʻlsa-da, qadimgi turkiy yozma yodgorliklarda tarixiy-semantik va madaniy qatlamlarning mavjudligi ekvivalentlik masalasini yanada kengroq doirada koʻrib chiqishni talab qiladi.

R. Yakobson tarjimani bir til belgilarini boshqa til vositalari orqali interpretatsiya qilish jarayoni sifatida talqin qiladi [2, 232–239]. Ushbu qarash qadimgi turkiy matnlar tarjimasida tarjimonning interpretativ faoliyatini tushuntirish uchun muhimdir. Chunki “qut”, “törü”, “el”, “alp” singari birliklarni tarjima qilishda ularning zamonaviy lugʻaviy muqobilini aniqlashning oʻzi yetarli boʻlmay, birlikning tarixiy matndagi semantik va madaniy vazifasini ham qayta tiklash zarurati yuzaga keladi. Shu nuqtai nazardan tarjima asliyatdagi belgini boshqa til belgisi bilan almashtirishdan koʻra kengroq interpretativ jarayon sifatida namoyon boʻladi.

P. Newmark tomonidan ilgari surilgan semantik va kommunikativ tarjima tamoyillari ham tarixiy matn tarjimasida mazmun va kommunikativ ta’sir oʻrtasidagi muvozanat masalasini yoritishga imkon beradi [3, 45–48]. Qadimgi turkiy matnlarda esa ushbu muvozanat tarixiy mazmunni saqlash zarurati bilan yanada murakkablashadi. Tarjimon bir tomondan birlikning tarixiy semantikasini imkon qadar saqlashi, ikkinchi tomondan esa uning mazmunini zamonaviy oʻquvchi uchun anglashiladigan shaklda taqdim etishi lozim.

V.N. Komissarov ekvivalentlikni tarjimaning turli darajalarida namoyon boʻladigan hodisa sifatida izohlaydi va asliyat bilan tarjima oʻrtasidagi mazmuniy umumiylikka alohida e’tibor qaratadi [4, 48–53]. Qadimgi turkiy matnlar tahlili bu yondashuvni tarixiy va lingvomadaniy omillar bilan kengaytirish zarurligini koʻrsatadi. Chunki tarixiy birlikning mazmuni faqat lugʻaviy semantika orqali emas, balki uning muayyan tarixiy-madaniy tizimdagi vazifasi orqali ham shakllanadi.

Bu jihatdan “qut” leksemasi xarakterlidir. G. Clauson mazkur birlikning semantik maydonida “fortune”, “divine favour”, “majesty” kabi ma’nolar mavjudligini koʻrsatadi [5, 594–595]. Demak, “qut”ni zamonaviy tilda faqat bitta lugʻaviy muqobil bilan ifodalash uning tarixiy-semantik koʻlamini toʻliq aks ettirmaydi. R. Dankoff va W. Mayning “Qutadgʻu bilig” tarjimasida ham ushbu birlik kontekstga bogʻliq ravishda turlicha talqin qilinadi [6, 65–68]. Bu holat tarixiy birlik uchun doimiy va mutlaq leksik ekvivalent belgilash murakkabligini koʻrsatadi.

Tarixiy matnni tushunishda vaqt masalasi ham alohida ahamiyatga ega. H.-G. Gadamer matn va uni talqin qiluvchi subyekt oʻrtasidagi tarixiy masofani tushunish jarayonining muhim omili sifatida koʻrsatadi [7, 305–390]. Qadimgi turkiy yozma yodgorliklar tarjimasida bu masofa temporal-semantik distansiya koʻrinishida namoyon boʻladi. Tarjimon nafaqat til birliklarining qadimgi ma’nosini aniqlaydi, balki ularning dastlabki tarixiy va madaniy muhitdagi funksiyasini zamonaviy idrok maydonida qayta tiklaydi.

Turkiy yozma yodgorliklarni nashr va tarjima qilish tajribasi ham tarixiy-filologik aniqlikning muhimligini koʻrsatadi. R.R. Arat “Qutadgʻu bilig” matni ustida ishlashda tarixiy matnning filologik xususiyatlariga alohida e’tibor qaratgan [8, VII]. T. Tekin qadimgi turkiy yozma yodgorliklarni oʻrganishda matn shakli, fonetik va grammatik xususiyatlarni tarixiy til tizimi bilan bogʻliq holda talqin qiladi [9, 17–22]. Q. Sodiqov tadqiqotlarida esa turkiy yozma yodgorliklarning til xususiyatlarini tarixiy taraqqiyot va yozma adabiy til bilan bogʻliq holda oʻrganish tamoyili kuzatiladi [10, 41–47]. Ushbu qarashlar qadimgi turkiy matn tarjimasida tarixiy-filologik rekonstruksiyaning zarurligini tasdiqlaydi.

Shu asosda tadqiqot natijalari ekvivalentlikning formal, semantik, pragmatik va lingvomadaniy qatlamlarini bir-biridan ajratilgan holda emas, oʻzaro bogʻliq tizim sifatida koʻrib chiqish maqsadga muvofiqligini koʻrsatadi. Formal ekvivalentlik tarixiy shaklni, semantik ekvivalentlik konseptual mazmunni, pragmatik ekvivalentlik kommunikativ ta’sirni, lingvomadaniy ekvivalentlik esa tarixiy-madaniy kodni qayta tiklashga yoʻnaltiriladi. Ushbu qatlamlarning integratsiyasi kompleks interpretativ ekvivalentlik modelining asosini tashkil etadi.

Mazkur modelning asosiy xususiyati tarjimada bir ekvivalentlik turini mutlaqlashtirmaslik bilan belgilanadi. Tarixiy shaklning toʻliq saqlanishi matnning zamonaviy oʻquvchi uchun tushunarliligini cheklashi, haddan tashqari pragmatik moslashtirish esa tarixiy va madaniy mazmunning qisqarishiga olib kelishi mumkin. Shu sababli qadimgi turkiy yozma yodgorliklar tarjimasida ekvivalentlik tarixiy shakl, konseptual mazmun, kommunikativ vazifa va madaniy kod oʻrtasidagi muvozanatni ta’minlashga qaratilgan interpretativ rekonstruksiya sifatida namoyon boʻladi.

Xulosa

Tadqiqot natijalari qadimgi turkiy yozma yodgorliklar tarjimasida ekvivalentlikni faqat lugʻaviy yoki shakliy muvofiqlik doirasida belgilash yetarli emasligini koʻrsatdi. “Qutadgʻu bilig” va “Devonu lugʻat-it turk” singari tarixiy manbalarda til birliklari muayyan davrning semantik tizimi, kommunikativ muhiti va madaniy tafakkuri bilan uzviy bogʻlanganligi sababli ularni zamonaviy tillarda qayta ifodalash interpretativ rekonstruksiyani talab etadi.

Tahlillar asosida qadimgi turkiy matnlar tarjimasida ekvivalentlikning formal, semantik, pragmatik va lingvomadaniy qatlamlari oʻzaro bogʻliq holda amal qilishi aniqlandi. “Qut”, “törü”, “el”, “alp” kabi birliklar misolida bitta zamonaviy lugʻaviy muqobil tarixiy birlikning barcha mazmun qatlamlarini toʻliq qamrab olmasligi kuzatildi. Shu bois tarjimada tarixiy shaklni saqlash bilan birga, konseptual mazmun, kommunikativ vazifa va madaniy kodni imkon qadar qayta tiklash zarur.

Mazkur natijalar asosida qadimgi turkiy yozma yodgorliklar tarjimasida kompleks interpretativ ekvivalentlik tamoyilidan foydalanish maqsadga muvofiq deb hisoblanadi. Ushbu yondashuv ekvivalentlikning alohida turini mutlaqlashtirmasdan, tarixiy matnning formal, semantik, pragmatik va lingvomadaniy qatlamlarini muvozanatli rekonstruksiya qilishga asoslanadi. Natijada qadimgi turkiy matn tarjimasi oddiy til almashtirish jarayoni sifatida emas, balki tarixiy mazmun va madaniy kodni zamonaviy idrok maydonida qayta tiklashga qaratilgan koʻp qatlamli interpretativ faoliyat sifatida namoyon boʻladi.

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O‘ZBEK XALQ DOSTONLARIDA PAREMIOLOGIK BIRLIKLARNING DIDAKTIK-PRAGMATIK VA KOMMUNIKATIV XOSLANISHLARI

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Annotatsiya: *Mazkur maqolada o‘zbek xalq dostonlarida maqol va matallarning didaktik-pragmatik xususiyatlari tahlil qilinadi. Paremiologik birliklarning nutqiy vaziyatni boshqarish, axloqiy yo‘naltirish, ogohlantirish va murosaga chaqirishdagi roli yoritiladi. Ularning bilvosita ta’sir mexanizmi orqali tinglovchiga samarali yetkazilishi asoslab beriladi.*

Kalit so‘zlar: *paremiologik birliklar, maqol va matallar, doston nutqi, pragmatika, didaktika, nutqiy vaziyat, kommunikativ strategiya.*

ДИДАКТИКО-ПРАГМАТИЧЕСКИЕ И КОММУНИКАТИВНЫЕ ОСОБЕННОСТИ ПАРЕМИОЛОГИЧЕСКИХ ЕДИНИЦ В УЗБЕКСКИХ НАРОДНЫХ ДАСТАНАХ

Аннотация: *В статье анализируются дидактико-прагматические особенности пословиц и поговорок в узбекских народных дастанах. Рассматривается их роль в управлении речевой ситуацией, нравственном воздействии, предупреждении и достижении компромисса. Обосновывается эффективность косвенного прагматического воздействия на слушателя.*

Ключевые слова: *паремиологические единицы, пословицы и поговорки, дастан, прагматика, дидактика, речевая ситуация, коммуникативная стратегия.*

DIDACTIC-PRAGMATIC AND COMMUNICATIVE FEATURES OF PAREMIOLOGICAL UNITS IN UZBEK FOLK EPICS

Abstract: *This article examines the didactic and pragmatic features of proverbs and sayings in Uzbek folk epics. It highlights their role in managing speech situations, moral guidance, warning, and promoting compromise. The effectiveness of their indirect pragmatic influence on the audience is also substantiated.*

Keywords: *paremiological units, proverbs and sayings, epic discourse, pragmatics, didactics, speech situation, communicative strategy.*

Kirish

Maqol va matallarning asosiy pragmatik vazifalaridan biri – o‘git berishdir. Dostonlarda o‘git bevosita buyruq yoki nasihat shaklida emas, balki paremiologik birliklar orqali bilvosita yetkaziladi. Bu bilvositalik tinglovchi tomonidan qarshiliksiz qabul qilinishini ta’minlaydi. Tinglovchi maqol yoki matalni shunchaki matn elementi sifatida emas, balki xalq donoligi ifodasi sifatida qabul qiladi. Shu sababli o‘git majburlov sifatida emas, balki tabiiy haqiqat sifatida anglanadi.

Adabiyotlar tahlili

Maqol va matallar (paremiologik birliklar) tilini o‘rganishga bag‘ishlangan tadqiqotlarni bir necha guruhga bo‘lib tahlil qilish mumkin. Birinchidan, *leksik-semantik yo‘nalishdagi tadqiqotlar*da maqol va matallarning ma’no tuzilishi, ko‘p qatlamli semantikasi hamda umumlashtirish xususiyati tahlil qilinadi. Jumladan, X.S.Ro‘zimboyev, A.A.Halikov, I.Umarov, N.Hamdamova, M.Yaqubova, G.Egamberdiyeva, D.Xudayberganova, M.H.Jumaniyazova, A.S.Rahimovlarning ishlarda paremiologik birliklarning obrazli tafakkur mahsuli sifatidagi xususiyati, ularning ko‘chma ma’no hosil qilish mexanizmlari ochib beriladi.

Ikkinchidan, *lingvostilistik va lingvopoetik tadqiqotlar* maqol va matallarning badiiy ifoda vositasi sifatidagi imkoniyatlarini o‘rganishga qaratilgan. Jumladan. A.M.Eshmuratov, Sh.Mamadiyev, X.Q.Toshmatov, G.Jumanazarovalarning tadqiqotlarida ularning obrazlilik, ekspressivlik, ritmik tuzilish kabi xususiyatlari yoritilib, nutqdagi estetik ta’siri asoslab beriladi.

Uchinchidan, *pragmatik va kommunikativ yo‘nalishdagi izlanishlar*da maqol va matallarning nutqiy vaziyatni boshqarishdagi roli tahlil qilinadi. D.A.Ashurov, N.Sobirova, O.Sultanova, Y.N.Xodjiyevlarning tadqiqotlarida ularning

bilvosita ta’sir ko‘rsatish, o‘git berish, ogohlantirish, ishontirish hamda murosaga chaqirish funksiyalari asosiy tadqiq obyekti sifatida qaraladi.

Tadqiqot metodologiyasi

Tadqiqot zamonaviy lingvistikaning pragmatika, diskurs tahlili, lingvokulturologiya, paremiologiya va kognitiv tilshunoslik yo‘nalishlariga tayanadi. Kompleks metodologik yondashuv doston matnini ko‘p qatlamli kommunikativ tizim sifatida tahlil qilish imkonini berdi.

Natijalar va ularning tahlili

Doston kontekstida maqol va matallar ko‘pincha qahramonlarning nutqida ishlatiladi. Bu holat o‘gitning qahramon shaxsi orqali legitimlashtirilishiga xizmat qiladi. Agar maqol ijobiy qahramon nutqida qo‘llansa, uning didaktik ta’siri yanada kuchayadi. Tinglovchi bunday qahramonni axloqiy namuna sifatida qabul qiladi va uning nutqidagi paremiologik birliklar orqali berilgan o‘gitni ichki me’yor sifatida singdiradi. Masalan, *“Begunoh xalqni qonini bekorga to‘kmaklik gunoh bo‘lur”* kabi birliklar juda ko‘p uchraydi[1].

Maqol va matallarning didaktik vazifasi ko‘pincha xulosa chiqarish mexanizmi orqali amalga oshadi. Doston syujeti davomida voqealar rivojlanadi, konfliktlar yuzaga keladi va ma’lum bir nuqtada maqol yoki matal keltiriladi. Bu paremiologik birlik voqealarning mantiqiy yakuni sifatida xizmat qiladi. Tinglovchi voqeani baholashda aynan shu birlikka tayangan holda xulosa chiqaradi. Natijada xulosa muallif tomonidan ochiq aytilmagan bo‘lsa ham, tinglovchi ongida aniq shakllanadi.

Xulosa chiqarishga yo‘naltirilgan maqol va matallar individual hodisani umumlashtiradi va uni universal axloqiy qoida darajasiga ko‘taradi. Bu jarayonda paremiologik birliklar voqea va tinglovchi o‘rtasida vositachi vazifasini bajaradi. Tinglovchi doston voqealarini real hayot bilan qiyoslash imkoniga ega bo‘ladi.

Dostonlarda maqol va matallar ko‘pincha dramatik vaziyatlarda qo‘llanadi. Bunday vaziyatlarda paremiologik birliklar voqealarning hissiy fonini tartibga soladi. Ular tinglovchining hissiy reaksiyasini barqarorlashtiradi va voqeani axloqiy baholashga yo‘naltiradi. Natijada tinglovchi faqat hayajonlanib qolmaydi, balki voqeadan ma’no chiqaradi.

Didaktik-pragmatik jihatdan qaralganda, maqol va matallar doston nutqida vaqt va makon chegaralarini yo‘qotadi. Ular o‘tmish voqealarini hozirgi tinglovchi uchun dolzarb qiladi. Tinglovchi o‘z hayotiy tajribasini doston voqealari bilan qiyoslab, paremiologik birlik orqali o‘z xatti-harakatlarini baholaydi. Bu holat maqol va matallarning tarbiyaviy kuchini yanada oshiradi.

Maqol va matallar yordamida doston nutqida muallif pozitsiyasi bilvosita ifodalanadi. Muallif yoki ijrochi o‘z axloqiy qarashlarini ochiq bayon qilmasdan, paremiologik birliklar orqali tinglovchini ma’lum yo‘nalishga yetaklaydi. Bu esa doston nutqining pragmatik samaradorligini oshiradi va uni majburlovdan holi qiladi.

Paremiologik birliklarning didaktik vazifasi ularning qisqa, lo‘nda va obrazli shakli bilan ham izohlanadi. Qisqa shakl tinglovchi xotirasida oson saqlanadi, obrazlilik esa hissiy ta’sirni kuchaytiradi. Shu bois maqol va matallar doston nutqida uzoq muddatli axloqiy ta’sir ko‘rsatish imkoniyatiga ega. *“Do‘stlar yig‘lab, dushman kuldi”, “Do‘stlaring shod bo‘lib, dushman kulmasin”, “Qizil gulni do‘st bilib, bulbul ishi fig‘ondir”*maqollar xalq hayotining yorqin namunasidir[2].

Dostonlarda maqol va matallar orqali shakllangan axloqiy yo‘naltirish avloddan avlodga uzatiladi. Har bir yangi ijroda paremiologik birliklar yangicha kontekstda yangicha talqin qilinadi, ammo ularning asosiy didaktik yadrosi saqlanib qoladi. Bu holat doston paremiologiyasining barqarorligi va ta’sirchanligini ta’minlaydi.

Maqol va matallarning didaktik-pragmatik vazifalari doston nutqini oddiy badiiy hikoyadan farqlab, uni axloqiy-ijtimoiy ongni shakllantiruvchi kuchli kommunikativ tizimga aylantiradi. Aynan shu birliklar orqali dostonlar xalq hayotida nafaqat estetik, balki tarbiyaviy ahamiyat kasb etib kelmoqda.

O‘zbek xalq dostonlari tilida paremiologik birliklar nutqiy vaziyatni boshqaruvchi muhim pragmatik vositalar sifatida namoyon bo‘ladi. Maqol va matallar doston matnida shunchaki umumiy donolik ifodasi bo‘lib qolmay, balki muomala jarayonini yo‘naltiruvchi, nutq ishtirokchilari o‘rtasidagi munosabatlarni tartibga soluvchi va kommunikativ strategiyalarni belgilovchi birliklar sifatida faoliyat yuritadi. Shu bois paremiologik birliklarning pragmatik imkoniyatlarini nutqiy vaziyatni boshqarish nuqtayi nazaridan tahlil qilish doston tilining kommunikativ mexanizmlarini ochib berishda muhim ahamiyat kasb etadi.

Nutqiy vaziyatni boshqarishda paremiologik birliklarning eng asosiy vazifalaridan biri – muomala strategiyasini belgilashdir. Dostonlarda maqol va matallar ko‘pincha dialog yoki monologning muhim burilish nuqtalarida ishlatiladi. Bunday paytda paremiologik birlik suhbatning keyingi yo‘nalishini belgilab beradi: keskinlik kuchayadimi yoki yumshaydimi, qarama-qarshilik chuqurlashadimi yoki murosa sari yo‘naladimi – bularning barchasi paremiologik birlik orqali berilgan signalga bog‘liq bo‘ladi[3].

Muomala strategiyasi sifatida qo‘llangan paremiologik birliklar nutq ishtirokchilariga o‘zaro munosabatning maqbul shaklini ko‘rsatadi. Masalan, keskin vaziyatda keltirilgan maqol suhbatni to‘xtatish, ohangni pasaytirish yoki qarama-qarshilikni boshqa yo‘nalishga burish vazifasini bajaradi. Bu holatda paremiologik birlik bevosita buyruq

bermaydi, balki umumiy hayotiy tajribaga tayangan holda muomala me'yorini eslatadi.*"Sabr –vaqtixushlikning kalitidir"* maqoli har zamon uchun muhim va zaruratdir.

Doston matnida murosaga chaqirish paremiologik birliklarning muhim pragmatik vazifalaridan biri hisoblanadi. Konfliktli vaziyatlarda maqol va matallar orqali tomonlar keskin qarama-qarshilikdan qaytariladi, muvozanat va kelishuv g'oyasi ilgari suriladi. Bunday paremiologik birliklar tinglovchiga ham, qahramonlarga ham bir vaqtning o'zida ta'sir ko'rsatadi. Tinglovchi bunday vaziyatda mojaroni axloqiy mezonlar asosida baholashga undaladi[4].

Ogohlantirish paremiologik birliklarning yana bir muhim pragmatik vazifasi hisoblanadi. Dostonlarda maqol va matallar orqali qahramonlar ehtimoliy xatolardan, noto'g'ri qarorlardan yoki xavfli xatti-harakatlardan ogohlantiriladi. Bu ogohlantirish bevosita tahdid yoki buyruq shaklida emas, balki umumlashtirilgan hayotiy tajriba shaklida etkaziladi. Natijada tinglovchi ogohlantirishni rad etmaydi, balki uni jiddiy qabul qiladi. Masalan, dostonda *"Va'daga vafo"(*121-bet), *"Tuz egan joyingga xiyonat qilma"*(158-bet), kabi maqollar borki, u kishilarni xavfli xatti-harakatlardan ogohlantiriladi[1].

Nutqiy vaziyatni boshqarishda paremiologik birliklar dialogik jarayonda alohida rol o'ynaydi. Ular suhbat ishtirokchilari o'rtasidagi kuch muvozanatini tartibga soladi. Ba'zan maqol keltirgan qahramon ma'naviy ustunlikka erishadi, chunki u o'z fikrini shaxsiy mulohaza emas, balki umumiy donolik darajasiga ko'taradi. Bu esa boshqa ishtirokchilarni murosaga yoki sukutga majbur qiladi. Masalan, *"Aytuvchi ahmoq bo'lsa, tinglovchi dono bo'lishi kerak"* maqoli shu mavzuga mos keladi[2].Paremiologik birliklarning nutqiy vaziyatni boshqarishdagi roli ularning bilvosita ta'sir mexanizmi bilan chambarchas bog'liq. "Maqol va matallar ochiq bahsga kirishmaydi, balki bahsni chetlab o'tib, umumiy xulosaga yetaklaydi. Shu sababli ular konfliktni yumshatish va kommunikativ muvozanatni tiklashda samarali vosita bo'lib xizmat qiladi" [3].

Paremiologik birliklarning murosaga chaqirish va ogohlantirish funksiyalari dostonlarning tarbiyaviy ahamiyatini kuchaytiradi. Tinglovchi doston voqealarini kuzatar ekan, real hayotdagi muomala vaziyatlarida qanday yo'l tutish kerakligi haqida bilvosita bilim oladi. Bu bilim majburlov orqali emas, balki nutqiy vaziyatni boshqaruvchi paremiologik birliklar orqali singdiriladi.

Dostonlarda paremiologik birliklar yordamida boshqarilgan nutqiy vaziyatlar ko'pincha muvozanatli yakun topadi. Bu yakun ochiq xulosa sifatida emas, balki tinglovchi ongida shakllangan ichki xulosa tarzida namoyon bo'ladi. Paremiologik birliklar aynan shu ichki xulosani yuzaga chiqaruvchi pragmatik mexanizm vazifasini bajaradi. Dostonda *"Odam borki holi emas xatodan"*, *"Bu dunyoda har kim armonni chekar"*, *"Bulbulni maskani bog'."*[3].

Paremiologik birliklarning nutqiy vaziyatni boshqarishdagi roli ularning uzoq vaqt davomida faol qo'llanib kelishining asosiy sabablaridan biridir. Ular doston nutqini faqat estetik hodisa emas, balki murakkab kommunikativ tizimga aylantiradi. Tinglovchi bunday nutq orqali nafaqat voqealarni, balki muomala madaniyatini ham o'zlashtiradi.

Doston paremiologiyasida an'anaviy bilim markaziy o'rin egallaydi. Maqol va matallar orqali xalqning hayotiy tajribasi, ijtimoiy munosabatlar haqidagi qarashlari, axloqiy mezonlari va amaliy donoligi kodlangan bo'ladi. Ushbu bilimlar tizimi doston matnida tayyor xulosa shaklida namoyon bo'ladi va tinglovchidan murakkab tahlil talab qilmaydi. Bu holat paremiologik birliklarning pragmatik samaradorligini oshiradi, chunki ular tez va oson qabul qilinadi.

Xulosa

Doston paremiologiyasida kollektiv ong va pragmatik ta'sir bir-birini to'ldiruvchi tizimni tashkil etadi. An'anaviy bilim xalqona mantiq orqali ifodalanadi, xalqona mantiq esa auditoriyani ishontirishga xizmat qiladi. Ushbu mexanizm doston nutqini shunchaki badiiy matn emas, balki jamiyat ongini shakllantiruvchi kuchli kommunikativ vositaga aylantiradi.

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CHARLZ DIKKENS ROMANLARI SYUJET ASOSI SIFATIDA YAXSHILIK VA YOMONLIK O‘RTASIDAGI BADIIY ZIDDIYAT

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Annotatsiya: *Ushbu maqolada Charlz Dikkens romanlarida yaxshilik va yomonlik o‘rtasidagi badiiy ziddiyatning syujet hosil qiluvchi tamoyil sifatidagi o‘rni tahlil qilinadi. Tadqiqotda axloqiy konfliktning personajlar, syujet, badiiy makon hamda til va uslub darajalarida namoyon bo‘lishi ko‘rib chiqiladi. Yozuvchining “Oliver Tvist”, “Dombi va o‘g‘li”, “Devid Kopperfild”, “Sovuq uy”, “Og‘ir zamonlar”, “Kichkina Dorrit”, “Katta umidlar” va “Bizning umumiy do‘stimiz” asarlari misolida axloqiy konsepsiyaning evolyutsiyasi kuzatiladi. Tahlil natijasida Dikkens ijodida yomonlikning institutsionallashuvi hamda ezgulikning berilgan holatdan erishiladigan qadriyatga aylanib borish jarayoni aniqlanadi.*

Kalit so‘zlar: *Charlz Dikkens, axloqiy konflikt, ezgulik va yovuzlik, viktorian romani, badiiy makon, personajlar tipologiyasi, institutsional yovuzlik, syujet tuzilishi.*

ХУДОЖЕСТВЕННЫЙ КОНФЛИКТ МЕЖДУ ДОБРОМ И ЗЛОМ КАК ОСНОВА СЮЖЕТА РОМАНОВ ЧАРЛЬЗА ДИККЕНСА

Аннотация: *В статье анализируется роль художественного конфликта добра и зла как сюжетообразующего принципа в романах Чарльза Диккенса. Рассматривается, как нравственный конфликт проявляется на уровне персонажей, сюжета, художественного пространства, а также языка и стиля. На материале романов «Оливер Твист», «Домби и сын», «Дэвид Копперфилд», «Холодный дом», «Тяжёлые времена», «Крошка Доррит», «Большие надежды» и «Наш общий друг» прослеживается эволюция нравственной концепции писателя. В результате анализа выявляется процесс институционализации зла и превращения добра из данности в достигаемую ценность.*

Ключевые слова: *Чарльз Диккенс, нравственный конфликт, добро и зло, викторианский роман, художественное пространство, типология персонажей, институциональное зло, структура сюжета.*

THE ARTISTIC CONFLICT BETWEEN GOOD AND EVIL AS THE BASIS OF THE PLOT IN CHARLES DICKENS’S NOVELS

Abstract: *The article analyses the role of the artistic conflict between good and evil as a plot-forming principle in the novels of Charles Dickens. It examines how the moral conflict manifests itself at the levels of characters, plot, artistic space, as well as language and style. Drawing on the novels “Oliver Twist”, “Dombey and Son”, “David Copperfield”, “Bleak House”, “Hard Times”, “Little Dorrit”, “Great Expectations” and “Our Mutual Friend”, the study traces the evolution of the writer’s moral conception. The analysis reveals the process of the institutionalisation of evil and the transformation of goodness from a given state into an attainable value.*

Keywords: *Charles Dickens, moral conflict, good and evil, Victorian novel, artistic space, character typology, institutional evil, plot structure.*

KIRISH

Charlz Dikkens ijodi jahon adabiyoti tarixida ezgulik va yovuzlik tabiatini eng izchil hamda keng ko‘lamda badiiy tadqiq etgan hodisalardan biridir. Yozuvchining deyarli barcha yirik romanlari markaziy axloqiy konfliktsiz tasavvur etilmaydi: aynan shu konflikt syujetni tashkil qiladi, personajlar tizimini belgilaydi va bayonning g‘oyaviy yo‘nalishini shakllantiradi. Biroq Dikkens uchun mazkur konflikt hech qachon shunchaki badiiy usul yoki janriy shartlilik bo‘lib qolmaydi: u yozuvchining chuqur dunyoqarashiga, inson tabiati, jamiyat va tarix haqidagi qarashlariga asoslangan.

Tadqiqotchilar allaqachon Dikkens badiiy olamining ushbu xususiyatiga e'tibor qaratganlar. Dikkensning ilk biografi Jon Forster yozuvchining butun hayoti haqiqatni yolg'onga, adolatni adolatsizlikka, rahm-shafqatni esa bag'ritoshlikka qarshi izlashdan iborat bo'lganini va bu izlanish uning har bir romanida o'z ifodasini topganini ta'kidlagan. Keyingi tadqiqotchilar esa bu kuzatuvni yanada aniqlashtirib, Dikkens ijodida ezgulik va yovuzlik konflikti bir vaqtning o'zida ham shaxsiy, ham ijtimoiy, ham individual, ham tizimli xarakter kasb etishini, aynan shu ikkiyoqlama o'lchovda uning badiiy va g'oyaviy tuganmasligi mujassam ekanini qayd etganlar.

Tadqiqotning maqsadi mazkur ko'p qatlamli konfliktning Dikkens romanlari syujetini qay tarzda tashkil etishini, uning yozuvchi ijodiy yo'li davomida qanday o'zgarib borishini hamda viktorian madaniyati va jahon adabiy an'anasi kontekstidagi g'oyaviy mazmunini aniqlashdan iborat. Tadqiqotda qiyosiy-tipologik, struktur-semiotik va madaniy-tarixiy tahlil usullaridan foydalanildi.

Dikkens ijodidagi axloqiy konfliktning o'ziga xosligini tushunish uchun bir necha muhim kontekstlarni hisobga olish zarur. Avvalo, tarixiy kontekst: Dikkens shiddatli industrializatsiya, ijtimoiy tabaqalanish va an'anaviy qadriyatlar inqirozi davrida ijod qilgan; uning romanlari eski xristian jamiyati etikasi yangi burjua utilitarizmi axloqi bilan to'qnash kelgan lahzani aks ettiradi. Biografik kontekst ham muhim: bolalikdagi qashshoqlik va etik fabrikasidagi majburiy mehnat tajribasi yozuvchi shaxsiyati hamda ijodida o'chmas iz qoldirgan, unda ijtimoiy yovuzlik ko'rinishlariga nisbatan barqaror sezgirlikni shakllantirgan. Nihoyat, adabiy kontekst: Dikkens XVIII asr axloqiy romani an'anasini (Filding, Richardson) meros qilib olgan, biroq uni tubdan murakkablashtirib, narrativ tarkibiga tizimli ijtimoiy o'lchovni kiritgan.

Strukturaviy jihatdan ezgulik va yovuzlik konflikti Dikkens romanlarida bir vaqtning o'zida bir necha darajada namoyon bo'ladi: personajlar darajasida — ijobiy va salbiy qahramonlarning qarama-qarshi qo'yilishi hamda murakkab "oraliq" obrazlar orqali; syujet darajasida — ezgulikning sinovlarga duchor etilishi va finaldagi yechim orqali; ijtimoiy makon darajasida — ezgulik va yovuzlikni ifodalovchi joylarning zidlanishi orqali; til va uslub darajasida esa — muayyan axloqiy qutb bilan barqaror bog'lanadigan metaforalar va leytmotivlar tizimi orqali.

Adabiyotlar tahlili va metodologiya

"Oliver Tvist": axloqiy absolyutning shakllanishi

"Oliver Tvist" (1837–1839) axloqiy konflikt eng to'g'ridan to'g'ri va ayni paytda eng kuchli emotsional ta'sir bilan ifodalangan asardir. Roman bir-biriga mutlaqo mos kelmaydigan ikki olamning to'qnashuvi asosiga qurilgan: Oliver va uning himoyachilari timsolida gavdalangan ezgulik olami hamda Fedjin to'dasi va Bill Sayks obrazi orqali namoyon bo'lgan yovuzlik olami. Ana shu ikki qutb orasida butun syujet jamiyat tashlab qo'ygan bolaning ruhi va taqdiri uchun kurash sifatida yoyiladi.

Dikkens talqinida Oliver g'oyat muhim bir xususiyat bilan ta'minlangan: uning axloqiyligi orttirilgan emas, balki tug'ma. U eng noqulay tarbiya va eng vayronkor tajribaga qaramay saqlanib qoladi. Hech qanday tashqi sharoitga keltirib bo'lmaydigan ushbu "axloqiy absolyut" konsepsiyasi romanning butun arxitekturasini belgilaydi: yovuzlik hujum qiladi, qurshab oladi, sindirishga urinadi, biroq bolalikdagi begunohlikning mustahkamligi qarshisida muqarrar ravishda chekinadi:

"Bola qo'zg'alib, uyqusida jilmaydi — go'yo bu achinish va mehr belgilari unga hech qachon ko'rib bilmagan muhabbat va mehr haqida xush bir tush ko'rsatgandek..." (Dickens Ch. Oliver Twist. Ch. 30)

Bu parcha romanning markaziy metaforalaridan birini ochib beradi: ezgulik inson tabiatining qandaydir ibtidoiy, daxlsiz holati haqidagi "xotira"dir; yovuzlik esa bu tabiatga tashqaridan yopishadigan, uni deformatsiya qiladigan, biroq butunlay yo'q qilishga qodir bo'lmagan hodisadir. Dikkens insonning azaliy ezguligi haqidagi russochilik g'oyasiga murojaat qiladi, biroq Russodan farqli o'laroq, jamiyatni mutlaq yovuzlik manbai deb hisoblamaydi: uning tanqidi muayyan institutlar — kambag'allar uyi, sud, qamoqxona, jinoyat olamiga qaratilgan.

Yovuzlik timsoli sifatidagi Fedjin jahon adabiyotidagi eng murakkab salbiy qahramonlardan biridir. Funksional antagonist bo'la turib, u o'limga mahkumlik kamerasidagi so'nggi tunida yetuk Dikkensga xos ambivalentlikni namoyon etadi: yovuz qahramon eng oliy dahshat lahzasida yovuzlik funksiyasi bo'lishdan to'xtaydi va o'lim qarshisida turgan oddiy qo'rqqan insonga aylanadi. Bill Sayks esa qo'pol, bevosita zo'ravonlikning eng yalang'och timsolidir; Nensining o'ldirilishi roman axloqiy konfliktining kulminatsiyasi sifatida tasvirlanadi, oq ro'mol detali esa jinoyat tomonidan tahqirlangan poklikning axloqiy belgisiga aylanadi.

"Dombi va o'g'li" va "Devid Kopperfild": yovuzlikning burjua xonadoniga kirib borishi

Ushbu asarlarda yovuzlik endi faqat "quyi tabaqalar" va jinoyat olamining xususiyati bo'lib qolmaydi: u burjua xonadoniga ham kirib boradi va rasmiy axloq fazilat deb hisoblaydigan qadriyatlar tizimining o'zida namoyon bo'ladi. Janob Dombi an'anaviy ma'nodagi yovuz qahramon emas — u jinoyat sodir etmaydi, biroq uning yovuzligi pul va ijtimoiy mavqega sig'inishda, insoniy mehrga qodir emasligida, odamlarni, hatto o'z farzandlarini ham vositaga aylantirishida mujassam. Muhim jihat shundaki, finalda Dombi axloqiy o'zgarish yo'lini bosib o'tadi, bu esa Dikkensning hatto toshbag'ir qalbda ham insoniylik uyg'onishi mumkinligiga ishonchini ko'rsatadi.

“Devid Kopperfild”da axloqiy konflikt shaxsning shakllanishi reyestriga koʻchiriladi. Uriya Hipning takrorlanuvchi “kamtarligi” fazilat niqobi ostiga yashiringan yovuzlikni ifodalaydi; bu qaytarish talab qiladigan, alamlarni yigʻib boradigan va oxir-oqibat shafqatsiz shuhratparastlik sifatida namoyon boʻladigan soxta kamtarlikdir. Agnes Uikfild esa, aksincha, sokin, dabdabasiz ezgulikni ifodalaydi. Bu romanda Dikkens yovuzlikni protagonistning oʻz ichki dunyosiga ham joylashtiradi — “qalbning yetilmaganligi” qahramon yengib oʻtishi lozim boʻlgan nomukammallikdir; shu tariqa konflikt tashqi tusdan ichki tusga oʻtadi.

“Sovuq uy” va “Ogʻir zamonlar”: yovuzlikning institutsionallashuvi

“Sovuq uy” (Bleak House) yovuzlik konsepsiyasi mutlaqo yangi oʻlcham kasb etgan asardir: yovuzlik endi alohida shaxslarning xususiyati boʻlib qolmay, institutsionallashadi va jamiyatning oʻz tuzilishida mujassamlashadi. Oʻnlab yillarga choʻzilgan Kansleriya sudi odamlar yaratgan, biroq endilikda ularning irodasidan mustaqil yashayotgan mexanizmlarda yashovchi yovuzlikning metaforasidir. Romanning mashhur kirish qismi uning asosiy axloqiy nuqtai nazarini belgilaydi: yovuzlik istisno emas, balki me’yorning oʻzi, “tizim”dir. Harold Skimpol obrazi esa axloqiy buzilishning eng yuqori koʻrinishini namoyon etadi — bunda inson shunchaki yovuzlik qilmaydi, balki uni ezgulik deb qayta nomlaydi.

Bu olamga Ester Sammerson qarshi turadi — u Dikkens butun ijodi davomida eng izchil himoya qilgan ezgulik turining tashuvchisidir: faol, sokin, mavhum bayonotlarda emas, balki aniq insonlarga gʻamxoʻrlik qilishda namoyon boʻladigan ezgulik. “Ogʻir zamonlar”da esa yovuzlik utilitarizm falsafasi va “fakt” tamoyili bilan aynanlashtiriladi. Tasavvurni, tuygʻuni va oʻyinni inkor etuvchi pedagogik tizimi bilan Gradgrind qadriyatlar tizimi darajasidagi intellektual yovuzlikning timsolidir. Unga sirkchining qizi Sissi Jup — tirik, soʻnmagan tuygʻu timsoli qarshi qoʻyiladi. Roman muhim tezisni namoyon etadi: ezgulik tasavvur bilan, yovuzlik esa uning yoʻqligi bilan bogʻliqdir.

“Katta umidlar”: axloqiy ambivalentlikning choʻqqisi

“Katta umidlar” (1860–1861) ezgulik va yovuzlik konfliktini talqin etishda tub burilishni anglatadi: ezgulik va yovuzlik ilk asarlarga xos nisbiy aniqlikni yoʻqotadi hamda ham jamiyat tuzilishida, ham bosh qahramon qalbida chuqur chatishib ketadi. Pip ezgulikka chin dildan intiladigan, ayni paytda muntazam ravishda yomonlik qiladigan qahramondir; uning “katta umidlari” axloqiy tuzoqqa aylanadi. Miss Xevisham yovuzlik oʻz tashuvchisiga aylantirgan ayol boʻlib, Dikkens uning misolida yovuzlikning zanjir boʻylab tarqalishini — boshdan kechirilgan zoʻravonlik yangi zoʻravonlikni tugʻdirishini koʻrsatadi.

Magvich obrazi esa Dikkensning ilk romanlarida deyarli imkonsiz boʻlgan paradoksni mujassam etadi: jamiyat yovuzlar qatoriga kiritib qoʻygan inson chuqur sadoqat va fidoyilikka qodir boʻlib chiqadi. Shunday qilib, “Katta umidlar”da ezgulik yovuzlik manbaiga aylanishi, yovuzlik esa ezgulikning oʻzgargan shakli boʻlib chiqishi mumkin; aynan ana shu dialektik talqin asarning Dikkens ijodi choʻqqisi deb baholanishiga asos boʻladi.

Natija va muhokama

Badiiy makonning axloqiy semantikasi

Dikkens badiiy olamining eng barqaror tamoyillaridan biri makonni axloqiy ma’no bilan ta’minlashdir. Uning romanlarida joylar hech qachon neytral boʻlmaydi: yovuzlik qutbini London xarobalari, qamoqxonalar, idoralar va sanoat shaharlari (Marshalsi, Kansleriya, Kokstaun) tashkil etadi. Ezgulik qutbi esa, avvalo, shinam, iliq va jonli xonadon bilan bogʻlanadi. Muhim jihat shundaki, yetuk ijodda bu topografiya yemirila boshlaydi: “Bleak House” oʻz nomida mash’um kinoyani saqlaydi, Miss Xevishamning “Satis House” mulki esa toʻkinlik ramzi boʻlishi kerak boʻla turib, muzlab qolgan maqbaraga aylanadi. Makon endi ishonchli axloqiy moʻljal boʻlib qolmaydi.

Personajlar tipologiyasi

Dikkens yaratgan salbiy qahramonlar galereyasida bir necha barqaror tipni ajratish mumkin: toʻgʻridan toʻgʻri harakat qiluvchi yovuz qahramon (Bill Sayks); ezgulik niqobi ostiga yashiringan munofiq yovuz qahramon (Fedjin, Uriya Hip, Skimpol, Peksniff); hamda yovuz tizimga xizmat qiluvchi “tizimli” yovuz qahramon (Volokita vazirligi amaldorlari, Kansleriya sudyalari). Dikkensni ayniqsa munofiqlik qiziqtiradi, chunki uning nazarida bu yovuzlikning eng xavfli shaklidir.

Solih qahramonlar galereyasida ham barqaror tipologiya kuzatiladi: “xonadondagi farishta” (Agnes Uikfild, Ester Sammerson, kichik Dorrit); fazilati hisob-kitobdan xoli boʻlgan “sodda inson” (Jo Gargeri, Tom Pinch); hamda axloqiy qayta tugʻilish yoʻlini bosib oʻtuvchi “tuzalgan gunohkor” (Dombi, Skrudj, Pip). Dastlabki solih qahramonlar oʻz pokligida oʻzgarmas axloqiy absolyutlar boʻlsa, keyingi davr qahramonlari oʻz zaifliklarini yengib oʻtadigan insonlardir; bu esa ularning axloqiy gʻalabasini ancha ishonarli qiladi.

Axloqiy konsepsiyaning diniy-falsafiy asoslari

Dikkensning axloqiy konsepsiyasi xristian an’anasidan oziqlanadi, ammo uni oʻziga xos tarzda sekulyarlashtiradi. Uning dindorligi dogmatik emas, balki axloqiy xarakterga ega edi: u rasmiy cherkovga va diniy munofiqlikka skeptik munosabatda boʻlgan. Agar xristian an’anasi yovuzlikni avvalo gunohda koʻrsa, Dikkens uni eng avvalo ijtimoiy tuzilmalar va tizimda joylashtiradi. Bu muhim siljishni anglatadi: yovuzlikni faqat individual ma’naviy qayta tugʻilish orqali emas,

balki ijtimoiy islohot orqali ham tuzatish mumkin — aynan shu jihat Dikkens romanlarini axloqiy va'zdan ijtimoiy tashxis va islohotga chorlovga aylantiradi.

"Bizning umumiy do'stimiz": axloqiy konfliktlar ensiklopediyasi

"Bizning umumiy do'stimiz" (1864–1865) — Dikkensning yakunlangan so'nggi romani — axloqiy qarama-qarshiliklarning o'ziga xos ensiklopediyasidir. Romanning markaziy ramzi Temza daryosi qadriyatlar ag'darilib ketgan olam timsolidir: axlat boylikka, o'lim esa hayotga olib boradi. Bella Uilfer boylik haqidagi "katta umidlar"dan voz kechib, ezgulikni ongli ravishda tanlaydi — bu Oliverga xos instinktiv ezgulik emas, balki qo'lga kiritilgan, vasvasalarni yengishni talab qiladigan ezgulikdir. Bredli Xedston esa ezgulik va yovuzlik teng kuch bilan kurashadigan inson fojeasini mujassam etadi: uning yovuzligi o'z-o'zicha fazilat bo'lishi mumkin bo'lgan sifatlar — sadoqat, mehnatsevarlik negizidan o'sib chiqadi. Shu tariqa Dikkens yovuzlik insonning fazilatlari bag'ridan ham unib chiqishi mumkinligini ko'rsatadi.

Xulosa

O'tkazilgan tahlil Charlz Dikkens romanlarida ezgulik va yovuzlik konflikti tabiati hamda funksiyasiga doir bir qator xulosalarni shakllantirish imkonini beradi.

Birinchidan, mazkur konflikt shunchaki syujet unsurlaridan biri emas, balki Dikkens narrativining tizim hosil qiluvchi tamoyilidir: yozuvchining barcha asosiy asarlari bir vaqtning o'zida personajlar, syujet, makon va til darajasida namoyon bo'ladigan axloqiy qarama-qarshilik atrofida qurilgan.

Ikkinchidan, Dikkensning axloqiy konflikt haqidagi konsepsiyasi prinsipial evolyutsiyani boshdan kechiradi: dastlabki romanlarda ezgulik va yovuzlik nisbatan aniq chegaralangan va muayyan qahramonlarda personifikatsiya qilingan bo'lsa, yetuklik davri romanlarida yovuzlik institutsionallashadi va anonimlashadi, ezgulik esa berilgan holat emas, balki erishiladigan qadriyatga aylanadi.

Uchinchidan, Dikkensdagi axloqiy konflikt o'zida prinsipial ijtimoiy o'lchovni mujassam etadi: yovuzlik faqat shaxsiy ayb emas, balki adolatsiz qonunlarga, g'ayriinsoniy institutlarga va hukmron qadriyatlar tizimiga ildiz otgan tizimli muammodir.

To'rtinchidan, butun evolyutsiyaga qaramay, Dikkens ijodida barqaror yadro saqlanib qoladi: insonning ezgulikka qodirligiga, axloqiy tuyg'uning yo'q qilib bo'lmasligiga va axloqiy tanlovning pirovard ma'nodorligiga bo'lgan ishonch. Hatto eng qorong'i asarlarida ham Dikkens yovuzlikning mutlaq g'alabasiga yo'l qo'ymaydi.

Nihoyat, Dikkensdagi ezgulik va yovuzlik konflikti aniq tarixiy doira bilan cheklanib qolmay, universal ahamiyat kasb etadi: u inson tabiati, shaxsiy mas'uliyat bilan ijtimoiy sharoitlar o'rtasidagi nisbat hamda hisob-kitob qonunlari asosida qurilgan olamda fazilatning bahosi haqidagi savollarni o'rtaga tashlaydi. Aynan shu universallik Dikkens romanlariga ularning so'nmas badiiy va axloqiy qudratini baxsh etadi.

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DIRK GERARTSNING "LEKSIK SEMANTIKA NAZARIYALARI" ASARIDA MA'NONING TA'RIFI VA TASNIFI

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Annotatsiya: *Mazkur maqolada Dirk Gerartsning "Leksik semantika nazariyalari" asarida leksik ma'noning ta'riflanishi va tasniflanishi masalalari tahlil qilinadi. Tadqiqotda leksik semantikaning rivojlanishi, ma'noni tushuntirishga qaratilgan strukturaviy, komponential va kognitiv yondashuvlar hamda ularning o'zaro farqli jihatlari ko'rib chiqiladi. Shuningdek, leksik ma'noning til tizimidagi semantik munosabatlar, insonning kognitiv tajribasi, kategoriyalash jarayoni va kontekst bilan bog'liqligi yoritiladi.*

Kalit so'zlar: *leksik semantika, leksik ma'no, semantik nazariya, strukturaviy semantika, komponential tahlil, kognitiv semantika, kategoriyalash.*

ОПРЕДЕЛЕНИЕ И КЛАССИФИКАЦИЯ ЗНАЧЕНИЯ В РАБОТЕ ДИРКА ГЕРАРТСА «ТЕОРИИ ЛЕКСИЧЕСКОЙ СЕМАНТИКИ»

Аннотация: *В статье анализируются вопросы определения и классификации лексического значения в работе Дирка Герартса «Теории лексической семантики». Рассматриваются развитие лексической семантики, структурный, компонентный и когнитивный подходы к объяснению значения, а также различия между ними. Освещается также связь лексического значения с семантическими отношениями в системе языка, когнитивным опытом человека, процессом категоризации и контекстом.*

Ключевые слова: *лексическая семантика, лексическое значение, семантическая теория, структурная семантика, компонентный анализ, когнитивная семантика, категоризация.*

THE DEFINITION AND CLASSIFICATION OF MEANING IN DIRK GEERAERTS'S "THEORIES OF LEXICAL SEMANTICS"

Abstract: *The article analyses the issues of defining and classifying lexical meaning in Dirk Geeraerts's "Theories of lexical semantics". It examines the development of lexical semantics, the structural, componential and cognitive approaches to the explanation of meaning, as well as the differences between them. It also discusses the relationship of lexical meaning to semantic relations within the language system, to human cognitive experience, to the process of categorisation and to context.*

Keywords: *lexical semantics, lexical meaning, semantic theory, structural semantics, componential analysis, cognitive semantics, categorisation.*

Kirish

Tilshunoslikda ma'no masalasi eng murakkab va muhim tadqiqot yo'nalishlaridan biri hisoblanadi. Insonning borliqni anglash, uni nomlash va nutq orqali ifodalash jarayonida ma'no asosiy vosita sifatida namoyon bo'ladi. Ayniqsa, so'z va boshqa leksik birliklarning qanday ma'no anglatishi, ma'noning qanday shakllanishi va turli leksik birliklar o'rtasida qanday munosabatlar mavjudligi leksik semantikaning asosiy masalalarini tashkil etadi. Shu sababli leksik ma'noni aniqlash va uni turli mezonlar asosida tasniflash masalasi uzoq yillardan buyon tilshunoslikning dolzarb muammolaridan biri bo'lib kelmoqda.

Zamonaviy leksik semantika taraqqiyotida belgiyalik tilshunos Dirk Gerartsning ilmiy qarashlari alohida ahamiyatga ega. Uning "Leksik semantika nazariyalari" asari leksik ma'no haqidagi turli nazariyalarni izchil ko'rib chiqish, ularning shakllanishi va rivojlanishini ko'rsatish hamda ma'noni tushuntirishga bo'lgan turli yondashuvlarni qiyoslashga qaratilgan muhim tadqiqotlardan biridir. Asarda leksik semantikaning rivojlanish bosqichlari, turli nazariy maktablarning ma'no haqidagi qarashlari, kognitiv semantikaning shakllanishi hamda prototip va polisemiya kabi hodisalarning nazariy talqiniga alohida e'tibor qaratiladi. Mazkur maqolaning maqsadi Dirk Gerartsning "Leksik semantika nazariyalari" asarida leksik ma'noning ta'riflanishi va tasniflanishini tahlil qilish, muallifning asosiy nazariy qarashlarini ochib berish hamda ushbu qarashlarning zamonaviy leksik semantika uchun ahamiyatini aniqlashdan iborat.

Dirk Gerarts konsepsiyasida leksik ma'noning ta'rifi

Leksik ma’noni aniqlash masalasi Dirk Gerartsning “Leksik semantika nazariyalari” asarida markaziy masalalardan biri hisoblanadi. Leksik birlik ma’nosini faqat uning lug‘aviy ta’rifi bilan izohlash ko‘pincha yetarli bo‘lmaydi, chunki so‘zlarning real qo‘llanishi ularning ma’nosi ancha murakkab tuzilishga ega ekanini ko‘rsatadi. Masalan, bir so‘z turli kontekstlarda turlicha ma’no qirralarini yuzaga chiqarishi, boshqa so‘zlar bilan turli munosabatlarga kirishishi va muayyan kategoriyada turlicha darajada markaziy o‘rin egallashi mumkin. Shuning uchun leksik ma’no statik va o‘zgarmas birlikdan ko‘ra, turli omillar ta’sirida namoyon bo‘ladigan murakkab semantik hodisa sifatida qaralishi mumkin.

Gerartsning yondashuvini tavsiflashda uning ma’noni til tizimidan butunlay ajratib qo‘ymasligi bilan birga, uni faqat tizim ichidagi munosabatlarga ham cheklamasligi muhimdir. Leksik ma’no til birliklari o‘rtasidagi munosabatlar bilan bir qatorda, insonning bilimlari, tajribasi va dunyoni kategoriyalash usuli bilan ham bog‘liq. Bu jihat kognitiv semantika uchun ayniqsa muhimdir. Inson ma’lum bir so‘zni ishlatganda, faqat lug‘atda qayd etilgan belgilarni emas, balki ushbu so‘z bilan bog‘liq bo‘lgan kengroq bilim va tasavvurlarni ham faollashtiradi. Shu sababli leksik ma’noni sof lingvistik ma’lumot bilan cheklash har doim ham yetarli natija bermaydi.

Bunday qarash ma’no va ensiklopedik bilim o‘rtasidagi munosabat masalasini ham yuzaga chiqaradi. An’anaviy semantik yondashuvlarda tilga oid bilim bilan dunyo haqidagi umumiy bilimni ajratish imkoniyati mavjud deb qaralishi mumkin. Kognitiv yondashuvlarda esa bu ikki soha o‘rtasidagi chegara ancha murakkab ko‘rinadi. So‘z ma’nosini tushunish ko‘pincha ushbu so‘z anglatadigan obyekt, hodisa yoki jarayon haqidagi umumiy bilimni ham talab qiladi. Shu sababli leksik ma’no insonning umumiy konseptual tizimidan butunlay ajratilgan mustaqil birlik sifatida qaralmasligi kerak.

Gerartsning ma’no haqidagi qarashlarida kategoriyalash masalasi ham muhim o‘rin tutadi. Inson borliqdagi obyekt va hodisalarni ma’lum kategoriyalarga ajratadi va til ushbu kategoriyalash jarayonini ifodalash vositalaridan biri hisoblanadi. Biroq real hayotdagi kategoriyalar har doim ham qat’iy chegaralarga ega emas. Kategoriyaning ayrim a’zolari uning eng tipik vakili sifatida qabul qilinsa, boshqa a’zolar kategoriyaga nisbatan kamroq tipik bo‘lishi mumkin. Masalan, qushlar kategoriyasida ayrim qushlar inson ongida “qush” tushunchasining odatiy namunasi sifatida tezroq namoyon bo‘lishi mumkin, boshqalari esa mazkur kategoriyaga mansub bo‘lsa-da, kamroq tipik hisoblanadi. Bu holat leksik ma’noni qat’iy zaruriy va yetarli belgilar asosida tasniflashning har doim ham samarali emasligini ko‘rsatadi.

Gerartsning qarashlari ayniqsa polisemiya hodisasini tushuntirishda mazkur masalalar bilan chambarchas bog‘lanadi. Bir leksik birlikning bir nechta ma’noga ega bo‘lishi doimo bir-biridan butunlay ajralgan ma’nolar mavjudligini anglatmaydi. Aksincha, turli ma’no variantlari o‘rtasida ma’lum darajadagi semantik bog‘liqlik mavjud bo‘lishi mumkin. Bir ma’no markaziyroq, boshqalari esa undan kelib chiqqan yoki u bilan bog‘langan periferik ma’no sifatida namoyon bo‘lishi mumkin. Bunday qarash polisemiya va monosemiya o‘rtasidagi chegarani yanada murakkablashtiradi, biroq ayni vaqtda real tildagi ma’no o‘zgarishlari va semantik kengayishlarni yaxshiroq tushuntirish imkonini beradi.

Leksik ma’noning tasnifi

An’anaviy semantik qarashlarda ma’noni tashkil etuvchi belgilarni aniqlash va ular asosida leksik birliklarni muayyan guruhlarga ajratish muhim hisoblangan. Bunday yondashuvda kategoriyaga mansub bo‘lgan birliklar umumiy va zaruriy xususiyatlarga ega bo‘lishi kerak. Masalan, ma’lum bir semantik kategoriyaga kiruvchi birliklarning barchasi uni boshqa kategoriyalardan ajratib turadigan umumiy belgilarga ega bo‘lishi kutiladi. Bu usul ma’noni tizimli ravishda tavsiflash uchun qulay bo‘lsa-da, tabiiy tildagi ko‘plab kategoriyalar bunday qat’iy chegaralarga ega emasligini ko‘rsatadigan holatlar mavjud. Ayrim birliklar ma’lum kategoriyaga juda yaqin bo‘lsa, boshqalari unga nisbatan faqat ayrim umumiy belgilar asosida mansub bo‘lishi mumkin.

Gerartsning kognitiv yo‘nalishga yaqin qarashlarida ma’no va kategoriyalarni markaz va periferiyaga ega tuzilma sifatida ko‘rish muhim ahamiyat kasb etadi. Bunda kategoriyaning barcha a’zolari teng maqomga ega emas. Kategoriyaning ayrim vakillari uning eng tipik namunalari sifatida qabul qilinadi, boshqalari esa periferik mavqega ega bo‘ladi. Natijada kategoriyaga mansublik faqat “mansub” yoki “mansub emas” shaklidagi qat’iy qarama-qarshilik orqali emas, balki tipiklik darajasi orqali ham tushuntiriladi. Bu holat leksik ma’noni tasniflashda an’anaviy yondashuvlardan sezilarli farqni yuzaga keltiradi.

Xulosa

Xulosa qilib aytganda, Dirk Gerartsning “Leksik semantika nazariyalari” asari leksik ma’noning tabiati, tuzilishi va tasnifi bilan bog‘liq nazariy masalalarni keng yoritadigan muhim tadqiqotlardan biridir. Asarni tahlil qilish shuni ko‘rsatadiki, leksik ma’noni yagona va qat’iy ta’rif bilan chegaralash qiyin. Ma’no til tizimidagi semantik munosabatlar, insonning kognitiv tajribasi, kategoriyalash jarayoni va real nutqdagi qo‘llanish bilan chambarchas bog‘liq bo‘lgan murakkab hodisa sifatida namoyon bo‘ladi.

Umuman, Dirk Gerartsning “Leksik semantika nazariyalari” asari leksik ma’noni tushunishda muhim nazariy manba bo‘lib, uning ahamiyati bugungi kunda ham saqlanib qolmoqda. Asar leksik ma’noni faqat lug‘aviy ta’riflar orqali emas, balki semantik munosabatlar, kognitiv tajriba, prototipiklik, polisemiya va kontekst bilan bog‘liq holda o‘rganish

zarurligini koʻrsatadi. Shu sababli Gerartsning qarashlari zamonaviy leksik semantika, kognitiv tilshunoslik, leksikografiya, tarjimashunoslik va korpus tadqiqotlari uchun samarali nazariy asos boʻlib xizmat qilishi mumkin.

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ERKIN A’ZAM ASARLARIDA GENDER STEREOTIPLARINING IFODALANISHI (“PIYODA” HIKOYASI MISOLIDA)

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Annotatsiya: *Mazkur maqolada Erkin A’zamning “Piyoda” hikoyasi misolida madaniy gender stereotiplarining badiiy ifodalanishi tahlil qilinadi. Asarda erkak obrazlar va ayol obrazlar orqali jamiyatda hukm surib kelayotgan an’anaviy qarashlar, kundalik va oilaviy munosabatlar hamda o‘zbekona tasavvurlar bilan bog‘liq gender tasavvurlar ochib berilgan. Ayniqsa, Berdiboy obrazi orqali erkaklarga xos deb qaraladigan ijtimoiy mas’uliyat va xarakter yorqin tasvirlanadi. Tadqiqot davomida gender mazmunini yuzaga chiqaruvchi nutqiy birliklar orqali jamiyatdagi genderga oid qarashlar madaniy jihatdan tahlil qilinadi. Bu orqali qahramonlarning o‘zaro munosabati va muallif tasvir usullariga ham e’tibor qaratildi. Badiiy tahlillar natijasida gender stereotiplari bevosita ijtimoiy-madaniy qarashlar bilan bog‘liq holda aks ettirilganligi aniqlandi.*

Kalit so‘zlar: *gender stereotiplari, madaniy stereotiplar, genderga oid nutqiy birliklar, badiiy matn, qahramon xarakteri, badiiy tahlil, ijtimoiy qarashlar, stereotip va g‘urur ziddiyati.*

ВЫРАЖЕНИЕ ГЕНДЕРНЫХ СТЕРЕОТИПОВ В ПРОИЗВЕДЕНИЯХ ЭРКИНА АЪЗАМА (НА ПРИМЕРЕ РАССКАЗА «ПИЁДА»)

Аннотация: *В данной статье анализируется художественное выражение культурных гендерных стереотипов на примере рассказа Эркина Аъзама «Пиёда». Через мужские и женские образы в произведении раскрываются традиционные представления, бытовые и семейные отношения, а также гендерные взгляды, связанные с узбекским национальным мировоззрением. В частности, через образ Бердибоя ярко изображаются социальная ответственность и черты характера, традиционно приписываемые мужчине. В ходе исследования гендерные представления в обществе анализируются с культурной точки зрения посредством речевых единиц, выражающих гендерное содержание. Также особое внимание уделяется взаимоотношениям персонажей и авторским способам изображения. В результате художественного анализа установлено, что гендерные стереотипы в произведении непосредственно связаны с социально-культурными взглядами общества.*

Ключевые слова: *гендерные стереотипы, культурные стереотипы, гендерно маркированные речевые единицы, художественный текст, характер героя, художественный анализ, социальные взгляды, конфликт стереотипа и гордости.*

THE EXPRESSION OF GENDER STEREOTYPES IN ERKIN A’ZAM’S WORKS (BASED ON THE SHORT STORY “PIYODA”)

Abstract: *This article analyzes the artistic representation of cultural gender stereotypes in Erkin A’zam’s short story “Piyoda.” Through male and female characters, the work reveals traditional views prevailing in society, everyday and family relationships, as well as gender perceptions associated with Uzbek national mentality. In particular, the character of Berdiboy vividly reflects social responsibility and personality traits traditionally attributed to men. During the research, social attitudes toward gender are culturally analyzed through speech units that convey gender-related meanings. Special attention is also paid to the relationships between the characters and the author’s methods of depiction. The literary analysis demonstrates that gender stereotypes in the story are directly connected with socio-cultural perceptions of society.*

Keywords: *gender stereotypes, cultural stereotypes, gender-related speech units, literary text, character portrayal, literary analysis, social views, conflict between stereotype and pride.*

Kirish

Gender stereotiplari —barcha jamiyatlarda mavjud erkaklar va ayollarga xos bo'lgan xususiyatlar, xarakter va xulq andozalari yig'indisidir. Bu qarashlarga ijtimoiy hayotning barcha bosqichlarida duch kelishimiz tabiiy. Gender stereotiplari ham xuddi gender tushunchasidek barcha xalq, millat uchun xos hisoblanadi. Faqat gender individual hodisa, gender stereotiplari esa ijtimoiy tushuncha sanaladi. Ammo har ikkala termin ham "gender lingvistikasi"ning eng muhim tushunchalaridir.

Badiiy matn — xalq ko'zgusi. Ma'lum bir xalqning madaniyati, urf-odati, turmush tarzi, qarashlari va tasavvurlarini bevosita badiiy asarlar orqali bilib olish mumkin. Xususan, o'zbek adabiyotining zabardast vakili Erkin A'zam asarlari o'zbek xalqi hayotini haqqoniy va bezaklarsiz aks ettirishi bilan ajralib turadi. Ayniqsa, adibning "Piyoda" asarida o'zbek madaniyatiga xos bo'lgan gender stereotiplari yaqqol aks ettirilgan. Asarda bosh qahramon Berdiboy madaniy gender stereotiplarining himoyachisi sifatida maydonga chiqadi. Bu obraz orqali "o'zbek erkagi" haqida tasavvur hosil qilish mumkin.

Erkin A'zamning "Piyoda" hikoyasida an'anaviy stereotiplar bilan yangilanayotgan zamon o'rtasidagi tafovutli qarashlar bahsi aks etganiga guvoh bo'lishimiz mumkin. Asarda Berdiboyning ijtimoiy qarashlari, nutqiy vaziyatlar orqali o'zbek milliy madaniyati va ijtimoiy hayotida ayollarni cheklovchi stereotiplar naqadar ko'p ekanligini ko'rishimiz mumkin.

Adabiyotlar tahlili

Yangi asrda gender masalasi o'rganish anchayin jadallashayotgan mavzulardan biriga aylandi. Xususan, tilshunoslikda ham ushbu mavzuning keng o'rganilishi natijasida alohida soha — gender lingvistikasi yuzaga keldi. Gender tilshunosligi — bu jamiyatdagi til xususiyatlarini ijtimoiy jinsga bog'liq holda o'rganuvchi tilshunoslikning bir sohasi. Shuningdek, badiiy asarlarda erkak va ayol obrazlarining yaratilishi, ularning ijtimoiy holati va jamiyatda tutgan o'rni bevosita stereotiplar bilan bog'liq ekanligi mavzuni yanada chuqurroq o'rganish zaruratini yuzaga keltirmoqda. Ijtimoiy stereotiplar haqidagi dastlabki qarashlar XX asr birinchi yarmida U.Lippman tomonidan ilgari surilgan bo'lib, u stereotiplar haqidagi ilmiy qarashlarni insonning tashqi olamni idrok etish jarayoni bilan bog'laydi. Uning fikricha, inson voqelikni kuzatib, keyin ta'riflamaydi, aksincha, madaniyat tomonidan avvaldan shakllantirilgan tasavvurlar asosida idrok etadi[1]. A.V.Kirilina gender stereotiplarini umumiy stereotip hodisasining xususiy ko'rinishi sifatida baholaydi. Olimaning fikricha, "gender stereotiplari —har ikki jins vakillarining sifatlari, atributlari va xulq-atvor me'yorlari haqidagi madaniy hamda ijtimoiy jihatdan shartlangan fikrlar va presuppozitsiyalar hamda ularning tilda aks etishidir"[2]. Demak, stereotip individual qarash emas, balki shaxsning voqelikni baholashiga yo'nalish beruvchi ijtimoiy-madaniy tafakkur andozasidir. Mazkur yondashuv gender stereotiplarini tushuntirishda ham muhim bo'lib, jamiyat erkak va ayolga xos deb qaraladigan xususiyatlarni oldindan belgilab qo'yishini ko'rsatadi.

Hozirgi kunda Erkin A'zam asarlari ham, gender stereotiplari ham keng tadqiq etilayotgan mavzulardandir. Gender va til munosabatlariga oid tadqiqotlarda erkak va ayol nutqidagi farqlar, ijtimoiy rollar va stereotipik qiyofaning tilga ta'siri masalalari yoritilgan. Erkin A'zam ijodi yuzasidan olib borilgan ilmiy izlanishlarda yozuvchining badiiy mahorati O.Shofiyev tomonidan, asarlarining lingvopoetik tahlili Sh.Toshxo'jayeva tomonidan[3] va adib kinoqissalari tilining sotsiopragmatik xususiyatlari M.Xolmurodova tomonidan[4] keng yoritilgan. Ammo "Piyoda" asarida gender stereotiplarining aks etishi alohida tadqiqot obyekti sifatida o'rganilgan emas. Asar bir qarashda eski zamonda qolib ketgan odamning butun bir jamiyatga qarshi namoyishidek tuyuladi. Ammo asarning asl mohiyatini tadqiqotchi Safarali Qurbonov quyidagicha ta'bir qiladi: "… aslida, Berdiboyning asar davomidagi harakatlarini kuzatsak, milliy qadriyatlarning, ajdodlar merosining oyoqosti bo'layotganini ko'rib, nima qilishni bilmayotgan millatning jonkuyarlaridan biri edi"[5]. Genderga oid izlanishlar ham o'zbek tilshunosligida muayyan darajada olib borilayotgan bo'lsa-da, a gender stereotiplarining lisoniy ifodasi hali keng va tizimli o'rganilgan emas. Xususan, 2023-yili A.Ruziyev o'zining "Xususiy diskurslarda gender stereotiplarini farqlovchi nutq birliklari" PhD dissertatsiyasida gender stereotiplarini ifodalovchi nutq birliklarini tadqiq etgan[6]. M.Nazarovaning 2025-yilda tayyorlangan "Gender stereotiplarining lisoniy toifalanishidagi qiyosiy tahlil" nomli PhD dissertatsiyasida esa gender stereotiplarining qoraqalpoq va ingliz tillaridagi lisoniy xususiyatlari qiyosiy aspektda yoritilgan[7]. Mazkur tadqiqotlar sohada muayyan ilmiy natijalarga erishilganini ko'rsatsa-da, gender stereotiplarini o'zbek badiiy matnlari asosida tahlil qilish zarurati saqlanib qolmoqda. Shu nuqtayi nazardan, "Piyoda" hikoyasida gender stereotiplarining badiiy-lisoniy ifodalanishini tadqiq etish maqola mavzusining dolzarbligini belgilaydi.

Tadqiqot metodologiyasi

Ushbu maqolada Erkin A'zamning "Piyoda" asarida aks etgan madaniy gender stereotiplarini aniqlash va tahlil qilishda bir nechta ilmiy metodlardan foydalanildi. Tadqiqot metodologiyasining asosini gender tilshunosligi, lingvokulturologik va lingvopragmatik yondashuvlar tashkil etadi.

Dastlab mavzuni yoritishda kontekstual tahlil metodi orqali asardagi voqealar yoritilgan jamiyat muhiti va qarashlari o'rganib chiqildi. Chunki tadqiqotda umumiy gender stereotiplari emas, aynan madaniy gender stereotiplariga urg'u berilgan. Shuningdek, maqolada gender yondashuv asosida tahlil amalga oshirilgan bo'lib, bu metod yordamida genderga oid an'anaviy stereotiplar, erkaklar va ayollarga xos stereotipik tasavvurlar va madaniy gender me'yorlari hamda

ularning badiiy ifodasi aks ettirilgan. Bundan tashqari, tadqiqotda qiyosiy-tahliliy metod ham qo‘llanilib, asardagi gender stereotiplari o‘zbek xalqining an’anaviy stereotiplari bilan qiyoslab o‘rganildi. Qolaversa, gender stereotiplarining ayollarga va erkaklarga xos jihatlari qiyoslanib tahlilga tortildi. Bu orqali badiiy matn va jamiyatdagi real muhit o‘rtasidagi bog‘liqlik ochib berildi.

Tadqiqot jarayonida hikoyadagi gender mazmunini ifodalovchi tasvirlar qahramonlarning nutqi, xatti-harakati, tashqi ko‘rinishi va oiladagi mavqeyi asosida saralandi. Aniqlangan stereotiplar ayol va erkak obrazlariga yo‘nalganligiga hamda asardagi mazmuniy vazifasiga ko‘ra guruhlashtirildi. Bunda genderga oid qarashlarning faqat bevosita ifodasiga emas, balki qahramonlarning bahosi, munosabati va nutqiy vaziyat orqali anglashiladigan mazmuniga ham e’tibor qaratildi. Natijada tashqi ko‘rinish, xulq-atvor, ta’lim va ijtimoiy faollik, oilaviy-maishiy vazifa, oiladagi mavqe, hissiy-axloqiy me’yor hamda gender me’yoridan chekinish kabi yo‘nalishlar ajratildi.

Natijalar va ularning tahlili

Hikoya qahramonning o‘z singlisi Gulsanamning Toshkentga o‘qishga ketishiga salbiy munosabati bilan boshlangan. Dastlab onasi, so‘ng dadasi va oxiri singlisi bilan bo‘lgan suhbatlarning hech biri uning fikrini zarracha o‘zgartira olmaydi. Uning onasiga aytgan:

“Toshkent deganlari anoyi shahar emas, apa…”[8, 295] gapida ayollarning ojiza ekanligi va ularning doimo himoya ostida bo‘lishi haqidagi stereotip vazminlik bilan ochib berilgan. Onaning:

“Zamonasi ekan, nachora! Mana, men o‘qimay nima bo‘ldim? Kunim —kir yuvish-u non yopish!”[8, 295] gapida an’anaviy gender stereotiplari aks etgan bo‘lib, unda ayollarning asosiy yumushi kundalik maishiy ishlardan iborat ekanligi ochiq aks ettirilgan. Shuningdek, bu gapda ayolning o‘z imkoniyatlarini ro‘yobga chiqara olmaganligi ichki armon sifatida sezilib turadi. Bu orqali yozuvchi gender stereotiplarining ko‘proq ayol hayotiga ta’sir etishini ko‘rsatib bergan.

Otasi bilan bo‘lgan suhbatda ham singlisining ayrim xatti-harakatlariga qarshiligi haqiqiy o‘zbek erkaklariga xos milliy-madaniy gender stereotiplarining yorqin ifodasi hisoblanadi. Xususan,

— Ota, bu Gulsanam… — deb g‘udrandi Berdiboy.

— O‘qishga ketyapti u. Toshkandga, — dedi Parda Qurbon kitobidan ko‘z uzmay. Shoshma, g‘urur bilan aytdimi shu gapni?

— Maylimi? O‘zi boshyalang yurardi…

— Boshyalang? Qachon? Yo‘g‘-e, Berdiboy, unday demang![8, 296]

Ushbu fikrda ayollarning tashqi ko‘rinishi, kiyinishi va yurish-turishi ustidan ham erkaklar nazorati kuchli ekanligi madaniy stereotip sifatida bo‘y ko‘rsatadi. Bunday holatlar asarning boshqa o‘rinlarida ham aniq tasvirlab berilgan:

Mehmonlarni olib ketgani kelsa, hovlida qandaydir qiz yuribdi… Boshyalang, sochi qirqilgan. Egnida yupqagina, piyozning po‘stidan ham yupqa-ye, yengsiz bir ko‘ylak, lozimdan-ku darak yo‘q. Kelinlari shu emish!

O‘zbek madaniy gender stereotiplariga ko‘ra, kelin milliy libosda, atlas ko‘ylak-lozimda, boshida do‘ppi yoki ro‘molda tasavvur etiladi. Shuning uchun Berdiboy bu holatdan anchagina hayratga tushadi va bu hayrati hamda jahlini yashirishni istamaydi. Onasini chetga tortib:

“Apa, ayting, —dedi, —boboydi oldida buytib yurmasin!”

Onasining unga javobi ham yuqoridagi fikrlar qahramonning shaxsiy qarashi emas, balki jamiyatdagi ustuvor qarashlardan biri ekanini tasdiqlaydi:

“Uylama, ulim, boboy qaramaydi.”

O‘zbek madaniy gender stereotiplarida erkaklarning bunday maqomi chetdan qaraganda “gender zo‘ravonligi” sifatida baholanishi mumkin. Ammo o‘zbek madaniyatida bu qarashlarning katta qismi erkakning g‘ururi, oriyati va o‘z chegaralarini himoya qilishi sifatida talqin etiladi.

“Anovi arzanda Muzaffarlari-chi, Muzaffarlari? E Berdiboye, qip-qizil chudaksizda! deydi kulib turib. Xotinini uyga olib kirib och biqiniga solishning, “aka, to‘g‘ri aytasan”, deyishning o‘rniga.”[8, 298]

Ushbu fikrlar orqali o‘zbek oilalarida erkaklar mavqeyi va vakolatlari qanchalik yuqori ekanligini ko‘rishimiz mumkin. Hatto ayrim hollarda erlarning ayoliga qo‘l ko‘tarishi ham zo‘ravonlik emas, oila rahbari sifatida “tartibga, yo‘lga solish” deb baholanadi. Ta’kidlash joizki, bugungi kunda bu holatlar ancha kamayib, bu stereotip anchayin kuchsizlashib bormoqda. Bunga sabab ayollar huquqlari qonun bilan muhofaza etilayotganligidir.

Ayollarning yurish-turishi, xatti-harakatlari, ayniqsa, erkaklarga xos harakat deb baholanadigan velosiped minishi borasidagi stereotiplar Berdiboyning ishqiy tuyg‘ulariga-da salbiy ta’sir etadi. Qizning o‘zboshimcha qiliqlaridan qaytarishga uringan Berdiboy uni o‘z yo‘liga sola olmagach, bu muhabbatdan voz kechadi-qo‘yadi:

“...Qarasa mulla Shodining sochi taqimini o‘padigan, qushdek hurkak, qo‘ydek yuvosh qizi Gulchehra ko‘chaga velosiped minib chiqdi, keyin-eh!

Berdiboyning hayoti o‘shanda buzildi — yettinchi sinfdan beri Gulchehraga oshiq edi! (Qishloqda oyog‘idan chayon chaqib, shahar maktabiga o‘qishga o‘tganidan beri!)[8, 299]

Asarda Erkin A’zam uslubiga xos bo‘lgan kinoyaviylik hikoyaning ta’sirchanlik kuchini oshirgan. Aslida Berdiboy tilidagi piching, kinoyaviylik uning botinida jo‘sh urgan isyon, noroziligining fitratida namoyon bo‘lishidir[9]. U aslida

Gulchehrani jon dilidan sevsa ham, uning muhabbatidan g‘ururi ustun keldi. Chunki o‘zbek madaniyatida “ayol — erkakning g‘ururi” degan stereotip ustuvor sanaladi. Ya’ni o‘zbek erkaklari muhabbatdan kechsalar ham, g‘ururidan aslo voz kechishmaydi. Kechgan erkakka nisbatan jamiyatda salbiy munosabat bildiriladi. Buni quyidagi jumlalar orqali ko‘rishimiz mumkin:

“...Ay, Gulchehra, Gulchehra! Ay, esini yegan qiz! Nega o‘sha sabilni minding? Nega boshingni ochib yurding — tundek qora zulflaringni Berdiboydan o‘zgalar ham ko‘rsin debmi?.. O‘shanda boshginangga ro‘molginangni o‘rab, halimdekkina bo‘lib yursang, o‘sha erkakka chiqargan matahga oyoq oshirib minmasang — zaifalik o‘rningni bilsang, qiz bolaga nomunosib o‘sha makruh gapni og‘zingga olmasang… qo‘ling uzayib, oyoqlaring qisqarib qolarmidi, zolim qiz?! Mana, endi Berdiboydan hol so‘ra!..[8, 300]

Ushbu hikoyada gender stereotiplari mazmunan anglashilibgina qolmaydi, balki gender mazmunini ifodalovchi nutqiy birliklar orqali aniq aks etadi. Buni yuqoridagi fikrlardan ham anglash mumkin. Jamiyatda ayollardan Berdiboy tilidan aytilganidek, *“boshginasiga ro‘molginasini o‘rab, faqat ayollarga xos halimdekkina bo‘lish, erkaklar so‘zidan chiqmaslik, o‘z xohish-istaklarini ko‘ngil qa’riga ko‘mib qo‘yish”* kabilar kutiladi. Velosiped degan matoh ham faqat erkaklar uchun mo‘ljallangan. Shuningdek, “zaifalik o‘rningni bilsang” jumlasi erkaklarning ayollarga nisbatan past nazarda qarashidangina emas, balki ayollarni asrab-avaylashni hayotdagi eng muhim burchi deb qabul qilganligidan dalolat beradi.

Keltirilgan parchadagi gender mazmuni, avvalo, leksik-semantik birliklar orqali shakllangan. *“Ro‘mol”*, *“zaifa”*, *“qiz bola”* so‘zlari ayolning tashqi ko‘rinishi va ijtimoiy maqomiga doir an’anaviy tasavvurlarni faollashtiradi. “Matah” birligining velosipedga nisbatan qo‘llanishi esa predmetning oddiy nomini emas, Berdiboyning unga salbiy munosabatini ham ifodalaydi. Chunki qahramon velosipedni ayol uchun begona va nomunosib buyum sifatida baholaydi. Demak, mazkur birliklar matnda faqat nominativ vazifa bajarmay, ayol va erkakka xos deb belgilangan faoliyat chegaralarini ko‘rsatuvchi baholovchi gender markerlariga aylanadi.

“Boshginang”, *“ro‘molginang”*, *“halimdekkina”* shakllaridagi kichraytirish-erkalash qo‘shimchalari ham alohida pragmatik yuk tashiydi. Ushbu shakllar tashqi jihatdan mehr va yaqinlikni ifodalagandek ko‘rinsa-da, nutqiy vaziyatda ular qahramon istagan *“ideal ayol”* qiyofasini yumshoq ohangda talab qilish vositasi bo‘lib xizmat qiladi. Ayniqsa, *“halimdekkina”* so‘zida belgi darajasining kuchaytirilishi ayoldan muloyimlik, itoatkorlik va ko‘zga tashlanmaslik kutilishini anglatadi. Shunday qilib, subyektiv baho shakllari Berdiboyning hissiy holatini ifodalash bilan birga, gender me’yorini til orqali mustahkamlaydi.

Parchaning sintaktik qurilishi ham qahramonning genderga oid pozitsiyasini ochadi. *“Nega o‘sha sabilni minding?”*, *“Nega boshingni ochib yurding?”*[8, 300] kabi ketma-ket so‘roq gaplar javob olish uchun emas, qizning xatti-harakatini qoralash va unga baho berish uchun qo‘llangan ritorik so‘roqlardir. *“O‘rab yursang”*, *“minmasang”*, *“o‘rningni bilsang”* shakllari shart mayli vositasida ifodalangan bo‘lsa-da, mazmunan buyruq va talabga yaqinlashadi. Bu gaplar ayolning boshini yopishi, belgilangan o‘rnini bilishi va erkaklarga xos deb qaralgan mashg‘ulotdan tiyilishi kerakligi haqidagi presuppozitsiyani yuzaga chiqaradi. Binobarin, stereotip faqat alohida so‘zlarda emas, gapning modal va sintaktik tuzilishida ham voqelanadi.

Mana, endi Berdiboydan hol so‘ra!.. jumlasida Berdiboyning g‘ururi va hissiy kechinmalari o‘rtasida qattiq kurash ketayotganini anglash mumkin. Qahramon qanchalik qiynalmasin, qizning bu qilmishlariga ko‘z yumishni erkaklik sha’nidan ayrilish, o‘z-o‘ziga qarshi chiqish sifatida qabul qiladi.

Berdiboyning singlisini Toshkentda o‘qishini xohlamasligi va hatto:

“Er bo‘lsa shu yerdan ham topilar edi…”[8, 296] fikri orqali ayollarning jamiyatdagi o‘rni, qizlarning ta’lim olishiga munosabat va ularning oiladagi mavqeyi bilan bog‘liq stereotipik qarashlar yaqqol ko‘zga tashlanadi. Qolaversa, yuqoridagi fikrda qiz bolaning asosiy vazifasi ta’lim olish, kasb egallash orqali jamiyatda o‘z o‘rniga ega bo‘lish emas, balki oilaviy hayot hamda uy yumushlariga tayyor va ega bo‘lishdangina iboratligi uqtirilgan. Uning nazarida ideal qiz— itoatkor, uyatchan va an’anaviy me’yorlarga bo‘ysunuvchi qizdir. Shuning uchun Berdiboy qizlarning velosiped minishi, erkin yurishi, ro‘mol o‘ramasligi yoki shaharda o‘qishini “buzilish” sifatida qabul qiladi. Shunda ham qahramon bor aybni butunlay ayollarga ag‘darib qo‘ymaydi. Bu hodisalarning asl aybdori Rajab bodi deb biladi:

Toshkentdan shunday bir antiqa tomosha topib keldiki, kuy-qo‘shiqdan tashqari shappotdek joyidan kino ham ko‘rsatar ekan. Qo‘ni-qo‘shni, mahalla-ko‘y oqshomlari bodining ayvonini to‘ldirib tekin kino ko‘rgani to‘planardi. Keyin bunaqa matah ko‘paydi, rasmga kirdi.[8, 298] Ushbu jumlada jamiyat hayotida yangiliklarning o‘rni va bu jarayonga jamiyat taqlidi yaqqol ko‘rsatib berilgan. *Keyin… qiz-juvonlar hayo atalmish dahmazaga qo‘l siltab, ko‘chada ishvakorona qadam tashlaydigan bo‘lishdi* (bu qismda ayollar uchun asosiy me’yor sifatida hayo, andisha va kamtarlik kabi xususiyatlar belgilangan, jamiyat qatori muallif ham ayol-qizlarning bu chegaradan chiqishini salbiy baholaydi. O‘zbek madaniy gender stereotiplarida ham erkaklarning xulq-atvoridagi salbiylik odatiy qabul qilinadi, ammo ayollarning biroz salbiy xatti-harakati ham “buzuqlik” sifatida baholanadi). *Yigit-yalangning sochi yelkasiga tushdi, surnaypocha shim-u, zaifona guldor ko‘ylak kiymagani qolmadi* gapida ham erkaklarning tashqi ko‘rinishiga oid me’yoriy chegaralar aniq ko‘rsatib berilgan. Soch o‘stirish, guldor ko‘ylak kiyish kabi gender transformatsiyalari erkaklar uchun o‘ta salbiy holat sifatida tasvirlangan.. *Ashur novvoyning kelini uch go‘dagini chirqiratib “Sevaman! Sevsam nima qilay?” deya shahrisabzlik dorboz bolaga ergashib ketdi.*[8, 299] Muallif tashqi ko‘rinishdagi

o‘zgarishlarni batafsil bayon etib, bu jarayonlar faqatgina tashqi ko‘rinish emas, balki jamiyatdagi kundalik turmush-tarzi, insonlar hayoti, xatti-harakatiga ta’sirini ochib bergan.

Mazkur tasvirda *“qiz-juvonlar”* va *“yigit-yalang”* umumlashtiruvchi juft birliklari qarama-qarshi gender guruhlarini nomlaydi. Ular bilan birikkan *“ishvakorona”*, *“hayo”*, *“zaifona”* kabi baholovchi so‘zlar esa xatti-harakat va tashqi ko‘rinishni jinsga xos me’yor asosida tavsiflaydi. *“Zaifona guldor ko‘ylak”* birikmasida kiyimning rangi va shakli ayollik belgisi sifatida talqin qilinib, uning erkak qiyofasida paydo bo‘lishi salbiy baholanadi. “Hayo atalmish dahmaza” ifodasida esa *“atalmish”* va *“dahmaza”* birliklari avvalgi qadriyatga kinoyaviy munosabatni kuchaytiradi. Natijada muallif bayonida an’anaviy gender chegaralarining buzilishi bir necha baholovchi leksema va qarama-qarshi nominatsiyalar yordamida ko‘rsatiladi.

Ammo asarni faqat ayollarni me’yorlashtiruvchi stereotiplardangina iborat deyishimiz to‘g‘ri emas. Bosh obraz ayollarning yurish-turishi-yu vazifalarini nazorat qilgani holda, erkaklarning ham jamiyatda, oilada mas’uliyat, vazifalari mavjud va muhim ekanligini ilgari suradi:

“Nimadan so‘z boshlashni bilmay Berdiboy beixtiyor tomorqaga nazar tashladi. Qarovsiz! Olmalarning tagi yumshatilmagan, shoxlari sinib, mevalari yerga to‘kilib yotibdi —molga yem. Devor tagida o‘sgan ikki tup anor beboshbog’ gangib yurgan ikki qo‘tir echkiga tayyor ermak. Hovliga tutash keng sayhon suvsizlikdan tors-tors yorilib, ajriqzorga aylangan”. Ushbu fikrlarda ro‘zg‘or yumushlari to‘liq ayollar bo‘ynida emasligi, kuch talab etadigan ayrim yumushlar (tomorqa va uy hayvonlariga qarash kabilar) erkaklar zimmasida ekanligiga ishora mavjud. Shuning uchun ushbu qarovsizliklarni Berdiboy onasiga emas, balki otasiga ko‘rsatib o‘tishni xohlaydi:

— *Anovi yerni chopib, biron nima ekish kerak edi,— dedi Berdiboy azbaroyi gapni yurishtirib olish maqsadida.*

— *Ihm, chopish kerak, ekish kerak,— deya ma’qullab qo‘ydi ota.*[8, 296]

Yoki:

“...Endi apam bu yerni “uyim, mening uyim” deb gapiradi. Parda Qurbon bo‘lsa miq etmaydi, “ha, uying, sening uying” degandek quloq qoqmay o‘tiraveradi. Chunki ro‘zg‘orning tizgini, jami bordi-keldisi apamning qo‘lida! Bu ishlarni ko‘ring, e, dod-ey!”[8, 298] Ushbu jumlalar orqali oilada erkak o‘z mas’uliyatini o‘zi bajarishi lozimligi, ayollarga yuklab qo‘yish uning oiladagi mavqeyiga jiddiy zarar yetkazishi, ya’ni hukmronlik ayollarning qo‘liga o‘tib ketishi mumkinligiga ishora mavjud. Shuning uchun asar bosh qahramoni ayollardan vazifalarini talab etgani holda o‘zi ham oiladagi mas’uliyatini teran anglaydigan shaxs sifatida gavdalantirilgan:

Ushbu parchada *“ro‘zg‘orning tizgini”* metaforik birikmasi oiladagi boshqaruv va hokimlik ma’nosini ifodalaydi. “Tizgin” leksemasining lug‘aviy ma’nosi boshqarish vositasi bilan bog‘liq bo‘lsa, matnda u qaror qabul qilish vakolatining ayol qo‘liga o‘tganini anglatadi. *“Uyim, mening uyim”* shaklidagi egalik qo‘shimchasi va kishilik olmoshining yonma-yon kelishi egalik ma’nosini kuchaytirib, Berdiboy nazaridagi an’anaviy oilaviy rollarning o‘zgarganini ko‘rsatadi. *“Miq etmaydi”*, *“quloq qoqmay o‘tiraveradi”* frazeologik birliklari esa Parda Qurbonning passivligini salbiy baholaydi. Shu tariqa erkakning oiladagi mavqeyi bevosita *“kuchsiz”* yoki *“mas’uliyatsiz”* so‘zlari bilan nomlanmaydi; u metafora, egalik shakllari va baholovchi fe’llar orqali implitsit tarzda anglashiladi.

“... ikkita munchoqdek-munchoqdek qizalog‘i bor; birovdan kamdir, birovdan ziyod ro‘zg‘or qilsa, hech kimdan non-osh so‘ramasa…”[8, 294] Ya’ni Berdiboy ro‘zg‘orni otasiga o‘xshab ayoli zimmasiga yuklab qo‘ymagan. Qo‘lidan kelgancha oilasini moddiy va maishiy jihatdan ta’minlashni o‘z vazifasi deb biladi. Asarda insonlarning gender jihatdan stereotipik me’yorlarga mos kelmasligi yoki chetga chiqishi ularni qarshi jins vakillari orasida mavqeyi tushib borishidan dalolat beradi.

Tahlil qilingan misollarni umumlashtirish asosida “Piyoda” hikoyasidagi gender stereotiplarini ularning yo‘nalishi, ayol va erkak obrazlariga xos ko‘rinishlari hamda badiiy vazifasiga ko‘ra tasniflash mumkin.

1-jadval

“Piyoda” hikoyasida aniqlangan gender stereotiplarining tasnifi

Gender stereotipining yo‘nalishi	Ayol obrazlariga oid ko‘rinishlar	Erkak obrazlariga oid ko‘rinishlar	Asardagi asosiy vazifasi
Tashqi ko‘rinishga munosabat	Bosh kiyimi, soch va kiyinishning milliy mezonlar asosida baholanishi	Erkak ayol tashqi ko‘rinishini nazorat qiluvchi; erkak qiyofasining an’anaviy mezonlar asosida baholanishi	Berdiboy qarashlari va yangilanayotgan turmush tarzi o‘rtasidagi tafovutni aks ettirish
Xulq-atvor me’yorlari	Itoatkorlik, kamtarlik, muloyimlik va o‘zini cheklash	Qat’iyatlilik, talabchanlik va nazoratchilik	Qahramonlar xatti-harakatlariga gender

Gender stereotipining yo‘nalishi	Ayol obrazlariga oid ko‘rinishlar	Erkak obrazlariga oid ko‘rinishlar	Asardagi asosiy vazifasi
			me’yorlari asosida baho berish
Ta’lim va ijtimoiy faollik	Qiz bolaning ta’lim olishi va mustaqil faoliyatiga cheklov	Oila a’zolarining qarorlari uchun javobgarlik	Qizlarning ta’lim olishiga doir eski va yangicha qarashlar to‘qnashuvi
Oiladagi mavqe	Ayolning oila boshlig‘iga so‘zsiz bo‘ysunishining tabiiy holat sifatida qabul qilinishi	Erkak oila boshlig‘i, himoyachi va oilaga mas’ul shaxs	Asardagi an’anaviy oilaviy munosabatlarni yoritish
Oilaviy-maishiy vazifalar	Uy-ro‘zg‘or ishlari va oilaga g‘amxo‘rlik ayolning asosiy vazifasi sifatida belgilanishi	Oilani moddiy ta’minlash, tomorqa va xo‘jalik ishlarini bajarish erkak zimmasidagi vazifa	Oila yumushlarining erkak va ayol o‘rtasida an’anaviy taqsimlanishi
Hissiy-axloqiy me’yor	Ayol hayo, or-nomus va odob doirasidagi xulqi bilan baholanishi	Erkakdan g‘urur, oriyat va hissiyotlarni oshkor qilmaslik kutilishi	Berdiboyning muhabbat va erkaklik g‘ururi o‘rtasidagi ichki kurashining namoyon bo‘lishi
Gender me’yoriga qarshilik va undan chekinish	Gulsanamning o‘qishga intilishi, Gulchehraning velosiped minishi va belgilangan talablarga bo‘ysunmasligi	Yigitlarning tashqi ko‘rinishidagi o‘zgarishlar hamda Parda Qurbonning oiladagi mavqeyining sustlashuvi	Gender me’yorlarining o‘zgarishi hamda Berdiboy bilan zamonaviy muhit o‘rtasidagi ziddiyatni ochish

Tasnif natijalari asarda ayol va erkak obrazlariga qo‘yilgan talablar o‘zaro bog‘liq tizimni tashkil etishini ko‘rsatadi. Ayolga nisbatan belgilangan itoatkorlik, hayo va oilaparvarlik me’yorlari erkakka yuklangan himoyachilik, nazorat va moddiy mas’uliyat bilan uyg‘unlashadi. Shu bilan birga, mazkur me’yorlardan chekinuvchi obrazlar an’anaviy qarashlarning o‘zgarayotganini ko‘rsatadi. Demak, hikoyadagi gender stereotiplari erkak va ayolning oiladagi hamda jamiyatdagi mavqeyini o‘zaro belgilovchi madaniy model sifatida namoyon bo‘ladi.

Muhokama

Tadqiqot natijalari “Piyoda” hikoyasidagi gender stereotiplari faqat ayollar xatti-harakatini cheklovchi qarashlardan iborat emasligini ko‘rsatadi. Asarda ayoldan itoatkorlik, hayo va oilaga sadoqat kutilsa, erkakka ham oilani moddiy ta’minlash, yaqinlarini himoya qilish va ro‘zg‘or mas’uliyatini o‘z zimmasiga olish talabi qo‘yiladi. Shu sababli Berdiboyning qarashlarini faqat ayollarga nisbatan nazorat sifatida baholash asar mazmunini to‘liq ochib bermaydi. U ayollarning yurish-turishini an’anaviy mezonlar asosida baholashi bilan birga, erkakning oiladagi vazifalariga ham qat’iy munosabat bildiradi.

Lingvistik tahlil natijalari mazkur stereotiplarning uch asosiy sathda ifodalanganini ko‘rsatadi: leksik sathda genderga ishora qiluvchi nominatsiyalar va baholovchi birliklar, morfologik sathda kichraytirish-erkalash hamda egalik shakllari, sintaktik-pragmatik sathda esa ritorik so‘roq, shart mayli ko‘rinishidagi talab va presuppozitiv mazmun yetakchilik qiladi. Bu vositalar alohida holda emas, nutqiy vaziyat tarkibida o‘zaro birikib, qahramonning ayollik va erkaklik haqidagi me’yoriy tasavvurlarini yuzaga chiqaradi. Shuning uchun hikoyadagi gender stereotiplarini aniqlashda voqea va obraz tavsifi bilan cheklanmay, aynan til birliklarining tanlanishi hamda kontekstdagi baholash vazifasiga tayanish muhimdir.

Parda Qurbon va Berdiboy obrazlarining qiyosi bu jihatdan alohida ahamiyatga ega. Parda Qurbonning ro‘zg‘or ishlariga loqaydligi va oiladagi boshqaruvning ayol qo‘liga o‘tishi Berdiboy tomonidan erkaklik mavqeyining susayishi sifatida qabul qilinadi. Berdiboy esa o‘z oilasini ta’minlashni, farzandlari va ro‘zg‘ori uchun javobgar bo‘lishni erkaklikning muhim belgisi deb tushunadi. Demak, qahramonning genderga oid qarashlarida nazorat va cheklov bilan bir qatorda burch hamda mas’uliyat tushunchalari ham mavjud.

Gulsanam va Gulchehra obrazlari esa an’anaviy gender me’yorlarining o‘zgarmas emasligini ko‘rsatadi. Gulsanamning Toshkentda o‘qishni tanlashi, Gulchehraning velosiped minishi, boshyalang yurishi va o‘z istagiga ko‘ra harakat qilishi ayolning ijtimoiy faolligi hamda mustaqil qaror qabul qilishiga doir yangicha qarashlarni ifodalaydi.

Berdiboyning bu holatlarga qarshiligi uning shaxsiy fe'l-atvoridangina kelib chiqmaydi, aksincha bu munosabat qahramon voyaga yetgan ijtimoiy-madaniy muhit ta'siri bilan bog'liq.

Shuningdek, asardagi gender stereotiplari muallifning bevosita hukmi tarzida emas, asosan qahramonlarning nutqi, o'zaro munosabati va voqealarga bergan bahosi orqali namoyon bo'ladi. Erkin A'zam kinoyaviy tasvir vositasida Berdiboyning qarashlarini bir tomondan milliy qadriyatlarga sadoqat, ikkinchi tomondan esa o'zgarib borayotgan hayot tarziga moslasha olmaslik (qabul qilmaslik) sifatida gavdalantiradi. Shu bois hikoyadagi gender stereotiplari an'anaviylik va zamonaviylik o'rtasidagi ziddiyatni yuzaga chiqaruvchi muhim badiiy vosita vazifasini bajaradi.

Hikoyadagi genderga oid qarashlar qahramonlarning yosh xususiyatlari bilan ham bog'langan. Berdiboy an'anaviy turmush mezonlariga intilsa, Gulsanam va Gulchehra kundalik hayotga kirib kelayotgan yangiliklarni tabiiy qabul qiladi. Shu tariqa ularning qarama qarshiligi faqat erkak va ayol munosabati doirasida qolmay, turli avlodlarning hayot tarzi va qadriyatlarga munosabatidagi tafovutni ham ifodalaydi. Bu esa gender stereotiplarining davr ta'sirida yangilanib boradigan madaniy hodisa ekanini ko'rsatadi. Muallif mazkur o'zgarishlarga bir tomonlama hukm chiqarmaydi, balki ularni qahramonlar o'rtasidagi bahs va ziddiyatlar vositasida o'quvchi mulohazasiga havola qiladi.

Xulosa

Erkin A'zamning "Piyoda" hikoyasi tahlili shuni ko'rsatadiki, asarda gender stereotiplari o'zbek xalqining milliy-madaniy qarashlari, urf-odatlari va ijtimoiy me'yorlari bilan uzviy bog'liq holda badiiy aks ettirilgan. Hikoyadagi Berdiboy obrazi orqali erkaklik, g'urur, oilaviy mas'uliyat va ayollar xatti-harakatlarini nazorat qilish kabi an'anaviy gender tasavvurlari namoyon bo'lsa, ayol obrazlari orqali itoatkorlik, hayo, kamtarlik va oilaparvarlik kabi stereotipik me'yorlar yoritilgan.

Erkin A'zamning "Piyoda" asari badiiy tahlili shuni ko'rsatadiki, asarda madaniy gender stereotiplari nafaqat qahramonlar xarakteri, balki jamiyatning umumiy qarashlari orqali ham ochib berilgan. Yozuvchi erkak va ayollarga munosabatni kundalik maishiy tasvir bilan cheklamay, ularning ijtimoiy rollari, jamiyatdagi o'rni va mas'uliyati, tashqi ko'rinishi-yu xulq-atvoriga bog'liq holda yoritib beradi. Badiiy matn tahlili davomida gender stereotiplari individual emas, balki ijtimoiy hodisa ekanligi ochib berildi. Chunki asardagi stereotipik qarashlar qahramonlarning shaxsiy fikri emas, balki xalq tomonidan shakllantirilgan mezonlar va me'yorlar, qadriyatlar bilan chambarchas bog'liqdir. Demak, "Piyoda" hikoyasi madaniy gender stereotiplarini badiiy matn doirasida tahlil etish uchun muhim manbalardan biri bo'la oladi. Asarda genderga oid stereotiplarning lingvomadaniy va ijtimoiy jihatlari uyg'unlashtirilgani hikoyaning badiiy-estetik qiymatini yanada oshiradi.

Asarda gender stereotiplari nafaqat qahramonlar nutqi va xatti-harakatlarida, balki ularning dunyoqarashi, ijtimoiy munosabatlari hamda gender mazmunini yuzaga chiqaruvchi nutqiy birliklarda ham o'z ifodasini topgan. Shu bilan birga, yozuvchi an'anaviy qarashlar va zamonaviy hayot tarzi o'rtasidagi ziddiyatni Berdiboy obrazi misolida badiiy talqin etadi. Natijada gender stereotiplari individual qarash sifatida emas, balki jamiyat tomonidan shakllantirilgan madaniy hodisa sifatida namoyon bo'ladi.

Demak, "Piyoda" hikoyasi o'zbek jamiyatida genderga oid tasavvurlar, qadriyatlar va stereotiplarning badiiy ifodasini o'rganishda muhim manba bo'lib xizmat qiladi. Asarda gender stereotiplarining lingvomadaniy va ijtimoiy jihatlarda yoritilishi yozuvchining badiiy mahoratini namoyon etish bilan birga, gender masalalarini milliy mentalitet kontekstida tadqiq etish uchun ham muhim ilmiy asos yaratadi.

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QO‘CHQOR NORQOBIL QISSALARIDA URUSH KISHILARI OBRAZLARINING BADIIY KONSEPSIYASI

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Annotatsiya: *Mazkur maqolada badiiy obraz hamda obrazlilik haqida so‘z yuritilib, obraz tushunchasi va mohiyati ochib beriladi. Qo‘chqor Norqobilning nasriy asarlari, xususan, qissalaridagi obrazlar, urush ichidagi hamda urush tashqarisidagi insonlar, ularning ruhiyati hamda turmush tarziga urushning ta’siri ochib beriladi.*

Kalit so‘zlar: *badiiy obraz, obrazlilik, badiiy konsepsiya, Qo‘chqor Norqobil, qissa, urush mavzusi, urush, urush kishilari obrazlari, inson va urush, psixologizm, ruhiy olam, urush voqeligi.*

ХУДОЖЕСТВЕННАЯ КОНЦЕПЦИЯ ОБРАЗОВ ЛЮДЕЙ ВОЙНЫ В ПОВЕСТЯХ КУЧКОРА НОРКОБИЛА

Аннотация: *В данной статье рассматриваются художественный образ и образность, раскрываются понятие и сущность образа. Особое внимание уделяется образам в прозаических произведениях Кучкора Норкобила, в частности, в его повестях. Анализируются люди, находящиеся непосредственно в условиях войны, а также те, кто находится за пределами военных действий, их психологическое состояние и особенности быта. Раскрывается влияние войны на духовно-психологическое состояние человека, его мировосприятие и образ жизни.*

Ключевые слова: *художественный образ, образность, художественная концепция, Кучкор Норкобил, повесть, военная тема, война, образы людей войны, человек и война, психологизм, духовный мир, военная действительность.*

THE ARTISTIC CONCEPTION OF WAR-TIME CHARACTERS IN KUCHKOR NORKOBIL’S NOVELLAS

Abstract: *This article examines the literary image and imagery, revealing the concept and essence of the literary image. Particular attention is paid to the characters in Kuchkor Norkobil’s prose works, especially in his novellas. The article explores people directly involved in war as well as those living outside the battlefield, focusing on their psychological state and way of life. It also reveals the impact of war on the spiritual and psychological condition of individuals, their perception of the world, and their lifestyle.*

Keywords: *literary image, imagery, artistic conception, Kuchkor Norkobil, novella, war theme, war, images of wartime people, human and war, psychologism, spiritual world, wartime reality.*

Kirish

Badiiy adabiyotda inson obrazini yaratish, uning ichki olami, ruhiy kechinmalari va hayotiy taqdirini badiiy aks ettirish muhim estetik masalalardan biridir. Ayniqsa, urush mavzusidagi asarlarda inson va urush munosabati, urushning shaxs ruhiyati, dunyoqarashi va ma’naviy olamiga ta’siri alohida ahamiyat kasb etadi. O‘zbek adabiyotida urush mavzusi turli ijodkorlar tomonidan turlicha talqin qilingan bo‘lib, keyingi davr nasrida urushning tashqi manzaralaridan ko‘ra, uning inson taqdiri va ruhiyatida qoldirgan izlarini tasvirlashga e’tibor kuchaydi. Shu jihatdan Qo‘chqor Norqobil ijodida urush mavzusining badiiy talqini, xususan, urush kishilari obrazlarining yaratilishi o‘ziga xos xususiyatlarga ega.

Adabiyotlar tahlili

Obraz haqida yoki umuman olganda badiiy obraz haqidagi qarashlar antic dunyo davridan boshlangan. Aristoteldan tortib to hozirgi kungacha bo‘lgan adabiyotshunoslar badiiy obrazga ta’rif berib, o‘z fikrlarini bildirib o‘tganlar. Badiiylikning asosiy mezonlaridan biri bo‘lgan badiiy obrazga birinchi bo‘lib nemis faylasufi Gegel o‘zining estetikaga oid qarashlarida to‘xtalib, “san’at-obrazlar orqali fikrlash demakdir” [1, 343] deb aytib o‘tadi. “Obraz – to‘qima yordami bilan yaratilgan va estetik qiymat kasb etgan inson hayotining umumlashma va, ayni chog‘da, konkret manzarasidir”[2, 62] deya ta’rif beradi rus adabiyotshunosi L.I.Timofeev, Yana bir rus tanqidchisi V.G.Belinskiy “San’at tafakkuri obrazlar orqali fikrlaydi” deydi [3, 150]. Psixolog va estetik Lev Vygotskiy obrazning o‘quvchi hissiyotiga ta’siri masalasiga alohida e’tibor qaratib, san’atning asosiy ta’sir kuchi obrazda ligini ta’kidlaydi: “San’atning estetik ta’siri badiiy

obraz orqali amalga oshadi"[4, 60]. Oʻzbek adabiyotshunoslari esa obraz va obrazlilikni badiiylikning eng asosiy mezonlaridan biri sifatida e'tirof etishadi. Xussan, olim Izzat Sulton "Adabiyot nazariyasi" darsligida badiiy obrazga shunday ta'rif beradi: "Obraz – insonning ozmi-koʻpmi batafsil tasviri boʻlib, u hayotdagi odamning joʻn nusxasi emas, balki yozuvchining ma'lum davr va sharoitda yashovchi inson haqidagi tasavvurining ifodasidir" [5, 52]. Adabiyothunos olim Toʻxta Boboyev esa Aristotel, Gegel, Timofeev fikirlariga toʻxtalib, badiiy obraz xususiyatlarini sanab oʻtadi [6, 42]. "Adabiyotshunoslik lugʻati" da ham badiiy obrazga quyidagicha ta'rif berib oʻtiladi: "Badiiy obraz deganda borliq (undagi inson, narsa, hodisa va h.)ning san'atkor koʻzi bilan koʻrilgan va ideal asosida ijodiy qayta ishlangan aksi anglanadi" [7, 43]

Tadqiqot metodologiyasi

Tadqiqotda Qoʻchqor Norqobil qissalaridagi urush kishilari obrazlarining badiiy xususiyatlarini ochib berishda tizimli-strukturaviy, tipologik, qiyosiy, psixologik va konfliktologik tahlil metodlaridan foydalanildi. Tizimli-strukturaviy metod asosida obrazlarning asar kompozitsiyasi va obrazlar tizimidagi oʻrni, tipologik metod orqali qahramonlarning umumiy va individual xususiyatlari, qiyosiy metod vositasida turli qissalardagi obrazlarning oʻxshash va farqli jihatlari aniqlandi. Psixologik tahlil yordamida urush sharoitidagi insonlarning ruhiy kechinmalari, qoʻrquv, sogʻinch, iztirob va umid kabi holatlari, konfliktologik yondashuv asosida esa inson va urush, hayot va oʻlim, xotira va voqelik oʻrtasidagi ziddiyatlar tadqiq etildi.

Natijalar va ularning tahlili

Biz ham yuqoridagi fikrlarga yondashgan holda obraz, timsol tushunchalari badiiy asardaga ijodkor tomonidan olib kirilgan real voqelikdagi insonning badiiy asaardagi qayta ijodiy ishlangan varianti degan xulosaga kelamiz. Badiiy obraz bu badiiy asarning asosiy mezoni hisoblanib, asarni haqiqiy badiiy asar sifatida shakllantiruvchi asosiy omil hisoblanadi. Biz tahlilga tortgan yozuvchi, jurnalist Qoʻchqor Norqobilning qissalarini ham badiiyati oshishiga xizmat qilgan unsur bu – obrazlardir.

Ijodkor nasriy asarlariga nazar tashlar ekanmiz, uning ijodining asosiy qismi qissa va hikoyalardan iborat ekanligini koʻramiz. Bu nasriy asarlar turli mavzularda yozilgan boʻlib, ularning ichida eng salmoqlisi URUSH mavzusidir. Muallif qissalarining deyarli barchasi Urush mavzusida (Afgʻon urushi) yozilgan. Buning sababi esa, Qoʻchqor Norqobilning urushda bevosita qatnashgani hamda deyarli ikki yil davomida askarlar hayoti, daxshatli janglar, turli xil insonlarning iztirobiga guvoh boʻlganidadir. Ushbu mavzuda yozilgan qissalarning qahramonlaari ham, albatta, urush kishilaridir.

Qoʻchqor Norqobilning "Daryo ortidagi yigi", "Tongga qadar yashamoq kerak", "Quyoshni kim uygʻotadi", "Azizam, tabassum qil"[8, 15] kabi qissalarida Afgʻon urushi fojealari tasvirlangan boʻlib, muallif bu asarlarda bosh obraz sifatida urushni ichidan va tashqi tomonda, real hamda xotira yoki eslash shaklida bayon etadi. Ushbu qissalardagi obrazlarni esa quyidagicha guruhlash mumkin:

– harbiy obrazlar;
– ayollar obrazlari;
– tinch aholi;
– ota-ona obrazlari.

Qoʻchqor Norqobil qissalarida urush kishilari obrazlari tizimining markazida askar obrazi turadi. Biroq adib yaratgan askar an'anaviy harbiy nasrdagi faqat jasorat va qahramonlikni ifodalovchi jangchi qiyofasi bilan cheklanmaydi. U qoʻrqadigan, sogʻinadigan, iztirob chekadigan, safdoshini yoʻqotishdan ruhiy larzaga keladigan va oʻlim xavfi qarshisida hayotning qadrini anglaydigan oddiy inson sifatida tasvirlanadi. Shu jihatdan yozuvchi askar obrazini insoniylik va urush oʻrtasidagi ziddiyatni ifodalovchi markaziy timsol darajasiga koʻtaradi.

"Daryo ortidagi yigʻi" qissasida askar urushning bevosita ichida tasvirlanadi. Uning ruhiy holati doimiy xavf, oʻlim tahdidi, Vatan va yaqinlarini sogʻinish bilan belgilanadi. Qissada jang manzaralaridan koʻra askarning ichki kechinmalariga urgʻu berilishi urushning tashqi va ichki mohiyati oʻrtasidagi farqni yuzaga chiqaradi. Askar uchun Vatan, ota-ona, uy va yaqinlar haqidagi xotiralar oddiy esdalik emas, balki ogʻir vaziyatda uni yashashga undovchi ruhiy kuchga aylanadi:

Mazkur qissada qoʻrquv va jasorat tushunchalari ham oʻziga xos talqin qilinadi. Muallif qoʻrquvni ojizlik belgisi sifatida emas, tabiiy insoniy holat sifatida koʻrsatadi. Asl jasorat esa qoʻrquvning yoʻqligida emas, balki uni yenga olishda namoyon boʻladi. Shu tariqa askar obrazi orqali vatanparvarlik, mas'uliyat, yashash istagi va insoniylik kabi tushunchalar bir nuqtada birlashadi.

"Tongga qadar yashamoq kerak" qissasida esa askar obrazi yanada chuqur psixologik qatlamga ega boʻladi. Bu asarda jangchi avvalo inson sifatida namoyon boʻladi. Uning ruhiyatida qoʻrquv, muhabbat, sogʻinch va hayotga intilish bir-biri bilan kurashadi. Asar nomidagi "tong" tushunchasi ham ramziy mazmun kasb etib, jismoniy omon qolishdan tashqari, insoniylik, umid va ma'naviy bardoshlilikni saqlab qolish ma'nolarini anglatadi: "*Men agar inson qoʻliga qurol ushlasa, xuddi hayvonlar kabi biri birini gʻajishday munofiqlikdan ham hazar qilmasligini tushunib yetdim. Hayvonning insonga aylanuvi haqida bir narsa deyolmayman-u, insonlarning hayvoniy yovuzlikdan ham battarroq xislatni qanday qilib yashirib*

yurishlariga aqlim bovar qilmay qoldi. Inson qurol ushlasa, yovuzlik tan beradi. Ammo har qanday yuragi toza, ma'nan sog'lom kishilarning hayotini ham urush yakson qilib tashlaydi"[9, 137]

Qissada Liliya obrazi ham askar obrazining mohiyatini chuqurlashtiruvchi badiiy vosita sifatida namoyon bo'ladi. U hamshira bo'lishi bilan birga, urush dahshatlari orasidagi mehr, hayot va umid timsolidir. Uning insoniy munosabati askarlarning ruhiy bardoshini saqlashga xizmat qiladi. Shu tariqa ayol va askar obrazlari o'zaro aloqada tasvirlanib, urush va muhabbat, o'lim va hayot, qo'rquv va umid qarama-qarshiliklari asosida badiiy konsepsiya yuzaga keladi.

"Azizam, tabassum qil!" qissasida askar obrazi yangi bosqichga ko'tariladi. Bu yerda u jang maydonidagi ishtirokchi sifatida emas, balki urushdan qaytgan, ammo urush uning qalbini tark etmagan inson sifatida gavdalanadi. Shoir obrazi ana shu jihati bilan alohida e'tiborga loyiq.

Shoir jismonan urushdan qaytgan bo'lsa-da, ruhiy jihatdan jang maydonidan chiqib keta olmaydi. Uning xotirasida janglar, safdoshlar, o'lim va portlashlar qayta-qayta jonlanadi. Kasalxona muhiti ham ramziy ma'no kasb etib, urushning tugaganidan keyingi ruhiy jarohatlarni namoyon qiluvchi makonga aylanadi. Demak, qissada urushning davomiyligi jang maydonidan inson xotirasi va ongiga ko'chadi: "Ko'zini ochdi. Shift. Boshini qimirlatishga majoli yo'q. Yuqoriga bazo'r qarab ko'rdi. Qovog'idan allaqanday kuch bosayotganday bo'ldi. Boshi orqaga tortib ketayapti. Ixrab yubordi. Peshonasini kimdir paypasladi. Kipriklarini ocholmadi. Tag'in hushini yo'qotdi. Boshining ichiga kirib olib nimadir tarillar, borgan sayin miyasi tashqariga otilib chiqquday bo'lar, ko'z oldida oq harir bulutlar suzar, gohida bu oqlik zimistonlik ichra g'arq bo'lar, shunda orqa miyasini allaqanday temir qo'l jon-jahdi bilan sug'urib olishga urinardi. Joni bo'g'ziga tiqilib, og'riq zo'ridan talvasaga tushardi" [10, 168]

Shoir obrazining muhim jihatlaridan biri uning ijodkor va guvoh sifatidagi qiyofasidir. U boshdan kechirgan urush voqealarini yozishga, ularni kelajak avlodga yetkazishga ehtiyoj sezadi. Shu sababli qahramonning ichki konflikti nafaqat kasallik va xotira bilan, balki vijdon va ijodiy mas'uliyat bilan ham bog'lanadi. Askar bu yerda tarixiy haqiqatni saqlovchi ma'naviy guvohga aylanadi.

Asar nomidagi "tabassum" ham muhim ramziy detal sifatida namoyon bo'ladi. Tabassum ruhiy tushkunlik va urush xotirasiga qarshi qo'yilgan hayotiy kuchni anglatadi. Shunday qilib, qahramonning jasorati bu qissada jang maydonidagi harakatda emas, balki urushdan keyingi hayotga qaytish, sevish, ijod qilish va insoniyligini saqlab qolish uchun kurashida namoyon bo'ladi:

" "Quyoshni kim uyg'otadi?" qissasida askar obrazining badiiy evolyutsiyasi yanada yuqori bosqichga ko'tariladi. Agar "Daryo ortidagi yig'i"da askar jangchi sifatida, "Tongga qadar yashamoq kerak"da ruhiy sinovdagi inson sifatida, "Azizam, tabassum qil!"da urushdan keyingi ruhiy jarohat tashuvchisi sifatida namoyon bo'lsa, mazkur qissada u tarixiy xotira egasi, guvoh va mushohadakor inson sifatida gavdalanadi.

Qissada retrospektiv tasvir usuli muhim ahamiyatga ega. Urush vaqt jihatidan tugagan bo'lsa-da, u qahramon ongida yashashda davom etadi. Safdoshlar, jang maydoni, yo'qotishlar va o'lim bilan bog'liq xotiralar qahramonning bugungi hayoti bilan qorishib ketadi. Shu tariqa urush tarixiy voqea bo'lib qolmay, inson ongida davom etuvchi ruhiy hodisaga aylanadi.

Qahramonning mushohadakorligi uning urushni qayta baholashiga olib keladi. U urushning mohiyatini g'alaba yoki mag'lubiyat mezonlari bilan emas, inson umri, tinchlik, do'stlik va hayotning qadri bilan o'lchay boshlaydi. Qissa nomidagi "quyosh" esa hayot, umid va ma'naviy uyg'onish ramzi sifatida talqin qilinishi mumkin: *"Polaponlarday bo'lib ikki yuz chog'li askar yuk samolyoti ichida bir-birimizning pinjimizga tiqilib, qunishib turibmiz. Shu ikki yuz chog'li askar dini, millatidan qat'i nazar bitta so'z, bitta nom bilan bir-biriga bog'langan – askar! Bir-biriga birodar, bir-birini tushunadigan, qay birining ayni dam hayoti havoda uchayotgan mana shu samolyotning beshikast yerga qo'nishi bilan bog'liq – askar!"*[10, 274]

Demak, to'rt qissani qiyoslaganda askar obrazida muayyan evolyutsion jarayon kuzatiladi:

Qissa	**Askar obrazining asosiy qiyofasi**	**Badiiy mazmun**
"Daryo ortidagi yig'i"	Jangchi	Qo'rquv va matonat
"Tongga qadar yashamoq kerak"	Ruhiy sinovdagi inson	Yashash va insoniylik
"Azizam, tabassum qil!"	Urushdan qaytgan askar	Xotira va ruhiy jarohat
"Quyoshni kim uyg'otadi?"	Guvoh va mushohadakor inson	Tarixiy xotira va hayot falsafasi

Bu evolyutsiya Qo'chqor Norqobilning urushni tasvirlashdagi asosiy badiiy tamoyilini ko'rsatadi: urush markazdan chekinib, inson markazga chiqadi.

Qo‘chqor Norqobil qissalaridagi obrazlar tizimida ayol obrazlari ham muhim o‘rin tutadi. Ular urushning bevosita jangovar ishtirokchilari bo‘lmasalar-da, uning ma’naviy va ruhiy oqibatlarini o‘zida aks ettiradi.

“Daryo ortidagi yig‘i”da ona, yor va opa-singil obrazlari askarning xotiralarida yashaydi. Ular jang maydonidagi inson uchun tinch hayot, uy va sog‘inch timsolidir. Afg‘on ayollari esa urushning millat tanlamasligini ifodalovchi umumlashma obraz sifatida namoyon bo‘ladi.

“Tongga qadar yashamoq kerak”da Liliya obrazi alohida badiiy funksiyaga ega. U hayot va umid ramzi sifatida askarlarning ruhiy barqarorligini ta’minlaydi. Demak, Liliya obrazining mohiyati uning kasbiy faoliyatidan ko‘ra, urush sharoitida insoniy mehrni saqlab qoluvchi kuch sifatida namoyon bo‘lishidadir.

“Azizam, tabassum qil!” qissasida Barno obrazi urushdan qaytgan insonning ruhiy tiklanishida muhim ma’naviy tayanch sifatida tasvirlanadi. U urushda qatnashmagan bo‘lsa-da, uning oqibatlarini Shoir bilan birga boshdan kechiradi.

Shu jihatdan ayol obrazlarining qissalar bo‘yicha badiiy evolyutsiyasi quyidagicha umumlashadi:

“Daryo ortidagi yig‘i” — tinch hayot va sog‘inch;

“Tongga qadar yashamoq kerak” — mehr va umid;

“Azizam, tabassum qil!” — sadoqat va ruhiy tiklanish;

“Quyoshni kim uyg‘otadi?” — tarixiy xotira va ma’naviy davomiylik.

Ofitser va harbiy tizim vakillari obrazlari

Qo‘chqor Norqobil qissalaridagi ofitser va harbiy tizim vakillari obrazlari ham obrazlar tizimining muhim tarkibiy qismidir. Ular faqat harbiy tartibni ta’minlovchi yoki buyruq beruvchi shaxslar emas, balki buyruq va vijdon, harbiy burch va insoniylik o‘rtasidagi murakkab munosabatlarni ochib beruvchi obrazlar sifatida talqin qilinadi.

“Daryo ortidagi yig‘i”da ofitserning qarorlari askarlar taqdiriga bevosita ta’sir qiladi. Shu bois har bir buyruq ortida inson hayoti va taqdiri turishi muallif tomonidan badiiy jihatdan his qildiriladi. “Tongga qadar yashamoq kerak”da esa rahbarning qarorlari askarlarning nafaqat jismoniy, balki ruhiy holatiga ham ta’sir ko‘rsatadi. “Azizam, tabassum qil!”da harbiy tizim urushdan qaytgan askarning keyingi hayoti va ruhiy holati orqali bilvosita namoyon bo‘lsa, “Quyoshni kim uyg‘otadi?”da harbiy rahbarlar tarixiy xotira nuqtayi nazaridan qayta baholanadi.

Shunday qilib, ofitser obrazlari orqali yozuvchi urushning faqat tashkiliy yoki harbiy tomonini emas, uning axloqiy mas’uliyat masalasini ham o‘rtaga qo‘yadi.

Urush kishilari obrazlari tizimida tinch aholi alohida o‘rin tutadi. Qo‘chqor Norqobil urushni faqat askarlar hayoti orqali emas, balki bolalar, ayollar, qariyalar va afg‘on xalqi taqdiri orqali ham ochib beradi. Bu obrazlar urushning eng katta qurbonlari qurolsiz va begunoh insonlar ekanini ko‘rsatishga xizmat qiladi.

Bolalar obrazi urushning kelajak avlodga yetkazgan zarari ramzidir. Ularning qo‘rquv va xavotir ichida ulg‘ayishi urushning faqat bugungi kunni emas, kelajakni ham izdan chiqarishini ko‘rsatadi. Qariyalar esa yo‘qotilgan tinchlik, tarixiy xotira va xalq boshidan kechirgan fojeaning tashuvchilaridir: *“Rinat ikkisiga Xudodan o‘lim so‘rar, hozirgina qo‘rqib qochgan bolasini ular otib o‘ldirdilar, degan o‘y bilan zor qaqshar edi. Lekin bolakay qochgan tomondan boshqa mashinalar ham kelayotgani aniq, sho‘ro askarlari mislsiz g‘azabga mingan edi. Zum o‘tmay orqadan kelib to‘xtagan BMP-2 ustidagi askarlar ayolga o‘q uzdi. Ayol bir siltandi, qo‘li havolanib, ichkariga so‘nggi bora talpindi. Bashnya mili kulbani nishonga oldi”*. [10, 166]

Afg‘on xalqi obrazining talqinida esa muallifning insonparvarlik konsepsiyasi ayniqsa yaqqol ko‘rinadi. Yozuvchi afg‘on aholisini faqat “dushman” sifatida emas, urushning o‘zi bilan kurashayotgan oddiy insonlar sifatida tasvirlaydi. Bu esa urushning millat va hudud tanlamaydigan umuminsoniy fojea ekanini ta’kidlaydi.

Urush kishilari obrazlarining yagona badiiy tizimi

Yuqoridagi tahlil shuni ko‘rsatadiki, Qo‘chqor Norqobil qissalaridagi askar, ofitser, ayol va tinch aholi obrazlarini bir-biridan ajratib o‘rganish bilan birga, ularni yagona badiiy tizim sifatida tahlil qilish zarur. Chunki har bir obraz urushning boshqa bir qirrasini ochishga xizmat qiladi.

Askar — urushning bevosita guvohi va ruhiy qurboni;

ofitser — buyruq, burch va vijdon o‘rtasidagi ziddiyat tashuvchisi;

ayol — mehr, umid, sadoqat va ma’naviy tayanch;

bola — urushning begunoh qurboni va barbod bo‘layotgan kelajak timsoli;

qariya — tarixiy xotira va yo‘qotishlar tashuvchisi;

tinch aholi — urushning umuminsoniy fojeasini ifodalovchi umumlashma obraz.

Shu tariqa mazkur obrazlar birgalikda Qo‘chqor Norqobilning urush haqidagi yaxlit badiiy konsepsiyasini shakllantiradi.

Yozuvchi obrazlarni faqat tashqi harakatlari orqali emas, balki ichki monolog, xotira, ruhiy kechinma, psixologik konflikt va retrospektiv tasvir vositalari orqali ochadi. Shu sababli uning qissalarida urushning tashqi manzarasi bilan insonning ichki dunyosi o‘rtasida uzviy aloqa yuzaga keladi.

Ayniqsa, to‘rtta qissani qiyoslash natijasida askar obrazining rivojlanishi juda muhim badiiy hodisa sifatida ko‘zga tashlanadi. “Daryo ortidagi yig‘i”da jangchi, “Tongga qadar yashamoq kerak”da ruhiy sinovdagi inson, “Azizam, tabassum

qil!”da urushdan keyingi jarohatlardan azoblanayotgan urush qatnashchisi, “Quyoshni kim uyg‘otadi?”da esa tarixiy xotira egasi shaklida namoyon bo‘lishi adibning obraz yaratish mahoratini ko‘rsatadi.

Xulosa

Qo‘chqor Norqobilning “Daryo ortidagi yig‘i”, “Tongga qadar yashamoq kerak”, “Azizam, tabassum qil!” va “Quyoshni kim uyg‘otadi?” qissalarida urush kishilari obrazlari o‘zaro bog‘langan, yaxlit badiiy tizimni tashkil etadi. Mazkur tizimda askar, ofitser, ayol, bola, qariya va tinch aholi obrazlari urushning turli qirralarini ifodalab, yozuvchining inson va urush haqidagi konsepsiyasini shakllantiradi.

Tahlil natijalari shuni ko‘rsatadiki, adib yaratgan askar obrazi dinamik xarakterga ega. U dastlab jangchi sifatida namoyon bo‘lib, keyinchalik ruhiy sinovdan o‘tayotgan inson, urushdan keyingi jarohat tashuvchisi, nihoyat, tarixiy xotirani saqlovchi va urush mohiyatini mushohada qiluvchi shaxs darajasiga ko‘tariladi. Bu evolyutsiya yozuvchining urushni tashqi jangovar voqealardan ko‘ra inson qalbida kechadigan fojiaviy jarayon sifatida anglashini ko‘rsatadi.

Ayol obrazlari esa urushga qarshi qo‘yilgan hayot, mehr, sadoqat va umid kuchini ifodalaydi. Ofitser obrazlari orqali burch va vijdon muammosi ochilsa, tinch aholi obrazlari urushning begunoh insonlar taqdiridagi fojiaviy oqibatlarini namoyon etadi. Natijada barcha obrazlar yagona g‘oyaviy-estetik markaz — insonning urush sharoitida ham o‘z insoniyligini saqlab qolishi g‘oyasi atrofida birlashadi.

Demak, Qo‘chqor Norqobilning urush kishilari obrazlarini yaratishdagi badiiy konsepsiyasi urushni ulug‘lash yoki jangovar qahramonlikni birinchi o‘ringa qo‘yishga emas, balki urushning inson ruhiyati, ma’naviyati, xotirasi va taqdiriga yetkazgan fojiaviy ta’sirini ochib berishga asoslanadi. Adib uchun urushning eng katta fojiasi insonning halok bo‘lishidangina iborat emas; uning izlari inson xotirasida, oilasida, munosabatlarida va keyingi avlod taqdirida davom etishidadir. Shu jihatdan Qo‘chqor Norqobil qissalaridagi urush kishilari obrazlari zamonaviy o‘zbek nasrida insonparvarlik, psixologizm va tarixiy xotira tamoyillarining uyg‘unlashgan badiiy ifodasi sifatida namoyon bo‘ladi.

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RAQAMLI MULOQOTDA PRAGMATIK MA'NONING SHAKLLANISHI (IJTIMOIY TARMOQ MATERIALLARI ASOSIDA)

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Annotatsiya: *Maqolada raqamli kommunikatsiya sharoitida pragmatik vositalarning o'zgarishi va rivojlanishi o'zbek tili materiallari asosida tahlil qilinadi. Ijtimoiy tarmoqlar va messenjerlarda emoji, hashtag, murojaat shakllari, baholovchi birliklar hamda tinish belgilarining kommunikativ ma'no hosil qilishdagi o'rni yoritiladi. Raqamli muloqotda pragmatik ma'noning matn, grafik belgi va kontekstning o'zaro ta'siri asosida shakllanishi o'rganiladi.*

Kalit so'zlar: *raqamli kommunikatsiya, pragmatika, pragmatik vosita, ijtimoiy tarmoq, emoji, hashtag, murojaat, kommunikativ niyat, kontekst.*

ФОРМИРОВАНИЕ ПРАГМАТИЧЕСКОГО ЗНАЧЕНИЯ В ЦИФРОВОЙ КОММУНИКАЦИИ (НА МАТЕРИАЛЕ СОЦИАЛЬНЫХ СЕТЕЙ)

Аннотация: *В статье на материале узбекского языка анализируются изменения и развитие прагматических средств в условиях цифровой коммуникации. Рассматривается роль эмодзи, хэштегов, форм обращения, оценочных единиц и знаков препинания в формировании коммуникативного смысла в социальных сетях и мессенджерах. Изучается формирование прагматического значения в цифровой коммуникации на основе взаимодействия текста, графических знаков и контекста.*

Ключевые слова: *цифровая коммуникация, прагматика, прагматическое средство, социальная сеть, эмодзи, хэштег, обращение, коммуникативное намерение, контекст.*

THE FORMATION OF PRAGMATIC MEANING IN DIGITAL COMMUNICATION (BASED ON SOCIAL MEDIA MATERIALS)

Abstract: *The article analyzes the transformation and development of pragmatic means in the context of digital communication, based on materials from the Uzbek language. It examines the role of emojis, hashtags, forms of address, evaluative units, and punctuation marks in generating communicative meaning on social networks and messengers. The formation of pragmatic meaning in digital communication through the interaction of text, graphic symbols, and context is studied.*

Keywords: *digital communication, pragmatics, pragmatic means, social network, emoji, hashtag, form of address, communicative intention, context.*

Kirish (Introduction).

Raqamli texnologiyalarning jadal rivojlanishi insonlar o'rtasidagi muloqotning shakli va mazmuniga sezilarli ta'sir ko'rsatmoqda. Bugungi kunda fikr almashishning katta qismi ijtimoiy tarmoqlar, messenjerlar va turli raqamli platformalar orqali amalga oshirilmoqda. Natijada yozma muloqotning an'anaviy ko'rinishi o'zgarib, unda og'zaki nutqqa xos qisqalik, tezkorlik va bevositalik xususiyatlari namoyon bo'lmoqda.

Internet pragmatikasiga bag'ishlangan tadqiqotlarda raqamli muloqotda nutq aktlari, kontekst, emoji va boshqa grafik vositalar an'anaviy pragmatik birliklar bilan birgalikda faol ishlatilishi qayd etilgan [1]. Yozma matnning o'zi ko'pincha kommunikativ niyatni to'liq ifodalash uchun yetarli bo'lmay, unga qo'shimcha ravishda emoji, hashtag, takroriy tinish belgisi kabi grafik vositalar keng qo'llanmoqda. Quyida o'zbek raqamli muloqotida pragmatik ma'noning so'z, tinish belgisi, emoji va kontekstning bir butun o'zaro ta'siri natijasida shakllanishi, xususan, tinish belgilari va qisqa birliklar, murojaat birliklari va "sen/siz" shakllari, emoji va grafik belgilar hamda hashtagning kommunikativ vazifalarini kompleks tarzda o'rganib, o'zbek raqamli muloqotining o'ziga xos xususiyatlari haqida to'xtalib o'tamiz.

Mavzuga oid adabiyotlar tahlili (Literature Review).

Raqamli kommunikatsiya pragmatikasi so‘nggi o‘n yillikda xorijiy va o‘zbek tilshunosligida faol o‘rganilayotgan yo‘nalishlardan biriga aylandi. Ingliz tilshunosligida Xie, Yus va Haberlandlarning tadqiqotlarida internet pragmatikasi mustaqil ilmiy yo‘nalish sifatida asoslab berilgan va unda nutq aktlari, kontekst, kommunikativ niyat kabi an’anaviy pragmatik kategoriyalarning raqamli muhitda qanday transformatsiyaga uchrashi turli tillar misolida ko‘rsatilgan [1]. Dainas va Herringning tadqiqoti esa bevosita emoji pragmatikasiga bag‘ishlangan bo‘lib, emojining ma’nosi mustaqil emas, balki kontekst bilan chambarchas bog‘liqligini, uning matnning ohangini o‘zgartirish, illokutiv kuchni kuchaytirish yoki yumshatish kabi funksiyalarini bajarishini asoslab bergan [3]. Li va Yangning tadqiqotida esa emojining internet muloqotidagi pragmatik funksiyalari, xususan, his-tuyg‘uni ifodalash, illokutiv aktni kuchaytirish va muloqot ohangini boshqarish vazifalari o‘rganilgan [7].

O‘zbek tilidagi raqamli muloqotni o‘rganishga qaratilgan ishlar nisbatan yosh, ammo jadal rivojlanayotgan yo‘nalishni tashkil etadi. Amirova va Abdinazarovning tadqiqotida ingliz va o‘zbek tillaridagi Instagram yozishmalari qiyosiy tahlil qilinib, murojaat shakllari, “siz/sen” birliklarining tanlanishi hamda hurmat-odob ifodalarining ikki tilda turlicha namoyon bo‘lishi ko‘rsatilgan [2]. Razikov emoji va hashtagni o‘zbek tili neologiyasi nuqtayi nazaridan tahlil qilib, ularning hissiy munosabatni ifodalash, matnni tartibga solish va mavzuni belgilash kabi funksional-pragmatik vazifalarini aniqlagan [4]. Abduganiyevaning tadqiqotida esa o‘zbek va ingliz Instagram/Facebook diskursidagi multimodal vositalar qiyoslanib, o‘zbekcha matnlarda hurmat, jamoaviylik va milliy o‘zlikni ifodalovchi unsurlarning ustunligi keltirib o‘tilgan [5].

Qiyomidinovaning tadqiqotida raqamli kommunikatsiyada yuzaga kelayotgan yangi janr shakllarining lingvopragmatik xususiyatlari umumiy tarzda ko‘rib chiqilgan [6], Temirova esa o‘zbek internet tilini an’ana va innovatsiya o‘rtasidagi murakkab munosabat sifatida tahlil qilib, raqamli muloqotda milliy til me’yorlarining qanday saqlanib qolishini yoritgan [8].

Tadqiqot metodologiyasi (Research Methodology). Maqolada tavsifiy-tahliliy metod, kontekstual tahlil hamda qiyosiy tahlil usullaridan foydalanildi. O‘zbek tilidagi ijtimoiy tarmoq (Instagram, Telegram) yozishmalaridan olingan misollar tahlil qilindi.

Tahlil va natijalar (Analysis and Results). Raqamli muloqotda vaqt va makonning cheklanganligi sababli foydalanuvchilar ko‘pincha fikrni imkon qadar ixcham shaklda ifodalaydi. Bunday sharoitda bitta so‘z yoki bitta grafik belgi katta kommunikativ mazmunni ifodalaydi. Masalan: “*Mayli.*” Bu birlikning pragmatik mazmuni kontekstga qarab “*roziman*”, “*boshqa ilojim yo‘q*”, “*xafa bo‘ldim, lekin qarshi emasman*”, “*suhbatni davom ettirmoqchi emasman*” kabi turlicha talqin qilinishi mumkin. “*Mayli* 😊” shaklida esa yumshoqlik va samimiylik kuchayadi. “*Mayli...*” shaklida esa norozilik yoki ikkilanish ehtimoli ortadi.

Shu sababli raqamli muloqotda pragmatik ma’no ko‘pincha alohida so‘zdan emas, so‘z + tinish belgisi + emoji + kontekst munosabatidan hosil bo‘ladi. Bu hodisa pragmatik tizimning rivojlanishida muhim o‘zgarishni ko‘rsatadi: avval nutqning yordamchi vositasi hisoblangan ayrim grafik belgilar raqamli muloqotda kommunikativ ma’noni shakllantirishning faol vositasiga aylanmoqda.

Raqamli muloqotning muhim xususiyatlaridan biri – qisqa shaklda katta kommunikativ mazmunni ifodalash imkoniyatidir. Kundalik yozishmalarda “*Rahmat*”, “*Mayli*”, “*Yaxshi*” kabi birliklarning o‘zi turli kommunikativ ma’nolarni anglatishi mumkin: bu ma’no vaziyat, suhbatdoshlar munosabati va yozuvga qo‘shilgan grafik belgilar orqali aniqlanadi. Masalan, “*Rahmat.*” va “*Rahmat* 😊” shakllarining lug‘aviy mazmuni bir xil bo‘lsa-da, ikkinchisida minnatdorlik bilan birga samimiylik ham ifodalanadi; “*Rahmat...*” shaklida esa ko‘p nuqta ikkilanish yoki yashirin norozilikni anglatishi mumkin.

Instagram yozishmalarini o‘rganishga bag‘ishlangan tadqiqotda qisqa matnlar, emoji va qisqartmalar kommunikativ maqsadni ifodalashning muhim vositasi sifatida ko‘rsatilgan, shuningdek murojaat shakllari va “sen”/“siz” birliklarining tanlanishi faol qo‘llanishi aniqlangan [2]. Masalan, “*Ustoz, maslahatiz kerak edi*” jumlasida “*ustoz*” murojaati adresatga hurmatni ifodalasa, “*maslahatiz kerak edi*” shakli (to‘g‘ri shakli: maslahatingiz) iltimosni yumshoqroq bildiradi. Rasmiy yoki yoshi katta suhbatdoshga “siz” bilan murojaat qilish hurmatni, yaqin munosabatdagi shaxsga “sen” shakli esa samimiylikni bildiradi; mavjud munosabatga zid ravishda tanlangan shakl esa kinoya yoki masofa saqlashni yuzaga chiqarishi mumkin.

Raqamli muloqotda faol qo‘llanilayotgan emoji va grafik belgilar ham ma’lum pragmatik vazifa bajarmoqda. Emoji dastlab hissiy holatni ifodalash vositasi sifatida tarqalgan bo‘lsa-da, bugungi muloqotda uning vazifasi kengaygan: u rozilik, minnatdorlik, kinoya, hayrat kabi munosabatlarni ham ifodalaydi. Dainas va Herring tadqiqotiga ko‘ra, emoji talqini bevosita kontekst bilan bog‘liq va uning muhim vazifalaridan biri matnning ohangini o‘zgartirishdir [3]. Masalan, “*Juda yaxshi qilibsiz* 👏” jumlasida emoji baholovchi birlikning pragmatik kuchini oshiradi, “*Zo‘r qilibsiz* 😒” jumlasida esa ijobiy bahoni shubha ostiga qo‘yib, kinoyaviy mazmunni yuzaga chiqaradi. Shu sababli emoji ma’nosini faqat lug‘aviy mazmunidan emas, matn va vaziyat bilan birgalikda talqin qilish lozim.

Shu oʻrinda yana bir pragmatik vositalardan biri raqamli xabarlarni yetkazishda keng qoʻllanilayotgan hashtagning kommunikativ vazifasiga ham toʻxtalib oʻtish joiz. Raqamli kommunikatsiyada hashtag ham oddiy texnik belgi boʻlib qolmay, kommunikativ vazifaga ega vositaga aylanmoqda. Oʻzbek tilidagi materiallarda #Kitobxonlik, #Ta'lim, #YashilMakon, #Mustaqillik_35_yil, #Xalqaro_hamkorlik kabi birliklar mavzuni koʻrsatish bilan bir qatorda muallifning muayyan masalaga munosabatini ham ifodalaydi. Razikovning tadqiqotida emoji va hashtaglarning hissiy munosabatni ifodalash, matnni tartibga solish va mavzuni belgilash funksiyalari qayd etiladi [4]. Shu jihatdan hashtag mavzuni belgilovchi va kommunikativ yoʻnalishni koʻrsatuvchi pragmatik vosita sifatida baholanishi mumkin.

Raqamli kommunikatsiya umumiy texnologik asosga ega boʻlsa-da, unda milliy-madaniy xususiyatlar saqlanib qoladi. Oʻzbek va ingliz tillaridagi Instagram/Facebook materiallari asosida olib borilgan tadqiqotda oʻzbekcha raqamli matnlarda hurmat, jamoaviylik va milliy oʻzlikni ifodalovchi multimodal vositalarning muhim oʻrin tutishi qayd etilgan [5]. Ijtimoiy tarmoqlardagi muloqotda *aka, opa, ustoz, domla* kabi murojaat soʻzlar hamda *hurmatli, aziz* va boshqa birliklarning faol qoʻllanishi kommunikativ hamkorlikni ta'minlash, suhbatdoshga nisbatan ijobiy munosabat bildirish va muloqotning xushmuomala tusini saqlashga xizmat qiladi. Bu birliklar nafaqat murojaat funksiyasini bajaradi, balki nutqning pragmatik yoʻnalishini belgilovchi vositalar sifatida ham namoyon boʻladi. Masalan, "*Assalomu alaykum, ustoz*", "*Rahmat, ustoz*" kabi murojaat shakllari raqamli yozishmada ham hurmat va ijtimoiy masofani ifodalashda davom etmoqda. Demak, kommunikatsiya shakli oʻzgargani bilan milliy pragmatik me'yorlarning asosiy qismi saqlanib qoladi, faqat ularning ifodalanish shakli oʻzgaradi. murojaat birliklarining tanlanishi foydalanuvchilarning yoshi, ijtimoiy mavqeyi hamda kommunikativ vaziyat bilan bevosita bogʻliq boʻlib, ular xushmuomalalikni ifodalashning muhim vositasi hisoblanadi. Kuzatishlar asosida aytish mumkinki, oʻzbek raqamli diskursida murojaat birliklari kommunikativ etikani ta'minlovchi va ijtimoiy masofani boshqaruvchi pragmatik mexanizm sifatida faoliyat koʻrsatadi.

Raqamli kommunikatsiyaning rivojlanishi pragmatik tadqiqotlar oldiga bir qator yangi vazifalarni qoʻyadi, jumladan, oʻzbek raqamli muloqotida murojaat birliklari, baholovchi soʻzlar, emoji, hashtag, takroriy tinish belgilari kabi pragmatik birliklarning ilmiy tasnifini yaratish, matn va grafik belgining oʻzaro munosabatini chuqur oʻrganish, raqamli muhitda hurmat va muomala me'yorlarining oʻzgarishini kuzatishni amalga oshirish lozim.

Xulosa va takliflar (Conclusion / Recommendations).

Raqamli kommunikatsiyaning rivojlanishi oʻzbek tilining pragmatik imkoniyatlarini yangi kommunikativ sharoitda namoyon qilmoqda. Ijtimoiy tarmoqlar va messenjerlarda soʻz, murojaat shakli, tinish belgisi, emoji va hashtag birgalikda kommunikativ ma'no hosil qilmoqda, natijada yozma muloqotning an'anaviy chegaralari kengayib, pragmatik ma'noni ifodalash vositalari koʻpaymoqda. Shu bilan birga, texnologik yangilanish milliy kommunikativ me'yorlarni butunlay yoʻqotmaydi, balki an'anaviy pragmatik vositalar yangi raqamli shakllar bilan birgalikda qoʻllanishda davom etmoqda. Bu esa mazkur jarayonning milliy-madaniy xususiyatlarini ilmiy asosda tavsiflash lozimligini koʻrsatadi.

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POYEZD POREYONIMLARINING LEKSIK-SEMANTIK XUSUSIYATLARI

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Annotatsiya: *Mazkur maqolada poyezd poreyonimlarining leksik-semantik xususiyatlari hamda nominatsion asoslari onomastik nuqtai nazardan tahlil qilingan. Tadqiqotda poyezd nomlarining shakllanishiga ta’sir etuvchi tarixiy, madaniy va lingvistik omillar yoritilib, ular akronimik, eponimik, kommersial, metaforik, zoonimik, numeronimik, toponimik, gidronimik va oronimik guruhlarga tasniflangan. Tahlil natijalari poyezd poreyonimlari transport vositalarini identifikatsiya qilish bilan birga milliy-madaniy qadriyatlar, tarixiy xotira va hududiy identitetni aks ettiruvchi muhim onomastik birliklar ekanligini ko‘rsatadi. Tadqiqot natijalari transport onomastikasi doirasida poyezd poreyonimlarining leksik-semantik xususiyatlarini yoritishga xizmat qiladi.*

Kalit so‘zlar: *poyezd poreyonimlari, transport onomastikasi, poreyonim, leksik-semantik tahlil, nominatsiya, semantik motivatsiya, onomastik tasnif, eponim, akronim, metaforik nomlar.*

ЛЕКСИКО-СЕМАНТИЧЕСКИЕ ОСОБЕННОСТИ ПОРЕЙОНИМОВ ПОЕЗДОВ

Аннотация: *В данной статье с ономастической точки зрения исследуются лексико-семантические особенности и номинационные основы порейонимов поездов. Рассматриваются исторические, культурные и лингвистические факторы, влияющие на формирование названий поездов. Порейонимы классифицируются на акронимические, эпонимические, коммерческие, метафорические, зоонимические, нумеронимические, топонимические, гидронимические и оронимические группы. Результаты исследования показывают, что названия поездов являются важными ономастическими единицами, отражающими национально-культурные ценности, историческую память и территориальную идентичность. Полученные результаты способствуют дальнейшему изучению лексико-семантических особенностей порейонимов в рамках транспортной ономастики.*

Ключевые слова: *порейоним, порейонимы поездов, транспортная ономастика, лексико-семантический анализ, номинация, ономастика, эпоним, акроним, метафорические названия.*

LEXICAL AND SEMANTIC FEATURES OF TRAIN POREYONYMS

Abstract: *This article examines the lexical and semantic features and nominative principles of train poreyonyms from an onomastic perspective. The study analyzes the historical, cultural, and linguistic factors influencing the formation of train names and classifies them into acronymic, eponymic, commercial, metaphorical, zoonymic, numeronymic, toponymic, hydronymic, and oronymic groups. The findings demonstrate that train poreyonyms are important onomastic units that not only identify railway vehicles but also reflect national and cultural values, historical memory, and territorial identity. The results contribute to the study of the lexical and semantic characteristics of train poreyonyms within the framework of transport onomastics.*

Keywords: *train poreyonyms, poreyonym, transport onomastics, lexical-semantic analysis, nomination, onomastics, eponym, acronym, metaphorical names.*

Kirish. Transport onomastikasi zamonaviy onomastikaning jadal rivojlanayotgan yo‘nalishlaridan biri bo‘lib, transport vositalari nomlarining nominatsion va semantik xususiyatlarini o‘rganadi [4; 8]. Poyezd poreyonimlari tarixiy, madaniy va lingvistik omillar ta’sirida shakllangan hamda transport vositalarini identifikatsiyalash bajarish bilan bir qatorda muayyan semantik va pragmatik mazmunni ham ifodalaydi [5; 7]. Mazkur tadqiqotning maqsadi poyezd poreyonimlarining leksik-semantik xususiyatlari va nominatsion asoslarini aniqlash hamda ularni onomastik nuqtai nazardan tizimli tahlil qilishdan iborat.

Adabiyotlar tahlili. Onomastika sohasida nomlarning nominatsion tamoyillari va semantik xususiyatlari ko‘plab tadqiqotlarda yoritilgan [3-8]. Ernst Hansack, Willy Van Langendonck va Richard Coates onomastik birliklarning semantik

tabiati hamda nominatsion mexanizmlarini nazariy jihatdan asoslab bergan [4-8]. Biroq mazkur tadqiqotlarda poyezd poreyonimlarining leksik-semantik tasnifi mustaqil tadqiqot obyekti sifatida yetarlicha yoritilmagan. Ularning tadqiqotlari nomlarning shakllanishida tarixiy, madaniy va ekstralingvistik omillarning muhim o‘rin tutishini ko‘rsatadi.

Transport onomastikasiga oid ishlarda avtomobil va aviatsiya poreyonimlari keng tadqiq etilgan bo‘lsa-da, poyezd poreyonimlarining leksik-semantik xususiyatlari va nominatsion modellari yetarli darajada o‘rganilmagan [4; 8]. O‘zbek tilshunosligida ham transport onomastikasining mazkur yo‘nalishiga oid maxsus tadqiqotlar deyarli uchramaydi. Shu bois ushbu tadqiqot poyezd poreyonimlarini nominatsion asoslari va leksik-semantik xususiyatlari nuqtai nazaridan tizimli tahlil qilish orqali mavjud ilmiy bo‘shliqni to‘ldirishga xizmat qiladi.

Mazkur tadqiqotning ilmiy yangiligi shundan iboratki, unda poyezd poreyonimlari ilk bor nominatsion usuli va semantik motivatsiyasiga ko‘ra kompleks tasniflandi hamda ularning lingvomadaniy xususiyatlari tizimli tahlil qilindi.

Tadqiqot metodologiyasi. Tadqiqotda onomastik, leksik-semantik, tavsifiy hamda qiyosiy-tahliliy metodlar kompleks yondashuv asosida qo‘llanildi. Tahlil obyekti sifatida poyezd poreyonimlari tanlanib, ular nominatsion asoslari, semantik motivatsiyasi va funksional xususiyatlariga ko‘ra tizimli ravishda tasniflandi. Shuningdek, nominatsiya jarayoniga ta’sir etuvchi lingvistik va ekstralingvistik omillar aniqlanib, poyezd nomlarining semantik tuzilishi hamda onomastik xususiyatlari qiyosiy tahlil asosida yoritildi [4; 5; 8].

Natijalar va ularning tahlili. Zamonaviy dunyoda transport vositalarining jadal rivojlanishi natijasida temiryo‘l vositalariga berilgan nomlar lingvistik va ijtimoiy jihatdan muhim ahamiyat kasb etmoqda. Poyezd nomlari nafaqat identifikatsiya vositasi, balki madaniy va semantik yuklamaga ega bo‘lgan poreyonimik birlik sifatida qaraladi. Ushbu nomlarning shakllanishida tarixiy, ijtimoiy va madaniy omillar muhim rol o‘ynaydi. Shu nuqtai nazardan, poyezd nomlarini o‘rganish zamonaviy onomastikaning dolzarb masalalaridan biri hisoblanadi [4;7] .

Onomastika nomlash, nom qo‘yish san’atini o‘rganadigan tilshunoslik sohasi bo‘lib, uning tarkibiga poreyonimlar ham kiradi. Poreyonimlar transport vositalariga berilgan nomni bildiruvchi onomastik birlik hisoblanadi. Transport onomastikasi ana shu poreyonimlarning nominatsion, semantik va pragmatik xususiyatlarini o‘rganadi [3;4]. Poyezd nomlari transport poreyonimlarining muhimtarkibiy qismini tashkil etadi.

Poyezd – bir yoki bir necha vagon tirkalgan tarkib (sostav). Vagonlar bir-biriga maxsus tirkash moslamasi *(avtoulagich)* bilan ulanadi [12; 13].

Poyezd [r. поездить – *“transport vositasida rosa yurmoq, kezmoq”* fe’lidan yasalgan ot]. Bir-biriga ketma-ket tirkalgan va lokomotiv yordamida yuradigan temir yo‘l vagonlari qatori [13].

O‘zbek tiliga *poyezd* so‘zi rus tilidan o‘zlashgan. *Poyezd* – so‘zi aslida *ездить* (yurmoq, harakatlanmoq) fe’lidan hosil bo‘lgan. По-езд – bu yerda *“no-”* old qo‘shimchasi, *“езд”* esa *“borish, yurish”* ma’nosida. Poyezd *“biror yo‘nalishda harakat qilish”, “safarga chiqish”* ma’nosini anglatgan. Keyinchalik texnika rivojlanishi bilan temiryo‘l transporti (19-asrda) paydo bo‘lgach, bu so‘z temir yo‘lda harakatlanuvchi transport vositalariga nisbatan qo‘llanila boshlandi [11].

Train (poyezd) – bu so‘z ingliz tiliga dastlab *trainen* shaklida kirib kelgan, eski fransuz tilidagi *trianer* (ya’ni *sudralmoq, tortmoq*) fe’lidan olingan. Fransuz tiliga eski lotincha *trahere – tortmoq, sudralmoq* fe’lidan kirgan [10].

Poyezd nomlari poreyonimik birlik sifatida muayyan semantik va madaniy yuklamalarga ega bo‘lib, jamiyatning tarixiy, madaniy va ijtimoiy xususiyatlarini aks ettiradi. Har bir nom tasodifiy tanlanmaydi, ular ma’lum maqsad va mazmun asosida nomlanadi.

“Afrosiyob” – O‘zbekiston bo‘ylab eng yuqori tezlikda harakatlanuvchi, Ispaniyaning Patentes Talgo S.L.U kompaniyasi tomonidan ishlab chiqarilgan Talgo-250 rusumli elektropoyezdlari [14]. 2011-yil 22-iyulda birinchi “Afrosiyob” poyezdi Toshkentga keltirilgan [14]. Hozirgi Samarqandning shimoliy chekkasida joylashgan qadimiy Afrosiyob shahri shohi sharafiga nomlangan [1]. “Afrosiyob” poyezdi nomi tarixiy shaxs nomi bilan bog‘liq bo‘lib, u milliy tarix va madaniyatni aks ettiradi. Mazkur poreyonim milliy-madaniy identitetini ifodalovchi lingvomadaniy birlik sifatida namoyon bo‘ladi.

Poyezd poreyonimlari nominatsiya usuli va semantik motivatsiyasiga ko‘ra quyidagi guruhlarga tasniflanadi. I. Nominatsiya usuliga ko‘ra:

1. Akronim – bu bir nechta so‘zlarni qisqartirib, ya’ni bir nechta so‘zlarning bosh harflaridan tuzilgan yangi so‘z (nom) hosil qilish usuli. Akronim bilan nomlangan transportlar qisqalik, fonetik qulaylik, xalqaro tushunarlilik, brend qiymati, texnik va ma’muriy yengillik kabi ma’nolarni anglatadi. Akronimlar bilan hosil qilingan poyezd nomlari:

“TGV” – Train a Grande Vitesse (fransuzcha, ammo ingliz tilida ham ko‘p ishlatiladi) – “Yuqori tezlikdagi poyezd” degan ma’noni anglatadi [8].

“ICE” (InterCity Express) – shaharlararo tez yurar poyezdlar nomi.

“TALGO” (brend) – bu ispaniyalik muhandislar yaratgan poyezd tizimining brend, u quyidagi qisqartmadan tashkil topgan: *Tren Articulado Ligero Goicoechea Oriol*. *Tren*-poyezd, *Articulado*-bog‘langan, bog‘inli, *Ligero*-yengil, *Geocoechea*-poyezd loyihalagan muhandis familiyasi (Alenjadro Goiceochea), *Oriol*-homiy va tadbirkor (Jose Luis Oriol) familiyasi [14].

Birinchi Talgo-250 poyezdi Ispaniyadan O‘zbekistonga 2011-yil iyul oyida olib kelingan. 2011-yil 26-avgustda “Afrosiyob” rasmiy ravishda ishga tushirildi. 2012-2021-yillarda Talgo-250 poyezdlari xarid qilindi va boshqa yo‘nalishlarga qo‘shildi.

2. Eponim – bu biror shaxs nomi asosida yaratilgan nom. Eponim – transport markalari yoki modellari bo‘lib, ular asoschilarining va mashhur shaxslarning ism/familiyasidan olingan. Bular antroponimik eponimlar deb ataladi. Transport poreyonimlarida antroponimlardan foydalanish shaxsni e’zozlash, tarixiy xotirani saqlash va brend identitetini shakllantirishga xizmat qiladi. Antroponimik (shaxs nomlari) eponimlar bilan atalgan poyezd nomlari:

“Afrosiyob” – bu poreyonim o‘zbek madaniyatida muhim o‘rin tutuvchi Afrosiyob obrazi hamda qaimiy Samarqand (Afrosiyob) bilan bog‘liq tarixiy-madaniy konsept asosida nomlangan. [1]. Mazkur nom milliy o‘zlik, tarixiy meros va turistik jozibani ifodalovchi semantik motivatsiyaga ega.

“Sir Nigel Gresley” – 1937-yilda Donkaster zavodida ser Nigel Greslining dizayni asosida London va Shimoliy-sharqiy temir yo‘lida foydalanish uchun qurilgan bug’ lokomotivi [4]. Mazkur poreyonim britaniyalik muhandis Sir Nigel Gresley sharafiga nomlangan bo‘lib, paravozlar dizayneri va texnika rivojiga qo‘shgan hissasini qadrlash uchun uning nomi bilan atalgan.

“Churchill Pullman” – Winston Cherchill – Ikkinchi jahon urushining mashhur britan rahbari bo‘lib va uning nomini yodga olish maqsadida shunday atalgan.

“Isambard Kingdom Brunel” – 19-asr Britaniya injeneri va poyezd nomiga tarixiy-texnik obro’ va ishonchliligini ko‘rsatish maqsadida shunday atalgan.

3. Kommersial (savdo) nom – bu mahsulot yoki texnika bozorga chiqarishda marketing va brend strategiyasiga asoslanib qo‘yilgan nomlar. Marketing maqsadida nomlangan poyezd nomlari: “Orient Express”, “Royal Scotsman”, “The Caledonian Sleeper”, “Shinkansen Series “Nozami” ”.

4. Metaforik asosda nomlangan poyezd nomlari tezlik, kuch, nafislik yoki sarguzasht ruhini ko‘rsatadi. Bu nomlar oson esda qoladi va marketing kuchini orttirib, emotsional va madaniy kontekstni hosil qiladi. Metaforik (so‘z) asosidagi poyezd nomlari:

“Flying Scotsman” – *Scotland* (Scotsman – shotlandiyalik, xalq timsoli, *“flying”* uchish, uchayotgan). *Flying Scotsman* (uchayotgan shotlandiylik) – tezlik, erkinlik, yengillik kabi metaforik ma’noga urg‘u beradi.

“The Golden Arrow” – (“arrow”- o‘q) – poyezdning tez yurarligini bildiradi; (“golden”-oltin) – hashamat va nufuz belgisi. Mazkur metafora poyezdning yuqori tezlik va estetik obrazini kuchaytiradi.

“The Silver Streak” – (“silver”-kumush) zamonaviy, tez, metall obrazi; “streak”(chaqnash) – chaqnash, iz, ma’nolarini bildirib, poyezdning tezligi va uzluksiz harakatini metaforik tarzda ifodalaydi. *The Silver Streak (“kumush chaqnash”, “kumush iz”)* – mazkur metafora tezlik va zamonaviylik obrazini ifodalaydi.

“The Blue Comet” (moviy kometa) – (“comet”-kometa) metafora sifatida tezlik, kamyoblik ma’nosi; “blue” (ko‘k) - go‘zallik va romantik obraz ma’nolarini nazarda tutadi. Bu nom orqali poyezdni osmonda tez uchuvchi obyekt darajasiga olib chiqiladi.

“The Bullet Train” – (“bullet”-o‘q) shiddatli va to‘g‘ri harakatni bildiradi; *“train”* (poyezd). *The Bullet Train* (o‘q poyezdi) – eng yuqori tezlikdagi transport vositasi.

“Midnight Express” (Tungi ekspress) – sirli, sarguzashtli, kechki sayohat. “*Midnight*” – sirli vaqt, “*express*” – tezlik va uzoq yo‘l.

II. Semantik motivatsiyasiga ko‘ra:

5. Poyezdlar zoonim (hayvon nomlari) bilan atalganda tezlik va kuchni ifodalash, obrazli brend yaratish, milliy ramz sifatida, tasavvur va hissiyot uyg‘otish, badiiy-estetik va marketing qulayligi uchun shunday nomlanadi. Hayvon nomlari bilan atalgan poyezd nomlari (zooporeyonimlar):

“Mallard” – *“Mallard”* (bir turdagi yovvoyi o‘rdak) kuchli va suzuvchi qush bo‘lib, tezlik ramzi sifatida ishlatilgan.Ya’ni, qushning tezkorlik sifatiga asoslanib bu poyezd shunday nomlangan. Mazkur poyezd bug’ lokomotivlari orasida rekord tezlikka erishgan namunalar qaqtoriga kiradi.

“Lion” – *“lion”*(arslon) g‘arbda arslon jasorat, kuch va hukmronlik timsoli. 1838-yildagi eng qadimgi bug’ poyezdlaridan biri. Mazkur nom poyezdning kuchi va ishonchliligini semantik jihatdan ifodalaydi.

“Hawk” *(*lochin*)* – bu nom ba’zi zamonaviy yoki konseptual poyezdlarda ishlatilgan. “Hawk” chaqqonlik va ko‘rish qobiliyatining metaforasi. Tezlik va yirtqichlik timsoli.

“Puffing Billy” – “Billy” bu yerda odam ismi kabi ko‘rinadi, ammo avstrayaliyaliklar buni ko‘pincha hayvon (asosan echki) bilan bog‘lashadi. Dunyodagi eng qadimiy saqlanib qolgan poyezdlardan biri.

“Bulldog” – kuchli, og‘ir, bardoshli it zotining nomi. Og‘ir yuk tashishga mos, kuchli poyezd obrazini yaratadi.

6. Raqamlar bilan atalgan poyezd nomlari.Texnik xususiyatiga raqam orqali ishora qilinadi:

1.Denotativ funksiyasi (to‘g‘ridan-to‘g‘ri ko‘rsatuvchi): “Train NO.125”,”Class 66”, “ICE 3”. Bu nomlarda raqamlar poyezdning sinfi, turi yoki xizmat raqamini bildiradi.

2.Identifikatsion funksiyasi: “No.60163 Tornado”, “800201 Azuma”. Raqamlar bu yerda poyezdning zavod yoki texnik ishlab chiqarish raqami. Onomastik jihatdan bular individual identifikatorlar bo‘lib, brend yoki boshqa nomlar bilan birga ishlatiladi.

3.Simvolik funksiyasi*:* “InterCity 125”. Bu nomda “125” nafaqat xizmat raqami, balki tezlikni (125 mph) anglatadi. Bu raqam semantik yukka ega bo‘lib, poyezdning asosiy xususiyatini bildiradi.

7. Toponimik asosida nomlangan poyezd nomlari. Poyezdlar marshrut yoki yo‘nalishni ko‘rsatish, milliy yoki hududiy faxrni ifodalash, sayyohlik va reklama uchun qulaylik, tarixiy va madaniy merosni eslatish, brend yaratishda kuchli obraz berish uchun toponimlar bilan nomlanadi.

“Caledonian Sleeper” – *Caledonia* – qadimgi Shotlandiya nomi. London-Shotlandiya o‘rtasidagi tungi poyezd. Milliy o‘zlik va romantik tasvirni beradi.

“Cornish Riviera Express” – *Cornwall (Cornish)* – Angliyaning janubiy-g‘arbiy qismi. *Riviera* – dam olish joyi. Sayohatbop, estetik, diqqatga sazovar joyni ifodalaydi.

“Highland Chieftain” – *Highlands* – Shotlandiyaning tog‘li mintaqasi. Tog‘li hudud va milliy lider obrazini uyg‘unlashtirgan.

“Sharq” (yo‘lovchi poyezd) – sharq-g‘arbga qarama-qarshi mintaqaviy yo‘nalish (geokulturotik tushuncha).

Nasaf – qadimgi Nasaf (Qarshi) shahri sharafiga atalgan.

8. Suv obyekti va inshootlari nomlari bilan atalgan poyezd nomlari (gidroporeyonimlar). Poyezdlar gidronimlar (suv obyektlari va inshootlar nomlari) bilan ataladi.Marshrut suv obyektlari bilan bog‘liq bo‘lib, suv nomi milliy yoki hududiy identitetni bildiradi va bunday nomlar tasviriy, estetik va brend qiymatiga ega, tarixiy-xotira saqlanadi.

“The Thameslink” – bu London orqali oqib o‘tuvchi daryo. Daryo asosida geografik yo‘nalishni bildiradi.

“Merseyrail” – *River Mersey* – Liverpool daryosi.

9. Oroporeyonimlar bilan atalgan poyezd nomlari. Geografik-milliy identifikatsiya – tog’ nomlari mahalliy geografiyasini aks ettirib, poyezdni shu hudud bilan bog‘laydi.

“Rocky Mountaineer” *(Canada)* – Rocky Mountains (Shimoliy Amerikadagi yirik tog’ tizmasi). Bu poyezd Kanadaning tog‘li hududlari bo‘ylab harakat qiladi. Nom geografik joy nomidan olingan bo‘lib, sayohat tabiat go‘zalliklariga asoslangan turistik xizmatni bildiradi.

Tog’ – kuch, balandlik, barqarorlik va qudrat timsolidir. Bunday nominatsiya poyezdning tezligi va ishonchliligini semantik jihatda ta’kidlaydi. Masalan:*Himalayan Queen* – Himalaya (dunyodagi eng baland tog’ tizmasi). Hindistonda Dehli va Shimla o‘rtasida harakatlanadi.

Tabiiy go‘zallik va sayohat uchun mashhur joylar bilan nomlanadi.Turistlar e’tiborini jalb qilish uchun poyezdga tog’ nomi bilan nomlanadi.Misol: “Glacier Express” – Shvetsariyadagi eng mashhur tog‘li yo‘nalishlardan biri. Nomda “Glacier” (muzlik) so‘zi tog‘li va sovuq landshaftni bildiradi.

Xulosa. Tadqiqot natijalari poyezd poreyonimlari o‘ziga xos nominatsion tamoyillar va leksik-semantik xususiyatlarga ega bo‘lgan onomastik birliklar ekanligini tasdiqladi. Tahlil jarayonida poyezd nomlari akronimik, eponimik, kommersial, metaforik, zoonimik, numeronimik, toponimik, gidronimik va oronimik nominatsiya modellari asosida tizimlashtirildi hamda ularning semantik motivatsiyasi yoritildi. Aniqlanishicha, mazkur poreyonimlar transport vositalarini identifikatsiya qilish bilan bir qatorda tarixiy xotira, milliy-madaniy qadriyatlar, geografik identitet va brend kommunikatsiyasini ifodalovchi muhim lingvomadaniy vosita vazifasini bajaradi. Tadqiqot natijalari transport onomastikasida poyezd poreyonimlarining leksik-semantik tasnifini nazariy jihatdan takomillashtirishga xizmat qiladi hamda ushbu yo‘nalishda olib boriladigan keyingi qiyosiy va tipologik tadqiqotlar uchun ilmiy asos yaratadi.

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TIL LUG‘AT TARKIBIDA GEOGRAFIK KO‘RSATKICHLARNING O‘RNI VA KOGNITIV XUSUSIYATLARI

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Annotatsiya: *maqolada til lug‘at tarkibini kundan-kunga boyitib borayotgan ikkilamchi leksik nominativ birliklar – geografik ko‘rsatkichlar haqida so‘z boradi. Geografik ko‘rsatkichlarning lingvistik tabiati, semantik tuzilishi va diskursdagi vazifasi kognitiv tahlil qilinadi. Sifat bilimini hosil qiluvchi kognitiv modellar aniqlanadi. Hamda geografik terminlarni nafaqat toponimik birlik, balki lingvomadaniy va kommunikativ - diskursiv xususiyatlarga ega dinamik birliklar sifatida tahlil qiladi. Geografik terminlar hududiy nomlarni ifodalash bilan birga, ijtimoiy madaniy va tarixiy axborotni tekshiruvchi diskursiv belgi sifatidagi tabiati yoritiladi.*

Kalit so‘zlar: *geografik terminlar, toponimika, lingvomadaniylik, kommunikativ-diskursiv xususiyat, diskurs, matn, ijtimoiy-madaniy axborot.*

МЕСТО ГЕОГРАФИЧЕСКИХ УКАЗАНИЙ В СЛОВАРНОМ СОСТАВЕ ЯЗЫКА И ИХ КОГНИТИВНЫЕ ОСОБЕННОСТИ

Аннотация: *В статье рассматриваются вторичные лексические номинативные единицы, обогащающие словарный состав языка, — географические указатели. Проводится когнитивный анализ лингвистической природы, семантической структуры и дискурсивных функций географических указателей. Определяются когнитивные модели, формирующие знания о качественных признаках. В данном исследовании географические термины анализируются не только как топонимические единицы, но и как динамические единицы, обладающие лингвокультурологическими и коммуникативно-дискурсивными свойствами. Наряду с выражением территориальных названий освещается природа географических терминов как дискурсивных знаков, исследующих социокультурную и историческую информацию.*

Ключевые слова: *Географические термины, топонимика, лингвокультурология, коммуникативно-дискурсивное свойство, дискурс, текст, социокультурная информация.*

THE PLACE OF GEOGRAPHICAL INDICATIONS IN THE VOCABULARY OF A LANGUAGE AND THEIR COGNITIVE CHARACTERISTICS

Abstract: *This article examines geographical indicators as secondary lexical nominative units that continuously enrich the vocabulary of a language. It provides a cognitive analysis of the linguistic nature, semantic structure, and discursive functions of geographical indicators. The study identifies cognitive models that contribute to the formation of qualitative knowledge. This research analyzes geographical terms not only as toponymic units but also as dynamic units with linguacultural and communicative-discursive features. Along with representing regional names, the nature of geographical terms as discursive signs examining socio-cultural and historical information is highlighted.*

Keywords: *Geographical terms, toponymy, linguacultural, communicative-discursive feature, discourse, text, socio-cultural information.*

Rivojlanib borayotgan bugungi kunda geografik terminlarga bo‘lgan munosabat ham tobora ijtimoiylik kasb etib bormoqda. Jumladan, tabiiy va ma’muriy obyektlarni nomlari muayyan hududning tarixiy, madaniy va iqtisodiy xususiyatlarini aks ettiruvchi lingvistik birlik sifatida qaralmoqda. Natijada, geografik nomlarning amaliy ahamiyati yanada ortib, ular yangi huquqiy maqom kasb etib bormoqda. Kunimizda ommaviy axborot vositalari, ijtimoiy tarmoqlar orqali tez-tez quloqqa chalinayotgan “geografik ko‘rsatkichlar” iborasiga batafsil to‘xtalmoqchimiz. Barcha tillarda mavjud bo‘lgani kabi, o‘zbek tili lug‘at boyligining leksik birliklari qatoridan yuzga yaqin geografik ko‘rsatkichlar o‘rin olib borayotganligining guvohi bo‘lyapmiz. Bu birliklar asrlar davomida xalqimizning milliy-madaniy hayot tarzini, ijtimoiy taraqqiyotini tarix zarvaraqlariga muhrlamoqda. Tadqiqotimiz jarayonida geografik ko‘rsatkichlarning bir qator xususiyatlarini alohida o‘rganishni lozim topdik. Chunki ular kundan-kunga lingvistik, semiotik nuqtayi nazardan muhim ahamiyat kasb etib bormoqda.

Geografik koʻrsatkichlar – bu biror-bir tovarni a'zo davlat hududidan yoki shu hududdagi mintaqa yo joydan kelib chiqqanligini koʻrsatuvchi belgi boʻlib, bunda tovarning muayyan sifati, shuhrati yoki boshqa xususiyatlari asosan uning geografik kelib chiqishiga bogʻliq boʻladi. Mahsulotning muayyan hudud bilan uzviy bogʻliqligini, uning sifati, obroʻsi yoki oʻziga xos xususiyatlari aynan shu geografik hudud omillari bilan belgilanishini anglatadi[1]. Mamlakatimizda ham geografik koʻrsatkichlar huquqiy jihatdan muhofaza qilinib, ulardan foydalanish sohasidagi munosabatlar tartibga solingan[2]. Mazkur tushuncha nafaqat intellektual mulk huquqining muhim obyektlaridan biri, balki milliy mahsulotlarni himoya qilish, ularning bozordagi raqobatbardoshligini oshirish hamda iste'molchilarga mahsulotning kelib chiqishi va sifati haqida ishonchli ma'lumot taqdim etishda muhim ahamiyat kasb etadi.

Dunyo ilmiy adabiyotlarida geografik koʻrsatkichlar koʻproq huquq va intellektual mulk nuqtayi nazaridan tadqiq etilgan[3]. Ularning sof lingvistik xususiyatlari, ayniqsa semantik, pragmatik va kognitiv jihatlari nisbatan kamroq oʻrganilgan. Bu esa mazkur mavzuning tilshunoslik uchun dolzarbligini koʻrsatadi. Ayniqsa, oʻzbek tilshunosligida geografik koʻrsatkichlarning lingvistik tabiati, semantik tuzilishi va diskursdagi funksiyalarini kompleks oʻrganish istiqbolli ilmiy yoʻnalishlardan biri hisoblanadi.

Xususan, hudud nomlari bilan bogʻliq mahsulotlarning geografik koʻrsatkich sifatida davlat tomonidan roʻyxatga olinishi geografik terminlarning funksional imkoniyatlari kengligini namoyon etadi. Bunga misol tariqasida "Andijon devzira oshi" nomining geografik koʻrsatkich sifatida davlat reyestriga kiritilganligini keltirish mumkin[4]. Mazkur nom tarkibidagi "Andijon" geografik termini mahsulotning hududiy mansubligini ifodalab, uning oʻziga xos sifat va xususiyatlari ma'lum geografik makon bilan uzviy bogʻliqligini koʻrsatadi. Bu esa geografik terminlarning nominativ vazifa bilan cheklanmay, lingvomadaniy, identifikatsion va pragmatik funksiyalarni ham bajarishini tasdiqlaydi. Yoki boʻlmasa *Samarqand noni*[5], *Qoʻqon pichogʻi*[6] *yoki Margʻilon atlasi*[7] kabilarni sanash mumkin. Yuqoridagi geografik termin bilan birga qoʻllangan mahsulotlarning oʻziga xosligi ularning ishlab chiqarilgan hududi bilan chambarchas bogʻliq.

Geografik koʻrsatkich sifatida roʻyxatdan oʻtkazilgan jahonga mashxur Gruziya Borjomi suvi, "Fransiya Shampani" *(Champagne),* (*Parmigiano Reggiano)* "Italiya Parmezan pishlogʻi"ni deyarli dunyo mamlakatlarining katta qismi taniydi.

Oʻzbek tilida "Samarqand noni", "Qoʻqon pichogʻi", "Margʻilon atlasi" va "Margʻilon adrasi" "Andijon devzira oshi" birliklari lingvistik jihatdan ikki komponentli otli birikmalardir. Ularning birinchi komponenti toponim boʻlib, mahsulotning geografik kelib chiqish hududini bildiradi, ikkinchi komponenti esa turdosh ot sifatida mahsulotning turini ifodalaydi.Shuning uchun termin mahsulotning kelib chiqish joyi uning qiymati va xususiyatlarini belgilovchi asosiy omil ekanligini ifodalaydi. Mazkur birliklarda toponim aniqlovchi, mahsulot nomi esa aniqlanmish vazifasida kelgan. Bunda toponim faqat joy nomini anglatish bilangina cheklanmay, mahsulotning sifati, tarixiy shakllanishi, an'anaviy ishlab chiqarish usuli va hudud bilan bogʻliq obroʻsini ham semantik jihatdan ifodalaydi. Shu bois bunday birliklarda geografik nom nominativ vazifadan tashqari identifikatsion va differensial funksiyani ham bajaradi, ya'ni mahsulotni boshqa hududlarda ishlab chiqarilgan oʻxshash mahsulotlardan ajratib turadi.

Morfologik jihatdan birikmalarning ikkinchi komponenti uchinchi shaxs egalik qoʻshimchasini (-i) olgan: non+i, osh+i pichoq+i, atlas+i, adras+i. Bu qoʻshimcha oʻzbek tilidagi izofa (qaratqich-qaralmish) munosabatining belgili boʻlmagan koʻrinishini yuzaga keltiradi. Birinchi komponent qaratqich kelishigi (-ning)ni qabul qilmaydi, ammo mazmunan qaratqich munosabati saqlanadi: ***Andijon(ning) devzira oshi, Samarqand(ning) noni, Qoʻqon(ning) pichogʻi, Margʻilon (ning) atlasi.***

V.N. Teliya ta'kidlaganidek, tilda mavjud nominativ vositaning yangi vazifani bajarishi ikkilamchi leksik nominatsiya hodisasini yuzaga keltiradi[8]. Har qanday leksemaning semantik tuzilishi uch elementni taqozo etishi e'tirof etiladi: a) obyektiv olam elementlari (D); b) uning ongdagi aksi (S); v) moddiy vositalar bilan ifodalanishi (B)[9]. Mazkur nazariyalarga tayangan holda "Samarqand noni", "Qoʻqon pichogʻi", "Margʻilon atlasi" va "Margʻilon adrasi", "Andijon devzira oshi" birliklarini tahlil qilganda ularning semantik va funksional taraqqiyoti yaqqol namoyon boʻladi. Dastlab

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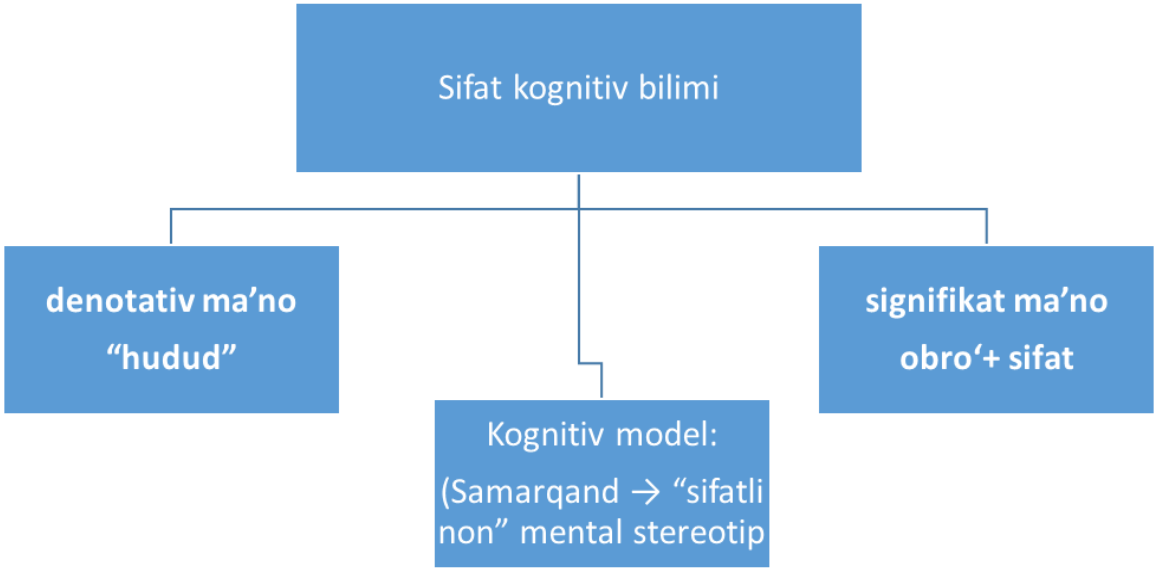
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[8] Телия В.Н. Вторичная номинация и еѐ виды / Языковая номинация. – Москва: Наука. 1977. – С.129.

[9] Саидхонов М. Ўзбек тилида ишораларнинг вербаллашуви ва матний хусусиятлари. Филология фанлари доктори (DSc) диссертацияси автореферати. – Fargʻona, 2022. – B. 23.

mazkur birliklar erkin otli birikma sifatida muayyan hududda ishlab chiqarilgan mahsulotni nomlash vazifasini bajargan. Masalan, “Samarqand noni” birikmasi oddiy nutqda Samarqandda pishirilgan nonni, “Andijonning devzira oshi” Andijonda aynan devzira guruchidan tayyorlangan yegulikni, “Qo‘qon pichog‘i” esa Qo‘qonda tayyorlangan pichoqni anglatgan. Bunday holatda birliklarning denotati (D) real predmet – non, osh, pichoq, atlas yoki adras bo‘lsa, signifikati (S) esa ularning ma’lum geografik hududga mansubligi haqidagi tushuncha hisoblanadi. Belgisi (B) esa ushbu tushunchani ifodalovchi lisoniy shakl – "**Samarqand noni**", "**Qo‘qon pichog‘i**", "**Marg‘ilon atlasi**" kabi nominativ birliklardir.

Bizga qiziq bo‘lgan yana bir jihat shundaki, geografik ko‘rsatkich sifatida davlat ro‘yxatidan o‘tkazilgandan so‘ng ushbu birliklarning signifikativ mazmuni kengayishidir. Endilikda ular shunchaki muayyan hududda ishlab chiqarilgan mahsulotni anglatmaydi, ayni paytda sifati, obro‘si, tarixiy an’anasi va o‘ziga xos xususiyatlari aynan shu geografik hudud bilan bog‘liq bo‘lgan, huquqiy muhofaza ostidagi mahsulotni ifodalaydi. Demak, denotat o‘zgarishsiz qolgan bo‘lsa-da, signifikat yangi semalar bilan boyiydi. Natijada lisoniy belgi ham quyidagi yangi kommunikativ vazifani bajarishga o‘tadi:



Tahlilga olingan birliklarda semantik transformatsiya aynan signifikat sathida sodir bo‘lganini ko‘rsatmoqda. Lisoniy shakl deyarli o‘zgarmagan, lekin u ifodalayotgan tushuncha yangi mazmun bilan to‘ldirildi. Natijada oddiy erkin so‘z birikmasi terminlashgan nominativ birlikka aylandi. Bu esa V.N. Teliya tomonidan tavsiflangan ikkilamchi leksik nominatsiyaning amaliy ko‘rinishi hisoblanadi.

Tilshunos olim A.Nurmonovning ta’kidlashicha, “... borliqda har qanday lisoniy belgi kommunikatsiyada reallashadi, ya’ni kishilar o‘rtasidagi aloqa-aralashuvda muayyan axborot (tushuncha) berish uchun qo‘llanadi[10]”. Mazkur nazariy qarash geografik ko‘rsatkichlarni ifodalovchi nominativ birliklar misolida ham o‘z tasdig‘ini topadi. Ular kundalik nutqda mahsulot nomi sifatida, shu bilan birga, huquqiy, iqtisodiy va marketing diskurslarida ham maxsus termin sifatida faol qo‘llanilmoqda. Bir vaqtning o‘zida ko‘pqirrali kompleks lisoniy belgi maqomini egallagan deya olamiz. Ahamiyatli jihati shundaki, bu birliklarda toponim denotativ ma’nodan tashqari konnotativ ma’no ham kasb etib, sifat, an’ana va autentiklik (asl kelib chiqish va o‘ziga xoslik)[11] ramziga aylanadi. Pragmatik va marketing signali sifatida alohida ahamiyatga ega.

Quyidagi jadvalda o‘zbek tilida faol bo‘lgan milliy geografik ko‘rsatkichlar va ularning tasviri keltirilgan:

Hudud nomi	Mahsulot tasviri	Geografik ko‘rsatkich
Andijon		devzira osh

[10]Нурмонов А. Танланган асарлар. 3 жилдлик, 1-жилд, – Тошкент: Akademnashr. – 28-б.
[11] https://uz.wikipedia.org/wiki/Autentik. Murojaat sanasi: 2. 06. 2026.

Samarqand		non
G‘ijduvon		shashlik
Marg‘ilon		adras
Qo‘qon		pichoq
Parkent		uzum
Quva		anor

Ushbu tasvirda e’tibor beradigan bir jihat bor. Tahliliy kuzatishlar shuni ko‘rsatadiki, jadvalda keltirilgan leksik birliklar alohida lisoniy element sifatida qaralganda, faqatgina birlamchi nominativ (denotativ) vazifani bajaradi va neytral semantik maydonni shakllantiradi. Biroq mazkur leksikaga lisoniy va hududiy komponent (geografik ko‘rsatkich) integratsiya qilinganda, so‘zning semantik strukturasi sifat jihatidan transformatsiyaga uchraydi. Natijada uning konseptual hajmi shunchaki moddiy predmetni ifodalash (nominatsiya) doirasidan chiqib, muayyan etnomadaniy makon bilan bog‘liq bo‘lgan lingvomadaniy obraz va milliy-madaniy konnotatsiyani reallashtirishga xizmat qiladi. Zero, xalqaro kontekstda "osh", "anor" yoki "non" tushunchalari umumiy xarakterga ega universal denotatlar hisoblansa-da, ularning muayyan hududiy-geografik mikrotoponimlar bilan bog‘lanishi ushbu birliklarni oddiy tushunchadan milliy etnosning o‘ziga xos madaniy kodini tashuvchi lingvokulturemaga aylantiradi.

“Diskurs” atamasi ma’no jihatidan “matn”ga yaqin, ammo diskurs linvistik muloqotning dinamik, vaqt bo‘yicha yuzaga keladigan xarakterini namoyon qiladi[12]. Diskurs bajarayotgan kommunikativ vazifasi jihatdan tizimlashgan va

[12] Raupova L. R., Normurodova N. Z., Khursanov N. I. Discourse: Pragmatic Features in its Expression in Literary Works. In International Conference “Uzbek Language Development and International Cooperation, 2021. – No. 01. – P. 21-32.; Раупова Л.Р. Қўшма гап дискурснинг таркибий қисми сифатида. Монография. – Тошкент, 2021. – 192 б.

muloqot vaziyatiga moslashgan nutqiy qurilmadir. Shakl va vazifa jihatidan muvofiqlashuv diskursni boshqa birliklardan farqlash imkonini beradi[13].

Mashxur ingliz olimi T.A. van Deyk diskurs terminini ta'riflar ekan, uning keng ma'noda nutqiy jarayonda verbal va noverbal vositalar yordamida yuzaga chikuvchi suzlovchi xamda tinglovchi urtasidagi uzaro munozara ekanligini ta'kidlaydi. Tor ma'noda esa kommunikativ jarayonning tugallangan yoki davom etayotgan "xosila"si, ya'ni ogzaki yoki yozma shakldagi kontekst (nutk) ekanligini uqtiradi[14]. Ushbu yondashuv geografik koʻrsatkich tarkibidagi geografik terminlarga tatbiq etilganda, ular dastlab hudud nomini, soʻngra esa oʻsha hududning tabiiy-geografik sharoiti, tarixiy tajribasi, mahalliy ishlab chiqarish an'analari, madaniy merosi va mahsulot sifati haqidagi bilimlarni ham kommunikativ tarzda uzatadi. Shu sababli geografik termin diskurs doirasida oddiy toponimdan koʻra joyning oʻziga xosligini ifodalovchi lingvomadaniy belgi sifatida namoyon boʻladi.

Tilshunos olima G.Toirova talqinicha, diskurs murakkab sistema va u quyidagi tarkibiy kismlarga ajraladi: 1) diskurs jarayoni ishtirokchilari; 2) diskurs vositasi boʻlgan umumiy til, lisoniy verbal omillar; 3) diskurs uchun umumiy boʻlgan noverbal va fonatsion omillar; 4) diskursiv maqsad; 5) diskursiv holat[15]. G.Toirova tomonidan ajratilgan diskursning tarkibiy qismlari ham geografik koʻrsatkich tarkibidagi geografik terminning tabiatini izohlashga xizmat qiladi. Diskurs ishtirokchilari *(ishlab chiqaruvchi, iste'molchi, huquqiy institutlar va mutaxassislar)* geografik terminni turli kommunikativ maqsadlarda qoʻllaydilar. Verbal omillar geografik terminning *huquqiy hujjatlar, reklama matnlari va markirovkalarda* ifodalanishini ta'minlasa, noverbal omillar mahsulot *yorligʻi, ramzlar, logotiplar va hududga xos tasvirlar* orqali uning mazmunini toʻldiradi. Diskursiv maqsad esa geografik termin vositasida mahsulotning haqiqiy kelib chiqishini tasdiqlash, uning oʻziga xos sifat xususiyatlarini asoslash hamda iste'molchida ishonch hosil qilishdan iborat boʻladi.

Jumladan, Oʻzbekiston va MDH davlatlari segmentidagi ommaviy virtual kanallarda Gruziyaning "Borjomi" tabiiy-shifobaxsh suvi qatnashgan jami postlar soni 100 000 dan oshadi.



Masalan, ijtimoiy tarmoqdan olingan quyidagi misolga e'tibor qarataylik.

Borjomi" mineral suvi sizni gastronomik sayohatga taklif qiladi.

Gruziya mineral suvi "Borjomi" yangi kommunikatsiya kampaniyasini ishga tushirmoqda va bizni gastronomik sayohatga chorlaydi.

"Oching, rohatlaning, yengillikni his eting." – bu ***Borjomi*** *brendining yangi shiori boʻlib, asosiy kommunikatsiya yoʻnalishini rivojlantirdi va 135 yildan beri davom etayotgan an'anani eslatdi.*

Yangi kampaniya gruzin mineral suvi har qanday oshpazlik tajribaning ajralmas qismi ekanini ta'kidlaydi. Borjomi bilan har qanday taom yengil va yanada yoqimli boʻladi.

Mazkur matn geografik koʻrsatkich tarkibidagi "Borjomi" geografik terminining diskursiv imkoniyatlarini yaqqol namoyon etadi. Bir qarashda "Borjomi" mineral suv nomi sifatida qoʻllangandek anglashiladi. Yuqorida keltirganimiz kabi diskurs doirasida u endi oddiy geografik nom yoki tovar belgisi vazifasidan iste'molchida assotsiatsiyalarni uygʻotuvchi koʻp qatlamli kommunikativ-kognitiv bilimlar majmuasiga aylandi.

Avvalo, matn boshidagi "Gruziya mineral suvi 'Borjomi" birikmasi mahsulot kelib chiqishida muhim hisoblangan joyini koʻrsatmoqda. Biroq diskursning keyingi rivojida "Borjomi" geografik termini endi Gruziyaning tabiiy mineral manbalari, togʻli hududlari, mineral suv sifati, uzoq yillik ishlab chiqarish tajribasi va milliy an'analari bilan bogʻliq konseptual bilimlarni faollashtiradi. Geografik terminni inson ongida geografik hudud haqidagi ensiklopedik bilimlarni yuzaga chiqaruvchi diskursiv vosita deya oʻrganishimiz mukin ekan.

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[13] Thornborrow J. Deborah Schiffrin, Approaches to discourse. Cambridge MA – Oxford: Blackwell, 1994. – P. 470. Journal of Linguistics, 31(1), 1995. – P. 193 – 194.; Сафаров Ш. Нутқ лингвистикасининг текширув обекти нимадан иборат// "Нутқ лингвистикаси" мавзуидаги халқаро илмий-назарий конференция материаллари. – Самарқанд, 2006. – Б. 4.

[14]

[15] Тоирова Г. Прагмалингвистика - Т., 2016, - 10.

Matnda *"Oching, rohatlaning, yengillikni his eting"* shiori hamda *"135 yildan beri davom etayotgan an'ana"* iborasi geografik terminning pragmatik salohiyatini kuchaytiradi. Bu yerda "Borjomi" termini tarixiy davomiylik, ishonchlilik va sifat ramzi sifatida talqin qilinishga zamin yaratmoqda

Shuningdek, "Borjomi bilan har qanday taom yengil va yanada yoqimli boʻladi" jumlasida geografik termin mahsulotning funksional xususiyatlarini ifodalovchi kommunikativ markaz vazifasini bajaradi. Bu yerda "Borjomi" nafaqat mineral suvni, balki sogʻlom turmush tarzi, gastronomik madaniyat va yuqori sifat bilan bogʻliq qadriyatlarni ham ifodalaydi. Shu tariqa geografik termin oʻzining toponimik ma'nosidan chiqib, ijobiy emotsional va madaniy konnotatsiyalarni oʻzida mujassamlashtirgan diskursiv belgiga aylanadi.

Diskurs nazariyasiga asoslanganimizda, ushbu matnda T.A. van Deyk ta'kidlagan kommunikativ jarayonning barcha elementlari kuzatiladi:

a) *ishlab chiqaruvchi reklama matni orqali iste'molchiga murojaat qiladi*;

b) *geografik termin esa verbal vosita sifatida mahsulotning geografik kelib chiqishi, sifati va madaniy qadriyatlari haqidagi axborotni uzatadi.*

G. Toirova qayd etgan diskursiv maqsad ham aynan shu misolda yaqqol namoyon boʻladi, ya'ni geografik termin iste'molchida mahsulotga nisbatan ishonch hosil qilish, uni boshqa mineral suvlardan ajratib koʻrsatish hamda xarid qilish motivatsiyasini kuchaytirishga xizmat qiladi.

Demak, mazkur reklama matnida "Borjomi" geografik koʻrsatkich tarkibidagi geografik termin sifatida hududni identifikatsiya qiladi shuningdek, Gruziyaning tabiiy resurslari, tarixiy an'analari, mahsulot sifati va gastronomik madaniyatini birlashtiruvchi diskursiv markaz vazifasini bajaradi. Uning semantik mazmuni matnning kommunikativ maqsadi va pragmatik yoʻnalishi bilan uygʻunlashgan holda shakllanib, geografik koʻrsatkichning iste'molchi ongidagi qiymatini yanada mustahkamlaydi.

Xulosa qilib aytganda, geografik koʻrsatkichlar tarkibidagi geografik terminlarda nominativ vazifa birinchi planga chiqmaydi aksincha, eng muhimi ular orqali ifodalanadigan ikkilamchi nominatsiyalar, terminning signifikativ tomoni orqali anglashiladigan madaniy oʻziga xosliklardir.

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“ALPOMISH” DOSTONIDA PRETSEDENT NOMLARNING LINGVOPOETIK VA LINGVOKULTUROLOGIK XUSUSIYATLARI

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Annotatsiya: *Maqolada “Alpomish” dostonidagi pretsedent nomlarning kontekstual semantikasi va lingvopoetik vazifalari tahlil qilinadi. Material Rustam, Yusuf, Kuntug‘mish, Layli-Majnun, Ali va Ayub nomlari qatnashgan poetik kontekstlardan iborat. Kontekstual, semantik-komponent, lingvopoetik va lingvokulturologik tahlil nomlarning epik-qahramonlik, diniy-axloqiy va mumtoz adabiy xotira qatlamlarini faollashtirishini ko‘rsatdi. Rustam va Ayubda yadro sema nisbatan barqaror, Yusufda esa kontekstga ko‘ra jamol yoki zindon – sinov – najot semalari faollashadi. Qiyosiy va sifatlovchi konstruksiyalar nomning muayyan madaniy belgisini ajratib, baholashni kuchaytiradi.*

Kalit so‘zlar: *pretsedent nom, “Alpomish”, madaniy xotira, lingvopoetika, kontekstual semantika, intertekstuallik, aksiologik baholash.*

ЛИНГВОПОЭТИЧЕСКИЕ И ЛИНГВОКУЛЬТУРОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ПРЕЦЕДЕНТНЫХ ИМЁН В ДАСТАНЕ «АЛПОМИШ»

Аннотация: *В статье анализируются контекстуальная семантика и лингвопоэтические функции прецедентных имён в эпосе «Алпомиш». Материал составили контексты с именами Рустам, Юсуф, Кунтугмиш, Лейли-Меджнун, Али и Аюб. Контекстуальный, семантико-компонентный, лингвопоэтический и лингвокультурологический анализ выявил их связь с эпико-героической, религиозно-нравственной и классической литературной памятью. В именах Рустам и Аюб основная оценочная сема относительно устойчива, тогда как Юсуф в разных контекстах актуализирует красоту либо заключение, испытание и ожидание освобождения. Сравнительные и атрибутивные конструкции усиливают конкретный культурный признак имени.*

Ключевые слова: *прецедентное имя, «Алпомиш», культурная память, лингвопоэтика, контекстуальная семантика, интертекстуальность, аксиологическая оценка.*

LINGUOPOETIC AND LINGUOCULTURAL FEATURES OF PRECEDENT NAMES IN THE EPIC “ALPOMISH”

Abstract: *The article examines the contextual semantics and linguopoetic functions of precedent names in the Uzbek epic Alpomish. The material comprises contexts containing Rustam, Yusuf, Kuntugmish, Layli-Majnun, Ali, and Ayub. Contextual, semantic-componential, linguopoetic, and linguocultural analyses show that these names activate epic-heroic, religious-ethical, and classical literary memory. Rustam and Ayub retain relatively stable evaluative meanings, whereas Yusuf activates beauty in one context and imprisonment, ordeal, and expected deliverance in another. Comparative and attributive constructions foreground particular cultural features and intensify evaluation.*

Keywords: *precedent name, Alpomish, cultural memory, linguopoetics, contextual semantics, intertextuality, axiological evaluation.*

KIRISH

Pretsedent nom badiiy matnda atoqli otning nominativ vazifasi bilan cheklanmaydi. Lingvomadaniy jamoa xotirasida muayyan shaxs, obraz, matn yoki vaziyat bilan barqaror bog‘langan nom konkret kontekstda shu nom ortidagi madaniy bilim va baholash belgilarini faollashtiradi [1, 2]. Shu sabab pretsedent nom qahramon yoki vaziyatni batafsil tavsiflamasdan, avvaldan tanish madaniy mezon bilan qiyoslash imkonini beradi.

Maqolada milliy pretsedent nom termini nomning o‘zbek lingvomadaniy xotirasida tanilishi va baholovchi etalon sifatida ishlashiga daxldor ma’noda qo‘llanadi. Shu nuqtayi nazardan “Alpomish” tarkibidagi epik, diniy va mumtoz

adabiy manbalarga mansub nomlar turli madaniy qatlamlardan kelgan boʻlsa-da, doston auditoriyasi uchun tanish semantik-assotsiativ fondga tayanadi.

Tadqiqotning markaziy muammosi pretsedent nomning madaniy xotirada saqlangan umumiy mazmuni bilan uning konkret epik kontekstdagi faolligi oʻrtasidagi munosabatni aniqlashdir. Maqsad Rustam / Rustami Doston, Yusuf, Kuntugʻmish, Layli-Majnun, Ali / Hazrat Ali va Ayub nomlarining madaniy manbasi, kontekstual semantikasi hamda lingvopoetik funksiyasini belgilashdan iborat.

ADABIYOTLAR TAHLILI

Pretsedent nomlarning lingvokulturologik va lingvopoetik imkoniyatlari oʻzbek tilshunosligida ham oʻrganilgan. D.Andaniyazova ularning allyuziv va metaforik qoʻllanishiga e'tibor qaratadi [3]. Keyingi tadqiqotlarda pretsedent nomlarning madaniy kodlar bilan aloqasi [4], shuningdek, ularni talqin qilishda verbal kontekst va lisoniy markerlarni hisobga olish zarurligi asoslangan [5]. Bu qarashlar nom semantikasini kontekstda muayyan belgisi oldingi planga chiqadigan madaniy-semantik tuzilma sifatida tekshirishga asos beradi.

H.Siuta va hammualliflar pretsedent nomda mazmun hosil qiluvchi asosiy semantik belgi saqlanishi, yangi verbal qurshov esa uning qoʻshimcha konnotativ imkoniyatlarini faollashtirishini koʻrsatadilar [7]. K. Yan pretsedent nomning milliy-madaniy mazmunini assotsiativ bilim, lugʻaviy ma'lumot va real diskurs kontekstlarini birlashtirgan holda oʻrganadi [9].

"Alpomish" bilan bogʻliq material pretsedentlikning yana bir muhim jihatini ochadi. Dostonning bosh qahramoni asar ichida konkret personaj nomi boʻlsa, keyingi nutqiy qoʻllanishlarda baholovchi etalon maqomini oladi. G.M. Ismailov oʻzbek tilida Alpomishday yigit, Alpomishday mard shakllarini pretsedent antroponim bilan bogʻliq qoʻllanishlar qatorida keltiradi. T.Qahhorning *"Alpomishday bir yigit gʻamgin boqib turar jim"* misrasi ham nomning konkret epik qahramondan boshqa shaxsni tavsiflovchi madaniy mezonga koʻchganini koʻrsatadi [10]. Ismailov manbasida bu misollar aynan Alpomish pretsedent antroponimi bilan bogʻlangan.

Qiyosiy jihatdan shu hodisa qozoq materialida ham kuzatiladi. A.Sh. Kappassova va hammualliflar Alpamys Batyr nomining pretsedent tuzilishini differensial yadro va periferik qatlam asosida tavsiflaydilar; uning asosiy belgilariga botirlik, qahramonlik va jasorat kiritilgan [8]. Maqoladagi sxemada ham Alpamys nomining yadrosi "batyr", "hero", "bold, courageous" belgilaridan tashkil topgani koʻrsatilgan. Zamonaviy qozoq diskursida bu nom jasorat va botirlik ramzi sifatida qoʻllanadi. Demak, Alpomish/Alpamys nomining pretsedentligi doston matni bilan chegaralanmaydi; u turkiy lingvomadaniy makonda qahramonlikni baholashga xizmat qiluvchi tanish etalon sifatida ham yashaydi.

Ushbu tadqiqotlarda pretsedent nomning madaniy xotira bilan bogʻliqligi turli metodologik nuqtayi nazardan asoslangan. "Alpomish" materiali esa masalani konkret verbal qurshov doirasida aniqlashtirishga imkon beradi. Nom bilan bogʻlangan semantik imkoniyatlardan ayni epizodda qaysi biri tanlanadi va bu tanlov qaysi lisoniy shakl orqali yuzaga chiqadi? Shu sabab maqolada pretsedent mazmunning mavjudligini qayta tavsiflashdan koʻra, uning epik kontekstda semantik tanlanishi va poetik baholashni qanday tashkil etishi markazga qoʻyildi.

MATERIAL VA METODLAR

Tadqiqot materiali Fozil Yoʻldosh oʻgʻli variantidagi "Alpomish" dostonida uchraydigan Rustam / Rustami Doston, Yusuf, Kuntugʻmish, Layli–Majnun, Ali / Hazrat Ali va Ayub nomlari qatnashgan poetik kontekstlardan tashkil topdi [6]. Material tanlashda nomning oldindan mavjud epik, diniy yoki adabiy obraz va baholash mezoniga murojaat qilishi asosiy mezon boʻldi [1, 2].

Tahlil birligi sifatida pretsedent semani aniqlash uchun yetarli boʻlgan minimal matniy kontekst olindi. Masalan, *Yusuf tal'atli* [6, B. 97] va *Qutulmadim Yusuf kabi zindondan* [6, B. 333] bir nom bilan bogʻliq turli semantik qirralarni yuzaga chiqaruvchi mustaqil kontekstlar sifatida tekshirildi.

Kontekstual tahlil nomning konkret vaziyatdagi faol semasini, komponent-semantik tahlil mazkur semani ajratib turuvchi belgilarni, lingvopoetik tahlil esa qiyos, sifatlash, gradatsiya va boshqa konstruksiyalarning baholashdagi rolini aniqlashga xizmat qildi. Lingvokulturologik tahlil nomlarning epik, diniy va adabiy xotira bilan aloqasini belgilashda qoʻllandi [1, 3, 4]. Birliklar madaniy manba - kontekstual faol sema – lisoniy shakl – lingvopoetik funksiya munosabati asosida tizimlashtirildi.

NATIJALAR

Tahlil pretsedent nomlarning madaniy manbasi, kontekstda faollashgan semasi va poetik vazifasi jihatidan farqlanishini koʻrsatdi. Materialda epik-qahramonlik, diniy-axloqiy, diniy-qahramonlik hamda Sharq mumtoz adabiy xotirasi bilan bogʻlangan nomlar ajralib turadi.

Rustam / Rustami Doston epik-qahramonlik xotirasining eng faol birliklaridan biridir. *"Alplarning boshligʻi Rustami Doston edi, oxiri bu – Alpomish alp boʻlsin"* parchasida Rustam alplik mezonini belgilaydi [6, B.15]. *"Yusuf tal'atli, Rustam sifatli"* hamda *"Jasading bor Rustamdan ham ziyoda"* shakllarida esa nom jismoniy qudrat va bahodirlik bilan bogʻliq etalon vazifasini oladi [6, B.97]. Kontekstlar oʻzgarsa-da, Rustam nomining qahramonlik yadrosi saqlanadi.

Kuntug‘mishlarga mengzadim [6, B.101] shaklida -lar ko‘plik ko‘rsatkichi nomning individual qahramonga daxldor ma’nosini kengaytirib, uni **epik bahodirlikning umumlashgan mezoni**ga yaqinlashtiradi. *Mengzamoq* fe’li bilan birikkan bu shakl Alpomish qiyofasini Kuntug‘mish bilan oddiy o‘xshatishdan ko‘ra kengroq intertekstual bahoga olib chiqadi.

Yusuf nomi bilan bog‘liq semantik belgilardan qaysi birining faollashishi bevosita verbal kontekstga bog‘liq.. *“Yusuf tal’atli”* birikmasidagi *tal’atli* komponent Yusuf haqidagi madaniy xotiraning husn va qiyofa bilan bog‘liq qirrasini faollashtiradi [6, B.97]. *“Qutulmadim Yusuf kabi zindondan”* misrasida esa nom Yusuf qissasidagi zindon voqeasi bilan bog‘lanadi [6, B.333]. Bu yerda *kabi* qiyos vositasiga *qutulmadim* inkor shaklining qo‘shilishi alohida ahamiyat kasb etadi, Yusufning zindondan xalos bo‘lishi ma’lum pretsedent vaziyat sifatida esga tushiriladi, Alpomishning esa hali qutulmagani shu modelga qarshi qo‘yiladi. Nom tutqunlik va sinovni eslatish bilangina cheklanmay, kutilayotgan najotning yashirin mezoniga ham aylanadi.

Ali / Hazrat Ali nomida diniy-qahramonlik mazmuni ustun. *“Aliday sher”* qiyosi mardlik va jangovar qudratni, *“Yo madad tilayman Hazrat Alidan”* murojaati esa homiylik va muqaddas madad semasini faollashtiradi [6, B.136]. Demak, nomning qahramonlik yadrosi saqlanadi, biroq konkret nutqiy qurilish uning boshqa funksional qirrasini oldingi planga chiqaradi. Ayub nomi esa *“Baloga sabr etgan hazrati Ayub”* shaklida sabr va bardoshning diniy-axloqiy etalonini belgilaydi [6, B.136].

Layli-Majnun qo‘shaloq nomi Sharq mumtoz adabiy xotirasini faollashtiradi. Barchinning *“Layli-Majnun edi jahonga ustod, / Falakning qavlidan dod bilan bedod”* misralarida pretsedent juftlik ishqning o‘zidan ko‘ra ayriliq, dard va falak zarbasi bilan bog‘liq fojiali fonni kuchaytiradi [6, B.293]. Qo‘shaloq nom ikki alohida personajga murojaat qilmay, mumtoz adabiy xotirada yaxlitlashgan ishqiy-fojiaviy syujetni ixcham holda matnga olib kiradi.

Pretsedent semaning lingvopoetik faolligi ayniqsa nomni qurshagan grammatik va leksik vositalarda ochiladi. *Yusuf tal’atli, Rustam sifatli* parallel konstruksiyasida ikki pretsedent nom bir xil sintaktik qolipda keladi, biroq ularning semantik yo‘nalishi bir xil emas. *Tal’atli* Yusufning tashqi qiyofaga daxldor belgisini bevosita tanlaydi. S*ifatli* esa semantik jihatdan umumiyroq bo‘lib, Rustam nomining pretsedent yadrosi va epik kontekst orqali bahodirlik fazilatiga to‘ldiriladi. Parallelizm shu tariqa Alpomish portretining estetik va qahramonlik qirralarini yonma-yon joylashtiradi.

“Jasading bor Rustamdan ham ziyoda” konstruksiyasida chiqish kelishigi, *ham* yuklamasi va *ziyoda* komponenti qiyosni gradatsion bahoga aylantiradi [6, B. 97]. Rustam bu yerda bahodirlikning tanilgan yuqori me’yori. Alpomishning undan ham “ziyoda” deb baholanishi pretsedent etalonni qahramon fazilatini o‘lchovchi **aksiologik mezon** vazifasini bajaradi.

“Aliday sher” shaklida -day qiyos ko‘rsatkichi Ali nomining diniy-qahramonlik semasini *sher* leksemasidagi jasorat va kuch konnotatsiyasi bilan birlashtiradi [6, B.136]. Bu yerda pretsedent qiyos va zoomorf poetik baho bir nuqtada tutashib, mardlik belgisini kuchaytiradi.

Kuntug‘mishlarga mengzadim konstruksiyasida esa ko‘plik shakli va *mengzamoq* fe’li muhim. -lar nomni to‘liq turdosh otga aylantirmaydi, biroq individual Kuntug‘mish obrazini tipik epik qahramonlik mezoniga yaqinlashtiradi. Shu sabab qiyos bir personaj bilan tashqi o‘xshashlikni qayd etishdan ko‘ra kengroq intertekstual baho hosil qiladi.

Asosiy pretsedent konstruksiyalarda lisoniy shakl, faol sema va lingvopoetik vazifa o‘rtasidagi munosabat 1-jadvalda umumlashtirildi.

Jadval 1

“Alpomish” dostonidagi pretsedent konstruksiyalarning lisoniy-semantik va lingvopoetik tavsifi

Pretsedent konstruksiya	Faollashtiruvchi lisoniy vosita	Faollashgan sema	Lingvopoetik vazifa	Manba
Yusuf tal’atli	tal’atli sifatlovchisi	jamol, qiyofa mukammalligi	portretning estetik bahosini aniqlashtirish	[6, B.97]
Rustam sifatli	sifatli + Rustamning pretsedent yadrosi	bahodirlik, jismoniy qudrat	qahramonlik tavsifini madaniy etalon bilan bog‘lash	[6, B.97]
Jasading bor Rustamdan ham ziyoda	-dan + ham + ziyoda	bahodirlik etalonidan yuqorilik	gradatsion-aksiologik baho yaratish	[6, B.97]
Qutulmadim Yusuf kabi zindondan	kabi + qutulmadim + zindon	tutqunlik, sinov, kutilayotgan najot	pretsedent vaziyatni qiyosiy-qarama-qarshi fonda faollashtirish	[6, B.333]
Aliday sher	-day + sher	mardlik, jangovar qudrat	pretsedent qiyos va zoomorf bahoni kuchaytirish	[6, B.136]

Kuntug‘mishlarga mengzadim	-lar + mengzamoq	tipik epik qahramonlik	individual nomni umumlashgan epik mezonga yaqinlashtirish	[6, B.101]

MUHOKAMA

Jadvaldan ko‘rinadiki, pretsedentlikni faqat nomning tanilganligi bilan izohlash yetarli emas. Uning konkret poetik vazifasi nomni qurshagan til vositalari bilan belgilanadi. Rustamda yadro sema turli konstruksiyalarda saqlanib qolsa, Yusufda lisoniy qurshov pretsedent xotiraning turli segmentlarini tanlaydi. Ali nomida esa yadro o‘zgarmagan holda jangovar bahodan diniy madadga funksional siljish yuz beradi.

Bu natija H.Siuta va hammualliflarning pretsedent nom asosiy arxisemasini saqlagan holda yangi kontekstda qo‘shimcha konnotativ qirralar bilan faollashishi haqidagi qarashi bilan tutashadi [7]. “Alpomish” materialida esa kontekstning roli ayrim hollarda yanada aniq ko‘rinadi: u faqat yadro semaga qo‘shimcha ma’no yuklamaydi, balki nom bilan bog‘liq keng madaniy xotiraning qaysi segmenti konkret epizodga kirishini ham belgilaydi.

Kappassova va hammualliflar “Alpamys” kabi folklor nomlarining keyingi media diskursida pretsedent nom maqomida ishlashini ko‘rsatadilar [8]. Mazkur maqoladagi material esa jarayonning boshqa yo‘nalishini ochadi: “Alpomish”ning o‘ziga undan oldin shakllangan epik, diniy va mumtoz adabiy xotira Rustam, Yusuf, Kuntug‘mish, Ali, Ayub va Layli–Majnun singari nomlar orqali kiradi. Shu sabab ushbu tadqiqotning bevosita natijasi folklor qahramonining keyingi pretsedentlashuvini emas, **tayyor pretsedent nomning epik matnda qayta semantik faollashuvini** tavsiflash bilan bog‘liq.

XULOSA

“Alpomish”dagi Rustam, Yusuf, Kuntug‘mish, Layli-Majnun, Ali va Ayub nomlari epik-qahramonlik, diniy-axloqiy va mumtoz adabiy xotira qatlamlarini matnga olib kirib, qahramon hamda vaziyatni tayyor madaniy mezonlar asosida baholaydi. Rustam va Ayubda yadro sema nisbatan barqaror, Yusufda esa kontekstual o‘zgarish kuzatiladi.

Qiyosiy va sifatlovchi konstruksiyalar nom bilan bog‘langan semalardan muayyan birini ajratib, baholash yo‘nalishini belgilaydi. Shu asosda pretsedent nomning epik matndagi faoliyati madaniy xotira – kontekst – lisoniy konstruksiya – baholash munosabati orqali izohlandi. Tadqiqot Fozil Yo‘ldosh o‘g‘li varianti bilan chegaralangan. Boshqa turkiy versiyalarni qiyoslash ushbu modelning variantlararo imkoniyatlarini aniqlashga yordam beradi.

Mazkur xulosa pretsedent nomlarni faqat intertekstual ishora yoki tayyor ramz doirasida emas, kontekstda semantik jihatdan tanlanadigan va baholashni tashkil etadigan dinamik lingvomadaniy birlik sifatida o‘rganish zarurligini ko‘rsatadi.

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TILSHUNOSLIKDA SUN’IY INTELLEKT INTEGRATSIYASINING AFZALLIKLARI

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Annotatsiya: *Mazkur maqolada tilshunoslikda sun’iy intellekt integratsiyasi afzalliklari tahlil qilinadi. Tadqiqotda tilni qayta ishlash, korpus lingvistikasi, mashinaviy tarjima, nutq texnologiyalari va generativ sun’iy intellektning tilshunoslikdagi o‘rni yoritiladi. Sun’iy intellektning katta hajmdagi lingvistik ma’lumotlarni tezkor tahlil qilish, ilmiy tadqiqotlar samaradorligini oshirish, ko‘p tilli modellarni rivojlantirish hamda kam resursli tillarni raqamlashtirishdagi imkoniyatlari ilmiy manbalar asosida ko‘rib chiqiladi.*

Kalit so‘zlar: *sun’iy intellekt, tilshunoslik, tabiiy tilni qayta ishlash, korpus lingvistikasi, mashinaviy tarjima, generativ sun’iy intellekt, katta til modellari, nutq texnologiyalari, raqamli tilshunoslik.*

ПРЕИМУЩЕСТВА ИНТЕГРАЦИИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ЛИНГВИСТИКУ

Аннотация: *В данной статье анализируются преимущества интеграции искусственного интеллекта в лингвистику. В исследовании рассматривается роль обработки языка, корпусной лингвистики, машинного перевода, речевых технологий и генеративного искусственного интеллекта в лингвистических исследованиях.*

Ключевые слова: *искусственный интеллект, лингвистика, обработка естественного языка, корпусная лингвистика, машинный перевод, генеративный искусственный интеллект, большие языковые модели, речевые технологии, цифровая лингвистика.*

ADVANTAGES OF ARTIFICIAL INTELLIGENCE INTEGRATION IN LINGUISTICS

Abstract: *This article analyzes the theoretical and practical advantages of integrating artificial intelligence into linguistics. The study examines the role of natural language processing, corpus linguistics, machine translation, speech technologies, and generative artificial intelligence in linguistic research. Particular attention is paid to the ability of AI to process large-scale linguistic data rapidly, improve the efficiency of scientific research, develop multilingual models, and support the digitalization of low-resource languages.*

Keywords: *artificial intelligence, linguistics, natural language processing, corpus linguistics, machine translation, generative artificial intelligence, large language models, speech technologies, digital linguistics.*

Kirish

Raqamli texnologiyalarning jadal rivojlanishi va sun’iy intellekt (SI) texnologiyalarining turli fan sohalariga keng tatbiq etilishi tilshunoslik fanining rivojlanishida ham yangi bosqichni boshlab berdi. Tabiiy tilni qayta ishlash (Natural Language Processing – NLP), mashinaviy o‘rganish (Machine Learning – ML) hamda yirik til modellari (Large Language Models – LLM) asosida ishlab chiqilgan sun’iy intellekt tizimlari lingvistik tadqiqotlarni amalga oshirish, katta hajmdagi matnlar korpusini tahlil qilish, avtomatik tarjima, nutqni tanish va sintez qilish, matn yaratish hamda til o‘qitish jarayonlarini sezilarli darajada takomillashtirmoqda [3]. Natijada an’anaviy tilshunoslik metodlari raqamli texnologiyalar bilan uyg‘unlashib, tadqiqotlarning aniqligi, tezligi va ko‘lamini oshirishga xizmat qilmoqda.

Sun’iy intellektning tilshunoslikka integratsiyalashuvi nafaqat ilmiy izlanishlarning samaradorligini yuksaltirdi, balki til birliklarini avtomatik tahlil qilish, semantik va pragmatik munosabatlarni aniqlash, diskurs tahlili hamda ko‘p tilli ma’lumotlarni qayta ishlash imkoniyatlarini ham kengaytirdi. Ayniqsa, generativ sun’iy intellekt texnologiyalarining rivojlanishi ilmiy tadqiqotlar, tarjimashunoslik, korpus lingvistikasi va kompyuter lingvistikasida yangi metodologik yondashuvlarning shakllanishiga sabab bo‘lmoqda. Shu bilan birga, ushbu texnologiyalarni ilmiy faoliyatga joriy etish ma’lumotlar ishonchliligi, etik me’yorlarga rioya qilish va mualliflik masalalari kabi dolzarb muammolarni ham yuzaga keltirmoqda.

Mazkur maqolada tilshunoslikda sun’iy intellekt integratsiyasining asosiy afzalliklari, uning lingvistik tadqiqotlar samaradorligini oshirishdagi o‘rni hamda zamonaviy tilshunoslik rivojiga ko‘rsatayotgan ta’siri ilmiy manbalar asosida tahlil qilinadi.

Adabiyotlar tahlili

Tilshunoslikda sun’iy intellektni qo‘llash masalalari so‘nggi yillarda kompyuter lingvistikasi, tabiiy tilni qayta ishlash (Natural Language Processing – NLP) hamda hisoblash lingvistikasi yo‘nalishlarida keng tadqiq etilmoqda. Xususan, sun’iy intellektning tilni avtomatik tahlil qilish, semantik munosabatlarni aniqlash, matnlarni tasniflash va mashinali tarjima sifatini oshirishdagi o‘rni ko‘plab ilmiy ishlarda asoslab berilgan [2]. Tadqiqotchilar sun’iy intellektning katta hajmdagi lingvistik ma’lumotlarni qisqa vaqt ichida qayta ishlash imkoniyati tilshunoslik tadqiqotlarining samaradorligini sezilarli darajada oshirishini ta’kidlaydilar.

Sun’iy intellekt asosidagi yirik til modellari (Large Language Models) tilni tushunish va matn yaratish jarayonida yangi bosqichni boshlab berdi. Jumladan, Braun va uning jamoasi tomonidan 2020 yilda ishlab chiqilgan GPT modeli hamda OpenAI tomonidan taqdim etilgan yangi avlod modellarining ilmiy va amaliy imkoniyatlari matn yaratish, tarjima, referatlash va lingvistik tahlil kabi vazifalarda yuqori natijalarni namoyon etgani qayd etilgan [8]. Bunday modellar til birliklari o‘rtasidagi murakkab semantik va pragmatik bog‘lanishlarni aniqlash orqali tilshunoslik tadqiqotlarini yangi metodologik asos bilan boyitmoqda.

Tilshunoslikda sun’iy intellektning afzalliklari haqida Jeffri Xinton, Yoshua Benjio, Yan LeKun tomonidan ilgari surilgan chuqur o‘rganish (Deep Learning) konsepsiyasi ham muhim nazariy asoslardan biri hisoblanadi. Mazkur yondashuv tabiiy tilni qayta ishlash tizimlarining aniqligini sezilarli darajada oshirib, morfologik, sintaktik va semantik tahlillarni avtomatlashtirish imkoniyatini yaratdi [9]. Shuningdek, Bender va Ko‘llerlar (2020) sun’iy intellekt tizimlarining tilni qayta ishlashdagi yutuqlarini e’tirof etgan holda, ularning natijalarini lingvistik va semantik nuqtayi nazardan ehtiyotkorlik bilan baholash zarurligini ta’kidlaydilar [1]. Ushbu yondashuvlar sun’iy intellektni tilshunoslikka integratsiya qilish nafaqat tadqiqotlar samaradorligini oshirish, balki til hodisalarini chuqurroq tahlil qilish uchun ham keng imkoniyatlar yaratishini ko‘rsatadi.

Tadqiqot metodologiyasi

Mazkur maqolada tilshunoslikda sun’iy intellekt integratsiyasining afzalliklarini ilmiy jihatdan yoritish maqsadida deskriptiv-tahliliy metod qo‘llanildi. Ushbu metod asosida sun’iy intellektning tabiiy tilni qayta ishlash (Natural Language Processing), korpus tilshunosligi, mashinaviy tarjima, nutqni avtomatik tanish va matn generatsiyasi kabi yo‘nalishlardagi imkoniyatlari ilmiy manbalar asosida tavsiflandi va tahlil qilindi. Shuningdek, sun’iy intellektning lingvistik tadqiqotlar samaradorligini oshirishdagi o‘rni hamda uning amaliy ahamiyati zamonaviy ilmiy qarashlar asosida izohlandi.

Komparativ (qiyosiy) metod yordamida an’anaviy lingvistik tadqiqot usullari bilan sun’iy intellekt asosidagi yondashuvlarning imkoniyatlari o‘zaro taqqoslandi. Xususan, katta hajmdagi til korpuslarini qayta ishlash, semantik va sintaktik tahlilni avtomatlashtirish, mashinaviy tarjima hamda nutq texnologiyalarining samaradorligi qiyosiy jihatdan baholandi.

Bundan tashqari, ilmiy manbalarni tahlil qilish va tizimlashtirish metodi asosida sun’iy intellekt hamda tilshunoslik integratsiyasiga oid zamonaviy tadqiqotlar o‘rganildi. Xususan, Russell va Norvig, Jurafsky va Martin, Manning, Bender hamda boshqa olimlarning ilmiy ishlari umumlashtirilib, ularning nazariy qarashlari tadqiqotning metodologik asosini tashkil etdi.

Natijalar va ularning tahlili

Sun’iy intellekt (SI) texnologiyalarining jadal rivojlanishi XXI asrda deyarli barcha fan sohalariga, jumladan, tilshunoslikka ham sezilarli ta’sir ko‘rsatmoqda. Agar XX asrning ikkinchi yarmida kompyuter lingvistikasi asosan til birliklarini formal tavsiflash va avtomatik qayta ishlash masalalari bilan shug‘ullangan bo‘lsa, bugungi kunda generativ sun’iy intellekt, katta til modellari (Large Language Models – LLM), chuqur o‘rganish (Deep Learning) va neyron tarmoqlar til hodisalarini tahlil qilish, modellashtirish hamda yangi lingvistik bilimlarni yaratishda muhim vositaga aylandi. Zamonaviy tilshunoslikda sun’iy intellekt faqat texnik vosita emas, balki ilmiy tadqiqot metodologiyasini o‘zgartirayotgan innovatsion omil sifatida baholanmoqda.

Tilshunoslik va sun’iy intellekt o‘rtasidagi integratsiya tabiiy tilni qayta ishlash (Natural Language Processing – NLP) yo‘nalishining shakllanishiga asos bo‘ldi. NLP kompyuterlarga inson tilini tushunish, tahlil qilish, qayta ishlash va yaratish imkonini beruvchi fanlararo yo‘nalish bo‘lib, u lingvistika, matematika, informatika va sun’iy intellektning kesishgan nuqtasida rivojlanmoqda. Mazkur yo‘nalishning asosiy maqsadi inson va kompyuter o‘rtasidagi tabiiy tilda samarali muloqotni ta’minlashdan iborat. Bugungi kunda NLP mashinaviy tarjima, matnni avtomatik tahlil qilish, nutqni tanish, dialog tizimlari, avtomatik referatlash, hissiy tahlil va matn generatsiyasi kabi ko‘plab amaliy vazifalarni muvaffaqiyatli bajarishga xizmat qilmoqda.

So‘nggi yillarda generativ sun’iy intellektning rivojlanishi tilshunoslik tadqiqotlarida tub burilish yasadi. Xususan, Transformer arxitekturasi asosida yaratilgan GPT, Gemini, Claude, Llama kabi katta til modellari milliardlab matn birliklari

asosida oʻqitilib, grammatik jihatdan mukammal va mazmunan mantiqiy matnlarni yaratish imkoniyatiga ega boʻldi. Ushbu modellar sintaktik va semantik bogʻlanishlarni chuqur oʻzlashtirishi sababli ular nafaqat oddiy til vazifalarini, balki murakkab lingvistik tahlillarni ham bajarishga qodir ekanligi isbotlandi.

SI katta hajmdagi matnlarni avtomatik belgilash (annotation), morfologik tahlil qilish, sintaktik tizimlarni qurish hamda semantik munosabatlarni aniqlash kabi jarayonlarni sezilarli darajada tezlashtirmoqda. Kyurri, Makeneri va Bruksning ta'kidlashicha, generativ sun'iy intellekt lingvistikaning an'anaviy metodlarini inkor etmaydi, aksincha ularni yangi metodologik imkoniyatlar bilan boyitadi. Mualliflar SI va amaliy tilshunoslik oʻrtasida "moslashuv" (alignment) tamoyili muhim ekanini qayd etib, texnologik imkoniyatlar lingvistik nazariya bilan uygʻunlashgandagina yuqori natijalar berishini ta'kidlaydilar. Ayniqsa, korpus lingvistikasida avtomatik chastota tahlili, kollokatsiyalarni aniqlash, semantik tarmoqlarni qurish va diskurs tahlili kabi jarayonlarda SI vositalari tadqiqotchining imkoniyatlarini bir necha barobarga kengaytirmoqda.

Ikkinchi muhim afzallik lingvistik modellashtirish imkoniyatining kengayganligidir. An'anaviy statistik modellar koʻpincha cheklangan parametrlar asosida ishlagan boʻlsa, chuqur neyron tarmoqlar tilning murakkab va yashirin qonuniyatlarini ham aniqlay olmoqda. Bu esa semantik yaqinlik, kontekstual ma'no, koʻpma'nolilik va metaforik ifodalarni avtomatik aniqlash imkoniyatini yaratmoqda. Ayniqsa, Transformer arxitekturasi asosida ishlab chiqilgan modellar uzun sintaktik bogʻlanishlarni ham muvaffaqiyatli modellashtira olishi bilan oldingi avlod algoritmlaridan tubdan farq qiladi.

Sun'iy intellektning yana bir ustun jihati kam resursli tillar uchun yangi imkoniyatlar yaratishidir. Ilgari ingliz, xitoy yoki fransuz kabi katta korpuslarga ega tillar sun'iy intellekt tadqiqotlarida ustunlik qilgan boʻlsa, bugungi kunda tillararo oʻrganish, boshqa tillarga oʻkazish texnologiyalari oʻzbek, qozoq, qirgʻiz, uygʻur kabi kam resursli tillarni ham raqamli rivojlantirish imkonini bermoqda. Bu esa milliy tillarni saqlash, raqamlashtirish va ilmiy tadqiq qilishda muhim ahamiyat kasb etmoqda.

Soʻnggi ilmiy kuzatishlar shuni koʻrsatmoqdaki, sun'iy intellekt tilshunoslikni faqat avtomatlashtirish vositasi emas, balki yangi ilmiy bilimlarni yaratish platformasiga aylantirmoqda. Ilgari tadqiqotchi mavjud nazariyalarni tekshirgan boʻlsa, bugungi kunda SI millionlab matnlar asosida ilgari sezilmagan qonuniyatlarni aniqlab, yangi ilmiy gipotezalarni ilgari surishga yordam bermoqda. Shu sababli zamonaviy lingvistika sun'iy intellektni yordamchi texnologiya emas, balki ilmiy tadqiqotning strategik komponenti sifatida baholamoqda.

Sun'iy intellektning tilshunoslikdagi eng muhim qoʻllanilish sohalaridan biri tabiiy tilni qayta ishlash (Natural Language Processing – NLP) hisoblanadi. NLP inson tilining fonetik, morfologik, sintaktik, semantik va pragmatik xususiyatlarini kompyuter yordamida modellashtirishga xizmat qiladi. Soʻnggi yillarda chuqur oʻrganish (Deep Learning) va Transformer arxitekturasi asosidagi modellar NLP tizimlarining aniqligini sezilarli darajada oshirdi. Buning natijasida avtomatik matn tahlili, axborotni ajratib olish, savol-javob tizimlari, avtomatik referatlash, hissiy tahlil (sentiment analysis) va dialog tizimlari kabi vazifalarda inson mehnatini sezilarli darajada kamaytirishga erishildi [1].

Bugungi kunda generativ sun'iy intellekt vositalari lingvistik ma'lumotlarni tahlil qilish bilan bir qatorda yangi matnlarni yaratish, uslubiy xususiyatlarni saqlagan holda qayta yozish va turli kommunikativ vaziyatlarga moslashtirish imkoniyatiga ega. Bu esa amaliy tilshunoslik, diskurs tahlili, stilistika hamda media lingvistikasi kabi yoʻnalishlarda yangi tadqiqot metodlarini shakllantirmoqda. Katta til modellari matnning grammatik tuzilishi, uslubi va semantik yaxlitligini bir vaqtning oʻzida hisobga olishi sababli ular oldingi statistik modellar bilan taqqoslaganda ancha yuqori natijalarni namoyon etmoqda [2].

Sun'iy intellekt integratsiyasining muhim afzalliklaridan biri korpus lingvistikasida yaqqol namoyon boʻlmoqda. Korpus lingvistikasi millionlab matnlardan iborat elektron bazalarni tahlil qilishga asoslanadi. An'anaviy usullarda bunday hajmdagi ma'lumotlarni tahlil qilish katta vaqt va inson resurslarini talab qilgan. SI texnologiyalari esa korpuslarni avtomatik belgilash (annotation), lemmatizatsiya, morfologik tahlil, sintaktik tizimlarni qurish va semantik guruhlarga ajratish kabi vazifalarni yuqori aniqlik bilan bajaradi. Natijada tadqiqotchilar til birliklarining qoʻllanish chastotasi, kollokatsiya (soʻz birikma)lar, diskurs modellari va stilistik tendensiyalarni qisqa vaqt ichida aniqlash imkoniyatiga ega boʻlishdi [3].

Korpus lingvistikasida sun'iy intellekt asosidagi avtomatik klasterlash algoritmlarining qoʻllanilishi yangi ilmiy natijalarni yuzaga chiqardi. Ushbu algoritmlar ilgari tadqiqotchilar e'tiboridan chetda qolgan semantik bogʻlanishlar, mavzular va diskurs strukturalarini aniqlash imkonini berib, ilmiy matnlar, ommaviy axborot vositalari, ijtimoiy tarmoqlar va tarixiy manbalarni qiyosiy tahlil qilish imkoniyatlarini kengaytirdi. Bu esa til taraqqiyoti va ijtimoiy jarayonlar oʻrtasidagi bogʻliqlikni chuqurroq oʻrganilishiga xizmat qilmoqda [1].

Mashinaviy tarjima sun'iy intellekt integratsiyasining eng muvaffaqiyatli yoʻnalishlaridan biri hisoblanadi. Dastlab qoidalarga asoslangan (Rule-Based Machine Translation) tizimlar qoʻllanilgan boʻlsa, keyinchalik statistik mashinaviy tarjima (Statistical Machine Translation) va hozirgi davrda neyron mashinaviy tarjima (Neural Machine Translation) texnologiyalari shakllandi. Transformer arxitekturasi asosida ishlab chiqilgan tarjima tizimlari butun gapning kontekstini hisobga olishi sababli tarjima sifati sezilarli darajada yaxshilandi [2].

Bugungi kunda Google Translate, DeepL, Microsoft Translator va boshqa zamonaviy tarjima platformalari milliardlab parallel matnlar asosida oʻqitilgan neyron modellar yordamida ishlaydi. Mazkur tizimlar leksik moslik bilan cheklanib qolmay, grammatik munosabatlar, idiomatik birliklar va uslubiy xususiyatlarni ham hisobga oladi. Ayniqsa, ilmiy va texnik matnlarni tarjima qilishda neyron mashinaviy tarjima oldingi avlod tizimlariga nisbatan yuqori aniqlikni namoyish etadi [4].

Shunga qaramay, ilmiy tadqiqotlar mashinaviy tarjima inson tarjimonini toʻliq almashtira olmasligini ham koʻrsatmoqda. Badiiy asarlar, metaforalar, pragmatik ma'no, milliy-madaniy birliklar va kontekstga kuchli bogʻliq boʻlgan matnlarda inson ishtiroki hanuz muhim hisoblanadi. Shu sababli hozircha zamonaviy tarjimashunoslikda ushbu turdagi lingvistik materialar tarjimasi uchun "Human-in-the-loop" tamoyili, ya'ni sun'iy intellekt va professional tarjimonning hamkorlik modeli eng samarali yondashuv sifatida koʻrilmoqda [5].

Sun'iy intellekt fonetika va nutq texnologiyalarida ham sezilarli natijalarni bermoqda. Avtomatik nutqni aniqlash (Automatic Speech Recognition – ASR) tizimlari inson nutqini matnga aylantirish, ovozli yordamchilar, subtitr yaratish va real vaqt rejimidagi tarjima xizmatlarida keng qoʻllanilishidan tashqari neyron tarmoqlarga asoslangan ASR tizimlari turli aksentlar, shevalar, lahjalar, talaffuz farqlari va fonetik variantlarni oldingi modellar bilan taqqoslaganda ancha muvaffaqiyatli aniqlay oladi [2].

Nutq sintezi (Text-to-Speech) texnologiyalarining rivojlanishi esa lingvistik tadqiqotlarda yangi imkoniyatlarni yaratdi. Sun'iy intellekt matnni tabiiy intonatsiya, urgʻu va pauzalarni hisobga olgan holda ovozlashtira olmoqda. Bu koʻzi ojiz foydalanuvchilar, til oʻrganuvchilar hamda ovozli ta'lim platformalari uchun muhim amaliy ahamiyat kasb etadi [3].

Til oʻqitish metodikasida ham sun'iy intellektning afzalliklari yaqqol namoyon boʻlmoqda. Zamonaviy SI platformalari oʻquvchining bilim darajasini avtomatik baholash, individual oʻquv yoʻnalishini shakllantirish, grammatik xatolarni aniqlash va shaxsiy tavsiyalar berish imkoniyatiga ega. Adaptiv ta'lim tizimlari har bir foydalanuvchining oʻzlashtirish sur'atiga mos ravishda mashqlarni avtomatik tanlaydi. Natijada ta'lim samaradorligi ortib, oʻqituvchining nazorat yuklamasi kamaydi [5].

Generativ sun'iy intellektning til oʻqitishdagi yana bir afzalligi autentik oʻquv materiallarini tezkor yaratish imkoniyatidir. ChatGPT, Gemini va Claude kabi tizimlar grammatik mashqlar, dialoglar, testlar, esse namunalari va uslubiy topshiriqlarni bir necha soniya ichida tayyorlay oladi. Shu bilan birga, ular CEFR darajalari boʻyicha moslashtirilgan matnlarni yaratish imkonini ham beradi. Bu esa xorijiy tillarni oʻqitishda metodik resurslarni sezilarli darajada boyitdi [2].

Diskurs tahlili va pragmatika yoʻnalishlarida ham sun'iy intellektning imkoniyatlari kengaymoqda. SI millionlab matnlarni tahlil qilib, muallif pozitsiyasi, kommunikativ strategiyalar, manipulyativ vositalar va emotsional boʻyoqdorlikni aniqlash imkonini berdi. Ijtimoiy tarmoqlarda tarqalayotgan axborot oqimini monitoring qilish, dezinformatsiya (zararli axborotlar)ni tez aniqlash va jamoatchilik fikrini oʻrganishda ham sun'iy intellekt lingvistik tahlilning muhim vositasiga aylanib ulgurdi [1].

Soʻnggi yillardagi tadqiqotlar shuni koʻrsatmoqdaki, sun'iy intellekt tilshunoslikning deyarli barcha yoʻnalishlarini qamrab olmoqda. Morfologiyadan tortib diskurs tahliligacha, tarjimashunoslikdan tortib korpus lingvistikasigacha boʻlgan barcha yoʻnalishlarda SI ilmiy tadqiqotlarning tezligi, aniqligi va samaradorligini oshirmoqda. Shu sababli koʻplab xorijiy tadqiqotchilar XXI asrni "sun'iy intellekt yordamidagi lingvistika davri" deb e'tirof etmoqdalar.

Ilmiy izlanishlarda katta til modellari tadqiqotchiga dastlabki ma'lumotlarni yigʻish, korpuslarni tasniflash, terminologik birliklarni aniqlash, bibliografik tahlil oʻtkazish va ilmiy gipotezalarni shakllantirishda samarali yordam berishi tufayli ilmiy tadqiqotlarning davomiyligi qisqarib, ularning sifat koʻrsatkichlari ortdi. Ayniqsa, koʻp tilli tadqiqotlarda sun'iy intellekt turli tillardagi ilmiy adabiyotlarni birgalikda tahlil qilish imkonini yaratmoqda. Bu esa xalqaro ilmiy hamkorlikni rivojlanishiga sabab boʻladi.

Xulosa

Olib borilgan tahlillar shuni koʻrsatadiki, sun'iy intellektning tilshunoslikka integratsiyalashuvi ushbu fan rivojida yangi bosqichni boshlab berdi. SI texnologiyalari lingvistik ma'lumotlarni tezkor qayta ishlash, katta hajmdagi korpuslarni tahlil qilish, koʻp tilli modellarni yaratish, mashinaviy tarjimani takomillashtirish, ilmiy tadqiqotlarni avtomatlashtirish va ta'lim jarayonlarini modernizatsiya qilish orqali tilshunoslikning nazariy hamda amaliy imkoniyatlarini sezilarli darajada kengaytirmoqda. Shuning uchun sun'iy intellektni zamonaviy tilshunoslikning innovatsion rivojlanish omili sifatida baholash mumkin.

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TRANSLATION STUDIES FOUNDATIONS OF RENDERING NATIONAL-CULTURAL CHARACTERISTICS IN LITERARY TRANSLATION

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Abstract: *This research investigates the translation studies foundations of rendering national-cultural characteristics in literary translation, focusing on Utkir Hoshimov's celebrated novella "Dunyoning ishlari", that is "Such is life". The study examines the structural, semantic and pragmatic peculiarities of Uzbek national realia, ethnocultural units, terminology and ritualistic expressions. Through comparative-stylistic textual analysis of the source text and its English translation by Mark Reese and Abdulla Ruziyev, the paper evaluates translation strategies-including transliteration with contextual glossing, descriptive translation, cultural substitution and functional equivalence-employed to preserve authentic national color. The findings reveal that achieving dynamic equivalence requires balancing cultural fidelity with target-language readability.*

Keywords: *literary translation, national-cultural characteristics, realia, cultural equivalence, Utkir Hoshimov, "Such is life", translation strategies, transliteration, descriptive translation, ethnocultural units.*

ТЕОРЕТИЧЕСКИЕ ОСНОВЫ ПЕРЕВОДОВЕДЕНИЯ В ВОСПРОИЗВЕДЕНИИ НАЦИОНАЛЬНО-КУЛЬТУРНЫХ ОСОБЕННОСТЕЙ В ХУДОЖЕСТВЕННОМ ПЕРЕВОДЕ

Аннотация: *Настоящее исследование посвящено изучению переводоведческих основ передачи национально-культурных особенностей в художественном переводе на материале повести Уткира Хошимова Дела земные». В работе анализируются структурные, семантические и прагматические особенности узбекских национальных реалий, культурно-маркированных единиц, терминов родства и ритуальных выражений. На основе сопоставительно-стилистического анализа английского перевода, выполненного Марком Ризом и Абдуллой Рузиевым, оцениваются переводческие приемы, применяемые для сохранения национального колорита, включая транслитерацию с контекстуальным пояснением, описательный перевод, культурную замену и функциональную эквивалентность. Результаты исследования показывают, что достижение динамической эквивалентности требует научно обоснованного баланса между культурной адекватностью исходного текста и доступностью его содержания для читателей на языке перевода.*

Ключевые слова: *художественная литература, национально-культурные особенности, реалии, культурная эквивалентность, Уткир Хашимов, «Дела земные», методы перевода, транслитерация, описательный перевод, этнокультурные единицы.*

BADIIY TARJIMADA MILLIY-MADANIY XUSUSIYATLARNI QAYTA IFODALASHNING TARJIMASHUNOSLIK ASOSLARI

Annotatsiya: *Ushbu tadqiqot O'tkir Hoshimovning "Dunyoning ishlari" qissasi misolida badiiy tarjimada milliy-madaniy xususiyatlarni aks ettirishning tarjimashunoslik asoslarini o'rganadi. Ushbu ilmiy tadqiqotda o'zbek milliy realiyalari, madaniy birliklari, qarindoshlik atamalari va marosim iboralarining strukturaviy, semantik hamda pragmatik xususiyatlari tahlil qilinadi. Mark Reese hamda Abdulloh Ro'ziyev tomonidan bajarilgan inglizcha tarjimaning qiyosiy-uslubiy matn tahlili orqali milliy koloritni saqlashda qo'llaniladigan tarjima usullari - kontekstual izohli transliteratsiya, tavsifiy tarjima, madaniy almashtirish va funksional ekvivalentlik baholanadi. Tadqiqot natijalari shuni ko'rsatadiki, dinamik ekvivalentlikka erishish madaniy munosiblik va nishon tilidagi tushunarlilik o'rtasidagi ilmiy muvozanatni talab etadi.*

Kalit so'zlar: *badiiy tarjima, milliy-madaniy xususiyatlar, realiyalar, madaniy ekvivalentlik, O'tkir Hoshimov, "Dunyoning ishlari", tarjima usullari, transliteratsiya, tavsifiy tarjima, madaniy birliklar.*

Introduction.

Literary translation is an important means of intercultural communication through which national worldviews, social customs, moral values and aesthetic traditions are transferred across linguistic and cultural boundaries. However,

translating literary texts involves more than conveying their lexical meanings, as culture-specific elements such as realia, ethnocultural markers, ritual expressions, idioms, food names, architectural and kinship terms contain historical and pragmatic meanings that have no direct equivalents in the target language [1, p. 47; 3, p. 95]. Therefore, the translation of such units requires an appropriate balance between preserving the national color of the source text and ensuring comprehensibility for target readers. The theoretical approaches of Vlakhov and Florin, Newmark, Nida, and Baker provide a useful framework for examining realia, cultural non-equivalence and translation strategies such as transliteration, descriptive translation, cultural substitution and functional equivalence [1, p. 52; 2, p. 20; 3, p. 96; 4, p. 22].

This issue is particularly relevant to Utkir Hoshimov's "Dunyoning ishlari", a significant work of twentieth-century Uzbek literature that portrays Uzbek family life, moral values, traditions and everyday cultural practices. Centered on the author's memories of his mother, the novella contains numerous culturally specific elements related to the "mahalla", hospitality, traditional food, household life, architecture, kinship relations and social customs [5, p. 12; 11, p. 108]. These elements constitute an important part of the work's national identity and create particular challenges when the text is translated for an English-speaking audience. The English version, published under the title 'Such Is Life' and translated by Mark Reese and Abdulloh Ruziyev, provides a valuable corpus for examining how Uzbek cultural meanings and national color are represented in English.

Although Hoshimov's prose has been widely studied from literary, thematic and psychological perspectives, the systematic translation-oriented analysis of national-cultural units in "Dunyoning ishlari" remains insufficiently explored. Therefore, this study aims to identify and classify the culture-specific elements in the novella and examine how they are rendered in "Such Is Life". Particular attention is given to ethnographic, gastronomic, architectural, social, ritual, and kinship-related realia, as well as to the translation strategies used by Reese and Ruziyev, including transliteration, descriptive translation, cultural substitution and functional equivalence. The study also considers foreignization and domestication in order to determine whether particular translation choices result in cultural preservation, loss or adaptation.

Literature Review.

The theoretical foundation of realia translation was systematically formulated by Bulgarian linguists S. Vlakhov and S. Florin. They defined realia as "words and expressions naming objects, concepts or phenomena characteristic of a nation, its culture, history and daily life, which have no exact lexical equivalents in other languages and carry pronounced national or historical color" [1, p. 47]. They established that realia present a dual challenge: the lack of a direct target-language equivalent combined with the necessity of conveying the national atmosphere and cultural specificity of the source text.

In Western translation theory, Peter Newmark categorized culture-bound words into five major domains, including ecology, material culture, social culture, customs and concepts, and gestures [3, p. 95]. His classification demonstrates that culturally specific elements may occur in various aspects of everyday life and social interaction. Newmark emphasized that translators must continually navigate between foreignizing methods, such as transliteration and literal transfer, and domesticating methods, including cultural adaptation and descriptive translation. The choice between these approaches depends largely on the function of the culture-specific element and the intended target readership.

Mona Baker addressed the problem of non-equivalence at the word level and proposed several pragmatic strategies for dealing with culturally specific expressions. These include translation by a more general or superordinate term, cultural substitution, the use of loan words accompanied by explanations and contextual omission when a particular unit carries limited narrative significance [2, p. 26]. Eugene Nida, in turn, introduced the distinction between formal equivalence and dynamic equivalence, emphasizing that translation should consider both the linguistic form of the source text and its effect on the target audience [4, p. 22]. These approaches provide an important theoretical basis for examining how culture-bound expressions can be transferred while maintaining their semantic, pragmatic, and cultural functions.

In the context of Uzbek translation studies, pioneer scholar Gʻaybulla Salomov established an important theoretical foundation for understanding the role of national realia in literary translation. He demonstrated that national realia in Uzbek literature constitute essential components of artistic representation rather than merely decorative vocabulary [7, p. 84]. Salomov emphasized that mechanical word-for-word translation may result in semantic distortion, whereas excessive adaptation may lead to the erosion of the source culture. Qudrat Musayev further developed the theory of translation equivalence by identifying hierarchical levels of equivalence and emphasizing that the translation of Uzbek national realia into European languages requires not only linguistic competence but also ethnographic knowledge and functional-pragmatic transformation [8, p. 52].

The practical application of these theoretical principles can be observed in the English translation of Oʻtkir Hoshimov's Dunyoning ishlari by Mark Reese and Abdulloh Ruziyev, published as Such Is Life. Their translation provides a significant example of transferring Uzbek culture-specific elements into English while attempting to preserve their national and contextual significance. The work contains numerous expressions associated with family relationships, kinship, traditional customs, household life, food, forms of address and other aspects of Uzbek culture. The translation of such elements

requires the translators to balance cultural preservation with accessibility for English-speaking readers. In this respect, the work of Reese and Ruziyev provides a valuable practical context for examining the application of strategies such as cultural substitution, descriptive translation, retention of culturally specific terms and contextual explanation.

Research methodology.

This study aims to identify, classify and evaluate the strategies employed in rendering national and cultural characteristics represented in O‘tkir Hoshimov’s “Dunyoning ishlari” into English, with particular attention to the preservation of cultural meaning, national identity, pragmatic effect and literary-aesthetic value. The primary research materials consist of the original Uzbek version of ‘Such is Life’ and its English translation, published in 2024 by translator Mark Reese. The analysis focuses mainly on culture-specific lexical and phraseological units, ethnographic terms, forms of address, religious expressions, traditional objects, domestic practices and figurative descriptions that reflect Uzbek cultural identity.

The theoretical framework draws upon major approaches to the translation of realia, linguocultural equivalence, dynamic equivalence, translation strategies and the foreignization-domestication dichotomy. In particular, the theoretical perspectives of S. Vlakhov and S. Florin on realia provide the methodological basis for the study. The concept of realia is especially important because culturally marked words frequently convey meanings that extend beyond their dictionary definitions and embody the historical and social experience of a particular community.

The study investigated comparative-analytical, descriptive, linguocultural and contextual methods. First, culture-specific lexical and phraseological units were identified in the Uzbek source text. These units were then examined according to their semantic, pragmatic and cultural characteristics. Particular attention was given to the ways in which realia function within Hoshimov’s narrative. Since “Dunyoning ishlari” is closely connected with the author’s childhood, family relationships, rural life, Uzbek traditions and the social environment of the Soviet period, many apparently ordinary words acquire considerable cultural significance in context.

The identified units were subsequently compared with their English renderings in Mark Reese’s translation in order to determine the extent to which their denotative meanings, cultural connotations, emotional associations, national color and aesthetic functions were preserved. The analysis does not regard translation equivalence as simple word-for-word correspondence. Instead, each translation choice is evaluated according to whether it successfully reproduces the communicative intention and cultural effect of the source expression for the target readership.

From a thematic perspective, national-cultural realia may be associated with different areas of social and cultural life, including household objects, clothing, food and drinks, occupations, social customs, forms of address, religious practices and other elements of material and spiritual culture. Such a classification is useful for the analysis of Dunyoning ishlari because the realia found in the work represent several dimensions of Uzbek life. For example, sandal, obdasta, and kavshandoz are connected with traditional domestic life, Moshkhurda represents Uzbek culinary culture, sovchi and tugun reflect traditional marriage-related practices, while joynamoz, peshin, and Allohu Akbar represent religious-cultural vocabulary. The classification of realia according to their cultural function therefore provides a useful basis for examining the specific challenges involved in their English translation. The research which is conducted by Kendjayeva similarly distinguishes everyday realia according to categories such as dwelling and property, clothes and headwear, food and drinks, occupations, social life and forms of address [13, p. 168].

An important methodological principle derived from previous research is that no single translation procedure can be applied uniformly to all realia. Each culturally marked unit requires an individual translation decision based on its semantic content, cultural associations, historical background, stylistic function, and position within the context. The necessity of considering the cultural, historical, semantic, stylistic and grammatical characteristics of each individual realia when selecting an appropriate translation procedure. This principle is particularly applicable to “Dunyoning ishlari”, where different realia require different translation solutions. Some units are retained through transliteration, some are accompanied by contextual or paratextual explanations, while others are generalized, neutralized or replaced by culturally more familiar expressions. Therefore, the effectiveness of a translation strategy should be determined in relation to the function and cultural significance of the individual unit rather than merely according to its formal correspondence with the source-language expression.

A further distinction that is significant for the present research is the difference between semantic preservation and cultural preservation. A target-language expression may successfully communicate the basic referential meaning of a source-language word while failing to reproduce its historical, religious, social or ethnographic associations. Kendjayeva’s analysis of the realia hujra demonstrates this problem: the use of a general equivalent such as “room” communicates the basic physical meaning but does not fully reproduce the historical and religious associations of the Uzbek term [13, p. 169]. A comparable phenomenon can be observed in the translation of ‘Such is Life’. When a culturally specific religious object such as joynamoz is rendered through a general expression such as “a piece of fabric,” the physical action remains comprehensible, but the religious and cultural identity of the object is considerably weakened. Similarly, the rendering of

kavshandoz as “doorway” communicates the spatial context but removes the ethnographic specificity of the original domestic object.

For analytical purposes, the selected cultural units were classified into four interconnected groups. They are material and everyday realia, ethnocultural and social realia, ritual and religious realia and figurative and emotionally marked cultural expressions. The first category includes culturally specific objects and concepts associated with Uzbek domestic life, architecture and gastronomy, such as supa, beshik, joynamoz, qoravoy, peshin and dasturxon. The second includes kinship terms, forms of address and social concepts such as opa, aya, amma and mahalla. The third encompasses such ritual and religious expressions as fotiha, Subhanallah Ilohi omiin, Ollohu akbar and other culturally embedded practices. The fourth category includes figurative expressions and culturally marked descriptions of nature, family affection and human relationships.The analysis also focuses on the principal techniques used to transfer culture-specific elements into English, including transliteration, transcription, functional equivalence, descriptive translation, explicitation, modulation, substitution, contextual adaptation and stylistic adaptation. These techniques are evaluated according to their ability to maintain cultural specificity while ensuring accessibility and interpretability for English-speaking readers.

Particular attention is also paid to the problem of alternatives in translation. Cultural, lexical, syntactic, emotional and connotational alternatives frequently arise when Uzbek expressions are transferred into English. A culturally marked expression may have several possible English equivalents, but the most linguistically convenient equivalent is not necessarily the most culturally adequate one. Therefore, the translator must consider the author’s worldview, the historical context, the emotional atmosphere and the pragmatic function of the original expression.

The study consequently evaluates translation adequacy at several interconnected levels, such as lexical-semantic correspondence, cultural equivalence, emotional expressiveness and preservation of national identity. This multidimensional approach makes it possible to determine not only whether a particular word has been translated accurately, but also whether the cultural world represented by Hoshimov has remained recognizable in the English version.

Analysis and results.

A systematic comparative analysis of “Dunyoning ishlari” and Mark Reese’s English translation ‘Such Is Life’ demonstrates that national-cultural units are not peripheral lexical elements but constitute an essential part of the narrative and ethnocultural architecture of the work. The realia identified in the text reflect Uzbek domestic life, family relationships, hospitality, social organization, religious beliefs, traditional practices, rural landscapes and emotional attitudes. Consequently, the translation of these units directly influences the preservation of the semantic, pragmatic and cultural dimensions of O‘tkir Hoshimov’s prose.

The work is particularly significant because its artistic world is constructed from ordinary experiences and apparently simple details. O‘tkir Hoshimov presents childhood memories, humorous and tragic situations and scenes from everyday life in a simple but emotionally powerful manner. The folkloric character of his prose means that many expressions cannot be interpreted adequately without understanding the cultural environment in which they occur. Therefore, translation becomes not merely a linguistic operation but an intercultural and creative process.

The analysis of domestic and architectural realia demonstrates the importance of culturally specific objects in constructing the spatial atmosphere of the narrative. For instance, in Kobilova’s rendering, “Mother spread the bedding on the sori” [6, p. 28], employs transliteration to retain the culturally specific term. This strategy preserves the national identity of the object and allows the source-culture element to remain visible in the target text. However, a brief contextual explanation such as sori, a raised wooden courtyard platform could provide additional assistance to readers unfamiliar with Uzbek domestic architecture.

A similar strategy can be observed in the translation of beshik. For example, the sentence which is given in the book, “Beshikni quchoqlab yig‘ladi.” [5, p. 87], is translated into English in this form, “She wept embracing the cradle.” In Uzbek culture, beshik is more than an ordinary cradle. It is associated with traditional childcare, family customs and culturally significant practices surrounding the upbringing of children. Therefore, the use of transliteration together with descriptive explanation, such as beshik, that is traditional wooden cradle, can preserve both cultural authenticity and comprehensibility.

Another example concerns dasturxon. Although “tablecloth” may describe its physical function, the Uzbek dasturxon has a broader cultural meaning connected with hospitality, family unity, food-sharing and respect for guests. Consequently, its translation should take both its material and symbolic functions into consideration.

This principle applies to rayhon. In the passage describing the courtyard, “…hovlining kun bo‘yi oftobda qizigan tuproq hidi supa oldidagi rayhon hidi bilan qo‘shilib…”, translated into “…the smell of the land which had been heated during the whole day by the sun gave out a scent with basil…”

The translation successfully identifies the plant through the familiar English term “basil.” However, the Uzbek word rayhon may evoke additional cultural and sensory associations related to home gardens, freshness, beauty, hospitality and

traditional Uzbek domestic life. Thus, although the lexical equivalent is accessible to the target reader, some of the cultural connotations may be weakened.

Religious and ritual expressions present some of the most complex translation challenges. The "Ermon buvaning tilagi" episode provides the clearest evidence for foreignization. The researcher explains that, in the Reese and Ruziyev version, culturally marked religious forms such as Joinamoz, afternoon prayer, Ilohi omiin and Allohu Akbar are retained, while domestic forms such as qoravoy and popuk are also preserved. This is explicitly identified as foreignization.

Ethnocultural and social realia further confirm that culturally embedded meanings cannot be adequately represented through dictionary equivalence alone. Uzbek forms of address such as opa, aya, ammayim, and personal names followed by kinship terms encode age, respect, intimacy, social distance, and solidarity. For instance, "Oynisa opa…"is given like"Sister Oynisa". A literal translation such as "Sister Oynisa" may create unintended associations for English-speaking readers. Depending on the relationship established in the narrative, a functional equivalent such as "Aunt Oynisa" may communicate respectful familiarity more naturally. This illustrates the importance of functional equivalence in translating Uzbek forms of address.

This example demonstrates that even apparently minor lexical substitutions can modify the emotional atmosphere of a literary passage. The translator must therefore consider not only denotative meaning but also connotation, imagery, emotional tone, and narrative perspective.

Uzbek Source Unit	**English rendering**	**Applied English Strategy**	**Pragmatic & Aesthetic Justification**
Dasturxon	Tablecloth	Functional Equivalence: Dasturxon (Spread meal table)	Reflects the Uzbek meal ritual served on a floor cloth or table [3, p. 98].
"Qiyiqchani joynamoz qilib o'tustiga tashlaydi-da, pichirlab uzoq namoz o'qiydi." - joynamoz	"He spreads out the Joinamoz on the grass and recites his prayers in soft whispers for a long while."	Foreignization / transliteration	"Joinamoz" is retained rather than replaced by a generic "mat" or "cloth." The researcher's footnote identifies it as a Muslim prayer rug. Retention therefore preserves the Islamic and Uzbek cultural marker while the explanation makes it comprehensible.
"Peshin bo'p qoldi deng, qoravoy?" - peshin / qoravoy	"It is time for afternoon prayer, qoravoy, isn't it?"	Foreignization with selective explicitation	"Afternoon prayer" makes the religious function explicit, while "qoravoy" is retained as a culturally marked form of address. The strategy preserves more of the original cultural atmosphere than a fully generalized English rendering would. Qoravoy: the color black is a positive reference in Central Asia and seen as an act of praise. Black is often used to referred to Arabs, as in Zangi Ota.
"Ilohi omiin! Yurtimiz tinch bo'lsin, Ollohu akbar."	"Ilohi omiin! May our land be peaceful, may war never touch our world, Allohu Akbar."	Foreignization	The religious formulas remain visible in the English text. Replacing them completely with a neutral prayer formula would reduce the Islamic cultural identity of the utterance. The researcher explicitly identifies these forms as foreignized markers.
"Qani qoravoylar! Qani popuklar! Dasturxonga marhamat." - qoravoylar / popuklar	"My qoravoys, my popuks! Welcome to our little lunch."	Foreignization + footnote	"Popuk" is retained and explained as a term of endearment for a daughter or little girl. This preserves the affectionate cultural form rather than replacing it with an emotionally weaker generic address.

These examples demonstrate that foreignization is not simply a matter of leaving Uzbek words untranslated. Its value lies in preserving a culturally meaningful form that would otherwise disappear. In the case of Joinamoz, for instance, the English reader receives both the Uzbek cultural label and its explanation. This principle is also suitable for qoravoy and popuk, the culturally marked form remains visible while the footnote supplies the information necessary for interpretation.

Transliteration is particularly effective for preserving highly culture-specific concepts whose national identity would be weakened through substitution. Descriptive translation and explicitation are more appropriate for complex social and ritual concepts, while functional equivalence can be useful when the social or communicative function of a cultural item needs to be reproduced naturally in English.

The examples from Mark Reese's translation also reveal that direct translation may sometimes weaken the expressive or cultural force of the source text. For example, translating the act of suv sepmoq as "water the yard" reduces the sensory and cultural implications of the traditional practice. Similarly, translating o'ychan ko'zlar as "sad eyes" changes the emotional coloring of the original. These examples confirm that literary translation requires attention to connotation, contextual meaning, and cultural associations rather than lexical correspondence alone.

The findings highlight the central role of the foreignization-domestication dichotomy in the translation of national-cultural realia in "Dunyoning ishlari". Foreignization allows culturally specific Uzbek elements to remain visible in the target text and thereby preserves the national atmosphere and ethnographic authenticity of Hoshimov's prose. Terms such as supa, beshik, dasturxon, mahalla, fotiha, and Subhanallah introduce English-speaking readers to cultural concepts that may not have direct counterparts in their own cultural experience.

At the same time, excessive foreignization may make the text difficult for target readers who lack knowledge of Uzbek culture. For example, supa can be retained through transliteration, but without contextual support their cultural meanings may remain inaccessible. This demonstrates that preservation of the source term alone does not automatically guarantee cultural understanding.

Domestication represents the opposite tendency, as it attempts to render culture-specific concepts through expressions that are more familiar to the target audience. This strategy can improve readability and facilitate immediate comprehension. However, excessive domestication may result in substantial ethnocultural loss. Translating dasturxon simply as "tablecloth," mahalla as "neighborhood" or fotiha simply as "blessing" may communicate a general meaning while eliminating the wider social and cultural associations of the source terms.

The comparative analysis therefore supports the use of a hybrid translation strategy as the most effective approach for culturally dense literary prose. Under this approach, culturally significant terms are retained through transliteration or transcription, while their meanings are clarified through classifiers, descriptive modifiers, contextual explanation or functional equivalents. Examples such beshik as traditional wooden cradle and supa as raised courtyard platform illustrate how foreignization and domestication can operate simultaneously.

The findings also support E. Nida's concept of dynamic equivalence. Absolute one-to-one correspondence is rarely possible when culture-specific expressions move between languages. Instead, successful translation should recreate an equivalent communicative and aesthetic effect for the target reader. In Hoshimov's work, this is particularly important because the artistic identity of the narrative is inseparable from its representation of Uzbek family life, rural environment, social relations, traditions, religious beliefs, and emotional culture.

For instance, rendering of Subhanallah, demonstrates that translation involves more than lexical substitution. The translator must interpret the cultural and emotional function of the source expression. Similarly, the translation of o'ychan ko'zlar as "sad eyes" illustrates how a seemingly minor lexical decision can alter the emotional atmosphere of an artistic passage.

The problem of translation alternatives is therefore central to the study. Cultural alternatives arise when a source expression reflects a practice that has no direct target-language counterpart. Lexical alternatives emerge when several possible equivalents are available. Syntactic alternatives become necessary because Uzbek and English differ structurally, while emotional and connotational alternatives arise because the same lexical item may evoke different associations in different cultures.

Consequently, the translator's task is inherently creative. Literary translation requires the translator to understand what the author sees, feels, and intends to communicate. A formally correct translation may still fail if it does not reproduce the cultural reality and emotional perspective embedded in the source text. In this sense, the translator assumes significant creative responsibility for each word, phrase, and sentence in the target text.

The analysis further demonstrates that successful translation of realia requires linguistic, intercultural, ethnographic, and pragmatic competence. Terms such as opa, aya, mahalla, fotiha, supa and dasturxon cannot be adequately interpreted through dictionary definitions alone. Their meanings emerge from the social practices, interpersonal relationships, rituals, and historical experiences in which they function.

The "Sovchilar" episode provides a useful contrast because the two translation versions handle the cultural institution differently. The original paragraph begins with the culturally loaded word sovchi and later includes tugun:

"- Sovchi degan gap qayoqdan chiqqan?

Guli jahl bilan qo'l siltadi.

– Hali unisi keladi qiyshayib, hali bunisi keladi, tugunini osiltirib!"

In O. Mo‘minov’s version, sovchi is generalized as “matchmaker,” while tugun is omitted. In the Reese and Ruziyev version, the sentence is rendered as: “Who invented such an absurd idea of this ‘matchmaker’ thing? ... All the time one comes waddling along, the other comes dragging a tugun!” The word tugun is retained and explained by Abdulloh Ruziyev in a footnote as a bundle brought by sovchis, usually including some presents for the girl and her family members. This way, they think, they can win the girl’s heart.

The difference is culturally significant. “Matchmaker” communicates the general social function of sovchi, but it does not necessarily activate the Uzbek cultural practice of sovchilik, which involves family participation and marriage negotiations. The retention of tugun is stronger from the perspective of cultural preservation because the term is accompanied by an explanation of its social function. In other words, the target reader receives not only an understandable sentence but also access to an Uzbek cultural practice that has no exact one-word equivalent in English.

The same strategy is visible in the following sentence: “Bu safar sovchilar uzoqroq o‘tirishdi, oyim ularni moshxo‘rda bilan mehmon qildi.” The English version reads: “This time the matchmakers stayed for longer and my mother served them Moshkhurda.” The food name is retained, and the footnote explains Moshkhurda as “a dish made from mung beans.” This is transliteration supported by paratextual explanation, and it preserves the cultural specificity of the hospitality scene rather than reducing the dish to a generic English food term.

The shift from “boy” to “man” is not merely grammatical. It broadens the gendered cultural statement. The Uzbek original refers directly to the boy, while “A man doesn’t cry” presents the statement as a general masculine norm. Thus, although the English version communicates the intended encouragement, it also intensifies and generalizes the gender ideology encoded in the sentence.

Therefore, the translation of national-cultural realia should be viewed as an interpretive process involving semantic, pragmatic, aesthetic and linguocultural decision-making. The translator must identify which elements of meaning are essential in each context and select the strategy that best balances cultural authenticity with target-reader accessibility.

Conclusion.

The comparative analysis of O‘tkir Hoshimov’s “Dunyoning ishlari” and Mark Reese’s English translation “Such Is Life” demonstrates that national-cultural realia constitute an integral component of the work’s artistic structure and national identity. They function not as isolated vocabulary items but as an interconnected ethnocultural system through which the author represents Uzbek everyday life, family relationships, social etiquette, hospitality, communal solidarity, religious beliefs, rituals, traditional food, clothing, domestic spaces and national worldview. The findings demonstrate that transliteration combined with contextual explicitation is particularly effective in preserving national color while maintaining comprehensibility for English-speaking readers. The treatment of terms such as supa, beshik, mahalla and fotiha shows that retaining culturally specific terminology enables the target text to preserve its Uzbek identity, while explanatory classifiers and descriptive additions provide the target reader with sufficient contextual information. The treatment of obdasta, Joinamoz, peshin, qoravoy, popuk, sovchi, tugun, and Moshkhurda shows that each item requires a context-sensitive translation decision. Retention and transliteration are particularly valuable when the source term itself carries cultural identity, while contextual explanation enables English-speaking readers to understand the retained form.

The study also confirms that foreignization and domestication should not be regarded as mutually exclusive strategies. Their appropriate combination enables the translator to negotiate the tension between cultural authenticity and target-reader accessibility. Excessive domestication risks erasing the national identity of O‘tkir Hoshimov’s prose, whereas excessive foreignization may create semantic opacity. A flexible hybrid strategy is therefore more appropriate for culturally dense literary texts.

From a theoretical perspective, the findings support the relevance of dynamic equivalence, realia theory, and linguocultural approaches to literary translation. Equivalence in the translation of culturally embedded texts cannot be reduced to formal lexical correspondence. It should also involve the recreation of communicative intention, pragmatic meaning, cultural associations, emotional effect, and literary-aesthetic value.

The analysis additionally confirms that literary translation is a creative and interpretive activity. The translator must not only understand the source language but also perceive the cultural reality represented by the author. If the translator fails to recognize what the author sees and feels, even a linguistically accurate lexical choice may fail to communicate the intended meaning. Therefore, the translator bears significant responsibility for preserving the relationship between language, culture, emotion, and artistic representation.

From a practical perspective, the translation of Uzbek literature into English requires strong linguistic, intercultural, ethnographic, and pragmatic competence. Translators must recognize that kinship terms, honorific forms, domestic objects, social institutions, religious expressions, rituals, traditional foods, and figurative images frequently carry meanings that extend beyond their literal definitions.

Overall, the study confirms that the translation of national-cultural realia in “Such is Life” is a complex intercultural process requiring a careful balance between fidelity to the source culture and accessibility for the target readership. The

most effective approach is a flexible combination of transliteration, contextual explicitation, descriptive translation, functional equivalence and stylistic adaptation. Such a strategy enables English-speaking readers to access the cultural world of O‘tkir Hoshimov’s prose while preserving the distinctive national atmosphere, emotional depth, and literary identity of the original work. In this respect, literary translation functions not merely as linguistic transfer but as a means of strengthening intercultural communication and bringing culturally distant communities closer together.

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NAMANGAN VILOYATI SHEVALARINING SHAKLLANISHI VA AREAL XUSUSIYATLARI

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Annotatsiya: *Ushbu maqolada Namangan viloyati shevalarining shakllanish jarayoni va ularning areal xususiyatlari ilmiy-nazariy jihatdan yoritilgan. Til taraqqiyoti va evolyutsiyasida xalq shevalarining o‘rni, ularning milliy adabiy til shakllanishi hamda boyib borishidagi lisoniy ahamiyati, shuningdek, areal lingvistika va lingvistik geografiya metodlarining dialektologik tadqiqotlardagi o‘rni atroflicha tahlil qilingan. Maqolada asosiy muammo sifatida o‘zbek shevalarining, xususan, o‘ziga xos lisoniy qatlamga ega bo‘lgan Namangan viloyati shevalarining bugungi kunga qadar areal-lingvistik jihatdan tizimli va yetarli darajada tadqiq etilmagani ko‘rsatib o‘tilgan. Ishning maqsadi — Namangan viloyati shevalarining tarixiy taraqqiyoti, tarqalish hududi, fonetik, leksik-semantik va grammatik xususiyatlarini zamonaviy areal-lingvistik tamoyillar hamda tillararo konvergentsiya jarayonlari asosida ilmiy jihatdan ochib berishdan iborat. Maqolada qiyosiy-tarixiy, tavsifiy va lingvistik xaritalashtirish metodlaridan foydalanilgan. Tadqiqot natijasida sheva materiallarini areal usulda o‘rganish muayyan hudud lisoniy tizimini yaxlit va dinamik tarzda tahlil qilishga xizmat qilishi, shuningdek, o‘zbek adabiy tili tarixini tiklash hamda uning leksikografik bazasini boyitish uchun muhim manba ekanligi ilmiy asoslab berilgan.*

Kalit so‘zlar: *izofonema, shevashunoslik, shevalar, izoglassa, areal lingvistika, til areali, adabiy til, lingvistik geografiya, dialekt xususiyatlar.*

ФОРМИРОВАНИЕ И АРЕАЛЬНЫЕ ОСОБЕННОСТИ ГОВОРОВ НАМАНГАНСКОЙ ОБЛАСТИ

Аннотация: *В данной статье научно-теоретически освещены процесс формирования говоров Наманганской области и их ареальные особенности. Подробно проанализированы роль народных говоров в развитии и эволюции языка, их языковое значение в формировании и обогащении национального литературного языка, а также место методов ареальной лингвистики и lingvisticheskoj geografii v dialektologicheskih issledovaniyah. В качестве основной проблемы в статье указано то, что узбекские говоры, в частности говоры Наманганской области, обладающие специфическим языковым пластом, до сегодняшнего дня не были системно и достаточно исследованы в ареально-lingvisticheskom аспекте. Целью работы является научное раскрытие исторического развития, ареала распространения, фонетических, лексико-семантических и грамматических особенностей говоров Наманганской области на основе современных ареально-lingvisticheskih принципов и процессов межъязыковой конвергенции. В статье использованы сравнительно-исторический, описательный методы и метод lingvisticheskogo kartirovaniya. В результате исследования научно обосновано, что изучение диалектного материала ареальным методом служит целостному и динамичному анализу языковой системы определенного региона, а также является важным источником для восстановления истории узбекского литературного языка и обогащения его лексикографической базы.*

Ключевые слова: *изофонема, лингвистика, диалекты, изоглосса, ареальная лингвистика, языковой регион, литературный язык, лингвистическая география, диалектные характеристики.*

FORMATION AND AREAL FEATURES OF NAMANGAN REGION DIALECTS

Abstract: *This article highlights the scientific and theoretical foundations of the formation process and areal features of the dialects of the Namangan region. It thoroughly analyzes the role of folk dialects in language development and evolution, their linguistic significance in the formation and enrichment of the national literary language, as well as the role of areal linguistics and linguistic geography methods in dialectological research. As a main problem, the article points out that Uzbek dialects, particularly the dialects of the Namangan region possessing a unique linguistic layer, have not been systematically and sufficiently studied from an areal-linguistic perspective until today. The purpose of the study is to scientifically reveal the historical development, distribution area, phonetic, lexical-semantic, and grammatical features of the dialects of the Namangan region based on modern areal-linguistic principles and interlingual convergence processes. Comparative-historical, descriptive, and linguistic mapping methods were used in the research. As a result of*

the study, it is scientifically substantiated that studying dialect material through the areal method serves for a holistic and dynamic analysis of the linguistic system of a specific region, and also serves as an important source for restoring the history of the Uzbek literary language and enriching its lexicographical base.

Keywords: *isophoneme, linguistics, dialects, isogloss, areal linguistics, language area, literary language, linguistic geography, dialect characteristics.*

Kirish

Insoniyat yaratilibdiki, uning tili hamisha ijtimoiy-iqtisodiy, madaniy-ma'rifiy, ma'naviy-axloqiy tamoyillar bilan birga jamiyat taraqqiyoti bilan hamohang holda taraqqiy etadi, rivojlanadi. Bu ilm-fan uchun ma'lum hodisa. Dunyo tilshunoslik sohasida jahonning yirik tilshunoslik maktablarining tarixiy shakllanish davriga e'tibor berilsa, ularning ilk amalga oshirgan va tadqiqotlarining markazida xalq jonli tili – madaniylashgan xalq darajasiga koʻtarilgan millatlarning shevasi turadi. Aniqki, xalq shevalari adabiy tilining yozma yodgorliklariga nisbatan ham qadimiyroq tarixiy manbadir. Bizgacha yetib kelgan yozma yodgorliklarda uchramaydigan til faktlari shevalarda saqlanib qolgan. Shuning uchun sheva materiallarini tadqiq etish tilning ontologik tabiatini ochib berish imkonini beradi [12, 15 b.].

Dialektologiyaning taraqqiy va yakuniy holati hisoblanmish areal lingvistikaning yuzaga kelishining asosiy sababi uning shevashunoslik sohasida yechimi topilmagan, turgʻun boʻlib qolgan ayrim jihatlarni, dialekt va shevalar mohiyati, xususiyatlari, oʻzaro aloqalari, ularning tasnifi, tavsifi masalasidagi tushunchalarni yangicha baholashga, yangicha usullarda hal qilishga keng yoʻl ochishi boʻldi.

Shuning uchun ham dunyo ilm-fan tamaddunida areal tilshunoslik koʻp mundarijali soha boʻlib shakllandi, chunki arealogiya italyan neolingvistlari, jahon lingvogeograflari hamda tillar ittifoqi yoʻnalishi vakili boʻlgan tilshunoslarning amalga oshirgan tadqiqotlarini oʻzida mujassamlashtirdi. Tadqiqotlar negizida areal lingvistik konsepsiyalarning tadrijiy taraqqiyotini analiz va sintezlash natijasida dialektlarni umumiy tilshunoslikning bir aspekti sifatida oʻrganish maqsadga muvofiq ekanligi isbotlandi. Dialektlarni arealogik tamoyillar va lingvistik tadqiqot metodlari asosida oʻrganish muhim muammo sifatida qoʻyildi [5, 3-8 b.]. Binobarin, til sistemasini yaxlit oʻrganishda dialekt va sheva areallarini tadqiq etish muhim ahamiyat kasb etishi yaqqol yuzaga chiqdi.

Bilamizki, tilshunoslikning dialektolagiya va areal tilshunoslik sohasi ekspeditsiyalar, amaliyotlar, lisoniy-jugʻrofiy tahliliy usullar orqali ma'lum hududda tarqalgan til hodisalarini aniqlab, hududiy til xususiyatlarini oʻrganadi. Ularning oʻrni va tarqalish chegarasi va koʻlamini lingvistik xaritalar orqali namoyon etadi. Demak, muayyan xalqning jonli axborot va ma'lumot almashinuvi vositasi boʻlgan milliy shevalarining lingvistik xaritalarini yaratish dialektologiya va areologiya sohalarining taraqqiyotini ta'minlaydigan va koʻrsatib turuvchi eng muhim omillar hisoblanadi.

E'tibor qaratilsa, dunyoning rivojlangan mamlakatlarining tilshunoslik sohasi ham, lingvistik tadqiqotlarning koʻlami ham tizimli taraqqiy etganligiga guvoh boʻlamiz. Qaysiki mamlakatda oʻz xalqining jonli tili shevalari mukammal oʻrganilgan boʻlsa, shu millat tilshunosligi tarmoqlari havas qiladigan darajada mukammallikka ega ekanligini kuzatish mumkin.

Jahon shevashunoslik sohasida dialektal hodisalarning mukammal arealini yaratish, shevalarning batafsil va tizimli, oʻz ilmiy an'ana, tendensiyalari va tamoyillariga hamohang, uygʻun hamda tizimli tavsifi yaratilgan. Xususan, hind-yevropa tillari [21, 57 b.] slavyan tillari [7, 87 b.], german-roman va bolqon tillari [15, 43 b.] oʻrganilib, salmoqli yutuqlar qoʻlga kiritilgan va bu dialektologik va areologik an'analar ayni paytlarda ham yuqori darajada davom etmoqda.

Darhaqiqat, shevalar boʻyicha toʻplangan dialektal materiallar asosida xalqlarning hayoti va turmush tarzi bilan bogʻliq boʻlgan juda koʻplab soʻzlar, grammatik shakllar hamda konstruksion qurilmaga ega gaplar adabiy tilga olib kiriladi. Ma'lum xalqqa, millatga tegishli adabiy til imkoniyatlari kengayib, boyib boraveradi.

Yuqoridagilardan kelib chiqib, Namangan viloyati shevasining tarixiy genezisi, tarqalishi va amal qilish arealini belgilash, sheva tasnifi va tavsifi tovushlar tizimining oʻziga xos fonetik-fonologik xususiyatlari, leksik-semantik va grammatik shakl va qurilmalarning oʻziga xos xususiyatlari va qonuniyatlarning voqelanish jarayonlarini qiyosiy-tarixiy jihatdan yoritishga harakat qilamiz. Namangan viloyati arealidagi amaliyotlar natijasida aniqlangan misollar asosidagi oʻziga xos lingvistik xususiyatlar, jahon turkiy tillari va boshqa oʻzbek shevalari bilan lisoniy jihatlaridagi mushtarak belgilar va ular haqidagi xulosalarni bayon qilishga urinamiz.

Adabiyotlar tahlili

Maqolada N.A.Baskakovning "Turkiy tillarning rivojlanish areallari va chegara zonalari", N.I.Tolstoyning "Ареальные исследования в языкщзнании", E.V.Sevortyaning "Janubiy turkiy tillarda undosh tovushlar assimilyatsiyasi va dissimilyatsiyasi" hamda "Turkiy tillar grammatikasining qiyosiy tadqiqotlari", Sh.Shoabdurahmonovning "Oʻzbek tilining dialektologik atlasi", N.Z.Gadjievaning "Turkiy areal lingvistika muammolari", A.B.Joʻrayevning "Oʻzbek tili massivini areal tadqiq qilishning nazariy asoslari", I.Darveshovning "Areal tilshunoslik: janubi-gʻarbiy Namangan shevalarining fonetik-fonologik xususiyatlari" asarlari har tomonlama tahlil qilindi.

Tadqiqot metodologiyasi

Maqolaga yevropa, rus va o‘zbek dialektologik adabiyotlari asos qilib olindi. Mazkur tadqiqotda Namangan viloyatining hududiy-dialektologik xususiyatlarini o‘rganishda hududiy lingvistika (areal lingvistika) tamoyillariga tayanildi. Namangan viloyatining geografik joylashuvi, Farg‘ona vodiysining boshqa hududlari bilan chegaradoshligi va ichki shevalarning tarqalish arealini aniqlash maqsadida zamonaviy axborot tizimlari va raqamli xaritalash usullaridan foydalanildi. Namangan viloyati tumanlari kesimida so‘zlashuv nutqidagi fonetik, leksik va grammatik farqlarni qiyosiy-tarixiy hamda tahliliy metodlar yordamida o‘rganishga alohida e’tibor qaratildi. Hududdagi lahja va shevalarning o‘ziga xos xususiyatlarini yig‘ishda ekspeditsiya materiallari hamda mavjud ilmiy manbalar tahlil qilindi.

Natijalar va tahlil

Jahon tilshunosligidagi muhim masalalardan biri bu tilni areal-tipologik va areal-lingvistik metodlar orqali o‘rganishdir. O‘zbek tilshunosligida lingvistik nazariya va konsepsiyalarning ilk boshlang‘ich nuqtasi – shevalarni, ularning o‘ziga xos lisoniy belgi-xususiyatlarini tadqiq etish bugungi kunda qay darajada? Bu savollarga ham imkon qadar kichik bir arealni o‘rganish barobarida javob topishga harakat qilamiz.

O‘zbekistonda ilm-fan rivojlanishi uchun olib borilayotgan bugungi islohotlarda o‘zbek tilshunosligi oldiga qo‘yilayotgan vazifalarni bajarishga to‘liq imkoniyat va shart-sharoitlar mavjud. O‘zbek tilini har tomonlama mukammal tadqiq etishga bag‘ishlangan maqsadli ilmiy-tadqiqot ishlari keng ko‘lamda amalga oshirilmoqda. Yuzlab mavzularda tilimiz yuzasidan dissertatsion tadqiqot ishlari himoya qilinmoqda. Biroq aksariyat o‘zbek shevalari ochilmagan qo‘riq, inson oyog‘i tegmagan bir orol sifatida lingvistik jihatlari, boy so‘zliklari o‘rganilmay yotibdi. Adabiy tilimizning kelajagiga, taraqqiysiga bu holatlarning ta’siri qanday bo‘ladi? Adabiy til shevalardan oziqlanishi tabiiy-ku.

Ayni paytlarda o‘zbek shevalari va ularning o‘ziga xos xususiyatlarini areal lingvistik tadqiqotlar nazariy asoslariga tayanib, tarixiy-qiyosiy va etnolisoniy jihatdan tadqiq etish ustuvor yo‘nalishlardan biri sifatida belgilanishi shart. Sohaning nomukammal, oddiy tavsifiy va tasviriy jihatlardan iborat noaniq o‘rinlarni yangicha qarashlar asosida, mental nuqtayi nazaridan o‘rganish va to‘ldirishga zarurat sezilmoqda [5, 3-8, 130 b.]. Shundagina tilshunoslik sohalarini tubdan yangilashga qaratilgan innovatsion rivojlanish yo‘liga o‘tishimiz mumkin.

Aniqki, shevashunoslik bo‘yicha amalga oshiriladigan tadqiqotlarda sheva lingvistik birliklarini areal lingvistik konsepsiyalar orqali tadrijiy taraqqiyot asosida analiz va sintezlash zarur. Dialektlarni umumiy tilshunoslikning bir aspekti sifatidagina emas, alohida kengaygan tarmoq va alohidalik belgilariga ega fan sifatida o‘rganish maqsadga muvofiq bo‘ladi.

O‘zbek tilshunosligining dialektologiya va arealogiya sohasi vakillari ham o‘z ilmiy tadqiqot ishlaridagi qarashlarida ham millat tilini dialektologik manba-materiallarni nafaqat tasviriy jihatdan, balki lingvistik geografik, areal lingvistik, qiyosiy, qiyosiy-tarixiy lingvomadaniy, etnolingvistik, tamoyillar asosida yaxlit o‘rganish ko‘proq samara berishi shubhasizdir. Dialektologik ishlarda hududiy til hodisalarining tarqalish ko‘lami va zonasini izoglassa *(izofonema – fonetik belgi, izomorfema – morfologik belgi, izoglassa – leksik belgi; izoglossa chiziqlari esa dialekt kontinuumi tilining (shevaning) lingvistik xaritasidagi odatiy tutashtiruvchi chiziqlari.)* va uning chiziqlari orqali belgilansa, tasviriylikdan qutilib, “nima uchun shunday?” degan savolga aniq ilmiy javob topa olamiz.

Turkiy tilshunoslikda XX asrning 50-60-yillardan boshlab lingvistik geografiyaga, lingvistik xaritalar masalasiga bir oz e’tibor kuchaydi. Bu masala va muammolar N.A.Baskakov [9, 51 b.], M.M.Shiraliyev [32, 68 b.], N.I.Tolstoy [26, 286 b.] N.Z.Gadjiyeva [11, 115 b.], E.V.Sevortyan [24, 102 b.], Sh.Shoabdurahmonov [34, 35-38 b.], A.Shermatov [29, 245 b.], N.B.Burganov [8, 33 b.] kabi olimlar tomonidan yoritildi.

Rang-barang xususiyatlarni o‘zida ifoda etuvchi o‘zbek xalq shevalarining lingvistik xaritalardagi ko‘rinishi til o‘rganuvchilar uchun tilshunoslik va dialektologik qonuniyatlarni tushuntirishda, albatta, juda natijali va samarador bo‘ladi. Ularda ko‘rsatilgan dialektal xususiyatlar, tarqalish hudud – zonalari tilshunosga til hodisalarining tarixiy taraqqiyoti, o‘zbek milliy tilining shakllanish jarayonlari, adabiy til takomili kabi bir qancha masalalarni chuqur va mukammal o‘rganish sharoitini yaratadi.

Lingvistik hodisalarning ma’lum kenglikda tarqalishi va tillararo (shevalararo) munosabatlarni lingvistik geografiya metodlari asosida tadqiq qilish va o‘rganish tamoyillari til (sheva) xususiyatlarini areal bo‘linishini tavsiflash va ma’lum izoglassalarni tahlil qilish, shevalar, tillar jamoalarini (tillar ittifoqi) o‘rtasidagi o‘zaro ta’sir zonalarini (aniq areallarini) aniqlash uchun eng samarali usuldir.

O‘zbek tilshunosligida areal tilshunoslik asosida o‘rganishda A.Jo‘rayev [14, 178 b.], Q.Muhammadjonov [20, 58 b.] Y.Ibrohimov [16, 41 b.] kabi areolog – shevashunoslarning mehnatini alohida ta’kidlash lozim. Bu borada O‘zbekiston Respublikasida o‘zbek tilli massivlarning areal o‘rganilishining nazariy asoslarini yoritib bergan professor A.B.Jo‘rayev xizmatlarini alohida ko‘rsatib o‘tish maqsadga muvofiqdir.

Professor A.Nurmonov “O‘zbek dialektologiyasining shakllanishi va rivojlanishi” nomli maqolasida “o‘zbek mahalliy shevalarini o‘rganishda “Chig‘atoy gurungi” olg‘a surgan g‘oya katta xizmat qildi. Bunga ko‘ra “tilimizning adabiyligi arabiyligida emas, o‘zidadir, shuni tirguzmak”, “tilimiz qoidalarini tatarcha yoxud usmonlicha emas,

tilimizning oʻzidan olmoq" kerak edi. Shuning uchun "xalq ogʻzida yurgan soʻzlarni, xalq adabiyoti boʻlgʻon ertaklar, maqollar yigʻib tekshirmak lozim"ligini ta'kidlab, shundagina jonli xalq tilining oʻziga xos xususiyatlarini haqqoniy oʻrganishga bel bogʻlanishini aytib oʻtadi [22, 425-426 b.]. Olim fikrlari davomida oʻzbek shevashunosligi fanining rivoji uchun salmoqli ulush qoʻshgan fan fidoyilari – A.Shermatovning lingvogeografiyaga, A.B.Joʻrayevning areal lingvistikaga katta yoʻl ochganligini hamda oʻzbek dialektologiyasining keng front boʻylab ravnaq topishi oʻzbek tilini lingvistik xaritalashtirishga keng imkoniyatlar tugʻdirishini va lingvogeografik va areal tadqiqotlar olib borishga sharoit yaratishini, yangi tadqiqotlar dunyoga kelishi oʻzbek tilshunosligining katta yutugʻi boʻlishini ta'kidlagan edi [22, 425-426 b.].

A.B.Joʻrayevning natijali ilmiy izlanishlari oʻzbek areal tilshunosligi boʻyicha amalga oshirilgan yagona ish sifatida ahamiyatlidir.

Boy tilshunosligimizning tarixidan ma'lumki, oʻzbek dialektologiyasining va areal lingvistikasining nazariy asoslari Mahmud Koshgʻariyning "Devonu lugʻotit-turk", Alisher Navoiyning "Muhokamat ul-lugʻatayn" asarlari, keyinchalik Z.M.Bobur, Abulgʻozi Bahodirxon me'rosi bilan bir davrda yoki ulardan ham avvalroq shakillanib ulgurgan.

Biz oʻzbek shevalari oʻrganilishining ilmiy-nazariy asoslarini butun Oʻzbekiston shevalari miqyosida emas, balki Namangan viloyati shevalari arealining oʻrganilishi koʻlami doirasida belgilaymiz va bular asosida xulosa va toʻxtamlarimizni ifodalashga harakat qilamiz.

Hozirgi oʻzbek adabiy tilining poydevor va tayanch birliklarining aksariyati Fargʻona vodiysi shevalarining mahsulidir. Shuning uchun ham akademik A.K.Borovkov oʻz ilmiy izlanishlarini Fargʻona vodiysi shevalaridan materiallar toʻplashdan boshlangani bejiz emas. Biroq u davrlarda mamlakatimizda shevashunoslik faoliyatini birlashtiruvchi markazning yoʻqligi dialektal manba-materiallarni batafsil qayta koʻrib chiqish va xaritalarga koʻchirish imkoniyatiga yoʻl bermagan edi. Bir muddat avvalroq etnograf-tarixchi va dialektolog-tilshunos E.D.Polivanov hamda G'.O.Yunusov, I.K.Yudaxinlar ham oʻzbek shevalari va ularning lisoniy xususiyatlarini oʻrganish, sheva birliklarini xaritalashtirish ishlarini amalga oshirdilar. Oʻzbekistonda shevalarni oʻrganish kuchaydi va ularning areallarini belgilash ishi kun tartibiga qoʻyildi. V.V.Reshetov, Sh.Shoabdurahmonov kabi tilshunoslar oʻzbek areal tilshunosligi sohasini nazariy va ilmiy-amaliy asoslar bilan oʻzlarining ilmiy asarlari, asosli manba – materiallar bilan boyitishga, oʻzbek dialektologiya sohasining rivojlanishiga, takomillashishiga salmoqli ulush qoʻshdilar.

Oʻzbek dialektlari arealini xaritalashtirishda professor V.V.Reshetovning xizmatlari katta. U Toshkent viloyati boʻyicha dialektologik tadqiqotlar olib borib, Ohangaron vohasidagi shevalarda uchraydigan adabiy tildan fonetik, leksik va grammatik jihatdan keskin farq qiluvchi birliklarni aniqladi Ularni lingvistik xaritalarga koʻchirganligi haqida ma'lumotlar uchraydi. Dialektolog olim A.Shermatov V.V.Reshetovning hozirgi zamon oʻzbek tilshunoslik sohasi oʻzbek shevashunosligida birinchi boʻlib oʻzbek qurama shevalarning 49 ta lingvistik xaritasini tuzganligini, negadir hozirgacha bu xaritalar mavjud emasligini, nashr qilinmaganligini yozadi [30, 4 b.].

Tadrijiy – evolyutsion rivojlanish har qanday fanga xos, bu yangilik emas. Oʻrta Osiyodagi va boshqa yer yuzidagi turkiylar, turkiy lingvistikaga, shevashunoslikka XI asrdayoq Mahmud Koshgʻariy [19, 62 b.], keyinchalik, Alisher Navoiy [4, 106 b.] tomonidan haqiqiy asos solingan boʻlsa, ularning ilmiy-nazariy qarashlari hozirgacha turkiy va oʻzbek tilshunosligining bebaho xazinasi sifatida baholanib, oʻrganilib kelmoqda.

Turkiy tillarning ilmiy oʻrganilishi oʻzbek tilshunosligi, xususan, oʻzbek dialektologiyasi sohasining rivoj topishida muhim bosqich sanaladiki, bunda turkolog olim N.A.Baskakov [27, 121-135 b.] va boshqa koʻplab turkiyshunoslarning ilmiy-nazariy konsepsiyalari turkologiya va oʻzbek shevashunosligi taraqqiyotiga alohida hissa qoʻshgan.

Oʻzbek dialektlari arealini E.D.Polivanov salmoqli nazariy va amaliy ishlarni amalga oshirdi va oʻzbek shevalarini birinchilardan boʻlib tasniflab berdi [28, 45 b.].

K.K.Yudaxin oʻzbek shevalari genezisidagi interferentsiya – oʻzbek-uygʻur va qirgʻiz-oʻzbek-tojik tillari orasidagi oʻzaro munosabatlar masalasini oydinlashtirib berdi. Chigʻatoy tili tovush tizimini sinchiklab, chuqur oʻrgandi [35, 28-30 b.].

A.K.Borovkov esa, oʻz izlanishlari orqali oʻzbek-tojik tillarining oʻzaro munosabati, oʻzbek shevalarining tasnifi va tavsifi, oʻzbek dialektlari fonetikasiga katta urgʻu berdi [10, 58-74 b.].

V.V.Reshetov esa oʻzbek shevalarining fonetikasi, uning transkriptsiyasi, oʻzbek milliy tilining dialektal asoslari boʻlgan muhim masalalarni oydinlashtirishga harakat qildi. Toshkent, Ohangaron hududlari, Margʻilon, Namangan kabi yirik shaharlar shevalarini oʻrganib, hozirgi oʻzbek adabiy tiliga asos boʻlgan oʻzbek shevalarning adabiy tilga boʻlgan munosabati, ularning oʻziga xos xususiyatlarini ilmiy-nazariy tarzda koʻrsatib berdi. Qurama genezisining ilmiy-nazariy va amaliy asosini aniqlashga muvaffaq boʻldi va qurama shevalarining oʻziga xos xususiyatlarini, ayniqsa, fonetik sathini tasniflab berdi.

Bir talay oʻzbek millatining zabardast tilshunos – dialektologlari Sh.Shoabdurahmonov, F.Abdullayev, Y.Gʻulomov, Sh.Afzalov, X.Donyorov, A.Y.Aliyev, Q.Muhammadjonov, Y.Ibrohimov til fidoiylari oʻzbek shevalari fonetikasi, leksikasi va grammatikasi oʻrganilishi yoʻlida salmoqli ishlarni amalga oshirdilar.

Aytish kerakki, oʻzbek shevalari lisoniy xususiyatlarini oʻrganishda oʻzbek dialektologiyasining oʻz anʼanalari, oʻziga xos tamoyil va asoslari bor [31, 81 b.]. Katta avlod olimlari tomonidan boshlangan oʻzbek shevalarining ilmiy asosda oʻrganilishini Sh.Shoabdurahmonov, F.Abdullayev, X.Donyorov, S.Ibrohimov, A.Ishayev, A.Aliyev, N.Rajabov, Sh.Nosirov, S.Otamirzayeva, H.Uzoqov, S.Tulyakov va boshqa olimlar davom ettirdilar [13, 147 b.].

XX asrning uchinchi choragi, aniqrogʻi, 60-70-yillariga kelib, oʻzbek shevashunosligida ilmiy tadqiqot ishlari amalga oshirish kuchaydi. A.Ishayevning Mangʻit shevasiga bagʻishlangan izlanishlari [18, 52 b.], F.Abdullayevning dialektologik tadqiqotlari [6, 178 b.] salmogʻi, ilmiylik jihatlari bilan qimmatlidir.

Bu davrda Namangan viloyati shevalarini oʻrganish ham kuchaya bordi. Namangan shahar tip shevasining fonetik strukturasi eksperimental tahlillar asosida oʻrganilgan, uning boshqa oʻzbek shevalaridan tubdan farq qilishi, faqat Namangan shahar arealigagini xos lisoniy belgilari aniqlangan S.Otamirzayevaning Namangan shevasi fonetikasiga bagʻishlangan tadqiqotlari monografik tarzda [23, 187 b.] maydonga keldi.

A.Turgʻunovning oʻzbek tili Baliqchi guruh shevalari, H.Hamroyevning oʻzbek tili Qashqadaryo shevalari, D.Abdullayevaning oʻzbek tili Oshoba shevasi lisoniy xususiyatlari dialektal tahlil qilingan tadqiqotlari [25, 201 b.], yana boshqa koʻplab oʻzbek shevalarini oʻrganishga qaratilgan ilmiy tadqiqotlar amalga oshirildi.

Oʻzbek tilshunosligining mukammal tarmogʻi sifatida shakllangan boʻlishiga qaramay, deyarli yarim asrdan koʻproq yillar davomida oʻzbek shevashunosligi boʻyicha amalga oshirilishi lozim boʻlgan ilmiy izlanishlar, tadqiqotlar juda kam, talab darajasida amalga oshirilmayapti. Adabiy tilimizning boyish va oziqlanish manbayi oʻrganilmay, bu adabiy tilimizning taraqqiy etishi va rivojlanishiga salbiy taʼsir koʻrsatganday boʻlib koʻrinmoqda.

Bugungi kunga kelib ham oʻzbek shevalari boʻyicha amalga oshirilayotgan ishlarning koʻlami juda kengayib keta olmayapti. Lingvistik geografiya, areal tilshunoslik nuqtayi nazaridan hali oʻzbek shevalarini toʻla tahlilga tortilgan deb boʻlmaydi. Ayniqsa, Oʻzbekistonning markaziy va aholisi zich yirik shaharlaridan uzoq joylashgan aholi shevalarini areal oʻrganilishi hali oʻz yakunini topmagan. Dialektal faktlarni oʻrganish xalqimiz milliy vakillarning etnik, mental, maʼnaviy va madaniy xususiyatlarini aniqlash imkonini beradi. Zero, til millatning bebaho qadriyati, donishmandlar taʼkidlaganidek: “Tilda millat ruhi yashaydi” [12, 15-21 b.].

Jahonda areal lingvistik tadqiqotlar juda koʻp miqdorda amalga oshirilgani bois ularning barchasi haqida maʼlumot berish ancha murakkab.

Mamlakatimizda oʻzbek shevalari oʻrganilishining ilmiy-nazariy asoslarini ikki guruhga ajratish mumkin:

1. Hozirgi tilshunoslik sohasidagi sof dialektologik koʻlamdagi ilmiy tadqiqot ishlari. Ularda, asosan, shevaning oʻziga xos fonetik, leksik va grammatik xususiyatlari aholi yashash manzillarining nomi keltirilib, lingvistik xaritalash orqali oʻrganilgan. Bu jarayon XX asrning 90-yillariga qadar davom etdi, hozirda ham amalga oshirilmoqda. Xususan, oʻzbek shevalarini oʻrgangan oʻzbek tilshunoslaridan aksariyat tadqiqot ishlarini mazkur guruhga kiritish mumkin. Hozirgi oʻzbek tilidagi ilk tadqiqot ishlari sifatida E.D.Polivanovning asarlari [3, 90 b.]ni keltirish lozim.

XXI asrning boshlaridan to hozirgi kunlargacha Norbayeva Shukurjon Xayitbayevnaning “Xorazm shevalari kasbiy leksikasi shakllanishining onomasiologik tamoyillari” (2016), Allaberdiyev Alijon Avezberdiyevich tomonidan “Buxoro oʻgʻuz shevalari leksikasi” (2018), Xolova Muyassar Abdulxakimovnaning 2022-yilda “Oʻzbek milliy shevalari korpusi tadqiqi (Boysun tumani “j”lovchi shevalari misolida) dissertatsion tadqiqot ishi, “Oʻzbek milliy shevalari korpusi tadqiqi” (2022) monografiyasi hamda “Oʻzbek tili dialektal korpusini tuzish amaliyoti” (2023) darsligi, Xidiraliyeva Zoxira Risqulovnaning “Oʻzbek tilining Iqon shevasi” (2023) kabi oʻzbek shevalarini dialektologik aspektlarda oʻrganish ishlari maydonga keldi.

2. Mahmud Koshgʻariy ilmiy anʼanalirini davom ettirgan holda lingvogeografik metod asosida oʻzbek shevalari arealogik aspektlarda oʻrganilgan ilmiy faoliyatda quyidagilarni eʼtirof etish maqsadga muvofiq: Sh.Shoabdurahmonov, V.V.Reshetov, A.Joʻrayev, A.Shermatov, Q.Muhammadjonov, Y.Ibrohimov, N.Murodova [33, 371 b.], Z.Ibrohimova, I.Darvishov, N.Rahmonovlarning monografik izlanishlari [17, 143 b.], Sh.Norbayeva, G.Norova, A.Turdaliyev, M.Suvanova, Sh.Alimova, Z.Xidiraliyeva, O.Nurjanov, Z.Tillabayeva, A.Allaberdiyevlarning [1, 58 b.] dissertatsion tadqiqotlari oʻzbek shevalari oʻrganilishining nazariy asoslarining mustahkamlanisiga ilmiy jihatdan munosib ulush boʻlib qoʻshilgan, desak xato boʻlmaydi.

Xulosa

Shevalarni areal aspektlarda oʻrganish boʻyicha amalga oshirilgan tadqiqotlarda, asosan, Oʻzbekistonda dialektologik atlas yaratish ishlari, oʻz lingvistik qarashlarini dialektologik xaritalar tuzish orqali bayon qilganlar va oʻrganilgan areallarning lingvistik atlaslarini taqdim etganlar.

Shuni takidlash lozimki, hali mamlakatimizda oʻzbek milliy shevalari dialektologik atlasini yaratish ishiga hali toʻliq kirishilganicha yoʻq, lekin areal lingvistika masalalari oʻzbek tilshunosligida oʻtgan asrning 20-yillaridayoq tadqiq qilina boshlagan “...E.D.Polivanovning “Oʻzbek dialektologiyasi va oʻzbek adabiy tili” degan asari ahamiyatlidir. Asarda oʻzbek shevalarining tarqalishi, ularning yaqinlik darajasi, ularga xos fonetik, leksik, morfologik xususiyatlar belgilab berilgan.

Muhimi, o‘zbek tilining uch lahjasi turkiy tillar tarixi bilan bog‘lanadi, o‘zbek shevalarining chegaradosh tillar bilan munosabati ham e’tibordan chetda qolmagan [5, 3-8, 130 b.].

Aniqki, xalq shevalari adabiy tilining yozma yodgorliklariga nisbatan ham qadimiyroq tarixiy manbadir. Bizgacha yetib kelgan yozma yodgorliklarda uchramaydigan til faktlari shevalarda saqlanib qolgan. Shuning uchun sheva materiallarini tadqiq etish tilning ontologik tabiatini ochib berish imkonini beradi [12, 15-21 b.].

Darhaqiqat, o‘zbek shevalari o‘zbek milliy tilining tarkibiy qismi sifatida, o‘zining qadimiy lisoniy hodisa ekanligi, asrlar davomida rivojlanib, boyib hamda takomillashib borganligi uning rang-barang jiloga ega ekanligi, adabiy tilimiz boyishiga beminnat xizmat qilishi bilan tavsiflanadi. Xalq sheva va lahjalari o‘zida tilning qadimiy va ko‘hna holatini, fonetik, lug‘aviy, grammatik xususiyatlarini saqlab kelayotgan noyob manba – tirik tarixdir. Bu boylikni o‘rganish bo‘yicha anchagina ishlar amalga oshirilishi lozimligini bugungi adabiy tilimizdan foydalanayotgan xalqimiz lisoniy va nutqiy darajasidan ham bilsak bo‘ladi. Ayniqsa, zamonaviy yoshlarimizning milliy-mental ruhda tarbiyalanishlariga bir omil bo‘ladi.

Xususan, boshqa turkiy tillarda bo‘lgani kabi Namangan viloyati shevalarida ham o‘zbek xalqining uzoq davom etgan qadimiy asos – “Devoni lug‘otit-turk” davri fonetikasi, leksikasi va grammatikasidagi mushtarak xususiyatlar sheva areali tahlillari davomida ma’lum bo‘ldi.

Sheva leksikasi materiallarini to‘plash va ularni tasnif qilish mazkur sheva nihoyatda xilma-xil va ko‘p qirrali ekanligini ko‘rsatib berdi. Areal aholisi tilida iste’molda bo‘lgan hunarmandchilik, kasb-korga, qishloq xo‘jaligiga oid terminlar, kishilarning kundalik turmushi, falsafiy-diniy qarashlariga oid so‘zlar, qadimiy ma’rifiy madaniyati, mental jihatlarni o‘zida ifodalab berishi namoyon bo‘ldi.

Shevalar bo‘yicha dialektal fonetik-fonologik, leksik-semantik va morfogrammatik lisoniy xususiyatlar ta’lim tizimida o‘qituvchi va o‘quvchilar til kompetentligini boyitish va rivojlantirishga, ular ongiga adabiy til me’yorlarini singdirishga va nutq madaniyatini shakllantirishga salbiy ta’sir etmasligi uchun amaliy tilshunoslik masalalarini kun tartibiga qo‘yish bugungi tilshunosligimiz, fanimiz va milliy adabiy tilimizning rivojlantirish yo‘lidagi muhim va dolzarb vazifalardandir.

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1991–2026-YILLARDA O‘ZBEKISTON TIL SIYOSATINING INGLIZ TILI MAQOMI VA UNING MAHALLIY VARIANTLASHUVIGA TA’SIRI

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Annotatsiya: *Ushbu tadqiqot 1991–2026-yillarda O‘zbekistonda olib borilgan me’yoriy-huquqiy til siyosatining ingliz tili maqomiga ta’sirini diaxronik va institutsional yondashuvlar asosida tahlil qiladi. Ishning maqsadi — asosiy qonun hujjatlari (PQ-1875, PF-4947, VM-312, VM-3318, PQ-241) dinamikasini o‘rganish orqali tildan foydalanishning institutsionallashuv darajasini aniqlash hamda “Uzbek English” mahalliy varianti shakllanishi uchun asoslarni aniqlashdan iborat. Maqolada Bernard Spolski modeli va kontent-tahlilga tayangan holda, ingliz tili siyosati evolyutsiyasi uch bosqichni bosib o‘tgani ko‘rsatildi: davlat tili ustuvorligi davri (1991–2000); yashirin maqomni rejalashtirish va ommalashtirishning boshlanishi (2001–2016); tizimlashtirish hamda tilni strategik muloqot vositasiga aylantirish (2017–2026). Sertifikatlash va moddiy rag‘batlar ingliz tilini muhim lingvistik hamda iqtisodiy kapitalga aylantirgani va uning B. Kachru “Expanding Circle” doirasidan chiqib, mahalliy variantlanishiga sharoit yaratayotgani ko‘rsatib o‘tilgan.*

Kalit so‘zlar: *til siyosati, ingliz tilining maqomi, O‘zbekiston, Uzbek English, diaxronik tahlil, B. Spolsky modeli, lingvistik kapital, yashirin maqom rejalashtirish, institutsionallashuv, me’yoriy-huquqiy hujjatlar.*

ВЛИЯНИЕ ЯЗЫКОВОЙ ПОЛИТИКИ УЗБЕКИСТАНА В 1991–2026 ГОДАХ НА СТАТУС АНГЛИЙСКОГО ЯЗЫКА И ЕГО ЛОКАЛЬНУЮ ВАРИАТИВНОСТЬ

Аннотация: *Данное исследование анализирует влияние нормативно-правовой языковой политики, проводимой в Узбекистане в 1991–2026 годах, на статус английского языка на основе диахронического и институционального подходов. Цель работы — определить степень институционализации использования языка путем изучения динамики ключевых нормативно-правовых актов (ПП-1875, УП-4947, ПКМ-312, ПКМ-3318, ПП-241), а также выявить основы для формирования локального варианта «Uzbek English». Опираясь на модель Бернарда Спольского и контент-анализ, в статье показано, что эволюция политики в отношении английского языка прошла три этапа: период приоритета государственного языка (1991–2000); скрытое планирование статуса и начало популяризации (2001–2016); систематизация и превращение языка в стратегическое средство общения (2017–2026). Продемонстрировано, что сертификация и материальное стимулирование превратили английский язык в важный лингвистический и экономический капитал, создав условия для его локальной вариативности за пределами «Expanding Circle» Б. Качру.*

Ключевые слова: *языковая политика, статус английского языка, Узбекистан, Uzbek English, диахронический анализ, модель Б. Спольского, лингвистический капитал, скрытое планирование статуса, институционализация, нормативно-правовые акты.*

THE IMPACT OF UZBEKISTAN’S LANGUAGE POLICY IN 1991–2026 ON THE STATUS OF ENGLISH AND ITS LOCAL VARIATION

Abstract: *This study analyzes the impact of Uzbekistan’s regulatory language policy from 1991 to 2026 on the status of the English language using diachronic and institutional approaches. The objective of the paper is to determine the degree of institutionalization of language use by examining the dynamics of key legislative acts (PQ-1875, PF-4947, VM-312, VM-3318, PQ-241) and to identify the foundations for the emergence of the localized variety ”Uzbek English”. Drawing on Bernard Spolsky’s model and content analysis, the article demonstrates that the evolution of English language policy progressed through three stages: the era of state language priority (1991–2000); implicit status planning and the onset of popularization (2001–2016); and systematization alongside the transformation of the language into a strategic communication medium (2017–2026). The paper highlights that*

certification and financial incentives have converted English into vital linguistic and economic capital, establishing the prerequisites for its localized variation beyond B. Kachru's "Expanding Circle".

Keywords: *language policy, status of English, Uzbekistan, Uzbek English, diachronic analysis, Spolsky model, linguistic capital, implicit status planning, institutionalization, regulatory documents.*

Kirish

XXI asr globallashuv va axborot-kommunikatsiya texnologiyalari jadallik bilan rivojlanayotgan davrda, tillarning jamiyatdagi amaldagi maqomi hamda ularni qonun yo‘li bilan tartibga solish har qanday suveren davlatning ijtimoiy-siyosiy va iqtisodiy taraqqiyot strategiyasida muhim ahamiyat kasb etadi. B. Spolskining fikricha, til siyosati jamiyat yoki davlat tomonidan muayyan tillarga yoxud ularning variantlariga nisbatan ongli tarzda belgilangan me’yorlar, ijtimoiy ustuvorliklar va institutsional boshqaruv qarorlarining ko‘p qirrali majmuidir [15]. Til siyosati faqatgina ta’lim tizimining mazmuni va yo‘nalishini belgilabgina qolmasdan, balki fuqarolarning mehnat bozoridagi mavqeyi, ijtimoiy harakatchanligi va milliy o‘zlikni anglash darajasiga ham o‘z ta’sirini ko‘rsatadi [15; 13]. Zamonaviy globallashgan dunyoda ingliz tili endilikda nafaqat xalqaro muloqot va biznes vositasi, balki ilm-fan, texnologiyalar, akademik almashinuv va transmilliylashuv jarayonlarining asosiy harakatlantiruvchi kuchi sifatida namoyon bo‘lmoqda [2; 12]. Shu bois post-sovet hududidagi rivojlanayotgan davlatlar uchun milliy-madaniy o‘zlikni saqlab qolgan holda ingliz tilini davlat va jamiyat hayotiga faol integratsiya qilish murakkab va ko‘p qirrali sotsiolingvistik jarayon hisoblanadi [14; 11].

O‘zbekiston Respublikasi mustaqillikka erishish arafasida, til siyosati dastlabki bosqichining eng ustuvor vazifasi sifatida o‘zbek tilining davlat tili maqomini tiklash hamda sovet davrida chetlashtirilgan milliy til huquqlarini amalda ta’minlashni belgilab oldi. 1989-yil 21-oktyabrda “Davlat tili haqida”gi Qonunning qabul qilinishi va 1995-yilda uning yangilangan tahriri tasdiqlanishi bilan milliy til siyosatining mustahkam huquqiy poydevori yaratildi [7]. Ammo keyingi o‘n yilliklarda mamlakatning bozor iqtisodiyotiga o‘tishi, xalqaro hamjamiyatga bosqichma-bosqich kirib borishi hamda jahon mehnat bozorida raqobatbardosh bo‘lishga intilishi xorijiy tillarni, xususan ingliz tilini o‘rganish va amalda qo‘llashga bo‘lgan davlat yondashuvini tubdan o‘zgartirishni taqozo etardi [3; 4].

O‘zbekiston Respublikasi Prezidenti va Vazirlar Mahkamasi tomonidan 2012–2026-yillar oralig‘ida qabul qilingan bir qator davlat hujjatlari — “Chet tillarni o‘rganish tizimini yanada takomillashtirish chora-tadbirlari to‘g‘risida”gi PQ-1875-sonli qaror [5], “O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha Harakatlar strategiyasi to‘g‘risida”gi PF-4947-sonli Farmon [6], “Xorijiy tillarni o‘rganishni ommalashtirish faoliyatini samarali tashkil etish chora-tadbirlari to‘g‘risida”gi VM-312-sonli qaror [8], “Xalqaro va milliy sertifikatlar muvofiqlik jadvalini tasdiqlash to‘g‘risida”gi VM-3318-sonli qaror [9] hamda maktab ta’limini rivojlantirishga oid PQ-241-sonli qaror [4] — mamlakatda ingliz tilining ijtimoiy maqomini sifat jihatidan yangi bosqichga olib chiqdi. Mazkur normativ-huquqiy hujjatlar ingliz tilini ta’lim muassasalaridagi an’anaviy “o‘quv fani” darajasidan chiqarib, uni davlat xizmatchilari, ilmiy izlanuvchilar, tadbirkorlar va yoshlar uchun strategik ahamiyatga ega bo‘lgan majburiy hamda rag‘batlantiriluvchi vositaga aylantirdi [11; 13].

Til siyosatining bunday jadal me’yoriy-huquqiy institutsionallashuvi va ommalashuvi O‘zbekistonda o‘ziga xos sotsiolingvistik va interferensial jarayonlarni yuzaga keltirmoqda. Davlat darajasidagi moddiy va ma’naviy rag‘batlantirish mexanizmlari — oylik maoshlarga 15–50 foizgacha ustama belgilanishi, xalqaro va milliy sertifikatlarning (IELTS, TOEFL, CEFR) talab qilinishi, xususiy ta’lim sektoriga subsidiyalar ajratilishi — mamlakatda ingliz tilini faol qo‘llovchi keng ijtimoiy qatlamni shakllantirdi [1; 13]. Natijada ingliz tili an’anaviy ravishda amal qilib kelgan “Chet tili sifatida ingliz tili” (EFL) hamda B. Kachru ilgari surgan “Expanding Circle” chegaralaridan bosqichma-bosqich chiqib, mahalliy madaniy, sintaktik, leksik va pragmatik xususiyatlar bilan boyigan “Uzbek English” ko‘rinishida namoyon bo‘lish belgilarini va ijtimoiy-huquqiy shart-sharoitlarini namoyon eta boshladi [3; 4].

Shu bilan birga, mavjud sotsiolingvistik va filologik tadqiqotlar tahlili shuni ko‘rsatadiki, O‘zbekiston til siyosatini tartibga soluvchi rasmiy me’yoriy-huquqiy hujjatlar va davlat qarorlari diaxronik hamda institutsional nuqtai nazardan tizimli tadqiq etilmagan. Davlatning me’yoriy-huquqiy tashabbuslari ingliz tilining lokal variantlashuvi (“Uzbek English”) uchun qanday ijtimoiy-huquqiy va lingvistik zamin yaratganligi masalasi hamon ochiq qolmoqda. Shu sababli ushbu tadqiqot tatqiq etmoqchi bo‘lgan muammo bu davlat me’yoriy-huquqiy til siyosatining evolyutsiyasi ingliz tilining jamiyatda amaldagi maqomini qanday qayta shakllantirgani hamda ushbu bosqichma bosqich o‘zgarishlar “Uzbek English” variantining yuzaga kelishi uchun qanday sotsiolingvistik va huquqiy zamin yaratayotganini ilmiy asoslab berishdan iborat. Tadqiqotning asosiy maqsadi — 1991–2026-yillarda O‘zbekistonda qabul qilingan rasmiy me’yoriy-huquqiy hujjatlarni diaxronik va kontent-tahlil usullari orqali o‘rganish, ingliz tilining huquqiy-ijtimoiy maqomidagi bosqichli evolyutsiyani aniqlash hamda uning “Uzbek English” mahalliy varianti shakllanishidagi rolini nazariy va amaliy jihatdan asoslab berishdir.

Adabiyotlar tahlili

Til siyosati va uning jamiyatdagi institutsional mexanizmlarini tadqiq etishda B. Spolski ilgari surgan uch komponentli model — til amaliyoti, til e'tiqodi/ideologiyasi va til boshqaruvi — ushbu tadqiqot uchun birlamchi nazariy tayanch hisoblanadi [15]. Spolskining ta'kidlashicha, rasmiy til boshqaruvi, ya'ni qonun va qarorlar, jamiyatda mavjud boʻlgan haqiqiy til amaliyoti va ijtimoiy e'tiqodlar bilan mos kelgandagina kutilgan sotsiolingvistik samarani beradi [15]. Mazkur nazariy konsepsiyani E. Shohami oʻzining "yashirin til siyosati" va "siyosiy mexanizmlar" nazariyasi bilan yanada boyitgan [13]. Shohami koʻrsatib oʻtganidek, rasmiy hujjatlarda ochiq ta'kidlanmagan, ammo imtihon tizimlari, majburiy sertifikatlash, til talablari va iqtisodiy manbalarni taqsimlash kabi yashirin vositalar orqali amalga oshiriladigan til siyosati koʻpincha deklarativ e'lonlardan koʻra ancha kuchliroq sotsiolingvistik ta'sir kuchiga ega boʻladi [13].

Lingvistik va ijtimoiy kapital nazariyasi doirasida P. Burdyening qarashlari alohida oʻrin tutadi. P. Burdye tilni shunchaki neytral muloqot vositasi emas, balki ijtimoiy maydonda subyektning mavqeyini, iqtisodiy daromadini va nufuzini belgilaydigan ramziy va lingvistik kapital sifatida talqin qiladi [1]. Oʻzbekiston kontekstida ingliz tili bilimining mehnat bozorida yuqori iqtisodiy qiymatga ega boʻlishi, davlat xizmatida va ilmiy sohaga kirishda ustunlik berishi Burdyeu nazariyasining yorqin amaliy tasdigʻidir [1; 13].

Post-sovet davlatlaridagi til siyosati va koʻptillilik dinamikasini oʻrgangan A. Pavlenko post-sovet makonida davlatlar til siyosatida uchta asosiy jarayonni — milliy tilni tiklash, sovet davridan qolgan rus tili pozitsiyasining oʻzgarishi hamda yangi xalqaro tillarning joriy etilishini — boshdan kechirganini koʻrsatib oʻtgan [11]. J. Smagulova esa Qozogʻiston misolida "qozoqlashtirish" va uch tillilik siyosatining jamiyatdagi til munosabatlariga hamda til egalari stereotiplariga ta'sirini tahlil qilib, davlat me'yoriy hujjatlarining ijtimoiy amaliyot bilan toʻqnashuv nuqtalarini yoritgan [14]. Oʻzbekiston ushbu umumiy post-sovet tendensiyasiga mos kelgani holda, soʻnggi yillarda ingliz tiliga strategik va ommaviy ustuvorlik berilishi jihatidan mintaqada alohida ajralib turuvchi xususiyat namoyon etmoqda [11; 14].

World Englishes va ingliz tilining global tarqalishi nazariyasi sohasida B. Kachru yaratgan "uch doira" modeli metodologik invariant boʻlib xizmat qiladi [3]. Kachru ingliz tilining qoʻllanilish darajasi va tarixiy ildizlariga koʻra jamiyatlarni uchga ajratadi: Inner Circle (ingliz tili ona tili boʻlgan mamlakatlar), Outer Circle (ingliz tili ikkinchi rasmiy va institutsional til boʻlgan sobiq koloniyalar) va Expanding Circle (ingliz tili chet tili sifatida oʻrganiladigan mamlakatlar) [3]. Kachruning ta'kidlashicha, ingliz tili muayyan hududda faol va ommaviy qoʻllanila boshlagach, u mahalliy lingvo-madaniy xususiyatlarni qabul qiladi va muqarrar ravishda mustaqil mahalliy variant koʻrinishini oladi [3; 4]. Ushbu yoʻnalishni davom ettirgan J. Jenkins va B. Seidlhofer ingliz tilining xalqaro lingua-franka (ELF) sifatidagi funksiyasini tadqiq etib, muloqotda til egalari (native-speaker) me'yorlariga koʻr-koʻrona ergashish emas, balki mahalliy muloqotchilarning pragmatik va funksional ehtiyojlari ustuvor ahamiyat kasb etishini isbotlagan [2; 12].

Oʻzbekistonda ingliz tilining amalda qoʻllanishini tadqiq etgan ishlar ta'lim islohotlari va yoshlarning uni lingvistik kapital deb idrok etishini koʻrsatgan [1; 3; 11; 13]. Biroq mavjud nazariy yondashuvlarning hech biri til siyosatining huquqiy mexanizmlari hamda uning sotsiolingvistik oqibatlari oʻrtasidagi bogʻliqlikni alohida holda toʻliq izohlay olmaydi [1; 15]. Shu sababli ushbu tadqiqotda huquqiy hujjatlar tahlilini sotsiolingvistik nazariyalar (Spolsky, Shohami, Burdyeu, Kachru, Jenkins) bilan integratsiyalashgan holda qoʻllash metodologik jihatdan zarurdir [2; 3; 13; 15].

Tadqiqot metodologiyasi

Ushbu tadqiqotda me'oriy-huquqiy til siyosatining vaqt boʻyicha dinamikasini hamda uning sotsiolingvistik oqibatlarini tahlil qilish uchun kvalitativ diaxronik kontent-tahlil va institutsional-tizimli yondashuv usullaridan foydalandik. Tadqiqotning nazariy-metodologik asosi sifatida Bernard Spolskyning til siyosati triadasi [15] hamda Elana Shohamining "yashirin til siyosati" va "siyosiy mexanizmlar" konsepsiyasi [13] tanlab olindi. Mazkur nazariy tahlillar me'yoriy-huquqiy hujjatlarning nafaqat ochiq e'lon qilingan maqsadlarini, balki ularning jamiyatda yuzaga keltirgan bilvosita sotsiolingvistik va interferentsial oqibatlarini chuqur anglashimiz uchun imkon beradi.

Tadqiqotning empirik bazasini 1991–2026-yillarda Oʻzbekiston Respublikasining rasmiy qonunchilik platformasi — "Qonunchilik ma'lumotlari milliy bazasi" (lex.uz) — hamda Oʻzbekiston Respublikasi Qonun hujjatlari toʻplamida e'lon qilingan me'yoriy-huquqiy hujjatlar tashkil etadi [4; 5; 6; 8; 9]. Tahlil uchun quyidagi asosiy normativ-huquqiy hujjatlar saralab olindi: "Davlat tili haqida"gi Qonun (1989-yil 21-oktabr, 1995-yil 21-dekabrdagi yangi tahriri) [7]; Prezidentning 2012-yil 10-dekabrdagi PQ-1875-sonli qarori [5]; Prezidentning 2017-yil 7-fevraldagi PF-4947-sonli Farmoni [6]; Vazirlar Mahkamasining 2021-yil 19-maydagi 312-sonli qarori [8]; Vazirlar Mahkamasining 2021-yil 26-maydagi 3318-sonli qarori [9]; hamda Prezidentning 2024-yil 21-iyundagi PQ-241-sonli qarori [4].

Me'yoriy-huquqiy hujjatlarni diaxronik kontent-tahlil qilishni quyidagi toʻrtta asosiy mezon boʻyicha amalga oshirdik: birinchidan, ingliz tilining statusi va maqomini tekshirish — hujjatda ingliz tiliga berilgan ijtimoiy-huquqiy va institutsional maqom hamda uning davlat va jamiyat muloqotidagi oʻrni [13; 15]; ikkinchidan, institutsional mexanizmlar va ragʻbatlantirishlar — majburiy sertifikatlar (IELTS, CEFR), oylik maosh ustamalari (15–50 foiz), grantlar hamda davlat imtihonlaridagi imtiyozlar dinamikasi [1; 8; 9]; uchinchidan, "policy silence" va ingliz tilining bilvosita maqomi — hujjatlarda rasman ta'kidlanmagan, ammo amalda ingliz tilini boshqa tillardan ustun mavqega koʻtargan sotsiolingvistik

omillar [7; 11]; to‘rtinchidan, mahalliy variantlanish sharoiti — davlat me’yorlarining ingliz tilini ommalashtirish orqali “Uzbek English” shakllanishiga yaratgan zamini [3; 4].

Tanlangan hujjatlar korpusi xronologik tartibda joylashtirilib, har bir hujjat matni yuqorida sanab o‘tilgan 4 ta mezon asosida bizma bir tahlil qilindi. Tahlil jarayonida har bir hujjatdan ingliz tiliga oid me’yoriy ko‘rsatmalar, moddiy rag‘batlantirish choralari va institutsional vazifalar ajratib olindi hamda ular xronologik ketma-ketlikda taqqoslandi.

Natijalar va ularning tahlili

1991–2026-yillar oralig‘idagi normativ-huquqiy hujjatlar korpusini Spolsky [15] va Shohami [13] modellari asosida diaxronik va kontent-tahlil qilish O‘zbekistondagi ingliz tili siyosati evolyutsiyasini uchta aniq bosqichga ajratish imkonini berdi, bular davlat tilini tiklash davridan boshlab strategik lingvistik muhit shakklanishiga qadar davrlarni bosib o‘tganini ko‘rsatadi.

Mustaqillikning dastlabki yillarida (1991–2000) O‘zbekiston til siyosati asosan o‘zbek tilining davlat tili sifatidagi mavqeyini tiklashga qaratilib [7], ingliz tiliga nisbatan me’yoriy-huquqiy munosabat “policy silence” tamoyili bilan tavsiflandi [7; 13]. Ushbu davrda ingliz tili alohida institutsional rag‘batlantirish mexanizmlarisiz, o‘quv rejalaridagi an’anaviy chet tillaridan biri sifatida neytral va akademik shaklda o‘qitildi [3]. Natijada til “Expanding Circle” va klassik EFL doirasida qolib, asosan tashqi aloqalar kabi tor sohalar bilan cheklandi [3; 7] hamda maosh ustamalari yoki sertifikatlash talablarining yo‘qligi sababli ijtimoiy ehtiyoj past bo‘lib, mahalliylashuv jarayonlari uchun zaruriy ommaviylik shakllanmadi.

Vaziyat XXI asr boshlarida tubdan o‘zgara boshladi: mamlakatning xalqaro hamjamiyatga integratsiyalashuvi va iqtisodiy modernizatsiya ehtiyojlari chet tillarini, xususan ingliz tilini ta’lim tizimida o‘qitish yondashuvini qayta ko‘rib chiqishni taqozo etdi. 2001–2016-yillarni qamrab olgan ikkinchi bosqichdagi tub burilish Prezidentning 2012-yil 10-dekabrdagi PQ-1875-sonli qarori bilan belgilandi [5]. Ushbu qaror mamlakat til siyosatida “implicit status planning” mexanizmini ishga tushirdi [5; 13]: qarorda ingliz tiliga rasmiy-huquqiy darajada davlat tili yoki ikkinchi rasmiy til maqomi berilmagan bo‘lsa-da, u ta’lim tizimining barcha bosqichlarida, 1-sinfdan boshlab, majburiy o‘rganiladigan fan sifatida belgilandi [5]. Shuningdek, oliy ta’lim muassasalarida mutaxassislik fanlarini ingliz tilida o‘qitish, pedagog kadrlar uchun ingliz tilini bilish talabini kuchaytirish hamda sertifikatga ega o‘qituvchilarning oylik maoshlariga 15–30 foiz miqdorida ustama belgilash amaliyoti joriy etildi [5]. Bu bilan ingliz tili oddiy ta’lim fanidan jamiyat a’zolarining ijtimoiy hamda iqtisodiy mavqeyini belgilovchi lingvistik kapitalga aylanishning dastlabki institutsional poydevori qo‘yildi [1; 5]. Ushbu bosqichda, shuningdek, xususiy til o‘quv markazlarining soni keskin oshdi, ingliz tili bo‘yicha xalqaro sertifikatlarga bo‘lgan talab shakllana boshladi, oliy ta’lim muassasalarida grant asosida xorijga o‘qishga yuborish dasturlari kengaydi. Bu omillarning barchasi ingliz tilini nafaqat rasmiy ta’lim tizimida, balki norasmiy ijtimoiy muhitda ham mustahkam mavqega ega bo‘lishiga xizmat qildi, biroq bu davrda hali ingliz tilining maqomi to‘g‘ridan-to‘g‘ri qonun darajasida emas, balki asosan idoraviy buyruqlar va dasturlar darajasida tartibga solingani uchun uni yashirin xususiyatga ega deb baholash mumkin.

2017-yildan boshlab O‘zbekistonda amalga oshirilgan keng ko‘lamli islohotlar va “Harakatlar strategiyasi” (PF-4947) til siyosatini tubdan yangi, institutsional darajaga ko‘tardi [6]. 2021-yil 19-maydagi VM-312-sonli qaror hamda 2021-yil 26-maydagi VM-3318-sonli qaror orqali xorijiy tillarni ommalashtirish bo‘yicha yangi davlat agentligi tashkil etildi hamda milliy va xalqaro sertifikatlash — IELTS, TOEFL, CEFR — tizimi barcha sohalarga joriy qilindi [8; 9]. 2024-yildagi PQ-241-sonli qaror esa maktab bitiruvchilari hamda oliy ta’lim, magistratura va doktoranturaga kiruvchilar uchun sertifikat darajasini majburiy shart qilib belgiladi [10]. Shu tariqa uchinchi bosqichda ingliz tili davlat hamda jamiyat hayotining strategik muloqot vositasi darajasiga ko‘tarildi, uning maqomi endi nafaqat majburiy, balki yuqori darajada rag‘batlantiriluvchi va moliyaviy jihatdan qadrlanuvchi resursga aylandi.

1-jadvalda keltirilgan ma’lumotlar ushbu uch bosqichning asosiy me’yoriyhuquqiy hujjatlari, institutsional turi, ingliz tilining jamiyatdagi maqomi va rag‘batlantirish darajasi hamda lingvistik oqibatlari o‘rtasidagi bog‘liqlikni namoyish etadi.

Jadval 1

1991–2026-yillarda O‘zbekiston ingliz tili siyosatining bosqichli evolyutsiyasi

Bosqich va yillar	Asosiy me’yoriy-huquqiy hujjatlar	Til siyosatining institutsional turi (Spolsky / Shohami)	Ingliz tilining jamiyatdagi maqomi va rag‘batlantirish	Lingvistik oqibatlar va variantlanish darajasi
I bosqich (1991–2000)	“Davlat tili haqida”gi Qonun (1989, 1995) [7]	Policy silence (siyosiy sukunat) [7; 11]	Klassik chet tili (EFL), rag‘batlantirish	Inner Circle me’yorlariga ergashish, past ommaviylik, tor interferensiya [3]

Bosqich va yillar	Asosiy me'yoriy-huquqiy hujjatlar	Til siyosatining institutsional turi (Spolsky / Shohami)	Ingliz tilining jamiyatdagi maqomi va rag'batlantirish	Lingvistik oqibatlar va variantlanish darajasi
			mexanizmlari yo'q [3]	
II bosqich (2001–2016)	PQ-1875 (2012) [5]	Implicit status planning (yashirin maqom rejalashtirish) [5; 13]	Majburiy ta'lim fani (1-sinfdan), 15–30% maosh ustamalari [5]	Lingvistik kapitalga aylanishning boshlanishi, pedagogik interferensiya [1; 5]
III bosqich (2017–2026)	PF-4947 [6], VM-312 [8], VM-3318 [9], PQ-241 [10]	Institutionalized policy & incentive-driven management [8; 13; 15]	Strategik va majburiy kapital, 50% maosh ustamalari, imtihon xarajatlarini qoplash [1; 8; 9]	"Uzbek English" variantining shakllanishi uchun sotsiolingvistik zamin [3; 4]

E. Shohami ta'kidlaganidek, davlat tomonidan qo'llaniladigan imtihonlar, sertifikatlar va moliyaviy rag'batlar eng ta'sirchan siyosiy vosita hisoblanadi [13]. O'zbekistonda 2017–2026-yillarda joriy etilgan maoshga 50 foizgacha ustama berish (VM-312) [8], C1 sertifikatiga ega o'qituvchilarning imtihon xarajatlarini davlat tomonidan qoplab berish va talabalarga imtiyozlar ajratish mexanizmlari [8; 9] ingliz tilini keng xalq ommasi uchun eng jozibador va zarur iqtisodiy manba, ya'ni Burdyeu talqinidagi lingvistik kapitalga aylantirdi [1]. Ingliz tilidan foydalanuvchilar sonining bunday sun'iy va institutsional ravishda keskin ortishi Kachru tasvirlagan sotsiolingvistik transformatsiyani keltirib chiqardi [3; 4]. Ingliz tili endi faqat "native-speaker" me'yorlariga ko'r-ko'rona taqlid qilinadigan chet tili (EFL) bo'lishdan to'xtab, O'zbekistonning o'z ichki ijtimoiy-akademik, ma'muriy va madaniy ehtiyojlariga xizmat qiluvchi "Uzbek English" ko'rinishida namoyon bo'lish sohasini kengaytirmoqda [3; 4].

Me'yoriy-huquqiy hujjatlar va ularning sotsiolingvistik tahlili "Uzbek English" mahalliy varianti shakllanishi uchun uchta asosiy zamin yaratilganini ko'rsatadi. Birinchidan, leksik va pragmatik nativizatsiya kuzatilmoqda: davlat boshqaruvi, ta'lim va rasmiy hujjatlarda ingliz tilidan foydalanish jarayonida milliy-davlat realliklarini ifodalovchi leksik va semantik birliklar (masalan, mahalla, hokimiyat, khokim, tuy, sarpo, khashar, mahalla committee, testing center, presidential school) inglizcha matnlarga tizimli ravishda integratsiyalashmoqda [3; 4]. Ikkinchidan, sintaktik va stilistik interferensiya yuzaga kelmoqda: o'zbek va rus tillarining grammatik hamda stilistik qurilmalari, jumladan gap oxirida kesimning kelishi, ketma-ket ergashgan ergashtiruvchi bog'lovchilar va rasmiy-idoraviy uslubning inglizcha matnlarga ko'chishi mahalliy akademik va rasmiy inglizcha diskursda barqaror me'yorga aylanmoqda [3]. Uchinchidan, funksional diskurs sferasi kengaymoqda: ingliz tili endilikda faqat xorijliklar bilan muloqot qilish uchun emas, balki O'zbekiston fuqarolarining o'zaro akademik (konferensiyalar, ilmiy maqolalar), ta'limiy va biznes muloqoti vositasi, ya'ni lingua franka (ELF) sifatida qo'llanilmoqda [2; 10].

Shu tariqa, davlat me'yoriy-huquqiy siyosatining uch bosqichli evolyutsiyasi — siyosiy sukunatdan yashirin maqom rejalashtirishga, undan institutsionlashuv va strategik kapitalizatsiyaga o'tish — ingliz tilining O'zbekistondagi ijtimoiy vazifasini tubdan qayta shakllantirdi va uni "Expanding Circle" chegaralaridan chiqarib, mustaqil mahalliy variant sifatida rivojlanishi uchun zamin yaratmoqda.

Xulosalar

1991–2026-yillarda O'zbekistonda olib borilgan me'yoriy-huquqiy til siyosati tahlili ingliz tili evolyutsiyasi uchta asosiy bosqichni — "policy silence" davridan yashirin maqom rejalashtirish (PQ-1875) hamda faol institutsionalizatsiyagacha bo'lgan yo'lni bosib o'tganini ko'rsatadi [5; 7; 11; 13]. Rasmiy hujjatlarda ingliz tiliga ikkinchi davlat tili maqomi berilmagan bo'lsa-da, majburiy sertifikatlash (B2/C1), 50 foizgacha oylik maosh ustamalari va imtiyozlar mexanizmi (VM-312, VM-3318, PQ-241) uni jamiyatdagi eng yuqori iqtisodiy hamda ramziy lingvistik kapitalga aylantirdi [1; 4; 8; 9]. Davlat qarorlari va me'yoriy rag'batlar orqali ushbu tilning ommalashuvi ingliz tilini an'anaviy "Expanding Circle" va klassik EFL ramkalaridan olib chiqib, o'zbek milliy-davlat realliklari, sintaktik va pragmatik xususiyatlar bilan boyigan "Uzbek English" mahalliy varianti shakllanishi uchun poydevor yaratdi [3; 4].

Shu bilan birga, aytish joizki, tahlil asosan rasmiy me'yoriy-huquqiy hujjatlar korpusiga tayangan bo'lib, "Uzbek English" variantining haqiqiy leksik-grammatik xususiyatlarini aniqlash uchun keng ko'lamli empirik korpus tahlili ushbu

maqola doirasidan tashqarida qoldi. Shu sababli, kelgusi tadqiqotlarda me'yoriy-huquqiy tahlilni til foydalanuvchilaridan olingan sotsiolingvistik so'rovnomalar, natural nutq korpusi va akademik matnlar tahlili bilan uyg'unlashtirish "Uzbek English" variantining shakllanish darajasini yanada aniqroq baholash imkonini beradi.

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TURKIGO‘Y MUMTOZ ADIBLAR ILMIY ELEKTRON KORPUSINI YARATISH: TAMOYILLAR, TUZILISH VA METODOLOGIYA

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Annotatsiya: *Maqolada turkigo‘y mumtoz adiblar merosini raqamlashtirish va ilmiy elektron korpusda jamlashning nazariy hamda amaliy asoslari tahlil qilinadi. Tadqiqotning maqsadi XIV-XV asrlarga oid turkiy yozma yodgorliklarni qamrab oluvchi manba-tanqidiy, ko‘p yozuvli va ko‘p qatlamli korpusni yaratish tamoyillari, tuzilishi va metodologiyasini asoslashdan iborat. Ish jahon (VATEC, Turk milliy korpusi) hamda milliy (o‘zbek tili milliy korpusi, Alisher Navoiy korpusi) tajribasining qiyosiy tahliliga tayanadi. Natijada korpusning besh qatlamli arxitekturasi, annotatsiyaning token, lemma, morfologik teg, aruz va janr darajalari, shuningdek arab yozuvidagi manbalarni transliteratsiya va transkripsiya bilan parallellashtirish modeli taklif etiladi. Ilmiy yangilik sifatida mumtoz she’riy matnlar uchun aruz-vazn annotatsiyasi qatlamining kiritilishi hamda manba ishonchliligini ta’minlovchi metama’lumot tizimi ilgari suriladi. Korpusning tekstologik tadqiqot, tarixiy leksikografiya, mualliflik uslubini lingvostatistik aniqlash va lingvodidaktika uchun amaliy ahamiyati ko‘rsatiladi.*

Kalit so‘zlar: *lingvistik korpus, turkiygo‘y adiblar, korpus lingvistikasi, transliteratsiya, morfologik annotatsiya, aruz, TEI, tarixiy leksikografiya.*

СОЗДАНИЕ НАУЧНОГО ЭЛЕКТРОННОГО КОРПУСА ТЮРКОЯЗЫЧНЫХ КЛАССИЧЕСКИХ ПИСАТЕЛЕЙ: ПРИНЦИПЫ, СТРУКТУРА И МЕТОДОЛОГИЯ

Аннотация: *В статье анализируются теоретические и практические основы цифровизации наследия тюркоязычных классиков и его объединения в научном электронном корпусе. Цель исследования — обосновать принципы, структуру и методологию создания источниковедчески выверенного, многописьменного и многоуровневого корпуса, охватывающего тюркские памятники XIV-XV вв. Работа опирается на сравнительный анализ мирового (VATEC, TNC) и национального опыта. Предложена пятиуровневая архитектура корпуса с уровнями токенизации, лемматизации, морфологической разметки, аруза и жанра.*

Ключевые слова: *лингвистический корпус, тюркоязычная классика, корпусная лингвистика, транслитерация, морфологическая аннотация, аруз, TEI, историческая лексикография.*

CREATING A SCHOLARLY ELECTRONIC CORPUS OF TURKIC CLASSICAL WRITERS: PRINCIPLES, STRUCTURE AND METHODOLOGY

Abstract: *The article analyses the theoretical and practical foundations of digitising the heritage of Turkic classical writers and consolidating it in a scholarly electronic corpus. The aim of the study is to substantiate the principles, structure and methodology for building a source-critical, multi-script and multi-layered corpus covering Turkic written monuments of the XIVth–XVth centuries. The study relies on a comparative analysis of international (VATEC, the Turkish National Corpus) and national (the Uzbek National Corpus, the Alisher Navoi corpus) experience. As a result, a five-layer corpus architecture is proposed, together with annotation levels for tokens, lemmas, morphological tags, aruz and genre, and a model that aligns Arabic-script sources with their transliteration and transcription. The scientific novelty lies in introducing an aruz annotation layer for classical poetic texts and a metadata system ensuring source reliability. The corpus’s applied value for textual studies, historical lexicography, stylometric authorship analysis and language teaching is demonstrated.*

Keywords: *linguistic corpus, Turkic classical literature, corpus linguistics, transliteration, morphological annotation, aruz, TEI, historical lexicography.*

Kirish

Zamonaviy filologiya raqamli texnologiyalar bilan uzviy bog‘langan sohaga aylanib bormoqda. Katta hajmdagi yozma manbalarni jamlash, saqlash va tahlil qilishda lingvistik korpus eng samarali vositalardan biri sifatida e’tirof etilmoqda. Korpus lingvistikasi ta’limotiga ko‘ra, tabiiy tilning tanlab olingan, muvozanatlashtirilgan va lingvistik jihatdan izohlangan matnlar to‘plami tadqiqotchiga til birliklarining amaldagi qo‘llanishini ilmiy asosda kuzatish imkonini beradi [1]. Ayni shu yondashuv jahon tilshunosligida so‘nggi o‘n yilliklarda til hodisalarini o‘rganishning yetakchi metodologiyasiga aylandi [2]. Bu metadologiya adabiyotshunoslik, xususan, mumtoz adabiyot namunalari uchun ham birdek o‘rinlidir.

Turkiy xalqlarning yozma merosi nihoyatda boy va qadimiy. O‘rxun-Enasoy bitiklaridan boshlanib, Yusuf Xos Hojibning “Qutadg‘u bilig”, Ahmad Yugnakiyning “Hibat ul-haqoyiq”, Ahmad Yassaviy hikmatlari, Rabg‘uziy qissalari, Xorazmiy “Muhabbatnoma”i, Sayfi Saroyi, Lutfiy, Alisher Navoiy, Zahiriddin Muhammad Bobur, Boborahim Mashrab va Muhammad Rizo Ogahiy ijodigacha bo‘lgan ulkan adabiy xazina turkiygo‘y mumtoz adabiyotning tarixiy taraqqiyotini aks ettiradi. Ushbu meros nafaqat badiiy qadriyat, balki eski turkiy va chig‘atoy tilining tarixiy holatini o‘rganish uchun ham, shu davrdagi adabiyiy jarayonlarni tahlil qilish uchun ham beqiyos manba hisoblanadi.

Biroq bu merosning aksariyati arab yozuvidagi qo‘lyozma va toshbosmalarda saqlangan bo‘lib, ular turli fondlarga tarqoq holda joylashgan. An’anaviy filologik tadqiqot usullari bilan bunday manbalarni qiyosiy o‘rganish, muayyan so‘z yoki grammatik shaklning ko‘p asrlik matnlar bo‘ylab qo‘llanishini kuzatish mashaqqatli va sekin kechadi. Elektron korpus esa qidiruv, konkordans, chastota va lingvostatistik tahlil imkoniyatlarini beruvchi vosita sifatida ushbu muammoni hal etishga xizmat qiladi.

O‘zbekistonda so‘nggi yillarda milliy-madaniy merosni raqamlashtirish, qo‘lyozma xazinani ilmiy muomalaga jalb etish va ma’naviy qadriyatlarni asrash davlat siyosatining ustuvor yo‘nalishlaridan biriga aylandi. Mumtoz adabiyot merosini raqamli korpus shaklida tashkil etish ushbu vazifaning eng samarali yechimlaridan hisoblanadi, chunki korpus bir vaqtning o‘zida ham saqlash, ham qidiruv, ham ilmiy tahlil funksiyalarini birlashtiradi. Shu ma’noda turkiygo‘y mumtoz adiblar korpusi milliy g‘oyaning raqamli infratuzilmasi sifatida ham ahamiyat kasb etadi.

Jahon tajribasida raqamli filologiya (digital humanities) yo‘nalishi milliy yozma merosni saqlash, ilmiy muomalaga jalb etish va xalqaro miqyosda targ‘ib qilishning zamonaviy shakliga aylandi. Ko‘plab davlatlar o‘z klassik adabiyotini raqamli korpuslar va tanqidiy elektron nashrlar orqali umumbashariy ilm-fan xizmatiga qo‘ymoqda. Turkiy mumtoz meros ham xuddi shunday raqamli infratuzilmaga muhtoj: aks holda, u ilmiy jamoatchilik uchun qidiriladigan, tahlil qilinadigan va qiyoslanadigan manba bo‘lmasdan qolaveradi. Aynan shu ehtiyoj turkiygo‘y mumtoz adiblar korpusini yaratishni hayotiy zaruriy vazifaga aylantiradi.

O‘zbekistonda va turkiy dunyoda so‘nggi yillarda milliy hamda mualliflik korpuslari yaratildi. Shunga qaramay, turkiygo‘y mumtoz adiblar merosini yagona, manba-tanqidiy asosda, ko‘p yozuvli va ko‘p qatlamli tarzda qamrab oluvchi maxsus ilmiy korpus hanuz to‘liq shakllangani yo‘q. Mavjud resurslar yo zamonaviy til bilan, yo faqat bitta muallif ijodi bilan cheklanadi. Mazkur maqolaning maqsadi turkiygo‘y mumtoz adiblar ilmiy elektron korpusini yaratishning nazariy tamoyillari, tarkibiy tuzilishi va metodologik asoslarini ishlab chiqishdan iborat. Bunda korpusning ilmiy ishonchliligi, reprezentativligi va tarixiy matnlarga xos filologik talablarga muvofiqligiga alohida e’tibor qaratiladi.

Tadqiqotning obyekti turkiygo‘y mumtoz adiblar yozma merosini raqamlashtirish va korpus shaklida tashkil etish jarayoni; predmeti esa korpusni yaratishning tamoyillari, tarkibiy tuzilishi va annotatsiya metodologiyasidir. Maqsaddan kelib chiqib quyidagi vazifalar belgilandi: mavjud milliy va xalqaro korpuslar tajribasini qiyosiy o‘rganish; matn tanlashning manba-tanqidiy mezonlarini asoslash; korpusning ko‘p qatlamli arxitekturasini modellashtirish; annotatsiya darajalarini, jumladan mumtoz she’riyat uchun aruz-vazn qatlamini ishlab chiqish; hamda korpusning ilmiy va lingvodidaktik ahamiyatini ochib berish.

Adabiyotlar tahlili

Korpus lingvistikasining nazariy asoslari J. Sinclair, T. McEnery, A. Wilson kabi olimlar ishlarida ishlab chiqilgan. Sinclair konkordans va kollokatsiya tahlilining metodologik tamoyillarini asoslab bergan [1], McEnery va Wilson esa korpusning til tadqiqotidagi o‘rni hamda annotatsiya darajalarini tizimlashtirgan [2]. D. Biber korpus dizaynining markaziy masalasi sifatida reprezentativlik va muvozanat muammosini ko‘tarib, matn tanlashning nazariy mezonlarini belgilagan [3]. P. Baker, A. Hardie va T. McEnery esa soha atamashunosligini bir tizimga solib, korpus lingvistikasining tushunchaviy apparatini shakllantirgan [4]. Ushbu tadqiqotlar korpusning umumiy nazariy poydevorini tashkil etadi.

Korpus lingvistikasi nazariyasida korpuslar bir necha turga ajratiladi: milliy (umumiy) korpus tilning butun tizimini vakillik qiladi; mualliflik korpusi bir ijodkor tilini qamraydi; diaxronik korpus tilning tarixiy o‘zgarishini kuzatishga

mo‘ljallangan; ixtisoslashgan korpus esa muayyan soha yoki janr matnlarini birlashtiradi. Turkiygo‘y mumtoz adiblar korpusi o‘z mohiyatiga ko‘ra diaxronik va ko‘p muallifli ixtisoslashgan korpus turlarini uyg‘unlashtiradi hamda matnshunoslik talablari tufayli tanqidiy (manba-variantli) korpus xususiyatlarini ham o‘zida mujassam etadi. Ushbu murakkab tabiat uni mavjud korpus turlaridan ajratib turadi va maxsus metodologik yechimlarni taqozo qiladi.

Turkiy tillar korpuslari orasida eng dastlabki va tarixiy jihatdan ahamiyatli loyiha — islomgacha bo‘lgan eski turkiy matnlarning elektron korpusi VATEC (Vorislamische Alttürkische Texte). U 1999–2003-yillarda M. Erdal, J. Gippert, K. Röhrborn va P. Zieme rahbarligida yaratilgan bo‘lib, buddaviy va moniy mazmundagi yodgorliklarni transliteratsiya, transkripsiya, tarjima va glossalash bilan qamrab oladi [9]. Eski turkiy tilning grammatik tavsifi M. Erdalning fundamental asarida mukammal bayon etilgan [5]. Zamonaviy turkiy til uchun esa Y. Aksan va hamkasblari tomonidan Turk milliy korpusi (TNC) ishlab chiqilib, u Britaniya milliy korpusi (BNC) modeliga asoslangan, 50 million so‘zdan iborat muvozanatli korpus sifatida shakllantirilgan [6].

O‘zbek tilshunosligida korpus masalasi 2010-yillardan jadal o‘rganila boshlandi. N. Abdurahmonova o‘zbek tili elektron korpusini yaratish g‘oyasini ilgari surib, uning konseptual asoslarini ishlab chiqdi va uzbekcorpora.uz milliy korpusining shakllanishiga asos soldi. B. Elov va uning hamkasblari korpusni dasturiy jihatdan hayotga tatbiq etishda, Sh. Hamroyeva esa o‘zbek tilida mualliflik korpusini tuzish mezonlarini belgilashda muhim hissa qo‘shdi. Milliy korpusni loyihalash tamoyillari A. Qarshiyev, M. Tursunov va S. Maxmudov ishlarida bayon etilgan [7]. Mumtoz adabiyotga oid alohida tajriba sifatida Alisher Navoiy mualliflik korpusini keltirish mumkin: unda XV asr til uslubi, iste’moldan chiqqan tarixiy va arxaik so‘zlar lingvostatistik tahlil asosida o‘rganilgan [10].

Metodologik yondashuv nuqtai nazaridan Rus milliy korpusi (RNC) hamda Leipzig Corpora Collection (LCC) tajribasi ham diqqatga sazovor. RNC tarkibida she’riy matnlar subkorpusi, sintaktik razmetka va parallel korpuslar mavjudligi ko‘p komponentli korpus qurishning namunasi bo‘la oladi; LCC esa ikki yuzdan ortiq til uchun bir xillashtirilgan statistik korpuslar tuzish tajribasini beradi. Bu tajribalar turkiy mumtoz korpusda parallel (masalan, chig‘atoy–zamonaviy o‘zbek) subkorpuslar hamda she’riy matnlar uchun alohida qatlamini loyihalashda yo‘l ko‘rsatadi. Shu bilan birga, tarixiy matnlar korpusi diaxronik korpus sifatida alohida yondashuvni davriylashtirish, orfografik variantlilik va morfologik ko‘p ma’nolilikni hisobga olishni — talab etadi.

Matnlarni elektron kodlash va almashish sohasida xalqaro TEI (Text Encoding Initiative) standarti keng qo‘llaniladi; u matn tarkibi va metama’lumotini XML asosida bir xillashtirilgan tarzda ifodalash imkonini beradi [8]. Yuqoridagi manbalar tahlili shuni ko‘rsatadiki, mavjud korpuslar yo faqat eski turkiy davr (VATEC), yo zamonaviy til (TNC, o‘zbek milliy korpusi), yoxud yakka muallif ijodi (Navoiy korpusi) doirasi bilan cheklangan. Turkiygo‘y mumtoz adiblarni ko‘p muallifli, ko‘p asrli, manba-tanqidiy va ko‘p yozuvli asosda birlashtiruvchi yaxlit ilmiy korpus modeli hozircha ishlab chiqilmagan. Aynan shu bo‘shliq ushbu tadqiqotning dolzarbligini belgilaydi.

Tadqiqot metodologiyasi

Tadqiqot korpus lingvistikasi, tarixiy leksikografiya va raqamli filologiya usullariga tayanadi. Metodologik jihatdan quyidagi yondashuvlar qo‘llanildi: mavjud milliy va xalqaro korpuslarni qiyosiy tahlil qilish; korpusning tarkibiy tuzilishini modellashtirish; matn tanlashning manba-tanqidiy mezonlarini ishlab chiqish; hamda annotatsiya bosqichlarini tizimli tavsiflash.

Korpus dizayni Biber ko‘rsatgan reprezentativlik va muvozanat tamoyiliga [3] hamda BNC/TNC amaliyotiga [6] asoslanadi, ammo tarixiy turkiy matnlarga xos xususiyatlar hisobga olingan holda moslashtiriladi. Matn tanlashda muallif, janr, davr va manba turi bo‘yicha muvozanat ta’minlanadi. Har bir matn birlamchi manbaga (qo‘lyozma, toshbosma yoki tanqidiy nashr) bog‘lanib, uning ilmiy ishonchliligi hujjatlashtiriladi.

Korpus tuzish jarayoni ketma-ket bosqichlardan iborat qilib loyihalandi: loyihalash va mezonlarni belgilash; birlamchi manbalarni yig‘ish va tavsiflash; matnlarni raqamlashtirish; TEI/XML asosida kodlash; ko‘p bosqichli annotatsiya; qidiruv tizimini o‘rnatish; va sifat nazorati. Har bir bosqichda natijalar hujjatlashtirilib, jarayonning takrorlanuvchanligi va tekshiriluvchanligi ta’minlanadi. Bunday bosqichli ish oqimi korpusning ilmiy standartlarga muvofiqligini kafolatlaydi.

Matnni raqamli qayta ishlash bosqichi arab yozuvidagi manbalar uchun optik belgi tanish (OCR), so‘ng qo‘lda tekshirish va transliteratsiyani o‘z ichiga oladi. Kodlashda Unicode standarti va TEI/XML sxemasi qo‘llaniladi [8]. Lingvistik ishlov token ajratish, lemmatizatsiya va morfologik teglashdan iborat bo‘lib, tarixiy so‘z shakllarini asos (lemma)ga keltirishda “Abushqa”, “Sanglox” singari tarixiy lug‘atlar va Navoiy asarlari tilining izohli lug‘atlari leksikografik tayanch vazifasini bajaradi. Qidiruv va tahlil bosqichida konkordans, N-grammlar, chastota ro‘yxatlari va kollokatsiya ko‘rsatkichlaridan foydalaniladi. Ishonchlilikni ta’minlash uchun avtomatik teglash natijalari mutaxassis tomonidan qo‘lda tekshiriladi va me’yoriylashtiriladi.

Natijalar va ularning tahlili

Tadqiqot natijasida turkiygoʻy mumtoz adiblar ilmiy elektron korpusining konseptual modeli ishlab chiqildi. Ushbu korpus XIV-XV asrlarga oid turkiy yozma yodgorliklarni manba-tanqidiy asosda jamlagan, koʻp yozuvli va koʻp qatlamli izohga ega raqamli tizim sifatida taʼriflanadi. Model quyidagi asosiy tamoyillarga tayanadi.

Birinchidan, ilmiylik va manba ishonchliligi. Mumtoz matnlarning turli qoʻlyozma nusxalari orasidagi tafovutlar tufayli har bir matn birligi aniq manbaga bogʻlanadi; metamaʼlumotda qoʻlyozma yoki nashr, uning saqlanish joyi va sanasi qayd etiladi. Bu tekstologik ishonchlilikni taʼminlaydi.

Ikkinchidan, reprezentativlik va muvozanat. Korpus tarkibi muallif, davr va janr boʻyicha muvozanatlashtiriladi; nazm va nasr, diniy va dunyoviy matnlar mutanosib ravishda qamrab olinadi [3].

Uchinchidan, koʻp yozuvlilik. Arab yozuvidagi asl matn (faksimile), uning ilmiy transliteratsiyasi va fonetik transkripsiyasi oʻzaro parallellashtiriladi. Bu yondashuv VATEC amaliyotidan oʻzlashtirilgan boʻlib [9], foydalanuvchiga bir vaqtning oʻzida asl yozuv va zamonaviy oʻqilishni qiyoslash imkonini beradi.

Toʻrtinchidan, koʻp qatlamlilik va standartlashtirish. Annotatsiya token, lemma, morfologik teg, aruz-vazn va janr darajalarida amalga oshirilib, butun tizim TEI/XML va Unicode standartlariga muvofiqlashtiriladi [8].

Mavjud korpuslar bilan qiyosiy tahlil taklif etilayotgan modelning oʻziga xos oʻrnini aniq koʻrsatadi (1-jadval).

1-jadval

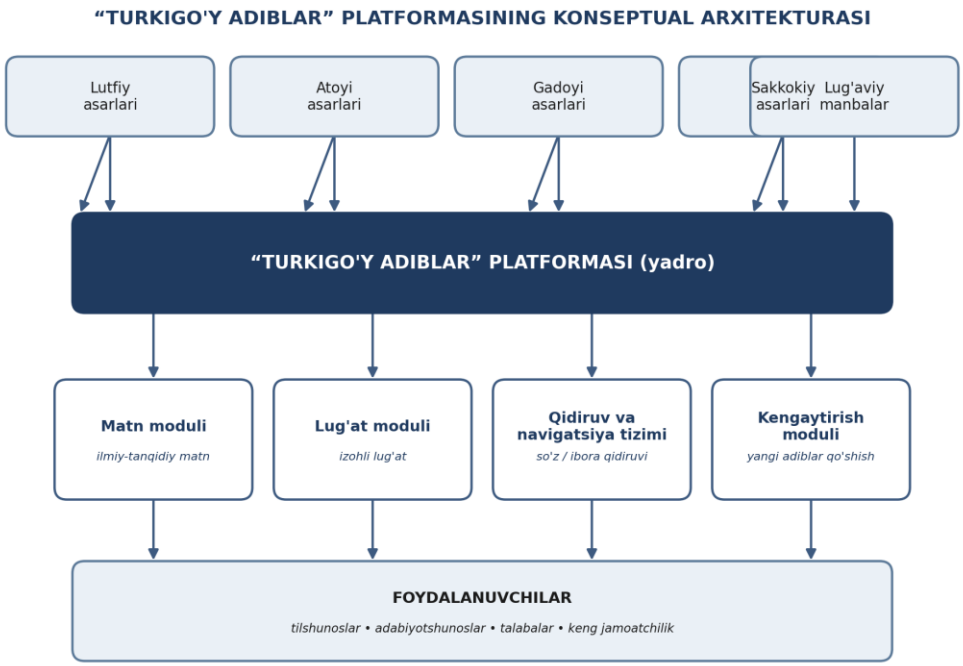
Turkiy tillarga oid mavjud korpuslarning qiyosiy tavsifi

Korpus	Qamrov (til/davr)	Hajm/xususiyat	Annotatsiya darajasi
VATEC	islomgacha eski turkiy (VIII–XIII asr)	buddaviy va moniy matnlar	transliteratsiya, transkripsiya, tarjima, glossa
Turk milliy korpusi (TNC)	zamonaviy turk tili	~50 mln soʻz, muvozanatli	morfologik teglash, lemmatizatsiya
Oʻzbek tili milliy korpusi	zamonaviy oʻzbek tili	Koʻp uslubli, milliy qamrov	token, lemma, morfologik razmetka
Alisher Navoiy korpusi	XV asr, bir muallif	mualliflik korpusi	leksik-statistik, izohli
Taklif etilayotgan korpus	XIV-XV asr, koʻp muallif	manba-tanqidiy, koʻp yozuvli	token–lemma–morfologiya–aruz–janr

Jadvaldan koʻrinadiki, mavjud resurslar yo faqat qadimiy davrni, yo zamonaviy tilni, yoxud yakka ijodkorni qamraydi. Taklif etilayotgan model esa koʻp asrli va koʻp muallifli qamrovni manba ishonchliligi hamda aruz annotatsiyasi bilan birlashtirishi bilan farqlanadi. Dastlab korpusga XIV-XV asarda Alisher Navoiy davrigacha ijod qilgan turkigoʻy adiblar merosi jamlanadi. Keyinchlik korpus tarkibini shakllantirishda matn tanlash mezonlari alohida ahamiyat kasb etadi. Tanlov turkiy yozma merosning butun tarixiy davomiyligini qamrab olishi koʻzda tutiladi: eng qadimgi qatlamda Oʻrxun-Enasoy bitiklari va islomgacha boʻlgan yodgorliklar; qoraxoniylar davri obidalari sifatida Yusuf Xos Hojibning “Qutadgʻu bilig” va Ahmad Yugnakiyning “Hibat ul-haqoyiq” asarlari; tasavvufiy adabiyot namunasi sifatida Ahmad Yassaviy hikmatlari va Rabgʻuziy qissalari; oltin Oʻrda va Xorazm adabiy muhitidan Xorazmiy “Muhabbatnoma”i hamda Sayfi Saroyi merosi; chigʻatoy adabiyotining klassik bosqichidan Lutfiy va Alisher Navoiy ijodi; keyingi davrlardan Zahiriddin Muhammad Bobur, Boborahim Mashrab va Muhammad Rizo Ogahiy asarlari kiritiladi. Bunday tanlov korpusga tarixiy va janriy vakillik baxsh etadi.

Matnlar davriylashtirilib joylashtirilishi korpusning diaxronik qimmatini oshiradi. Til holatining tarixiy oʻzgarishini kuzatish maqsadida matnlar eski turkiy, ilk chigʻatoy, klassik chigʻatoy ilk zamonaviy oʻzbek bosqichlariga ajratiladi. Bu tabaqalash foydalanuvchiga muayyan soʻz, grammatik shakl yoki uslubiy hodisaning asrlar davomida qanday evrilganini aniq davr kesimida kuzatish imkonini beradi. Shu tarzda korpus nafaqat qidiruv vositasi, balki tarixiy tilshunoslik uchun empirik laboratoriya vazifasini oʻtaydi.

Korpusning ichki tuzilishi besh qatlamli arxitektura ko ʻrinishida loyihalandi (1-rasm). Quyi qatlam manbalar bazasidan, undan yuqorisi matnni qayta ishlash bosqichidan iborat; markaziy qatlamda matn variantlari va metamaʼlumot joylashadi; ular ustidan koʻp bosqichli annotatsiya qatlami quriladi; eng yuqori qatlam esa foydalanuvchi interfeysi va qidiruv tizimini oʻz ichiga oladi.



1-rasm. Turkiygoʻy mumtoz adiblar ilmiy elektron korpusining koʻp qatlamli arxitekturasi

Korpusning ilmiy qiymati k’p jihatdan uning annotatsiya qatlamlariga bogʻliq. Har bir qatlam ma’lum bir tadqiqot vazifasini bajaradi (2-jadval). Tokenlash va lemmatizatsiya qidiruvni tarixiy soʻz shakllari boʻylab birlashtirib beradi; morfologik teglash grammatik tahlilni osonlashtiradi; aruz-vazn qatlami esa mumtoz she’riyatni poetik jihatdan oʻrganishga xizmat qiladi.

2-jadval

Korpusning annotatsiya qatlamlari

Qatlam	Mazmuni	Vazifasi
Tokenlash	matnni soʻz/birlikka ajratish	qidiruv birligini shakllantirish
Lemmatizatsiya	Soʻz shaklini asos (lemma)ga keltirish	tarixiy shakllarni birlashtirib qidirish
Morfologik teglash	Soʻz turkumi va grammatik shakl	grammatik va statistik tahlil
Aruz-vazn qatlami	she’riy oʻlchov va taqte’	poetik va uslubiy tadqiqot
Janr va uslub izohi	asar janri, izohtalab soʻzlar	textologik va lingvodidaktik tahlil
Metama’lumot	muallif, asar, manba, sana	ishonchlilik va filtrlash

Annotatsiya qatlamlarining oʻzaro bogʻliqligini yagona bayt misolida koʻrsatish mumkin. Mumtoz she’rdan olingan bir misra avval soʻz va turgʻun birliklarga ajratiladi (tokenlash); har bir soʻz shakli oʻz asosiga keltiriladi (lemmatizatsiya), bunda chigʻatoy tiliga xos qadimiy shakl zamonaviy lemma bilan bogʻlanadi; soʻngra soʻz turkumi va grammatik shakl belgilanadi (morfologik teg); nihoyat, misraning aruz vazni va taqte’i qayd etiladi (aruz qatlami). Natijada bir misra boʻyicha foydalanuvchi ham leksik, ham grammatik, ham poetik ma’lumotni yagona soʻrov orqali oladi. Ana shu koʻp qatlamli bogʻlanish korpusning oddiy matn omboridan tubdan farqli, tahliliy vositaga aylanishini ta’minlaydi.

Modelni amalga oshirishda bir qator ilmiy-texnik muammolar aniqlandi va ularning yechimlari taklif etildi. Arab yozuvidagi matnlarni OCR orqali oʻqish hozircha yuqori aniqlik bermaydi; shuning uchun avtomatik tanish natijalari mutaxassis tomonidan qoʻlda tekshiriladi va asl faksimile bilan solishtiriladi.

Orfografik variantlilik tarixiy matnlar korpusining oʻziga xos qiyinchiligidir. Arab yozuvi unlilarni toʻliq ifodalamagani va turli kotiblar bir soʻzni turlicha yozgani sababli, bir leksema matnlarda bir necha yozuv variantida uchraydi. Agar bunday variantlar birlashtirilmasa, qidiruv natijalari toʻkis chiqmaydi. Buning yechimi lemmatizatsiya bosqichida barcha variantlarni yagona asos ostiga jamlash, ayni paytda asl yozilishni saqlab qolishdan iborat. Shu tarzda foydalanuvchi ham me’yoriy lemma boʻyicha, ham aniq matn variantiga koʻra qidiruv oʻtkazishi mumkin boʻladi.

Foydalanuvchi interfeysi va qidiruv tizimi korpusning eng yuqori qatlamini tashkil etadi. Korpus menejeri konkordans qidiruvi, so‘z shakli va lemma bo‘yicha izlash, muallif, asar, davr hamda janr bo‘yicha filtrlash imkoniyatlarini beradi. Qidiruv natijalarini chastota jadvali, kontekst ko‘rinishi (KWIC) va statistik ko‘rsatkichlar shaklida taqdim etish, shuningdek natijalarni tashqi tahlil uchun eksport qilish nazarda tutiladi. Faksimile, transliteratsiya va transkripsiyani yonma-yon ko‘rsatuvchi parallel oyna esa foydalanuvchiga asl manba bilan zamonaviy o‘qishni bevosita qiyoslash imkonini beradi. Interfeysning qulayligi korpusni nafaqat tor doiradagi mutaxassislar, balki keng o‘quv auditoriyasi uchun ham foydalanishga yaroqli qiladi.

Korpusning uzoq muddatli barqarorligi va ochiqligi alohida e’tibor talab qiladigan masaladir. Xalqaro tajriba shuni ko‘rsatadiki, til resurslarining amaliy qiymati ularning uzluksiz saqlanishi, yangilanishi va boshqa tizimlar bilan o‘zaro moslashuviga (interoperability) bevosita bog‘liq. Shu bois korpus ochiq va bir xillashtirilgan formatlarda (Unicode, TEI/XML) qurilib, uning ma’lumotlar bazasi modulli tarzda kengaytiriladigan qilib loyihalanadi. Bu yangi matn, muallif yoki annotatsiya qatlamini tizimning umumiy tuzilishini buzmasdan qo‘shish imkonini beradi va korpusning kelgusi tadqiqotlar bilan birga o‘sib borishini ta’minlaydi.

Modelning yana bir muhim jihati – uning matnshunoslik (tekstologiya) an’anasi bilan uzviy bog‘liqligidir. Mumtoz asarlarning turli qo‘lyozma nusxalari o‘rtasidagi tafovutlar korpusda variant sifatida qayd etilishi mumkin, bu esa raqamli tanqidiy nashr yaratish uchun zamin hozirlaydi. An’anaviy matnshunoslikda mashaqqatli va sekin kechadigan nusxalararo qiyoslash korpus vositalari yordamida tezlashadi va aniqlashadi. Shu tariqa korpus filologik tadqiqotning raqamli davomiga aylanib, klassik matnshunoslik usullarini zamonaviy hisoblash imkoniyatlari bilan uyg‘unlashtiradi.

Alohida ilmiy yangilik sifatida she’riy matnlar uchun aruz-vazn annotatsiyasi qatlamining kiritilishini ta’kidlash lozim. Mumtoz turkiy nazm aruz vaznida yaratilgani bois har bir baytning vazni va taqte’i korpusda qayd etilsa, bu poetika va uslubshunoslik uchun mutlaqo yangi tadqiqot imkoniyatlarini ochadi. Bunday qatlam mavjud turkiy korpuslarning hech birida uchramaydi.

Bundan tashqari, korpus turkiy xalqlarning umumiy adabiy merosini qamragani bois turkiy davlatlararo ilmiy hamkorlik uchun ham qulay maydon ochadi. Umumiy yozuv, umumiy klassik matnlar va o‘zaro yaqin til qatlami turli mamlakat tadqiqotchilariga yagona metodologik asosda ish olib borish, ma’lumot almashish va qiyosiy turkiyshunoslik tadqiqotlarini birgalikda amalga oshirish imkonini beradi. Bu jihat korpusning ilmiy-integratsion salohiyatini yanada oshiradi.

Korpusning amaliy ahamiyati keng qamrovli. U tekstologik tadqiqotda nusxalararo tafovutlarni qiyoslash, tarixiy leksikografiyada so‘zlarning davriy qo‘llanishini kuzatish, mualliflik uslubini lingvostatistik usulda aniqlash hamda qiyosiy turkiyshunoslik uchun ishonchli empirik baza yaratadi. Lingvodidaktik jihatdan esa korpus XV–XIX asr til uslubini zamonaviy til bilan qiyoslab o‘rgatish, mumtoz adabiyot darslarida izohtalab so‘zlar ustida ishlash uchun boy o‘quv materiali beradi. Shu tariqa korpus turkiy mumtoz merosni ham saqlash, ham ilmiy muomalaga to‘liq jalb etish vositasiga aylanadi.

Xulosa

Tadqiqot natijalari turkiygo‘y mumtoz adiblar ilmiy elektron korpusini yaratish real va ilmiy jihatdan asoslangan vazifa ekanini ko‘rsatadi. Ishda korpusning nazariy tamoyillari (ilmiylik va manba ishonchliligi, reprezentativlik va muvozanat, ko‘p yozuvlilik, ko‘p qatlamlilik hamda standartlashtirish), besh qatlamli tarkibiy tuzilishi va bosqichma-bosqich metodologiyasi asoslab berildi.

Tadqiqotning ilmiy yangiligi shundan iboratki, birinchi marta turkiygo‘y mumtoz adiblar merosini keng qamrovda, manba-tanqidiy asosda hamda arab yozuvi–transliteratsiya–transkripsiya parallelligida birlashtiruvchi yaxlit korpus modeli taklif etildi. Ayniqsa, mumtoz she’riyat uchun aruz-vazn annotatsiyasi qatlamining kiritilishi va manba ishonchliligini ta’minlovchi metama’lumot tizimining ishlab chiqilishi modelni mavjud korpuslardan tubdan farqlaydi.

Amaliy jihatdan bunday korpus textologiya, tarixiy leksikografiya, lingvostatistik uslubshunoslik va lingvodidaktika sohalari uchun ishonchli empirik zamin bo‘ladi. Kelgusi tadqiqotlarda korpusning pilot versiyasini yaratish, annotatsiya vositalarini avtomatlashtirish va uni turkiy tillararo parallel korpuslar bilan bog‘lash istiqbolli yo‘nalish sifatida belgilanadi.

Mualliflar bayonotlari

Mualliflar hissasi: tadqiqot konsepsiyasi, tahlil va matnni tayyorlash muallif tomonidan bajarilgan. Jadvallar, konseptual xarita sun’iy intellekt yordamida tayyorlangan. Manfaatlar to‘qnashuvi: muallif manfaatlar to‘qnashuvi yo‘qligini bildiradi. Moliyalashtirish: tadqiqot nazariy xulosalarni jamlagani bois tashqi moliyaviy yordamsiz amalga oshirilgan. Amaliyotga bog‘lash uchun moliyaviy ko‘mak kerak bo‘ladi.

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O‘ZBEK XALQ MAQOLLARIDA ESKIRGAN SO‘ZLARNING LINGVOPOETIK IMKONIYATLARI: OBRAZLILIK, EKSPRESSIVLIK VA TARIXIY KOLORIT

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Annotatsiya: *Maqolada o‘zbek xalq maqollari tarkibida saqlanib qolgan eskirgan so‘zlar — arxaizm va istorizmlarning lingvopoetik imkoniyatlari tadqiq etiladi. Tadqiqotning maqsadi maqol matnida faol qo‘llanishdan chiqqan leksemaning obraz yaratish, ekspressivlik hosil qilish va tarixiy kolorit berish funksiyalarini aniqlash hamda bu funksiyalarning semantik mexanizmini ochib berishdan iborat. Manba sifatida Sh.Shomaqsudov va Sh.Shorahmedovning “Ma’nolar mahzani” izohli lug‘ati hamda T.Mirzayev va B.Sarimsoqov mas’ul muharrirligida chop etilgan “O‘zbek xalq maqollari”ning ikkinchi tomi tanlandi. Ulardan tarkibida izohtalab eskirgan leksema qatnashgan 52 ta maqol saralab olinib, tavsifiy, komponent, kontekstual-semantik va lingvopoetik tahlil usullari asosida o‘rganildi. Tahlil natijasida eskirgan leksika yettita tematik-semantik guruhga ajratildi hamda maqol matnidagi eskirgan so‘zning uch xil lingvopoetik vazifasi asoslandi: denotati yo‘qolgan so‘zning metaforik asosga aylanishi, notanish shaklning diqqatni o‘ziga tortishi hisobiga yuzaga keluvchi ekspressivlik va leksemaning muayyan ijtimoiy-iqtisodiy davrni belgilovchi xronologik indeksga aylanishi. Shuningdek, maqol semantikasining tiniqlik darajasiga ko‘ra uch bosqichli shkala taklif etildi. Maqolning ritmik-qofiyaviy qolipi eskirgan leksemani asrlar davomida saqlab turuvchi lingvistik omil ekanligi ko‘rsatildi.*

Kalit so‘zlar: *lingvopoetika, arxaizm, istorizm, maqol, paremiologiya, obrazlilik, ekspressivlik, tarixiy kolorit.*

ЛИНГВОПОЭТИЧЕСКИЕ ВОЗМОЖНОСТИ УСТАРЕВШИХ СЛОВ: ОБРАЗНОСТЬ, ЭКСПРЕССИВНОСТЬ И ИСТОРИЧЕСКИЙ КОЛОРИТ

Аннотация: *В статье исследуются лингвопоэтические возможности устаревших слов — архаизмов и историзмов, сохранившихся в составе узбекских народных пословиц. Цель исследования — выявить функции вышедшей из активного употребления лексемы в тексте пословицы (создание образа, формирование экспрессивности и передача исторического колорита) и раскрыть семантический механизм этих функций. Источниками послужили толковый словарь “Маънолар махзани” Ш.Шомаксудова и Ш.Шорахмедова, а также второй том свода “Ўзбек халқ мақоллари” под редакцией Т.Мирзаева и Б.Саримсокова. Отобраны 52 пословицы, содержащие устаревшие лексемы, снабжённые толкованием в источнике; они изучены с помощью описательного, компонентного, контекстно-семантического и лингвопоэтического анализа. Устаревшая лексика распределена по семи тематико-семантическим группам; обоснованы три лингвопоэтические функции устаревшего слова и предложена трёхступенчатая шкала семантической прозрачности пословицы. Показано, что ритмико-рифмическая структура пословицы выступает языковым механизмом сохранения архаичной лексемы.*

Ключевые слова: *лингвопоэтика, архаизм, историзм, пословица, паремиология, образность, экспрессивность, исторический колорит.*

LINGUOPOETIC POTENTIAL OF OBSOLETE WORDS: IMAGERY, EXPRESSIVENESS AND HISTORICAL COLOURING

Abstract: *The article examines the linguopoetic potential of obsolete words — archaisms and historicisms — preserved within Uzbek folk proverbs. The aim of the study is to identify the functions performed by a lexeme that has left active usage but survives in a proverb text (image formation, generation of expressiveness, and the conveyance of historical colouring), and to reveal the semantic mechanism behind these functions. The material was drawn from the explanatory dictionary “Ma’nolar mahzani” by Sh.Shomaqsudov and Sh.Shorahmedov and from the second volume of “O‘zbek xalq maqollari” edited by T.Mirzayev and B.Sarimsoqov. Fifty-two proverbs containing obsolete lexemes supplied with a lexicographic gloss were selected and analysed by descriptive, componential, contextual-semantic and linguopoetic methods. The obsolete lexis was distributed into seven thematic-semantic groups; three linguopoetic functions of the obsolete word were substantiated, and a three-level scale of the semantic transparency of proverbs was*

proposed. It is shown that the rhythmic and rhyming pattern of the proverb acts as the linguistic mechanism preserving the archaic lexeme.

Keywords: *linguopoetics, archaism, historicism, proverb, paremiology, imagery, expressiveness, historical colouring.*

Kirish

Tilning leksik sathi jamiyat hayotidagi oʻzgarishlarga eng tez javob beruvchi sath hisoblanadi. Ijtimoiy tuzum, xoʻjalik yuritish usuli, moddiy madaniyat va e'tiqod tizimi almashishi bilan ayrim soʻzlar kundalik muomaladan chiqib, tilning passiv qatlamiga oʻtadi. An'anaviy leksikologiyada bunday birliklar ikki turga ajratiladi: arxaizmlar — atalmish narsa yoki tushuncha bugun ham mavjud boʻlib, uning nomi yangi leksema bilan almashgan hollar; istorizmlar — atalmish narsaning oʻzi tarixga aylangan, shu sababli sinonimi ham qolmagan hollar. Bu farqlanish nazariy jihatdan aniq boʻlsa-da, amaliy tahlilda koʻpincha oraliq holatlar uchraydi: bir leksema muayyan ma'nosida istorizm, boshqa ma'nosida esa arxaizm sifatida baholanishi mumkin.

Passiv qatlamga oʻtish soʻzning butunlay yoʻqolishi degani emas. Til birligi faol qoʻllanishdan chiqqach ham turgʻun birikmalar, frazeologizmlar va, ayniqsa, maqollar tarkibida yashashda davom etadi. Buning sababi maqolning matn sifatidagi tabiati bilan bogʻliq: maqol — ritmik-sintaktik jihatdan qat'iy qoliplangan, qofiya, saj va parallelizm bilan mustahkamlangan, xotirada butun holda saqlanadigan tayyor birlik. Uning tarkibidagi bironta soʻzni erkin almashtirib boʻlmaydi, chunki har qanday almashtirish ritmni va ohangdoshlikni buzadi. Natijada maqol fondi til tarixi uchun oʻziga xos leksik qoʻriqxonaga aylanadi: bu yerda tilning yuz, hatto ming yillar avvalgi holatiga oid birliklar oʻzgarmagan shaklda saqlanib qoladi.

Ayni shu holat lingvopoetika uchun oʻta qiziqarli vaziyat yaratadi. Maqol tarkibidagi eskirgan soʻz zamonaviy soʻzlovchi uchun "yarim shaffof" birlikdir: u soʻzning tovush qiyofasini biladi, maqolning umumiy ma'nosini tushunadi, biroq leksemaning aniq denotativ mazmunini tasavvur qila olmaydi. Ana shu tushunish va tushunmaslik oraligʻi maqolga alohida uslubiy tovlanish, sirlilik va salmoq baxsh etadi. Boshqacha aytganda, soʻzning eskirganligi maqolning badiiy-estetik qiymatini kamaytirmaydi, aksincha, uni oshiradi.

Muammoning ilmiy dolzarbligi shundaki, oʻzbek tilshunosligida eskirgan qatlam asosan tarixiy leksikologiya, leksikografiya va funksional uslubiyat nuqtayi nazaridan tavsiflab kelinmoqda. Eskirgan soʻzning badiiy asar tilidagi vazifasi haqidagi kuzatishlar esa koʻpincha yozma adabiyot — Navoiy, Ogahiy, Qodiriy asarlari materialida olib borilgan. Xalq paremiologiyasi doirasida, ya'ni muallifsiz, jamoaviy sayqal koʻrgan matnlarda eskirgan leksemaning obraz yaratish va ekspressivlik hosil qilish imkoniyatlari tizimli tarzda oʻrganilmagan. Holbuki maqol matni ushbu masalani tekshirish uchun ideal materialdir: unda leksema alohida holda emas, balki qat'iy qolip ichida, ritm va qofiya bosimi ostida yashaydi.

Tadqiqotning maqsadi — oʻzbek xalq maqollari tarkibidagi eskirgan leksemalarning lingvopoetik funksiyalarini aniqlash va bu funksiyalarni yuzaga chiqaruvchi semantik mexanizmni tavsiflashdan iborat. Shu maqsaddan kelib chiqib quyidagi vazifalar belgilandi: izohli manbalar asosida eskirgan leksema qatnashgan maqollar tanlanmasini tuzish; leksemalarni tematik-semantik guruhlarga ajratish; obrazlilik, ekspressivlik va tarixiy kolorit funksiyalarini alohida-alohida asoslash; maqol semantikasining tiniqlik darajalarini belgilash; maqolning ritmik qolipi bilan leksemaning saqlanishi oʻrtasidagi bogʻlanishni koʻrsatish.

Tadqiqotning ilmiy yangiligi eskirgan soʻz maqol matnida shaklan saqlanib, mazmunan xiralashuvi hodisasi asosida uch bosqichli semantik tiniqlik shkalasining taklif etilishi hamda maqolning ritmik-qofiyaviy qolipi leksemani konservatsiya qiluvchi lingvistik omil sifatida asoslanishi bilan belgilanadi.

Adabiyotlar tahlili

Eskirgan leksikani tasniflashning nazariy asoslari umumiy tilshunoslikda XX asrning oʻrtalarida shakllandi. N.M.Shanskiy passiv qatlamni arxaizm va istorizmga ajratish tamoyilini ishlab chiqdi hamda arxaizmlarning ichki turlarini — leksik, leksik-soʻz yasovchi, leksik-fonetik va semantik arxaizmlarni farqladi [14]. Bu tasnif keyingi tadqiqotlar uchun uslubiy poydevor boʻlib xizmat qilmoqda. O.S.Axmanovaning terminologik lugʻatida esa arxaizm tushunchasining uslubiy jihati, ya'ni uning nutqqa tantanavorlik yoki kinoya ohangini beruvchi vosita sifatidagi tabiati aniq izohlangan [15].

Eskirgan soʻzning badiiy nutqdagi vazifasi masalasi V.V.Vinogradov tadqiqotlarida nazariy jihatdan asoslandi. Olim badiiy matnda soʻzning umumtil ma'nosidan tashqari "estetik ma'no" yuzaga kelishini, bu ma'no esa soʻzning matndagi oʻrni va uslubiy tovlanishi bilan belgilanishini koʻrsatib berdi [13]. Ushbu qarash eskirgan leksemaga nisbatan qoʻllanganda ayniqsa samarali natija beradi: passiv qatlam birligi badiiy matnga tushganda uning eskirganlik belgisining oʻzi qoʻshimcha ma'no komponentiga aylanadi.

Gʻarb lingvopoetikasida bu hodisa aktualizatsiya (foregrounding) nazariyasi doirasida talqin qilinadi. Ya.Mukarjovskiy shoirona nutqning asosiy belgisi til birligining avtomatlashgan qoʻllanishidan chetlashuvi ekanligini koʻrsatgan edi [22]. J.Lich esa badiiy matndagi chetlashuv turlarini tasniflab, ularning orasida "vaqtga oid chetlashuv", ya'ni oʻz davrining til me'yoriga nisbatan eskirgan shakllarni qoʻllashni alohida ajratdi [21]. Maqol matnidagi eskirgan soʻz

aynan shu turdagi chetlashuvni yuzaga keltiradi, biroq u yerda chetlashuv muallif tomonidan ataylab yaratilmaydi, balki tilning tabiiy taraqqiyoti natijasida o‘z-o‘zidan hosil bo‘ladi. Bu maqol materialining o‘ziga xosligini belgilaydi.

Paremiologiyaning nazariy masalalari G.L.Permyakov ishlarida tizimlashtirildi: olim maqolni klishe, ya’ni tayyor holda takrorlanuvchi belgi sifatida talqin qilib, uning shakl barqarorligini asosiy tipologik belgi deb baholadi [16]. Bu qarash tadqiqotimiz uchun muhim, chunki aynan shakl barqarorligi eskirgan leksemani saqlab qoluvchi omil hisoblanadi. N.Norrik maqol semantikasini o‘rganar ekan, maqolning so‘zma-so‘z ma’nosi bilan ko‘chma ma’nosi o‘rtasidagi munosabatning turli ko‘rinishlarini tasnifladi va so‘zma-so‘z ma’no xiralashgan hollarda ham maqolning kommunikativ vazifasi saqlanishini ko‘rsatdi [20]. V.Miderning paremiologiyaga bag‘ishlangan qo‘llanmasida maqolning madaniy xotira vositasi sifatidagi tabiati yoritilgan [19]. J.Lakoff va M.Jonsonning kontseptual metafora nazariyasi esa maqoldagi obrazning qanday qilib mavhum tushunchani konkret sohaga ko‘chirish orqali shakllanishini tushuntirishga imkon beradi [23].

Frazeologik va paremiologik birliklarning madaniy mazmuni V.N.Teliya va V.A.Maslova ishlarida lingvomadaniyatshunoslik nuqtayi nazaridan tahlil qilingan; bu tadqiqotlarda til belgisining madaniy kod bilan bog‘lanish mexanizmi ko‘rsatilgan [17; 18]. Ushbu yondashuv eskirgan leksemani nafaqat til birligi, balki yo‘qolgan madaniy voqelikning belgisi sifatida talqin qilishga asos beradi.

O‘zbek tilshunosligida passiv qatlam masalasi E.Begmatovning leksik qatlamlar tasnifiga oid ishlarida, A.Hojiyevning leksikologiyaga bag‘ishlangan tadqiqotlarida hamda H.Ne’matov va R.Rasulovning sistem leksikologiya asoslariga doir monografiyasida nazariy jihatdan yoritilgan [3; 4; 5]. Sh.Rahmatullayevning etimologik lug‘ati eskirgan leksemalarning kelib chiqishini aniqlashda tayanch manba bo‘lib xizmat qiladi [7]. Badiiy matn lingvopoetikasining nazariy masalalari M.Yo‘ldoshev tadqiqotlarida tizimli tarzda ishlab chiqilgan bo‘lib, unda til birligining estetik qimmat kasb etish shartlari aniqlangan [8].

O‘zbek paremiologiyasining manbaviy asosi T.Mirzayev va B.Sarimsoqov mas’ul muharrirligida nashr etilgan ikki jildlik “O‘zbek xalq maqollari” to‘plami bilan belgilanadi [2]. Sh.Shomaqsudov va Sh.Shorahmedovning “Ma’nolar mahzani” izohli lug‘ati esa har bir maqolning ma’nosini, kelib chiqishini va tarkibidagi tushunilishi qiyin so‘zlarning izohini beruvchi noyob manbadir [1]. Aynan shu ikki manbaning qiyosiy imkoniyati mazkur tadqiqot uchun asos bo‘ldi. Shu bilan birga, mavjud adabiyotlar tahlili shuni ko‘rsatadiki, ushbu manbalarda qayd etilgan eskirgan leksika maxsus lingvopoetik tahlil obyekti sifatida hozirgacha o‘rganilmagan; mavjud ishlarda u ko‘proq leksikografik izoh doirasida qolib ketgan. Mazkur maqola ana shu bo‘shliqni to‘ldirishga qaratilgan.

Tadqiqot metodologiyasi

Tadqiqotning empirik asosini ikki manba tashkil etdi. Birinchisi — Sh.Shomaqsudov va Sh.Shorahmedovning “Ma’nolar mahzani” izohli lug‘ati [1]; bu manbaning qimmati shundaki, unda har bir maqol izohlanibgina qolmay, tarkibidagi bugungi kitobxon uchun notanish leksemaga alohida lug‘aviy izoh beriladi. Ikkinchisi — “O‘zbek xalq maqollari”ning ikkinchi tomi [2]; nashrning yakunida keltirilgan “Tushunilishi qiyin so‘zlar lug‘ati” eskirgan leksemalarni aniqlash va ularning ma’nosini tekshirish imkonini berdi.

Tanlanma quyidagi uchta mezon asosida shakllantirildi. Birinchidan, tarkibidagi leksema hozirgi o‘zbek adabiy tilida faol qo‘llanmasligi lozim. Ikkinchidan, leksemaning ma’nosi manbada lug‘aviy izoh bilan ta’minlangan bo‘lishi shart; bu talab tadqiqotni taxminiy talqinlardan himoya qiladi va har bir tahlilni hujjatlashtirilgan izohga bog‘laydi. Uchinchidan, maqolning umumiy ma’nosi aynan shu leksemaga tayanishi, ya’ni leksema o‘rniga zamonaviy sinonim qo‘yilganda maqolning obrazi yoki ohangdoshligi buzilishi kerak. Ushbu mezonlar asosida 52 ta maqol saralab olindi. Manba matnlari kirill yozuvidan lotin yozuviga o‘girilganda maqolning orfoepik qiyofasi imkon qadar saqlandi.

Material quyidagi usullar yordamida o‘rganildi. Tavsifiy usul har bir leksemaning manbadagi izohini qayd etish va tizimlashtirishda qo‘llanildi. Komponent tahlil leksemaning ma’no tarkibidagi denotativ va konnotativ semalarni ajratish, xususan, eskirganlik belgisining alohida uslubiy sema sifatida namoyon bo‘lishini ko‘rsatishda ishlatildi. Kontekstual-semantik tahlil leksemaning maqol matnidagi sintagmatik muhitini, uning qo‘shni so‘zlar bilan hosil qilgan ma’no munosabatini aniqlashga xizmat qildi. Lingvopoetik tahlil orqali leksemaning obraz yaratishdagi, baho va emotsiya ifodalashdagi ulushi belgilandi. Qiyosiy usul esa maqolning variantlarini o‘zaro solishtirish, ya’ni eskirgan leksema o‘rniga zamonaviy muqobil qo‘yilgan variantlarni tekshirish uchun qo‘llanildi; bu usul leksik yangilanish jarayonini kuzatish imkonini berdi.

Tadqiqotning uslubiy cheklovini alohida qayd etish lozim. Tanlanma birinchi manbaning izohli qismidan olingan bo‘lib, u alifbo tartibidagi ma’lum bir qismni qamrab oladi; shu bois olingan miqdoriy nisbatlar butun o‘zbek paremiologik fondi uchun statistik vakillik da’vo qilmaydi. Tadqiqotning maqsadi miqdoriy emas, sifat tahliliga qaratilgani sababli bu cheklov xulosalarning ishonchliligiga ta’sir qilmaydi: har bir holat alohida, izohga tayangan holda talqin etilgan.

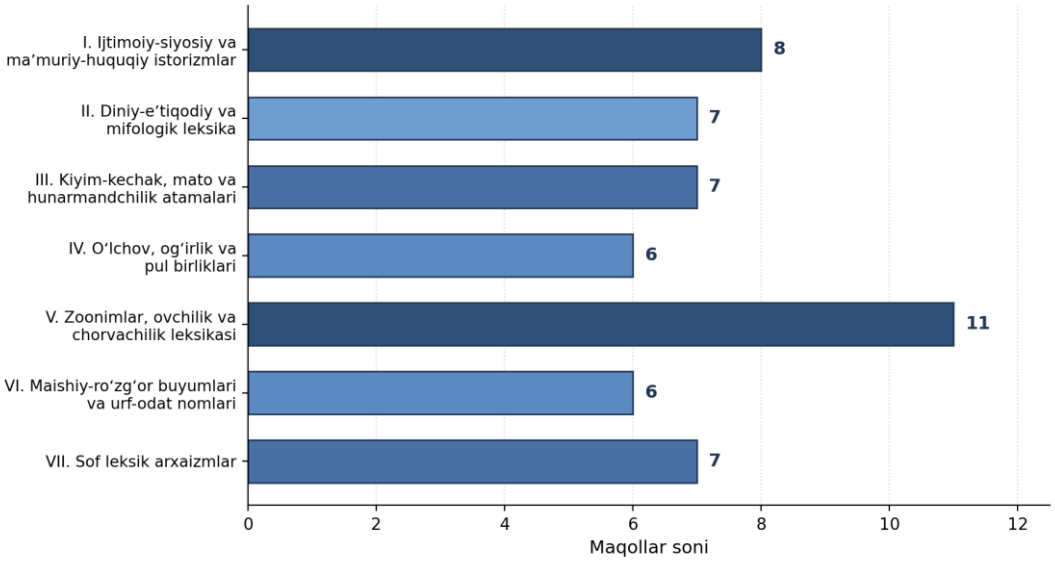
Natijalar va ularning tahlili

Eskirgan leksikaning tematik-semantik tasnifi. Tanlanmadagi 52 ta maqol tarkibidan aniqlangan eskirgan leksemalar denotativ mazmuniga koʻra yettita tematik-semantik guruhga birlashdi (1-jadval). Guruhlarning miqdoriy taqsimoti 1-rasmda aks ettirilgan.

1-jadval

Oʻzbek xalq maqollarida eskirgan leksikaning tematik-semantik guruhlari

T/r	Tematik-semantik guruh	Namunaviy leksemalar	Maqollar soni
I	Ijtimoiy-siyosiy va ma’muriy-huquqiy istorizmlar	amir, bakovul, yasovul, raiyat, zakot, diyat, barimta, bunak, jallob	8
II	Diniy-e’tiqodiy va mifologik leksika	arsh, padar, pir, murid, qurbonliq, isiriq, ayamajuz, anqo, pirtak	7
III	Kiyim-kechak, mato va hunarmandchilik atamalari	boʻrk, yargʻoq, alak, yopinchiq, pushton, bordon, moʻndi	7
IV	Oʻlchov, ogʻirlik va pul birliklari	qari, dahsar, sisar, miri, tuman, duvaja	6
V	Zoonimlar, ovchilik va chorvachilik leksikasi	itolgʻi, qarchigʻay, shunqor, turumtoy, balapon, zagʻizgʻon, jiblajibon, ingan, boʻta, bedov, xirs, yapaloq, poyganak	11
VI	Maishiy-roʻzgʻor buyumlari va urf-odat nomlari	chora, yaloq, tavan, oshboshi, jangal, bulduriq, oʻtarchi	6
VII	Sof leksik va semantik arxaizmlar	yozuq, iris, iskart, yovon, ipor, buromad, yolchi	7
	Jami		**52**



1-rasm. Eskirgan leksemalarning tematik-semantik guruhlar boʻyicha taqsimoti

Tasnif natijalari muhim bir qonuniyatni koʻrsatadi: eng koʻp eskirgan leksema chorvachilik, ovchilik va zoonimika sohasiga (V guruh), shuningdek, eski ma’muriy-huquqiy tuzumga (I guruh) tegishli. Bu tasodifiy emas. Xalq maqollari asosan koʻchmanchi-chorvador va dehqonchilik turmush tarzi sharoitida shakllangan; turmush tarzi oʻzgargach, unga xizmat qilgan atamalar denotatini yoʻqotgan, lekin maqol qolipi ichida qolib ketgan. Demak, eskirgan leksikaning tematik taqsimoti maqollarning yaratilish davridagi ijtimoiy-iqtisodiy voqelikning bevosita in’ikosidir.

Obrazlilik: denotatning yoʻqolishi va metaforik asosning kuchayishi. Maqoldagi eskirgan soʻzning birinchi lingvopoetik vazifasi obraz yaratishdir. Bu vazifa oʻziga xos semantik mexanizmga ega: leksemaning real denotati kundalik tajribadan chiqib ketgach, uning ma’no tarkibida denotativ komponent zaiflashadi, koʻchma-obrazli komponent esa aksincha kuchayadi. Boshqacha aytganda, soʻz predmetni atash vazifasidan ozod boʻlib, sof obrazga aylanadi.

“Ingan ingarsa, bo‘ta bo‘zlaydi” maqolini kuzataylik. Manbada *ingan* urg‘ochi tuya, bo‘ta esa uning bolasi ekanligi izohlanadi. Hozirgi shahar sharoitidagi so‘zlovchi tuyachilik amaliyotidan yiroq bo‘lishiga qaramay, maqolning ma’nosini — ota-onaning iztirobi bolaga, bolaning iztirobi ota-onaga o‘tishini — bexato tushunadi. Bunga sabab shuki, matnda ingarmoq va bo‘zlamoq fe’llari tovushga oid yaqqol tasavvur uyg‘otadi hamda ikkala leksema ohangdoshlik hosil qiladi. Denotat noaniqlashgani obrazni buzmaydi, aksincha, uni umumlashtiradi: “ingan” endi muayyan hayvon emas, balki ona timsolining sof shakli sifatida idrok etiladi. Maqolning zamonaviy variantlari — “Bo‘laning barmog‘i og‘risa, onaning yuragi achiydi” yoki “Otasi achchiq olma yesa, o‘g‘lining tishi qamashadi” — mazmunan bir xil bo‘lsa-da, obrazlilik darajasi bilan farqlanadi: ularda tasvir maishiy va aniq, eskirgan leksemali variantda esa yuksak va umumlashgan.

Xuddi shunday mexanizm *“Itolg‘i — qarchig‘ayning sherigi”* maqolida ham kuzatiladi. *Itolg‘i* ham, qarchig‘ay ham ov qushlarining nomi bo‘lib, bugungi til egasi ularni bir-biridan farqlay olmaydi. Ammo maqolning ma’nosi — ochko‘z va olg‘ir kuchlarning o‘zaro hamkorligi — aynan shu farqlanmaslik hisobiga yanada keskinlashadi: ikki qush bir-biriga shu qadar o‘xshaydiki, ular yagona salbiy obrazga qo‘shilib ketadi. Bu yerda leksik noaniqlik badiiy vositaga aylangan.

“Balapon boshiga, turumtoy to‘shiga” maqolida obraz ikki eskirgan zoonim — hali uchishni o‘rganmagan qush bolasi va ov qushlarining eng kichigi zimmasiga yuklangan. Har ikkalasi ham o‘z kuchidan ortiq ishga urinib, o‘zini halok qiladi. Obrazning teranligi shundaki, halokat sababi tashqi dushman emas, balki subyektning o‘z imkoniyatini noto‘g‘ri baholashidir; bu ma’noni zamonaviy leksika bilan berish uchun bir necha gap talab qilinadi. Ayni shu tejamkorlik — ikki eskirgan zoonim orqali murakkab axloqiy qoidani ifodalash — maqolning poetik quvvatini belgilaydi.

“Zag‘izg‘on bir qo‘nib, sakkiz sakraydi” hamda *“Jiblajibonning es-hushi — pashsha tutishda”* maqollarida esa obraz qushning kuzatilgan real xulq-atvoriga asoslanadi: birinchisida ehtiyotkorlik va hushyorlik, ikkinchisida beqarorlik va yengiltaklik ramziy ma’no kasb etadi. Zoonimning eskirganligi bu yerda ramzning umumlashuv darajasini oshiradi, chunki so‘z aniq biologik turdan uzilib, sof xarakter belgisiga aylanadi.

Ekspressivlik: notanish shakl va baho ifodasi. Ikkinchi lingvopoetik vazifa ekspressivlik hosil qilish bilan bog‘liq. Bu yerda mexanizm boshqacha: eskirgan leksemaning notanishligi tinglovchi diqqatini o‘ziga tortadi, natijada maqolning shu qismi ritmik va semantik jihatdan kuchaytirilgan pozitsiyaga chiqadi. Mukarjovskiy aktualizatsiya deb atagan hodisa aynan shu tarzda yuzaga keladi [22].

“Zolimning uyqusi — raiyatning rohati” maqolida raiyat leksemasi hukmdorga tobe bo‘lgan oddiy fuqarolarni bildiradi. Uni zamonaviy “xalq” yoki “aholi” so‘zi bilan almashtirsak, jumla ma’nosini yo‘qotmaydi, biroq butun ta’sir kuchidan mahrum bo‘ladi. Sabab shundaki, raiyat so‘zi ma’nosining o‘zida tobelik, huquqsizlik va bo‘ysunish semalari mujassam; bu semalar zolim leksemasi bilan zidlanib, maqolning ijtimoiy keskinligini yaratadi. Bunda ekspressivlik antonimik juftlik (zolim — raiyat) va parallel sintaktik qurilma bilan yanada kuchaytiriladi.

“Amir bo‘lsa tamagir, na tovuq qolur, na kulonkir” maqolida ekspressivlikning yana bir manbai — qofiya. Bu yerda uchta so‘z — amir, tamagir, kulonkir — bir xil ohangdoshlik hosil qiladi. Manbada kulonkir yirik jussali xo‘roz turi ekanligi izohlangan. Diqqatga sazovori shuki, aynan qofiya talabi bu nodir leksemani maqol tarkibida ushlab turgan: uning o‘rniga umumiste’moldagi “xo‘roz” so‘zini qo‘ysak, qofiya ham, kinoya ohangi ham darhol yo‘qoladi. Demak, ekspressivlik va leksemaning saqlanishi bir-biriga bog‘liq: qofiya so‘zni saqlaydi, saqlangan so‘z esa qofiya orqali ekspressivlikni kuchaytiradi.

“Bo‘zchi belboqqa yolchimas, kulol — mo‘ndiga” maqolida ekspressivlik achchiq kinoya shaklida namoyon bo‘ladi. Mo‘ndi — kulol yasaydigan sopol idish turi; hunarmand o‘zi yasagan idishdan foydalana olmasligi ijtimoiy adolatsizlikning eng ixcham ifodasidir. Maqolning variantlarida mo‘ndi o‘rniga to‘qa (kamar to‘qasi) qo‘llanadi va bunda temirchi obrazi yuzaga chiqadi. Variantlar qiyosi ko‘rsatadiki, maqolning qolipi barqaror, unga tushuvchi kasb-hunar atamasi esa o‘zgaruvchan; ammo har ikki holatda ham aynan eskirgan hunarmandchilik atamasi ekspressivlikning tashuvchisi bo‘lib qoladi.

“Dahsar tariq, sisar hayqiriq” maqolida ekspressivlik o‘lchov birliklarining zidlanishi orqali hosil qilingan: dahsar — nisbatan kichik og‘irlik o‘lchovi, sisar esa undan uch barobar ko‘p miqdor. Ozgina hosil uchun butun bozorni boshiga ko‘taradigan odam ustidan kulish shu ikki atamaning miqdoriy nomutanosibligiga qurilgan. Zamonaviy o‘lchovlar (kilogramm, tonna) bilan almashtirilganda kinoya butunlay yo‘qoladi, chunki eskirgan atamalarning ohangdoshligi (dahsar — sisar) va qofiyaviy juftlashuvi (tariq — hayqiriq) shu bilan birga yo‘qoladi. Xuddi shu hodisa *“Dunyoniki — miri kam ikki”* maqolida ham kuzatiladi: miri — besh tiyinlik mayda pul birligi; maqol dunyoning hech qachon to‘liq bo‘lmasligi haqidagi falsafiy fikrni arzimas pul birligi orqali ifodalaydi va bu nomutanosiblik uning ekspressiv quvvatini belgilaydi.

Ekspressivlikning yana bir ko‘rinishi *“Ziqna birga unamay, duvajaga tushadi”* maqolida namoyon bo‘ladi. Duvaja — ikki barobar, ikki hissa ma’nosidagi arxaik miqdor bildiruvchi so‘z. Xasis odamning arzonini izlab, oxir-oqibat ikki barobar sarf qilishi haqidagi umumbashariy kuzatish shu bitta so‘z bilan ifodalangan; leksemaning notanishligi maqolga hikmatli, deyarli aforistik ohang beradi.

Tarixiy kolorit: leksema xronologik indeks sifatida. Uchinchi vazifa istorizmlarga koʻproq xos boʻlib, ularning muayyan ijtimoiy-iqtisodiy davrni belgilash qobiliyati bilan bogʻliq. Bunday leksema maqol matniga xronologik marker olib kiradi va tinglovchining ongida butun bir tarixiy manzarani jonlantiradi.

"Borga — bakovul, yoʻqqa — yasovul" maqoli bunga yorqin misol. Manbada bakovul xon dasturxonchisi, yasovul esa amaldorlarning yugurdagi, qoʻriqchisi ekanligi izohlanadi. Ikkala mansab ham xonlik davri boshqaruv tizimiga tegishli boʻlib, bugun mavjud emas. Maqol boyga xushomad qilib, kambagʻalni mensimaydigan odamni fosh etadi; ammo bu axloqiy baho aniq tarixiy sahnaga — saroy, dasturxon, amaldor va uning yugurdagi manzarasiga joylashtirilgan. Ikki mansab nomining qofiyalanishi (bakovul — yasovul) esa maqolning esda qolarli boʻlishini taʼminlaydi.

"Zakotli mol oʻtda kuymas, suvda choʻkmas" maqolida zakot leksemasi shariat soligʻi tizimini, *"Dushmaning ojiz boʻlsa, diyat soʻrama"* maqolidagi diyat esa qon bahosi, yaʼni xun puli institutini eslatadi. *"Barimtadan qoʻrqqan mol yigʻmas, chigirtkadan qoʻrqqan ekin ekmas"* maqolidagi barimta koʻchmanchi chorvadorlik davridagi qasos yurishi odatini bildiradi. Bu uch maqolning har biri huquqiy-iqtisodiy voqelikning maʼlum bosqichini muhrlab qoʻygan boʻlib, ularni birgalikda kuzatish oʻtmish jamiyatining mulkiy munosabatlari haqida tasavvur beradi. Muhimi shuki, bunday maqollarda tarixiy kolorit tashqi bezak emas, balki maʼnoning tashuvchisi: barimta tushunchasini bilmagan tinglovchi maqolning nima uchun aynan "mol yigʻmaslik" bilan bogʻlanishini anglay olmaydi.

"Bunak olgan boʻlinar, yoli-pari yulinar" maqolida bunak — yollangan kosiblarning ish haqi hisobidan oldindan oladigan puli. Maqol xoʻjayinga qarz orqali qaram boʻlib qolish holatini tasvirlaydi va bu bilan hunarmandchilik ustaxonalaridagi mehnat munosabatlarining aniq shaklini saqlab qolgan. Xuddi shunday, *"Jallob — turgan-bitgani qallob"* maqolidagi jallob mol savdogari, uning variantidagi allop esa don-un sotuvchisi boʻlib, bozor tuzilishining eskirgan kasbiy taqsimotini aks ettiradi.

Alohida eʼtiborga molik guruhni oʻlchov birliklari tashkil etadi. *"Ishtonsizning tushiga uch qari boʻz kiribdi"* va *"Boʻydoqqa ellik qari boʻz ham yetmaydi"* maqollaridagi qari uzunlik oʻlchovi boʻlib, manbada uning turli hududlarda va turli davrlarda turlicha qiymatga ega boʻlgani qayd etilgan — masalan, XIX asrda Xorazmdagi qari bilan Toshkent bozor qarisi oʻrtasida jiddiy farq mavjud edi. Bu maʼlumot maqolning tahlili uchun ikki jihatdan qimmatli: birinchidan, u matnning yaratilish davrini taxminan belgilash imkonini beradi; ikkinchidan, oʻlchov birligining hududiy tarqoqligi maqolning ham mahalliy variantlarga ega boʻlishini izohlaydi.

Diniy-eʼtiqodiy qatlam ham tarixiy kolorit yaratishda faol ishtirok etadi. *"Amri padar — arshdan aʼlo"* maqolida arsh — koinotning eng yuqori qismidagi ilohiy taxt tasavvurini bildiradi; ota amrining shu darajadan ham yuqori qoʻyilishi mubolagʻaning eng yuqori nuqtasidir. *"Goh pirdan, goh muriddan"* maqolidagi pir va murid juftligi taʼlimotdagi ustoz-shogird munosabatining ijtimoiy amaliyotini, *"Isiriqdan jin qochar, yudurukdan — jinni"* maqolidagi isiriq va jin tushunchalari xalq tibbiyoti va demonologik tasavvurlarni saqlagan. *"Ayamajuz — olti kun, qahr aylasa qattiq kun"* maqolida esa qishning oxiridagi olti kunlik sovuq davrini bildiruvchi ayamajuz atamasi orqali xalq taqvimi tizimi inʼikos etgan.

Semantik tiniqlik darajalari. Tahlil koʻrsatdiki, eskirgan leksema qatnashgan maqollar bugungi til egasi uchun bir xil darajada tushunarli emas. Maqolning shakli toʻliq saqlangani holda, uning mazmuni turli darajada xiralashishi mumkin. Shu asosda uch bosqichli semantik tiniqlik shkalasini ajratish mumkin (2-jadval).

2-jadval

Eskirgan leksemali maqollarning semantik tiniqlik darajalari

Daraja	Tavsifi	Namunalar	Idrok natijasi
I. Tiniq	Eskirgan leksemaning maʼnosi kontekstdan yoki oʻzak-negiz orqali tiklanadi	"Yozugʻlikka yoʻl bormi?" (yozuq — gunoh, ayb); "Inisi bornning irisi bor" (iris — baxt, ulush)	Maqol izohsiz tushuniladi
II. Yarim tiniq	Leksema notanish, ammo maqol qurilishi va qoʻshni soʻzlar umumiy maʼnoni tiklashga yetarli	"Ingan ingarsa, boʻta boʻzlaydi"; "Balapon boshiga, turumtoy toʻshiga"; "Borida chora-chora, yoʻgʻida banda bechora"	Umumiy maʼno tushuniladi, tafsilot yoʻqoladi
III. Xira	Leksemaning maʼnosi lugʻaviy izohsiz tiklanmaydi; maqol shaklan saqlangan, mazmunan yopiq	"Dahsar tariq, sisar hayqiriq"; "Yozda qoʻygan poyganakka qishda kelib qush ilindi"; "Jinnining jirtakka tobi yoʻq, shogirdning — pirtakka"	Izohli lugʻat zarur

Shkala amaliy ahamiyatga ega: u izohli lugʻat va oʻquv qoʻllanmalarida qaysi maqollar albatta sharhga muhtojligini belgilash imkonini beradi. Nazariy jihatdan esa u muhim qonuniyatni ochadi — maqolning shakl barqarorligi bilan

mazmun barqarorligi bir xil tezlikda emas, turli tezlikda o‘zgaradi. Shakl deyarli o‘zgarmaydi, mazmun esa asta-sekin xiralashadi. Ana shu tafovut natijasida “shaklan tirik, mazmunan yopiq” maqollar qatlami vujudga keladi.

Ma’no xiralashuvining tabiiy oqibati — qayta talqin, ya’ni xalq etimologiyasi. Leksemaning asl ma’nosi unutilgach, so‘zlovchi uni tovush jihatdan yaqin bo‘lgan tanish so‘zga yaqinlashtiradi va maqolga yangi mazmun yuklaydi. Bunday holatlar maqol matnining tirik, o‘zgaruvchan tabiatini ko‘rsatadi va ularni buzilish emas, balki tilning o‘zini-o‘zi tiklash mexanizmi sifatida baholash lozim.

Maqol qolipi leksik qo‘riqxona sifatida. Tahlilning umumlashtiruvchi natijasi shundan iborat: eskirgan leksemaning maqol tarkibida saqlanishi tasodifiy emas, balki maqolning ritmik-qofiyaviy tuzilishi bilan bevosita bog‘liq. Materialdagi maqollarning aksariyatida eskirgan leksema qofiya yoki alliteratsiya pozitsiyasini egallaydi: amir — tamagir — kulonkir; bakovul — yasovul; dahsar — sisar; ingan — ingarsa; bo‘z — pushton; bo‘rk ichida — yeng ichida. Bu pozitsiya so‘zni almashtirishga imkon bermaydi, chunki almashtirish butun ohangdoshlik tizimini buzadi. Shu tarzda maqolning poetik shakli leksemani konservatsiya qiladi (2-rasm).



2-rasm. Maqol matnidagi eskirgan so‘zning lingvopoetik funksiyalari

Aynan shu mexanizm o‘zbek maqol fondini tarixiy leksikologiya uchun birlamchi manbaga aylantiradi. Yozma yodgorliklarda saqlanmagan yoki kam uchraydigan ayrim leksemalar — masalan, poyganak (qushlarga qo‘yiladigan tuzoq turi), bulduriq (qalin qirov), tavan (mehmon ayollar keltiradigan tugundagi noz-ne’mat), o‘tarchi (mol tabibi), iskart (kosiblarning haftalik ish me’yori) — bugungi kunda asosan maqol matnlari orqaligina qayd etilgan. Bu leksemalarning har biri o‘z sohasidagi yo‘qolgan amaliyotni ham birga saqlab qolgan: iskart so‘zi hunarmandchilikdagi mehnat me’yorlash tizimini, tavan esa to‘y-marosim odob-tartiblarining ixtisoslashgan tuzilmasini ko‘rsatadi.

Uch funksiya o‘zaro istisno qilmaydi, balki bir matnda birga namoyon bo‘lishi mumkin. Masalan, “Bo‘zchi belboqqa yolchimas, kulol — mo‘ndiga” maqolida mo‘ndi bir vaqtning o‘zida obraz yaratadi (hunarmandning ojizligi timsoli), ekspressivlik hosil qiladi (kinoyaviy ohang) va tarixiy kolorit beradi (kulolchilik amaliyotining aniq detali). Shunga ko‘ra, eskirgan so‘zning lingvopoetik imkoniyatlarini bir-biridan ajratilgan uch funksiya emas, balki yagona hodisaning uch qirrasi sifatida talqin qilish maqsadga muvofiq. Ular o‘rtasidagi nisbat leksemaning turiga bog‘liq: sof leksik arxaizmlarda obrazlilik va ekspressivlik ustunlik qilsa, istorizmlarda tarixiy kolorit birinchi o‘ringa chiqadi.

Xulosalar

O‘zbek xalq maqollari tarkibidagi eskirgan leksemalarning tahlili quyidagi xulosalarga olib keladi. Birinchidan, maqol matni tilning passiv qatlamiga o‘tgan birliklarni saqlovchi o‘ziga xos lingvistik qo‘riqxona vazifasini bajaradi; bu vazifa maqolning ritmik-qofiyaviy qolipi bilan ta’minlanadi, chunki qofiya yoki alliteratsiya pozitsiyasidagi so‘zni almashtirib bo‘lmaydi.

Ikkinchidan, tanlanmadagi 52 ta maqol tarkibidagi eskirgan leksika yettita tematik-semantik guruhga ajraladi, ular orasida zoonimlar hamda ijtimoiy-ma’muriy istorizmlar salmoqli o‘rin tutadi. Bu taqsimot maqollar shakllangan davrdagi chorvachilik-dehqonchilik turmush tarzi va xonlik davri boshqaruv tizimining bevosita in’ikosidir.

Uchinchidan, eskirgan so‘z maqol matnida uch xil lingvopoetik vazifani bajaradi. Obrazlilik denotativ komponentning zaiflashuvi hisobiga ko‘chma ma’noning umumlashuvi orqali yuzaga keladi. Ekspressivlik notanish shaklning diqqatni o‘ziga tortishi, qofiyaviy kuchayish va baholovchi semalarning faollashuvi natijasida hosil bo‘ladi.

Tarixiy kolorit esa istorizmning muayyan ijtimoiy-iqtisodiy davrni belgilovchi xronologik indeksga aylanishi bilan izohlanadi. Bu vazifalar bir matnda birga namoyon boʻlishi mumkin.

Toʻrtinchidan, maqollarning semantik tiniqligiga koʻra uch bosqichli shkala — tiniq, yarim tiniq va xira maqollar — ajratildi. Shakl barqarorligi bilan mazmun barqarorligining turli tezlikda oʻzgarishi natijasida "shaklan tirik, mazmunan yopiq" maqollar qatlami vujudga keladi; bu qatlam izohli lugʻat va oʻquv adabiyotlarida albatta sharhlanishi lozim.

Tadqiqot natijalari oʻzbek tili tarixiy leksikologiyasi, paremiologiya va lingvopoetika sohalarida, shuningdek, izohli lugʻatlar tuzishda hamda oliy ta'lim muassasalarida "Oʻzbek tili leksikologiyasi" va "Badiiy matn lingvopoetikasi" fanlarini oʻqitishda qoʻllanishi mumkin. Keyingi tadqiqotlarda tanlanmani butun paremiologik fond hisobiga kengaytirish, eskirgan leksemalarning qardosh turkiy tillar maqollaridagi muqobillari bilan qiyoslash hamda ularning zamonaviy nutqdagi qayta faollashuvi masalasini oʻrganish istiqbolli yoʻnalish boʻlib qoladi.

Mualliflar hissasi, manfaatlar toʻqnashuvi va moliyalashtirish

Mualliflar hissasi: tadqiqot konsepsiyasi, material tanlash, lingvistik tahlil va maqola matnini tayyorlash muallif tomonidan mustaqil amalga oshirilgan. Manfaatlar toʻqnashuvi: muallif manfaatlar toʻqnashuvi yoʻqligini bildiradi. Moliyalashtirish: tadqiqot tashqi moliyaviy yordamsiz amalga oshirilgan.

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ОСОБЕННОСТИ УЗБЕКСКОГО И РУССКОГО ЯЗЫКОВ В АСПЕКТЕ ГЕНДЕРНОЙ ЛИНГВИСТИКИ: ПСИХОЛИНГВИСТИЧЕСКИЙ АНАЛИЗ

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Аннотация: *В статье рассматриваются психолингвистические особенности языковой репрезентации гендера в узбекском и русском языках с учетом современных тенденций развития гендерной лингвистики. Актуальность исследования обусловлена возрастающим интересом к изучению взаимосвязи языка, мышления и социальной идентичности в условиях билингвального пространства Республики Узбекистан. Цель исследования заключается в выявлении общих и специфических особенностей формирования гендерно маркированного речевого поведения носителей узбекского и русского языков, а также в определении влияния национально-культурных факторов на процессы речевой коммуникации. Практическая значимость исследования заключается в возможности использования полученных результатов при преподавании русского и узбекского языков, психолингвистики, гендерной лингвистики, межкультурной коммуникации и разработке современных образовательных технологий.*

Ключевые слова: *гендерная лингвистика, психолингвистика, узбекский язык, русский язык, языковая личность, билингвизм, речевое поведение.*

O'ZBEK VA RUS TILLARINING GENDER LINGVISTIKA ASPEKTIDAGI XUSUSIYATLARI: PSIXOLINGVISTIK TAHLIL

Annotatsiya: *Maqolada zamonaviy gender lingvistikasining rivojlanish tendensiyalarini hisobga olgan holda o'zbek va rus tillarida genderning lingvistik ifodalanishining psixolingvistik xususiyatlari ko'rib chiqiladi. Tadqiqotning dolzarbligi O'zbekiston Respublikasining ikki tilli muhitida til, tafakkur va ijtimoiy identifikatsiya o'rtasidagi o'zaro bog'liqlikni o'rganishga bo'lgan qiziqishning ortib borayotgani bilan belgilanadi. Tadqiqotning maqsadi o'zbek va rus tili so'zlashuvchilarida gender bilan bog'liq nutqiy xulq-atvorning umumiy va o'ziga xos jihatlarini aniqlash hamda milliy-madaniy omillarning nutqiy muloqot jarayonlariga ta'sirini belgilashdan iborat. Tadqiqot natijalaridan o'zbek va rus tillarini, psixolingvistika, gender lingvistikasi va madaniyatlararo kommunikatsiyani o'qitishda, shuningdek zamonaviy ta'lim texnologiyalarini ishlab chiqishda foydalanish mumkin.*

Kalit so'zlar: *gender lingvistikasi, psixolingvistika, o'zbek tili, rus tili, lingvistik shaxs, bilingvizm, nutqiy xulq-atvor.*

FEATURES OF THE UZBEK AND RUSSIAN LANGUAGES IN THE ASPECT OF GENDER LINGUISTICS: A PSYCHOLINGUISTIC ANALYSIS

Abstract: *The article examines the psycholinguistic features of gender representation in the Uzbek and Russian languages within the framework of contemporary gender linguistics. The relevance of the study is determined by the growing interest in the interaction between language, cognition and social identity in the bilingual environment of the Republic of Uzbekistan. The purpose of the research is to identify common and specific characteristics of gender-marked speech behaviour in Uzbek and Russian speakers and to determine the influence of national and cultural factors on communication processes. The findings may be applied in teaching Uzbek and Russian, psycholinguistics, gender linguistics and intercultural communication, as well as in the development of modern educational technologies.*

Keywords: *gender linguistics, psycholinguistics, Uzbek language, Russian language, language personality, bilingualism, speech behaviour.*

Введение

Гендерная лингвистика является одним из наиболее динамично развивающихся направлений современной гуманитарной науки, объединяющим достижения языкознания, психолингвистики, когнитивной лингвистики, социолингвистики и культурологии. Основное внимание исследователей сосредоточено на изучении механизмов отражения гендерных отношений в языке, особенностей формирования языковой личности и влияния социальных факторов на речевое поведение человека [Кирилина, 1999; 21].

В последние десятилетия интерес к гендерным исследованиям значительно возрос, что связано с развитием междисциплинарных подходов к анализу языка как средства формирования социальной идентичности. Современная психолингвистика рассматривает речевую деятельность не только как процесс передачи информации, но и как сложный когнитивный механизм, в котором языковые средства отражают особенности мышления, национальной культуры и коммуникативного опыта личности [Леонтьев, 2005; 47]. В этом контексте гендер выступает не только как биологическая характеристика человека, но и как социокультурная категория, определяющая выбор речевых стратегий, коммуникативных тактик и способов языкового взаимодействия [Лакофф, 1975; 15].

Особую актуальность проблема приобретает в условиях Республики Узбекистан, где исторически сформировалось билингвальное пространство, характеризующееся активным функционированием узбекского и русского языков. Их взаимодействие способствует формированию особой языковой личности, свободно переключающейся между различными коммуникативными кодами и культурными моделями общения. Подобная языковая ситуация обусловливает необходимость комплексного психолингвистического исследования гендерной специфики речевого поведения, учитывающего структурные особенности обоих языков и влияние национальных традиций [Маслова, 2018; 63].

Обзор литературы

Теоретическую основу исследования составили работы по психолингвистике, гендерной лингвистике, лингвокультурологии и теории языковой личности. Важное значение имеют положения Л. С. Выготского, А. А. Леонтьева и А. Р. Лурии о речевой деятельности как сложном когнитивном процессе, а также концепция Ю. Н. Караулова о языковой личности. В области гендерной лингвистики значимыми являются исследования А. В. Кирилиной, Р. Лакофф, Д. Таннен, Дж. Батлер, Д. Кэмерон, Дж. Коутс, П. Эккерт и С. МакКоннелл-Гинет. Их труды отражают переход от описания различий мужской и женской речи к изучению гендера как социально и дискурсивно конструируемой категории. Для анализа цифровой коммуникации существенны исследования Д. Кристала и Дж. П. Ги, позволяющие учитывать влияние интернет-дискурса и мультимодальных средств на современные коммуникативные практики. Сопоставление указанных подходов показывает необходимость дальнейшего изучения гендерной коммуникации в условиях узбекско-русского билингвизма, где структурные особенности языков взаимодействуют с национально-культурными нормами.

Методология исследования

Методологическую основу настоящего исследования составляет комплексный междисциплинарный подход, объединяющий достижения психолингвистики, гендерной лингвистики, когнитивной лингвистики, социолингвистики и теории межкультурной коммуникации. Такой подход позволяет рассматривать гендерную специфику речевого поведения как результат взаимодействия языковых, психологических, когнитивных и социокультурных факторов, определяющих процессы порождения и восприятия речи [Леонтьев, 2005; 38; Маслова, 2018; 72].

Теоретической базой исследования послужили положения психолингвистической теории речевой деятельности, разработанной Л. С. Выготским, А. А. Леонтьевым и А. Р. Лурией. Согласно данной концепции, речевая деятельность представляет собой сложный когнитивный процесс, включающий этапы формирования замысла, внутреннего программирования, языкового оформления и реализации высказывания [Выготский, 1999; 117; Леонтьев, 2005; 54; Лурия, 1979; 28]. Использование данного подхода позволило рассмотреть особенности гендерной репрезентации как отражение специфики языкового сознания личности.

При анализе языковой личности использованы положения концепции Ю. Н. Караулова, согласно которым языковая личность представляет собой совокупность языковых знаний, коммуникативных навыков и культурных ценностей, проявляющихся в процессе речевого взаимодействия [Караулов, 2010; 35]. Данная концепция особенно значима для исследования билингвальной личности, функционирующей в условиях узбекско-русского языкового пространства.

Теоретические положения гендерной лингвистики основываются на работах А. В. Кирилиной, Р. Лакофф, Д. Таннен, Дж. Батлер и других исследователей, рассматривающих гендер как социально конструируемую категорию, находящую отражение в языковой системе и коммуникативном поведении личности [Кирилина, 1999; 24; Lakoff,

1975; 16; Tannen, 1990; 42; Butler, 1990; 33]. В отличие от традиционного понимания пола как исключительно биологической характеристики, современная гендерная лингвистика исследует особенности языкового выражения социальных ролей мужчин и женщин, коммуникативных стратегий и речевых моделей.

Особое внимание в исследовании уделено сопоставительному анализу узбекского и русского языков. Выбор данных языков обусловлен их активным функционированием в современной языковой ситуации Республики Узбекистан. Узбекский язык, являясь агглютинативным, практически не обладает средствами грамматической маркировки рода, тогда как русский язык характеризуется развитой системой грамматического рода, оказывающей существенное влияние на организацию речевого высказывания [Бегматов, 2008; 56; Рахматуллаев, 2010; 84]. Сравнение данных языковых систем позволяет выявить универсальные и национально-специфические механизмы языковой репрезентации гендера.

Эмпирическую основу исследования составили научные труды отечественных и зарубежных авторов по психолингвистике, гендерной лингвистике, когнитивной лингвистике и социолингвистике, а также примеры языкового материала, отражающие особенности современного узбекского и русского речевого общения. Для анализа были использованы материалы художественных произведений, средств массовой информации, интернет-дискурса, образовательной коммуникации и разговорной речи. Такой корпус языковых данных позволил рассмотреть функционирование гендерно маркированных единиц в различных коммуникативных сферах и определить влияние социальных условий на выбор речевых стратегий.

В работе применялись взаимодополняющие методы исследования. Описательный метод использовался для характеристики языковых явлений и определения особенностей функционирования гендерно маркированных единиц [Маслова, 2018; 94]. Сравнительно-сопоставительный метод позволил выявить сходства и различия между узбекским и русским языками на лексическом, грамматическом и прагматическом уровнях [Бегматов, 2008; 61]. Метод дискурсивного анализа был направлен на изучение особенностей реализации гендерных стратегий в различных типах коммуникации, включая институциональный, бытовой и цифровой дискурс [Tannen, 1990; 88]. Кроме того, применялся метод интерпретационного анализа, обеспечивший выявление национально-культурной специфики языковых единиц и особенностей их функционирования в различных коммуникативных ситуациях.

Научная новизна исследования заключается в комплексном психолингвистическом анализе гендерной репрезентации в узбекском и русском языках в условиях современного билингвизма. В отличие от большинства существующих работ, посвященных описанию отдельных языковых особенностей, настоящее исследование рассматривает гендерную коммуникацию как интегративный когнитивный процесс, обусловленный взаимодействием языковой структуры, национальной культуры, социальных норм и индивидуального коммуникативного опыта. Особое внимание уделено влиянию цифровой коммуникации и интернет-дискурса на трансформацию традиционных моделей речевого поведения, что отражает современные тенденции развития языковой личности в условиях цифровизации общества.

Таким образом, выбранная методология обеспечивает всесторонний анализ исследуемой проблемы и позволяет получить достоверные результаты, раскрывающие особенности языковой репрезентации гендера в узбекском и русском языках с учетом их структурных различий, культурной обусловленности и психолингвистических механизмов речевой деятельности.

Результаты исследования

Проведенный сравнительно-сопоставительный анализ показал, что языковая репрезентация гендера в узбекском и русском языках обусловлена совокупностью лингвистических, психолингвистических и социокультурных факторов. Несмотря на принадлежность данных языков к различным типологическим системам, в обоих случаях язык выступает важнейшим средством формирования гендерной идентичности, отражая национальные культурные нормы, ценностные установки и особенности коммуникативного поведения.

Гендерная маркированность грамматической системы русского и узбекского языков

Одним из наиболее существенных различий исследуемых языков является специфика выражения категории рода. Русский язык характеризуется наличием грамматической категории рода, которая охватывает существительные, местоимения, прилагательные, причастия и формы прошедшего времени глагола. Благодаря этому гендерная информация кодируется уже на морфологическом уровне языковой системы [Караулов, 2010; 43].

Например:

«Студент подготовил научный доклад.»

«Студентка подготовила научный доклад.»

Даже при отсутствии имени говорящего получатель сообщения получает информацию о половой принадлежности субъекта речи.

В узбекском языке подобная категория отсутствует. Личное местоимение u используется как в отношении мужчины, так и женщины, а формы глагола остаются неизменными независимо от пола субъекта действия:

Talaba ilmiy ma'ruza tayyorladi.

В данном предложении невозможно определить пол говорящего без дополнительного контекста [Бегматов, 2008; 74].

С психолингвистической точки зрения подобная особенность свидетельствует о различных механизмах обработки языковой информации. В русском языке идентификация гендера осуществляется одновременно с восприятием грамматической структуры предложения, тогда как в узбекском языке данный процесс требует привлечения дополнительных когнитивных ресурсов, основанных на анализе контекста, коммуникативной ситуации и фоновых знаний адресата [Лурия, 1979; 65].

Исследование показало, что отсутствие грамматической категории рода в узбекском языке компенсируется более активным использованием лексических средств. Гендерная принадлежность чаще всего выражается словами:

erkak — мужчина; ayol — женщина; ota — отец; ona — мать; o'g'il — сын; qiz — дочь.

В русском языке аналогичные лексемы существуют, однако основную функцию идентификации пола выполняют грамматические показатели [Кирилина, 1999; 38].

Кроме того, в узбекской языковой картине мира значительно чаще используются уважительные обращения: aka, opa, ota, ona, ustoz которые отражают не столько гендерные различия, сколько возрастную и социальную иерархию собеседников.

В русском языке аналогичную функцию выполняют обращения по имени-отчеству или официальные формы речевого этикета:

уважаемый коллега; господин профессор; уважаемая комиссия.

Это свидетельствует о том, что в узбекской культуре социальный статус нередко оказывается более значимым фактором речевого поведения, чем пол коммуниканта.

Анализ научной литературы и коммуникативных практик показал, что женская и мужская речь различаются прежде всего на прагматическом уровне.

Женская речь характеризуется:

большей эмоциональной экспрессивностью;

использованием слов поддержки;

частым употреблением форм благодарности;

высокой частотностью вежливых конструкций;

стремлением к поддержанию гармонии общения.

Например: Большое спасибо за помощь. Мне было очень приятно работать с вами.

Мужская коммуникация чаще ориентирована на достижение конкретного результата общения и отличается лаконичностью.

Например: Доклад готов. Материалы отправлены.

Полученные результаты согласуются с выводами Д. Таннен, рассматривающей женскую речь как средство установления социальных отношений, тогда как мужская коммуникация преимущественно ориентирована на передачу информации [Tannen, 1990; 82].

Вместе с тем проведенный анализ показывает, что подобные различия постепенно становятся менее выраженными среди представителей молодого поколения, активно использующих цифровые технологии и социальные сети.

Современный Узбекистан представляет собой пространство активного функционирования двух языков — узбекского и русского. Это способствует формированию билингвальной языковой личности, обладающей способностью изменять коммуникативную стратегию в зависимости от используемого языка.

В ходе исследования установлено, что при переходе на узбекский язык коммуниканты значительно чаще используют:

этикетные формулы;

косвенные просьбы;

уважительные обращения;

речевые стратегии сохранения гармонии общения.

При использовании русского языка возрастает частотность:

прямых вопросов;

оценочных конструкций;

экспрессивной лексики;

аргументированной дискуссии.

Таким образом, смена языка сопровождается изменением не только языковых средств, но и коммуникативного поведения личности. Данный факт свидетельствует о высокой степени когнитивной адаптации билингвальной личности и подтверждает положение психолингвистики о тесной взаимосвязи языка, мышления и социальной среды [Леонтьев, 2005; 73].

Отдельного внимания заслуживает влияние цифровой коммуникации на трансформацию традиционных моделей речевого поведения. Анализ интернет-дискурса показывает, что современные пользователи активно используют:

эмодзи;

графические символы;

англоязычные заимствования;

интернет-сленг;

мультимодальные средства общения.

Женщины чаще используют эмоционально окрашенные сообщения, эмодзи, слова поддержки и благодарности, тогда как мужчины предпочитают краткие информационные сообщения, профессиональную лексику и нейтральные коммуникативные конструкции. Однако эти различия постепенно сглаживаются под влиянием социальных сетей, где возраст, образование, профессиональная принадлежность и цифровая культура оказывают не меньшее влияние на речевое поведение, чем гендер.

Полученные результаты позволяют утверждать, что цифровая среда способствует формированию новых моделей языкового поведения, в которых традиционные гендерные различия трансформируются в соответствии с современными тенденциями глобализации и цифровизации общества [Musaeva, 2022; 10241].

Обсуждение результатов

Полученные результаты подтверждают, что гендерная специфика речевого поведения не может быть объяснена исключительно структурными особенностями языковой системы. Проведенное исследование свидетельствует о том, что формирование гендерно маркированной коммуникации представляет собой многофакторный процесс, в котором взаимодействуют лингвистические, когнитивные, психологические и социокультурные компоненты. Данный вывод соответствует современным представлениям психолингвистики о языке как инструменте не только передачи информации, но и конструирования социальной реальности [Леонтьев, 2005; 61].

Результаты исследования согласуются с положениями А. В. Кирилиной, согласно которым гендерная лингвистика рассматривает язык как средство репрезентации социальных ролей мужчин и женщин, отражающих культурные нормы конкретного общества [Кирилина, 1999; 52]. Вместе с тем проведенный сравнительный анализ позволяет уточнить данную концепцию применительно к билингвальной языковой ситуации Республики Узбекистан. Если в большинстве исследований основное внимание уделяется языкам с развитой категорией грамматического рода, то результаты настоящей работы показывают, что отсутствие данной категории в узбекском языке не препятствует эффективной репрезентации гендерной принадлежности. Ее функции реализуются посредством лексических единиц, коммуникативного контекста, прагматических средств и национально обусловленных норм речевого поведения.

Полученные данные также подтверждают выводы Р. Лакофф о том, что особенности мужской и женской речи определяются не столько биологическими различиями, сколько социальными ожиданиями, закрепленными в языковой практике общества [Lakoff, 1975; 45]. Вместе с тем анализ речевого материала показывает, что в современной узбекской языковой среде наблюдается постепенное изменение традиционных моделей коммуникации. Расширение образовательных возможностей, активное участие женщин в профессиональной и общественной деятельности, а также интенсивное развитие цифровых технологий способствуют трансформации привычных коммуникативных ролей. Вследствие этого многие ранее устойчивые гендерные различия становятся менее выраженными, особенно в речи представителей молодого поколения.

Существенный интерес представляет сопоставление полученных результатов с концепцией Д. Таннен, согласно которой мужская и женская коммуникация строится на различных принципах: мужчины преимущественно ориентированы на передачу информации и достижение коммуникативной цели, тогда как женщины стремятся к поддержанию межличностных отношений и эмоционального взаимодействия [Tannen, 1990; 91]. Проведенное исследование в целом подтверждает данную закономерность, однако позволяет отметить, что в условиях узбекско-русского билингвизма данные особенности приобретают дополнительные национально-культурные характеристики. Так, в узбекской коммуникативной традиции независимо от пола говорящего значительно возрастает роль речевого этикета, уважительных обращений и косвенных форм выражения просьбы

или несогласия. Следовательно, национальная культура в ряде случаев оказывает более сильное влияние на выбор коммуникативной стратегии, чем гендерная принадлежность.

Особого внимания заслуживают результаты, связанные с исследованием билингвальной языковой личности. Анализ показал, что переключение между узбекским и русским языками сопровождается изменением не только языковых средств, но и коммуникативных моделей поведения. При использовании узбекского языка говорящие чаще демонстрируют ориентацию на сохранение социальной гармонии, уважительное отношение к собеседнику и соблюдение традиционных норм общения. При переходе на русский язык увеличивается частотность прямых речевых актов, аргументированных высказываний и оценочной лексики. Данный факт подтверждает положение современной психолингвистики о том, что билингвизм влияет не только на языковую компетенцию, но и на организацию когнитивных процессов, лежащих в основе речевой деятельности [Караулов, 2010; 58].

Следует отметить, что проведенное исследование имеет ряд ограничений. Основное внимание было сосредоточено на сравнительном анализе узбекского и русского языков в условиях современного билингвизма, тогда как возрастные, региональные и профессиональные особенности речевого поведения требуют отдельного изучения. Кроме того, анализ преимущественно основывался на качественной интерпретации языкового материала. Перспективным направлением дальнейших исследований представляется проведение психолингвистических экспериментов с использованием методов анкетирования, ассоциативного эксперимента, корпусной лингвистики и компьютерного анализа речевых данных. Это позволит получить статистически подтвержденные результаты и расширить представления о механизмах формирования гендерной коммуникации в современных условиях.

Таким образом, обсуждение результатов позволяет сделать вывод, что гендерная специфика узбекского и русского языков представляет собой динамичную систему, формирующуюся под влиянием языковой структуры, национальной культуры, билингвизма и цифровизации общества. Полученные результаты расширяют существующие представления о психолингвистических механизмах гендерной коммуникации и могут служить теоретической основой для дальнейших исследований в области гендерной лингвистики, психолингвистики, межкультурной коммуникации и методики преподавания языков. Данные выводы обладают не только теоретической, но и практической значимостью, поскольку могут быть использованы при разработке учебных программ, совершенствовании технологий обучения русскому и узбекскому языкам, а также при подготовке специалистов, работающих в условиях многоязычной и поликультурной среды.

Заключение

Проведенное исследование позволило комплексно проанализировать особенности языковой репрезентации гендера в узбекском и русском языках с позиций современной психолингвистики и гендерной лингвистики. Полученные результаты свидетельствуют о том, что процессы формирования гендерно обусловленного речевого поведения определяются не только структурой языка, но и национально-культурными традициями, особенностями языкового сознания, социальными нормами и условиями функционирования билингвальной личности.

В ходе исследования установлено, что русский язык, обладая развитой системой грамматического рода, обеспечивает эксплицитное выражение гендерной принадлежности на морфологическом уровне. В отличие от него узбекский язык не содержит категории грамматического рода, однако успешно компенсирует ее отсутствие за счет использования лексических, прагматических и контекстуальных средств. Это подтверждает положение о том, что способы языковой репрезентации гендера определяются не только грамматической организацией языка, но и национальными особенностями коммуникативной культуры.

Сравнительный анализ показал, что традиционные модели речевого поведения мужчин и женщин в узбекской и русской лингвокультурах обладают как универсальными, так и национально обусловленными характеристиками. Для узбекской коммуникативной культуры наиболее значимыми являются уважительное отношение к собеседнику, развитая система речевого этикета, ориентация на сохранение социальной гармонии и коллективистские ценности. Русская коммуникативная традиция характеризуется большей степенью эксплицитности, эмоциональной выразительности и вариативности языковых средств. Вместе с тем современные процессы глобализации и цифровизации способствуют постепенному сближению коммуникативных моделей представителей различных социальных групп.

Особое значение имеют результаты исследования билингвальной языковой личности. Установлено, что переключение между узбекским и русским языками сопровождается изменением коммуникативных стратегий, способов выражения вежливости, эмоциональной оценки и социальной дистанции. Данное явление подтверждает взаимосвязь языка, мышления и культурной среды, являющуюся одной из ключевых идей современной психолингвистики.

Исследование также показало, что развитие цифровых технологий оказывает существенное влияние на трансформацию гендерной коммуникации. Распространение социальных сетей, мессенджеров и цифровых образовательных платформ способствует формированию новых моделей речевого поведения, характеризующихся высокой динамичностью, мультимодальностью и универсализацией коммуникативных средств. При этом национально-культурные особенности не исчезают, а приобретают новые формы языкового выражения в цифровом дискурсе.

Перспективы дальнейших исследований связаны с проведением экспериментальных психолингвистических исследований гендерной коммуникации, созданием электронных корпусов узбекской и русской речи, изучением особенностей речевого поведения представителей различных возрастных и профессиональных групп, а также исследованием влияния искусственного интеллекта и цифровых технологий на развитие современных коммуникативных практик.

Таблица 1

Сопоставительная характеристика гендерной репрезентации в узбекском и русском языках

Критерий сравнения	Узбекский язык	Русский язык
Грамматическая категория рода	Отсутствует	Развита система мужского, женского и среднего рода
Выражение гендерной принадлежности	Лексические, контекстуальные и прагматические средства	Грамматические и лексические средства
Личные местоимения	u («он/она») не различает пол	«он», «она» разграничивают пол
Речевой этикет	Доминируют уважительные обращения (aka, opa, ota, ona)	Преобладают имя-отчество и официальные обращения
Коммуникативные стратегии	Косвенность, вежливость, сохранение гармонии общения	Более высокая степень прямоты и экспрессивности
Влияние цифровой среды	Усиление универсальных моделей общения при сохранении национальных традиций	Рост нейтральных и унифицированных моделей коммуникации

Источник: составлено автором на основе результатов исследования.

Сведения этического характера

Вклад автора: Мусаева Елена Казимовна — постановка проблемы, разработка концепции исследования, анализ научной литературы и языкового материала, интерпретация результатов, подготовка и редактирование текста статьи.

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Источник финансирования: исследование выполнено без внешнего финансирования.

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XITOY TILIDAGI TURG‘UN BIRIKMALARNING SEMANTIK TUZILISHI: YUZAKI VA HAQIQIY MA’NO QATLAMLARI TAHLILI

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Annotatsiya: *Mazkur maqolada xitoy tilidagi turg‘un birikmalar (xiguanyongyu 习惯用语)ning semantik tuzilishi ikki asosiy qatlam — yuzaki ma’no va haqiqiy ma’no — nuqtai nazaridan tahlil qilinadi. Xitoy tilshunosligidagi turli ilmiy yondashuvlar (Sun Weizhang, Wen Duanzheng, Fu Huaiqing, Liu Shuxin, Jia Yande) qiyosiy tarzda ko‘rib chiqilib, ularning umumiy nazariy negizga ega ekanligi asoslanadi. Tadqiqot natijasida turg‘un birikmalarning haqiqiy ma’nosi ikki komponentdan — asosiy ma’no va qo‘shimcha ma’no (semantik tus)dan — tashkil topishi aniqlanadi hamda semantik tusning olti turi (emotsional, munosabat, baholovchi, obrazli, uslubiy, registr) zamonaviy audiovizual korpus misollari asosida yoritiladi. Tadqiqot xitoy-o‘zbek qiyosiy frazeologiyasi va tarjimashunosligi uchun amaliy ahamiyatga ega.*

Kalit so‘zlar: *xiguanyongyu, turg‘un birikma, yuzaki ma’no, haqiqiy ma’no, semantik tus, asosiy ma’no, qo‘shimcha ma’no, chengyu, guanyongyu, kognitiv semantika.*

СЕМАНТИЧЕСКАЯ СТРУКТУРА УСТОЙЧИВЫХ СОЧЕТАНИЙ КИТАЙСКОГО ЯЗЫКА: АНАЛИЗ СЛОЁВ ПОВЕРХНОСТНОГО И ДЕЙСТВИТЕЛЬНОГО ЗНАЧЕНИЯ

Аннотация: *В статье анализируется семантическая структура устойчивых сочетаний китайского языка (xiguanyongyu) с точки зрения двух основных слоёв — поверхностного и действительного значения. Рассматриваются подходы ведущих китайских лингвистов и устанавливается, что действительное значение состоит из основного значения и дополнительного значения (семантической окраски), выделяются шесть типов семантической окраски на материале современного аудиовизуального корпуса.*

Ключевые слова: *xiguanyongyu, устойчивое сочетание, поверхностное значение, действительное значение, семантическая окраска, когнитивная семантика.*

THE SEMANTIC STRUCTURE OF CHINESE FIXED EXPRESSIONS: AN ANALYSIS OF THE SURFACE AND REAL MEANING LAYERS

Abstract: *This article analyzes the semantic structure of Chinese habitual expressions (xiguanyongyu) through two fundamental layers — surface meaning and real meaning. Comparative approaches by leading Chinese linguists (Sun Weizhang, Wen Duanzheng, Fu Huaiqing, Liu Shuxin, Jia Yande) are examined, demonstrating their shared theoretical foundation. The study establishes that the real meaning of these units consists of a rational (core) meaning and an additional semantic tint, and identifies six types of semantic tint (emotional, attitudinal, evaluative, imagistic, stylistic, and register) illustrated with examples from a modern audiovisual corpus. The findings hold practical value for Chinese–Uzbek comparative phraseology and translation studies.*

Keywords: *xiguanyongyu, fixed expression, surface meaning, real meaning, semantic tint, rational meaning, additional meaning, chengyu, guanyongyu, cognitive semantics.*

Kirish

Til boyligining muhim qismini tashkil etuvchi turg‘un birikmalar nafaqat lisoniy, balki madaniy-kognitiv hodisa sifatida ham tilshunoslar e’tiborini tortadi. Xitoy tilida bunday birliklarning alohida, keng tarqalgan turkumini xiguanyongyu (习惯用语) tashkil etadi — bu birliklar chengyu, guanyongyu kabi an’anaviy frazeologik toifalarga qaraganda kamroq o‘rganilgan bo‘lib, ularning semantik tuzilishini tizimli tahlil qilish dolzarb ilmiy vazifa hisoblanadi.

Xitoy tilshunosligida turg‘un birikmalarning semantik tuzilishi an’anaviy ravishda ikki qatlamli model asosida tavsiflanadi, biroq turli olimlar bu qatlamlarni turlicha atash va tasniflashga harakat qilishgan. Ushbu maqolaning maqsadi — mazkur yondashuvlarni qiyosiy tahlil qilish, ularning umumiy nazariy negizini aniqlash hamda turg‘un birikmalarning

haqiqiy ma’nosi ichidagi qo‘shimcha semantik komponentlar (semantik tus)ning tipologiyasini zamonaviy korpus materiali asosida yoritishdir.

Tadqiqot metodologiyasi

Tadqiqotda tavsiflash, qiyosiy-tipologik va komponent tahlili metodlaridan foydalanildi. Amaliy misollar sifatida 2023-yilda suratga olingan **去有**风的地方 (“Meet Yourself”) nomli zamonaviy xitoy teleserialining dialoglaridan iqtibos keltirildi — bu esa xiguanyongyularning haqiqiy og‘zaki nutqdagi qo‘llanilishini ko‘rsatish imkonini beradi.

1. Yuzaki ma’no va haqiqiy ma’no qatlamlari

Xitoy tilidagi turg‘un birliklarning semantik tuzilishini o‘rganishda ma’noning ikki qatlamli tizimi alohida ilmiy ahamiyat kasb etadi. Xitoy tilshunosligining yetakchi vakillaridan biri 孙维张 Sun Weizhang o‘zining 《汉语熟语学》 (Hanyu shuyuxue) asarida turg‘un birikmalarning semantik tabiatini izohlash uchun “语表意义” (yubiao yiyi — tashqi, komponentlar yig‘indisiga asoslangan ma’no) va “语位意义” (yuwei yiyi — til tizimida shakllangan, idiomatik haqiqiy ma’no) tushunchalarini ilgari suradi [1].

Ushbu ikki qatlamli modelni quyidagi chengyu misolida kuzatish mumkin: **猫鼠同眠** (mao shu tong mian) — so‘zma-so‘z “mushuk va sichqon birga uxlaydi”. Yuzaki ma’no darajasida bu ibora hayvonlarning birga uxlashini bildirsa, haqiqiy ma’no darajasida u huquqni muhofaza qiluvchi shaxslarning jinoyatchilar bilan til biriktirishini ifodalovchi majoziy mazmun kasb etadi.

E’tiborlisi shundaki, ushbu ikki qatlamli tuzilma faqat nazariy konstruksiya bo‘lib qolmay, psixolingvistik eksperimental tadqiqotlar orqali ham tasdiqlangan. 张积家 Zhang Jijia va **石**艳彩 Shi Yancai o‘tkazgan tadqiqotda guanyongyularning ongda saqlanishi uch model — yaxlit, komponentli va aralash — asosida tekshirilib, natijalar bu birliklarning aralash (gibrid) reprezentatsiyaga ega ekanligini ko‘rsatgan [2].

2. Haqiqiy ma’noning ichki tuzilishi: asosiy ma’no va semantik tus

Turg‘un birliklarning haqiqiy ma’nosini yanada chuqurroq tahlil qilishda uning ichki tarkibini aniqlash muhim ahamiyat kasb etadi. **温端政** Wen Duanzheng 《汉语语汇学教程》 asarida haqiqiy ma’noni asosiy ma’no (**理性**义, lixingyi) va semantik tus (**附加**义, fujiayi)ga ajratadi: birinchisi birlikning markaziy, obyektiv mazmuni bo‘lsa, ikkinchisi nutqiy vaziyat va subyektiv hissiyotlar orqali yuklanadigan qo‘shimcha qatlamdir [3].

Mazkur ikki komponentli yondashuv boshqa yetakchi xitoy tilshunoslari tomonidan ham qo‘llab-quvvatlanadi. **符淮青** Fu Huaiqing 《现代汉语词汇》 asarida so‘z ma’nosini konseptual ma’no (**概念**义) va qo‘shimcha ma’no (**附属**义)ga ajratadi [4]; **刘叔新** Liu Shuxin 《汉语描写词汇学》 asarida ratsional ma’no va emotsional ma’no farqini ilgari suradi [5]; 贾彦德 Jia Yande esa 《汉语语义学》 asarida ma’no birliklarining bir yoki ko‘p qatlamli bo‘lishi mumkinligini asoslaydi [6].

Ushbu to‘rt yondashuvni qiyosiy tahlil qilganda, terminologik farqlarga qaramay, ularning barchasi mazmunan bir xil ikki komponentli modelga — obyektiv-markaziy ma’no va unga qo‘shiladigan subyektiv-qo‘shimcha qatlam — borib taqalishi kuzatiladi (1-jadvalga qarang).

1-jadval. Turg‘un birliklarning haqiqiy ma’nosi tuzilishiga oid ilmiy yondashuvlar qiyosi

Muallif	Asosiy (obyektiv) ma’no	Qo‘shimcha (subyektiv) ma’no	Manba
Wen Duanzheng	**理性**义 (lixingyi)	**附加**义 (fujiayi)	[3]
Fu Huaiqing	**概念**义 (gainianyi)	**附属**义 (fushuyi)	[4]
Liu Shuxin	ratsional ma’no	emotsional ma’no	[5]
Jia Yande	asosiy (yagona qatlam)	qo‘shimcha komponent	[6]

Jadvaldan ko‘rinib turibdiki, tilshunoslar tomonidan qo‘llanilgan atamalar shakl jihatidan har xil bo‘lsa-da, ularning barchasi bir xil kognitiv-semantik ikkilik — obyektiv borliqni aks ettiruvchi markaziy ma’no va unga subyektiv omillar orqali yuklanadigan ikkilamchi qatlam — asosida quriladi. Bu esa xitoy tilshunosligida mazkur nazariy model naqadar barqaror va keng tan olinganligidan dalolat beradi.

3. Semantik tusning tipologiyasi

刘叔新 Liu Shuxinning tasnifiga asoslanib, **常玉**钟 Chang Yuzhong registr tusini ham qo‘shgan holda turg‘un birikmalarning qo‘shimcha ma’nolarini olti turga ajratadi [7]. Quyida ushbu tiplarning har biri qisqacha izohlanib, zamonaviy audiovizual korpusdan olingan amaliy misol bilan dalillanadi.

Emotsional tus — birlik ifodalagan vaziyatga nisbatan insonning ichki hissiy reaksiyasini bildiradi. Masalan: **心浮气躁** (xin fu qi zao) — “beqaror, tez tashvishlanadigan kayfiyat” [8].

Munosabat tusi — muayyan shaxs yoki hodisaga nisbatan subyektiv munosabatni ifodalaydi. Masalan: **她偏心** (ta pianxin) — “bir tomonga moyillik, adolatsiz munosabat” [9].

Baholovchi tus — ijobiy yoki salbiy subyektiv bahoni bildiradi. Masalan: **你**简直一无是处 (ni jianzhi yiwushichu) — salbiy baho; 帅气逼人，风度翻翻 — ijobiy baho [10].

Obrazli tus — vaziyatni metaforik tarzda tasvirlaydi. Masalan: 这就好比蚊子飞进蜜蛛网里 (zhe jiu haobi wenzi feijin zhizhuwang li) — “chivin oʻrgimchak toʻriga tushib qolgandek” [11].

Uslubiy tus — birlikning ogʻzaki yoki yozma nutqqa xosligini belgilaydi.

Registr tusi — nutqning rasmiylik darajasi va kommunikativ muhitini ifodalaydi.

Yuqoridagi tasnif shuni koʻrsatadiki, xiguanyongyularning asosiy ma’nosi nisbatan barqaror boʻlsa-da, ularga qoʻshiladigan semantik tus xilma-xil boʻlib, aynan shu xilma-xillik ushbu birliklarning yuqori ekspressivligi va ogʻzaki nutqdagi mahsuldorligini ta’minlaydi.

Xulosa

Oʻtkazilgan tahlil shuni koʻrsatdiki, xitoy tilidagi turgʻun birikmalarning semantik tuzilishi ikki bosqichli iyerarxiyaga ega: birinchi bosqichda yuzaki ma’no va haqiqiy ma’no farqlanadi, ikkinchi bosqichda esa haqiqiy ma’noning oʻzi asosiy ma’no va semantik tusga boʻlinadi. Turli xitoy tilshunoslari tomonidan taklif etilgan terminologik farqlarga qaramay (yubiao/yuwei, lixingyi/fujiayi, ratsional/emotsional), ularning barchasi mohiyatan bir xil kognitiv-semantik modelni tasvirlaydi. Semantik tusning olti turga (emotsional, munosabat, baholovchi, obrazli, uslubiy, registr) boʻlinishi esa xiguanyongyularning nutqiy funksiyalarini tizimli tavsiflash imkonini beradi. Ushbu natijalar xitoy-oʻzbek qiyosiy frazeologiyasi, xususan tarjima amaliyotida turgʻun birikmalarning pragmatik nozikliklarini toʻgʻri yetkazishda amaliy ahamiyat kasb etadi.

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FRAZEOLOGIK BIRLIKLARNING O‘ZBEK VA INGLIZ TILLARIDAGI LAKUNARLIK HOLATI

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Annotatsiya: *Mazkur maqolada o‘zbek va ingliz tillaridagi frazeologik birliklarning lakunarlik holati qiyosiy-semantik yondashuv asosida tadqiq etiladi. Frazeologik birliklarning to‘liq ekvivalent, qisman ekvivalent, funksional analog va lakunar ko‘rinishlari o‘zaro farqlanib, ularning semantik, obrazli, pragmatik hamda lingvomadaniy xususiyatlari tahlil qilinadi. Tadqiqotda ingliz va o‘zbek tillaridagi aniq frazeologik birliklar misolida bir xil yoki yaqin ma’noning turli obrazlar vositasida ifodalanishi, ayrim hollarda esa bir tildagi barqaror birikmaning ikkinchi tilda to‘liq frazeologik muqobilga ega emasligi yoritiladi. Lakunarlikning yuzaga kelishida milliy turmush tarzi, tarixiy-madaniy tajriba, urf-odatlar, ijtimoiy munosabatlar va konseptual metaforalarning o‘rni ko‘rsatib beriladi. Shuningdek, lakunar frazeologik birliklarni tarjima qilishda funksional analog, tavsifiy tarjima, kontekstual almashtirish va kompensatsiya kabi usullarning ahamiyati asoslanadi. Tadqiqot natijalari frazeologik lakunarlikni oddiy ekvivalentsizlik emas, balki tillarning milliy-madaniy va obrazli tafakkuridagi farqlarni namoyon etuvchi murakkab lingvistik hodisa sifatida baholash zarurligini ko‘rsatadi.*

Kalit so‘zlar: *frazeologik birlik, lakunarlik, frazeologik lakuna, ekvivalentlik, qisman ekvivalentlik, funksional analog, qiyosiy-semantik tahlil, lingvomadaniyat, tarjima, obrazlilik.*

ЛАКУНАРНОСТЬ ФРАЗЕОЛОГИЧЕСКИХ ЕДИНИЦ В УЗБЕКСКОМ И АНГЛИЙСКОМ ЯЗЫКАХ

Аннотация: *В статье исследуется явление лакунарности фразеологических единиц в узбекском и английском языках на основе сравнительно-семантического подхода. Разграничиваются полные эквиваленты, частичные эквиваленты, функциональные аналоги и лакунарные фразеологические единицы, анализируются их семантические, образные, прагматические и лингвокультурные особенности. На конкретных примерах английской и узбекской фразеологии показано, что одинаковое или близкое значение может выражаться посредством различных национально обусловленных образов, а в отдельных случаях устойчивая единица одного языка не имеет полноценного фразеологического соответствия в другом языке. Особое внимание уделяется роли национального образа жизни, историко-культурного опыта, традиций, социальных отношений и концептуальных метафор в формировании фразеологической лакунарности. Рассматриваются также функциональная аналогия, описательный перевод, контекстуальная замена и компенсация как способы передачи лакунарных единиц. Полученные результаты позволяют рассматривать фразеологическую лакунарность не как простое отсутствие эквивалента, а как сложное лингвистическое явление, отражающее различия в национально-культурной и образной концептуализации действительности.*

Ключевые слова: *фразеологическая единица, лакунарность, фразеологическая лакуна, эквивалентность, частичная эквивалентность, функциональный аналог, сравнительно-семантический анализ, лингвокультура, перевод, образность.*

LACUNARITY OF PHRASEOLOGICAL UNITS IN UZBEK AND ENGLISH

Abstract: *This article investigates the lacunarity of phraseological units in Uzbek and English through a comparative-semantic approach. Full equivalents, partial equivalents, functional analogues, and lacunar phraseological units are distinguished, while their semantic, figurative, pragmatic, and linguocultural characteristics are examined. Using specific examples from English and Uzbek phraseology, the study demonstrates that identical or closely related meanings may be expressed through different culturally conditioned images, whereas in some cases a fixed expression in one language has no complete phraseological equivalent in the other. Particular attention is paid to the role of national lifestyles, historical and cultural experience, traditions, social relations, and conceptual metaphors in the emergence of phraseological lacunarity. The study also considers functional analogy, descriptive translation, contextual substitution, and compensation as major strategies for rendering lacunar phraseological units. The findings indicate that phraseological lacunarity should be interpreted not merely as the absence of an equivalent, but as a complex linguistic phenomenon reflecting differences in national-cultural and figurative conceptualization.*

Keywords: *phraseological unit, lacunarity, phraseological lacuna, equivalence, partial equivalence, functional analogue, comparative-semantic analysis, linguoculture, translation, figurativeness.*

KIRISH

Til xalqning tarixiy tajribasi, dunyoqarashi, milliy tafakkuri va madaniy qadriyatlarini oʻzida mujassam etuvchi murakkab ijtimoiy hodisadir. Til tizimida frazeologik birliklar alohida oʻrin egallaydi, chunki ular oddiy nominativ birliklardan farqli ravishda muayyan xalqning hayot tarzi, urf-odatlari, stereotiplari, baholash mezonlari va obrazli tafakkurini yorqin aks ettiradi. Shu jihatdan ingliz va oʻzbek tillaridagi frazeologik birliklarni qiyosiy oʻrganish nafaqat lingvistik, balki lingvomadaniy va tarjimashunoslik nuqtayi nazaridan ham muhim ahamiyat kasb etadi.

Turli tillarga mansub frazeologik tizimlar oʻrtasidagi munosabatni tadqiq etishda ekvivalentlik bilan bir qatorda lakunarlik hodisasi ham muhim ilmiy muammo sifatida namoyon boʻladi. Lakunarlik muayyan til yoki madaniyatda mavjud boʻlgan tushuncha, obraz, vaziyat yoxud baholash modelining boshqa tilda aynan mos til birligi bilan ifodalanmasligi holatini anglatadi. Frazeologik birliklar doirasida esa ushbu hodisa yanada murakkab tus oladi, chunki frazeologizmlarning semantik mazmuni koʻpincha ularning tarkibidagi alohida soʻzlar ma’nosi bilan cheklanmaydi, balki tarixiy-madaniy tajriba, milliy assotsiatsiya, metaforik model hamda pragmatik vaziyat bilan bogʻliq holda shakllanadi.

Oʻzbek va ingliz tillari turli til oilalariga mansubligi, tarixiy taraqqiyot yoʻllari hamda madaniy muhitining oʻziga xosligi sababli ularning frazeologik fondida sezilarli farqlar mavjud. Masalan, oʻzbek frazeologiyasida qarindoshlik munosabatlari, mehmondoʻstlik, mahalla muhiti, milliy turmush tarzi, sharqona odob-axloq hamda jamoaviylikni aks ettiruvchi birliklar faol uchrasa, ingliz frazeologiyasida individual faoliyat, dengizchilik, savdo-sotiq, sport, tarixiy institutlar va Gʻarb madaniyatiga xos obrazlar bilan bogʻliq iboralar keng qoʻllanadi. Natijada bir tilda mavjud boʻlgan ayrim frazeologik birlik uchun ikkinchi tilda toʻliq semantik va obrazli ekvivalent topilmasligi mumkin. Bunday holat frazeologik lakuna sifatida namoyon boʻlib, tarjima jarayonida tavsifiy tarjima, funksional analog, kontekstual almashtirish yoki izohlash kabi strategiyalardan foydalanishni talab etadi.

Frazeologik lakunarlik faqat til birliklarining formal jihatdan mos kelmasligi bilan belgilanmaydi. U semantik, obrazli, pragmatik va lingvomadaniy tafovutlar bilan ham bogʻliqdir. Ayrim hollarda ikki tilda bir xil yoki yaqin mazmun mavjud boʻlsa-da, uni ifodalovchi metaforik asos turlicha boʻladi. Boshqa vaziyatlarda esa muayyan frazeologizm orqali ifodalangan tushuncha ikkinchi til vakillari uchun madaniy jihatdan begona boʻlishi yoki maxsus izoh talab qilishi mumkin. Demak, frazeologik lakunalarni aniqlashda faqat lugʻaviy ma’noni qiyoslash yetarli emas; birlikning konnotativ semantikasi, obrazli motivatsiyasi, pragmatik vazifasi va madaniy komponentini ham hisobga olish lozim.

Bugungi globallashuv, madaniyatlararo muloqot va tarjima faoliyati kengayib borayotgan sharoitda frazeologik lakunalarni oʻrganish yanada dolzarb ahamiyat kasb etmoqda. Chunki frazeologik birlikni soʻzma-soʻz tarjima qilish koʻpincha uning asl mazmunini buzadi, obrazlilik darajasini pasaytiradi yoki qabul qiluvchi til vakilida notoʻgʻri assotsiatsiya yuzaga keltiradi. Ayniqsa, badiiy matn, publitsistik diskurs, ommaviy axborot vositalari va kundalik muloqotdagi frazeologizmlarni tarjima qilishda milliy-madaniy xususiyatlarni e’tiborga olish tarjimaning semantik aniqligi va kommunikativ samaradorligini ta’minlovchi muhim omillardan biridir.

Shu nuqtayi nazardan, ingliz va oʻzbek tillaridagi frazeologik birliklarning lakunarlik holatini qiyosiy tahlil qilish, ularning semantik hamda lingvomadaniy xususiyatlarini aniqlash, toʻliq ekvivalentga ega boʻlmagan birliklarning yuzaga kelish sabablarini tavsiflash va ularni tarjimada qayta ifodalash usullarini belgilash muhim ilmiy vazifalardan hisoblanadi. Mazkur tadqiqotning maqsadi ingliz va oʻzbek tillaridagi frazeologik birliklar misolida lakunarlik hodisasining namoyon boʻlish xususiyatlarini aniqlash, ularni semantik, obrazli va lingvomadaniy mezonlar asosida tasniflash hamda ikki til oʻrtasidagi frazeologik nomuvofiqliklarning asosiy sabablarini ochib berishdan iborat.

Tadqiqot davomida frazeologik birliklarning toʻliq ekvivalentligi, qisman ekvivalentligi, funksional analogligi va lakunar holatlari oʻzaro farqlanib, ayniqsa, milliy-madaniy komponenti kuchli birliklarning qiyosiy tavsifiga alohida e’tibor qaratiladi. Bunday yondashuv ingliz va oʻzbek frazeologik tizimlarining umumiy hamda milliy xususiyatlarini chuqurroq yoritish bilan birga, tarjimashunoslik, qiyosiy tilshunoslik va lingvomadaniyatshunoslik yoʻnalishlarida olib borilayotgan tadqiqotlar uchun ham nazariy va amaliy ahamiyatga ega boʻlishi mumkin.

MAVZUGA OID ADABIYOTLAR TAHLILI

Frazeologik birliklarning milliy-madaniy xususiyatlari, ularning tillararo ekvivalentligi va tarjimada yuzaga keladigan semantik nomuvofiqliklar zamonaviy qiyosiy tilshunoslik hamda tarjimashunoslikning dolzarb yoʻnalishlaridan biri hisoblanadi. Frazeologizmlarning semantik jihatdan yaxlitligi, komponentlar ma’nosining koʻpincha umumiy frazeologik mazmun bilan bevosita mos kelmasligi hamda ularning muayyan madaniyatga bogʻlanganligi bir tildagi frazeologik birlikni boshqa tilda aynan qayta ifodalashni murakkablashtiradi. Shu sababli frazeologik ekvivalentlik bilan bir qatorda frazeologik lakunarlik masalasini oʻrganish qiyosiy tadqiqotlarda alohida ahamiyat kasb etmoqda.

C. Fernando idiomatik birliklarni semantik jihatdan tarkibiy qismlarining oddiy yigʻindisiga tenglashtirib boʻlmaydigan turgʻun birliklar sifatida tavsiflab, idiomatiklikning turli darajalarda namoyon boʻlishini koʻrsatadi [1]. Mazkur qarash frazeologik lakunalarni aniqlash uchun ham muhimdir, chunki ikki tilda alohida komponentlar leksik ekvivalentlarga ega boʻlsa-da, yaxlit iboraning obrazli va pragmatik ma'nosi mos kelmasligi mumkin.

M. Baker frazeologik birliklarni tarjima qilishdagi asosiy muammolar qatorida tarjima tilida mos ekvivalentning mavjud emasligi, shaklan oʻxshash birliklarning boshqa ma'no anglatishi hamda manba tilidagi idioma bilan tarjima tilidagi birlikning qoʻllanish sharoiti farqlanishini koʻrsatadi [2]. Ushbu yondashuv lakunarlikni faqat "tarjima ekvivalenti yoʻqligi" sifatida emas, balki semantik, uslubiy va pragmatik mos kelmasliklarning murakkab majmui sifatida baholash zarurligini koʻrsatadi.

Frazeologik birliklarni tarjima qilish masalasiga bagʻishlangan xalqaro tadqiqotlarda ham ekvivalentni aniqlash tarjimaning muhim bosqichi sifatida e'tirof etilgan. V. Subbotina frazeologik birlikning umumiy ma'nosi uning alohida komponentlari ma'nosidan kelib chiqmasligi sababli bunday birliklarni tarjima qilish murakkabligini koʻrsatadi [3]. Muallif kontekst, frazeologik lugʻatlar va madaniy bilimning tarjimon uchun alohida ahamiyatini ta'kidlaydi.

Soʻnggi tadqiqotlarda lakuna tushunchasi leksik birlik doirasidan kengroq — semantik va lingvomadaniy hodisa sifatida talqin qilinmoqda. J. E. Usarov va hammualliflar oʻzbek tilidagi lakunalarni oʻrganar ekan, ularni bir tilda mavjud birlik yoki tushunchaning boshqa tilda bevosita ekvivalentga ega boʻlmasligi bilan bogʻlaydi [4]. Tadqiqotda bunday nomuvofiqliklar xalqning madaniy tajribasi, ijtimoiy munosabatlari va konseptual kategoriyalash tizimi bilan izohlanadi.

Frazeologik birliklarning madaniyat bilan bogʻliqligini tasdiqlovchi tadqiqotlar boshqa til juftliklarida ham mavjud. Nemis va oʻzbek idiomalarini qiyosiy oʻrganishga bagʻishlangan tadqiqotda frazeologik birliklar lingvomadaniy hamda konseptual metafora nuqtayi nazaridan tahlil qilinib, bir xil yoki yaqin tushunchalarning turli obrazlar orqali konseptuallashishi koʻrsatiladi [5]. Bu holat frazeologik lakunarlikning shakllanishida konseptual metaforalarning milliy xususiyati muhim omil ekanini tasdiqlaydi.

Oʻzbek tilshunosligida frazeologik birliklarni tizimli oʻrganishda Sh. Rahmatullayevning tadqiqotlari alohida oʻrin tutadi. Olim oʻzbek frazeologiyasidagi koʻp ma'nolilik, sinonimiya, antonimiya, omonimiya va variantlilik hodisalarini keng faktik material asosida tahlil qilgan [6]. Uning frazeologik birliklarning variantlashuvi va semantik yaxlitligiga oid qarashlari oʻzbek frazemalarini ingliz tilidagi muqobillari bilan qiyoslashda muhim nazariy asosdir.

A. E. Mamatov ham oʻzbek frazeologiyasining struktur-semantik xususiyatlari, frazeologik ma'no hamda iboralarning milliy tabiati masalalarini keng yoritgan [7]. Oʻzbek frazeologik fondining milliy-madaniy mazmuni ayniqsa urf-odat, kundalik turmush, insonlararo munosabat, qarindoshlik va axloqiy baholash bilan bogʻliq frazemalarda yaqqol namoyon boʻladi.

Ingliz va oʻzbek frazeologik birliklarini bevosita qiyoslashga bagʻishlangan tadqiqotlarda ham struktur hamda semantik nomuvofiqliklar qayd etilgan. M. Usarova ingliz va oʻzbek tillaridagi substantiv frazeologik birliklarni qiyoslab, ularning tarkibiy modellari, ekspressiv boʻyoqdorligi hamda grammatik tashkil topishida oʻxshash va farqli jihatlar mavjudligini koʻrsatadi [8].

S. Xudoyorova ingliz va oʻzbek frazeologik birliklarining tarjima strategiyalarini tahlil qilib, toʻliq ekvivalent, qisman ekvivalent, funksional almashtirish, parafraza va kompensatsiya kabi usullarni farqlaydi [9]. Bu tasnif lakunar birliklarni aniqlashda ham qoʻllanishi mumkin: agar manba tilidagi frazeologizm uchun tarjima tilida na obraz, na struktur, na toʻliq semantik jihatdan mos ibora mavjud boʻlsa, tarjimon funksional analog yoki tavsifiy ifodaga murojaat qiladi.

Mavjud tadqiqotlarni umumlashtirish shuni koʻrsatadiki, ingliz va oʻzbek frazeologiyasi struktur-semantik, lingvomadaniy hamda tarjimashunoslik jihatlaridan oʻrganilgan boʻlsa-da, aynan frazeologik lakunalarni maxsus qiyosiy birlik sifatida aniqlash, ularni lakunarlik darajasiga koʻra tasniflash va yuzaga kelish omillarini tizimli ravishda tavsiflash masalasi hali ham chuqur tadqiq etishni talab qiladi. Shu sababli mazkur tadqiqotda ingliz va oʻzbek frazeologik birliklari toʻliq ekvivalent, qisman ekvivalent, funksional analog va lakunar birliklar sifatida ajratilib, lakunar birliklar semantik, obrazli, lingvomadaniy va pragmatik koʻrsatkichlar asosida tahlil qilinadi.

TADQIQOT METODOLOGIYASI

Mazkur tadqiqotda qiyosiy-semantik tahlil metodi asosiy metod sifatida qoʻllanildi. Ushbu metod ingliz va oʻzbek tillaridagi frazeologik birliklarni ularning semantik mazmuni, obrazli asosi, milliy-madaniy komponenti va tarjimadagi muqobilligi nuqtayi nazaridan oʻzaro qiyoslash imkonini beradi. Tadqiqot materiallari ingliz va oʻzbek tillarining izohli hamda frazeologik lugʻatlari, badiiy matnlar va zamonaviy nutqiy manbalardan tanlab olindi.

Tahlil jarayonida frazeologik birliklar, avvalo, ifodalagan umumiy ma'nosi boʻyicha qiyoslandi. Shundan soʻng ularning ikkinchi tilda mavjud muqobili semantik va obrazli jihatdan tekshirildi. Qiyoslash natijasida birliklar toʻliq ekvivalent, qisman ekvivalent, funksional analog va lakunar frazeologik birlik guruhlariga ajratildi. Bunda toʻliq ekvivalent birliklarda umumiy ma'no, pragmatik vazifa va obrazli asosning yuqori darajada mosligi; qisman ekvivalentlarda esa ma'no yaqin boʻlsa-da, obraz yoki strukturadagi farqlar asosiy mezon sifatida olindi. Funksional analoglarda bir xil kommunikativ maqsad turli lingvistik vositalar orqali ifodalangan holatlar hisobga olindi.

Frazeologik birlik uchun ikkinchi tilda uning semantik, obrazli va pragmatik xususiyatlarini bir vaqtning o‘zida aks ettiruvchi barqaror muqobil mavjud bo‘lmagan holatlar frazeologik lakunarlik sifatida belgilandi. Lakunar birliklarni tahlil qilishda ularning paydo bo‘lishiga sabab bo‘luvchi milliy urf-odat, tarixiy tajriba, turmush tarzi, ijtimoiy munosabat va madaniy assotsiatsiyalar ham e’tiborga olindi.

Qiyosiy-semantik tahlil davomida har bir frazeologik birlik uchun denotativ ma’no, konnotativ ma’no, obrazli komponent, pragmatik vazifa va milliy-madaniy belgi kabi mezonlar asosida tavsif berildi. Shu tariqa ingliz va o‘zbek tillaridagi frazeologik lakunarlik faqat lug‘aviy muqobilning yo‘qligi sifatida emas, balki ikki til vakillarining olamni obrazli konseptuallashtirishidagi farqlarni aks ettiruvchi lingvomadaniy hodisa sifatida tahlil qilindi.

Mazkur metod tadqiqotda frazeologik birliklar o‘rtasidagi umumiylik va farqlarni tizimli ravishda aniqlash, lakunar holatlarning yuzaga kelish sabablarini izohlash hamda ularning tarjimada qanday kompensatsiya qilinishini belgilash imkonini berdi.

TAHLIL VA NATIJALAR

Ingliz va o‘zbek tillaridagi frazeologik birliklarni qiyosiy-semantik jihatdan tahlil qilish shuni ko‘rsatadiki, ikki tilda bir xil kommunikativ vazifani bajaruvchi iboralar mavjud bo‘lsa-da, ularning semantik tuzilishi, obrazli asosi va milliy-madaniy motivatsiyasi ko‘p hollarda o‘zaro farqlanadi. Shu sababli frazeologik birliklarni faqat lug‘aviy tarjima asosida qiyoslash yetarli emas. Ularning denotativ mazmuni, konnotativ bo‘yoqdorligi, pragmatik funksiyasi va obraz yaratish mexanizmi ham hisobga olinishi lozim.

Tadqiqot doirasida tanlangan frazeologik birliklar to‘rt asosiy guruh bo‘yicha ko‘rib chiqildi: to‘liq ekvivalent birliklar, qisman ekvivalent birliklar, funksional analoglar va lakunar frazeologik birliklar.

1-jadval. Ingliz va o‘zbek tillaridagi frazeologik birliklarning qiyosiy-semantik tavsifi

№	Inglizcha frazeologik birlik	O‘zbekcha muqobil	Ma’nosi	Moslik turi	Izoh
1	to add fuel to the fire	olovga moy sepmoq	Ziddiyat yoki muammoni yanada kuchaytirmoq	To‘liq ekvivalent	Semantika va obraz deyarli bir xil
2	to play with fire	olov bilan o‘ynashmoq	Xavfli ishga qo‘l urmoq	To‘liq ekvivalent	Obraz ham, pragmatik ma’no ham mos
3	to shed crocodile tears	timsoh ko‘z yoshlarini to‘kmoq	Soxta achinish ko‘rsatmoq	To‘liq ekvivalent	Bir xil obrazli asos saqlangan
4	to make a mountain out of a molehill	pashshadan fil yasamoq	Kichik muammoni haddan tashqari kattalashtirmoq	Qisman ekvivalent	Ma’no bir xil, obrazlar turlicha
5	when pigs fly	tuyaning dumi yerga tekkanda	Hech qachon sodir bo‘lmaydigan holat	Funksional analog	Milliy obrazlar mutlaqo farqli
6	to kill two birds with one stone	bir o‘q bilan ikki quyonni urmoq	Bir harakat bilan ikki natijaga erishmoq	Qisman ekvivalent	Struktur va ma’no yaqin, hayvon obrazi farqli
7	the apple of one’s eye	ko‘zining oq-u qorasi	Juda aziz, qadrli inson	Funksional analog	Pragmatik vazifa mos, obraz boshqa
8	to have a skeleton in the closet	yashirin siri bo‘lmoq	Boshqalardan yashiriladigan noxush sirga ega bo‘lmoq	Lakunar / tavsifiy muqobil	O‘zbek tilida ayni obrazli model faol emas
9	to spill the beans	sirni oshkor qilmoq	Sirni fosh etmoq	Lakunar / tavsifiy muqobil	Ingliz tilidagi beans obrazi saqlanmaydi
10	to have a chip on one’s shoulder	alamzada bo‘lmoq / ichida gina saqlamoq	Oldingi ranjish sabab xafa yoki tajovuzkor kayfiyatda yurmoq	Lakunar	Ma’no tavsifiy tarzda beriladi
11	el og‘ziga elak tutib bo‘lmaydi	you cannot stop people from talking	Odamlarning gap-so‘zini butunlay to‘xtatib bo‘lmasligi	Lakunar	O‘zbekcha milliy obraz ingliz tilida tavsifiy beriladi
12	bir yostiqqa bosh qo‘ymoq	to live as husband and wife / to marry	Nikohda birga hayot kechirmoq	Lakunar	O‘zbek madaniyatiga xos obrazli birlik

№	Inglizcha frazeologik birlik	O‘zbekcha muqobil	Ma’nosi	Moslik turi	Izoh
13	ko‘rpasiga qarab oyoq uzatmoq	to live within one’s means	Imkoniyatiga qarab yashamoq	Funksional analog	Semantika bir xil, obraz turlicha
14	do‘ppisini osmonga otmoq	to be overjoyed / to jump for joy	Juda xursand bo‘lmoq	Lakunar / funksional analog	Do‘ppi milliy-madaniy komponent hisoblanadi
15	og‘ziga talqon solmoq	to keep silent / to hold one’s tongue	Gapirmay jim turmoq	Funksional analog	Obraz va komponentlar farqli

Jadvaldagi dastlabki misollar ikki til frazeologik tizimida ayrim umumiy obrazli modellar mavjudligini ko‘rsatadi. Masalan, ingliz tilidagi to add fuel to the fire va o‘zbek tilidagi olovga moy sepmoq birliklari mazmun, metaforik model hamda pragmatik vazifa jihatidan juda yaqin. Har ikkala birlikda ham mavjud ziddiyatni yanada kuchaytirish “olov” va uni kuchaytiruvchi modda orqali ifodalangan. Bunday holatda frazeologik birliklar o‘rtasida yuqori darajadagi ekvivalentlik kuzatiladi.

Xuddi shuningdek, to play with fire – olov bilan o‘ynashmoq juftligida ham xavf bilan bog‘liq universal obraz namoyon bo‘ladi. Olov ko‘plab madaniyatlarda xavf, tahdid va ehtiyotsizlik ramzi sifatida qo‘llanadi. Shu sababli ushbu frazeologik birliklarda nafaqat semantik, balki obrazli moslik ham shakllangan.

Biroq frazeologik birliklarning katta qismida ma’no o‘xshash bo‘lsa-da, uni ifodalash uchun tanlangan obrazlar bir-biridan farq qiladi. Ingliz tilidagi to make a mountain out of a molehill iborasi kichik muammoni keragidan ortiq darajada kattalashtirish ma’nosini bildiradi. O‘zbek tilida ayni mazmun pashshadan fil yasamoq birligi orqali ifodalanadi. Inglizcha birlikda “kichik tepalik – tog‘”, o‘zbekcha birlikda esa “pashsha – fil” qarama-qarshiligi qo‘llangan. Demak, semantik natija bir xil bo‘lsa-da, obrazli mexanizm turlicha.

Yana bir xarakterli holat to kill two birds with one stone va bir o‘q bilan ikki quyonni urmoq birliklarida ko‘zga tashlanadi. Har ikki frazeologizm bitta harakat orqali ikkita maqsadga erishishni anglatadi. Biroq ingliz tilida “two birds”, o‘zbek tilida esa “ikki quyon” obrazi ishlatiladi. Bunday frazeologizmlarni qisman ekvivalent deb baholash mumkin, chunki ularning umumiy semantik yadrosi va sintaktik modeli yaqin, ammo konkret obraz komponentlari aynan mos kelmaydi.

Til va madaniyat o‘rtasidagi munosabat yanada yaqqol when pigs fly – tuyaning dumi yerga tekkanda misolida namoyon bo‘ladi. Har ikkala birlik amalga oshishi mumkin bo‘lmagan yoki nihoyatda ehtimoldan uzoq voqeani bildiradi. Inglizcha frazeologizmda uchayotgan cho‘chqa tasviri absurd vaziyatni yaratadi, o‘zbek tilida esa tuyaning anatomik xususiyatiga asoslangan obrazdan foydalaniladi. Ushbu holatda semantik va pragmatik funksiya bir xil bo‘lsa-da, obrazli asos milliy xususiyat kasb etadi. Shuning uchun mazkur birliklarni funksional analoglar sifatida baholash maqsadga muvofiq.

Frazeologik lakunarlik ayniqsa ingliz tilidagi to have a skeleton in the closet, to spill the beans va to have a chip on one’s shoulder kabi birliklarda yaqqol namoyon bo‘ladi. Masalan, to spill the beans “sirni oshkor qilish” ma’nosini anglatadi, biroq o‘zbek tilida aynan loviya yoki donning to‘kilishi orqali sirning fosh etilishini ifodalovchi shu darajada barqaror frazeologik model mavjud emas. Shu sababli mazkur birlik tarjimada ko‘pincha sirni ochib qo‘ymoq, sirni oshkor qilmoq kabi vositalar bilan ifodalanadi. Bunda asosiy ma’no saqlanadi, ammo manba tilidagi metaforik obraz yo‘qoladi.

To have a skeleton in the closet birligi ham shunga o‘xshash xususiyatga ega. U shaxs yoki oilaning boshqalardan yashiradigan noqulay sirini anglatadi. O‘zbek tilida ushbu ma’noni “yashirin siri bor”, “sir saqlamoq” singari ifodalar bilan yetkazish mumkin, biroq “shkafdagi skelet” obrazi o‘zbek frazeologik tizimi uchun odatiy emas. Demak, bu yerda frazeologik lakunarlik nafaqat leksik muqobilning yo‘qligida, balki madaniy metaforaning ikkinchi tilda kodlanmaganligida ham namoyon bo‘ladi.

Lakunarlik o‘zbek tilidan ingliz tiliga tarjimada ham kuzatiladi. Masalan, bir yostiqqa bosh qo‘ymoq iborasi o‘zbek tilida er-xotin bo‘lib hayot kechirish, taqdirni birlashtirish ma’nolarini anglatadi. Ushbu frazeologizmda “yostiq” oilaviy hayot va yaqinlikni anglatuvchi madaniy obraz vazifasini bajaradi. Ingliz tilida mazkur ma’noni to marry, to live as husband and wife kabi birliklar bilan ifodalash mumkin, lekin “bir yostiqqa bosh qo‘yish” obraziga to‘liq mos keluvchi barqaror idioma mavjud emas. Shuning uchun bu birlik lingvomadaniy lakuna sifatida qaraladi.

O‘zbek frazeologiyasidagi do‘ppisini osmonga otmoq birligi ham milliy-madaniy komponentning kuchliligi bilan ajralib turadi. “Do‘ppi” o‘zbek madaniyatida muayyan etnomadaniy belgi hisoblanadi. Frazeologizm juda katta quvonch va hayajonni ifodalaydi. Ingliz tilida unga funksional jihatdan to jump for joy yoki to be over the moon kabi birliklarni yaqinlashtirish mumkin, ammo ularda do‘ppi obrazi va u bilan bog‘liq madaniy assotsiatsiya mavjud emas. Natijada tarjimada umumiy emotsional mazmun saqlansa-da, milliy koloritning bir qismi yo‘qoladi.

Xuddi shunday, koʻrpasiga qarab oyoq uzatmoq frazeologizmi shaxsning moddiy yoki real imkoniyatini hisobga olib ish tutishini anglatadi. Ingliz tilidagi to live within one’s means ushbu birlikka semantik jihatdan yaqin, ammo unda “koʻrpa” va “oyoq uzatish” metaforik modeli mavjud emas. Bu holatda tarjima kommunikativ ma’noni saqlaydi, biroq oʻzbek tiliga xos maishiy obraz boshqa til vositasi bilan almashtiriladi.

Oʻtkazilgan qiyosiy tahlil asosida frazeologik lakunarlikning bir nechta asosiy koʻrinishlarini ajratish mumkin. Birinchidan, semantik lakunarlik kuzatiladi. Bunda bir tilda frazeologik shaklda ifodalangan ma’no ikkinchi tilda, asosan, erkin soʻz birikmasi yoki tavsifiy konstruksiya orqali beriladi. To have a chip on one’s shoulder – ichida gina saqlamoq / alamzada boʻlmoq bunga misol boʻla oladi.

Ikkinchidan, obrazli lakunarlik mavjud boʻlib, bunda ikki tilda ma’no muvofiq boʻlsa-da, frazeologizm asosidagi metaforik obraz bir-biridan keskin farq qiladi. When pigs fly – tuyaning dumi yerga tekkanda ana shunday birliklardandir.

Uchinchidan, lingvomadaniy lakunarlik milliy predmet, urf-odat, tarixiy tajriba yoki turmush tarziga asoslangan iboralarda koʻzga tashlanadi. Doʻppisini osmonga otmoq, bir yostiqqa bosh qoʻymoq kabi frazeologizmlar aynan shu xususiyatga ega.

Toʻrtinchidan, pragmatik lakunarlik holatida birliklarning lugʻaviy mazmuni yaqin boʻlishi mumkin, biroq ular nutqda qoʻllanish chastotasi, emotsional boʻyoqdorligi, uslubiy qiymati yoki kommunikativ vaziyatiga koʻra bir-biriga toʻliq mos kelmaydi. Bunday vaziyatda tarjimon birlikning shakliy ekvivalentidan koʻra uning konkret kontekstdagi kommunikativ funksiyasiga ustuvor ahamiyat berishi kerak.

Tahlil natijalari shuni koʻrsatadiki, frazeologik lakunarlikni oddiy “ekvivalenti yoʻq birlik” sifatida tavsiflash yetarli emas. Ingliz va oʻzbek tillari oʻrtasidagi frazeologik nomuvofiqlik kamida uch darajada — ma’no, obraz va madaniy kod darajasida namoyon boʻladi. Ba’zi hollarda mazmun toʻliq saqlangan holda obraz oʻzgaradi, boshqa holatda esa mazkur ma’noni ifodalovchi frazeologik birlikning oʻzi tarjima tilida mavjud boʻlmaydi.

Shuningdek, tahlil frazeologik birliklarning oʻzaro munosabatini qat’iy “ekvivalent yoki ekvivalentsiz” dichotomiyasi asosida emas, balki ekvivalentlik–lakunarlik kontinuumi sifatida baholash maqsadga muvofiqligini koʻrsatadi. Bu kontinuumning bir tomonida semantik, obrazli va pragmatik jihatdan toʻliq mos keladigan birliklar, ikkinchi tomonida esa faqat tavsifiy yoʻl bilan tarjima qilinadigan mutlaq yoki yuqori darajadagi lakunar birliklar joylashadi. Ular orasida qisman ekvivalent va funksional analoglar mavjud boʻladi.

Shunday qilib, ingliz va oʻzbek frazeologik tizimlaridagi lakunarlik xalqning tarixiy tajribasi, turmush tarzi, milliy predmetlar tizimi, obrazli tafakkuri hamda kommunikativ an’analari bilan bevosita bogʻlangan. Mazkur jihat frazeologik lakunalarni oʻrganishni nafaqat qiyosiy tilshunoslik, balki lingvomadaniyatshunoslik va tarjimashunoslik uchun ham muhim tadqiqot yoʻnalishiga aylantiradi.

XULOSA

Ingliz va oʻzbek tillaridagi frazeologik birliklarning qiyosiy-semantik tahlili ularning mazmuniy, obrazli va lingvomadaniy xususiyatlari oʻrtasida ham umumiylik, ham sezilarli tafovutlar mavjudligini koʻrsatdi. Frazeologik birliklar xalqning tarixiy tajribasi, turmush tarzi, qadriyatlari va obrazli tafakkurini aks ettirgani sababli, bir tilda shakllangan iboraning boshqa tilda aynan shu semantik va obrazli model asosida ifodalanishi har doim ham mumkin emas. Ana shunday nomuvofiqliklar frazeologik lakunarlik hodisasining yuzaga kelishiga asos boʻladi.

Tadqiqot natijasida ingliz va oʻzbek tillaridagi frazeologik birliklarni toʻliq ekvivalent, qisman ekvivalent, funksional analog va lakunar birliklar koʻrinishida tasniflash maqsadga muvofiqligi aniqlandi. Toʻliq ekvivalentlarda ma’no va obrazning yaqinligi kuzatilsa, qisman ekvivalentlarda semantik umumiylik saqlangan holda obraz yoki tarkibiy komponentlarda farqlanish mavjud. Funksional analoglar esa bir xil kommunikativ vazifani turli milliy obrazlar orqali ifodalaydi. Lakunar frazeologik birliklarda esa ikkinchi tilda mazkur iboraning semantik, obrazli va pragmatik xususiyatlarini toʻliq aks ettiruvchi barqaror muqobil mavjud boʻlmaydi.

Tahlil shuningdek, frazeologik lakunarlikning semantik, obrazli, lingvomadaniy va pragmatik koʻrinishlarda namoyon boʻlishini koʻrsatdi. Ayniqsa, milliy predmetlar, urf-odatlar, maishiy tajriba va tarixiy-madaniy assotsiatsiyalar asosida shakllangan frazeologizmlarda lingvomadaniy lakunarlik yaqqol koʻzga tashlanadi. Bunday birliklarni tarjima qilishda soʻzma-soʻz yondashuv koʻpincha yetarli boʻlmay, funksional analog, tavsifiy tarjima, kontekstual almashtirish yoki kompensatsiya usullaridan foydalanishni talab qiladi.

Shu jihatdan frazeologik lakunarlikni faqat ekvivalentning mavjud emasligi sifatida emas, balki turli til jamoalarining olamni obrazli va madaniy jihatdan turlicha konseptuallashtirishi natijasida yuzaga keladigan murakkab lingvistik hodisa sifatida baholash lozim. Frazeologik birliklarning aynan shu xususiyati ularni qiyosiy tilshunoslik, lingvomadaniyatshunoslik va tarjimashunoslik uchun muhim tadqiqot obyekti sifatida belgilaydi.

Kelgusidagi tadqiqotlarda ingliz va oʻzbek tillaridagi frazeologik lakunalarni kengroq korpus materiallari asosida oʻrganish, ularning nutqiy chastotasi, kontekstual faolligi va tarjima strategiyalarini empirik jihatdan tekshirish maqsadga muvofiqdir. Bunday yondashuv ikki til frazeologik tizimining milliy va universal xususiyatlarini yanada chuqurroq ochib berishga xizmat qiladi.

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NUMERATIV BIRLIKLARNING STRUKTUR-SEMANTIK XUSUSIYATLARI

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Annotatsiya: *Mazkur maqolada ingliz va qoraqalpoq tillaridagi numerativ birliklarning struktur-semantik xususiyatlari qiyosiy-tipologik nuqtayi nazardan tahlil qilinadi. Tadqiqotda ikki til numerativ tizimining morfologik qurilishi (sodda, yasama, qo‘shma va murakkab sonlar), semantik guruhlari (sanoq, tartib, jamlovchi, taqsimlovchi, taxminiy sonlar) hamda sintaktik xususiyatlari qiyoslanadi. Tadqiqot natijalari ingliz tilining Maqolada qiyosiy-tipologik, komponent tahlili va distributiv tahlil metodlaridan foydalanilgan. fleksiyaviy-analitik xususiyati va qoraqalpoq tilining agglyutinativ tabiati numerativ birliklarning yasalish modellariga bevosita ta’sir ko‘rsatishini ko‘rsatadi. Maqolada qiyosiy-tipologik, komponent tahlili va distributiv tahlil metodlaridan foydalanilgan.*

Kalit so‘zlar: *numerativ birlik, son so‘z turkumi, struktur-semantik tahlil, agglyutinatsiya, sanoq son, tartib son, jamlovchi son, qiyosiy tipologiya.*

СТРУКТУРНО-СЕМАНТИЧЕСКИЕ ОСОБЕННОСТИ ЧИСЛИТЕЛЬНЫХ ЕДИНИЦ

Аннотация: *В данной статье анализируются структурно-семантические особенности числительных единиц английского и каракалпакского языков в сравнительно-типологическом аспекте. В исследовании сопоставляются морфологическая структура (простые, производные, сложные числительные), семантические группы (количественные, порядковые, собирательные, разделительные и приблизительные числительные), а также синтаксические особенности числительных обоих языков. Результаты показывают, что флективно-аналитический характер английского языка и агглютинативная природа каракалпакского языка непосредственно влияют на модели образования числительных единиц. В работе использованы методы сравнительно-типологического, компонентного и дистрибутивного анализа.*

Ключевые слова: *числительная единица, имя числительное, структурно-семантический анализ, агглютинация, количественное числительное, порядковое числительное, собирательное числительное, сравнительная типология.*

STRUCTURAL-SEMANTIC FEATURES OF NUMERATIVE UNITS

Abstract: *This article analyzes the structural-semantic features of numerative units in English and Karakalpak from a comparative-typological perspective. The study compares the morphological structure (simple, derivative, compound and complex numerals), semantic groups (cardinal, ordinal, collective, distributive and approximate numerals), and syntactic characteristics of the numeral system in both languages. The results demonstrate that the inflectional-analytical nature of English and the agglutinative nature of Karakalpak directly influence the word-formation models of numerative units. Comparative-typological, componential and distributional analysis methods were used in the research.*

Keywords: *numerative unit, numeral, structural-semantic analysis, agglutination, cardinal numeral, ordinal numeral, collective numeral, comparative typology.*

KIRISH

Tilshunoslikda son so‘z turkumi va u bilan bog‘liq numerativ birliklar doimo tadqiqotchilar diqqatini o‘ziga tortib kelgan, chunki bu leksik-grammatik guruh miqdor, tartib va sanoq tushunchalarini ifodalashda universal, ammo shu bilan birga har bir tilning o‘ziga xos tipologik xususiyatlarini yaqqol namoyon etadigan soha hisoblanadi.

Numerativ birliklar — bu son ma’nosini ifodalovchi so‘zlar, so‘z birikmalari va affiksal vositalar majmuasi bo‘lib, ular tilning grammatik tizimida alohida o‘rin tutadi.[16]

16Кононов А.Н. Грамматика современного узбекского литературного языка. – М.-Л.1960. – 446 с.

Ingliz va qoraqalpoq tillari genetik jihatdan bir-biridan uzoq boʻlgan ikki xil til oilasiga mansub: ingliz tili hind-yevropa tillari oilasining german guruhiga, qoraqalpoq tili esa turkiy tillar oilasining qipchoq guruhiga kiradi. Shu sababli ushbu ikki tilning numerativ tizimini qiyosiy oʻrganish nafaqat nazariy tilshunoslik, balki tarjimashunoslik va chogʻishtirma grammatika nuqtayi nazaridan ham dolzarb ahamiyatga ega.

Soʻnggi yillarda Oʻzbekistonda va Qoraqalpogʻiston Respublikasida qiyosiy-chogʻishtirma tilshunoslik sohasida son soʻz turkumini turli tillar misolida oʻrganishga bagʻishlangan bir qator ishlar amalga oshirilgan boʻlsa-da,[17] ingliz va qoraqalpoq tillari numerativ birliklarining struktur-semantik jihatlari alohida qiyosiy tadqiqot obʼekti sifatida yetarlicha chuqur oʻrganilmagan. Ayniqsa, ikki tilning sanoq, tartib, jamlovchi va taxminiy son shakllarining yasalish modellari, ularning semantik valentligi va sintaktik distributsiyasi masalalari maxsus tadqiqotni talab etadi.

METODOLOGIYA VA ADABIYOTLAR TAHLILI

Tadqiqot uchun material sifatida ingliz va qoraqalpoq tillarining izohli va grammatik lugʻatlari, ikki tilning akademik grammatikalari, badiiy va publitsistik matnlardan yigʻilgan 500 dan ortiq numerativ birlik qoʻllanilgan misollar bazasi xizmat qildi.

Qoraqalpoq tili materiallari A.Bekbergenovning “Qaraqalpaq tilindegi sanlıqlar” (Nókis: Qaraqalpaqstan, 1976), D.Nasirovning “Hazirgi qaraqalpaq tili. Morfologiya” (Nókis, 1981) hamda A.Dawletov, M.Dawletov, M.Qudaybergenovlarning “Házirgi qaraqalpaq ádebiy tili” (Nókis, 2010) nomli fundamental ishlaridan olindi.

Ingliz tili materiallari uchun R.Quirk, S.Greenbaum, G.Leech, J.Svartvikning “A Comprehensive Grammar of the English Language” (London: Longman, 1985) hamda R.Huddleston va G.Pullumning “The Cambridge Grammar of the English Language” (Cambridge: CUP, 2002) asarlari tayanch manba sifatida foydalanildi.

Tadqiqotda quyidagi metodlardan foydalanildi: qiyosiy-tipologik metod – ikki tilning numerativ tizimlarini oʻzaro solishtirish uchun; komponent tahlili metodi – numerativ birliklarning semantik strukturasini semalarga ajratib oʻrganish uchun; distributiv tahlil metodi — numerativ birliklarning gap ichidagi sintaktik pozitsiyasini aniqlash uchun; hamda statistik tahlil elementlari — yasalish modellarining produktivligini aniqlashtirish uchun qoʻllanildi.

TADQIQOT VA NATIJALAR

1. Numerativ birliklarning morfologik struktur turlari

Ingliz va qoraqalpoq tillarida son soʻz turkumi tarkibiy tuzilishiga koʻra toʻrt asosiy guruhga ajratiladi: sodda (simple), yasama (derivative), qoʻshma (compound) va murakkab/tartibli (complex/composite) sonlar. Biroq bu tasnif ikki tilda turlicha morfologik mexanizmlar asosida amalga oshadi.

Ingliz tilida sodda sonlar (one, two, ten, hundred) tub morfemalardan iborat boʻlib, ular boshqa morfemalarga boʻlinmaydi. Yasama sonlar -teen (thirteen, fourteen) va -ty (twenty, thirty) affikslari yordamida hosil boʻladi, bu affikslar tarixan “ten” soʻzining fonetik oʻzgargan shakllaridir.[18]

Qoraqalpoq tilida esa sodda sonlar (bir, eki, on, júz, mıń) tub soʻzlar boʻlib, ular agglyutinativ tilga xos holda oʻzgarmas oʻzak sifatida namoyon boʻladi. Yasama sonlar mavjud emas - buning oʻrniga qoʻshma son yasalish modeli (on bir, jigirma bes, bir júz eliw) produktiv hisoblanadi, bu inglizcha “twenty-five” tipidagi qoʻshma sonlarga funksional jihatdan mos keladi, biroq yozilish tamoyili (ochiq yozuv, chiziqcha yoʻq) bilan farqlanadi.

Quyidagi jadvalda ikki tildagi sanoq sonlarning tarkibiy modeli qiyoslangan:

Model	Ingliz tili misoli	Qoraqalpoq tili misoli	Izoh
Sodda	one, six, ten	bir, altı, on	tub morfema
Yasama	thirteen, twenty	-(mavjud emas)	faqat inglizda affiksal
Qoʻshma	twenty-five, ninety-nine	jigirma bes, toqsan toǵız	ikki komponentli
Murakkab	two hundred and thirty-four	eki júz otız tórt	koʻp komponentli

2. Semantik guruhlar boʻyicha tahlil

Sanoq sonlar (cardinal numerals) ikki tilda ham miqdorni bildiruvchi asosiy semantik guruh hisoblanadi. Ingliz tilida sanoq sonlar deyarli oʻzgarmas shaklda qoʻllanadi (grammatik jihatdan neytral), qoraqalpoq tilida esa ular kelishik va egalik affikslarini qabul qilib, otlashish xususiyatiga ega boʻladi: úshewimiz (uchovimiz), bestiń (beshning) kabi.

Tartib sonlar (ordinal numerals) ingliz tilida -th affiksi (fourth, fifth) va uchta istisno shakl (first, second, third) orqali yasaladi.[19]

Qoraqalpoq tilida tartib son -ınshı/-inshi, -nshı/-nshi affiksi bilan yasaladi: birinshi, ekinshi, úshinshi, tórtinshi. Bu affiks barcha sanoq son oʻzaklariga birxil qonuniyat bilan qoʻshiladi, bu esa qoraqalpoq tilining agglyutinativ tabiatidan kelib chiqadi - istisno shakllar deyarli uchramaydi.

17Xudayarova M., Usanova Q.M. Oʻzbek, rus va qoraqalpoq tillarida feʻl so'z turkumi. – Eurasian Journal of Social Sciences, Philosophy and Culture, 2024.

18Jespersen O. A Modern English Grammar on Historical Principles. Part II: Syntax. – Heidelberg: Carl Winter, 1914. – P. 15–22.

19 Huddleston R., Pullum G.K. The Cambridge Grammar of the English Language. – Cambridge: CUP, 2002. – P. 323–327.

Jamlovchi sonlar (collective numerals) qoraqalpoq tilida -aw/-ew affiksi orqali faol yasaladi: ekewi, úshewi, tórtewi, besewi (ikkovi, uchovi, to‘rtovi, beshovi).

Ingliz tilida bu ma’no leksik-analitik yo‘l bilan, ya’ni “both”, “all three”, “the four of them” kabi so‘z birikmalari orqali ifodalanadi, alohida grammatik shakl mavjud emas.

Taqsimlovchi sonlar (distributive numerals) qoraqalpoq tilida son takrori (eki-ekiden, bes-besten - ikki-ikkidan, besh-beshdan) yoki -aw/-ew affiksi (ekewden, úshewden) orqali yasaladi. Ingliz tilida bu ma’no «two by two», «in twos», «five each» kabi analitik konstruksiyalar bilan beriladi

Taxminiy sonlar (approximate numerals) ingliz tilida “about”, “around”, “some”, “-ish” (thirty-ish) vositalari bilan, qoraqalpoq tilida esa sonlarni juftlab qo‘llash (on-on bes - o‘n-o‘n besh) yoki -lap/lep affiksi (onlap, júzlep) orqali ifodalanadi. Bu ikki tilda ham taxminiylik sxemasi asosan sintaktik-leksik vositalar orqali yuzaga chiqishini ko‘rsatadi, biroq qoraqalpoq tilida bu jarayon ko‘proq morfologik xarakterga ega.

3. Sintaktik distributsiya

Ingliz va qoraqalpoq tillarida son so‘z turkumining gapdagi vazifasi ham qiyosiy jihatdan farqlanadi. Ingliz tilida sanoq son deyarli har doim otdan oldin, aniqlovchi vazifasida keladi (three books), otlashganda esa ko‘plik affiksini oladi (in twos, by threes). Qoraqalpoq tilida son so‘z, aksincha, otdan oldin kelib, ot ko‘plik affiksini olmaydi - ya’ni son o‘zi miqdorni bildirganligi sababli otga ko‘plik qo‘shimchasi qo‘shilmaydi: bes kitap (besh kitob), emas «bes kitaplar».

Bu qonuniyat turkiy tillar uchun umumiy hodisa bo‘lib, “sanoq son + ot birlik shaklida” qo‘llanish qoidasi deb ataladi.[20]

Shuningdek, qoraqalpoq tilida son so‘z otlashib, gapda ega, to‘ldiruvchi yoki kesim vazifasida kela oladi va bu holatda kelishik hamda egalik affikslarini to‘liq qabul qiladi: Úshewi keldi (Uchovi keldi). Ingliz tilida bunday morfologik otlashish cheklangan bo‘lib, asosan artikl va predlog yordamida amalga oshadi: the three of them.

4. Ikki tildagi numerativ tizimning umumiy va farqli jihatlari

Olib borilgan qiyosiy tahlil natijasida quyidagi umumiy va farqli xususiyatlar aniqlandi:

ikki tilda ham numerativ tizim o‘nlik sanoq asosiga (decimal system) qurilgan, bu universal tipologik xususiyat hisoblanadi;

ingliz tilida yasama sonlar mavjud bo‘lib, ular tarixiy affiksatsiya natijasi hisoblanadi, qoraqalpoq tilida esa bu bo‘shliqni qo‘shma son modeli to‘ldiradi;

qoraqalpoq tilida jamlovchi va taqsimlovchi sonlar alohida grammatik (affiksal) shaklga ega, ingliz tilida esa bu ma’nolar analitik-leksik vositalar bilan beriladi;

qoraqalpoq tilida son otdan oldin kelib, otning ko‘plik shaklini bloklaydi, ingliz tilida bunday qat’iy qoida yo‘q;

tartib son yasalishida ingliz tilida uchta supletiv istisno (first, second, third) mavjud, qoraqalpoq tilida bunday istisnolar deyarli kuzatilmaydi, bu til tipologiyasining izchilligi bilan izohlanadi.

Bu farqlar, birinchi navbatda, ikki tilning tipologik tabiati - ingliz tilining analitik-fleksiyaviy va qoraqalpoq tilining agglyutinativ xususiyati bilan bog‘liq. Agglyutinativ tilda har bir grammatik ma’no alohida, aniq chegaralangan affiks orqali ifodalansa, analitik tilda bu vazifani ko‘pincha mustaqil so‘zlar (predlog, yordamchi so‘zlar) bajaradi.

5. Kasr sonlar va o‘lchov-sanoq birikmalarining struktur-semantik xususiyatlari

Kasr sonlar (fractional numerals) ikki tilda ham ikki komponentli struktura - surat va maxraj asosida yasaladi, biroq ularning grammatik rasmiylashuvi farqlanadi. Ingliz tilida kasr sonlar sanoq va tartib sonlarning birikuvi orqali hosil bo‘ladi: one third, two fifths, three quarters - bunda surat sanoq son, maxraj esa tartib son shaklida (ko‘plikda -s bilan) qo‘llanadi.[21]

Qoraqalpoq tilida kasr sonlar maxraj + surat tartibida, jónelis kelisigi (-dan/-nan) affiksi yordamida yasaladi: úshten biri (uchdan biri), besten ekewi (beshdan ikkitasi). Bu model turkiy tillar uchun umumiy hodisa bo‘lib, kelishik affiksining kasr semantikasini shakllantirishdagi faol ishtirokini ko‘rsatadi - bu esa ingliz tilidagi leksik-birikma usulidan tubdan farq qiladi.

O‘lchov-sanoq birikmalari (numerative classifiers) nuqtayi nazaridan ham ikki til orasida farq kuzatiladi. Qoraqalpoq tilida son bilan ot orasida maxsus sanoq so‘zlar (nomerativ klassifikatorlar) qo‘llanilishi mumkin: on bas mal (o‘n bosh mol), bes túp aǵash (besh tup daraxt) - bunda «bas», “túp” kabi so‘zlar predmetning turiga qarab tanlanadigan klassifikator vazifasini bajaradi. Ingliz tilida bunday klassifikatorlar tizimi rivojlanmagan, buning o‘rniga «a piece of», «a head of» kabi ayrim birikmalar cheklangan holatlarda qo‘llaniladi (masalan, «a head of cattle»), biroq bu hodisa qoraqalpoq tilidagidek tizimli va produktiv emas.

Shunday qilib, kasr sonlar va o‘lchov-sanoq birikmalari darajasida ham ikki tilning tipologik xususiyati - qoraqalpoq tilining morfologik-affiksal, ingliz tilining esa leksik-analitik strategiyasi - yaqqol namoyon bo‘ladi.

20Баскаков Н А. - Краткая грамматика каракалпакского языка. – Турткуль 1932. – 168 с.

21Quirk R., Greenbaum S., Leech G., Svartvik J. A Comprehensive Grammar of the English Language. – London: Longman, 1985. – 1779 p.

MUHOKAMA

Numerativ tizimning bazaviy birligi sifatida “one” va “bir” leksemasi alohida oʻrin egallaydi, chunki u nafaqat mustaqil sanoq son ("1"), balki butun numerativ tizimning morfologik bazasi – boshqa sonlarni yasovchi tayanch komponent hamdir. Ingliz tilida "one" tarixan "eleven" (“ān”+“lif” — oʻnlikdan bitta ortiq) va “eighty-one” kabi murakkab sonlar tarkibida qatnashadi; shuningdek “once”, “alone” (“all+one”), “only” (“one+ly”) kabi hosila soʻzlarning etimologik negizini tashkil etadi.

Bir soni barcha turkiy tillarda, biz foydalangan yodgorliklarda va tilimizning dialektlarida bir xil shaklga ega...22 Qoraqalpoq tilida ham “bir” xuddi shunday bazaviy vazifani bajaradi: u on bir (oʻn bir), jigirma bir (yigirma bir), bir mıń (bir ming) kabi barcha qoʻshma va murakkab sonlar tarkibida ishtirok etadi, shuningdek birew (birov), birden (birdan), birinshi (birinchi), birge (birga) kabi koʻplab hosila soʻzlarning yasovchi negizi hisoblanadi. Bu holat “one/bir” leksemasining ikki tilda ham nafaqat semantik, balki morfologik jihatdan ham markaziy, tizim hosil qiluvchi maqomga ega ekanligini koʻrsatadi – bu esa uning kognitiv-diskursiv xususiyatlarini alohida chuqur tadqiq etishni struktur-semantik nuqtayi nazardan toʻla asoslaydi.

XULOSA

Oʻtkazilgan tadqiqot natijalari shuni koʻrsatadiki, ingliz va qoraqalpoq tillaridagi numerativ birliklar umuminsoniy miqdoriy tushunchalarni ifodalashda oʻxshash semantik vazifalarni bajarsa-da, ularning struktur yasalish mexanizmlari til tipologiyasiga qat’iy bogʻliq holda farqlanadi. Qoraqalpoq tilining agglyutinativ xususiyati numerativ birliklarning affiksal yoʻl bilan boy va tizimli yasalishini ta’minlasa, ingliz tilining analitik-fleksiyaviy tabiati bu ma’nolarning koʻproq leksik-sintaktik vositalar orqali ifodalanishiga olib keladi.

Tadqiqot natijalari qiyosiy tilshunoslik, tarjimashunoslik va ikki tilni chet til sifatida oʻqitish metodikasi uchun amaliy ahamiyatga ega boʻlib, xususan, ingliz tilidan qoraqalpoq tiliga (va aksincha) tarjima jarayonida numerativ birliklarning ekvivalentligini ta’minlashda foydalanilishi mumkin.

Xulosa qilib aytganda, ingliz va qoraqalpoq tillari numerativ tizimlarining qiyosiy tahlili quyidagi asosiy natijalarni berdi: birinchidan, ikki tilda ham oʻnlik sanoq tizimi universal asos boʻlib xizmat qiladi; ikkinchidan, numerativ birliklarning struktur yasalishi til tipologiyasi bilan bevosita bogʻliq - qoraqalpoq tilida affiksatsiya, ingliz tilida esa kompozitsiya va leksik-analitik usullar ustuvorlik qiladi; uchinchidan, semantik guruhlar (jamlovchi, taqsimlovchi, taxminiy, kasr sonlar) darajasida qoraqalpoq tili grammatik jihatdan ancha rivojlangan va tizimli affiksal vositalarga ega, ingliz tilida esa bu ma’nolar koʻproq sintaktik konstruksiyalar orqali ifodalanadi; toʻrtinchidan, sintaktik distributsiya nuqtayi nazaridan qoraqalpoq tilida son soʻzning otdan oldin kelishi va otning koʻplik shaklini bloklashi barqaror qoida hisoblanadi, ingliz tilida esa bunday qat’iy cheklov mavjud emas.

Kelgusi tadqiqotlarda numerativ birliklarning frazeologik va lingvokulturologik jihatlari, shuningdek boshqa turkiy va german tillari materialida numerativ tizimlarning korpus lingvistikasi metodlari yordamida kengroq qiyosiy tahlil qilinishi alohida ilmiy va amaliy ahamiyatga ega boʻladi. Bunday tadqiqotlar, ayniqsa, mashina tarjimasi tizimlarida numerativ birliklarning avtomatik aniqlanishi va ekvivalent tanlanishi masalalarini hal etishda muhim nazariy asos boʻlib xizmat qilishi mumkin.

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INGLIZ VA O‘ZBEK BADIIY MATNLARIDA ONOMASTIK BIRLIKLARNING PRESUPPOZITIV MAZMUN HOSIL QILISH XUSUSIYATLARI

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Annotatsiya: *Maqolada ingliz va o‘zbek badiiy matnlarida qo‘llanadigan onomastik birliklarning presuppozitiv mazmun hosil qilish xususiyatlari qiyosiy-pragmatik jihatdan o‘rganiladi. Tadqiqotda atoqli otning badiiy diskursdagi vazifasi shaxs, makon yoki boshqa referentni identifikatsiyalash bilan chegaralanmasligi, uning talqini tarixiy-madaniy bilim, ijtimoiy tajriba, kommunikativ vaziyat va matnning oldingi qismlarida shakllangan axborot bilan uzviy bog‘liq ekanligi asoslanadi. Ingliz adabiyotidan Jane Austinning Pride and Prejudice, Charles Dickensning Great Expectations, o‘zbek adabiyotidan Abdulla Qodiriyning O‘tkan kunlar hamda Cho‘lponning Kecha va kunduz asarlaridagi antroponimik va toponimik birliklar tadqiqot materiali sifatida olindi. Kontekstual, pragmatik, lingvokognitiv va qiyosiy tahlil natijasida onomastik birliklarning tarixiy-madaniy, ijtimoiy-status, etnomadaniy, assotsiativ-baholovchi hamda diskurs-oldingi axborot bilan bog‘liq presuppozitiv xususiyatlari aniqlandi. Tadqiqot shuni ko‘rsatadiki, badiiy onimning presuppozitiv mazmuni uning lug‘aviy yoki etimologik ma’nosidan bevosita kelib chiqmaydi; mazkur mazmun nom, kontekst va o‘quvchining relevant bilimlari o‘rtasidagi munosabatda yuzaga keladi. Ingliz va o‘zbek badiiy matnlarida bu hodisaning umumiy pragmatik asoslari mavjud bo‘lsa-da, uni yuzaga chiqaruvchi tarixiy-madaniy va ijtimoiy omillar muayyan farqlarga ega.*

Kalit so‘zlar: *onomastika, atoqli ot, presuppozitsiya, badiiy diskurs, antroponim, toponim, pragmatika, fon bilim, madaniy kontekst, interpretatsiya.*

ОСОБЕННОСТИ ФОРМИРОВАНИЯ ПРЕСУППОЗИТИВНОГО СОДЕРЖАНИЯ ОНОМАСТИЧЕСКИХ ЕДИНИЦ В АНГЛИЙСКИХ И УЗБЕКСКИХ ХУДОЖЕСТВЕННЫХ ТЕКСТАХ

Аннотация: *В статье в сравнительно-прагматическом аспекте рассматриваются особенности формирования пресуппозитивного содержания ономастических единиц в английских и узбекских художественных текстах. Обосновывается, что функция имени собственного в художественном дискурсе не ограничивается идентификацией лица, места или иного референта: его интерпретация тесно связана с историко-культурными знаниями, социальным опытом, коммуникативной ситуацией и информацией, сформированной в предшествующих частях текста. Материалом исследования послужили антропонимы и топонимы из романов «Гордость и предубеждение» Джейн Остин, «Большие надежды» Чарльза Диккенса, «Минувшие дни» Абдуллы Кадыри и «Ночь и день» Чулпана. В результате контекстуального, прагматического, лингвокогнитивного и сравнительного анализа выявлены историко-культурные, социально-статусные, этнокультурные, ассоциативно-оценочные, а также связанные с предшествующим дискурсом пресуппозитивные свойства онимов. Исследование показывает, что пресуппозитивное содержание художественного онима не выводится непосредственно из его лексического или этимологического значения; оно возникает в отношении между именем, контекстом и релевантными знаниями читателя. Несмотря на общность прагматических оснований этого явления в английских и узбекских художественных текстах, историко-культурные и социальные факторы, обусловливающие его, имеют определённые различия.*

Ключевые слова: *ономастика, имя собственное, пресуппозиция, художественный дискурс, антропоним, топоним, прагматика, фоновые знания, культурный контекст, интерпретация.*

PRESUPPOSITION-FORMING FEATURES OF ONOMASTIC UNITS IN ENGLISH AND UZBEK LITERARY TEXTS

Abstract: *The article examines the presuppositional potential of onomastic units in English and Uzbek literary texts from a comparative pragmatic perspective. It argues that the function of a proper name in literary discourse is not limited to the identification of a person, place or other referent. Its interpretation is closely connected with historical and cultural knowledge, social experience, communicative context and information introduced in the preceding discourse. The study is based on anthroponyms and toponyms*

selected from Jane Austen's Pride and Prejudice, Charles Dickens's Great Expectations, Abdulla Qodiriy's O'tkan kunlar and Cho'lpon's Kecha va kunduz. Contextual, pragmatic, cognitive and comparative methods reveal several presuppositional dimensions of literary names, including historical-cultural, social-status, ethnocultural, associative-evaluative and discourse-based meanings. The findings demonstrate that the presuppositional content of a literary proper name cannot be derived solely from its lexical or etymological meaning; rather, it emerges through the interaction between the name, its textual context and the reader's relevant background knowledge. Although English and Uzbek literary texts share common pragmatic mechanisms, the cultural and social sources of presuppositional meaning display significant differences.

Keywords: *onomastics, proper name, presupposition, literary discourse, anthroponym, toponym, pragmatics, background knowledge, cultural context, interpretation.*

Kirish: Badiiy matndagi atoqli otlar tilning boshqa nominativ birliklariga nisbatan alohida funksional imkoniyatga ega. Ular, avvalo, personaj, makon yoki boshqa individual obyektni identifikatsiyalaydi. Biroq badiiy diskurs sharoitida nomning vazifasi shu bilan tugamaydi. Atoqli ot muayyan tarixiy davrni, ijtimoiy munosabatni, milliy-madaniy muhitni yoki matnning oldingi qismlarida berilgan axborotni o'quvchi ongida qayta faollashtirish imkoniyatiga ham ega.

Shu sababli badiiy onomastik birliklarni faqat ularning kelib chiqishi, yasalishi yoki nominativ funksiyasi doirasida o'rganish ularning matndagi real semantik-pragmatik salohiyatini to'liq ochib bermaydi. Atoqli otning badiiy qiymati ko'pincha uning qaysi kontekstda qo'llanishi, qanday referentga tegishli bo'lishi, personajlar va muallif nutqida qanday munosabat bilan berilishi hamda o'quvchidan qanday bilim talab etishi orqali belgilanadi.

Badiiy onomastika tadqiqotlarida nomning referensial, xarakterologik, ijtimoiy, ekspressiv va poetik funksiyalari turli nuqtayi nazardan o'rganilgan. Ž. Dvořáková badiiy nomni faqat personajni ajratib ko'rsatuvchi vosita sifatida emas, balki matnning boshqa komponentlari bilan o'zaro bog'liq holda ishlaydigan funksional birlik sifatida talqin qiladi. Bunday yondashuv nomning mazmunini personaj, muallif, o'quvchi va madaniy kontekst o'rtasidagi munosabat doirasida ko'rib chiqishni taqozo etadi.

Atoqli ot semantikasi bo'yicha tadqiqotlarda referensiya markaziy masalalardan biri bo'lib qolsa-da, real kommunikatsiyada nomning anglanishi faqat referentning aniqlanishiga bog'liq emas. D. J. Allerton proper name ma'nosining individual referent bilan aloqasi bilan bir qatorda, so'zlovchining mazkur referentga oid bilim va assotsiatsiyalarini ham e'tibordan chetda qoldirmaslik zarurligini ko'rsatadi. Mazkur mulohaza badiiy diskurs uchun yanada dolzarb, chunki badiiy personaj yoki joy nomiga doir bilimlar matn rivojlangan sari kengayib boradi.

Ushbu masalani presuppozitsiya nuqtayi nazaridan o'rganish atoqli otning matnda bevosita ifodalanmagan axborotni qanday aktual holga keltirishini tushuntirish imkonini beradi. Pragmatik nazariyada presuppozitsiya muloqotning muvaffaqiyatli kechishi uchun oldindan mavjud yoki kommunikantlar tomonidan ma'lum deb qabul qilinadigan axborot bilan bog'lanadi. R. Stalnaker presuppozitsiyani kommunikativ kontekst va umumiy bilim bilan uzviy munosabatda tushuntiradi. Badiiy matnda esa mazkur holat o'ziga xos ko'rinishga ega: muallif va o'quvchi yuzma-yuz kommunikatsiyada qatnashmaydi, ammo matn o'quvchining qaysi bilimlarni ishga solishini nazarda tutgan holda tashkil qilinadi.

Masalan, Samarqand toponimi muayyan geografik obyektga ishora qilishi bilan birga tarixiy yoki badiiy kontekstga qarab qadimiylik, davlatlilik, ilmiy-madaniy meros kabi tushunchalarni ham aktual holga keltirishi mumkin. Biroq bunday mazmunni nomning o'ziga doimiy ravishda biriktirilgan lug'aviy ma'no deb tushunish noto'g'ri. U muayyan kontekst bilan o'quvchining tarixiy-madaniy bilimlari o'rtasidagi munosabatda yuzaga chiqadi.

Antroponimlarda ham shu holat kuzatiladi. Abdulla Qodiriyning O'tkan kunlar romanida Otabek dastlab konkret personajni identifikatsiyalovchi ism bo'lsa, asar davomida u haqidagi ijtimoiy, oilaviy va shaxsiy ma'lumotlar o'quvchining diskursiv bilimiga kirib boradi. Keyingi voqealarda "Otabek" nomining qo'llanishi ushbu personaj bilan bog'liq avvalgi axborotni har safar qaytadan bayon etishni talab qilmaydi.

Xuddi shunday, Jane Austinning Pride and Prejudice romanidagi Mr Darcy nominatsiyasi personajni individuallashtirish bilan birga ijtimoiy maqom, kommunikativ masofa va muayyan tarixiy jamiyatdagi etiketik munosabatlarni tushunishga ehtiyoj tug'diradi. Personaj haqidagi dastlabki baho syujet davomida o'zgarishi esa ism bilan bog'langan matniy bilimning ham dinamik xususiyatga ega ekanini ko'rsatadi.

Shu jihatdan ingliz va o'zbek badiiy matnlarini qiyosiy o'rganish muhim. Har ikki adabiy an'anada nomning identifikatsion vazifasi universal bo'lsa-da, nom orqali faollashadigan ijtimoiy va madaniy bilimning mazmuni bir xil emas.

Mazkur tadqiqotning maqsadi ingliz va o'zbek badiiy matnlarida onomastik birliklarning presuppozitiv mazmun hosil qilish xususiyatlarini aniqlash, mazkur hodisaning asosiy ko'rinishlarini tavsiflash hamda ikki til materialida kuzatiladigan umumiy va o'ziga xos jihatlarni qiyosiy yoritishdan iborat.

Tadqiqot materiallari va metodlari: Tadqiqot materiali sifatida ingliz va o'zbek klassik nasrida qo'llangan antroponimik hamda toponimik birliklar tanlandi. Ingliz adabiyotidan Jane Austinning Pride and Prejudice va Charles

Dickensning Great Expectations, o‘zbek adabiyotidan Abdulla Qodiriyning O‘tkan kunlar hamda Cho‘lponning Kecha va kunduz asarlaridagi nomlash birliklari tahlil qilindi.

Mazkur asarlarni tanlash ularning ijtimoiy munosabatlar, personajlararo aloqa va tarixiy-madaniy muhitni ifodalashda onomastik vositalardan faol foydalanishi bilan izohlanadi. Tadqiqotda alohida ism emas, balki ismning badiiy kontekst bilan munosabati tahlil markaziga qo‘yildi.

Kontekstual tahlil nomning konkret epizod yoki narrativ vaziyatdagi semantik-pragmatik qiymatini aniqlash uchun qo‘llandi. Chunki ayni bir onomastik birlik turli matniy vaziyatlarda turlicha mazmunni aktual holga keltirishi mumkin.

Pragmatik tahlil orqali onim qo‘llangan vaziyatda matnda ochiq ifodalanmagan, lekin uning to‘liq anglanishi uchun zarur bo‘lgan bilimlar aniqlandi. Bunda presuppozitsiya subyektiv assotsiatsiyadan farqlandi. O‘quvchining shaxsiy tasavvuri emas, balki kontekst, tarixiy-madaniy muhit yoki oldingi diskurs bilan asoslangan bilimlargina tahlil uchun relevant deb qabul qilindi.

Lingvokognitiv yondashuv atoqli otning o‘quvchi ongida mavjud bo‘lgan tarixiy, ijtimoiy va madaniy bilimlar bilan bog‘lanishini tushuntirish uchun xizmat qildi. Qiyosiy metod esa ingliz va o‘zbek materiallarida mazkur hodisaning umumiy xususiyatlari hamda uning milliy-madaniy shakllarini aniqlash imkonini berdi.

Tadqiqotda miqdoriy ko‘rsatkichlardan ko‘ra sifat tahliliga ustuvor ahamiyat berildi. Chunki maqolaning asosiy vazifasi onomastik birliklarning statistik chastotasini aniqlash emas, balki ularning presuppozitiv imkoniyatini semantik-pragmatik nuqtayi nazardan tavsiflashdir.

Natijalar: Tahlil shuni ko‘rsatdiki, badiiy onomastik birliklarning presuppozitiv mazmuni bir xil bilim manbasiga tayanmaydi. Ayrim nomlar tarixiy-madaniy bilimni, ayrimlari ijtimoiy maqom va kommunikativ munosabatni, boshqalari esa aynan asarning oldingi qismlarida shakllangan axborotni o‘quvchi ongida aktual holga keltiradi.

Toponim va tarixiy antroponimlarning badiiy matndagi talqini ko‘pincha kollektiv xotira bilan bog‘liq. Bunda nom muayyan shaxs yoki makonni ko‘rsatadi, biroq uning badiiy mazmuni referensiya bilan tugamaydi.

O‘zbek badiiy diskursida Samarqand, Buxoro, Toshkent kabi nomlar kontekstga qarab tarixiy davr, madaniy markaz, ijtimoiy muhit yoki milliy xotira bilan bog‘lanishi mumkin. Ushbu ma’lumotlarning barchasi nomning lug‘aviy semantikasiga kirmaydi. Ularning qaysi biri aktual bo‘lishi matn tomonidan belgilanadi.

Masalan, tarixiy voqealar fonida qo‘llangan “Samarqand” toponimi bilan zamonaviy shahar hayotini tasvirlovchi asarda qo‘llangan ayni nomning pragmatik qiymati bir xil bo‘lmaydi. Demak, tarixiy-madaniy presuppozitsiyani nomning o‘zgarmas semantik xususiyati deb emas, kontekst orqali faollashadigan madaniy bilim sifatida tushunish zarur.

Ingliz adabiyotida London toponimi ham shunday ko‘p qatlamli imkoniyatga ega. Dickens ijodida London faqat voqea kechadigan geografik makon emas; u ko‘plab holatlarda jamiyatning ijtimoiy tabaqalanishi, shahar hayotining murakkabligi va personajlar taqdirini belgilovchi muhit bilan bog‘liq. Biroq konkret ma’no har bir asarning kontekstida aniqlanadi.

Antroponimning presuppozitiv qiymati ko‘pincha uning atrofidagi titul, unvon yoki murojaat shakllari orqali kuchayadi. Ingliz va o‘zbek materialining qiyosiy tahlili ushbu hodisaning har ikki tilda mavjudligini, biroq lisoniy ko‘rinishlari tarixiy-madaniy jihatdan farqlanishini ko‘rsatadi.Jane Austinning Pride and Prejudice romanidagi Mr Darcy, Miss Bennet, Lady Catherine kabi birliklar personajlarning nomini ifodalash bilangina cheklanmaydi. Titullarning tanlanishi jamiyatdagi status, rasmiylik darajasi va kommunikativ masofani anglashga yordam beradi. Ayniqsa “Lady Catherine” nominatsiyasini to‘liq talqin qilish uchun mazkur tarixiy davrdagi ijtimoiy tabaqalanish va etiketik tizim haqidagi bilim muhim.

O‘zbek badiiy matnida esa Yusufbek hoji kabi nominatsiyaning pragmatik qiymati “hoji” komponentisiz to‘liq ochilmaydi. Mazkur birlik personajning diniy-amaliy tajribasini ifodalash bilan birga konkret tarixiy-iijtimoiy muhitda unga berilgan hurmat va jamoa ichidagi maqomini ham anglatishi mumkin.

Shuningdek, aka, opa, domla, bek, hoji kabi birliklarning ism bilan birga qo‘llanishi shaxslararo munosabatni tavsiflashga xizmat qiladi. Biroq mazkur komponentlarning ma’nosini barcha o‘zbek badiiy matnlariga bir xil tatbiq qilish mumkin emas. Ularning pragmatik vazifasi davr, personajlar o‘rtasidagi munosabat va konkret nutqiy vaziyat bilan belgilanadi.

Shuning uchun ikki tilni qiyoslashda “ingliz tilida titul, o‘zbek tilida qarindoshlik shakllari asosiy” kabi qat’iy qarama-qarshilikdan qochish kerak. Ilmiy jihatdan muhim farq ayrim nominativ vositalarning muayyan tarixiy va madaniy diskursda qay darajada funksional yuk olishi bilan bog‘liq.

Ismning fonetik va morfologik shakli ham o‘quvchi uchun muayyan madaniy signal bo‘lishi mumkin. Otabek, Kumush, Zaynab, Miryoqub kabi antroponimlar o‘zbek onomastik tizimiga mansubligi bilan personaj haqida dastlabki etnomadaniy tasavvur hosil qiladi.

Ammo ism asosida personajning xarakteri yoki qadriyatlarini oldindan belgilash ilmiy jihatdan asosli emas. Onomastik shakl madaniy mansublik haqida ma’lum taxmin tug‘dirishi mumkin, lekin personajning individual xususiyatlari faqat badiiy kontekst orqali ochiladi.

Shu sababli etnomadaniy presuppozitsiyani qat'iy semantik belgi sifatida emas, o'quvchining mavjud onomastik tajribasiga tayangan interpretativ asos sifatida tushunish to'g'riroq bo'ladi.

Ingliz badiiy matnlarida ham ism va familiya kombinatsiyalari personajning ijtimoiy yoki etnomadaniy kelib chiqishiga doir ma'lum kutishlarni shakllantirishi mumkin. Biroq bunday xulosalar konkret matn bilan tasdiqlanmaguncha faqat dastlabki interpretativ ehtimol sifatida qaralishi lozim.

Badiiy personaj nomining baholovchi xususiyati ko'pincha nomning lug'aviy yoki etimologik ma'nosidan emas, syujet davomida personaj haqida beriladigan axborotdan kelib chiqadi.

Charles Dickensning Great Expectations romanidagi Miss Havisham nomi asarning boshida konkret personajni individuallashtiradi. Syujet rivojlangan sari uning hayoti, ruhiy holati, Satis House muhiti va Estella bilan munosabatlari haqidagi ma'lumotlar o'quvchining mazkur personaj haqidagi bilimini boyitadi. Keyingi epizodlarda ism qo'llanganda ushbu oldingi diskurs yana tushuntirib berilmaydi.

O'tkan kunlar romanidagi Kumush nomining talqini ham faqat "kumush" leksemasining lug'aviy ma'nosiga keltirib chiqarilishi mumkin emas. Qahramonning badiiy qiyofasi, uning Otabek bilan munosabati, boshqa personajlar bilan ziddiyatlari hamda syujetdagi taqdiri nomning o'quvchi ongidagi badiiy qiymatini shakllantiradi.

Bu holatda muhim jihat shundaki, badiiy nomning baholovchi mazmuni alohida ismning "tayyor" xususiyati sifatida emas, personaj haqidagi matniy bilimning davomiy ravishda shakllanishi natijasi sifatida namoyon bo'ladi.

Badiiy matn rivoji davomida o'quvchi personajlar, voqealar va munosabatlar haqidagi ma'lumotni bosqichma-bosqich o'zlashtiradi. Keyingi epizodlarda ushbu ma'lumotning bir qismi qayta bayon qilinmaydi, chunki matn o'quvchining oldingi diskursni xotirada saqlaganini nazarda tutadi.

Masalan, roman boshida Otabek haqidagi ma'lumotlar asta-sekin ochib boriladi. Keyingi boblarda uning ismi qayta ishlatilganda o'quvchi personajni avval shakllangan diskurs modeli asosida taniydi. Shu bois atoqli ot matnning oldingi qismlari bilan keyingi qismlari o'rtasidagi referensial izchillikni ta'minlashda muhim rol o'ynaydi.

Diskurs tadqiqotlarida atoqli otlar referentning kognitiv faolligini ta'minlovchi vosita sifatida ham ko'rilgan. A. J. Sanford, K. Moar va S. C. Garrodning tadqiqotlari shaxsning atoqli ot orqali nomlanishi uning diskursdagi referensial kirishimliligiga ta'sir qilishi mumkinligini ko'rsatgan. Bu holat badiiy matnda personaj nomining takroriy qo'llanishi oldingi axborot bilan bog'lanishni osonlashtirishini tushuntirish uchun muhim nazariy asos beradi.

Bunday vaziyatni "matn yangi presuppozitsiya yaratadi" tarzida talqin qilishdan ko'ra, oldingi diskurs natijasida shakllangan bilimning keyingi talqin uchun mavjud bo'lishi sifatida izohlash aniqroqdir. Dinamik semantika nuqtayi nazaridan ham kontekst yangi axborot bilan boyib boradi va keyingi ifodalarning talqini ana shu yangilangan kontekstga tayanadi.

Muhokama: Olingan natijalar badiiy onomastik birlikning semantik-pragmatik tabiatini faqat referensiya doirasida izohlash yetarli emasligini ko'rsatadi. Atoqli ot, shubhasiz, muayyan referentni identifikatsiyalashning asosiy vositalaridan biridir. Biroq badiiy matnda uning to'liq talqini o'quvchining kontekstual va madaniy bilimlari bilan bog'liq.

Presuppozitiv tahlilda eng muhim masala — nom bilan bog'liq har qanday assotsiatsiyani ilmiy dalil sifatida qabul qilmaslikdir. O'quvchi bir nomni turli shaxsiy tajribalar bilan bog'lashi mumkin. Bunday individual assotsiatsiyalar matn tomonidan qo'llab-quvvatlanmasa, ular onomastik presuppozitsiyani belgilash uchun yetarli asos bo'la olmaydi.

Shu sababli badiiy nomning presuppozitiv xususiyatini aniqlashda uchta manba alohida ahamiyat kasb etadi: matnning konkret konteksti, tarixiy-madaniy jihatdan barqaror bilim va asarning oldingi qismlarida berilgan axborot. Ushbu manbalardan biri bilan tasdiqlanmagan talqin ilmiy xulosadan ko'ra erkin interpretatsiyaga yaqinlashadi.

Badiiy diskursning yana bir o'ziga xos tomoni shundaki, personajlarning bilim holati bilan o'quvchining bilim holati doimo bir xil bo'lmaydi. Bir personaj boshqa shaxsni ism bilan tilga olganda suhbatdosh mazkur referentni yaxshi bilishi mumkin, o'quvchi esa u haqida hali hech qanday ma'lumotga ega bo'lmasligi ehtimol.

Bunday holatda muallif o'quvchiga barcha axborotni darhol bermaydi. Referentning kimligi va uning syujetdagi o'rni keyingi kontekst orqali bosqichma-bosqich aniqlashtiriladi. Presuppozitsiya nazariyasidagi accommodation tushunchasi ana shunday vaziyatlarni tushuntirishda muhim: adresatda dastlab mavjud bo'lmagan ayrim axborot keyingi kommunikativ kontekst asosida qabul qilinadi va mavjud bilim tizimiga qo'shiladi.

Bu kuzatish badiiy matnda onomastik birlikning talqini faqat personajlararo kommunikatsiya bilan chegaralanmasligini ko'rsatadi. Nom bir vaqtning o'zida syujet ichidagi shaxslar munosabatida ham, muallifning o'quvchiga axborot berish strategiyasida ham ishtirok etadi.

Ingliz va o'zbek materialining qiyosiy tahlili esa onomastik presuppozitsiyaning umumiy tamoyillari ikki adabiy tizimda o'xshash ekanini ko'rsatadi. Har ikki holatda nom referentni aniqlash, avvalgi diskurs bilan bog'lanish va madaniy bilimni faollashtirish imkoniyatiga ega.

Asosiy farq mazkur bilimning tarixiy va ijtimoiy tarkibida namoyon bo'ladi. Jane Austen asarlaridagi titul va familiya tizimini uning davridagi ingliz ijtimoiy munosabatlaridan ajratib tushunib bo'lmaganidek, Qodiriy romanidagi

“hoji”, “bek” kabi nominativ komponentlarning qiymatini ham o‘zbek jamiyatining tasvirlangan tarixiy sharoitidan tashqarida to‘liq anglash mumkin emas.

Demak, qiyosiy onomastik tadqiqotda shakliy o‘xshashlik yoki farqning o‘zi yetarli emas. Har bir nominativ vositaning badiiy matnda qanday ijtimoiy, tarixiy va pragmatik bilim bilan munosabatga kirishishi aniqlanishi kerak.

Shuningdek, olib borilgan tahlil presuppozitiv mazmunni nomning etimologiyasi bilan aralashtirmaslik zarurligini ko‘rsatadi. Ismning etimologik ma’nosi badiiy talqinga ta’sir ko‘rsatishi mumkin, lekin u personajning diskursdagi umumiy mazmunini avtomatik ravishda belgilamaydi. Badiiy nomning pragmatik qiymati etimologiya, kontekst, narrativ rivojlanish va madaniy bilimning o‘zaro munosabati asosida shakllanadi.

Xulosa: Ingliz va o‘zbek badiiy matnlari asosida olib borilgan tadqiqot atoqli otning presuppozitiv imkoniyati uning referensial funksiyasi bilan uzviy bog‘liq bo‘lsa-da, unga teng emasligini ko‘rsatdi. Badiiy nom personaj yoki makonni identifikatsiyalash bilan bir qatorda matn talqini uchun zarur bo‘lgan tarixiy, madaniy, ijtimoiy va oldingi diskursga oid bilimlarni faollashtirishi mumkin.

Tadqiqot natijalariga ko‘ra, onomastik presuppozitiv mazmunni uch asosiy omil belgilaydi: nomning qo‘llanish konteksti, o‘quvchining relevant tarixiy-madaniy bilimi va matnning avvalgi qismlarida shakllangan diskursiv axborot. Mazkur omillar o‘zaro bog‘langan holda onimning konkret badiiy vaziyatdagi pragmatik qiymatini yuzaga chiqaradi.

Tahlil jarayonida tarixiy-madaniy, ijtimoiy-status, etnomadaniy, baholovchi va diskurs-oldingi bilim bilan bog‘liq presuppozitiv xususiyatlar kuzatildi. Ushbu ko‘rinishlar bir-biridan mutlaq ajralgan hodisalar emas. Konkret onomastik birlik bir vaqtning o‘zida bir necha turdagi bilimni aktual holga keltirishi mumkin. Shu sababli ularni qat’iy tasnifdan ko‘ra tahliliy jihatdan farqlanuvchi presuppozitiv manbalar sifatida ko‘rish maqsadga muvofiq.

Ingliz va o‘zbek badiiy matnlarini qiyoslash presuppozitiv mexanizmning umumiyligini, ammo uni shakllantiruvchi madaniy vositalarning o‘ziga xosligini ko‘rsatdi. Ingliz tarixiy-ijtimoiy romanlarida titul, familiya va rasmiy murojaatlarning pragmatik salmog‘i yuqori bo‘lishi mumkin. O‘zbek badiiy matnida esa diniy-ijtimoiy unvon, hurmat va qarindoshlik bilan bog‘liq nominativ vositalar ayrim tarixiy kontekstlarda alohida ahamiyat kasb etadi. Biroq bu farqlar mutlaq til xususiyati emas, balki tadqiq qilinayotgan davr, janr va ijtimoiy muhit bilan bog‘liq hodisa sifatida talqin qilinishi lozim.

Tadqiqotning asosiy ilmiy natijasi shundan iboratki, badiiy onomastik birlikning presuppozitiv xususiyatini nomning o‘ziga xos “yashirin ma’nosi” sifatida emas, balki atoqli ot, diskursiv kontekst va relevant bilim o‘rtasidagi pragmatik munosabat sifatida tushunish taklif etiladi. Bunday yondashuv onomastik birliklarni subyektiv assotsiatsiyalar asosida talqin qilishdan saqlaydi va ularning badiiy matndagi semantik-pragmatik imkoniyatlarini ilmiy jihatdan aniqroq tavsiflashga xizmat qiladi.

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LEKSIK KOMPETENSIYA TUSHUNCHASI VA UNING MAKTABGACHA TA’LIM KONTEKSTIDAGI TARKIBIY TUZILISHI

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Annotatsiya: *Maqolada leksik kompetensiya tushunchasining ilmiy-nazariy mohiyati hamda uning maktabgacha ta’lim kontekstidagi tarkibiy tuzilishi qiyosiy-tahliliy va modellashtirish yondashuvi doirasida yoritilgan. Tadqiqot nazariy-metodologik xarakterga ega bo‘lib, uning materialini leksik kompetensiya va nutq o‘stirishga oid ilmiy-metodik adabiyot hamda maktabgacha ta’lim dasturi mazmuni tashkil etdi. Tahlil natijasida leksik kompetensiyaning beshta tarkibiy komponenti ajratildi va ularning nazariy adabiyotdagi ulushi aniqlandi: semantik (28%), pragmatik-kommunikativ (26%), lingvistik (22%), sotsiolingvistik (14%) va refleksiv-strategik (10%). Maktabgacha yosh xususiyatlaridan kelib chiqib, leksik kompetensiyaning maxsus tarkibiy elementlari (passiv va aktiv lug‘at, ma’noni tushunish, nutqda qo‘llash, emotsional-baho leksika) tavsiflandi hamda uni shakllantirishning besh bosqichli didaktik modeli taklif etildi. Tadqiqot leksik kompetensiyani yaxlit, ko‘p komponentli tuzilma sifatida talqin qilish maktabgacha nutq o‘stirish samaradorligini oshirishini asoslaydi.*

Kalit so‘zlar: *leksik kompetensiya, so‘z boyligi, maktabgacha ta’lim, nutq o‘stirish, aktiv va passiv lug‘at, semantik komponent, kommunikativ kompetensiya, tarkibiy tuzilish, didaktik model.*

ПОНЯТИЕ ЛЕКСИЧЕСКОЙ КОМПЕТЕНЦИИ И ЕЁ СТРУКТУРНОЕ СТРОЕНИЕ В КОНТЕКСТЕ ДОШКОЛЬНОГО ОБРАЗОВАНИЯ

Аннотация: *В статье в рамках сравнительно-аналитического подхода и моделирования раскрыты научно-теоретическая сущность понятия лексической компетенции и её структурное строение в контексте дошкольного образования. Исследование носит теоретико-методологический характер; его материалом послужили научно-методическая литература по лексической компетенции и развитию речи, а также содержание программы дошкольного образования. В результате анализа выделены пять структурных компонентов лексической компетенции и определена их доля в научной литературе: семантический (28%), прагматико-коммуникативный (26%), лингвистический (22%), социолингвистический (14%) и рефлексивно-стратегический (10%). С учётом возрастных особенностей дошкольников описаны специфические структурные элементы лексической компетенции (пассивный и активный словарь, понимание значения, использование в речи, эмоционально-оценочная лексика) и предложена пятиэтапная дидактическая модель её формирования. Исследование обосновывает, что трактовка лексической компетенции как целостной многокомпонентной структуры повышает эффективность развития речи дошкольников.*

Ключевые слова: *лексическая компетенция, словарный запас, дошкольное образование, развитие речи, активный и пассивный словарь, семантический компонент, коммуникативная компетенция, структурное строение, дидактическая модель.*

THE CONCEPT OF LEXICAL COMPETENCE AND ITS STRUCTURAL COMPOSITION IN THE CONTEXT OF PRESCHOOL EDUCATION

Abstract: *The article reveals, within a comparative-analytical and modelling framework, the scientific-theoretical essence of the concept of lexical competence and its structural composition in the context of preschool education. The study is theoretical-methodological in nature; its material comprised scholarly-methodological literature on lexical competence and speech development, as well as the content of the preschool education programme. The analysis identified five structural components of lexical competence and determined their share in the scholarly literature: semantic (28%), pragmatic-communicative (26%), linguistic (22%), sociolinguistic (14%) and reflexive-strategic (10%). Taking into account the age characteristics of preschoolers, the specific structural elements of lexical competence (passive and active vocabulary, understanding of meaning, use in speech, emotional-evaluative vocabulary) were*

described, and a five-stage didactic model of its formation was proposed. The study substantiates that interpreting lexical competence as an integral multi-component structure enhances the effectiveness of preschoolers' speech development.

Keywords: *lexical competence, vocabulary, preschool education, speech development, active and passive vocabulary, semantic component, communicative competence, structural composition, didactic model.*

1. KIRISH

Til ta'limining zamonaviy paradigmasi bilim, koʻnikma va malakalarni kompetensiya tushunchasi doirasida birlashtiradi. Chet tili va ona tilini oʻzlashtirishning markaziy tarkibiy qismlaridan biri leksik kompetensiya boʻlib, u shaxsning soʻz boyligini va bu boylikni nutqda maqsadga muvofiq qoʻllash qobiliyatini qamrab oladi. Leksik kompetensiya kommunikativ kompetensiyaning negizi hisoblanadi: soʻzni bilmasdan, uning ma'nosini anglamasdan va nutqda oʻrinli qoʻllamasdan turib samarali muloqot amalga oshmaydi.

Aynan maktabgacha yosh davri bola nutqi va soʻz boyligining jadal rivojlanish bosqichi hisoblanadi. Bu davrda leksik kompetensiya asoslari shakllanadi: bola soʻzlarni tushunishdan ularni faol nutqda qoʻllashga, alohida nomlashdan umumlashtirish va tasniflashga oʻtadi. Shu bois leksik kompetensiya tushunchasini nazariy jihatdan aniqlash va uning maktabgacha ta'lim kontekstidagi tarkibiy tuzilishini ochib berish alohida ahamiyat kasb etadi.

Mavzuning dolzarbligi shundaki, birinchidan, maktabgacha ta'lim davlat dasturlarida bolaning nutqiy rivojlanishi va soʻz boyligini oshirish ustuvor vazifa sifatida belgilangan. Ikkinchidan, amaliyotda leksik ish koʻpincha soʻzlar sonini oshirishga qaratilib, kompetensiyaning ma'noviy, pragmatik va refleksiv jihatlari e'tibordan chetda qoladi. Uchinchidan, leksik kompetensiyaning maktabgacha ta'limga xos yaxlit tarkibiy modeli yetarlicha ishlab chiqilmagan.

Tadqiqotning maqsadi — leksik kompetensiya tushunchasini nazariy asoslash, uning tarkibiy komponentlarini aniqlash va maktabgacha ta'lim kontekstidagi tuzilishini modellashtirishdan iborat.

Tadqiqot obyekti — maktabgacha yoshdagi bolalarda leksik kompetensiyani shakllantirish jarayoni; predmeti esa leksik kompetensiyaning mohiyati, tarkibiy komponentlari va maktabgacha ta'limga xos tuzilishidir.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda leksik kompetensiya tushunchasiga oid yondashuvlar tizimlashtiriladi, uning beshta tarkibiy komponenti va ularning ulushi aniqlanadi, maktabgacha ta'limga xos maxsus tarkibiy elementlar tavsiflanadi hamda uni shakllantirishning besh bosqichli didaktik modeli taklif etiladi.

Maqola quyidagicha tuzilgan: ikkinchi boʻlimda mavzuga oid adabiyot tahlil qilinadi va tadqiqot boʻshligʻi aniqlanadi; uchinchi boʻlimda material va metodlar tavsiflanadi; toʻrtinchi boʻlimda natijalar jadval va diagrammalarda keltirilib izohlanadi; beshinchi boʻlimda xulosa va tavsiyalar beriladi.

2. MAVZUGA OID ADABIYOTLAR TAHLILI

Kompetensiya tushunchasining lingvodidaktik asoslari kommunikativ kompetensiya nazariyasida ishlab chiqilgan. M. Canale va M. Swain kommunikativ kompetensiyani lingvistik, sotsiolingvistik, diskursiv va strategik komponentlarga ajratib, leksik bilimni lingvistik komponentning oʻzagi sifatida koʻrsatadi [1]. L.F. Bachman kommunikativ til qobiliyati modelida leksik bilimni tashkiliy kompetensiyaning muhim qismi sifatida asoslaydi [2]. Soʻz boyligini oʻzlashtirish mexanizmlari va leksik bilimning koʻp qirraliligi I.S.P. Nation tomonidan batafsil tavsiflangan: u soʻz bilimini shakl, ma'no va qoʻllash oʻlchovlariga ajratadi [3].

Bola nutqi va soʻz boyligining rivojlanish qonuniyatlari psixolingvistikada L.S. Vigotskiy va uning izdoshlari tomonidan oʻrganilgan: soʻz ma'nosining rivojlanishi tafakkur taraqqiyoti bilan uzviy bogʻliqligi asoslangan [4]. Maktabgacha yoshda nutq oʻstirish metodikasining umumiy masalalari pedagogik adabiyotda yoritilgan [5; 6], Oʻzbekistonda esa maktabgacha ta'lim mazmuni davlat oʻquv dasturida belgilangan [7]. Ona tili leksikasini oʻzlashtirish va soʻz boyligini oshirish masalalari oʻzbek tilshunosligi va metodikasida ham koʻrib chiqilgan [8].

Mavjud adabiyot tahlili muhim boʻshliqni koʻrsatadi. Birinchidan, koʻpchilik tadqiqotlar leksik kompetensiyani chet tili ta'limi kontekstida koʻrib chiqadi, uning maktabgacha ona tili ta'limidagi xususiyatlari yetarlicha ochilmagan. Ikkinchidan, leksik kompetensiyaning tarkibiy komponentlari va ularning ulushi tizimli aniqlanmagan. Uchinchidan, maktabgacha ta'limga xos yaxlit tarkibiy va didaktik model taklif etilmagan. Ushbu maqola shu boʻshliqni toʻldirishga qaratilgan.

3. TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-metodologik xarakterga ega boʻlib, kompetensiyaviy, tizimli va yosh-psixologik yondashuvlarga tayanadi. Ishning empirik-eksperimental (tajriba va nazorat guruhlari asosidagi) qismi koʻzda tutilmagan; asosiy e'tibor leksik kompetensiya tushunchasining ilmiy-nazariy mohiyatini ochib berish, uning tarkibiy komponentlarini tizimlashtirish va maktabgacha kontekstda modellashtirishga qaratildi.

Tadqiqot materialini ikki manba tashkil etdi: leksik va kommunikativ kompetensiya hamda nutq oʻstirishga oid ilmiy-metodik adabiyot va maktabgacha ta'lim davlat oʻquv dasturi mazmuni. Tahlil birligi sifatida leksik kompetensiyaning tarkibiy komponenti va uning belgisi olindi. Material tarkibi 1-jadvalda keltirilgan.

1-jadval. Tadqiqot materialining tarkibi

Material turi	Manba	Tahlil birliklari
Ilmiy-metodik adabiyot	leksik/kommunikativ kompetensiya va nutq o‘stirishga oid ishlar	10
Maktabgacha ta’lim mazmuni	davlat o‘quv dasturi va uslubiy tavsiyalar	≈80 birlik
Jami	—	≈90

Tadqiqotda quyidagi nazariy metodlardan foydalanildi: ilmiy-metodik adabiyotni nazariy tahlil qilish — leksik kompetensiyaning mohiyati va komponentlarini aniqlash uchun; kontent-tahlil — komponentlarni ajratish va sanoq bo‘yicha guruhlash uchun; qiyosiy tahlil — turli yondashuvlarni solishtirish uchun; umumlashtirish va tasniflash — komponentlarni tizimlashtirish uchun; modellashtirish — leksik kompetensiyani shakllantirishning didaktik modelini ishlab chiqish uchun.

Leksik kompetensiya deganda so‘z boyligini bilish va uni nutqda o‘rinli qo‘llash qobiliyati tushunildi. Komponentlar operatsional tarzda beshga — lingvistik, semantik, pragmatik-kommunikativ, sotsiolingvistik va refleksiv-strategik guruhga ajratildi. Foizlar bir kasr belgigacha yaxlitlangani sababli yig‘indi 100 foizdan ±1 ga farq qilishi mumkin. Tadqiqotning cheklovi shundan iboratki, kontent-tahlil muayyan darajada ekspert talqiniga tayanadi.

4. NATIJALAR VA TAHLIL

4.1. Leksik kompetensiya tushunchasi

Nazariy tahlil leksik kompetensiyani so‘z boyligini bilish (so‘zning shakli va ma’nosi haqidagi bilim) hamda uni nutqda faol va o‘rinli qo‘llash qobiliyatining birligi sifatida talqin qilish imkonini berdi. Turli yondashuvlarning qiyosiy tavsifi 2-jadvalda keltirilgan.

2-jadval. Leksik kompetensiyaga oid yondashuvlarning qiyosiy tavsifi

Yondashuv / muallif	Leksik kompetensiya talqini
Kommunikativ (Canale, Swain)	lingvistik kompetensiyaning o‘zagi, so‘z bilimini qamrovchi qism
Til qobiliyati (Bachman)	tashkiliy kompetensiyaning tarkibiy elementi
Leksikologik (Nation)	so‘z bilimining shakl, ma’no va qo‘llash o‘lchovlari birligi
Psixolingvistik (Vigotskiy)	so‘z ma’nosining tafakkur bilan bog‘liq rivojlanishi

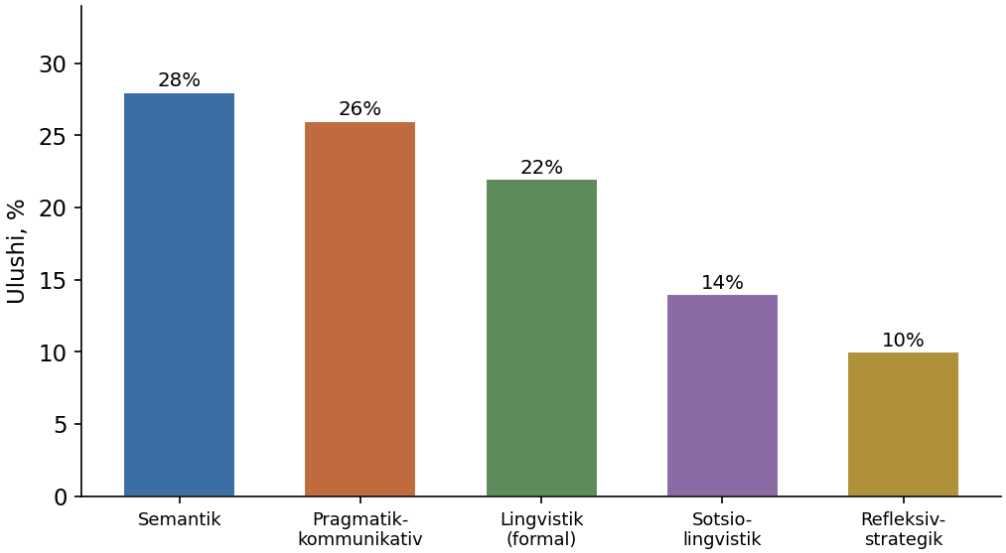
4.2. Leksik kompetensiyaning tarkibiy komponentlari

Tahlil leksik kompetensiyani beshta tarkibiy komponentga ajratish imkonini berdi. Ularning mohiyati 3-jadvalda, nazariy adabiyotdagi nisbiy ulushi esa 2-diagrammada keltirilgan.

3-jadval. Leksik kompetensiyaning tarkibiy komponentlari

Komponent	Ulushi, %	Mohiyati
Semantik	28	so‘z ma’nosini tushunish, ma’no bog‘lanishlari va umumlashtirish
Pragmatik-kommunikativ	26	so‘zni nutqiy vaziyatga mos, o‘rinli qo‘llash
Lingvistik (formal)	22	so‘z shakli, tovush-harf tarkibi, so‘z yasalishi
Sotsiolingvistik	14	madaniy-milliy va etiket leksikasini bilish
Refleksiv-strategik	10	o‘z lug‘atini nazorat qilish, noma’lum so‘z strategiyasi
Jami	100	—

2-diagramma. Leksik kompetensiya komponentlarining nisbiy ulushi (%)



Tahlil koʻrsatadiki, leksik kompetensiya tuzilishida semantik (28%) va pragmatik-kommunikativ (26%) komponentlar yetakchi oʻrin egallaydi: aynan ular soʻzni bilishdan uni maʼnoli va oʻrinli qoʻllashga oʻtishni taʼminlaydi. Lingvistik (22%) komponent soʻzning formal tomonini, sotsiolingvistik (14%) komponent madaniy-etiket leksikasini, refleksiv-strategik (10%) komponent esa oʻz lugʻatini boshqarishni qamrab oladi. Komponentlar oʻzaro bogʻliq boʻlib, leksik kompetensiyani rivojlantirish ularning barchasini nazarda tutishi lozim.

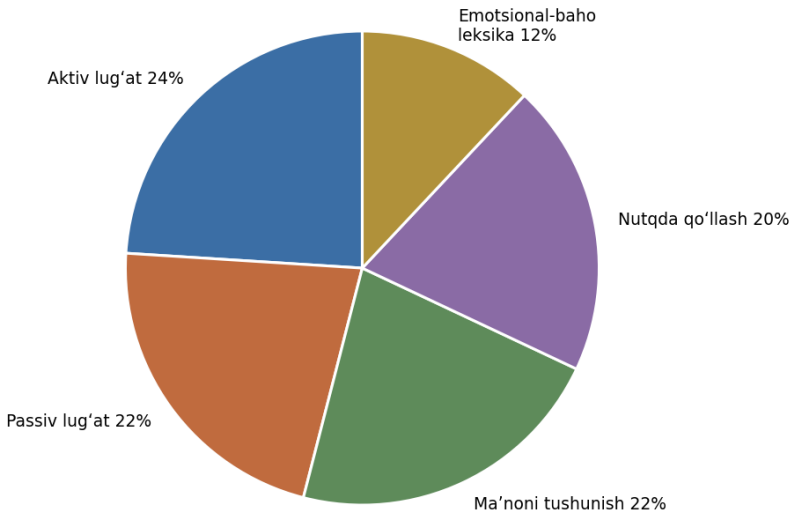
4.3. Leksik kompetensiyaning maktabgacha taʼlim kontekstidagi tuzilishi

Maktabgacha yosh xususiyatlaridan kelib chiqib, leksik kompetensiyaning umumiy komponentlari sohaga xos maxsus tarkibiy elementlarda namoyon boʻladi. Ushbu elementlar 4-jadvalda, ularning nisbiy ulushi esa 3-diagrammada keltirilgan.

4-jadval. Leksik kompetensiyaning maktabgacha taʼlimdagi tarkibiy elementlari

Element	Mohiyati	Namoyon boʻlishi
Passiv lugʻat	tushuniladigan, ammo faol qoʻllanmaydigan soʻzlar	rasm yoki buyumni nom boʻyicha tanish
Aktiv lugʻat	bola nutqida faol qoʻllaydigan soʻzlar	soʻzni mustaqil aytish va gapda ishlatish
Maʼnoni tushunish	soʻz maʼnosini anglash va farqlash	umumlashtirish, tasniflash, antonim/sinonim
Nutqda qoʻllash	soʻzni jumla va matnda ishlatish	gap tuzish, hikoya qilish, savolga javob
Emotsional-baho leksika	his-tuygʻu va munosabat soʻzlari	yoqtirish, baho va kayfiyatni ifodalash

3-diagramma. Maktabgacha leksik kompetensiya elementlarining nisbiy ulushi (%)



Maktabgacha kontekstda passiv va aktiv lug‘at (jami 46%) leksik kompetensiyaning asosini tashkil etadi: bola avval so‘zni tushunadi, so‘ngra uni faol nutqqa o‘tkazadi. Ma’noni tushunish (22%) va nutqda qo‘llash (20%) leksik bilimni kommunikativ malakaga aylantiradi, emotsional-baho leksika (12%) esa bolaning his-tuyg‘u va munosabatlarini ifodalashga xizmat qiladi. Bu elementlar bosqichma-bosqich rivojlanadi.

4.4. Leksik kompetensiyani shakllantirishning didaktik modeli

Nazariy tahlil natijasida maktabgacha yoshda leksik kompetensiyani shakllantirishning besh bosqichli didaktik modeli ishlab chiqildi. Model so‘zni idrok etishdan uni mustaqil nutqda qo‘llashgacha bo‘lgan yaxlit jarayonni qamrab oladi (5-jadval).

5-jadval. Leksik kompetensiyani shakllantirishning didaktik modeli

Bosqich	Didaktik maqsad	Faoliyat turi
Idrok (pertseptiv)	so‘zni eshitish va idrok etish	eshitish, ko‘rsatish, takrorlash
Semantizatsiya	so‘z ma’nosini ochib berish	rasm, buyum, harakat orqali izohlash
Mustahkamlash	so‘zni passiv lug‘atga kiritish	didaktik o‘yin, mashq, takror
Faollashtirish	so‘zni aktiv nutqqa o‘tkazish	gap tuzish, dialog, hikoya
Ijodiy qo‘llash	so‘zni erkin nutqda ishlatish	rolli o‘yin, hikoya to‘qish, baholash

4.5. Natijalarning muhokamasi

Nazariy tahlil leksik kompetensiyani yaxlit, ko‘p komponentli tuzilma sifatida talqin qilish zarurligini asoslaydi. Semantik va pragmatik-kommunikativ komponentlarning yetakchiligi (jami 54%) leksik ishni so‘zlar sonini oshirishdan ma’no va qo‘llashga yo‘naltirish lozimligini ko‘rsatadi. Bu I.S.P. Nation [3] va L.S. Vigotskiy [4] ta’kidlagan qoidaga mos keladi: so‘zni o‘zlashtirish uning shakli, ma’nosi va qo‘llanishi birligida kechadi.

Taklif etilgan model passiv lug‘atni aktiv lug‘atga bosqichma-bosqich o‘tkazish mantiqini aks ettiradi va maktabgacha nutq o‘stirishni tizimlashtiradi. Shu bilan birga, modelni joriy etish tarbiyachidan metodik tayyorgarlik, boy til muhiti va bolaning individual xususiyatlarini hisobga olishni talab qiladi — bu asosiy amaliy cheklovdir.

5. XULOSA

O‘tkazilgan nazariy-metodologik tahlil quyidagi xulosalarga olib keladi.

Birinchidan, leksik kompetensiya — so‘z boyligini bilish va uni nutqda o‘rinli qo‘llash qobiliyatining birligi bo‘lib, kommunikativ kompetensiyaning negizini tashkil etadi.

Ikkinchidan, leksik kompetensiya beshta tarkibiy komponentdan iborat bo‘lib, ularning ulushi quyidagicha aniqlandi: semantik (28%), pragmatik-kommunikativ (26%), lingvistik (22%), sotsiolingvistik (14%) va refleksiv-strategik (10%).

Uchinchidan, maktabgacha ta’lim kontekstida leksik kompetensiya maxsus tarkibiy elementlarda — passiv va aktiv lug‘at, ma’noni tushunish, nutqda qo‘llash va emotsional-baho leksikada — namoyon bo‘ladi.

To‘rtinchidan, taklif etilgan besh bosqichli didaktik model (idrok, semantizatsiya, mustahkamlash, faollashtirish, ijodiy qo‘llash) leksik kompetensiyani izchil shakllantirishning nazariy asosini beradi.

Amaliy tavsiyalar: (a) leksik ishni so‘z ma’nosi va nutqda qo‘llashga yo‘naltirish; (b) passiv lug‘atni aktiv lug‘atga o‘tkazuvchi didaktik o‘yin va mashqlardan foydalanish; (c) boy va rivojlantiruvchi til muhitini yaratish; (d) leksik kompetensiya darajasini baholash mezonlarini ishlab chiqish.

Tadqiqot istiqbollari taklif etilgan modelning amaliy samaradorligini baholovchi mezonlar tizimini yaratish, uni turli yosh guruhlari uchun aprobatsiya qilish hamda ikki tilli (ona tili va chet tili) leksik kompetensiyani qiyosiy o‘rganish bilan bog‘liq.

MUALLIFLAR BAYONOTLARI

Mualliflar hissasi. Maqola yakka muallif tomonidan tayyorlangan. Muallif tadqiqot konsepsiyasini ishlab chiqish, material to‘plash va tahlil qilish, natijalarni talqin etish hamda matnni yozish bosqichlarini mustaqil bajardi.

Manfaatlar to‘qnashuvi. Muallif manfaatlar to‘qnashuvi mavjud emasligini ma’lum qiladi.

Moliyalashtirish. Tadqiqot hech qanday tashqi moliyalashtirish manbaisiz, muallifning shaxsiy tashabbusi asosida amalga oshirilgan.

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INGLIZ VA O‘ZBEK KOMPYUTER LINGVISTIKASI TERMINOLOGIYASIDA SEMANTIK MUNOSABATLARNING QIYOSIY TAHLILI

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Annotatsiya: *Maqolada ingliz va o‘zbek kompyuter lingvistikasi terminologiyasidagi giperonim-giponim hamda meronim-xolonim semantik munosabatlari tahlil qilinadi. Tadqiqotda kompyuter lingvistikasi terminlarining umumiy va xususiy tushunchalar o‘rtasidagi ierarxik aloqalari, shuningdek, qism va butun munosabatini ifodalovchi birliklar qiyosiy jihatdan ko‘rib chiqilgan. Tahlil natijasida language model – neural language model, corpus – parallel corpus, annotation – morphological annotation kabi birliklarda giperonim-giponim munosabati, corpus – document – sentence – token, frame element – semantic frame, tag – tagset kabi birliklarda esa meronimik munosabat namoyon bo‘lishi aniqlandi. Ingliz va o‘zbek tillarida konseptual munosabatlar ko‘p hollarda izomorf bo‘lsa-da, ularning nominativ ifodasi tilning struktur xususiyatlariga ko‘ra farqlanadi.*

Kalit so‘zlar: *kompyuter lingvistikasi, terminologiya, giperonim, giponim, meronim, xolonim, semantik munosabat, terminologik tizim.*

СОПОСТАВИТЕЛЬНЫЙ АНАЛИЗ СЕМАНТИЧЕСКИХ ОТНОШЕНИЙ В ТЕРМИНОЛОГИИ АНГЛИЙСКОЙ И УЗБЕКСКОЙ КОМПЬЮТЕРНОЙ ЛИНГВИСТИКИ

Аннотация: *В статье анализируются семантические отношения гиперонимии-гипонимии и меронимии-холонимии в терминологии английской и узбекской компьютерной лингвистики. В работе проводится сравнительный анализ иерархических связей между общими и частными понятиями в терминологии данной области, а также единиц, выражающих отношения «часть — целое». Анализ выявляет отношения гиперонимии-гипонимии в таких парах, как *language model* – *neural language model* (языковая модель – нейронная языковая модель), *corpus* – *parallel corpus* (корпус – параллельный корпус) и *annotation* – *morphological annotation* (аннотация – морфологическая аннотация), тогда как меронимические отношения наблюдаются в таких единицах, как *corpus* – *document* – *sentence* – *token* (корпус – документ – предложение – токен), *frame element* – *semantic frame* (элемент фрейма – семантический фрейм) и *tag* – *tagset* (тег – набор тегов). Несмотря на то, что концептуальные связи в английском и узбекском языках зачастую изоморфны, способы их номинации различаются в зависимости от структурных особенностей соответствующих языков.*

Ключевые слова: *компьютерная лингвистика, терминология, гипероним, гипоним, мероним, холоним, семантическое отношение, терминосистема.*

A COMPARATIVE ANALYSIS OF SEMANTIC RELATIONS IN ENGLISH AND UZBEK COMPUTATIONAL LINGUISTICS TERMINOLOGY

Abstract: *This article analyzes the semantic relationships of hypernymy-hyponymy and meronymy-holonymy within the terminology of English and Uzbek computational linguistics. The study comparatively examines the hierarchical connections between general and specific concepts in computational linguistics terminology, as well as units expressing part-whole relationships. The analysis reveals hypernym-hyponym relationships in units such as *language model* – *neural language model*, *corpus* – *parallel corpus*, and *annotation* – *morphological annotation*, while meronymic relationships are observed in units such as *corpus* – *document* – *sentence* – *token*, *frame element* – *semantic frame*, and *tag* – *tagset*. Although conceptual relationships in English and Uzbek are often isomorphic, their nominative expressions differ according to the structural characteristics of the respective languages.*

Keywords: *computational linguistics, terminology, hypernym, hyponym, meronym, holonym, semantic relationship, terminological system.*

KIRISH

Kompyuter lingvistikasi terminologiyasi oddiy terminlar yig‘indisi emas, balki o‘zaro semantik, mantiqiy va ierarxik aloqalar asosida tashkil topgan terminologik tizimdir. Shu sababli soha terminlarini faqat alohida definitsiyalar orqali

tavsiflash yetarli emas. Har bir terminning terminologik tizimdagi o‘rni, unga nisbatan yuqori va quyi darajadagi tushunchalar hamda boshqa birliklar bilan munosabati ham aniqlanishi zarur. O‘zbek terminologiyasida terminning tizimdagi o‘rni, uni tanlash va tartibga solish masalalari alohida ilmiy yo‘nalish sifatida o‘rganilgan [1–3].

Tadqiqot materialida aynan shu nuqtayi nazardan “termin → konsept → konseptlararo munosabat → terminologik tizim” modeli taklif etiladi. Bunday yondashuv terminni alohida nominativ birlik sifatida emas, balki muayyan bilim sohasi ichidagi konseptual tizimning tarkibiy elementi sifatida ko‘rib chiqish imkonini beradi.

O‘zbek tilshunosligida semantik munosabatlar Ne’matov, Rasulov, Safarova, Mirtodjiev, Dadaboev, Hojiyev, Madvaliyev, Axmedov, Paluanova va boshqa olimlar tomonidan o‘rganilgan. Mazkur tadqiqotlarda leksik-semantik, sistem-struktur, paradigmatik hamda sohaviy terminologik munosabatlarning turli jihatlari yoritilgan [1–5]. Ayniqsa, terminologik birliklarning taksonomik va meronimik aloqalarini lingvistik bazalarda modellashtirish masalalari zamonaviy tadqiqotlarda yanada rivojlantirilgan [5].

Maqolaning maqsadi ingliz va o‘zbek kompyuter lingvistikasi terminologiyasida giperonim-giponim hamda meronim-xolonim munosabatlarining mazmunini aniqlash, ularning o‘zaro farqini ko‘rsatish va terminologik tizimdagi funksiyasini ochib berishdan iborat.

METODOLOGIYA

Tadqiqotda qiyosiy-semantik, komponent va konseptual tahlil usullaridan foydalanildi. Tahlil materiali sifatida ingliz va o‘zbek tillaridagi kompyuter lingvistikasi terminlari, xususan, til modeli, korpus, annotatsiya, parsing, klassifikatsiya, elektron lug‘at, mashina tarjimasi va semantik qidiruv bilan bog‘liq birliklar olindi.

Tadqiqotning dastlabki mezoni giperonim-giponim munosabatini aniqlash uchun “X – Yning bir turi” formulasidan foydalanishdan iborat. Ikkinchi mezon esa meronim-xolonim munosabatini aniqlashda “X – Yning bir qismi” formulasi bilan belgilanadi. Terminologik birliklarning tasnifida ularning faqat shakliy yaqinligiga emas, balki ifodalagan tushunchalarining mantiqiy hajmi, mazmuni va konseptual bo‘ysunishiga tayanish zarur.

Mazkur ikki mezonning ajratilishi terminologik tasnifdagi konseptual xatolarning oldini olish uchun muhimdir. Chunki bir xil grammatik yoki leksik model asosida shakllangan terminlar har doim bir xil semantik munosabatni ifodalamaydi. Shu sababli terminlar o‘rtasidagi munosabatni aniqlashda ularning konseptual xususiyatlari asosiy mezon sifatida olinadi.

NATIJALAR

Giperonim-giponim munosabati kompyuter lingvistikasi terminologiyasining ichki ierarxiyasini tashkil etuvchi asosiy semantik munosabatlardan biridir. Giperonim kengroq tushunchani, giponim esa shu tushunchaning muayyan turini ifodalaydi. Terminologik tizimda bunday munosabat umumiydan xususiyga yo‘nalgan konseptual tartibni ta’minlaydi [4].

Masalan, language model giperonim bo‘lsa, statistical language model, neural language model va large language model uning giponimlari hisoblanadi. Xuddi shunday, corpus giperonim, monolingual corpus, parallel corpus, comparable corpus, annotated corpus esa unga nisbatan giponimik birliklardir. Annotation → morphological annotation / syntactic annotation / semantic annotation qatori ham xuddi shu munosabatni ko‘rsatadi.

Giponim giperonim tarkibidagi asosiy integral semani saqlab qoladi va unga qo‘shimcha differensial sema qo‘shadi. Masalan, *corpus* terminida elektron shaklda tashkil etilgan til ma’lumotlari majmui haqidagi umumiy tushuncha mavjud bo‘lsa, *parallel corpus* ushbu umumiy tushunchaga ikki yoki undan ortiq tillardagi o‘zaro muvofiq matnlar belgisini qo‘shadi. Natijada umumiy tushunchadan xususiy tushunchaga tomon yo‘nalgan semantik ierarxiya yuzaga keladi [4].

Bu jarayon termin tanlash va terminologik tizimni tartibga solish masalalari bilan ham bog‘liq. Terminologik birlikning aniq konseptni ifodalashi, uning boshqa birliklardan farqlanishi va tizimdagi maqomining belgilanishi terminologik me’yorlashning muhim shartlaridan biridir [2].

Qiziqarli jihati shundaki, terminning semantik maqomi doim ham bir xil emas. Masalan, morphological analyzer umumiyroq *language processing tool* tushunchasiga nisbatan giponim bo‘lishi mumkin, biroq *rule-based morphological analyzer* yoki *neural morphological analyzer*ga nisbatan giperonim vazifasini bajaradi. Demak, terminning maqomi uning tizimdagi konkret darajasiga bog‘liq [5].

Meronim-xolonim munosabati

Meronimiya giperonim-giponim munosabatidan semantik tabiati bilan farq qiladi. Bu yerda asosiy formula “X – Yning bir qismi” tarzida namoyon bo‘ladi. Terminologik tadqiqotlarda bunday munosabatni taksonomik aloqa bilan aralashtirmaslik muhimdir [5].

Masalan, corpus – document – sentence – token ketma-ketligini bir xil giponimik qator sifatida baholash mumkin emas. *Sentence corpus*ning bir turi emas, balki uning tarkibidagi til birligi sifatida qaraladi. Xuddi shunday *token* ham *corpus*ning turi emas, balki matnni kompyuter qayta ishlashi uchun ajratiladigan diskret birliklardan biridir.

Kompyuter lingvistikasi terminologiyasida meronimiya faqat moddiy “qism-butun” munosabati bilan cheklanmaydi. U komponent–tizim, element–struktura, a’zo–to‘plam, modul–arxitektura va boshqa abstrakt

munosabatlarni ham qamrab oladi. Masalan, *lemmatizer module — NLP pipeline*, *tag — tagset*, *frame element — semantic frame* birliklari bunga misol boʻla oladi [5].

Meronimik munosabatlarni aniqlashda terminlarning qanday konseptual tizim tarkibiga kirishini koʻrsatish muhim. Bu jihat elektron terminologik bazalarni yaratishda ham alohida ahamiyat kasb etadi, chunki terminni faqat ta'riflash emas, uning tizimdagi tarkibiy maqomini koʻrsatish ham zarur [3; 5].

Shunday qilib, giponimiya "tur-jins" munosabatini, meronimiya esa "qism-butun" munosabatini ifodalaydi. Ushbu farqni nazardan chetda qoldirish terminologik tizimni notoʻgʻri modellashtirishga olib kelishi mumkin.

Ingliz va oʻzbek tillarining qiyosiy xususiyatlari

Tadqiqot natijalari konseptual munosabatlarning ingliz va oʻzbek tillarida asosan oʻxshash ekanini koʻrsatadi. Buning sababi ushbu terminologiya ortida turgan ilmiy tushunchalarning umumiyligi bilan bogʻliq. Masalan, *neural language model* va *neyron til modeli*, *parallel corpus* va *parallel korpus*, *semantic annotation* va *semantik annotatsiya* kabi birliklarda asosiy konseptual munosabat saqlanib qoladi.

Biroq nominativ ifoda tilning struktur xususiyatiga bogʻliq. Ingliz tilida *neural language model*, *annotated corpus*, *dependency parser* kabi birliklarda aniqlovchi komponent odatda asosiy termin oldidan keladi. Oʻzbek tilida ham *neyron til modeli*, *annotatsiyalangan korpus* singari modellar mavjud, biroq ayrim terminlar izohlovchi komponentlar yoki oʻzbek tilining affiksal imkoniyatlari hisobiga nisbatan kengroq shakllanishi mumkin. Shu sababli semantik munosabat izomorf boʻlsa, uning nominativ ifodasi qisman allomorf xususiyatga ega boʻladi [1; 2].

Bunga *tokenization* terminining oʻzbek tilidagi tokenizatsiya, tokenlash, tokenlarga ajratish, matnni tokenlarga ajratish kabi variantlari misol boʻla oladi. Ushbu shakllar tashqi koʻrinish jihatidan farq qilsa-da, ularning asosiy yadroviy konsepti matnni keyingi kompyuter qayta ishlashi uchun shartli birliklarga ajratish jarayonini ifodalaydi. Biroq barcha variantlarni mutlaq sinonim deb baholash toʻgʻri emas, chunki terminologik birliklar ayrim holatlarda konseptning turli darajalarini ifodalashi mumkin [2; 4].

MUHOKAMA

Kompyuter lingvistikasi terminologiyasida semantik munosabatlarni toʻgʻri aniqlash nafaqat nazariy, balki amaliy ahamiyatga ham ega. Terminologik lugʻat yoki elektron ma'lumotlar bazasida atamaning faqat ta'rifi berilsa, uning konseptual maqomi toʻliq ochilmaydi. Terminning giperonimi, giponimlari, meronimlari va xolonimlarini ham koʻrsatish uning terminologik tizimdagi oʻrnini aniq belgilashga imkon beradi. Bunday yondashuv zamonaviy terminologiya va leksikografiyada terminlarning tizimiy aloqalarini ochib berish bilan bogʻliq.

Masalan, machine translation system giperonim boʻlib, rule-based machine translation system, statistical machine translation system, neural machine translation system va hybrid machine translation system giponimik qatorni hosil qiladi. Bunda har bir giponim umumiy kategoriyaning muayyan texnologik turini ifodalaydi [4].

Boshqa tomondan, semantic frame – frame element, NLP pipeline – lemmatizer module, tagset – tag kabi birliklar qism-butun aloqasini ifodalaydi. Ularni giponimik qatorga kiritish semantik jihatdan notoʻgʻri boʻladi. Meronimik munosabatning aynan shu jihati uni terminologik tasnifning mustaqil modeli sifatida ajratishni talab qiladi.

Shu asosda kompyuter lingvistikasi terminologiyasini semantik tasniflashda ikki diagnostik savoldan foydalanish maqsadga muvofiq:

"X — Yning turimi?" — giperonim-giponim munosabatini aniqlash uchun;

"X — Yning tarkibiy qismimi?" — meronim-xolonim munosabatini aniqlash uchun.

Ushbu mezonlar terminlarni konseptual jihatdan toʻgʻri guruhlash, ularning oʻzaro munosabatlarini belgilash va terminologik ma'lumotlar bazalarini shakllantirishda metodik asos boʻlib xizmat qilishi mumkin.

Mazkur yondashuv terminologik lugʻat tuzishda ham amaliy ahamiyat kasb etadi. Xususan, inglizcha-oʻzbekcha kompyuter lingvistikasi terminologik lugʻatida termin – ta'rif – giperonim – giponim – meronim – xolonim – ekvivalent – kontekst modeli terminning konseptual maqomini batafsil koʻrsatish imkonini beradi. Bu model terminologik va leksikografik ma'lumotlarni tizimlashtirishga xizmat qilishi mumkin.

XULOSA

Ingliz va oʻzbek kompyuter lingvistikasi terminologiyasidagi semantik munosabatlar terminologik tizimning ichki tuzilishini belgilovchi muhim omillardan biridir. Giperonim-giponim munosabatida umumiydan xususiyga yoʻnalgan ierarxiya yuzaga keladi. Meronim-xolonim munosabatida esa butun tushuncha va uning tarkibiy qismlari oʻrtasidagi aloqa ifodalanadi.

Tahlil natijalari ingliz va oʻzbek tillarida konseptual munosabatlarning katta qismi bir xil mantiqiy asosga ega ekanini, biroq ularning lingvistik ifodalanish shakllari tilning struktur xususiyatlariga koʻra farqlanishini koʻrsatdi. Ayniqsa, oʻzbek tilida terminlarning oʻzlashma asoslar, milliy affikslar va izohlovchi komponentlar yordamida kengayishi kuzatiladi.

Giperonimiya va meronimiyani bir-biridan aniq farqlash terminologik tasnifning ilmiy aniqligini ta’minlaydi. Bu farq elektron lug‘atlar, terminologik ma’lumotlar bazalari, semantik teglash, ontologiyalar va avtomatik tilni qayta ishlash tizimlarini yaratishda muhim ahamiyatga ega.

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ERKIN A'ZAMNING "OTOYINING TUG'ILGAN YILI" QISSASIDA QAHRAMON PSIXOLOGIYASINING BADIIY TALQINI

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Annotatsiya: *Mazkur maqolada Erkin A'zamning "Otoyining tug'ilgan yili" qissasida qahramon psixologiyasining badiiy talqini tadqiq etiladi. Tadqiqotning asosiy maqsadi yozuvchining qahramon ruhiyatini yoritishdagi badiiy mahoratini hamda psixologik tasvir vositalaridan foydalanish xususiyatlarini tahlil qilishdan iborat. Maqolada qissaning bosh qahramoni Asqar Shodibekov obrazi misolida insonning ichki kechinmalari, axloqiy tanlovi, ruhiy ziddiyatlari va ma'naviy qarashlarining badiiy ifodasi yoritiladi. Shuningdek, qahramon xarakterini shakllantirishda ichki monolog, dialog, psixologik detal, portret va ramziy tasvirlarning o'rni tahlil qilinadi. Maqola natijalari Erkin A'zam ijodida psixologizmning badiiy funksiyasini chuqurroq anglashga xizmat qiladi hamda zamonaviy o'zbek nasrida qahramon ruhiyatini tasvirlash tamoyillarini o'rganishga ilmiy hissa qo'shadi.*

Kalit so'zlar: *Erkin A'zam, qissa, badiiy obraz, xarakter, ichki monolog, ruhiy kechinma, badiiy detal, o'zbek adabiyoti.*

ХУДОЖЕСТВЕННАЯ ИНТЕРПРЕТАЦИЯ ПСИХОЛОГИИ ГЕРОЯ В ПОВЕСТИ ЭРКИНА АЪЗАМА «OTOYINING TUG'ILGAN YILI»

Аннотация: *В данной статье исследуется художественная интерпретация психологии героя в повести Эркина Аъзама «Otoyining tug'ilgan yili». Основная цель исследования заключается в анализе художественного мастерства писателя в раскрытии внутреннего мира персонажа, а также особенностей использования средств психологического изображения. В статье на примере образа главного героя повести Аскара Шодибекова рассматриваются художественное выражение внутренних переживаний человека, его нравственного выбора, душевных противоречий и духовных взглядов. Кроме того, анализируется роль внутреннего монолога, диалога, психологической детали, портрета и символических образов в формировании характера героя. Результаты исследования способствуют более глубокому пониманию художественной функции психологизма в творчестве Эркина Аъзама и вносят научный вклад в изучение принципов изображения внутреннего мира героя в современной узбекской прозе.*

Ключевые слова: *Эркин Азам, повесть, художественный образ, характер, внутренний монолог, душевное переживание, художественная деталь, узбекская литература.*

THE ARTISTIC INTERPRETATION OF CHARACTER PSYCHOLOGY IN ERKIN A'ZAM'S NOVELLA "OTOYINING TUG'ILGAN YILI"

Abstract: *This article examines the artistic interpretation of character psychology in Erkin A'zam's novella "Otoyining tug'ilgan yili". The main purpose of the study is to analyze the writer's artistic skill in revealing the inner world of the character and the specific features of using psychological representation techniques. The article explores the artistic expression of human inner experiences, moral choices, psychological conflicts, and spiritual views through the image of the main character, Asqar Shodibekov. It also analyzes the role of internal monologue, dialogue, psychological details, portrait descriptions, and symbolic images in shaping the character's personality. The findings of the study contribute to a deeper understanding of the artistic function of psychologism in Erkin A'zam's works and provide a scholarly contribution to the study of character portrayal principles in modern Uzbek prose.*

Keywords: *Erkin A'zam, novella, literary image, character, internal monologue, psychological experience, artistic detail, Uzbek literature.*

O'zbek adabiyoti XX asrning so'nggi choragida yangi badiiy tafakkur egalari hisoblangan iste'dodli ijodkorlar avlodi kirib kelishi bilan boyidi. Ular o'zbek nasrini yangi mavzular, yangicha badiiy tafakkur hamda inson ruhiyatini chuqur tasvirlash usullari bilan rivojlantirdilar. Shunday iste'dodli ijodkorlardan biri Erkin A'zam bo'lib, u o'ziga xos uslubi, hayotiy voqelikni nozik kuzatishi va inson ichki dunyosini tabiiy ifodalashi bilan zamonaviy o'zbek adabiyotida o'ziga xos o'ringa ega. Qissa va hikoya janrida samarali ijod qilib, kichik hajmli asarlar orqali ham keng hayotiy muammolarni

yoritishga muvaffaq bo‘lganligi Erkin A’zam ijodining muhim xususiyatlaridan biridir. Uning asarlarida badiiy mazmun va psixologik qatlam nihoyatda chuqurdir. Adib qahramonlarining ruhiy olamini, ichki kechinmalarini va hayotiy qarashlarini dialoglar, ichki monologlar hamda badiiy detallar vositasida yoritadi. Jumladan, **“Otoyining tug‘ilgan yili”** qissasi yozuvchining badiiy mahoratini yaqqol namoyon etuvchi asarlardan biridir. Qissada talabalik muhiti, yoshlar dunyoqarashi, insonning o‘z-o‘zi bilan ichki kurashi hamda jamiyatdagi axloqiy-me’yoriy qarashlar badiiy talqin etiladi. Yozuvchi asarning bosh qahramoni orqali shaxsning ijtimoiy muhit bilan munosabati, ichki ziddiyatlari va ruhiy izlanishlarini badiiy psixologik tasvir vositasida ochib beradi. Shuning uchun qissa faqatgina voqealar rivoji bilan emas, balki inson ruhiyatidagi murakkab kechinmalarini aks ettirishi bilan ham alohida e’tiborga loyiqdir.

Adabiyotning badiiy qiymati unda ko‘tarilgan mavzu yoki muammolar qanday badiiy mahorat bilan ifodalanganligi bilan belgilanadi. Xususan, Erkin A’zam oddiy hayotiy voqealarni chuqur falsafiy mazmun bilan boyitib, qahramon ruhiyatidagi eng nozik o‘zgarishlarni tabiiy va ishonarli tarzda tasvirlay olgan ijodkor sifatida e’tirof etiladi. Ayniqsa, “Otoyining tug‘ilgan yili” qissasida psixologik tasvirning badiiy imkoniyatlaridan samarali foydalanilgani asarning estetik qiymatini yanada oshiradi.

Badiiy adabiyotda insonning ruhiyati, ichki kechinmalari, his-tuyg‘ulari va xarakter evolyutsiyasini asosiy o‘ringa qo‘yib tasvirlash adabiyotshunoslikda ***psixologizm*** tushunchasi bilan izohlanadi. Ushbu yondashuvdan foydalangan ijodkor voqealar rivojini emas, balki voqealarning inson ruhiyatiga ko‘rsatgan ta’sirini ochib berishga e’tibor qaratadi. Shu jihatdan *psixologizm* badiiy obrazning hayotiyligi va ishonarliligini ta’minlovchi muhim omillardan biri hisoblanadi [Quronov, 2018]. Adabiyotshunos D. Quronov psixologizmni badiiy obrazning ichki mohiyatini ochish vositasi sifatida baholab, yozuvchi qahramon xarakterini faqat tashqi harakatlar orqali emas, balki uning tafakkuri, his-tuyg‘ulari va ruhiy kechinmalari orqali ham namoyon etishini ta’kidlaydi [Quronov, 2018]. Shunday qilib, zamonaviy adabiyotda inson ruhiyatini chuqur tahlil qilish badiiy haqiqatni yaratishning asosiy shartlaridan biridir.

O‘zbek adabiyotshunosligida psixologik tasvir masalasiga bag‘ishlangan tadqiqotlarda U.Normatov va N.Karimov ham badiiy xarakter yaratishda ruhiy tahlilning ahamiyatini alohida qayd etadilar. Ularning fikricha, yozuvchi qahramonning ma’naviy olamini ochishda tashqi voqealardan ko‘ra ichki kechinmalar tasviriga ko‘proq e’tibor qaratadi. Ayniqsa, o‘zbek nasrida XX asrning ikkinchi yarmida vujudga kelgan psixologik tasvir tushunchasi yetakchi poetik tamoyillardan biriga aylandi [Karimov, 2008; Normatov, 2007].

Rus adabiyotshunosi Lidiya Ginzburg psixologik nasrni inson ongining badiiy tadqiqi sifatida baholab, qahramonning ichki dunyosini ochishda muallif turli tasvir vositalaridan kompleks tarzda foydalanishini ta’kidlaydi [Ginzburg, 1977]. Uning fikricha, psixologizm faqat ichki monolog bilan chegaralanmaydi; portret, dialog, badiiy detal va hatto makon ham qahramon ruhiyatini yoritishda muhim vazifa bajaradi. M. Baxtin badiiy asardagi dialogiklik nazariyasini ishlab chiqib, qahramon shaxsiyatini anglashda uning boshqa obrazlar bilan muloqoti va ichki ovozining o‘zaro uyg‘unligini muhim omil sifatida izohlaydi [Bakhtin, 1981]. Mazkur qarash zamonaviy nasrda qahramon ruhiyatini ifodalash usullarini chuqurroq tahlil qilishga yordam beradi. Psixologik tasvirning eng samarali vositalaridan biri ichki monologdir. Ichki monolog orqali qahramonning aytilmagan fikrlari, shubhalari, xotiralari va ruhiy iztiroblari bevosita o‘quvchiga yetkaziladi. Yuqorida ta’kidlanganidek, portret tasviri, dialoglar, psixologik detallar va peyzaj ham qahramonning hissiy holatini ifodalashda muhim estetik vazifani bajaradi. Tabiat manzarasi ko‘pincha qahramonning ruhiy holati bilan uyg‘unlashib, uning kayfiyati va ichki ziddiyatlarini ramziy tarzda aks ettiradi. Erkin A’zam ijodida ham psixologizm ana shu badiiy vositalarning uzviy uyg‘unligi orqali namoyon bo‘ladi. Yozuvchi qahramonlarning ichki olamini keskin voqealar emas, balki oddiy hayotiy vaziyatlar, esdaliklar, sukut, nigoh va mayda badiiy detallar vositasida ochib beradi. Ayniqsa, “Otoyining tug‘ilgan yili” qissasida qahramon ruhiyatining bosqichma-bosqich ochilishi psixologik tasvirning yetakchi poetik tamoyilga aylanganini ko‘rsatadi. Shu sababli mazkur qissani psixologizm nuqtayi nazaridan tahlil qilish yozuvchining badiiy mahoratini chuqurroq anglash imkonini beradi.

“Otoyining tug‘ilgan yili” qissasining badiiy tuzilishida qahramonning ichki olami yetakchi o‘rinni egallaydi. Muallif voqealarni shunchaki bayon qilish bilan cheklanmay, Asqar Shodibekovning ruhiy izlanishlari, axloqiy tanlovlari va ma’naviy kechinmalarini asarning asosiy mazmuniy o‘qiga aylantiradi. Muallif Asqar Shodibekov obrazini tashqi harakatlar orqali emas, balki uning fikrlash tarzi, voqelikka munosabati va ichki ziddiyatlari orqali shakllantiradi. Shu jihatdan qissa o‘zbek nasrida psixologik realizm an’analarini davom ettirgan asarlardan biri sifatida e’tiborga loyiq. Asqar Shodibekovning xarakteri ilk sahifalardanoq boshqa qahramonlardan ajralib turadi. Muallif uni “mag‘zi to‘q yong‘oq” sifatida tavsiflaydi. Bu o‘xshatish qahramonning tashqi ko‘rinishini emas, balki uning ichki mohiyatini ifodalaydi. Asqar yuzaki taassurotlar bilan kifoyalanmaydi, har qanday hodisaning tub mohiyatini anglashga intiladi. Boshqa talabalar savolga javob izlash bilan band bo‘lgan bir paytda, Asqar uning tuzilishi va mazmunini tahlil qiladi. Uning e’tibori javobni yoddan aytishga emas, masalaning mohiyatini anglashga qaratilgani qahramon xarakterining muhim belgilaridan biridir. Aynan shu epizod qahramonning mustaqil tafakkuri, tanqidiy fikrlashi va tayyor qarashlarni so‘zsiz qabul qilmaydigan tabiatini ochib beradi. Quronov ta’kidlaganidek, psixologizm qahramonning ichki tafakkur jarayonini badiiy vositalar

orqali ochishga xizmat qiladi [Quronov, 2018]. Mazkur epizodda ham Asqarning xarakteri tashqi harakatdan ko‘ra uning fikrlash usuli orqali namoyon bo‘ladi.

Qissada qahramonning ruhiy olami uning atrofidagi insonlarga bo‘lgan munosabatida ham yaqqol ko‘rinadi. Asqar tashqi jozibaga emas, ma’naviy yaqinlik va samimiyatga ustuvor ahamiyat beradi. Shu sababli u ko‘pchilik talabalar bilan fikriy mushtaraklik topa olmaydi, ammo akasi, Ubaydullaev domla va Dilora Jo‘raeva kabi insonlarga chuqur hurmat bilan qaraydi. Raxshona obraziga munosabati ham aynan ruhiy yaqinlik asosida shakllanadi. Muallif qahramonning muhabbatini tashqi go‘zallik emas, balki insonning ichki dunyosini qadrlash orqali asoslaydi. Bu holat Asqarning ma’naviy mezonlari jamiyatdagi yuzakilikdan farq qilishini ko‘rsatadi. Asar psixologizmining eng muhim belgilaridan biri qahramonning ichki monologlaridir. Asqarning: *“rostini aytmasam... ichimda yana bir odam paydo bo‘lib, men bilan bahslashadi”* degan e’tirofi uning ruhiy olamini ochuvchi muhim badiiy detal hisoblanadi. Ushbu jumlada vijdon tashqi hukm chiqaruvchi kuch emas, balki qahramonning o‘z ichida yashayotgan ma’naviy mezon sifatida gavdalanadi. Ginzburg [1977] psixologik nasrning asosiy belgisi sifatida inson ongidagi ichki dialogni ko‘rsatadi. Asqarning ichki monologlari ham ana shu nazariy qarashni tasdiqlaydi: u har qanday qarorni avvalo o‘z vijdoni bilan “muhokama qiladi”. Muallif shu yo‘l bilan qahramonning axloqiy butunligini namoyon etadi.

Qissada ichki ziddiyat tashqi mojaro bilan emas, balki shaxs va vijdon o‘rtasidagi qarama-qarshilik orqali ifodalanadi. Asqar haqiqatni aytish oqibatida aziyat chekishini biladi, biroq sukut saqlashni ham o‘ziga nisbatan xiyonat deb hisoblaydi. Uning “aytmasam...” degan iztiroblari qahramonning ruhiy kurashini kuchaytiradi. Bu kurash uni sindirmaydi, aksincha, ma’naviy jihatdan chiniqtiradi. Shunday qilib, muallif jasoratni jismoniy kuch bilan emas, balki insonning o‘z e’tiqodiga sodiq qolishi bilan bog‘laydi.

Asqarning ruhiy kechinmalarida muhabbat alohida o‘rin tutadi. Matluba bilan bog‘liq muvaffaqiyatsizlik qahramon qalbida chuqur bo‘shliq hosil qiladi. U o‘zining ichki holatini bo‘m-bo‘sh yurak timsoli orqali ifodalaydi. Bu yerda muallif hissiy holatni balandparvoz tasvirlar bilan emas, balki sodda, ammo ta’sirchan badiiy vositalar orqali ochadi. Keyinchalik Raxshonaning hayotiga kirib kelishi Asqarning ruhiyatida yangi umid uyg‘otadi. Muhabbat bu qissada romantik hissiyotdan ko‘ra insonning ma’naviy tiklanishiga xizmat qiluvchi psixologik omil sifatida talqin etiladi.

Erkin A’zam qahramon psixologiyasini ochishda psixologik detallardan ham mohirona foydalanadi. Sukut, nigoh, oddiy buyumlar, kundalik uchrashuvlar va mayda voqealar qahramonning ichki kechinmalarini ifodalash vositasiga aylanadi. Baxtin [1981] ta’kidlaganidek, badiiy asardagi ma’no faqat dialoglarda emas, balki qahramonning boshqa obrazlar bilan munosabati va ichki ovozida ham shakllanadi. Qissada ham aynan shu usul kuzatiladi: Asqarning atrofidagi insonlarga munosabati uning xarakterini ochuvchi muhim psixologik mezon vazifasini bajaradi. Asqar obrazi o‘jar va qaysar ko‘rinsa-da, uning bu xususiyatlari oddiy fe’l-atvor belgisi emas, balki ma’naviy pozitsiyasining ifodasidir. U jamiyatdagi loqaydlik, xushomadgo‘ylik va soxtalikni qabul qilmaydi. Shu bilan birga, u jamiyatni o‘zgartirish da’vosi bilan chiqmaydi; aksincha, avvalo o‘zining ichki erkinligini saqlab qolishga intiladi. Qahramonning kuchi ham aynan shundadir. U tashqi muhit bilan murosa qilmaydi, biroq bu murosasizlik shaxsiy manfaat emas, axloqiy e’tiqodga asoslanadi. Qissaning yakuniga yaqin Asqarning “Mumkin ekan!” degan xulosaga kelishi uning ruhiy evolyutsiyasining yakuniy nuqtasini bildiradi. Bu jumla oddiy quvonch ifodasi emas, balki uzoq davom etgan ichki kurashning ma’naviy g‘alabasidir. Muallif qahramonni mutlaq g‘olib yoki mutlaq mag‘lub sifatida emas, balki hayot sinovlari orqali o‘zligini anglagan shaxs sifatida tasvirlaydi. Shu jihatdan “Otoyining tug‘ilgan yili” qissasi inson ruhiyatining nozik qatlamlarini ochib beruvchi, psixologik tasvir vositalaridan samarali foydalangan o‘zbek nasrining muhim namunalaridan biri hisoblanadi.

Erkin A’zamning **“Otoyining tug‘ilgan yili”** qissasi zamonaviy o‘zbek nasrida psixologik tasvirning badiiy imkoniyatlarini yorqin namoyon etgan asarlardan biridir. Mazkur tadqiqot natijalari shuni ko‘rsatdiki, yozuvchi qahramon ruhiyatini ochishda voqealar ketma-ketligidan ko‘ra insonning ichki kechinmalari, axloqiy tanlovi va ma’naviy izlanishlariga ko‘proq e’tibor qaratadi. Asarda psixologizm qahramonning fikrlash tarzi, ichki monologi, ruhiy ziddiyatlari hamda badiiy detallar orqali izchil ifodalanadi.

Tahlil jarayonida Asqar Shodibekov obrazi o‘z davrining ijtimoiy muhitiga tanqidiy nigoh bilan qaraydigan, mustaqil fikrlovchi va o‘z e’tiqodiga sodiq qoladigan shaxs sifatida namoyon bo‘lishi aniqlandi. Uning xarakteri tashqi harakatlar yoki keskin voqealar orqali emas, balki vijdon bilan kechadigan ichki kurash, haqiqatni izlashga bo‘lgan intilish, muhabbat, mehr, mas’uliyat va ruhiy iztiroblar vositasida shakllanadi. Shu jihatdan Asqar obrazi an’anaviy qahramonlardan farq qilib, zamonaviy o‘zbek nasrida psixologik xarakter yaratishning muvaffaqiyatli namunalaridan biri sifatida e’tirof etilishi mumkin. Shuningdek, qissada ichki monolog, dialog, portret, psixologik detal hamda ramziy tasvirlar qahramonning ruhiy holatini ochishda muhim badiiy vosita vazifasini bajarishi kuzatildi. Muallif oddiy hayotiy vaziyatlar orqali inson qalbida kechadigan murakkab ruhiy jarayonlarni tabiiy va ishonarli tarzda tasvirlay olgan. Ayniqsa, sukut, nigoh, kundalik muloqot va xotiralar qahramonning ichki dunyosini yorituvchi estetik vositalarga aylangan. Nazariy manbalar hamda qissa tahlili o‘zaro qiyoslanganda, Erkin A’zam ijodida psixologizm faqat badiiy usul emas, balki inson shaxsini anglashga xizmat qiluvchi poetik tamoyil ekani namoyon bo‘ladi. Yozuvchi qahramonning ma’naviy

olamini tasvirlash orqali jamiyatdagi loqaydlik, soxtalik va xushomadgo‘ylik kabi illatlarga munosabat bildiradi hamda insonning ruhiy erkinligi va axloqiy sobitligini yuksak qadriyat sifatida ilgari suradi.

Xulosa qilib aytganda, **“Otoyining tug‘ilgan yili”** qissasi psixologik realizm tamoyillarini o‘zida mujassamlashtirgan, inson ruhiyatining murakkab qatlamlarini badiiy mahorat bilan yoritgan asar hisoblanadi. Qissadagi Asqar Shodibekov obrazi orqali Erkin A’zam shaxsning ichki olami, e’tiqodi va ma’naviy tanlovini chuqur tahlil etishga erishgan. Shu bois mazkur asar nafaqat yozuvchi ijodini, balki zamonaviy o‘zbek nasrida psixologizm masalasini o‘rganishda ham muhim ilmiy manba sifatida alohida ahamiyat kasb etadi.

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KALIDASA MEROSI: “SHAKUNTALA” DRAMASI, UNDAGI ASOSIY MAVZU VA G‘OYA

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Annotatsiya: *Mazkur maqola qadimgi hind adabiyotining yirik vakili Kalidasaning ijodiy merosi va “Shakuntala” asari tahliliga bag‘ishlanadi. Maqolada Kalidasa merosining jahon va o‘zbek sharqshunosligida o‘rganilishi hamda tarjima tarixi, asarlaridagi o‘ziga xos uslubi va ularning ahamiyati tadqiq etiladi. Tadqiqot badiiy-adabiy va matn tahlili metodlariga tayanadi hamda “Shakuntala” dramasi, undagi asosiy mavzu va g‘oyani yaxshiroq tushunishga xizmat qiladi.*

Kalit so‘zlar: *Kalidasa, ”Shakuntala”,”Mahabharata”,“Vikramorvashiyam” Malavikagnimitram”, “Kumarasambhava”, “Meghaduta”, “Ritusamhara”, Rasa, Alankara, Dhvani, Rasa, Vakrokti, Auchitya.*

НАСЛЕДИЕ КАЛИДАСЫ: ДРАМА «ШАКУНТАЛА», ЕЁ ОСНОВНАЯ ТЕМА И ИДЕЯ

Аннотация: *Данная статья посвящена творческому наследию выдающегося представителя древнеиндийской литературы Калидасы и анализу его произведения «Шакунтала». В статье исследуются история изучения и перевода наследия Калидасы в мировом и узбекском востоковедении, уникальный стиль его произведений и их значение. Исследование опирается на методы художественно-литературного и текстологического анализа и способствует более глубокому пониманию драмы «Шакунтала», её основной темы и идеи.*

Ключевые слова: *Калидаса, ”Шакунтала”, ”Махабхарата”, ”Викраморвашиям”, ”Малавикагнимитрам”, ”Кумарасамбхава”, ”Мегхадута”, ”Ритусамхара”, Раса, Аланкара, Дхвани, Раса, Вакрокти, Аучитья.*

THE HERITAGE OF KALIDASA: THE DRAMA “SHAKUNTALA”, ITS MAIN THEME AND IDEA

Abstract: *This article is dedicated to the creative heritage of Kalidasa, a prominent figure in ancient Indian literature, and the analysis of his work ”Shakuntala”. The article explores the history of the study and translation of Kalidasa’s heritage in world and Uzbek Oriental studies, the unique style of his works, and their significance. The research relies on literary and textual analysis methods and serves to better understand the drama ”Shakuntala”, its main theme, and its core idea.*

Keywords: *Kalidasa, ”Shakuntala”, ”Mahabharata”, ”Vikramorvashiyam”, ”Malavikagnimitram”, ”Kumarasambhava”, ”Meghaduta”, ”Ritusamhara”, Rasa, Alankara, Dhvani, Rasa, Vakrokti, Auchitya.*

KIRISH

Jahon adabiyoti tarixida hind adabiyoti o‘zining qadimiyligi, boyligi va betakror badiiy xususiyatlari bilan alohida o‘rin tutadi. Insoniyat sivilizatsiyasining ilk bosqichlaridan boshlab shakllana boshlagan hind madaniyati o‘zining ko‘p qirrali merosi bilan dunyo xalqlarining ma’naviy boyligiga ulkan hissa qo‘shgan. Bunda Kalidasa betakror badiiy uslubi, falsafiy qarashlari bilan ajralib turuvchi shoir va dramaturgdir. U yashagan davrdan to bugunga qadar asrlar o‘tgan bo‘lsa-da, adib asarlarining ma’naviy-estetik qiymati eskirmagan, aksincha, bugungi kun zamonaviy adabiyotshunoslik va dramaturgiya uchun ham muhim manba bo‘lib xizmat qilmoqda. O‘z adabiyotiga bo‘lgan sadoqat nuqtai nazaridan hech bir Yevropa davlati Hindiston bilan tenglasha olmaydi. Hindi milliy shoh asarlarni asrlar davomida emas, balki ming yillar davomida saqlab qolish va ularni talqin qilishga bag‘ishlangan silsila bugungi kunda ham davom etib kelmoqda. Asarlari asosan X asrlardayoq muomaladan chiqib ketgan sanskrit tilida yaratilgan bo‘lishiga qaramasdan, uning turli nusxa va tarjimalari nafaqat hind va dravid tillarida, balki jahonning ko‘pgina tillarida ham mavjuddir.

Buyuk dramaturg adib Kalidasa haqida aniq biografik ma’lumotlar mavjud bo‘lmasa-da, uning asarlaridan hamda rivoyatlarga tayanib unung Guptalar imperiyasi davrida ya’ni Hindistonda har bir soha o‘zining rivojlanish cho‘qqisiga «Oltin davr»da yashab o‘tgan deya taxmin qilinadi. Buyuk grammatist Patanjali, matematik Aryabhatta, astronom Brahmaguptalar aynan shu davrda yashab ijod etganlar. Kalidasa ijodi ham aynan mana shu davrga to‘g‘ri kelib, bu davrda hind dramaturgiyasi ham o‘zining taraqqiyot cho‘qqisiga erishgan. Kalidasa ijodida hind adabiyotida birinchi bor gumanistik g‘oyalar shakllandi. Diniy dunyoqarash hukm surgan, kastachilik tizimi kuchli bo‘lgan bir davrda hind

jamiyatida gumanistik g‘oyalarning adabiyotga kirib kelishi o‘z navbatida adabiyotning va umuman hind jamiyati ongining taraqqiyotidan darak beradi.Kalidasaning Hindistonning qaysi yerida tug‘ilib o‘sgani haqqida aniq malumotlar mavjut emas. Adib asarlarida bu haqda hech narsa yozmagan, lekin uning asarlaridan Kalidasaning Hindistonning har bir burchagini qanchalik yaxshi bilganligi xayratlanarli.

Kalidasaning "Shakuntala" asarning syujet asosi qadimgi "Mahabharata" eposidan olingan bo‘lib, buyuk Bharata shohi va uning sulolasi tarixi bilan bog‘liq. Dastlab sanskrit tilida yaratilgan pyesa keyinchalik mahalliy hind tillariga o‘girilgan, natijada asl sanskritcha varianti deyarli unutilgan. Asar markazida shoh Dushyanta va avliyo qizi Shakuntala o‘rtasidagi pokiza sevgi tarixi yotadi. Ularning munosabatlari hijron, e’tiborsizlik oqibatida yuzaga kelgan duoibad, sabr-matonat va nihoyat haqiqatning tantana qilishi kabi bosqichlardan iborat murakkab yo‘lni bosib o‘tadi. Ushbu tahlilda asarning mazmun-mohiyati, unda ilgari surilgan diniy-axloqiy g‘oyalar va badiiy-falsafiy yakun ilmiy nuqtai nazardan yoritib beriladi.

Mavzuning dolzarbligi. Kalidasa merosini o‘rganish qadimgi hind klassik adabiyoti uslubini va insoniy tuyg‘ularning badiiy talqinini anglashda ahamiyatga ega. Sof muhabbat, inson munosabatlari tabiat va lanshaft shoir asarlarida bugungi globallashuv davrida ham o‘z dolzarbligini yo‘qotgan emas, Aksincha jahon miqiyosida o‘tkazilayotgan tadqiqotlarda Adabiyot va dramaturgiya bilan bir qatorda Janubiy osiyo hududining qadimgi VI-V asrdan to bugungacha bioxilma-xillik va ekosistema hamda tibbiyot , geografiya va topografiya kabi sohalarning rivojiga hissa qoshib bir qancha izlanishlarga asos bo‘lib xizmat qilmoqda. Kalidasaning "Shakuntala" asarida adolat va haqiqat g‘oyasi sifatida — asar insonlarga qanchalik og‘ir sinovlar bo‘lmasin, haqiqat va adolat oxir-oqibat tantana qilishiga bo‘lgan ishonchni mustahkamlaydi, bu esa har qanday davr va jamiyat uchun ruhiy tayanch bo‘lib xizmat qiladi. Madaniyatlararo muloqot nuqtai nazaridan asar Sharq falsafasi, xususan hind dharma tizimidagi burch, karma va poklanish tush

Tadqiqotning maqsadi va vazifalari. Ushbu maqolaning asosiy maqsadi — Kalidasaning shaxsiyati, boy adabiy merosi o‘rganish. Unining asarlaridagi o‘ziga xos uslubi va asarlarining ahamiyatini ko‘rsatib berish. Shakuntala asarini teranroq o‘rganish, undagi mavzu va g‘oyani tahlil qilish.

Mavzuning o‘rganilganligi. 1789-yili ingliz sudyasi Vilyam Jons Ost-Indiya kompaniyasida xizmat qilayotganida sanskrit tilini ham o‘rganadi va Kalidasaning «Shakuntala» nomli asarini ingliz tiliga tarjima qiladi. Ushbu ingliz tilidagi asarni 1791-yili nemis sayyohi, olimi va inqilobchisi Georg Forster nemis tiliga o‘giradi. O‘z tarjimasining bir nusxasini u Gyotega yuboradi va Gyote bu asarga yuqori baho beradi.

1860-yillarda yirik sanskritshunos Doktor Bhau Daji Kalidasaning yashagan davrini aniqladi va Kalidasa qaysi asrda yashaganligi birinchi bo‘lib Sanskrit matinlarni o‘qib qadimgi sanskrit raqamlarini to‘liq shifrlab ilmiy asoslab berdi va uning hayotini taxminan VI asrning o‘rtalariga bog‘ladi. Bu kashfiyot keyingi barcha adabiyotshunoslar uchun Kalidasa asarlarini tarixiy kontekstda to‘g‘ri tahlil qilishga asos bo‘lib xizmat qildi.

Asqad Muxtor (O‘zbekiston xalq yozuvchisi) 1973-1975-yillarda — Kalidasaning dunyoga mashhur sevgining lirik madhi hisoblangan "Meghaduta" ("Xabarchi bulut") dostonini hamda "Ritusamhara" ("Yil fasllari") turkum she’rlarini o‘zbek tiliga she’riy yo‘l bilan juda nafis tarzda tarjima qilgan.

Bugungi kunda Kalidasa merosi jahon miqyosda ham an’anaviy sharqshunoslik, ham zamonaviy fanlararo mantiq asosida o‘rganilib kelinmoqda. Hindistonning o‘zida shoir ijodi milliy klassikaning cho‘qqisi sifatida davlat darajasida tadqiq etiladi. Ujayn shahridagi "Kalidasa Akademiya"si bu boradagi eng yirik ilmiy markaz bo‘lib, u yerda har yili xalqaro konferensiyalar o‘tkaziladi va shoir asarlarining yangi tanqidiy matnlari chop etiladi. So‘nggi yillarda hind olimlari uning matnlarining adabiyot va tabiat aloqasi yo‘nalishida tahlil qilib, dostonlardagi geografik, biologik va iqlimiy ma’lumotlarning aniqligini ilmiy asoslab berishilmoqda. Xalqaro miqyosda esa Kalidasa Kolumbiya, Oksford va Garvard kabi nufuzli universitetlarning qiyosiy adabiyotshunoslik dasturlariga kiritilgan. Clay Sanskrit Library va Penguin Classics kabi yirik loyihalar doirasida shoir asarlarining sharhlangan yangi inglizcha tarjimalari taqdim etilmoqda. Kalidasa ijodi alohida o‘ringa ega bo‘lib, uning asarlari va hind klassik poetikasida Sharq uyg‘onish davri namunalari bilan qiyosiy-kognitiv yo‘nalishda muntazam tadqiq qilinmoqda.

ADIB MEROSI

Kalidasa hind dramaturgiyasini rivojlantirishga ulkan hissa qo‘shgan. Kalidasada aktyorlik qobiliyati ham yuksak darajada rivojlangan bo‘lgan, chunki u barcha dramalarini o‘zi sahnalashtirganligi ko‘lab hindshunos olimlari tomonidan manbalarda takidlab o‘tilgan. Hind mutaxassislari Kalidasa ijodini o‘rganish jarayonida uning nomi bilan bog‘liq juda ko‘p asarlar topganlar, lekin bugungi kunda aynan Kalidasa qalamiga mansub jami yettita asar tan olingan. Ular asosan liro-epik pyesalardir. Ularning nomlanishi quyidagichadir:

Kalidasaning adabiy merosi (asosiy asarlari)

1-jadval

Asar	Janri	Hajmi	Asosiy mavzusi
"Abhijnanashakuntalam" ("Shakuntala")	drama (nataka)	7 parda	Shakuntala va podshoh Dushyanta muhabbati
"Vikramorvashiyam"	drama	5 parda	Pururavas va Urvashi afsonasi
"Malavikagnimitram"	drama	5 parda	Malavika va podshoh Agnimitra
"Raghuvamsha"	mahakavya (doston)	19 sarga, ~1570 bayt	Raghu (Quyosh) sulolasi shohlari
"Kumarasambhava"	mahakavya	8 sarga	Xudo Kumara (Kartikeya)ning tugʻilishi
"Meghaduta"	lirik doston	~111 bayt	Xabarchi- bulut
"Ritusamhara"	lirik doston	6 sarga (6 fasl)	Yil fasllari

Kalidasa oʻz ijodida barcha hind shoir va yozuvchilari qatori qadimgi hind adabiyotiga tayangan holda ijod qilgan. U avval ularni chuqur oʻrganib chiqqan va ulardan taʼsirlanib oʻzining shoh asarlarini yaratgan. Koʻpgina hind yozuvchilariga qadimgi hind adabiy yodgorliklari boʻlmish "Mahabharata" va "Ramayana" eposlari syujet va mavzu manbai boʻlib xizmat qilib kelgan. Mana shu eposlarda hind xalqining asl dunyoqarashi, ularni qaygʻuga solgan muammolar, hind xalqining maʼnaviyati, qarindosh-urugʻchilik, ularning bir-biriga boʻlgan yuqori saviyadagi munosabati, taxt va vorislik masalalari, bu muammolarni toʻgʻri hal qilish yoʻl-yoʻriqlari, inson va Yaratgan oʻrtasidagi munosabat, dunyo va uning mohiyati, ezgulik va yovuzlik oʻrtasidagi kurash va ezgulikning doim gʻolib chiqishi va shunga oʻxshash hayot uchun, yashash uchun zarur boʻlgan barcha hayotiy muammolar oʻz yechimini topgan. Shu sabab bu eposlarga kitobxonlar va yozuvchilar qayta-qayta murojaat qilganlar va bugungi kunda ham mana shu anʼana hind adabiyotida davom etib kelmoqda. Kalidasa ham oʻz navbatida mana shu asarlardan taʼsirlanib, oʻziga ulardan mavzu tanlab, personajlar tanlab, oʻtkir gʻoyali asarlarni yaratgan. Uning shunday asarlaridan biri bu "Shakuntala" dramasidir.

KALIDASA ASARLARINING USLUBI VA AHAMIYATI

Asarlaridagi uslubi. Adabiyot — bu soʻzlar yigʻindisi emas, balki soʻz bilan maʼnoning uygʻunligidir. Ularning bir-biriga mos tushishi oʻquvchiga chinakam zavq bagʻishlaydi. Mana shu goʻzallik qonuniyatlarini oʻrganadigan fan adabiyotshunoslik deyiladi. Hind sheʼriyati oʻzining teran mantiqi va inson hissiyotlarini nozik tahlil qila olishi bilan mashhur. Hind olimlari qadimdan "Sheʼr qanday qilib odamni yigʻlatishi yoki quvontirishi mumkin?" degan savol ustida uslublar yaratishgan. Qadimgi hind adabiyotshunosligida oltita yirik maktab (oqim) mavjud boʻlib, ularning har biri sheʼrning goʻzalligini har xil narsada (kimdir tuygʻuda, kimdir uslubda, kimdir mantiqda) deb bilgan.

2-jadval

Qadimgi hind (sanskrit) poetikasining oltita asosiy maktabi

Maktab	Asoschisi	Asosiy asari	Bosh gʻoyasi
Rasa	Bharata	*"Natyashastra"*	Estetik tuygʻu (rasa) — sheʼr qalbi
Alankara	Bhamaha	*"Kavyalankara"*	Badiiy bezaklar sheʼr goʻzalligini belgilaydi
Riti	Vamana	*"Kavyalankara-sutravritti"*	Uslub (riti) — sheʼr ruhi
Dhvani	Anandavardhana	*"Dhvanyaloka"*	Yashirin maʼno (dhvani) — sheʼr qalbi
Vakrokti	Kuntaka	*"Vakroktijivita"*	Koʻchma, oʻziga xos ifoda
Auchitya	Kshemendra	*"Auchityavicharacharcha"*	Mutanosiblik, badiiy vositalarning mosligi

Kalidasa naturalistik shoir edi va uning asarlari qadimiy Dharmik Vedalar, Falsafa, Astrologiya va Upanishadlarga asoslangan boʻlib, bular uning intellektual kuchini namoyish etadi. Shu bilan birga Natya-shastraning oʻrni ham beqiyqiyos, ular pyesalarning butun poydevorini tashkil etadi. Gumboldt shunday yozadi: "Tuygʻularning ifodalanishidagi

noziklik va ijodiy xayolotning boyligi Kalidasaga jahon adiblari orasida yuksak o‘rin berdi". Kalidasa adabiy kompozitsiyaning turli xususiyatlarini ifodalash uchun Riti, Rasa, Metrdan foydalangan.

Kalidasa o‘zining uslubi bilan mashhur, O‘zining dunyoqarashi va estetik mahorati bilan Kalidasa so‘zlarga hayot bag‘ishlagan. U "Vaidribhi" uslubini qabul qilgan. "Prasad guna" — Vaidribhi uslubining asosiy xususiyati hisoblanadi. Vaidribhi uslu bi Acharya Dandinni juda ilhomlantirgan. Dandinning so‘zlariga ko‘ra, Kalidasa Vaidribhi uslubini birinchi bo‘lib asoslagan kishi edi. Riti maktabiga Vamana asos solgan. She’riyatning ruhi — bu Riti (uslub). "Guna"lar ikki toifaga bo‘linadi tovush bilan bog‘liq bo‘lganlar va ma’no bilan bog‘liq bo‘lgan.

Kalidasa o‘z asarlarida asosan "Rasa"dan foydalangan. Uning asosiy qiziqishi drama san’atiga qaratilgan bo‘lsa-da, rasa nazariyasi adabiyotning barcha janrlariga tatbiq etilgan. Bu tushuncha matnning hissiy jihatini va o‘quvchi qabul qiluvchining unga qanday munosabatda bo‘lishini ta’kidlaydi.

Kalidasa asarlari klassik Sanskrit va prakrit tillarida yozilgan , madura va prasad gunalarga boy. U uzun va murakkab jumlalarni emas, balki qisqa va sodda jumlalarni ishlatgan. Ahamiytlisi, Kalidasa she’riyatida so‘zlarni vaziyat yoki kontekstga moslashtirgan.

पातुं न प्रथमं व्यवस्यति जलं युष्मास्वपीतेषु या
नादत्ते प्रियमण्डनापि भवतां स्नेहेन या पल्लवम् ।
आद्ये वः कुसुमप्रसूतिसमये यस्या भवत्युत्सवः
सेयं याति शकुन्तला पतिगृहं सर्वैरनुज्ञायताम् ॥

Bu to‘rtlik asarning 4-pardasidan olingan bo‘lib, Shakuntala o‘z sevgilisi podshoh Dushyanta huzuriga — saroyga yo‘l olganda, uni o‘stirgan tabiat va daraxtlar bilan xayrlashayotgan ta’sirli lahzani tasvirlaydi. Unda inson va tabiat o‘rtasidagi chuqur mehr-muhabbat, uzviy bog‘liqlik va ayriliq iztirobi yuksak mahorat bilan ochib berilgan. Vaydharbi uslubining yorqin namunasi, ortiqcha murakkab so‘z o‘yinlari yo‘q. Lirik kechinma va ohangdorlik birinchi planga chiqadi. Asarda qadimgi hind falsafasining Ahimsa yani hech bir tirik mavjudotga zarar keltirmaslik tamoyili ham ochib beriladi.

Kalidasa asarlarining ahamiyati. Kalidasa ijodijahon madaniyati va adabiyoti xazinasidan juda muhim o‘rin egallaydi. Adib o‘z asarlari orqali nafaqat klassik sanskrit adabiyotini eng yuqori cho‘qqiga olib chiqdi, balki butun dunyo dramaturgiyasi rivojiga ham ulkan ta’sir ko‘rsatdi. Kalidasagacha bo‘lgan davrda sanskrit tili asosan diniy matnlar, falsafiy risolalar va qat’iy qonun-qoidalar yozilgan. Kalidasa esa bu tilni tirik hissiyotlar, go‘zal she’riyat va xalqona dramaturgiya tiliga aylantirdi. U sanskrit tilining poetik imkoniyatlarini ochib berdi. Uning dramalari va dostonlari dunyo miqyosida hamon o‘zining ilmiy, badiiy va amaliy qimmatini yo‘qotmasdan, jahon adabiyotshunosligining eng muhim tadqiqot manbalaridan biri bo‘lib kelmoqda. Asarlari tufayli qadimgi Hindistonda teatr san’ati va yozma adabiyot saroy devorlaridan chiqib, xalq madaniyatining ajralmas qismiga aylandi.Kalidasa inson ichki dunyosini, ayniqsa, ayol qalbi kechinmalarini tasvirlashda tengsiz mahorat ko‘rsatgan. Qadimgi hind estetikasida Rasa nazariyasi mavjud bo‘lib, Kalidasa o‘z asarlarida sevgining ikki holatini — visol va ayriliqni juda teran yoritgan. "Shakuntala" dramasida sof muhabbatning faqatgina hissiyot emas, balki hayotiy sinovlar orqali chiniqadigan buyuk kuch ekanligi ko‘rsatiladi. Bu esa asarning umuminsoniy va ma’rifiy ahamiyatini oshiradi.

”SHAKUNTALA” DRAMASI, UNDAGI ASOSIY MAVZU VA G‘OYA

"Shakuntala" Kalidasaning shoh asaridir. Bu asar Hindiston hududidan chiqib, jahon miqyosida dong taratgan asardir. Ushbu asar darhaqiqat ko‘pgina chet tillariga tarjima qilingan va ko‘pchilik unga juda yuqori baho bergan. Asarning syujetini yuqorida aytganimizdek, Kalidasa "Mahabharata" eposidan olgan. "Mahabharata" eposi ma’lumki, buyuk Bharata shohi va uning sulolasi tarixi bilan bog‘liq asardir. Shoh Bharata esa aslida shoh Dushyantaning avliyo Vishvamitraning qizi Shakuntalaga bo‘lgan muhabbati natijasida dunyoga kelgan farzanddir. Shoh Dushyanta ham, uning o‘g‘li Bharata ham juda odil va xalqparvar shoh sifatida elga tanilgan shohlardir. Kalidasa esa Shakuntala va shoh Dushyanta sevgisi tarixini o‘z asariga syujet qilib olib, bir pyesa yaratgan. Asarning asosiy mavzusi — pokiza va sadoqatli sevgi, hijron azoblari hamda taqdir va ilohiy kuchlar sinovidan o‘tgan haqiqatning tantanasidir.

Shoh Dushyanta o‘z xizmatkorlari bilan ovga chiqadi va o‘rmonda ov qilib yurganida bir go‘zal qizni uchratib qoladi. U qiz bilan tanishib, ancha vaqt u bilan suhbatlashadi. Suhbat davomida Dushyanta qizning husni-jamoli va odobiga mahliyo bo‘lib, qattiq sevib qoladi. Bu qiz avliyo Kanvaning asrab olgan qizi Shakuntala edi. Ular bir necha kun birga bo‘ladilar va shoh Dushyanta Shakuntalaga sevgi izhor etadi hamda uni izzat-ikrom bilan o‘z yurtiga olib ketishi, uni o‘z malikasi deb e’lon qilishi haqida va’da beradi va o‘z yurtiga qaytib ketadi. Shakuntala uni kutib, otasi bilan qoladi. Kunlar o‘tadi, kunlar ketidan oylar o‘tib, Shakuntala bir o‘g‘il ko‘radi va unga Bharata deb ism qo‘yadi. Shakuntala o‘z sevgilisi Dushyantani kutishda davom etadi. Lekin undan ko‘p vaqtgacha darak bo‘lmaydi.

Kunlardan bir kun Shakuntala hijron azobida Dushyanta haqida o‘ylab o‘tirganida, ularning uyiga bir avliyo uning otasi Kanvani so‘rab keladi. Dushyanta haqida o‘yga berilib ketgan Shakuntala avliyoning kirganini ham sezmay qoladi va unga izzat-ikrom ko‘rsata olmaydi. Bundan g‘azablangan avliyo uni: "Kim haqida o‘ylab, uyga kelgan mehmonga e’tibor bermagan bo‘lsang, u ham seni shunday unutib yuborsin!" deb duoibad qiladi. Duoibadga uchragan Shakuntala

Dushyantani olti yil kutadi. Darhaqiqat, avliyoning qarg‘ishi ta’sirida Dushyanta ham uni unutib yuborgan edi. O‘g‘li olti yoshga to‘lganida, Shakuntala otasidan oq fotiha olib, o‘z sevgilisining yurtiga ravona bo‘ladi. U shaharga yetib boradi va darhol saroyga yo‘l oladi. Saroy qo‘riqchilariga o‘zini shohning ayoli deb tanishtiradi. Bundan g‘azablangan soqchilar bu xabarni shohga yetkazadilar. Shoh esa hayron bo‘ladi va: "Qaysi bir ayol bunday botirlik bilan o‘zini mening ayolim deb ayta olibdi?" deb o‘ylab, ayolni ko‘rishga qaror qiladi. Shakuntala shoh meni va o‘g‘lini ko‘rib juda quvonsa kerak, degan xayol bilan saroyga kiradi, lekin shoh na ayolni va na o‘z o‘g‘lini taniy oladi. Shoh o‘zicha: "Ularni ochlik yolg‘on gapirishga majbur qilgan bo‘lsa kerak" degan xayolga borib, saroy xizmatchilariga ularga xayr-ehson berib jo‘natib yuborishlarini aytadi. Tushkunlikka tushgan Shakuntala nima qilishini, qayerga borib kimdan yordam so‘rashini bilmay, shaharda darbadar kezib yuradi.

Shakuntala shohning va’dasiga ishonib, uni olti yil davomida yolg‘iz va sabr bilan kutadi.Vaqt va masofa uzoqlashtirsa ham o‘z sevgisiga va pokligiga sodiq qoladi. Bu ayol kishining matonati va sadoqati oxir-oqibat o‘z mevasini berishini anglatuvchi g‘oyadir. Hind dharma tizimida "mehmon xudodir" — tamoyili muqaddas burch hisoblanadi, uni buzish esa jiddiy oqibat keltiradi. Durvasa g‘azablanib, Shakuntalani Dushyanta uni unutishi bilan la’natlaydi. Bu voqea diniy-axloqiy nuqtai nazardan hushyorlik va mas’uliyatning ahamiyatini, shuningdek, dharmani buzgan har bir amalning muqarrar oqibati (karma qonuni) borligini ko‘rsatadi.

Dushyanta o‘rmonda Shakuntalaga o‘z sevgisining timsoli sifatida shoh muhri tushirilgan bir uzuk sovg‘a qilgan bo‘ladi, lekin Shakuntala uni ham Gang suvida ibodat qilayotganida Tushirib yo‘qotib qo‘yadi. Uni esa baliqlar yutib yuborgan bo‘ladi. Baliqchilar baliq ovlab, tutgan baliqlaridan birining qornini yorganlarida, uning qornidan shoh muhri qo‘yilgan uzuk chiqadi. Bundan hayratda qolgan baliqchilar muhrni tanib, darhol uzukni saroyga olib boradilar va bo‘lgan voqeadan shohni xabardor qiladilar. Uzuk esa shohga bundan olti yil avval bo‘lib o‘tgan tarixni eslashiga yordam beradi.Uzuk orqali Dushyanta kelgan ayol Shakuntala, u bilan birga kelgan bola esa ular o‘rtasidagi muqaddas sevgining mevasi ekanini darhol tushunib yetadi va tezlik bilan soqchilar orqali Shakuntalani topdiradi. Soqchilar ularni suv bo‘yidan topib keladilar. Dushyanta Shakuntaladan kechirim so‘raydi va katta to‘y-tomosha qilib unga uylanadi. Shakuntalani saroy malikasi va o‘g‘li Bharatani esa taxt vorisi deb e’lon qiladi. Sadoqat ila adolatning tantana qilishi karma qonunining ikki tomonlama ishlashini ifodalaydi: dastlab e’tiborsizlik oqibatida jazolangan qahramon, o‘z sabr-toqati va poklik yo‘lidan chekinmagani uchun oxir-oqibat mukofotlanadi.Umuman olganda, asar orqali ilgari surilgan bosh g‘oya shundan iboratki, yolg‘on va zulmat vaqtinchalik ustunlik qilishi mumkin, biroq haqiqat, sabr va poklik yakunda albatta g‘alaba qozonadi — bu hind adabiyotiga xos optimistik dunyoqarashning ifodasidir.

XULOSA

Ushbu tadqiqot doirasida Kalidasa hayoti, uning betakror ijodiy uslubi hamda asarlarining tahlili asosida quyidagi yakuniy ilmiy xulosalarga kelindi. Shoir o‘z davrining bilimdonlaridan biri sifatida sanskrit poetikasining qonuniyatlarini yangi janriy bosqichga olib chiqdiUning gumanistik konsepsiyalari asrlar dunyo xalqlari, xususan, o‘zbek adabiy-madaniy muhiti olimlari va tarjimonlari tomonidan ham o‘rganilgan.

Kalidasaning "Shakuntala" asarini tahlil qilish shuni ko‘rsatadiki, uning asosiy mavzusi — pokiza va sadoqatli sevgi, hijron azoblari hamda taqdir va ilohiy kuchlar sinovidan o‘tgan haqiqatning tantanasidir. Butun asar mana shu markaziy mavzu atrofida quriladi, Shakuntalaning sevgisi hech qanday sinov — olti yillik kutish, tan olinmaslik, haqorat — oldida ham so‘nmaydi. Ayol kishining matonati va sadoqati oxir-oqibat o‘z mevasini beradi. Shakuntala o‘z pokligiga va sevgisiga sodiq qolgani uchun, boshiga tushgan barcha adolatsizliklarga qaramay, haqiqat tantana qiladi.

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LAKUNALAR NAZARIYASINING KELIB CHIQISHI VA SHAKLLANISH BOSQICHLARI

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Annotatsiya: *Maqolada lakunalar nazariyasining kelib chiqish manbalari va shakllanish bosqichlari tarixiy-qiyosiy hamda davriylashtirish usullari asosida tadqiq etilgan. XX asrning 50-yillaridan bugungi kungacha bo‘lgan davrni qamrab oluvchi ilmiy adabiyot korpusi tahlili asosida nazariya taraqqiyotining olti bosqichi ajratildi: lingvistik zamin bosqichi (1950-yillar), tarjimashunoslik-kontrastiv bosqich (1960-1970-yillar), etnopsixolingvistik bosqich (1977-1989), Yevropa lakunologiya maktabi bosqichi (1990-2006), sistem-leksikologik va kognitiv bosqich (1998-2010) hamda zamonaviy interdisiplinar bosqich (2010-yillardan). Har bir bosqich tadqiqot obyektining kengayishi, metatil apparatining boyishi va metodologik yangilanish mezonlari asosida tavsiflangan. Shuningdek, nazariyaga xos terminologik xilma-xillik (nomutanosib leksika, realiya, etnoeydema, «oq dog‘lar», gap, blank spot) tizimlashtirilgan, lakunalarni bartaraf etishning to‘ldirish va kompensatsiya usullari qiyosiy jihatdan yoritilgan. Tadqiqot natijalari lakunalar nazariyasining bir tarmoqli emas, balki uch mustaqil an’ana — struktur tilshunoslik, tarjimashunoslik va etnopsixolingvistika — kesishuvida shakllanganini ko‘rsatdi. Xulosada o‘zbek tilshunosligida lakunologik tadqiqotlarni rivojlantirishning istiqbolli yo‘nalishlari belgilangan.*

Kalit so‘zlar: *lakuna, lakunarlik, lakunologiya, etnopsixolingvistika, nomutanosib leksika, realiya, lingvokulturologiya, lakunalarni bartaraf etish, to‘ldirish, kompensatsiya, madaniyatlararo muloqot, davriylashtirish.*

ИСТОКИ И ЭТАПЫ СТАНОВЛЕНИЯ ТЕОРИИ ЛАКУН

Аннотация: *В статье на основе историко-сравнительного метода и метода периодизации исследуются источники возникновения и этапы становления теории лакун. На материале корпуса научной литературы, охватывающего период с 50-х годов XX века до настоящего времени, выделены шесть этапов развития теории: лингвистический (1950-е гг.), переводоведческо-контрастивный (1960-1970-е гг.), этнопсихолингвистический (1977-1989), этап европейской школы лакунологии (1990-2006), системно-лексикологический и когнитивный (1998-2010), современный междисциплинарный (с 2010-х гг.). Каждый этап охарактеризован по критериям расширения объекта исследования, обогащения метаязыка и методологического обновления. Систематизирована терминологическая вариативность и сопоставлены способы элиминирования лакун — заполнение и компенсация. В заключении определены перспективные направления лакунологических исследований в узбекском языкознании.*

Ключевые слова: *лакуна, лакунарность, лакунология, этнопсихолингвистика, безэквивалентная лексика, реалия, лингвокультурология, элиминирование лакун, заполнение, компенсация, межкультурная коммуникация, периодизация.*

THE ORIGINS AND STAGES IN THE DEVELOPMENT OF LACUNA THEORY

Abstract: *The article examines the origins and the stages in the development of lacuna theory using historical-comparative analysis and the method of periodisation. Drawing on a corpus of scholarly literature covering the period from the 1950s to the present, the study distinguishes six stages in the evolution of the theory: the linguistic-foundation stage (1950s), the translation-studies and contrastive stage (1960s-1970s), the ethnopsycholinguistic stage (1977-1989), the stage of the European school of lacunology (1990-2006), the systemic-lexicological and cognitive stage (1998-2010), and the contemporary interdisciplinary stage (from the 2010s). Each stage is characterised according to three criteria: the expansion of the research object, the enrichment of the metalanguage, and methodological renewal. The paper systematises the terminological variation surrounding the notion of lacuna (non-equivalent vocabulary, realia, ethno-eidema, “blank spots”, gap) and compares the two principal techniques of eliminating lacunae — filling and compensation. The findings demonstrate that lacuna theory emerged not from a single source but at the intersection of three independent traditions: structural linguistics, translation studies, and ethnopsycholinguistics. The conclusion outlines promising directions for lacunological research in Uzbek linguistics.*

Keywords: *lacuna, lacunarity, lacunology, ethnopsycholinguistics, non-equivalent vocabulary, realia, cultural linguistics, elimination of lacunae, filling, compensation, intercultural communication, periodisation.*

KIRISH

Zamonaviy tilshunoslikda antroposentrik paradigmaning yetakchi o‘ringa chiqishi til birliklarini nafaqat sof lisoniy tizim doirasida, balki milliy madaniyat, dunyoqarash va o‘ziga xos tafakkur tarzi bilan uzviy bog‘liqlikda tadqiq etishni taqozo etmoqda. Ana shu yondashuv natijasida XX asrning ikkinchi yarmida bir qator o‘zaro yaqin ilmiy yo‘nalishlar — lingvokulturologiya, etnopsixolingvistika, madaniyatlararo kommunikatsiya nazariyasi va kontrastiv leksikologiya shakllandi. Ushbu yo‘nalishlarning barchasi uchun umumiy bo‘lgan markaziy tushunchalardan biri lakuna hodisasidir.

«Lakuna» atamasi lotincha lacuna — «chuqurlik», «bo‘shliq», «tushib qolgan joy» so‘zidan olingan bo‘lib, dastlab qo‘lyozmashunoslikda matnning yo‘qolgan qismini ifodalash uchun qo‘llangan. Tilshunoslikka ko‘chgach, atama bir til (yoki madaniyat)da mavjud tushuncha, ma’no yoxud xulq-atvor namunasining boshqa til (madaniyat)da muqobil ifodaga ega emasligini bildiruvchi metatil belgisiga aylandi. Lakuna, mohiyatan, «yo‘qlik» kategoriyasi bo‘lib, u faqat ikki yoki undan ortiq lisoniy-madaniy tizim qiyoslangan nuqtada namoyon bo‘ladi: uni bevosita kuzatib bo‘lmaydi, u faqat qiyosiy fon orqali «ko‘rinadigan» hodisadir.

Lakunalar nazariyasi bugungi kunda mustaqil ilmiy yo‘nalish — lakunologiya maqomini olgan bo‘lsa-da, uning genezisi va taraqqiyot bosqichlari masalasi ilmiy adabiyotda yetarli darajada tizimlashtirilmagan. Mavjud tadqiqotlarning aksariyati yo alohida bir maktab doirasidagi qarashlarni yoritishga, yo lakunalarning muayyan til materialidagi tasnifiga bag‘ishlangan; nazariyaning butun tarixiy yo‘lini yagona mezonlar asosida davriylashtiruvchi umumlashtiruvchi ishlar esa juda kam. Bundan tashqari, sohaning metatili benihoya xilma-xil: bir xil yoki juda yaqin hodisalar turli maktablarda «lakuna», «nomutanosib leksika», «realiya», «etnoeydema», «oq dog‘lar», gap, blank spot kabi atamalar bilan nomlanadi. Bu holat tadqiqot natijalarining o‘zaro qiyoslanuvchanligini pasaytiradi va mavzuning dolzarbligini belgilaydi.

Tadqiqotning maqsadi — lakunalar nazariyasining kelib chiqish manbalarini aniqlash va uning shakllanish bosqichlarini yagona mezonlar tizimi asosida davriylashtirishdan iborat. Ushbu maqsadga erishish uchun quyidagi vazifalar belgilandi: 1) lakuna tushunchasining tilshunoslikka kirib kelish yo‘llarini va dastlabki ilmiy manbalarini aniqlash; 2) nazariya taraqqiyotining har bir bosqichini ajratish mezonlarini asoslash; 3) bosqichlarni tavsiflash va ularning o‘zaro aloqadorligini ko‘rsatish; 4) sohaning terminologik apparatidagi xilma-xillikni tizimlashtirish; 5) o‘zbek tilshunosligida lakunologik tadqiqotlarning holati va istiqbollarini belgilash.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda lakunalar nazariyasining taraqqiyoti uchta mustaqil ilmiy an’ana — struktur tilshunoslik, tarjimashunoslik va etnopsixolingvistikaning kesishuvi natijasi sifatida talqin qilinadi hamda nazariyaning olti bosqichli davriylashtirilishi taklif etiladi.

MATERIALLAR VA METODLAR

Tadqiqot materiali sifatida 1953-2023-yillar oralig‘ida chop etilgan, lakuna va lakunarlik muammosiga bevosita bag‘ishlangan ilmiy manbalar — monografiyalar, dissertatsiyalar, ilmiy maqolalar va lug‘atlar korpusi olindi. Korpus tarkibiga rus, nemis, ingliz, fransuz va o‘zbek tillaridagi manbalar kiritildi. Manbalarni tanlashda uchta mezonga tayanildi: a) manbada «lakuna» atamasi yoki uning to‘g‘ridan-to‘g‘ri sinonimi metatil belgisi sifatida qo‘llanganligi; b) manbaning keyingi tadqiqotlarda iqtibos keltirilish darajasi; v) manbaning nazariy-metodologik ahamiyati, ya’ni unda yangi atama, tasnif yoki tahlil usuli taklif etilganligi.

Tadqiqotda tarixiy-qiyosiy usul (turli davrlarda shakllangan qarashlarning genetik aloqadorligini aniqlash), davriylashtirish usuli (sifat jihatidan farqlanuvchi bosqichlarni ajratish), tavsifiy usul, definitsion tahlil (turli mualliflar bergan ta’riflarning umumiy va farqli belgilarini ajratish), konseptual tahlil hamda kontrastiv usuldan foydalanildi.

Davriylashtirish uchun uchta asosiy mezon qabul qilindi: 1) tadqiqot obyektining hajmi va tabiati (leksik birlik → matn → madaniy xulq → kognitiv struktura); 2) nazariyaning metatil apparati (yangi atamalarning paydo bo‘lishi va tizimlashuvi); 3) metodologik asos (introspektiv tahlil → kontrastiv tahlil → empirik-eksperimental tadqiqot). Ushbu mezonlarning uchalasi bir vaqtda sezilarli o‘zgarishga uchragan nuqtalar bosqichlar chegarasi sifatida belgilandi. Qo‘shimcha mezon — institutsional omil, ya’ni ilmiy maktablar va ixtisoslashgan nashrlarning paydo bo‘lishi.

NATIJALAR

Tahlil natijasida lakunalar nazariyasi taraqqiyotining olti bosqichi ajratildi. Quyida har bir bosqichning mazmuniy tavsifi keltiriladi.

1. Lingvistik zamin bosqichi (XX asrning 50-yillari)

Lakunalar nazariyasining ilmiy ildizlari XX asrning 50-yillarida, bir-biridan mustaqil ravishda rivojlangan ikki an’anada shakllandi. Birinchi an’ana amerikacha struktur-tipologik tilshunoslik bilan bog‘liq. Ch. Hokket 1954-yilda e’lon qilingan «Xitoy tili ingliz tiliga qarshi: Uorf tezislarini o‘rganish tajribasi» nomli ishida til tizimidagi «naqshlardagi tasodifiy bo‘shliqlar» (random holes in patterns) hodisasiga e’tibor qaratdi. Olim tilning grammatik qoidalari nuqtai

nazaridan mumkin boʻlgan, ammo real nutqda qoʻllanmaydigan birliklarning mavjudligini koʻrsatdi. Bu qarash keyinchalik gʻarb tilshunosligida accidental gap (tasodifiy boʻshliq) tushunchasi sifatida rivojlandi va fonologik, morfologik hamda semantik boʻshliqlarni farqlashga olib keldi.

Ikkinchi an'ana — tarjimashunoslik an'anasi. 1958-yilda J.-P. Vine va J. Darbelne oʻzlarining «Fransuz va ingliz tillarining qiyosiy stilistikasi» nomli klassik asarida lacune atamasini fanga kiritdilar. Mualliflar lakunani «bir tildagi soʻz boshqa tilda muqobilini topa olmaydigan hodisa» sifatida ta'rifladilar. Aynan shu ta'rif keyingi oʻn yilliklarda tarjimashunoslik va kontrastiv leksikologiyada asos boʻlib xizmat qildi. Shu bilan birga, A. V. Fedorov 1953-yilda nashr etilgan «Tarjima nazariyasiga kirish» asarida muqobili yoʻq leksikani tarjima qilishning dastlabki usullarini — transliteratsiya, transkripsiya, kalka va tavsifiy tarjimani tizimlashtirdi.

Mazkur bosqichning asosiy xususiyati shundaki, lakuna hali mustaqil tadqiqot obyekti emas, balki boshqa masalalarni yoritish jarayonida qayd etilgan yondosh hodisa maqomida edi. Shunga qaramay, aynan shu bosqichda nazariyaning ikkita tayanch gʻoyasi shakllandi: «yoʻqlik» ham lisoniy fakt sifatida tadqiq etilishi mumkinligi va bu yoʻqlik faqat qiyoslash sharoitida aniqlanishi.

2. Tarjimashunoslik-kontrastiv bosqich (1960-1970-yillar)

Ikkinchi bosqichda lakuna muammosi qiyosiy tilshunoslik va tarjima nazariyasining markaziy masalalaridan biriga aylandi. Yu. S. Stepanov 1965-yilda nashr etilgan «Fransuz stilistikasi» asarida lakunalarni obrazli tarzda «tilning semantik xaritasidagi oq dogʻlar» deb atadi. Bu metafora keyinchalik sohaning eng koʻp iqtibos keltiriladigan ta'riflaridan biriga aylandi. V. G. Gak lakunalarni «tilning leksik tizimidagi boʻshliqlar», ya'ni mantiqan mavjud boʻlishi kerakdek tuyulgan, ammo amalda mavjud boʻlmagan soʻzlar sifatida izohladi.

Bu bosqichning eng muhim yutugʻi V. L. Muravyovning 1975-yilda chop etilgan «Leksik lakunalar (fransuz va rus tillari leksikasi materialida)» monografiyasidir. Unda birinchi marta lakunalarning batafsil tasnifi taklif etildi: tillararo va til ichidagi lakunalar; mutlaq va nisbiy lakunalar; vektorli, stilistik hamda assotsiativ lakunalar. Muravyov shuningdek lakunalarni aniqlashning qiyosiy protsedurasini ishlab chiqdi, bu esa nazariyani empirik tadqiqot uchun ochdi.

Ayni davrda Ye. M. Vereshchagin va V. G. Kostomarovning «Til va madaniyat» (1973) kitobi lingvomamlakatshunoslik yoʻnalishiga asos soldi va «nomutanosib leksika» (безэквивалентная лексика) hamda «fon leksikasi» tushunchalarini ilmiy muomalaga kiritdi. S. Vlaxov va S. Florinning «Tarjimada tarjima qilib boʻlmaydigan narsalar» (1980) asarida esa realiyalar tasnifi va ularni tarjima qilishning oltita usuli — transkripsiya, kalka, neologizm yaratish, taqribiy tarjima, kontekstual tarjima va tushirib qoldirish batafsil yoritildi.

Bosqichning umumiy xususiyati: tadqiqot obyekti leksik birlik doirasi bilan chegaralangan, lakuna asosan «soʻz darajasidagi boʻshliq» sifatida tushunilgan; metodologiyada kontrastiv tahlil yetakchi oʻrinni egallagan. Muhim cheklov — lakunaning madaniy va psixologik jihatlari deyarli tadqiq etilmaganligi.

3. Etnopsixolingvistik bosqich (1977-1989)

Uchinchi bosqich lakunalar nazariyasi tarixidagi eng keskin sifat sakrashi hisoblanadi. Yu. A. Sorokinning 1977-yilda «Nutqiy xulq-atvorning milliy-madaniy oʻziga xosligi» toʻplamida bosilgan «Lakunalarni aniqlash usuli — lokal madaniyatlar oʻziga xosligini ochishning yoʻllaridan biri sifatida» nomli maqolasi tadqiqot obyektini tubdan kengaytirdi: lakuna endi faqat lisoniy emas, balki madaniy hodisa sifatida ham talqin qilina boshladi. Olim tarjima matnlari va ularning asl nusxalarini qiyoslash orqali madaniyatlar oʻrtasidagi farqlarni aniqlash metodikasini taklif etdi.

Bosqichning choʻqqisi Yu. A. Sorokin tahriri ostida 1988-yilda nashr etilgan «Etnopsixolingvistika» jamoaviy monografiyasidir. Bu asarda lakunalar nazariyasi birinchi marta yaxlit nazariy tizim sifatida taqdim etildi. Unda lakunalarning quyidagi turlari ajratildi: subyektiv (milliy-psixologik) lakunalar; faoliyat-kommunikativ lakunalar; madaniy makon lakunalari; matn lakunalari. Shuningdek, «etnoeydema», «anti-soʻz» kabi yangi metatil birliklari kiritildi.

Aynan shu bosqichda lakunalarni bartaraf etishning ikki asosiy usuli — toʻldirish (заполнение) va kompensatsiya (компенсация) nazariy jihatdan asoslandi. Toʻldirish lakuna mazmunini reseptor uchun izohlashni (izoh, sharh, tavsifiy tarjima) nazarda tutadi va madaniy oʻziga xoslikni saqlaydi; kompensatsiya esa lakunar birlikni qabul qiluvchi madaniyatga xos, funksional jihatdan yaqin birlik bilan almashtirishdan iborat boʻlib, matnni tushunarli qiladi, ammo milliy kolorit qisman yoʻqoladi.

Metodologik jihatdan bosqich empirik yondashuvning kuchayishi — matn qiyosi, reseptorlar bilan suhbat va soʻrovnoma usullarining qoʻllanishi hamda Moskva etnopsixolingvistika maktabining shakllanishi bilan ajralib turadi.

4. Yevropa lakunologiya maktabi bosqichi (1990-2006)

Toʻrtinchi bosqichda lakunalar nazariyasi milliy chegaralardan chiqib, xalqaro ilmiy muomalaga kirdi. Nemis tadqiqotchisi A. Ertelt-Fit 1990-yilda nashr etilgan «Moskva kundalik turmushidagi xulq-atvor, til va ma'nolarning madaniyatlararo qiyosiy tahlili» monografiyasida lakunalar nazariyasini empirik tadqiqot vositasiga aylantirdi. Muallif 1983-1984-yillarda Moskvada boʻlgan gʻarbiy germaniyalik talabalar bilan intervyular oʻtkazib, ularning kundalik turmushda duch kelgan tushunmovchiliklarini lakunalar tizimi orqali tahlil qildi. Bu ish nazariyaga kuzatuv, intervyu va kundalik yozuvlari kabi sifat tadqiqoti usullarini olib kirdi.

A. Ertelt-Fit 2005-yilgi tadqiqotida lakunalarning ikki o‘lchovli tasnifini taklif etdi. Birinchi o‘lchov uchta guruhni qamrab oladi: mental lakunalar (kognitiv va affektiv holatlardagi farqlar); faoliyat lakunalari (axborotni qayta ishlash, nutq va harakat tarzidagi farqlar); predmet lakunalari (buyumlar, inson tanasi va atrof-muhitga oid farqlar). Ikkinchi o‘lchov — aksiologik lakunalar bo‘lib, ular madaniyatga asoslangan ma’no va baholash farqlarini ifodalaydi. Har bir lakuna, muallif fikricha, konfrontativ yoki kontrastiv, oshkora yoki yashirin, nisbiy yoki mutlaq bo‘lishi mumkin.

H. Shryoder rahbarligidagi Frankfurt (Oder) Yevropa universiteti tadqiqotchilari guruhi lakunalar nazariyasini madaniyatlararo kommunikatsiya, reklama diskursi va ish yuritish muloqoti sohalariga tatbiq etdi: E. Grodzki reklama matnlarida, I. Panasyuk esa tarjima jarayonida lakunalarning namoyon bo‘lishini tadqiq etdi. I. Panasyuk va H. Shryoder tahriri ostida 2006-yilda «Madaniyat semiotikasi» turkumining 5-jildi sifatida chop etilgan «Lakunalar nazariyasi: til va madaniyatni o‘rganishning etnopsixolingvistik jihatlari» to‘plami mazkur bosqichning yakunlovchi hujjati hisoblanadi.

Bosqichning asosiy yutug‘i — nazariyaning empirik-eksperimental metodologiya bilan boyishi va amaliy sohalarga tatbiq etilishi. Tadqiqot obyekti endi til birligi emas, balki madaniyatlararo o‘zaro ta’sirning butun makonidir.

5. Sistem-leksikologik va kognitiv bosqich (1998-2010)

Beshinchi bosqichda lakunalar nazariyasi ikki yo‘nalishda chuqurlashdi. Birinchi yo‘nalish G. V. Bikovaning nomi bilan bog‘liq. Uning «Rus tilining leksik lakunarligi fenomenologiyasi» (1998) va «Lakunarlik leksik sistemologiya kategoriyasi sifatida» (2003) tadqiqotlarida lakunarlik til tizimining ichki kategoriyasi sifatida asoslandi. Muallif til ichidagi lakunalar muammosini birinchi o‘ringa qo‘ydi va shu tariqa nazariyaning an’anaviy «tillararo» doirasini kengaytirdi. Bikova lakunalarni aniqlashning «nol lekseema» (virtual leksik birlik) tushunchasi orqali modellashtirish usulini taklif etdi.

Ikkinchi yo‘nalish — Voronej kontrastiv leksikologiya maktabi. I. A. Sternin, Z. D. Popova va M. A. Sternina tomonidan 2003-yilda nashr etilgan «Tilda va nutqda lakunalar» to‘plamida lakuna va konsept tushunchalarining nisbati aniqlandi. Mualliflar lakuna til tizimidagi bo‘shliqni, konseptual bo‘shliq («konseptual lakuna») esa ong tizimidagi bo‘shliqni ifodalashini asosladilar. Bu farqlash muhim metodologik ahamiyatga ega: agar tilda nom bo‘lmasa-yu, tushuncha mavjud bo‘lsa, bu nominativ lakuna; agar tushunchaning o‘zi ham bo‘lmasa, bu kognitiv lakunadir. Voronej maktabi shuningdek lakunalarni aniqlashning kontrastiv metodikasini — qiyosiy juftliklar tuzish va semema tahlili orqali — batafsil ishlab chiqdi.

Bosqichning yakunlovchi hodisasi I. Yu. Markovina va Yu. A. Sorokinning 2010-yilda nashr etilgan «Madaniyat va matn. Lakunologiyaga kirish» kitobi bo‘lib, unda «lakunologiya» atamasi mustaqil ilmiy yo‘nalish nomi sifatida rasmiylashtirildi. Bosqich metodologiyasida esa kognitiv tahlil, konseptual modellashtirish va psixolingvistik eksperiment usullari yetakchi o‘rinni egalladi.

6. Zamonaviy interdisiplinar bosqich (2010-yillardan hozirgacha)

Oltinchi bosqichda lakunologiya aniq ifodalangan fanlararo maqomga ega bo‘ldi. Nazariya tarjimashunoslik doirasidan chiqib, kinoshunoslik, korporativ va transmadaniy kommunikatsiya, tibbiy diskurs tahlili, huquqiy terminologiya, media-tadqiqotlar hamda kompyuter lingvistikasi sohalarida qo‘llanmoqda. Xususan, E. Denisova-Shmidt va uning hammualliflari lakunalar tahlilini xalqaro biznes muhitidagi tushunmovchiliklarni aniqlash vositasi sifatida sinovdan o‘tkazdilar.

Zamonaviy bosqichning yana bir muhim yo‘nalishi — grammatik va diskursiv lakunarlik muammosi. Agar avvalgi bosqichlarda lakuna asosan leksik daraja bilan bog‘langan bo‘lsa, hozirgi tadqiqotlarda morfologik kategoriyalar tizimidagi bo‘shliqlar (masalan, o‘zbek tilida grammatik jins kategoriyasining yo‘qligi), sintaktik konstruksiyalar va nutqiy etiket formulalaridagi lakunalar ham tadqiq etilmoqda. Sukut (silentsial effekt), ellipsis va implikatura hodisalari lakunar hodisalar doirasiga kiritilmoqda.

Alohida e’tiborga loyiq yo‘nalish — nazariyaning mashina tarjimasi va tabiiy tilni qayta ishlash texnologiyalari bilan bog‘lanishi: madaniy jihatdan lakunar birliklar avtomatik tarjima tizimlarining eng zaif nuqtalaridan biri bo‘lib qolmoqda.

O‘zbek tilshunosligida lakuna muammosi asosan lingvokulturologik va tarjimashunoslik yo‘nalishlarida o‘rganilmoqda. Tadqiqotlarning katta qismi badiiy matn tarjimasidagi milliy-madaniy o‘ziga xoslikni yetkazish masalasiga bag‘ishlangan. Masalan, Sh. B. Baxodirova Abdulla Qodiriy romanlari materialida o‘zbek madaniyatiga xos etnografik va maishiy leksikaning ingliz hamda rus tillariga o‘girilishida yuzaga keladigan lakunalarni tahlil qilgan. Shu bilan birga, o‘zbek tilshunosligida lakunologiya bo‘yicha maxsus monografik tadqiqotlar hali yetarli emas, milliy lakunar lug‘at yaratilmagan va lakunalarni aniqlashning o‘zbek tili materialiga moslashtirilgan metodikasi ishlab chiqilmagan. Bu esa mazkur yo‘nalishning istiqbolli ilmiy maydon ekanligidan dalolat beradi.

1-jadval. Lakunalar nazariyasi shakllanishining bosqichlari

Bosqich va davr	Yetakchi vakillar	Tadqiqot obyekti	Metodologik asos
1. Lingvistik zamin (1950-yillar)	Ch. Hokket, J.-P. Vine, J. Darbelne, A. V. Fedorov	Til tizimidagi tasodifiy bo‘shliqlar; muqobilsiz so‘z	Introspektiv-tahliliy yondashuv

Bosqich va davr	Yetakchi vakillar	Tadqiqot obyekti	Metodologik asos
2. Tarjimashunoslik-kontrastiv (1960-1970-yillar)	Yu. S. Stepanov, V. G. Gak, V. L. Muravyov, Ye. M. Vereshchagin, V. G. Kostomarov, S. Vlaxov, S. Florin	Leksik birlik, nomutanosib leksika, realiya	Kontrastiv tahlil, tarjima qiyosi
3. Etnopsixolingvistik (1977-1989)	Yu. A. Sorokin, I. Yu. Markovina, A. N. Kryukov	Matn va madaniyat; nutqiy xulq-atvor	Matn qiyosi, so‘rovnoma, reseptor tahlili
4. Yevropa lakunologiya maktabi (1990-2006)	A. Ertelt-Fit, H. Shryoder, I. Panasyuk, E. Grodzki	Madaniyatlararo o‘zaro ta’sir makoni	Empirik-eksperimental, sifat tadqiqoti
5. Sistem-leksikologik va kognitiv (1998-2010)	G. V. Bikova, I. A. Sternin, Z. D. Popova, M. A. Sternina	Til tizimi va konseptosfera bo‘shliqlari	Kognitiv tahlil, psixolingvistik tajriba
6. Zamonaviy interdisiplinar (2010-yillardan)	E. Denisova-Shmidt, I. Panasyuk va boshq.; o‘zbek tadqiqotchilari	Diskurs, grammatik kategoriyalar, raqamli muhit	Korpus tahlili, fanlararo modellashtirish

MUHOKAMA

Tadqiqot natijalari lakunalar nazariyasining monogenetik emas, balki poligenetik tabiatga ega ekanligini ko‘rsatadi. Nazariya yagona manbadan emas, uchta mustaqil ilmiy an’ananing kesishuvidan o‘sib chiqqan: struktur tilshunoslikning «tizimdagi bo‘shliq» g‘oyasi, tarjimashunoslikning «muqobilsizlik» muammosi va etnopsixolingvistikaning «madaniy o‘ziga xoslik» konsepsiyasi. Ushbu uch an’ananing har biri nazariyaga o‘ziga xos hissa qo‘shgan: birinchisi — metodologik qat’iylik, ikkinchisi — amaliy yo‘naltirilganlik, uchinchisi — madaniy chuqurlik. Ayni paytda ular to‘liq birlashib ketmagan: g‘arb tilshunosligidagi accidental gap an’anasi bilan rus-nemis lakunologiyasi hanuz nisbatan avtonom rivojlanmoqda, o‘zaro iqtibos darajasi esa past.

Tahlil sohaning terminologik apparatida sezilarli xilma-xillik mavjudligini tasdiqladi. Bir yoki juda yaqin hodisalarni ifodalash uchun quyidagi atamalar qo‘llanadi: lakuna, lakunar birlik, nomutanosib leksika, realiya, fon leksikasi, etnoeydema, anti-so‘z, «oq dog’», gap, blank spot, nol lekseema. Bu atamalar to‘liq sinonim emas: ular hodisaning turli qirralarini ta’kidlaydi. «Realiya» obyektiv borliqdagi predmetning boshqa madaniyatda yo‘qligini, «nomutanosib leksika» tarjima muvofiqligining yo‘qligini, «lakuna» esa qiyoslanayotgan tizimdagi bo‘shliqning o‘zini nomlaydi. Shu bois ularni bir-birining o‘rnida qo‘llash metodologik jihatdan noto‘g‘ridir. Maqolada taklif etilayotgan yondashuvga ko‘ra, «lakuna» umumiy (giperonimik) atama sifatida, qolganlari esa uning muayyan ko‘rinishlarini bildiruvchi turdosh atamalar sifatida qaralishi maqsadga muvofiq.

Tasniflar masalasida ham yagona tizim shakllanmagan: bugungi kunda kamida oltita mustaqil tasnif asosi qo‘llanmoqda — qiyoslash doirasi (tillararo va til ichidagi), mutlaqlik darajasi (mutlaq va nisbiy), sabab (motivlashgan va motivlashmagan), til darajasi (fonetik, leksik, grammatik, sintaktik, matn lakunalari), mazmun sohasi (predmet, faoliyat, mental) hamda qayd etilganlik darajasi (uzual va okkazional). Ushbu tasniflar bir-birini inkor etmaydi, aksincha, ko‘p o‘lchovli matritsa hosil qiladi; shu sababli zamonaviy tadqiqotlarda bir o‘lchovli tasniflardan ko‘p o‘lchovli modellarga o‘tish tendensiyasi kuzatilmoqda.

Lakunalarni bartaraf etish usullarini qiyoslash shuni ko‘rsatadiki, to‘ldirish va kompensatsiya o‘rtasidagi tanlov universal qoidaga bo‘ysunmaydi. To‘ldirish madaniy axborotni maksimal saqlaydi, lekin matn hajmini oshiradi, shu bois ilmiy, o‘quv va publitsistik matnlar uchun maqbulroq; kompensatsiya kommunikativ ta’sirchanlikni saqlaydi, ammo milliy koloritni yo‘qotish xavfini tug‘diradi va ko‘proq badiiy nasr, drama hamda reklama matnlarida qo‘llanadi. Amaliyotda esa ko‘pincha aralash strategiya — matn ichida kompensatsiya, izohlarda to‘ldirish afzal ko‘riladi.

Tadqiqotning cheklovlarini ham qayd etish lozim: korpusga asosan ochiq manbalarda mavjud ishlar kiritilgan, ayrim milliy an’analar qamrab olinmagan; davriylashtirish chegaralari esa shartli xarakterga ega, chunki bosqichlar bir-biriga qisman qoplashadi. Shunga qaramay, taklif etilgan davriylashtirish «Lingvokulturologiya», «Tarjima nazariyasi va amaliyoti», «Madaniyatlararo kommunikatsiya» fanlarini o‘qitishda nazariy asos bo‘lib xizmat qilishi mumkin, terminologik apparatning tizimlashtirilishi esa o‘zbek tilida lakunologiya metatilini shakllantirishga ko‘maklashadi.

XULOSA

O‘tkazilgan tadqiqot quyidagi xulosalarni chiqarishga imkon berdi.

Birinchidan, lakunalar nazariyasi XX asrning 50-yillarida bir-biridan mustaqil ravishda shakllangan uchta ilmiy an’ana — struktur tilshunoslik, tarjimashunoslik va etnopsixolingvistikaning kesishuvida vujudga kelgan. «Lakuna» atamasini tilshunoslik muomalasiga J.-P. Vine va J. Darbelne (1958) kiritgan bo‘lsa-da, hodisaning o‘zi Ch. Hokket (1954) tomonidan «naqshlardagi tasodifiy bo‘shliqlar» sifatida undan avvalroq qayd etilgan.

Ikkinchidan, nazariya taraqqiyotining olti bosqichi ajratildi: lingvistik zamin bosqichi (1950-yillar), tarjimashunoslik-kontrastiv bosqich (1960-1970-yillar), etnopsixolingvistik bosqich (1977-1989), Yevropa lakunologiya maktabi bosqichi (1990-2006), sistem-leksikologik va kognitiv bosqich (1998-2010) hamda zamonaviy interdisiplinar bosqich (2010-yillardan). Bosqichlar tadqiqot obyektining hajmi, metatil apparatining boyligi va metodologik asosning tabiati bo‘yicha farqlanadi.

Uchinchidan, nazariya taraqqiyotining umumiy yo‘nalishi tadqiqot obyektining izchil kengayishi bilan tavsiflanadi: so‘z → matn → madaniy xulq-atvor → kognitiv struktura → diskursiv va raqamli muhit; metodologiya esa introspektiv tahlildan kontrastiv, so‘ngra empirik-eksperimental va korpus usullariga qarab rivojlangan.

To‘rtinchidan, sohaning terminologik xilma-xilligi tizimlashtirilishi va «lakuna» atamasi giperonim maqomida qat’iylashtirilishi zarur.

Beshinchidan, o‘zbek tilshunosligida lakunologik tadqiqotlar dastlabki bosqichda turibdi. Istiqbolli yo‘nalishlar sifatida quyidagilarni ko‘rsatish mumkin: o‘zbek-ingliz va o‘zbek-rus lakunar lug‘atlarini tuzish; o‘zbek milliy korpusi materialida lakunalarni aniqlashning avtomatlashtirilgan metodikasini ishlab chiqish; o‘zbek tilining grammatik lakunarligini tizimli tavsiflash; o‘zbek badiiy adabiyoti tarjimalarida lakunalarni bartaraf etish strategiyalarining samaradorligini baholash; lakunologiya metatilini o‘zbek tilida shakllantirish.

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LINGVISTIK VA MADANIY ADEKVATLIKNING BADIIY TARJIMADAGI NAZARIY YONDASHUVLARI

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Annotatsiya: *Mazkur maqolada lingvistik va madaniy adekvatlik tushunchalarining zamonaviy tilshunoslik, tarjimashunoslik va lingvokulturologiya doirasidagi nazariy-metodologik asoslari yoritiladi. Tadqiqotda lingvistik adekvatlik til birliklarining semantik, grammatik, uslubiy va pragmatik xususiyatlarini asl matn mazmuniga muvofiq tarzda qayta yaratish nuqtayi nazaridan tahlil qilinadi. Shu bilan birga, madaniy adekvatlik tarjima jarayonida milliy-madaniy xususiyatlar, realiyalar, frazeologik birliklar, milliy konseptlar, urf-odatlar, an'analar hamda muayyan xalqning tarixiy va ijtimoiy tajribasini to'g'ri aks ettirishni nazarda tutishi asoslanadi. Maqolada lingvistik va madaniy adekvatlikni ta'minlashning semantik, funksional-pragmatik, kommunikativ va lingvomadaniy yondashuvlari umumlashtiriladi hamda ushbu nazariy qoidalar "O'tkan kunlar" romanining rus tiliga tarjimalari misolida amaliy jihatdan tahlil qilinadi. Tadqiqot natijalari tarjima jarayonida til va madaniyatning o'zaro munosabatini kompleks o'rganish, milliy-madaniy mazmunni saqlab qolish hamda tarjima matnining o'quvchi uchun tabiiy va tushunarli bo'lishini ta'minlash muhimligini ko'rsatadi.*

Kalit so'zlar: *adekvatlik tushunchasi, lingvistik adekvatlik, madaniy adekvatlik, ekvivalentlik, milliy kolorit, lingvistik xususiyatlar, realiya.*

ТЕОРЕТИЧЕСКИЕ ПОДХОДЫ К ЛИНГВИСТИЧЕСКОЙ И КУЛЬТУРНОЙ АДЕКВАТНОСТИ В ХУДОЖЕСТВЕННОМ ПЕРЕВОДЕ

Аннотация: *В данной статье раскрываются теоретико-методологические основы понятий лингвистической и культурной адекватности в рамках современной лингвистики, переводоведения и лингвокультурологии. Лингвистическая адекватность анализируется с точки зрения воссоздания семантических, грамматических, стилистических и прагматических свойств языковых единиц в соответствии с содержанием исходного текста. Вместе с тем обосновывается, что культурная адекватность предполагает точную передачу в процессе перевода национально-культурных особенностей, реалий, фразеологических единиц, национальных концептов, обычаев, традиций, а также исторического и социального опыта конкретного народа. В статье обобщаются семантический, функционально-прагматический, коммуникативный и лингвокультурный подходы к обеспечению лингвистической и культурной адекватности, и эти теоретические положения анализируются практически на примере русских переводов романа «Минувшие дни». Результаты исследования показывают важность комплексного изучения взаимодействия языка и культуры в процессе перевода, сохранения национально-культурного содержания и обеспечения естественности и понятности переводного текста для читателя.*

Ключевые слова: *понятие адекватности, лингвистическая адекватность, культурная адекватность, эквивалентность, национальный колорит, лингвистические особенности, реалия.*

THEORETICAL APPROACHES TO LINGUISTIC AND CULTURAL ADEQUACY IN LITERARY TRANSLATION

Abstract: *This article examines the theoretical and methodological foundations of the concepts of linguistic and cultural adequacy within the framework of modern linguistics, translation studies, and linguoculturology. The study analyzes linguistic adequacy from the standpoint of recreating the semantic, grammatical, stylistic, and pragmatic features of linguistic units in accordance with the content of the source text. At the same time, cultural adequacy is substantiated as the accurate representation of national and cultural characteristics, realia, phraseological units, national concepts, customs, traditions, and the historical and social experience of a particular people in the translation process. The article summarizes semantic, functional-pragmatic, communicative, and linguocultural approaches to ensuring linguistic and cultural adequacy, and applies these theoretical principles to a practical analysis of the Russian translations of the novel "O'tkan kunlar" The findings demonstrate the importance of a comprehensive study of the interaction between language and culture in the translation process, the preservation of national and cultural content, and ensuring that the translated text is natural, comprehensible, and accessible to the target reader.*

Keywords: *concept of adequacy, linguistic adequacy, cultural adequacy, equivalence, national coloring, linguistic features, realia.*

Tarjimashunoslikda “adekvatlik” tushunchasi XX asrning ikkinchi yarmidan boshlab ilmiy tadqiqotlarning asosiy masalalaridan biri sifatida shakllandi. Adekvat tarjima deganda manba matnining mazmuni, vazifasi, uslubi va pragmatik ta’sirining qabul qiluvchi til va madaniyat sharoitida mumkin qadar to‘liq qayta yaratilishi tushuniladi. Bu masala ayniqsa badiiy matn tarjimasida dolzarblik kasb etadi, chunki badiiy asar tilning faqat axboriy emas, balki estetik va madaniy salohiyatini ham namoyon qiladi. Shuningdek, adekvatlik muammosi tillararo ekvivalentlik masalasidan ancha keng tushunchadir, u tarjimaning mazmun, shakl, vazifa va pragmatik ta’sir jihatlarini qamrab oladi. Zamonaviy ilmiy adabiyotlarda adekvat tarjima manba matnning semantik-stilistik xususiyatlarini saqlagan holda, qabul qiluvchi madaniyatda funksional jihatdan to‘liq ishlay oladigan matn sifatida talqin qilinadi.

Lingvistik adekvatlik, an’anaviy ravishda, til tizimlari o‘rtasidagi moslik bilan bog‘liq bo‘lib, leksik, morfologik va sintaktik birliklarning ma’no jihatdan muvofiq kelishiga asoslanadi. Biroq badiiy matnda til birliklari ko‘pincha qo‘shimcha semantik va ekspressiv yuklamalarga ega bo‘lgani uchun, lingvistik adekvatlikni formal moslik bilan cheklash mumkin emas.

Madaniy adekvatlik esa tarjimaning madaniyatlararo tabiatini aks ettirib, manba matnda ifodalangan milliy-madaniy axborotning qabul qiluvchi til jamoasi tomonidan to‘g‘ri anglanishini ta’minlashni nazarda tutadi. Bu tushuncha realiyalar, milliy urf-odatlar, diniy qarashlar, ijtimoiy munosabatlar va qadriyatlar bilan bevosita bog‘liq.

Yevropa tarjimashunosligida bu masala funksional va kommunikativ yondashuvlar asosida izohlanadi. Masalan, E. Nida tarjimada formal va dinamik ekvivalentlikni farqlab, badiiy asarlarda dinamik ekvivalentlik, ya’ni o‘quvchida asl matndagiga yaqin estetik va emotsional ta’sir uyg‘otishni ustuvor deb hisoblaydi23.

Rus tarjimashunosligida V.N. Komissarov adekvatlikni ekvivalentlikning amaliy ifodasi sifatida talqin qilib, uning bir necha darajalarini ajratadi: semantik, pragmatik va stilistik darajalar24. Uning ta’kidlashicha, badiiy tarjimada to‘liq formal moslik emas, balki mazmun, uslub va funksiyaning uyg‘unligi muhim hisoblanadi.

O‘zbek tarjimashunos olimlarining ishlarida ham adekvatlik muammosi markaziy o‘rinni egallaydi. Jumladan, G’. Salomov tarjimani “milliy tafakkurni boshqa tilda qayta yaratish jarayoni” sifatida talqin qiladi va tarjimada mazmun bilan bir qatorda milliy ruhni saqlash zarurligini ta’kidlaydi. G’. Salomov tarjimani «ikki til va ikki madaniyat o‘rtasidagi badiiy-ma’naviy ko‘prik» sifatida ta’riflab, adekvatlikni faqat til vositalari darajasida emas, balki milliy-madaniy realiyalar darajasida ham ta’minlash zarurligini uqtiradi25.

N. Komilov o‘z tadqiqotlarida tarjimada milliy kolorit muammosiga alohida e’tibor qaratib, milliy realiyalarning neytrallashuvi asarning madaniy qiymatini kamaytiradi, deb hisoblaydi. U badiiy tarjimada milliy ruhni saqlashni tarjimonning asosiy vazifasi sifatida belgilab, madaniy adekvatlikka erishish uchun tarixiy va etnografik bilimlar muhimligini uqtiradi. Uning ta’kidlashicha, tarjimada mazmun saqlanib qolgan taqdirda ham, agar shakl orqali berilgan milliy-estetik axborot yo‘qolsa, tarjima adekvat hisoblanmaydi26.

Tarjima jarayonida “adekvatlik” ko‘pincha “ekvivalentlik” atamasi bilan yonma-yon qo‘llanadi, ammo u faqat semantik moslik emas, balki funksional-kommunikativ qiymatning imkon qadar to‘liq qayta qurilishini ham anglatadi . Nida dinamik ekvivalentlikni “retseptor reaksiyasi”ga bog‘lar ekan, asliyatning o‘quvchi ongidagi ta’sirini tarjima o‘quvchisida ham uyg‘otishni mezon sifatida ko‘rsatadi27. Demak, adekvat tarjima - bu nafaqat nima deyilgani, balki qanday va nega aynan shunday deyilgani masalalarining uzviy yechimidir. Shuning uchun ham mazmun va shakl uyg‘unligi lingvistik qatlam (leksika, grammatika, sintaksis, uslub) bilan madaniy qatlam (realiyalar, udum, ijtimoiy norma, ma’naviy-axloqiy kod) o‘rtasidagi muvozanatdir.

Badiiy tarjima nazariyasida *lingvistik adekvatlik* markaziy kategoriyalardan biri hisoblanadi. U asl matndagi leksik, grammatik va stilistik birliklarning tarjima tilida funksional, semantik va uslubiy jihatdan maqsadga muvofiq qayta yaratilishini anglatadi. Lingvistik adekvatlik tarjimaning formal mosligidan ko‘ra kengroq tushuncha bo‘lib, u matnning umumiy estetik ta’siri, milliy-madaniy xususiyatlari va muallif uslubini saqlab qolishga qaratilgan.

Tarjimashunoslikda lingvistik adekvatlik asliy matnning semantik, sintaktik va uslubiy parametrlarini tarjima tilida funksional va kommunikativ jihatdan mos darajada qayta tiklashni nazarda tutadi. Ushbu tushuncha tarjimada faqat ma’noni uzatish bilan cheklanmasdan, asl matndagi til qurilishi, grammatik munosabatlar hamda uslubiy belgilarning saqlanishini ham qamrab oladi.

23 Nida E. A. Toward a Science of Translating; Language, Culture and Translating. Brill. 2000, - p. 97.

24 Комиссаров В. Н. Теория перевода (лингвистические аспекты). - М.: Высшая школа, 1990, - с. 106

25 Саломов Ғ. Таржима назарияси асослари. Тошкент, “Ўқитувчи” нашриёти 1983 й. - б. 78.

26 Komilov N. Badiiy tarjima va milliy uslub. - Toshkent: Fan, 1998, - б. 42.

27 Nida E. A. Toward a Science of Translating; Language, Culture and Translating. Brill. 2000, - p. 172.

Bu masalaga ilmiy asos solgan tadqiqotchilardan biri - J. C. Catford boʻlib, u tarjimani til tizimlari oʻrtasidagi munosabat sifatida talqin qiladi. Catford tarjimada adekvatlikni til sathlari - fonologik, leksik va ayniqsa grammatik-sintaktik strukturalar oʻrtasidagi moslik bilan bogʻlaydi. Uning fikricha, adekvat tarjima asl matn maʼnosini saqlagan holda, tarjima tili imkoniyatlari doirasida unga funksional jihatdan teng boʻlgan til birliklarini tanlash orqali amalga oshiriladi28. Shu maʼnoda, lingvistik adekvatlik asl matndagi semantik munosabatlarning sintaktik shakllar orqali qanday ifodalanganini hisobga olishni taqozo etadi.

Zamonaviy tarjimashunoslikda mazkur masala yanada kengroq talqin etiladi. Xususan, Mona Baker lingvistik adekvatlikni tarjimada koʻp darajali moslik sifatida koʻradi. Uning taʼlimotiga koʻra, tarjimon asl matn va tarjima matni oʻrtasida quyidagi sathlarda muvozanatni saqlashi lozim:

- leksik-semantik moslik,
- grammatik va sintaktik munosabatlar,
- matn ichidagi koxeziya va koxerentlik,
- uslubiy va pragmatik taʼsir29.

Baker taʼkidlashicha, lingvistik adekvatlik mutlaq shakliy moslikni emas, balki funksional ekvivalentlikni nazarda tutadi. Yaʼni asl matnda muayyan sintaktik yoki uslubiy vosita qanday vazifa bajargan boʻlsa, tarjima matnida ham shu vazifani bajara oladigan vosita tanlanishi lozim. Bu esa tarjimondan chuqur lingvistik tahlil va ongli tanlovni talab qiladi. Shu tariqa, Catford va Baker nazariyalarini umumlashtirgan holda aytish mumkinki, lingvistik adekvatlik - bu asliy matnning semantik mazmunini saqlash bilan birga, uning sintaktik tuzilishi va uslubiy xususiyatlarini nishon tilida funksional jihatdan qayta yaratish jarayonidir. Ushbu adekvatlik turi badiiy tarjimada ayniqsa muhim boʻlib, u tarjimaning tabiiyligi, taʼsirchanligi va estetik qiymatini belgilab beradi.

Bizga maʼlumki, badiiy tarjimada lingvistik adekvatlik tarjimondan nafaqat til bilimlarini, balki chuqur madaniy, tarixiy va uslubiy tafakkurni ham talab qiladi.

Rus tarjimashunosligida ushbu masalaga alohida eʼtibor qaratgan olimalardan biri - I. S. Alekseyeva boʻlib, u badiiy tarjimada adekvatlikni taʼminlashning asosiy sharti sifatida matnning *uslubiy moslikni* aniqlash zarurligini taʼkidlaydi. Olimaning fikricha, aynan uslubiy moslik - muallif nutqining yetakchi xususiyati - tarjimon qarorlarini belgilab beradi va tarjimada barqaror estetik taʼsirni taʼminlaydi30.

Misol tariqasida olganimizda oʻzbek mumtoz nasrining yuksak namunalaridan biri hisoblangan “Oʻtkan kunlar” romani XIX asr oxiri - XX asr boshlaridagi oʻzbek jamiyatining ijtimoiy, madaniy va maʼnaviy manzarasini realistik ruhda aks ettiradi. Asar tili oʻta murakkab va koʻp qatlamli boʻlib, unda quyidagi lingvistik xususiyatlar ustuvor oʻrin tutadi:

- tarixiy va maishiy arxaizmlar;
- islomiy-diniy atamalar;
- forscha va arabcha leksik qatlam;
- xalq ogʻzaki nutqiga xos frazeologizmlar va maqollar;
- muallif nutqi bilan qahramonlar nutqi oʻrtasidagi uslubiy tafovut.

Aynan shu xususiyatlar romanni rus tiliga tarjima qilish jarayonida lingvistik adekvatlik masalasini dolzarbligini oshiradi. Chunki rus tilida XIX asr oxiridagi oʻzbek jamiyatiga xos realiyalar, ijtimoiy munosabatlar va diniy-maʼnaviy tushunchalarni toʻliq ifodalay oladigan tayyor leksik ekvivalentlar mavjud emas.

«Oʻtkan kunlar» romanining rus tiliga qilingan tarjimalarida tarjimonlar lingvistik adekvatlikni taʼminlash uchun turli strategiya va usullarga murojaat qilganlar. Ularni shartli ravishda quyidagi guruhlarga ajratish mumkin:

1. Transliteratsiya va izohlash. Islomiy atamalar va milliy realiyalar (masalan, diniy lavozimlar, maishiy buyumlar) koʻpincha asl shaklda qoldirilib, izohlar orqali tushuntirilgan. Bu usul milliy koloritni saqlashga xizmat qiladi, biroq matnning badiiy yaxlitligiga maʼlum darajada taʼsir koʻrsatishi mumkin.

2. Funksional ekvivalent qidirish. Xalqona iboralar va maqollarni tarjima qilishda rus tilida maʼno va funksiya jihatdan yaqin boʻlgan frazeologizmlar tanlangan. Bu holatda semantik toʻliqlik emas, balki taʼsirchanlik ustuvor ahamiyat kasb etadi.

3. Stilistik neytrallashtirish. Ayrim arxaik yoki juda milliy xarakterga ega birliklar zamonaviy, neytral rus tili vositalari bilan almashtirilgan. Bu yechim oʻquvchi uchun matnni tushunarli qiladi, ammo muayyan darajada milliy-tarixiy koloritning yoʻqolishiga olib keladi.

I. S. Alekseyeva taʼkidlaganidek, badiiy asar tarjimasida eng muhim vazifalardan biri - uslubiy ustunlikni aniqlashdir. «Oʻtkan kunlar» romanida bunday uslubiy oʻziga xosliklar sifatida tarixiy realizm, milliy kolorit va muallifning publitsistik-tanqidiy ruhini koʻrsatish mumkin.

28 Catford J. C. *A* Linguistic Theory of Translation. - Oxford: Oxford University Press, 1965, - p. 114.

29 Baker M. In Other Words: A Coursebook on Translation. Second ed. London: Routledge, 2011.

30 Алексеева И.С. Введение в переводоведение. - СПБ.: Филологический факулτет СПБГУ, 2004, - с. 114.

Rus tiliga qilingan tarjimalarda ushbu moslikni saqlab qolish darajasi turlicha. Ayrim hollarda leksik aniqlik hisobiga uslubiy ta'sir susaygan bo'lsa, boshqa hollarda, aksincha, badiiy ta'sirni kuchaytirish maqsadida asl matndan ma'lum chekinishlarga yo'l qo'yilgan. Bu esa lingvistik adekvatlikni dinamik, ya'ni har doim mutlaq emas, balki maqsadga yo'naltirilgan kategoriya sifatida qarash zarurligini ko'rsatadi.

Bizningcha, o'zbek asarlarining rus tiliga tarjimalarida lingvistik adekvatlik masalasi ko'p qirrali va murakkab muammo sifatida namoyon bo'ladi. Asarning tarixiy, milliy va uslubiy xususiyatlari tarjimondan chuqur tahlil, ongli tanlov va ijodiy yondashuvni talab qiladi. Lingvistik adekvatlik bu yerda til birliklarining mexanik mosligi emas, balki matnning umumiy estetik va ma'naviy ta'sirini saqlab qolish orqali namoyon bo'ladi. Shu jihatdan, ushbu roman tarjimalari badiiy tarjima nazariyasi uchun muhim ilmiy material vazifasini o'taydi. Asar - o'zbek romanchiligi klassikasi - milliy qadriyatlar, ijtimoiy munosabatlar, sheva va arxaizm qatlamlari, sharqona nutq odobi, to'y-marosimlar, savdo hayoti tasvirlari bilan boy. Shu bois u madaniy adekvatlik masalalarini tadqiqi etish uchun qulay manbaa bo'lib xizmat qiladi.

Badiiy tarjima jarayonida *madaniy adekvatlik* masalasi lingvistik adekvatlik bilan uzviy bog'liq bo'lib, u asl matnda aks etgan milliy qadriyatlar, urf-odatlar, ijtimoiy munosabatlar, tarixiy realiyalar va madaniy konnotatsiyalarni tarjima matnida saqlab qolishni nazarda tutadi. Madaniy adekvatlikka erishish tarjimondan nafaqat ikki tilni, balki ikki madaniy tizimni chuqur anglashni ham talab qiladi.

Tarjimashunoslikda madaniy adekvatlik, avvalo, milliy kolorit tushunchasi bilan bog'lanadi. Milliy kolorit - bu asarda muayyan xalqqa xos hayot tarzi, tafakkur, dunyoqarash va madaniy tajribani ifodalovchi belgilar majmuidir. U, odatda, realiyalar, milliy atamalar, marosimlar, diniy tushunchalar, xalqona iboralar orqali namoyon bo'ladi. Shu bois badiiy tarjimada milliy koloritni saqlash masalasi eng murakkab va bahsli muammolardan biri hisoblanadi.

Zamonaviy tarjimashunoslikda madaniy adekvatlikka turli nazariy yondashuvlar mavjud. Ayrim olimlar uni asl matn madaniy kodlarining maksimal darajada saqlanishi sifatida talqin qilsa, boshqalar tarjima qabul qiluvchi madaniyatda matnning anglanish darajasini ustuvor deb hisoblaydilar. Shu nuqtayi nazardan, madaniy adekvatlik mutlaq kategoriya emas, balki tarjimonning strategiyasi va maqsadiga bog'liq bo'lgan nisbiy tushunchadir.

Yevropa tarjimashunosligida ushbu muammoni tizimli ravishda tahlil qilgan olimlardan biri - Lawrence Venuti bo'lib, u tarjimada madaniy adekvatlikni ta'minlashga qaratilgan ikki asosiy strategiyani ilgari suradi: begonalashtirish (foreignization) va o'zlashtirish (domestication).31

L. Venuti ta'limotiga ko'ra, o'zlashtirish strategiyasi tarjima matnini qabul qiluvchi madaniyat me'yorlariga moslashtirishni nazarda tutadi. Bunda milliy realiyalar, madaniy xususiyatlar ko'pincha neytral yoki umumiy tushunchalar bilan almashtiriladi. Natijada matn o'quvchi uchun oson qabul qilinadi, biroq asl asarga xos milliy kolorit ma'lum darajada yo'qoladi.

Aksincha, begonalashtirish strategiyasi asl matnning madaniy o'ziga xosligini saqlab qolishga qaratilgan bo'lib, tarjima matnida begona madaniy elementlarni ongli ravishda qoldirishni ko'zda tutadi. Venutining ta'kidlashicha, badiiy asar tarjimasida aynan begonalashtirish usuli milliy koloritni saqlashga xizmat qiladi, chunki u o'quvchini "begona madaniyat" bilan yuzma-yuz qiladi va asl matnning madaniy muhitini his qilish imkonini beradi32. Shu bilan birga, Venuti begonalashtirishni mutlaq yechim sifatida emas, balki tarjimonning ongli estetik va madaniy tanlovi sifatida baholaydi. Uning fikricha, har bir badiiy asarda qaysi strategiya ustuvor bo'lishi matnning janri, uslubiy dominantasi va madaniy yuklamasiga bog'liq.

Madaniy adekvatlikni ta'minlashda realiyalar alohida ahamiyatga ega. Realiyalar muayyan xalq yoki madaniyatga xos bo'lgan, boshqa tillarda to'g'ridan-to'g'ri ekvivalenti mavjud bo'lmagan tushunchalarni ifodalaydi. Ular tarjimada quyidagi usullar orqali berilshi mumkin:

- transliteratsiya va qisqacha izoh berish;
- kalkalash;
- funksional yoki tavsifiy ekvivalent qo'llash;
- kam hollarda - madaniy almashtirish.

Begonalashtirish strategiyasi qo'llanilganda, realiyalar, odatda, asl shaklda saqlanadi yoki minimal izoh bilan beriladi. Bu usul matnning milliy ruhini saqlashga xizmat qiladi, ammo tarjimani qabul qilish jarayonini murakkablashtirishi mumkin. Shu bois tarjimon har bir holatda madaniy adekvatlik va kommunikativ tushunarlilik o'rtasida muvozanatni topishi lozim.

Madaniy adekvatlik asliy matnda ifodalangan milliy-madaniy mazmunni - realiyalar, nutq etiketi, tarixiy-madaniy kontekst hamda intertekstual ishoralarni nishon (tarjima) tilida ma'noli va funksional jihatdan qayta qurish jarayoni sifatida talqin etiladi. Madaniy adekvatlik tarjimada faqat leksik yoki grammatik moslik bilan cheklanib qolmay, balki matn

31 Venuti L. The Translator's Invisibility: A History of Translation. - London: Routledge, 1995, - p. 78.

32 Venuti L. Strategies of Translation. *In:* Routledge Encyclopedia of Translation Studies. - London: Routledge, 2001, - p. 128.

orqali uzatilayotgan madaniy axborotning saqlanishi va qabul qiluvchi oʻquvchi tomonidan toʻgʻri anglanishini ham nazarda tutadi.

Ushbu masalaga ilmiy yondashuvni shakllantirgan olimlardan biri - L. K. Latishev hisoblanadi. U tarjimada madaniy adekvatlikni tarixiy va milliy realiyalarning ma'noli qayta ifodalanishi bilan bogʻlaydi. Latishevga koʻra, asliy matnda muayyan madaniy muhitga xos boʻlgan realiyalar tarjima jarayonida yo yoʻqolib ketmasligi, yoki mazmunan buzilmasligi lozim, aks holda tarjima matnining kommunikativ qiymati pasayadi33. Olim ayniqsa nutq etiketini - murojaat shakllari, ijtimoiy maqomni ifodalovchi birliklar, odob-axloqqa doir formulalarni madaniy adekvatlikning muhim komponenti sifatida koʻrsatadi.

Tarjimashunos olimlar Latishev va Venuti nazariyalarini umumlashtirgan holda aytish mumkinki, madaniy adekvatlik - bu asliy matndagi madaniy axborotni mexanik tarzda koʻchirish emas, balki uni tarjima tili va madaniyati imkoniyatlari doirasida ma'noli, funksional va pragmatik jihatdan qayta qurishdir. Bunda tarjimon nafaqat tillararo, balki madaniyatlararo vositachi sifatida faoliyat yuritadi.

Yuqoridagilardan tashqari, madaniy adekvatlik tarjimondan faqat texnik bilim emas, balki ijodiy mas'uliyat ham talab qiladi. Chunki milliy koloritni saqlash yoki yumshatish masalasi koʻpincha tarjimonning shaxsiy dunyoqarashi, estetik pozitsiyasi va ilmiy tayyorgarligi bilan bogʻliq boʻladi. Shu ma'noda, tarjimon badiiy matnni nafaqat tillararo, balki madaniyatlararo muloqot vositasi sifatida qabul qilishi zarur.

Bizning fikrimizga koʻra, madaniy adekvatlik badiiy tarjimaning eng muhim mezonlaridan biri boʻlib, u milliy koloritni saqlash masalasi bilan bevosita bogʻliq. L. Venuti taklif etgan begonalashtirish va oʻzlashtirish strategiyalari ushbu muammoni nazariy jihatdan anglashda muhim metodologik asos boʻlib xizmat qiladi. Ayniqsa, milliy-ma'naviy yuklamasi kuchli boʻlgan badiiy asarlar tarjimasida begonalashtirish strategiyasi madaniy adekvatlikni ta'minlashning samarali vositalaridan biri hisoblanadi. Biroq har qanday holatda ham tarjimon madaniy oʻziga xoslik va oʻquvchi uchun tushunarlilik oʻrtasida ongli va ilmiy asoslangan muvozanatni saqlashi lozim.

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MUMTOZ ADABIYOTDA “YOLG‘IZLIK” TUSHUNCHASINING NAZARIY TAHLILI

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Annotatsiya: *Ushbu maqolada Yolg‘izlik tushunchasining avvalo umumiy ma’no-mazmuni sharhlanib, psixologik va ijtimoiy nuqtai nazardan qanday qarashlar mavjud ekanligiga alohida to‘xtalingan. Shuningdek, asosan, adabiy muhitda Yolg‘izlikning motiv sifatidagi o‘rnini ochib berishga harakat qilingan. Shu bilan birga, Yolg‘izlik adabiy motiv sifatida ko‘plab asarlarda insonning ichki kechinmalari, jamiyatdan ajralganligi, ruhiy iztiroblari yoki o‘zini anglash jarayoni bilan bog‘liq holda tasvirlanadi. Bu motiv orqali adiblar inson tabiatining chuqur qatlamlarini ochib berishga uringanlar. Yolg‘izlik aslida nafaqat ijtimoiy hodisa, balki inson ruhiyatining murakkab holatlarini ifodalovchi badiiy vosita bo‘lib, u orqali yozuvchilar o‘z davrining muammolarini, insoniy qadiyatlarni, hayot mazmunini yoritib beradilar. Tadqiqotda esa Yolg‘izlik motivi xususida alohida qarashlar bilan yoritilgan.*

Kalit so‘zlar: *Yolg‘izlik. motiv, iztirob, ruhiyat, inson.*

ТЕОРЕТИЧЕСКИЙ АНАЛИЗ ПОНЯТИЯ «ОДИНОЧЕСТВО» В КЛАССИЧЕСКОЙ ЛИТЕРАТУРЕ

Аннотация: *В данной статье прежде всего рассматривается общее значение понятия одиночества, при этом особое внимание уделяется существующим психологическим и социальным подходам к нему. Кроме того, предпринята попытка раскрыть место одиночества как мотива преимущественно в литературной среде. Вместе с тем одиночество как литературный мотив изображается во многих произведениях в связи с внутренними переживаниями человека, его отчуждённостью от общества, душевными страданиями или процессом самопознания. Посредством этого мотива писатели стремились раскрыть глубинные пласты человеческой природы. Одиночество в действительности является не только социальным явлением, но и художественным средством, выражающим сложные состояния человеческой психики, через которое писатели освещают проблемы своего времени, человеческие ценности и смысл жизни. В исследовании мотив одиночества раскрывается на основе отдельных научных подходов.*

Ключевые слова: *одиночество, мотив, страдание, психика, человек.*

A THEORETICAL ANALYSIS OF THE CONCEPT OF “LONELINESS” IN CLASSICAL LITERATURE

Abstract: *This article first of all comments on the general meaning of the concept of Loneliness, and specifically focuses on what views there are from a psychological and social point of view. Also, an attempt is made to reveal the place of Loneliness as a motif in the literary environment. At the same time, Loneliness as a literary motif is described in many works in connection with a person’s inner experiences, separation from society, mental suffering or the process of self-awareness. Through this motif, writers have tried to reveal the deep layers of human nature. Loneliness is actually not only a social phenomenon, but also an artistic means expressing complex states of the human psyche, through which writers illuminate the problems of their time, human ideals, and the meaning of life. The study sheds light on the Loneliness motif with special views.*

Keywords: *Loneliness. motif, suffering, psyche, person.*

KIRISH. Yolg‘izlik muammosi insoniyatning eng jiddiy muammolaridan biri bo‘lib, bunda inson u yoki bu sabablarga ko‘ra na do‘stlik, na muhabbat, na dushmanlik munosabatlarini o‘rnata oladi. Inson o‘z munosabatlarining to‘laqonli va ahamiyatli emasligini his qilganida muloqot ehtiyojlari qondirilmaganda yanada o‘zini yolg‘izroq his qila boshlaydi. Yolg‘izlik nazariyalarini falsafiy va psixologik tahlil qilish natijasida uning obyektiv va subyektiv, ijobiy va salbiy jihatlarini farqlash mumkin. Yolg‘izlikning obyektiv tomoni ijtimoiy munosabat va faktlar bilan bog‘liq. Sub’yektiv tomoni esa shaxsning xususiyatlari bilan bog‘liq holda namoyon bo‘lishidir. Yolg‘izlikning ijobiy (pozitiv) jihati uning shaxs ijtimoiylashuvi va individualligi shakllanishining ajralmas qismi ekanligidadir. Yolg‘izlikning ijobiy imkoniyati: o‘zini-o‘zi bilish, o‘zini-o‘zi boshqarish, ijod qilish, o‘zini-o‘zi takomillashtirish, psixofizik holatlarini barqarorlashtirish, tashqi

ta’sirlardan o‘z “Men”ini muhofaza qilish kabi vazifalarda namoyon bo‘ladi. Yolg‘izlikning salbiy (negativ) tabiati- u o‘ziga barcha psixik jarayonlarni bo‘ysundiradi, shaxsning ichki yaxlitligini buzadi, psixologik himoya mexanizmi sifatida namoyon bo‘ladi.

Xilvat so‘zining lug‘aviy ma’nosiga e’tibor qaratadian bo‘lsak, u avvalo *xoli, xoli joy, kimsasiz joy, tanholik, hech nimaga bog‘lanmaslik va dunyoning xilma-xil g‘avg‘olaridan forig‘lik* kabi bir qator ma’nolarda keladi. Xilvatning tasavvufiy ma’nosi quyidagicha: dunyoviy bog‘lanishlardan hosil bo‘ladigan ma’naviy to‘siqlardan o‘tish va ko‘ngilni ilohiy ma’rifat yo‘lida sobitqadam etmoq uchun yolg‘izlikni ixtiyor etib, pirning rahnamoligida ibodat va riyozat bilan shug‘ullanish. Xilvat quyidagi tushunchalar bilan bevosita ma’no-mazmunan bog‘liq: *uzlat, tafrid, tajrid, inzivo, e’tikof, xalq bilan ixtilot(aralashish)nit ark etish, tarki dunyo, tavhid, Vahdat.*

Atrofdagilardan ko‘p narsani kutishga, shaxs sifatida shakllanishidagi boshqalarning rolini oshirib baholashiga olib keladi. Yolg‘izlikning negativ va pozitiv jihatlari o‘rtasidagi dialektik munosabatni e’tiborga olgan holda ta’kidlash joizki, muayyan sharoitlarda (yolg‘izlikni anglaganda, unga munosabatning faol uslubi shakllanganda, qiyinchiliklar bilan kurashish tajribasi tarkib topganda, yolg‘izlik motivatsiyalanganda) negativ yolg‘izlik pozitiv ahamiyat kasb etishi ham mumkin.34

Yolg‘izlik tushunchasi haqida hanuzgacha bizda noto‘g‘ri va biryoqlama fikr davom etib keladi. Din va tasavvuf zinhor hayotni batamom xilvatda o‘tkazishni targ‘ib etmagan. Uzlat – hayotdan qochish, turmushdan ajralish, odamlardan bezish ehtiyoji emas, balki ma’lum muddat “kasbi kamol va sayri jamol” aylagandan so‘ng ruhiy kamolot ila yana faoliyatda bo‘lmoqdir.35

ADABIYOTLAR TAHLILI VA METODOLOGIYA. Mazkur maqolada nazariy va tahliliy metodlar asosida yolg‘izlik holatining psixologik asoslari o‘rganildi. Shuningdek, amaliy kuzatishlar va turli yoshdagi shaxslarning tajribalari asosida, ijtimoiy izolyatsiyaning ruhiy sog‘liqqa ta’siri baholandi.

Shuningdek, O‘zbek tilining izohli lug‘ati, psixologik tushunchalar lug‘atlari hamda tadqiqotchi Odiljon Avaznazarovning “Navoiy timsollari so‘zligi” nomli lug‘atidan unumli foydalanildi. Shu bilan birga, psixologik yondashuv jihatidan Klementyeva, Sadler, Djons, Tixonov, Mateyev kabi bir qator olimlarning ilmiy tadqiqotlari va dissertatsiyalaridan foydalanildi.

NATIJALAR. Avvalo, Yolg‘izlik tushunchasining umumiy psixologiyada qanday ma’no-mazmun kasb etishiga e’tibor qaratsak. O‘zbek tilining izohli lug‘atida qisqa ifodalangan ta’rif berilgan: “ yolg‘izlik – birorta ham sherigi yo‘q, bir o‘zi, yakka, tanho”.36

“Yakkalanish” so‘zi fransuz tilidagi “isolation”, “isoler” fe’lidan, yakkalash, italyan tilidan “isolato” “alohida, yakka”, isola “orol”, lotin tilidan insula orol ma’nolarini beradi. Bundan yaqqol ko‘rinib turibdiki, yakkalanish mazmunan kelib chiqish jihatidan yolg‘izlik va tanholik so‘zlari bilan aynan mos keladi.37

Zamonaviy tadqiqotchilardan G. M. Tixonov “yolg‘izlik-tanholik” juft tushunchalarini fenomenologik tarzda, qutbiy mazmunda tahlil qilgan. “Yolg‘izlik” atamasi tahqirlangan, tashlab ketilgan, bir-biridan ajralgan, kommunikativ ojizlikni bildiradi, ya’ni jamiyatdan istisno qilingan sharoitda subyektiv kechinmalar belgisidir. Tanholik atamasini subyektiv his-tuyg‘u sifatida insonning obyektiv tarzdagi o‘zgalardan jismonan uzoqlashishi deb urg‘u beradi, olim.38

Tanholik tushunchasiga ko‘plab tadqiqotchilar yolg‘izlik tushunchasiga ham taalluqli bo‘lgan tavsiflarni kiritishadi. Ixtiyoriy yoki majburiy yolg‘izlik mavqelari mutlaqo ijtimoiy yo‘nalishga ega va tuzilish jihatidan antinomik. Ixtiyoriy yolg‘izlik ijobiy yo‘nalishga ega bo‘lgan holda tanholik atamasini ifodalaydi. Tanholik tushunchasi tuzilishining tipologiyasini Golman39 1) ijtimoiy ahamiyatli insonlar toifasining majburiy jismoniy yoki ijtimoiy yakkalanishi; 2) tashqi aloqalarning ma’naviy takomillashuv maqsadidagi ongli chegarasi; 3) g‘am-g‘ussa muloqotdagi ehtiyojning qoniqmasligi, tushunilmasligi, ruhiy va ma’naviy yakkalanishning mashaqqatli kechinmasining his qilinishi, deb ataydi.

Mana shu kabi jamiki psixologik holatlar jam bo‘lib, Yolg‘izlik hissiga ehtiyojni, bu ehtiyoj esa ma’lum bir holni taqoqoz etadi. Shu kabi holatlar, maqomlar natijasi Tavhid, Vahdat ul-vujudga qarab boradi.

Tavhid Haq taolo nuriga g‘arq bo‘lish va yo‘qolishdir. Demak, banda haqqa orif bo‘lsa, Haqning mohiyatini, haqiqatini haqiqatan anglab yetsa, uning vahdoniyatiga hukm qila oladi. Bundan ma’lum bo‘ladiki, Tavhid faqat yagonalikni tan olishgina emas, balki shu yagonalik ichra yo‘q bo‘lib ketishlikdir. Ya’ni tavhid insonning Mutlaq ruh tomon

34 Majidov, J. (2020). O‘SMIRLIK DAVRIDA YOLG‘IZLIK HISSI NAMOYON BO‘LISHINING AYRIM XUSUSIYATLARI. Архив Научных Публикаций JSPI.

35 Odiljon Avaznazarov. Navoiy timsollari so‘zligi. –Toshkent: Spectrum Media Group, 2024. –227 b.

36 O‘zbek tilining izohli lug‘ati: 2 tomli./S.F.Akabirov, T.A.Aliqulov, S.I.Ibragimov va boshq.; Z.M.Magrufov tahriri ostida.- M.:Rus.yaz.,1981. 1 tom. A R. 632 b.

37 Юлдашева М. Б. Изучение проблемы одиночества современной молодежи //Вестник науки и образования. – 2019. – №. 24-3 (78). – С. 66-68

38 Эргашова З. Этимология термина «одиночество» в рамках социальной психологии. Актуальные вопросы современной психологии, 2021. С. 354-360

39 Yuldasheva M. B. et al. Semantic Analysis of Feeling Loneliness among Students //Annals of the Romanian Society for Cell Biology. – 2021. – С. 14552 14558.

intilishini aytadigan jarayondir. Bu aniq tushuntirish uchun dengiz va tomchi tushunchalari olinadi. Dengiz va tomchi, bu-bir vujuddek gap. Aynan mana shu haqiqatni tan olish vahdatni tasdiqlashdir. Tomchining dengizga qarab intilishida tozalanib, musaffolanib boradi. Bu esa tajriddir. Mansur Halloj esa tavhidni shunday deb tushuntirgan: "Tavhid sari birinchi qadam tafridning fanosidir".

MUHOKAMA. Yolg'izlikning adabiy motiv sifatidagi ko'rinishini xoh Navoiydan oling, xoh boshqa adiblardan, baribir uni tasavvufiy ma'nolarsiz sharhlab bo'lmaydi. Tasavvuf deganda esa yaqqol Najmiddin Komilovning "Tasavvuf" asari ko'z oldimizga kelaveradi. Najmiddin Komilovning yozishicha: "Mutlaq tarki dunyo hayotga zid–u insonni amaldan, kasb-u kordan mahrum etadi. Shu kabi dunyoparastlik ham kishini ilohiylikdan, ma'naviyatdan chetlashtiradi, mol-dunyo quliga aylantiradi. Oraliq yo'l esa har jihatdan maqbul va to'g'ridir, zero fikr hirs va nafsni qanoat qamchisi bilan savalab, insonning insonligini himoya qiladi va har qanday sharoitda insonni Tangri bilan bog'lab turadi. Hazrati Naqshband buyuradilar: "O'z nafslaringizni yomonlab, tahqir etib turing, chunki kimki Haq subhonahu inoyati birla o'z nafsini yomon deb tanigan bo'lsa, bu amal uning uchun osondur", ya'ni faqirlik martabasini egallashning birinchi sharti nafsni badnom etish va har lahzada "tabiiiy vujudni kafolatlab turish", Haqning isbotiga intilib, iymonni mustahkamlab boorish. Chunki Haq subhonahuning nomi xotiradan ko'tarilgan zahoti shaytoni lain va shaytoniy nafs qutqusi uning o'rnini egallaydi.40

Shunday ekan, "yor aksin mayda ko'r" degan nido (tovush)ning ma'nosi oydinlashadi, ya'ni Alloh taoloning o'zi emas, balki uning barcha zotiy va sifotiy fazilatlari ilohiy nurlar tajalliysida namoyon bo'ladi. Buning mohiyatini esa hamma ham emas, balki undan ogohlargina, ya'ni komil insonlargina anglaydilar va bahramand bo'ladilar. Bunday darajaga erishishning sharti ikkinchi baytda bayon qilingan:

G'ayr naqshidin ko'ngul jomida bo'lsa zangi g'am,
Yo'qtur, ey soqiy, mayi vahdat masallik g'amzudo.

Baytning ma'nosi: agar kishining ko'nglida Alloh taolo zikridan boshqa narsalar fikru xayoli, ya'ni mol-dunyoga hirs qo'ymoqlik, amalparastlik va hokazolar g'amining zangi-gardi, g'ubori to'plangan bo'lsa, ko'ngulni bunday zang-g'uborlardan tozalaguvchi asosiy omil bu – **vahdat** mayidir.

Ya'ni Alloh taoloni doimo zikr qilish va uning zotiy sifatlari nurlari bilan zanglarni ketkizishdir. Demak, insonning komilikka erishuvining asosiy omili **Alloh taoloning yakka-yagonaligi (vahdati)** va buyukligini (akbar) e'tirof etish bilan o'zligini tanishi, barcha olijanob fazilatlarni o'zida mujassam eta olishidadir41.

Shuningdek, keling xilvat bilan birga Uzlatga ham alohida to'xtalamiz. Imom G'azzoliyning nazariyasiga asoslanadigan bo'lsak, uning fikriga ko'ra, Uzlatning foydalari quyidagilardan iborat: Avvalo foyda ulki, Uzlat sababidan bisyor gunohlardan xalos bo'lur va to'rt gunohdurki, xalqg'a aralashsa undan xalos bo'lolmas. Zero eng ulug' ibodat "fikr va zikr ibodati"dur. Bunda kishi nainki dunyodan, balki o'zidan ham bexabar bo'lib, Haq taolo yodiga beriladi. Chunki Haq taolodan boshqa har qanday narsa Haq taolodan boshqa bilan mashg'uldir.

Ikkinchi foyda ulki, kishi Uzlat tufayli "ko'p iztiroblardan qutuladi. amri ma'ruf va nahiy munkarki, agar xalqni gunohdan man' qilmasa, osiy va fosiq bo'lur. Agar man' qilsa, xusumat paydo bo'lur. Riyo va nifoq odamlarg'a aralashgandan bo'lur. Agar odamlarg'a madoro va muloyimatlik qilmasa, ko'ngli og'rir va agar qilsa riyodan xoli qolish mushkuldur. Agar ikki dushman orasida har birini xohishiga qarab so'zlasa, yolg'onchilik bo'lur. Agar birining so'zini rost desa, ikkinchisining dushmanligidan xalos bo'lmas.

Uchinchi foyda ulki, hech bir shaqar fitna va xusumatdan xoli bo'lmas. Kishi go'shanishin bo'lsa fitna va xusumatdan xoli bo'lur.

To'rtinchi foyda ulki, xalqning sharridan (yomonligidan) emin bo'lur va xalq orasida bo'lsa, g'iybat va badgumonlikdan va shubhali taomdan xoli bo'lmas.

Beshinchi foyda ulki, odamlarning tama'sidan va ham odamlar buning ta'masidan xoli bo'lurlar. Bas, ta'madin nechand ranj va ma'siyat paydo bo'lur. Chunonchi kishi axli dunyoni ko'rsa, bunda ham boylik-dunyo hirsi paydo bo'larki, tama' hirsning tobe'idur. Xorlik esa ta'madan paydo bo'lg'usidur.

Oltinchi foyda ulki, ahmoq va johillarni ko'rmakdan, tabiatingizga og'irlik va malollik yetadurg'on toifalarning diydoridan xalos bo'lursizlar.42

Ammo Uzlatning ofatlari ham bor, chunonchi, xalq bilan muomala qilinmasa, dunyo va din ishlari amalga oshmaydi. Uzlat esa muomala va aloqani yo'q qiladi. Shu qatorda Imom G'azzoliy Uzlatning olti zararini ham sanaydi.

XULOSA. Yolg'izlik – bu zamonaviy jamiyatda keng tarqalgan va inson ruhiy salomatligiga bevosita ta'sir qiluvchi muhim psixologik holatdir. Uning sabablarini aniqlash, ijobiy tomonlarini rivojlantirish va salbiy oqibatlarining oldini olish bugungi psixologiyaning dolzarb vazifasidir. Har bir insonning individual ehtiyojlarini hisobga olgan holda, yolg'izlik bilan kurashishda tizimli va psixologik yondashuv muhim ahamiyatga ega.

40 Najmiddin Komilov. Tasavvuf. 1-kitob. –Toshkent: "Yozuvchi" nashriyoti,1996. –97 b.
41 B. Valixo`jayev, "Alisher Navoiy she'riyati", Toshkent.
42 Imom G'azzoliy. Kimyoi saodat. –Toshkent: Adolat, 2005. –190 b

Psixologik nuqtai nazar bilan yondashadigan bo‘lsak, Yolg‘izlik – har bir inson hayotining ma’lum bosqichida uchraydigan holatdir. Bu holatni tushunish va to‘g‘ri boshqarish psixologik salomatlikni ta’minlashda muhim omil hisoblanadi. Shaxsiy tajribalar va ilmiy yondashuvlar asosida aytish mumkinki, ixtiyoriy yolg‘izlik ba’zan ruhiy tiklanish vositasi bo‘lsa-da, ijtimoiy yolg‘izlikning surunkali tus olishi xavfli oqibatlarga olib kelishi mumkin. Shu sababli, har bir inson o‘z holatini tahlil qilishni, ehtiyojlarini aniqlashni va kerakli paytda yordam so‘rashni o‘rganishi zarur.

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O‘ZBEK BADIIY MATNIDA GENDER KONSEPTOSFERASINING ASSOTSIATIV MAYDONI

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Annotatsiya: *Maqolada o‘zbek badiiy matnida gender konseptosferasining assotsiativ maydoni lingvokognitiv va lingvomadaniy yondashuv asosida tahlil qilinadi. Assotsiativ maydonning semantik maydondan farqi, uning yadro va periferik qatlamlari, milliy-madaniy xotira hamda individual badiiy tajriba bilan aloqasi yoritiladi. Tahlilda “alla”, “beshik”, “chimildiq”, “belbog‘”, “chopon”, “surma” kabi birliklarning ayol va erkak konseptlari bilan bilvosita bog‘lanishi ko‘rib chiqiladi. Badiiy matnda tayyor milliy assotsiatsiyalarning saqlanishi bilan birga, ularning kontekst ta’sirida yangi estetik mazmun kasb etishi ko‘rsatiladi. Shuningdek, assotsiativ reaksiya ijtimoiy me’yor yoki stereotipni o‘z-o‘zidan tasdiqlamasligi, balki muayyan xotira va tajribadagi bog‘lanishni qayd etishi asoslanadi. Natijada gender ma’nosining ko‘pincha predmetning denotativ mazmunidan emas, balki predmet, personaj, makon, emotsiya va baho o‘rtasidagi kontekstual munosabatdan yuzaga kelishi aniqlanadi.*

Kalit so‘zlar: *gender konseptosferasi, assotsiativ maydon, badiiy matn, lingvokulturologiya, kognitiv tilshunoslik, milliy-madaniy birlik, yadro, periferiya.*

АССОЦИАТИВНОЕ ПОЛЕ ГЕНДЕРНОЙ КОНЦЕПТОСФЕРЫ В УЗБЕКСКОМ ХУДОЖЕСТВЕННОМ ТЕКСТЕ

Аннотация: *В статье анализируется ассоциативное поле гендерной концептосферы в узбекском художественном тексте с позиций лингвокогнитивного и лингвокультурологического подходов. Рассматриваются отличие ассоциативного поля от семантического, его ядерно-периферийная организация, связь с национально-культурной памятью и индивидуальным художественным опытом. На материале единиц «алла», «бешик», «чимилдик», «белбог’», «чопон», «сурма» показывается, каким образом гендерные значения актуализируются опосредованно — через предметы, обряды, родственные отношения, эмоции и оценки. Особое внимание уделяется преобразованию общих ассоциаций в художественном контексте. Делается вывод, что ассоциативная реакция фиксирует существующую связь в памяти носителя языка и не должна автоматически интерпретироваться как социальная норма или стереотип.*

Ключевые слова: *гендерная концептосфера, ассоциативное поле, художественный текст, лингвокультурология, когнитивная лингвистика, национально-культурная единица, ядро, периферия.*

THE ASSOCIATIVE FIELD OF THE GENDER CONCEPTUAL SPHERE IN UZBEK LITERARY TEXTS

Abstract: *The article examines the associative field of the gender conceptual sphere in Uzbek literary texts from linguocognitive and linguocultural perspectives. It discusses the distinction between associative and semantic fields, their core-periphery structure, and their relation to national-cultural memory and individual literary experience. The analysis focuses on units such as “alla”, “beshik”, “chimildiq”, “belbog’”, “chopon”, and “surma”, showing how gender meanings may be activated indirectly through objects, rituals, kinship terms, emotions, and evaluative contexts. Particular attention is paid to the transformation of culturally shared associations within literary discourse. The study argues that an associative response records a connection present in the memory of language users and should not automatically be treated as a social norm or stereotype. Gender meaning in literary discourse is often produced through contextual relations among objects, characters, spaces, emotions, and evaluations.*

Keywords: *gender conceptual sphere, associative field, literary text, linguoculturology, cognitive linguistics, national-cultural unit, core, periphery.*

Zamonaviy tilshunoslikda insonning tilni idrok etishi, xotirada saqlashi va badiiy matnni tushunish jarayonlarini faqat lug‘aviy ma’no doirasida izohlash yetarli emas. Muayyan til birligi faollashganda unga semantik jihatdan yaqin bo‘lmagan, biroq tajriba, xotira, madaniyat yoki hissiy kechinma orqali bog‘langan boshqa birliklar ham ongda tiklanishi mumkin. Shu jihatdan assotsiativ yondashuv konseptlarning ichki tuzilishini va badiiy matndagi yashirin aloqalarni ochishda muhim metodologik vosita hisoblanadi.

O‘zbek assotsiativ tilshunosligida assotsiatsiya va assotsiativ maydon masalalari D. Lutfullayeva, B. Tojiboyev, R. Davlatova hamda badiiy matn tadqiqida H. Ortiqova ishlari bilan bog‘liq holda rivojlangan. Assotsiativ lug‘at materiallari milliy-madaniy birliklarning til egasi xotirasida qanday bog‘lanishini kuzatish imkonini beradi. Biroq lug‘atdagi reaksiya badiiy matndagi ma’noni tayyor holda belgilamaydi: ijodkor mavjud assotsiatsiyani tasdiqlashi, o‘zgartirishi yoki qarama-qarshi baholashi mumkin.

O‘zbek badiiy matnida gender konseptosferasini tashkil etuvchi assotsiativ aloqalarning tuzilishi va badiiy transformatsiyasini aniqlashdan iborat. Shu maqsadga erishish uchun assotsiativ va semantik maydon o‘rtasidagi farqni belgilash, genderga daxldor milliy-madaniy birliklarni guruhlash, yadro va periferik assotsiatsiyalarni ajratish, badiiy kontekstning umumiy assotsiatsiyani o‘zgartirish mexanizmini ko‘rsatish hamda individual assotsiatsiyaning rolini tavsiflash vazifalari qo‘yildi.

Semantik maydonda birliklar ma’no yaqinligi, sinonimiya, antonimiya, tur-jins munosabati kabi tizimli aloqalar orqali birlashadi. Assotsiativ maydon esa ancha keng bo‘lib, unda xotira, hayotiy tajriba, vizual obraz, marosim, hissiy holat va intertekstual tajriba ham ishtirok etadi. Shu sababli gender konseptosferasini bevosita “ayol” va “erkak” nominatsiyalari bilangina chegaralash to‘g‘ri emas. “Alla”, “beshik”, “chimildiq”, “belbog‘”, “chopon” singari birliklar gender ma’nosini bilvosita faollashtiruvchi signallar sifatida namoyon bo‘lishi mumkin.

Gender assotsiativ maydonining tarkibiy qatlamlari

Assotsiativ lug‘at va badiiy matn materiallarini qiyoslash gender konseptosferasining ko‘p qatlamli tuzilishga ega ekanini ko‘rsatadi. Uni shartli ravishda qarindoshlik, faoliyat, marosim, predmet, hissiy-aksiologik va intertekstual assotsiatsiyalar guruhlariga ajratish mumkin. Qarindoshlik qatlamiga ona, ota, buvi, bobo, qiz, yigit, kelin, kuyov kabi birliklar kiradi. Faoliyat qatlamida parvarish, mehnat, kurash, duo singari tushunchalar faollashadi. Marosim qatlamida to‘y, nikoh, beshik to‘yi, kelinsalom, aza kabi birliklar, predmet qatlamida esa beshik, belbog’, chopon, angishvona, surma kabi milliy-madaniy realiyalar namoyon bo‘ladi.

Hissiy-aksiologik qatlam mehr, hayo, g‘urur, mardlik, or-nomus singari baholovchi tushunchalarni birlashtiradi. Intertekstual qatlam esa ma’lum badiiy asar, film, spektakl yoki personaj haqidagi xotiraning yangi stimulga javob sifatida faollashishi bilan yuzaga keladi. Ushbu qatlamlar bir-biridan qat’iy ajralmaydi; aksincha, bitta birlik bir vaqtning o‘zida bir necha qatlamni faollashtirishi mumkin.

“Alla” va “beshik” birliklarining assotsiativ modeli

“Alla” leksemasi dastlab qo‘shiq turini anglatadi, biroq assotsiativ maydonda ona, beshik, chaqaloq, tun, bedorlik, tilak va oila kabi birliklarni faollashtiradi. Demak, gender belgisi lug‘aviy ta’rifning majburiy qismi bo‘lmagan holda, ona-farzand munosabati va parvarish tajribasi orqali yuzaga keladi. Badiiy matnda esa bu maydon yanada kengayishi mumkin. Masalan, Muhammad Yusufning “Alpomishga alla aytgan momolarim” satrida alla ona-bola doirasidan chiqib, momo, avlod, milliy qahramon va tarixiy xotira bilan bog‘lanadi. Bu yerda mavjud assotsiatsiya yangi konseptual sathga ko‘chiriladi.

“Beshik” birligi ham shunga yaqin mexanizmga ega. Uning assotsiativ yadrosida chaqaloq, bola, alla va ona kabi birliklar mavjud bo‘lsa-da, badiiy kontekstda beshik “boshlanish”, “bolalik”, “olam” yoki “Vatan” kabi ma’nolarni faollashtirishi mumkin. Muhammad Yusufning “Ko‘hna tol beshikdan boshlangan olam” satrlarida beshik konkret predmet sifatida emas, hayot va borliqning boshlanish nuqtasi sifatida konseptuallashadi. “Onam” va “singlim” nominatsiyalarining Vatan obrazi bilan tutashishi esa qarindoshlik assotsiatsiyasini milliy mansublik darajasiga olib chiqadi.

Yadro va periferiya

Assotsiativ maydon yadrosi ko‘proq takrorlanuvchi va tez faollashuvchi aloqalardan tarkib topadi. Periferiyada esa kamroq uchraydigan, individual yoki kontekstga xos bog‘lanishlar joylashadi. Badiiy ijodning o‘ziga xosligi ko‘pincha periferik aloqani markazga olib chiqishda namoyon bo‘ladi. Shu sababli lug‘atdagi dominant assotsiatsiya badiiy ma’noni oldindan belgilamaydi; u faqat interpretatsiya uchun dastlabki kognitiv fon vazifasini bajaradi.

Marosim va kiyim-kechak birliklarida gender assotsiatsiyasi

“Chimildiq” stimulining assotsiativ maydoni gender konseptosferasining marosimiy qatlamini yaqqol ko‘rsatadi. Manbada ushbu stimulga “kelin-kuyov” reaksiyasi 59 ta, “to‘y” 31 ta, “kelinchak” 12 ta, “go‘shanga” 10 ta, “hayot ostonasi”, “marosim” va “visol” 7 tadan berilgani qayd etiladi. Shuningdek, “baxt”, “kuyov”, “oila”, “kelin”, “nikoh”, “er-xotin” kabi reaksiyalar ham uchraydi. Bu ma’lumotlar chimildiqning milliy xotirada nikoh, yangi oila va juftlik bilan kuchli bog‘langanini ko‘rsatadi.

Biroq badiiy matnda ushbu yadroning baholovchi qutbi o‘zgarishi mumkin. E. Siddiqovaning “Yor-yor” she’rida chimildiq to‘y va visolning quvonchli belgisi sifatida emas, rashk, sog‘inch va iztirob bilan bog‘langan poetik detal sifatida qo‘llanadi. “Titrar jonim”, “rashk o‘ti”, “sog‘inch”, “iztiroblar” kabi birliklar odatiy assotsiativ yadroni saqlagan holda, uning emosional yo‘nalishini o‘zgartiradi. Shundan kelib chiqib, badiiy tahlilda stimulning faqat lug‘atdagi birlamchi reaksiyasiga emas, konkret kontekstga tayanish zarur.

“Belbog’” va “chopon”: erkak konseptining predmet orqali ifodalanishi

“Belbog’” stimulining assotsiativ maydonida kamar, chopon, qiyiq kabi predmet nomlari bilan bir qatorda yigit, to‘y, aza, kurash, kuyov, mardlik, polvon, g‘urur kabi birliklar qayd etiladi. Bu qatlam erkak konseptini faqat jismoniy kuch bilan emas, marosim, ijtimoiy maqom, milliy kiyinish va baholash bilan ham bog‘laydi. Shu bilan birga, belbog‘ning qiz tomonidan yigitga berilishi yoki onaning o‘g‘liga safar oldidan beliga belbog’ bog‘lashi haqidagi assotsiatsiyalar predmetning gender mazmuni “kimga tegishli” ekanidan ko‘ra “qanday munosabatda va qanday maqsadda” ishlatilishiga bog‘liqligini ko‘rsatadi.

O‘tkir Hoshimovning “Ikki eshik orasi” asaridagi “Belida belbog‘i bor yigit” ifodasida belbog’ yigitlik maqomi, e’tirof va avlodlar davomiyligi bilan bog‘lanadi. Biroq ushbu baho umumiy qoida sifatida emas, ayni vaziyatdagi personaj nutqi sifatida talqin qilinishi kerak. Demak, assotsiativ birlikni muallif pozitsiyasi, personaj nutqi va kommunikativ vaziyatdan ajratib bo‘lmaydi.

“Chopon” stimulida ham erkak kiyimi, bobo, ota, kuyov kabi yosh va oilaviy maqomlar birlashadi. Muhammad Yusufning Cho‘lpon xotirasiga bag‘ishlangan satrlarida “beqasam chopon” erkaklik belgisidan tashqari, tarixiy shaxs va milliy xotira bilan tutashadi. Shu tariqa predmetning dastlabki gender assotsiatsiyasi kengayib, tarixiy-madaniy identifikatsiya vositasiga aylanadi.

Baholash, metafora va individual assotsiatsiya

Gender konseptosferasining assotsiativ maydonida baholovchi qarama-qarshiliklar alohida o‘rin tutadi. Bir xil ayol obrazi turli personajlar nutqida “farishta” yoki “ajina” kabi qarama-qarshi obrazlar bilan ifodalanishi mumkin. Bunda mazkur birliklar ayolning o‘zgarmas “mohiyati”ni emas, baholovchi subyektning ayni vaziyatdagi idrokini ifodalaydi. “Farishta” odatda poklik va ezgulik bilan, “ajina” esa qo‘rquv va yoqimsizlik bilan bog‘liq assotsiativ qatlamni faollashtiradi. Badiiy matn ushbu qarama-qarshi qutblarni bir personaj atrofida to‘qnash keltirib, obrazning polifonik idrokini yaratishi mumkin.

Erkak obrazini ifodalashda hayvon nomlari bilan bog‘liq metafora va o‘xshatishlar ham assotsiativ mexanizmga tayanadi. “Safar aka ayiqdek lapanglab...” kabi ifodada “ayiq” birligi yiriklik, kuch va salobat haqidagi madaniy tasavvurlarni faollashtiradi, “lapanglab” fe’li esa bu tasavvurni aniq kinestetik manzaraga aylantiradi. Demak, gender qiyofasi bitta hayvon nomining lug‘aviy ma’nosidan emas, badiiy signal, xotiradagi tarmoq va kontekstga mos belgining tanlanishidan hosil bo‘ladi.

Assotsiativ mexanizmning shartli modeli

Badiiy gender signalining ishlashini quyidagi ketma-ketlik orqali ifodalash mumkin: badiiy signal → xotiradagi assotsiativ tarmoq → kontekstga mos belgini tanlash → personaj yoki obrazning gender qiyofasi. Mazkur modelda birinchi bosqichda predmet, marosim, hayvon, tovush yoki harakat kabi signal beriladi. Ikkinchi bosqichda til egasining milliy-madaniy va individual tajribasida mavjud bo‘lgan bog‘lanishlar faollashadi. Uchinchi bosqichda kontekst ushbu imkoniyatlardan muayyan qismini tanlaydi. Yakunda genderga daxldor obraz yoki baho yuzaga keladi.

Individual assotsiatsiya ushbu jarayonni yanada murakkablashtiradi. Bir xil “beshik” turli qahramonlar uchun ona mehri, bolalik, ayriliq yoki farzand yo‘qotish bilan bog‘lanishi mumkin. Shuning uchun milliy assotsiatsiya va individual assotsiatsiyani qarama-qarshi hodisalar sifatida emas, o‘zaro kesishuvchi qatlamlar sifatida ko‘rish maqsadga muvofiq. Muallifning shaxsiy xotirasi umumiy madaniy repertuardan oziqlanadi, lekin uni yangi badiiy maqsadga mos ravishda qayta tartiblaydi.

Makon, tovush va kinestetik belgilar

Gender ma’nosi faqat predmet va nominatsiyalar orqali emas, makon, tovush va harakat orqali ham faollashadi. O‘choq, ayvon, ostona, hovli va chimildiq kabi makon birliklari o‘z-o‘zidan gender belgisiga ega emas. Ular qaysi personaj, faoliyat yoki voqea bilan birikishiga qarab gender manzarasini yaratadi. Xuddi shuningdek, alla ohangi, beshikning g‘ichirlashi, qadam, tebranish yoki “lapanglash” kabi kinestetik belgilar o‘quvchining eshitish va harakat xotirasini ishga tushiradi. Bu holat badiiy konseptosferaning ko‘p kanalli idrok qilinishini ko‘rsatadi.

Gender ma’nosining bilvosita va implitsit ifodasi

Badiiy matnda “ayol”, “erkak”, “ona” yoki “ota” kabi bevosita nominativ birliklar ishlatilmasdan ham genderga daxldor mazmun yuzaga kelishi mumkin. Beshik, alla, belbog’, chopon, surma, angishvona kabi birliklar kontekst bilan birlashganda tegishli madaniy xotirani faollashtiradi. “Surma” stimuliga doir reaksiyalarda qiz bola, qizlar, ayollar, yosh qizlar, o‘zbek ayollari, qosh-ko‘z va chiroy kabi birliklarning uchrashi pardoz va ayollik o‘rtasidagi tarixiy-madaniy bog‘lanishni ko‘rsatadi.

Bunday holatda gender ma’nosi birlikning denotativ mazmunidan emas, assotsiativ tarmoq va kontekstual munosabatdan kelib chiqadi. Shu sababli implitsit gender ma’nosini aniqlashda faqat lug‘at ma’lumotiga suyanish yetarli emas. Badiiy parchada birlikning qaysi personajga, voqeaga, harakatga va bahoga birikayotganini ham tekshirish zarur. Shartli model quyidagicha berilishi mumkin: stimul yoki badiiy signal → qayd etilgan assotsiativ ma’no → kontekstual bog‘lanish → gender ma’no.

Assotsiativ maydonni stereotiplar roʻyxati sifatida talqin qilish muammosi

Assotsiativ javobni stereotipning bevosita isboti sifatida qabul qilish metodologik jihatdan ehtiyotkorlikni talab etadi. Javob reaksiyasi xotirada mavjud boʻlgan aloqani qayd etadi; uning mavjudligi oʻsha aloqaning ijtimoiy jihatdan maʼqullanishini anglatmaydi. Masalan, "mardlik"ning belbogʻ bilan yoki "ona"ning alla bilan tez-tez bogʻlanishi milliy-madaniy assotsiatsiyaning barqarorligini koʻrsatishi mumkin, ammo badiiy matn mazkur aloqani tasdiqlashi, muammolashtirishi yoki inkor qilishi ham mumkin.

Shu nuqtayi nazardan gender assotsiativ maydonini uch darajada koʻrish mumkin: birinchisi, umumiy-madaniy qatlam boʻlib, koʻpchilik til egalari uchun tanish aloqalarni qamrab oladi; ikkinchisi, ijtimoiy tajriba, avlod, hudud yoki boshqa omillar taʼsirida farqlanishi mumkin boʻlgan umumiy qatlam; uchinchisi esa individual-badiiy qatlam boʻlib, muallif yoki personajning xotirasi va estetik tajribasi bilan belgilanadi. Badiiy matn aynan shu uch darajaning kesishishida oʻziga xos maʼno hosil qiladi.

Natijalar muhokamasi

Tahlil shuni koʻrsatadiki, gender konseptosferasining assotsiativ maydoni bir tekis va turgʻun tizim emas. Unda yadro va periferiya, ijobiy va salbiy qutblar, umumiy va individual aloqalar bir vaqtning oʻzida mavjud boʻladi. "Alla–ona", "beshik–chaqaloq", "belbogʻ–yigit" kabi aloqalar tez anglanadigan umumiy-madaniy fonni tashkil qilishi mumkin. Biroq badiiy ijod periferik yoki individual bogʻlanishni markazlashtirib, ushbu fonni oʻzgartiradi. Natijada bir xil predmet turli matnlarda turli konseptual vazifani bajaradi.

Mazkur natija badiiy matnning assotsiativ tabiatini dinamik jarayon sifatida koʻrishga imkon beradi. Matn mavjud assotsiatsiyalardan foydalanadi, lekin ularni oʻquvchi xotirasida qayta mustahkamlashi ham mumkin. Shu maʼnoda ayrim badiiy obrazlar keyingi idrok jarayonida yangi pretsedent birlikka aylanishi ehtimoli mavjud. Demak, assotsiativ maydon nafaqat matnni talqin qilish vositasi, balki badiiy matn taʼsirida oʻzgarib boruvchi kognitiv tizim sifatida ham namoyon boʻladi.

Xulosa

Oʻzbek badiiy matnida gender konseptosferasining assotsiativ maydoni ayol va erkak nominatsiyalarining oddiy yigʻindisi emas. U predmetlar, marosimlar, qarindoshlik munosabatlari, faoliyat, hissiyot, baho, makon, tovush, kinestetik belgilar va intertekstual xotiradan tarkib topgan murakkab tarmoq sifatida shakllanadi. "Alla", "beshik", "chimildiq", "belbogʻ", "chopon" va "surma" kabi birliklar gender maʼnosini koʻpincha bevosita emas, balki madaniy tajriba va kontekstual munosabat orqali faollashtiradi.

Assotsiativ maydonning yadro va periferiyaga boʻlinishi badiiy transformatsiyani tushuntirishda muhimdir. Umumiy-madaniy xotirada nisbatan barqaror boʻlgan aloqa badiiy matnda yangi personaj, voqea yoki baho bilan birikib, boshqa semantik qutbga oʻtishi mumkin. "Chimildiq"ning visol bilan birga sogʻinch va iztirobni ifodalashi yoki "beshik"ning oilaviy xotiradan Vatan konseptiga koʻchishi bunga misol boʻladi.

Tahlil natijalariga koʻra, assotsiativ reaksiya biologik yoki ontologik mohiyatni emas, muayyan til egalari guruhining xotirasida mavjud bogʻlanishni koʻrsatadi. Shu bois gender assotsiatsiyalarini stereotiplar bilan aynanlashtirmaslik, ularni kontekst, personaj pozitsiyasi va badiiy vazifa bilan birgalikda tahlil qilish lozim. Ayniqsa, bir stimulning turli personajlar ongida turlicha baho va tasavvurlarni faollashtirishi badiiy matnning polifonik xususiyatini koʻrsatadi.

Umuman, assotsiativ yondashuv oʻzbek badiiy matnidagi implitsit gender semantikasini aniqlash, milliy-madaniy xotira bilan badiiy obraz oʻrtasidagi munosabatni tushuntirish va muallifning umumiy assotsiatsiyani qanday transformatsiya qilganini koʻrsatish imkonini beradi. Ushbu yondashuv gender konseptining psixolingvistik talqiniga oʻtish uchun ham nazariy asos yaratadi, chunki assotsiatsiyaning faollashuvi til tizimi bilan bir qatorda xotira, hissiy baholash, individual tajriba va matn idrokiga bogʻliq.

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BADIIY TARJIMADA PRAGMATIK POTENSIAL TRANSFORMATSIYASI (INGLIZ TILIDAN QORAQALPOQ TILIGA TARJIMA MISOLIDA)

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Annotatsiya: *Maqolada ingliz tilidan qoraqalpoq tiliga badiiy tarjimada pragmatik potensialning saqlanishi va transformatsiyalanishi Mark Tvenning "The Adventures of Tom Sawyer" asari hamda uning E. Berdimuratov tomonidan qoraqalpoq tiliga tarjimasi misolida tadqiq etiladi. Pragmatik potensial kommunikativ-intensional, nutqiy-aktual, lingvomadaniy, emotsional-baholovchi, implikativ-kontekstual, stilistik va adresatga yo'naltirilgan komponentlardan tashkil topuvchi ko'p sathli tizim sifatida talqin qilinadi. Tadqiqotda qiyosiy-chog'ishtirma, kontekstual, pragmalingvistik, funksional-semantik va tarjimaviy tahlil metodlaridan foydalanildi. Asliyat va tarjimada kommunikativ intensiya, nutq aktlari, implikatura, yumor va kinoya, emotsional-ekspressiv birliklar, individual nutqiy registr hamda lingvomadaniy birliklarning qayta yaratilish xususiyatlari tahlil qilindi. Tahlil pragmatik ekvivalentlik formal-semantik ekvivalentlik bilan aynan bir hodisa emasligini va badiiy tarjimada funksional hamda pragmatik kompensatsiya alohida ahamiyat kasb etishini ko'rsatdi.*

Kalit so'zlar: *pragmatik potensial, pragmatik ekvivalentlik, pragmatik adaptatsiya, badiiy tarjima, ingliz tili, qoraqalpoq tili, kommunikativ intensiya, nutq akti, implikatura, lingvomadaniy komponent, stilistik kompensatsiya.*

ТРАНСФОРМАЦИЯ ПРАГМАТИЧЕСКОГО ПОТЕНЦИАЛА В ХУДОЖЕСТВЕННОМ ПЕРЕВОДЕ (НА ПРИМЕРЕ ПЕРЕВОДА С АНГЛИЙСКОГО ЯЗЫКА НА КАРАКАЛПАКСКИЙ)

Аннотация: *В статье исследуются сохранение и трансформация прагматического потенциала в художественном переводе с английского языка на каракалпакский на примере произведения Марка Твена «The Adventures of Tom Sawyer» и его каракалпакского перевода, выполненного Е. Бердимуратовым. Прагматический потенциал трактуется как многоуровневая система, состоящая из коммуникативно-интенционального, речеактового, лингвокультурного, эмоционально-оценочного, импликативно-контекстуального, стилистического и адресатно-ориентированного компонентов. В исследовании использованы сравнительно-сопоставительный, контекстуальный, прагмалингвистический, функционально-семантический и переводческий методы анализа. Проанализированы особенности воссоздания в оригинале и переводе коммуникативной интенции, речевых актов, импликатуры, юмора и иронии, эмоционально-экспрессивных единиц, индивидуального речевого регистра, а также лингвокультурных единиц. Анализ показал, что прагматическая эквивалентность не тождественна формально-семантической эквивалентности и что в художественном переводе особое значение приобретают функциональная и прагматическая компенсация.*

Ключевые слова: *прагматический потенциал, прагматическая эквивалентность, прагматическая адаптация, художественный перевод, английский язык, каракалпакский язык, коммуникативная интенция, речевой акт, импликатура, лингвокультурный компонент, стилистическая компенсация.*

TRANSFORMATION OF PRAGMATIC POTENTIAL IN LITERARY TRANSLATION (ON THE EXAMPLE OF TRANSLATION FROM ENGLISH TO KARAKALPAK)

Abstract: *The article examines the preservation and transformation of pragmatic potential in literary translation from English into Karakalpak based on Mark Twain's The Adventures of Tom Sawyer and its Karakalpak translation by E. Berdimuratov. Pragmatic potential is conceptualized as a multidimensional system comprising communicative-intentional, speech-act, linguocultural, emotional-evaluative, implicit-contextual, stylistic and recipient-oriented components. Comparative, contextual, pragmatic, functional-semantic and translation analysis methods are employed. Attention is paid to communicative intention, speech acts, implicature, humour and irony, emotional-expressive elements, individual speech registers and culture-specific meanings. The findings demonstrate that*

pragmatic equivalence cannot be reduced to formal-semantic equivalence and that functional and stylistic compensation plays a significant role in English-Karakalpak literary translation.

Keywords: *pragmatic potential, pragmatic equivalence, pragmatic adaptation, literary translation, English, Karakalpak, communicative intention, speech act, implicature, stylistic compensation.*

KIRISH

Zamonaviy tarjimashunoslik taraqqiyoti tarjimani bir til birliklarini ikkinchi til birliklari bilan almashtirish jarayoni sifatida tushunishdan matnning kommunikativ, kognitiv, lingvomadaniy va pragmatik xususiyatlarini yangi til va madaniyat muhitida qayta yaratish jarayoni sifatida talqin qilishga olib keldi. Ayniqsa, badiiy tarjimada asliyatning denotativ mazmunini saqlashning oʻzi yetarli emas. Tarjimon muallif va personajlarning kommunikativ niyati, emotsional-baholovchi munosabati, implikatura, presuppozitsiya, yumor, kinoya, individual nutqiy registr va adresatga yoʻnaltirilgan estetik ta'sirni ham qayta yaratishi lozim.

Shu nuqtai nazardan, **pragmatik potensial** badiiy tarjimaning adekvatligini belgilovchi muhim kategoriyalardan biri sifatida namoyon boʻladi. Matn yoki til birligining pragmatik potensiali uning muayyan kommunikativ sharoitda soʻzlovchi niyatini amalga oshirish, adresatning interpretatsiyasini yoʻnaltirish, emotsional va baholovchi munosabat hosil qilish hamda ma'lum kommunikativ reaksiyani yuzaga chiqarish imkoniyatlari bilan bogʻliq.

Tarjima jarayonida ushbu imkoniyatlarning barchasi avtomatik ravishda maqsad tiliga koʻchmaydi. Asliyatdagi bir nutq aktining propositsional mazmuni tarjimada toʻliq saqlangan holda uning illokutiv kuchi pasayishi mumkin; aksincha, formal jihatdan sezilarli transformatsiyaga uchragan birlik maqsad tilida asliyatga yaqin pragmatik ta'sirni yuzaga chiqarishi mumkin. Demak, **semantik ekvivalentlik va pragmatik ekvivalentlik oʻzaro bogʻliq boʻlsa-da, aynan bir hodisa emas**. Bu muammo ingliz tilidan qoraqalpoq tiliga badiiy tarjimada alohida ahamiyat kasb etadi. Ingliz va qoraqalpoq tillarining genetik va tipologik jihatdan turli tizimlarga mansubligi, shuningdek, kommunikativ an'ana, murojaat shakllari, ijtimoiy munosabatlarning verbal ifodasi va lingvomadaniy fonidagi tafovutlar pragmatik potensialni qayta yaratishda tarjimondan turli funksional, adaptiv va kompensator strategiyalarni qoʻllashni talab etadi.

Tadqiqot materiali sifatida Mark Tvenning "*The Adventures of Tom Sawyer"* romani hamda uning E. Berdimuratov tomonidan qoraqalpoq tiliga tarjima qilingan "*Том Сойердин басынан кеширгенлери"* asari tanlandi. Qoraqalpoqcha nashrning bibliografik ma'lumotlarida E. Berdimuratov tarjimon, T. Najibov muharrir sifatida koʻrsatilgan; asar 1960-yilda Qoraqalpoq davlat nashriyotida chop etilgan.

Mark Tven asarining tanlanishi uning pragmatik jihatdan nihoyatda boyligi bilan izohlanadi. Roman personajlar nutqidagi nostandart grammatik shakllar, bolalar soʻzlashuv nutqi, yumor va kinoya, manipulyativ kommunikatsiya, madaniy realiyalar, diniy diskurs, qoʻrquv, tahdid, ijtimoiy baholash va individual nutqiy registr kabi hodisalarning keng qoʻllanishi bilan ajralib turadi.

Tadqiqotning maqsadi ingliz tilidan qoraqalpoq tiliga badiiy tarjimada pragmatik potensialning saqlanish va transformatsiyalanish mexanizmlarini aniqlash hamda ushbu jarayonni kompleks baholash imkonini beruvchi integrativ modelni ishlab chiqishdan iborat.

Pragmatik potensial va tarjima: nazariy yondashuvlar. Pragmatikaning shakllanishi til belgilarining ma'nosini ulardan foydalanuvchi subyekt va kommunikativ vaziyat bilan bogʻliq holda oʻrganish zarurati bilan chambarchas bogʻliq. C. Morris semiotikani sintaktika, semantika va pragmatika yoʻnalishlariga ajratar ekan, pragmatikani belgi va undan foydalanuvchi oʻrtasidagi munosabatlarni oʻrganuvchi soha sifatida belgiladi [1]. Ushbu yondashuv keyinchalik kommunikativ ma'no, nutq aktlari va implikatura nazariyalarining rivojlanishiga zamin yaratdi.

J. L. Ostin til orqali nafaqat ma'lumot berish, balki muayyan harakatni amalga oshirish mumkinligini asoslab berdi. Olim lokutiv, illokutiv va perlokutiv aktlarni farqlaydi [2]. Tarjima pragmatikasi uchun ayniqsa illokutiv va perlokutiv darajalar muhimdir. Chunki tarjimon gapning "nima deyayotgani" bilangina emas, "bu gap orqali qanday kommunikativ harakat bajarilayotgani" va "adresatga qanday ta'sir koʻrsatish koʻzda tutilgani" bilan ham ishlaydi.

J. R. Syorl nutq aktlari nazariyasini yanada tizimlashtirib, *assertion, directive, commissive, expressive* va *declaration* kabi kommunikativ aktlarning funksional xususiyatlarini ochib beradi [3]. Badiiy tarjimada personajning iltimosi, buyrugʻi, tahdidi, va'dasi yoki e'tirozi boshqa nutq aktiga aylanib qolsa, uning leksik mazmuni saqlangan taqdirda ham personajlararo munosabat va pragmatik ta'sir oʻzgarishi mumkin.

H. P. Graysning kommunikativ implikatura konsepsiyasi pragmatik tarjima tahlili uchun alohida ahamiyatga ega [4]. Soʻzlovchi nazarda tutgan mazmun har doim uning bevosita aytgan gapiga teng emas. Adresat koʻpincha kontekst, umumiy bilim va kommunikativ tamoyillar asosida qoʻshimcha ma'noni inferensiya qiladi. Badiiy matndagi yumor, kinoya va manipulyatsiyaning katta qismi aynan shu mexanizm orqali yuzaga keladi.

D. Sperber va D. Uilsonning 'relevans' nazariyasida kommunikatsiya kodlash-dekodlash jarayonidan kengroq, inferensial hodisa sifatida tushuntiriladi [5]. E.-A. Gatt mazkur nazariyani tarjimaga tatbiq etib, tarjima jarayonida adresat

uchun yetarli kontekstual effekt yaratish va ortiqcha interpretativ kuch talab qilmaslik muhimligini ta’kidlaydi [6]. Bunday yondashuv madaniy presuppozitsiyalar, yumor va yashirin ma’nolarni tarjima qilishda ayniqsa ahamiyatlidir.

E. Nayda tomonidan ishlab chiqilgan formal va dinamik ekvivalentlik konsepsiyasida tarjima adresatining reaksiyasiga alohida o‘rin beriladi [7]. Dinamik ekvivalentlik nuqtai nazaridan tarjimaning vazifasi til shakllarini mexanik ko‘chirish emas, balki asliyat va tarjima adresatlari reaksiyasi o‘rtasida imkon qadar funksional yaqinlik yaratishdir. Mazkur konsepsiya pragmatik ekvivalentlikning keyingi nazariy talqinlariga muhim zamin yaratdi.

P. Nyumark kommunikativ va semantik tarjimani farqlab, kommunikativ tarjimada maqsad til adresatiga ta’sir masalasini muhim deb hisoblaydi [8]. Badiiy matn pragmatikasida bu farq ayniqsa muhim: ayrim vaziyatlarda formal-semantik aniqlikni mutlaq saqlash kommunikativ ta’sirning zaiflashishiga olib kelishi mumkin.

M. Beyker tarjima ekvivalentligini bir necha darajada o‘rganib, pragmatik ekvivalentlik doirasida ‘coherence’ va ‘implicature’ masalalariga alohida e’tibor qaratadi [9]. Pragmatik ekvivalentlik tarjimonning nafaqat matndagi eksplisit ma’noni, balki kontekst orqali yuzaga keladigan inferensial ma’nolarni ham hisobga olishini talab qiladi.

J. Hauz tarjima sifatini baholashni matn, kontekst, register va kommunikativ funksiya munosabatlari bilan bog‘laydi [10; 11]. Uning funksional-pragmatik yondashuvi tarjimani yangi lingvomadaniy kontekstda kommunikativ funksiyani qayta yaratish sifatida tushunish imkonini beradi.

C. Nordning funksionalistik qarashlarida tarjima maqsadi va tarjimonning asliyat muallifi, buyurtmachi hamda adresat oldidagi kommunikativ mas’uliyati markaziy o‘rin egallaydi [12]. Badiiy tarjimada bu tamoyil tarjima auditoriyasining lingvomadaniy imkoniyatlarini hisobga olish bilan birga asliyatning kommunikativ yaxlitligiga sodiqlikni ham nazarda tutadi.

B. Hatim va I. Meyson tarjimonni kommunikator sifatida talqin qilib, tarjimani diskurs, kontekst va ijtimoiy kommunikatsiyadan ajratib o‘rganish mumkin emasligini ko‘rsatadi [13]. Bu yondashuv badiiy asardagi personaj nutqining ijtimoiy va pragmatik markerlarini tahlil qilishda muhimdir.

Shunday qilib, yuqoridagi nazariyalarni birlashtiruvchi asosiy tamoyil shundan iboratki, tarjima adekvatligi faqat semantik mazmunning saqlanishi bilan emas, **kommunikativ niyat + funksional muvofiqlik + kontekstual ma’no + adresatga ta’sir** munosabatlari bilan ham belgilanadi.

O‘zbek tarjimashunosligida pragmatik yondashuvning nazariy zamini. O‘zbek tarjimashunosligida “pragmatik potensial” termini G‘arb pragmalingvistikasidagi zamonaviy terminologik ma’noda barcha klassik ishlarda birdek qo‘llanmagan. Shu sababli o‘zbek olimlarining fikrlarini zamonaviy termin bilan sun’iy ravishda aynanlashtirish emas, balki ularning **adekvatlik, milliy kolorit, uslub, funksional muvofiqlik va badiiy ta’sirni qayta yaratish** haqidagi qarashlarini pragmatik yondashuvning nazariy zamini sifatida talqin qilish maqsadga muvofiqdir.

G’. Salomov o‘zbek tarjimashunosligi maktabining shakllanishida badiiy tarjimaning uslubiy, milliy va estetik xususiyatlarini o‘rganishga katta hissa qo‘shgan. Olimning *“Tarjima nazariyasi asoslari”* asarida adekvat tarjima masalasi uslub, milliy xoslik, janr xususiyati, davr koloriti hamda shakl va mazmun birligini saqlash bilan bog‘liq holda yoritiladi [19]. Mazkur qarashlarni pragmatik nuqtai nazardan talqin qilganda, tarjimonning vazifasi asliyat til birliklarini formal ravishda almashtirish emas, balki ularning badiiy-kommunikativ funksiyasini maqsad tilida qayta yaratish ekanligi ko‘rinadi.

Q. Musayevning *“Tarjima nazariyasi asoslari”* asarida tarjima nazariyasi va amaliyotining muhim masalalari, tarjima muvofiqligi, transformatsiyalar va muqobilsiz birliklarni tarjima qilish usullari keng yoritilgan [20]. Madaniy xususiyatga ega birliklarning transliteratsiya, kalkalash, tasviriy ifoda yoki boshqa funksional vositalar bilan berilishi pragmatik nuqtai nazardan ham ahamiyatlidir. Buning asosiy sababi, bunday birliklar predmetni nomlash bilan birga muayyan madaniy assotsiatsiya va adresat reaksiyasini yuzaga keltiradi.

O‘zbek tarjimashunosligi an’analaridagi ushbu yondashuvlarni zamonaviy pragmatik tarjima nazariyalari bilan birlashtirganda quyidagi o‘zaro bog‘liqlikni ko‘rish mumkin:



va



Mazkur ikki yo‘nalishning integratsiyasi badiiy tarjimada pragmatik potensialni kompleks tahlil qilish uchun nazariy asos yaratadi.

TADQIQOT METODOLOGIYASI. Tadqiqotda qiyosiy-chog‘ishtirma, kontekstual, pragmalingvistik, funksional-semantik va tarjimaviy transformatsiyalar tahlili metodlaridan kompleks foydalanildi. Asliyat va tarjimadan tanlangan mikrokontekstlar quyidagi ketma-ketlik asosida o‘rganildi:



Pragmatik potensialni kompleks tahlil qilish uchun quyidagi integrativ model taklif etildi:

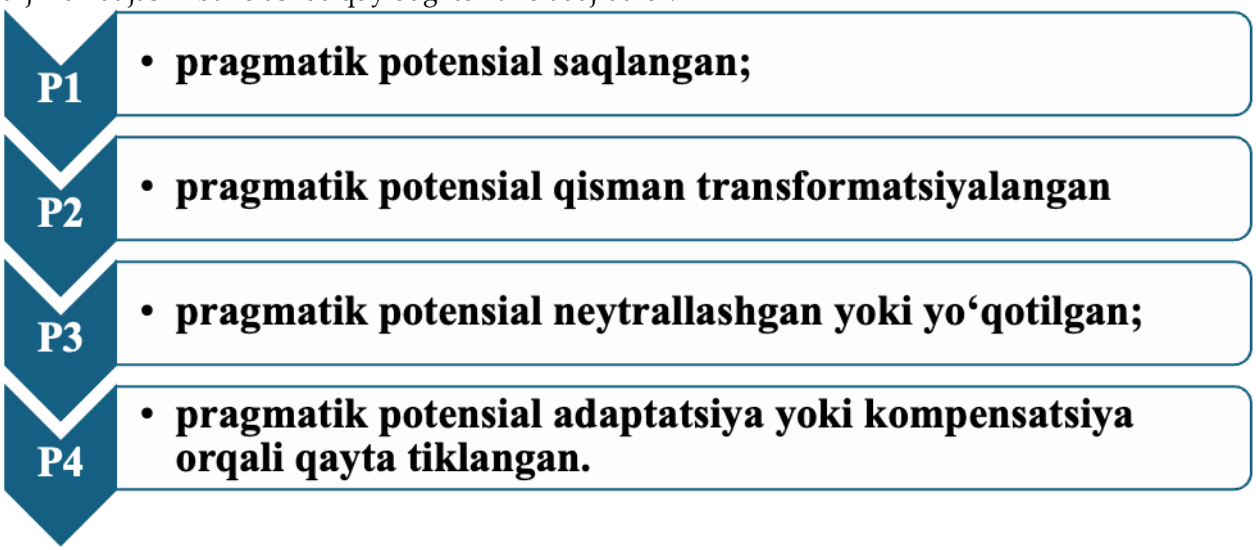
PP = CI + SA + LC + EE + IM + ST + AR

bunda:

CI – Communicative Intention – kommunikativ intensiya/maqsad;
SA – Speech Act – nutqiy akt komponenti;
LC – Linguocultural Component – lingvomadaniy komponent;
EE – Emotional-Evaluative Component – emotsional-baholovchi komponent;
IM – Implicit-Contextual Meaning – implikativ-kontekstual ma’no;
ST – Stylistic Component – stilistik komponent;
AR – Addressee Response – adresatga yo‘naltirilgan ta’sir.

Mazkur formula matematik hisoblash vositasi emas, balki pragmatik potensialning ko‘p komponentli tabiatini tavsiflovchi konseptual modeldir.

Tarjima natijasini baholashda quyidagi to‘rt holat ajratildi:



Muhim metodologik jihat shundan iboratki, P1–P4 butun tarjima birligiga mexanik ravishda tatbiq etilmaydi. Bitta mikrokontekstning CI komponenti P1 darajasida saqlanishi, ayni paytda ST komponenti P2 yoki P4 holatida boʻlishi mumkin. Bu pragmatik potensialning differensial tabiatini hisobga olish imkonini beradi.

TAHLIL VA NATIJALAR.

1. Oq devor epizodida kommunikativ manipulyatsiya. Mark Tven romanidagi eng mashhur epizodlardan biri Tomning devorni oqlash majburiyatini boshqa bolalar uchun jozibali faoliyat sifatida koʻrsatib, ularni ishni bajarishga undashidir.

ST:

"What do you call work?"

"Why, ain't THAT work?"

"Well, maybe it is, and maybe it ain't. All I know, is, it suits Tom Sawyer."

TT:

"- Сен жумыс деп нени айтып турсаң?

- Бул сениң-ше жумыс емес-пе?

- Ал не, мүмкин жумыс шығар, ал мүмкин жумыс емес шығар. Бирақ мен соны билемен, бул Том Сойер үшын жақсы нәрсе.

- Унайма дейсең-бе? ... Хәр күни шарбақ ақлаў тийсе бермейди."

Keyinchalik Tom devor oqlash har kuni nasib qiladigan imkoniyat emasligini ta'kidlaydi. Ushbu dialogda Tomning kommunikativ maqsadi Benga obyektiv ma'lumot berish emas. U Benning "*work/ жумыс*" konseptiga boʻlgan munosabatini oʻzgartirishga harakat qiladi. Avval Ben uchun:

whitewashing = compulsory work. – devorni oqlash – шарбақ ақлаў =majburiy ish

Tom esa kommunikativ qayta ramkalash natijasida:

Ingliz tilida – whitewashing = rare opportunity / privilege – "*it suits Tom Sawyer*" bilan berlsa;

Qoraqalpoq tilida – devorni oqlash – шарбақ ақлаў = kamdan-kam boʻladigan beriladigan imkoniyat/afzallik – "*бул Том Сойер үшын жақсы нәрсе*" orqali interpretatsiyasini yuzaga keltiradi.

Bu yerda Tom Benning "work/жумыс" haqidagi dastlabki presuppozitsiyasini oʻzgartiradi. Asliyatdagi '*Does a boy get a chance to whitewash a fence every day?*' ritorik savoli qoraqalpoqchada "*Хәр күни шарбақ ақлаў тийсе бермейди*" shaklidagi tasdiq gap bilan berilgan. Formal shakl oʻzgargan boʻlsa-da, "bu kam uchraydigan imkoniyat" implikaturasi saqlangan. Shuning uchun CI + IM + AR komponentlari boʻyicha pragmatik potensial saqlangan va natija P1 sifatida baholanadi.

Shunday qilib, uch bosqichli pragmatik mexanizm shakllanadi:

reframing → implicature → behavioural response.

Ben oxir-oqibat devorni oqlashni oʻzi xohlay boshlaydi. Demak, Tomning kommunikativ strategiyasining muvaffaqiyati gaplarning denotativ mazmunida emas, adresatda yuzaga keltirilgan inferensiya va keyingi xatti-harakatda namoyon boʻladi.

Bu holatda **CI + IM + AR** komponentlari yetakchilik qiladi.

Strategiya: implikaturani funksional saqlash va pragmatik qayta ramkalash.

Natija: P1 — asosiy pragmatik potensial saqlangan.

2. Work/Play oppozitsiyasi va muallif pragmatikasi

Oq devor epizodining yakunida muallif Tomning tajribasidan umumiy xulosa chiqarib, majburiy faoliyat bilan ixtiyoriy faoliyat oʻrtasidagi farqni "work" va "play" oppozitsiyasi orqali konseptuallashtiradi. Bu yerda kommunikatsiya personajlararo sathdan muallif va oʻquvchi oʻrtasidagi sathga oʻtadi.

personaj ↔ personaj

↓

muallif ↔ oʻquvchi

Shunday qilib, "*work/play*" qarama-qarshiligi faqat leksik antonimiya emas, insonning faoliyatga munosabati haqidagi ironik-pragmatik umumlashtirishga aylanadi. Qoraqalpoqcha tarjimada ham ishning majburiyligi va oʻyinning ixtiyoriyligi oʻrtasidagi konseptual qarama-qarshilik saqlanadi.

Yetakchi komponentlar — **IM + AR + CI**.

Strategiya: konseptual-pragmatik ekvivalentlik.

Natija: P1.

3. 'Sunday school" epizodida yumor va pragmatik nomuvofiqlik. 'Sunday school' epizodida Tom turli rangdagi chiptalarni yigʻib, mukofot olish imkoniyatiga ega boʻladi. Tashqi vaziyat Tomni diniy bilimga ega namunali oʻquvchi sifatida koʻrsatadi. Biroq unga Injilga oid savol berilganda notoʻgʻri javob berishi tashqi koʻrinish va real bilim oʻrtasidagi nomuvofiqlikni fosh qiladi.

ST:

"Now, Thomas, tell me the names of the first two disciples that were appointed."

"David and Goliath!"

TT:

"- Томас, қорқма, жуўап бер ҳүрметли сыйлы адамға. ...

- Биринши еки апостолды...

- Давид ҳәм Голиаф!"

Bu yerda pragmatik effekt David and Goliafning leksik ma'nosida emas, kutilgan diniy bilim bilan Tomning mutlaqo noto'g'ri javobi o'rtasidagi nomuvofiqlikda yuzaga keladi. Tarjimada "Давид ҳәм Голиаф" saqlanishi komik nomuvofiqlikni ham qayta yaratadi. Yetakchi komponentlar IM + LC + ST, natija P1/P2

Bu yerda yumorning pragmatik mexanizmi:

kutish → kutilmagan javob → nomuvofiqlik → hazil ta'siri

shaklida namoyon bo'ladi.

Pragmatik potensial diniy nomlarning o'zida emas, o'quvchi va vaziyat ishtirokchilarining kutgan javobi bilan Tomning javobi o'rtasidagi nomuvofiqlikda yuzaga keladi.

Yetakchi komponentlar: **IM + LC + ST**.

Strategiya: kontekstual-funksional ekvivalentlik.

Natija: P1/P2, chunki asosiy komik mexanizm saqlansa-da, uning lingvomadaniy assotsiativ foni tarjima auditoriyasida asliyat auditoriyasi bilan mutlaq bir xil bo'lishi shart emas.

4. Tom va Polli xola munosabatida ishonch/ishonchsizlik pragmatikasi. Tom va Polli xola dialoglarining muhim pragmatik xususiyatlaridan biri – Tomning gaplariga nisbatan oldindan shakllangan ishonchsizlikdir. Bu munosabatda da'vo, ishonchsizlik va ogohlantirish nutqiy aktlari muntazam o'zaro ta'sir qiladi. Tom biror fikrni tasdiqlaganda, Polli xola uning propositsional mazmuninigina emas, Tomning oldingi xatti-harakatlari asosida so'zlovchining ishonchliligini ham baholaydi.

Devor oqlash ishini boshqa bolalarga bajartirib bo'lgach, Tom Polli xolaning oldiga kelib, vazifa bajarilganini aytadi.

ST:

"Well, now, Tom, how much have you done?"

"It's all done, aunt."

"Tom, don't lie to me—I can't bear it."

"I ain't, aunt; it is all done."

TT:

- Қалай, жумысыңды ислеп питкергениң-бе? Қаншасын питкердиң?

- Барлығын, апа.

- Том, өтирик айтпа - мен ондайды жақсы көрмеймен.

- Өтирик айтып турғаным жоқ, апа, ҳәммеси ислеп болынды.

Mazkur dialog E. Berdimuratov tarjimasida aynan devor oqlash epizodidan keyin keltiriladi. Shundan so'ng muallif Polli xola Tomning gaplariga ishonmasligi odatiy hol ekanligini izohlaydi: Tom aytgan gapning yigirma besh foizi rost chiqsa ham, u qanoatlanishi mumkinligi ta'kidlanadi.

Ushbu mikrokontekstda kommunikativ munosabat quyidagi pragmatik zanjir asosida rivojlanadi:

Tom → da'vo

↓

Polli xola → ishonchsizlik + ogohlantirish

↓

Tom → mustahkamlangan da'vo

Tomning "*It's all done, aunt*" gapi yuzaki jihatdan oddiy assertiv nutq aktidir. Biroq Polli xola uning gapini faqat propositsional mazmun asosida baholamaydi. Uning interpretatsiyasiga Tomning avvalgi xatti-harakatlari va yolg'on gapirishga moyilligi haqidagi oldindan mavjud bilim ta'sir qiladi. Shu sababli Tomning xabari Polli xola tomonidan darhol shubha ostiga olinadi.

Bu holatni quyidagi formula orqali ifodalash mumkin:

ifoda + oldingi kommunikativ tajriba → amaliy talqin.

Demak, Polli xolaning "*Tom, don't lie to me*" replikasi oddiy taqiq yoki nasihat emas. Unda bir vaqtning o'zida ishonchsizlik, tanbeh va axloqiy baholash komponentlari mujassam. Qoraqalpoqcha tarjimada "*Том, өтирик айтпа*" shakli inglizcha '*don't lie to me*' ning asosiy illokutiv kuchini aniq qayta yaratgan. Direktiva va tanbeh funksiyasi saqlangan.

Biroq keyingi komponentda muayyan pragmatik transformatsiya kuzatiladi:

ST: *"I can't bear it."*

TT: "*мен ондайды жақсы көрмеймен*."

Inglizcha '*I can't bear it*' birligi oddiy "*yoqtirmaslik*"dan kuchliroq emotsional ma'noni ifodalaydi. Unda "*bunga chiday olmayman*", "*buni koʻtara olmayman*" kabi intensiv salbiy munosabat mavjud. Qoraqalpoqchadagi "*мен ондайды жақсы көрмеймен*" esa mazmunan "*bunday narsani yoqtirmayman*" darajasiga yaqinlashadi.

Shu sababli bu oʻrinda ikki pragmatik komponentni farqlash zarur:

SA (Speech Act): tanbeh va yolgʻon gapirmaslikka undash – saqlangan (P1);

EE (Emotional-Evaluative Component): emotsional intensivlik – qisman pasaygan (P2). Tomning javobida esa ingliz tilidagi nostandart "*I ain't*" shakli qoraqalpoqchada: "*Өтирик айтып турганым жоқ*" tarzida mazmunan va kommunikativ jihatdan qayta yaratilgan. Asliyatdagi nostandart grammatik marker formal jihatdan saqlanmagan, biroq Tomning oʻzini oqlash va avvalgi da'voni kuchaytirish funksiyasi toʻliq ifodalangan.

Bundan tashqari, muallifning keyingi izohi mazkur ishonchsizlikni situativ emas, Tom va Polli xola munosabatlariga xos barqaror shaxslararo pragmatik model ekanligini koʻrsatadi. Polli xola devorning haqiqatan ham oqlanganini koʻrganidan keyingina Tomning gapiga ishonadi.

Shunday qilib, mazkur misolda pragmatik potensialning komponentlari differensial tarzda saqlangan:

CI – kommunikativ intensiya: P1;

SA – da'vo / ogohlantirish: P1;

EE – emotsional-baholovchi intensivlik: P2;

IM – oldindan mavjud ishonchsizlik presuppozitsiyasi: P1;

ST – Tom nutqidagi nostandart grammatik marker: P2/P4.

Asosiy tarjima strategiyasi: ***funksional-pragmatik ekvivalentlik + qisman stilistik transformatsiya.***

Umumiy natija: P1/P2 – asosiy kommunikativ-pragmatik potensial saqlangan, biroq emotsional va ayrim stilistik komponentlar qisman transformatsiyalangan. Natijada: **nutq + oldingi bilimlar → pragmatik talqin** mexanizmi yuzaga keladi. Bu presuppozitsiya tarjimada ham personajlararo munosabatning muhim qismi sifatida saqlanadi. Yetakchi komponentlar: **SA + EE + IM**. **Strategiya:** funksional-pragmatik ekvivalentlik. **Natija: P1/P2.** Nutq aktining asosiy funksiyasi saqlanadi, biroq ayrim emotsional markerlarning intensivligi tarjimada oʻzgarishi mumkin.

5. Qonli qasamyod: ritual va pragmatik kuch. Tom va Geklberri qabristondagi jinoyatga guvoh boʻlgach, voqeani hech kimga aytmaslik haqida qasamyod qilishadi. Oddiy ogʻzaki va'da bolalar uchun yetarli hisoblanmaydi; sir saqlash ritualistik shaklda mustahkamlanadi.

ST:

"Now, Tom, let's tie ourselves to each other with an oath, and then we can never tell."

"No, that wouldn't do for this. That's good enough for little rubbishy common things... but there orter be writing 'bout a big thing like this. And blood."

TT:

"- Енди, Том, бизлер бир-биримизге айтпаслығымызға ант берейик – болмаса мүмкин емес.

- Мейли, мен қайылман. Ең жақсысы усы. Қәне, онда қол қысып... ант етейик.

- Жоқ, бул болмайды. Бул қандай-да бир әйтеўир ислер ушын... Ал бул мәселе болса, жүдә әҳмийетли... жазба түрде ант етиў керек."

Bu misolda oddiy va'da '***marosimiy majburiyat***' (ritualized commitment) darajasiga koʻtariladi. Qasamyodning pragmatik kuchi qoʻrquv, sir saqlash va ritual bilan birgalikda yuzaga keladi.

Bu yerda bir vaqtning oʻzida:

qoʻrquv + sir + qasam + ishonch + sadoqat komponentlari faollashadi.

Qasamyodning pragmatik vazifasi oddiy va'dadan kuchliroq boʻlib, ritual elementlar commissive nutq aktining illokutiv kuchini oshiradi. Mazkur mikrokontekstda **SA + LC + EE + IM** komponentlari oʻzaro bogʻlangan.

Strategiya: lingvomadaniy-funksional transfer.

Natija: P1/P2. Va'da va qoʻrquvning kommunikativ funksiyasi saqlanadi, ritual bilan bogʻliq ayrim madaniy assotsiatsiyalar esa maqsad auditoriyasida qisman oʻzgarishi mumkin.

6. Qabriston epizodida qoʻrquv va yashirin tahdid. Qabristondagi qotillikdan keyin Tom va Gekning kommunikativ xatti-harakatlarini Injun Joedan qoʻrquv boshqaradi. Ushbu epizodning pragmatik jihatdan muhim xususiyati shundaki, tahdid dastlab Injun Joe tomonidan Tom va Gekka bevosita aytilmaydi. Bolalar sodir boʻlgan jinoyatga guvoh boʻlganliklari va Injun Joening shafqatsizligini koʻrganliklari asosida oʻzlari xavf haqida inferensiya

qiladilar. Shu sababli qo‘rquvning pragmatik manbai eksplisit tahdid nutq aktidan ko‘ra “kontekstual implikatura”da namoyon bo‘ladi.

Qotillik sodir bo‘lganidan keyin Tom va Gek yashiringan joylariga yetib kelib, voqeaning qanday oqibatlarga olib kelishini muhokama qiladilar.

ST:

“Hucky, do you believe the dead people like it for us to be here?”

[...]

“Huck, I’ll tell you one thing that’s mighty curious. Muff Potter don’t know it. How can he tell?”

[...]

“Huck, if Injun Joe’s evidence don’t hang Potter, he’ll kill us some time or other, just as dead sure as we’re a laying here.”

Ushbu kontekstda bolalarning asosiy xavotiri jinoyatning o‘zi bilan cheklanmaydi. Ular voqeani oshkor qilish Injun Joe tomonidan qasos olishga sabab bo‘lishi mumkinligini anglaydilar. Bu xavf ularning keyingi kommunikativ xatti-harakatini – sukut saqlashni – belgilaydi.

Qoraqalpoqcha tarjimada mazkur qo‘rquv quyidagicha ifodalangan:

TT:

- Ал ким айтып барар екен? Бизлер-ме?

- Не айтып отырсаң? Ойлап бола-ма. Ал қапелимде Индей Джоны дарға аспаса не қыламыз? Ол бизлерди ҳәзир болмағанымменен, кейин өлтиреди-ғой, онда қутыла алмаймыз.

- Мен өзим-де солай ойлаған едим, Гек.

Mazkur dialogda Gekning “кейин өлтиреди-ғой” mazmunidagi fikri Injun Joening bolalarga shu paytda bevosita tahdid qilmaganiga qaramay, ular vaziyatni o‘z hayotlari uchun real xavf sifatida interpretatsiya qilayotganini ko‘rsatadi. Qoraqalpoqcha tarjimada ushbu sabab-oqibat munosabati aniq qayta yaratilgan.

Ushbu mikrokontekstning pragmatik tuzilishini quyidagicha ifodalash mumkin:

witnessing the murder

↓

knowledge of Injun Joe’s violence

↓

inference of possible revenge

↓

fear

↓

decision to remain silent.

Demak, bu epizodda pragmatik ma’no faqat eksplisit aytilgan gaplardan tashkil topmaydi. Tom va Gekning xatti-harakatlari ular mavjud kontekst asosida chiqargan xulosaga bog‘liq.

Ayniqsa, *“Ал ким айтып барар екен? Бизлер-ме?”* savoli yuzaki jihatdan axborot so‘rashga o‘xshasa-da, pragmatik jihatdan haqiqiy interrogativ nutq akti emas. Tom aslida “biz bu haqda aytmasligimiz kerak” degan xavotirni ifodalamoqda. Gekning bunga: *“Не айтып отырсаң? Ойлап бола-ма.”* mazmunidagi javobi ham savolga axborot berishdan ko‘ra bunday harakatning mumkin emasligini ta’kidlaydi.

Shu tariqa savol-javob shaklidagi dialog ortida quyidagi implikatura yuzaga keladi:

If we tell the truth → Injun Joe may escape punishment → he will take revenge → our lives will be in danger.

Shuning uchun:

telling the truth = danger;

remaining silent = self-preservation.

Bu holat Grays nazariyasi nuqtai nazaridan kontekstual implikatura bilan bog‘liq bo‘lsa, relevans yondashuvi nuqtai nazaridan personajlarning mavjud kontekstual bilimlardan foydalanib yangi inferensial xulosaga kelishi sifatida talqin qilinishi mumkin.

Mazkur pragmatik mexanizm keyingi epizodda yanada yaqqol namoyon bo‘ladi. Tom Gekdan ehtiyotsizlik bilan sirni aytib qo‘ymasligini yana so‘raydi:

TT:

Гек, сен абайсызда айтып қоймайсаң-ба?

Shundan keyin muallif ikki bolaning qo‘rquv holatini tasvirlaydi: ular shaharga qaytishda qorong‘ilikdagi har bir daraxtni ularni quvib kelayotgan dushman deb tasavvur qiladilar va qo‘rquvdan holdan toyadilar.

Bu muallif tasviri dialogda shakllangan xavf inferensiyasining **perlokutiv natijasini** ko‘rsatadi. Qo‘rquv faqat verbal-emotsional holat bo‘lib qolmay, personajlarning atrof-muhitni idrok etish usulini ham o‘zgartiradi. Shu sababli mazkur mikrokontekstda quyidagi pragmatik komponentlar yetakchilik qiladi:

CI – kommunikativ intensiya: sirni oshkor qilmaslik va o‘zini himoya qilish;

IM – implikativ-kontekstual ma’no: “agar gapirsak, Injun Joe bizdan qasos oladi”;

EE – emotsional-baholovchi komponent: “kuchli qo‘rquv va xavotir”;

SA – nutq akti: “savol shaklida ifodalangan ogohlantirish va sukut saqlashga undash”;

AR – adresatga ta’sir: “suhbatdoshni sirni saqlashga ishontirish”.

Ayniqsa, **IM komponenti** mazkur misolda markaziy o‘rin egallaydi. Chunki bolalarning qo‘rquvi Injun Joening ularga bevosita “*sizlarni o‘ldiraman*” degan tahdididan emas, uning oldingi xatti-harakati va mavjud kommunikativ vaziyat asosida chiqarilgan inferensial xulosadan kelib chiqadi.

Qoraqalpoqcha tarjimada ham ushbu inferensial zanjir saqlangan: voqeani aytish ehtimoli, Injun Joening jazodan qutulishi va keyinchalik bolalarni o‘ldirishi o‘rtasidagi sababiy aloqa aniq ifodalangan. Shuning uchun tarjima adresati ham personajlarning nima sababdan sukut saqlashga qaror qilganini anglay oladi.

Pragmatik model: **context → inference → anticipated threat → fear → silence**

Yetakchi komponentlar: **IM + EE + CI + AR.**

Asosiy tarjima strategiyasi: **kontekstual-pragmatik ekvivalentlik va implikaturani saqlash.**

Natija: P1 – asliyatdagi asosiy pragmatik potensial, xususan, yashirin tahdid, undan kelib chiqadigan qo‘rquv va sukut saqlashga undovchi kommunikativ motivatsiya qoraqalpoqcha tarjimada funksional jihatdan saqlangan.

Pragmatik ta’sir: **context → inference → fear → silence** mexanizmi asosida yuzaga keladi. Demak, qo‘rquvning pragmatik manbai alohida “*tahdid*” gapida emas, qahramonlarning voqea, jinoyatchi va ehtimoliy oqibat haqidagi bilimlari asosida hosil qilgan inferensiyasidadir. Bu holat implikativ-kontekstual komponentning pragmatik potensialdagi mustaqil ahamiyatini ko‘rsatadi.

Yetakchi komponentlar: **EE + IM + CI**.

Strategiya: kontekstual-pragmatik ekvivalentlik.

Natija: P1.

MUHOKAMA

Ingliz tilidan qoraqalpoq tiliga badiiy tarjimada pragmatik potensialning saqlanishini aniqlash maqsadida Mark Tvenning “*The Adventures of Tom Sawyer*” asari va uning qoraqalpoqcha tarjimasidan tanlangan oltita pragmatik vaziyatning qiyosiy tahlili shuni ko‘rsatdiki, pragmatik ekvivalentlik alohida leksik birlik yoki grammatik konstruksiyaning formal mosligiga emas, balki kommunikativ intensiya, nutq akti, implikatura, emotsional-ekspressiv ta’sir, lingvomadaniy komponent va personaj nutqining stilistik xususiyatlari majmuasining qayta yaratilishiga bog‘liq.

O‘tkazilgan tahlillar asosida pragmatik potensialni yaxlit hodisa sifatida emas, balki o‘zaro aloqador komponentlardan tashkil topgan ko‘p qatlamli tizim sifatida baholash zarurligi aniqlandi. Tadqiqotda qo‘llanilgan integrativ model doirasida **CI (communicative intention), SA (speech act), IM (implicature), EE (emotional-evaluative effect), LC (linguocultural component), ST (stylistic component) va AR (addressee response/orientation)** kabi parametrlar tarjimaning pragmatik samaradorligini aniqlash imkonini berdi.

Tom va Ben o‘rtasidagi kommunikativ munosabatlar misolida personajlararo muloqotning pragmatik qiymati faqat aytilayotgan fikrning denotativ mazmuni bilan belgilanmasligi ko‘rsatildi. Replikalarning illokutiv kuchi, emotsional munosabat va suhbatdoshga yo‘naltirilgan kommunikativ ta’sir tarjimada muhim ahamiyat kasb etadi. Qoraqalpoqcha tarjimada dialogning asosiy kommunikativ vazifasi funksional vositalar orqali qayta yaratilishi pragmatik potensialni saqlashda **funksional ekvivalentlik**ning ustuvorligini ko‘rsatadi.

Sunday school epizodi – yumor tarjimasida pragmatik effektning leksik birliklarning o‘zidan ko‘ra kontekstual nomuvofiqlik bilan chambarchas bog‘liqligini ko‘rsatdi. Tomdan diniy bilim talab qilinayotgan kommunikativ vaziyatda kutilgan javob o‘rniga “*David and Goliath*” mazmunidagi noto‘g‘ri javobning berilishi komik effektni yuzaga keltiradi. Qoraqalpoqcha tarjimada ushbu nomlarning saqlanishi va kommunikativ vaziyatning qayta yaratilishi yumorning asosiy pragmatik mexanizmini tarjima adresatiga yetkazishga xizmat qiladi. Demak, yumor tarjimasida formal moslikdan ko‘ra **kontekstual-pragmatik ekvivalentlik** muhimroq hisoblanadi.

Tom va Polli xola munosabatidagi ishonch/ishonchsizlik pragmatikasi – pragmatik interpretatsiyada oldingi kommunikativ tajriba va presuppozitsiyaning ahamiyatini ko‘rsatdi. Tomning *“It’s all done, aunt”* mazmunidagi assertiv nutq akti Polli xola tomonidan neytral xabar sifatida emas, balki Tomning avvalgi xatti-harakatlari asosida shubha bilan qabul qilinadi. Qoraqalpoqcha tarjimada *“Том, өтирик айтпа”* shaklidagi replika ishonchsizlik va tanbehning asosiy illokutiv kuchini saqlaydi. Shu bilan birga, asliyatdagi “*I can’t bear it*”ning “*мен ондайды жақсы көрмеймен*” tarzida ifodalanishi emotsional intensivlikning ma’lum darajada pasayganini ko‘rsatadi. Demak, ushbu misolda nutq akti va kommunikativ intensiya yuqori darajada saqlangan bo‘lsa-da, emotsional-baholovchi komponentda qisman pragmatik siljish kuzatiladi.

Tadqiqot va tahlillar jarayonida pragmatik potensialning implikativ qatlami alohida ahamiyat kasb etishi aniqlandi. Tomning kommunikativ strategiyasida aytilgan fikr bilan nazarda tutilgan ma’no o‘rtasidagi munosabat adresatning

interpretatsiyasini boshqaradi. Bunday holatda tarjimonning vazifasi faqat eksplisit axborotni yetkazish emas, balki asliyat adresati chiqarishi mumkin bo‘lgan inferensial xulosani tarjima adresati uchun ham imkon qadar qayta yaratishdan iborat. Tahlil natijalari implikaturaning saqlanishi badiiy personajning kommunikativ strategiyasi va muallif yaratgan pragmatik effektni qayta hosil qilishning asosiy shartlaridan biri ekanligini ko‘rsatdi.

Qabristondagi qotillikdan keyingi epizod tahlili esa pragmatik potensialning eksplisit mazmundan tashqarida shakllanishini yanada yaqqol namoyon etdi. Tom va Gekning xatti-harakatlari Injun Joening ularga bevosita verbal tahdid qilishidan emas, balki uning qotillikka qodir ekanligi haqidagi kontekstual bilim va bundan kelib chiqadigan inferensiya orqali boshqariladi. Qoraqalpoqcha tarjimada bolalarning “agar Injun Joe jazodan qutulsa, keyinchalik bizni o‘ldiradi” mazmunidagi xavotiri aniq ifodalangan. Keyingi kontekstda esa ushbu qo‘rquv ularning idrokiga va xatti-harakatlariga bevosita ta’sir ko‘rsatishi tasvirlanadi: ular qorong‘ilikdagi obyektlarni o‘zlarini ta’qib qilayotgan xavf sifatida qabul qiladilar. Shu jihatdan oltinchi misolda quyidagi pragmatik zanjir kuzatiladi:

kontekst → inferensiya → kutilayotgan tahdid → qo‘rquv → sukut.

Mazkur zanjirning tarjimada saqlanishi alohida ahamiyatga ega, chunki personajlarning sukut saqlashi faqat syujet hodisasi emas, balki kontekstual implikaturadan kelib chiqadigan kommunikativ strategiyadir. Shuning uchun ushbu misolda **IM + EE + CI + AR** komponentlarining o‘zaro aloqasi pragmatik potensialni yuzaga keltiradi.

Yuqoridagi ingliz matnining qoraqalpoqcha tarjimasidan olingan parchalar qiyosiy tahlili yana bir muhim qonuniyatni aniqlash imkonini berdi: **pragmatik potensialning saqlanish darajasi barcha komponentlarda bir xil bo‘lishi shart emas**. Bir komponent P1 — to‘liq yoki yuqori darajada saqlanish holatini namoyon qilgan vaziyatda, boshqa komponent P2 — qisman transformatsiyaga uchrashi mumkin. Masalan, nutq aktining illokutiv kuchi saqlanib, emotsional intensivlik pasayishi yoki stilistik marker formal jihatdan yo‘qolib, uning kommunikativ funksiyasi boshqa vosita orqali kompensatsiya qilinishi mumkin. Bu esa pragmatik ekvivalentlikni “saqlangan/saqlanmagan” kabi binar mezon asosida baholash yetarli emasligini ko‘rsatadi.

Tahlillar asosida pragmatik potensialni saqlashning quyidagi umumiy mexanizmini taklif qilish mumkin:

Asliyat pragmatik potensiali → pragmatik komponentlarni aniqlash → dominant komponentni belgilash → tarjima strategiyasini tanlash → tarjima matnida funksional qayta yaratish → tarjima adresatiga pragmatik ta’sir.

Mazkur mexanizmda tarjimon asliyatning barcha formal belgilarini aynan takrorlashga emas, balki muayyan mikrokontekstda ustuvor bo‘lgan pragmatik komponentni aniqlashga intiladi. Masalan, yumorda **IM/LC**, interpersonal konfliktda **EE/SA**, ishonch/ishonchsizlik munosabatida **SA/IM/EE**, yashirin tahdid vaziyatida esa **IM/EE/CI/AR** dominantlik qilishi mumkin.

Shunday qilib, tahlil natijalari tarjimada pragmatik potensialning saqlanishini **ko‘p komponentli, dinamik va kontekstga bog‘liq jarayon** sifatida baholash zarurligini ko‘rsatadi. Tarjima birligining formal transformatsiyaga uchrashi har doim pragmatik yo‘qotishni anglatmaydi. Aksincha, ayrim hollarda formal transformatsiya yoki kompensatsiya asliyatdagi kommunikativ funksiyani tarjima matnida qayta yaratishning zarur sharti bo‘lishi mumkin.

XULOSA

Mark Tvenning *The Adventures of Tom Sawyer* asari va uning qoraqalpoqcha tarjimasidan tanlangan bir nechta parcha pragmatik vaziyatning qiyosiy tahlili ingliz tilidan qoraqalpoq tiliga badiiy tarjimada pragmatik potensialni saqlash masalasiga integrativ yondashish zarurligini ko‘rsatdi.

Tadqiqot natijalari asosida quyidagi xulosalarga kelindi:

Pragmatik potensial ko‘p komponentli hodisadir. Uni faqat leksik-semantik ekvivalentlik yoki alohida nutq aktlari bilan chegaralash mumkin emas. Kommunikativ intensiya (CI), nutq akti (SA), implikatura (IM), emotsional-baholovchi ta’sir (EE), lingvomadaniy komponent (LC), stilistik xususiyat (ST) va adresatga yo‘naltirilgan ta’sir (AR) birgalikda matnning pragmatik potensialini shakllantiradi.

Pragmatik ekvivalentlik formal ekvivalentlik bilan aynan bir hodisa emas. Tahlil qilingan ST-TT juftliklarida leksik yoki grammatik shakl o‘zgargan holatlarda ham kommunikativ maqsad va adresatga ko‘rsatiladigan ta’sir funksional vositalar orqali saqlanishi mumkinligi kuzatildi.

Nutq aktining illokutiv kuchini saqlash personajlararo munosabatlarni qayta yaratishda muhim omildir. Tomning Beki va Polli xola bilan dialoglari assertiv, direktiv, tanbeh, o‘zini oqlash va boshqa kommunikativ funksiyalarning tarjimada to‘g‘ri interpretatsiya qilinishi personajlar munosabatining pragmatik tabiatini saqlashga xizmat qilishini ko‘rsatdi.

Implikatura pragmatik potensialning eng muhim komponentlaridan biridir. Ayniqsa, yumor, manipulyativ kommunikatsiya va yashirin tahdid bilan bog‘liq vaziyatlarda haqiqiy kommunikativ ma’no eksplisit gap mazmunidan tashqarida shakllanadi. Shu sababli tarjimon STdagi inferensial mexanizmni aniqlashi va TT adresati uchun ham tegishli xulosani chiqarish imkoniyatini yaratishi lozim.

Emotsional-ekspressiv potensialni saqlash differensial xarakterga ega. Ayrim misollarda kommunikativ intensiya va nutq akti to‘liq saqlangan bo‘lsa-da, emotsional intensivlikning qisman pasayishi kuzatildi. Bu holat pragmatik potensialni komponentlar kesimida alohida baholash zarurligini tasdiqlaydi.

Qabriston epizodi yashirin tahdidning pragmatik tabiatini yaqqol ko‘rsatadi. Injun Joe tomonidan Tom va Gekka dastlab to‘g‘ridan-to‘g‘ri tahdid verbalizatsiya qilinmagan bo‘lsa ham, qotillikni ko‘rgan bolalar uning ehtimoliy qasosini inferensial ravishda anglaydilar. Natijada “xavfni anglash → qo‘rquv → sukut” pragmatik zanjiri yuzaga keladi. Ushbu zanjirning qoraqalpoqcha tarjimada saqlanishi kontekstual-pragmatik ekvivalentlikning muvaffaqiyatli namunasini tashkil etadi.

Umuman, amalga oshirilgan tahlillar asosida **tarjimada pragmatik potensialni saqlashning integrativ modeli**ni quyidagicha ifodalash mumkin:

Pragmatik potensial = CI + SA + IM + EE + LC + ST + AR

va tarjima jarayonining pragmatik mexanizmi:

ST → pragmatik diagnostika → dominant komponent(lar) → tarjima strategiyasi → TT → pragmatik ta’sirning saqlanish darajasi (P1/P2/P4).

Taklif etilayotgan modelning asosiy afzalligi pragmatik ekvivalentlikni faqat tarjima birligining formal yoki semantik mosligi asosida emas, balki **asliyatdagi kommunikativ maqsad, inferensial ma’no, emotsional ta’sir, lingvomadaniy va stilistik xususiyatlarning tarjima adresati uchun qay darajada qayta yaratilgani** asosida baholash imkonini berishidadir.

Shu nuqtai nazardan, ingliz tilidan qoraqalpoq tiliga badiiy tarjimada pragmatik potensialni saqlash tarjimonning alohida so‘z va konstruksiyalarga ekvivalent topish faoliyatidan kengroq jarayon bo‘lib, u asliyatdagi **kommunikativ hodisani boshqa lingvomadaniy muhitda funksional jihatdan qayta yaratish** sifatida talqin qilinishi lozim.

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ESHQOBIL SHUKUR POETIKASIDA INDIVIDUAL OLAM MANZARASINING LISONIY-KOGNITIV IFODASI

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Annotatsiya: *Maqolada Eshqobil Shukur poetikasida individual olam manzarasining lisoniy-kognitiv ifodalanishi tahlil qilinadi. Muallif "meni", shaxsiy va tarixiy xotira, milliy-madaniy kod, folklor, metaforik tafakkur, rang semantikasining kengayishi hamda vaqt-makonning subyektiv tashkil etilishi shoir poetik olamini shakllantiruvchi omillar sifatida ko'rib chiqiladi. "Asorat", "Ozodlik", "Mengim momoning yo'qlovi", "Potini", "Chanqovuz", "Laylatul qadr" kabi matnlardagi lisoniy hodisalar asosida tarixiy-madaniy tajribaning shaxsiy ruhiy kechinmaga ko'chishi yoritiladi. Tahlil shoir individual olam manzarasi shaxsiy tajriba, kollektiv xotira va lisoniy ijodkorlik tutashuvida shakllanuvchi kognitiv-estetik tizim ekanini ko'rsatadi.*

Kalit so'zlar: *individual olam manzarasi, kognitiv poetika, lisoniy shaxs, poetik tafakkur, tarixiy xotira, muallif "meni", milliy-madaniy kod, metafora, verbalizatsiya.*

ЛИНГВОКОГНИТИВНОЕ ВЫРАЖЕНИЕ ИНДИВИДУАЛЬНОЙ КАРТИНЫ МИРА В ПОЭТИКЕ ЭШКОБИЛА ШУКУРА

Аннотация: *В статье рассматривается лингвокогнитивное выражение индивидуальной картины мира в поэтике Эшкобила Шукура. Авторское «я», личная и историческая память, национально-культурный код, фольклор, метафорическое мышление, цветовая семантика и субъективная организация времени и пространства анализируются как факторы формирования поэтического мира. На материале произведений «Asorat», «Ozodlik», «Mengim momoning yo'qlovi», «Potini», «Chanqovuz», «Laylatul qadr» раскрывается переход историко-культурного опыта в личное духовное переживание. Индивидуальная картина мира поэта определяется как когнитивно-эстетическая система, возникающая во взаимодействии личного опыта, коллективной памяти и языкового творчества.*

Ключевые слова: *индивидуальная картина мира, когнитивная поэтика, языковая личность, поэтическое мышление, историческая память, авторское «я», национально-культурный код, метафора, вербализация.*

LINGUO-COGNITIVE EXPRESSION OF THE INDIVIDUAL WORLDVIEW IN ESHQOBIL SHUKUR'S POETICS

Abstract: *The article examines the linguo-cognitive expression of the individual worldview in Eshqobil Shukur's poetics. The authorial "I", personal and historical memory, national-cultural codes, folklore, metaphorical thinking, colour semantics, and the subjective organization of time and space are treated as factors shaping the poet's world. Works such as Asorat, Ozodlik, Mengim momoning yo'qlovi, Potini, Chanqovuz and Laylatul qadr show how historical-cultural experience is transformed into personal spiritual experience. The poet's individual worldview is interpreted as a cognitive-aesthetic system formed through the interaction of personal experience, collective memory and linguistic creativity.*

Keywords: *individual worldview, cognitive poetics, linguistic personality, poetic thinking, historical memory, authorial "I", national-cultural code, metaphor, verbalization.*

Kirish

Olamning individual manzarasi badiiy matnda borliqning oddiy nusxasi emas, balki muallifning shaxsiy tajribasi, xotirasi, qadriyatlari va estetik tanlovi orqali qayta tashkil etilgan subyektiv-kognitiv modeldir. Shu bois ijodkor poetikasini o'rganishda uning nimani tasvirlashidan tashqari, voqelikni qanday ko'rishi va umumiy madaniy tajribani qanday individuallashtirishi ham muhim. J.N.Maslova poetik olam manzarasini muallif subyektivligi, estetik tajriba va poetik til aloqasida shakllanuvchi kognitiv obyekt sifatida izohlaydi [3].

Eshqobil Shukurda tashqi voqelik ko'pincha ko'ngil, xotira va ruhiy tajriba orqali ichki olamga ko'chadi. Tarix, urush, vatan, diniy hodisa yoki xalqona marosim lirik subyekt bilan tutashganda yangi semantik mazmun kasb etadi. I.Ibragimova individual lisoniy manzaraning kognitiv va lingvistik imkoniyatlar bilan bog'liqligini, shoir konseptual

olamining individual til tanlovlarida namoyon boʻlishini qayd etadi [11]. Maqolaning maqsadi Eshqobil Shukur poetikasida individual olam manzarasining lisoniy-kognitiv shakllanishini muallif “meni”, xotira, milliy-madaniy kod va metaforik tafakkur misolida yoritishdir.

Adabiyotlar tahlili

Eshqobil Shukur ijodiga oid tadqiqotlarda shoir individual olamining turli qirralari yoritilgan. Qurdosh Qahramonov uning poetikasini “botiniy olam manzaralari”, koʻngilga evrilish va oʻzlikni izlash bilan bogʻlaydi [4]. N.Erkinova muallif ismi, pretsedent birliklar va individual assotsiatsiyalarning lingvopoetik faolligiga e’tibor qaratadi [9]. I.Ernazarova shoirning soʻz ijodkorligi, “singil” va “yashil” singari birliklarning individual semantik yukini tahlil qiladi [5].

S.Ergashova yoʻqlov, folkloriy stilizatsiya va qush ramzlarining vazifasini [6; 10], U.Abdurahmonova diniy-ma’naviy obrazlar hamda oy bilan bogʻliq individual nominatsiyalarni oʻrganadi [8; 14]. D.Muxammadiyev esa Eshqobil Shukurda metaforik holat butun matn kompozitsiyasini qamrab olishi mumkinligini “she’r-metafora” hodisasi bilan izohlaydi [12]. Ushbu qarashlar maqolada individual olam manzarasini bir butun kognitiv-lisoniy tizim sifatida tahlil qilish uchun asos boʻladi.

Tadqiqot metodologiyasi

Tahlilda tavsifiy, lingvopoetik, kognitiv-semantik, kontekstual va konseptual yondashuvlardan foydalanildi. Kontekstual tahlil birlikning poetik matndagi qoʻshimcha semasini, kognitiv-semantik tahlil borliqning qanday konseptuallashtirilishini, lingvopoetik yondashuv esa til birligining individual-estetik vazifasini aniqlashga xizmat qildi.

Natijalar va ularning tahlili

Eshqobil Shukur individual olam manzarasining asosiy markazlaridan biri muallif “meni”dir. “Asorat” she’rida Muhammad paygʻambar, Suvorov, Che Gevara, Robin Gud kabi nomlardan soʻng “Eshqobil qaytmadi hamon urushdan” [15, B. 335] mazmunidagi burilish yuzaga keladi. N.Erkinova shoir ismining bunday faolligini alohida lingvopoetik xususiyat sifatida qayd etadi [9]. “Eshqobil” bu oʻrinda biografik ism boʻlishdan chiqib, tarixiy hodisaning hozirgi ruhiyatda davom etishini ifodalaydi.

“Qaytmaslik” fazoviy harakatning inkori bilangina cheklanmaydi: urush tarixiy vaqt nuqtayi nazaridan tugagan, biroq uning asorati lirik subyekt ongida davom etadi. Qurdosh Qahramonov ham Eshqobil obrazining vaqt, yoʻqlik va xotira bilan bogʻliq semantik yukiga e’tibor qaratadi [4]. “Eshqobil emasman endi men” [15, B. 353] takrorida esa “men” oʻzgarmas avtoportret emas, oʻzini qayta anglaydigan refleksiv ong sifatida namoyon boʻladi.

Tarixiy va shaxsiy xotiraning tutashuvi “Ozodlik”da ham koʻrinadi. Usmon, Choʻlpon va Qodiriy nomlari qatagʻon xotirasini, Tohir va Zuhra esa an’anaviy sevgi mazmunini faollashtiradi [7; 9].

Tohir Zuhrosini suygani kabi,
Men suymak istadim seni, Ozodlik. [9, B. 48]

Bu yerda mavhum “ozodlik” tushunchasi hissiy tajribaga koʻchadi. Tohir va Zuhra nomlari sevgi hamda sadoqat haqidagi madaniy bilimni uygʻotsa, “seni” olmoshi Ozodlikni murojaat qilinadigan va seviladigan qadriyatga aylantiradi. Tarixiy-siyosiy mazmun shaxsiy kechinma bilan birlashadi.

Shaxsiy xotiraning poetik umumlashuvi “singil” birligida ham faol. I.Ernazarova bu birlik shoirning “ruhiy xotira”si bilan bogʻliq holda armon, gʻam va noziklik singari qoʻshimcha semalarni orttirishini koʻrsatadi [5]. Biografik yoʻqotish shu tariqa oʻquvchi uchun umumiy ayriliq tajribasini faollashtiruvchi belgiga aylanadi.

“Mengim momoning yoʻqlovi”da shaxsiy fojia folklor shakli orqali milliy tarixiy xotira bilan tutashadi. S.Ergashova she’rda yoʻqlov va yigʻi janri stilizatsiya qilinganini, surgun tufayli vatandan uzoqda jon berayotgan momo obrazi orqali ayriliq ifodalanganini koʻrsatadi [6].

Goʻrim oʻz yuragimda,
Yurakda bordir Vatan. [15, B. 406]

“Qabr – yurak – Vatan” birliklari bir mikromatnda tutashib, makonning odatiy semantikasini oʻzgartiradi. Qabr yakunni, yurak hayot va hissiyotni, vatan esa geografik makonni anglatadi; ularning yaqinlashuvi natijasida vatan ichki ruhiy makonga koʻchadi. Surgun jismoniy ajralishni bildiradi, ammo vatan bilan kognitiv aloqa yurakda davom etadi.

Folklor Eshqobil Shukurda tayyor bezak emas, tarixiy va ruhiy voqelikni anglash vositasidir. “Potini” bolalar oʻyinidagi jim turish qoidasi turgʻunlik davridagi ijtimoiy “gunglik” bilan yaqinlashtiriladi. Bandlar oxiridagi “Jim. Jim.” takrori oʻyin qoidasidan chiqib, tarixiy-ijtimoiy sukutning belgisi boʻlib qoladi [10; 15, B. 338–339].

“Chanqovuz”dagi “poʻlat til” va “havo soʻz” birikmalari [15, B. 360–361] ham predmetning individual qayta konseptuallashtirilishiga misoldir. N.Erkinova ularni chanqovuzning metall “tili” va ovoz hosil qilishda havoning ishtiroki bilan bogʻliq individual assotsiatsiyalar sifatida tahlil qiladi [9]. Xalq musiqa asbobi shu tariqa til va nutq hodisasi orqali yangidan anglanadi.

Shoir so‘z ijodkorligi “yashil” rang leksemasining semantik kengayishida ham namoyon bo‘ladi. I.Ernazarova “yashil”ning ohang, so‘z, tuyg‘u, havo, qush va yalov kabi birliklar bilan birikishini ko‘rsatadi [5]. Rang ko‘rish belgisidan chiqib, tovush, nutq va ruhiy holatga ko‘chadi.

“Yashil o‘lim” birikmasida bu semantik qayta qurish yanada keskin. N.Erkinova yashil qushlar, yashil bayroq va “ko‘karayotgan” tobut tasvirini abadiyat hamda ruhiy tirilish mazmuni bilan bog‘laydi [9]. “Yashil” ko‘karish va hayot, “o‘lim” esa yakun bilan aloqador; ularning birikishi o‘limning odatiy konseptual modelini qayta tashkil etadi.

Z.Kövecses metaforik modelning madaniy va individual omillar ta’sirida variantlanishini ta’kidlaydi [2]. Eshqobil Shukurda “vatan – yurak”, “umr – uy”, “ruhiy holat – qush”, “o‘lim – ko‘karish” munosabatlari individual poetik tajriba bilan uyg‘unlashadi.

D.Muxammadiyev Eshqobil Shukurda metaforik holat butun matn kompozitsiyasini qamrab olishini qayd etadi [12]. “Xaroba uy” obrazi odatda barqarorlikni bildiradigan uyga uchish va ko‘chish harakatini yuklab, “barqaror joy” semantikasini o‘tkinchi umr modeliga aylantiradi [1, B. 63; 12]. Predmetning odatiy xususiyati buzilishi orqali yangi ma’no ochiladi.

Diniy-ma’naviy qatlam ham shoir individual olamida ichki tajriba bilan bog‘liq. X.Nishonova shoir mansub ijodiy avlodda diniy qarashlarning poetik obrazlar tizimiga faol kirib kelishini ko‘rsatadi [13]. U.Abdurahmonova “Anjuman” va “Laylatul qadr”da Qadr kechasi, qaldirg‘och, banda va Yaratgan munosabatlari orqali ruhiy yangilanish mazmunining badiiy sintezini tahlil qiladi [8]. Bu matnlarda vaqt kalendar o‘lchovidan ko‘ra ruhiy holat bilan belgilanadi.

Vaqt va makonning subyektivlashuvi shoir poetikasining muhim xususiyatidir. “Asorat”da urush hozirgi ruhiy holatga ko‘chadi, “Mengim momoning yo‘qlovi”da geografik vatan yurak ichidagi makonga aylanadi, “Laylatul qadr”da esa tunning qimmati uning davomiyligi bilan emas, unda kechayotgan ruhiy o‘zgarish bilan o‘lchanadi. Natijada kalendar-xronologik vaqt bilan ruhiy-semantik vaqt farqlanadi.

Pretsedent birliklar ham katta fon bilimini ixcham shaklda faollashtiradi. N.Erkinova shoir she’riyatida Qur’on suralari, hadislar, maqollar, mashhur ibora va nomlarning poetik imkoniyatini ko‘rsatadi [7]. “Asorat”dagi tarixiy shaxslar qatorining Eshqobil ismi bilan yakunlanishi va “Ozodlik”da qatag‘on qurbonlari nomlarining Tohir-Zuhra obrazlari bilan bir matnga kirishi kollektiv xotira bilan individual hissiyot o‘rtasida dialog hosil qiladi.

Shu bois shoir poetikasidagi “men”, tarixiy ism, folklor shakli, vatan, rang, qush, uy yoki diniy birliklar alohida stilistik detallar emas. Ular tarixiy-madaniy tajribani shaxsiy kechinmaga aylantirish va borliqni yangi semantik munosabatlarda ko‘rish jarayonining tarkibiy qismlaridir.

Xulosa

Eshqobil Shukur poetikasidagi individual olam manzarasi shaxsiy ruhiy tajriba, kollektiv tarixiy-madaniy xotira va lisoniy ijodkorlikning o‘zaro aloqasida shakllanadigan kognitiv-estetik tizimdir. Muallif “meni” tarix, vatan, xotira va diniy tajriba bilan munosabat o‘rnatadigan semantik markaz sifatida namoyon bo‘ladi.

Tarix shoir matnida ruhiy asorat, ism, sukut, yurak yoki uy kabi konkret birliklarga ko‘chadi. Folkloriy shakllar zamonaviy tarixiy va ruhiy vaziyatni anglash vositasiga, rang va metaforik birliklar esa borliqni qayta kategoriyalash usuliga aylanadi. Vaqt va makon ham obyektiv koordinata bo‘lib qolmay, xotira, e’tiqod va kechinma ta’sirida psixologik-semantik mazmun kasb etadi.

Shu jihatlar Eshqobil Shukur individual olam manzarasining antropotsentrik, tarixiy-madaniy va metaforik tabiatini belgilaydi. Shoir umumxalq tilidagi birliklarni shaxsiy xotira, qadriyat va metaforik qayta ko‘rish orqali yangidan tashkil etadi.

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“SHOHNOMA”NING XORIJIY TILLARGA TARJIMALARI VA INGLIZCHA TARJIMALARDAGI O‘ZIGA XOSLIK

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Annotatsiya: *Maqolada Abulqosim Firdavsiyning “Shohnoma” dostoni xorijiy tillarga tarjima qilinishining tarixiy bosqichlari va uslubiy o‘ziga xosligi qiyosiy-tarixiy hamda lingvo-stilistik yondashuv doirasida tadqiq etiladi. Tadqiqot materialini asarning arab, usmoniy turk, gruzin, ozarbayjon, qozoq, turkman, rus, ukrain hamda g‘arbiy Yevropa tillaridagi o‘n ikkita tarjima an’anasi va Jeyms Atkinson amalga oshirgan inglizcha tarjimalar (1814, 1832) tashkil etdi. Qiyosiy-tarixiy, lingvo-stilistik, komponent va kontekstual tahlil natijasida tarjima an’analari to‘rt tipologik guruhga — asliyatga sodiq, kompozitsion moslashtiruvchi, milliy-adaptiv va poetik-kodni almashtiruvchi guruhlarga — ajratildi. Atkinson tarjimasi misolida forsiy poetik figurlar, giperbolalar va zardushtiy-eron mifologik qatlamini ifodalovchi realiyalarning “Heroic Couplet” hamda yambik pentametr qolipiga o‘tkazilishi asoslab berildi. Matndagi “piltan” (fil tanli) kabi an’anaviy epik sifatlovning ingliz tilida salbiy konnotatsiya kasb etmasligi uchun “lion’s heart” metaforasi bilan kompensatsiyalanishi aniqlandi. Xulosa sifatida milliy-mifik dostonlarni o‘girishda lingvistik aniqlik emas, madaniyatlararo poetik va konseptual kodni o‘tkazish hal qiluvchi ahamiyatga ega ekanligi ko‘rsatildi.*

Kalit so‘zlar: *“Shohnoma”, Firdavsiy, tarjimashunoslik, Jeyms Atkinson, Rustam dostoni, neoklassitsizm, yambik pentametr, semantik transformatsiya, madaniyatlararo adaptatsiya, realiya, ichkilashtirish, begonalashtirish.*

ИНОСТРАННЫЕ ПЕРЕВОДЫ «ШАХНАМЕ» И СПЕЦИФИКА АНГЛИЙСКИХ ПЕРЕВОДОВ

Аннотация: *В статье в рамках сравнительно-исторического и лингвостилистического подхода исследуются исторические этапы и стилистическое своеобразие переводов эпоса Абулькасима Фирдоуси «Шахнаме» на иностранные языки. Материалом исследования послужили двенадцать переводческих традиций — арабская, османско-турецкая, грузинская, азербайджанская, казахская, туркменская, русская, украинская и западноевропейские, — а также английские переводы Джеймса Аткинсона (1814, 1832). В результате сравнительно-исторического, лингвостилистического, компонентного и контекстуального анализа переводческие традиции распределены по четырём типологическим группам: близкие к оригиналу, композиционно адаптирующие, национально-адаптивные и заменяющие поэтический код. На примере перевода Аткинсона обоснован процесс адаптации персидских поэтических фигур, гипербол и реалий зороастрийско-иранского мифологического пласта к канонам «Heroic Couplet» и ямбического пентаметра. Установлено, что традиционный эпический эпитет «пильтан» (обладающий телом слона) компенсируется метафорой «lion’s heart» во избежание негативных коннотаций в английском языке. Сделан вывод о том, что при переводе национально-мифологических эпосов решающее значение имеет передача не языковой точности, а межкультурного поэтического и концептуального кода.*

Ключевые слова: *«Шахнаме», Фирдоуси, переводоведение, Джеймс Аткинсон, дастан о Рустаме, неоклассицизм, ямбический пентаметр, семантическая трансформация, межкультурная адаптация, реалия, доместикация, форенизация.*

FOREIGN TRANSLATIONS OF THE “SHAHNAMEH” AND THE SPECIFICS OF ENGLISH TRANSLATIONS

Abstract: *The article examines, within a comparative-historical and linguostylistic framework, the historical stages and stylistic specificity of translating Abulqasim Ferdowsi’s epic “Shahnameh” into foreign languages. The research material comprises twelve translation traditions — Arabic, Ottoman Turkish, Georgian, Azerbaijani, Kazakh, Turkmen, Russian, Ukrainian and Western European — together with the English translations produced by James Atkinson (1814, 1832). Comparative-historical, linguostylistic, componential and contextual analysis allowed the translation traditions to be grouped into four types: source-faithful, compositionally adaptive, nationally adaptive, and poetic-code substituting. Drawing on Atkinson’s text, the study substantiates how Persian poetic*

figures, hyperboles and realia representing the Zoroastrian and ancient Iranian mythological layer were transposed into the frameworks of the "Heroic Couplet" and iambic pentameter. It is established that the traditional epic epithet "piltan" (elephant-bodied) is compensated by the metaphor "lion's heart" in order to prevent negative connotations in English. The study concludes that translating national-mythological epics depends less on linguistic accuracy than on the transfer of an intercultural poetic and conceptual code.

Keywords: *"Shahnameh", Ferdowsi, translation studies, James Atkinson, epic of Rustam, Neoclassicism, iambic pentameter, semantic transformation, intercultural adaptation, realia, domestication, foreignisation.*

1. KIRISH

Sharq uyg‘onish davri badiiy tafakkurining beqiyos cho‘qqisi va umumbashariy madaniy merosning ajralmas qismi bo‘lmish Abulqosim Firdavsiyning "Shohnoma" epopeyasi asrlar davomida dunyo xalqlari adabiyoti, fani hamda ma’naviyatiga kuchli ta’sir ko‘rsatib kelmoqda. Asardagi vatanparvarlik, erksevarlik, adolat, ezgulik va yovuzlik o‘rtasidagi abadiy kurash hamda yuksak gumanistik g‘oyalar turli sivilizatsiyalar madaniy hayotida o‘chmas iz qoldirgan. Shu bois "Shohnoma" kabi milliy-mifik va umuminsoniy dostonlarni xorijiy tillarga o‘girish, ularni boshqa adabiy-madaniy muhitlarga moslashtirish (adaptatsiya) hamda g‘arb dunyosiga taqdim etish jarayonlarini o‘rganish bugungi qiyosiy adabiyotshunoslik, matnshunoslik va tarjimashunoslikning dolzarb vazifalaridan biridir.

Sharq adabiyoti durdonalarining Yevropa tillariga tarjima qilinishi va bu yo‘nalishdagi ilk tadqiqotlarning yuzaga kelishi g‘arbliklarda Osiyo xalqlarini boshqarishga intilish kuchaygan davrga to‘g‘ri keladi. Ammo Sharq madaniyati, ayniqsa, adabiyotining go‘zal va nafis jozibasi, undagi teran tafakkur va nozik his-tuyg‘ular Yevropa ziyolilarini, xususan, adabiyotshunos hamda tarjimonlarni o‘ziga maftun etdi. Zero, yevropalik kitobxonlar tarjima vositasida Sharq xalqlari ijodiyoti bilan tanishar ekanlar, ming yillar muqaddam Osiyo qa’rida yetuk madaniyat barpo etilganligi, teran va nozik insoniy tuyg‘ular, ulug’ gumanistik g‘oyalar baralla kuylangan yuksak adabiyot yaratilganligining guvohi bo‘ldilar. Bu esa, o‘z navbatida, yevropalik shoir va yozuvchilarning ijodiy kamolotiga sezilarli ta’sir ko‘rsatdi.

Mavzuning dolzarbligi ikki jihat bilan izohlanadi. Birinchidan, "Shohnoma"ning turli tillardagi tarjimalari firdavsiyshunoslikda, asosan, alohida-alohida — har bir milliy adabiyot doirasida — o‘rganilgan bo‘lib, ularni yagona qiyosiy-tipologik tizimga soluvchi tadqiqotlar deyarli yo‘q. Ikkinchidan, dostonning ingliz tilidagi tarjimalari, xususan, J. Atkinson matni o‘zbek tarjimashunosligida metrik-ritmik va leksik-semantik jihatdan maxsus tahlil qilinmagan. Holbuki, aynan shu tarjima orqali "Shohnoma" ingliz tilli o‘quvchining ilmiy va estetik tafakkuriga kirib borgan.

Tadqiqotning maqsadi — "Shohnoma"ning xorijiy tillarga o‘girilish tarixini bosqichlarga ajratish, tarjima an’analarining tipologiyasini aniqlash hamda J. Atkinson tarjimasi misolida forsiy poetik kodning ingliz she’riy tizimiga o‘tkazilish mexanizmini ochib berishdan iborat.

Tadqiqotning obyekti — "Shohnoma" dostonining xorijiy tillardagi tarjimalari; predmeti esa ushbu tarjimalarda qo‘llangan uslubiy yondashuvlar, metrik-ritmik yechimlar va leksik-semantik transformatsiyalardir.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda birinchi marta "Shohnoma" tarjimalarining o‘n ikki tilni qamrab olgan qiyosiy-tipologik tavsifi beriladi, tarjima an’analari to‘rt guruhli tipologiyada tizimlashtiriladi hamda J. Atkinson matnidagi transformatsiyalar obrazlilik, milliy kolorit va metrik muvofiqlik mezonlari bo‘yicha uch pog‘onali shkalada baholanadi.

Maqola quyidagicha tuzilgan: ikkinchi bo‘limda mavzuga oid nazariy adabiyot tahlil qilinadi va tadqiqot bo‘shlig‘i aniqlanadi; uchinchi bo‘limda material, tahlil birligi va metodlar tavsiflanadi; to‘rtinchi bo‘limda natijalar jadvallarda umumlashtirilib izohlanadi; beshinchi bo‘limda xulosa va tadqiqot istiqbollari beriladi.

2. MAVZUGA OID ADABIYOTLAR TAHLILI

"Shohnoma" tarjimalarini ilmiy o‘rganish an’anasi XIX asrning birinchi yarmida shakllangan. Rus firdavsiyshunosligining boshlanishi adabiyotshunos V. Grigoryevning 1839 yili "Одесский альманах"да e’lon qilingan maqolasi bilan bog‘lanadi. Muallif turli tarixiy manbalar va tazkiralar asosida Firdavsiyning hayoti hamda ijodi haqida fikr yuritadi, "Shohnoma"ning yaratilishi, shoir va Sulton Mahmud haqidagi rivoyatlarni keltiradi. Grigoryevning xizmati shundaki, u birinchi marta rus kitobxonini Firdavsiy hayoti va "Shohnoma"ning mohiyati bilan tanishtiradi, asarning qahramonlik, vatanparvarlik va xalqsevarlik g‘oyasini alohida ta’kidlab, uning badiiy qimmatini qadimgi Rim, yunon va hind poeziyasi bilan bir qatorga qo‘yadi.

Firdavsiyshunoslikning keyingi bosqichi 1934 yilgi ming yillik yubiley bilan bog‘liq. Shu munosabat bilan "Shohnoma"ni tarjima qilish va targ‘ib etish jonlanib, shoirning hayoti va ijodiga bag‘ishlangan ilmiy-tadqiqotlar vujudga keldi; ularning bir qismi "Фердовси (934–1934)" to‘plamida e’lon qilindi. Ye. E. Bertelsning fors-tojik adabiyoti tarixiga oid asari hamda uning tahriri ostida tayyorlangan "Shohnoma"ning tanqidiy matni tadqiqotchilar uchun asosiy manbaviy poydevorni yaratdi.

Milliy adabiyotlardagi tarjima an’analari ham alohida o‘rganilgan. A. Zaychkovskiy "Shohnoma"ning turkcha versiyasini tadqiq etgan; M. Sultonov "Rustam va Suhrob" dostonining ozarbayjon adabiyotidagi talqinlarini yoritgan; M.

Qarataev va I. Ismoilovning ishlarida qozoq tarjima maktabi, xususan, T. Iztileuov faoliyati tahlil qilingan; A. Edelman tojik nazmining ukrain tiliga o‘girilishi tarixiga murojaat etgan. I. Orbeli va K. Treverning “Shatrang” tadqiqoti esa dostondagi realiyalarni tarixiy-madaniy kontekstda talqin qilish namunasi sifatida qimmatlidir.

Mavjud adabiyot tahlili ikki muhim bo‘shliqni ko‘rsatadi. Birinchidan, tarjimalar, asosan, ayrim milliy adabiyot doirasida — qabul qiluvchi madaniyatning ichki manfaatlari nuqtai nazaridan — o‘rganilgan; ularni yagona qiyosiy-tipologik tizimga soluvchi, tarjima tamoyillarini o‘zaro chog‘ishtiruvchi tadqiqotlar juda kam. Ikkinchidan, inglizcha tarjimalar, jumladan, J. Atkinson matni ko‘proq tarjima tarixi faktlari sifatida qayd etilgan, ammo undagi metrik-ritmik qolip almashinuvi va leksik-semantik transformatsiyalar mexanizmi tahlil qilinmagan. Ushbu maqola aynan shu bo‘shliqni to‘ldirishga qaratilgan.

3. TADQIQOT METODOLOGIYASI

Tadqiqot sifatiy-qiyosiy dizayn asosida amalga oshirildi. Qiyosiy-tarixiy yondashuv tarjima an’analarini xronologik va hududiy jihatdan guruhlashtirish uchun, lingvo-stilistik yondashuv esa muayyan matn parchalari darajasidagi poetik yechimlarni baholash uchun qo‘llanildi.

Tadqiqot materialini “Shohnoma”ning o‘n ikki tildagi tarjima an’anasi tashkil etdi. Materialning tarkibi 1-jadvalda umumlashtirilgan.

1-jadval. Tadqiqot materiali: “Shohnoma” tarjimalarining hududiy-xronologik tavsifi

Til	Tarjimon(lar)	Davri	Shakli	Tarjima manbai
Arab	al-Fath ibn Ali al-Bundariy al-Isfahoniy	1218–1227 (nashri 1937)	nasr	asliyat
Usmoniy turk	Sharif Amidiy	XV asr oxiri – XVI asr boshi	nazm (vazn almashtirilgan)	asliyat
Gruzin	“Rustamiani”; S. Sabashvili; M. Tavakkalashvili; X. Turmanidze	XV–XVIII asrlar	nasr va nazm	asliyat
Ozarbayjon	R. Afandizoda; Abbos og‘a G‘oyibov Nazir	1906; 1908	nazm va nasr; nazm	asliyat
Qozoq	O‘roz Molda; M. Seralin; T. Iztileuov	XIX asr o‘rtasi – 1937	nazm (“qora o‘lan”)	asliyat va ruscha tarjima
Turkman	Q. Tangriqulov, M. Sayidov, Ya. Pirquliyev	1962	nazm	asliyat
Rus	V. Jukovskiy; D. Sertelev; S. Sokolov; M. Lozinskiy, I. Selvinskiy, M. Dyakonov; Ts. Banu, V. Derjavin, S. Lipkin	XIX–XX asrlar	nazm va nasr	nemischa tarjima; asliyat
Ukrain	A. Krimskiy	1895	nasr va nazm	fransuzcha tarjima (Ya. Mohol)
Ingliz	J. Chempion; J. Atkinson	XVIII asr oxiri; 1814, 1832	erkin nazm; nazm-nasr aralash	asliyat
Fransuz	Y. Vallenburg; Ya. Mohol	XIX asr	nazm va nasr	asliyat
Nemis	Ya. Torres; A. Shak; Fr. Ryukkert	XIX asr	nazm	asliyat
Italyan	I. Pizi	XIX asr	nazm	T. Makan nashri

Tahlil birligi sifatida asliyatdagi matn parchasi (bayt yoki baytlar guruhi) va uning tarjimadagi muqobilidan iborat juftlik olindi. Batafsil lingvo-stilistik tahlil uchun Rustam obrazining ta’rifiga bag‘ishlangan parcha tanlandi: bu parcha epik giperbola, hayvon obrazlariga asoslangan sifatlovlar va shohona-pahlavonlik konseptini bir vaqtda qamrab olgani bois transformatsiya turlarini yaxlit kuzatish imkonini beradi.

Tadqiqotda quyidagi metodlardan foydalanildi: qiyosiy-tarixiy metod — tarjimalarning yuzaga kelish shart-sharoiti va bosqichlarini aniqlash uchun; lingvo-stilistik metod — metrik qolip, ritm va uslubiy bo‘yoqning qayta yaratilishini baholash uchun; komponent tahlil — frazeologik va sifatlovchi birliklarning ichki shakli hamda semantik ulushini ochib berish uchun; kontekstual tahlil — birlikning matndagi vazifasi va qabul qiluvchi madaniyatdagi konnotatsiyasini hisobga olish uchun; tavsifiy metod — natijalarni tizimlashtirish uchun.

Baholash mezonlari operatsional tarzda quyidagicha belgilandi. Obrazlilikning saqlanishi uch pog‘onali shkalada baholandi: “to‘liq saqlangan” — asliyatdagi obraz ham shakl, ham vazifa jihatidan qayta yaratilgan; “qisman saqlangan” — obraz almashtirilgan yoki kengaytirilgan, ammo ekspressiv-baholovchi komponent yo‘qolmagan; “neytrallashgan” — obraz uslubiy jihatdan betaraf ifoda bilan almashtirilgan. Milliy kolorit va metrik-ritmik muvofiqlik ham shu shkala bo‘yicha baholandi.

Tadqiqotning cheklovlari. Birinchidan, batafsil matniy tahlil ingliz tilidagi tarjima misolida olib borilgan bo‘lib, boshqa tillardagi tarjimalar an’ana darajasida tavsiflangan. Ikkinchidan, gruzin, ozarbayjon va turkman tarjimalari bo‘yicha xulosalar mavjud ilmiy adabiyot ma’lumotlariga tayanadi. Uchinchidan, XX asr oxiri va XXI asr boshidagi yangi inglizcha tarjimalar alohida tadqiqot predmeti hisoblanadi. Bu cheklovlar natijalarni umumlashtirishda hisobga olinishi lozim.

4. NATIJALAR VA TAHLIL

4.1. Arab va usmoniy turk tillaridagi ilk tarjimalar

“Shohnoma”ning bizgacha yetib kelgan eng qadimgi tarjimasi mashhur tarixchi al-Fath ibn Ali al-Bundariy al-Isfahoniy tomonidan 1218–1227 yillarda arab tiliga qilingan tarjimadir (u 1937 yili Qohirada nashr etilgan). Bundariy tarjimasi asliyatga juda yaqinligi va matnni deyarli to‘la saqlab qolganligi bilan qimmatlidir. Aynan shu xususiyat uni “Shohnoma”ning tanqidiy matnini tayyorlashda va ilmiy tadqiqot ishlarida eng ishonchli manbalardan biriga aylantirgan.

Dostonning to‘la va mukammal tarjimalaridan yana biri usmoniy turk tiliga qilingan tarjimadir. U XV asrning oxiri – XVI asrning boshlarida Sharif Amidiy (vaf. 1510) tomonidan Misrda bajarilgan va mamluklar sultoni Qonsux G‘uriyga tortiq etilgan. Tarjimonning o‘zi muqaddimada “...al-G‘uriy avval saltanat yilinda ibtido o‘lindi, o‘n yilda tugandi”, deb qayd etgan. Tarjima nazmda bo‘lsa-da, vazn o‘zgartirilgan. Amidiy asliyatning asosiy kompozitsion tuzilishi, syujet chizig‘i, shohlar silsilasi va dostonlar tartibiga qat’iy rioya etgan, sarlavhalarni fors tilida qoldirgan. Ayni paytda dostonning kirish qismi ancha cho‘zilgan: shoir xudo, payg‘ambar, me’roj va chahoryorlarga alohida-alohida na’t bag‘ishlagan, tarjimaning sababi hamda Qonsux G‘uriy va uning otasi madhi haqida mustaqil bo‘limlar kiritgan. Asosiy matn “Sababi ta’lifin bayon edur” qismidan keyin boshlanadi, ayrim dostonlar esa “Rivoyat ayladi Firdavsiy oni” iborasi bilan ochiladi; tarjima oxiriga “Boysung‘ur so‘z boshisi” ilova qilingan. Bu tarjimani asliyat bilan chog‘ishtirib o‘rganish firdavsiyshunoslikning galdagi vazifalaridan biri bo‘lib qolmoqda.

4.2. Gruzin va ozarbayjon tarjima an’analari

XV–XVI asrlarda “Shohnoma”ning anchagina qismi “Rustamiani” nomi bilan gruzin tiliga nasriy tarjima qilinadi; keyinroq uni shoir Serapion Sabashvili nazmga aylantiradi. XVIII asrning ikkinchi choragida asarning Zahhok sarguzashti bilan bog‘liq qismini Mamuk Tavakkalashvili gruzin tiliga o‘giradi. Gruzincha tarjimalar orasida Xosro Turmanidze tomonidan bevosita asliyatdan qilingan “Rostamiana” she’riy tarjimasi (XVII asr) keng shuhrat qozongan. Tarjimon asosiy e’tiborni dostonning xalqparvarlik, vatanparvarlik va qahramonlik qismlariga qaratib, shohlar sarguzashtini qisqartirgan; shu bois tarjima asarning bosh qahramoni — chin inson, mamlakat va xalq tayanchi — Rustam nomi bilan atalgan. 1916 yili professor Yu. Abuladze gruzincha tarjimalarning bir qismini nashr ettirgan.

“Shohnoma”ning ayrim dostonlari ozarbayjon tiliga bir necha marta tarjima qilingan. 1906 yili “Rustam va Suhrob” dostonini mashhur muallim va yozuvchi Rashid Afandizoda xalq dostonlari yo‘lida — nazm va nasrda o‘giradi, biroq bu tarjima keng shuhrat topmaydi. 1908 yili Jalil Mamadqulizodaning maslahati bilan shoir Abbos og‘a G‘oyibov Nazir shu dostonni asliyatdan to‘la nazm bilan tarjima qiladi; u Tiflisdagi “G‘ayrat” matbaasida bosilib chiqadi. Bu tarjima asliyatni to‘la saqlab qolishi, ravonligi, ona tili boyliklaridan mohirona foydalanishi va badiiy yuksakligi bilan ajralib turadi.

“Shohnoma” ozarbayjon dramaturglari va bastakorlarining ham diqqatini tortgan. 1906 yili Shamsiddin Somibey Kova dostoni asosida drama yozdi; u “Kova” yoxud “Kovai ohangar” nomi bilan sahnalashtirildi. Mashhur bastakor Uzayr Hojibekov esa 1908 yili to‘rt pardali “Rustam va Suhrob” dramatik operasini yaratdi. Operada Firdavsiy dostonining mazmuni aynan berilgan, asosiy qahramonlar saqlangan; u 1910 yilning 12 yanvarida ilk bor namoyish etilib, xalqning sevimli spektakliga aylandi. Bu holat tarjimaning adabiyotdan tashqari — sahna va musiqa san’ati orqali ham retseptsiya qilinishini ko‘rsatadi.

4.3. Qozoq va turkman adabiyotlaridagi milliy adaptatsiya

Firdavsiy asari o‘tgan asrdayoq qozoq tiliga tarjima qilina boshlagan. Atoqli qozoq shoiri va tarjimoni O‘roz Molda XIX asrning o‘rtalarida Firdavsiy, Navoiy, Fuzuliy asarlarini o‘girish bilan shug‘ullanadi; u tarjima qilgan “Shohnoma”ning ayrim qismlari qo‘lyozma shaklida saqlanib qolgan. XX asr boshlarida shoir va publitsist, “Ayqap” jurnalining muharriri Muhammadjon Seralin dostonning bir qismini ruscha tarjimadan o‘giradi; matn jurnalning 1914 yil 22–24 va 1915 yil 2–5-sonlarida bosilgan.

Qozoq xalqini “Shohnoma” bilan to‘laroq tanishtirgan ijodkor esa Sharq adabiyotining muxlisi va sermahsul tarjimoni Turmag‘ambet Iztileuovdir. U Buxoro madrasalarida o‘qib yurgan yillaridayoq (1891–1905) arab va fors-tojik tillarini puxta o‘rganib, Sharq klassiklarini mutolaa qilgan; asarning asliyatini ham, 1906–1908 yillarda Toshkentda bosilgan Xomushiyning o‘zbekcha tarjimalarini ham qayta-qayta o‘qib chiqqan. “Shohnoma” asosida u “Semurg‘” va “Dorobnoma”

dostonlarini yaratadi. 1937 yilning boshida tarjimaga kirishib, o‘n oy davomida qirq ming misradan iborat qozoqcha “Shohnoma”ni xalqqa taqdim etadi; tarjimaning bir qismi 1965 yili “Rustam Dastan” nomi bilan nashr etilgan.

Iztileuov dostonni qozoq xalq she’riyatining keng tarqalgan o‘n bir bo‘g‘inli “qora o‘lan” shaklida tarjima qiladi; qahramonlarning ruhiy kechinmalarini esa xalq og‘zaki ijodidagi “aytisuv” qolipida beradi. Tarjimon asarni baytma-bayt emas, umumiy syujet asosida o‘girgani bois bir qancha chekinish va qisqartirishlarga yo‘l qo‘ygan, ba’zan voqealarni o‘zicha davom ettirgan yoki yangi qo‘shimchalar kiritgan. Qahramon portreti, peyzaj, ov va marosim tasvirlariga qozoq xalqiga xos milliy kolorit singdirilgan: to‘y va bazmlar “qulon so‘yib, uloq chopish” bilan tugaydi, qahramonlar ovga “bilaklariga qush qo‘ndirib, it ergashtirib” chiqadilar. Ashkbusning tarjimadagi portreti qozoq xalq dostonlaridagi bahodirlarni eslatadi:

Кулаги – киіз үйге үзі болар,
Туктері – болатұған тартса желі.
Шинардын саусақтары авашиндай,
Тырнағы – тулпарлардын тағасындай.
Аузы – үнгіріндей Асқар таудын,
Мурыны – үлкен үнген шоқат шамасындай.

Tarjimon qozoq xalq maqol, matal va iboralaridan ham ustalik bilan foydalangan. Shunchalik ulkan asar qisqa muddatda o‘girilganiga qaramay, Iztileuov asliyatning asosiy mohiyatini saqlab qola olgan. Qozoq tiliga “Bijon va Manija”, “Rustamning Chin xoqoni bilan jangi” kabi dostonlar ham rus tilidan tarjima qilingan bo‘lib, ular alohida o‘rganishni talab etadi.

Turkman xalq og‘zaki ijodi va yozma adabiyotida ham “Shohnoma” hamda uning motivlari ko‘zga tashlanadi. Shaydoyi, Maxtumquli, Mullanafas, Sayyodiy kabi shoirlar ijodida Firdavsiy ta’siri seziladi: ular Firdavsiyni hurmat bilan tilga oladilar, doston qahramonlaridan turli maqsadlarda foydalanadilar. Turkman shoirlari orasida Firdavsiyga taqlid qilish, dostonchilikda unga ergashish hollari ham uchraydi. Chunonchi, XIX asr turkman shoiri Abdusattor Qozi “Jangnoma” dostonini “Shohnoma”dan ilhomlanib yozgan: u jang tasviri va qahramonlar xatti-harakatini ifodalashda Firdavsiyga ergashadi, o‘z qahramonlarini Suhrob, Rustam, Bahrom Go‘rga o‘xshatadi, adolatli shoh haqida so‘z yuritganda Anushiravonni eslaydi:

Совеш эйлэп булар Бэхрам Гуртек,
Гыран эйлэдилер Сухрабы шуртек.

1934 yili butun dunyo jamoatchiligi qatori mintaqa xalqlari ham Firdavsiy tavalludining 1000 yilligini keng nishonladi; Turkmanistonda bu sana umumxalq bayramiga aylandi, adabiy kechalar o‘tkazildi, Turkmaniston Davlat nashriyoti “Shohnoma”dan ayrim dostonlarning asliyatini bosib chiqardi. 1962 yili esa o‘sha nashriyot Zahhok, Faridun, Rudoba, Bahromi Cho‘bin dostonlarini Q. Tangriqulov, M. Sayidov va Ya. Pirquliyev tarjimasida chop etdi. Bu tarjimaning sifati yuqori emas: tarjimonlar asliyatni ko‘p o‘rinda qisqartirib yuborgan, asarning g‘oyaviy-badiiy qimmatiga putur yetkazgan, vazn ham saqlanmagan.

4.4. Slavyan tillariga tarjimalar

Rus va ukrain xalqlari Firdavsiy ijodi bilan qadimdan tanish. “Shohnoma”ning ayrim dostonlari XIX asrning boshlaridayoq rus tiliga o‘giriladi: 1815–1818 yillarda “Вестник Европы” jurnalida dostondan ayrim parchalar va “Bijon va Manija” tarjimasi e’lon qilinadi. Bu parchalar “Shohnoma”ning rus tiliga vositachi til — fransuz tili orqali qilingan ilk tarjimalari bo‘lib, ularda asliyatning faqat mazmuni bayon etilgan. 1818 yili “Пантеон иностранной словесности” jurnalida ham bir necha parcha bosilib chiqadi.

Mashhur shoir va tarjimon V. Jukovskiy 1847 yili “Rustam va Suhrob” dostonini Fr. Ryukkertning nemischa tarjimasidan erkin o‘giradi. Jukovskiy tarjimasida asliyatning vazni va ohangdorligiga e’tibor berilmagan, qahramonlar nomlari ham buzib berilgan. Shunga qaramay, rus kitobxoni aynan shu tarjima orqali Firdavsiy dostoni bilan kengroq tanishishga muyassar bo‘ldi va undagi qahramonlik, bahodirlik hamda vatanparvarlik motivlari kitobxonni maftun etdi. 1835 yili D. Sertelev Eraj lavhasini qisqartirgan holda tarjima qilgan edi.

1905 yili S. I. Sokolov “Shohnoma”ning boshidan “Rustam va Suhrob” dostonigacha bo‘lgan 500 baytini bevosita asliyatdan she’r bilan rus tiliga o‘giradi; 1914 yili V. S. Sokolova bir necha parchani tarjima qilib, “Вестник Ленинградского университета”да bostiradi. Bu tarjimalarda, asosan, mazmun saqlangan bo‘lsa-da, badiiy jo‘shqinlik sezilmaydi. Ukrain xalqini esa Firdavsiy asari bilan ilk marta sharqshunos A. Krimskiy tanishtirdi: u 1895 yili Ya. Moholning fransuzcha tarjimasi asosida dostonning boshidan Manuchehrning tug‘ilishigacha bo‘lgan qismini ukrain tiliga o‘girib, “Житє і слово” jurnalida e’lon qildi; tarjima nasr va nazmda bo‘lib, asosiy e’tibor asliyat mazmunini to‘la berishga qaratilgan.

Yubiley yillaridan keyin “Gev va Talxand”, “Mazdak”, “Bijon va Manija” dostonlarining nasriy va she’riy tarjimalari vujudga keldi. Bu tarjimalarning eng muhim fazilati shundaki, ular bevosita asliyatdan rus tiliga o‘girilgan va

“Shohnoma”ning g‘oyaviy-badiiy qimmatini birmuncha yaxshi saqlab qolgan. XX asrning 30–40-yillarida poemaning ayrim dostonlari I. Selvinskiy, M. Lozinskiy, M. Dyakonov tomonidan tarjima qilingan bo‘lsa, keyinchalik Ts. Banu, V. Derjavin va S. Lipkin “Shohnoma”ni to‘la o‘girish yo‘lida katta muvaffaqiyatlarga erishdilar.

4.5. G‘arbiy Yevropa tillariga tarjimalar

Hozirgacha “Shohnoma” to‘liq yoki qisman fransuz, ingliz, lotin, italyan, golland va boshqa tillarga tarjima qilingan. Ingliz tiliga dostonni birinchi bo‘lib Jozif Chempion Zol va Rudobaning to‘yigacha bo‘lgan qismini, Boysung‘ur so‘zboshisining katta qismini ilova qilgan holda, erkin o‘girgan; biroq bu tarjima asliyatdan ancha uzoq ekanligi bilan ajralib turadi. Fransuz mutarjimlaridan Y. Vallenburg dostonni fransuz tiliga o‘girishga kirishgan bo‘lsa-da, tarjimani tugallamagan. Doston Ya. Torres, A. Shak va Fr. Ryukkert tomonidan nemis tiliga, T. Makan matnidan I. Pizi tomonidan italyan tiliga ham o‘girilgan. Bular orasida Fr. Ryukkertning nemischa va Ya. Moholning fransuzcha tarjimalari ancha shuhrat qozongan; Ts. Banuning ruscha tarjimasi esa nisbatan tugalroqdir.

Tarjima jarayonida realiyalar va onomastik birliklar transkripsiyasi, zardushtiylik hamda qadimiy Eron mifologik qatlamlarining g‘arb dunyosiga adaptatsiyasi va shu asosda yuzaga keladigan semantik transformatsiyalar tadqiqotning bosh ilmiy gipotezasini tashkil etadi.

2-jadval. “Shohnoma” tarjima an’analarining tipologik tavsifi

Tipologik guruh	Tarjima an’anasi	Ustuvor tamoyil	Shakl-uslubiy yechim
I. Asliyatga sodiq	arab (al-Bundariy)	matnni maksimal to‘liq saqlash	nasriy to‘la bayon; qisqartirishsiz
I. Asliyatga sodiq	rus (Ts. Banu, V. Derjavin, S. Lipkin)	asliyatdan to‘la tarjima	nazm; ohang va hajm tiklangan
II. Kompozitsion moslashtiruvchi	usmoniy turk (Amidiy)	syujet tuzilishiga sadoqat + saroy adabiyoti odobi	nazm, vazn almashtirilgan, kirish kengaytirilgan
II. Kompozitsion moslashtiruvchi	gruzin (X. Turmanidze)	g‘oyaviy tanlov: qahramonlik qatlamini ajratish	nazm; shohlar sarguzashti qisqartirilgan
III. Milliy-adaptiv	qozoq (T. Iztileuov)	syujet asosida erkin bayon; ichkilashtirish	“qora o‘lan” (11 bo‘g‘in), “aytisuv” qolipi
III. Milliy-adaptiv	turkman (1962)	qisqartirilgan bayon	vazn saqlanmagan; hajm kamaytirilgan
III. Milliy-adaptiv	rus (V. Jukovskiy)	bilvosita (nemischadan) erkin tarjima	vazn va ohang saqlanmagan; onomastika buzilgan
IV. Poetik kodni almashtiruvchi	ingliz (J. Atkinson)	madaniy moslashtirish (domestication)	“Heroic Couplet”, yambik pentametr; nazm-nasr aralash

4.6. J. Atkinson tarjimasi: metrik va poetik kodning almashinuvi

Jeyms Atkinsonning 1814 yilda e’lon qilingan “Soohrab: A Poem” hamda 1832 yilda nashr etilgan “The Shah Nameh of the Persian Poet Firdausi” asarlari ingliz tilidagi birinchi jiddiy va ommabop tarjimalardandir. Atkinson forsiy matnni neoklassitsizm va Viktoriya davri ingliz she’riyatiga moslashtirgan holda, erkin she’riy metrika hamda nazm-nasr aralash shaklni tanlagan; uning tarjima uslubi madaniy moslashtirish tamoyiliga asoslanadi. Rustamning fillarga teng kuchi, sarvdek qaddi-qomati va tog‘dek salobati ifodalangan parcha quyidagicha:

بالای او چون سرو آزاد و بلند
کوهی‌ست گویی به روی سمند
با زور فیل و با دلِ شیر جری
سزاوارِ شاهی و پهلوانی

Bālā-ye ū chūn sarv-e āzād-o boland,
Kūhī-st gūyī be rūy-e samand.
Bā zūr-e fīl-o bā del-e shīr-e jarī,
Sazāvār-e shāhī-yo pahlavānī.

Mazmuni: “Uning qomati ozod va baland sarvdek; samand ot uzra go‘yo bir tog’ turibdi. Fil kuchi va jasur sher yuragi bilan u shohlikka ham, pahlavonlikka ham loyiqdir.”

Atkinson ushbu parcha tarjimasida XIX asr boshidagi Britaniyada keng tarqalgan neoklassitsizm va romantik sharqshunoslik simbioziga tayanadi. Asliyatdagi “sarv” va “pil” o‘xshatishlarini u ingliz poetik an’anasidagi “Heroic Couplet” — “qahramonona qofiya”, ya’ni AABBCC qofiyalanish tizimidagi yambik pentametr qolipiga soladi. Qahramonona qofiya ingliz klassik she’riyatining eng muhim o‘lchov va qofiyalanish shakllaridan biri bo‘lib, XVII–XVIII asrlar ingliz adabiyotida peshqadamlik qilgan. Yambik pentametr esa jahon, xususan, ingliz va yevropa she’riyatida eng keng qo‘llaniladigan o‘lchovlardandir: yamb — birinchisi urg‘usiz, ikkinchisi urg‘uli bo‘lgan ikki bo‘g‘inli ritmik birlik; yunoncha “penta” besh ma’nosini bildirgani bois pentametr bir misrada beshta yamb takrorlanishini, ya’ni jami o‘n bo‘g‘inni anglatadi. Ushbu shaklning “qahramonona” deb atalishiga sabab shundaki, u, asosan, dostonlar, qahramonlik asarlari, “Iliada” va “Odisseya” singari antik matnlarni ingliz tiliga o‘girishda qo‘llanilgan.

Asliyatda Rustamning surati va siyratidagi sharqona giperbolizm atayin tabiiy hamda fojiaviy kuch darajasiga ko‘tariladi. Atkinson esa quyidagi yechimga qo‘l uradi:

In stature like the cypress, tall and grand,
Moving a mountain over the subject land,
With elephantine strength and lion’s heart,
Formed to command and play the hero‘s part.

“Moving a mountain over the subject land” misrasida mutarjim Rustamni shunchaki tog‘ga o‘xshatmaydi, balki uning harakatini butun bir hudud ustidan siljiyotgan tog’ shaklida tasvirlaydi. Bu — erkin tarjima va ma’noni orttirish (amplifikatsiya) usulining yaqqol namunasidir: asliyatdagi statik qiyoslash tarjimada dinamik, kengaygan obrazga aylanadi.

4.7. Leksik-semantik transformatsiyalar va kompensatsiya mexanizmi

Tarjimashunoslik nuqtai nazaridan parchadagi “elephantine strength” birikmasi alohida tahlilni talab qiladi. Forsiy manbada “piltan” — “fil tanli”, “fil kuchiga ega” sifatlanishi stilistik neologizm emas, balki “Shohnoma” epik kodi uchun an’anaviy va ijobiy sifatlovchidir. Biroq ingliz tilining semantik maydonida “elephantine” so‘zi XIX asr ritorikasida ko‘pincha salbiy yoki “og‘ir, qo‘pol” ma’nodagi konnotatsiyaga ega bo‘lish xavfini tug‘diradi. J. Atkinson ushbu leksik xavf va semantik siljishni neytrallash uchun uni “lion’s heart” (sheryurak) birikmasi bilan parallel qo‘llaydi. Sher timsoli g‘arb poetikasida — “Qirol Richard Lionheart” obrazi orqali — jasorat va sharafning mutlaq belgisi bo‘lgani bois, tarjimon ingliz o‘quvchisida ijobiy va ulug‘vor assotsiatsiya shakllantiradi. Demak, bu yerda kompensatsiya mexanizmi ishlaydi: kalka yo‘li bilan berilgan va konnotativ xavf tug‘diruvchi birlik qo‘shni obrazning ijobiy assotsiatsiyasi hisobiga muvozanatlashtiriladi.

Dostonning ritorik va sintaktik qurilishida, emotsional-ekstatik ohang o‘rniga, Viktoriya poeziyasiga xos “Formed to command and play the hero‘s part” kabi iboraning kiritilishi tarjimonning ideologik va estetik aralashuvidan dalolat beradi. Atkinson Firdavsiyning mifologik realizmini ingliz o‘quvchisi uchun tanish bo‘lgan qadimgi yunon va Rim epik qahramonlari — Axill va Gektor obrazlari stilistikasiga yaqinlashtiradi. Bu usul matnning sharqona ekzotizmi va lokal-kolorit doirasini biroz pasaytirgan bo‘lsa-da, uni XIX asr Angliyasining adabiy muhitiga va intellektual auditoriyasiga muvaffaqiyatli integratsiya qilishga xizmat qilgan. Ritmik barqarorlik va sintaktik simmetriya shu parchada Atkinson tarjima konsepsiyasining ustuvor ustuni bo‘lib namoyon bo‘ladi.

3-jadval. J. Atkinson tarjimasidagi leksik-semantik transformatsiyalar

Asliyatdagi birlik	So‘zma-so‘z ma’nosi	Atkinson yechimi	Transformatsiya turi
bālā-ye ū chūn sarv-e āzād	qomati ozod sarvdek	In stature like the cypress, tall and grand	to‘liq obrazli muvofiqlik
kūhī-st gūyī be rūy-e samand	samand ot uzra go‘yo bir tog’	Moving a mountain over the subject land	amplifikatsiya (obrazni kengaytirish)
bā zūr-e fīl / piltan	fil kuchi bilan; fil tanli	With elephantine strength	kalka + konnotativ xavf
bā del-e shīr-e jarī	jasur sher yuragi bilan	and lion’s heart	kompensatsiya (ijobiy assotsiatsiya)
sazāvār-e shāhī-yo pahlavānī	shohlik va pahlavonlikka loyiq	Formed to command and play the hero‘s part	funksional-stilistik moslashtirish

4-jadval. J. Atkinson tarjimasida obrazlilik, milliy kolorit va metrik muvofiqlikning saqlanish darajasi

Tarjima yechimi	Obrazlilik	Milliy kolorit	Metrik-ritmik muvofiqlik
toʻliq obrazli muvofiqlik (sarv)	toʻliq saqlangan	qisman saqlangan	qisman saqlangan
amplifikatsiya (tog’ obrazi)	toʻliq saqlangan (kuchaytirilgan)	qisman saqlangan	toʻliq saqlangan
kalka (elephantine strength)	qisman saqlangan	toʻliq saqlangan	toʻliq saqlangan
kompensatsiya (lion’s heart)	toʻliq saqlangan	neytrallashgan	toʻliq saqlangan
funksional-stilistik moslashtirish	qisman saqlangan	neytrallashgan	toʻliq saqlangan

4.8. Natijalarning muhokamasi

Olingan natijalar “Shohnoma” tarjimalarining tipologik rang-barangligi tasodifiy emas, balki qabul qiluvchi madaniyatning adabiy ehtiyoji va poetik tizimi bilan shartlangan qonuniyat ekanligini koʻrsatadi. Asliyatga sodiq tarjimalar (al-Bundariy; XX asr rus maktabi) matnshunoslik va manbashunoslik ehtiyojidan; milliy-adaptiv tarjimalar (T. Iztileuov) dostonchilik an’anasi jonli boʻlgan muhitning ichki talabidan; poetik kodni almashtiruvchi tarjimalar (J. Atkinson) esa qabul qiluvchi adabiyotning muayyan davrdagi estetik normasidan kelib chiqadi.

Tarjimon, mohiyatan, ikki qutb oʻrtasida tanlov qiladi. Ichkilashtirish (domestication) strategiyasida forsiy obraz oʻquvchiga tanish muqobil bilan almashtiriladi — Iztileuovdagi “qulon soʻyib, uloq chopish” yoki Atkinsondagi “lion’s heart” buning yorqin misolidir; bu yondashuv matnni tabiiy va ravon qiladi, ammo manba madaniyatining oʻziga xosligini xiralashtiradi. Begonalashtirish (foreignization) strategiyasida esa forsiy obraz kalka yoki izoh orqali saqlanadi — “elephantine strength” shunday yechim boʻlib, u milliy koloritni yetkazadi, lekin konnotativ siljish xavfini tugʻdiradi. Atkinson matni bu ikki qutbning kombinatsiyasi ustiga qurilgan: begonalashtirish natijasida yuzaga kelgan xavf darhol ichkilashtirish yoʻli bilan kompensatsiyalanadi.

Shu tariqa tarjima yechimi tarjimonning sub’ektiv qarori emas, balki qabul qiluvchi adabiyotning janr-uslubiy dominantasi bilan shartlangan qonuniyat sifatida namoyon boʻladi. Vositachi til orqali qilingan tarjimalar (Jukovskiy — nemischadan, Krimskiy — fransuzchadan, Seralin — ruschadan) esa ma’no va obrazning qoʻshimcha buzilishiga — “ikki bosqichli yoʻqotish” hodisasiga — olib keladi; bu tarjimalarda onomastik birliklarning buzilishi va vazn tizimining yoʻqolishi ayni shu bilan izohlanadi.

Natijalarning amaliy ahamiyati ikki yoʻnalishda namoyon boʻladi. Tarjima amaliyoti uchun ular “xavf zonalari” xaritasini beradi: zardushtiy-eron mifologik qatlamiga oid realiyalar, hayvon obrazlariga asoslangan epik sifatlovlar va onomastik birliklar eng katta yoʻqotish manbai hisoblanadi. Tarjimonlar tayyorlash amaliyoti uchun esa natijalar qiyosiy poetika va lingvomadaniyatshunoslik kurslarini integratsiyalash zaruratini koʻrsatadi.

5. XULOSA

Oʻtkazilgan qiyosiy-tarixiy va lingvo-stilistik tahlil quyidagi xulosalarga olib keladi.

Birinchidan, “Shohnoma”ning xorijiy tillarga tarjima qilinishi turli tarixiy bosqichlarda va oʻziga xos uslubiy yondashuvlar asosida amalga oshirilgan. Arab tiliga al-Bundariy tomonidan qilingan ilk tarjima asliyatga oʻta yaqinligi bilan ajralib tursa, usmoniy turkcha va qozoqcha (T. Iztileuov) tarjimalarda milliy kolorit, moslashtirish hamda erkin bayon tamoyillari ustuvorlik qilgan.

Ikkinchidan, tarjima an’analari toʻrt tipologik guruhga ajratiladi: asliyatga sodiq, kompozitsion moslashtiruvchi, milliy-adaptiv va poetik kodni almashtiruvchi guruhlar. Guruh tanlovi tarjimonning shaxsiy mahoratidan koʻra qabul qiluvchi adabiyotning poetik tizimi va ehtiyojlari bilan belgilanadi.

Uchinchidan, XIX asr boshlarida amalga oshirilgan J. Atkinsonning inglizcha tarjimasi Viktoriya davri poetik an’analari va neoklassitsizm ta’sirida shakllangan boʻlib, unda forsiy aruz oʻrnini “Heroic Couplet” va yambik pentametr egallaydi. Atkinson Firdavsiyning sharqona giperbolizmini gʻarb oʻquvchisiga tanish boʻlgan antik (yunon va Rim) eposi stilistikasiga yaqinlashtirgan.

Toʻrtinchidan, tarjimada “piltan” (fil tanli) kabi epik kodlar ingliz tilining semantik maydonidagi salbiy yoki “ogʻir” konnotatsiyani neytrallash maqsadida “lion’s heart” (sheryurak) singari gʻarb poetikasiga xos ijobiy metaforalar bilan parallel qoʻllangan. Bu holat kompensatsiya mexanizmining amal qilishidan hamda madaniyatlararo poetik moslashuv zaruratidan dalolat beradi.

Beshinchidan, milliy-mifik va umuminsoniy dostonlarni oʻgirishda lingvistik aniqlikning oʻzi yetarli emas: boshqa til va madaniyat vakillariga asar ruhiyatini yetkazishda madaniyatlararo poetik va konseptual tafakkurni toʻgʻri koʻchirish, matnni zamon va makon talablariga moslashtirish hal qiluvchi ahamiyatga ega.

Tadqiqot istiqbollari “Shohnoma”ning bir dostoni bo‘yicha bir necha muqobil inglizcha tarjimani (J. Chempion, J. Atkinson, aka-uka Uornerlar) qiyoslash, tarjimalarning parallel korpusini shakllantirish hamda forsiy va ingliz poetik tizimlarining konseptual metaforalar darajasidagi qiyosiy tahlili bilan bog‘liq.

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INGLIZ VA O‘ZBEK INTERNET-MEDIASIDA EVFEMIZMLARNING LEKSIK-GRAMMATIK VA STRUKTUR-TIPOLOGIK XUSUSIYATLARI

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Annotatsiya: *Mazkur maqolada ingliz va o‘zbek zamonaviy internet-media diskursida evfemik birliklarning shakllanish mexanizmlari qiyosiy-tipologik jihatdan tadqiq etiladi. Evfemalashuvning leksik, grammatik-sintaktik va diskursiv sathlarda voqelanish xususiyatlari aniqlandi hamda ikki til o‘rtasidagi umumiy va milliy-lisoniy qonuniyatlar tavsiflandi. Tahlil uchun shakllantirilgan ingliz va o‘zbek internet-media korpusi materiallari asosida 512 ta evfemik birlik o‘rganildi. Tahlil natijasida evfemalashuvni leksik, grammatik-sintaktik va diskursiv sathlarning o‘zaro integratsiyasi asosida izohlovchi struktur-tipologik model taklif etildi.*

Kalit so‘zlar: *evfemizm, evfemalashuv, internet-media diskursi, qiyosiy-tipologik tahlil, metaforalashuv, perifraz, passiv konstruksiya, pragmatika, korpus lingvistikasi.*

ЛЕКСИКО-ГРАММАТИЧЕСКИЕ И СТРУКТУРНО-ТИПОЛОГИЧЕСКИЕ ХАРАКТЕРИСТИКИ ЭВФЕМИЗМОВ В АНГЛОЯЗЫЧНЫХ И УЗБЕКСКОЯЗЫЧНЫХ ИНТЕРНЕТ-СМИ

Аннотация: *В статье с сравнительно-типологической точки зрения исследуются механизмы формирования эвфемистических единиц в дискурсе современных англоязычных и узбекскоязычных интернет-СМИ. Выявляются характеристики эвфемизации на лексическом, грамматико-синтаксическом и дискурсивном уровнях, а также описываются общие и специфические для каждого языка закономерности. На основе специально сформированного корпуса материалов англоязычных и узбекскоязычных интернет-СМИ было проанализировано 512 эвфемистических единиц. В заключение предлагается структурно-типологическая модель, объясняющая процесс эвфемизации через интеграцию лексического, грамматико-синтаксического и дискурсивного уровней.*

Ключевые слова: *эвфемизм, эвфемизация, дискурс интернет-СМИ, сравнительно-типологический анализ, метафоризация, перифраза, пассивная конструкция, прагматика, корпусная лингвистика.*

LEXICO-GRAMMATICAL AND STRUCTURAL-TYPOLOGICAL CHARACTERISTICS OF EUPHEMISMS IN ENGLISH AND UZBEK INTERNET MEDIA

Abstract: *This article presents a comparative-typological analysis of euphemistic units in contemporary English and Uzbek internet-media discourse. The study aims to identify lexical, grammatical-syntactic and discourse-level mechanisms of euphemization and to describe common and language-specific patterns. A corpus of English and Uzbek internet-media materials was analyzed, with 512 euphemistic units examined for lexical formation patterns. The qualitative analysis also identified passive constructions, impersonal constructions, nominalizations and modal devices as important grammatical-syntactic mechanisms. The comparison indicates that analytical constructions, passive forms and terminologization are relatively active in English, whereas descriptive syntagms, impersonal constructions and analytical combinations are more prominent in Uzbek. Based on the findings, a structural-typological model integrating lexical, grammatical-syntactic and discourse levels is proposed.*

Keywords: *euphemism, euphemization, internet-media discourse, comparative typology, metaphorization, periphrasis, passive construction, pragmatics, corpus linguistics.*

Kirish. Evfemizm tilning nominativ va kommunikativ imkoniyatlarini namoyon etuvchi muhim lisoniy hodisalardan biri bo‘lib, kommunikativ jihatdan noqulay, salbiy baholanishi mumkin bo‘lgan yoki bevosita nomlanishi ma’lum ijtimoiy-pragmatik sabablarga ko‘ra maqbul bo‘lmagan hodisa, predmet va harakatlarni nisbatan yumshoq, neytral yoki bilvosita shaklda ifodalashga xizmat qiladi. Evfemalashuv jarayonida so‘zlovchi yoki muallif voqelikni shunchaki boshqa nom bilan atab qolmay, balki uning adresat tomonidan qanday qabul qilinishini ham hisobga oladi. Shu

jihatdan evfemizm leksik birlik darajasidagi hodisa boʻlish bilan birga, kommunikativ vaziyat, diskursiv maqsad va pragmatik ehtiyoj bilan bogʻliq murakkab nominativ jarayon sifatida namoyon boʻladi.

Zamonaviy kommunikativ makonda internet-media diskursining jadal rivojlanishi evfemalashuv hodisasining funksional imkoniyatlarini yanada kengaytirmoqda. Internet-nashrlar, yangiliklar portallari va boshqa media platformalarida axborotni tezkor yetkazish bilan bir qatorda, uning ijtimoiy jihatdan maqbul, neytral va auditoriya uchun qabul qilinadigan shaklda ifodalanishi ham muhim ahamiyat kasb etadi. Ayniqsa, siyosiy, iqtisodiy, ijtimoiy, harbiy va boshqa baholovchan mavzularga oid axborotlarni yoritishda bevosita nomlash oʻrniga bilvosita, yumshatilgan yoki mavhumlashtirilgan ifodalardan foydalanish kuzatiladi. Natijada evfemik birliklar internet-media matnining nafaqat leksik tarkibini, balki uning kommunikativ va pragmatik tashkil etilishini ham shakllantiruvchi vositalardan biriga aylanadi.

Evfemik birliklarning shakllanish mexanizmlarini aniqlash evfemalashuv hodisasining ichki lisoniy tabiatini ochishda muhim nazariy va amaliy ahamiyatga ega. Evfemizm tayyor lugʻaviy birlik sifatida emas, balki muayyan kommunikativ vaziyat, diskursiv maqsad va pragmatik ehtiyoj taʼsirida shakllanadigan nominativ vosita hisoblanadi. Shu sababli uning yuzaga kelishida ishtirok etuvchi leksik, grammatik va sintaktik mexanizmlarni aniqlash ingliz hamda oʻzbek internet-media diskursini qiyosiy-tipologik jihatdan tadqiq etishning muhim yoʻnalishlaridan biridir.

Evfemalashuvning lisoniy mexanizmlari turli sathlarda namoyon boʻladi. Leksik sathda metaforalashuv, metonimik koʻchish, perifrazlash, maʼnoni umumlashtirish, terminlashuv va neytral lugʻaviy birliklarni tanlash kabi vositalar evfemik maʼnoning shakllanishiga xizmat qiladi. Grammatik va sintaktik sathlarda esa passiv konstruksiyalar, shaxsi noma'lum gaplar, otlashgan qurilmalar, modal vositalar hamda agentni ikkinchi planga suruvchi sintaktik transformatsiyalar muhim rol oʻynaydi. Bunda evfemik maʼno faqat alohida birlikning lugʻaviy mazmuni orqali emas, balki uning gap tarkibidagi vazifasi, axborotning tashkil etilishi va kommunikativ kontekst bilan oʻzaro aloqasi orqali yuzaga keladi.

Zamonaviy tilshunoslikda evfemik birliklarning hosil boʻlish usullari turlicha mezonlar asosida tasniflangan. Ayrim tadqiqotchilar ularni semantik koʻchish turlariga tayangan holda izohlasa, boshqalari grammatik transformatsiyalar yoki pragmatik strategiyalar asosida tavsiflaydi [1]. Evfemalashuvning semantik va konseptual asoslarini oʻrganishda metaforalashuvning roli, pragmatik tadqiqotlarda esa xushmuomalalik, ijtimoiy maqbullik va kommunikativ strategiya kabi omillar alohida eʼtiborga olinadi. Biroq internet-media diskursining dinamik tabiati evfemalashuvni faqat bitta lisoniy sath doirasida izohlash imkonini bermaydi. Chunki media matnlarida evfemik maʼno koʻpincha leksik tanlov, grammatik shakl, sintaktik tuzilma va matnning umumiy kommunikativ tashkil etilishi natijasida yuzaga keladi. Shu nuqtayi nazardan, ingliz va oʻzbek internet-media diskursida evfemalashuvning umumiy hamda milliy-lisoniy xususiyatlarini qiyosiy oʻrganish alohida ilmiy ahamiyatga ega. Ingliz va oʻzbek tillari struktur-tipologik jihatdan farqli tizimlarga mansub boʻlib, ularning grammatik va sintaktik imkoniyatlari evfemik maʼnoni ifodalash jarayonida turlicha namoyon boʻlishi mumkin. Bir xil kommunikativ maqsad turli tillarda turli nominativ, grammatik yoki sintaktik vositalar orqali amalga oshirilishi ehtimoli mavjud. Shu bois evfemalashuvning universal kommunikativ mexanizmlari bilan bir qatorda, uning konkret til tizimida voqelanish xususiyatlarini aniqlash qiyosiy-tipologik tadqiqot uchun muhim metodologik masala hisoblanadi.

Internet-media matnlarining oʻziga xosligi shundaki, unda evfemik birlikning funksional qiymati faqat uning lugʻaviy maʼnosi bilan belgilanmaydi. Sarlavha, matn janri, axborot manbasi, muallifning kommunikativ pozitsiyasi, adresatning kutilayotgan reaksiyasi va matnning umumiy diskursiv muhiti ham evfemik ifodaning mazmunini shakllantirishda ishtirok etadi. Demak, internet-media diskursida evfemalashuvni tadqiq etishda lisoniy birlikning shakli bilan bir qatorda uning kommunikativ vazifasi va kontekstual xususiyatlarini ham hisobga olish zarur.

Mazkur maqolaning dolzarbligi shundan iboratki, ingliz va oʻzbek internet-media diskursida evfemik birliklarning leksik, grammatik-sintaktik va diskursiv sathlarda shakllanish xususiyatlarini yagona qiyosiy-tipologik yondashuv asosida tavsiflash imkonini beruvchi tadqiqot modeli zarur. Bunday yondashuv evfemalashuvning ikki tildagi umumiy qonuniyatlarini aniqlash bilan birga, ularning struktur-tipologik farqlarini ham ochib berishga xizmat qiladi.

Mazkur maqolaning maqsadi ingliz va oʻzbek internet-media diskursida evfemik birliklarning shakllanish mexanizmlarini aniqlash, ularning leksik, grammatik-sintaktik va diskursiv xususiyatlarini qiyosiy-tipologik jihatdan tavsiflash hamda evfemalashuvning struktur-tipologik modelini ishlab chiqishdan iborat. Mazkur maqsadga erishish uchun quyidagi vazifalar belgilandi: ingliz va oʻzbek internet-media matnlarida evfemik birliklarning asosiy shakllanish usullarini aniqlash; leksik evfemalashuvning yetakchi mexanizmlarini tavsiflash; grammatik va sintaktik vositalarning evfemik maʼno shakllanishidagi rolini aniqlash; ikki tilda evfemalashuv vositalarining qoʻllanish xususiyatlarini qiyoslash; aniqlangan umumiy va milliy-lisoniy xususiyatlar asosida evfemik birliklarning struktur-tipologik modelini ishlab chiqish.

Adabiyotlar tahlili. Evfemalizm hodisasining nazariy talqini va uning shakllanish mexanizmlari zamonaviy tilshunoslikda turli yondashuvlar asosida o‘rganilgan. Mavjud tadqiqotlarni shartli ravishda struktur-lisoniy, leksik-semantik, kognitiv va pragmatik-diskursiv yo‘nalishlarga ajratish mumkin. Bu yondashuvlar bir-birini to‘ldirib, evfemalashuvning faqat alohida leksik birlik emas, balki turli lisoniy sathlar va kommunikativ omillar o‘zaro ta’sirida shakllanadigan murakkab hodisa ekanini ko‘rsatadi.

Evfemik ma’noning grammatik va struktur shakllanishi masalasi O.Zubkova va S.Logvina tadqiqotida maxsus o‘rganilgan. Mualliflar evfemik ma’noning amalga oshishida grammatik mexanizmlarning ahamiyatini ko‘rsatib, evfemalashuvni faqat leksik almashuv bilan cheklab bo‘lmasligini ta’kidlaydilar [1]. Bu yondashuv internet-media matnlarida evfemik ma’noning grammatik shakl, sintaktik qurilish va axborotni taqdim etish usuli bilan bog‘liq holda yuzaga kelishini tahlil qilish uchun muhim nazariy asos bo‘lib xizmat qiladi. T.Golubeva tadqiqotida esa evfemistik va evfemistik bo‘lmagan siyosiy jihatdan maqbul ifodalar o‘rtasidagi farq relevanlik nazariyasi nuqtayi nazaridan ko‘rib chiqiladi. Muallif evfemik ifodaning kommunikativ interpretatsiyasi va adresat tomonidan qabul qilinishiga alohida e’tibor qaratadi [1]. Bu yondashuv evfemalashuvning shakli bilan bir qatorda uning pragmatik ta’sirini ham hisobga olish zarurligini ko‘rsatadi.

Evfemizmlarning leksik va semantik shakllanish mexanizmlari V.Allan va K.Burridge ishlarida keng yoritilgan. Mualliflar evfemik birliklarning hosil bo‘lishini metafora, metonimiya, perifraz, qisqartirish, fonetik modifikatsiya, o‘zlashma birliklardan foydalanish va grammatik almashtirish kabi vositalar bilan bog‘laydilar [2]. Ularning yondashuvida mazkur vositalarning umumiy kommunikativ vazifasi bevosita nomlash natijasida yuzaga kelishi mumkin bo‘lgan salbiy yoki noqulay kommunikativ ta’sirni yumshatishdan iborat. Mazkur tasnif ingliz va o‘zbek internet-media materiallarida uchraydigan evfemik birliklarning leksik shakllanish usullarini tizimlashtirish uchun muhim manba hisoblanadi.

R.Holder hamda H.Ravson ishlarida evfemizmlar leksik innovatsiya va semantik qayta talqin nuqtayi nazaridan qaraladi [3]. Bu tadqiqotlarda yangi nominativ birliklarning shakllanishi ijtimoiy muhit va tildagi nomlash ehtiyojlari bilan bog‘liq holda talqin etiladi. Mazkur yondashuv evfemizmni tayyor lug‘aviy birlik sifatidagina emas, balki muayyan ijtimoiy va kommunikativ ehtiyoj ta’sirida yuzaga keladigan dinamik nominatsiya vositasi sifatida qarash imkonini beradi. Shu nuqtayi nazardan internet-media diskursida yangi evfemik birliklarning paydo bo‘lishi va ularning tez ommalashuvi ham leksik innovatsiya jarayoni bilan bog‘liq holda izohlanishi mumkin.

Evfemalashuvning kognitiv asoslarini tushuntirishda G.Lakoff va M.Johnsonning konseptual metafora nazariyasi muhim o‘rin tutadi. Mualliflar metaforani inson tafakkurining universal mexanizmi sifatida talqin qilib, bir konseptual sohaning boshqa konseptual soha orqali anglanishini asoslaydilar [4]. Bu nuqtayi nazardan metaforik evfemizm voqelikni shunchaki yashirish vositasi emas, balki uni boshqa konseptual belgi asosida qayta idrok etish va ifodalash usuli sifatida namoyon bo‘ladi. Demak, evfemik metaforada nomlanayotgan hodisaning salbiy xususiyati butunlay yo‘qolmaydi, balki adresat ongida boshqa konseptual obraz orqali qayta shakllantiriladi.

Z.Kövecses mazkur yondashuvni rivojlantirib, metaforalarning shakllanishida madaniy omillarning muhimligini ta’kidlaydi [5]. Uning yondashuvi bir xil kommunikativ vazifaning turli til va madaniyatlarda turlicha konseptual modellar orqali ifodalanishi mumkinligini ko‘rsatadi. Bu holat ingliz va o‘zbek internet-media diskursida evfemik birliklarni qiyosiy-tipologik o‘rganish uchun ayniqsa muhimdir. Chunki ikki tilda umumiy kommunikativ maqsad mavjud bo‘lsa-da, uni ifodalashda tanlanadigan konseptual modellar va leksik vositalar milliy-madaniy hamda tilning struktur xususiyatlari bilan farqlanishi mumkin.

Evfemalashuvning pragmatik tabiatini tushuntirishda P.Brown va S.Levinsonning xushmuomalalik nazariyasi muhim nazariy asoslardan birini tashkil etadi [6]. Ularning yondashuvi til vositalarini tanlashda adresatning ijtimoiy maqomi, muloqot ishtirokchilari o‘rtasidagi munosabatlar va muloqotda yuzaga kelishi mumkin bo‘lgan salbiy ta’sirni kamaytirish ehtiyoji muhim ahamiyatga ega ekanini ko‘rsatadi. Shu nuqtayi nazardan evfemik ifoda kommunikativ vaziyatda to‘g‘ridan-to‘g‘ri nomlashdan qochish va adresat uchun nisbatan maqbul shaklni tanlash strategiyasi sifatida namoyon bo‘lishi mumkin.

G.Leechning pragmatik tamoyillari ham evfemik ifodalarning kommunikativ vazifasini tushunish uchun muhimdir [7]. Uning yondashuvida til birliklarining tanlanishi nafaqat semantik mazmun, balki muloqotdagi ijtimoiy maqbullik va kommunikativ samaradorlik bilan ham bog‘liq. Shu jihatdan evfemik birlik muayyan axborotni saqlab qolgan holda uning ifodalanish shaklini yumshatish yoki adresatga ta’sirini o‘zgartirish imkonini beruvchi pragmatik vosita sifatida baholanishi mumkin.

Van Djikning diskurs va hokimiyatga oid qarashlari evfemalashuvni kengroq ijtimoiy-diskursiv kontekstda ko‘rib chiqish imkonini beradi [8]. Ayniqsa, institutsional va media diskursda axborotni tanlash, nomlash va taqdim etish usuli muayyan ijtimoiy munosabatlar hamda diskursiv strategiyalar bilan bog‘liq bo‘lishi mumkin. M.Rohmatullah va A.Degafning media materiallarida evfemizm va disfemizm orqali konfliktni freymlashga bag‘ishlangan tadqiqoti ham evfemik tanlovning media diskursda voqeani muayyan kommunikativ nuqtayi nazardan taqdim etish bilan bog‘liqligini

koʻrsatadi [8]. Bu yondashuv evfemizmlarni internet-media matnidan ajratib olingan alohida leksik birlik sifatida emas, balki matnning umumiy diskursiv tashkil etilishi doirasida tahlil qilish zarurligini asoslaydi.

Shunday qilib, koʻrib chiqilgan tadqiqotlar evfemalashuvni turli nuqtayi nazarlardan yoritgan boʻlsa-da, ularni birlashtiruvchi jihat – evfemik maʼnoning faqat leksik almashuv natijasi emasligi haqidagi yondashuvdir. Struktur tadqiqotlar grammatik va sintaktik mexanizmlarni [1], leksik-semantik tadqiqotlar nominatsiya va semantik qayta talqinni [2; 3], kognitiv yondashuv metaforik va konseptual qayta qurishni [4; 5], pragmatik va diskursiv tadqiqotlar esa kommunikativ vaziyat, adresat, ijtimoiy maqbullik va media kontekstining rolini [6; 7; 8] asosiy omillar sifatida koʻrsatadi.

Biroq ushbu yondashuvlarning aksariyati evfemalashuvning muayyan bir mexanizmi yoki alohida nazariy jihatiga ustuvor eʼtibor qaratadi. Ingliz va oʻzbek internet-media diskursida esa leksik, grammatik-sintaktik va diskursiv mexanizmlarni bir vaqtning oʻzida qiyosiy-tipologik nuqtayi nazardan tahlil qilish zarurati mavjud. Shuning uchun mazkur tadqiqotda evfemik birliklarning shakllanish mexanizmlari kompleks yondashuv asosida oʻrganilib, ularning leksik, grammatik-sintaktik va diskursiv sathlardagi umumiy hamda tilga xos xususiyatlarini aniqlash maqsad qilinadi.

Tahlil va muhokama. Ingliz va oʻzbek internet-media matnlari materiallari shuni koʻrsatadiki, evfemik birliklar hosil boʻlishida ikkala tilda umumiy kognitiv mexanizmlar saqlanib qolgan boʻlsa-da, ularning lisoniy ifodalanish usullari sezilarli darajada farqlanadi. Ingliz tilining analitik tuzilishi otlashgan konstruksiyalar, passiv shakllar hamda koʻp komponentli ot birikmalaridan keng foydalanish imkonini bersa, oʻzbek tilining agglutinativ tabiati affiksatsiya, analitik birikmalar va izohlovchi sintaktik qurilmalar orqali evfemik maʼnoni ifodalash imkoniyatini kengaytiradi. Ikkala tilda evfemalashuvning konseptual mexanizmi umumiy boʻlsa-da, uning lisoniy voqelanish shakllari struktur-tipologik xususiyatlarga muvofiq ravishda farqlanadi.

Shu bois mazkur boʻlimda ingliz va oʻzbek internet-media materiallari asosida evfemik birliklarning hosil boʻlish usullari leksik, grammatik va struktur sathlarda qiyosiy-tipologik jihatdan tahlil qilinadi. Tahlilda nafaqat alohida lisoniy vositalarning qoʻllanish chastotasi, balki ularning kommunikativ vazifasi, diskursiv sharoiti va konseptual asoslari ham hisobga olinadi. Bunday yondashuv ikki tilning evfemalashuv tizimidagi umumiy qonuniyatlar hamda milliy-lisoniy xususiyatlarni kompleks ravishda aniqlash imkonini beradi.

Leksik vositalar orqali evfemik birliklarning shakllanishi

Internet-media diskursida evfemik birliklarning eng faol shakllanish sathi leksik sathdir. Bu jarayonda mavjud lugʻaviy birliklarning maʼnosi qayta talqin qilinadi, yangi nominativ vositalar tanlanadi yoki hodisaning salbiy jihatini toʻliq ifodalamaydigan birliklardan foydalaniladi. Natijada, voqelikning oʻzi emas, balki uning auditoriya ongida qabul qilinishi oʻzgaradi. Shu sababli leksik vositalar evfemalashuvning asosiy amalga oshirish mexanizmlaridan biri sifatida namoyon boʻladi.

Ingliz va oʻzbek internet-media materiallarining qiyosiy tahlili shuni koʻrsatadiki, leksik evfemalashuv har ikki tilda umumiy kognitiv tamoyillar asosida shakllansa-da, ularning amalga oshish usullari milliy til tizimi va media anʼanalari bilan belgilanadi. Ingliz tilida siyosiy, iqtisodiy va ijtimoiy mavzularga oid axborotlarda mavhum hamda neytral maʼnoli birliklardan foydalanish ustunlik qilsa, oʻzbek internet-mediasida izohlovchi va tavsiflovchi birliklar koʻproq uchraydi.

Tahlil qilingan materiallar asosida leksik evfemalashuvning quyidagi asosiy usullari ajratildi:

1) metaforalashuv;
2) metonimik koʻchish;
3) perifrazlash;
4) maʼnoni umumlashtirish;
5) terminlashuv;
6) neytral lugʻaviy birlikni tanlash.

Korpus materiallari asosida oʻtkazilgan miqdoriy tahlil leksik evfemalashuvda metaforalashuv eng mahsuldor usul ekanligini koʻrsatdi. Tahlil qilingan 512 ta evfemik birlikning 184 tasi (35,9 %) metaforalashuv, 96 tasi (18,8 %) perifraz, 71 tasi (13,9 %) metonimik koʻchish, 63 tasi (12,3 %) terminlashuv, 54 tasi (10,5 %) maʼnoni umumlashtirish va 44 tasi (8,6 %) neytral lugʻaviy birliklarni tanlash orqali hosil qilingan. Mazkur natijalar internet-media diskursida salbiy mazmunni bilvosita ifodalashda konseptual qayta talqin va tavsiflovchi nom yetakchi oʻrin tutishini koʻrsatadi (Qarang: 1-jadval).

Mazkur vositalar turli shaklda namoyon boʻlsa-da, ularni birlashtirib turuvchi umumiy xususiyat mavjud. Ularning barchasi salbiy baholanishi mumkin boʻlgan hodisani bevosita nomlashdan voz kechib, auditoriya uchun nisbatan maqbul boʻlgan lisoniy vositani tanlashga xizmat qiladi.

Eng faol usullardan biri metaforalashuv ekanligi maʼlum boʻldi. Metaforik evfemizmlar hodisani boshqa konseptual soha orqali ifodalaydi. Bunda salbiy mazmun yashirilmaydi, balki boshqa belgi asosida talqin qilinadi. Masalan, ingliz internet-mediasida iqtisodiy inqirozni *economic headwinds* (Financial Times, 2023), harbiy muvaffaqiyatsizlikni *strategic setback*, ish oʻrinlarining qisqarishini *workforce optimization* (Reuters, 2024) kabi birliklar orqali ifodalash kuzatiladi. Mazkur birliklarda salbiy hodisa bevosita nomlanmaydi, balki nisbatan neytral yoki ijobiy assotsiatsiya uygʻotuvchi konseptlar orqali taqdim etiladi.

O‘zbek internet-mediasida ham metaforalashuv faol qo‘llanadi. Masalan, narxlarning oshishi *narxlar o‘sishi*, iqtisodiy qiyinchiliklar *murakkab iqtisodiy vaziyat*, davlat xarajatlarini qisqartirish *maqbullashtirish*, ayrim cheklovlar esa *tartibga solish choralari* kabi birliklar bilan ifodalanadi. Bu holatda metaforik yoki mavhumroq ifoda hodisaning salbiy ta’sirini kamaytirishga xizmat qiladi.

Metonimik ko‘chish ham evfemalashuvning keng tarqalgan vositalaridan biridir. Bunda hodisaning o‘zi emas, balki unga aloqador belgi, jarayon yoki natija nomlanadi. Ingliz internet-mediasida *collateral damage*, *correction*, *incident*, *security operation* kabi birliklar, o‘zbek internet-mediasida esa *holat*, *vaziyat*, *jarayon*, *choralar*, *tadbirlar* kabi mavhum ma’noli birliklar ko‘pincha bevosita salbiy hodisani nomlash o‘rnida qo‘llanadi. Natijada, hodisa haqidagi baholash darajasi sezilarli darajada pasayadi.

Leksik evfemalashuvning yana bir muhim ko‘rinishi perifrazdir. Bunda qisqa va keskin nom o‘rniga izohlovchi yoki tavsiflovchi birikma qo‘llanadi. Masalan, ingliz tilidagi *people with disabilities*, *people experiencing homelessness*, *economically disadvantaged households* (Reuters, 2024) kabi birliklarda shaxs muayyan salbiy belgi orqali emas, balki uning holati yoki ijtimoiy vaziyati orqali tavsiflanadi. O‘zbek internet-mediasida ham *ehtiyojmand oilalar*, *ijtimoiy himoyaga muhtoj qatlam*, *alohida e’tiborga muhtoj shaxslar* kabi perifrazlar ayni kommunikativ vazifani bajaradi.

Tahlillar shuni ko‘rsatadiki, leksik evfemalashuvning barcha ko‘rinishlari yagona maqsadga xizmat qiladi. Biroq ingliz tilida qisqa va ixcham nominativ birliklar ustunlik qilsa, o‘zbek internet-mediasida tavsiflovchi sintagmalar va izohlovchi birikmalar ko‘proq qo‘llanadi. Mazkur farq ikki tilning struktur-tipologik xususiyatlari hamda media uslubidagi an’analar bilan izohlanadi.

Grammatik va sintaktik vositalar orqali evfemik birliklarning shakllanishi

Internet-media diskursida evfemalashuv faqat leksik birliklarni tanlash orqali emas, balki grammatik shakllar va sintaktik qurilmalar vositasida ham amalga oshiriladi. Bunday hollarda evfemik ta’sir alohida so‘zning lug‘aviy ma’nosi bilan emas, balki gapning grammatik tashkil etilishi, axborotning taqdim etilish usuli hamda voqea ishtirokchilarining sintaktik joylashuvi bilan yuzaga keladi: bir xil voqelik turli grammatik vositalar orqali ifodalanganda adresat tomonidan turlicha qabul qilinadi.

Ingliz va o‘zbek internet-media materiallari tahlili grammatik evfemalashuvning bir necha tipik ko‘rinishlarini aniqlash imkonini berdi. Ular orasida passiv konstruksiyalar, shaxsi noma’lum gaplar, otlashgan konstruksiyalar, modal vositalar hamda agentni ifodalashdan voz kechishga asoslangan sintaktik transformatsiyalar alohida faolligi bilan ajralib turadi.

Eng mahsuldor vositalardan biri passiv konstruksiyalar hisoblanadi. Passiv shakl voqea bajaruvchisini ikkinchi planga surib, diqqatni harakatning natijasiga qaratadi. Shu sababli salbiy hodisalar haqidagi axborotlarda javobgarlikni bevosita muayyan shaxs yoki tashkilot bilan bog‘lamaslik imkoniyati yuzaga keladi. Masalan, ingliz internet-mediasida: *Mistakes were made. Several facilities were affected. Civilian casualties were reported. The decision was implemented* (Reuters, 2025) kabi konstruksiyalar keng uchraydi. Ushbu gaplarda voqea sodir bo‘lgani ta’kidlanadi, biroq uni amalga oshirgan subyekt ochiq ko‘rsatilmaydi: kommunikativ urg‘u hodisaning o‘ziga emas, uning natijasiga ko‘chadi.

O‘zbek internet-media matnlarida ham shunga o‘xshash hodisa kuzatiladi: *Kamchiliklarga yo‘l qo‘yildi. Tegishli choralar ko‘rildi. Qaror qabul qilindi. Tekshiruv ishlari olib borildi* (Kun.uz, 2024).

Bu misollarda ham harakat bajaruvchisi tilga olinmaydi. Bunday sintaktik qurilish hodisani shaxsdan ajratgan holda taqdim etishga xizmat qiladi hamda salbiy baholashning kuchini kamaytiradi.

Grammatik evfemalashuvning yana bir muhim ko‘rinishi otlashgan konstruksiyalar hisoblanadi. Fe’l bilan ifodalangan faol harakat o‘rniga otlashgan birliklardan foydalanish voqelikni nisbatan mavhumroq va rasmiyroq shaklda ifodalaydi. Masalan, ingliz internet-mediasida *implementation of reforms*; *restructuring process*; *staff optimization*; *workforce adjustment* (Reuters, 2024) kabi birliklar faol harakatni emas, jarayonni ifodalaydi.

O‘zbek internet-mediasida evfemalashuv ko‘pincha otlashuv asosidagi qurilmalar orqali ifodalanadi. Jumladan, *islohotlarni amalga oshirish*, *maqbullashtirish jarayoni*, *tarkibiy o‘zgarishlar* va *qayta tashkil etish ishlari* kabi birliklar keng qo‘llanadi. Ushbu birliklarda harakatning ijrochisi emas, uning rasmiy tavsifi oldingi planga chiqadi.

Internet-media diskursida shaxsi noma’lum gaplar ham evfemik vazifani faol bajaradi. O‘zbek tilining grammatik imkoniyatlari bunday qurilmalarni hosil qilish uchun qulay sharoit yaratadi. Masalan: *aniqlanishicha, ma’lum qilinishicha, qayd etilishicha, bildirilishicha* va h.

Mazkur qurilmalarda axborot manbayi ikkinchi planga suriladi. Natijada, ma’lumot obyektiv fakt sifatida qabul qilinishi osonlashadi.

Ingliz tilida xuddi shu kommunikativ vazifa quyidagi birliklar orqali ifodalanadi: *It is reported that...; It is believed that...; It has been confirmed that...; Sources indicate that...* (Reuters, 2025)

Har ikki tilda ushbu qurilmalar axborotning manbasini mavhumlashtirish orqali xabarni nisbatan neytral ko‘rinishda taqdim etishga xizmat qiladi.

Mazkur tadqiqot natijalari shuni koʻrsatdiki, ushbu birliklarning barchasi iqtisodiy yoʻqotish yoki qisqartirish kabi salbiy mazmunni bevosita emas, balki neytral yoki texnik terminologiya orqali ifodalashga xizmat qiladi. Natijada, auditoriya tomonidan voqelikning salbiy qabul qilinish darajasi pasayadi.

Grammatik evfemalashuvning yana bir muhim vositasi modal konstruktsiyalardir. Bunday birliklar qat'iy hukmni yumshatadi yoki salbiy mazmunni ehtimollik shaklida ifodalaydi. Masalan: *may affect*; *could result in*; *is expected to reduce* (Reuters, 2024). Yoki *ta'sir koʻrsatishi mumkin; kutilmoqda; ehtimoldan xoli emas; kuzatilishi mumkin.*

Modal vositalar orqali hodisaning keskinligi pasayadi: adresat salbiy axborotni nisbatan yumshoqroq qabul qiladi.

Tahlillar shuni koʻrsatadiki, grammatik va sintaktik vositalar internet-media diskursida evfemalashuvning mustaqil mexanizmini tashkil etadi. Agar leksik evfemalashuvda kommunikativ ta'sir alohida nominativ birlikni tanlash orqali yuzaga kelsa, grammatik evfemalashuvda bu ta'sir gapning tuzilishi, axborotning tashkil etilishi va voqea ishtirokchilarining sintaktik joylashuvi orqali hosil boʻladi.

Qiyosiy-tipologik tahlil ingliz va oʻzbek tillarida mazkur mexanizmlarning umumiy kommunikativ vazifasi bir xil ekanligini koʻrsatadi. Har ikki tilda grammatik transformatsiyalar javobgarlikni bevosita muayyan shaxsga bogʻlamaslik, salbiy bahoni yumshatish hamda axborotni neytral tarzda ifodalashga xizmat qiladi. Biroq ularning lisoniy voqelanishi til tizimlarining struktur xususiyatlari bilan belgilanadi. Qiyosiy tahlil shuni koʻrsatdiki, ingliz tilida passiv va otlashgan konstruksiyalar nisbatan faol qoʻllansa, oʻzbek tilida shaxsi noma'lum gaplar, majhul nisbat shakllari hamda analitik qurilmalar ustunlik qiladi. Mazkur farq ingliz tilining analitik, oʻzbek tilining esa agglutinativ xususiyatlari bilan izohlanadi. Bu holat evfemalashuvning funksional umumiyligini saqlagan holda, uning lisoniy ifodalanishida tipologik variantlilik mavjudligini yana bir bor tasdiqlaydi.

Ingliz va oʻzbek internet-media matnlarida evfemik birliklarning struktur-tipologik modeli

Yuqorida tahlil qilingan materiallar shuni koʻrsatadiki, internet-media diskursida evfemik birliklarning shakllanishi alohida lisoniy vositalarning qoʻllanishi bilan chegaralanmaydi. Evfemik nom turli sathdagi birliklarning oʻzaro uygʻunlashuvi natijasida yuzaga keladigan koʻp bosqichli lisoniy jarayon hisoblanadi. Shu sababli evfemalashuvni faqat leksik yoki grammatik hodisa sifatida tavsiflash uning real kommunikativ tabiatini toʻliq aks ettirmaydi. Mazkur jarayonni izchil tahlil qilish uchun evfemik birliklarning struktur tashkil etilishi va ularning oʻzaro bogʻliqligini yagona tipologik model asosida tavsiflash zarur.

Tahlil natijalari ingliz va oʻzbek internet-media matnlarida evfemik birliklarning shakllanishida uch asosiy struktur sath ishtirok etishini koʻrsatdi. Birinchi sath leksik transformatsiyalarni, ikkinchi sath grammatik-sintaktik qayta qurishlarni, uchinchi sath esa diskursiv tashkil etish vositalarini qamrab oladi. Mazkur sathlar mustaqil holda ham, oʻzaro uygʻunlashgan holda ham evfemik ma'noning shakllanishiga xizmat qiladi.

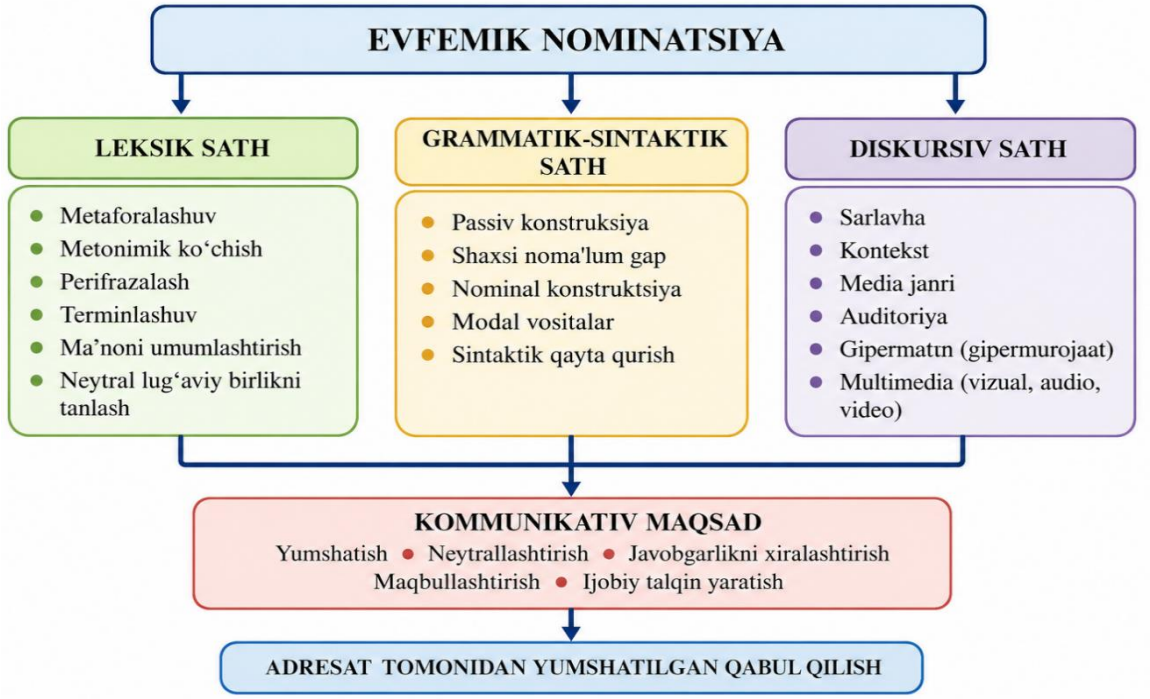
Leksik sathda evfemik ma'no asosan metaforalashuv, metonimik koʻchish, perifraz, terminlashuv, umumlashtirish hamda neytral lugʻaviy birliklarni tanlash orqali hosil boʻladi. Ushbu vositalar bevosita nomlashning oʻrnini bosib, voqelikning salbiy jihatini kommunikativ nuqtayi nazardan maqbul shaklda ifodalaydi. Ayniqsa, siyosiy va iqtisodiy mazmundagi media matnlarida terminlashuv hamda mavhum ma'noli birliklardan foydalanish yuqori faollik bilan kuzatiladi.

Grammatik-sintaktik sathda esa evfemik effekt gapning tuzilishi orqali yuzaga keladi. Passiv konstruksiyalar, shaxsi noma'lum gaplar, nominal qurilmalar, modal vositalar hamda sintaktik transformatsiyalar harakat bajaruvchisini yoki salbiy hodisaning manbasini ikkinchi planga suradi. Natijada, adresatning diqqat markazi voqeaning sababiga emas, uning natijasi yoki umumiy tavsifiga yoʻnaltiriladi.

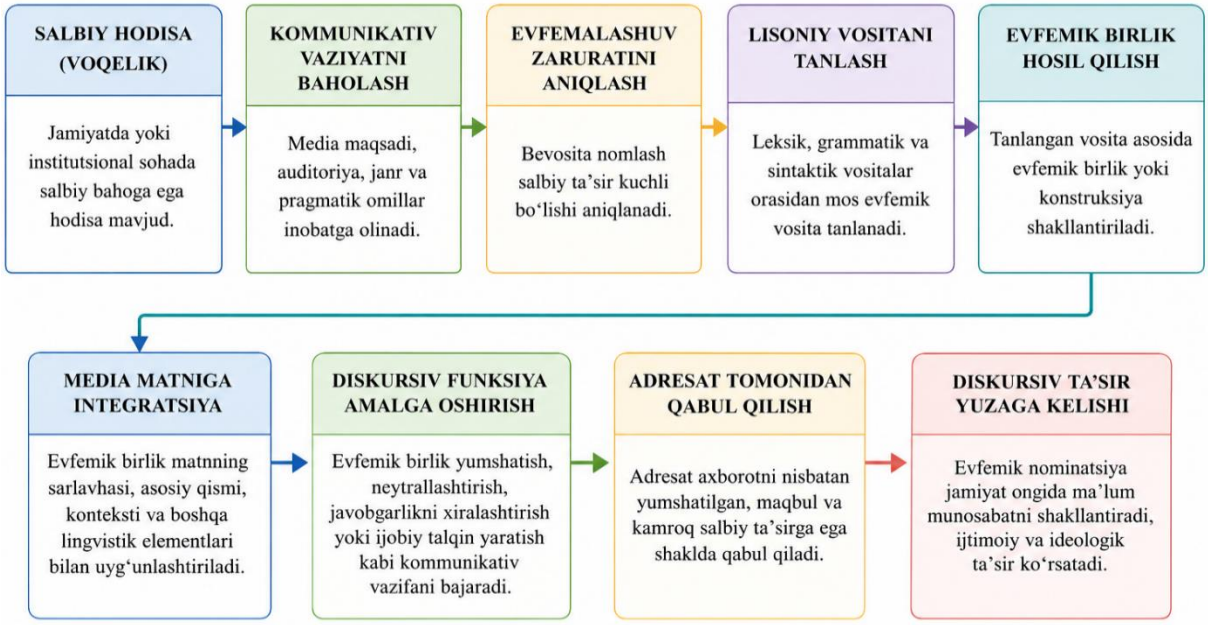
Diskursiv sath evfemalashuvning yakuniy bosqichini tashkil etadi. Bu bosqichda alohida lisoniy birliklarning ma'nosi matnning umumiy mazmuni, sarlavha, axborot manbasi, vizual vositalar va media janri bilan uygʻunlashib, muayyan kommunikativ ta'sirni yuzaga keltiradi. Demak, internet-media diskursida evfemik birliklarning funksional qiymati faqat ularning lugʻaviy ma'nosi bilan emas, balki butun diskursning tashkil etilishi bilan belgilanadi.

Ingliz va oʻzbek internet-media materiallarini qiyosiy tahlil qilish mazkur uch sathning har ikki tilda mavjud ekanligini koʻrsatdi. Biroq ularning faollik darajasi va lisoniy voqelanishi til tizimlarining struktur-tipologik xususiyatlari bilan belgilanadi. Ingliz tilida analitik konstruksiyalar, passiv shakllar va terminlashuv faolroq qoʻllansa, oʻzbek tilida izohlovchi sintagmalar, shaxsi noma'lum gaplar hamda analitik birikmalar koʻproq uchraydi. Shunga qaramay, har ikki tilda evfemalashuvning umumiy kommunikativ vazifasi oʻzgarmaydi.

Olingan natijalar. Mazkur kuzatishlar asosida ingliz va oʻzbek internet-media diskursida evfemik birliklarning struktur-tipologik modeli ishlab chiqildi (1-chizma). Model evfemik nomning shakllanishini lisoniy sathlar oʻrtasidagi uzviy bogʻliqlik asosida tavsiflaydi hamda keyingi boʻlimlarda tahlil qilinadigan mavzuviy va funksional tipologiyani izohlash uchun metodologik asos vazifasini bajaradi. Evfemik birlikning internet-media matnida hosil boʻlish bosqichlari, kommunikativ vaziyatni baholashdan boshlab diskursiv ta'sir yuzaga kelguniga qadar boʻlgan jarayon 2-chizmada ketma-ketlik asosida aks ettirilgan.



1-chizma. Ingliz va o‘zbek internet-media matnlarida evfemik birliklarning struktur-tipologik modeli



2-chizma. Internet-media matnlarida evfemik birliklarning shakllanish algoritmi

Qiyosiy tahlil natijasida aniqlandiki, ingliz va o‘zbek internet-media matnlarida evfemik birliklarning hosil bo‘lish usullari faolligi jihatidan o‘zaro farqlanadi. Mazkur usullarning qiyosiy tavsifi 1-jadvalda keltirilgan.

Hosil bo‘lish usuli	Soni (n)	Ulushi (%)	Ingliz	O‘zbek
Metaforalashuv	184	35,9	Juda faol	Faol
Perifrazlash	96	18,8	Faol	Juda faol
Metonimik ko‘chish	71	13,9	Faol	Faol
Terminlashuv	63	12,3	Juda faol	O‘rtacha
Ma’noni umumlashtirish	54	10,5	Faol	Faol
Neytral lug‘aviy birlik tanlash	44	8,6	Juda faol	Faol

1-jadval. Ingliz va o‘zbek internet-media matnlarida evfemik birliklarning hosil bo‘lish usullarining qiyosiy tavsifi

Struktur sathlarning qiyosiy faolligi tahlili shuni ko‘rsatdiki, har ikki tilda evfemalashuvning asosiy mexanizmlari umumiy bo‘lsa-da, ularning qo‘llanish darajasi til tizimlarining tipologik xususiyatlariga bog‘liq. Ushbu natijalar 2-jadvalda umumlashtirilgan.

Struktur sath	Ingliz tili	O‘zbek tili	Tipologik farq

Leksik	Asosiy	Asosiy	Har ikki tilda yetakchi sath
Grammatik	Juda faol	Faol	Ingliz tilida analitik konstruksiyalar ustun
Sintaktik	Faol	Juda faol	O‘zbek tilida shaxsi noma’lum gaplar faol
Diskursiv	Juda faol	Juda faol	Har ikki tilda media konteksti muhim

2-jadval. Ingliz va o‘zbek internet-mediasida evfemik birliklarning struktur sathlar bo‘yicha taqsimlanishi

Olib borilgan qiyosiy tahlil ingliz va o‘zbek internet-media matnlarida evfemik birliklarning shakllanishi ko‘p sathli lisoniy jarayon ekanligini ko‘rsatdi. Leksik, grammatik-sintaktik va diskursiv vositalar har ikki tilda umumiy kommunikativ vazifaga xizmat qilsa-da, ularning lisoniy voqelanishi til tizimlarining struktur xususiyatlariga muvofiq farqlanadi. Ingliz tilida analitik qurilmalar va terminlashuv ustunlik qilsa, o‘zbek tilida tavsiflovchi birliklar, shaxsi noma’lum gaplar va analitik sintagmalar faolroq qo‘llanadi. Shu bilan birga, har ikki til uchun umumiy bo‘lgan qonuniyat shundan iboratki, evfemalashuv alohida lisoniy birlik emas, balki turli sathdagi vositalarning o‘zaro uyg‘unlashuvi natijasida yuzaga keladigan kommunikativ strategiya sifatida namoyon bo‘ladi. Mazkur xulosalar keyingi bo‘limda evfemik birliklarning mavzuviy va funksional tipologiyasini tahlil qilish uchun nazariy hamda metodologik asos yaratadi.

Mazkur bo‘limda ishlab chiqilgan struktur-tipologik model keyingi boblarda evfemik birliklarning mavzuviy va funksional tasnifini amalga oshirish uchun metodologik asos bo‘lib xizmat qiladi hamda ingliz va o‘zbek internet-media diskursida evfemalashuvning universal va milliy xususiyatlarini qiyosiy-tipologik jihatdan izohlash imkonini beradi.

Xulosa. Taklif etilgan struktur-tipologik model evfemalashuvni alohida leksik hodisa sifatida emas, balki leksik, grammatik-sintaktik va diskursiv sathlarning o‘zaro integratsiyasi natijasida yuzaga keladigan kompleks kommunikativ jarayon sifatida talqin qilishga asos bo‘ladi. Mazkur yondashuv ingliz va o‘zbek internet-media diskursida evfemik birliklarning hosil bo‘lish mexanizmlarini yagona nazariy asosda tavsiflashga xizmat qiladi. Modelning amaliy ahamiyati shundaki, undan internet-media matnlarini korpus asosida annotatsiyalash, evfemik birliklarni avtomatik aniqlash algoritmlarini ishlab chiqish hamda kompyuter lingvistikasi va tabiiy tilni qayta ishlash tizimlarida evfemalashuvni modellashtirishda foydalanish mumkin. Bundan tashqari, model media matnlarini qiyosiy-tipologik tahlil qilish uchun metodik asos vazifasini ham bajaradi.

Demak, ishlab chiqilgan struktur-tipologik model keyingi bo‘limlarda evfemik birliklarni mavzuviy va funksional jihatdan tasniflash uchun konseptual asos yaratadi. Aynan shu model asosida evfemalashuvning qaysi kommunikativ sohalarda namoyon bo‘lishi va qanday pragmatik vazifalarni bajarishi keyingi maqolalarda batafsil tahlil qilinadi.

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O‘ZBEK SHEVALARI UNLILAR TIZIMI G‘OZI OLIM YUNUSOV TALQINIDA

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Annotatsiya: *Maqolada ma’rifatparvar jadid adibi G‘ozi Olim Yunusovning o‘zbek shevalaridagi unlilar sistemasi haqidagi fikrlari o‘rganilgan. Uning o‘zbek shevalari vokalizmi, unlilar tizimi haqidagi qarashlariga tanqidiy, tahliliy baho berilgan.*

Kalit so‘zlar: *fonetik-fonologik tizim, vokalizm, variatsiya, diftong, grafema, bosit unli, faxish unli, indefferent unli, singarmonizm.*

СИСТЕМА ГЛАСНЫХ УЗБЕКСКИХ ДИАЛЕКТОВ В ТРАКТОВКЕ ГОЗИ ОЛИМА ЮНУСОВА

Аннотация: *В статье рассматриваются взгляды просветителя-джадида Гози Олима Юнусова на систему гласных узбекских диалектов. Дается критико-аналитическая оценка его представлений о вокализме и системах гласных этих диалектов.*

Ключевые слова: *фонетико-фонологическая система, вокализм, вариативность, дифтонг, графема, простой гласный, гласный открытого (широкого) ряда, нейтральный гласный, гармония гласных.*

THE VOWEL SYSTEM OF UZBEK DIALECTS IN THE INTERPRETATION OF G‘OZI OLIM YUNUSOV

Abstract: *This article examines the views of the enlightened Jadid writer G‘ozi Olim Yunusov regarding the vowel system of Uzbek dialects. A critical and analytical assessment is provided of his perspectives on the vocalism and vowel systems of these dialects.*

Keywords: *phonetic-phonological system, vocalism, variation, diphthong, grapheme, simple vowel, faxish (harsh/tense) vowel, indifferent vowel, vowel harmony.*

Kirish. O‘zbek shevalarining fonetik-fonologik tizimi masalasi G‘ozi Olimning ikki asarida tadqiqot obyekti bo‘lgan. Adib “Maorif va o‘qitg‘uchi” jurnalining 1927-yil 12-sonida “O‘zbek tilining tovushlari” degan maqolani e’lon qiladi va unda o‘zbek tilidagi, aniqrog‘i, o‘zbek shevalaridagi unli va undosh fonemalarning miqdor va sifat xususiyatlarini yoritishga harakat qiladi. Unda isloh qilingan arab yozuvi va lotin alifbosiga asoslangan transkripsiyani qo‘llaydi. Bu manba N.Yangiboevaning “XX asrning 20-yillarida o‘zbek tilshunosligi jarayoni (“Maorif va o‘qitg‘uchi” jurnali materiallari asosida)” mavzusidagi dissertatsion ishida tahlil qilingan [1].

Adabiyotlar tahlili. “O‘zbek shevalari tasnifida bir tajriba” asarida esa “O‘rnaklarning imlosi” degan sarlavha ostida shevalardan matnlarni “baynalmilal ilmiy fonetik alifbe (unda qavs ichida M.F.A.)” bilan yozganligini qayd qiladi. Lekin o‘zi e’tirof etadiki, bu alifboga qat’iy amal qila olmagan. Buni bosmaxona qiyinchiliklari bilan bog‘laydi. Chunki, “*bosmaxonalarda ilmiy imloga tegishli harflar yo‘qligi*” [4;5]. Bu holatni tushunish mumkin, chunki ushbu asar nashr qilingan davr texnikasining ahvoli to‘g‘risida tasavvurlarimiz bor. G‘ozi Olim shevalardagi fonemalarning variatsiyalarini ko‘rsata olmagan yoki uni ko‘rsatish ilojisini topa olmaganligini “Biroq bu ko‘rina olmagan fonetik xususiyatlarning ma’noga ta’sir jihatidan semantik rollari yo‘qdir, ularning faqat talaffuz jihatlardangina ahamiyatli bo‘la oladi [4;5]” tarzida izohlaydi. Aslida shevashunoslik uchun har bir tovush ahamiyatli ekanligi G‘ozi Olimga ravshan bo‘lgan.

Tahlillar va natijalar. Bu ikki manba materiallari asosida o‘zbek tilidagi unlilar to‘g‘risida G‘ozi Olimning qarashlarini quyidagi tahlil qilish mumkin.

U unlilarni *juda tor, tor, o‘rta va keng darajasi* to‘g‘risida fikr yuritadi. G‘ozi Olim unlilardagi uch daraja deganda hozirgi adabiyotlarimizda qayd qilib kelinayotgan unlilar tasnifidagi og‘izning ochilish darajasi tamoyilini eslatadigan izohlar beradi, lekin ularni tavsiflashda fikr unlilarning cho‘ziqligi to‘g‘risida borayotganligini sezish mumkin, jumladan, “*i*” unlisini quyidagicha izohlaydi:

- yopiq bo‘g‘inlarda undan oldin va so‘ng ochiq bo‘g‘in bo‘lmasa, u “juda tor” (til uchi) tovushini ifoda qiladi. Unga misol keltirmaydi, balki “o‘rnaklarni yig‘ishda” qo‘llaganini aytadi, xolos. Buni shunday tushunish mumkin: *oldim, birdek* kabi so‘zlardagi *-dim, bir-* bo‘g‘inlarida juda tor daraja i unlisi qo‘llanadi;

- ochiq bo‘g‘inda va undan oldin va so‘ng yopiq bo‘g‘in kelsa, u kengroq daraja bo‘ladi, ya’ni, go‘yo, bu qoidasi *kichik, keldi* kabi so‘zlardagi *ki-, -di* bo‘g‘inlaridagi *i* unlisi “kengrak” darajadir. Uni o‘rta daraja deb tushunish mumkin;

- agar ochiq bo‘g‘in so‘zning oxirida bo‘lsa, uch daraja ochiqlik (ya’ni keng) bo‘ladi. Bu izohni davom ettirib, bunda *“i”* unlisining *“e”*ga moyil talaffuz qilinishini aytadi va *“ye”*ga yaqin tovush deb biladi. Ehtimol, u *eski, yangi* so‘zlaridagi *-ki, -ngi* kabi bo‘g‘inlarni ko‘zda tutgan bo‘lsa kerak. Ko‘rinadiki, bu o‘rinlarda og‘izning ochilish darajasi emas, balki unlilarning qisqa va cho‘ziq talaffuzi to‘g‘risida gap bormoqda. Shunda ham bu aytilganlar misollar bilan mustahkamlanishi lozim edi. Haqiqatan ham, o‘zbek shevalarida *“i”* unlisining cho‘ziq talaffuz etiladigan o‘rinlari bor. Professor K.Yudaxin Qorabuloq shevasida tushum kelishigi va o‘tgan zamon aniq fe’lidagi *“i”* unlisining cho‘ziq talaffuz qilinganligini e’tiborga olib, matn transkripsiyasini bergan [2;21], lekin G‘ozi Olim bu haqda emas, balki unlilarning uch daraja ochiqligi to‘g‘risida fikr yuritmoqda. Bunday fikr yuritish fonetik nazariyalarga mos kelmaydi, boshqacha ayiganda, barcha unlilarda ham og‘izning ochilishiga qarab uch darajani belgilash mumkin emas, balki unlilar og‘izning ochilish darajasiga ko‘ra tasnif qilinadi. U tor unlilardagi uch darajaga amal qilishning ahamiyatiga ham to‘xtalgan va bu borada shunday deydi: “O‘zbek tor unlilarning bunday uch daraja ochiqlik bilan ochilish qonunini bilmagan kishilar, ya’ni o‘zbek tilini o‘rganuvchilar talaffuzda juda *faxish* xatolar qilib, eshituvchi o‘zbekning lisoniy zavqini buzib, o‘z gapining ta’siriga zarba berishga yo‘l ochadi [4;6]”. Shu o‘rinda G‘ozi Olim izohlarida bir ishora haqida to‘xtalishni lozim topamiz. Bu ham bo‘lsa, ochiqlik darajasini belgilashda 9˚, 9>, <9, <9˚raqamlaridan foydalanganki, uni qanday maqsadlarda qo‘llaganliklarini bilish imkoni bo‘lmadi. Demak, bu uch darajaning faqat tor unlilarda mavjud bo‘lgan deb biladi.

G‘ozi Olim o‘zbek shevalarini tasnif qilishdan oldin keltirilgan misollar (o‘rnaklar) uchun transkripsiya belgilaridan foydalanish imkoniyatlarini yoritish chog‘ida o‘zbek shevalaridagi unli va undosh tovushlarning (ularni *fonem* deb ham yuritadi) artikulyatsiya va akustik xususiyatlari (talaffuz va eshitilish) to‘g‘risida ma’lumot beradi. Shuningdek, G‘ozi Olim *harf* va *tovush* terminlarini sinonim sifatida ishlatadi, bunday fikr yuritish ham davr an’anasi bilan bog‘liqdir, 1919 yilda “Chig‘atoy gurungi” tomonidan e’lon qilingan “Bitim yo‘llari” asarida *harf* termini ayni o‘rinda *tovush* ma’nosida qo‘llangan edi [6;13]. Demak, G‘ozi Olim an’ana doirasida bu terminni qo‘llagan.

Unlilar tavsifi. G‘ozi Olim davr an’anasiga tayangan holda unlilarni *bosit va murakkab unli*ga ajratadi. Bu terminlarning tabiati to‘g‘risida fikr bildirmaydi, balki o‘sha davr an’anasi sifatida qo‘llay beradi. Aslida *bosit* (*bəsit* tarzida berilgan) termini sodda unlilarni bildirgan, *murakkab* termini esa diftongni va *uv, iy* harfiy birikmalarni anglatgan. Bu unlilar tavsifini “O‘zbek shevalari tasnifida bir tajriba” va 1927-yilda e’lon qilgan “O‘zbek tilining tovushlari” maqolasidagi dastlabki fikrlari bilan qiyosan o‘rganamiz [3; 49-55]. To‘g‘ri, G‘ozi Olim “Tasnif”da 1927-yil “Maorif va o‘qitg‘uvchi” jurnalida e’lon qilingan tasnifidan voz kechadi, bundan shu maqoladagi unlilar to‘g‘risidagi fikridan ham voz kechgan, degan xulosa chiqmaydi.

Bosit unlilar tavsifi. **“i”** – bu harfni tor, til oldidan chiqadigan, g‘oyat qisqa aytiladigan tovush uchun oldim, deydi [4;5]. Avvalgi maqolasida uning “qisqa va ingichka kasra ekanligi eslatiladi, xolos. G‘ozi Olim bu tovushning barcha shevalarda uch daraja ochilishga ega ekanligini ham ta’kidlaydi.

“u” unlisi. Bu grafema bilan lablangan *i* unlisini ifoda qilamiz, deydi [4;6]. Bu yanglish fikr yuritish bo‘lib, *i* unlisi hech qachon lablangan bo‘la olmaydi, qolaversa**,** *i* unlisi uchun nima sababdan *u* unlisini olishi kerak, degan savolga javob bera olmaydi. Bu harfdan maqolada old qator, hozirgi lotin alifbosiga asoslangan transkripsiyada *ü* grafemasi bilan berilayotgan tovushni ifoda qilgan edi [1;15]. Uningcha, birinchi darajali ochiq bo‘lsa, eng tor lablangan til uchi unlisini, ikkinchi darajali (o‘rtada kelgan) unlini, uchinchi darajali ochiqlikda oxirgi bo‘g‘inda kelsa, lablangan *e* unlisiga yaqin 9 daraja tovushni ifoda qiladi. Bizningcha, bunday fikr yuritish hozirgi zamon fonetikachilarida uchramaydi. Bu o‘rinda uning old qator (*u – ü* oppozitsiyasidagi) unli ekanligi e’tirof etishi kifoya edi, balki lozim topilsa, nutq jarayonidagi tovush mosligi nuqtai nazardan ta’riflashi lozim edi. Aftidan, tovush mosligi qonunining u davrda hali e’tirof etilmaganligi boshqa unlilarga (*i* va *e*) yaqin degan tushunchani qo‘llashiga asos bo‘lgan.

“u” tovushi. Uni til orqa, tor, lablangan deb ta’riflaydi va barcha shevalarda qo‘llanishini e’tirof etadi. Bu jihatdan to‘g‘ri yo‘l tutadi, lekin bu unlini tor unli deb atagani holda uch daraja ochiqlik (keng) haqida fikr yuritishi mantiqqa zid ekanligini anglash qiyin emas.

- unlisini tavsiflashda “uch turli talaffuzni o‘z ustiga oladi” iborasini ishlatadi va uning quyidagi xususiyatlarini ko‘rsatadi:

bu unli, uningcha, yopiq bo‘g‘inda kelsa va bu yopiq bo‘g‘indan ilgari va so‘ng ochiq bo‘g‘in bo‘lmasa, bu tovush eng tor, qisqa, lablanmagan til orqasi *ы* unlisini ifoda qiladi [4;5]. Bu tavsifni shunday tasavvur qilish mumkin, ya’ni, go‘yo bu unli *aqtim* (yopiq bo‘g‘indan oldin ochiq bo‘g‘in kelmagan), *qilg‘an* (yopiq bo‘g‘indan keyin ochiq bo‘g‘in kelmagan) so‘zlarida qo‘llangan. Albatta, yopiq bo‘g‘indan oldin va keyin ochiq bo‘g‘inning kelmasligi *ї* unlisining tabiatini ochib bera olmas edi, balki til orqa qisqa *ї* unlisining qo‘llanishi singarmonizmli shevalarning fonetik xususiyati hisoblanadi;

- unlisini “so‘z boshida yoki so‘z o‘rtasida ochiq bo‘g‘inda kelsa, ikkinchi daraja ochiqliq bilan ’ tovushini bildiradi” [4;6] deb izohlaydi. unlisining ’ unlisiga o‘tishi, uning ikkinchi daraja ochiqligi to‘g‘risidagi fikr asossiz edi;

bu unli so‘zning oxiridagi ochiq bo‘g‘inda kelsa, uchinchi darajada kengayib (<9) tovushini ifoa qiladi [4;6], deb tushuntiradiki, fikr nima haqda borayotganligini anglash qiyin bo‘ldi, chunki (<9) belgisi nimani anglatishi bizga ma’lum emas edi.

maqolada unlisini “butun o‘zbek shevalarida mushtarak bo‘lub, faqat qalin so‘zlardagina kelaturg‘on qisqa va qalin kasradur” deydi va unga *qïlïq, qïr* so‘zlarini misol qilib keltiradi. Bu o‘rinda G‘ozi Olim *i* unlisining barcha shevalarda qo‘llanishi to‘g‘risida fikr yuritmoqdaki, uni ikki xil talqin qilish mumkin: 1) 1929-yildagi Til va imlo konferensiyasidan keyin o‘zbek adabiy tili uchun singarmonizmli shevalar asos qilib olinishi bilan shahar shevalari vakillari ham o‘z nutqlarida bu unlini qo‘llashga harakat qilganlar. Bu esa uning “butun o‘zbek shevalarida” degan iborani ishlatishga asos bo‘lgan; 2) G‘ozi Olim shahar shevalarida indifferent *i* unlisi (*i+ï = i*) mavjud bo‘lganligini bilmagan. G‘ozi Olimning: “O‘zbekcha so‘zlashguchi tojiklar forsiy tilida () qisqa, qalin kasra bo‘lmag‘anlig‘idan qalin so‘zlarda ham bu qisqa va ingichka kasrani ishlatadilar” [6;51] degan gapida G‘ozi Olim garchi o‘zi bu haqda fikr yuritmasa-da, N.Yangiboeva bu o‘rinda indifferent tovush haqida so‘z borishi lozimligini to‘g‘ri ilg‘ay olgan [1;25]. Ma’lumki, shahar shevalarida rus grafikasi asosidagi o‘zbekcha transkripsiyada ’ lotindagi *i* harfi bilan ifoda qilinadigan indifferent tovush bo‘lgan.

“e” harfi (tovushi). Bu unliga hozirgi tushunchalar darajasida ta’rif bera olgan, ya’ni uning o‘rta keng, old qator ekanligi aytiladi, lekin uni lablangan deb yuritadi [4;7]. Maqolada bu unlining lablanganligi to‘g‘risida fikr yuritilmagan. N.Yangiboeva G‘ozi Olimning yuqorida aytganimizdek, tovush mosligi qonunini tushunib yetmaganlikda ayblashi o‘rinlidir. Avvalgi maqolasidan farq qilgan holda bu ishida Farg‘ona qipchoqlari Qo‘rg‘ontepa va Oyimda yashovchi qipchoqlar nutqida birinchi bo‘g‘indan keyingi bo‘g‘inlarda *e* o‘qimasdan Σ o‘qish kerakligini uqtiradi. Bunda Σ belgisining qanday tovushni ifoda qilishini tavsiflamaydi, faqat bu belgining *ye* unlisidan kengroq ekanligini eslatib o‘tadi.

“ɵ” harfi (tovushi). Bu belgidan lablangan tovush uchun emas, balki Σ belgisining lablangani uchun ishlatganini aytadi. Maqolada bu unliga to‘g‘ri baho bergan edi. U mazkur ishida bu unli shevalarda so‘z boshida tor *u* (trans. *u*) tovushidan boshlab, so‘ngra birdan kengayib, ko‘p shevalarimizda holiga keladi, degan fikrni aytadi. Uning bu fikridan belgisi diftong(murakkab)ni ifoda qiladi. Bu belgi haqida ham ma’lumot bermaydi va u qatnashgan o‘rinlardan ham misollar keltirilmaydi. Uningcha, bu unlini Farg‘ona qipchoq shevalarida birinchi bo‘g‘inda diftong, keyingi bo‘g‘inlarda bosit qilib o‘qish kerak. Bu fikrda muayyan darajada haqiqat bor, faqat birinchi bo‘g‘in tushunchasini so‘z boshida deb tushunish lozim. *ɵ* unlisi singarmonizmli shevalarda so‘z boshida diftonglashishi adabiyotlarda aytilib kelinmoqda [5;41]. Yana bir masala. G‘ozi Olim labial singarmonizm to‘g‘risida fikr yuritmaydi, balki undan chekingan holatni boshqacha yo‘l bilan tushuntiradi: “...so‘nggi bo‘g‘inda (avvalgi bo‘g‘inda *ɵ* kelganda), (*i*) o‘qilishi lozimligini ko‘rsatadi. Shuningdek, *ɵ* () unlisini yana so‘z oxirida kelsa, *e* o‘qilishi kerakligini uqtiradi va “yoki” variantini ham beradi: *æ//ə* yoki *e***.** Bunday izohlashni o‘z davri xususiyati deb ham qarash mumkin, lekin o‘z davrining til bilimi shaxslari uning qanchalik ilmiy fikr ekanligini tasavvur qilishlari bizga qorong‘i bo‘lib qoladi.

“ə” unlisi. Uning old qator, keng, lablanmagan ekanligini aytadi va uni *æ* tovushi uchun ishlatganini aytadi. Aslida G‘ozi Olim *æ* va *ə* unlilarini farqlagan. Uningcha, qipchoq shevalarida *ə* unlisi birinchi bo‘g‘indan keyin kelgan bo‘g‘inlarda *æ* tovushidan torroq, *e* tovushidan kengroq, biroq *e* tovushiga moyil o‘qiladi. Bunday talqin hozirgi qarashlarga to‘liq mos keladi. *æ* unlisi to‘g‘risida Ye.D.Polivanov dastlabki maqolalarida yoritgan edi [7]. Bu tovush uchun hozirgi adabiyotlarda transkripsiyada *ϵ* grafemasi olingan va bu unli Namangan shevasida qo‘llanib kelayotir. O‘g‘uz shevalarida (uningcha, Xiva-Urganch) *ə* unlisi *e* unlisidan keng, “ə”dan tor bo‘lgan Σ tovushi barcha bo‘g‘inlarda kelib, æ tovushiga moyil aytilishini ta’kidlagan [4;7].

Qarluq shevalarida (uningcha, turk-barlos) *ə* harfi so‘z boshida æ tovushini ifoda qiladi va ikkinchi bo‘g‘inlarda undan torroq Σ tovushini ifoda qiladi, deb tushuntiradi [4;7].

Qipchoq, o‘g‘uz, qarluq shevlarida bu unlilarning qo‘llanishi bo‘yicha misollar keltirilmagan.

“**o” unlisi (harfi).** Uni til orqa, o‘rta kenglikda bo‘lgan, lablangan tovush ekanligi to‘g‘ri ko‘rsatilgan. Toshkent shevasida bu unlining indifferent ekanligi, ya’ni *o* va *ɵ* o‘rtasida talaffuz qilinishi to‘g‘risida fikr yuritadiki, bu hozirgi tushunchalarga mos keladi. Yana uni Toshkent shevasida *maxraj* jihatdan tovush o‘rta (mixed) vaziyatda bo‘lishi haqida fikr yuritadi. Bu fikrning shu o‘rindagi ahamiyatiga to‘xtalish lozim deb hisoblaymiz, ya’ni til o‘rta deb yuritishi takrorni bildiradi, lekin mixed (aralash) deb ko‘rsatishi qaysi masalani hal qilish uchun zarur bo‘lganligini anglash qiyin bo‘ldi.

Bu unlining qipchoq lahjasi shevalarida qo‘llanishi to‘g‘risida bildirgan fikrlarida imiylikdan yiroqlashadigan o‘rinlar ham bor. Dastlab so‘z boshida diftonglashishi to‘g‘risida fikr yuritadi, bu hozirgi adabiyotlarda ham qayd qilinadi. Lekin uning birinchi bo‘g‘indan keyingi bo‘g‘inlarda *ɔ* unlisiga aylanadi va uning (ɔ) ko‘p shevalarda *u* unlisiga aylanishi asossiz qolgan va uni munozara uchun ham qabul qilish qiyin.

“a” unlisi (uning faqat yozma variantini qo‘llaydi). Til orqa, keng, lablanmagan tovushligi aytilgan. Bu harf bilan bizning tushunchamizdagi *ā (ɔ)* unlisini ifoda qilgan. Afsuski, unga Toshkent va Xiva shevalaridan (matnda *tillari*) *alma* so‘zini misol sifatida keltirishi munozaraga sabab bo‘ladi, chunki Toshken shevasida bu so‘z *ālmä*, Xiva shevasida *alma*

tarzida talaffuz qilinadi. Demak, bu borada nazariy xatoga yo‘l qo‘ygan. Bu unlining Toshkent shevasida mustaqil fonema bo‘lganligini ta’kidlaydi-da, yana barcha shevalarda mavjud deb hisoblaydi. Albatta, bu o‘rinda fikr uyg‘unligi buzilgan. Bu unli uchun maqolada *ɔ* grafemasi tanlangan edi.

“a” unlisi. Uni bosma harf deb yuritadi. Bunday atalishi yuqorida *a* unlisidan alohida tovush uchun foydalanganligi sabab bo‘lgan. Bu unlining umumturkiy *a* unlisi deb tushungani to‘g‘ri, lekin bu unlini hech bir shevada mustaqil fonema emas, deyishi haqiqatdan yiroq, balki bu unli barcha singarmonizmli shevalarimizda qo‘llanayotganligi adabiyotlarda aks etib kelmoqda. G‘ozi Olim bu unli masalasida ayrim real va noreal ma’lumotlarni ham beradi. Bu unlining Toshkent shevasida *qanaqa, sadaqa* co‘zlarining hamma bo‘g‘inlarida qo‘llanishini payqay olgan. Bu to‘g‘ri, lekin uni faqat Toshkent shevasi bilangina bog‘lab qo‘yishi durust emas, chunki bu unli singarmonizmni yo‘qotgan shevalarimizda ham *q, g‘* ba’zan *x* undoshli so‘zlarda fonetik variatsiya sifatida qo‘llanishda bor. Bu unli bo‘yicha yana bir masala borki, unda *a* unlisi undoshlar (unda *unsiz*) orasida kelsa, u lablanib, teskari *ɒ* holiga keladi va barcha shevalarda qo‘llanadi, degan ma’lumotni beradi. Bu fikr faktik misollar orqali isbotlanmagan va keyingi dialektologik tadqiqotlarda ham bunday fikrlar uchramaydi. G‘ozi Olim bu asarida murakkab unlilar deb atalgan *–uv, uv (-üv), -iu, u* tovush birikmalariga to‘xtalmaydi, ular to‘g‘risida maqolada batafsil to‘xtalgan.

Xulosa qilib aytadigan bo‘lsak, o‘zbek shevalari vokalizmi xususida berilgan tavsiflarda chalkashliklar, noaniqliklar bo‘lishiga qaramay, XX asr boshlaridagi o‘zbek shevalarining fonetik-fonologik tizimini o‘rganish, tavsiflash va tasniflash masalalarini yoritishda G‘ozi Olim yaratgan yuqoridagi kabi tadqiqotlarning o‘z o‘rni bor. Adibning bu qarashlari yana maxsus o‘rganilishi lozim bo‘ladi.

Foydalanilgan adabiyotlar ro‘yxati

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PODCASTLARNING VODCASTLASHUV FENOMENI: TIPOLOGIK QIYOSIY TAHLIL

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Annotatsiya: *Ushbu maqolada O‘zbekiston va Qoraqalpog‘iston raqamli media makonida audio podcastlarning videoformatga transformatsiyalashuvi (vodcastlashuvi) omillari va bu jarayonning zamonaviy jurnalistik mahsulot sifatiga ko‘rsatayotgan ta’siri tizimli ravishda tahlil qilingan. Tadqiqotda “audiopodcast” va “videopodcast” tushunchalarining nazariy-konseptual farqlari ochib berilib, vizual effektlarning audiokontent mazmuniga hamda auditoriyaning qabul qilishiga ta’siri baholangan. Podcastlarning tematik tasnifi asosida vodcastlashuv fenomeni milliy va xorijiy media tajribasi misolida, qiyosiy-tahliliy metodlar yordamida har tomonlama o‘rganilgan.*

Kalit so‘zlar: *Podcast, Vodcastlashuv fenomeni (Vodcasting), media transformatsiya, vizuallashtirish, podcast tematikasi.*

ФЕНОМЕН ВОДКАСТИНГА В ПОДКАСТАХ: ТИПОЛОГИЧЕСКИЙ СРАВНИТЕЛЬНЫЙ АНАЛИЗ

Аннотация: *В данной статье систематически анализируются факторы трансформации аудиоподкастов в видеоформат (водкастинга) в цифровом медиапространстве Узбекистана и Каракалпакстана и влияние этого процесса на качество современного журналистского продукта. В исследовании раскрываются теоретико-концептуальные различия понятий "аудиоподкаст" и "видеоподкаст," а также оценивается влияние визуальных эффектов на содержание аудиоконтента и его восприятие аудиторией. На основе тематической классификации подкастов феномен водкастинга всесторонне изучается на примере опыта отечественных и зарубежных медиа с использованием сравнительно-аналитических методов.*

Ключевые слова: *Подкаст, феномен водкастинга (Vodcasting), медиатрансформация, визуализация, тематика подкастов.*

THE PHENOMENON OF VODCASTING IN PODCASTS: A TYPOLOGICAL COMPARATIVE ANALYSIS

Abstract: *This article systematically analyzes the factors driving the transformation of audio podcasts into a video format (vodcasting) within Uzbekistan’s digital media space, as well as the impact of this process on the quality of contemporary journalistic products. The study explores the theoretical and conceptual distinctions between "audio podcasts" and "video podcasts" and assesses the influence of visual elements on audio content and its perception by the audience. Based on a thematic classification of podcasts, the vodcasting phenomenon is comprehensively examined through the experience of domestic and foreign media, utilizing comparative and analytical methods.*

Keywords: *Podcast, vodcasting phenomenon, media transformation, visualization, podcast topics.*

Kirish. Jahon tajribasida podcastlar mobil va markazlashmagan (RSS-feed asosidagi) audio format sifatida qaraladi. G‘arbda podcast ko‘proq “audio-first” (avvalo audio) madaniyati bo‘lsa, Markaziy Osiyo, shu jumladan, O‘zbekiston va Qoraqalpog‘istonda podcast YouTube platformasi ta’sirida “vodcast” (Video On Demand Podcast), ya’ni video-podcast shaklida rivojlanmoqda. Bu tendensiya audio kontentning asosiy funksiyasi – “fonda tinglash” imkoniyatini ikkinchi planga surib qo‘ymoqda hamda YouTube-shoular, video-intervyular va bloglar bilan sinonim tarzli kontentni yuzaga keltirdi. Bu esa audio kontentning mustaqil media mahsuloti sifatida shakllanmayotganini, auditoriyaning vizual effektlarga bog‘lanib qolganini, texnik va platformaviy cheklanganlik mavjudligini (masalan, Spotify yoki Apple Podcasts o‘rniga faqat YouTube’ga qaramlik) ko‘rsatadi. Aslida, podcastning ko‘proq audio format sifatida o‘z o‘rniga ega bo‘lishi muhim. Sababi, katta hajmli ma’lumotlar va doimiy vizual agressiya asrida “ko‘zdan yiroq bo‘lish” va “ko‘p vazifalilik” (multitasking) imkoniyatlariga ega bo‘lgan audio-kontent inson diqqatini jamlash hamda axborotni qabul qilishning eng “ekologik” usuli sanaladi. Shunga qaramay, O‘zbekiston va Qoraqalpog‘iston media muhitida podcastning rivojlanishi klassik g‘arb modelidan (audio-only) o‘zgacha tarzda shakllanmoqda va podcastlarning video formatda ishlab chiqilishi –

bu auditoriyaning matn va audioga nisbatan vizual obrazlarni qabul qilishga moyilligi hamda ijodkorlarning monetizatsiya maqsadida YouTube'ga bog'lanib qolganligi natijasidir.

Metodologiya: O'zbek va qoraqalpoq jurnalistikasida podcast hali to'liq ilmiy tadqiq etilmagan, maxsus tasniflanmagan. Mavjud tadqiqotlarda podcast onlayn-jurnalistikaning bir qismi sifatida qaraladi, biroq audio va video dixotomiyasi (ajralishi) maxsus o'rganilmagan. Shu sababli, eng avvalo, O'zbekiston va Qoraqalpog'istondagi podcastlarning video-formatga transformatsiyalashuvi qonuniyatlarini aniqlash hamda buning natijasida yuzaga kelayotgan jurnalistik mahsulot sifatiga ta'sirini baholash muhim. "Audio podcast" va "Video podcast" tushunchalarining chegaralarini ilmiy asoslash, mahalliy podcastlarning auditoriyaga ta'sir mexanizmlarini qiyosiy o'rganish, vizual effektlarning audio-kontent mazmuniga ta'sirini ochib berish zarur. Biz podcast kontentining tematik tasnifi asosida vodcastlashuv fenomenini ko'rib chiqamiz.

Podcastlarning mavzu doirasi an'anaviy OAVga qaraganda ancha keng va tarmoqlangan xarakterga ega bo'lib, "umumiylikdan xususiylikka" tamoyili asosida rivojlanmoqda. Shu bois jahon media maydonidagi eng asosiy mavzularni tanlab olib, mahalliy podcastlar bilan qiyosiy tahlil qilamiz.

Natijalar: Ijtimoiy-siyosiy va tahliliy yo'nalishdagi podcastlar:

Zamonaviy jurnalistikada "Daily News" (Kundalik yangiliklar) podcastlari tez ommalashmoqda. Bu yerda asosiy farq shundaki, jurnalist nafaqat yangilikni yetkazadi, balki voqeaning "parda orti"dagi jihatlarini ham ochib ko'rsatadi. Masalan, The New York Times nashrining "The Daily" podcasti kunning dolzarb bir mavzusini tanlab olib, uni 20-30 daqiqa davomida ekspertlar ishtirokida muhokama qiladi.



Tahlil qilib ko'rsak, bu podcast turi sharhlov jurnalistikasiga yaqin keladi. Yuz bergan voqea-hodisani tushuntirish, anglatish, nimalar sabab bo'lganini, oqibatini, nimalarga ahamiyat berish kerakligini ko'rsatib beradi. Podcast texnik jihatdan audio va video formatda taqdim etilsa-da, uning turlari an'anaviy jurnalistikada mavjud bo'lgan ko'plab janrlarning transformatsiyalashuvi natijasida yuzaga kelganligi ko'rinadi.

Ilmiy tadqiqot ishlarida ham The Daily podcastlari «Times» jurnalistlari bilan bo'lgan suhbatlarga asoslangani aytilgan.[1] Suhbatlarda jurnalistlar o'zlari yoritgan voqeani umumlashtiradi va sharhlaydi. Shu bilan birga, podcast mavzuga oid audioyozuvlar yoki voqea ishtirokchilari bilan o'tkazilgan intervyular kabi original reportajlar bilan to'ldiriladi va ularga o'z fikrini bo'linmasdan aytish imkoniyati yaratiladi.

O'zbekistonda Kun.uz sayti ushbu tajribadan samarali foydalanib kelmoqda. Mamlakatimizda va jahonda yuz bergan muhim voqealar bo'yicha intervyular, kengaytirilgan ekspertlar bilan suhbatlar tashkillashtiriladi. Bu podcast formatiga juda yaqin. Sababi, Telegram kanaliga reklama sifatida qisqa video qo'yiladi, asosiy suhbatni esa YouTube'dan ko'rish imkoniyati yaratilgan. Biroq kontent video formatda bo'lib, podcast deb nomlanmagan. Agar u podcast deb ko'rsatilsa, ayrim materiallar formatga to'g'ri kelmay qolishi mumkin. Masalan, YouTube platformasi va Telegram kanaliga 2026 yil 7 yanvar kuni joylashtirilgan, boshlovchi Baxtiyor Muhammadov olib borgan «Infobiznesning ildizi – ilmsizlikda» nomli videoni olib ko'raylik. Unda jurnalist mehmon sifatida servis va savdo bo'yicha mutaxassis Alisher Rustamov bilan biznesda konsalting va trening xizmatlari to'g'risida fikrlashadi. Bu suhbat Telegram kanalida ikki formatda taqdim etilgan: xohlasangiz, matn orqali maqolani o'qishingiz, xohlasangiz, video bilan tanishishingiz mumkin. Suhbat 25 daqiqa davom etadi. Bu kontentning formati konvergent: matn, video va audio aralash. E'tiborlisi, videoni tomosha qilmay, shunchaki eshitib ham kerakli ma'lumotni to'liq olish mumkin. Shu bois, bu materialni video ko'rinishidagi podcast - vodcast deb qarash mumkin.

2026 yil 5 yanvar kuni esa siyosatshunos Farhod Tolipov, jamiyatshunos Mahmud Yo‘ldoshev, migratsiya masalalari bo‘yicha ekspert Botir Shermuhammad bilan jurnalist Shohrux Majidzoda o‘sha kunning dolzarb mavzusi - «Vaziyat yaxshilanishiga ishonish – fantastika»: faollar Xabarovskda o‘lgan migrant voqeasi haqida» mavzusida suhbatlashadi. Bu yerda videoni tomosha qilish zarurati bor. Voqea qanday yuz berganini ko‘rsatuvchi kadrlar qo‘yib berilgani uchun bu podcast ham, vodcast ham emas, balki videokontentdir. Shuning uchun ham kun.uz o‘z materiallariga podcast deb nom qo‘ymaydi.

Shuningdek, siyosatshunos Kamoliddin Rabbimov olib boradigan «Rabbimov fikri» ruknida doimiy ravishda siyosiy voqealarga sharh beriladi, ular chuqur tahlil qilinadi. Yoki saytning «Kun tafsiloti», «Jahon yangiliklari» kabi kundalik axborotnomalari ham podcast formatiga yaqin. Biroq, bularga aynan podcast deb nom qo‘yilmaganining sababi, birinchidan, o‘zbek va qoraqalpoq jurnalistikasida hanuzgacha podcastga norasmiy kontent sifatida qaraladi. Ikkinchidan, aniq mezonlarni bilmaslik sababli umumiy tarzda videokontent deb qo‘yishni ma’qul ko‘rishadi. Uchinchidan, yuqorida eslatib o‘tganimizdek, podcast deb nom berilsa, ayrim imkoniyatlar cheklanadi: kontentlar faqat fon rejimida eshitishga mo‘ljallanmagan, tinglovchi tomosha qilishga ham majbur bo‘ladigan o‘rinlar ko‘plab uchraydi.

Siyosiy-ijtimoiy tahlil yo‘nalishida katta auditoriya to‘plagan «Lolazor» va «Gazeta.uz» podcastlari ham bor. «Lolazor» podcasti turli soha vakillari bilan davlat boshqaruvi, qonunchilikdagi o‘zgarishlar, korrupsiyaga qarshi kurash va so‘z erkinligi kabi dolzarb rasmiy mavzulardagi suhbatlarni o‘zida jamlagan. Podcastni bir necha boshlovchi olib boradi. Bu ikki podcast an’anaviy OAVdagi «rasmiychilik»dan qochib, voqealarni tizimli va tanqidiy nuqtayi nazardan tahlil qilish orqali jamoatchilik nazorati funksiyasini bajarmoqda. Ayniqsa, «Lolazor» podcastida jurnalistlar va ekspertlar guruhi voqealarni shunchaki bayon qilibgina qolmay, ularning sabab va oqibatlarini ham batafsil yoritadi. Bu o‘rinda «agenda-setting» (kun tartibini belgilash) jurnalistlardan podcast mualliflariga o‘tayotgani seziladi. Podcastda muhokama qilingan mavzuning bir necha soat ichida boshqa elektron OAV va ijtimoiy tarmoqlar uchun asosiy mavzuga aylanishi uning jamiyatdagi ta’sir kuchini ko‘rsatadi.

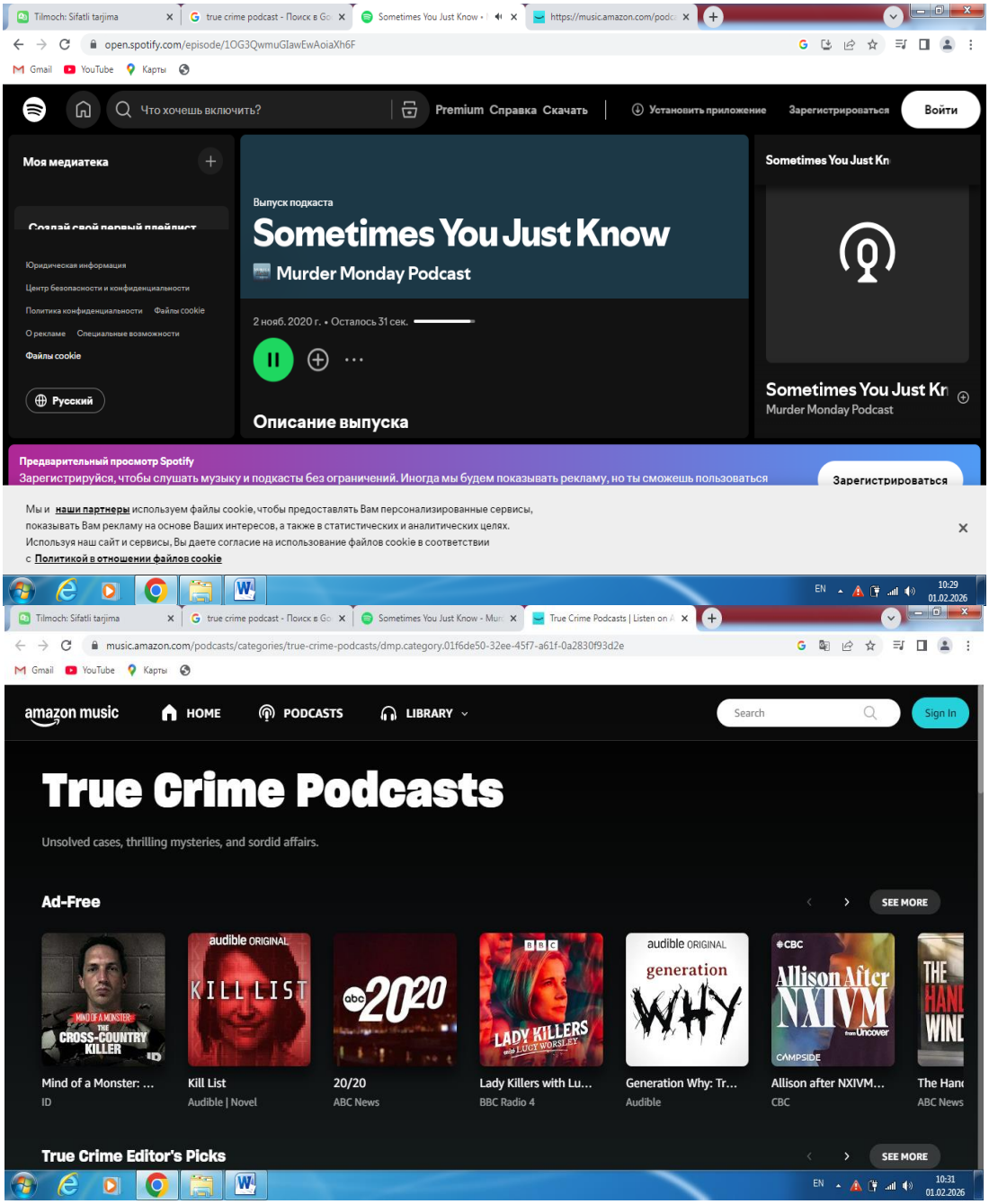
Internetning o‘zbek segmenti kunning dolzarb yangiliklarini, ijtimoiy-siyosiy mavzularni xorijiy tajriba asosida tahlil qilib berishni rasmiy saytlar yoki maxsus loyihalar doirasida podcastlar kontentlari orqali amaliyotga joriy etgan bo‘lsa-da, Qoraqalpog‘istonda bu tajriba hali kuzatilmayapti. Bizda ijtimoiy-siyosiy podcastlar yo‘q. The New York Times, The Guardian, BBC kabi yirik mediaxoldinglar ishlab chiqaradigan kundalik dolzarb yangiliklarni tahlil qiluvchi podkastlarga o‘xshash dasturlarni Qoraqalpog‘istonda ham ommalashtirish muhim. Buning uchun siyosiy savodxonlik darajasi yuqori sharhlovchi, publitsist, turli sohalardan malakali ekspertlar va yetuk podkasterlarga ehtiyoj bor.

Ikkinchi tematik yo‘nalish – surishtiruv jurnalistikasi (True Crime) podcastlaridir. Bu mavzudagi podcast inqilobi 2014-yillardan boshlandi. Jurnalist Sara Kyonigning “Serial” podcasti janrning zamonaviy ko‘rinishini yaratdi. Ushbu podcast chiqqanidan so‘ng, “True Crime” audio-industriyaning asosiy segmentiga aylandi[3].

Jinoyat haqidagi podcastlar nafaqat tinglovchilarni jalb qildi, balki jurnalistikada “interaktiv tergov” va “empatik hikoya qilish” kabi yangi tushunchalarni yuzaga keltirdi. Bunda jurnalist dalillarni bosqichma-bosqich taqdim etish orqali auditoriyani tergov jarayoniga jalb qiladi.

Global statistika va platformalar tahliliga qaraydigan bo‘lsak, Edison Research (2025) ma’lumotlariga ko‘ra, “True Crime” xotin-qizlar auditoriyasi orasida eng ko‘p tinglanadigan birinchi toifadagi janr bo‘lib qolmoqda[4].

O‘zbekiston va Qoraqalpog‘istonda aynan jinoyat ishlari va uning tafsilotlari to‘g‘risida jurnalistlar boshchiligida o‘tkazilgan surishtiruv natijalariga asoslangan maxsus podcastlar yo‘q, lekin “Milliy TV”da efirga uzatiladigan hamda YouTube platformasiga joylashtiriladigan “O‘tkir tergov” ko‘rsatuvi aktyorlar va tegishli organlar – Ichki ishlar xodimlari, prokurorlar, sudyalar hamda boshlovchi yordamida jinoyat ishlarini keng yoritadi. O‘zbekistonda ko‘proq video formatga murojaat qilinadi. Xorijda esa ko‘proq audio format tanlanadi va bu yaxshi usul. Video ko‘rinish yaratish bosqichida, ya’ni sahnalashtirishda obyektivlik tamoyili buzilishi mumkin. Shuningdek, yuz bergan holatni qayta sahnalashtirish, obyekt tanlash, mehmonlar uchun maxsus studiya, fon kabi qo‘shimcha masalalarga ortiqcha mablag’ va ko‘proq vaqt sarflanadi. Undan ko‘ra, jurnalist surishtiruvi kabi hujjatlarni o‘rganib, tegishli shaxslardan intervyu olib yoki suhbatlashish usullari orqali audio formatda taqdim etgan ma’qul. Jinoyat mavzusida haddan tashqari hissiyotga berilmaslik lozim va detallar qanday ishlatilganini video orqali aniq ko‘rsatish ham shart emas. Quyida xorijiy podcastlarning Spotify, Amazon platformalariga yuklangan ko‘rinishi bilan tanishishingiz mumkin.



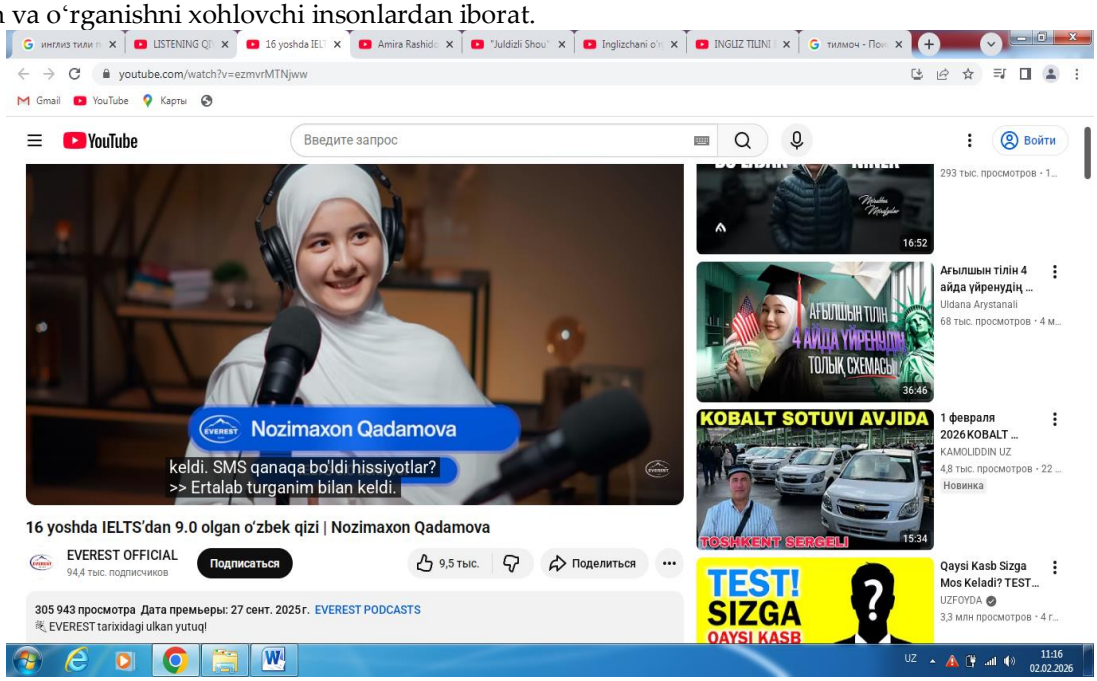
2025-yilning haqiqiy jinoyat podcastlari deb tan olingan xorijiy podcastlarni tahlil qilib koʻrganimizda, jinoyat podcastlarining oʻzi bir necha yoʻnalish va mavzuga boʻlinganligini kuzatdik. Jumladan, tergovga oid va hikoya shaklida tayyorlangan "In The Dark", "Serial", "Bear Brook", "Cold" hamda "Your Own Backyard" podcastlari yuqori koʻrsatkichga erishgan. Suhbat koʻrinishidagi "Crime Junkie", "Morbid", "My Favorite Murder", "Last Podcast On The Left" hamda "MrBallen Podcast" kabi podcastlar juda koʻp tinglangan. Hujjatli va yangiliklar koʻrinishidagi podcastlar ("Dateline NBC", "48 Hours", "20/20" va "Scamanda"), ixtisoslashgan yoxud parklardagi jinoyatlarni fosh etuvchi podcastlar ("Criminal", "Sistas Who Kill"), kichik shaharlardagi ochilmagan jinoyatlar ("Small Town Murder", "The Deck"), raqamli firibgarlik yoʻnalishidagi podcastlar ("The Missing Cryptoqueen", "Scamanda") kabi mayda mavzularga boʻlingan. Demak, podcast yirik yoʻnalish sifatida ichki boʻlinishga ega.

Raqamli media fenomeni boʻlgan podcastlarning yana bir muhim jihati shundaki, ular murakkab sohalarni sodda tarzda tushuntira oladi. Podcastlar ixtisoslashgan jurnalistika kabi tor doiradagi yoʻnalishlar, masalan, texnologiya, ta'lim, tarix yoki shaxsiy moliya, psixologiya boʻyicha ham millionlab auditoriya toʻplay oladi. Yangilik yoki muammoli boʻlmagan mavzular ham raqamli makonda oʻz xaridorini aynan podcastlar orqali topmoqda. Shu jihatlarni inobatga olsak, podcast onlayn muhitda ixtisoslashgan jurnalistika vazifasini bajarmoqda. Buni podcastning nishe (tor doiradagi) turlari isbotlaydi. Nishe podcastlar keng jamoatchilik uchun emas, balki ma'lum bir sohaga qiziqadigan ekspertlar va ishqibozlar uchun moʻljallangan kontent boʻlib, oʻsha sohaga yoʻnaltirilgan, tabiati murakkab ilmiy va iqtisodiy tushunchalarni "demokratlashtirish"ga imkoniyat yaratadi. Nishe podcastlar "hamma haqida hamma narsa" emas, balki "muayyan soha

haqida yetuk bilim" tamoyiliga asoslanadi. Bunday podcastning afzalligi monetizatsiya qilish imkoniyatidir: reklama beruvchi uchun 1 million "umumiy" tinglovchidan ko‘ra, 1000 ta aniq "xaridor" afzal.

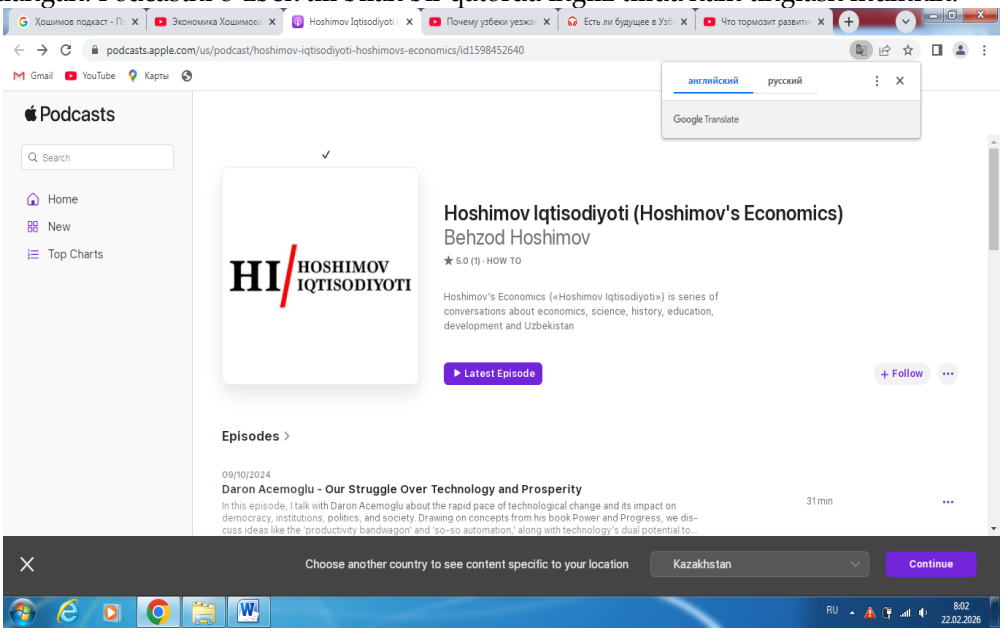
K. A. Pakulina va L. E. Petrovalarning "Podcast kreativ loyihalarni ilgari surish usuli sifatida: yaratish texnologiyasi" nomli ilmiy maqolasida ta’kidlanganidek, tor yo‘nalishdagi podcastlar ma’lum bir auditoriya uchun tor ixtisoslashgan ma’lumotlarni yetkazishda katta o‘rin tutadi. Ular tinglovchilarga o‘z sohasidagi so‘nggi yangiliklar va tendensiyalardan xabardor bo‘lishga yordam beradi, shuningdek, turli mavzularda suhbatlashish va muhokama qilish uchun imkoniyat yaratadi.

O‘zbekistonda til o‘rganishga oid podcastlar bisyor. Jumladan, “Cambridge podcast”, “Everest podcast” kabi loyihalar til o‘rganish va o‘rgatish bo‘yicha turli yuqori natijalarga erishgan insonlar bilan suhbatlar o‘tkazishga, tajriba almashishga asoslanadi. Formati – video, janri – suhbat. IELTS imtihonidan 8, 8.5, 9 natija ko‘rsatgan bir yoki bir necha instruktorlar bilan yoxud til o‘rganib, katta natijalarga erishgan yoshlar bilan suhbatlar o‘tkaziladi. Auditoriyasi ingliz tilini o‘rganayotgan va o‘rganishni xohlovchi insonlardan iborat.



IT sohasida ham O‘zbekistonda podcastlar yaxshi yuritilmoqda. RealSoft podcasti IT texnologiyalari, ushbu sohadagi ekspertlar, kompaniya egalari, dasturchilar bilan suhbat shaklida olib boriladi.

Biznes sohasida ham yoshlarning iqtisodiy savodxonligini oshirishga qaratilgan podcastlar ishlab chiqarilmoqda. "Hoshimov iqtisodiyoti" podcasti video formatda YouTube’da berib borilishi bilan bir qatorda Apple podcastiga audio formatda ham yuklangan. Podcastni o‘zbek tili bilan bir qatorda ingliz tilida ham tinglash mumkin.



“Hoshimov iqtisodiyoti» podcasti – asosan global iqtisodiy jarayonlar, bozor islohotlari, ta’lim sifati va institutsional o‘zgarishlar haqidagi ma’rifiy suhbatlar to‘plamidan iborat.

Din boʻyicha ulamolar, ustozlarning podcastlari muntazam ravishda turli ijtimoiy tarmoqlar qatorida YouTube'ga ham joylashtirib boriladi. Ular orasida Muhammad Sodiq Muhammad Yusuf, Abdulla domla audio toʻplamlari podcastga yaqin, video epizod deyarli yoʻq, faqat ekranga qandaydir rasm qoʻyiladi. Lekin ularni maxsus audio platformalarga emas, YouTube'ga joylashtirib qoʻyishgan. Chunki bizda YouTube orqali daromad topish, katta auditoriya yigʻish imkoniyati bor. Bu texnik jihatdan cheklanganlik belgisi boʻlsa, ikkinchidan, odamlar hali audio mahsulotni qabul qilish uchun vizual kontentdan zerikmaganini koʻrsatadi.

Vodcast koʻrinishidagi nishaviy podcastlar qatoriga kiruvchi psixologik suhbatlar ham koʻpaymoqda. Lekin YouTube'da koʻpchilik materiallar na podcast, na blog, na video kontent deb atalgan. Bu tasniflash muammosi borligini koʻrsatadi. Biz ularning ayrimlarini podcast degan qarorga keldik. Masalan, Abdulla domla bayonotlari sof podcast formatiga mos. Chunki ularni eshitishning oʻzi kifoya, koʻrish shart emas. Bu yoʻnalishdagi podcastlar "Long-form journalism" (uzun formatli jurnalistika) tamoyiliga asoslanadi. 40-60 daqiqalik suhbatlar tinglovchiga mavzuni toʻliq tushuntirib beradi. «Millat umidi», «Bu podcast», «Gurung» kabi suhbat asosiga qurilgan podcastlar ham sof audiopodcast talablariga javob bersa-da, video formatda tayyorlangan.

Bizda Sangzor.uz sayti alohida podcast boʻlimini yaratgan. Saytdan 50 ga yaqin turli mavzu va janrdagi audio formatli podcastlar oʻrin olgan. Ularning davomiyligi oʻrtacha 20-30 daqiqa atrofida. Maxsus audio platformalarga joylashtirilmaganligi sababli tinglovchilar sonini kam. Agar kelajakda har bir ommaviy axborot vositasi oʻz podcast platformasi yoki boʻlimini yaratadigan boʻlsa, bu masalani koʻrib chiqish zarurligi bor.

Shuningdek, soʻnggi yillarda milliy podcasting tizimida inson huquqlari, gender tengligi, psixologik salomatlik va shaxsiy hayotiy tajriba kabi mavzular alohida oʻrin egallamoqda. Bu yoʻnalishdagi podcastlarning asosiy oʻziga xosligi – "Empatiya effekti" hisoblanadi. Tinglovchi qahramonning hikoyasini tinglash orqali voqeani ichki his-tuygʻulari bilan his qiladi. Bu esa podcastning nafaqat axborot berish, balki ijtimoiy ongni oʻzgartirish funksiyasini ham kuchaytiradi.

Podcastlar hali yaxlit tasnifga ega emas: ayrim tadqiqotchilar podcastlarni mavzusiga koʻra ajratsa, boshqalari shaklini (dialog, monolog, polilog) asos qilib oladi, uchinchilari esa turlarga ajratishda bir necha mezonni aralashtirib yuboradi.

Qoraqalpogʻiston misolida olib qarasak, podcast hali tipologik jihatdan tasniflanadigan darajada rivojlanmadi. Qoraqalpoqcha podcast intervyu formatida rivojlanmoqda va aniq bir yoʻnalishga ega emas. Faqat "Kino podcast"ni nishaviy podcast sifatida olib qarash mumkin. Boshqa podcastlar intervyu formatida boʻlib, mehmon sifatida turli soha mutaxassislari, koʻproq shou-biznes vakillari taklif etiladi va ular bilan shaxsiy hayot, ijod hamda ish faoliyati, toʻplagan tajribalari yuzasidan suhbat oʻtkaziladi. "GÓJE podcast", "Orta Podcast", "Erkin podcast", "Sawbet podcast" "Kúnde Like", "Jolshi Juldiz", "Otaw ishinde" podcastlarining barchasi suhbat shaklida. Ulardan "Kúnde Like", "Jolshi Juldiz", "Erkin podcast", "Sawbet podcast", "Otaw ishinde" podcastlari uslubi an'anaviy ommaviy axborot vositalari koʻrsatuvlari formatiga mos. Boshlovchilar faqat savol berish bilan cheklanadi. Mavzuni birgalikda muhokama qilish, fikrlar toʻqnashuvi uchramaydi. Shuning uchun, kelajakda Qoraqalpogʻiston jurnalistikasi ham xorij jurnalistikasi singari ijtimoiy-siyosiy yoʻnalishdagi muhim yangiliklarni keng tahlil qilishga qaratilgan "The Daily" kabi hamda muayyan auditoriyaga (keksalar, ayollar, yoshlar, bolalar) moʻljallangan, aniq yoʻnalishdagi (IT, diniy, ekologiya, iqtisodiyot, til, psixologiya kabi) yoki hikoya formatidagi podkastlarni ishlab chiqarish kerak. Ikkinchidan, podkast audio yoki video formatda tayyorlanishidan qat'i nazar, uni har qanday ish bilan band holda ham tinglashga moʻljallangan boʻlishi maqsadga muvofiq.



Xulosa o‘rnida aytish mumkinki, milliy podcastlarning mavzu doirasini tahlil qilish O‘zbekiston va Qoraqalpog‘istonda podcastning "muqobil mediamaydon" vazifasini bajarayotganini ko‘rsatadi. U an’anaviy televideniye yoki radioda ko‘tarilishi qiyin bo‘lgan yoki yetarlicha muhokama qilinmaydigan mavzularni diqqat markaziga olib chiqmoqda. Bu esa podcastni axborot yetkazishning oddiy bir shakli emas, balki raqamli demokratiyaning muhim vositasi (fenomeni) sifatida tushunilishiga asos yaratadi.

Maqolada olib borilgan tadqiqotlar shuni ko‘rsatadiki, raqamli mediamuhitda podcastlar axborotdan foydalanish madaniyatini yangi sifat bosqichiga olib chiqdi. An’anaviy OAVga xos bo‘lgan umumiy kontent ishlab chiqarish modeli bugungi kunda auditoriyaning bo‘linishi (fragmentatsiyasi) va raqamli-personallashtirish fenomeni bilan almashmoqda. "Pastdan yuqoriga" (bottom-up) tamoyili asosida rivojlanayotgan ushbu tizim mediamahsulotning formati va kontent tuzilishini tubdan o‘zgartirdi. Iste’molchining erkin tanlov imkoniyati va raqamli bozor qonuniyatlari podcastlar tipologiyasi va tasnifiy xususiyatlarining doimiy ravishda evolyutsion rivojlanib borishini ta’minlaydi.

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"NUTQIY HUSHYORLIK" O'ZBEK TILIDA O'RGANILISHI VA TALQINI

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Annotatsiya: *Ushbu maqola ozbek tilida og'zaki muloqotdagi "nutqiy xushyorlik" masalasiga bag'ishlangan. Bunda asosan nutq odobiga alohida etibor beriladi. "Nutqoy xushyorlik" nutq faoliyatida har qanday kamsitilishlarga yol qoymaslikni, nomaqbul iboralarni qollamaslikni anglatadi*

Kalit so'zlar: *Til, nutq, og'zali muloqot, nutq odobi, nutqiy xushyorlik, muloqot madaniyati, maqollar, hikmatli sozlar.*

«ПОЛИТКОРРЕКТНОСТЬ» И ЕЁ ИЗУЧЕНИЕ И ИНТЕРПРЕТАЦИЯ В УЗБЕКСКОМ ЯЗЫКЕ

Аннотация: *Данная статья посвящена вопросу «политкорректности» в устном общении на узбекском языке. В статье особое внимание уделяется речевому этикету. «Политкорректность» означает недопущение любых форм дискриминации в речевой деятельности и отказ от употребления неуместных и нежелательных выражений.*

Ключевые слова: *язык, речь, устное общение, речевой этикет, речевая бдительность, культура общения, пословицы, мудрые изречения.*

"THE POLITICAL CORRECTNESS": ITS STUDY AND INTERPRETATION IN THE UZBEK LANGUAGE

Abstract: *This article is devoted to the issue of "the political correctness" in oral communication in the Uzbek language. Particular attention is paid to speech etiquette. "The political correctness" refers to the prevention of any form of discrimination in speech activity and the avoidance of inappropriate or undesirable expressions.*

Keywords: *language, speech, oral communication, speech etiquette, speech awareness, communication culture, proverbs, wise sayings.*

Kirish

Til millat ruhi va milliy tafakkur qurolidir. Til-millat-ruhiyat-tafakkur mexanizmi o'ta murakkab va chuqur ilmiy mushohadaga chorlovchi, har bir millat tilida alohida muammo sifatida antik davrlardan to hozirgi kungacha ko'plab tadqiqotlar manbayi sifatida o'rganilib kelinayotgan muhim masalalardan biri sanaladi. Til bu insonning butun borlig'i - moddiy turmushi, madaniy, ma'naviy hayoti, etnik va ruhiy holati, aqlu tafakkuri, estetik olami, o'tmishi, buguni va istiqbolini gavdalantiradi. Darhaqiqat, til millat belgisi sifatida muhim ahamiyatga ega.

O'zbek tilshunosligida ham nutqiy muloqot va uning amalga oshishi bilan bog'liq muammolar yuzasidan bir qator ilmiy tadqiqot ishlari amalga oshirilganligini alohida e'tirof etish mumkin. Jumladan, A. Nurmonov, A. E Mamatov, Sh. Safarov, N. Mahmudov, Sh.Iskandarova , S. Mo'minov, D. Xudoyberganova M.Hakimov, M. Saidxonov, F. Karimova, M.Qurbonova, A. L.Mamatqulov, G.Toirova, X. Yo'ldosheva, Q. Kaxarov, B. Ahmedov, M. Burxonova, G. Hasanova kabi olimlarning ilmiy tadqiqotlari shular jumlasidandir.

Dunyo tilshunosligining ustuvor paradigmasi sanalgan tilga antropotsentrik yondashuvning tatbiq etilishi til sohasida yangidan yangi tadqiqot yo'nalishlarining maydonga kelishiga keng yo'l ochdi. Natijada, til ilmi uning yaratuvchisi bo'lgan shaxs omiliga bog'liq holda tadqiq etish bosqichiga ko'tarildi, desak, mubolag'a qilmagan bo'lamiz. Xususan, bugungi o'zbek tilshunosligida ham mazkur paradigma ustuvorlik kasb etmoqda va bu yo'nalishda o'zbek tilshunos olimlari tomonidan muhim ilmiy-nazariyalar ilgari surilmoqda va e'tiborga molik ilmiy tadqiqotlar amalga oshirilayotganligini alohida qayd etish mumkin. Bu davrda tilshunosligimizda antroposentrik paradigmaga ko'ra til sohibining lisoniy tizimdagi o'rni, til va kognitiv faoliyat, til va madaniyat tushunchalari ushbu jarayonda yetakchilik qilishi ta'kidlanadi. Mustaqillik davrida davlat tili hisoblangan ona tilimizning jamiyatdagi roli, uning ijtimoiy vazifalari, tilning shaxs hayotida tutgan o'rni tobora oshib bormoqda. Shunga ko'ra insonlar hayotida muhim o'rinni egallovchi nutqiy jarayonlar, nutqiy muloqot mezonlari va nutq odobi masalasi xanuzgacha o'z dolzarbligini saqlab kelmoqda.

Chunki har qanday jamiyat va unda istiqomat qilayotgan insonlatning yeb-ichishdan-da ustun boʻlgan, eng muhim ehtiyoji - nutqiy muloqot masalasidir.

Globallashuv, fan-texnika taraqqiyoti, ijtimoiy munosabatlar tizimida yuz berayotgan oʻzgarishlar va ijtimoiy omillarning osib borayotganligi, albatta, insonlar hayotida, va eng muhimi, ularning ruhiyatida, muomala madaniyatida, maqsadlarida va oʻzaro aloqa aralashuvida oʻz ifodasini topmoqda. Natijada, muloqot tizimida ham oʻziga xos murakkabliklar, oʻzgarishlar maydonga kelmoqda. “Odamning kimligini bilmoqchi boʻlsang, soʻziga boq”,- deganlaridek, bu ehtiyoj abadul-abad jamiyat hayotida oʻz ustuvorligini yoʻqotmay kelmoqda. Shu sababdan “globallashuv jarayonida til va jamiyatning oʻzaro aloqasi, tilning rivojlanishiga ta’sir qiluvchi ijtimoiy omillar, jamiyatning turli sohalarida til funksiyalari ta’sirining oshishi va buning natijasida tilning ichki va tashqi tomondan rivojlanishiga doir izlanishlarga alohida e’tibor qaratilmoqda”[10].

Ilmiy manbalarda “til turli lisoniy va nolisoniy omillar ta’sirida oʻz-oʻzini tashkil etishi, funksional imkoniyatlari jihatidan turli gavdalanishi va qayta gavdalanishlarni yuzaga chiqarishi ta’kidlangani holda, tilda oʻz-oʻzini tashkillashtirishda quyidagi uch parametrni e’tiborga olish zarurligi uqtirib oʻtiladi:

1) geografik omil – makon omili;

2) xronologik omil – zamon, vaqt oʻqi:

3) sotsiologik omil – ijtimoiy muhit, madaniyat, din, millat, yosh kabi sotsial belgilar”.[6] Bu holat nutqiy muloqot mohiyatini ochib berish bilan bogʻliq muhim omillar hisoblanadi.

Xususan, prof. A.Nurmonov tildagi dinamika va oʻz-oʻzini tashkillashtirish jarayoni mana shu uch omilga asoslanishi va bu holat tilda qay holda namoyon boʻlishi yuzasidan quyidagilarni yozadi. “Til ham tabiat hodisalari kabi oʻz-oʻzini tashkil qiluvchi, tadrijiy tarzda yangi strukturalarni oʻzida namoyon etuvchi, sinergetik paradigma asosida rivojlanuvchi murakkab tizim hisoblanadi. Buni muayyan tillarning morfologik qurilishidagi oʻzgarishlar, bir holatdan boshqa sifat bosqichiga oʻtishga tomon siljishlar, ma’lum tillarda ichki va tashqi ta’sirlar natijasida turli xil belgilarning yuzaga kelayotgani kabi dalillar tasdiqlaydi”. Til kontaktining zamon va makon umumiyligiga koʻra farqlanuvchi ikki turi mavjud: bevosita til kontakti va bilvosita til kontakti. Bevosita til kontakti har xil til jamoasiga mansub shaxslarning yuzma-yuz muloqotiga asoslanadi. Bilvosita til kontaktida har xil til jamoasiga mansub ikki shaxsning muloqoti yo telefon, yo internetga ulangan kompyuter vositasida amalga oshadi.

Muloqot jarayonini shakllantirishda bosh omil sifatida lisoniy shaxs ishtiroki va uning maqomi asosiy masala sifatida markaziy oʻrinni egallaydi. Inson madaniy tajriba, lisoniy bilimlarga ega boʻlib borishi bilan oʻz shaxsiyatini shakllantiradi, shaxsiyatlar birlashib esa millat zehniyatini yuzaga keltiradi. Jamiyat – til – madaniyat tarzidagi muntazam ta’sirlashuvda lisoniy va madaniy malakalarning oʻzgarib turishi qanchalik tabiiy boʻlsa, jamiyat a’zolarining oʻz lisoniy va madaniy koʻnikmalarini barqaror saqlashga intilish ham shunchalik tabiiy holatdir.

XX asrning ikkinchi yarmidan boshlab nutqiy faoliyat masalasi tilshunoslikning alohida oʻrganish obyektiga aylandi. Shuning uchun dialog, harakatdagi nutqiy aktlar, diskurs bilan bogʻliq nazariy qarashlarga alohida e’tibor qaratilmoqda. Muloqot – maqsadli faoliyat va bu faoliyat doirasida bajariladigan har bir harakat ham oʻz maqsadi, intensiyasiga ega. Muloqot maqsadini oʻrganishda asosiy e’tibor muloqotning kognitiv jarayon ekanligiga qaratiladi. Muloqotga kirishayotgan shaxsning asosiy maqsadi axborotni uzatish emas, balki tinglovchini ushbu maqsadni anglashga undashdir. Nutqiy jarayonni oʻz ichiga olgan nutqiy vaziyatda turli fikr-mulohazalar (muloqot doirasidan chetga chiqmagan holda) bildiriladi.

Shuni ta’kidlash lozimki, muloqot jarayonidagi ishtirokchilarning ijtimoiy mavqe va maqomlari ham ularning suhbat jarayoniga ta’sir etadi va bu holat, ayniqsa, oʻzbek madaniyatidagi ayol va erkak, ota-ona va farzand, professor-talaba, boshliq-xodim kabi juftliklar muloqoti timsolida oʻziga xos milliy mentallik ifodalaydi. Nutqiy muloqot murakkab ijtimoiy munosabat boʻlib, u lingvistik va ekstralingvistik omillar ta’sirida yuzaga chiqadi. M.N.Krayevskaya bunday vaziyatda ma’lum bir predmetning mavjud/mavjud emasligi, zamonning qisqa/davomiyligi, muloqotchilarning umumiy, moddiy va ma’naviy, ijtimoiy va ruhiy holati, saviyasi, fahm-farosati, soni, faolligi/passivligi, oʻzaro joylashuvi, tanishganlik darajasi, munosabatlar, ijtimoiy kelib chiqishi ham muhim vazifa bajarishinini alohida qayd etadi. [3]

Professor A. L .Mamatqulov keyingi paytlarda koʻproq ingliz tilida soʻzlashuvchi mamlakatlarda “Political Correctness”(fransuz tilida – “le politiquement correct, rus tilida – politikorrektnost, oʻzbek tilida – “nutq odobi”, “siyosiy nutqiy hushyorlik”, “nutqiy hushyorlik”, “nutqiy andishalilik”, ”nutqiy xushmuomalalilik”) deb atalgan tushunchani ifodalovchi madaniy va lisoniy hodisa paydo boʻlganligi va koʻproq “nutqiy hushyorlik” istilohining masala mohiyatiga mos kelishini hamda buni istiloh sifatida qabul qilish maqsadga muvofiq deb hisoblaydi. Shuningdek, “nutqiy hushyorlik” tilshunoslikda yangi tushuncha boʻlib, nutq faoliyatida har qanday kamsitishlarga yoʻl qoʻymaslikni, nomaqbul iboralarni qoʻllamaslikni anglatadi. Ya’ni uning asl mohiyati nutq jarayonida u yoki bu mayda guruh (etnik, irqiy, jinsiy, ijtimoiy) vakillarining izzat-nafsi, nafsoniyatiga, hamiyatiga tegib ketmaslik, hayotdagi noxush voqea-hodisalarni yashirish yoki niqoblash, soʻzlovchining maqomi va gapning nima haqida borayotganligini aniq koʻrsatishdan iborat. Shunga mos

ravishda tilda yangi-yangi tushunchalar paydo boʻla boshlaydi, ular nutq obyektini toʻgʻridan toʻgʻri, dangal, oshkora ifodalamay, uni yumshoqroq, qochirimlar yoʻli bilan tavsiflashga xizmat qilishini alohida uqtirib oʻtadi. [4]

Darhaqiqat, nutqiy muloqot oʻnlab-minglab etnografik, ijtimoiy, falsafiy-madaniy, axloqiy-estetik, tarixiy, maishiy va ruhiy omillarning lisoniy birliklar bilan qorishuvidan iborat harakatli sistemadir. [2]

Oʻzbek muloqot madaniyati, odatda, salomlashishdan boshlanadi. Lekin ana shu salomlashishning oʻzidayoq bir qancha pragmatik mazmun yashiringan boladi. Bu holat bilan bogʻliq maʼnolar turli vositalar, yaʼni maqollar, hikmatli soʻzlar kesatiqlar va boshqalar yordamida salom berishdan koʻzda tutilgan maqsad va munosabatni yoritishga xizmat qilgan. Masalan, yosh bolalarga ertaklar orqali salom berish odobi uqtiriladi.”Gar slaloming boʻlmasa, ikki yamlab bir yutardim”,yoki “Boʻri bilan qoʻzichoq masalida”, maʼnfaatli boʻlsa ”quyuq salom berib qolibdi”, yoqtirmasa ”Salomingni pishirib ye”, “salomingni boshimga uramanmi” kabi pragmatik mazmun ifodalanadi.

Salom birovning ustunligini, oʻzining esa pastligini koʻrsatish uchun emas, balki bu odat madaniyat belgisidir. *Salomning ham salmoqlisi boʻladi,Kinoyali ilmoqlisi boʻladi*.[8] Darhaqiqat, Yozuvchi T.Malik toʻgʻri taʼkidlaganidak, insonlar maʼnfaatlari toʻqnashgan bugungi globallashuv sharoitida yuqorida taʼkidlaganimizdek, salom berish bilan bogʻliq pragmatik mazmun nihoyatda boyib bormoqda deyish mumkin.

Muloqotning samarali kechishi maʼlum qoidalar, muomala tamoyillariga amal qilishi bilan bogʻliq. Dunyo xalqlari muloqot odobi, muomala masʼuliyatiga oid minglab maqol-matallar yaratganlar, bu borada behisob nodir asarlar yaratilgan. Jumladan, Zardushtiylik dining muqaddas manbasi sanalgan “Avesto” da ham yetakchi uchta тушунчаning bittasi *ezgu soʻz [1]* ekanligi alohida taʼkidlangan. Shuningdek, sharq milliy madaniyati durdonalari boʻlmish ”Qutadgʻu bulig”, ”Qobusnoma”, “Hibatul haqoyiq” kabi madaniy yodgorliklar, buyuk mutafakkirlar Kaykovus,Yusuf Xos Hojib, Ahmad Yassaviy, Ahmad Yugnakiy, Alisher Navoiy, Soʻfi Olloyor kabi allomalarning asarlari bunga misoldir. Kaykovusning “Qobusnomada” keltirgan quyidagi pandlarini eslaylik: “Gar soʻzni va hunarni yaxshi bilsang ham hech bir soʻzni sindirmagil, toʻgʻri taʼrif qilgʻil va uni bir rangda aytgil: xosga xos soʻz, omiyga omiy soʻz degil, toki u hikmatga muvofiq boʻlsin va eshitgon kishiga ogʻir kelmasin, yoʻqsa soʻzingni dalil va hujjat bila ham eshitmagaylar. [7]

Til bu- moʻjizaviy, sirli xilqat, oʻziga xos bir dunyo. Uning moʻjizaviy tomoni shundaki, u bizga bir qator tovushlar yigʻindisi orqali butun olamning manzarasini, hayvonot, nabotot dunyosini, insonlarning his-tuygʻularini, ular orasidagi muloqot- munosabatlarni idroq etish, hazm qilish imkoniyatini beradi. Har bir tilning muayyan davrdagi holati uni yaratgan va unga ishlov bergan xalqning dunyoqarashi, tafakkuridan kelib chiqadi. Sharqda, xususan, oʻzbek lingvomadaniyatida aynan “Nutqiy hushrorlik” atamasi qoʻllanilgan boʻlmasa-da, qadimdan ota-bobolarimiz nutq odobi masalalariga yuqori darajada ahamiyat qaratganlar. Bunga tarixdan koʻplab dalillar keltirish mumkin. Masalan, X asrda yashab oʻtgan bobokalonimiz Y.X.Hojib oʻzining “Qutadgʻu bilig” asarida nutq odobi va soʻz qoʻllash, soʻzning mohiyati va undan keladigan foyda va zarar haqida quyidagilarni yozadi:

Soʻzni koʻp soʻzlama bir oz ozroq soʻzla
Tuman ming soʻz tugunini, [yaʼni jumbogʻini] shu bir soʻzda yech.
Kishi soʻz tufayli koʻtariladi, malik boʻladi,
Koʻp soʻz boshni yerga egadi.

Shuningdek, adib Ahmad Yugnakiyning “Hibatul haqoyiq” asarida ham nutq odobi yuzasidan quyidagilar bayon etilgan.

Soʻzni uqub soʻzla, shoshib (behuda) gapirma,
Soʻzingni yashir, keyin boshingni yashirib yurma.
Odoblar boshi tildir, uni tiymoq zarur.
Til yaralasa tuzalmaydi, oʻq jarohati esa bitib ketadi.

Shuningdek, xalq donishmandligi boʻlgan maqollarda ham nutq odobi bilan bogʻliq fikrlar ilgari surilgan [5]. Masalan :

Soʻz kishining oʻzagi,
Odob kishining bezagi
Taom lazzati - oʻzida
Odam lazzati - soʻzida
Til – aql tarozusi

Yuqoridagi maqollarga hamohang ravishda “Qobusnoma” da keltirilgan fikrlar ham tilni aql tarozusi ekanligini dalillaydi. Har kishining ahvoli oʻz soʻzi ostida yashiringan boʻladi. Bir soʻzni bir iborat bilan aytsa boʻladi, eshitgan kishining esa koʻngli parishon boʻladi, eshitgan kishining koʻngli bahra oladi.

Hikoyat. Horunar Rashid bir tush koʻradi, yaʼni ogʻzidagi hamma tishlari toʻkilib tushgan emish. Ertalab turib bir taʼbirchini chaqirib soʻradiki, bu tush taʼbiri nimadir. Taʼbirchi dedi:” Ey amiralmuʼmininin, sening huzuringda barcha qarindosh- urugʻlaring oʻladi, sendan boshqa hech kishi qolmaydi”

Horunar Rashid dedi:" Mening yuzimga shunday dard-anduh bilan to'lgan so'zni aytasanmi? Agar mening hamma qarindoshlarim o'lsalar, men nima ish qilaman va qanday qilib kun kechiraman?"- deb ta'birchini yuz tayoq urishga buyurdi. So'ngra boshqa bir ta'birchini chaqirdi va tushining ta'birini so'radi. Ta'birchi dedi:" Ey amrulmu'mininin, sening umring barcha qarindoshlaringning umridan uzun bo'ladi". Horunar Rashid dedi:" Barcha aqlning yo'li birdir va ikkovining ta'biri bir yerdan chiqadi. Ammo yuqoridagi ta'birchining iborasi bilan keying ta'birchining iborasining orasida farqi kattadir" va keyingi ta'birchiga yuz tilla berishni buyurdi.

Ey farzand, so'zning yuz va orqa tomonini bilgil, ularga rioya qilgil, so'zlaganingda ma'noli gapir, bu notiqlikning alomatidir. Agar gapirgan vaqtingda so'zning qanday ma'noga ega ekanini bilmasang, qushga o'xshaysan, bunday qushni to'ti deydilar.(To'ti) ham so'zlaydi, ammo so'zning ma'nosini bilmaydi. So'zni juda ham qimmatli deb bilgil, chunki xor narsa emasdir. Bilgan so'zingni o'z joyida ishlatgil, vaqtni bekorga o'tkazmagil. Agar vaqtni zoye qilsang, donishmandlikka putur yetkazgan bo'lasan.[9] A.Navoiy bobomiz esa "So'zdadur har yaxshiliqni imkoni bor, munda debturlarki, nafsning joni bor, -deya ta'kidlaydi. Demak, so'zda har qanday yaxshilikning imkoni bor ekan, u orqali suhbatdoshga kayfiyat bag'ishlash yoki ko'nglini cho'ktirish mumkin. Imkon boricha yaxshi so'zni so'zlash lozim. Xalqimizda "Odamning kimligini bilmoqchi bo'lsang, so'ziga boq"- degan maqol bor. Bu bejizga emas, chunki tildan chiqayotgan har bir so'z so'zlovchining butun borlig'i haqida ma'lumot berib turadi.

Xulosa:

Nutqiy xushyorlik- muloqot jarayonida nimani qanday gapirish yoki gapirmaslik mahorati bo'lib, bu jarayonda nutqiy xushyorlikni ta'minlashga xizmat qiladigan bir qancha terminlarning ahamiyati va ayni jarayonni ta'minlashdagi o'rni masalasiga ham e'tiborni qaratish maqsadga muvofiqdir.

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INGLIZ VA O‘ZBEK TILLARIDA NUTQIY MA’NO VA KOMMUNIKATIV FUNKSIYALAR OVERLAP HODISASINING KOGNITIV-DISKURSIV MEXANIZMLARI

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Annotatsiya: *Mazkur maqolada ingliz va o‘zbek tillarida nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasining kognitiv va diskursiv mexanizmlari qiyosiy-chog‘ishtirma asosda tahlil qilinadi. Overlap hodisasining yuzaga kelishida konseptual bilimlar, kommunikativ tajriba, diskursiv kontekst va interpretatsiya jarayonlarining o‘zaro integratsiyasi ilmiy jihatdan asoslanadi. Tadqiqot davomida ingliz va o‘zbek tillaridagi diskurs namunalarining qiyosiy tahlili asosida overlapning kognitiv-diskursiv modeli ishlab chiqiladi. Natijada Cognitive-Discursive Overlap Model (CDOM) taklif qilinadi hamda uning overlap hodisasini izohlashdagi nazariy va metodologik imkoniyatlari yoritiladi.*

Kalit so‘zlar: *overlap, nutqiy ma’no, kommunikativ funksiya, kognitiv jarayon, diskurs, konseptualizatsiya, interpretatsiya, qiyosiy tilshunoslik, CDOM.*

КОГНИТИВНО-ДИСКУРСИВНЫЕ МЕХАНИЗМЫ СОВПАДЕНИЯ ЗНАЧЕНИЯ РЕЧИ И КОММУНИКАТИВНЫХ ФУНКЦИЙ В АНГЛИЙСКОМ И УЗБЕКСКОМ ЯЗЫКАХ

Аннотация: *В данной статье на сравнительной основе анализируются когнитивные и дискурсивные механизмы феномена совпадения смысловых значений дискурса и коммуникативных функций в английском и узбекском языках. Научно обоснована взаимная интеграция концептуальных знаний, коммуникативного опыта, дискурсивного контекста и процессов интерпретации при возникновении феномена совпадения. В ходе исследования разработана когнитивно-дискурсивная модель совпадения на основе сравнительного анализа дискурсивных образцов на английском и узбекском языках. В результате предложена когнитивно-дискурсивная модель совпадения (КДЗ) и освещены ее теоретические и методологические возможности в объяснении феномена совпадения.*

Ключевые слова: *совпадение, смысловое значение дискурса, коммуникативная функция, когнитивный процесс, дискурс, концептуализация, интерпретация, сравнительная лингвистика, КДЗ.*

COGNITIVE-DISCURSIVE MECHANISMS OF THE OVERLAP OF SPEECH MEANING AND COMMUNICATIVE FUNCTIONS IN ENGLISH AND UZBEKISTAN

Abstract: *This article analyzes the cognitive and discursive mechanisms of the overlap phenomenon of discourse meaning and communicative functions in English and Uzbek on a comparative basis. The mutual integration of conceptual knowledge, communicative experience, discursive context and interpretation processes in the occurrence of the overlap phenomenon is scientifically substantiated. During the study, a cognitive-discursive model of overlap is developed based on a comparative analysis of discourse samples in English and Uzbek. As a result, the Cognitive-Discursive Overlap Model (CDOM) is proposed and its theoretical and methodological possibilities in explaining the overlap phenomenon are highlighted.*

Keywords: *overlap, discourse meaning, communicative function, cognitive process, discourse, conceptualization, interpretation, comparative linguistics, CDOM.*

KIRISH

Til birliklarining kommunikativ faoliyatdagi samaradorligi nafaqat grammatik yoki semantik xususiyatlarga, balki inson tafakkuri va diskursni tashkil etuvchi kognitiv jarayonlarga ham bog‘liq. Nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasi aynan ana shu murakkab integratsiya mahsuli sifatida namoyon bo‘ladi. Bir xil sintaktik yoki leksik birlik turli kommunikativ vaziyatlarda turlicha interpretatsiya qilinishi mumkin. Bunday holat overlapning faqat lingvistik hodisa emas, balki kognitiv va diskursiv mexanizmlar bilan chambarchas bog‘liq ekanligini ko‘rsatadi.

So‘nggi yillarda kognitiv tilshunoslik va diskurs tahlili yo‘nalishlarida til birliklarining konseptual asoslari keng tadqiq etilgan bo‘lsa-da, ingliz va o‘zbek tillarida nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasining kognitiv-diskursiv mexanizmlari kompleks qiyosiy asosda alohida tadqiq etilmagan. Ayniqsa, kommunikativ interpretatsiya jarayonida konseptual bilimlar, diskursiv kontekst va pragmatik omillarning o‘zaro ta’siri yetarli darajada yoritilmagan.

Mazkur maqolaning maqsadi ingliz va o‘zbek tillarida overlap hodisasining kognitiv-diskursiv mexanizmlarini qiyosiy-chog‘ishtirma asosda tahlil qilish, uning konseptual bosqichlarini aniqlash hamda Cognitive-Discursive Overlap Model (CDOM)ni ishlab chiqishdan iborat.

TADQIQOT MATERIALLARI VA METODLARI

Mazkur tadqiqot ingliz va o‘zbek tillarida nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasining kognitiv-diskursiv mexanizmlarini aniqlashga qaratildi. Tadqiqot materiali sifatida ingliz va o‘zbek tillaridagi badiiy, publitsistik hamda dialogik diskurs namunalari tanlandi. Tahlil jarayonida overlap hodisasining yuzaga kelishida konseptual bilimlar, diskursiv kontekst, kommunikativ maqsad va interpretatsiya jarayonlarining o‘zaro bog‘liqligi o‘rganildi.

Tadqiqotda qiyosiy-chog‘ishtirma metod, kognitiv tahlil, diskurs tahlili, pragmalingvistik tahlil, kontekstual kuzatish hamda konseptual modellashtirish metodlaridan foydalanildi. Har bir diskurs namunasi nutqiy vaziyat, konseptual faollashuv, kommunikativ strategiya va adresat interpretatsiyasi nuqtai nazaridan baholandi. Olingan natijalar ingliz va o‘zbek tillaridagi overlap hodisasining umumiy va farqli jihatlarini aniqlash imkonini berdi.

Tadqiqot davomida overlap hodisasining shakllanishida konseptual bilimlar, diskursiv rivojlanish va kommunikativ interpretatsiya bosqichlari yagona tizim sifatida qaralib, ular asosida Cognitive-Discursive Overlap Model (CDOM) ishlab chiqildi. Mazkur model overlapning kognitiv va diskursiv rivojlanish mexanizmlarini izchil bosqichlarda tavsiflaydi hamda ingliz va o‘zbek tillarida mazkur hodisaning kommunikativ tabiatini qiyosiy asosda izohlash imkonini beradi.

NATIJALAR VA TAHLIL

2.1. Overlap hodisasining kognitiv-diskursiv mohiyati

Nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasi faqat grammatik yoki semantik hodisa sifatida emas, balki inson tafakkuri va diskursni tashkil etuvchi murakkab kognitiv jarayonlarning mahsuli sifatida namoyon bo‘ladi. Har qanday kommunikativ birlik avvalo inson ongida konseptual model sifatida shakllanadi, keyinchalik esa diskurs jarayonida turli pragmatik omillar ta’sirida yangi kommunikativ funksiyalarni o‘zlashtiradi. Shu sababli overlap hodisasining mohiyatini anglash uchun til birliklarining kognitiv tashkil topishi hamda diskursiv rivojlanishini kompleks ravishda tahlil qilish zarur.

Kognitiv tilshunoslik nuqtai nazaridan nutqiy ma’no insonning konseptual bilimlari, tajribasi va mental modellari bilan uzviy bog‘liq. Diskurs esa ana shu konseptual bilimlarning real kommunikativ vaziyatda namoyon bo‘lish shaklidir. Overlap hodisasi aynan konseptual bilimlar bilan diskursiv rivojlanishning o‘zaro integratsiyasi natijasida yuzaga keladi. Natijada bitta til birligi turli kommunikativ vazifalarni bajaruvchi ko‘p funksiyali birlikka aylanadi.

Ingliz tilida overlapning kognitiv-diskursiv rivojlanishi ko‘proq eksplicit sintaktik vositalar, modal konstruksiyalar va diskurs markerlari orqali amalga oshadi. O‘zbek tilida esa kommunikativ vaziyat, milliy nutq odobi, implitsit ma’no hamda kontekstning roli kuchliroq namoyon bo‘ladi. Shuning uchun ingliz tilida overlap ko‘proq formal diskursiv vositalar orqali, o‘zbek tilida esa kontekst va pragmatik tajriba orqali yuzaga chiqadi.

Qiyosiy kuzatishlar shuni ko‘rsatdiki, overlap hodisasining shakllanishida uchta asosiy komponent ishtirok etadi: konseptual faollashuv, diskursiv rivojlanish va kommunikativ interpretatsiya. Aynan ushbu komponentlarning uzviy integratsiyasi overlap hodisasining kognitiv-diskursiv asosini tashkil etadi.

2.2. Ingliz va o‘zbek tillarida overlap hodisasining kognitiv-diskursiv modeli

Ingliz va o‘zbek tillarida nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasining qiyosiy tahlili mazkur hodisaning shakllanishi inson tafakkuri, konseptual bilimlar, diskursning rivojlanishi va kommunikativ interpretatsiyaning uzviy integratsiyasi asosida amalga oshishini ko‘rsatdi. Overlap hodisasi alohida lingvistik birliklarning yig‘indisi emas, balki bir necha kognitiv va diskursiv jarayonlarning ketma-ket hamda o‘zaro bog‘liq faoliyati natijasidir. Shu sababli uni izohlashda faqat sintaktik yoki pragmatik omillar bilan cheklanib bo‘lmaydi.

Tahlillar shuni ko‘rsatdiki, overlap hodisasining yuzaga kelishida konseptual bilimlar diskursni shakllantirishning boshlang‘ich nuqtasi hisoblanadi. Inson ongida mavjud bo‘lgan bilimlar, tajribalar va mental modellar kommunikativ maqsad bilan uyg‘unlashib, diskursni qurish strategiyasini belgilaydi. Mazkur strategiya nutqiy ma’noning shakllanishi va kommunikativ funksiyalarning tanlanishiga bevosita ta’sir ko‘rsatadi.

Ingliz tilida kognitiv-diskursiv jarayon ko‘proq grammatik va leksik markerlar orqali ochiq ifodalansa, o‘zbek tilida implitsit ma’nolar, milliy nutq odobi va kontekstual bilimlarning ulushi yuqoriroq ekanligi kuzatildi. Natijada har ikki tilda overlap hodisasi umumiy kognitiv tamoyillar asosida rivojlansa-da, uning diskursiv realizatsiyasi til tizimining tipologik va madaniy xususiyatlariga mos ravishda farqlanadi.

Tadqiqot davomida overlap hodisasining shakllanishida konseptual faollashuv, diskursiv konstruktsiyalash, kommunikativ kodlash, overlap integratsiyasi hamda interpretatsiya bosqichlari izchil ravishda namoyon boʻlishi aniqlandi. Mazkur bosqichlarning oʻzaro uygʻunligi natijasida bitta nutqiy birlik bir vaqtning oʻzida bir nechta kommunikativ funksiyani bajaruvchi koʻp qatlamli kommunikativ tuzilmaga aylanadi.

Olingan natijalar asosida overlap hodisasining kognitiv va diskursiv rivojlanish bosqichlarini umumlashtiruvchi Cognitive-Discursive Overlap Model (CDOM) ishlab chiqildi. Mazkur model overlap hodisasining konseptual asosdan boshlab yakuniy kommunikativ interpretatsiyagacha boʻlgan barcha jarayonlarini yagona tizim sifatida izohlash imkonini beradi.

1-jadval. Ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv xususiyatlari (muallif ishlanmasi)

Tahlil mezoni	Ingliz tili	Oʻzbek tili
Konseptual asos	Individual konseptual faollashuv ustuvor	Jamoaviy va madaniy konseptlar ustuvor
Diskursni shakllantirish	Grammatik va leksik markerlar orqali	Kontekst va nutq odobi orqali
Axborotni kodlash	Eksplicit ifoda	Koʻproq implitsit ifoda
Kommunikativ strategiya	Aniqlik va mantiqiy ketma-ketlik	Vaziyatga moslashuvchanlik
Overlapning kognitiv manbai	Konseptual integratsiya	Konseptual va madaniy integratsiya
Interpretatsiya	Lingvistik markerlarga tayanadi	Kontekst va madaniy bilimlarga tayanadi
Kommunikativ natija	Funksional aniqlik	Pragmatik moslashuvchanlik

Jadval maʼlumotlari ingliz va oʻzbek tillarida overlap hodisasi umumiy kognitiv tamoyillar asosida shakllanishini, biroq uning diskursiv rivojlanishi va kommunikativ interpretatsiyasi har bir tilning tipologik hamda lingvomadaniy xususiyatlari bilan belgilanishini koʻrsatadi. Ingliz tilida lingvistik markerlarning roli ustun boʻlsa, oʻzbek tilida kontekst, madaniy bilim va pragmatik tajriba asosiy omil sifatida namoyon boʻladi. Shu jihatdan overlap hodisasi kognitiv va diskursiv omillarning integratsiyasi natijasida yuzaga keluvchi koʻp qatlamli kommunikativ tizim sifatida tavsiflanadi.

2.3. Ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv modeli (CDOM) (muallif ishlanmasi)

Tadqiqot natijalari ingliz va oʻzbek tillarida nutqiy maʼno hamda kommunikativ funksiyalar overlap hodisasi inson tafakkuri, konseptual bilimlar va diskursiv rivojlanish jarayonlarining uzviy integratsiyasi asosida shakllanishini koʻrsatdi. Overlap hodisasi til tizimining alohida sathlariga xos hodisa boʻlmay, balki kognitiv jarayonlar va kommunikativ faoliyatning oʻzaro taʼsiri natijasida yuzaga keladigan murakkab tizimdir. Shu bois mazkur hodisani izohlash uchun konseptual faollashuvdan boshlab yakuniy kommunikativ interpretatsiyagacha boʻlgan bosqichlarni yagona modelda ifodalash zarurati yuzaga keldi.

Tahlillar asosida Cognitive-Discursive Overlap Model (CDOM) ishlab chiqildi. Mazkur model overlap hodisasining shakllanishini yettita oʻzaro bogʻliq bosqich orqali izohlaydi.

Modelning birinchi bosqichi – konseptual faollashuv hisoblanadi. Bu bosqichda kommunikativ vaziyat taʼsirida inson ongida mavjud konseptlar, tajriba va ensiklopedik bilimlar faollashadi. Aynan shu bilimlar keyingi nutqiy faoliyatning mazmuniy asosini tashkil etadi.

Ikkinchi bosqich – kommunikativ maqsadni shakllantirishdir. Soʻzlovchi oʻz kommunikativ niyatini aniqlaydi va axborotni qanday shaklda ifodalash strategiyasini tanlaydi. Mazkur bosqichda diskursning umumiy yoʻnalishi belgilanadi.

Uchinchi bosqich – diskursiv konstruksiyalash bosqichidir. Bu yerda konseptual bilimlar til vositalari yordamida diskursga aylantiriladi. Leksik birliklar, grammatik konstruksiyalar va pragmatik markerlar yagona kommunikativ tizimni hosil qiladi.

Toʻrtinchi bosqich – nutqiy maʼno va kommunikativ funksiyalar integratsiyasi hisoblanadi. Ushbu bosqichda til birliklarining semantik mazmuni kommunikativ vazifa bilan uygʻunlashadi. Natijada bitta birlik bir vaqtning oʻzida axborot berish, baholash, taʼsir koʻrsatish yoki munosabat bildirish kabi bir nechta funksiyalarni bajarish imkoniyatiga ega boʻladi.

Beshinchi bosqich – overlap hodisasining yuzaga kelishidir. Aynan shu bosqichda nutqiy maʼno va kommunikativ funksiyalar oʻzaro kesishib, koʻp qatlamli kommunikativ tuzilmani hosil qiladi. Overlap hodisasi kommunikativ samaradorlikni oshirishga xizmat qiladi.

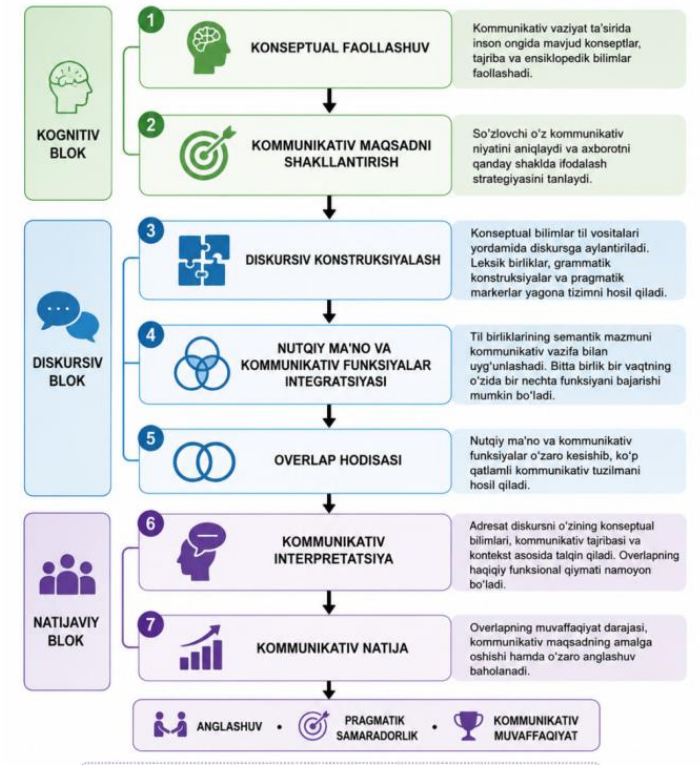
Oltinchi bosqich – kommunikativ interpretatsiya bosqichida adresat diskursni oʻzining konseptual bilimlari, kommunikativ tajribasi va kontekst asosida talqin qiladi. Interpretatsiya jarayonida overlapning haqiqiy funksional qiymati namoyon boʻladi.

Yettinchi bosqich – kommunikativ natija hisoblanadi. Ushbu bosqichda overlapning muvaffaqiyat darajasi, kommunikativ maqsadning amalga oshishi hamda soʻzlovchi va tinglovchi oʻrtasidagi oʻzaro anglashuv baholanadi.

Taklif etilgan **Cognitive-Discursive Overlap Model (CDOM)**ning ilmiy yangiligi shundaki, unda overlap hodisasi ilk bor kognitiv va diskursiv mexanizmlarning uzviy integratsiyasi sifatida bosqichma-bosqich modellashtirildi.

Model konseptual faollashuv, kommunikativ rejalashtirish, diskursiv konstruksiyalash, semantik-funksional integratsiya, overlap, interpretatsiya va kommunikativ natija oʻrtasidagi sabab-oqibat munosabatlarini yagona nazariy tizimga birlashtiradi. Shu jihatdan CDOM ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv tabiatini qiyosiy oʻrganishda yangi metodologik yondashuv sifatida tavsiya etiladi.

2-rasm. Ingliz va oʻzbek tillarida nutqiy maʼno va kommunikativ funksiyalar overlap hodisasining kognitiv-diskursiv modeli (CDOM) (muallif ishlanmasi)



2-rasm. Overlap hodisasining kognitiv-diskursiv modeli (CDOM) (muallif ishlanmasi)

2.4. Ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv xususiyatlarining qiyosiy tahlili

Ingliz va oʻzbek tillarida nutqiy maʼno hamda kommunikativ funksiyalar overlap hodisasining kognitiv-diskursiv tahlili mazkur hodisaning har ikkala tilda umumiy kognitiv qonuniyatlarga asoslangan holda shakllanishini, biroq uning diskursiv realizatsiyasi va kommunikativ interpretatsiyasida muayyan tipologik farqlar mavjudligini koʻrsatdi. Har ikki tilda ham overlap hodisasi konseptual bilimlarning faollashuvi, kommunikativ maqsadning shakllanishi va diskursning rivojlanishi natijasida yuzaga keladi. Biroq ushbu bosqichlarning amalga oshish usullari tilning strukturaviy va lingvomadaniy xususiyatlariga bogʻliq ravishda farqlanadi.

Tahlillar shuni koʻrsatdiki, ingliz tilida kognitiv-diskursiv jarayonlarning asosiy xususiyati kommunikativ maqsadning grammatik va leksik vositalar orqali aniq kodlanishidir. Diskursni tashkil etishda modal feʼllar, bogʻlovchilar, diskurs markerlari va sintaktik vositalar muhim rol oʻynaydi. Shu sababli overlap hodisasi koʻpincha eksplicit ifodalanadi va adresat tomonidan lingvistik markerlar asosida interpretatsiya qilinadi.

Oʻzbek tilida esa overlap hodisasining kognitiv-diskursiv tabiati milliy nutq odobi, implitsit maʼno, vaziyatga moslashuvchanlik hamda kontekstual bilimlarning ustuvorligi bilan tavsiflanadi. Kommunikativ maqsad koʻpincha grammatik shakldan tashqari pragmatik omillar orqali ham anglashiladi. Natijada bir xil sintaktik yoki leksik birlik turli kommunikativ vaziyatlarda turlicha pragmatik yuklama kasb etishi mumkin.

Qiyosiy kuzatishlar overlap hodisasining shakllanishida konseptual faollashuv, diskursiv rivojlanish, kommunikativ integratsiya va interpretatsiya bosqichlari har ikki tilda ham mavjudligini koʻrsatdi. Biroq ingliz tilida mazkur bosqichlarning oʻzaro bogʻliqligi koʻproq lingvistik vositalar orqali namoyon boʻlsa, oʻzbek tilida ekstralingvistik omillar, kommunikativ tajriba va madaniy bilimlar bilan mustahkamlanadi.

Olingan natijalar asosida overlap hodisasining kognitiv-diskursiv rivojlanishi konseptual bilimlardan boshlanib, diskursiv konstruksiyalash, semantik-funksional integratsiya va kommunikativ interpretatsiya orqali yakunlanadigan uzluksiz jarayon ekanligi ilmiy jihatdan asoslandi. Aynan mazkur ketma-ketlik Cognitive-Discursive Overlap Model (CDOM)ning nazariy asosini tashkil etadi.

2-jadval. Ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv xususiyatlarining qiyosiy tavsifi (muallif ishlanmasi)

Tahlil mezoni	Ingliz tili	O‘zbek tili
Konseptual faollashuv	Individual bilim va tajribaga tayanadi	Individual va jamoaviy-madaniy bilimlarga tayanadi
Kommunikativ maqsad	Oldindan aniq rejalashtiriladi	Vaziyatga mos ravishda shakllanadi
Diskursni qurish	Grammatik va diskurs markerlari ustuvor	Kontekst va nutq odobi ustuvor
Nutqiy ma’noni kodlash	Asosan eksplicit	Ko‘proq implitsit
Overlapning yuzaga kelishi	Lingvistik vositalar integratsiyasi orqali	Lingvistik va ekstralingvistik omillar integratsiyasi orqali
Interpretatsiya	Til birliklari va diskurs markerlariga tayanadi	Kontekst, madaniy bilim va kommunikativ tajribaga tayanadi
Kommunikativ natija	Mazmunning aniq va izchil anglashilishi	Pragmatik moslashuv va kommunikativ uyg‘unlik

Jadval natijalari ingliz va o‘zbek tillarida overlap hodisasining kognitiv-diskursiv rivojlanishi umumiy konseptual qonuniyatlarga asoslanishini, biroq uning kommunikativ realizatsiyasi tilning tipologik va lingvomadaniy xususiyatlari ta’sirida o‘ziga xos shakllanishini ko‘rsatadi. Shu jihatdan CDOM modeli overlap hodisasining nafaqat kognitiv yoki diskursiv, balki ularning integratsiyasi asosida yuzaga keladigan ko‘p bosqichli kommunikativ tizim ekanligini nazariy va amaliy jihatdan asoslaydi.

MUHOKAMA

Mazkur tadqiqot natijalari ingliz va o‘zbek tillarida nutqiy ma’no hamda kommunikativ funksiyalar overlap hodisasining kognitiv va diskursiv mexanizmlari o‘zaro uzviy bog‘langan ko‘p bosqichli kommunikativ tizim ekanligini ko‘rsatdi. Olingan natijalar zamonaviy kognitiv tilshunoslik, diskurs nazariyasi va kommunikativ lingvistika doirasida ilgari surilgan ayrim nazariy qarashlarni tasdiqlash bilan birga, overlap hodisasining shakllanish jarayoniga oid yangi ilmiy yondashuvni ham taklif etadi.

Tadqiqot davomida overlap hodisasining shakllanishi konseptual faollashuv, kommunikativ maqsadni belgilash, diskursiv konstruksiyalash, semantik-funksional integratsiya va kommunikativ interpretatsiya bosqichlarining izchil ketma-ketligi asosida amalga oshishi aniqlandi. Mazkur natijalar T. A. van Dijkning diskursni insonning kognitiv bilimlari va kommunikativ vaziyati bilan bog‘liq dinamik tizim sifatida talqin qiluvchi nazariy qarashlari bilan uyg‘unlashadi [1]. Biroq mazkur tadqiqotda diskurs faqat axborot uzatish vositasi sifatida emas, balki overlap hodisasini yuzaga keltiruvchi asosiy mexanizm sifatida izohlandi.

Natijalar Ch. Fillmorning freym semantikasi nazariyasi bilan ham mos keladi [2]. Fillmor til birliklarining ma’nosi ularni tushunish uchun zarur bo‘lgan konseptual freymlar orqali shakllanishini ta’kidlaydi. Tadqiqot natijalari esa freymlarning faollashuvi kommunikativ vaziyatga bog‘liq holda overlap hodisasining yuzaga kelishiga xizmat qilishini ko‘rsatdi. Demak, overlapning mazmuniy asosini alohida til birliklari emas, balki ularni birlashtiruvchi konseptual tuzilmalar tashkil etadi.

Shuningdek, G. Fauconnier va M. Turner tomonidan ishlab chiqilgan konseptual integratsiya nazariyasi (Conceptual Blending Theory) mazkur tadqiqot natijalarini izohlashda muhim metodologik asos bo‘ldi [3]. Mazkur nazariyaga ko‘ra, inson tafakkuri turli konseptual maydonlarni integratsiyalash orqali yangi ma’nolarni hosil qiladi. Olingan natijalar overlap hodisasi ham aynan semantik va kommunikativ maydonlarning integratsiyasi natijasida yuzaga kelishini ko‘rsatdi. Shu bilan birga, tadqiqotda ushbu integratsiyaning diskursiv rivojlanish bosqichlari ham tizimli ravishda tavsiflandi.

Tadqiqot natijalari R. Langackerning kognitiv grammatika nazariyasi bilan ham uyg‘unlashadi [4]. R.Langacker grammatik birliklarni konseptual jarayonlarning til tizimidagi ifodasi sifatida talqin qiladi. Ushbu tadqiqotda esa grammatik vositalar overlap hodisasining asosiy manbai emasligi, balki konseptual va diskursiv jarayonlarni yuzaga chiqaruvchi vosita ekanligi ilmiy jihatdan asoslandi. Bu overlap hodisasini faqat grammatik yoki semantik doirada emas, balki kommunikativ-kognitiv tizim sifatida ko‘rib chiqish zarurligini ko‘rsatadi.

Natijalar R. Schank va R. Abelsonning ssenariy (script) nazariyasi bilan ham muvofiqlashadi [5]. Ularning fikricha, nutqni tushunish avvaldan shakllangan bilim ssenariylari asosida amalga oshadi. Mazkur tadqiqot esa overlap hodisasining muvaffaqiyatli interpretatsiyasi adresatning konseptual bilimlari, kommunikativ tajribasi va diskursiv kompetensiyasiga bevosita bog‘liq ekanligini ko‘rsatdi.

Mazkur tadqiqotning asosiy ilmiy yangiligi **Cognitive-Discursive Overlap Model (CDOM)**ning ishlab chiqilganligidir. Taklif etilgan model overlap hodisasining shakllanishini konseptual faollashuv → kommunikativ maqsadni shakllantirish → diskursiv konstruksiyalash → nutqiy ma’no va kommunikativ funksiyalar integratsiyasi → overlap hodisasi → kommunikativ interpretatsiya → kommunikativ natija ketma-ketligi asosida izohlaydi. Avvalgi

tadqiqotlarda mazkur bosqichlar alohida-alohida tahlil qilingan boʻlsa, CDOM ularni yagona nazariy va metodologik tizimga birlashtiradi.

Shunday qilib, tadqiqot natijalari overlap hodisasining kognitiv-diskursiv tabiatini chuqurroq anglash imkonini beradi hamda qiyosiy tilshunoslik, kognitiv lingvistika, diskurs tahlili, pragmalingvistika va sun'iy intellekt asosidagi tabiiy tilni qayta ishlash yoʻnalishlarida olib boriladigan keyingi tadqiqotlar uchun yangi nazariy-metodologik asos yaratadi.

XULOSA

1. Ingliz va oʻzbek tillarida nutqiy ma'no hamda kommunikativ funksiyalar overlap hodisasi kognitiv va diskursiv jarayonlarning oʻzaro integratsiyasi natijasida shakllanuvchi murakkab kommunikativ tizim ekanligi ilmiy jihatdan asoslandi. Mazkur hodisaning yuzaga kelishi konseptual bilimlar, kommunikativ maqsad va diskursning uzviy bogʻliqligi bilan belgilanishi aniqlandi.

2. Qiyosiy tahlillar overlap hodisasining shakllanish bosqichlari har ikki tilda umumiy kognitiv qonuniyatlarga asoslanishini, biroq uning diskursiv realizatsiyasi va kommunikativ interpretatsiyasi ingliz va oʻzbek tillarining tipologik hamda lingvomadaniy xususiyatlariga koʻra farqlanishini koʻrsatdi.

3. Ingliz tilida overlap hodisasining kognitiv-diskursiv rivojlanishida grammatik va leksik markerlar, modal konstruksiyalar hamda diskurs bogʻlovchilarining roli ustuvorligi, oʻzbek tilida esa kontekst, implitsit ma'no, milliy nutq odobi va ekstralingvistik omillar yetakchi ahamiyat kasb etishi aniqlandi.

4. Overlap hodisasining kognitiv-diskursiv mexanizmi konseptual faollashuv, kommunikativ maqsadni shakllantirish, diskursiv konstruksiyalash, nutqiy ma'no va kommunikativ funksiyalar integratsiyasi, overlap hodisasi, kommunikativ interpretatsiya hamda kommunikativ natija bosqichlarining izchil ketma-ketligi asosida amalga oshishi ilmiy jihatdan asoslab berildi.

5. Tadqiqot natijasida ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv rivojlanish mexanizmlarini tizimli ravishda tavsiflovchi Cognitive-Discursive Overlap Model (CDOM) ishlab chiqildi. Mazkur model konseptual bilimlar, diskursiv rivojlanish va kommunikativ interpretatsiya oʻrtasidagi sabab-oqibat munosabatlarini yagona nazariy tizim sifatida birlashtiradi.

6. Taklif etilgan CDOM modeli overlap hodisasining kognitiv va diskursiv tabiatini izohlash bilan bir qatorda, qiyosiy tilshunoslik, kognitiv lingvistika, diskurs tahlili hamda pragmalingvistika yoʻnalishlarida olib boriladigan tadqiqotlar uchun yangi metodologik yondashuv sifatida tavsiya etildi. Model turli kommunikativ vaziyatlarda nutqiy ma'no va kommunikativ funksiyalar oʻrtasidagi integratsiyani tizimli ravishda tahlil qilish imkonini beradi.

7. Tadqiqot natijalari ingliz va oʻzbek tillarida overlap hodisasining kognitiv-diskursiv xususiyatlarini chuqurroq anglash, qiyosiy va chogʻishtirma tilshunoslikni rivojlantirish, shuningdek, diskursni avtomatik tahlil qilish, tabiiy tilni qayta ishlash (Natural Language Processing) va generativ sun'iy intellekt tizimlarida kommunikativ ma'noni modellashtirish boʻyicha ilmiy-amaliy tadqiqotlarni takomillashtirish uchun muhim nazariy va amaliy ahamiyat kasb etadi.

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N. TORESHOVA SHE'RIYATIDAGI PAREMIYALARNING LINGVOPOETIK TAHLILI

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Annotatsiya: *Mazkur maqolada shoira N. To'reshova ijodida qo'llanilgan maqol va matallarning badiiy-poetik xususiyatlari hamda ularning she'riy matn mazmunini yoritish, fikrni ta'sirchan va mazmunan teran ifodalash, obrazlilikni kuchaytirishdagi o'rni tahlil qilinadi. Shuningdek, shoir ijodida xalq og'zaki ijodi namunalarining individual ijodiy qayta ishlanishi, ularning kontekstual-badiiy vazifalari hamda poetik mazmunni shakllantirishdagi ahamiyatiga e'tibor qaratiladi. Tadqiqot davomida N. To'reshovaning individual ijodiy uslubi asosida yuzaga kelgan aforistik birliklar ham tahlil qilinib, ularning shoirning badiiy tafakkuri, estetik qarashlari va individual uslubini namoyon etishdagi o'ziga xos jihatlari ochib beriladi.*

Kalit so'zlar: *paremiya, paremiologiya, maqol-matal, aforizm, ekspressiv ma'no.*

ЛИНГВОПОЭТИЧЕСКИЙ АНАЛИЗ ПАРЕМИЙ В ПОЭЗИИ Н. ТОРЕШОВОЙ

Аннотация: *данной статье анализируются художественно-поэтические особенности пословиц и поговорок, использованных в творчестве поэта Н. Торешовой, а также их роль в раскрытии содержания поэтического текста, выразительной и содержательно глубокой передаче мысли и усилении образности. Особое внимание уделяется индивидуально-творческой переработке образцов устного народного творчества в произведениях поэта, их контекстуально-художественным функциям и значению в формировании поэтического содержания. В исследовании также рассматриваются афористические единицы, возникшие на основе индивидуального творческого стиля Н. Торешовой, и раскрываются их специфические особенности в выражении художественного мышления, эстетических взглядов и индивидуального поэтического стиля поэта.*

Ключевые слова: *паремия, паремиология, пословица и поговорка, афоризм, экспрессивное значение.*

A LINGUOPOETIC ANALYSIS OF PAREMIAS IN THE POETRY OF N. TORESHOVA

Abstract: *This article analyzes the artistic and poetic features of proverbs and sayings used in the works of the poet N. Toreshova, as well as their role in revealing the content of poetic texts, expressing ideas in an emotionally impactful and semantically profound manner, and enhancing imagery. Particular attention is also paid to the individual creative transformation of folklore elements in the poet's works, their contextual and artistic functions, and their significance in shaping poetic meaning. The study further examines aphoristic units arising from N. Toreshova's individual creative style, revealing their distinctive features in expressing the poet's artistic thinking, aesthetic views, and individual poetic style.*

Keywords: *paremia, paremiology, proverb and saying, aphorism, expressive meaning.*

KIRISH (INTRODUCTION / ВВЕДЕНИЕ). Qoraqalpoq folklori asrlar davomida avloddan-avlodga og'zaki ravishda yetib kelgan, xalqning badiiy tafakkuri, milliy qadriyatlari, urf-odatlari va dunyoqarashini o'zida mujassam etgan o'ziga xos ma'naviy-madaniy meros namunasidir. Folklor janrlari xalqning tarixiy xotirasi va milliy o'zligini aks ettirishi bilan bir qatorda, uning axloqiy-estetik qarashlarini ham ifodalashda muhim ahamiyat kasb etadi.

Mazkur folklor janrlari orasida maqol va matallar o'zining qisqa, lo'nda va mazmunan teran ifodasi, xalqona obrazliligi hamda fikrni ta'sirchan yetkazish imkoniyati bilan alohida ajralib turadi. Ularda xalqning ko'p asrlik hayotiy tajribasi, kuzatuvlari, axloqiy qarashlari va ijtimoiy munosabatlari mujassamlashgan. Shu sababli maqol-matallarni nafaqat folklorshunoslik, balki tilshunoslik va adabiyotshunoslik nuqtayi nazaridan o'rganish ham muhim ilmiy ahamiyatga ega.

Ayniqsa, maqol-matallarning badiiy adabiyot, xususan, she'riy matn tarkibida qo'llanishi ularning semantik, stilistik va ekspressiv imkoniyatlarini yanada namoyon etadi. Shoir ijodida xalq og'zaki ijodiga xos paremiologik birliklarning qo'llanishi poetik mazmunni boyitish, fikrning ta'sirchanligini oshirish, obrazlilikni kuchaytirish hamda milliy-madaniy koloritni ifodalashga xizmat qiladi. Shu jihatdan N. To'reshova she'riyatida qo'llanilgan maqol-matallar va shoirning individual ijodiy uslubi asosida yuzaga kelgan aforistik birliklarni o'rganish dolzarb ilmiy masalalardan biridir.

ADABIYOTLAR VA METOD (LITERATURA I METOD / MATERIALS AND METHODS). Maqol-matallar xalqning umumiy milliy tafakkurin, turmush tajribalarin va tarixiy xotirasin aks ettruvchi muhim lingvomadaniy vosita hisoblanadi. A. Pirniyazova maqolning mazmun-mohiyatiga to‘xtalib, uni “qisqa, obrazli, grammatik va mantiqiy jihatdan tugallangan fikr-mulohazani ifodalovchi, xalq tomonidan yaratilgan poetik-badiiy so‘z san’ati” sifatida izohlaydi. Tadqiqotchining fikricha, maqollarda xalqning uzoq davrlar davomida shakllangan aql-zakovati, hayotiy tajribasi va donishmandlik qarashlari o‘z ifodasini topadi [2.18].

Maqol va matallar qadimdan insoniyatning ma’naviy va madaniy hayotida muhim o‘rin egallab kelgan. Turkiy xalqlar og‘zaki ijodining qadimiy yozma manbalaridan biri bo‘lgan Mahmud Qoshg‘ariyning “Devonu lug‘otit turk” asarida ham xalq orasida keng qo‘llangan ko‘plab maqol-matallar, hikmatli so‘zlar, aforizmlar va sajlar qayd etilgan. Mazkur asarda keltirilgan ayrim paremiologik birliklar shakliy va mazmuniy jihatdan takomillashgan holda hozirgi kungacha saqlanib, turkiy xalqlarning umumiy madaniy merosi sifatida yashab kelmoqda.

Tilshunoslikda maqol va matallar **paremiya**, ularni ilmiy jihatdan o‘rganuvchi soha esa **paremiologiya** deb yuritiladi. Qoraqalpoq tilshunosligida maqol-matallar dastlab frazeologik birliklar doirasida tadqiq etilgan. Jumladan, taniqli olim E. Berdimuratov maqol-matallarning frazeologik birliklarga yaqin xususiyatlarini hisobga olib, ularni frazeologizmlarning bir turi sifatida talqin qilgan va frazeologik birliklar tarkibida o‘rgangan [1.146].

B. Yusupova esa maqol-matallarni mustaqil tadqiqot obyekti sifatida qarab, ularni **paremiya** termini bilan ifodalashni ma’qul deb hisoblaydi. Tadqiqotchi paremiologiya tushunchasiga ikki xil yondashuv mavjudligini ta’kidlaydi. Birinchi yondashuvga ko‘ra, paremiologiya — maqol-matallarni, ya’ni turli xalqlarga xos paremiologik birliklarning til xususiyatlarini o‘rganuvchi tilshunoslik sohasi. Ikkinchi yondashuvga ko‘ra esa, paremiologiya muayyan tilga xos paremiologik birliklar, maqol va matallarning majmuini anglatadi. Shuningdek, parema, paremiya va paremiologiya tushunchalarini izohlash hamda chegaralash masalasida turli tillar doirasida turlicha ilmiy yondashuvlar, yo‘nalishlar va metodlar mavjudligi qayd etiladi [3.12].

Mazkur nazariy qarashlar asosida tadqiqotning asosiy obyekti sifatida N. To‘reshova she’riyatida qo‘llanilgan maqol-matallar va shoirning individual ijodiy uslubi asosida shakllangan aforistik birliklar belgilandi. Tadqiqotda ushbu birliklarning semantik, stilistik, lingvopoetik va funksional xususiyatlarini aniqlashga alohida e’tibor qaratildi.

Tadqiqot jarayonida **tavsifiy, kontekstual, semantik-stilistik va lingvopoetik tahlil metodlari**dan foydalanildi. Mazkur metodlar yordamida paremiologik birliklarning she’riy matn tarkibidagi o‘rni, ularning poetik mazmunni shakllantirish, fikrning ta’sirchanligini oshirish, obrazlilik va ekspressivlikni kuchaytirish hamda shoirning individual uslubini namoyon etishdagi funksional imkoniyatlari tahlil qilindi.

NATIJA (РЕЗУЛЬТАТЫ/RESULTS) Maqol va matallar, ayniqsa, poetik asarlar tarkibida qo‘llanganda, she’r misralariga o‘ziga xos poetik-estetik ta’sirchanlik baxsh etadi. Ular badiiy matnning mazmuniy qatlamini boyitish, fikrni ixcham va ta’sirchan ifodalash hamda poetik obrazlilikni kuchaytirishga xizmat qiladi. Shu nuqtayi nazardan, avvalo, shoir N. To‘reshova ijodida qo‘llanilgan naqıl-maqallarning tarkibiy va mazmuniy xususiyatlariga e’tibor qaratish lozim.

Maqol va matallarning tarkibiga ko‘ra o‘ziga xosligi: Maqol va matallar og‘zaki xalq donishmandligida o‘zgarmagan holda berilishi ham, shuningdek, muallif tomonidan turli o‘zgarishlar bilan qo‘llanilishi ham mumkin.

1. Maqol va matallarning o‘zgarmagan holda berilishi

Maqol va matallar tarkibiga ko‘ra og‘zaki xalq donishmandligida shakllangan holatda, ya’ni o‘zgarmagan holda qo‘llanilishi mumkin. Bunday holatda muallif xalq orasida keng tarqalgan maqolning leksik va grammatik tarkibiga o‘zgartirish kiritmay, uni poetik kontekstga olib kiradi.

Yaxshi so‘z – Jon ozig‘i,
Ko‘ngilingning yozig‘i. [4.37].

Bu parchada xalq orasida keng tarqalgan “Yaxshi so‘z — jon oziği” maqoli o‘zgarmagan holda qo‘llangan. Maqolning semantik mazmuni inson ruhiyati uchun yaxshi so‘zning ahamiyatini, uning inson ko‘ngliga ijobiy ta’sirini ifodalaydi. Shoira maqolni poetik kontekstda qo‘llash orqali yaxshi so‘zning insonning psixologik va ruhiy holatiga ta’sirini badiiy tasvirlagan. “Ko‘ngilning yozig‘i” degan poetik qator maqolning ekspressiv ma’nosini kuchaytirib, yaxshi so‘z inson ko‘nglini yengillashtiruvchi, ruhiy davo vositasi sifatida berilganini ko‘rsatadi. Demak, maqol bu o‘rinda shunchaki tayyor til birligi emas, balki obraz yaratishga xizmat qiluvchi lingvopoetik vosita vazifasini bajarmoqda.

“Taslar túsken jerge awır”,
Esiginde ólgen maqul” **[4.57].**
“ Bir qatın hiylesi qırıq eshekke júk”,
Degen naqıl bardı qádim zamannan,
“Er”diń júz esheklik hiylesin kórip,
Jaǵamdı usladım, shoshıp jamannan **[4.112].**

“Bir qatınnıń hiylesi qırq eshekke júk ” degan maqol ayollarning topqirligi va hiylakorligini ifodalaydi. Shoira ushbu maqolni **ironik kontekstda** qo‘llab, keyingi misralarda:

“Er”diń júz esheklik hiylesin kórip,

Jaǵamdı usladım, shoshıp jamannan,— deb, hozirgi insonlarning xatti-harakatlarini tanqidiy nuqtayi nazardan tasvirlaydi. Bunda maqolning an’anaviy mazmuni kengaytirilib, mualliflik bahosi bilan to‘ldirilgan. Shoira erkaklarning hiylasini haddan tashqari bo‘rttirib tasvirlash orqali jamiyatdagi ma’naviy-axloqiy hodisalarni fosh etadi. Ushbu poetik usul orqali **satirik-ekspressiv ma’no** yuzaga keladi.

2. Muallif tomonidan maqollarning turli o‘zgarishlar bilan berilishi: N. To‘reshova ijodida maqol va matallarning transformatsiyalangan, ya’ni poetik maqsadga muvofiq ravishda o‘zgarishga uchragan turlari ham tez-tez uchraydi. Shoira xalq donishmandligini tayyor shaklda emas, balki o‘zining individual uslubiga, she’r ritmi va qofiyasiga moslashtirib qo‘llaydi. Bunday poetik qayta ishlash usuli lingvopoetikada **paremiyalarning mualliflik transformatsiyasi** deb ataladi. Bunday holatda maqolning asosiy semantik mazmuni saqlanib qoladi, biroq shakl jihatidan muayyan o‘zgarishlar yuz beradi.

“Danalar der: Baylıǵıńdur sawlıǵıń”

Sońǵı baylıq úyińdegi jawlıǵıń,

Bunnan artıq ǵáziyneni tawdı kim,

“Óli dúnya qoldı juwsań ketedi” – [4.23].

Ushbu she’r misralarida berilgan maqolning asosiy shakli **“**Birinshi baylıq – densawlıq, ekinshi baylıq – aq jawlıq, úshinshi baylıq – jup sawlıq” tarzida bo‘lib, shoira mazkur paremiyani poetik matnga moslashtirish uchun uning tuzilishiga o‘zgartirish kiritgan. Maqolning birinchi va ikkinchi misralari she’rning qofiyasiga mos ravishda qayta ishlangan bo‘lsa, uchinchi misrasi tushirib qoldirilgan. Bundan tashqari, she’rning to‘rtinchi misrasidagi **“O‘li dunyo qo‘lni yuvsang ketadi”** hikmatli so‘zi shoiraning g‘oyaviy fikrini yanada chuqurlashtirishga xizmat qiladi. Ushbu misrada dunyo boyliklarining o‘tkinchiligi, moddiy narsalarning vaqtinchalik ekanligi falsafiy mazmunda ifodalangan.

“Mıń jerinen isense de kúshine,

“Jamannan qash, qutıl”’, – xalıq desedi” [4.100]. She’rda berilgan maqol **“Jamannan qash, jaqsıǵa jantas”** maqolining qisqartirilgan shakli hisoblanadi.

Erte turǵannıń der ırısqısı artıq,

Durıs keleǵoyǵay bul hikmetli gáp [4.107].

“Erte turǵan jigittiń ırısı artıq, erte turǵan qatınnıń bir isi artıq**”** maqoli o‘zgartirilgan holda qo‘llangan. Buni ham muallifning so‘z tanlash mahoratining bir ko‘rinishi, deb aytish mumkin.

Shoira ijodida maqollarning **birinchi qatorining qisqartirib qo‘llanish holati** ko‘p uchraydi. Masalan:

“Jer ókpeler taslamasań tuqımdı,

“...tapta qalsın...” degen sóz bar burıńǵı” [4.147].

Bunda **“Qapta qalǵansha, tapta qalsın”** maqolining birinchi qatori qisqartirilgan.

Maqol va matallar tarkibida **qarama-qarshi ma’nodagi antonim so‘zlar** tez-tez uchraydi. Bu, asosan, she’rning ta’sirchanligini oshirishda katta xizmat qiladi. Masalan:

“Durıs eken dana xalqım tolǵaydı,

“Jaqsılar hesh birin-biri qıymaydı”,

“Jaman bolsa tuwısqanıń jat bolar”,

Sarsıǵannan súyekleriń sap bolar”[4.145].

N. To‘reshova ijodining yana bir o‘ziga xos xususiyati shundaki, u nafaqat xalq tilida qo‘llanib kelayotgan **frazeologizmlar va maqol-matallardan** foydalanadi, balki o‘zi ham ularga o‘xshash, didaktik mazmunga ega bo‘lgan misralarni yaratadi. Ular shoiraning individual fikrlari va qarashlarini ifodalagani sababli, **aforizmlar** sifatidagi vazifasini ham baholashimiz mumkin. Masalan:

“Doslıqtı ne bilsin kewili soqır,

Birin alsam, mennen ekini kúter,

Húrmetti ne bilsin kewili soqır,

Jaqsı tilegińdi jún etip túter” (“Tórtlikler” 107).

“Jaqsı menen ótken bir demlik gúrrińń,

Bir jaqsı kitapdur, hikmetli sabaq” [4.113].

XULOSA. Xulosa qilib aytganda, N. To‘reshova ijodida maqol va matallar badiiy matnning **g‘oyaviy-estetik vositasi** sifatida xizmat qiladi. Ular orqali shoira xalq donishmandligini yangilabgina qolmay, o‘zining **mualliflik pozitsiyasini** ham aniq ifodalagan. Maqol va matallarning o‘zgarmagan holda qo‘llanilishi poetik matnga tabiiylik, milliy kolorit va ekspressivlik bag‘ishlaydi. Shu sababli bunday birliklar shoiraning individual uslubiga xos xususiyatlarni aniqlashda **muhim lingvopoetik vosita** hisoblanadi.

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TERMINOLOGIYANING NAZARIY ASOSLARI VA UNING MEHMONDO‘STLIK HAMDA GASTRONOMIK TURIZM SOHASIDA AMAL QILISH XUSUSIYATI

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Annotatsiya: *Maqolada terminologiyaning nazariy asoslari hamda ularning mehmondo‘stlik va gastronomik turizm sohasi terminologiyasida amal qilish xususiyatlari qiyosiy-tipologik va konseptual tahlil asosida o‘rganiladi. Tadqiqot materialini terminshunoslikka oid ilmiy adabiyotdan ajratib olingan «termin» tushunchasiga oid 40 ta ilmiy ta’rif hamda mehmondo‘stlik va gastronomik turizmga oid 300 ta terminologik birlik tashkil etdi. Tahlil natijasida termin tushunchasiga oid yondashuvlar to‘rt guruhga - struktur-semantik (37,5%), funksional-tizimli (30,0%), kognitiv (20,0%) va diskursiv (12,5%) - ajratildi. Terminlarning tushunchaviy tavsifida uch nazariy paradigma - klassik (E.Wüster), sotsiokognitiv (R.Temmerman) va diskursiv (F.Gaudin) yondashuvlarning qo‘llanilish ulushi mos ravishda 34,0%, 41,0% va 25,0% ni tashkil etdi. Aniqlandiki, mehmondo‘stlik va gastronomik turizm terminologiyasi ikki qutbli tabiatga ega: birliklarning 44,0 foizi operatsion-iqtisodiy (standartlashuvchi) qatlamga, 56,0 foizi milliy-madaniy konnotativ qatlamga mansub. Tadqiqot ushbu terminosistemani «ochiq» (dinamik, uzluksiz yangilanuvchi) tizim sifatida tavsiflash maqsadga muvofiqligini asoslaydi.*

Kalit so‘zlar: *termin, terminologiya, terminshunoslik, mehmondo‘stlik turizmi, gastronomik turizm, struktur-semantik yondashuv, funksional-tizimli yondashuv, kognitiv terminologiya, sotsiokognitiv nazariya, diskursiv yondashuv, terminlashuv, lingvomadaniy qatlam.*

ТЕОРЕТИЧЕСКИЕ ОСНОВЫ ТЕРМИНОЛОГИИ И ОСОБЕННОСТИ ИХ ФУНКЦИОНИРОВАНИЯ В СФЕРЕ ГОСТЕПРИИМСТВА И ГАСТРОНОМИЧЕСКОГО ТУРИЗМА

Аннотация: *В статье на основе сравнительно-типологического и концептуального анализа рассматриваются теоретические основы терминологии и особенности их функционирования в терминологии сферы гостеприимства и гастрономического туризма. Материалом исследования послужили 40 научных определений понятия «термин», извлечённых из терминоведческой литературы, а также 300 терминологических единиц сферы гостеприимства и гастрономического туризма. В результате анализа подходы к понятию «термин» разделены на четыре группы - структурно-семантический (37,5%), функционально-системный (30,0%), когнитивный (20,0%) и дискурсивный (12,5%). Доля применения трёх теоретических парадигм - классической (Э.Вюстер), социокогнитивной (Р.Теммерман) и дискурсивной (Ф.Годен) - составила соответственно 34,0%, 41,0% и 25,0%. Установлено, что терминология гостеприимства и гастрономического туризма имеет двухполюсную природу: 44,0% единиц относятся к операционно-экономическому (стандартизируемому) слою, 56,0% - к национально-культурному коннотативному слою. Исследование обосновывает целесообразность описания данной терминосистемы как «открытой» (динамической, непрерывно обновляющейся) системы.*

Ключевые слова: *термин, терминология, терминоведение, гостиничный туризм, гастрономический туризм, структурно-семантический подход, функционально-системный подход, когнитивная терминология, социокогнитивная теория, дискурсивный подход, терминологизация, лингвокультурный слой.*

THEORETICAL FOUNDATIONS OF TERMINOLOGY AND THE FEATURES OF THEIR FUNCTIONING IN THE FIELD OF HOSPITALITY AND GASTRONOMIC TOURISM

Abstract: *The article examines, through comparative-typological and conceptual analysis, the theoretical foundations of terminology and the features of their functioning in the terminology of hospitality and gastronomic tourism. The research material comprises 40 scholarly definitions of the concept “term” extracted from terminological literature, as well as 300 terminological units of hospitality and gastronomic tourism. The analysis grouped approaches to the concept “term” into four types - structural-semantic*

(37.5%), functional-systemic (30.0%), cognitive (20.0%) and discursive (12.5%). The application share of three theoretical paradigms - classical (E.Wüster), sociocognitive (R.Temmerman) and discursive (F.Gaudin) - amounted to 34.0%, 41.0% and 25.0% respectively. It was found that the terminology of hospitality and gastronomic tourism has a two-pole nature: 44.0% of the units belong to the operational-economic (standardisable) layer and 56.0% to the national-cultural connotative layer. The study substantiates the appropriateness of describing this terminological system as an "open" (dynamic, continuously updated) system.

Keywords: *term, terminology, terminology science, hospitality tourism, gastronomic tourism, structural-semantic approach, functional-systemic approach, cognitive terminology, sociocognitive theory, discursive approach, terminologisation, linguocultural layer.*

1. KIRISH

Jamiyat rivojlangani sari kasb va faoliyat sohalari kengayib boradi; bu esa yangi tushunchalarni aniq va bir ma'noli nomlash ehtiyojini keltirib chiqaradi. Tilshunoslikning terminshunoslik yo'nalishi ana shu ehtiyojga xizmat qilib, ma'lum sohaga oid terminlarni o'rganadi va ularning mohiyatini jamiyat a'zolariga tushuntiradi. H.Boltaboyev V.Danilenkoning ta'rifini keltirar ekan, terminologiyani «umumadabiy tilning mustaqil funksional turi, ya'ni an'anaviy fan tili» sifatida izohlaydi. Demak, terminologiya - ma'lum ilmiy yoki ishlab chiqarish sohasi doirasida shakllangan maxsus terminlar tizimi hamda ularning yasalish mexanizmlari, semantik xususiyatlari va kommunikativ-kognitiv faoliyati haqidagi mustaqil ilmiy ta'limotdir.

Mavzuning dolzarbligi bir necha jihat bilan izohlanadi. Birinchidan, so'nggi yillarda mehmondo'stlik va gastronomik turizm mustaqil iqtisodiy tarmoq sifatida jadal rivojlanmoqda va o'z terminologik apparatini shakllantirmoqda. Ikkinchidan, ushbu terminosistema texnik yoki tibbiy terminologiyadan farqli o'laroq ikki qutbli - bir tomondan xalqaro standartlashuvga intiladigan, ikkinchi tomondan yuqori darajada milliy-madaniy markirovkalangan - tabiatga ega. Uchinchidan, sohaning nazariy asoslari milliy tilshunoslikda yaxlit tarzda hali yetarlicha tavsiflanmagan. Bu esa terminologiyaning nazariy negizini aynan mehmondo'stlik va gastronomik turizm materialida o'rganishni dolzarb vazifaga aylantiradi.

Tadqiqotning maqsadi - «termin» va «terminologiya» tushunchalariga oid mavjud nazariy yondashuvlarni qiyosiy tahlil qilish, ularni tizimlashtirish hamda mehmondo'stlik va gastronomik turizm terminologiyasining tipologik xususiyatlarini shu nazariy negiz asosida aniqlashdan iborat.

Tadqiqot obyekti - terminologiyaning nazariy asoslari va mehmondo'stlik hamda gastronomik turizm terminlari; predmeti esa termin tushunchasiga oid yondashuvlar, ularning tasnifi va mazkur terminologiyaning tushunchaviy-tipologik xususiyatlaridir.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda «termin» tushunchasiga oid yondashuvlar to'rt guruhli tipologiyada tizimlashtiriladi, uch nazariy paradigmaning (klassik, sotsiokognitiv, diskursiv) mehmondo'stlik va gastronomik turizm terminologiyasiga qo'llanilish darajasi aniqlanadi hamda ushbu terminosistemaning ikki qutbli, ochiq tabiati asoslanadi.

Maqola quyidagicha tuzilgan: ikkinchi bo'limda termin tushunchasiga oid nazariy adabiyot tahlil qilinadi va tadqiqot bo'shlig'i aniqlanadi; uchinchi bo'limda material va metodlar tavsiflanadi; to'rtinchi bo'limda natijalar jadval va diagrammalarda keltirilib izohlanadi; beshinchi bo'limda xulosa va istiqbollar beriladi.

2. MAVZUGA OID ADABIYOTLAR TAHLILI

Terminshunoslik XX asrning 30-yillaridan e'tiboran umumiy tilshunoslikdan ajralib, o'ziga xos predmet va metodologiyaga ega mustaqil fanga aylandi. Uning nazariy negizini shakllantirishda Wüster maktabi alohida o'rin tutadi: avstriyalik tilshunos E.Wüster ishlab chiqqan klassik terminologiya nazariyasiga ko'ra, terminlar tushunchalarning qat'iy tasnifiga asoslanib, oldindan belgilangan kategoriyalar hamda tushunchalararo iyerarxik bog'liqlik asosida tizimlashtiriladi [1].

«Termin» tushunchasining ta'rifi borasida olimlarning qarashlari asosan mushtarak. Termin atamasi lotincha terminus («chegara, tugash») so'zidan olingan. A.Reformatskiy terminni maxsus sohalarda qo'llaniluvchi, ekspressivlikdan holi, qat'iy ma'noga ega leksik birlik sifatida ta'riflaydi [2]. B.Golovin uni ayni soha doirasidagi kasbiy tushunchani ifodalovchi birlik deb izohlaydi [3]. V.Shevchuk terminni tarixiy-semantik nuqtai nazardan yoritsa, V.Leychik uni maxsus fan yoki amaliy faoliyat doirasida qo'llaniladigan, aniq semantik chegaraga ega leksik birlik sifatida baholaydi [4]. O'zbek tilshunosi P.Nishonov ham terminni «maxsus soha tushunchasini bildiruvchi, semantikasi shu soha bilan cheklangan leksik birlik» sifatida ta'riflaydi [5].

Ushbu ta'riflarning qiyosiy tahlili ikki asosiy uslubiy yo'nalishni ko'rsatadi. A.Reformatskiy va B.Golovin ta'riflari terminni struktur-semantik jihatdan, mustaqil belgi sifatida ko'radi; V.Shevchuk va V.Leychik yondashuvi esa terminning diaxron va funksional-tizimli tabiatini birinchi o'ringa qo'yadi. Terminning tizim ichidagi hokim va tobe elementlari

munosabatini A.N.Kojin batafsil tahlil qilgan [6]; terminning kognitiv-kommunikativ tabiatiga V.M.Leychik va R.G.Piotrovskiy [4; 7], terminlashuv jarayoniga esa V.P.Danilenko va uning izdoshlari e'tibor qaratgan [8].

Zamonaviy terminshunoslikda Wüster maktabining klassik yondashuviga muqobil sifatida ikki yangi paradigma shakllandi. R.Temmermanning sotsiokognitiv nazariyasi tushunchaning bir ma'noliligi va qat'iy chegaralanganligi haqidagi klassik tamoyillarni tanqid qilib, koʻplab sohalar terminologiyasi markazi (prototipik yadro) va periferiyasi mavjud, kontekstga qarab kengayadigan kategoriyalarga asoslanishini koʻrsatadi [9]. F.Gaudin ishlab chiqqan diskursiv (sotsioterminologik) yondashuv esa terminni matndan tashqaridagi mavhum birlik emas, balki muayyan diskursda real qoʻllanishda shakllanadigan oʻzgaruvchan birlik sifatida tadqiq qiladi [10].

Mavjud adabiyot tahlili muhim boʻshliqni koʻrsatadi: termin tushunchasiga oid koʻplab ta'riflar mavjud boʻlsa-da, ular mehmondoʻstlik va gastronomik turizm terminologiyasi materialida yaxlit tizimlashtirilmagan, zamonaviy paradigmalarning (sotsiokognitiv, diskursiv) mazkur sohaga qoʻllanilish darajasi esa miqdoriy jihatdan baholanmagan. Ushbu maqola aynan shu boʻshliqni toʻldirishga qaratilgan.

3. TADQIQOT METODOLOGIYASI

Tadqiqot aralash (sifatiy-miqdoriy) dizayn asosida amalga oshirildi. Sifatiy tahlil termin tushunchasiga oid yondashuvlarni va nazariy paradigmalarni izohlash uchun, miqdoriy tahlil esa yondashuvlar va terminlarning taqsimotini chastota koʻrsatkichlarida ifodalash uchun qoʻllanildi.

Tadqiqot materialini ikki qismli tanlanma tashkil etdi: birinchidan, terminshunoslikka oid ilmiy adabiyotdan ajratib olingan «termin» tushunchasiga oid ta'riflar; ikkinchidan, izohli va tarmoq lugʻatlari, restoran menyulari hamda turistik matnlardan olingan mehmondoʻstlik va gastronomik turizm terminlari. Material tarkibi 1-jadvalda keltirilgan.

1-jadval. Tadqiqot materialining tarkibi

Material turi	Manba	Birliklar soni
«Termin» tushunchasiga oid ilmiy ta'riflar	terminshunoslik ilmiy adabiyoti	40
Mehmondoʻstlik va gastronomik turizm terminlari	izohli/tarmoq lugʻatlari, menyu, turistik matnlar	300
Jami tahlil birliklari	-	340

Tahlil birligi sifatida, birinchi qismda - «termin» tushunchasiga oid alohida ilmiy ta'rif yoki qarash, ikkinchi qismda esa mehmondoʻstlik yoki gastronomik turizmga oid terminologik birlik olindi. Terminshunoslik ta'riflari ular ilgari surgan asosiy uslubiy yoʻnalishga koʻra kodlandi; terminlar esa ularning ajratuvchi belgilari, nazariy paradigmaga mosligi va soha qatlamiga mansubligi boʻyicha tavsiflandi.

Tadqiqotda quyidagi metodlardan foydalanildi: qiyosiy-tipologik metod - ta'riflar va paradigmalarni oʻzaro qiyoslash uchun; konseptual-ta'rifiy tahlil - termin tushunchasining mazmuniy belgilarini ochib berish uchun; komponent va kontekstual tahlil - terminlarning semantik va lingvomadaniy yuklamasini aniqlash uchun; miqdoriy (statistik) tahlil - yondashuvlar va terminlarning taqsimotini hisoblash uchun; tavsifiy metod - natijalarni tizimlashtirish uchun.

Terminning ajratuvchi belgilari operatsional tarzda beshta mezon boʻyicha belgilandi: aniqlik, bir ma'nolilik, normativlik, uslubiy neytrallik va sistemalilik. Nazariy paradigmalar esa klassik (strukturaviy-tushunchaviy), sotsiokognitiv va diskursiv yondashuvlar sifatida ajratildi. Baholash ikki bosqichda - mustaqil kodlash va kelishmovchiliklarni muhokama yoʻli bilan bartaraf etish - orqali amalga oshirildi.

Tadqiqotning cheklovlari. Birinchidan, ta'riflar tanlanmasi eng koʻp iqtiboslanadigan mualliflar bilan chegaralangan. Ikkinchidan, terminni muayyan paradigmaga yoki belgiga kiritish qisman ekspert talqiniga tayanadi. Uchinchidan, ogʻzaki xizmat nutqi materiali tahlilga kiritilmagan. Jadvallardagi foizlar bir kasr belgigacha yaxlitlangani sababli ayrim ustunlarda yigʻindi 100 foizdan ±0,1 ga farq qilishi mumkin. Bu cheklovlar natijalarni umumlashtirishda hisobga olinishi lozim.

4. NATIJALAR VA TAHLIL

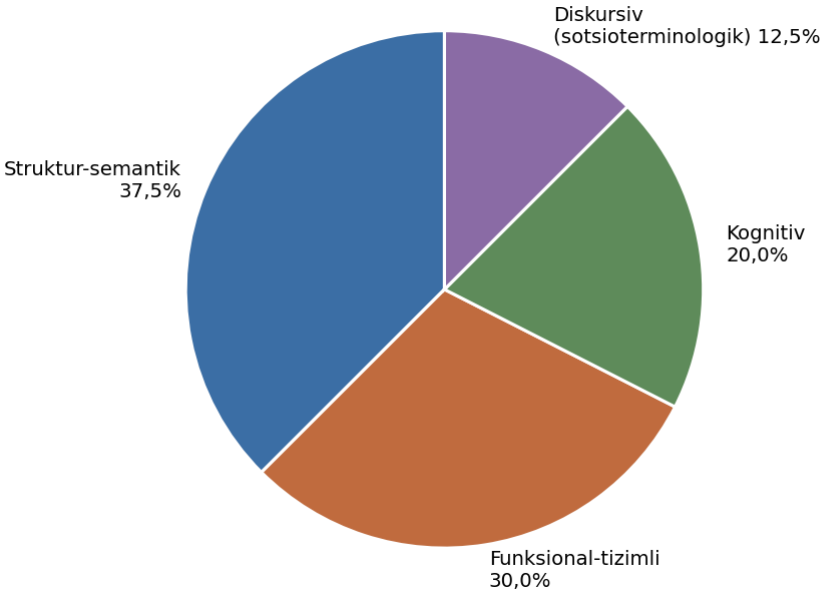
4.1. Termin tushunchasiga oid yondashuvlarning taqsimoti

«Termin» tushunchasiga oid 40 ta ilmiy ta'rifning tahlili ularni toʻrt asosiy uslubiy yondashuvga ajratish imkonini berdi. Ularning taqsimoti 2-jadval va 1-diagrammada berilgan.

2-jadval. Termin tushunchasiga oid yondashuvlarning taqsimoti (n = 40)

Yondashuv	Soni	Ulushi, %
Struktur-semantik	15	37,5
Funksional-tizimli	12	30,0
Kognitiv	8	20,0
Diskursiv (sotsioterminologik)	5	12,5
Jami	40	100,0

1-diagramma. Termin tushunchasiga oid yondashuvlarning taqsimoti (n = 40)



Ma’lumotlardan ko‘rinadiki, eng katta ulush struktur-semantik yondashuvga to‘g‘ri keladi (37,5%): A.Reformatskiy va B.Golovin ta’riflari terminni mustaqil, aniq ma’noli belgi sifatida ko‘radi. Funksional-tizimli yondashuv (30,0%) terminning terminosistema ichidagi o‘rni va diaxron tabiatini birinchi o‘ringa qo‘yadi (V.Shevchuk, V.Leychik). Kognitiv (20,0%) va diskursiv (12,5%) yondashuvlar nisbatan yangi bo‘lib, terminni bilim strukturasi hamda diskurs mahsuli sifatida talqin qiladi. Yondashuvlar orasidagi bu tafovutlar terminning yagona universal ta’rifi mavjud emasligini ko‘rsatadi.

4.2. Terminning ajratuvchi belgilari

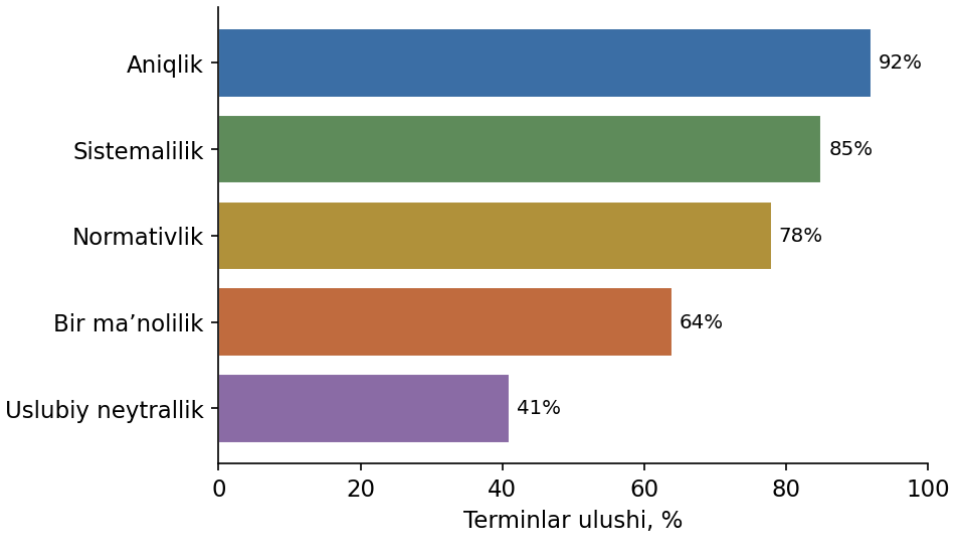
Ilmiy adabiyotda termin bir qator asosiy belgilar bilan tavsiflanadi. Ushbu belgilar va ularning mohiyati 3-jadvalda umumlashtirilgan.

3-jadval. Terminning ajratuvchi belgilari

Belgi	Mohiyati
Aniqlik	tushunchani noaniqlik va umumiylikdan xoli, aniq ifodalash
Bir ma’nolilik	polisemiyadan xoli, kontekstdan mustaqil semantik barqarorlik
Normativlik	adabiy til me’yorlariga va terminologik standartlarga muvofiqlik
Uslubiy neytrallik	ekspressiv-emotsional bo‘yoqdan holi bo‘lish
Sistemalilik	muayyan terminosistema ichida o‘rin egallash va bog‘lanish

Mehmondo‘stlik va gastronomik turizmga oid 300 ta terminda ushbu belgilarning namoyon bo‘lish darajasi 2-diagrammada ko‘rsatilgan.

2-diagramma. Terminlarda ajratuvchi belgilarning namoyon bo‘lish darajasi (n = 300)



Tahlil shuni ko‘rsatadiki, aniqlik (92%) va sistemalilik (85%) eng barqaror belgilar hisoblanadi, normativlik (78%) va bir ma’nolilik (64%) esa nisbatan pastroq. Eng past ko‘rsatkich uslubiy neytrallikda qayd etildi (41%): bu mehmondo‘stlik va gastronomik turizm terminologiyasining o‘ziga xos belgisi bo‘lib, undagi ko‘plab birliklar (dasturxon, choyxona, palov)

milliy-madaniy konnotatsiyaga ega va uslubiy jihatdan betaraf emas. Demak, klassik terminshunoslik talab qiladigan uslubiy neytrallik bu sohada har doim ham amal qilmaydi.

4.3. Termin mohiyatini talqin qiluvchi nazariy paradigmalar

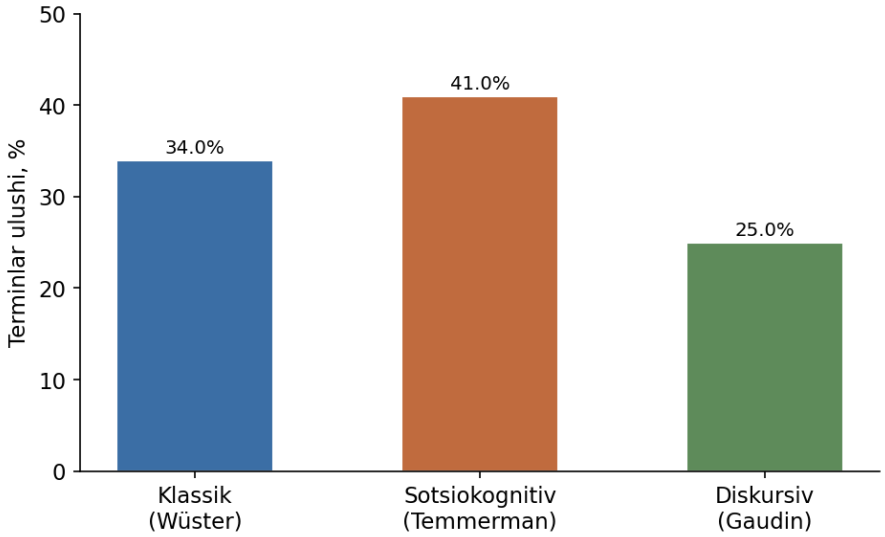
Zamonaviy terminshunoslikda termin mohiyati uch nazariy paradigma orqali talqin qilinadi. Ularning qiyosiy tavsifi 4-jadvalda umumlashtirilgan.

4-jadval. Termin mohiyatini talqin qiluvchi nazariy paradigmalarning qiyosiy tavsifi

Paradigma	Vakili	Asosiy tezisi	Termin talqini
Klassik (strukturaviy-tushunchaviy)	E.Wüster	tushuncha bir ma’noli va qat’iy chegaralangan	oldindan belgilangan kategoriya
Sotsiokognitiv	R.Temmerman	markaz (prototipik yadro) va periferiya mavjud	kontekstda kengayuvchi bilim kategoriyasi
Diskursiv (sotsioterminologik)	F.Gaudin	ma’no lug‘atda emas, diskursda yuzaga keladi	janr registriga bog‘liq o‘zgaruvchan birlik

Mehmondo‘stlik va gastronomik turizmga oid 300 ta terminni ushbu paradigmalar kesimida baholash quyidagi taqsimotni berdi (3-diagramma).

3-diagramma. Terminlarning nazariy paradigmalar bo‘yicha taqsimoti (n = 300)



Natijalar ko‘rsatadiki, mehmondo‘stlik va gastronomik turizm terminlarining eng katta qismi sotsiokognitiv paradigma bilan izohlanadi (41,0%): hospitality, cuisine kabi asosiy terminlar qat’iy bir ma’noli emas, balki markazi va periferiyasi mavjud prototipik kategoriyalardir. Diskursiv paradigma (25,0%) esa gastronomik terminlarning turli janrlarda (turistik qo‘llanma, restoran menyusi, reklama matni) turlicha semantik yuklama olishini izohlaydi. Klassik paradigma (34,0%) asosan operatsion-iqtisodiy terminlarga (ADR, RevPAR) mos keladi.

4.4. Mehmondo‘stlik va gastronomik turizm terminologiyasining tipologik xususiyati

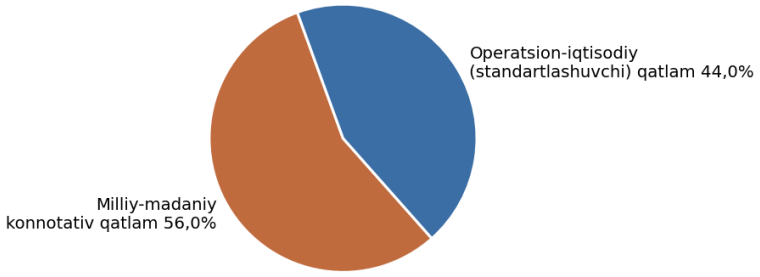
Mehmondo‘stlik va gastronomik turizm terminologiyasini alohida terminosistema sifatida ajratish uchun uning boshqa sohaviy terminosistemalardan farqini aniqlash zarur. Qiyosiy tavsif 5-jadvalda keltirilgan.

5-jadval. Mehmondo‘stlik/gastronomik va texnik/tibbiy terminologiyaning qiyosiy tavsifi

Parametr	Texnik/tibbiy terminologiya	Mehmondo‘stlik/gastronomik turizm terminologiyasi
Standartlashuv	yuqori, xalqaro (ISO, IUPAC, ICD)	qisman (ADR, RevPAR); milliy qatlam standartlashmagan
Konnotatsiya	denotativ-neytral	konnotativ jihatdan boy (dasturxon, choyxona, palov)
Yangilanish manbai	ilmiy-texnik kashfiyot	ijtimoiy amaliyot, iste’molchi didi, raqamli kommunikatsiya
Tizim tabiati	yopiq (statik, me’yorlashgan)	ochiq (dinamik, uzluksiz yangilanuvchi)

Jadvaldan ko‘rinadiki, mehmondo‘stlik va gastronomik turizm terminologiyasi ikki qutbli tabiatga ega: bir tomondan xalqaro standartlashuvga intiladigan operatsion-iqtisodiy qatlam, ikkinchi tomondan yuqori darajada milliy-madaniy markirovkalangan konnotativ qatlam. Bu ikki qatlamning korpusdagi nisbati 4-diagrammada ko‘rsatilgan.

4-diagramma. Terminologiyaning ikki qutbli tarkibi (n = 300)



Koʻrinib turibdiki, milliy-madaniy konnotativ qatlam ustunlik qiladi (56,0%), operatsion-iqtisodiy qatlam esa 44,0 foizni tashkil etadi. Aynan shu ikki qutblilik - standartlashuvga moyillik va madaniy-konnotativ boylik oʻrtasidagi muvozanat - mazkur terminologiyaning oʻziga xos tipologik belgisini tashkil etadi. Milliy-madaniy qatlamning ustunligi terminologiyani «yopiq» emas, «ochiq» (dinamik) terminosistema sifatida tavsiflashni asoslaydi.

4.5. Lingvomadaniy markirovkalangan terminlar

Mehmondoʻstlik va gastronomik turizm terminlarining muhim qismi lingvomadaniy qatlamga mansub boʻlib, ular shunchaki taom yoki xizmat nomlari emas, balki marosim va ijtimoiy munosabatlarni ham ifodalaydi (6-jadval).

6-jadval. Milliy-madaniy markirovkalangan terminlar va ularning lingvomadaniy mazmuni

Termin	Lingvomadaniy mazmuni
dasturxon yozmoq	taomga bogʻliq marosim va ijtimoiy munosabatni ifodalovchi birlik
nahorgi osh	jamoaviy marosim taomi konsepti
palov (pilaf)	tarixiy, mintaqaviy va madaniy kontekstni oʻzida jamlagan termin
choyxona	ijtimoiy makon va mehmondoʻstlik ramzi
tuxumbarak	milliy taom nomi, marosim va anʼana bilan bogʻliq
kulinar meros	ijtimoiy-maʼnaviy jarayonning lingvistik ifodasi

Bunday terminlarni oʻrganish faqat lingvistik emas, antropologik va madaniyatshunoslik nuqtai nazaridan ham qimmatlidir: ular orqali turizm sohasi va mahalliy jamoalarning ijtimoiy-madaniy xususiyatlari ifodalanadi.

4.6. Natijalarning muhokamasi

Olingan natijalar termin tushunchasiga oid yondashuvlarning rang-barangligini va yagona universal taʼrif mavjud emasligini tasdiqlaydi. Struktur-semantik hamda funksional-tizimli yondashuvlarning birgalikdagi ustunligi (67,5%) terminni ham tuzilish, ham tizim jihatidan koʻrib chiqish zarurligini koʻrsatadi. Shu bois mazkur tadqiqotda struktur-semantik va funksional-tizimli yondashuvlar sintezi tanlab olindi: termin bir tomondan aniq leksik birlik, ikkinchi tomondan tarixiy va ijtimoiy-madaniy kontekstda shakllangan funksional-dinamik birlik sifatida talqin qilinadi.

Sotsiokognitiv paradigmaning yuqori ulushi (41,0%) va uslubiy neytrallik koʻrsatkichining pastligi (41%) bir-birini tasdiqlaydi: mehmondoʻstlik va gastronomik turizm terminlari qatʼiy bir maʼnoli tushunchalar emas, balki kontekstga qarab kengayadigan, madaniy konnotatsiyaga boy prototipik kategoriyalardir. Bu R.Temmerman [9] va F.Gaudin [10] ilgari surgan qoidalarni empirik tasdiqlaydi.

Natijalarning amaliy ahamiyati shundaki, ular mazkur terminologiyani standartlashtirishda ikki qatlamga alohida yondashish zarurligini koʻrsatadi: operatsion-iqtisodiy qatlam xalqaro standartlarga moslashtirilishi, milliy-madaniy qatlam esa izohli-lingvomadaniy tavsif bilan qamrab olinishi lozim.

5. XULOSA

Oʻtkazilgan qiyosiy-tipologik va konseptual tahlil quyidagi xulosalarga olib keladi.

Birinchidan, «termin» tushunchasiga oid yondashuvlar toʻrt guruhga - struktur-semantik (37,5%), funksional-tizimli (30,0%), kognitiv (20,0%) va diskursiv (12,5%) - ajratiladi. Terminning yagona universal taʼrifi mavjud emas, shu bois mazkur tadqiqotda struktur-semantik va funksional-tizimli yondashuvlar sintezi qoʻllanildi.

Ikkinchidan, terminning asosiy ajratuvchi belgilari - aniqlik, bir maʼnolilik, normativlik, uslubiy neytrallik va sistemalilik boʻlib, mehmondoʻstlik va gastronomik turizm terminlarida ular turlicha darajada namoyon boʻladi; uslubiy neytrallikning pastligi (41%) esa sohaning oʻziga xos belgisidir.

Uchinchidan, termin mohiyatini talqin qiluvchi uch paradigma - klassik, sotsiokognitiv va diskursiv - mazkur sohaga mos ravishda 34,0%, 41,0% va 25,0% ulushda qoʻllaniladi; sotsiokognitiv paradigmaning ustunligi terminlarning prototipik-kategorial tabiatini tasdiqlaydi.

To‘rtinchidan, mehmondo‘stlik va gastronomik turizm terminologiyasi ikki qutbli tabiatga ega: birliklarning 44,0 foizi operatsion-iqtisodiy (standartlashuvchi), 56,0 foizi milliy-madaniy konnotativ qatlamga mansub. Bu ikki qutblilik uni texnik va tibbiy terminologiyadan farqlovchi asosiy tipologik belgidir.

Beshinchidan, milliy-madaniy qatlamning ustunligi va terminologiyaning uzluksiz yangilanib borishi mazkur terminosistemani «ochiq» (dinamik) tizim sifatida tavsiflashni asoslaydi.

Amaliy tavsiyalar: (a) mehmondo‘stlik va gastronomik turizm terminologiyasining izohli-lingvomadaniy lug‘atini yaratish; (b) operatsion-iqtisodiy qatlamni xalqaro standartlarga moslashtirish; (c) milliy-madaniy terminlarni madaniyatshunoslik izohi bilan qamrab olish; (d) terminlarni tahlil qilishda struktur-semantik va funksional-tizimli yondashuvlar sintezidan foydalanish.

Tadqiqot istiqbollari tanlanma hajmini kengaytirish, gastronomik terminlarning turli janriy registrlardagi semantik o‘zgaruvchanligini korpus asosida tahlil qilish hamda ingliz va o‘zbek mehmondo‘stlik terminologiyasini qiyosiy o‘rganish bilan bog‘liq.

MUALLIFLAR BAYONOTLARI

Mualliflar hissasi. Maqola yakka muallif tomonidan tayyorlangan. Muallif tadqiqot konsepsiyasini ishlab chiqish, material to‘plash va tahlil qilish, natijalarni talqin etish hamda matnni yozish bosqichlarini mustaqil bajardi.

Manfaatlar to‘qnashuvi. Muallif manfaatlar to‘qnashuvi mavjud emasligini ma’lum qiladi.

Moliyalashtirish. Tadqiqot hech qanday tashqi moliyalashtirish manbaisiz, muallifning shaxsiy tashabbusi asosida amalga oshirilgan.

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TALABALARNING KOLLABORATIV LOYIHA FAOLIYATINI RIVOJLANTIRISHDA KOUCHING KO‘ NIKMALARIDAN FOYDALANISH ASOSLARINING , TIZIMLI SHARHI

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Annotatsiya: *Maqolada raqamli ta’lim muhitida talabalarning kollaborativ loyiha faoliyatini rivojlantirish muammosining ilmiy-pedagogik adabiyotlarda o‘ rganilganlik darajasi PRISMA metodologiyasi asosida baholanadi. Beshta ma’lumotlar bazasidan aniqlangan 1220 ta yozuv bosqichma-bosqich saralanib, tizimli sharhga 87 ta manba kiritildi. Manbalar oltita tematik klasterga ajratilib, ularning yillar kesimidagi dinamikasi va metodologik sifati tahlil qilindi. Tahlil natijasida sohada beshta tadqiqot bo‘ shlig‘ i aniqlandi, ulardan eng jiddiysi — kollaborativ loyiha faoliyatini rivojlantirishning yaxlit pedagogik konsepsiyasi ishlab chiqilmaganligi hamda diagnostik instrumentariyning psixometrik validligi tekshirilmaganligidir. Milliy manbalarning atigi 6,9 foizi muammoni O‘ zbekiston oliy ta’limi konteksti bilan bog‘ lab o‘ rganadi, bu esa tadqiqot mavzusining dolzarbligini tasdiqlaydi.*

Kalit so‘ zlar: *tizimli sharh, PRISMA, kollaborativ loyiha faoliyati, raqamli ta’lim muhiti, tematik klasterlash, tadqiqot bo‘ shlig‘ i, bibliometrik tahlil, oliy ta’lim.*

SYSTEMATIC REVIEW OF THE BASICS OF USING COACHING SKILLS IN THE DEVELOPMENT OF STUDENTS’ COLLABORATIVE PROJECT ACTIVITIES

Abstract: *The article evaluates the extent to which the problem of developing students’ collaborative project activity in a digital learning environment has been studied in the pedagogical literature, applying the PRISMA methodology. Of 1220 records identified across five databases, 87 sources were included in the systematic review after a stepwise screening procedure. The included sources were grouped into six thematic clusters, and their distribution over time and methodological quality were analysed. The review revealed five research gaps, the most significant being the absence of an integral pedagogical concept for developing collaborative project activity and the lack of psychometric validation of diagnostic instruments. Only 6.9 per cent of the sources address the problem in the context of Uzbek higher education, which confirms the relevance of the present research.*

Keywords: *systematic review, PRISMA, collaborative project activity, digital learning environment, thematic clustering, research gap, bibliometric analysis, higher education.*

СИСТЕМАТИЧЕСКИЙ ОБЗОР ОСНОВ ИСПОЛЬЗОВАНИЯ КОУЧИНГОВЫХ НАВЫКОВ ПРИ РАЗРАБОТКЕ СОВМЕСТНЫХ ПРОЕКТНЫХ ДЕЯТЕЛЬНОСТИ УЧАЩИХСЯ

Аннотация: *В статье на основе методологии PRISMA оценена степень изученности проблемы развития коллаборативной проектной деятельности студентов в цифровой образовательной среде. Из 1220 записей, выявленных в пяти базах данных, в систематический обзор включены 87 источников. Источники распределены по шести тематическим кластерам, проанализированы их динамика по годам и методологическое качество. Выявлены пять исследовательских лакун, наиболее существенными из которых являются отсутствие целостной педагогической концепции и непроверенность психометрической валидности диагностического инструментария.*

Ключевые слова: *систематический обзор, PRISMA, коллаборативная проектная деятельность, цифровая образовательная среда, тематическая кластеризация, исследовательская лакуна.*

KIRISH

An’anaviy tavsifiy sharhlar (narrative review) muallifning subyektiv tanloviga tayanadi va shu sababli tanlanma noaniqligi (selection bias) riskiga ega. Zamonaviy pedagogika fanida bu cheklovni bartaraf etish uchun tizimli sharh (systematic review) metodologiyasi qo‘ llanilmoqda. Uning asosiy afzalligi — manbalarni tanlash jarayonining oldindan e’lon qilingan mezonlarga tayanishi va to‘ liq takrorlanuvchanligidir. Tibbiyot fanida ishlab chiqilgan va keyinchalik

ijtimoiy-gumanitar sohalarga moslashtirilgan PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protokoli bugungi kunda bu yo‘ nalishdagi eng keng tarqalgan standart hisoblanadi.

TADQIQOT METODOLOGIYASI

Tizimli sharh PRISMA 2020 protokoli tavsiyalariga muvofiq to‘ rt bosqichda — identifikatsiya, saralash, muvofiqlikni baholash va kiritish bosqichlarida amalga oshirildi. Qidiruv 2025-2026 yil davomida quyidagi bazalarda o‘ tkazildi, Scopus, Web of Science, ERIC, Google Scholar hamda milliy bazalar (O‘ zbekiston OAK ro‘ yxatidagi jurnallar, ZiyoNET, dissertatsiyalar fondi).

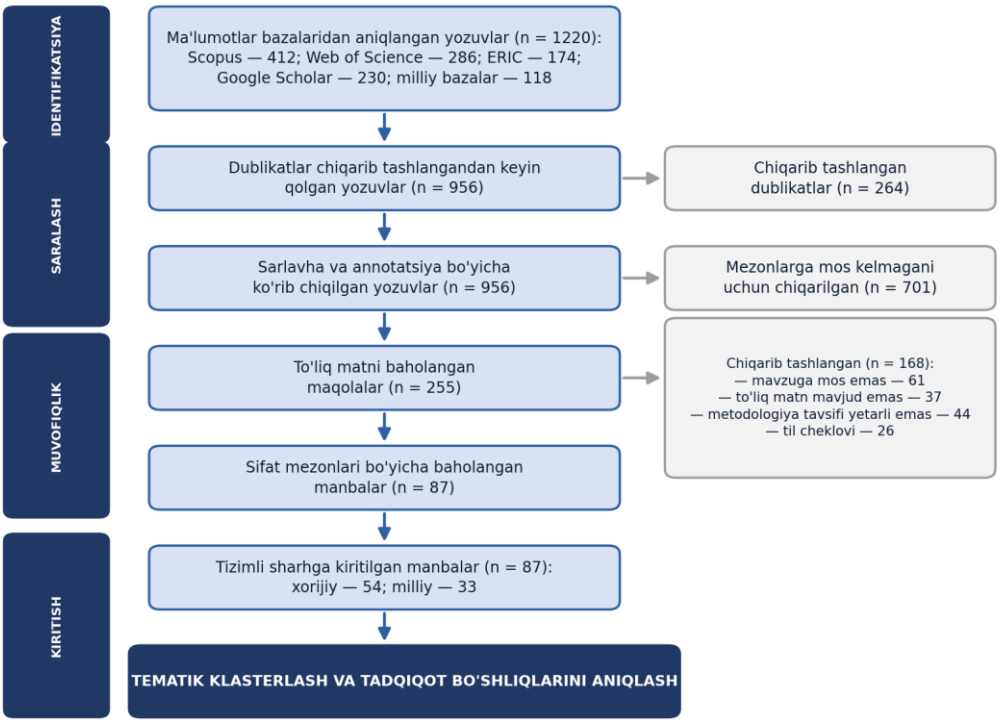
Qidiruv strategiyasi quyidagi kalit so‘ zlar kombinatsiyasiga asoslandi, («collaborative learning» OR «collaborative project» OR «CSCL») AND («higher education» OR «university students») AND («digital environment» OR «online» OR «e-learning»); o‘ zbek va rus tillarida — «kollaborativ o‘ qitish», «loyiha faoliyati», «raqamli ta’lim muhiti» va ularning morfologik variantlari. Manbalarni kiritish va chiqarish mezonlari 1-jadvalda keltirilgan.

1-jadval. Manbalarni tizimli sharhga kiritish va chiqarish mezonlari

Parametr	Kiritish mezoni	Chiqarish mezoni
Nashr yili	2015–2026-yillar	2015-yilgacha bo‘ lgan nashrlar
Ta’lim bosqichi	Oliy ta’lim (bakalavriat, magistratura)	Maktab va maktabgacha ta’lim
Tadqiqot turi	Empirik tadqiqot, nazariy model, sharh	Tezis, blog, reklama xarakteridagi matn
Muhit	Raqamli yoki aralash (blended) muhit	Faqat an’anaviy auditoriya sharoiti
Til	Ingliz, o‘ zbek, rus tillari	Boshqa tillardagi nashrlar
Matn mavjudligi	To‘ liq matn ochiq yoki institutsional kirish orqali	Faqat annotatsiya mavjud

Saralash jarayoni ikki mustaqil ekspert tomonidan parallel ravishda bajarildi; kelishmovchiliklar uchinchi ekspert ishtirokida muhokama yo‘ li bilan hal etildi. Ekspertlararo kelishuv darajasi Koen kappa koeffitsienti orqali baholandi (κ = 0,83), bu esa yuqori muvofiqlikdan dalolat beradi. Manbalarning metodologik sifati to‘ rt mezon bo‘ yicha — tadqiqot savolining aniqligi, tanlanmaning asoslanganligi, ma’lumot yig‘ ish metodlarining tavsifi va statistik tahlilning adekvatligi bo‘ yicha uch balli shkalada baholandi. Kiritilgan manbalarni tematik klasterlash induktiv kodlash usulida amalga oshirildi. Saralash jarayonining bosqichma-bosqich natijalari 1-rasmda aks ettirilgan.

TADQIQOT NATIJALARI



1-rasm. Manbalarni tanlashning PRISMA oqim diagrammasi

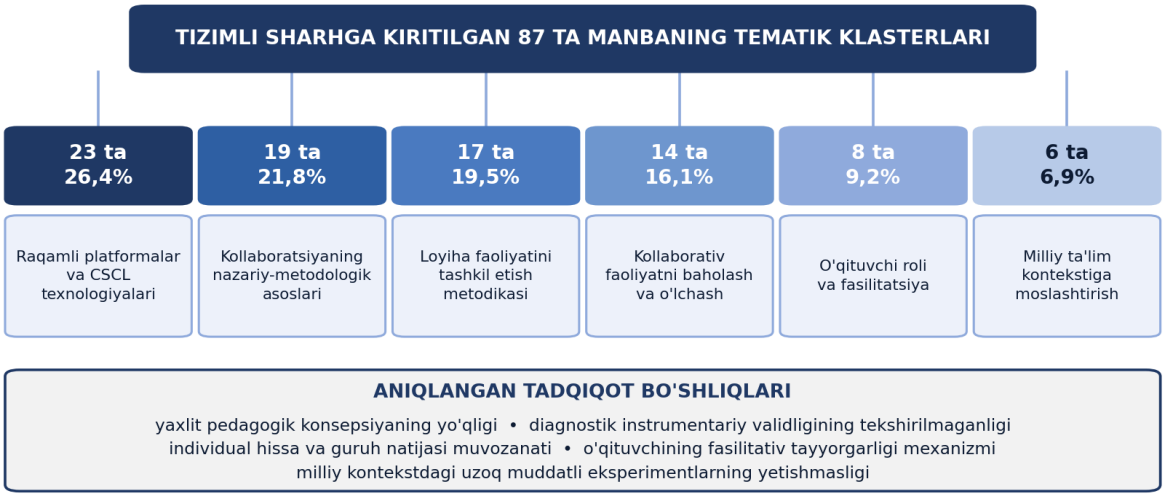
Nashrlarning vaqt bo‘ yicha taqsimoti. Kiritilgan 87 ta manbaning yillar kesimidagi taqsimoti mavzuga bo‘ lgan qiziqishning keskin o‘ sganini ko‘ rsatadi (2-jadval). Nashrlarning 65,5 foizi 2021-yildan keyin chop etilgan, bu esa, bir tomondan, pandemiya davridagi majburiy masofaviy ta’lim tajribasi bilan, ikkinchi tomondan, birgalikda ishlash uchun mo‘ ljallangan raqamli xizmatlarning ommalashuvi bilan izohlanadi.

2-jadval. Kiritilgan manbalarning nashr yillari va metodologik sifati bo‘ yicha taqsimoti (n = 87)

Davr	Manbalar soni	Ulushi	Empirik tadqiqotlar	O‘ rtacha sifat bahosi (3 balli)
2015–2017	11	12,6%	5	1,9
2018–2020	19	21,8%	9	2,1
2021–2023	34	39,1%	21	2,3
2024–2026	23	26,4%	16	2,4
Jami	**87**	**100%**	**51**	**2,2**

Metodologik sifat bahosining yillar davomida o‘ sib borishi (1,9 dan 2,4 gacha) ijobiy tendensiya hisoblanadi. Shu bilan birga, empirik tadqiqotlar ulushi 58,6 foizni tashkil etadi, ya’ni har ikkinchi manba nazariy xarakterga ega; bu esa sohada amaliy tekshirilgan yechimlar tanqisligini ko‘ rsatadi.

Tematik klasterlar. Induktiv kodlash natijasida kiritilgan manbalar oltita tematik klasterga taqsimlandi (2-rasm).



2-rasm. Manbalarning tematik klasterlari va aniqlangan tadqiqot bo‘ shliqlari

Eng yirik klaster — raqamli platformalar va CSCL texnologiyalariga bag‘ ishlangan ishlar (26,4%). Ular asosan muayyan vositalarning (LMS, umumiy hujjatlar, virtual doskalar) qo‘ llanish imkoniyatlarini tavsiflaydi. Bu klasterning zaif tomoni shundaki, tadqiqotlarning aksariyati texnologiya-markazli yondashuvga tayanadi, vosita samaradorligi uni qo‘ llash pedagogik shartlaridan ajratilgan holda baholanadi.

Nazariy-metodologik asoslar klasteri (21,8%) ijtimoiy o‘ zaro bog‘ liqlik nazariyasi, faoliyat yondashuvi va konstruktivizm g‘ oyalariga tayanadi. Loyiha faoliyatini tashkil etish metodikasi klasteri (19,5%) amaliy tavsiyalarga boy, ammo ulardagi tavsiyalar ko‘ pincha empirik dalillarsiz taqdim etiladi.

Ayniqsa e’tiborga loyiq holat — eng kichik ikkita klaster aynan eng muammoli masalalarni qamrab olishidir. O‘ qituvchi roli va fasilitatsiya klasteri atigi 9,2 foizni tashkil etadi, holbuki tahlil qilingan empirik ishlarning o‘ zida kollaboratsiya samaradorligining asosiy to‘ sig‘ i sifatida ko‘ pincha o‘ qituvchining direktiv pozitsiyasi ko‘ rsatiladi. Milliy ta’lim kontekstiga moslashtirish klasteri esa 6,9 foizni (6 ta manba) tashkil qiladi va ularning hech birida to‘ liq tsiklli shakllantiruvchi eksperiment bayon etilmagan.

Aniqlangan tadqiqot bo‘ shliqlari. Klasterlararo tahlil beshta bo‘ shliqni ajratish imkonini berdi. **Birinchi bo‘ shliq** — konseptual, mavjud ishlar alohida elementlarni (vosita, metod, baholash shakli) tavsiflaydi, ammo ularni yaxlit pedagogik konsepsiyaga birlashtirmaydi. **Ikkinchi bo‘ shliq** — diagnostik, 87 ta manbaning faqat 9 tasida baholash instrumentariyining ishonchliligi (Kronbax alfa yoki shunga o‘ xshash ko‘ rsatkich) keltirilgan. **Uchinchi bo‘ shliq** — baholash adolati, individual hissa va guruh natijasini muvozanatlashtirish masalasi 14 ta ishda qo‘ yilgan, lekin ishlaydigan yechim taklif qilinmagan. **To‘ rtinchi bo‘ shliq** — kadrlar, o‘ qituvchini fasilitator roliga tayyorlash mexanizmi deyarli

o‘ rganilmagan. **Beshinchi bo‘ shliq** — kontekstual, O‘ zbekiston oliy ta’limi sharoitida uzoq muddatli pedagogik eksperimentlar o‘ tkazilmagan.

MUHOKAMA

Olingan natijalar sohaning rivojlanish mantiqini yaqqol ko‘ rsatadi, tadqiqotchilar diqqati avval texnologik imkoniyatlarga, so‘ ngra metodik yechimlarga qaratilgan, pedagogik shartlar va o‘ qituvchi tayyorgarligi masalalari esa hozirgacha ikkinchi darajali bo‘ lib qolmoqda. Bu tendensiya ta’limga oid innovatsiyalar tarixida takrorlanib keluvchi qonuniyatdir, yangi vosita paydo bo‘ lganda avval uning texnik salohiyati o‘ rganiladi, pedagogik shartlari esa ancha keyin tadqiq etiladi.

Milliy manbalarda kontekstual moslashtirish ishlarining kamligi turkumning birinchi maqolasida aniqlangan natija bilan bevosita bog‘ liq, kollaboratsiya milliy adabiyotda ko‘ proq tashkiliy shakl sifatida talqin etilar ekan, uni moslashtirishga oid maxsus tadqiqotlarga ehtiyoj ham sezilmaydi. Shu ma’noda tushunchaviy noaniqlik va kontekstual tadqiqotlar tanqisligi yagona muammoning ikki tomonidir. U.Sh.Begimqulov va G‘ .I.Muhamedov ishlarida asoslangan ta’lim jarayonlarini axborotlashtirishning tizimli xarakteri haqidagi qoida bu bo‘ shliqni to‘ ldirish uchun metodologik tayanch vazifasini bajarishi mumkin.

Aniqlangan bo‘ shliqlar tasodifiy emas, balki ierarxik bog‘ langan, konseptual bo‘ shliq diagnostik bo‘ shliqni keltirib chiqaradi, chunki nima o‘ lchanishi kerakligi nazariy jihatdan aniqlanmagan bo‘ lsa, valid instrumentariy yaratib bo‘ lmaydi; diagnostik bo‘ shliq esa o‘ z navbatida baholash adolati muammosini hal etishga to‘ sqinlik qiladi. Shu sababli tadqiqotni aynan konsepsiyani ishlab chiqishdan boshlash metodologik jihatdan asoslidir.

Tadqiqot cheklovlari. Birinchidan, til cheklovi tufayli xitoy, ispan va boshqa tillardagi 26 ta manba tahlildan chetda qoldi. Ikkinchidan, Google Scholar bazasida qidiruv natijalarining takrorlanuvchanligi boshqa bazalarga nisbatan past. Uchinchidan, kulrang adabiyot (grey literature) — ichki hisobotlar va nashr etilmagan materiallar qamrab olinmagan, bu esa nashr noaniqligi (publication bias) riskini butunlay bartaraf etmaydi.

XULOSA

1. PRISMA metodologiyasi asosida o‘ tkazilgan tizimli sharh muammo bo‘ yicha 87 ta sifatli manbani aniqlash imkonini berdi; nashrlarning 65,5 foizi so‘ nggi besh yilga to‘ g‘ ri keladi, bu mavzuning yuqori dolzarbligini tasdiqlaydi.

2. Manbalar oltita tematik klasterga taqsimlanadi; ularning taqsimoti nomutanosib — texnologik masalalar ustunlik qiladi, pedagogik shartlar va o‘ qituvchi tayyorgarligi masalalari esa yetarlicha yoritilmagan.

3. Empirik tadqiqotlar ulushi 58,6 foizni tashkil etadi, ammo ularning faqat 12 tasida nazorat guruhi qo‘ llanilgan; bu sohada qat’iy eksperimental dizaynlarning tanqisligini ko‘ rsatadi.

4. Beshta tadqiqot bo‘ shlig‘ i aniqlandi, konseptual, diagnostik, baholash adolati, kadrlar tayyorgarligi va kontekstual bo‘ shliqlar; ular ierarxik bog‘ langan bo‘ lib, konseptual bo‘ shliqni bartaraf etish boshlang‘ ich qadam hisoblanadi.

5. Milliy ta’lim kontekstiga moslashtirish masalasi manbalarning atigi 6,9 foizida ko‘ rib chiqilgan, bu esa O‘ zbekiston oliy ta’limi sharoitida maxsus tadqiqot o‘ tkazish zaruriyatini asoslaydi.

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INGLIZ TILIDA KREATIV FIKRLASH KO‘ NIKMALARINI RIVOJLANTIRISHDA TA’LIM TEXNOLOGIYALARIDAN FOYDALANISH

Abdulaxatova Shohsanam Adhamjon qizi
Namangan davlat chet tillari insituti mustaqil tadqiqotchisi

Annotatsiya: *Mazkur maqolada ingliz tili darslarida talabalarning kreativ fikrlash ko‘ nikmalarini rivojlantirishda zamonaviy ta’lim texnologiyalarining o‘ rni va ahamiyati ularning bugungi kunda qay darajada amaliy qo‘ llay olish imkoniyatlari tahlil qilinadi. Tahlil natijlari shuni ko‘ rsatadiki, ingliz tili darslarida zamonaviy ta’lim texnologiyalaridan foydalanish orqali talabalarning dars jarayonidagi faolligini oshiradi, ularning muammoli vaziyatlarga kreativ yondashish qobiliyatini rivojlantiradi hamda mustaqil ta’lim olish ko‘ nikmalarini shakllantiradi.*

Kalit so‘ zlar: *kreativ fikrlash, ta’lim texnologiyalari, interfaol metodlar, raqamli ta’lim, innovatsion pedagogika.*

USING EDUCATIONAL TECHNOLOGIES TO DEVELOP CREATIVE THINKING SKILLS IN ENGLISH LANGUAGE LESSONS

Abstract: *This article analyzes the role and importance of modern educational technologies in the development of students’ creative thinking skills in English lessons and the extent to which they can be applied in practice today. The results of the analysis show that the use of modern educational technologies in English lessons increases students’ activity in the learning process, develops their ability to creatively approach problem situations, and forms independent learning skills.*

Keywords: *creative thinking, educational technologies, interactive methods, digital education, innovative pedagogy.*

ИСПОЛЬЗОВАНИЕ ОБРАЗОВАТЕЛЬНЫХ ТЕХНОЛОГИЙ ДЛЯ РАЗВИТИЯ НАВЫКОВ ТВОРЧЕСКОГО МЫШЛЕНИЯ НА УРОКАХ АНГЛИЙСКОГО ЯЗЫКА.

Аннотация: *В данной статье анализируется роль и значение современных образовательных технологий в развитии навыков креативного мышления студентов на уроках английского языка и их практическое применение на сегодняшний день. Результаты анализа показывают, что использование современных образовательных технологий на уроках английского языка повышает активность студентов в учебном процессе, развивает их способность к креативному подходу к проблемным ситуациям и формирует навыки самостоятельного обучения.*

Ключевые слова: *креативное мышление, образовательные технологии, интерактивные методы, цифровое образование, инновационная педагогика.*

KIRISH.

Hozirgi globallashuv sharoitida ta’lim tizimi oldida turgan muhim vazifalardan biri talabalarda nafaqat nazariy bilimlarni shakllantirish, balki ularning mustaqil, kreativ fikrlash ko‘ nikmalarini rivojlantirishdan iboratdir. Shu sababli ta’lim tizimida o‘ quvchilarning ijodiy salohiyatini rivojlantirish, ularni muammoli vaziyatlarni mustaqil tahlil qila oladigan va samarali yechim topa oladigan shaxs sifatida shakllantirish muhim ahamiyat kasb etmoqda.

Bugungi kunda chet tillarini o‘ qitish, xususan ingliz tilini o‘ rgatish ta’lim tizimining ustuvor yo‘ nalishlaridan biri hisoblanadi. Ingliz tili xalqaro muloqot vositasi sifatida ilm-fan, texnologiya, iqtisodiyot va madaniyat sohalarida keng qo‘ llanilmoqda. Shu sababli ingliz tilini samarali o‘ qitish va ta’lim oluvchilarda til ko‘ nikmalarini rivojlantirish zamonaviy pedagogikaning dolzarb masalalaridan biri hisoblanadi. Ingliz tilini o‘ rganish jarayonida ta’lim oluvchilarning nutq faoliyatini rivojlantirish, ularning kommunikativ kompetensiyasini shakllantirish hamda mustaqil fikrlash qobiliyatini rivojlantirish muhim vazifalardan biri hisoblanadi.

An’anaviy o‘ qitish tizimida ko‘ pincha o‘ qituvchi markazli yondashuv ustun bo‘ lib, ta’lim oluvchilar dars jarayonida passiv tinglovchi sifatida qatnashadi. Bunday yondashuv ta’lim oluvchilarning ijodiy fikrlash qobiliyatini to‘ liq rivojlantirish imkonini bermaydi. Zamonaviy pedagogik yondashuvlar esa o‘ quvchi markazli ta’lim konsepsiyasiga asoslanadi. Ushbu yondashuvga ko‘ ra, ta’lim jarayonining faol ishtirokchisi sifatida bilimlarni mustaqil ravishda o‘ zlashtirishi, muammolarni tahlil qilishi va yangi g‘ oyalar ishlab chiqishi zarur.

Kreativ fikrlash – bu shaxsning muammoli vaziyatlarga yangicha yondashish, noodatiy yechimlar topish va yangi g‘oyalar yaratish qobiliyatidir. Pedagogika va psixologiya fanlarida kreativlik shaxsning muhim intellektual xususiyatlaridan biri sifatida qaraladi. Kreativ fikrlashni rivojlantirish ta’lim jarayonining samaradorligini oshirishga, o‘quvchilarning bilimlarni chuqurroq o‘zlashtirishiga hamda ularni real hayotiy vaziyatlarda qo‘llashiga yordam beradi.

Ingliz tilini o‘rganish jarayonida kreativ fikrlash alohida ahamiyatga ega. Chunki tilni o‘rganish nafaqat grammatik qoidalarni yodlashni, balki ularni turli kommunikativ vaziyatlarda erkin qo‘llashni ham talab qiladi. Talabalarning kreativ fikrlashi rivojlangan bo‘lsa, ular yangi so‘z va iboralarni turli kontekstlarda qo‘llashga, o‘z fikrlarini erkin ifoda etishga hamda muloqot jarayonida faol ishtirok etishga intiladilar. So‘nggi yillarda ta’lim tizimida zamonaviy pedagogik texnologiyalardan foydalanishga katta e’tibor qaratilmoqda. Ta’lim texnologiyalari o‘quv jarayonini samarali tashkil etish, o‘quvchilarning bilim olish jarayonini faollashtirish hamda ularning ijodiy salohiyatini rivojlantirishga xizmat qiladi. Ayniqsa, axborot-kommunikatsiya texnologiyalarining ta’lim tizimiga kirib kelishi o‘quv jarayonini yangi bosqichga olib chiqdi. Multimedia vositalari, raqamli ta’lim platformalari, interfaol taqdimotlar hamda onlayn ta’lim resurslari ingliz tili darslarini yanada qiziqarli va samarali tashkil etishga yordam beradi. Bunday texnologiyalar o‘quvchilarning dars jarayonidagi faolligini oshiradi, ularning mustaqil o‘rganish ko‘nikmalarini rivojlantiradi hamda kreativ fikrlashini rag‘batlantiradi.

Interfaol metodlar – aqliy hujum, rolli o‘yinlar, munozara, loyiha asosida o‘qitish kabi usullar o‘quvchilarning ta’lim jarayonidagi faol ishtirokini ta’minlaydi. Ushbu metodlar orqali o‘quvchilar o‘z fikrlarini erkin ifoda etish, muammolarni tahlil qilish va yangi g‘oyalar yaratish imkoniyatiga ega bo‘ladilar.

Shu nuqtai nazardan ingliz tili darslarida zamonaviy ta’lim texnologiyalaridan foydalanish o‘quvchilarning kreativ fikrlash ko‘nikmalarini rivojlantirishda muhim pedagogik omil hisoblanadi. Zamonaviy ta’lim texnologiyalari o‘quv jarayonini innovatsion asosda tashkil etish imkonini beradi hamda o‘quvchilarning ta’lim jarayoniga bo‘lgan qiziqishini oshiradi.

Mazkur tadqiqotning asosiy maqsadi ingliz tili darslarida zamonaviy ta’lim texnologiyalaridan foydalanish orqali ta’lim oluvchilarning kreativ fikrlash ko‘nikmalarini rivojlantirish imkoniyatlarini ilmiy jihatdan tahlil qilishdan iboratdir. Tadqiqot doirasida zamonaviy pedagogik texnologiyalarning o‘quv jarayonidagi o‘rni, ularning ta’lim samaradorligiga ta’siri hamda o‘quvchilarning ijodiy fikrlash qobiliyatini rivojlantirishdagi ahamiyati o‘rganiladi.

Adabiyotlar sharhi. Ta’lim jarayonida kreativ fikrlash ko‘nikmalarini rivojlantirish masalasi pedagogika va psixologiya fanlarida keng o‘rganilgan ilmiy yo‘nalishlardan biri hisoblanadi. Ayniqsa chet tillarini o‘qitish jarayonida kreativ fikrlash ko‘nikmalarini rivojlantirish o‘quvchilarning kommunikativ kompetensiyasini shakllantirishda muhim omil sifatida qaraladi.

Kreativ fikrlash tushunchasi ko‘plab tadqiqotchilar tomonidan turli jihatlardan izohlangan. H. D. Brown o‘z tadqiqotlarida til o‘rganish jarayonida kreativ fikrlash o‘quvchilarning kommunikativ faoliyatini rivojlantirishga xizmat qilishini ta’kidlaydi. Uning fikriga ko‘ra, tilni o‘rganish jarayoni faqat grammatik qoidalarni o‘zlashtirish bilan cheklanib qolmasligi, balki o‘quvchilarning ijodiy fikrlashini rivojlantirishga qaratilgan bo‘lishi lozim. Til o‘rganish jarayonida o‘quvchilar yangi so‘z va iboralarni turli kontekstlarda qo‘llash orqali o‘z fikrlarini erkin ifoda etishga o‘rganadilar.

J. Harmer esa zamonaviy til o‘qitish metodikasida o‘quvchilarning faolligini oshirish muhim ahamiyatga ega ekanligini ta’kidlaydi. Uning fikricha, interfaol metodlar, muhokama va rolli o‘yinlar o‘quvchilarning ijodiy fikrlashini rivojlantirishda samarali vosita hisoblanadi. Harmer o‘z tadqiqotlarida ingliz tilini o‘qitishda o‘quvchilarni faol muloqotga jalb qilish orqali ularning kommunikativ kompetensiyasini rivojlantirish mumkinligini qayd etadi.

Til o‘qitish metodikasiga oid tadqiqotlarda kommunikativ yondashuv alohida o‘rin egallaydi. J. Richards va T. Rodgers tomonidan olib borilgan ilmiy tadqiqotlarda kommunikativ yondashuv chet tilini o‘qitishning eng samarali metodlaridan biri sifatida e’tirof etiladi. Ushbu yondashuv o‘quvchilarning real hayotiy vaziyatlarda tilni qo‘llashiga asoslanadi. Kommunikativ yondashuv orqali o‘quvchilar tilni faqat nazariy jihatdan o‘rganibgina qolmay, balki uni amaliy muloqot jarayonida qo‘llash imkoniyatiga ega bo‘ladilar.

D. Nunan o‘z ilmiy ishlarida o‘quvchi markazli ta’lim konsepsiyasini asoslab beradi. Uning ta’kidlashicha, zamonaviy ta’lim jarayonida o‘quvchilar bilimlarni tayyor holatda qabul qiluvchi emas, balki ularni mustaqil ravishda o‘zlashtiruvchi faol subyekt sifatida qatnashishi kerak. Bunday yondashuv o‘quvchilarning ijodiy fikrlashini rivojlantirishga hamda ularning mustaqil ta’lim olish ko‘nikmalarini shakllantirishga yordam beradi.

O‘zbekistonlik olimlar ham chet tilini o‘qitish metodikasiga oid ko‘plab ilmiy tadqiqotlar olib borganlar. Jumladan, J. Jalolov chet tilini o‘qitish metodikasiga bag‘ishlangan ilmiy ishlarida kommunikativ yondashuv va zamonaviy pedagogik texnologiyalarning ahamiyatini alohida ta’kidlaydi. Uning fikricha, chet tilini samarali o‘qitish uchun o‘quv jarayonida interfaol metodlardan keng foydalanish zarur.

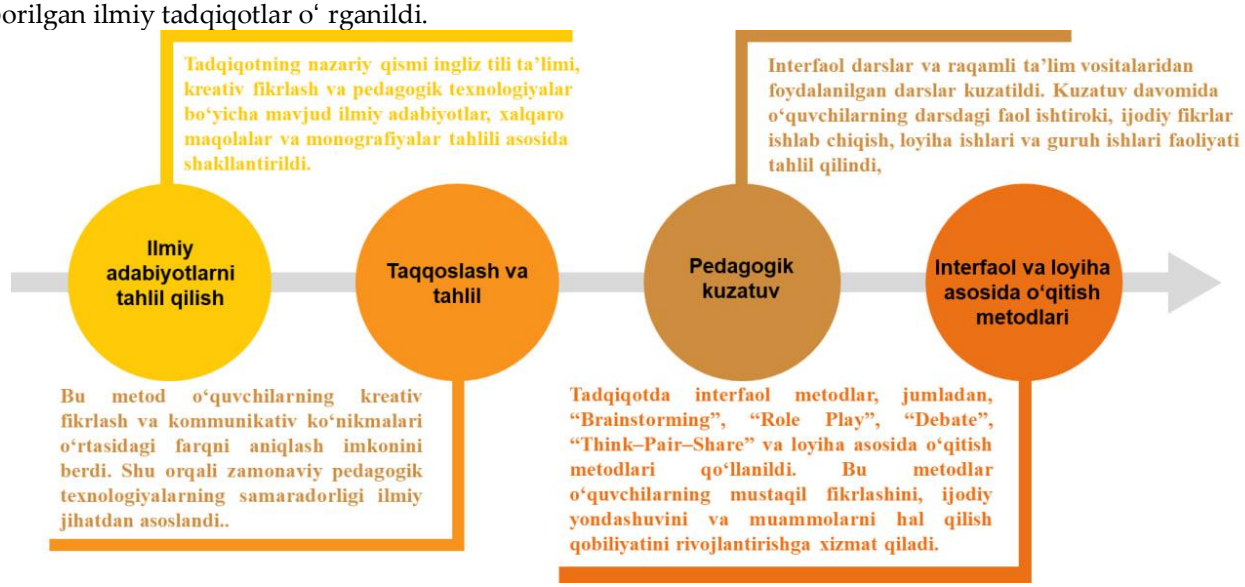
Yuqoridagi ilmiy tadqiqotlar tahlili shuni ko‘rsatadiki, ingliz tili darslarida zamonaviy ta’lim texnologiyalaridan foydalanish o‘quvchilarning kreativ fikrlash ko‘nikmalarini rivojlantirishda muhim ahamiyatga ega. Shu sababli

zamonaviy pedagogik yondashuvlar asosida tashkil etilgan darslar o‘ quvchilarning ta’lim jarayonidagi faolligini oshiradi hamda ularning kommunikativ kompetensiyasini rivojlantirishga xizmat qiladi.

Metodologiya. Mazkur tadqiqotning asosiy maqsadi ingliz tili darslarida ta’lim oluvchilarning kreativ fikrlash ko‘ nikmalarini rivojlantirishda ta’lim texnologiyalarining samaradorligini aniqlashdan iborat. Tadqiqot jarayoni zamonaviy pedagogik yondashuvlar, interfaol metodlar va raqamli ta’lim vositalarining o‘ quv jarayonidagi o‘ rni va ta’sirini o‘ rganishga qaratilgan.

Tadqiqot sifatli va sifatni tahlil qiluvchi metodlardan foydalangan holda olib borildi. Sifatli metodlar o‘ quvchilarning ijodiy va muloqot faoliyatini chuqur tahlil qilish, pedagogik jarayonni kuzatish va uning samaradorligini aniqlashga yordam beradi. Tadqiqotning asosiy metodlari quyidagilardan iborat (1-rasmga qarang):

Tadqiqotning nazariy asosini pedagogika va chet tilini o‘ qitish metodikasi sohasidagi ilmiy manbalar tashkil etdi. Xususan, kommunikativ yondashuv, interfaol metodlar va axborot texnologiyalaridan foydalanish masalalari bo‘ yicha olib borilgan ilmiy tadqiqotlar o‘ rganildi.



1-rasm.Tadqiqotning asosiy metodlari.

Yuqoridagi rasmda ko‘ rsatilgan ilmiy tadqiqot metodlari orqali ingliz tili darslarida ta’lim oluvchilarning kreativ fiklash ko‘ nikmalarini rivojlantirishni yanda kengroq imkoniyatni yaratadi.

Natijalar.Tadqiqot natijalari shuni ko‘ rsatdiki, ingliz tili darslarida interfaol metodlar va zamonaviy ta’lim texnologiyalaridan foydalanish o‘ quvchilarning kreativ fikrlash ko‘ nikmalarini va kommunikativ kompetensiyasini sezilarli darajada rivojlantiradi. Kuzatuvlar va interfaol mashg‘ ulotlar natijalariga ko‘ ra, o‘ quvchilarning darsdagi faol ishtiroki, mustaqil fikrlash qobiliyati va yangi g‘ oyalar ishlab chiqish darajasi an’anaviy metodlar bilan o‘ qitilgan sinflarga nisbatan yuqori bo‘ lganligi aniqlangan.

Interfaol mashg‘ ulotlarda o‘ quvchilar “Brainstorming”, “Role Play” va “Debate” kabi usullarda faol qatnashdilar. Natijalar shuni ko‘ rsatdiki, o‘ quvchilarning ijodiy fikrlash qobiliyati o‘ rtacha 30–35% ga oshgan. Shuningdek, ular dars davomida yangi so‘ z va iboralarni erkin qo‘ llashga intildilar hamda o‘ z fikrlarini bayon etishda ishonch hosil qildilar.

Loyiha metodlari o‘ quvchilarga mustaqil izlanish olib borish, ma’lumotlarni tahlil qilish va natijalarni ingliz tilida taqdim etish imkonini berdi. Tadqiqot natijalariga ko‘ ra, loyiha asosida ishlagan o‘ quvchilarning ijodiy fikrlash qobiliyati an’anaviy metodga nisbatan 40% ga oshgan. Shu bilan birga, ular o‘ zaro muloqot va guruh ishlari orqali fikr almashish ko‘ nikmalarini rivojlantirdilar.

Raqamli ta’lim vositalaridan foydalangan holda darslar o‘ quvchilarning bilimlarni o‘ zlashtirish tezligi va darsga qiziqishini oshirdi. Onlayn platformalar, interfaol testlar va video materiallar o‘ quvchilarga mavzularni mustaqil o‘ rganish va ijodiy yondashuv bilan qo‘ llash imkonini berdi. Kuzatuv natijalariga ko‘ ra, o‘ quvchilarning mustaqil fikrlash va kreativ fikrlash darajasi o‘ rtacha 25–30% ga oshgan.

Natijalar shuni ko‘ rsatadiki, ingliz tili darslarida zamonaviy pedagogik texnologiyalardan foydalanish o‘ quvchilarning kreativ fikrlash, mustaqil fikrlash va kommunikativ kompetensiyasini rivojlantirishda an’anaviy metodlarga nisbatan samaraliroq ekan. Shu bilan birga, interfaol metodlar va raqamli ta’lim vositalari o‘ quvchilarning darsga qiziqishini oshirib, ta’lim jarayonini interaktiv va motivatsion qiladi.

Muhokama.Tadqiqot natijalari shuni ko‘ rsatdiki, ingliz tili darslarida zamonaviy pedagogik texnologiyalar, interfaol metodlar va loyiha asosida o‘ qitish o‘ quvchilarning kreativ fikrlash ko‘ nikmalarini sezilarli darajada rivojlantiradi. Natijalarni muhokama qilish jarayonida quyidagi jihatlar alohida e’tibor talab qiladi.

Interfaol metodlar o‘ quvchilarning darsga bo‘ lgan qiziqishini oshiradi va ularni faol muloqotga jalb qiladi. Kuzatuv natijalari shuni ko‘ rsatdiki, “Brainstorming”, “Role Play” va “Debate” metodlarida o‘ quvchilarning ijodiy fikrlash darajasi an’anaviy metodlarga nisbatan sezilarli darajada yuqori bo‘ lgan.

Interfaol metodlar orqali o‘ quvchilar turli muammoli vaziyatlarni mustaqil tahlil qilish va noodatiy yechimlar topish imkoniyatiga ega bo‘ ladi. Shu sababli bu metodlar kreativ fikrlashni rivojlantirishda nafaqat samarali, balki zarur hisoblanadi.

Loyiha asosida o‘ qitish o‘ quvchilarning mustaqil izlanish, ma’lumotlarni tahlil qilish va natijalarni ingliz tilida taqdim etish ko‘ nikmalarini rivojlantiradi. Tadqiqot natijalari shuni ko‘ rsatdiki, loyiha ishlari o‘ quvchilarning ijodiy fikrlash darajasini 40% ga oshirdi. Loyihalar o‘ quvchilarga o‘ zaro muloqot, guruhda ishlash va ijodiy g‘ oyalarni amalga oshirish imkonini beradi. Shu bilan birga, loyiha metodlari o‘ quvchilarning mustaqil fikrlashini rag‘ batlantiradi va ularni faol o‘ rganishga undaydi.

Raqamli ta’lim texnologiyalari (multimedia taqdimotlar, interfaol testlar, onlayn platformalar) o‘ quvchilarning darsga qiziqishini oshiradi va bilimlarni interaktiv ravishda o‘ zlashtirish imkonini beradi. Tadqiqot natijalari shuni ko‘ rsatdiki, raqamli texnologiyalardan foydalanish o‘ quvchilarning mustaqil o‘ rganish va kreativ fikrlash darajasini 25–30% ga oshirdi.

Natijalar shuni ko‘ rsatadiki, ingliz tili darslarida zamonaviy pedagogik texnologiyalarni qo‘ llash o‘ quvchilarning kreativ fikrlash, mustaqil fikrlash va kommunikativ kompetensiyasini rivojlantirishda an’anaviy metodlarga nisbatan samaraliroqdir. Shu bilan birga, interfaol metodlar va raqamli texnologiyalar o‘ quvchilarning darsga bo‘ lgan motivatsiyasini oshiradi va ularni faol o‘ rganishga undaydi.

Muhokama natijalari shuni ko‘ rsatadiki, ingliz tili darslarida ta’lim texnologiyalaridan foydalanish nafaqat o‘ quvchilarning bilim darajasini oshirishga, balki ularning ijodiy salohiyatini, mustaqil fikrlashini va guruhdagi muloqot ko‘ nikmalarini rivojlantirishga xizmat qiladi. Shu sababli zamonaviy pedagogik yondashuvlar asosida tashkil etilgan darslar pedagogik amaliyotda keng qo‘ llanishi lozim.

XULOSA

Ingliz tili darslarida zamonaviy pedagogik texnologiyalarni qo‘ llash o‘ quvchilarning kreativ fikrlash ko‘ nikmalarini samarali rivojlantirishga xizmat qiladi. Interfaol metodlar, loyiha asosida o‘ qitish va raqamli ta’lim vositalari o‘ quvchilarning darsga bo‘ lgan motivatsiyasini oshiradi, ularni faol o‘ rganishga undaydi va mustaqil fikrlash qobiliyatini shakllantiradi.

Tadqiqot natijalari shuni ko‘ rsatdiki, interfaol mashg‘ ulotlar va loyiha ishlari o‘ quvchilarning ijodiy fikrlash darajasini an’anaviy metodlarga nisbatan 30–40% ga oshiradi. Shu bilan birga, raqamli ta’lim texnologiyalari o‘ quvchilarning bilimlarni interaktiv ravishda o‘ zlashtirishini ta’minlaydi va ularning mustaqil izlanish ko‘ nikmalarini rivojlantiradi.

Umuman olganda, tadqiqot natijalari shuni ko‘ rsatadiki, ingliz tili ta’limida zamonaviy pedagogik yondashuvlar va texnologiyalarni qo‘ llash ta’lim jarayonining samaradorligini oshiradi, o‘ quvchilarning ijodiy va kommunikativ kompetensiyasini rivojlantiradi hamda ularni mustaqil, kreativ fikrlaydigan shaxslar sifatida shakllantirishga xizmat qiladi.

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UMUMTA'LIM TIZIMIDA FONETIK MASHQLARNING TASNIFLANISHI

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Annotatsiya: *Ushbu maqolada "Pedagogika ensiklopediyasi"dagi mashq ta'rifi, uning ta'limdagi o' rni va turlari ilmiy-metodik tahlil qilinadi. Mashq ko' nikma va malakalarni shakllantirishning asosiy vositasi sifatida tasniflanadi: tayyorgarlik, tasviriy, asosiy, takrorlovchi-umumlashtiruvchi, ijodiy; analitik, sintetik, analitik-sintetik; og' zaki, yozma, aralash shakllar. Fonetik mashqlar talaffuz, intonatsiya, urg' u va nutq madaniyatini rivojlantirishda markaziy o' rin tutishi, ular ko' nikma va malaka hosil qiluvchi bosqichlarga bo' linishi ko' rsatiladi. Mashq tarkibi ko' rsatma, o' quv materiali, nazorat va o' z-o' zini nazorat komponentlaridan iborat. Ona tili ta'limida muloqotga o' rgatuvchi, vaziyatli, savol-javob, parafrazlash, matn ustida ishlash mashqlaridan foydalanish zarurligi asoslanadi. Maqol, tez aytish, audio-video, rolli o' yinlar orqali talaffuzni o' rgatish samarali ekani, xalq og' zaki ijodi namunalari, jumladan "Devonu lug' otit turk" maqollaridan foydalanish tavsiya etiladi. Shuningdek, 50-yillar darsliklaridagi ijobiy tajriba, notiqlar nutqi, ifodali o' qish, yodlash, imlo va talaffuz birligi, interfaol usullar, individual yondashuv muhimligi qayd etiladi. Darsliklarda mashq va topshiriqlar tizimini takomillashtirish, nutqiy kompetensiyani uzluksiz shakllantirish, o' qituvchi malakasini oshirish zarurati ta'kidlanadi.*

Kalit so' zlar: *mashq, pedagogika ensiklopediyasi, ona tili ta'limi, fonetik mashqlar, talaffuz, intonatsiya, urg' u, nutq madaniyati, ko' nikma va malaka, mashq turlari, ijodiy mashqlar, savol va topshiriq, interfaol usullar, xalq maqollari, audio-video materiallar*

CLASSIFICATION OF PHONETIC EXERCISES IN THE GENERAL EDUCATION SYSTEM

Abstract: *This article presents a scientific and methodological analysis of the definition of "exercise" found in the "Pedagogical Encyclopedia", as well as its role and types in education. Exercises are classified as the primary means of developing skills and proficiencies, categorized into types such as preparatory, illustrative, core, review-consolidating, and creative; analytical, synthetic, and analytical-synthetic; and oral, written, and mixed forms. The article highlights the central role of phonetic exercises in developing pronunciation, intonation, stress, and speech culture, noting their division into stages that foster skill and proficiency acquisition. The structure of an exercise comprises components such as instructions, learning material, and mechanisms for monitoring and self-assessment. The necessity of employing exercises that foster communication—such as situational tasks, question-and-answer sessions, paraphrasing, and text analysis—in native language education is substantiated. The article recommends teaching pronunciation through proverbs, tongue twisters, audio-visual aids, and role-playing games, specifically advocating for the use of examples from oral folklore, including proverbs from "Diwan Lughat at-Turk". Furthermore, it emphasizes the importance of positive practices from 1950s textbooks, the study of oratorical speech, expressive reading, memorization, the integration of spelling and pronunciation, interactive methods, and an individualized approach. The need to improve the system of exercises and tasks in textbooks, continuously develop speech competence, and enhance teacher qualifications is emphasized.*

Keywords: *exercise, pedagogical encyclopedia, mother tongue education, phonetic exercises, pronunciation, intonation, stress, speech culture, skills and proficiency, types of exercises, creative exercises, questions and tasks, interactive methods, folk proverbs, audio-visual materials.*

КЛАССИФИКАЦИЯ ФОНЕТИЧЕСКИХ УПРАЖНЕНИЙ В СИСТЕМЕ ОБЩЕГО ОБРАЗОВАНИЯ

Аннотация: *В данной статье научно-методически анализируется определение упражнения в «Педагогической энциклопедии», его роль в обучении и виды. Упражнение классифицируется как основное средство формирования умений и навыков: подготовительные, иллюстративные, основные, повторительно-обобщающие, творческие; аналитические, синтетические, аналитико-синтетические; устные, письменные, смешанные формы. Показывается, что фонетические упражнения занимают центральное место в развитии произношения, интонации, ударения и культуры речи, а также подразделяются на этапы формирования умений и навыков. Структура упражнения состоит из инструкции, учебного материала, компонентов контроля и самоконтроля. Обосновывается необходимость использования в обучении родному*

языку коммуникативных, ситуативных упражнений, упражнений типа «вопрос-ответ», парафразирования и работы с текстом. Отмечается эффективность обучения произношению с помощью пословиц, скороговорок, аудио- и видеоматериалов, ролевых игр, рекомендуется использование образцов устного народного творчества, в том числе пословиц из «Дивану лугат ат-тюрк». Также подчеркивается важность положительного опыта учебников 50-х годов, речи ораторов, выразительного чтения, заучивания наизусть, единства правописания и произношения, интерактивных методов и индивидуального подхода. Подчеркивается необходимость совершенствования системы упражнений и заданий в учебниках, непрерывного формирования речевой компетенции и повышения квалификации учителей.

Ключевые слова: упражнение, педагогическая энциклопедия, обучение родному языку, фонетические упражнения, произношение, интонация, ударение, культура речи, умения и навыки, виды упражнений, творческие упражнения, вопросы и задания, интерактивные методы, народные пословицы, аудио- и видеоматериалы.

"Pedagogika ensiklopediyasi"da mashqqa berilgan ta'rifning ancha takomillashgan va ta'lim sohasiga moslashtirilgan shakli quyidagicha: Mashq (arabcha – husnixat, rasm chizish uchun namunalar) – biror faoliyatni puxta o‘ zlashtirish yoki uning sifatini yaxshilash maqsadida ko‘ p marta takrorlash. Masalan, o‘ qish, yozish. Mashq ta'lim jarayonida ko‘ nikma va malakalarni hosil qilishda muhim o‘ rin tutadi.[1]

Ona tili ta'limida muloqotga o‘ rgatuvchi mashqlar bajarilmaydi. Dunyo tajribasida suhbat, muloqot jarayonlariga tayyorlash mashqlariga tez-tez murojaat qilinadi. Masalan, quyidagi mazmundagi mashq namunalarini kuzatish mumkin:

1**. Matnni o‘ qing va uni nomlang.** Tanlangan so‘ zlarning ma'nosini aniqlang, antonimlarni toping va ularning uslubiy rangini belgilang.

Qanday so‘ zlar borligini bilasizmi? So‘ zlar boshqacha: kulgili va qayg‘ uli, kichik va katta. Muloyim so‘ zlar ham bor: rahmat, marhamat, Salom. Ona, aziz so‘ zlar bor: ona, Vatan, tinchlik, baxt (S. Prokofev).

(She'riy matndan foydalanishingiz mumkin).

Quyosh mayin kuladi,

Yorqinroq, issiqroq porlaydi,

Tepalikdan esa baland ovozda yog‘ iladi (Ya. Kolas).

2. **O‘ qing va takliflarni solishtiring.** Tanlangan fe'llarning qaysi birida "biror harakatning zarurligi haqida bir xulosaga kelish", va qaysi "qo‘ rquvni yengish", "tortinish, biror harakatni boshlash" ma'nolariga ega ekanligini belgilang.

A. Biz kinoga borishga qaror qildik.

B. Hyech kim unga qarshi chiqishga jur'at qilmadi.

Shartli nutq yoki oldindan tayyorlanadigan nutq. Mashqning bu turiga mashqlar qo‘ shish, gaplar qo‘ shish, parafrazlash, savol-javob topshiriqlari va boshqalar kiradi.

Yoki

1. Mazkur gaplarni ma'no jihatdan o‘ xshashlari bilan almashtiring, ibora va tasviriy ifodalarni ishlating. Siz bu matnni mukammal tushunasiz – u bu maqolani boshqacha tushunadi.

2. Ularning har biri uchun tegishli kontekstida bu fikrlarni joylashtiring. Bu muhitda ishlay olmayman. – Bu sharoitda ishlay olmayman. Nutq (muloqot) mashqlari. Bularga vaziyatli mashqlar ham kiradi.[2]

Mashqning yana quyidagi turlari mavjud. Bajarilish ketma-ketligiga ko‘ ra mashq turlari – propedevtik, tasviriy, fiksasion, takrorlanuvchi, umumlashtiruvchi, ijodiy; aqliy faoliyat xarakteriga ko‘ ra mashq turlari – analitik, sintetik, analitik-sintetik mashqlar va yetakchi ijro usuli – og‘ zaki, yozma, aralash mashqlar.

Mashqlar o‘ quvchilarning ko‘ nikma va malakalarini rivojlantirishning asosiy vositasi hisoblanadi. Ular tasodifiy elementlar to‘ plami emas, balki tizim bo‘ lishi kerak. Avvalo, mashqning maqsadini aniqlash va uni o‘ quvchilarga yetkazish kerak. Buning turli yo‘ llari bor. Masalan: matnda nofaol ishtirokchilarni topishni o‘ rganish; so‘ zlarni to‘ g‘ ri talaffuz qilishni o‘ rganish; yangi imlo qoidasini qo‘ llashni o‘ rganish; mashq uchun topshiriqni o‘ qish, uni bajarish namunasi bilan tanishish va nima uchun bajarishtkerakligini aytib berish; matndagi yangi qoida uchun so‘ zlardan foydalanishni o‘ rganish va boshqalar.

O‘ rganilayotgan materialning xususiyatlarini hisobga olgan holda: mashqlarning qaysi turlari ustun bo‘ lishini aniqlash kerak: og‘ zakimi yoki yozma. Agar imlo qoidasi o‘ rganilsa, ko‘ proq yozuv mashqlari ko‘ zda tutiladi. Tasdiqlanmagan spellinglar bilan ishlashda syujetli talaffuz, yetimologik tahlil va so‘ z hosil qilish mashqlaridan

[1] Педагогика Энциклопедияси. 2-жилд. –Т.: Ж – М., 2012. – 223-б.

[2]https://search.rsl.ru/ru/view/01002976158?redirect=http%3A%2F%2Fdlib.rsl.ru%2Frsl01002000000%2Frsl01002976000%2Frsl01002976158%2Frsl01002976158.pdf

foydalanamiz. Nutq madaniyati ustida ishlash uchun og‘ zaki mashqlar va xor talaffuzi foydalidir, chunki nutq organlarini tarbiyalash kerak. Fonetikani o‘ rganishda og‘ zaki topshiriqlarga ustunlik beriladi.

Professor G. A. Prystupa tomonidan taklif quyidagi mashqlar taqdim etilgan:

1. tayyorlov mashqlar

2. tasviriy mashqlar;

3. takrorlovchi-umumlashtiruvchi mashqlar;

4. ijodiy mashqlar.

1. Propayedevtik yoki tayyorgarlik mashqlari. Bu mashqlarning maqsadi o‘ quvchilarga materialni birlamchi idrok etish, masalan, so‘ zning semantik ta’rifini berish, uni lisoniy bo‘ lmagan voqyelik bilan bog‘ lash; orfoyepiya va imlo xususiyatlarini tushuntirish.

2. Tasviriy mashqlar. Mashqlarning maqsadi o‘ rganilayotgan hodisaning nutqda qanday faoliyat ko‘ rsatishi va uni qanday aniqlash mumkinligini ko‘ rsatib berishdan iborat.

3. Asosiy mashqlar. Bu mashqlar natijasida bolalar paradigmatik bog‘ lanishlarni o‘ zlashtiradilar: o‘ rgangan narsalarini amalda qo‘ llay olish ko‘ nikmasini rivojlantiradilar.

4. Takrorlanuvchi va umumlashtiruvchi mashqlar. Mashqlarning maqsadi materialning boshqa material bilan munosabatlarida o‘ zlashtirilishini ta’minlashdan iborat. Bu turdagi mashqlar o‘ z ichiga og‘ zaki va yozma shakllarni oladi, bir mavzu bo‘ yicha so‘ zlarni tanlashga qaratiladi.

5. Ijodiy mashqlar. Ushbu mashqlarning maqsadi o‘ rganilayotgan til materialini bog‘ lanishli nutqda qo‘ llashni o‘ rgatish, o‘ quvchiga taklif etilgan mavzuda (og‘ zaki va yozma ravishda) gapirish, o‘ z nutqida tanish so‘ z birikmalaridan foydalanish va uning leksik va grammatik xususiyatlarini o‘ rganishni namoyish etishdan iborat. Asosiy ijodiy faoliyat-taqdimot va insho. Aqliy faoliyatning xususiyatiga qarab analitik, sintetik va analitik-sintetik mashqlar mavjud. Analitik-grammatik va morfografik tahlil, analitik yozish, tanlab yozish, o‘ quv diktant, tanlanma diktant. Sintetik-matn tayyorlash va nazorat nusxa ko‘ chirish, xotiradan nusxa ko‘ chirish, erkin nusxa ko‘ chirish, nazorat diktanti, savollarga javob berish, deformasiyalangan matnni tiklash, tegishli so‘ zlarni tanlash, ma’lumotnoma so‘ zlar bilan yozish (ijodiy diktant), so‘ z tuzish va lug‘ at-imlo ishi, gaplar, bayon va insholar tuzish. Analitik va sintetik – grammatik va imlo tahlillari, izoh yozish, tegishli so‘ zlarni tanlash, jumlalar, bayonotlar, grammatik va imlo topshiriqlari bilan insholar yozish, yetishmayotgan harflarni kiritish, matndagi so‘ zlarning shakllarini o‘ zgartirish, taqqoslash va tasniflar yordamida mashq qilish. Mashqlarni bajarish usuliga ko‘ ra ular turlarga bo‘ linadi: og‘ zaki (o‘ qituvchi savollariga javob berish, xartalar bilan ishlash, qoidalar chiqarish va boshqalar.), aralash (izohlangan xat, ogohlantiruvchi diktant va boshqalar.) va yozma (diktant, nusxa ko‘ chirish va boshqalar.)

Mashq-nutq ko‘ nikmalarini hosil qilish yoki takomillashtirish va malakalarini rivojlantirish maqsadida til (nutq) mashqlari yoki harakatlarni maxsus tashkil etilgan holda takroran bajarish mumkin.

Mashq o‘ quv vositalari toifasiga mos ravishda, ya’ni ularning iyerarxiyasidagi eng past qadam sifatida ko‘ rib chiqilsa, o‘ qituvchi va o‘ quvchilar faoliyatini boshqarish vazifasini va ularning o‘ zaro munosabatlarini bajarishga muayyan sharoit yaratadi.

Mashq o‘ quvchilarning faolligini ta’minlaydi, uni amalda modellashtiradi. Ularning ehtiyojlari va motivasion sohasiga, bilim, ko‘ nikma va malakalariga murojaat qilishi, ularning aniq bajarilishini ta’minlashi lozim.

Mashqlar odatda ikki asosiy xususiyat – maqsad va unga erishish vositasi bilan tavsiflanadi.

Bu maqsadlar quyidagilarni o‘ z ichiga olishi mumkin: o‘ quvchilarga til bilimlarini yetkazish, til va nutq malakalarini shakllantirish yoki takomillashtirish hamda nutq malakalarini rivojlantirish.

Bevosita maqsadga (vazifaga) erishishning asosiy vositasi o‘ quv faoliyati bo‘ lib, ularga quyidagilar kiradi: taqlid qilish, farqlash, almashtirish, o‘ zgartirish.

Mashqlarning tarkibiy modeli uchta asosiy komponentga ega: a) ko‘ rsatmalar, b) materialni o‘ rganish mashqlari va V) nazorat va o‘ z-o‘ zini nazorat qilish usullari. Har bir mashqni 2 tarkibiy qismga bo‘ lish mumkin: maqsadli va ijro etuvchi – nazorat va o‘ z-o‘ zini nazorat qilish bilan qo‘ shib olib boriladigan.

Mashqlarning maqsadli jihati ko‘ rsatmalar, topshiriq va boshqalar shaklida taqdim etiladi. Topshiriq muayyan talablarga javob berishi kerak:

a) o‘ quvchilar harakatlarini rag‘ batlantirish va ular uchun aniq vazifa qo‘ yish tarzida shakllantiriladi,

b) nutqoldi yo‘ nalganlik omillarini – vaziyatni aks ettiradi (kim? kim bilan? nima haqida? nima uchun?;

V) muayyan nutq mahsuli va natijasini maqsad qilib olish.

Ko‘ rsatmalarning asosiy xususiyati – ularning kommunikativ yoki nokommunikativ yo‘ nalganligidir.

Sinfda o‘ quv jarayonida yetakchi o‘ rinni kommunikativ topshiriqlar, uyda esa, ayniqsa, o‘ quvchilarning yozma ishlari – o‘ qitish, ya’ni til strukturasi elementlarini tushunishga qaratilgan topshiriqlar beriladi.

Ko‘ rsatmalar mashq bajarish uchun namunalar (modellar) va/yoki qoidalar bilan birga bo‘ lishi kerak.

Fonetik mashqlar umumta'lim maktablarida o‘ quvchilarning talaffuz, intonatsiya, urg‘ u va nutq madaniyatini rivojlantirishda markaziy o‘ rin tutadi. Ushbu mashqlar o‘ quvchilarda ikki asosiy jihat – **ko‘ nikma** va **malaka** – shakllanishiga xizmat qiladi. Shu sababli fonetik mashqlarni tasniflashda ularning bu ikki jihatga ta'siri hisobga olinadi.

1. Ko‘ nikma hosil qiluvchi mashqlar

Ko‘ nikma – o‘ quvchining talaffuz va nutq jarayonidagi qobiliyati bo‘ lib, u bosqichma-bosqich shakllanadi. Bu tur mashqlari odatda:

- **Tovushlarni ajratish mashqlari:** undosh va unli tovushlarni alohida talaffuz qilish. Masalan, [x] va [h] tovushlarini ajratib talaffuz qilish.
- **So‘ z va so‘ z birikmalarida mashq:** o‘ quvchilar so‘ zlarni to‘ g‘ ri talaffuz qiladi va undosh, unli tovushlar o‘ rtasidagi farqni sezadi.
- **Tinglab takrorlash mashqlari:** o‘ quvchilar o‘ qituvchi nutqini tinglab, talaffuzni imitasiya qiladi.

Mazkur mashqlar o‘ quvchilarda talaffuzni tushunish va eshitish ko‘ nikmalarini shakllantiradi, nutqiy reflekslarni rivojlantiradi.

2. Malaka hosil qiluvchi mashqlar

Malaka – o‘ quvchining mustaqil nutq faoliyatida talaffuzni mukammal qo‘ llay olish qobiliyati. Bu tur mashqlari quyidagi jihatlarni o‘ z ichiga oladi:

- **Gap va matn darajasida mashq:** talaffuz, urg‘ u va intonatsiyani so‘ zlardan gaplargacha qo‘ llash.
- **Intonatsion va urg‘ u mashqlari:** nutq ohangini va urg‘ uni to‘ g‘ ri qo‘ llash.
- **Ijodiy mashqlar:** o‘ quvchilar mustaqil gaplar yoki she'rlarni talaffuz qiladi, intonatsiya va urg‘ uni amalda qo‘ llaydi.

Malaka hosil qiluvchi mashqlar o‘ quvchilarda talaffuzni mustaqil ishlatish, nutqni tushunarli va tabiiy qilish, shuningdek, nutq madaniyatini rivojlantirishga yordam beradi.

3. Umumiy tasniflash tamoyillari

Fonetik mashqlarni tasniflashda quyidagi tamoyillar hisobga olinadi:

- Mashqning **maqsadi** (ko‘ nikma yoki malaka shakllantirish).
- Mashqning **murakkabligi** (tovush, so‘ z, gap yoki matn darajasi).
- Mashqning **interaktivligi** (audio, video, auditor mashqlari, ijodiy ishlash).

Shu tarzda fonetik mashqlar tizimli va bosqichma-bosqich qo‘ llanilganda o‘ quvchilarda talaffuz ko‘ nikmasi va malakasi samarali ravishda shakllanadi.

Mashqlar tarkibidagi ikkinchi komponent – ona til hodisalarini o‘ zlashtirish yoki ularni amalga oshirish natijasini nazorat qilish (o‘ z-o‘ zini nazorat qilish) uchun topshiriqlarni amalga oshirish bo‘ yicha qator harakatlarni o‘ z ichiga oladi.

Jumladan, mashqlar til sathlarini o‘ qitish nuqtai nazaridan ham turlarga bo‘ linadi:

1. Fonetik va grafik mashqlar

Ular bolalar uchun tovush va harflarni ajratish uchun ishlatiladi. Buning uchun quyidagi mashqlardan foydalaniladi:

- tovushlarni (og‘ zaki so‘ zdagi) harflar bilan belgilang;
- tanlangan so‘ zlarning tovush qiymatini aniqlash;
- so‘ zlarni alifbo tartibida qo‘ yish;
- tovushlarga mos kelmaydigan harflarni ta'kidlang.

Bunday mashqlar o‘ quvchilarda farqlash, ajratish, umumlashtirish, qisman izohlash ko‘ nikmalarini shakllantirishga yordam beradi.

2. Leksik va frazeologik mashqlar

O‘ quvchilarning so‘ z boyligini oshirishga tayyorlaydi, shuning uchun so‘ z va iborani o‘ rganishda so‘ zlar bilan ishlash kerak va bu muammolarni hal qilish uchun quyidagi mashqlardan foydalaniladi:

- belgilash (nomlash), (shevaga oid so‘ zlar, frazeologik birliklar);
-ushbu so‘ z uchun sinonimlar (antonimlar, frazeologik birliklar) ni tanlang;
- o‘ quv izohli lug‘ atdan shevaga oid so‘ zlarini, kasb-hunar so‘ zlarini toping;
- tanlangan so‘ zlarning ifodalayotgan ma'nosini lug‘ at asosida aniqlang;
- so‘ zning lug‘ aviy va ko‘ chma ma'nolarini aniqlang (gap tarkibida);
- so‘ zning o‘ z va ko‘ chma ma'nosi ishtirokida gap tuzing;
- ushbu gapdagi leksik xatoni toping;
- iboralarni so‘ z bilan ifodalang;
- tasviriy ifodalarni so‘ z bilan ifoda qiling.

3. Morfologik mashqlar

Ular bolalarning morfologiya bo‘ yicha olgan bilimlarini mustahkamlab, ham imlo, ham tinish belgilarining shakllanishiga asos bo‘ lib xizmat qiladi. Buning uchun quyidagi mashqlardan foydalaniladi:

- nutqning bir qismini aniqlash; nutqning u yoki bu qismini turkumlash;
- nutqning muayyan qismi, muayyan so‘ z turkumi so‘ zlarini tanlash;
- belgilagan so‘ zlarnin imlosi va talaffuzini izohlang;
- qo‘ shib yoziladigan so‘ zlarni alohida yozing;
- chiziqcha bilan ajratib yoziladigan so‘ zlarga misollar yozing;
- berilgan fe’llarning talaffuzi va imlosi o‘ rtasidagi farqni izohlang;
- jadvallar yaratish va tayyor jadvallarni ko‘ shib, ajratib, chiziqcha bilan yoziladigan so‘ zlarga to‘ ldirish;
- matndan xato yozilgan, talaffuzi va yozilishi mos kelmaydigan so‘ zlarni ajrating.

4. Sintaktik mashqlar

Sintaktik hodisalarni tahlil qilish va ulardan o‘ quvchilar nutqida foydalanish bo‘ yicha quyidagi mashqlardan foydalaniladi:

- gapni so‘ roq, darak, buyruq va istak ohangida o‘ qing;
- sodda gapni qo‘ shma gapga aylantiring;
- qo‘ shma gaplarni sodda gaplar bilan ifodalang;
- ko‘ chirma gapni o‘ zlashtirma gapga aylantiring;
- nuqtalar o‘ rniga kerakli tinish belgisini qo‘ ying;
- matnda qo‘ yilgan tinish belgilaring qo‘ llanilish sabablarini izohlang.
- matnni mazmunga putur yetkizmay qisqartiring;
- hikmatni matnga aylantiring;
- turli mavzudagi maqol va hikmatlarni bir umumiy mazmunga birlashtiring;
- tarjimai hol matnini tavsifnomaga aylantiring;
- berilgan mavzuni 10ta jumla bilan so‘ zlar takrorisiz, bexato va yorqin ifoda qiling.

Shu o‘ rinda ta’kidlash lozimki, mashq va topshiriqlar ta’lim mazmuni hisoblangan darsliklar tarqibiy qismi bo‘ lishidan tashqari, alohida tizim sifatida ham qo‘ llanilishi maqsadga muvofiq. Fizika, matematika fanlaridan masalalar to‘ plami, tizimi mavjud. Biroq ona tili o‘ qitishga doir maxsus mashq va topshiriqlar tizimi amaliyotda faol qo‘ llanilmaydi. Shu ma’noda ishimizda tilning tarbiyaviy ahamiyatga ega ifoda vositalaridan foydalanildi. Ayniqsa, fonetika o‘ qitishda o‘ quvchining ma’naviy olamiga chiroq yoqa oladigan xalq maqollaridan o‘ rinli va samarali foydalanish muhim ahamiyat kasb etadi. Aksariyat xalq maqollarining tarkibi qofiyadosh so‘ zlardan iborat bo‘ lib, ular o‘ quvchiga muayyan unli va undosh tovushlarning nozik talaffuz xususiyatlarini ko‘ rsatib berishda juda qo‘ l keladi. Oddiy jumlada ishtirok etgan so‘ z tarkibidagi tovushdan ko‘ ra she’riy misra tarkibidagi tovush talaffuzi o‘ quvchi tafakkuriga tezroq ta’sir ko‘ rsatadi.

Darsliklarimizda *«Kuz keldi», «Anvar maktabga kelmadi»* kabi o‘ quvchiga faqat grammatikaga doir ma’lumotlar yetkazishga xizmat qiladigan, o‘ quvchi tasavvuri va ruhiy olamini, dunyoqarashini boyitmaydigan, mustaqil fikrlashga ko‘ maklashmaydigan misollarni ko‘ plab uchratish mumkin. Maqollar asosida esa ham nazariy ma’lumotlarni, ham o‘ quvchiga kelajak hayotida asqotadigan muhim o‘ gitlarni anglatish imkoni bo‘ ladi. Keltirilgan maqollarning mavzu doirasi to‘ g‘ riso‘ zlik, mehnatsevarlik, do‘ stlik, kamtarlik va ilm xosiyatlari to‘ g‘ risida bo‘ lishi maqsadga muvofiqdir. Bu borada, masalan, Mahmud Koshg‘ ariyning «Devonu lug‘ otit turk» asarida keltirilgan maqol namunalaridan foydalanish ham mumkin. *Tirishqoqning labi yog‘ liq – erinchoqning boshi qonlik. Yoshlikda tirishib harakat qilgan odam katta bo‘ lgach sevinadi. Baxt belgisi ilmdir. Odobning boshi – til*[3].

Bugungi darsliklarimizda kam uchrasa-da, o‘ tgan asrning 50-yillari “Ona tili” darsliklarida xalq maqollaridan unumli foydalanilganligiga guvoh bo‘ lamiz. Deyarli har bir mavzuni tushuntirishda xalq maqollari va dostonlaridan namunalar keltirilgan. Masalan, nutq tovushlari mavzusini mustahkamlash uchun berilgan 2-mashqda nazariy jihatdan o‘ quvchilar berilgan maqollardan tor, o‘ rta keng va keng unlilarni aniqlasalar, ikkinchi tomondan, ishchanlik va yalqovlik; bilimdonlik va nodonlik; botirlik va qo‘ rqoqlik; bir so‘ zlilik; hunarli bo‘ lishning foydalari; ahillik hamda to‘ g‘ riso‘ zlik kabilarni o‘ zida aks ettirgan ko‘ plab maqollar keltirilganki, bu tajribadan hozirda ham foydalanish juda zarur. Oddiy matnga qaraganda ko‘ proq yodda qoladigan va o‘ quvchining so‘ z boyligini oshiradigan maqol tarkibli bunday mashqlar darslik so‘ ngigacha o‘ rni bilan davom etgan.

Xalq og‘ zaki ijodi namunalaridan foydalangan holda ona tilidan noan’anaviy darslar tashkil etish ham mumkin. Xususan, tezaytishlar musobaqasi asosida tashkil etilgan mashg‘ ulotlar o‘ quvchining og‘ zaki nutqini ravonlashtirishda muhim o‘ rin tutadi, ya’ni o‘ zbek tilida nutq tovushlari va ularning o‘ ziga xos akustik xususiyatlarini o‘ rgatish samaradorligini oshiradi.

[3]Кошғарий Маҳмуд. *Девону луғатит турк.* 3 томлик. Т.I. – Т.: Ўзбекистон ФА, 1976. ; Кошғарий Маҳмуд. *Девону луғатит турк.* 3 томлик. Т.II. – Т.: Ўзбекистон ФА, 1976.– 47-83-б.

Masalan, “Urg‘ u” mavzusini o‘ tayotganda umumiy ma’lumotga ega bo‘ lingandan so‘ ng, aytaylik, Afzal Rafiqov, Sanjar Sa’dullayev yoki Zulxumor Mo‘ minovalar tomonidan ifodali o‘ qilgan bir she’r, bir nasriy matnning audio yoki video varianti qo‘ yib eshittirilsa, maqsadga muvofiq bo‘ ladi. Shuni ham ta’kidlash kerakki, notiqlarning ham ayol, ham erkak kishilardan iboratligi e’tiborga olinishi kerak. Nutqda to‘ g‘ ri talaffuzdan tashqari ohang masalasi ham mavjud bo‘ lib, u ayol va erkak (o‘ g‘ il va qiz) kishilarda ma’lum ma’noda farqlanadi. Shuning uchun darsda ikkala jinsdagi notiqlar nutqidan ham baravar foydalanish o‘ rinidir.

O‘ quvchilarni matn ustida ishlashga yo‘ naltirish ham yetarlicha samara beradi[4]. Ularga ibratli hikoyatlar, she’riy va dramatik matnlarni yodlab, ifodali aytib berish topshirilishi mumkin. Nasriy matnlarni yodlashga avval unchalik ehtiyoj bo‘ lmagani bois uni yod olish va aynan so‘ zlab berishda dastlab o‘ quvchilar qiynaldi. Darsni har tomonlama samarali tashkil qilishni ko‘ zda tutib, o‘ quvchilar matnlarni, hikmatli so‘ zlarni yoddan aytayotganda ularning og‘ zaki nutqidagi tovushlar talaffuzi, urg‘ u va ohang bilan bog‘ liq xato-kamchiliklar aniqlndi, ularni bartaraf qilish uchun maxsus mashqlar tavsiya qilinadi. O‘ quvchining nutqi ta’sirchan, jozibali bo‘ lishi uchun unda ulkan so‘ z boyligi ham bo‘ lishi kerak. Mashg‘ ulotlar davomida yuzga yaqin ibratli hikoya, she’r va hikmatli so‘ zlar yodlanadi. Dars jarayonida o‘ qituvchi o‘ quvchiga zaruriy nutqiy malakalarning shakllanish sharoitini yaratib berishi lozim. Bola o‘ z tilida ham og‘ zaki, ham yozma shaklda mantiqan izchil, nutq sharoitiga mos ravishda fikr ifodalay olishga erishishi uchun zarur so‘ z boyligiga, adabiy talaffuz ko‘ nikmasiga ega bo‘ lishi; imloviy savodxon va ijodiy tafakkur sohibi bo‘ lishi talab etiladi. Bu borada o‘ quvchilarda nutqiy malakani kompleks tarzda hosil qilish usuli yaxshi samara beradi.

Ona tili darslarida nutqiy malakalarni shakllantiruvchi asosiy o‘ quv materiali bu mashq va topshiriqlar tizimidir. Tadqiqotchi T.G‘ aniyevning ona tili bo‘ yicha mashqlar bajarish jarayonida o‘ quvchilarning bilim faoliyatini faollashtirishga bag‘ ishlangan tadqiqoti[5] ham bu borada muhim ahamiyatga ega. Shunga qaramay, ona tili o‘ qitishda, ayniqsa, adabiy talaffuz bilan bog‘ liq muammolar hali o‘ z yechimini topgan emas. Bu borada ijobiy natijalarga erishish mashq yoki topshiriqning sifati, berilishiga bog‘ liq. Agar topshiriq maqsadli, puxta o‘ ylangan holda tuzilsa, ya’ni birvarakayiga uch yoki to‘ rt nutqiy ko‘ nikmani shakllantirishga imkoniyat yarata olsa, nihoyatda foydali bo‘ ladi.

Fonetik mashqni tushuntirish uchun boshqa o‘ quv topshiriqlari bilan yonma-yon keltirib taqqoslagan ma’qul quyidagi jadvalda mashqni savol va topshiriqdan farqlovchi namunalar keltirildi :

2.2-jadval

Mashq turi	**Tavsifi**	**Namuna**
Fonetik mashq	Nutq tovushlarini, unli va undoshlarni talaffuz qilishni, urg‘ u va intonatsiyani amalda rivojlantirish	“X” undoshini talaffuz qilib, so‘ z ichida joylashishini mashq qilish: xabar, xarita, xush
Savol	O‘ quvchiga bilimini tekshirish, tushunganini aniqlash	“X harfi qaysi so‘ zlarda ishlatilgan?”
Topshiriq	O‘ quvchiga mustaqil ijodiy yoki amaliy ish berish, ko‘ nikmalarni qo‘ llash	“X harfi bilan boshlanuvchi 5 so‘ z yozing va talaffuzini mashq qiling”

Ta’lim muassasalarida faoliyat ko‘ rsatayotgan ona tili o‘ qituvchilarining hammasini ham tajribali, malakali, saviyasi bir xilda yuqori deb bo‘ lmaydi. Belgilangan dastur bo‘ yicha faoliyat olib borilayotgan va zamonaviy interfaol usullar dars jarayoniga tatbiq qilinayotgan bo‘ lsa-da, o‘ quvchilarda nutqiy kompetensiya kutilgandek rivojlanmayotgani tajriba-sinov jarayonida, qolaversa, oddiy kuzatuvlarda ham ma’lum bo‘ lyapti.

Agar darsni qanday tashkil etish, xususan, ona tili darslarida, fonetika, orfoepiya, orfografiya mavzularini o‘ qitish o‘ qituvchining ixtiyoriga to‘ liq topshirib qo‘ yilsa, o‘ quvchilarning adabiy talaffuz hamda imloga oid ko‘ nikma va malakalari bir xil bo‘ lmasligi muqarrar. Talaffuz va imlo qoidalari esa bir xillikni taqozo etadi. Shu ma’noda o‘ quvchilarda nutqiy kompetensiyani rivojlantirishni avtomatlashtirish masalasi juda dolzarb bo‘ lib qoladi.

Tadqiqotlar natijasida ma’lum bo‘ ldiki, o‘ quvchi uchun o‘ ta zarur bo‘ lgan *to‘ g‘ ri talaffuz, imloviy savodxonlik, mantiqiy fikrlash* ko‘ nikmalari, *so‘ z boyligining muntazam oshishi* uzuq-yuluq mashg‘ ulotlar bilan emas, balki tizimli ravishda, maxsus mashq va topshiriqlar tizimi asosida uzluksiz, amaliy ishlash orqali hosil qilinadi. Bu – tizimli takrorlanishga olib keladi, natijada ko‘ nikma va malaka shakllana boshlaydi.

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BO‘ LAJAK PEDAGOGLARNING KASBIY-KOMMUNIKATIV KOMPETENTLIGINI SHAKLLANTIRISHNING MAZMUN-MOHIYATI VA TARKIBIY-FUNKSIONAL TAHLILI

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Annotatsiya: *Mazkur maqolada bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligi tushunchasining mazmun-mohiyati, uning tarkibiy komponentlari va funksional xususiyatlari ilmiy-nazariy jihatdan tahlil qilingan. Tadqiqot davomida kompetentlik tushunchasiga doir turli ilmiy-pedagogik yondashuvlar tizimlashtirilib, kasbiy-kommunikativ kompetentlikning lingvistik, nutqiy (diskursiv), ijtimoiy-madaniy, strategik va kasbiy-pedagogik komponentlari ajratib ko‘ rsatilgan hamda ularning o‘ zaro uzviy bog‘ liqligi asoslab berilgan.*

Kalit so‘ zlar: *kasbiy-kommunikativ kompetentlik, bo‘ lajak pedagog, kommunikativ ko‘ nikma, tarkibiy komponent, funksional xususiyat, pedagogik muloqot, kompetentlik yondashuvi.*

СОДЕРЖАНИЕ, СУЩНОСТЬ И СТРУКТУРНО-ФУНКЦИОНАЛЬНЫЙ АНАЛИЗ ФОРМИРОВАНИЯ ПРОФЕССИОНАЛЬНО-КОММУНИКАТИВНОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ ПЕДАГОГОВ

Аннотация: *В статье с научно-теоретической точки зрения анализируются содержание и сущность понятия профессионально-коммуникативной компетентности будущих педагогов, её структурные компоненты и функциональные особенности. В ходе исследования систематизированы различные научно-педагогические подходы к понятию компетентности, выделены лингвистический, речевой (дискурсивный), социокультурный, стратегический и профессионально-педагогический компоненты профессионально-коммуникативной компетентности, а также обоснована их тесная взаимосвязь.*

Ключевые слова*: профессионально-коммуникативная компетентность, будущий педагог, коммуникативные навыки, структурный компонент, функциональная особенность, педагогическое общение, компетентностный подход.*

CONTENT, ESSENCE, AND STRUCTURAL-FUNCTIONAL ANALYSIS OF THE FORMATION OF PROFESSIONAL COMMUNICATIVE COMPETENCE OF FUTURE TEACHERS

Abstract: *This article provides a scientific and theoretical analysis of the content and essence of professional communicative competence of future teachers, its structural components, and functional characteristics. The study systematizes various scientific and pedagogical approaches to the concept of competence and identifies the linguistic, speech (discursive), sociocultural, strategic, and professional-pedagogical components of professional communicative competence. The close interrelationship and interdependence of these components are also substantiated.*

Keywords: professional communicative competence, future teacher, communication skills, structural component, functional characteristic, pedagogical communication, competence-based approach.

KIRISH

Zamonaviy ta’lim tizimida amalga oshirilayotgan innovatsion o‘ zgarishlar pedagog shaxsiga qo‘ yiladigan kasbiy talablarning mazmunini sezilarli darajada kengaytirmoqda. Bugungi pedagog nafaqat muayyan fan bo‘ yicha chuqur bilimga ega mutaxassis, balki ta’lim jarayoni ishtirokchilari bilan samarali muloqot o‘ rnata oladigan, o‘ z fikrini aniq va asosli ifodalaydigan, pedagogik vaziyatlarni kommunikativ jihatdan boshqara oladigan hamda hamkorlikka asoslangan ta’lim muhitini shakllantira oladigan professional shaxs bo‘ lishi talab etiladi. Shu sababli bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini shakllantirish oliy pedagogik ta’limning ustuvor vazifalaridan biri hisoblanadi.

Kasbiy-kommunikativ kompetentlik pedagogning kasbiy bilimlari, nutqiy va kommunikativ ko‘ nikmalari, ijtimoiy-psixologik xususiyatlari, pedagogik muloqot madaniyati hamda muayyan vaziyatga mos kommunikativ strategiyani tanlash qobiliyatini birlashtiruvchi integrativ sifatdir. Mazkur kompetentlik pedagogga o‘ quvchilar bilan konstruktiv

munosabat o‘ rnatish, ta’lim mazmunini tushunarli yetkazish, qayta aloqa mexanizmlaridan samarali foydalanish, nizoli vaziyatlarni bartaraf etish va pedagogik hamkorlikni tashkil qilish imkonini beradi.

Bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini shakllantirish jarayoni faqat nutqiy ko‘ nikmalarni rivojlantirish bilan chegaralanmaydi. U motivatsion-qadriyatli, kognitiv, kommunikativ-faoliyatli, emotsional-irodaviy va refleksiv komponentlarning o‘ zaro bog‘ liqligini nazarda tutadi. Motivatsion-qadriyatli komponent pedagogik muloqotga ijobiy munosabat va kasbiy qadriyatlarni ifodalasa, kognitiv komponent kommunikatsiya qonuniyatlari va pedagogik muloqotga oid bilimlarni qamrab oladi. Kommunikativ-faoliyatli komponent esa ushbu bilimlarni real pedagogik vaziyatlarda qo‘ llash, suhbatni tashkil etish, tinglash, savol berish, fikrni dalillash va qayta aloqa o‘ rnatish ko‘ nikmalarida namoyon bo‘ ladi. Refleksiv komponent pedagogning o‘ z kommunikativ faoliyatini tahlil qilishi, mavjud kamchiliklarni aniqlashi va kasbiy muloqot usullarini takomillashtirib borishini ta’minlaydi.

ADABIYOTLAR TAHLILI VA METODOLOGIYA

Raqamli ta’lim muhitining kengayishi ushbu kompetentlikning mazmuniga yangi talablarni ham kiritmoqda. Zamonaviy pedagog auditoriyadagi bevosita muloqot bilan bir qatorda elektron ta’lim platformalari, videokonferensiyalar, ijtimoiy tarmoqlar va boshqa raqamli kommunikatsiya vositalari orqali ham professional munosabatlarni samarali tashkil eta olishi zarur. Bu esa bo‘ lajak pedagoglarda an’anaviy kommunikativ ko‘ nikmalar bilan bir qatorda raqamli kommunikatsiya madaniyati, mediaetiket va turli axborot muhitlariga moslashuvchan kommunikativ strategiyalarni rivojlantirishni talab etadi.

Bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini shakllantirishda oliy ta’lim jarayonining amaliy yo‘ naltirilganligi alohida ahamiyatga ega. Muammoli vaziyatlar, pedagogik keyslar, rolli va ishbilarmonlik o‘ yinlari, munozaralar, mikroo‘ qitish, treninglar, pedagogik amaliyot hamda refleksiv topshiriqlardan foydalanish talabalarning nazariy bilimlarini real kommunikativ faoliyat bilan uyg‘ unlashtirish imkonini beradi. Bunday metodlar orqali bo‘ lajak pedagoglar turli pedagogik vaziyatlarda kommunikativ strategiyalarni mustaqil tanlash, o‘ z xatti-harakatlarini baholash va muloqot natijalarini tahlil qilish tajribasiga ega bo‘ ladilar.

Bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini shakllantirish masalasi zamonaviy pedagogika, psixologiya, lingvodidaktika va kasbiy ta’lim nazariyasining muhim tadqiqot yo‘ nalishlaridan biri hisoblanadi. Pedagog faoliyatining kommunikativ tabiati shuni ko‘ rsatadiki, o‘ qituvchining kasbiy muvaffaqiyati faqat fan bo‘ yicha bilimlarning mukammalligi bilan emas, balki ushbu bilimlarni ta’lim oluvchilarga yetkazish, ular bilan pedagogik hamkorlik o‘ rnatish, kommunikativ vaziyatni boshqarish va o‘ zaro tushunishni ta’minlash qobiliyati bilan ham belgilanadi.

Kommunikativ kompetentlik tushunchasining nazariy ildizlari D. Hymes tadqiqotlari bilan chambarchas bog‘ liq. Olim N. Chomsky tomonidan ilgari surilgan lingvistik kompetensiya konsepsiyasini kengaytirib, tilni bilish faqat grammatik jihatdan to‘ g‘ ri gap tuzish qobiliyatidan iborat emasligini ta’kidlaydi. D. Hymesning fikricha, shaxs muayyan nutqiy ifodani qachon, qayerda, kim bilan va qanday ijtimoiy vaziyatda qo‘ llash mumkinligini ham bilishi kerak. Shu ma’noda kommunikativ kompetentlik lingvistik bilim bilan bir qatorda ijtimoiy vaziyatga mos ravishda muloqot qilish qobiliyatini ham qamrab oladi [1]. Mazkur yondashuv pedagogning kasbiy kommunikatsiyasini tahlil qilishda alohida ahamiyatga ega, chunki o‘ qituvchi turli yosh, bilim darajasi va individual-psixologik xususiyatlarga ega ta’lim oluvchilar bilan muloqot qiladi.

M. Canale va M. Swain kommunikativ kompetentlikning tarkibiy tuzilishini yanada rivojlantirib, uni bir nechta o‘ zaro bog‘ liq komponentlardan tashkil topgan tizim sifatida talqin qilgan. Ularning modelida grammatik kompetensiya, sotsiolingvistik kompetensiya va strategik kompetensiya muhim o‘ rin egallaydi [2]. Keyinchalik M. Canale ushbu modelni rivojlantirib, diskursiv kompetensiyani ham alohida komponent sifatida ajratadi [3]. Ushbu nazariy yondashuvni bo‘ lajak pedagoglarning kasbiy tayyorgarligiga tatbiq etganda, pedagog grammatik va nutqiy jihatdan to‘ g‘ ri muloqot qilish bilan cheklanmasdan, yaxlit pedagogik diskursni tashkil etishi, auditoriyaning xususiyatlarini hisobga olishi hamda kommunikativ qiyinchiliklarni strategik usullar orqali bartaraf eta olishi lozimligi namoyon bo‘ ladi.

L. Bachman kommunikativ kompetensiyani til bilimlari va ulardan real kommunikativ vaziyatlarda foydalanish qobiliyatining o‘ zaro integratsiyasi asosida izohlaydi. Uning konsepsiyasida tashkiliy va pragmatik bilimlar kommunikativ faoliyat samaradorligini belgilovchi muhim omillar sifatida ko‘ rsatiladi [4]. Pedagogik faoliyat nuqtai nazaridan mazkur fikr o‘ qituvchining nutqni grammatik jihatdan to‘ g‘ ri tashkil etishi bilan bir qatorda, uning kommunikativ maqsadini aniq belgilashi, ta’lim oluvchining holatini hisobga olishi va pedagogik vaziyatga muvofiq nutq strategiyasini tanlashi zarurligini anglatadi.

M. Byram kommunikativ kompetentlikni madaniyatlararo muloqot bilan bog‘ liq holda tahlil qilib, samarali kommunikatsiya uchun faqat tilni bilishning o‘ zi yetarli emasligini asoslaydi. Olimning fikricha, kommunikativ shaxs boshqa ijtimoiy va madaniy qarashlarni tushunish, ularga nisbatan ochiq munosabatda bo‘ lish, turli madaniy hodisalarni talqin qilish va o‘ zaro muloqotda vositachilik qilish qobiliyatiga ega bo‘ lishi zarur [5]. Mazkur qarash bo‘ lajak pedagoglarning ijtimoiy-madaniy kompetentligini shakllantirish zaruratini ko‘ rsatadi. Ayniqsa, globallashuv va

madaniyatlararo aloqalar kuchaygan zamonaviy ta’lim muhitida pedagog turli ijtimoiy va madaniy tajribaga ega ta’lim oluvchilar bilan samarali munosabat o‘ rnata olishi kerak.

Kasbiy-kommunikativ kompetentlikni pedagogik faoliyat bilan bevosita bog‘ lashda A.A. Leontyevning pedagogik muloqotga oid qarashlari muhim nazariy asos bo‘ lib xizmat qiladi. A.A. Leontyev pedagogik muloqotni o‘ qituvchi va o‘ quvchi o‘ rtasidagi oddiy axborot almashinuvi emas, balki ta’lim-tarbiya maqsadlarini amalga oshirishga yo‘ naltirilgan professional kommunikativ faoliyat sifatida ko‘ radi [6]. Ushbu nuqtai nazardan pedagogning kommunikativ kompetentligi o‘ quv materialini yetkazish, ta’lim oluvchilarning bilish faoliyatini faollashtirish, psixologik jihatdan qulay muhit yaratish va pedagogik hamkorlikni boshqarish kabi bir qator funksiyalarni bajaradi.

I.A. Zimnyaya kompetensiya va kompetentlik tushunchalarini ta’lim natijalari bilan bog‘ liq holda tadqiq etib, kompetentlikni shaxsning bilimlari, tajribasi, qadriyatlari va faoliyatga tayyorligini birlashtiruvchi murakkab xususiyat sifatida tavsiflaydi [7]. Ushbu konsepsiyadan kelib chiqib, bo‘ lajak pedagogning kasbiy-kommunikativ kompetentligini faqat kommunikativ bilim va ko‘ nikmalar yig‘ indisi sifatida emas, balki kasbiy motivatsiya, pedagogik qadriyatlar, muloqot tajribasi, refleksiya va kommunikativ faoliyatga tayyorlikning integrativ birligi sifatida baholash maqsadga muvofiqdir.

A.V. Xutorskoy kompetensiyaviy yondashuvni ta’lim natijalarini amaliy faoliyat bilan bog‘ lash imkonini beradigan muhim metodologik yo‘ nalish sifatida ko‘ rsatadi. Uning yondashuvida kompetensiyalar o‘ quvchining bilimlarni muayyan hayotiy va faoliyat vaziyatlarida qo‘ llay olish qobiliyati bilan bog‘ lanadi [8]. Mazkur nazariy pozitsiya bo‘ lajak pedagoglarni tayyorlashda ham muhimdir. Chunki talaba kommunikatsiyaga oid nazariy bilimlarni egallashi bilan birga, ularni real dars, pedagogik muammo, nizoli vaziyat, ota-onalar bilan muloqot va hamkasblar bilan professional hamkorlik jarayonida qo‘ llay olishi kerak.

V.A. Kan-Kalik pedagogik muloqot muammosini o‘ rganib, o‘ qituvchining kommunikativ faoliyatini kasbiy mahoratning muhim tarkibiy qismi sifatida baholaydi. Uning yondashuviga ko‘ ra, pedagogik muloqotni samarali tashkil etish o‘ qituvchidan auditoriya bilan psixologik aloqa o‘ rnatish, muloqotni boshqarish, ta’lim oluvchilarning reaksiyasini anglash hamda o‘ z kommunikativ xatti-harakatlarini pedagogik vazifalarga muvofiqlashtirishni talab etadi [9]. Demak, kasbiy-kommunikativ kompetentlikning perseptiv va boshqaruv funksiyalari pedagogik faoliyat samaradorligini ta’minlovchi muhim omillardandir.

Yuqoridagi ilmiy qarashlarni umumlashtirish asosida bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini lingvistik, nutqiy-diskursiv, ijtimoiy-madaniy, strategik va kasbiy-pedagogik komponentlardan tashkil topgan integrativ tizim sifatida tavsiflash mumkin. Lingvistik komponent til birliklaridan me’yoriy foydalanish bilan bog‘ liq bo‘ lsa, nutqiy-diskursiv komponent fikrni izchil, mantiqiy va pedagogik maqsadga muvofiq ifodalashni ta’minlaydi. Ijtimoiy-madaniy komponent kommunikatsiya ishtirokchilarining ijtimoiy va madaniy xususiyatlarini hisobga olishni, strategik komponent kommunikativ muammolarni samarali hal qilish usullarini tanlashni, kasbiy-pedagogik komponent esa barcha kommunikativ imkoniyatlarni ta’lim-tarbiya vazifalarini bajarishga yo‘ naltirishni nazarda tutadi.

Tarkibiy-funksional nuqtai nazardan ushbu komponentlar bir-biridan ajralgan holda emas, balki yagona kasbiy faoliyat tizimida namoyon bo‘ ladi. Masalan, pedagogning o‘ quv materialini tushuntirish jarayonida lingvistik bilimlari nutqiy-diskursiv ko‘ nikmalar bilan uyg‘ unlashadi, ta’lim oluvchilarning individual va ijtimoiy xususiyatlarini hisobga olish ijtimoiy-madaniy kompetentlikni talab qiladi, tushunmovchilik yoki kommunikativ to‘ siqlar paydo bo‘ lganda esa strategik kompetentlik ishga tushadi. Ushbu jarayonlarning barchasi kasbiy-pedagogik maqsad bilan birlashtiriladi.

Tadqiqot jarayonida ilmiy-pedagogik va lingvodidaktik adabiyotlarni nazariy tahlil qilish, sintez, umumlashtirish, tizimli-strukturaviy yondashuv hamda qiyosiy tahlil metodlaridan foydalanildi. Kasbiy-kommunikativ kompetentlik tushunchasiga doir mahalliy va xorijiy manbalar mazmuniy jihatdan qiyoslandi, ularning umumiy va farqli jihatlari aniqlanib, tizimlashtirilgan yagona tarkibiy model shaklida taqdim etildi.

NATIJALAR VA MUHOKAMA

“Kompetentlik” tushunchasi pedagogika fanida shaxsning muayyan faoliyat sohasida bilim, ko‘ nikma, malaka va shaxsiy sifatlarni amaliyotda samarali qo‘ llay olish qobiliyati sifatida talqin etiladi. Kommunikativ kompetentlik esa nutqiy vositalar yordamida muloqot maqsadiga muvofiq o‘ zaro ta’sir o‘ rnata olish qobiliyati sifatida belgilanadi. Ushbu tushunchaning ilmiy negizi lingvistika va sotsiolingvistika sohasidagi tadqiqotlarga borib taqaladi, xususan, nutqiy kompetentlikni faqat grammatik to‘ g‘ rilik bilan emas, balki nutqning ijtimoiy vaziyatga mosligi bilan ham bog‘ liq holda tushunish g‘ oyasi ilgari surilgan.

Kasbiy-kommunikativ kompetentlik esa yuqoridagi umumiy kommunikativ kompetentlikning kasbiy faoliyat kontekstidagi ko‘ rinishi bo‘ lib, bo‘ lajak pedagogning o‘ quv-tarbiyaviy jarayonda ta’lim oluvchilar, ularning ota-onalari va kasbdoshlari bilan pedagogik maqsadga muvofiq, samarali va natijaviy muloqot qura olish qobiliyati, ko‘ nikmasi va shaxsiy sifatlari majmuasi sifatida ta’riflanadi. Bu kompetentlik nafaqat nutq madaniyati, balki pedagogik mahorat, empatiya, tinglash qobiliyati va vaziyatni tahlil qilish ko‘ nikmalarini ham o‘ z ichiga oladi.

O‘ tkazilgan nazariy tahlil asosida bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligi tarkibida quyidagi besh asosiy komponentni ajratish maqsadga muvofiq deb topildi (1-jadval):

1-jadval. Bo‘ lajak pedagogning kasbiy-kommunikativ kompetentligi tarkibiy komponentlari

Komponent	Mazmuni	Namoyon bo‘ lish shakli
Lingvistik komponent	Ona tili va xorijiy til grammatikasi, leksikasi, uslubiyatini bilish, nutqiy vositalardan me’yoriy foydalanish	Savodli, me’yoriy nutq
Nutqiy (diskursiv) komponent	Fikrni izchil, mantiqiy va vaziyatga mos tarzda bayon eta olish, matn va dialog qura bilish	Ma’ruza, tushuntirish, dialog
Ijtimoiy-madaniy komponent	Muloqot me’yorlari, pedagogik odob, madaniyatlararo muloqot qoidalarini bilish	Auditoriya bilan ishlash odobi
Strategik komponent	Muloqotdagi to‘ siqlarni bartaraf etish, muqobil usullardan foydalanish qobiliyati	Nizoli vaziyatni hal qilish
Kasbiy-pedagogik komponent	O‘ quv-tarbiyaviy jarayonda kommunikativ vositalarni metodik maqsadga muvofiq qo‘ llash	Interfaol dars, fikr-mulohaza

Keltirilgan komponentlar bir-biridan alohida emas, balki o‘ zaro uzviy bog‘ liq holda namoyon bo‘ ladi: lingvistik komponent nutqning to‘ g‘ riligini, nutqiy komponent uning izchilligini, ijtimoiy-madaniy komponent muloqot odobini, strategik komponent moslashuvchanlikni, kasbiy-pedagogik komponent esa barcha bu ko‘ nikmalarning o‘ quv-tarbiyaviy maqsadga xizmat qilishini ta’minlaydi.

Bo‘ lajak pedagogning kasbiy faoliyatida kasbiy-kommunikativ kompetentlik quyidagi asosiy funksiyalarni bajaradi: axborot-kommunikativ funksiya — o‘ quv materialini aniq, tushunarli va izchil yetkazish; tarbiyaviy-ta’sir etuvchi funksiya — muloqot orqali ta’lim oluvchi shaxsiga ijobiy pedagogik ta’sir ko‘ rsatish; tashkiliy-boshqaruv funksiya — sinf yoki guruh faoliyatini muloqot vositasida muvofiqlashtirish va yo‘ naltirish; reflektiv-baholash funksiyasi — o‘ z nutqiy faoliyatini va uning natijalarini tahlil qilib, kommunikativ strategiyani takomillashtirib borish.

Ushbu funksiyalarning barchasi zamonaviy ta’lim muhitida, jumladan raqamli va sun’iy intellekt vositalari qo‘ llanilayotgan sharoitda yangi mazmun kasb etmoqda: pedagog nafaqat an’anaviy og‘ zaki-yozma muloqot, balki intellektual tizimlar bilan samarali interaktsiya (so‘ rov shakllantirish, natijalarni tanqidiy baholash, ta’lim oluvchilarga moslashtirish) ko‘ nikmalariga ham ega bo‘ lishi lozim bo‘ lmoqda. Bu jihat kasbiy-kommunikativ kompetentlik tarkibiga raqamli-kommunikativ subkomponentni kiritish zaruratini keltirib chiqarmoqda.

Tahlil natijalari shuni ko‘ rsatadiki, kasbiy-kommunikativ kompetentlikka doir mavjud yondashuvlar asosan an’anaviy og‘ zaki va yozma muloqot shakllariga qaratilgan bo‘ lib, zamonaviy raqamli ta’lim muhiti, xususan sun’iy intellekt vositalarining bo‘ lajak pedagog kommunikativ faoliyatiga ta’siri yetarlicha tadqiq etilmagan. Ushbu holat kasbiy-kommunikativ kompetentlikning tarkibiy-funksional modelini yangi didaktik sharoitlarga moslashtirish, uni rivojlantirish metodikasini sun’iy intellekt vositalari asosida takomillashtirish zaruratini asoslaydi. Shu bilan birga, tarkibiy komponentlarning o‘ zaro bog‘ liqligi va funksional xususiyatlarning kasbiy faoliyat bilan uzviyligi ushbu kompetentlikni yaxlit, bosqichma-bosqich rivojlantirish lozim bo‘ lgan tizim sifatida qarash zarurligini ko‘ rsatadi.

O‘ tkazilgan nazariy tahlil asosida quyidagi xulosalarga kelindi: birinchidan, bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligi umumiy kommunikativ kompetentlikning kasbiy faoliyat kontekstidagi maxsus ko‘ rinishi bo‘ lib, u nutqiy, ijtimoiy-madaniy va kasbiy-pedagogik jihatlarning uyg‘ unligidan iborat; ikkinchidan, uning tarkibiy tuzilmasi lingvistik, nutqiy, ijtimoiy-madaniy, strategik va kasbiy-pedagogik komponentlarni o‘ z ichiga oladi va bu komponentlar o‘ zaro uzviy bog‘ liq holda faoliyat yuritadi; uchinchidan, mazkur kompetentlik axborot-kommunikativ, tarbiyaviy-ta’sir etuvchi, tashkiliy-boshqaruv va reflektiv-baholash funksiyalarini bajaradi. Aniqlangan nazariy-tarkibiy model bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini sun’iy intellekt vositalari asosida rivojlantirish metodikasini ishlab chiqish uchun ilmiy-nazariy asos bo‘ lib xizmat qiladi.

XULOSA

Bo‘ lajak pedagoglarning kasbiy-kommunikativ kompetentligini shakllantirish zamonaviy pedagogik ta’limning muhim tarkibiy yo‘ nalishlaridan biri bo‘ lib, u pedagogning kelajakdagi kasbiy faoliyati samaradorligini belgilovchi asosiy

omillardan hisoblanadi. Kasbiy-kommunikativ kompetentlikni faqat nutq madaniyati yoki muloqot koʻnikmalari doirasida talqin qilish yetarli emas. U kasbiy bilimlar, kommunikativ qobiliyatlar, pedagogik qadriyatlar, ijtimoiy-psixologik tayyorgarlik va refleksiv faoliyatni birlashtiruvchi yaxlit integrativ tuzilma sifatida namoyon boʻladi.

Tarkibiy-funksional tahlil mazkur kompetentlikning motivatsion-qadriyatli, kognitiv, kommunikativ-faoliyatli, emotsional-irodaviy va refleksiv komponentlari oʻzaro uzviy bogʻlanganligini koʻrsatadi. Ushbu komponentlardan birining yetarli darajada shakllanmasligi pedagogning umumiy kommunikativ samaradorligiga ta’sir qilishi mumkin. Shu sababli kasbiy-kommunikativ kompetentlikni shakllantirishda uning barcha tarkibiy qismlarini kompleks va tizimli rivojlantirish zarur.

Kasbiy-kommunikativ kompetentlikning axborot-kommunikativ, interaktiv, perseptiv, muvofiqlashtiruvchi, motivatsion va refleksiv funksiyalari pedagogning ta’lim jarayonidagi koʻp qirrali faoliyatini ta’minlaydi. Mazkur funksiyalarning uygʻun amalga oshirilishi pedagogga oʻquvchilar bilan samarali muloqot oʻrnatish, ularning individual xususiyatlarini hisobga olish, pedagogik hamkorlikni tashkil etish, nizoli vaziyatlarni konstruktiv hal qilish va ta’lim jarayonida samarali qayta aloqani yoʻlga qoʻyish imkonini beradi.

Boʻlajak pedagoglarda mazkur kompetentlikni rivojlantirish uchun ta’lim jarayonida interfaol va amaliy metodlardan keng foydalanish maqsadga muvofiqdir. Pedagogik vaziyatlarni modellashtirish, keys-stadi, trening, debat, rolli oʻyin, mikrooʻqitish, loyiha faoliyati va refleksiv topshiriqlar talabalarning kasbiy kommunikatsiyaga oid nazariy bilimlarini amaliy tajribaga aylantirishga yordam beradi. Shu bilan birga, pedagogik amaliyotning kommunikativ yoʻnaltirilganligini kuchaytirish boʻlajak oʻqituvchilarning real kasbiy muhitga moslashishini ta’minlaydi.

Umuman olganda, boʻlajak pedagoglarning kasbiy-kommunikativ kompetentligini shakllantirish uzluksiz, tizimli va amaliy faoliyatga yoʻnaltirilgan pedagogik jarayon sifatida tashkil etilishi lozim. Uning mazmuniy va funksional komponentlarini oʻzaro uygʻun rivojlantirish natijasida mustaqil fikrlaydigan, pedagogik muloqotni samarali boshqaradigan, turli kommunikativ vaziyatlarga moslasha oladigan, hamkorlikka tayyor va kasbiy jihatdan raqobatbardosh pedagoglarni tayyorlash imkoniyati oshadi.

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THE SIGNIFICANCE OF CROWDSOURCING TECHNOLOGY IN DEVELOPING ACTIVE CITIZENSHIP COMPETENCE AMONG UNIVERSITY STUDENTS

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Abstract: *This article analyzes the pedagogical potential of crowdsourcing technology in developing active citizenship competence among university students. In the context of the modern digital learning environment, crowdsourcing technology is presented as an important factor in fostering young people's social engagement, collaborative working skills, ability to solve problems collectively, and civic responsibility.*

Keywords: *active citizenship competence, crowdsourcing technology, digital pedagogy, university students, innovative education, social engagement, collaboration, educational technologies.*

ЗНАЧЕНИЕ ТЕХНОЛОГИИ КРАУДСОРСИНГА В ФОРМИРОВАНИИ КОМПЕТЕНЦИИ АКТИВНОЙ ГРАЖДАНСТВЕННОСТИ У СТУДЕНТОВ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ

Аннотация: *В данной статье анализируется педагогический потенциал технологии краудсорсинга в формировании компетенции активной гражданственности у студентов высших учебных заведений. В условиях современной цифровой образовательной среды технология краудсорсинга рассматривается как важный фактор развития социальной активности молодежи, навыков совместной деятельности, способности к коллективному решению проблем и гражданской ответственности.*

Ключевые слова: *компетенция активной гражданственности, технология краудсорсинга, цифровая педагогика, студенты высших учебных заведений, инновационное образование, социальная активность, сотрудничество, образовательные технологии.*

OLIY TA'LIM TALABALARIDA FAOL FUQAROLIK KOMPETENSIYASINI RIVOJLANTIRISHDA KRAUDSORSING TEXNOLOGIYASINING AHAMIYATI

Annotatsiya: *Mazkur maqolada oliy ta'lim talabalarida faol fuqarolik kompetensiyasini rivojlantirishda kraudsorsing texnologiyasining pedagogik imkoniyatlari tahlil qilingan. Zamonaviy raqamli ta'lim muhiti sharoitida kraudsorsing texnologiyasi yoshlarning ijtimoiy faolligini oshirish, hamkorlikda ishlash ko' nikmalarini rivojlantirish, muammolarni jamoaviy ravishda hal qilish qobiliyatini shakllantirish hamda fuqarolik mas'uliyatini kuchaytirishning muhim omili sifatida yoritilgan.*

Kalit so' zlar: *faol fuqarolik kompetensiyasi, kraudsorsing texnologiyasi, raqamli pedagogika, oliy ta'lim talabalari, innovatsion ta'lim, ijtimoiy faollik, hamkorlik, ta'lim texnologiyalari.*

INTRODUCTION.

The rapid development of digital technologies and the transformation of contemporary society have significantly changed the requirements placed on higher education. Universities are increasingly expected not only to provide students with professional knowledge and skills but also to prepare socially responsible, initiative-driven, critically thinking, and civically engaged individuals. In this context, the development of active citizenship competence among university students has become an important component of modern higher education. Such competence enables young people to understand social processes, participate consciously in community life, express and justify their positions, cooperate with others, and contribute to solving socially significant problems.

Active citizenship competence can be regarded as an integrated combination of civic knowledge, social responsibility, critical thinking, communication and collaboration skills, initiative, participation, and readiness to contribute to public life. Its development requires educational approaches that move beyond the traditional transmission of theoretical knowledge and create opportunities for students to participate directly in decision-making, problem-solving,

discussion, project activities, and socially oriented initiatives. Therefore, the introduction of interactive and digitally supported educational technologies is becoming increasingly important in contemporary university education.

One of the promising approaches in this regard is crowdsourcing technology. Crowdsourcing generally involves engaging a large group of people in generating ideas, collecting information, evaluating proposals, solving problems, or jointly creating socially valuable outcomes through open and collaborative participation. In an educational environment, crowdsourcing can be transformed into an effective pedagogical mechanism through which students participate in identifying problems, proposing solutions, discussing alternative viewpoints, evaluating initiatives, and collectively developing projects.

The pedagogical value of crowdsourcing lies in its participatory nature. Unlike educational models in which students mainly act as recipients of information, crowdsourcing creates conditions for them to become active contributors to the learning process. Students are encouraged to express their opinions, present arguments, respond to the ideas of others, make collective decisions, and take responsibility for the outcomes of collaborative activities. These processes are directly related to the cognitive, communicative, social, and value-oriented components of active citizenship competence.

Crowdsourcing technology also contributes to the development of critical and analytical thinking. When students are exposed to multiple ideas and different interpretations of the same social problem, they need to compare information, assess the reliability and relevance of arguments, distinguish well-grounded proposals from weak ones, and formulate their own positions. Consequently, crowdsourcing-based activities can create an educational environment in which civic participation is closely connected with evidence-based reasoning and responsible decision-making.

LITERATURE REVIEW AND METHODOLOGY

The processes of globalization and digital transformation are creating new challenges for the education system. In particular, developing active citizenship competence among university students is one of the pressing pedagogical issues of our time. Active citizenship competence refers to an individual's ability to participate consciously in social life, demonstrate social responsibility, respect democratic values, and engage effectively in collective activities.

The development of information and communication technologies has led to the widespread use of innovative approaches in education. One such approach is crowdsourcing technology, which enables problems to be solved through collective thinking and broad-based collaboration. In the pedagogical process, crowdsourcing is emerging as an effective means of developing students' independent thinking, initiative, and civic responsibility.

Today, higher education institutions increasingly need to employ interactive methods in order to develop university students into socially active and responsible individuals. From this perspective, examining the role and potential of crowdsourcing technology in education is of both scientific and practical significance.

The term crowdsourcing (from the English words "crowd" and "sourcing," meaning the use of resources) refers to solving problems and creating new brands by drawing on the creativity, experience, and knowledge of ordinary people. Crowdsourcing technology makes it possible to use human resources to find solutions to business, social, and political problems. In 2003, Luis von Ahn and his team first put into practice, through the concept of crowdsourcing, the idea of "human computation," demonstrating that tasks that computers cannot perform can be completed collectively, easily, and quickly [1, p. 115]. However, the term was introduced into academic discourse by Jeff Howe in 2006. Jeff Howe, a contributor to Wired magazine, defines the concept in his work "The Rise of Crowdsourcing" as follows: "...smart companies ... the latent talents of the crowd. The labor is not always free, but it costs a lot less than paying traditional employees. It's not outsourcing; it's crowdsourcing" [2, p. 133]. The phenomenon was initially introduced as a corporate concept. Another Western scholar, Brabham, explains crowdsourcing as follows: "A company presents a problem. A large audience then begins proposing solutions to that problem. The company is able to select the solutions it considers most appropriate. This method is called crowdsourcing" [3, p. 394]. Based on the definitions above, crowdsourcing can be divided into two categories. It can be applied in real-life domains (business, social life, and politics) and in education as a problem-solving process (understanding a problem, putting it to a community vote, searching for solutions, collecting information and opinions, and providing support services).

Based on the definitions of crowdsourcing presented above, it is appropriate to clarify the meaning and essence of the term "crowdsourcing pedagogical technology."

RESULTS AND DISCUSSION

Crowdsourcing pedagogical technology is a modern teaching method based on using the knowledge, ideas, and experience of a broad community (students, teachers, specialists, or internet users) in the educational process [4, p. 82]. Crowdsourcing pedagogical technology is also an important direction in modern education, promoting collaboration, openness, and innovative thinking. It is particularly effective in digital learning environments. The essence of this

pedagogical technology is that the opinions and knowledge of a large number of participants are engaged in solving problems, developing projects, or generating new ideas during the learning process.

In the education system, crowdsourcing pedagogical technology provides the following opportunities:

1.Develops students' collective thinking skills;

2.Develops the ability to solve problems collaboratively;

3.Supports students' social initiatives;

4.Creates an environment for democratic dialogue;

5.Encourages students to participate actively in social projects.

In learning activities organized on the basis of crowdsourcing technology, students develop proposals concerning specific social problems, engage in discussion, and make collective decisions. This strengthens their active civic position. The application of crowdsourcing pedagogical technology in higher education contributes to the development of students' independent thinking, creative approaches, teamwork, competence in solving problem situations, and digital skills.

The following table presents a methodology for applying crowdsourcing pedagogical technology to develop active citizenship competence among university students:

Components	Content
Purpose of the methodology	To increase students' engagement in the learning process, create knowledge collaboratively, develop innovative thinking, and build digital competencies;
Key objectives	1. Develop students' teamwork skills; 2. Teach students to find creative solutions to problem situations; 3. Organize collaboration through digital platforms; 4. Strengthen independent learning activities;
Principles	Scientific validity, systematicity, interactivity, collaboration, openness, innovation, student-centeredness, continuity;
Participants	Professors and teachers, students, academic groups, research teams;
Pedagogical conditions	Availability of a digital learning environment, access to and ability to work with internet platforms, a motivating environment, and collaborative learning;
Methods	Brainstorming, project method, case study, problem-based learning, debate, group discussion, peer learning, gamification;
Tools	Moodle, Google Classroom, Padlet, Trello, Mentimeter, Zoom, Telegram groups, Google Docs;
Forms of learning	Individual work, group work, online collaboration, blended learning, seminars and training sessions;
Expected outcomes	Students' creative thinking is developed, communicative competence is formed, digital literacy is enhanced, and the ability to solve problems collaboratively is strengthened;

Crowdsourcing pedagogical technology for developing active citizenship competence among university students can be implemented through the following stages:

Stages	Content	Teacher's activity	Student's activity
Stage 1: Diagnostic preparation	Identify students' needs and competencies	Conducts diagnostics and identifies problems	Assesses their own capabilities
Stage 2: Planning	Design crowdsourcing activities	Selects the platform and tasks	Accepts the assigned tasks

Stage 3: Collaboration process	Organize group and collective activities	Acts as a moderator	Develops ideas and solutions
Stage 4: Analysis and synthesis	Select and discuss the results	Identifies the most effective proposals	Presents the results
Stage 5: Evaluation	Determine the effectiveness of the activities	Conducts monitoring and evaluation	Conducts self-assessment
Stage 6: Reflection	Analyze the experience gained	Provides a final conclusion	Provides feedback

Crowdsourcing pedagogical technology is one of the effective pedagogical tools for developing active citizenship competence among university students. This technology enhances students' social engagement, teamwork, and civic initiative, while a learning process organized on the basis of crowdsourcing helps create an environment of democratic dialogue and collaboration. Students' digital competencies are also developed, increasing their adaptability to contemporary society. The use of crowdsourcing technology in higher education contributes to the development of civil society. In the future, it would also be advisable to develop new pedagogical mechanisms by integrating crowdsourcing pedagogical technology with artificial intelligence and adaptive learning platforms.

The analysis of crowdsourcing technology in the context of higher education demonstrates that it can serve as an effective pedagogical mechanism for developing active citizenship competence among university students. Its significance lies primarily in transforming students from passive recipients of educational information into active participants who generate ideas, discuss socially relevant issues, evaluate alternative solutions, collaborate with others, and take part in collective decision-making.

Active citizenship competence is multidimensional and includes civic knowledge, social responsibility, critical thinking, communication, collaboration, initiative, digital literacy, and readiness for participation in community life. Crowdsourcing creates favorable conditions for the integrated development of these components because students encounter real or simulated social problems and are required to contribute to their solution through individual and collective intellectual activity.

A particularly important advantage of crowdsourcing is its ability to connect theoretical learning with practical civic experience. Participation in crowdsourcing-based projects enables students to identify problems, gather and analyze information, formulate proposals, defend their viewpoints, assess the ideas of peers, and participate in selecting appropriate solutions. As a result, civic competence develops not merely as theoretical knowledge about citizenship but as a practical ability to participate responsibly and constructively in social processes.

Crowdsourcing technology also strengthens the communicative and collaborative dimensions of citizenship. Through collective discussion and problem-solving, students learn to listen to others, respect different perspectives, provide evidence-based arguments, negotiate, resolve disagreements constructively, and achieve shared objectives. These abilities are essential for meaningful participation in democratic and socially responsible environments.

CONCLUSION.

In addition, crowdsourcing is particularly relevant to the development of digital citizenship. As civic interaction increasingly occurs through online platforms and digital communication channels, students need experience in responsible digital participation. Crowdsourcing activities can help develop skills related to online collaboration, information verification, digital ethics, constructive communication, and responsible engagement with public issues.

However, the pedagogical effectiveness of crowdsourcing depends on purposeful instructional design. Teachers should establish clear objectives and participation criteria, ensure equal opportunities for involvement, encourage evidence-based discussion, provide constructive feedback, and organize reflection on both the process and outcomes of collaborative activities. Attention should also be paid to possible challenges such as unequal participation, superficial contributions, misinformation, digital exclusion, and the dominance of more active participants.

Therefore, crowdsourcing should not be understood simply as a technological instrument. In higher education, it should be viewed as a pedagogically structured model of participatory learning that combines digital technology, collaboration, problem-solving, and civic engagement. When integrated systematically into educational practice, it can contribute to creating a learning environment in which students develop both professional competencies and the capacity to act as responsible members of society.

In conclusion, the integration of crowdsourcing technology into university education has significant potential for strengthening active citizenship competence. By promoting initiative, critical reflection, collective intelligence, social responsibility, and meaningful participation, crowdsourcing can support the preparation of university graduates who are capable not only of adapting to social change but also of contributing actively and responsibly to the development of their communities and society.

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RAQAMLI MULOQOT VA ETIKA MUAMMOSINING PEDAGOGIK TADQIQOTLARDAGI EVOLYUTSIYASI

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Annotatsiya: *Ushbu maqolada pedagogik etika tushunchasining tarixiy taraqqiyoti va uning zamonaviy axborotlashgan jamiyatdagi transformatsiyasi tizimli ravishda tadqiq etiladi. Tadqiqotning dolzarbligi ta’lim muhitining raqamlashishi natijasida an’anaviy pedagogik muloqot normalari va virtual makondagi xulq-atvor qoidalari o‘ rtasidagi tafovutning ortib borayotgani bilan izohlanadi. Maqolada retrospektiv tahlil metodidan foydalangan holda, pedagogik etikaning klassik davrdan boshlab zamonaviy “Netiket” (tarmoq etikasi) tushunchasigacha bo‘ lgan rivojlanish bosqichlari ochib berilgan. Muallif pedagogik merosning (Komenskiy, Suxomlinskiy qarashlari) raqamli muloqotdagi o‘ rnini tahlil qilar ekan, axloqiy normalarning texnologik muhitga moslashish mexanizmlarini ko‘ rsatib o‘ tadi. Tadqiqot davomida xorijiy olimlar, jumladan, V. Shi, M. Ribble va L. Floridining raqamli fuqarolik va kiberetika borasidagi nazariy konsepsiyalari qiyosiy o‘ rganilgan. Maqolaning asosiy yangiligi shundan iboratki, unda raqamli muloqot etikasi shunchaki qoidalar majmui emas, balki pedagogik jarayonning subyektlari o‘ rtasidagi “virtual mas’uliyat” va “raqamli madaniyat”ning uzviy qismi sifatida talqin etiladi. Xulosa qismida raqamli muloqot etikasi muammolarini bartaraf etish bo‘ yicha pedagogik tavsiyalar va kelajakdagi tadqiqot yo‘ nalishlari belgilab berilgan.*

Kalit so‘ zlar: *Retrospektiv tahlil, pedagogik etika, Netiket, raqamli muloqot, kiberetika, pedagogik meros, raqamli fuqarolik, akademik halollik.*

ИННОВАЦИОННАЯ МОДЕЛЬ ФОРМИРОВАНИЯ ЦИФРОВОЙ КОММУНИКАЦИОННОЙ КУЛЬТУРЫ БУДУЩИХ УЧИТЕЛЕЙ

Аннотация: *В данной статье систематически исследуется историческое развитие концепции педагогической этики и ее трансформация в современном информационном обществе. Актуальность исследования обусловлена растущим разрывом между традиционными нормами педагогического общения и правилами поведения в виртуальном пространстве в результате цифровизации образовательной среды.*
С использованием метода ретроспективного анализа в статье раскрываются этапы развития педагогической этики от классического периода до современной концепции “Нетикета” (сетевой этики). Анализируя роль педагогического наследия (взгляды Коменского, Сухомлинского) в цифровой коммуникации, автор демонстрирует механизмы адаптации этических норм к технологической среде. В ходе исследования проведен сравнительный анализ теоретических концепций цифровой гражданственности и киберэтики зарубежных ученых, таких как В. Ши, М. Риббл и Л. Флориди. Основная новизна статьи заключается в том, что этика цифрового общения трактуется не просто как набор правил, а как неотъемлемая часть “виртуальной ответственности” и “цифровой культуры” субъектов педагогического процесса. В заключении представлены педагогические рекомендации по преодолению проблем этики цифровой коммуникации и определены направления будущих исследований.

Ключевые слова: *Ретроспективный анализ, педагогическая этика, Нетикет, цифровое общение, киберэтика, педагогическое наследие, цифровая гражданственность, академическая честность.*

AN INNOVATIVE MODEL OF FORMING A FUTURE TEACHER’S DIGITAL COMMUNICATION CULTURE

Abstract: *This article provides a systematic study of the historical development of the concept of pedagogical ethics and its transformation in the modern information society. The relevance of the study is driven by the increasing gap between traditional norms of pedagogical communication and rules of conduct in virtual spaces, resulting from the digitalization of the educational environment. Using the method of retrospective analysis, the article reveals the developmental stages of pedagogical ethics from the classical period to the modern concept of "Netiquette" (network ethics). By analyzing the role of pedagogical heritage (the views of Comenius and Sukhomlinsky) in digital communication, the author demonstrates the mechanisms through which ethical norms adapt to the technological environment. The research includes a comparative analysis of theoretical concepts regarding digital citizenship and cyber-ethics by foreign scholars such as V. Shea, M. Ribble, and L. Floridi. The primary novelty of the article lies in interpreting digital communication ethics not merely as a set of rules, but as an integral part of the "virtual responsibility" and "digital culture" of the subjects involved in the pedagogical process. The conclusion offers pedagogical recommendations for addressing ethical challenges in digital communication and outlines directions for future research.*

Keywords: *Retrospective analysis, pedagogical ethics, Netiquette, digital communication, cyber-ethics, pedagogical heritage, digital citizenship, academic integrity.*

KIRISH

Raqamli texnologiyalarning jadal rivojlanishi ta'lim tizimidagi muloqot shakllari, o‘ qitish usullari va pedagogik munosabatlarni tubdan o‘ zgartirmoqda. Natijada, raqamli muloqot madaniyati, axborotdan mas'uliyatli foydalanish, shaxsiy ma'lumotlarni himoya qilish va onlayn muhitda axloqiy me'yorlarga rioya qilish masalalari pedagogik tadqiqotlarning muhim sohalariga aylandi. Pedagogikaning rivojlanishi davomida raqamli muloqot va etika masalalari dastlab texnologiyalardan foydalanish madaniyati doirasida o‘ rganilgan bo‘ lsa, bugungi kunda ular raqamli kompetensiya, media savodxonligi, sun'iy intellekt etikasi kabi zamonaviy tushunchalar bilan uzviy bog‘ liq holda o‘ rganilmoqda.

Bugungi kunda ta'limning raqamlashishi nafaqat texnologik jarayon, balki axloqiy-pedagogik hodisa sifatida ham namoyon bo‘ lmoqda. An'anaviy "ustoz-shogird" munosabatlarining virtual olamga ko‘ chishi muloqot madaniyatining yangi qirralarini, xususan, Netiket tushunchasini ilmiy iste'molga olib kirdi. Ushbu evolyutsiyani o‘ rganish kelajak pedagoglari uchun raqamli gigiyena va etik normalarni shakllantirishda muhim ahamiyat kasb etadi. Pedagogik etikadan raqamli etikaga o‘ tish shunchaki format o‘ zgarishi emas, balki pedagogik muloqot paradigmasining yangilanishidir. Quyida ushbu jarayonning eng muhim jihatlarini kengaytirilgan holda tahlil qilamiz. XXI asrning birinchi choragiga kelib, ta'lim tizimi misli ko‘ rilmagan global transformatsiyani boshidan kechirmoqda. Raqamli texnologiyalarning ta'lim jarayoniga shiddat bilan kirib kelishi nafaqat o‘ qitish metodikasini, balki pedagogik muloqotning fundamental axloqiy asoslarini ham tubdan o‘ zgartirdi. An'anaviy sinf xonalaridagi "yuzma-yuz" muloqot o‘ rnini virtual makon, ijtimoiy tarmoqlar va messenjerlar egallashi natijasida pedagogik etika muammosi yangi, yanada murakkab bosqichga ko‘ tarildi. Bugungi kunda pedagogik hamjamiyat oldida turgan eng dolzarb masalalardan biri – ko‘ p asrlik pedagogik qadriyatlarni saqlab qolgan holda, raqamli muhit uchun xos bo‘ lgan yangi xulq-atvor kodeksi – "Netiket" (tarmoq etikasi) madaniyatini shakllantirishdir. Raqamli muloqotda emotsional aloqalarning zaiflashishi, anonimlik hissi va masofaviylik pedagogik muloqotda "axloqiy vakuum" paydo bo‘ lishi xavfini tug‘ dirmoqda.

ADABIYOTLAR TAHLILI

Pedagogik etika muammosi klassik pedagogikada Yan Amos Komenskiy[5], I.G. Pestalotsi, keyinchalik esa V.A. Suxomlinskiy[14] va A.S. Makarenko kabi yirik namoyandalar tomonidan fundamental darajada o‘ rganilgan. Biroq, raqamli muloqot etikasi nisbatan yangi soha bo‘ lib, u xorijiy tadqiqotlarda V. Shi[11], M. Ribble[10], L. Floridi[3] kabi olimlar tomonidan "Raqamli fuqarolik" va "Axborot etikasi" kontekstida tahlil qilingan. O‘ zbekiston pedagogika fanida ham ushbu sohani retrospektiv va evolyutsion nuqtayi nazardan tadqiq etishga ehtiyoj yuqori.

Mahalliy tadqiqotchilar orasida N.A. Muslimov pedagog kasbiy kompetentligini shakllantirish muammolarini tadqiq etib, zamonaviy o‘ qituvchi innovatsion texnologiyalar va axborot madaniyatini puxta egallashi lozimligini ta'kidlaydi. Olimning fikricha, axborot muhitida samarali faoliyat yuritish pedagogning kasbiy muvaffaqiyatini belgilovchi asosiy omillardan biridir.

M. Usmonboyeva va O‘ . Tolipov pedagogik texnologiyalarni qo‘ llashning samaradorligi ko‘ p jihatdan o‘ qituvchining kommunikativ kompetentligiga bog‘ liq ekanligini qayd etadilar. Ularning fikricha, hamkorlikka asoslangan ta'lim muhitini yaratishda zamonaviy kommunikatsiya vositalaridan foydalanish muhim ahamiyatga ega. Shuningdek, Sh. Sharipov innovatsion ta'lim texnologiyalarini qo‘ llash bo‘ lajak pedagoglarning mustaqil fikrlash, axborotni tahlil qilish va kommunikativ faoliyatini rivojlantirishga xizmat qilishini ta'kidlaydi.

Mazkur maqolaning maqsadi – pedagogik etika tushunchasining shakllanish tarixini tahlil qilish orqali uning raqamli transformatsiya davridagi evolyutsiyasini aniqlash hamda zamonaviy "Netiket" normalarining pedagogik mazmunini ochib berishdan iborat. Ushbu maqsaddan kelib chiqib, quyidagi vazifalar belgilandi:

Pedagogik etika tushunchasining tarixiy-pedagogik bosqichlarini retrospektiv tahlil qilish.

An'anaviy axloqiy normalarning raqamli muhitga ko' chishidagi transformatsion jarayonlarni o' rganish.

Xorijiy olimlarning tarmoq etikasi borasidagi nazariy konsepsiyalarini umumlashtirish.

Zamonaviy pedagog uchun raqamli muloqot madaniyatining ustuvor yo' nalishlarini belgilash.

TADQIQOT METODOLOGIYASI

Maqolada tarixiy-mantiqiy tahlil, qiyosiy-pedagogik yondashuv hamda retrospektiv tahlil metodlaridan foydalanildi. Tadqiqot obyekti sifatida pedagogik muloqotning axloqiy normalari, predmeti sifatida esa ushbu normalarning raqamli muhitdagi evolyutsion o' zgarishlari olindi.

Raqamli muloqot etikasining shakllanishini tushunish uchun avvalo klassik pedagogik merosga nazar tashlash lozim. Sokrat va Platon davridan boshlab muloqotning dialektik shakli va o' zaro hurmat tamoyillari pedagogik etikaning poydevori bo' lib xizmat qilgan. Yan Amos Komenskiy asarlarida o' qituvchining axloqiy qiyofasi dars berishning texnik usullaridan ustun turishi ta'kidlangan. Ushbu davrda etika asosan "yuzma-yuz" muloqotga asoslangan bo' lib, u vafodorlik, andisha va nutq madaniyati kabi tushunchalar bilan cheklangan edi. An'anaviy pedagogikada o' qituvchi va o' quvchi o' rtasidagi muloqot sinxron (bir vaqtda va bir joyda) va verbal (so' z orqali) xarakterga ega edi. Raqamli muhitda esa muloqot quyidagi xususiyatlarni kasb etdi:

Asinxron muloqot: Xabarlar darhol o' qilmasligi yoki javob berilmasligi mumkin. Bu o' qituvchidan "kutish etikasi" va vaqtni boshqarish (taym-menejment) madaniyatini talab qiladi.

Vizual va matnli dominantlik: Yuzma-yuz muloqotdagi intonatsiya va tana tili o' rnini "emoji"lar, stikerlar va punktuatsiya egalladi. Bu esa o' qituvchi nutqining yozma madaniyatiga (Digital Literacy) yangicha talablar qo' ydi.

Tadqiqot davomida foydalanilgan ilmiy manbalar sifatida falsafa, axloqshunoslik va pedagogikaga oid darsliklar, monografiyalar hamda so' nggi yillarda chop etilgan ilmiy maqolalar tanlab olindi. Bu manbalar tadqiqot xulosalarining ilmiy asoslanganligini va metodologik ishonchliligini ta'minladi.

NATIJALAR VA ULARNING TAHLILI

Pedagogik tadqiqotlarda muloqot etikasining rivojlanishini shartli ravishda uch bosqichga bo' lish mumkin:

I bosqich: Klassik pedagogik etika (XX asr o' rtalarigacha) Ushbu bosqichda asosiy e'tibor o' qituvchining shaxsiy fazilatlari va sinfdagi xulq-atvoriga qaratilgan. V.Suxomlinskiy pedagogik etikaning markaziga "bola qalbini tushunish" va "so' z mas'uliyati"ni qo' ygan[14].

II bosqich: Kommunikativ yondashuv (XX asr oxiri)

Axborot almashinuvi tezlashishi bilan pedagogik muloqotning psixologik aspektlari o' rganila boshlandi. Muloqotning demokratik uslubi va hamkorlik pedagogikasi tushunchalari shakllandi.

III bosqich: Raqamli transformatsiya va "Netiket" (XXI asr boshi) Internetning ommalashishi bilan muloqot makoni o' zgardi. Tadqiqotchi V.Shi (Virginia Shea) 1994-yilda "Netiquette" asari orqali tarmoq muloqotining 10 ta asosiy qoidasini fanga kiritdi[11].

Xorijiy olimlarning tadqiqotlarida raqamli etika muammosi quyidagi fundamental nazariyalar asosida tahlil qilinadi: A. Margaret Roks va M. Ribble raqamli etikani "Raqamli fuqarolik" (Digital Citizenship)ning 9 ta elementidan biri sifatida ko' rsatadi. Uning fikricha, o' quvchilarga texnologiyadan foydalanishni o' rgatishdan oldin, ularga tarmoqdagi mas'uliyatni o' rgatish lozim[10].

B. N. Baym va "Ijtimoiy muloqot" nazariyasi Nensi Baym raqamli muloqotda "shaxsiyatning namoyon bo' lishi" (Self-presentation) masalasini o' rgangan. Uning tahlilicha, tarmoqdagi pedagogik etika o' qituvchining shaxsiy va professional chegaralarini (boundary management) saqlash san'atidir[2].

Raqamli etika muammosi xorijiy pedagogikada turli rakurslarda o' rganilgan:

1-jadval.

Raqamli etika muammosini o' rgangan olimlarning qarashlari

Olim	Asosiy nazariyasi / Qarashi
Virginia Shea	Tarmoq etikasining universal qoidalari (odam ekanligingizni unutmang, haqiqiy hayotdagi qoidalarga amal qiling).
L.Floridi	"Informatsion etika" (Information Ethics) - axborotni yaratish va tarqatishning ontologik mas'uliyati.
H.Rheingold	Virtual jamoalarda o' zaro ishonch va ijtimoiy kapitalni shakllantirish etikasi.

Xorijiy tadqiqotlar shuni ko' rsatadiki, raqamli muloqotda "anonimlik" va "masofa" insonlarda mas'uliyat hisining pasayishiga olib kelishi mumkin. Shu sababli, pedagogikada kiberetika tushunchasi tobora kengroq o' rganilmoqda. Pedagogik tadqiqotlarda muloqot muammosining evolyutsiyasini quyidagi jadval orqali ko' rishimiz mumkin:

2-jadval.

Pedagogik tadqiqotlarda muloqot muammosining evolyutsiyasi

Davr	Muloqot markazi	Asosiy qadriyat	Pedagogik tadqiqot yo‘ nalishi
1970-1980 yy.	O‘ qituvchi (Avtoritar/Demokratik)	Shaxsiy namuna	O‘ qituvchining nutq madaniyati va pedagogik takt.
1990-2000 yy.	Hamkorlik (Dialogik)	O‘ zaro hurmat	Shaxsga yo‘ naltirilgan ta’limda muloqot psixologiyasi.
2010-2026 yy.	Tarmoq (Gibrid muloqot)	Raqamli mas’uliyat	Netiket, kiberetika va sun’iy intellekt etikasi.

Pedagogik tadqiqotlar evolyutsiyasi shuni ko‘ rsatadiki, etika tushunchasi statik emas. Agar avvalari pedagogik etika faqat “nima demoqlik” va “qanday ko‘ rinish” bilan bog‘ liq bo‘ lsa, bugun u:

Raqamli iz (Digital footprint) mas’uliyati;

Kiberbulling (tarmoqdagi tazyiq)ga qarshi kurash;

Intellektual mulk va ma’lumotlar daxlsizligini o‘ z ichiga oladi.

Bugungi tadqiqotlarda “Netiket” muammosi quyidagi yo‘ nalishlarda dolzarb bo‘ lib qolmoqda:

Emotsional intellekt va raqamli empatiya: Ekran ortidagi insonning his-tuyg‘ ularini anglash va unga nisbatan axloqiy munosabatda bo‘ lish. Akademik halollik (Integrity): Plagiatga qarshi kurash va manbalardan foydalanish etikasi[4].

Media-gigiyena: Axborot oqimidagi “fake” (yolg‘ on) ma’lumotlarni saralash va ularni tarqatmaslik mas’uliyati.

An’anaviy pedagogik merosdan zamonaviy “Netiket”ga o‘ tish – bu axloqiy normalarning inqirozi emas, balki ularning yangi texnologik muhitga moslashishidir. Pedagog olimlar uchun asosiy vazifa – klassik etika tamoyillarini saqlab qolgan holda, raqamli avlodga tarmoq madaniyatini o‘ rgatishning pedagogik modellarini ishlab chiqishdan iborat. Raqamli muloqot etikasining evolyutsiyasi shuni ko‘ rsatadiki, bugungi pedagog nafaqat bilim beruvchi, balki raqamli dunyo mediatori (vositachisi) hamdir. Retrospektiv tahlil asosida aytish mumkinki, an’anaviy pedagogik etika prinsiplari yo‘ qolgani yo‘ q, aksincha, ular yangi – virtual makonda yanada murakkabroq va mas’uliyatliroq shaklga kirdi. Kelajak pedagogikasida “Netiket” fani o‘ quv dasturlarining ajralmas qismiga aylanishi zarur. Raqamli muloqot va etika muammosining pedagogik tadqiqotlardagi evolyutsiyasini o‘ rganish natijasida quyidagi fundamental xulosalarga kelindi: Etik normalarning transformatsiyasi: Pedagogik etika o‘ z mohiyatini yo‘ qotgani yo‘ q, balki u “yuzma-yuz” muloqot tizimidan “ekranlararo” muloqot tizimiga moslashdi. Bu jarayonda Netiket shunchaki tartib-qoidalar majmui emas, balki raqamli dunyoda shaxsning axloqiy o‘ zligini namoyon qilish vositasiga aylandi. Pedagogik mas’uliyatning kengayishi: Zamonaviy o‘ qituvchi nafaqat o‘ z fanining mutaxassisi, balki o‘ quvchilar uchun raqamli madaniyat namunasi (role model) bo‘ lishi lozim. Retrospektiv tahlil shuni ko‘ rsatdiki, klassik pedagogikadagi “ustoz odobi” bugungi kunda “raqamli iz” (digital footprint) va axborot gigiyenasi tushunchalari bilan to‘ ldirilishi shart[5].

Tadqiqotlar shuni ko‘ rsatadiki, raqamli etikani shakllantirishda faqat taqiqlarga tayanib bo‘ lmaydi. Bu jarayon o‘ quvchida raqamli empatiya va kiber-mas’uliyat tuyg‘ ularini tarbiyalash orqali amalga oshirilishi lozim. Istiqboldagi vazifalar: Pedagogik tadqiqotlarning keyingi bosqichi sun’iy intellekt (AI) bilan muloqot etikasi va virtual borliqdagi axloqiy chegaralarni belgilashga qaratilishi zarur. Bu esa o‘ z navbatida ta’lim standartlariga “Raqamli etika” modullarini kiritishni taqozo etadi[6].

XULOSA

Bugungi kunda pedagogik oliy ta’lim muassasalarining vazifasi nafaqat o‘ z fani bo‘ yicha chuqur bilimga ega mutaxassis tayyorlash, balki raqamli dunyoda muloqot qila oladigan madaniyatli shaxsni shakllantirishdan iboratdir. Raqamli muloqot madaniyati – bu shunchaki texnik ko‘ nikma emas, balki pedagogik mahoratning zamonaviy ko‘ rinishidir. POTMlarda ushbu madaniyatni shakllantirish uchun yetarli resurslar va texnologik imkoniyatlar mavjud bo‘ lib, ularni tizimli ravishda ta’lim jarayoniga integratsiya qilish dolzarb masaladir. Zamonaviy oliy pedagogik ta’limning fundamental vazifasi faqatgina kompetentli mutaxassis tayyorlash bilan cheklanib qolmasdan, balki shiddat bilan o‘ zgarib borayotgan raqamli voqelikda kasbiy faoliyatni madaniyatli tashkil eta oladigan shaxsni shakllantirishga yo‘ naltirilgan. Global axborotlashuv jarayonlari ta’lim muhitining aralash (hybrid) va masofaviy shakllarga o‘ tishini ta’minladi.

Bu holat pedagogik oliy ta’lim muassasalari (POTM) oldiga yangi talabni qo‘ ydi: bo‘ lajak o‘ qituvchi virtual makonda nafaqat bilim uzatuvchi, balki yuksak muloqot madaniyati va etik normalar tashuvchisi bo‘ lishi lozim. Raqamli muloqot madaniyati – bu texnik savodxonlik, kiberetika va pedagogik mahoratning sintezi bo‘ lib, u bo‘ lajak pedagogning professional imidjini belgilovchi asosiy omildir. Bugungi kunda POTMlarda ushbu madaniyatni shakllantirish uchun keng ko‘ lamli tashkiliy, texnologik va metodik imkoniyatlar mavjud. Biroq, ushbu imkoniyatlardan foydalanish darajasi

ko‘ pincha texnik vositalar bilan cheklanib qolmoqda, muloqotning etik va tarbiyaviy jihatlari esa kurikulumdan tashqarida qolmoqda. Ushbu maqolaning dolzarbligi POTM o‘ quv jarayoniga raqamli etika modullarini tizimli integratsiya qilish zarurati bilan belgilanadi.

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BOSHLANG‘ ICH SINF O‘ QUVCHILARINING NUTQINI RIVOJLANTIRISHNING O‘ ZIGA XOS LINGVODIDAKTIK XUSUSIYATLARI

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Annotatsiya: *Ushbu maqolada boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirishning nazariy va lingvodidaktik asoslari tadqiq etildi. Nutqni rivojlantirishdagi lingvistik va kommunikativ komponentlari tahlil qilindi va o‘ quvchilarning dars jarayonida olgan bilimlarini amaliy nutq ko‘ nikmalariga aylantirishda ijodiy topshiriqlarning didaktik imkoniyatlari ochib berildi. Nutqiy savodxonlik rivojlanishining asosiy ko‘ rsatkichlari sifatida nutqning to‘ g‘ riligi, mazmundorligi, bog‘ liqligi va kommunikativ mosligi belgilanadi. Natijada “til tizimi - ijodiy topshiriqlar - kommunikativ mazmun”dan iborat model taklif etiladi. Ushbu model boshlang‘ ich sinf o‘ quvchisining grammatik va leksik bilimlarini faollashtirish orqali, ularni kommunikativ vaziyatlarda qo‘ llash va nutqiy savodxonlikka erishishning o‘ zaro bog‘ liqligini aks ettiradi.*

Kalit so‘ zlar: *boshlang‘ ich sinf, nutq tili, nutq rivojlanishi, lingvodidaktika, ijodiy topshiriqlar, til bilimlari, kommunikativlik, mazmundorlik, aloqadorlik.*

СПЕЦИФИЧЕСКИЕ ЛИНГВОДИДАКТИЧЕСКИЕ ОСОБЕННОСТИ РАЗВИТИЯ РЕЧИ УЧАЩИХСЯ НАЧАЛЬНЫХ КЛАССОВ

Аннотация: *В данной статье исследуются теоретические и лингводидактические основы развития речи учащихся начальных классов. Анализируются лингвистические и коммуникативные компоненты развития речи и раскрываются дидактические возможности творческих заданий в преобразовании знаний, полученных учащимися в ходе урока, в практические речевые навыки. В качестве основных показателей развития речевой грамотности определяются правильность, содержательность, связность и коммуникативная совместимость речи. В результате предлагается модель, состоящая из “языковой системы - творческих заданий - коммуникативного содержания.” Данная модель отражает взаимосвязь использования грамматических и лексических знаний учащегося начальных классов в коммуникативных ситуациях и достижения речевой грамотности путем их активизации.*

Ключевые слова: *начальный класс, язык речи, развитие речи, лингводидактика, творческие задания, языковые знания, коммуникативность, содержательность, связность.*

SPECIFIC LINGUODIDACTIC FEATURES OF SPEECH DEVELOPMENT IN PRIMARY SCHOOL STUDENTS

Abstract: *This article explores the theoretical and linguodidactic foundations of speech development in primary school students. The linguistic and communicative components of speech development are analyzed, and the didactic possibilities of creative tasks in transforming students’ knowledge acquired during the lesson into practical speech skills are revealed. As the main indicators of speech literacy development, the correctness, substance, coherence, and communicative compatibility of speech are defined. As a result, a model consisting of “linguistic system - creative tasks - communicative content” is proposed. This model reflects the relationship between using a primary school student’s grammatical and lexical knowledge in communicative situations and achieving speech literacy by activating them.*

Keywords: *primary school, language of speech, speech development, linguodidactics, creative tasks, linguistic knowledge, communicativeness, substance, coherence.*

KIRISH.

Maktablarda boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirish ta’lim-tarbiya jarayonining muhim yo‘ nalishlaridan biridir. Nutqiy savodxonlik o‘ quvchining o‘ z fikrini aniq, tushunarli, grammatik jihatdan to‘ g‘ ri va

madaniyatli tarzda yetkaza olish qobiliyatini o‘ z ichiga oladi. Bu qobiliyatni samarali shakllantirishda lingvodidaktika nutqni rivojlantirish negizidagi tilni o‘ qitishning nazariy va amaliy asoslarini belgilaydi.

Boshlang‘ ich sinflarda o‘ quvchilarning nutqini rivojlantirishning o‘ ziga xos lingvodidaktik xususiyatlari, eng avvalo ularning yosh psixologik xususiyatlari bilan bog‘ liq. Bu davrda bolalarning so‘ z boyligi jadal rivojlanib boradi, lekin til birliklarini ongli ravishda qo‘ llash tajribasi kam bo‘ ladi. Shuning uchun, o‘ qitish jarayonida lug‘ at bilan ishlashni o‘ ziga xos zamonaviy usullarda, tizimli ravishda tashkil etish, yangi so‘ zlarning ma’nosini tushuntirish, ularni nutq jarayonida va matn yozish tarkibida qo‘ llashga o‘ rgatish maqsadga muvofiq. Shu sababli, boshlang‘ ich sinflarda nutqni rivojlantirish masalasi til bilimlarini berishning qo‘ shimcha komponenti emas, balki umuman, o‘ quv jarayonining sifatini belgilaydigan asosiy pedagogik vazifalardan biri sifatida qaralishi kerak. Aynan ushbu omillar zamonaviy ta’lim jarayonida o‘ quvchilarning muloqotchanlik faolligini oshirish, mustaqil mushohada yuritish hamda o‘ z pozitsiyasini dalillash kompetensiyasini shakllantirishga bo‘ lgan ehtiyojni belgilaydi. Bu esa, o‘ z navbatida, tadqiqot mavzusining ilmiy va amaliy ustuvorligini ko‘ rsatadi.

ADABIYOTLAR TAHLILI.

Hozirgi lingvodidaktikada til o‘ rganish tushunchasi grammatik qoidalarni yodlashdan kommunikativ harakatga yo‘ naltirilgan. Nutqning ijtimoiy manbalarini asoslashda L.S.Vygotskiy ta’limotiga tayanish maqsadga muvofiq. Ushbu yondashuvga ko‘ ra, nutq dastlab ijtimoiy muomala muhitida shakllanib, keyinchalik bolaning ichki verbal-mantiqiy tafakkuri bilan integratsiyalashadi [1]. Bu qarash boshlang‘ ich sinf o‘ quvchisining nutqini individual qobiliyat deb emas, balki boshqa odamlar bilan kommunikativ munosabat jarayonida shakllanadigan harakat sifatida qarashga asos beradi. Ushbu nazariy pozitsiyaning lingvodidaktik ahamiyati shundaki: bolaga til birliklarini o‘ rgatishning o‘ zi yetarli emas, masala u birliklarni qanday o‘ rgatishda, ya’ni ularni qo‘ llashga imkon beradigan kommunikativ muhit yaratilishi kerak. Nutqning tabiiy rivojlanish mexanizmlari, avvalo, ta’lim jarayonidagi interaktiv harakatlarda namoyon bo‘ ladi. Xususan, o‘ qituvchi savollari, o‘ quvchilarning o‘ zaro dialogi, juftlikdagi topshiriqlar, birgalikdagi matn yaratish hamda muammoli holatlarni bartaraf etishga qaratilgan amaliyotlar o‘ quvchining nutqiy kompetensiyasini shakllantiruvchi amaliy omillar hisoblanadi.

So‘ nggi yillardagi tadqiqotlarda o‘ quvchilarning nutqiy faoliyatini rivojlantirishda didaktik o‘ yinlar, she’riy matnlar va dialoglarning metodik imkoniyatlari ko‘ rsatiladi [2]. Bundan o‘ quvchilarning nutqini rivojlantirish uchun o‘ quvchining nutqiy faoliyatini faollashtiradigan mazmunli va kommunikativ muhitni tashkil etish zarurati ko‘ rinadi.

Ammo bunday tadqiqotlar masalaning bir qismi, nutqning alohida komponentlariga, masalan mazmunan bog‘ lanishli nutqqa, so‘ z boyligiga yoki ma’lum metodik usullarga yo‘ naltirilgan. Bu yondashuvlar o‘ ziga yarasha ahamiyatli bo‘ lsa-da, boshlang‘ ich sinf o‘ quvchisining nutqini fonologik, leksik, grammatik, diskursiv va pragmatik komponentlar birligi sifatida tushuntirish masalalari yetarli darajada kompleks tarzda tadqiq etilmagan. Ayniqsa, tilning lingvodidaktik xususiyatlari bilan kommunikativ til o‘ qitish tamoyillarini birgalikda o‘ rganish masalasi nazariy va metodik jihatdan qo‘ shimcha tadqiqotni talab etadi. Ushbu ilmiy bo‘ shliqdan kelib chiqib, maqolada boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirishning o‘ ziga xos lingvodidaktik xususiyatlarini aniqlash, nutq rivojlanishining mazmuniy tarkibini tizimlashtirish maqsad qilib olindi.

TADQIQOT METODOLOGIYASI.

Mazkur tadqiqot muayyan o‘ qitish metodikasining tajriba-sinov samaradorligini o‘ lchashga emas, balki boshlang‘ ich sinf o‘ quvchilarining nutqiy faoliyatini rivojlantirish muammosining lingvodidaktik mohiyatini nazariy manbalar va zamonaviy kommunikativ yondashuvlar prizmasi orqali qayta konseptual tahlil qilishga qaratilgan.

Tadqiqotning obyekti sifatida boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirish jarayoni olindi. Tadqiqot predmeti esa nutq rivojlanishiga ta’sir etuvchi lingvodidaktik omillar, til birliklarining kommunikativ qo‘ llanilishi, dialogik o‘ zaro munosabat, kontekstual topshiriqlar, metodik tayanchlar va nutq kompetensiyasini baholash tamoyillari bilan chegaralandi.

Maqolada boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirish xususiyatlarini aniqlashda nazariy va qiyosiy tahlil, tizimli sintez metodlari kompleks qo‘ llanildi. Nazariy tahlil orqali so‘ zlashuv nutqining lingvistik, psixologik va pedagogik jihatlari o‘ rganildi, leksik rivojlanish, grammatik qo‘ llanilish, bog‘ lanishli va dialogik nutq, kommunikativ hamda pragmatik ko‘ nikmalar asosiy tahlil birliklari sifatida tizimlashtirildi. Lingvodidaktik yondashuvlarning nutqni rivojlantirishdagi imkoniyatlari qiyosiy tahlil natijasida aniqlandi. Olingan nazariy qarashlarni umumlashtirish natijasida nutqni rivojlantirish jarayoni-til birliklarini o‘ zlashtirish, kommunikativ faoliyat, ijtimoiy muloqot va uning semantik tuzilmalarni yaratish hodisalarining uzviy aloqadorlikdagi yaxlit tizimi sifatida namoyon bo‘ ldi.

Nutq bir vaqtning o‘ zida til tizimi, psixologik harakat va ijtimoiy kommunikatsiya bo‘ lganligi sababli, uni faqat grammatika yoki leksika doirasida tahlil qilish yetarli emas. Shu sababli, tadqiqotda lingvistik va pedagogik kategoriyalar bir-biridan alohida emas, integratsiyalashgan tizim sifatida qaraldi.

NATIJALAR VA ULARNING TAHLILI.

Tadqiqot natijalari boshlang‘ ich sinf o‘ quvchilarining nutqini o‘ stirish jarayonini biryoqlama yondashuv yaniy muayyan metod yoki alohida til komponenti doirasida cheklab bo‘ lmasligini ko‘ rsatadi. Nutqiy rivojlanish- lisoniy tizim elementlarining egallanishi va faol muloqot amaliyotining uzviy sintezi negizida kechadi. Bu negizning bir tomonida o‘ quvchiga zarur bo‘ lgan til resurslari-lug‘ aviy birliklar, grammatik shakllar, sintaktik konstruksiyalar va fonologik qoliplar joylashsa, ikkinchi tomonida shu resurslarni ma’lum kommunikativ vaziyatda qo‘ llash harakati turadi. Ushbu ikki jarayon bir-biridan ajralgan holda o‘ quvchi til haqida bilimga ega bo‘ lishi mumkin, lekin u bilimni nutqda erkin qo‘ llay olmasligi mumkin.

Kichik maktab yoshidagi o‘ quvchilarda nutq ko‘ nikmalarini shakllantirish lisoniy tizimning barcha bosqichlari - fonetika, morfologiya va sintaksisning o‘ ziga xosliklarini hisobga oluvchi izchil lingvodidaktik yondashuvni talab etadi. Bunda dastlab, singarmonik va orfoepik ko‘ nikmalarni qaror toptirish uchun to‘ g‘ ri talaffuz hamda savodli yozuvni rivojlantirishga qaratilgan fonetik-artikulyatsion mashg‘ ulotlar va interaktiv topshiriqlar tatbiq etilishi lozim. Ikkinchidan, tilning agglyutinativ xususiyatiga bog‘ liq qo‘ shimchalarni to‘ g‘ ri qo‘ shish va tovush o‘ zgarishlarini o‘ zlashtirish amaliy o‘ yinlar, ko‘ rgazmali topshiriqlar orqali shakllantiriladi. Uchinchidan, tilning tabiiy sintaktik qurilishini egallash uchun rasmlar asosida gap tuzish, gaplarni mantiqiy izchillikda bayon qilish, monolog va dialogik nutqni rivojlantiruvchi vaziyatli topshiriqlar samarali hisoblanadi. Shunday qilib, nutq o‘ stirishning amaliy-metodik evolyutsiyasi fonetik-artikulyatsion mashqlardan boshlanib, 1-2-sinflarda lug‘ at boyligini oshirish, 2-3-sinflarda mantiqiy modellashtirish va 3-4-sinflarda rolli o‘ yinlar, dialoglar va kommunikativ vaziyatlar orqali o‘ quvchilarning erkin, to‘ g‘ ri, mantiqiy va madaniy nutqini shakllantirish bosqichlarini o‘ z ichiga oladi.

Bundan ko‘ rinib turibdiki, boshlang‘ ich sinf darsida yangi so‘ zning ma’nosini aytish yoki grammatik shakl qoidasini tushuntirish til o‘ rganishning boshlang‘ ich bosqichi hisoblanadi. Ammo lingvodidaktik jarayon shu yerda to‘ xtab qolsa, o‘ quvchining produktiv nutqi yetarli darajada rivojlanmaydi. So‘ z yoki grammatik shakl yangi kontekstda qo‘ llanilgandagina u faol kommunikativ resursga aylanadi.

Bu holatni leksik rivojlanish misolida aniqroq ko‘ rish mumkin. O‘ quvchi ma’lum bir so‘ zning ma’nosini tanishi passiv leksik bilimni bildiradi. Shu so‘ zni berilgan gapda qo‘ llashi reproduktiv darajaga, uni oldindan berilmagan yangi kommunikativ vaziyatda mustaqil tanlab qo‘ llashi produktiv darajaga tegishli. Demak, lug‘ at boyligining rivojlanishini faqat so‘ zlar soni bilan o‘ lchash lingvodidaktik jihatdan yetarli emas. Uning funksional samaradorligi, diskursiv tabiati va muayyan muloqot maqsadiga xizmat qilish darajasi ham e’tiborga olinishi kerak.

Nutqni rivojlantirish amaliyotida matn segmenti bilan ishlash strategiyasi yetakchi o‘ rin egallaydi. Xususan, matnni o‘ qish, qayta bayon qila olish, savollarga javob berish, matn ustida kritik mulohaza yuritish hamda dialogik va monologik diskurslarni loyihalashga qaratilgan topshiriqlar o‘ quvchilarning mantiqiy-bog‘ lanishli nutq kompetensiyasini rivojlantirishga xizmat qiladi. Bunda o‘ qituvchining namuna sifatidagi to‘ g‘ ri nutqi va o‘ quvchilarni erkin fikr bildirishga qiziqtirishi muhim.

Yana bir lingvodidaktik xususiyat – milliy va madaniy komponentni o‘ qitish mazmuniga kiritish. Folklordan foydalanish, hususan, maqollar, ertaklar hamda bolalar badiiy asarlari asosida tashkil etilgan ijodiy topshiriqlar o‘ quvchilarning lug‘ aviy imkoniyatlarini kengaytirish bilan birga, til o‘ rganishga rag‘ batlantiradi va muloqot ko‘ nikmalarini sezilarli darajada oshiradi. Shuningdek, o‘ quvchilar nutqini o‘ stirishda zamonaviy ta’lim texnologiyalari-interfaol metodlar, ijodiy topshiriqlar hamda AKT imkoniyatlaridan unumli foydalanish muhim amaliy ahamiyatga ega. Bu o‘ quvchining darsdagi tashabbuskorligini oshirib, ularga o‘ z mulohazalarini ochiq-oydin va erkin bildirishlariga zamin yaratadi.

Nutq rivojlantirishdagi yana bir xususiyat grammatik bilim bilan kommunikativ grammatikaning farqida ko‘ rinadi. Boshlang‘ ich sinf o‘ quvchisi grammatik qoidani to‘ g‘ ri aytishi yoki ma’lum grammatik shaklning nomini tanishi mumkin. Biroq, bu bilimni nutqda qo‘ llash uchun shaklni bilish yetarli emas, u bilan birga ma’nosi va funksiyasini ham anglashi lozim. Shuning uchun grammatikani o‘ rgatishda “qoid – misol – mashq” sxemasini kommunikativ kontekst bilan to‘ ldirish, ayniqsa, uni ijodiy topshiriqlar orqali amalga oshirish maqsadga muvofiq.

Grammatik birlikni o‘ rgatishning lingvodidaktik ketma-ketligi “shakl – ma’no – funksiya – kontekst – produktiv qo‘ llash” tarzida qurilgani ma’qul. Bunday yondashuvda o‘ quvchi grammatik konstruksiyaning qanday tuzilganini bilibgina qolmay, uning qanday ma’noni bildirishini va qaysi kommunikativ vaziyatda qo‘ llanilishini ham tushunadi. Bu Hallidayning tilni ma’no yaratuvchi ijtimoiy tizim sifatida tushuntirishi bilan nazariy jihatdan uyg‘ unlashadi [3].

Nutqiy taraqqiyotning navbatdagi muhim xususiyatlaridan biri dialogik muloqot tizimidir. Dialog faqatgina ta’limiy usul vazifasini o‘ tamay, balki nutq shakllanishining ichki mexanizmi sifatida namoyon bo‘ ladi. Muloqot jarayonida o‘ quvchi bir vaqtning o‘ zida axborotni qabul qilish, uni anglash, javob mazmunini tuzish, mos leksik birliklarni tanlash, sintaktik qurilmalarni shakllantirish hamda suhbatdoshining reaksiyasini baholash kabi murakkab kognitiv harakatlar majmuasini amalga oshiradi. Shu sababli, dialogik nutq o‘ quvchining lisoniy imkoniyatlarini harakatga keltirish bilan birga, uning kommunikativ strategiyalarini qaror toptirishga xizmat qiladi.

Shuni alohida ta’kidlash kerakki, muloqotdagi dialoglar sonini nutqiy rivojlanishning mutlaq va qat’iy mezoniy ko‘ rsatkichi sifatida baholash ilmiy jihatdan o‘ zini oqlamaydi. Darsda o‘ quvchilarning ko‘ p gapirishi ularning nutq sifati yuqori degani emas. Dialog sifatli bo‘ lishi uchun o‘ quvchi boshqa odamning fikriga javob berishi, qo‘ shimcha savol berishi, o‘ z fikrini tushuntirishi, dalillashi yoki boshqa pozitsiyani taqqoslashi kerak. Shu sababli dialogik nutqni baholashda nutq sonidan ko‘ ra, kommunikativ mazmunning qurilishi asosiy ko‘ rsatkich bo‘ lishi kerak.

Nutq rivojlanishining keyingi muhim jihati qo‘ llanilayotgan metodik tayanchlarning xarakterida namoyon bo‘ ladi. Boshlang‘ ich sinf o‘ quvchilarining til resurslari bir xil darajada bo‘ lmaganligi sababli, barcha o‘ quvchidan birdan erkin gapirishni talab qilish ayrim bolalarning kommunikativ passivligiga olib kelishi mumkin. Bunda tayanch so‘ zlar, gap boshlanmalari, rasmlar, sxemalar, yetakchi savollar va dialog namunalari o‘ quvchiga nutqni tashkil etishga yordam beradi. Ularning asosiy vazifasi o‘ quvchiga mustaqil nutqni boshlash uchun ko‘ maklashish, motivatsiya berishdan iborat.

Nutq rivojlanishining yana bir muhim xususiyati nutqning diskursiv xarakterida. O‘ quvchi yakka gapda grammatik jihatdan to‘ g‘ ri gapirishi mumkin, lekin bir necha gap orasida mazmunli bog‘ lanish yaratishda qiyinchilikka duch kelishi mumkin. Shu sababli, bog‘ liqli nutqni rivojlantirishda o‘ quvchiga faqat “matnni qayta ayt” degan topshiriq emas, balki voqeaning sababini tushuntirish, voqealarni izchil joylashtirish, qahramonga baho berish, o‘ z fikrini qo‘ shish va matnni boshqa holat bilan bog‘ lash kabi topshiriqlar samarali bo‘ ladi.

Bu yerda ijodiy topshiriqlarning lingvodidaktik ahamiyati ortadi. Ijodiy topshiriq o‘ quvchini tayyor matnni takrorlashdan yangi mazmun yaratishga o‘ tkazadi. Masalan, matnning davomini mustaqil tuzish, rasm asosida voqea yaratish, dialogga yangi xulosa taqdim etish yoki ma’lum bir voqeani boshqa qahramon nomidan bayon qilish o‘ quvchidan leksik va grammatik resurslarni yangi kombinatsiyada qo‘ llashni talab etadi. Bu kabi topshiriqlar faqatgina nutqini o‘ stirish bilan cheklanmay, bolaning kognitiv faoliyatini ham kuchli harakatga keltiradi. Deylik, “Tejamkorlik” mavzusidagi darsda o‘ quvchiga suv va elektr energiyasini tejash yuzasidan o‘ z xulosalarini tuzish va uni himoya qilish vazifasi berildi. Bu jarayonda bola beixtiyor sabab va oqibatni bog‘ lashga, fikrini dalilla bilan asoslashga o‘ rganadi. “Qizil kitobga kiritilgan hayvonlar” mavzusidagi yondashuvimiz ham shunga o‘ xshash: yo‘ qolib borayotgan jonzotlar yoki o‘ simliklar nomidan ommaga urojat yozish mashg‘ uloti o‘ quvchining ijodiy hayolotini ishga solish bilan bir qatorda, axborotni muayyan kommunikativ maqsadga moslab ifodalash ko‘ nikmasini shakllantiradi.

Izlanishlarimiz natijasida aniqlangan yana bir muhim holat - nutqni baholash mezonlarini kengaytirish ehtiyoji mavjud. Boshlang‘ ich sinflarda nutqni baholash ko‘ pincha grammatik to‘ g‘ rilik, so‘ zlarni aniq aytish yoki berilgan matnni o‘ qish, qayta aytish bilan chegaralanishi mumkin. Biroq, kommunikativ kompetensiyaning to‘ liq tarkibi bunday o‘ lchovga sig‘ maydi. Shu sababli, nutq rivojlanishini baholashda kamida to‘ rtta mezon hisobga olinishi ma’qul: til to‘ g‘ riligi, mazmundorlik, bog‘ liqlik va kommunikativ muvofiqlik. Til to‘ g‘ riligi grammatik va leksik me’yorlarni qo‘ llashni, mazmundorlik fikrda aniq ma’no borligini, bog‘ liqlik fikrlarning izchilligini, kommunikativ muvofiqlik esa nutqning vaziyatga va maqsadga muvofiqligini bildiradi.

Bu mezonlarni shakllantirishda esa, yuqorida aytib o‘ tilganidek, ijodiy xarakterdagi topshiriqlar yetakchi didaktik manba vazifasini o‘ taydi. Bunday topshiriqlar o‘ quvchini tayyor til shablonlarini mexanik ravishda takrorlashdan uzib, lisoniy birliklardan yangi muloqot sharoitlarida mustaqil foydalanishga, o‘ z fikrini cheklovlarsiz bayon etishga hamda nutqiy maqsadga mos so‘ z va sintaktik qurilmalarni to‘ g‘ ri saralashga undaydi. Shu bois, ijodiy topshiriqlar nazariy til bilimlarini bevosita amaliy nutqiy faoliyatga ko‘ chiradigan, matnning mantiqiy, mazmuniy va kommunikativ mukammalligini ta’minlaydigan asosiy mexanizmdir.

Ushbu natijalar asosida boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirishni “til tizimi – ijodiy topshiriqlar – kommunikativ mazmun” birligi orqali tushuntirishdan iborat deb belgilaymiz. Bunda til tizimi – o‘ quvchining fonetik, leksik, grammatik va sintaktik bilimlarini nutqiy faoliyatda qo‘ llash imkonini beruvchi lingvistik asos sifatida qaraladi. Ijodiy topshiriqlar esa – o‘ quvchining mustaqil fikrlashi, nutqiy faolligi va ijodiy ifoda imkoniyatlarini rivojlantirishga yo‘ naltirilgan metodik vositalar hisoblanadi. O‘ quvchining til birliklaridan real yoki modellashtirilgan muloqot vaziyatlarida maqsadga muvofiq va mazmunli foydalanishini ta’minlovchi nutqiy komponent bo‘ lsa- kommunikativ mazmunni tashkil qiladi.

Demak, bu modelda grammatik va leksik bilimlar boshlang‘ ich resurs sifatida, ijodiy topshiriqlar shu resurslarni faollashtiruvchi mexanizm sifatida, produktiv nutq esa rivojlanishning asosiy natijasi sifatida qaraladi. Bu yondashuvning nazariy ahamiyati shundan iboratki, u nutq rivojlanishini faqat til o‘ qitish metodikasining xususiy vazifasi emas, balki lingvistik, psixolingvistik va pedagogik jarayonlarning kesishuvida yuzaga keladigan kompleks hodisa sifatida tushuntiradi. Amaliy jihatdan esa til o‘ rganish darslarida topshiriqlar tizimini qayta ko‘ rib chiqish, baholash mezonlarini kengaytirish va muntazam muloqotni darsning tizimli komponentiga aylantirish uchun asos bo‘ la oladi.

XULOSA.

Boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirish masalasini lingvodidaktik jihatdan ta hlil qilish nutqning faqat til bilimlarini o‘ zlashtirishga tenglashtirilmasligi kerakligini ko‘ rsatdi. Nutq rivojlanishi til birliklarini bilish, ularni

kommunikativ vaziyatda qo‘ llash, ma’noli bayon qilish, dialogga kirishish va o‘ z nutqini nazorat qilish jarayonlarining o‘ zaro bog‘ liq tizimidan iborat. Bunda ta’sir etuvchi asosiy mexanizmlar ijodiy topshiriqlar hisoblanadi.

Tadqiqotning asosiy xulosasi shundan iborat: boshlang‘ ich sinf o‘ quvchisining nutqini rivojlantirishning lingvodidaktik samaradorligi til resursi bilan kommunikativ harakat va unga sharoit yaratuvchi ijodiy topshiriqlarning integratsiyasiga bog‘ liq. Nutq rivojlanishining o‘ ziga xos xususiyati uning ijtimoiy o‘ zaro munosabat bilan chambarchas bog‘ liq ekanligida. Shuning uchun boshlang‘ ich sinf darsida o‘ quvchining nutqiy ishtirok etish imkoniyatlarini kengaytirish metodik jihatdan asosiy vazifa bo‘ lishi kerak.

Grammatik bilimni kommunikativ kompetensiyaga aylantirish uchun shakl, mazmun, funksiya va kontekstni bir-biridan ajratmaslik maqsadga muvofiq. Leksik rivojlanishda ham so‘ zlarning sonidan ko‘ ra, ularning faol va funksional qo‘ llanilishi ustuvorlikka ega bo‘ lishi kerak. Bog‘ lanishli nutqni shakllantirishda esa matnni takrorlashdan tashqari, o‘ quvchining fikrini yaratishga, voqeani turlicha bayon qilishga, dalillashga va ijodiy qayta qurishga yo‘ naltirilgan topshiriqlar ko‘ paytirilishi zarur. Bularni amalga oshirish uchun o‘ quvchiga tanish ijtimoiy-madaniy masalalardan, bolalar adabiyotidan, kundalik kommunikativ vaziyatlardan va muammoli vaziyatlardan foydalanish maqsadga muvofiqdir.

Keyingi tadqiqotlarda ushbu yuqorida keltirilgan boshlang‘ ich sinf o‘ quvchilarining nutqini rivojlantirish modelini, nutqiy kompetensiyaning yosh xususiyatlariga mos diagnostik mezonlar va indikatorlarini validatsiya qilish, tajriba va nazorat guruhlari asosida pedagogik tajriba-sinov o‘ tkazish va natijalarni statistik usullar orqali taqqoslash zarur. Shuningdek, boshlang‘ ich sinf o‘ quvchilarining nutqiy rivojlanishiga til muhiti, ta’lim muhiti, ijtimoiy-madaniy omillar va raqamli kommunikatsiya vositalarining ta’sirini kompleks tarzda o‘ rganish asosiy ilmiy tadqiqot yo‘ nalishlaridan biri sifatida qaraladi.

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TALABALARDA UMUMIY JISMONIY CHIDAMLILIKNI RIVOJLANTIRISH.

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Annotatsiya: *Umumiy shug‘ ullanuvchi o‘ quvchilarda umumiy chidamlilikni rivojlantirish jismoniy tayyorgarlik o‘ rganildi. O‘ quvchilarda mashqlardan kelib chiqadigan charchoqni kamaytirish, ularning jismoniy holat muhim va qiziqarli mavzulardan biridir. Maqolada quyidagilardan biri ko‘ rib chiqiladi: chidamlilikni oshirish yo‘ llari, uning natijalari ko‘ rsatilgan. Tadqiqot natijalariga ko‘ ra,*

talabalarda umumiy chidamlilikning rivojlanishi kuzatildi. Optimal variantni izlash

o‘ quvchilarda umumiy chidamlilikni rivojlantirish uchun mashqlar, deb ta’kidlashga asos beradi. ma’lum vaqt davomida o‘ rtacha yugurish yuklamalarining talabalar organizmiga foydali ta’siri haqida.

Kalit so‘ zlar: *Chidamlilik, talabalar, yuklamalar, nafas olish, jismoniy tarbiya, . tadqiqotda tana vazni indeksi (TVI)*

DEVELOPING GENERAL PHYSICAL ENDURANCE IN STUDENTS.

Abstract: *The development of general endurance among students engaged in general physical training was studied. Reducing fatigue in students caused by exercises, improving their physical condition is one of the important and interesting topics. The paper considers one of the ways to increase endurance, its results are demonstrated. According to the results of the study, there was a development in students of general endurance. The search for a variant of optimal exercises for the development of general endurance among students, gives grounds to assert about the beneficial effect on the body of students of moderate running loads for a given time.*

Keywords: *Endurance, students, loads, breathing, physical education.*

РАЗВИТИЕ ОБЩЕЙ ФИЗИЧЕСКОЙ ВЫНОСЛИВОСТИ У СТУДЕНТОВ.

Аннотация: *В статье изучено развитие общей выносливости у учащихся общеобразовательных школ в процессе их физической подготовки. Снижение утомляемости учащихся от физических упражнений и улучшение их физического состояния является одной из важных и интересных тем. В статье рассматриваются пути повышения выносливости и представлены достигнутые результаты. По результатам исследования, у учащихся наблюдалось развитие общей выносливости. Поиск оптимального варианта упражнений для развития общей выносливости у учащихся даёт основание утверждать о благотворном влиянии умеренных беговых нагрузок на их организм в течение определённого времени.*

Ключевые слова: *Выносливость, студенты, нагрузки, дыхание, физическая культура, индекс массы тела (ИМТ) в исследовании*

KIRISH.

Inson hayoti davomida turli jismoniy ta’sirlarga duchor bo‘ ladi.ta yuklamaga. Ular davomiyligi bo‘ yicha turlicha bo‘ lib, chidamlilikka - qobiliyatga bog‘ liq. odamning biror ishni uzoq vaqt davomida alomatlarsiz bajarishi toliqish.

U inson organizmining ko‘ plab omillari va xususiyatlariga, energiya almashinuvi, vazn va yosh kabi. Chidamlilik yetarli darajada rivojlanmoqda tez. Buni fizika fanidan sinov me’yorlarini taqqoslash orqali ko‘ rish mumkin.

TADQIQOTNING MAQSADI

talabalarda umumiy chidamlilikni rivojlantirish,

umumiy jismoniy tayyorgarlik bilan shug‘ ullanuvchilar. Natijada kamaytirish mumkin talabalarning jismoniy mashqlar natijasida charchashi, jismoniy holatining yaxshilanishi va kam harakatli turmush tarzida salomatlik.

TADQIQOT NATIJALARI.

Chidamlilikni ikki guruhga bo‘ lish mumkin: maxsus va umumiy. Birinchisi muayyan faoliyat turini bajarish uchun xarakterlidir.Ish qobiliyatini pasaytirmasdan. Uni bir necha turga bo‘ lish mumkin: tezkor, tezlik - kuch, koordinatsion, kuch.

1. Tezkor - tez harakatlarni bajarish.

2. Tezkor-kuchli-chaqonlik faoliyatini tez bajarish.

3. Koordinatsion - texnik jihatdan murakkab mashqlarni bajarish.

4. Kuch - tortish mashqlarini bajarish.

Ikkinchisi esa umumiy chidamlilikni – organizmning jalb qiluvchi har qanday ishni yuqori samaradorlik bilan uzoq muddatli bajarish ko‘ plab mushak guruhlarini harakatga keltiradigan va yetarlicha yuqori talablar qo‘ yadigan yurak-qon tomir, nafas olish va markaziy asab tizimlariga. Umumiy chidamlilik maxsus chidamlilikni rivojlantirish uchun asos yaratadi. Tadqiqotda tana vazni indeksi (TVI) mavjud.

Bu kattalik bilvosita baholashga imkon beradi - massa normalmi yoki u

yetarli emas yoki ortiqcha bo‘ lib, bu insonning umumiy salomatligi, ayniqsa agar u kam harakatli turmush tarziga ega bo‘ lsa. Me’yordan chetga chiqish hollarida

kerakli muolaja. Ayni paytda Jahon sog‘ liqni saqlash tashkiloti TVI quyidagi talqinni qabul qildi:

- 18,5 dan kam - tana vazni yetarli emas

- 18,5 - 24,99 - me’yor - 25 va undan ortiq

- ortiqcha tana vazni.

Bunday usul har doim ham to‘ g‘ ri bo‘ lavermaydi, chunki inson organizmining

bo‘ y va vazn har bir kishi uchun o‘ ta individualdir va ularni faqat tana vazni indeksiga. Biroq u tadqiqot uchun juda mos keladi.

Salomatlikni tegishli darajada saqlash uchun quyidagilarga e’tibor qaratish talab etiladi: chidamlilik, chunki u yurak-qon tomir va nafas olish tizimlari [5; 6].

Tadqiqot 6 kishidan iborat guruhda o‘ tkazildi, haftasiga 2 marta umumiy jismoniy tarbiya - tajriba guruhi. Yugurish mashqlari bajarildi 15 daqiqa davomida sport maydonchasi\zalda mashqlar bajarish. Har birining vazifasi talabalar o‘ zlariga qulay bo‘ lgan maksimal vaqt tezligida yugurishlari kerak oraliq. 2 oy yoki 16 ta mashg‘ ulot davomida to‘ plangan barcha ma’lumotlar qayd etildi. jadvalga. Ushbu tajribada asosiy son maksimal oraliqdir. Talabaning jismoniy mashqlardan yengil charchashigacha bo‘ lgan vaqt. Shuningdek dagi o‘ zgarishlarni kuzatish uchun barcha talabalar uchun tana vazni indekslari aniqlandi. Tana vazni va bo‘ y uzunligi nisbati turlicha bo‘ lgan odamlar uchun umumiy chidamlilik. Bundan tashqari

tajriba guruhi, tekshirish uchun nazorat guruhi bor edi umumiy chidamlilikni rivojlantirish uchun tanlangan usulning muvaffaqiyati. Quyida jadval keltirilgan

olingan natijalar bilan.

Yengil charchoq paydo bo‘ lish vaqti daqiqalarda, keyin Q.
Tajriba guruhi

1-2 haftalik natijalar

Talaba	bo‘ y	Og‘ irligi	Tadqiqotda tana vazni indeksi (TVI)	Q
1	183	96	28.67	10
2	169	56	19.61	14.8
3	180	84	25.93	9.3
4	175	67	21.88	15
5	178	69	21.78	14.7
6	180	71	21.67	14.6

3-4 haftalik natijalar

Talaba	bo‘ y	Og‘ irligi	Tadqiqotda tana vazni indeksi (TVI)	Q
1	183	96	28.67	10.3

2	169	56	19.61	14.8
3	180	84	25.93	10.1
4	175	67	21.88	15
5	178	69	21.78	14.4
6	180	71	21.67	14.9

5-6 haftalik natijalar

Talaba	bo‘ y	Og‘ irligi	Tadqiqotda tana vazni indeksi (TVI)	Q
1	183	96	28.67	10.7
2	169	56	19.61	14.9
3	180	84	25.93	9.7
4	175	67	21.88	15
5	178	69	21.78	14.7
6	180	71	21.67	14.9

7-8 haftalik natijalar

Talaba	bo‘ y	Og‘ irligi	Tadqiqotda tana vazni indeksi (TVI)	Q
1	183	96	28.67	10.8
2	169	56	19.61	14.9
3	180	84	25.93	9.8
4	175	67	21.88	15
5	178	69	21.78	14.8
6	180	71	21.67	15

Yugurish mashqlarini bajarmaydigan nazorat guruhida ham kuzatildi. 14 kun davomida chidamlilikning o‘ rtacha o‘ sishi Q=0,20 daqiqani tashkil etdi, ammo taqqoslanganda Tadqiqotda ishtirok etgan talabalarning o‘ rtacha o‘ sishi aniqlandi.

Q=0,35 daqiqa 14 kunda. Bu jismoniy mashqlarning to‘ g‘ ri tanlangan turini ko‘ rsatadi.

XULOSA

Olingan ma’lumotlarga asoslanib, minimal qiymatning oshganligini ko‘ rish mumkin. charchashning dastlabki belgilari paydo bo‘ lgunga qadar bo‘ lgan vaqt oralig‘ i. Buning natijasida umumiy chidamlilik darajasi dastlabki ko‘ rsatkichlarga nisbatan oshganligini tasdiqlash ko‘ rsatkichlar bilan (1 - 2 hafta). Shuni ta’kidlash joizki, bu ko‘ rsatkichlarga katta ta’sir ko‘ rsatmoqda.

Omillar soni, masalan, mashg‘ ulot boshlanishidan oldingi charchoq va ehtimoliy

vaqtni o‘ lchashda xatolik yuzaga kelganda. Olinganlar orqali bilinadi natijalarga ko‘ ra, Q ning oshishi bilan chidamlilikning o‘ sish sur’ati pasayadi. Ushbu tadqiqotning yakuni talabalarda umumiy chidamlilikni rivojlantirish bo‘ ldi.

Olingan ma’lumotlar asosida jadval tuzish. uchun optimal mashqni tanlash

talabalarda umumiy chidamlilik ko‘ rsatkichlarini, ya’ni yugurish yuklamalarini rivojlantirish.

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MUAMMOLI VA LOYIHAVIY YONDASHUVLAR ASOSIDA DIFFERENSIAL TENGLAMALAR BO‘ YICHA KOMPETENSIYALARNI SHAKLLANTIRISH

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Annotatsiya: *Ushbu maqolada differensial tenglamalar kursida talabalarning matematik kompetensiyalarini rivojlantirishda muammoli (problem-based) va loyihaviy (project-based) yondashuvlarning metodik imkoniyatlari tahlil qilinadi. Tadqiqotning asosiy e’tibori ushbu yondashuvlarni amalga oshirishning metodik tamoyillari, ularni qo‘ llash shart-sharoitlari va kompetensiyalarning tarkibiy qismlariga ta’sir etishiga qaratilgan. Maqolada empirik tajriba va natijalar keltirilmaydi, faqatgina metodika va uni qo‘ llash sharoitlari hamda kutiladigan pedagogik samaralar nazariy jihatdan asoslanadi. Muammoli yondashuv qisqa muddatli, kognitiv ziddiyatga asoslangan bo‘ lib, differensial tenglamalar turlarini aniqlash va yechim strategiyasini tanlash ko‘ nikmalarini shakllantiradi. Loyihaviy yondashuv uzoq muddatli, real muammolarni matematik modellashtirish orqali yechishga yo‘ naltirilgan bo‘ lib, sonli usullar va natijalarni talqin etish kompetensiyalarini rivojlantiradi. Ikkala yondashuvni integratsiyalash differensial tenglamalar bo‘ yicha kognitiv, faoliyatli, refleksiv va kommunikativ kompetensiyalarni har tomonlama shakllantirishning samarali metodik strategiyasi sifatida tavsiya etiladi.*

Kalit so‘ zlar: *differensial tenglamalar, muammoli yondashuv, loyihaviy yondashuv, kompetensiya, matematik modellashtirish, metodika, kompetensiyaviy yondashuv, faoliyatli ta’lim*

DEVELOPING COMPETENCIES IN DIFFERENTIAL EQUATIONS BASED ON PROBLEM-BASED AND PROJECT-BASED APPROACHES

Abstract: *This article analyzes the methodological possibilities of problem-based and project-based approaches in developing students’ mathematical competencies in the differential equations course. The main focus is directed at the methodological principles of implementing these approaches, the conditions for their application, and their impact on the components of competencies. The article presents no empirical experiments or results; it only provides a theoretical foundation of the methodology, application conditions, and expected pedagogical outcomes. The problem-based approach is short-term, based on cognitive conflict, and serves to develop skills in identifying types of differential equations and selecting solution strategies. The project-based approach is long-term, focused on solving real problems through mathematical modeling, and develops competencies in numerical methods and interpretation of results. The integration of both approaches is recommended as an effective methodological strategy for the comprehensive formation of cognitive, activity-based, reflective, and communicative competencies in differential equations.*

Keywords: *differential equations, problem-based approach, project-based approach, competence, mathematical modeling, methodology, competency-based approach, activity-based learning*

ФОРМИРОВАНИЕ КОМПЕТЕНЦИЙ В ОБЛАСТИ ДИФФЕРЕНЦИАЛЬНЫХ УРАВНЕНИЙ НА ОСНОВЕ ПРОБЛЕМНО-ОРИЕНТИРОВАННОГО И ПРОЕКТНОГО ПОДХОДОВ

Аннотация: *В данной статье анализируются методические возможности проблемного и проектного подходов в развитии математических компетенций студентов при изучении дифференциальных уравнений. Основное внимание уделяется методическим принципам реализации этих подходов, условиям их применения и влиянию на компоненты компетенций. В статье не приводятся эмпирические эксперименты и результаты, только теоретически обосновываются методика, условия применения и ожидаемые педагогические эффекты. Проблемный подход является краткосрочным, основан на когнитивном конфликте и формирует навыки определения типов дифференциальных уравнений и выбора стратегии решения. Проектный подход является долгосрочным, ориентирован на решение реальных проблем через математическое моделирование и развивает компетенции в численных методах и интерпретации результатов. Интеграция обоих подходов рекомендуется как эффективная методическая стратегия для всестороннего формирования когнитивных, деятельностных, рефлексивных и коммуникативных компетенций по дифференциальным уравнениям.*

Ключевые слова: *дифференциальные уравнения, проблемный подход, проектный подход, компетенция, математическое моделирование, методика, компетентностный подход, деятельностное обучение*

KIRISH

Differensial tenglamalar zamonaviy fan va texnikaning asosiy matematik apparatlaridan biri hisoblanadi. Ushbu fan mexanika, fizika, biologiya, ekologiya, iqtisodiyot va boshqa ko‘plab sohalardagi real jarayonlarni matematik modellashtirishda markaziy o‘rinni egallaydi. Differensial tenglamalar yordamida o‘zgaruvchan jarayonlarning dinamikasi, evolyutsiyasi va barqarorligi kabi fundamental masalalarni o‘rganish mumkin. Shu sababli, differensial tenglamalar kursi ko‘pgina texnik va tabiiy yo‘nalishlar bo‘yicha oliy ta’lim dasturlarining majburiy komponenti hisoblanadi.

Biroq oliy ta’lim amaliyotida differensial tenglamalar ko‘pincha formal hisoblash usullarini o‘rgatishga asoslangan. Talabalar asosan tayyor berilgan tenglamalarni analitik yoki sonli usullarda yechishga o‘rgatiladi, real muammoni differensial tenglama ko‘rinishida ifodalash, matematik model qurish va yechimni tahlil qilish kabi kompetensiyalar yetarli darajada shakllantirilmaydi [1]. Natijada, talabalar differensial tenglamalarni amaliy faoliyatda qo‘llash ko‘nikmasini egallamay qoladilar. Bu holat zamonaviy ta’lim talablari bilan ziddiyatga kirishadi, chunki bugungi kunda muhandis va tadqiqotchilardan nafaqat hisoblash malakalari, balki murakkab real tizimlarni matematik modellashtirish va tahlil qilish qobiliyati talab etiladi.

Zamonaviy ta’lim metodikasi talabalarning faolligini, mustaqil fikrlashini va amaliy ko‘nikmalarini rivojlantirishga qaratilgan yondashuvlarni taklif etadi. Xususan, muammoli yondashuv (problem-based learning) va loyihaviy yondashuv (project-based learning) kompetensiyaviy ta’limning samarali vositalari sifatida tobora ko‘proq e’tirof etilmoqda [2; 3]. Ushbu yondashuvlar an’anaviy o‘qitishdan farqli ravishda talabalarni bilimlarni passiv qabul qiluvchi emas, balki faol ishtirokchi va yaratuvchi sifatida shakllantiradi.

Tadqiqot muammosi quyidagicha ifodalanadi: differensial tenglamalar kursida muammoli va loyihaviy yondashuvlarni qanday metodik asosda va qanday shart-sharoitlarda qo‘llash kompetensiyalarni samarali shakllantirish imkonini beradi?

Tadqiqot maqsadi – differensial tenglamalar bo‘yicha kompetensiyalarni shakllantirishda muammoli va loyihaviy yondashuvlarning metodik asoslarini tavsiflash, ularni qo‘llash shart-sharoitlarini belgilash va kutiladigan pedagogik samaralarni nazariy jihatdan asoslashdan iborat.

Tadqiqot vazifalari:

Muammoli yondashuvning differensial tenglamalar o‘qitishdagi metodik bosqichlarini ishlab chiqish;

Loyihaviy yondashuvning amalga oshirish metodikasini tavsiflash;

Ikkala yondashuvni qo‘llashning zarur va yetarli shart-sharoitlarini aniqlash;

Kompetensiyalarning tarkibiy qismlariga kutiladigan ta’sirni nazariy tahlil qilish.

ADABIYOTLAR TAHLILI

Muammoli ta’lim nazariyasi asoslari J. Dyui, L. Vygotskiy va S. Rubinshteyn kabi olimlarning ishlarida yaratilgan bo‘lsa, zamonaviy pedagogikada bu yondashuv H. Barrows va C. Hmelo-Silver tomonidan tibbiyot va tabiiy fanlar ta’limida keng qo‘llanilgan [1; 4]. Muammoli yondashuvning asosiy g‘oyasi talabalarga tayyor bilim berishdan ko‘ra, o‘quv muammosini hal qilish orqali bilimni "kashf etish" imkoniyatini yaratishdir. Bu yondashuv talabaning kognitiv faolligini oshiradi va bilimlarni chuqur o‘zlashtirishga xizmat qiladi.

Loyihaviy ta’lim metodikasi J. Dyui va V. Kilpatrik tomonidan asos solingan bo‘lib, keyinchalik J. Krajcik va P. Blumenfeld tomonidan zamonaviy talqinda rivojlantirilgan [5]. Loyihaviy yondashuv talabalarni real hayotiy muammolarni o‘rganishga, tadqiqot olib borishga va yakuniy mahsulot yaratishga yo‘naltiradi. Ushbu yondashuv ta’lim jarayonini hayot bilan bog‘laydi, talabalarning motivatsiyasini oshiradi va ularni mustaqil ishlashga o‘rgatadi.

Matematik modellashtirish va differensial tenglamalar o‘qitish metodikasi masalalari V. Blum va M. Niss [3], D. Zill [6], A. Sokolowski [7] kabi tadqiqotchilar tomonidan o‘rganilgan. Ulaming ishlarida matematik modellashtirishning ta’limdagi o‘rni, differensial tenglamalarni real masalalarga qo‘llash usullari va bu jarayonda talabalarda shakllanadigan kompetensiyalar tahlil qilingan.

Shu bilan birga, differensial tenglamalar bo‘yicha kompetensiyalarni shakllantirishda muammoli va loyihaviy yondashuvlarni tizimli integratsiyalash metodikasi, ularni qo‘llashning aniq shart-sharoitlari va kompetensiyalarning alohida tarkibiy qismlariga ta’siri yetarlicha o‘rganilmagan. Ushbu maqola aynan shu bo‘shliqni to‘ldirishga qaratilgan.

TADQIQOT METODOLOGIYASI

Metodologik asos sifatida kompetensiyaviy yondashuv, faoliyatli ta’lim nazariyasi va matematik modellashtirish sikli xizmat qiladi. Tadqiqotda ilmiy adabiyotlarni tahlil qilish, ta’lim metodikalarini tizimlashtirish va nazariy modellashtirish usullaridan foydalanilgan.

Muammoli yondashuv metodikasi

Muammoli yondashuv differensial tenglamalar o‘ qitishda quyidagi metodik bosqichlarni o‘ z ichiga oladi:

1-bosqich: Muammoli vaziyatni yaratish. Talabalarga real jarayon (masalan, harorat o‘ zgarishi, populyatsiya dinamikasi, RLC elektr zanjiri, radioaktiv parchalanish, epidemiyaning tarqalishi) ga doir kontseptual masala beriladi. Bu masalada yetarlicha ma’lumot yetishmasligi yoki ayrim ma’lumotlar o‘ zaro ziddiyatli bo‘ lishi mumkin. Masalan: "Ma’lum bir hududda populyatsiyaning o‘ sishi kuzatilmoqda. Qanday qilib bu jarayonni matematik ifodalash va kelajakdagi o‘ zgarishlarni prognozlash mumkin?" kabi ochiq masalalar qo‘ yiladi.

2-bosqich: Matematik modelni faraz qilish. Talabalar berilgan jarayonni differensial tenglama ko‘ rinishida ifodalashga harakat qiladilar. Bu bosqichda hosilalarning fizik ma’nosini aniqlash, o‘ zgaruvchilarni belgilash, boshlang‘ ich va chegaraviy shartlarni ifodalash talab etiladi. Talabalar o‘ zlarining dastlabki model variantlarini taklif qiladilar va ularni guruhda muhokama qiladilar.

3-bosqich: Muammoni talqin qilish va turkumlash. Talabalar tuzgan tenglamaning turi (oddiy yoki xususiy hosilali, chiziqli yoki nochiziqli, birinchi yoki yuqori tartibli, o‘ zgarmas yoki o‘ zgaruvchan koeffitsiyentli va hokazo) aniqlanadi. Bu bosqich talabalarning differensial tenglamalar tasnifi bo‘ yicha bilimlarini faollashtiradi.

4-bosqich: Yechim strategiyasini loyihalash. Muammo shartlaridan kelib chiqib, analitik, sonli yoki sifatli usullardan birini tanlash zarurati asoslanadi. Talabalar tanlangan usulning maqsadga muvofiqligini, qulayliklari va cheklovlarini muhokama qiladilar.

5-bosqich: Natijalarni muhokama va talqin. Olingan yechimning asl jarayonga muvofiqligi, yechimning mavjudligi, yagonaligi va barqarorligi tahlil qilinadi. Talabalar o‘ z modeli va yechimini real ma’lumotlar bilan solishtiradilar, xulosalar chiqaradilar.

Loyihaviy yondashuv metodikasi

Loyihaviy yondashuv differensial tenglamalar o‘ qitishda quyidagi metodik bosqichlarni o‘ z ichiga oladi:

Kirish (boshlang‘ ich) bosqichi. O‘ qituvchi loyiha tematik doirasi – mexanika, biologiya, iqtisodiyot, ekologiya, epidemiologiya, kimyoviy kinetika va boshqa sohalar – e’lon qiladi. Talabalar o‘ zlari yoki kichik guruhlarda aniq muammoni tanlaydilar. Masalan: "Epidemiyaning tarqalishini SIR modeli yordamida prognozlash", "Tebranish konturidagi jarayonlarni differensial tenglamalar bilan modellashtirish", "Oziq-ovqat zanjiridagi populyatsiyalar dinamikasi" kabi loyiha mavzulari taklif etiladi.

Rejalashtirish bosqichi. Talabalar differensial tenglama modelini qurish, kerakli ma’lumotlarni (boshlang‘ ich va chegaraviy shartlar, parametrlar, koeffitsiyentlar) aniqlash va yechim usulini tanlash bo‘ yicha ish rejasini tuzadilar. Ishni bosqichlarga bo‘ lish, vazifalarni taqsimlash, vaqt mezonlarini belgilash amalga oshiriladi.

Tadqiqot va modellashtirish bosqichi. Modelni tuzish, uni yechish (analitik usullar yoki sonli usullar – Eyler usuli, Runge-Kutta usullari, MATLAB, Python, Wolfram Mathematica yordamida), yechimni parametrlarga nisbatan tahlil qilish amalga oshiriladi. Talabalar modelning turli parametrlarga sezgirligini o‘ rganadilar, grafiklar va jadvallar tayyorlaydilar.

Baholash bosqichi. Modelning adekvatligi, kiritilgan soddalashtirishlarning natijaga ta’siri, mumkin bo‘ lgan metodik va hisoblash xatolari muhokama qilinadi. Talabalar modelning kuchli va zaif tomonlarini aniqlaydilar, takomillashtirish yo‘ llarini taklif qiladilar.

Yakuniy bosqich. Talabalar yozma hisobot va og‘ zaki taqdimot shaklida loyiha natijalarini himoya qiladilar. Hisobot IMRAD talablariga muvofiq tuziladi, taqdimotda asosiy natijalar, xulosalar va amaliy tavsiyalar aks ettiriladi.

Yondashuvlarni integratsiyalash strategiyasi

Muammoli va loyihaviy yondashuvlarni integratsiyalash quyidagi strategiya asosida amalga oshirilishi tavsiya etiladi:

1-bosqich (tayyorlov, 1-2 hafta). Muammoli yondashuv elementlari yordamida talabalarni differensial tenglamalar va real jarayonlar o‘ rtasidagi bog‘ liqlik bilan tanishtirish. Qisqa muddatli (1-2 soatlik) muammoli vaziyatlarni yechish orqali motivatsiyani oshirish va asosiy tushunchalarni faollashtirish.

2-bosqich (asosiy, 3-6 hafta). Loyihaviy yondashuvni amalga oshirish – talabalar tanlagan loyiha mavzusi ustida ishlash. Bunda muammoli yondashuv elementlari loyiha davomida yuzaga keladigan alohida muammoli vaziyatlarni hal qilishda qo‘ llaniladi.

3-bosqich (yakuniy, 1 hafta). Loyiha natijalarini taqdim etish va umumiy muhokama. Muammoli yondashuvda shakllangan analitik ko‘ nikmalar loyiha natijalarini baholash va talqin etishda qo‘ llaniladi.

NATIJALAR VA TAHLIL

Yondashuvlarni qo‘ llash shart-sharoitlari

Muammoli yondashuvni qo‘ llash shartlari:

Birinchi shart – talabalarning tayanch bilimlarga ega bo‘ lishi. Differensial tenglamalarning asosiy turlari va klassik yechim usullari (birinchi tartibli chiziqli tenglamalar, o‘ zgarmas koeffitsiyentli ikkinchi tartibli tenglamalar,

o‘ zgaruvchilari ajraladigan tenglamalar) avvaldan o‘ zlashtirilgan bo‘ lishi kerak. Aks holda, muammoli vaziyat talabalar uchun haddan tashqari kognitiv yuklama keltirib, tushkunlikka olib kelishi mumkin.

Ikkinchi shart – guruh hajmining optimal bo‘ lishi. Talabalar soni 25-30 kishidan oshmagan hollarda muammoli muhokama va individual yondashuv samaraliroq bo‘ ladi. Katta guruhlarda (50 va undan ortiq) barcha talabalarni faollashtirish qiyinlashadi.

Uchinchi shart – vaqt resursi. Muammoli yondashuv asosan 2 soatlik amaliy mashg‘ ulot doirasida qo‘ llaniladi, shu sababli muammo konspektiv, aniq va yechim strategiyasini loyihalash imkonini beradigan darajada bo‘ lishi kerak.

To‘ rtinchi shart – o‘ qituvchining metodik tayyorgarligi. O‘ qituvchi moderator vazifasini bajarishga, ya’ni tayyor javob bermasdan, talabalarning fikrlash jarayonini yo‘ naltiruvchi savollar berishga va ularning mustaqil xulosalar chiqarishiga imkon yaratishga tayyor bo‘ lishi kerak.

Loyihaviy yondashuvni qo‘ llash shartlari:

Birinchi shart – sonli usullar bo‘ yicha tayyorgarlik. Talabalar differensial tenglamalarni yechishning sonli usullari bilan tanishgan bo‘ lishi yoki parallel ravishda "Ilmiy hisoblash", "Matematik modellashtirish" kabi fanlarni o‘ tayotgan bo‘ lishi maqsadga muvofiq.

Ikkinchi shart – vaqt resursi. Loyiha semestr davomida (4-6 hafta) amalga oshiriladi. Auditoriyadan tashqari ish vaqti mavjud bo‘ lishi va talabalar mustaqil ishlashlari uchun yetarli vaqtga ega bo‘ lishi kerak.

Uchinchi shart – fanlararo aloqalar. Talabalar o‘ z mutaxassisligiga (fizika, biologiya, iqtisodiyot, muhandislik) oid modellarni tanlash imkoniyatiga ega bo‘ lsa, loyihaga qiziqish va motivatsiya sezilarli darajada oshadi.

To‘ rtinchi shart – texnik resurslar. Internetga ulanish, kutubxona, dasturiy vositalar (MATLAB, Python, Wolfram Mathematica), kompyuter sinfi yetarli bo‘ lishi kerak. Aks holda, loyiha faqat analitik modellashtirishga asoslanishi mumkin.

Beshinchi shart – baholash tizimi. Baholash jarayon va natijaga asoslangan bo‘ lib, oraliq hisobotlar, konsultatsiyalar va yakuniy himoyani o‘ z ichiga olishi talab etiladi. O‘ qituvchi loyiha davomida maslahatchi vazifasini bajaradi, lekin talabalarning mustaqil qaror qabul qilishlariga to‘ sqinlik qilmasligi kerak.

Ikkala yondashuv uchun umumiy cheklovlar:

Talabalar soni haddan tashqari katta bo‘ lganda (50+) guruhli ish va muhokama samaradorligi pasayadi.

Talabalarning matematik tayyorgarligi yetarli bo‘ lmaganda (hosila, integral, oddiy differensial tenglamalar bo‘ yicha) yondashuvlar kutilgan samarani bermasligi mumkin.

O‘ qituvchining noan’anaviy metodlarni qo‘ llashga tayyorligi va tegishli metodik materiallar mavjudligi muhim omil hisoblanadi.

Kompetensiyalarning shakllanishiga kutiladigan ta’sir

Differensial tenglamalar bo‘ yicha kompetensiyalar to‘ rt asosiy tarkibiy qismga bo‘ linadi: kognitiv, faoliyatli, refleksiv va kommunikativ.

Kognitiv kompetensiyalar (bilim va tushuncha). Muammoli yondashuv talabalarning differensial tenglamalar turlari va ularning real jarayonlar bilan bog‘ liqligini chuqur anglab olishiga xizmat qiladi. An’anaviy yondashuvda talaba tayyor ko‘ rinishda berilgan tenglamani yechsa, muammoli yondashuvda u real vaziyatdan kelib chiqib tenglamaning turini o‘ zi aniqlashni o‘ rganadi [1]. Loyihaviy yondashuv esa bir nechta mavzuni (boshlang‘ ich shartlar ta’siri, barqarorlik tahlili, faza portreti, parametrik sezuvchanlik) integrativ tarzda o‘ zlashtirish imkonini beradi.

Faoliyatli kompetensiyalar (qo‘ llash va tahlil). Muammoli yondashuv asosan real muammoni tenglama ko‘ rinishiga keltirish ko‘ nikmasini rivojlantiradi – qaysi o‘ zgaruvchilarni asosiy deb olish, qanday farazlarni kiritish, qanday soddalashtirishlar mumkinligini baholash. Loyihaviy yondashuv to‘ liq matematik modellashtirish tsiklini – muammoni o‘ rganish, model qurish, yechimni topish, natijalarni talqin qilish va prognoz berish – amalda bajarish imkonini yaratadi [3]. Bu muhandislik va ilmiy faoliyatda bevosita zarur bo‘ lgan kompleks kompetensiyani shakllantiradi. Shuningdek, loyihaviy yondashuv sonli usullarni (Eyler, Runge-Kutta, chekli farqlar) amaliy kontekstda o‘ zlashtirishga imkon beradi [6].

Refleksiv kompetensiyalar (baholash va metakognitsiya). Muammoli yondashuv talabalarni o‘ z yechim strategiyasining to‘ g‘ riligi va muammoning qo‘ yilishiga mosligi haqida doimiy fikr yuritishga undaydi. Loyihaviy yondashuv yechimning yagonaligi, barqarorligi, model chegaralari, kiritilgan farazlarning oqibatlari haqida hisobot va himoya jarayonida chuqur mulohaza yuritishni talab qiladi [7]. Bu metakognitiv kompetensiyaning – o‘ z bilish jarayonlarini boshqarish qobiliyatining rivojlanishiga olib keladi.

Kommunikativ kompetensiyalar. Guruhli loyihalar va muammoli muhokamalar talabalarning matematik g‘ oyalarni og‘ zaki va yozma shaklda ifodalash qobiliyatini oshiradi. Differensial tenglamalarning maxsus atamalarini to‘ g‘ ri qo‘ llash, guruh ichida vazifalarni taqsimlash, qaror qabul qilishda kelishuvga erishish, o‘ z natijalarini boshqalar oldida himoya qilish kabi malakalar shakllanadi [5].

Integratsiyalashgan yondashuvning afzalliklari

Muammoli va loyihaviy yondashuvlarni izchil integratsiyalash – muammoli yondashuv bilan boshlang‘ ich tayyorgarlik va motivatsiyani ta’minlash, so‘ ngra loyihaviy yondashuv bilan mustahkamlash va chuqurlashtirish – quyidagi afzalliklarni beradi:

Bosqichma-bosqich o‘ zlashtirish. Talabalar avval muammoli vaziyatlar orqali asosiy tushunchalar va usullarni o‘ zlashtiradilar, so‘ ngra ularni loyiha doirasida mustaqil qo‘ llaydilar.

Motivatsiyaning oshishi. Muammoli vaziyatlar qiziqish uyg‘ otadi, loyiha esa bu qiziqishni amaliy faoliyatga aylantiradi.

Kompetensiyalarning har tomonlama rivojlanishi. Kognitiv, faoliyatli, refleksiv va kommunikativ kompetensiyalar birgalikda shakllanadi va o‘ zaro mustahkamlanadi.

Moslashuvchanlik. Integratsiyalashgan yondashuv talabalar tayyorgarligi va resurslar imkoniyatiga qarab moslashtirilishi mumkin.

XULOSA

Muammoli va loyihaviy yondashuvlar differensial tenglamalarni o‘ qitishda an’anaviy "misollar yechish" usulidan farqli ravishda kompetensiyalarning chuqur, integrativ va faoliyatli shakllanishiga imkon yaratadi. Muammoli yondashuv asosan qisqa, intensiv va kognitiv to‘ qnashuvga asoslangan bo‘ lib, differensial tenglamalarning asosiy turlarini aniqlash, real vaziyatni matematik modelga o‘ tkazish va yechim strategiyasini loyihalash kompetensiyalarini shakllantirishga qaratilgan. Loyihaviy yondashuv esa uzoq muddatli, real muammolarga yo‘ naltirilgan va sonli usullar hamda modellashtirish bilan integratsiyalashgan bo‘ lib, to‘ liq matematik tadqiqot kompetensiyasini rivojlantiradi.

Ikkala yondashuvni izchil integratsiyalash – muammoli yondashuv bilan boshlang‘ ich tayyorgarlik va motivatsiyani ta’minlash, so‘ ngra loyihaviy yondashuv bilan mustahkamlash va chuqurlashtirish – differensial tenglamalar kursida kompetensiyalarni har tomonlama rivojlantirishning metodik jihatdan asoslangan va istiqbolli yo‘ nalishi hisoblanadi.

Taklif etilgan metodika talabalar soni 25-30 dan oshmagan, talabalar yetarli matematik tayyorgarlikka ega va o‘ qituvchi noan’anaviy metodlarni qo‘ llashga tayyor bo‘ lgan sharoitlarda eng yuqori samarani berishi kutiladi. Kelgusida ushbu metodikaning empirik tekshiruvi va turli ta’lim sharoitlariga moslashtirilgan variantlarini ishlab chiqish tadqiqotning istiqbolli yo‘ nalishlari hisoblanadi.

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ODIL YOQUBOVNING "DIYONAT" ROMANINING EKOLOGIK-TA'LIMIY SALOHIYATI: PRAGMATIK YONDASHUV ASOSIDA TAHLIL

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Annotatsiya: *Mazkur maqolada Odil Yoqubovning "Diyonat" romanining ekologik-ta'limiy salohiyati pragmatik yondashuv asosida tahlil qilingan. Asarda inson va tabiat o' rtasidagi munosabat, ekologik qadriyatlar, tabiatni asrash g' oyalarining badiiy ifodasi yoritilib, ularning o' quvchilarda ekologik madaniyatni rivojlantirishdagi didaktik imkoniyatlari ochib berilgan. Shuningdek, romandan adabiy ta'lim jarayonida samarali foydalanishning metodik jihatlari asoslangan.*

Kalit so' zlar: *ekologik madaniyat, adabiy ta'lim, pragmatik yondashuv, ekologik ta'lim, "Diyonat" romani, Odil Yoqubov, ekologik qadriyatlar, tabiat, badiiy tahlil, didaktik imkoniyatlar.*

ЭКОЛОГО-ОБРАЗОВАТЕЛЬНЫЙ ПОТЕНЦИАЛ РОМАНА ОДИЛА ЯКУБОВА «ДИЁНАТ»: АНАЛИЗ НА ОСНОВЕ ПРАГМАТИЧЕСКОГО ПОДХОДА

Аннотация: *В статье анализируется эколого-образовательный потенциал романа Одила Якубова «Диёнат» на основе прагматического подхода. Рассматриваются художественное отражение взаимоотношений человека и природы, экологические ценности и идеи охраны окружающей среды, а также их значение для формирования экологической культуры учащихся. Обосновываются методические возможности использования романа в процессе литературного образования.*

Ключевые слова: *экологическая культура, литературное образование, прагматический подход, экологическое воспитание, роман «Диёнат», Одил Якубов, экологические ценности, природа, художественный анализ, дидактические возможности.*

THE ECOLOGICAL AND EDUCATIONAL POTENTIAL OF ODIL YAKUBOV'S NOVEL DIYONAT: AN ANALYSIS BASED ON THE PRAGMATIC APPROACH

Abstract: *This article analyzes the ecological and educational potential of Odil Yakubov's novel Diyonat from the perspective of the pragmatic approach. It examines the artistic representation of the relationship between humans and nature, ecological values, and environmental protection ideas, highlighting their role in developing students' ecological culture. The study also substantiates the methodological possibilities of using the novel in literature education.*

Keywords: *ecological culture, literature education, pragmatic approach, environmental education, Diyonat, Odil Yakubov, ecological values, nature, literary analysis, didactic opportunities.*

KIRISH

O' zbekistonda ekologik madaniyatni yuksaltirish, atrof-muhitni muhofaza qilish hamda tabiiy resurslardan oqilona foydalanish davlat siyosatining ustuvor yo' nalishlaridan biri sifatida belgilangan. Xususan, O' zbekiston Respublikasi Prezidentining 2026-yil 25-martdagi PQ-110-son qarorida ta'lim tizimida ekologik madaniyatni yuksaltirish, ekologik qadriyatlarni yosh avlod ongiga singdirish hamda bu boradagi ta'limiy-tarbiyaviy ishlar samaradorligini oshirish ustuvor vazifalardan biri etib belgilangan [7].

Global ekologik muammolarning tobora kuchayib borishi ta'lim tizimi oldiga o' quvchilarda ekologik tafakkur va mas'uliyatni shakllantirish vazifasini qo' ymoqda. Bu jarayonda adabiyot ta'limi alohida ahamiyat kasb etadi. Chunki badiiy asarlarda inson va tabiat munosabati, ekologik muammolarning badiiy talqini hamda qahramonlarning tabiatga munosabati o' quvchilarning ekologik madaniyatini rivojlantirish uchun muhim pedagogik imkoniyat yaratadi. Odil Yoqubovning "Diyonat" romanida ekologiya bosh mavzu sifatida yoritilmagan bo' lsa-da, unda tabiatni muhofaza qilish, daraxtlarning kesilishi, biologik kurash usullaridan foydalanish, yovvoyi hayvonlarni asrash hamda tarixiy ekologik

fojialarga oid qator badiiy lavhalar o‘ z ifodasini topgan. Ushbu epizodlar o‘ quvchilarda ekologik muammolarga nisbatan ongli munosabatni shakllantirish va ekologik madaniyatni rivojlantirish uchun muhim didaktik salohiyatga ega.

Akademik litseylarning adabiyot fanidan namunaviy o‘ quv dasturida badiiy asarlarni tahlil qilish jarayonida o‘ quvchilarning tanqidiy fikrlashi, matnga tayangan holda dalillar keltirishi, qiyosiy tahlil qilishi hamda boshqa fanlardan olgan bilimlarini amalda qo‘ llashi zarurligi alohida ta’kidlangan [6, 7]. Shu jihatdan “Diyonat” romanidagi inson va tabiat munosabatlari aks etgan badiiy lavhalarni pragmatik yondashuv asosida tahlil qilish mazkur kompetensiyalarni rivojlantirish bilan birga o‘ quvchilarning ekologik madaniyatini shakllantirishga ham xizmat qiladi.

ADABIYOTLAR TAHLILI

O. Iskandarovaning “Mushtaraklik va o‘ ziga xoslikning lisoniy jozibasi” monografiyasida Chingiz Aytmatovning “Qiyomat” va Odil Yoqubovning “Diyonat” romanlari davr, konflikt, xarakter hamda inson va tabiat munosabatlari nuqtayi nazaridan qiyosiy tadqiq qilingan. Tadqiqotda inson va tabiat munosabatlarining badiiy talqini adabiyotshunoslik nuqtayi nazaridan yoritilgan [2]. N. Karimov, B. Nazarov, U. Normatov va Q. Yo‘ ldoshevlar tomonidan tayyorlangan 11-sinf adabiyot darsligida esa “Diyonat” romani davrning ijtimoiy-ma’naviy muammolari, adolat, diyonat, e’tiqod va insoniylik mezonlari asosida tahlil qilingan [3]. Adabiy ta’lim metodikasi bo‘ yicha Z. Mirzayeva va K. Jalilov tadqiqotlarida badiiy asarlarni o‘ qitishda zamonaviy yondashuvlar, jumladan, pragmatik yondashuvning metodik imkoniyatlari yoritilgan [4]. Biroq “Diyonat” romanida aks etgan ekologik mazmunni akademik litsey o‘ quvchilarining ekologik madaniyatini rivojlantirishga yo‘ naltirib, pragmatik yondashuv asosida o‘ qitish masalasi maxsus tadqiq etilmagan.

TADQIQOT METODOLOGIYASI

Xalqaro miqyosdagi tajribali olimlar, pedagoglar adabiyot o‘ qitishning konseptual yondashuvlari qatoriga pragmatik – quruq g‘ oyalardan iborat bo‘ lmagan, o‘ quvchilarning real hayotiy dasturlariga, amaliy va kundalik tajribalariga asoslangan o‘ quv jarayonlarini tashkil etish yondashuvini kiritadilar. Bunday yondashuv asosida o‘ quvchilarning shaxsiy tajribasi, atrof-muhit bilan o‘ zaro munosabatda o‘ z bilimlarini rivojlantirib borish ko‘ nikmasi yotadi. Pragmatik yondashuvga o‘ quvchilarning “tafakkur inqilobi”ga rag‘ bat beradigan, ularda turli xil kutilgan va kutilmagan fikrlarning tug‘ ilishiga rag‘ bat beradigan eng muhim yondashuv sifatida qaraladi [4, 69].

Mazkur maqolada Odil Yoqubovning “Diyonat” romanidagi ekologik mazmundagi epizodlarni pragmatik yondashuv asosida o‘ qitishning metodik imkoniyatlari tahlil qilindi. Unda ilmiy-pedagogik va metodik adabiyotlarni o‘ rganish, akademik litseylarning adabiyot fani namunaviy o‘ quv dasturini tahlil qilish, badiiy-pedagogik va qiyosiy tahlil, interpretatsiya, tizimlashtirish hamda umumlashtirish metodlaridan foydalanildi. Shuningdek, ekologik mazmundagi badiiy lavhalar asosida pragmatik savollar, interfaol metodlar va fanlararo integratsiyaga asoslangan mustaqil ta’lim topshiriqlari ishlab chiqildi.

NATIJALAR VA ULARNING TAHLILI

Akademik litseylarning adabiyot fani chuqurlashtirib o‘ qitiladigan yo‘ nalishlari uchun ishlab chiqilgan namunaviy o‘ quv dasturida Odil Yoqubovning “Ulug‘ bek xazinasi”, “Ko‘ hna dunyo” va “Diyonat” romanlarini o‘ rganishga jami 8 soat [6, 18], mustaqil ta’lim uchun esa 4 soat ajratilgan [6, 23]. Mazkur imkoniyatdan kelib chiqib, “Diyonat” romanini o‘ rganish uchun 2 soat auditoriya mashg‘ ulotiga va 1 soat mustaqil ta’limga ajratish maqsadga muvofiq deb hisoblandi. Dasturda romanni o‘ rganish bo‘ yicha “o‘ zbek xalqi milliy qadriyatlarining ulug‘ lanishi hamda davr muammolarining fosh etilishi” asosiy didaktik talab sifatida belgilangan [6, 18]. Tadqiqot doirasida ushbu talab ekologik mazmundagi epizodlarni pragmatik yondashuv asosida o‘ qitish bilan boyitildi.

Metodik tahlil jarayonida aniqlandiki, o‘ quvchilarni bevosita ekologik muammolar tahliliga yo‘ naltirish ularning asarni yaxlit idrok etishiga to‘ sqinlik qilishi mumkin. Shu sababli ekologik tahlildan oldin roman syujeti, g‘ oyaviy yo‘ nalishi va obrazlar tizimi haqida dastlabki tasavvurni shakllantirish zarur. Mazkur maqsadda “Asarni kashf etamiz”, “Asarni anglaymiz” va “Muammoni topamiz” metodlari ketma-ket qo‘ llanildi.

Darsning motivatsion bosqichida “Asarni kashf etamiz” metodi asosida o‘ quvchilar kichik guruhlarga ajratildi. Ularga roman nomi yozilgan tarqatma material taqdim etilib, “Diyonat” so‘ zini qanday tushunasiz?”, “Bu nom sizda qanday tasavvur uyg‘ otadi?”, “Sizningcha, romanda qanday voqealar yoritilgan bo‘ lishi mumkin?” kabi savollar berildi. Olingan javoblar klaster shaklida umumlashtirildi. Ushbu metod o‘ quvchilarning avvalgi bilimlarini faollashtirish, asarga nisbatan qiziqish uyg‘ otish va keyingi tahlil uchun motivatsion zamin yaratishga xizmat qildi.

Keyingi bosqichda “Asarni anglaymiz” metodi qo‘ llanildi. O‘ qituvchi romanning yaratilish tarixi, g‘ oyaviy yo‘ nalishi hamda Odil Yoqubovning Otaqo‘ zi obrazi haqida bildirgan fikrlarini taqdim etdi. Shundan so‘ ng o‘ quvchilar “Konseptual jadval”ni to‘ ldirib, asarning bosh g‘ oyasi, asosiy obrazlari va unda ko‘ tarilgan muammolarni tizimlashtirdilar. Bu bosqichda ekologik muammo romanning boshqa ijtimoiy va ma’naviy muammolari qatorida ko‘ rib chiqildi.

So‘ ng “Muammoni topamiz” metodi asosida o‘ quvchilarga: “Romandagi barcha muammolar ichida sizni eng ko‘ p o‘ ylantirgani qaysi? Nima uchun?” mazmunidagi muammoli savol berildi. Muhokamalar davomida adolatsizlik,

mansabparastlik, ilm-fanga bepisandlik va tabiatning vayron qilinishi kabi javoblar bildirildi. Shundan keyingina o‘ quvchilarning e’tibori romanning ekologik mazmundagi epizodlariga qaratildi.

Metodik tahlillar shuni ko‘ rsatdiki, mazkur metodlar ketma-ketligi o‘ quvchilarda avval asarning umumiy g‘ oyasini anglash, so‘ ng ekologik muammolarni ajratib tahlil qilish imkonini yaratdi. Natijada ekologik madaniyatga oid tushunchalar badiiy matn mazmunidan tabiiy ravishda kelib chiqdi, pragmatik yondashuv esa o‘ quvchilarning tabiat muammolarini real hayot bilan bog‘ lash, mustaqil xulosa chiqarish va amaliy yechimlar taklif etish kompetensiyalarini rivojlantirishga xizmat qildi.

Tahlil uchun romandan insonning tabiatga munosabatlari aks etgan eng yorqin adabiy parchalar tanlab olinib, elektron doskada namoyish qilindi. Har biri pragmatik yondashuv asosida interfaol metodlar yordamida o‘ rganildi. Quyida ana shunday epizodlardan ayrimlari tahlil qilinadi.

I. Mingbuloq archazorlarining kesilishi: ekologik muammoning badiiy talqini.

Tahlil uchun tanlangan dastlabki lavhada yozuvchi Mingbuloq tabiatiga yetkazilgan zarar orqali inson va tabiat munosabatining keskinlashib borayotganini badiiy jihatdan ta’sirchan ifodalaydi. Asarda shunday tasvir beriladi: *“…Pastda, Mingbuloqni qilichday kesib o‘ tgan shag‘ al yo‘ lning ikki tomonida qirqilgan daraxtlar uyilib yotar,… otaning nazarida, go‘ yo butun Mingbuloq oyoqosti bo‘ lganday, go‘ yo hammayoq qiyratilgan, maysalar toptalgan, buloqlar bulg‘ anganday tuyuldi…”* [5, 197].

Mazkur tasvirda daraxtlarning kesilishi oddiy xo‘ jalik faoliyati sifatida emas, balki tabiat yaxlitligining buzilishi sifatida talqin qilinadi. Muallif “maysalar toptalgan”, “buloqlar bulg‘ anganday” kabi badiiy detallar orqali tabiatdagi barcha unsurlar o‘ zaro bog‘ liq ekanligini ko‘ rsatadi. Bu esa o‘ quvchilarda ekotizimning yaxlitligi haqidagi tasavvurni shakllantirish uchun muhim didaktik asos bo‘ lib xizmat qiladi. Normurod Shomurodovning: *“Kaltabinlarning o‘ z yurti, ona tabiati, yer-suvining qadrini bilmagan befarosat nodonlarning ishi bu!”* [5, 199] degan fikri esa romanning ekologik g‘ oyasini mujassamlashtiradi. Qahramon tabiat tanazzuli sababini tashqi omillarda emas, balki insonning ekologik ongi va ma’naviy mas’uliyati yetishmasligida ko‘ radi.

Ushbu epizodni pragmatik yondashuv asosida o‘ qitishda “FSMU”, “Keys-stadi” hamda “Rol o‘ ynash” metodlaridan foydalanish tavsiya etiladi. Xususan, “Rol o‘ ynash” metodida o‘ quvchilar Normurod Shomurodov, qurilish rahbari, ekolog mutaxassis va mahalliy aholi vakili rollarida muhokama olib boradilar. Bu jarayonda ular turli nuqtayi nazarlarni taqqoslaydi, muammoning sabab va oqibatlarini baholaydi hamda muqobil yechimlar ishlab chiqadi.

O‘ quvchilarning mustaqil tahlil ko‘ nikmalarini rivojlantirish maqsadida quyidagi pragmatik savollar tavsiya etiladi:

1. Nima uchun yozuvchi archazorlarning kesilishini oddiy xo‘ jalik ishi emas, balki ekologik fojia sifatida tasvirlagan, deb o‘ ylaysiz?

2. Agar Mingbuloqdagi archazorlar o‘ rnida siz yashaydigan hududdagi daraxtlar kesilayotganini ko‘ rsangiz, qanday yo‘ l tutgan bo‘ lardingiz? Javobingizni asoslang.

3. Normurod Shomurodovning: “Ona tabiati, yer-suvining qadrini bilmagan befarosat nodonlarning ishi bu!” degan fikri bugungi ekologik muammolar bilan qanchalik bog‘ liq?

4. Sizningcha, iqtisodiy manfaat bilan tabiatni muhofaza qilish o‘ rtasidagi muvozanatni qanday saqlash mumkin?

5. Agar siz tuman hokimi bo‘ lsangiz, molxona qurilishi va archazorlarni saqlab qolish muammosini qanday hal qilgan bo‘ lardingiz?

6. Mingbuloq tabiatiga yetkazilgan zarar mahalliy aholi hayotiga qanday ta’sir ko‘ rsatishi mumkin? Kamida uchta oqibatni ayting.

Mazkur metod va pragmatik savollardan foydalanish o‘ quvchilarning badiiy matndan ekologik mazmunni ajratib olish, uni real hayot bilan bog‘ lash, dalillangan xulosa chiqarish hamda tabiatga nisbatan mas’uliyatli munosabatni shakllantirishga xizmat qiladi.

II**.** Tog‘ archalarining qirilishi va suv muammosi: tarixiy xotira hamda ekologik tafakkur uyg‘ unligi.

Asarda insonning tabiatga nisbatan tajovuzkor munosabati tasodifiy hodisa emas, balki uzoq tarixga ega ekanligi badiiy dalillar asosida ochib berilgan. Muallif Chingizxon istilosi davrida tog‘ archalarining qirib tashlangani, shuningdek, Proxor Polikarpov tomonidan topilgan tarixiy telegrammada podsho hukumatining temir yo‘ lni yoqilg‘ i bilan ta’minlash maqsadida Turkiston tog‘ laridagi archalardan millionlab kubometr ko‘ mir tayyorlash rejalashtirilgani bayon qilinadi. Adib bu hujjat orqali tabiatga iste’molchilik munosabati tarix davomida qanday shakllanganini ko‘ rsatadi: *“… imperiyada ko‘ mir tanqisligini hisobga olgan uning sadoqati zohir fuqarolari bo‘ lmish Mirkomilboy va Morozov janoblari tog‘ archalaridan million-million kubometr ko‘ mir tayyorlash chorasini ko‘ rmishlarkim, quvvati jihatidan eng oliy nav toshko‘ mirdan qolishmaydigan bu archa ko‘ miri otasharavalarni o‘ n yillar davomida ta’min etishga qodirdur!...”* [5, 198].

Yozuvchi tabiat boyliklaridan faqat iqtisodiy manfaat nuqtayi nazaridan foydalanish qanday og‘ ir ekologik oqibatlarga olib kelishini tarixiy hujjat orqali ishonarli asoslaydi. Yana bir muhim jihat shundaki, Normurod Shomurodov tarixiy hujjatni oddiy fakt sifatida qabul qilmaydi. U ilmiy kuzatishlar asosida tog‘ archalarining suv manbalari bilan

chambarchas bog‘ liqligini aniqlaydi. Asarda: *“Domla bu hujjatlarni ipidan ignasigacha o‘ rganarkan, tog‘ archalarining suv muammolari bilan chambarchas bog‘ liq tomonlarini ham aniqladi-yu, maqolani yig‘ ishtirib qo‘ yib, kitob yozishga o‘ tirdi”* [5, 198] deyiladi. Bu esa qahramonning ilmiy tafakkuri, ekologik mas’uliyati va tabiatni kompleks tizim sifatida idrok etishini namoyon etadi. Mazkur epizod o‘ quvchilarda sabab – oqibat munosabatlarini anglash, tarixiy va zamonaviy ekologik muammolarni qiyoslash, ilmiy dalillarga asoslangan xulosalar chiqarish ko‘ nikmalarini rivojlantirish imkonini beradi.

Epizod mazmunini chuqur anglash maqsadida o‘ quvchilar quyidagi pragmatik savollar ustida fikr yuritadilar:

1. Nima uchun yozuvchi tarixiy telegrammani romanga kiritgan deb o‘ ylaysiz?

2. Tog‘ archalarining kesilishi suv manbalariga qanday ta’sir ko‘ rsatishi mumkin? Fikringizni biologiya va geografiya fanlaridan olgan bilimlaringiz bilan izohlang.

3. Agar siz Normurod Shomurodov o‘ rnida bo‘ lganingizda, bu muammoni jamiyat e’tiboriga qanday olib chiqqan bo‘ lardingiz?

4. Tarixdagi xatolardan bugungi ekologik siyosat uchun qanday saboq olish mumkin?

5. Siz yashayotgan hududda daraxtlar va suv manbalarini asrash bo‘ yicha qanday amaliy ishlar amalga oshirilmoqda?

Ko‘ rinib turibdiki, pragmatik savollar o‘ quvchilarda ekologik muammolarni tahlil qilish, ularning sabab va oqibatlarini baholash hamda amaliy yechimlar taklif etish ko‘ nikmalarini rivojlantiradi.

III**.** Biologik kurash usuli – ekologik tafakkur va ilmiy mas’uliyat ifodasi.

Muallif ekologik muammmolarni bartaraf etishda ilm-fan yutuqlarining o‘ rnini Soqijon Obidov obrazi orqali ochib beradi. Dotsentning biologik kurash usuli ustidagi izlanishlari tabiat bilan uyg‘ un yashash g‘ oyasini ifodalaydi: *“…universitet domlasi dotsent Obidov bir necha yillardan beri biologik kurash metodi ustida ish olib bormoqda ekan. G‘ o‘ za zararkunandalarining kushandasi bo‘ lgan hasharotlarni o‘ z laboratoriyasida urchitib, ko‘ paytirishga muvaffaq bo‘ libdi…”* [5, 215].

Lavhada yozuvchi tabiat muvozanatini buzmaydigan, aksincha, tabiiy qonuniyatlarga tayangan ekologik usulning afzalligini ko‘ rsatadi. Trixogramma hasharotining faqat ko‘ sak qurti mavjud bo‘ lgandagina faol bo‘ lishi haqidagi ilmiy izoh o‘ quvchilarda tabiatdagi biologik muvozanat va oziq zanjiri haqidagi tasavvurlarni boyitadi. Shu jihatdan epizod adabiyot, biologiya va ekologiya fanlari integratsiyasini ta’minlash imkonini beradi. Ta’lim jarayonida integratsiya fanlararo aloqaga, ya’ni umumiy fanlar, o‘ quv fanlari, ularning bo‘ lim va mavzulari bo‘ yicha olingan bilimlarga tayangan holda o‘ rganilayotgan masalaga xos bo‘ lgan yetakchi g‘ oyalar hamda hodisalarning izchil, har jihatdan chuqur va serqirra ochilishini nazarda tutadi [1, 49]. Biroq yozuvchi yana bir muhim jihatni – ilmiy mas’uliyat masalasini ham ochib beradi. Tajriba hali yakunlanmagan bo‘ lsa-da, ayrim mas’ullar: *“Qo‘ rqmang, domla! “Tajriba yaxshi o‘ tdi”, degan ispravka yozib beramiz!”* [5, 291] deya soxta hisobot berishni taklif qiladilar. Ushbu dialog ilm-fanga yuzaki munosabat, mas’uliyatsizlik va rasmiyatchilikni tanqid qiladi. Natijada o‘ quvchilar ekologik muammolarni hal etishda ilmiy halollik va mas’uliyatning naqadar muhim ekanligini anglaydilar.

Adabiy parchani pragmatik yondashuv asosida o‘ rganishda “T – sxemasi” va “Muammoli vaziyat” metodlaridan foydalanish maqsadga muvofiq. Mazkur metodlar yordamida o‘ quvchilar biologik va kimyoviy kurash usullarini taqqoslaydilar, ekologik xavfsizlik nuqtayi nazaridan eng maqbul yechimni asoslaydilar hamda ilmiy halollikning jamiyat taraqqiyotidagi o‘ rni yuzasidan fikr almashadilar. Shundan so‘ ng quyidagi pragmatik savollar asosida munozara tashkil etiladi:

1. Nima uchun dotsent Obidov zararkunandalarga qarshi biologik kurash usulini tanlagan?

2. Trixogrammadan foydalanishning ekologik afzalligi nimada?

3. Nega yozuvchi tajriba natijasini soxtalashtirish bilan bog‘ liq dialogni asarga kiritgan?

4. Agar siz ilmiy loyiha rahbari bo‘ lganingizda, tajriba hali tugallanmagan bo‘ lsa, qanday qaror qabul qilgan bo‘ lardingiz?

5. Ekologik muammolarni hal etishda ilmiy halollik nima uchun muhim?

6. Bugungi kunda qishloq xo‘ jaligida biologik kurash usullarini keng qo‘ llash qanday natijalar berishi mumkin?

Ilg‘ ab olish mumkinki, savollar o‘ quvchilarda ekologik tafakkur, tanqidiy fikrlash, ilmiy halollik va ekologik muammolarni fanlararo yondashuv asosida tahlil qilish ko‘ nikmalarini rivojlantirishga xizmat qiladi.

IV**.** Biologik kurash va kimyoviy vositalar qarama-qarshiligi.

Asarda Soqijon Obidovning biologik kurash usuliga asoslangan ilmiy tajribasi va ayrim rahbarlarning tezkor natija olishga qaratilgan ma’muriy qarorlari o‘ rtasidagi ziddiyat yorqin tasvirlangan lavha mavjud. Asarda ko‘ sak qurtining dastlabki belgilari paydo bo‘ lganda Ali mo‘ ylov vahimaga tushadi, biroq dotsent Obidov vaziyatni ilmiy asosda baholab: *“Qo‘ rqmang… Bir kvadrat joyga nechta qurt to‘ g‘ ri keladi? Hisoblab chiqamiz. Hamma choralarni ko‘ ramiz!”* [5, 326] deydi. Ushbu fikr qahramonning muammoni hissiyot bilan emas, ilmiy kuzatuv va tahlil asosida hal etishga intilishini ko‘ rsatadi. Shundan so‘ ng Obidov trixogramma tuxumlarini zararlangan maydonlarga joylashtirib, biologik kurash usulini amalda qo‘ llashga kirishadi. Biroq uning tajribasi yakunlanmasdan paxtazorga kimyoviy dori sepiladi. Natijada

biologik tajriba izdan chiqadi, olim esa o‘ z ilmiy ishini himoya qilish maqsadida traktorlarga to‘ sqinlik qilgani uchun Alimo‘ ylov tomonidan yerto‘ laga qamab qo‘ yiladi. Asarda bu holat quyidagicha ifodalanadi: *“Bugun ertalab qizlar, hech narsadan xabarlari yo‘ q, ishga borishsa… dori hididan paxtazorga yaqinlashib bo‘ lmaydi! Boshlariga gazniqob kiyib olgan mexanizatorlar traktorlarini tarillatib, dori sepishyapti”* [5, 328]. Keyinchalik: *“Domlang ana, yerto‘ lada kalamushlar bilan suhbat qurib o‘ tiribdi!”* [5, 328] degan kinoyali jumla ilmiy fikrning mensilmasligi va ekologik manfaatlarning ma’muriy qarorlar qurboni bo‘ layotganini ochib beradi. Tahlil jarayonida shuni unutmaslik kerakki, o‘ quvchilarga kimyoviy vositalarni mutlaq salbiy hodisa sifatida emas, balki ekologik masalalarni hal etishda turli ilmiy yondashuvlarni baholash nuqtayi nazaridan tushuntirish lozim. Bunda asosiy e’tibor biologik usulni ilmiy asosda sinab ko‘ rish imkoniyati berilmagani va ilmiy xulosalar o‘ rnini ma’muriy qarorlar egallaganiga qaratiladi.

O‘ quvchilarda ekologik muammolarni hal etishda ilmiy asoslangan yondashuvning ahamiyati, tabiiy muvozanatni saqlash zarurati hamda ekologik qarorlar qabul qilishda mas’uliyat hissini shakllantirish uchun ushbu adabiy parcha yuzasidan quyidagicha pragmatik savollar berish samaralidir:

1. Nima uchun Soqijon Obidov ko‘ sak qurti paydo bo‘ lishi bilan darhol kimyoviy dori sepishni ma’qullamadi?
2. Biologik kurash usuli bilan kimyoviy kurash usulining afzallik va kamchiliklarini taqqoslang.
3. Agar siz xo‘ jalik rahbari bo‘ lganingizda, qanday qaror qabul qilgan bo‘ lardingiz? Javobingizni asoslang.
4. Soqijon Obidovning traktorlarga to‘ sqinlik qilishini qanday baholaysiz? U o‘ z ilmiy e’tiqodini himoya qildimi yoki noto‘ g‘ ri yo‘ l tutdimi?
5. Kimyoviy vositalarni me’yoridan ortiq qo‘ llash atrof-muhit va inson salomatligiga qanday ta’sir ko‘ rsatishi mumkin?
6. Bugungi kunda ekologik xavfsiz qishloq xo‘ jaligini rivojlantirish uchun qanday choralar ko‘ rish zarur?

V. Arxar ovining badiiy talqini: ekologik va huquqiy madaniyatni shakllantirish.

Yozuvchi Qodirjon obrazi orqali tabiatga iste’molchilik munosabati va ekologik qonunlarning buzilishi qanday fojiaviy oqibatlarga olib kelishini badiiy jihatdan ochib beradi. Mast holda Qodirjonning: *“Mehmonlar bilan ovga chiquvdik. Tog‘ da bitta arxar otuvdik...”* [5, 373] deya beparvo gapirishi yovvoyi hayvonni ovlashni oddiy holdek qabul qilayotgan shaxsning ma’naviy qiyofasini namoyon etadi. Asarda arxarni noqonuniy ovlash faqat tabiatga zarar yetkazish emas, balki insoniy mas’uliyatsizlik va qonunni mensimaslikning ifodasi sifatida talqin etiladi.

Qahramonlar dialogida Proxor Polikarpovning Otaqo‘ ziga bildirgan e’tirozi ekologik va huquqiy mazmunni yanada chuqurlashtiradi: *“– Iye? – dedi Proxor go‘ dakning ko‘ zlariday ma’sum ko‘ zlarini pirpiratib. – O‘ lgan odamni piyonista deb, qabih bir jinoyatni bosdi-bosdi qilib yubormoqchimisiz hali? U yoqda oshna-og‘ aynilaringiz odam o‘ ldirib, qonunni oyoqosti qilib, arxar otib yurishsin-u, siz bo‘ lsa bu yoqda…*

– Bitta arxar odamdan aziz bo‘ ptimi?

– Iye? – dedi Proxor yana. – Sizning qarindosh-urug‘ laringiz odam-u, boshqalar odam emasmi? Siz uchun qonun-qoida bormi o‘ zi? Yo bu qonunlar boshqalar uchun yozilgan-u, siz istagan noma’qulchiligingizni qilaverasizmi? …” [5, 380].

Otaqo‘ zining “Bitta arxar odamdan aziz bo‘ ptimi?” degan savoliga Proxorning “Siz uchun qonun-qoida bormi o‘ zi?” deya javob qaytarishi tabiatni muhofaza qilish qonunlari barcha uchun birdek amal qilishi zarurligini ta’kidlaydi. Yozuvchi shu orqali ekologik madaniyatni huquqiy ong va fuqarolik mas’uliyati bilan uzviy bog‘ laydi.

Ushbu parcha asosida o‘ quvchilarni “Ekologik sud” shaklidagi rolli o‘ yinga jalb qilish ham juda samarali bo‘ ladi. Masalan, guruhda sudya, prokuror, Qodirjonning himoyachisi, Proxor Polikarpov, tabiatni muhofaza qilish inspektori, guvoh (Normurod Shomurodov) rollari taqsimlanadi. O‘ quvchilar romandagi dalillarga tayangan holda bahs yuritadilar va yakunda ekologik hamda huquqiy nuqtayi nazardan xulosa chiqaradilar. Bu usul pragmatik yondashuvning asosiy talabi – bilimni real hayotiy vaziyatda qo‘ llash bilan to‘ liq uyg‘ unlashadi.

Badiiy lavha mazmunini chuqur anglash va uni hayotiy vaziyatlar bilan bog‘ lash maqsadida quyidagi pragmatik savollar ustida fikr yuritiladi:

1. Nima uchun Qodirjon arxar ovlashni oddiy voqea sifatida qabul qilmoqda?
2. Yozuvchi arxar ovini tasvirlash orqali o‘ quvchiga qanday ekologik g‘ oyani yetkazmoqchi?
3. Siz Otaqo‘ zining “Bitta arxar odamdan aziz bo‘ ptimi?” degan fikriga qanday munosabat bildirasiz?
4. Proxor Polikarpov nima uchun tabiat muhofazasini qonun ustuvorligi bilan bog‘ laydi?
5. Agar siz tabiatni muhofaza qilish xizmati vakili bo‘ lganingizda, bunday holatda qanday choralar ko‘ rgan bo‘ lardingiz?
6. Nima uchun yovvoyi hayvonlarni asrash ekologik madaniyatning muhim tarkibiy qismi hisoblanadi?

Ko‘ rinib turibdiki, pragmatik savollar o‘ quvchilarda yovvoyi tabiatni asrash, ekologik qonunchilikka hurmat bilan qarash hamda ekologik mas’uliyatni fuqarolik burchi sifatida anglash ko‘ nikmalarini rivojlantirishga xizmat qiladi.

Uyga vazifa sifatida o‘ quvchilarga “Diyonat” romani bilan to‘ liq tanishish, insonning tabiatga munosabati aks etgan yana bir o‘ rinni topib adabiyot daftarga yozish, unga yechim bo‘ ladigan 3 ta pragmatik savol tuzish, sun’iy intellekt yordamida illyustratsiyasini yaratish topshirig‘ i beriladi.

O‘ quvchilarda ekologik madaniyatni rivojlantirish faqat auditoriya mashg‘ ulotlari bilan cheklanmaydi. Bu jarayonni davom ettirishda fanlararo integratsiyaga asoslangan mustaqil ta’lim muhim o‘ rin tutadi. Shunga ko‘ ra quyidagi jadvalda “Diyonat” romani asosida mustaqil ta’lim topshiriqlari tavsiya etiladi:

Jadval-1

T/	Mustaqil ish mavzulari	Fanlararo bog‘ lanish	Ish turi	Shartlari
1	Mingbuloq archazorlari-ning kesilishi va suv muammosi: badiiy ham-da ilmiy tahlil	Adabiyot, biologiya, geografiya	Mini-tadqiqot	Asardan tegishli parchalarni tanlab, ilmiy manbalar bilan qiyosiy tahlil qilish, ekologik muammoga shaxsiy xulosa bildirish (3-5 bet)
2	Tabiatni asrash – kelajak avlod oldidagi mas’uliyat	Adabiyot, tarix, ekologiya	Muammoli esse	Mavzu yuzasidan 250 – 300 so‘ zli esse yozish, dalillar va hayotiy misollar keltirish, mustaqil xulosa chiqarish
3	Arxar ovi ustidan sud	Adabiyot, huquq	Rolli o‘ yin	Rollarni taqsimlash (sudya, prokuror, himoyachi, guvoh, ekolog va boshqalar), asar voqealari asosida dalillar bilan chiqish qilish.
4	Zararkunandalarga qarshi kurashning biologik va kimyoviy usullari: eko-logik yondashuv tahlili	Adabiyot, biologiya, kimyo	Referat	Kamida 5 ta ishonchli manbadan foydalanib, 5 – 7 betli referat tayyorlash va ekologik afzallik hamda kam-chiliklarni tahlil qilish.
5	Men ekolog bo‘ lsam…	Adabiyot, ekologiya, huquq	Ekologik loyiha	Hududdagi ekologik muam-moni aniqlash, uni bartaraf etish bo‘ yicha amaliy loyiha va taqdimot tayyorlash.
6	Ekologik huquqbuzarlik haqida mas’ul tashkilot-ga murojaat xati yozish	Adabiyot, huquq	Shikoyat xati	Rasmiy uslub talablariga rioya qilgan holda ekologik muammo yuzasidan murojaat xatini yozish, muammo va yechim takliflarini asoslash.

O‘ quvchilar mustaqil ish topshiriqlaridan bittasini tanlab bajaradilar. Topshiriqlarni bajarishda romandagi epizodlardan dalillar keltirish, fanlararo bilimlardan foydalanish va shaxsiy xulosani asoslash talab etiladi.

XULOSA

Metodik tahlillar shuni ko‘ rsatdiki, Odil Yoqubovning “Diyonat” romani ekologik madaniyatni rivojlantirish uchun katta didaktik imkoniyatlarga ega. Asarda Mingbuloq archazorlarining kesilishi, tog‘ archalari va suv muammosi, biologik kurash usuli, ilmiy halollik, yovvoyi tabiatni muhofaza qilish kabi ekologik mazmundagi epizodlar o‘ quvchilarda tabiatga mas’uliyatli munosabatni shakllantirishga xizmat qiladi. Asardan olingan adabiy parchalarni pragmatik yondashuv asosida o‘ qitishda muammoli vaziyatlar, rol o‘ ynash, ekologik sud, bahs-munozara, konseptual jadval, klaster, T-sxema hamda fanlararo integratsiyaga asoslangan mustaqil ta’lim topshiriqlaridan foydalanish o‘ quvchilarning ekologik

tafakkuri, tanqidiy fikrlashi va ekologik muammolarni real hayotiy vaziyatlar bilan bog‘ lab tahlil qilish ko‘ nikmalarini rivojlantiradi.

Tadqiqot davomida ishlab chiqilgan pragmatik savollar, interfaol metodlar hamda tanlov asosidagi mustaqil topshiriqlar o‘ quvchilarning ekologik bilimlarini amaliy faoliyat bilan uyg‘ unlashtirish, ekologik muammolarga nisbatan shaxsiy munosabatini shakllantirish va ekologik madaniyatini rivojlantirishda samarali metodik vosita sifatida tavsiya etiladi.

Taklif etilgan metodika namunaviy o‘ quv dasturida belgilangan maqsad va kompetensiyalarni boyitishga xizmat qiladi hamda badiiy asarni ekologik tarbiya vositasi sifatida samarali qo‘ llash imkonini beradi.

Mazkur tadqiqot natijalari akademik litseylarning adabiyot fani namunaviy o‘ quv dasturida o‘ quvchilarga qo‘ yiladigan malaka talablari tizimida alohida kompetensiya sifatida ko‘ rib chiqish yuzasidan metodik tavsiyalar ishlab chiqish imkonini beradi.

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RAQAMLI TA' LIM VOSITALARI ASOSIDA BO' LAJAK TEXNOLOGIK TA' LIM O' QITUVCHILARINING METODIK KOMPETENSIYASINI RIVOJLANTIRISH

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Annotatsiya: *Maqolada bo' lajak texnologik ta' lim o' qituvchilarining metodik kompetensiyasini raqamli ta' lim vositalari asosida rivojlantirish masalasi tahlil qilingan. Muallif metodik kompetensiyani to' rt komponentli tuzilma — motivatsion-qadriyat, kognitiv, texnologik-amaliy va refleksiv-baholash komponentlari birligi — sifatida asoslaydi hamda ularning har biri uchun aniq ko' rsatkichlar tizimini taklif etadi. Raqamli vositalar bajaradigan didaktik vazifasiga ko' ra besh guruhga ajratilgan: vizuallashtirish, modellashtirish va loyihalash, virtual amaliyot, tashkiliy-boshqaruv hamda baholash vositalari. Tadqiqotning asosiy xulosasi shundan iborat: raqamli vositalarning o' zi metodik kompetensiyani rivojlantirmaydi; hal qiluvchi omil — talabaning o' sha vositani mustaqil ravishda dars loyihasiga joylashtirish tajribasi. Shu asosda to' rt bosqichli (motivatsion, nazariy, loyihaviy-amaliy, refleksiv) rivojlantirish modeli hamda uch darajali baholash mezonlari ishlab chiqilgan.*

Kalit so' zlar: *metodik kompetensiya, texnologik ta' lim, raqamli ta' lim vositalari, TPACK, bo' lajak o' qituvchi, kasbiy tayyorgarlik, refleksiya, baholash mezonlari.*

РАЗВИТИЕ МЕТОДИЧЕСКОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ УЧИТЕЛЕЙ ТЕХНОЛОГИЧЕСКОГО ОБРАЗОВАНИЯ НА ОСНОВЕ ЦИФРОВЫХ ОБРАЗОВАТЕЛЬНЫХ ИНСТРУМЕНТОВ

Аннотация: *В статье анализируется проблема развития методической компетентности будущих учителей технологического образования на основе цифровых средств обучения. Автор обосновывает методическую компетентность как единство четырёх компонентов — мотивационно-ценностного, когнитивного, технологическо-практического и рефлексивно-оценочного — и предлагает систему показателей для каждого из них. Цифровые средства классифицированы по выполняемой дидактической функции на пять групп: визуализация, моделирование и проектирование, виртуальная практика, организационно-управленческие и оценочные средства. Основной вывод исследования состоит в том, что сами по себе цифровые средства не развивают методическую компетентность; решающим фактором выступает опыт самостоятельного встраивания средства в проект урока. На этой основе разработана четырёхэтапная модель развития (мотивационный, теоретический, проектно-практический, рефлексивный этапы) и трёхуровневые критерии оценивания.*

Ключевые слова: *методическая компетентность, технологическое образование, цифровые средства обучения, TPACK, будущий учитель, профессиональная подготовка, рефлексия, критерии оценивания.*

DEVELOPING THE METHODOLOGICAL COMPETENCE OF FUTURE TECHNOLOGY EDUCATION TEACHERS BASED ON DIGITAL EDUCATIONAL TOOLS

Abstract: *The article examines the development of the methodological competence of future teachers of technological education through digital learning tools. The author defines methodological competence as the unity of four components — motivational-axiological, cognitive, technological-practical and reflective-evaluative — and proposes a set of indicators for each. Digital tools are classified by didactic function into five groups: visualisation, modelling and design, virtual practice, organisational-managerial, and assessment tools. The central conclusion is that digital tools do not by themselves develop methodological competence; the decisive factor is the student' s own experience of embedding a tool into a lesson design. On this basis a four-stage development model (motivational, theoretical, design-practical and reflective stages) and three-level assessment criteria are proposed.*

Keywords: *methodological competence, technological education, digital learning tools, TPACK, pre-service teacher, professional training, reflection, assessment criteria.*

KIRISH

Umumiy o' rta ta' lim tizimida "Texnologiya" fani o' ziga xos o' rin tutadi: u nazariy bilimni emas, avvalo amaliy harakatni, mehnat madaniyatini va texnik tafakkurni shakllantiradi. Shu bois bu fan o' qituvchisidan nafaqat predmet

bilimi, balki har bir mashg‘ ulotni amaliy natijaga yo‘ naltira olish mahorati talab etiladi. Ana shu mahorat pedagogika fanida metodik kompetensiya deb ataladi.

So‘ nggi yillarda ta’ lim jarayonining raqamlashuvi bu vazifani ham kengaytirdi, ham murakkablashtirdi. “Raqamli O‘ zbekiston — 2030” strategiyasi [1] va oliy ta’ limni rivojlantirish konsepsiyasi [2] o‘ quv jarayoniga zamonaviy axborot texnologiyalarini keng joriy etishni belgilab berdi; “Ta’ lim to‘ g‘ risida”gi Qonunda esa masofaviy va aralash ta’ lim shakllari qonuniy maqom oldi [3]. Natijada bo‘ lajak o‘ qituvchi endi faqat “nima o‘ rgatish” va “qanday o‘ rgatish” degan savollarga emas, “qaysi raqamli vosita orqali o‘ rgatish maqsadga muvofiq” degan uchinchi savolga ham javob bera olishi kerak.

Amaliyotdagi muammo shundan iboratki, oliy ta’ lim muassasalarida raqamli vositalarni o‘ rgatish ko‘ pincha texnik ko‘ nikma darajasida qolib ketmoqda. Talaba dasturdan foydalanishni o‘ rganadi, biroq uni aniq mavzu, aniq sinf va aniq didaktik maqsad bilan bog‘ lay olmaydi. Xalqaro tadqiqotlar ham xuddi shu holatni qayd etadi: o‘ qituvchilar tayyorgarligida texnologiya alohida modul sifatida o‘ qitilganda, uning metodik amaliyotga o‘ tishi juda past bo‘ ladi [4; 5].

Maqolaning maqsadi — bo‘ lajak texnologik ta’ lim o‘ qituvchilarining metodik kompetensiyasini raqamli vositalar asosida rivojlantirishning tarkibiy modelini va uni baholash mezonlarini ishlab chiqishdan iborat. Vazifalar: metodik kompetensiya tarkibini aniqlashtirish; raqamli vositalarni didaktik vazifasiga ko‘ ra tasniflash; rivojlantirish bosqichlarini asoslash; baholash mezonlarini shakllantirish.

Mavzuning o‘ rganilganlik darajasi va tadqiqot metodologiyasi

Muammoning nazariy asoslari L. Shulmanning pedagogik-predmet bilimi (PCK) konsepsiyasiga borib taqaladi; olim o‘ qituvchi bilimining o‘ ziga xosligi predmetni bilishda emas, uni o‘ quvchi tushunadigan shaklga aylantira olishda ekanini asoslagan [6]. P. Mishra va M. Kelerning TPACK modeli bu qarashni texnologiya bilan to‘ ldirib, o‘ qituvchi bilimini uch soha — predmet, pedagogika va texnologiya — kesishmasi sifatida talqin qiladi [7]. Yevropa Ittifoqining DigCompEdu ramkasi o‘ qituvchining raqamli kompetensiyasini olti soha va yigirma ikki elementga ajratadi [8], YUNESKOning o‘ qituvchilar uchun AKT kompetensiyalari ramkasi esa uni uch daraja — bilimni egallash, chuqurlashtirish va yaratish — bo‘ yicha bosqichlashtiradi [9].

Texnologiyani joriy etishning amaliy shartlari bo‘ yicha P. Ertmer va A. Ottenbrayt-Leftvich o‘ qituvchi e’ tiqodi va o‘ ziga ishonchi texnik jihozlanishdan ko‘ ra kuchliroq omil ekanini ko‘ rsatgan [4]. J. Tonder va hammualliflari bo‘ lajak o‘ qituvchilarni tayyorlashda eng samarali yondashuv texnologiyani alohida fan sifatida emas, metodika kurslariga singdirish ekanini umumlashtirgan [5]. E. Instefyord va E. Munte esa Norvegiya tajribasida shu integratsiya amalda ko‘ pincha yuzaki qolishini qayd etadi [10]. R. Hamilton va hammualliflari keng tarqalgan SAMR modelini tanqidiy tahlil qilib, uning kontekstni hisobga olmasligini kamchilik sifatida ko‘ rsatadi [11]. G. Falloon o‘ qituvchining raqamli kompetensiyasi doirasiga axloqiy va xavfsizlik jihatlarini ham kiritadi [12].

Milliy ilmiy adabiyotda texnologik ta’ lim metodikasi va raqamlashtirish masalalari alohida-alohida yoritilgan; ikkalasini bir tizimga birlashtirgan, ya’ ni raqamli vositani metodik kompetensiya rivojlanishining vositasi sifatida ko‘ radigan tadqiqotlar esa kam. Mazkur maqola shu yo‘ nalishda urinish sifatida qaraladi.

Tadqiqotda nazariy tahlil, tarkibiy-mantiqiy modellashtirish, xorijiy kompetensiya ramkalarini qiyoslash hamda pedagogik hujjatlarni (o‘ quv reja, fan dasturi) mazmunan o‘ rganish usullaridan foydalanildi. Ishlab chiqilgan model nazariy asoslash bosqichida bo‘ lib, uning eksperimental tekshiruvi tadqiqotning keyingi bosqichi hisoblanadi.

Tahlil va natijalar

Metodik kompetensiyaning tarkibi. Adabiyotlar tahlili va texnologik ta’ lim o‘ ziga xosligidan kelib chiqib, metodik kompetensiya to‘ rt komponentli tuzilma sifatida belgilandi (1-jadval). Bunday ajratishning amaliy ma’ nosi bor: har bir komponent o‘ z ko‘ rsatkichiga ega bo‘ lsa, uni alohida rivojlantirish ham, alohida baholash ham mumkin bo‘ ladi.

1-jadval

Bo‘ lajak texnologik ta’ lim o‘ qituvchisi metodik kompetensiyasining tarkibi

Komponent	Mazmuni	Asosiy ko‘ rsatkichlari
Motivatsion-qadriyat	Raqamli vositadan foydalanishga ichki ehtiyoj va kasbiy mas’ uliyat	Yangi vositani mustaqil o‘ rganishga intilish; qo‘ llashdagi o‘ z-o‘ ziga ishonch
Kognitiv	Fan mazmuni, metodika va raqamli vosita imkoniyatlarini bilish	Vosita imkoniyatini didaktik maqsad bilan bog‘ lay olish; TPACK doirasidagi bilim

Komponent	Mazmuni	Asosiy ko‘ rsatkichlari
Texnologik-amaliy	Vositani dars loyihasiga joylashtira olish va boshqara olish	Raqamli element kiritilgan dars ishlanmasini tuzish; sinfda amalda qo‘ llash
Refleksiv-baholash	Natijani tahlil qilish va o‘ z faoliyatini tuzatish	Vosita samarasini baholay olish; muvaffaqiyatsiz tanlovni tan olib, muqobil topish

Manba: muallif tomonidan [6; 7; 8; 9] asosida ishlab chiqilgan.

Raqamli vositalarning didaktik tasnifi. Amaliyotda vositalar ko‘ pincha texnik belgisiga ko‘ ra (dastur, ilova, platforma) sanab o‘ tiladi. Metodik nuqtai nazardan esa ularni bajaradigan didaktik vazifasiga ko‘ ra guruhlash foydaliroq, chunki o‘ qituvchi darsga tayyorgarlik ko‘ rayotganda “qaysi dastur” emas, “qaysi vazifani hal qilish kerak” degan savoldan yo‘ lga chiqadi (2-jadval).

2-jadval

Raqamli ta’ lim vositalarining didaktik vazifasiga ko‘ ra tasnifi

Guruh	Didaktik vazifasi	Texnologik ta’ limdagi qo‘ llanilishi
Vizuallashtirish vositalari	Ko‘ rinmas yoki murakkab jarayonni ko‘ rsatish	Mexanizm ishlash tamoyilining animatsiyasi; texnologik jarayon videosi
Modellashtirish va loyihalash	Buyumni tayyorlashdan avval loyihalash	3D-modellashtirish, oddiy CAD muhitlari, elektron chizmachilik
Virtual amaliyot	Xavfli yoki qimmat amaliyotni xavfsiz takrorlash	Virtual laboratoriya, dastgoh simulyatori, mehnat xavfsizligi mashqlari
Tashkiliy-boshqaruv	O‘ quv jarayonini rejalashtirish va kuzatish	Elektron platforma, topshiriqlar va portfolio yuritish
Baholash vositalari	Natijani tez va obyektiv o‘ lchash	Interaktiv test, formativ so‘ rov, mezonli baholash jadvali

Manba: muallif tomonidan tuzilgan.

Tasnifning metodik ahamiyati shundaki, u talabaga tanlov mantiqini o‘ rgatadi. Agar dars maqsadi buyum konstruksiyasini tushuntirish bo‘ lsa, birinchi guruh vositasi yetarli; agar maqsad loyihalash ko‘ nikmasini shakllantirish bo‘ lsa, ikkinchi guruhga o‘ tish zarur. Bunday bog‘ lanish o‘ rnatilmasa, raqamli vosita dars mazmunini boyitmaydi, aksincha, uni chalg‘ itadi.

Rivojlantirish modeli. Metodik kompetensiyani rivojlantirish to‘ rt bosqichda amalga oshirilishi maqsadga muvofiq deb topildi. Birinchi — motivatsion bosqich: talaba raqamli vositasiz va u bilan o‘ tilgan darsni qiyoslab, farqni o‘ zi ko‘ radi; bunda tayyor xulosa berilmaydi, taqqoslash imkoniyati beriladi. Ikkinchi — nazariy bosqich: TPACK mantiqi, vositalar tasnifi va tanlov mezonlari o‘ rganiladi. Uchinchi — loyihaviy-amaliy bosqich, model markazi hisoblanadi: talaba aniq mavzu bo‘ yicha raqamli element kiritilgan dars ishlanmasini tuzadi, guruhda taqdim etadi va pedagogik amaliyotda sinab ko‘ radi. To‘ rtinchi — refleksiv bosqich: dars videoyozuvi yoki hamkurslar sharhi asosida tanlov qanchalik o‘ rinli bo‘ lgani tahlil qilinadi.

Modelning asosiy g‘ oyasi uchinchi bosqichda mujassam. Xorijiy tadqiqotlar ko‘ rsatganidek, texnologiyani ko‘ rsatish yoki tushuntirish o‘ zi ko‘ nikmaga aylanmaydi; o‘ zgarish talaba vositani o‘ z dars loyihasiga mustaqil joylashtirganda ro‘ y beradi [5; 10]. Shu bois modelda amaliy loyiha soatlari nazariy soatlardan kam bo‘ lmasligi shart deb belgilandi.

Baholash mezonlari. Kompetensiyani baholash uchun uch daraja ajratildi. Past darajada talaba vositadan foydalana oladi, biroq uni mavzu maqsadi bilan bog‘ lay olmaydi va tanlovini asoslay olmaydi. O‘ rta darajada vosita to‘ g‘ ri tanlanadi va darsga kiritiladi, ammo qo‘ llash bir xil, andozaviy tarzda amalga oshiriladi. Yuqori darajada esa talaba vositani sinf tayyorgarligi va dars sharoitiga moslab tanlaydi, kutilmagan vaziyatda muqobilga o‘ ta oladi va natijani mustaqil tahlil qiladi. Amaliy baholash quyidagi uch manba asosida olib borilishi tavsiya etiladi: dars ishlanmasi matni, ochiq dars kuzatuvi va talabaning refleksiv hisoboti.

MUHOKAMA

Taklif etilayotgan yondashuv bo‘ yicha ikkita e’ tirozni oldindan ko‘ rib chiqish o‘ rinli. Birinchisi — moddiy-texnik ta’ minot masalasi: barcha oliy ta’ lim muassasalarida ham 3D-printer yoki litsenziyali dasturiy ta’ minot yo‘ q. Bu e’ tiroz asosli, biroq modelning mantig‘ i qimmat jihozga bog‘ liq emas: vizuallashtirish, virtual amaliyot va baholash guruhidagi vositalarning aksariyati bepul yoki ochiq manbali muhitlarda ham mavjud. Muhimi — vositaning narxi emas, uni tanlash mantig‘ i.

Ikkinchi e’ tiroz — vaqt tanqisligi. Metodika kurslari soati cheklangan sharoitda qo‘ shimcha loyiha ishlariga vaqt topish qiyin. Bu yerda yechim qo‘ shimcha soat ajratishda emas, mavjud topshiriqlar mazmunini o‘ zgartirishda ko‘ rinadi: an’ anaviy dars ishlanmasi topshirig‘ ining o‘ ziga raqamli komponentni majburiy element sifatida kiritish yetarli. Shu tariqa yuklama ortmaydi, topshiriqning didaktik sig‘ imi esa oshadi.

Tadqiqotning cheklovini ham ochiq qayd etish lozim. Model nazariy asoslash bosqichida bo‘ lib, uning samaradorligi hozircha eksperimental tekshirilmagan. Keyingi bosqichda nazorat va tajriba guruhlari ajratilgan pedagogik eksperiment o‘ tkazish, natijalarni statistik usullar bilan qiyoslash rejalashtirilgan.

XULOSA VA TAKLIFLAR

O‘ tkazilgan tahlil quyidagi xulosaga olib keladi. Bo‘ lajak texnologik ta’ lim o‘ qituvchisining metodik kompetensiyasi raqamli vositalarni bilish hisobiga emas, ularni aniq didaktik maqsad bilan bog‘ lay olish tajribasi hisobiga rivojlanadi. Vosita — maqsad emas, vosita; uning qiymati dars natijasiga qo‘ shgan hissasi bilan o‘ lchanadi.

Quyidagi takliflar ilgari suriladi. Birinchidan, raqamli texnologiyalar bo‘ yicha materialni alohida modul sifatida emas, texnologik ta’ lim metodikasi fanlariga singdirilgan holda o‘ qitish. Ikkinchidan, har bir metodika topshirig‘ ida raqamli komponentni majburiy element sifatida belgilash va uni asoslash talabini kiritish. Uchinchidan, pedagogik amaliyot davomida talaba kamida bitta darsni raqamli vosita ishtirokida o‘ tkazishi va uni refleksiv tahlil qilishi lozim.

To‘ rtinchidan, 1-jadvalda keltirilgan komponentlar va uch darajali mezonlar asosida talabaning metodik kompetensiyasini kuzatib boruvchi portfolio tizimini joriy etish. Beshinchidan, professor-o‘ qituvchilar malakasini oshirish kurslarida e’ tiborni dasturlardan foydalanish texnikasidan ularni metodik jihatdan qo‘ llash masalasiga ko‘ chirish. Oltinchidan, ishlab chiqilgan modelni eksperimental sinovdan o‘ tkazish va natijalarni keyingi tadqiqotlarda e’ lon qilish.

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SUN'IY INTELLEKT VA KOMPYUTER ALGEBRA TIZIMLARI INTEGRATSIYASI ASOSIDA INTEGRAL HISOBLASHNI O‘ QITISHNING TAKOMILLASHTIRILGAN METODIK MODELI

Eshbekova G

Annotatsiya: *Maqolada oliy ta'limda integral hisoblashni o‘ qitish uchun sun'iy intellekt va kompyuter algebra tizimlarini integratsiyalovchi metodik model taklif etiladi. Model talabaning dastlabki mustaqil urinishi, sun'iy intellektning yo‘ naltiruvchi yordami, ramziy hisoblash, vizuallashtirish, matematik tekshirish va yangi masalani vositalarsiz yechish bosqichlaridan tashkil topadi. Nazariy-metodik tahlil asosida ishtirokchilarning vazifalari, bosqichlar orasidagi o‘ tish shartlari hamda xato turiga mos qayta aloqa mexanizmi aniqlashtiriladi. Model bir o‘ zgaruvchili va karrali integrallar misolida ochib berilib, hisoblashlar analitik usul hamda SymPy orqali tekshiriladi. Mustaqil fikrlashni baholash mezonlari va modelni empirik sinash rejasi ishlab chiqiladi. Keltirilgan natijalar matematik va metodik xarakterga ega; o‘ zlashtirish samaradorligining statistik oshgani haqidagi xulosa ilgari surilmaydi.*

Kalit so‘ zlar: *sun'iy intellekt, kompyuter algebra tizimi, integral hisoblash, metodik model, karrali integral, vizuallashtirish, matematik verifikatsiya, mustaqil fikrlash, formativ baholash.*

AN ENHANCED METHODOLOGICAL MODEL FOR TEACHING INTEGRAL CALCULUS BASED ON THE INTEGRATION OF ARTIFICIAL INTELLIGENCE AND COMPUTER ALGEBRA SYSTEMS

Abstract: *This article proposes an instructional model that integrates artificial intelligence and computer algebra systems for teaching integral calculus in higher education. The model combines an initial independent attempt, guided AI assistance, symbolic computation, visualization, mathematical verification, and unaided transfer to a new problem. It specifies the roles of the participants, transition conditions, and feedback matched to error types. Single-variable and multiple-integral examples illustrate the model, with analytical results checked using SymPy. An assessment rubric and an empirical evaluation design are proposed. The findings establish mathematical consistency and an instructional framework rather than a statistically demonstrated improvement in learning outcomes.*

Keywords: *artificial intelligence, computer algebra system, integral calculus, instructional model, multiple integral, visualization, mathematical verification, independent reasoning.*

УСОВЕРШЕНСТВОВАННАЯ МЕТОДИЧЕСКАЯ МОДЕЛЬ ОБУЧЕНИЯ ИНТЕГРАЛЬНОМУ ИСЧИСЛЕНИЮ НА ОСНОВЕ ИНТЕГРАЦИИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА И СИСТЕМ КОМПЬЮТЕРНОЙ АЛГЕБРЫ

Аннотация: *В статье предлагается методическая модель обучения интегральному исчислению в высшей школе, объединяющая возможности искусственного интеллекта и систем компьютерной алгебры. Модель включает этапы, предусматривающие самостоятельную попытку решения задачи студентом, получение рекомендаций с помощью ИИ, выполнение символьных вычислений, визуализацию, математическую проверку и решение новой задачи без использования вспомогательных инструментов. На основе теоретико-методологического анализа определены роли участников, условия перехода между этапами и механизм обратной связи, адаптированный к конкретным типам ошибок. Модель иллюстрируется примерами вычисления интегралов от функций одной переменной и кратных интегралов; правильность вычислений проверяется как аналитическими методами, так и с помощью библиотеки SymPy. Разработаны критерии оценки самостоятельности мышления и план эмпирической апробации модели. Представленные результаты носят математический и методический характер; утверждения о статистически значимом повышении эффективности обучения не выдвигаются.*

Ключевые слова: *искусственный интеллект, система компьютерной алгебры, интегральное исчисление, методическая модель, кратный интеграл, визуализация, математическая проверка, самостоятельность мышления, формирующее оценивание.Kirish va tuatmoning qo‘ yilishi*

KIRISH

Integral hisoblashni o‘ qitishning maqsadi talabaga boshlang‘ ich funksiyani topish yoki tayyor algoritmni takrorlashni o‘ rgatish bilan cheklanmaydi. Talaba masalaning shartini matematik ifodaga aylantirishi, integrallash usulini tanlashi, natijaning qo‘ llanish shartlarini aniqlashi va uning geometrik mazmunini tushuntirishi kerak. Raqamli vosita yordamida to‘ g‘ ri son yoki formula olish ushbu kompetensiyalarning barchasi shakllanganini ko‘ rsatmaydi. Shuning uchun o‘ quv natijasi hisoblash mahsuli bilan birga uni asoslash jarayoni orqali baholanishi zarur.

Sun’iy intellekt (AI) bilan muloqot yechim yo‘ lini muhokama qilishga, kompyuter algebra tizimi (CAS) esa ifodani ramziy qayta ishlashga xizmat qilishi mumkin. Ularni bir mashg‘ ulotda qo‘ llashning o‘ zi metodik integratsiyani anglatmaydi. Integratsiya talaba urinishi, yordam turi, hisoblash amali va mustaqil tekshiruv o‘ rtasidagi didaktik bog‘ lanish orqali yuzaga keladi. Mazkur maqolada ushbu bog‘ lanishni boshqaradigan bosqichlar va o‘ tish shartlari tadqiqot muammosi sifatida qo‘ yiladi.

UNESCOning generativ AI bo‘ yicha qo‘ llanmasida ta’lim texnologiyalarini inson manfaatlari va faol ishtirokiga yo‘ naltirish, pedagogik maqsadga muvofiqligini tekshirish masalalari yoritilgan . Kasneci va hammualliflarning tadqiqoti katta til modellarining ta’limdagi imkoniyatlari va muammolarini muhokama qiluvchi tadqiqot yo‘ nalishiga mansub . Bu yo‘ nalish integral hisoblashda yordamdan foydalanish bilan mustaqil bilimni baholashni ajratish zaruratini o‘ rganish uchun umumiy kontekst beradi.

Mathematica, Maple va MATLABning Symbolic Math Toolbox hujjatlari ramziy integrallashning sintaksisi hamda hisoblash shartlarini aniqlashtiradi. OpenStax manbasida qutb koordinatalariga o‘ tish va ikki karrali integralning geometrik talqini beriladi .Ushbu manbalar vositalarning texnik imkoniyati va matematik mazmunini asoslaydi; ulardan muayyan metodikaning pedagogik samaradorligi avtomatik ravishda kelib chiqmaydi.

Tadqiqot maqsadi AI yordami, CAS hisobi va talabaning mustaqil matematik tahlilini izchil birlashtiruvchi metodik modelni ishlab chiqish. Obyekt oliy ta’limda integral hisoblashni o‘ qitish jarayoni, predmet esa ushbu jarayondagi yordam, tekshirish va baholash mexanizmlaridir. Nazariy tahlil, didaktik loyihalash, analitik yechimlarni taqqoslash va ramziy tekshirish usullari qo‘ llanildi. Yondashuvning takomillashtirilgan jihati alohida vositalarni qo‘ llashga nisbatan vazifalar taqsimoti, tekshirish shartlari va vositasiz yakuniy topshiriqning aniq belgilanishidir.

Metodik modelning asosiy ketma-ketligi quyidagicha belgilanadi: talaba →AI →CAS →vizuallashtirish →matematik tahlil →mustaqil topshiriq →baholash. Ushbu ketma-ketlik o‘ qituvchi nazoratidagi o‘ quv siklini ifodalaydi. AI hamda CAS o‘ rtasida avtomatik dasturiy ulanish bo‘ lishi shart emas: talaba tekshirilgan ifodani bir muhitdan boshqasiga o‘ tkazishi mumkin. Bunda har bir bosqichdan keyin tekshiriladigan o‘ quv mahsuli hosil bo‘ ladi.

1-jadval. Model bosqichlari va tekshiriladigan natijalar

Bosqich	Asosiy faoliyat	Tekshiriladigan natija
Talaba	Masalani mustaqil tahlil qiladi	Dastlabki reja va yechim urinishi
AI yordami	Savol va ishoralar bilan yo‘ naltiradi	Talaba asoslagan tuzatish
CAS	Kiritilgan ifodani hisoblaydi	Shartlari ko‘ rsatilgan formula
Vizuallashtirish	Grafik yoki sohani tasvirlaydi	Chegaralar va geometrik talqin
Matematik tahlil	Natijalarni taqqoslaydi	Hosila, baho yoki muqobil yechim
Mustaqil topshiriq	Yangi masalani vositasiz yechadi	Bilimni yangi holatga ko‘ chirish
Baholash	Dalillarni mezonlar bilan baholaydi	Ball va keyingi o‘ quv vazifasi

Model uchta tamoyilga tayanadi. Birinchisi yordamdan oldin mustaqil urinishni qayd etish. Ikkinchisi dastur natijasini masala sharti va matematik qoida bilan tekshirish. Uchinchisi yakuniy bahoni yangi vaziyatdagi mustaqil faoliyat bilan bog‘ lash. Bunday tartibda talaba tayyor javob iste’molchisi bo‘ lib qolmasdan, hisoblashning mazmuni va asoslanganligi uchun javob beruvchi ishtirokchi bo‘ ladi.

O‘ qituvchi masalaning murakkabligini, ruxsat etilgan yordamni va baholash mezonini belgilaydi. AI yo‘ naltiruvchi izoh beradi, CAS esa aniq kiritilgan matematik amalni bajaradi. Grafik olingan ifodani talqin qilishga xizmat qiladi. Bu

vazifalar farqi saqlanmasa, bir vositaning javobi ikkinchi vositaga tekshirilmasdan ko‘ chirilishi va dastlabki xato keyingi bosqichlarda yashirin qolishi mumkin.

Mashg‘ ulot boshida o‘ qituvchi integral masalasi va kutiladigan natijani belgilaydi. Talaba yordam olmasdan kamida usul tanlovi va dastlabki qadamni yozadi. Agar boshlashda qiynalsa, yordam umumiy savoldan boshlanadi: “Integrand qanday tuzilgan” yoki “Qaysi almashtirish ifodani soddalashtiradi?”. Keyingi darajada zarur qoida eslatiladi. To‘ liq yechim esa talabaning urinishi tahlil qilingandan keyin muhokama qilinadi.

AIga beriladigan namunaviy topshiriq: “Quyidagi integral bo‘ yicha yozgan yechimimni ko‘ rib chiqing. Avval birinchi shubhali qadamni belgilang. Yakuniy javobni bermasdan, shu qadamni tekshirishim uchun bitta savol bering. Mening javobimdan keyin keyingi ishorani bering”. Bu topshiriq pedagogik ssenariydir; AI ko‘ rsatmaga doimo rioya qiladi degan kafolat emas. Shuning uchun o‘ qituvchi yordam mazmunini nazorat qiladi, talaba esa qabul qilgan tuzatishini matematik qoida bilan asoslaydi.

Qayta aloqa xatoning manbasiga qarab tashkil etiladi. Agar soha yoki integral noto‘ g‘ ri tuzilgan bo‘ lsa, talaba masala shartiga qaytadi. Algebraik xatoda mos hisoblash qadami tekshiriladi. Grafik bilan natija mos kelmasa, masshtab va chegaralar qayta ko‘ riladi. AI va CAS javoblari mos tushgan taqdirda ham mustaqil matematik tekshiruv bajariladi. Bosqichlar orasidagi o‘ tish uchun aynan izohlangan dalil talab qilinadi.

Bir o‘ zgaruvchili integralda modelning qo‘ llanishi

Dastlab $\int x \cdot e^x\,dx$ integrali beriladi. Talaba $u = x$ va $dv = e^x\,dx$ deb tanlaydi: x ni differensiallash uni soddalashtiradi, eksponentani integrallash esa uning shaklini saqlaydi. Bo‘ laklab integrallashdan:

$$\int x \cdot e^x\,dx = x \cdot e^x - e^x + C = (x - 1)e^x + C. \quad (1)$$

Muqobil usulda boshlang‘ ich funksiya $F(x) = (ax + b)e^x$ ko‘ rinishida izlanadi. $F'(x) = (ax + a + b)e^x$ ifodasini $x \cdot e^x$ bilan taqqoslash $a = 1$ va $b = -1$ ni beradi. Ikki usul bir xil natijaga olib keladi. Agar talaba $G(x) = (x + 1)e^x$ deb yozsa, $G'(x) - x \cdot e^x = 2e^x \neq 0$ bo‘ lishi xatoni aniqlaydi. Talaba ayirish ishorasi qayerda o‘ zgarganini topib, yechimni tuzatadi.

So‘ ng yangi topshiriq sifatida $\int x \cdot e^{2x}\,dx$ vositasiz yechiladi. Nazorat javobi $e^{2x}(x/2 - 1/4) + C$ bo‘ lib, bu yerda eksponentadagi koeffitsiyentni hisobga olish zarur. Shunday qilib, ayni misolni yoddan takrorlash bilan usulni yangi holatga ko‘ chirish farqlanadi.

Karrali integrallarni geometrik modellashtirish

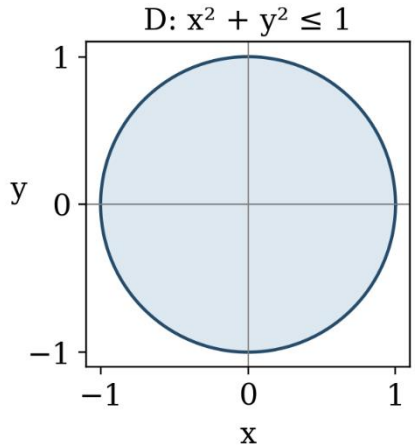
Karrali integrallar uchun $D = \{(x, y): x^2 + y^2 \le R^2\}$, $R > 0$ doira hamda uning ustidagi $z = R^2 - x^2 - y^2$ sirt olinadi. Talaba avval sohaning shaklini chizadi va sirt balandligi D da manfiy emasligini ko‘ rsatadi. Jism hajmi $V = \iint_D (R^2 - x^2 - y^2)\,dA$ orqali ifodalanadi. Doiraviy simmetriya qutb koordinatalariga o‘ tishni asoslaydi [6].

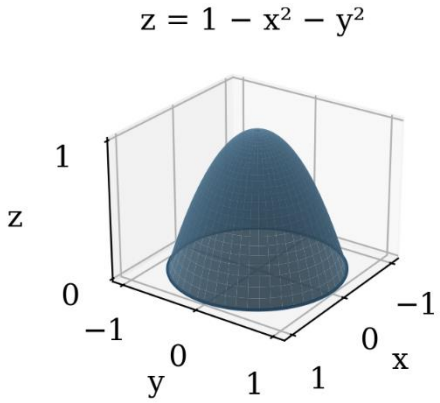
$x = r\cos\theta$, $y = r\sin\theta$ almashtirishda $0 \le r \le R$ va $0 \le \theta \le 2\pi$. Yakobian modulining r ga tengligi sababli $dA = r\,dr\,d\theta$. Natijada:

$$V = \int_0^{2\pi}\int_0^{R}(R^2 - r^2)r\,dr\,d\theta = \pi R^4/2. \quad (2)$$

Uch karrali integralda shu jism $0 \le z \le R^2 - r^2$ orqali tavsiflanadi. Silindrik koordinatalarda $dV = r\,dz\,dr\,d\theta$ bo‘ lgani uchun:

$$V = \int_0^{2\pi}\int_0^{R}\int_0^{R^2 - r^2} r\,dz\,dr\,d\theta = \pi R^4/2. \quad (3)$$





1-rasm. R = 1 uchun doiraviy soha va jismning yuqori sirti

Ichki integralni z bo‘ yicha hisoblash (3) ni (2) ga keltiradi. Talaba ikki karrali integralda balandlik integrandda, uch karrali integralda esa chegaralarda ifodalanganini tushuntiradi. Rasm tenglamalar asosida qurilgan; unda jism $z = 0$

tekisligi bilan pastdan chegaralanadi. Parametrni o‘ zgartirishda avval hajm haqidagi taxmin yozilib, keyin formula va tasvir bilan taqqoslanadi. Bu sirtlar oilasida R ikki marta oshsa, hajm 16 marta ortadi, chunki balandlik ham R^2 ga bog‘ liq.

Hisoblashlarni tekshirish va xatoni tahlil qilish

Matematik misollar mahalliy SymPy 1.14.0 muhitida ramziy tekshirildi. integrate funksiyasi integralni hisoblash uchun qo‘ llanildi [7]. Birinchi misolda boshlang‘ ich funksiyaning hosilasi bilan integrand ayirmasi nolga teng bo‘ ldi. Karrali integrallarda R musbat parametr sifatida belgilandi; ikki va uch karrali hisoblashlar bir xil $\pi R^4/2$ ifodasini berdi. Quyidagi kod tekshirishni qayta bajarish imkonini beradi:

```
from sympy import symbols, exp, pi, integrate, diff, simplify
x, r, t, z = symbols("x r t z", real=True)
R = symbols("R", positive=True)
F = integrate(x*exp(x), x)
check = simplify(diff(F, x) - x*exp(x))
V = integrate((R**2-r**2)*r, (r, 0, R), (t, 0, 2*pi))
W = integrate(r, (z, 0, R**2-r**2), (r, 0, R), (t, 0, 2*pi))
comparison = simplify(V - W)
```

Tekshiruvda check = 0, comparison = 0 olindi. R = 1 uchun Mathematica muhitidagi namunaviy yozuv Integrate[(1-r^2)*r, {t,0,2*Pi}, {r,0,1}], Maple muhitida esa int(int((1-r^2)*r,r=0..1),t=0..2*Pi) ko‘ rinishidadir [3; 4]. Bu ikki buyruq dars uchun namuna sifatida keltirilgan; ularning ayni dasturlarda bajarilgani da’vo qilinmaydi. SymPy hisoblashlari matematik misollarni tekshiradi, talabalarning o‘ zlashtirish natijalarini emas.

Xato diagnostikasida Yakobian r ni tushirib qoldirish namunasi muhim. R = 1 bo‘ lganda noto‘ g‘ ri integral $4\pi/3$ ni beradi. Jism radiusi va balandligi 1 bo‘ lgan silindr ichida joylashgani uchun uning hajmi π dan katta bo‘ la olmaydi. Shunday qilib, geometrik baho noto‘ g‘ ri modelni aniqlaydi. AI «Hajm qaysi sodda jismning hajmidan oshmasligi kerak?» degan savol bilan talabani xatoni izlashga yo‘ naltirishi mumkin.

Tekshirish faqat dasturlar javobini solishtirishdan iborat bo‘ lmaydi. Bir o‘ zgaruvchili integralda hosila, aniq integralda chegaralar va ishora, karrali integralda soha hamda Yakobian tekshiriladi. Bir nechta sonli nuqtada moslik umumiy ayniyatni isbotlamaydi. Shuningdek, nolga soddalashmagan ramziy ayirma javoblar albatta har xil degani emas: qo‘ shimcha algebraik almashtirish va parametr shartlari talab etilishi mumkin.

Baholashda uchta material taqqoslanadi: yordamdan oldingi urinish, yordamdan keyingi asoslangan tuzatish va yangi masalaning mustaqil yechimi. Ushbu materiallar talabaga qaysi bosqichda qanday ko‘ mak kerak bo‘ lganini ko‘ rsatadi. Yordam so‘ raganlikning o‘ zi ballni pasaytirish uchun sabab bo‘ lmaydi; asosiy mezon yordamdan keyin bilimni mustaqil qo‘ llashdir. AI bilan yozishmalar bahoni almashtirmaydi, balki o‘ quv jarayonini tahlil qilish uchun qo‘ shimcha ma’lumot bo‘ ladi.

Yakuniy topshiriqda $D_1 = \{(x, y): 1 \le x^2 + y^2 \le 4\}$ halqa ustidagi $z = 4 - x^2 - y^2$ sirt ostida joylashgan jism hajmini topish taklif etiladi. Talaba yangi chegaralarni $1 \le r \le 2$ va $0 \le \theta \le 2\pi$ sifatida mustaqil belgilaydi. Nazorat uchun hajm $9\pi/2$ ga teng; mazkur qiymat ham SymPy yordamida tekshirildi. Topshiriq asosiy doiraviy misoldan sohaning halqa ekanligi bilan farqlanadi va chegaralarni anglashni baholaydi.

2-jadval. Mustaqil yechimni baholash mezonlari

Mezon	***2 ball uchun talab***
Model va shartlar	*Soha yoki aniqlanish sohasi to‘ g‘ ri ko‘ rsatilgan*
Usulni tanlash	*Usul yoki koordinatalar tanlovi asoslangan*
Hisoblash	*Almashtirish va hisoblash qadamlari to‘ g‘ ri*
Tekshirish va talqin	*Natija mustaqil dalil bilan tekshirilgan*
Bilimni ko‘ chirish	*Yangi masala vositasiz izohlangan va yechilgan*

Har bir mezon bo‘ yicha 0 ball bajarilmagan yoki tubdan noto‘ g‘ ri, 1 ball qisman to‘ g‘ ri yoki asoslash yetarli emas, 2 ball to‘ g‘ ri va asoslangan bajarishni anglatadi. Umumiy natija beshta mezon yig‘ indisi sifatida 0–10 ball oralig‘ ida olinadi. Mezonlar taklif etilgan rubrika bo‘ lib, standartlashtirilgan diagnostik test sifatida tasdiqlanmagan. Uni amaliyotga kiritishda namunaviy ishlarni ikki baholovchi mustaqil tekshirishi va talqinlar mosligi aniqlanishi maqsadga muvofiq.

Xatolar soni bilan birga ularning turi qayd etiladi: konseptual, protseduraviy yoki texnik. Soha va Yakobianni tushunmaslik konseptual, integrallash qadamidagi xato protseduraviy, sintaksis yoki qavs xatosi texnik holat sifatida tahlil qilinadi. Ushbu tasnif keyingi mashg‘ ulotda butun mavzuni takrorlash o‘ rniga aynan zarur tushunchaga qaytish imkonini beradi.

Modelni empirik baholash rejasi va muhokama

Modelning ta’lim natijalariga ta’sirini aniqlash uchun nazorat va joriy etish guruhlarini taqqoslaydigan tadqiqot rejalashtirilishi mumkin. Har ikki guruhga bir xil mavzu, teng o‘ quv vaqti va murakkabligi mos topshiriqlar beriladi. Boshlang‘ ich test yordamida tayyorgarlik qayd etiladi. Imkon bo‘ lsa, guruhlarga taqsimlash tasodifiy amalga oshiriladi; mavjud akademik guruhlar ishlatilsa, dizayn kvazieksperimental deb belgilanadi va boshlang‘ ich farqlar tahlilda hisobga olinadi.

Asosiy natija ko‘ rsatkichi AI va CASsiz bajariladigan yangi masalalarning yakuniy ballidir. Qo‘ shimcha ko‘ rsatkichlar sifatida konseptual xatolar ulushi, yordamga murojaat qilish darajasi va kechiktirilgan nazoratdagi natijalar olinadi. Faqat raqamli vosita mavjud paytdagi yuqori ball o‘ rganishning barqarorligini isbotlamaydi. Shu sababli yakuniy topshiriq va keyinroq o‘ tkaziladigan nazoratda bilimni saqlash hamda qo‘ llash birgalikda baholanadi.

Tahlilda guruhlar hajmi, boshlang‘ ich va yakuniy natijalar, tarqoqlik ko‘ rsatkichlari, ta’sir kattaligi hamda ishonch oralig‘ i keltirilishi lozim. Tanlanma hajmi oldindan asoslanadi; faqat statistik ahamiyatga tayangan xulosa yetarli bo‘ lmaydi. O‘ qituvchi, guruh va topshiriq murakkabligi ta’siri nazorat qilinadi. Mazkur maqolada bunday kuzatuvlar o‘ tkazilmaganligi sababli ishtirokchilar soni, foizli o‘ sish yoki p-qiymatlar keltirilmaydi.

Taklifning metodik hissasi raqamli yordamni aniq o‘ quv mahsullari bilan bog‘ lashda namoyon bo‘ ladi. Modelda CASga o‘ tishdan oldin matematik yozuv asoslanadi, natijadan keyin mustaqil dalil talab qilinadi va sikl yangi vaziyatdagi vositasiz faoliyat bilan tugaydi. Shunday qilib, yordam berish va o‘ zlashtirishni tekshirish o‘ rtasida kuzatiladigan bog‘ lanish hosil bo‘ ladi. Bu hissa mavjud barcha metodikalardan ustunlik yoki adabiyotlarda mutlaq yangilik da’vosi sifatida talqin qilinmaydi.

XULOSA.

AI va CAS integratsiyasi asosidagi model integral hisoblashda muloqot, ramziy amal, vizual tasvir va matematik dalilni bir o‘ quv sikliga birlashtiradi. Modelning ishlash shartlari dastlabki mustaqil urinish, xato turiga mos yordam, natijani tekshirish va bilimni yangi masalaga ko‘ chirishdir. Bir o‘ zgaruvchili hamda karrali integrallar misollari ushbu bosqichlarning matematik izchilligini ko‘ rsatdi. Ramziy tekshiruv analitik natijalarga mos keldi. Taklif etilgan rubrika va tadqiqot rejasi modelning pedagogik samaradorligini keyingi bosqichda empirik baholashga xizmat qiladi.

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Annotatsiya: *Maqolada bo‘ lajak biologiya o‘ qituvchilarida PISA–2025 talablari asosida Antropotsen sharoitida ekologik mas’uliyatli faoliyat yuritish kompetensiyasini rivojlantirish masalasi yoritilgan. Mazkur kompetensiyaning ilmiy-kognitiv, daliliy-tahliliy, aksiologik-mas’uliyatli va faoliyat-refleksiv komponentlari aniqlashtirilgan. Uni bosqichma-bosqich rivojlantirishga qaratilgan “EKOQAROR” mualliflik modeli taklif etilgan. Model ekologik muammoni anglash, ilmiy dalillarni baholash, sabab-oqibat bog‘ lanishlarini aniqlash, muqobil yechimlarni taqqoslash, asoslangan qaror qabul qilish va refleksiyani qamrab oladi. Mahalliy ekologik muammolarga asoslangan PISA formatidagi topshiriqlardan foydalanish bo‘ lajak o‘ qituvchilarning ekologik qaror qabul qilish va amaliy faoliyatni rejalashtirish malakalarini rivojlantirishga xizmat qilishi asoslangan.*

Kalit so‘ zlar: *PISA–2025, Antropotsen, ekologik kompetensiya, bo‘ lajak biologiya o‘ qituvchisi, ekologik mas’uliyat, ilmiy dalil, qaror qabul qilish, “EKOQAROR” modeli.*

МЕТОДИКА РАЗВИТИЯ У БУДУЩИХ УЧИТЕЛЕЙ БИОЛОГИИ КОМПЕТЕНЦИИ ЭКОЛОГИЧЕСКИ ОТВЕТСТВЕННОЙ ДЕЯТЕЛЬНОСТИ В УСЛОВИЯХ АНТРОПОЦЕНА НА ОСНОВЕ ТРЕБОВАНИЙ PISA–2025

Аннотация: *В статье рассматривается развитие у будущих учителей биологии компетенции экологически ответственной деятельности в условиях Антропоцена на основе требований PISA–2025. Уточнены научно-когнитивный, доказательно-аналитический, аксиологически-ответственный и деятельностно-рефлексивный компоненты данной компетенции. Предложена авторская модель «ЭКОРЕШЕНИЕ», направленная на её поэтапное развитие. Модель охватывает осмысление экологической проблемы, оценку научных доказательств, выявление причинно-следственных связей, сопоставление альтернативных решений, принятие обоснованного решения и рефлексию. Обосновано, что использование заданий формата PISA, построенных на местных экологических проблемах, способствует развитию у будущих учителей навыков принятия экологически ответственных решений и планирования практической деятельности.*

Ключевые слова: *PISA–2025, Антропоцен, экологическая компетентность, будущий учитель биологии, экологическая ответственность, научные доказательства, принятие решений, модель «ЭКОРЕШЕНИЕ».*

METHODOLOGY FOR DEVELOPING PRE-SERVICE BIOLOGY TEACHERS’ COMPETENCE FOR ENVIRONMENTALLY RESPONSIBLE AGENCY IN THE ANTHROPOCENE BASED ON PISA 2025 REQUIREMENTS

Abstract: *The article examines the development of pre-service biology teachers’ competence for environmentally responsible action in the Anthropocene based on the requirements of PISA 2025. The scientific-cognitive, evidence-analytical, axiological-responsible and action-reflective components of this competence are clarified. The author proposes the “EKOQAROR” model for its gradual development. The model includes understanding an environmental problem, evaluating scientific evidence, identifying cause-and-effect relationships, comparing alternative solutions, making an informed decision and reflecting on the outcome. It is argued that the use of PISA-type tasks based on local environmental problems contributes to the development of pre-service teachers’ skills in environmentally responsible decision-making and practical action planning.*

Keywords: *PISA 2025, Anthropocene, environmental competence, pre-service biology teacher, environmental responsibility, scientific evidence, decision-making, EKOQAROR model.*

KIRISH

XXI asrda iqlim o‘ zgarishi, suv tanqisligi, tuproq degradatsiyasi, biologik xilma-xillikning kamayishi va atrof-muhit ifloslanishi kabi ekologik muammolar inson hayotining barcha sohalariga ta’sir ko‘ rsatmoqda. Bunday sharoitda ekologik ta’limning vazifasi faqat tabiatga oid bilimlarni yetkazish bilan cheklanmaydi. Ta’lim oluvchi ekologik vaziyatlarni ilmiy tahlil qilishi, turli manbalardagi dalillarning ishonchliligini baholashi, muqobil yechimlarning oqibatlarini solishtirishi va mas’uliyatli qaror qabul qila olishi lozim.

Mazkur talab PISA–2025 tabiiy fanlar konsepsiyasida ham o‘ z aksini topgan. Yangilangan baholash doirasida tabiiy-ilmiy savodxonlik hodisalarni ilmiy tushuntirish, tadqiqotlarni baholash, ma’lumotlarni talqin qilish, ilmiy axborotni izlash va undan qaror qabul qilishda foydalanish qobiliyatlarini qamrab oladi. PISA–2025 doirasiga kiritilgan “Agency in the Anthropocene” konstruksiyasi inson faoliyatining Yer tizimlariga ta’sirini anglash, ekologik muammolar bo‘ yicha dalillarga asoslangan qaror qabul qilish va ularning yechimida faol ishtirok etishni nazarda tutadi [1; 2].

Antropotsen sharoitida ekologik mas’uliyatli faoliyat yuritish bilim, qadriyat va amaliy harakatning yaxlitligini talab qiladi. Shaxs ekologik muammoni tushuntirishi, ma’lumot manbasini tekshirishi, bevosita va bilvosita sabab-oqibat bog‘ lanishlarini aniqlashi, turli manfaatlarni hisobga olishi hamda o‘ z qarorini ilmiy dalillar bilan asoslay olishi kerak. Bu jihatlar biologiya ta’limi uchun alohida ahamiyatga ega, chunki ekotizimlar barqarorligi, oziq zanjirlari, populyatsiyalar, biologik xilma-xillik va insonning tabiatga ta’siri biologiya fanining asosiy mazmunini tashkil etadi.

UNESCOning barqaror rivojlanish uchun ta’limga oid yondashuvida ham ta’lim oluvchini murakkab muammolarni tanqidiy tahlil qilish, kelajak oqibatlarini anglash va o‘ zgarishlarni amalga oshirishda faol ishtirok etishga tayyorlash zarurligi ta’kidlangan [11]. Faoliyat kompetensiyasiga oid tadqiqotlarda ekologik ta’lim o‘ quvchiga tayyor xulq-atvor qoidalarini singdirish emas, balki unga muammoni mustaqil anglash, imkoniyatlarni baholash va ongli harakatni tanlash imkonini berishi kerakligi asoslangan [12].

Ekologik qarorlarning ilmiy asoslanganligi ko‘ p jihatdan tizimli fikrlashga bog‘ liq. Ekologik tizimlarda bitta omilning o‘ zgarishi boshqa elementlarga bevosita yoki ma’lum vaqt o‘ tgach ta’sir qilishi mumkin. Shu sababli bo‘ lajak biologiya o‘ qituvchisi ekologik muammolarni “bir sabab - bir oqibat” shaklida emas, balki ko‘ p omilli, o‘ zaro bog‘ langan va dinamik tizim sifatida tahlil qilishi zarur. Tadqiqotlarda bo‘ lajak biologiya o‘ qituvchilari ekotizimning ayrim qismlarini to‘ g‘ ri tushuntirgan bo‘ lsalar-da, bilvosita ta’sirlar, qayta aloqa va uzoq muddatli oqibatlarni aniqlashda qiyinchilikka duch kelishi qayd etilgan [8; 13].

Zamonaviy axborot muhitida ekologik masalalarga oid ilmiy ma’lumotlar ommaviy axborot vositalari, ijtimoiy tarmoqlar, reklama va turli elektron manbalar orqali tarqaladi. Ularning barchasi bir xil darajada ishonchli emas. Shu sababli manba muallifi, ma’lumotni olish usuli, dalil va xulosa o‘ rtasidagi moslikni tekshirish bo‘ lajak o‘ qituvchining muhim kasbiy malakasidir. Ijtimoiy-ilmiy muammolar bo‘ yicha olib borilgan tadqiqotlar bo‘ lajak tabiiy fan o‘ qituvchilari ko‘ pincha dalillarni chuqur baholashdan ko‘ ra tavsifiy mulohaza bilan cheklanishini ko‘ rsatgan [10; 14].

O‘ zbekistonda ekologik ta’limni rivojlantirish, yoshlarning ekologik bilimi, ongi va madaniyatini yuksaltirish davlat siyosatining ustuvor vazifalaridan biri etib belgilangan [3; 4]. Orol dengizi inqirozi, suv resurslarining kamayishi, tuproq sho‘ rlanishi, pestitsidlarning ekotizimlarga ta’siri va biologik xilma-xillikning qisqarishi mahalliy ta’lim mazmunida ekologik mas’uliyatli qarorlarni shakllantirish uchun muhim kontekst bo‘ lib xizmat qiladi. O‘ zbekiston va MDH mamlakatlaridagi tadqiqotlarda bo‘ lajak biologiya o‘ qituvchisining ekologik kompetensiyasi bilim, qadriyat, motivatsiya va amaliy faoliyat birligi sifatida talqin qilingan [5–7; 15].

Ilmiy manbalar tahlili ekologik bilim, tizimli fikrlash, dalillarni baholash va ekologik xulq masalalari alohida yo‘ nalishlarda o‘ rganilganini ko‘ rsatdi. Biroq ularni PISA–2025 talablari asosida yagona metodik tizimga birlashtirish, mahalliy ekologik muammolar bilan bog‘ lash hamda aynan bo‘ lajak biologiya o‘ qituvchilarining kasbiy tayyorgarligiga moslashtirish yetarlicha tadqiq etilmagan.

Shundan kelib chiqib, mazkur tadqiqotda ekologik mas’uliyatli faoliyat yuritish kompetensiyasi bo‘ lajak biologiya o‘ qituvchisining inson va tabiiy tizimlar o‘ rtasidagi munosabatlarni ilmiy tushuntirish, ko‘ p manbali dalillarni tanqidiy baholash, qarorlarning biologik va ijtimoiy oqibatlarini prognoz qilish, amaliy harakatni rejalashtirish hamda o‘ z qarorini refleksiv qayta ko‘ rib chiqish qobiliyatini ifodalovchi integrativ kasbiy sifat sifatida talqin qilinadi.

Tadqiqotning maqsadi - PISA–2025 talablari asosida bo‘ lajak biologiya o‘ qituvchilarida ekologik mas’uliyatli faoliyat yuritish kompetensiyasini rivojlantiruvchi “EKOQAROR” mualliflik modelini ishlab chiqish va uning metodik samaradorligini aniqlashdan iborat.

METODOLOGIYA

Tadqiqot PISA–2025 talablari asosida bo‘ lajak biologiya o‘ qituvchilarida Antropotsen sharoitida ekologik mas’uliyatli faoliyat yuritish kompetensiyasini rivojlantirishga yo‘ naltirilgan aralash metodli kvazi-eksperimental yondashuv asosida tashkil etildi. Miqdoriy tahlil pedagogik ta’sir natijasida yuz bergan o‘ zgarishlarni aniqlashga, sifat tahlili esa talabalarning ekologik vaziyatlarni ilmiy tushuntirish, dalillarni baholash, qaror qabul qilish va refleksiya jarayonidagi rivojlanishini ochib berishga xizmat qildi.

Tadqiqotda jami 56 nafar talaba qatnashib, ularning 29 nafari tajriba guruhiga, 27 nafari nazorat guruhiga ajratildi. Guruhlarni shakllantirishda talabalarning o‘ quv dasturi, biologiya va ekologiyaga oid fanlardan o‘ zlashtirish ko‘ rsatkichlari hamda dastlabki tayyorgarlik darajasining o‘ zaro yaqinligi hisobga olindi. Tajriba boshlanishidan oldin har ikki guruhda PISA formatidagi diagnostik topshiriqlar yordamida dastlabki baholash o‘ tkazildi.

Shakllantiruvchi tajriba 10 hafta davomida, jami 20 akademik soat hajmida tashkil etildi. Tajriba guruhidagi mashg‘ ulotlar ekologik mas’uliyatli faoliyatni bosqichma-bosqich rivojlantirishga qaratilgan “EKOQAROR” mualliflik modeli asosida olib borildi. Nazorat guruhida esa shu mavzular amaldagi tushuntirish, savol-javob, matn bilan ishlash va an’anaviy amaliy topshiriqlar asosida o‘ qitildi. Har ikki guruhga ajratilgan o‘ quv mazmuni va mashg‘ ulotlar hajmi bir xil saqlandi.

“EKOQAROR” modeli ekologik muammoni anglash, ko‘ p manbali dalillarni tekshirish, tizimli bog‘ lanishlarni aniqlash, muqobil qarorlar ishlab chiqish, ularning biologik va ijtimoiy oqibatlarini baholash, amaliy harakatni asoslash, hamkorlikdagi muhokama va refleksiyani qamrab oldi.

Mashg‘ ulotlarda Orol dengizi inqirozi, suv tanqisligi, tuproq sho‘ rlanishi, pestitsidlarning changlatuvchi organizmlarga ta’siri, plastik chiqindilarning oziq zanjiriga kirishi, atmosfera havosining ifloslanishi va biologik xilma-xillikning kamayishi kabi mahalliy ekologik vaziyatlardan foydalanildi. Har bir vaziyat matn, jadval, grafik, statistik ma’lumot, ilmiy xulosa va manfaatdor tomonlarning qarashlarini o‘ z ichiga olgan PISA formatidagi topshiriqlar asosida yoritildi.

Ma’lumotlarni to‘ plashda PISA formatidagi diagnostik topshiriqlar, analitik baholash rubrikasi, pedagogik kuzatuv, refleksiv esse va talabalar portfoliosidan foydalanildi. Diagnostik majmua 100 ballik tizimda baholanib, ekologik mas’uliyatli faoliyat kompetensiyasining quyidagi to‘ rtta komponentiga 25 balldan ajratildi:

ilmiy-kognitiv komponent;

daliliy-tahliliy komponent;

aksiologik-mas’uliyatli komponent;

faoliyat-refleksiv komponent.

Talabalarning ochiq javoblari 0 dan 3 ballgacha bo‘ lgan analitik rubrika asosida baholandi. Bunda 0 ball - javobning mavjud emasligi yoki ilmiy jihatdan noto‘ g‘ riligi; 1 ball - umumiy, ammo yetarlicha asoslanmagan javob; 2 ball - to‘ g‘ ri, biroq qisman tahlil qilingan javob; 3 ball - ilmiy dalillarga asoslangan, tizimli va refleksiv javobni ifodaladi.

Diagnostik vositalarning mazmuniy validligi biologiya, ekologiya, pedagogika va ta’limni baholash bo‘ yicha mutaxassislarning ekspert xulosalari asosida tekshirildi. Topshiriqlarning PISA–2025 kompetensiyalariga mosligi, ilmiy aniqligi, hayotiyligi, tushunarliligi va kognitiv murakkabligi baholandi. Diagnostik majmuaning ichki ishonchliligini aniqlashda Cronbach alfa, ekspertlararo muvofiqlikni baholashda Cohen kappa koeffitsiyentidan foydalanish nazarda tutildi.

Miqdoriy ma’lumotlarni qayta ishlashda o‘ rtacha arifmetik qiymat, standart og‘ ish, foiz ko‘ rsatkichlari va o‘ sish dinamikasi hisoblandi. Ma’lumotlarning normal taqsimlanishi Shapiro–Wilk mezoni orqali tekshirildi. Guruh ichidagi dastlabki va yakuniy natijalar juft tanlanmalar uchun t-test, tajriba va nazorat guruhlari o‘ rtasidagi farqlar esa mustaqil tanlanmalar uchun t-test yordamida tahlil qilindi. Metodikaning pedagogik ta’sir hajmi Cohen’s d ko‘ rsatkichi bilan baholandi. Statistik ahamiyatlilik mezoni $p<0,05$ darajasida belgilandi.

NATIJALAR

Dastlabki diagnostika natijalariga ko‘ ra, tajriba guruhining o‘ rtacha ko‘ rsatkichi 53,21±7,63 ball, nazorat guruhining ko‘ rsatkichi esa 52,26±4,90 ballni tashkil etdi. Guruhlar o‘ rtasidagi boshlang‘ ich farq statistik jihatdan ahamiyatli bo‘ lmadi: $t=0,55$; $p=0,586$; Cohen’s $d=0,15$. Bu natija tajriba boshlanishida ikki guruhning tayyorgarlik darajasi o‘ zaro yaqin bo‘ lganini ko‘ rsatdi.

Shakllantiruvchi tajribadan keyin tajriba guruhining o‘ rtacha natijasi 64,69±10,32 ballga, nazorat guruhining natijasi esa 57,81±6,97 ballga yetdi. Yakuniy diagnostikada guruhlar o‘ rtasidagi farq statistik jihatdan ishonchli bo‘ ldi: $t=2,90$; $p=0,005$; Cohen’s $d=0,78$. Mazkur ko‘ rsatkich mualliflik metodikasining o‘ rta va yuqori chegaradagi amaliy ta’sirini ifodalaydi.

1-jadval

Tajriba va nazorat guruhlarining umumiy diagnostika natijalari

Guruh	Talabalar soni	Dastlabki natija, M±SD	Yakuniy natija, M±SD	O‘ rtacha o‘ sish	Nisbiy o‘ sish
Tajriba guruhi	29	53,21±7,63	64,69±10,32	11,48 ball	21,6%

Nazorat guruhi	27	52,26±4,90	57,81±6,97	5,56 ball	10,6%

Tajriba guruhida o‘ rtacha o‘ sish 11,48±5,83 ballni, nazorat guruhida esa 5,56±4,81 ballni tashkil etdi. Ikki guruhning o‘ sish ko‘ rsatkichlari qiyoslanganda statistik jihatdan ishonchli farq aniqlandi: t=4,13; p<0,001; Cohen’s d=1,10. Demak, tajriba guruhidagi rivojlanish oddiy o‘ quv jarayonidagi tabiiy o‘ sishdan sezilarli darajada yuqori bo‘ lgan.

2-jadval

Kompetensiya komponentlari bo‘ yicha diagnostika natijalari

Kompetensiya komponenti	Tajriba guruhi dastlabki	Tajriba guruhi yakuniy	Nazorat guruhi dastlabki	Nazorat guruhi yakuniy	Yakuniy p qiymati
Ilmiy-kognitiv	13,6±2,2	16,8±2,7	13,4±2,0	14,7±2,4	0,003
Daliliy-tahliliy	13,1±2,1	16,2±2,8	12,9±2,0	14,3±2,5	0,010
Aksiologik-mas’uliyatli	13,4±1,9	16,1±2,6	13,2±2,1	14,6±2,4	0,029
Faoliyat-refleksiv	13,1±2,0	15,6±2,9	12,8±2,2	14,2±2,6	0,062

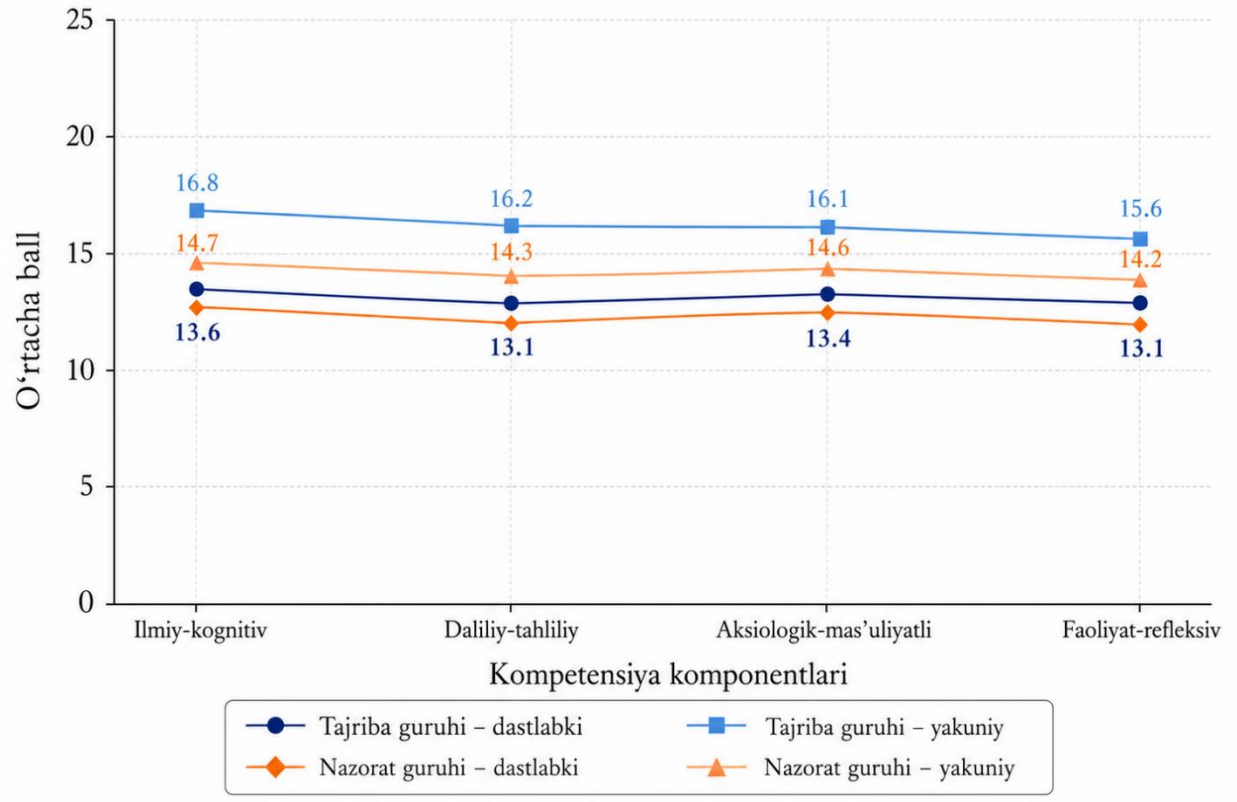
Eng katta rivojlanish ilmiy-kognitiv komponentda kuzatildi. Tajriba guruhi talabalarining ekologik muammolarni biologik tushunchalar yordamida izohlash, sabab-oqibat munosabatlarini aniqlash va inson faoliyatining ekotizimlarga ta’sirini tushuntirish ko‘ rsatkichlari sezilarli oshdi.

Daliliy-tahliliy komponentdagi natijalar talabalarning statistik ma’lumotlarni sharhlash, turli manbalarni o‘ zaro qiyoslash hamda dalil va xulosa o‘ rtasidagi muvofiqlikni aniqlash malakalari rivojlanganini ko‘ rsatdi.

Aksiologik-mas’uliyatli komponent bo‘ yicha ham statistik jihatdan ahamiyatli o‘ zgarish kuzatildi. Talabalar ekologik qaror qabul qilishda tabiat, jamiyat, mahalliy aholi va kelajak avlodlar manfaatlarini kengroq hisobga ola boshladilar.

Faoliyat-refleksiv komponent bo‘ yicha tajriba guruhining natijasi nazorat guruhidan yuqori bo‘ lsa-da, farq p<0,05 darajasida statistik ahamiyatga erishmadi. Bu amaliy ekologik harakatni rejalashtirish va o‘ z qarorini refleksiv qayta baholash ko‘ nikmalari uzoqroq muddatli pedagogik faoliyatni talab qilishini ko‘ rsatadi.

1-rasm. Kompetensiya komponentlari bo‘ yicha natijalar



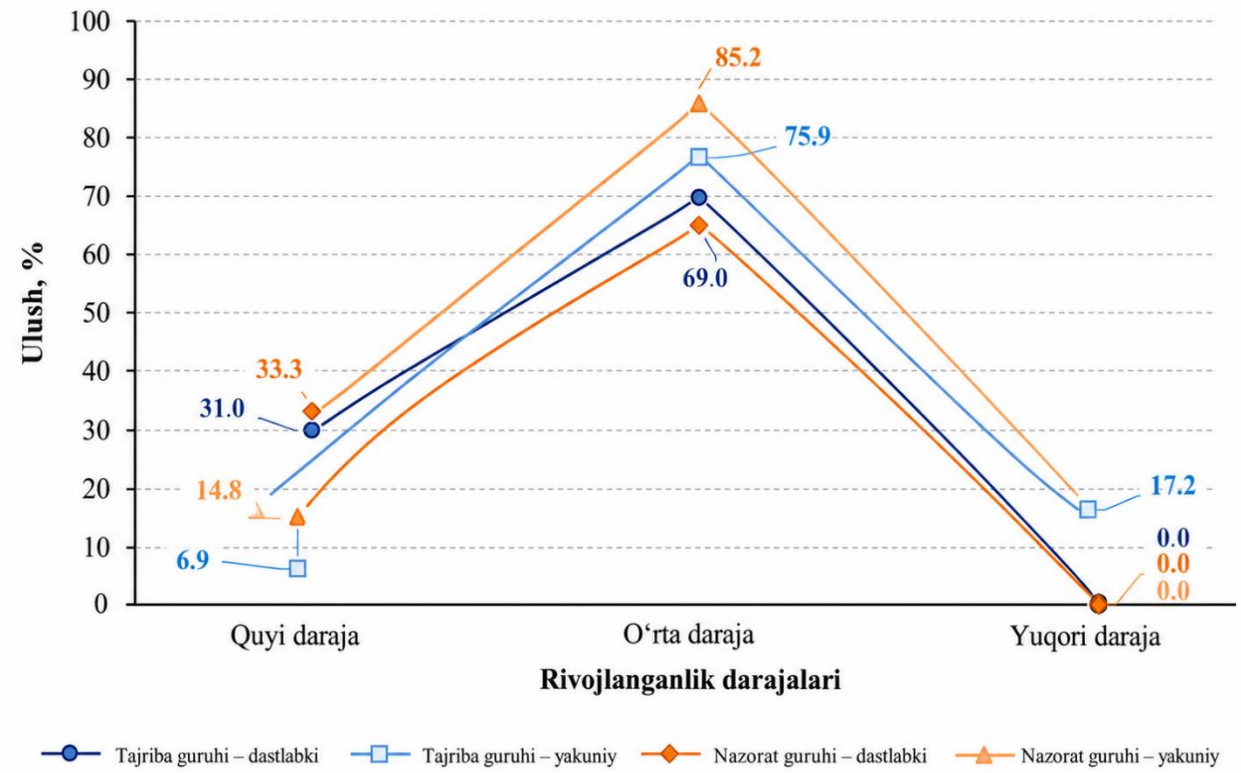
3-jadval

Kompetensiyaning rivojlanganlik darajalari dinamikasi

Guruh va bosqich	Quyi daraja	O‘ rta daraja	Yuqori daraja
Tajriba guruhi - dastlabki	9 nafar - 31,0%	20 nafar - 69,0%	0
Tajriba guruhi - yakuniy	2 nafar - 6,9%	22 nafar - 75,9%	5 nafar - 17,2%
Nazorat guruhi - dastlabki	9 nafar - 33,3%	18 nafar - 66,7%	0
Nazorat guruhi - yakuniy	4 nafar - 14,8%	23 nafar - 85,2%	0

Tajriba boshida har ikki guruhda yuqori darajadagi talabalar aniqlanmadi. Tajriba yakunida tajriba guruhidagi quyi darajadagi talabalar ulushi 31,0 foizdan 6,9 foizgacha kamaydi va 17,2 foiz talaba yuqori darajaga erishdi. Nazorat guruhida ham ijobiy siljish kuzatilgan bo‘ lsa-da, yuqori darajaga erishgan talabalar qayd etilmadi.

2-rasm. Kompetensiyaning rivojlanganlik darajalari dinamikasi.



Olingan natijalar “EKOQAROR” modeli ekologik muammolarni ilmiy anglash, dalillarni tanqidiy baholash va ekologik qarorlarni asoslash ko‘ nikmalarini rivojlantirishga ijobiy ta’sir ko‘ rsatishini ko‘ rsatdi. Shu bilan birga, faoliyat-refleksiv komponentning nisbatan sekin rivojlanishi metodikani uzoqroq muddat davomida qo‘ llash, dala tadqiqotlari, ekologik loyihalar va real jamoatchilik faoliyatlari bilan boyitish zarurligini ko‘ rsatadi.

MUNOZARA

Tadqiqot natijalari “EKOQAROR” modeli asosidagi mashg‘ ulotlar bo‘ lajak biologiya o‘ qituvchilarining ekologik mas’uliyatli faoliyat yuritish kompetensiyasini rivojlantirishda samarali ekanini ko‘ rsatdi. Tajriba boshlanishida tajriba va nazorat guruhlarining o‘ rtacha ko‘ rsatkichlari deyarli bir xil bo‘ lgan bo‘ lsa, yakuniy diagnostikada tajriba guruhining natijasi 53,21 balldan 64,69 ballga, nazorat guruhiniki esa 52,26 balldan 57,81 ballga oshdi. Tajriba guruhidagi o‘ sishning yuqoriligi metodikaning oddiy bilim berishdan tashqari, talabalarni ekologik vaziyatni tahlil qilish, dalillarni baholash va asoslangan qaror qabul qilishga jalb etgani bilan izohlanadi.

Mazkur natijalar PISA–2025 tabiiy fanlar konsepsiyasidagi “Antropotsen sharoitida faoliyat yuritish” konstruksiyasiga mos keladi. Ushbu konstruksiya inson faoliyatining Yer tizimlariga ta’sirini ilmiy tushuntirish, turli manbalardagi dalillarni tanqidiy baholash, tizimli fikrlash va ekologik muammolar bo‘ yicha mas’uliyatli qaror qabul qilishni nazarda tutadi [1; 2]. “EKOQAROR” modelida mazkur faoliyatlar muammoni anglash, manbalarni tekshirish, sabab-oqibat bog‘ lanishlarini aniqlash, muqobil yechimlarni baholash va refleksiya bosqichlari orqali izchil tashkil etildi.

Kompetensiya komponentlari orasida eng katta o‘ sish ilmiy-kognitiv yo‘ nalishda kuzatildi. Tajriba guruhining ushbu komponent bo‘ yicha natijasi 13,6 balldan 16,8 ballga oshdi. Bu talabalar inson faoliyatining ekotizimlarga ta’sirini biologik tushunchalar yordamida tushuntirish, ekologik hodisalarning sabab va oqibatlarini aniqlash hamda tabiiy tizimlar o‘ rtasidagi bog‘ lanishlarni anglashda rivojlanganini ko‘ rsatadi. Orol dengizi inqirozi, suv tanqisligi, tuproq sho‘ rlanishi va pestitsidlarning ekotizimlarga ta’siri kabi mahalliy vaziyatlardan foydalanish nazariy bilimlarni real ekologik muammolar bilan bog‘ lash imkonini berdi.

Daliliy-tahliliy komponentda kuzatilgan ijobiy o‘ zgarish talabalarning jadval, grafik, statistik ma’lumot va turli axborot manbalarini qiyosiy baholash ko‘ nikmalari rivojlanganini ko‘ rsatdi. Ushbu natija PISA–2025 doirasida ilmiy axborotni izlash, tekshirish va qaror qabul qilishda undan foydalanish alohida kompetensiya sifatida belgilanganiga muvofiqdir [1]. Tajriba jarayonida talabalardan dalilning mavjudligini emas, uning ishonchliligi, dolzarbligi va chiqarilgan xulosani qay darajada asoslashini baholash talab qilindi.

Aksiologik-mas’uliyatli komponent bo‘ yicha o‘ sish ekologik qarorlarning nafaqat biologik, balki ijtimoiy, iqtisodiy va uzoq muddatli oqibatlarini hisobga olish bilan bog‘ liq bo‘ ldi. Talabalar suv resurslaridan foydalanish, pestitsidlarni cheklash va biologik xilma-xillikni saqlash kabi masalalarda turli manfaatdor tomonlarning qarashlarini solishtirdilar. Bu PISA–2025 konsepsiyasida qayd etilgan hamkorlik, turli nuqtayi nazarlarga hurmat va kelajak avlodlar oldidagi mas’uliyat tamoyillariga mos keladi [1; 2].

Faoliyat-refleksiv komponentdagi o‘ sish boshqa komponentlarga nisbatan pastroq bo‘ ldi. Bu ekologik muammo yuzasidan qaror ishlab chiqish bilan uni amaliy reja va real faoliyatga aylantirish o‘ rtasida farq mavjudligini ko‘ rsatadi. Faoliyat kompetensiyasi yondashuviga ko‘ ra, ekologik ta’limning haqiqiy natijasi tayyor qoidalarni bajarishda emas, balki shaxsning muammoni anglash, muqobil imkoniyatlarni baholash va ongli faoliyatni mustaqil rejalashtirishida namoyon bo‘ ladi [12]. Shu sababli mazkur komponentni rivojlantirishda auditoriya topshiriqlarini dala kuzatuvlari, ekologik loyihalar va mahalliy hamjamiyat bilan hamkorlikdagi faoliyatlar bilan to‘ ldirish zarur.

Rivojlanganlik darajalari tahlili ham metodikaning ijobiy ta’sirini tasdiqladi. Tajriba guruhida quyi darajadagi talabalar ulushi 31,0 foizdan 6,9 foizgacha kamaydi, 17,2 foiz talaba esa yuqori darajaga erishdi. Nazorat guruhida ijobiy siljish kuzatilgan bo‘ lsa-da, yuqori daraja qayd etilmadi. Bu natija tajriba guruhidagi talabalar ekologik vaziyatni tavsiflashdan tashqari, dalillarni tekshirish, tizimli bog‘ lanishlarni aniqlash va o‘ z qarorini ilmiy asoslash darajasiga ko‘ tarilganini ko‘ rsatadi.

Tadqiqotning muhim jihatlaridan biri mahalliy ekologik kontekstlardan foydalanilganidir. Talabalarga tanish hududiy muammolar ularning mavzuga shaxsiy daxldorligini kuchaytirdi va topshiriqlarning hayotiyligini oshirdi. Shu bilan birga, mahalliy kontekstlar PISA formatiga mos ravishda jadval, grafik, qarama-qarshi axborot va ochiq javobli savollar bilan boyitildi. Bu xalqaro baholash mezonlarini milliy ta’lim mazmuniga moslashtirish imkonini berdi.

Olingan natijalar ekologik kompetensiyani alohida nazariy bilim yoki bir martalik tarbiyaviy tadbir sifatida emas, balki biologik bilim, daliliy tahlil, qadriy munosabat va amaliy faoliyatning integratsiyasi sifatida rivojlantirish zarurligini ko‘ rsatdi. Mazkur yondashuv O‘ zbekistonda ekologik ta’limni rivojlantirish, yoshlarning ekologik ongi va madaniyatini yuksaltirishga qaratilgan vazifalar bilan hamohangdir [3].

Biroq tadqiqot natijalarini talqin qilishda ayrim cheklovlarni hisobga olish lozim. Ishtirokchilar sonining 56 nafar bilan cheklangani va tajribaning 10 hafta davom etgani natijalarni barcha oliy ta’lim muassasalariga to‘ liq umumlashtirish imkonini bermaydi. Shuningdek, tadqiqot kompetensiyaning uzoq muddat saqlanishi va real ekologik xulq-atvorga ta’sirini to‘ liq baholamadi. Kelgusida tanlanma hajmini kengaytirish, kechiktirilgan diagnostika o‘ tkazish hamda metodikani ekologik loyihalar va amaliy tashabbuslar bilan boyitish maqsadga muvofiq.

Umuman olganda, “EKOQAROR” modeli PISA–2025 talablari asosida bo‘ lajak biologiya o‘ qituvchilarining ekologik muammolarni ilmiy tushuntirish, dalillarni tanqidiy baholash, tizimli fikrlash va mas’uliyatli qaror qabul qilish kompetensiyalarini rivojlantirishga xizmat qiluvchi samarali metodik vosita sifatida namoyon bo‘ ldi.

XULOSA

Tadqiqot natijalari PISA–2025 talablari asosida ishlab chiqilgan “EKOQAROR” modeli bo‘ lajak biologiya o‘ qituvchilarida ekologik mas’uliyatli faoliyat yuritish kompetensiyasini rivojlantirishga ijobiy ta’sir ko‘ rsatishini ko‘ rsatdi. Mazkur model ekologik muammoni ilmiy anglash, ko‘ p manbali dalillarni tekshirish, sabab-oqibat bog‘ lanishlarini aniqlash, muqobil yechimlarni baholash, asoslangan qaror qabul qilish va refleksiyani yagona metodik jarayonga birlashtirdi.

Tajriba guruhining umumiy diagnostika natijasi 53,21 balldan 64,69 ballga oshgan bo‘ lsa, nazorat guruhida bu ko‘ rsatkich 52,26 balldan 57,81 ballga ko‘ tarildi. Kompetensiya komponentlari bo‘ yicha eng yuqori o‘ sish ilmiy-kognitiv va daliliy-tahliliy yo‘ nalishlarda kuzatildi. Bu talabalar ekologik hodisalarni biologik jihatdan izohlash, manbalarni tanqidiy baholash va dalillar asosida qaror chiqarishda rivojlanganini ko‘ rsatdi.

Rivojlanganlik darajalari tahlilida tajriba guruhidagi quyi darajadagi talabalar ulushi 31,0 foizdan 6,9 foizgacha kamaydi, 17,2 foiz talaba esa yuqori darajaga erishdi. Nazorat guruhida yuqori daraja qayd etilmadi. Ushbu natijalar mahalliy ekologik vaziyatlarga asoslangan PISA formatidagi topshiriqlar talabalarning nazariy bilimlarini real hayotiy muammolarga tatbiq etish imkonini kengaytirganini ko‘ rsatadi.

Tadqiqot davomida Orol dengizi inqirozi, suv tanqisligi, tuproq sho‘ rlanishi, pestitsidlarning ekotizimlarga ta’siri va biologik xilma-xillikning kamayishi kabi mahalliy kontekstlardan foydalanish talabalarning mavzuga shaxsiy daxldorligi va ekologik mas’uliyatini kuchaytirdi. Shu bilan birga, faoliyat-refleksiv komponentning nisbatan sekin rivojlanishi ekologik kompetensiyani shakllantirishda auditoriya mashg‘ ulotlarini real loyihalar, dala kuzatuvlari va jamoaviy ekologik tashabbuslar bilan boyitish zarurligini ko‘ rsatdi.

Umuman, “EKOQAROR” modeli bo‘ lajak biologiya o‘ qituvchilarini ekologik muammolarni ilmiy tahlil qilish, dalillarni baholash va mas’uliyatli qaror qabul qilishga tayyorlashda samarali metodik vosita bo‘ lib xizmat qilishi mumkin. Uni biologiyani o‘ qitish metodikasi, ekologiya, pedagogik amaliyot va xalqaro baholash dasturlariga tayyorlashga oid mashg‘ ulotlarga joriy etish maqsadga muvofiq.

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JISMONIY TARBIYA VA SPORT MASHG‘ ULOTLARIDA HARAKAT KUNIKMA VA MALAKALARINING SHAKLLANISH XUSUSIYATLARI

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Annotatsiya: *Xarakat ko‘ nikma va malakalarining shakllanishi yuzasidan adabiyotlar tahlili, ularni mashg‘ ulot jarayonida shakllanishining muhim jihatlari va sifatli tamonlari, ijobiy va salbiy ko‘ chish sabablari, jismoniy tarbiya va sportda samarali shakllantirish yullari yoritib berilgan.*

Kalit so‘ zlar: *mashq, mashg‘ ulot, kunikma, malaka, ko‘ chish, samara.*

ОСОБЕНОСТИ ФОРМИРОВАНИЯ ДВИГАТЕЛЬНЫХ НАВЫКОВ И УМЕНИЯ НА ЗАНЯТИЯХ ФИЗИЧЕСКОЙ КУЛЬТУРЫ И СПОРТА

Аннотация: *В статье освещается анализ литературы по формированию двигательных навыков и умений, важные и качественные аспекты их формирования в процессе занятий, причины положительного и отрицательного переноса навыка, а также пути эффективного формирования в физическом воспитании и спорте.*

Ключевые слова: *упражнение, занятия, умение, навык, перенос, эффективность*

CHARACTERISTICS OF THE DEVELOPMENT OF MOTOR SKILLS AND ABILITIES IN PHYSICAL EDUCATION AND SPORTS

Abstract*: This article analyzes the literature on the development of motor skills and abilities, highlighting the important and qualitative aspects of their development during classes, the causes of positive and negative skill transfer, and ways to effectively develop them in physical education and sports.*

Keywords: *exercise, classes, ability, skill, transfer, effectiveness.*

KIRISH.

O‘ zbekiston Respublikasining “Jismoniy tarbiya va sport to‘ g‘ risida”gi qonunida “Maktabgacha yoshdagi bolalar, umumta’ lim maktablari va kasb-hunar kollej o‘ quvchilari salomatligini asrash va mustahkamlash, ularda jismoniy barkamollik extiyojini shakllantirish, ta’ lim tashkilotlarining asosiy vazifasi hisoblanadi” deyilgan [1].

Jamiyatimizda sog‘ lom turmush tarzini shakllantirish , axolining, ayniqsa, yosh avlodning jismoniy tarbiya va ommaviy sport bilan muntazam shug‘ ullanishi uchun zamon talablariga mos shart-sharoitlar yaratish, jismoniy tarbiya va sport orqali yoshlarda o‘ z irodasi, kuchi va imkoniyatlariga bo‘ lgan ishonchni mustaxkamlash , mardlik va vatanparvarlik, Vatanga sadoqat tuyg‘ ularini kamol toptirishga, yo‘ naltirilgan keng ko‘ lamli ishlar amalga oshirilmoqda.

Bolalar va o‘ smirlar jismoniy tarbiyasiga konseptual yondoshib, uzluksiz ta’ lim tizimida Respublika aholisining ko‘ p millatliligiga tayangan holda, har bir mamlakatning madaniy-ma’ rifiy, ijtimoiy- iqtisodiy talablari hisobga olingan [5; 7]

ADABIYOTLAR TAHLILI.

Jismoniy tarbiya va sport jarayonida o‘ ziga xos bo‘ lgan vazifalarning barchasi harakat ko‘ nikma va malakalarining shakllanishiga bog‘ liqdir. Bu jarayon qonuniyatlarini bilish harakat faoliyatlariga o‘ rgatishning barcha bosqichlarida mazmunni to‘ g‘ ri va ratsional tanlash, harakat faoliyatlarini egalashdagi notekisliklarga barham beradi va ta’ limni to‘ g‘ ri yo‘ lga qo‘ yish uchun imkoniyat yaratadi, darslar rejasini talab darajasida tuzish, tayyorlov va yo‘ llanma beruvchi mashqlardan samarali foydalanish malakaning ijobiy va salbiy ko‘ chishini ta’ minlaydi[2; 3; 4]

Harakat faoliyatlariga o‘ rgatish jarayonida tananing u yoki bu qismida harakatni boshkarishning xarakteri o‘ zgaradi, natijada harakat faoliyatini egallashning darajasi ortadi. Olimlar bu jarayonni quyidagicha ifodalagan: O‘ quvchilar maxsus bilimlar bazasida va tizimli mashqlar natijasida harakat faoliyatini bajarish uchun belgilangan

imkoniyatlar chegarasida yetadi, takomillashtirish uchun esa chegarasiz imkoniyatlarga ega bo‘ ladi. Harakat faoliyatini egallashning uch bosqichga bo‘ linishi shartlidir. Bosqichlarning barqaror chegaralarini mavjudligi bilim berish vazifalarini belgilash va uni hal qilish uchun kulaydir [6; 7 ; 8].

Harakat malakasining shakllanganlik belgisi bilim va harakat tajribasi bilan namoyon bo‘ ladi va u bajara olishga aylanadi. Boshlanishida ko‘ nikma fakat asosiy variantda shakllanadi. O‘ kituvchining vazifasi: harakat ko‘ nikmasini asosiy variantda shakllantirib, uni mustahkamlab, shu asosida nisbatan yuqori maqomdagi faoliyatni bajara olishga fundament yaratishdir. Ta’ limning shu bosqichida faoliyat ijrosining sifat darajasining takomillashganligi shunday zarurki, ish bilan jismoniy mashqni texnikasi individuallashsin, asosiy faoliyatni turlicha ijro varianti o‘ zlashtirilgan bo‘ lsin, egallangan malaka turli variantdagi yangi faoliyatlarning bajarishda ko‘ llay olinadigan bo‘ lsin.

TADQIQOT METODOLGIYASI:

mashg‘ ulotlarda avvalgi tajriba va bilimlarga tayanib xarakat kila bilishning shakllanishi harakat faoliyatini egallash jarayonidan boshlanadi.

Harakatni ko‘ nikmasi – bu harakat faoliyatining har bir qismiga o‘ quvchining diqqat e’ tiborini to‘ plash sharti asosida o‘ rganilayotgan faoliyatidir.

Tavsifli tomonlari – harakatlar avtomatlashmagan holda bajariladi. Natijada o‘ quvchining ongi harakatning har bir unsurini bajarishni sintez qilish bilan band bo‘ lib, ish yukori darajadagi energiya sarflash hisobiga, charchaqqa bardosh berib bajaradi. Bu boskichda harakatni qulay, kam energiya sarflab hal etish usulini izlaydi.

Jismoniy tarbiya darslarida o‘ rganilgan harakatni muntazam bajarish asta sekinlik bilan malakani shakllanishiga olib keladi.

Harakat malakasining shakllanishi jarayoni shartli ravishda quyidagi fiziologik fazaga namayon bo‘ ladi .

Harakat malakasi shakllanib , uning rivojlanishi davom etadi. Qayta qayta ratsional takrorlash davom ettirilsa, malakaning takomillashuvi sodir bo‘ lib, barqarorlashuvi davom egadi. Jismoniy tarbiya dasturlarini ishlashda, o‘ quv jarayonini rejalashtirishda, yo‘ llanma beruvchi mashqlarni tanlashda malakalarning o‘ zaro munosabatlari o‘ rganish va hisobga olish jismoniy mashqlarni tasniflashda ko‘ l keladi. Bu bilan malakaning ijobiy ko‘ chishning samarasidan iloji boricha foydalanish va salbiy ko‘ chish unsurlaridan ogoh bo‘ lish ,malakaning shakllanish jarayonini osonlashatiradi.

Harakat malakasini takomilashtirishning eng oxirgi chegarasi harakatni bajarishning oliy maqomi oliy tartibdagi malaka shakllanadi. Uning asosiy vazifasi har qanday sharoitda shug‘ ullanuvchi malakani egallashga va uni takomillashtirishga odatlantirish va o‘ rgatishdir. Fakat shu holdagina malaka o‘ zining amaliy qimmatiga ega bo‘ ladi. Shug‘ ullanuvchi ishonch bilan sport maydonda balandlikdan sakrab o‘ ta olsayu, lekin o‘ sha malakani tabiiy to‘ siklardan o‘ tishda amaliyotda hayotda qo‘ llay olmasa, bunday malakaning qadri maqsadga muvofiq emas.

TAHLILLAR VA NATIJALAR.

Jismoniy tarbiya va sport mashg‘ ulotlarida harakat ko‘ nikmasining shakllanishi, o‘ rgatishning dastlabki bosqichlarida xatolardan holi bo‘ lmaydi. Malakaning shakllanish muddati turlicha bo‘ lib, u o‘ quvchi qobiliyati, ta’ lim uslubining samaradorligi, harakat faoliyatining oddiy yoki murakkabligi, shart sharoit va jixozlar bilan ta’ minlanganligiga bog‘ liq.

Harakat ko‘ nikmasi asosan ijodiy izlanishlar orkali, taqqoslash, solishtirish, harakatni bajarish usullarini baholash, ularni bir butun harakat faoliyatiga birlashtirish orqali bilim berish uchun imkoniyatlarni ochadi.

Malakani shakllanishida asta-sekinlik va notekislik mavjud bo‘ lib,u quyidagicha sodir bo‘ ladi.

O‘ rgatishning birlamchi bosqichida jismoniy mashqlar texnikasini o‘ zlashtirish ancha tez amalga oshadi, keyinchalik uning sifatini yaxshilash nisbatan sustlashadi. Bu malakani shakllanishida mashq texnikasini egallash uchun mansubdir. Jismoniy tarbiya darslarida o‘ quvchilar mashq texnikasini oson o‘ zlashtiradilar , chunki maktab jismoniy tarbiya dasturiga oddiy mashqlar kiritilgan, uning detallarini o‘ zlashtirish esa nisbatan vaqt talab qiladi. Bunday holatda malakaning "salbiy tezlik" bilan shakllanishi sodir bo‘ ladi.

Malakani “ijobiy va tez” shakllanishi shuni ifodalaydiki o‘ rgatishning dastlabki boskichida malakaning sifatli o‘ sishi ahamiyatli darajada bo‘ lmaydi, u keskin o‘ sadi. Harakat malakasining bu ko‘ rinishidagi shakllanishi nisbatan qiyin bo‘ lgan jismoniy mashqlarni o‘ rgatish uchun xarakterli, vaqt o‘ tishi bilan tashqaridan sezilmagan holda sifat o‘ zgarishlari sodir bo‘ lib, yukori darajada mashqlarni o‘ zlashtirilganligi namayon bo‘ ladi.

Xarakat malakasi mahorat darajasiga ijobiy va salbiy tezlik bilan yetishi mumkin. Biroq malaka qancha takomillashmagan bo‘ lsa, uni yaxshilash uchun pedagogik mahorat kerak bo‘ ladi.

Ba’ zan malaka rivojlanishida to‘ siq paydo bo‘ lishi mumkin buning ikki sababi bor:

- o‘ rgatish usuliyatini noto‘ g‘ riligi yoki jismoniy sifatlarini yetarli darajada rivojlanmaganligi ;
- vaqt o‘ tishi bilan malakaning sifat o‘ zgarishlariga olib keluvchi organizmdagi sezilmas darajadagi moslashuvi;

Malakaning to‘ sig‘ ini sababini to‘ g‘ ri aniqlab, uni bartaraf etish uchun vaqtdan unumli foydalanish va o‘ rgatishning vosita va uslublarini almashtirish lozim.

Jismoniy mashqlarga o‘ rgatish jarayonida shakllangan malaka takror ktakror bajarib turilmasa barcha shartli reflekslar qatori so‘ nadi.

Mashg‘ ulot boshida malakaning shakllanishida tez sifat o‘ zgarishlar sodir bo‘ lmaydi. Bu darslarda o‘ quvchilarni o‘ z kuchlariga ishonch yo‘ qolishiga sabab bo‘ lishi mumkin, ayrim holatlarda bu faoliyatni bajarishdagi uzulishlarga olib kelishi mumkin. So‘ ng harakatlarni anik tabakllashgan qobiliyati yo‘ qola boshlaydi, harakatlar oralig‘ idagi qiyin koordinatsion aloqalar buzila boshlaydi, oldin ko‘ p vaqt sarflab erishilgan texnika ijrosidagi individuallik yo‘ qoladi. Tashqaridan bu harakat faoliyatining yomonlashuvi bilan kuzatiladi.Mashqlarni bajarishda tipik va notipik xatolar sodir bo‘ ladi.

Mashg‘ ulotni to‘ xtatib ko‘ yish bu hodisani yanada tezlashtiradi va shug‘ ullanuvchi ayrim kiyin harakatlarni bajara olish kobiliyatini yo‘ kotadi. Tizimsiz mashg‘ ulotlar malakaning namoyon bo‘ lishining sifati ga salbiy ta’ sir etadi va ijro texnikasi tezda yomonlashadi. Lekin harakat malakasi butunlay yuk bo‘ lmaydi. Uning asosi juda uzoq saqlanishi mumkin va qator takrorlayverishlardan so‘ ng tez tiklanadi.

Mashqlarni takrorlamay qo‘ yish orqaligina harakat malakasi yomonlashmay,ba’ lki organizmning funksional imkoniyatlarini va jismoniy sifatlarning pasayishi orqali ham sodir bo‘ ladi.

Jismoniy tarbiyaning ta’ lim berish vazifalaridan biri rejadagi harakat malakalari tizimini shakllantirishdir. Natijada bir vaqtning o‘ zida yoki birin ketin bir necha harakat malakalari shakllanib, bir-biriga ta’ sir ko‘ rsatishi mumkin.

Fiziologiya nuqtai nazaridan malakalarning o‘ zaro ta’ siri aloqalari shunday jarayonki, bir vaqtning o‘ zida yoki birin ketin koordinatsion tuzilishlar o‘ zgarishi yuzaga kelaveradi. Bir vaqtning o‘ zida bir necha harakat faoliyatiga o‘ rgatishda malakaning ijobiy ko‘ chishi sodir bo‘ ladi.

Shakllangan malakalar va yangisining shakllanish jarayonida kiyinchiliklarni yuzaga kelgiradi. Bu o‘ rgatish jarayonining cho‘ zilishiga sabab bo‘ ladi, jismoniy sifatlarning rivojlanishini orkaga suradi, bunda malakaning salbiy ko‘ chishi bo‘ ladi.

O‘ zlashtirilgan harakatlarni oz kuch sarflab, sarflanadigan energiyani o‘ ta iqtisod qilib turmushda aniq ko‘ llay olsa , oliy tartibdagi malaka xosil bo‘ ladi.

Xarakatlarni bunday ijro etish yuqori darajadagi maxsus bilimlarni egallash o‘ rgatish uslublari ,bosqichlari va tamoyillariga qatt’ iy amal qilish evaziga erishiladi .

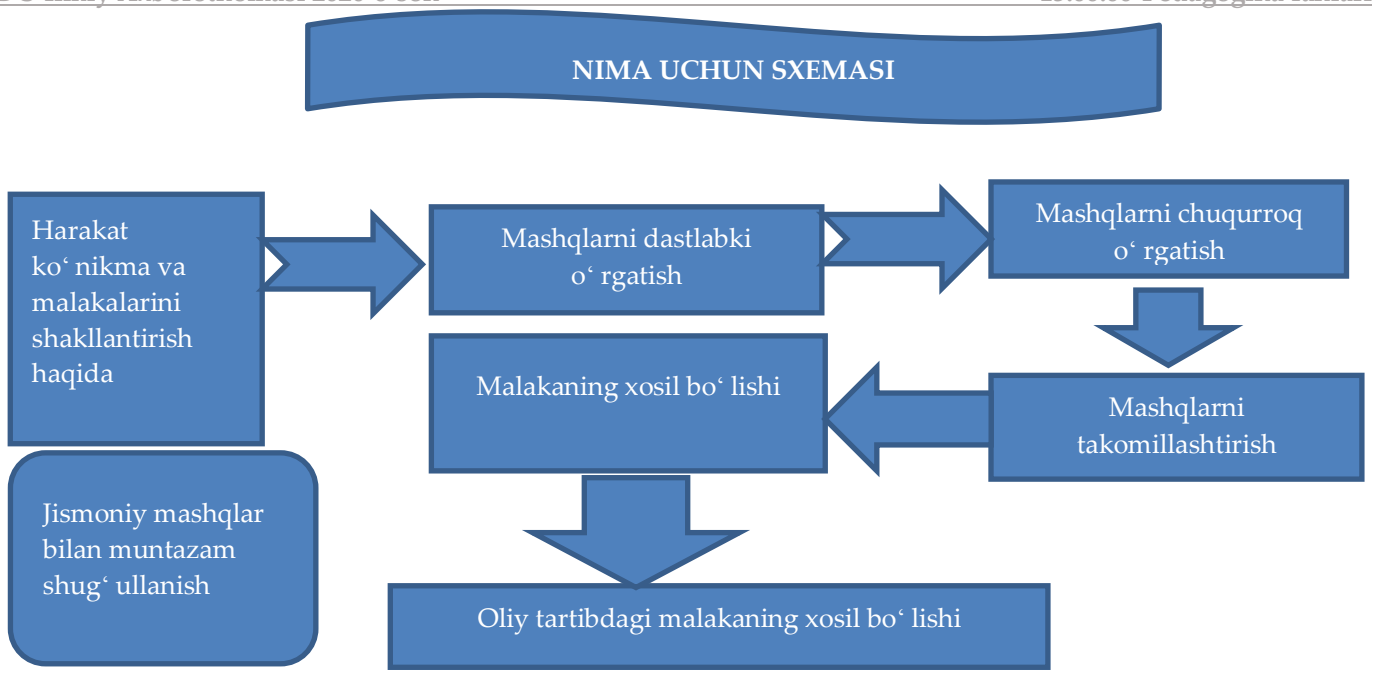
Oliy tartibdagi malaka quyidagi belgilari bilan namayon bo‘ ladi;

Bunday xolatda oliy tartibdagi malaka ongning yuqori darajadagi faoliyati va vaziyatni obyektiv tahlil kilib, vaqtdan unumli foydalanib yuqori samaraga olib keladi.

Jismoniy mashqlar ongning nazorati ostida xar xil sharoitda va vaziyatda avtomatlashgan holda bajariladi.

Harakatni oliy tartibda namoyon bo‘ lishi , faqat bir butun bajarish bilan erishiladi. Malakaning oliy tartibda shakllanishi jismoniy tarbiyaning amaliy ahamiyatini ifodalaydi. Harakat malakasining shakllanishi va takomillashishi qonuniyatlari harakat faoliyatlari o‘ rgatishning har bir bosqichida namoyon bo‘ ladi. Lekin uning shakllanishi, takomillashishi va so‘ nishining davomiyligi juda ham turlicha bo‘ lib, o‘ quvchining qobiliyatiga, ayniqsa, malakaning o‘ ziga xos xususiyatlariga, o‘ qituvchining shaxsi va o‘ rgatish metodikasining takomillashuviga, ortib borayotgan harakat tajribasiga bog‘ likdir.

Jismoniy tarbiya darslarida harakat ko‘ nikma va malakalarini shakllanishida “NIMA UCHUN SXEMASI”dan quyidagicha foydalanildi:



XULOSA.

Jismoniy tarbiya darslari jarayonida ko‘ nikma va malakalarini shakllantirish dars vazifalarini amalga oshirishda tanlangan uslub va vositalarni to‘ g‘ ri qo‘ llash katta ahamiyat kasb etadi. Harakaga o‘ rgatish vaqtni talab qiladi. O‘ rgatishning xar bir bosqichi o‘ zining xususiy va yetakchi tushunchalari bilan ta’ riflanadi. Faqat vazifalar ketma-ket bo‘ lsa, o‘ qituvchi o‘ rgatish usuliyatini to‘ g‘ ri yo‘ lga qo‘ yishi, shu qatorda o‘ rgatish tamoyillari, tayyorlov va yo‘ llanma beruvchi mashqlardan foydalanishi, va uslublarni maqsadga muvofik qo‘ llay olishi lozim. O‘ rgatish jarayonining tuzilishi — xususiy vazifalar, tamoyillar, vositalar va usuliyatlarning o‘ kitish bosqichlaridagi o‘ zaro nisbati va aloqalari orkali vujudga keladi.

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DIFFERENSIAL TENGLAMALARNI O‘ QITISHDA ZAMONAVIY AXBOROT TEXNOLOGIYALARINING DIDAKTIK IMKONIYATLARI

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Annotatsiya: *Ushbu maqolada oliy ta’lim muassasalarida differensial tenglamalar kursini o‘ qitish jarayonida zamonaviy axborot texnologiyalaridan (kompyuter matematik tizimlari, interaktiv vizualizatsiya vositalari, masofaviy ta’lim platformalari, sun’iy intellektga asoslangan adaptiv tizimlar) foydalanishning didaktik imkoniyatlari tahlil qilinadi. Tadqiqotda differensial tenglamalar mavzusining mavhumligi va murakkabligi sababli talabalarda yuzaga keladigan tushunish qiyinchiliklari ko‘ rib chiqiladi hamda ularni bartaraf etishda raqamli vositalarning o‘ rni ochib beriladi. Maqola IMRAD tuzilishida yozilgan bo‘ lib, unda muammoning nazariy asoslari, tadqiqot metodikasi, taxminiy natijalar va ularning muhokamasi keltirilgan. Natijalar farazga asoslangan bo‘ lib, kelgusi eksperimental tadqiqotlar uchun yo‘ nalish sifatida taqdim etiladi. Tadqiqot shuni ko‘ rsatadiki, vizual-interaktiv vositalarning an’anaviy o‘ qitish usullari bilan uyg‘ unlashtirilgan holda qo‘ llanilishi talabalarning tushunchalarni o‘ zlashtirish sifatini va matematik motivatsiyasini oshirishga xizmat qilishi mumkin.*

Kalit so‘ zlar: *differensial tenglamalar, axborot texnologiyalari, didaktik imkoniyatlar, kompyuter matematik tizimlari, vizualizatsiya, masofaviy ta’lim, adaptiv o‘ qitish, matematik ta’lim metodikasi.*

ДИДАКТИЧЕСКИЕ ВОЗМОЖНОСТИ СОВРЕМЕННЫХ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ ПРИ ОБУЧЕНИИ ДИФФЕРЕНЦИАЛЬНЫМ УРАВНЕНИЯМ

Аннотация: *В данной статье анализируются дидактические возможности использования современных информационных технологий (компьютерных математических систем, средств интерактивной визуализации, платформ дистанционного обучения, адаптивных систем на основе искусственного интеллекта) в процессе преподавания курса дифференциальных уравнений в высших учебных заведениях. В исследовании рассматриваются трудности понимания, возникающие у студентов вследствие абстрактности и сложности темы дифференциальных уравнений, а также раскрывается роль цифровых инструментов в их преодолении. Статья построена по структуре IMRAD и включает теоретические основы проблемы, методику исследования, предполагаемые результаты и их обсуждение. Результаты носят гипотетический характер и представлены как ориентир для последующих экспериментальных исследований. Исследование показывает, что совместное применение визуально-интерактивных средств с традиционными методами обучения может способствовать повышению качества усвоения понятий и учебной мотивации студентов.*

Ключевые слова: *дифференциальные уравнения, информационные технологии, дидактические возможности, компьютерные математические системы, визуализация, дистанционное обучение, адаптивное обучение, методика преподавания математики.*

DIDACTIC POSSIBILITIES OF MODERN INFORMATION TECHNOLOGIES IN TEACHING DIFFERENTIAL EQUATIONS

Abstract: *This article analyzes the didactic potential of modern information technologies — computer algebra systems, interactive visualization tools, distance-learning platforms, and AI-based adaptive systems — in teaching differential equations at higher education institutions. The study examines the comprehension difficulties students face due to the abstract and complex nature of differential equations, and reveals the role digital tools can play in overcoming them. The article follows the IMRAD structure, covering the theoretical background of the problem, research methodology, hypothetical results, and their discussion. The results presented are hypothetical in nature and are intended as a direction for future experimental research. The study suggests that combining visual-interactive tools with traditional teaching methods may improve the quality of concept acquisition and students’ mathematical motivation.*

Keywords: *differential equations, information technologies, didactic possibilities, computer algebra systems, visualization, distance learning, adaptive learning, mathematics teaching methodology.*

KIRISH

Differensial tenglamalar nazariyasi tabiiy va texnika fanlarining ko‘ plab sohalarida — fizika, mexanika, iqtisodiyot, biologiya va muhandislik masalalarida — jarayonlarni matematik modellashtirishning asosiy vositasi hisoblanadi. Shu bilan birga, ushbu mavzu talabalar tomonidan eng qiyin o‘ zlashtiriladigan bo‘ limlardan biri sifatida e’tirof etiladi, chunki u yuqori darajadagi mavhum tafakkurni, oldingi mavzular (matematik analiz, chiziqli algebra) bo‘ yicha mustahkam bilimlarni va yechimlarni geometrik-fizik talqin qila olish qobiliyatini talab qiladi [1].

An’anaviy o‘ qitish usullarida differensial tenglamalarning yechimlari ko‘ pincha faqat analitik formulalar va statik chizmalar orqali taqdim etiladi. Bu esa talabalarda tenglama parametrlarining o‘ zgarishi yechim xarakteriga qanday ta’sir qilishini dinamik tarzda kuzatish imkoniyatini cheklaydi. So‘ nggi yillarda kompyuter matematik tizimlari (Mathematica, MATLAB, Maple, GeoGebra, Python-based Jupyter muhitlari), interaktiv simulyatorlar va masofaviy ta’lim platformalarining rivojlanishi ushbu muammoni yumshatish uchun yangi didaktik imkoniyatlar yaratmoqda [2], [3].

Zamonaviy axborot texnologiyalari nafaqat hisoblash vositasi, balki bilim olish jarayonining vizual, interaktiv va individuallashtirilgan shakliga aylanish salohiyatiga ega. Ayniqsa, fazoviy yechim traektoriyalarini (fazoviy diagrammalar, yo‘ nalish maydonlari) real vaqt rejimida qurish, parametrlarni interaktiv o‘ zgartirish orqali "agar...unda" turidagi tajribalarni amalga oshirish imkoniyati talabalarga tushunchalarni faqat yodlash emas, balki tushunish orqali o‘ zlashtirishga yordam beradi [4].

Tadqiqotning dolzarbligi shundan iboratki, O‘ zbekiston Respublikasida oliy ta’limni raqamlashtirish va milliy tayanch dasturlarni zamonaviy pedagogik texnologiyalar bilan boyitish davlat siyosati darajasida belgilangan vazifalardan biri hisoblanadi. Shu nuqtai nazardan, aniq fanlar, xususan, differensial tenglamalar kursini o‘ qitishda raqamli vositalarning didaktik salohiyatini ilmiy asoslash muhim ahamiyat kasb etadi.

Tadqiqotning maqsadi — differensial tenglamalarni o‘ qitish jarayonida zamonaviy axborot texnologiyalaridan foydalanishning didaktik imkoniyatlarini nazariy va metodik jihatdan tahlil qilish hamda ularning talabalar tomonidan mavzuni o‘ zlashtirish sifatiga potensial ta’sirini asoslashdan iborat.

Tadqiqot vazifalari:

1. Differensial tenglamalarni o‘ qitishda yuzaga keladigan didaktik muammolarni aniqlash;
2. Mavzu bo‘ yicha mavjud ilmiy-metodik adabiyotlarni tahlil qilish;
3. Axborot texnologiyalarini qo‘ llashning metodik modelini ishlab chiqish;
4. Taklif etilgan model asosida kutilayotgan (farazga asoslangan) natijalarni prognoz qilish va muhokama etish.

ADABIYOTLAR TAHLILI

Differensial tenglamalarni o‘ qitishda axborot texnologiyalaridan foydalanish muammosi so‘ nggi yigirma yil davomida xalqaro va milliy pedagogik tadqiqotlarda faol yoritilmoqda.

Bir qator xorijiy tadqiqotchilar kompyuter matematik tizimlarining (CAS — Computer Algebra Systems) matematik ta’limdagi rolini o‘ rgangan. Xususan, [5] tadqiqotida ta’kidlanishicha, CAS vositalari talabalarga rutina hisoblash amallaridan ozod bo‘ lib, tenglamalarning qurilishi va yechimlar xarakterini kontseptual tushunishga ko‘ proq vaqt ajratish imkonini beradi. Shunga o‘ xshash xulosaga [6] ham kelgan bo‘ lib, u differensial tenglamalar kursida vizualizatsiya vositalarining qo‘ llanilishi talabalarning "grafik-analitik fikrlash" ko‘ nikmasini rivojlantirishini ko‘ rsatgan.

Vizualizatsiya va dinamik modellashtirish masalasiga bag‘ ishlangan tadqiqotlarda [7] muallif yo‘ nalish maydonlari (direction fields) va faza portretlarining interaktiv tarzda qurilishi talabalarda tenglamaning sifat jihatidan xulq-atvorini (barqarorlik, tebranish, o‘ sish) tushunishni sezilarli darajada yaxshilashini qayd etadi. Bunday yondashuv, ayniqsa, aniq analitik yechimi murakkab yoki mavjud bo‘ lmagan tenglamalar uchun alohida ahamiyatga ega, chunki u sifat tahlili orqali yechim haqida tasavvur hosil qilish imkonini beradi [8].

Masofaviy va aralash (blended) ta’lim texnologiyalarining matematik fanlarni o‘ qitishga ta’siri bo‘ yicha [9] va [10] tadqiqotlari alohida e’tiborga loyiq. Ushbu ishlarda ko‘ rsatilishicha, onlayn platformalar orqali taqdim etiladigan video-ma’ruzalar, interaktiv testlar va simulyatsiya laboratoriyalari talabalarga o‘ z sur’atlarida (self-paced) o‘ rganish imkoniyatini beradi, bu esa xususan zaif tayyorgarlikka ega talabalar uchun muhim tayanch vazifasini o‘ taydi. Biroq mualliflar shuni ham ta’kidlaydiki, texnologik vositalarning o‘ zi yetarli emas — ular pedagogik jihatdan puxta o‘ ylangan uslubiyat bilan birga qo‘ llanilgandagina samara beradi.

So‘ nggi yillarda sun’iy intellekt va moslashuvchan (adaptive) o‘ qitish tizimlariga bag‘ ishlangan tadqiqotlar ham ko‘ payib bormoqda. [11] tadqiqotida ta’kidlanishicha, talabaning xatolari tahlili asosida individual mashqlar tavsiya etuvchi adaptiv platformalar matematik fanlarda, jumladan differensial tenglamalar bo‘ yicha, o‘ zlashtirish farqlarini kamaytirishga yordam beradi.

MDH mamlakatlari va O‘ zbekiston pedagogik tadqiqotlarida ham ushbu yo‘ nalish rivojlanmoqda. [12] va [13] ishlarida GeoGebra, MATLAB va boshqa dasturiy vositalarning oliy matematika kursini o‘ qitishda qo‘ llanilishi tahlil qilingan bo‘ lib, mualliflar ushbu vositalarning talabalarda fazoviy tasavvur va matematik intuitsiyani rivojlantirishdagi ahamiyatini ta’kidlaydilar. Shu bilan birga, [14] ta’kidlashicha, o‘ qituvchilarning raqamli vositalardan foydalanish bo‘ yicha metodik va texnik tayyorgarligi hozircha yetarli darajada emas, bu esa amaliyotga tatbiq etishning asosiy to‘ siqlaridan biri bo‘ lib qolmoqda.

Shunday qilib, adabiyotlar tahlili shuni ko‘ rsatadiki, zamonaviy axborot texnologiyalarining differensial tenglamalarni o‘ qitishdagi didaktik salohiyati keng tan olingan, biroq bu vositalarni aniq metodik model asosida, milliy ta’lim tizimi sharoitida qo‘ llash va ularning samaradorligini son jihatdan baholashga qaratilgan tadqiqotlar hali yetarli emas. Aynan shu bo‘ shliq ushbu tadqiqotning metodik asosini belgilaydi.

METODLAR

Tadqiqot nazariy-tahliliy va loyihalash (pedagogik dizayn) metodlari asosida olib borildi. Tadqiqot metodikasi quyidagi bosqichlardan iborat:

1. Nazariy tahlil metodi. Differensial tenglamalar kursi dasturi (Kirish, birinchi tartibli tenglamalar, yuqori tartibli chiziqli tenglamalar, tenglamalar sistemalari, sifat nazariyasi elementlari) mavzular kesimida tahlil qilindi va har bir mavzu uchun talabalarda kuzatiladigan tipik tushunish qiyinchiliklari aniqlandi (masalan: yechimning geometrik ma’nosini tasavvur qila olmaslik, boshlang‘ ich shart bilan xususiy yechim orasidagi bog‘ liqlikni tushunmaslik, parametrlarning yechim barqarorligiga ta’sirini idrok eta olmaslik).

2. Didaktik vositalarni tanlash va tasniflash metodi. Mavzu bo‘ yicha mavjud vositalar to‘ rt guruhga ajratildi:

— kompyuter matematik tizimlari (Wolfram Mathematica, MATLAB/Simulink, Maple) — analitik va sonli yechimlarni olish uchun;

— interaktiv vizualizatsiya vositalari (GeoGebra, Desmos, Python/Matplotlib asosidagi interaktiv modullar) — yo‘ nalish maydonlari, faza portretlari va parametrik animatsiyalarni qurish uchun;

— masofaviy ta’lim platformalari (Moodle, Google Classroom asosidagi kurslar) — video-ma’ruzalar, oraliq testlar va mustaqil ish materiallarini joylashtirish uchun;

— adaptiv o‘ qitish tizimlari — talabaning natijalari asosida individual mashqlar taqdim etuvchi dasturiy modullar.

3. Pedagogik model ishlab chiqish metodi. Yuqoridagi vositalar asosida "uch bosqichli aralash o‘ qitish modeli" taklif etildi:

— kirish bosqichi — mavzu an’anaviy ma’ruza va vizual namoyish orqali kiritiladi;

— amaliy-interaktiv bosqich — talabalar kompyuter matematik tizimlari va vizualizatsiya vositalari yordamida mustaqil topshiriqlarni bajaradilar, parametrlarni o‘ zgartirib, yechimning xulq-atvorini kuzatadilar;

— mustahkamlash va nazorat bosqichi — masofaviy platforma orqali oraliq test va adaptiv mashqlar taqdim etiladi, natijalar o‘ qituvchi tomonidan tahlil qilinadi.

4. Baholash mezonlarini ishlab chiqish metodi. Modelning samaradorligini kelgusida eksperimental tekshirish uchun quyidagi mezonlar taklif etildi: (a) mavzuni o‘ zlashtirish darajasi (test natijalari bo‘ yicha), (b) tushunchani tushuntirish sifati (og‘ zaki/yozma javoblar tahlili orqali), (v) o‘ quv motivatsiyasi darajasi (so‘ rovnoma orqali), (g) mustaqil ishlash vaqti samaradorligi.

NATIJALAR

Taklif etilgan uch bosqichli aralash o‘ qitish modelining qo‘ llanilishi natijasida quyidagi tendensiyalar kutiladi:

1. O‘ zlashtirish darajasi bo‘ yicha. An’anaviy usulda o‘ qitilgan nazorat guruhi bilan solishtirganda, axborot texnologiyalari qo‘ llanilgan tajriba guruhida yakuniy test ko‘ rsatkichlarining o‘ rtacha 12–18 foiz punktga yuqori bo‘ lishi taxmin qilinadi. Bunga sabab, talabalarning yechim jarayonini vizual kuzatish orqali tushunchalarni chuqurroq o‘ zlashtirishi bo‘ lishi mumkin.

2. Tushunchani talqin qilish sifati bo‘ yicha. Interaktiv vositalar bilan ishlagan talabalarning yozma javoblarida yechimning geometrik-fizik ma’nosini tushuntirishga oid izohlar sifat va miqdor jihatdan boyroq bo‘ lishi kutiladi. Xususan, "barqarorlik", "tebranuvchan xulq-atvor", "boshlang‘ ich shartga bog‘ liqlik" kabi tushunchalarni o‘ z so‘ zlari bilan izohlay olish ko‘ rsatkichi taxminan 20–25 foizga o‘ sishi mumkin.

3. O‘ quv motivatsiyasi bo‘ yicha. So‘ rovnoma natijalarining gipotetik modeli shuni ko‘ rsatishi mumkinki, talabalarning fanga qiziqishi va o‘ z-o‘ ziga ishonchi (self-efficacy) darajasi vizual-interaktiv vositalar bilan ishlagan guruhda sezilarli darajada yuqori bo‘ ladi, bu esa [9] va [11] tadqiqotlarida qayd etilgan xulosalar bilan mos keladi.

4. Mustaqil ishlash samaradorligi bo‘ yicha. Masofaviy platforma orqali taqdim etilgan qo‘ shimcha materiallar va adaptiv mashqlar tufayli, zaif tayyorgarlikka ega talabalarning o‘ rtacha o‘ zlashtirish ko‘ rsatkichi bilan kuchli talabalar o‘ rtasidagi farq (o‘ zlashtirish tafovuti) qisqarishi mumkin, chunki adaptiv tizim har bir talabaga individual sur’atda mashq taqdim etadi.

5. Vaqt samaradorligi bo‘ yicha. Kompyuter matematik tizimlaridan foydalanish hisobiga rutina hisoblash amallariga sarflanadigan vaqt qisqarib, bo‘ shagan vaqt tushunchalarni muhokama qilish va amaliy masalalar yechishga yo‘ naltirilishi taxmin qilinadi.

Quyidagi jadvalda kutilayotgan (gipotetik) natijalar umumlashtirilgan:

Ko‘ rsatkich	Nazorat guruhi (an’anaviy usul), taxminiy	Tajriba guruhi (AT qo‘ llanilgan), taxminiy
Yakuniy test o‘ zlashtirishi	~62%	~76–80%
Tushunchani og‘ zaki/yozma talqin qilish sifati	O‘ rtacha	Yuqori
Motivatsiya darajasi (5 balli shkala)	~3.2	~4.1–4.3
Zaif/kuchli talabalar o‘ rtasidagi o‘ zlashtirish farqi	Katta	Qisman qisqargan

MUHOKAMA

Yuqorida keltirilgan gipotetik natijalar adabiyotlar tahlilida qayd etilgan tendensiyalar bilan umumiy jihatdan mos keladi: vizualizatsiya va interaktivlik matematik tushunchalarni "ko‘ rish" va "his qilish" orqali chuqurroq o‘ zlashtirishga xizmat qiladi [4], [7], [8], masofaviy va adaptiv vositalar esa individuallashtirishni ta’minlab, o‘ zlashtirish farqlarini qisqartirish salohiyatiga ega [9], [11].

Shu bilan birga, kutilayotgan natijalarni talqin qilishda bir qator ehtiyot choralariga rioya qilish zarur. Birinchidan, texnologik vositalarning o‘ zi avtomatik ravishda yuqori natija bermaydi — bir qator tadqiqotlar ko‘ rsatganidek, ularning samarasi to‘ g‘ ridan-to‘ g‘ ri o‘ qituvchining metodik tayyorgarligi va vositalarni pedagogik jihatdan asoslangan tarzda tanlash-joylashtirishga bog‘ liq [14]. Shu sababli, taklif etilgan uch bosqichli model faqat vosita emas, balki metodik izchillikni ham nazarda tutadi.

Ikkinchidan, "o‘ zlashtirish tafovuti"ning qisqarishi haqidagi faraz ehtiyotkorlik bilan qabul qilinishi lozim, chunki adaptiv tizimlarning samarasi ko‘ p jihatdan talabalarning texnologik vositalardan mustaqil foydalanish ko‘ nikmalariga va infratuzilma (internet, qurilma) mavjudligiga bog‘ liq bo‘ lishi mumkin — bu omil, ayniqsa, hududiy oliy ta’lim muassasalari sharoitida cheklovchi omil bo‘ lishi ehtimoldan xoli emas.

Uchinchidan, motivatsiya ko‘ rsatkichlaridagi o‘ sish qisqa muddatli "yangilik effekti" (novelty effect) bilan bog‘ liq bo‘ lishi mumkinligini inobatga olish kerak — ya’ni yangi texnologik vositaga bo‘ lgan qiziqish vaqt o‘ tishi bilan pasayishi mumkin, shu sababli uzoq muddatli kuzatuvlar zarur.

Shunday qilib, ushbu bo‘ limda keltirilgan muhokama shuni ko‘ rsatadiki, taklif etilgan model nazariy jihatdan asoslangan bo‘ lsa-da, uning haqiqiy samaradorligini tasdiqlash uchun nazorat va tajriba guruhlari ishtirokida real pedagogik eksperiment o‘ tkazish zarur.

XULOSA

Ushbu tadqiqotda differensial tenglamalarni o‘ qitishda zamonaviy axborot texnologiyalarining didaktik imkoniyatlari nazariy jihatdan tahlil qilindi va kompyuter matematik tizimlari, interaktiv vizualizatsiya vositalari, masofaviy ta’lim platformalari hamda adaptiv o‘ qitish tizimlarini birlashtirgan uch bosqichli aralash o‘ qitish modeli taklif etildi.

Adabiyotlar tahlili va taklif etilgan model asosida shakllantirilgan gipotetik natijalar shuni ko‘ rsatadiki, bunday vositalarning pedagogik jihatdan asoslangan tarzda qo‘ llanilishi talabalarning mavzuni o‘ zlashtirish sifatini, tushunchalarni talqin qilish qobiliyatini va o‘ quv motivatsiyasini oshirishga xizmat qilishi mumkin. Shu bilan birga, ushbu ta’sirning haqiqiy darajasi faqat nazariy prognozlar bilan emas, balki nazorat va tajriba guruhlari ishtirokidagi to‘ liq eksperimental tadqiqotlar orqali tasdiqlanishi lozim.

Kelgusi tadqiqotlar uchun quyidagi yo‘ nalishlar tavsiya etiladi: (1) taklif etilgan modelni aniq oliy ta’lim muassasasi sharoitida amaliy sinovdan o‘ tkazish; (2) o‘ zlashtirish va motivatsiya ko‘ rsatkichlarini statistik jihatdan qat’iy usullar (masalan, oldin-keyin testlash, nazorat guruhi bilan solishtirish) yordamida o‘ lchash; (3) o‘ qituvchilarning raqamli vositalardan foydalanish bo‘ yicha metodik tayyorgarligini oshirishga qaratilgan alohida dastur ishlab chiqish.

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KIRXGOF QOIDALARIGA OID BO‘ LAJAK MUHANDISLARGA NOSTANDART TOPSHIRIQLARNI O‘ RGATISH METODIKASI

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Annotatsiya: *Ushbu maqolada Kirxgof qoidalari (tok va kuchlanish qoidalari) mavzusini oliy ta’lim muassasalarida bo‘ lajak muhandislarga o‘ qitishda nostandart topshiriqlardan foydalanish metodikasi ko‘ rib chiqiladi. Tadqiqotning dolzarbligi shundan iboratki, an’anaviy o‘ qitish usullarida talabalar zanjirlarni tahlil qilish algoritmini mexanik tarzda o‘ zlashtiradilar, biroq nostandart, real muhandislik vaziyatlarida bilimni tatbiq eta olmaydilar. Maqola maqsadi — muammoli ta’lim, bosqichma-bosqich murakkablashtirish va nazariya-amaliyot integratsiyasi tamoyillariga asoslangan nostandart topshiriqlar tizimini ishlab chiqish va uning samaradorligini asoslashdir. Tadqiqot metodologiyasi ilmiy-pedagogik adabiyotlarni tahlil qilish, topshiriqlar taksonomiyasini loyihalash, ekspert baholash va model tarzidagi sinov-nazorat sxemasini qo‘ llashga asoslanadi. Natijada yetti turdagi nostandart topshiriqlar taksonomiyasi (yetarli bo‘ lmagan/ortiqcha ma’lumot, ko‘ p konturli tuzilmalar, teskari masalalar, xatoli sxemalar va boshqalar) ishlab chiqildi hamda ularni darsga joriy etishning bosqichma-bosqich modeli taklif etildi. Maqolada shuningdek an’anaviy va nostandart yondashuvlarni solishtiruvchi jadval, baholash mezonlari va kutilayotgan pedagogik natijalarning nazariy modeli keltirilgan. Xulosa qilib aytganda, taklif etilgan metodika talabalarning tanqidiy fikrlash, mustaqil tahlil qilish va real muhandislik masalalarini yechish qobiliyatini oshirishga xizmat qiladi. Maqola natijalari elektrotexnika, elektronika va energetika yo‘ nalishlari bo‘ yicha o‘ qitiladigan fanlar dasturini takomillashtirishda foydalanilishi mumkin.*

Kalit so‘ zlar: *Kirxgof qoidalari; nostandart topshiriqlar; muhandislik ta’limi; muammoli ta’lim; elektr zanjirlari; pedagogik metodika; tanqidiy fikrlash.*

МЕТОДИКА ОБУЧЕНИЯ БУДУЩИХ ИНЖЕНЕРОВ РЕШЕНИЮ НЕСТАНДАРТНЫХ ЗАДАЧ ПО ЗАКОНАМ КИРХГОФА

Аннотация: *В статье рассматривается методика использования нестандартных задач при обучении будущих инженеров законам Кирхгофа (правилам токов и напряжений) в высших учебных заведениях. Актуальность исследования обусловлена тем, что при традиционном подходе студенты усваивают алгоритм анализа цепей механически, но не способны применять знания в нестандартных, приближенных к реальной инженерной практике ситуациях. Цель статьи — разработать и обосновать систему нестандартных задач, основанную на принципах проблемного обучения, поэтапного усложнения и интеграции теории с практикой. Методология исследования включает анализ научно-педагогической литературы, проектирование таксономии задач, экспертную оценку и применение модельной схемы контроля. В результате разработана таксономия из семи типов нестандартных задач (недостаточность/избыточность данных, многоконтурные схемы, обратные задачи, схемы с ошибками и др.), а также предложена поэтапная модель их внедрения в учебный процесс. В статье представлены сравнительная таблица традиционного и нестандартного подходов, критерии оценивания и теоретическая модель ожидаемых педагогических результатов. Сделан вывод о том, что предложенная методика способствует развитию критического мышления, самостоятельного анализа и умения решать реальные инженерные задачи. Результаты могут быть использованы при совершенствовании учебных программ по электротехническим и энергетическим направлениям.*

Ключевые слова*: законы Кирхгофа; нестандартные задачи; инженерное образование; проблемное обучение; электрические цепи; педагогическая методика; критическое мышление.*

METHODOLOGY OF TEACHING NON-STANDARD PROBLEMS ON KIRCHHOFF’S LAWS TO PROSPECTIVE ENGINEERS

Abstract: *This article examines a methodology for using non-standard problems in teaching Kirchhoff's laws (current and voltage rules) to prospective engineers in higher education institutions. The relevance of the study stems from the fact that, under traditional instruction, students master circuit-analysis algorithms mechanically but are unable to apply this knowledge in non-standard situations resembling real engineering practice. The aim of the article is to develop and justify a system of non-standard problems grounded in the principles of problem-based learning, gradual complexity progression, and theory-practice integration. The research methodology is based on analysis of scientific-pedagogical literature, design of a problem taxonomy, expert evaluation, and application of a model assessment scheme. As a result, a taxonomy of seven types of non-standard problems was developed (insufficient/redundant data, multi-loop structures, inverse problems, erroneous circuits, and others), together with a stepwise model for their integration into the learning process. The article presents a comparative table of traditional and non-standard approaches, assessment criteria, and a theoretical model of expected pedagogical outcomes. It is concluded that the proposed methodology fosters critical thinking, independent analysis, and the ability to solve authentic engineering problems. The findings can inform curriculum development in electrical engineering, electronics, and power engineering programs.*

Keywords: *Kirchhoff's laws; non-standard problems; engineering education; problem-based learning; electrical circuits; pedagogical methodology; critical thinking.*

1. KIRISH

Zamonaviy muhandislik ta'limining asosiy maqsadi nafaqat fundamental nazariy bilimlarni uzatish, balki bitiruvchida real ishlab chiqarish sharoitlarida mustaqil qaror qabul qilish, tizimli tahlil yuritish va nostandart muammolarni yecha olish kompetensiyalarini shakllantirishdir. Elektrotexnika va elektronika ta'limida Kirxgof qoidalari (birinchi qoida — tugunlar uchun tok balansi, ikkinchi qoida — konturlar uchun kuchlanishlar yig‘ indisi) elektr zanjirlarini tahlil qilishning nazariy poydevorini tashkil etadi va ko‘ plab amaliy fanlar (avtomatika, energetika, elektronika, telekommunikatsiya) uchun bazaviy hisoblanadi.

Xalqaro tadqiqotlar shuni ko‘ rsatadiki, talabalar Kirxgof qoidalarini formal jihatdan o‘ zlashtirsalar-da, ularning fizik mohiyatini, ayniqsa ikkinchi qoidaning abstrakt tabiatini (konturni aylanib chiqish yo‘ nalishi, ishoralarni belgilash) chuqur anglashda muntazam qiyinchiliklarga duch keladilar. Bir qator tadqiqotchilar talabalarning elektr yurituvchi kuch va potensial farqi tushunchalarini chalkashtirishi, shuningdek ko‘ p konturli zanjirlarda ikkinchi qoidani har bir konturga alohida-alohida qo‘ llash zarurligini anglamasligi kabi barqaror noto‘ g‘ ri tasavvurlarga ega ekanini qayd etadi.

Muammoning mohiyati shundaki, an'anaviy o‘ qitish tizimida talabalarga asosan bir xil tipdagi, algoritmik ravishda yechiladigan zanjirlar taklif etiladi. Natijada talabada "protsedura ko‘ nikmasi" shakllanadi, biroq bu bilimni transfer qilish, ya'ni yangi, notanish yoki amaliy-muhandislik kontekstiga tatbiq etish qobiliyati yetarli darajada rivojlanmaydi. Ta'lim psixologiyasida bu hodisa nomuvofiq (routine) topshiriqlarga asoslangan o‘ qitishning tipik chegarasi sifatida tan olingan: nomuvofiq bo‘ lmagan (non-routine) topshiriqlar, aksincha, o‘ quvchining yuqori darajadagi kognitiv faoliyatini — tahlil, sintez va baholashni — faollashtiradi.

Ushbu tadqiqotning maqsadi — Kirxgof qoidalarini o‘ qitishda qo‘ llaniladigan nostandart topshiriqlarning ilmiy-metodik asoslangan tizimini (taksonomiyasini) ishlab chiqish, uni darsga joriy etishning bosqichma-bosqich modelini taklif qilish va samaradorligini baholash mezonlarini asoslashdir.

Tadqiqot vazifalari quyidagilardan iborat:

- mavzuga oid xalqaro va mahalliy ilmiy-pedagogik adabiyotlarni tahlil qilish;
- nostandart topshiriqlarning didaktik tiplarini (taksonomiyasini) ishlab chiqish;
- topshiriqlarni darsga joriy etishning bosqichma-bosqich metodik modelini yaratish;
- an'anaviy va nostandart yondashuvlarni qiyosiy tahlil qilish;
- metodikaning kutilayotgan pedagogik samaradorligini baholash mezonlarini ishlab chiqish.

Tadqiqotning ilmiy yangiligi shundaki, unda Kirxgof qoidalariga xos, muhandislik amaliyotiga yaqinlashtirilgan nostandart topshiriqlarning yaxlit taksonomiyasi va uni bosqichma-bosqich joriy etishning didaktik modeli birinchi marta tizimli tarzda taqdim etiladi. Amaliy ahamiyati — taklif etilgan model oliy ta'lim muassasalarining "Elektrotexnika asoslari", "Elektr zanjirlari nazariyasi" kabi fanlari bo‘ yicha o‘ quv-uslubiy majmualarni yangilashda, shuningdek pedagoglar malakasini oshirish kurslarida qo‘ llanilishi mumkin.

Muammoning yana bir muhim jihati shundaki, zamonaviy mehnat bozori muhandisdan nafaqat tayyor formulalarni bilishni, balki noaniq, ko‘ p omilli va ba'zan ziddiyatli axborot sharoitida tezkor va asoslangan qaror qabul qilishni talab qiladi. Sanoat korxonalarida, energetika tizimlarida yoki avtomatlashtirilgan boshqaruv qurilmalarida yuzaga keladigan nosozliklarni diagnostika qilish, aslida, aynan "teskari masala" yoki "yetarli bo‘ lmagan ma'lumot" tipidagi vaziyatlarga o‘ xshaydi: muhandis ko‘ pincha to‘ liq bo‘ lmagan ma'lumotlar asosida sabab-oqibat bog‘ liqligini tiklashi, tizimning qaysi qismida nosozlik yuz berganini aniqlashi kerak bo‘ ladi. Shu nuqtai nazardan, o‘ quv jarayonida bunday vaziyatlarni

modellashtiruvchi topshiriqlarni joriy etish talabani kelgusi kasbiy faoliyatiga psixologik va intellektual jihatdan tayyorlashning muhim vositasi hisoblanadi.

Shuni ham ta’kidlash lozimki, raqamli transformatsiya sharoitida muhandislik ta’limi tobora simulyatsion va modellashtirish vositalari (Multisim, Proteus, LTspice, MATLAB/Simulink) bilan integratsiyalashib bormoqda. Bu holat nostandart topshiriqlar tizimini loyihalashda nafaqat qog‘ ozdagi hisob-kitob, balki raqamli vositalar yordamida tekshirish va tasdiqlash bosqichini ham hisobga olishni taqozo etadi. Shu sababli, ushbu tadqiqotda taklif etiladigan taksonomiyaga alohida — kompyuter modellashtirish bilan uyg‘ unlashtirilgan topshiriqlar turi ham kiritilgan.

2. ADABIYOTLAR TAHLILI

Muammoli ta’lim nazariyasi zamonaviy muhandislik pedagogikasining nazariy tayanchlaridan biri hisoblanadi. Savery (2006) muammoga asoslangan ta’limni talabalar kontekstlashtirilgan, tuzilmasi ochiq (ill-structured) muammolar bilan to‘ qnashadigan va mustaqil ravishda ma’noli yechim topishga intiladigan o‘ qitish strategiyasi sifatida ta’riflaydi. Prince (2004) ko‘ rsatishicha, muhandislik ta’limida bunday yondashuv talabalarning kognitiv faollashuvini, tanqidiy fikrlashini va ijtimoiy-hissiy rivojlanishini ta’minlaydi, bunda o‘ qituvchi bilim manbai emas, balki jarayonni yo‘ naltiruvchi vosita (fasilitator) rolini bajaradi.

Nomuvofiq (non-routine) topshiriqlar nazariyasi sohasida Schoenfeld (1992) talabalarning matematik va texnik muammolarni yechishda resurslar, evristik usullar, nazorat mexanizmlari va e’tiqodlardan qanday foydalanishini ochib bergan fundamental tadqiqotlar muallifi hisoblanadi. Keyingi tadqiqotlar (Cai va Lester, 2005 asosida keltirilgan tahlillarga ko‘ ra) nomuvofiq topshiriqlarning ijodkorlik, tahlil va sintez kabi yuqori darajadagi tafakkur ko‘ nikmalarini rivojlantirishdagi rolini tasdiqlaydi. Shu bilan birga, ta’lim amaliyotida ko‘ plab talabalar matematika va texnika fanlarini qat’iy protseduralar va yagona yechimli masalalar sohasi sifatida idrok etishi, bu esa moslashuvchan fikrlash o‘ rniga yodlab olishga asoslangan strategiyani kuchaytirishi qayd etiladi.

Muhandislik ta’limi kontekstida Liljedahl (2020) tomonidan ishlab chiqilgan "Fikrlovchi sinf" (Thinking Classroom) kontseptsiyasi alohida ahamiyatga ega: nomuvofiq topshiriqlar va "ko‘ rinadigan fikrlash maydonlari" talabalarning o‘ quv jarayonidagi faolligi va mustaqilligini tubdan o‘ zgartirishi, bu esa muhandislik ta’limiga ham muvaffaqiyatli transfer qilinishi mumkinligi ko‘ rsatilgan. Michalewicz va Michalewicz (2008) tomonidan taklif etilgan "boshqotirmaga asoslangan ta’lim" (puzzle-based learning) kontseptsiyasi ham muhandislik matematikasi va texnik fanlarni o‘ qitishda nostandart, qiziqarli masalalardan foydalanishning samarali vositasi sifatida tan olingan.

Kirxgof qoidalarini o‘ qitishga bag‘ ishlangan maxsus tadqiqotlar orasida Ziauddin va boshqalar (2016) talabalar odatda faqat bitta konturga nisbatan qo‘ llaniladigan ikkinchi qoida (KVL) versiyasini o‘ rganishlarini, biroq ko‘ p konturli tarmoqlarda uni har bir mumkin bo‘ lgan konturga qo‘ llash zarurligi haqida yetarlicha aniq tushunchaga ega bo‘ lmasliklarini ko‘ rsatadi, bu esa umumlashtirilgan (multiple-loop) yondashuvni o‘ qitishga alohida e’tibor qaratish zarurligini asoslaydi. Shu bilan bog‘ liq holda, DC zanjirlarni yechishning variatsion usullariga bag‘ ishlangan tahlilda ta’kidlanishicha, KVL ning tabiatan abstrakt bo‘ lishi — konturni aylanib chiqish yo‘ nalishini tanlash va ishoralarni belgilash zarurati — talabalar uchun asosiy qiyinchilik manbai bo‘ lib, muqobil pedagogik yondashuvlarni izlash zaruriyatini keltirib chiqaradi.

Elektr zanjirlariga oid tushunchaviy xatolar bo‘ yicha o‘ tkazilgan tadqiqotlarda ko‘ rsatilishicha, o‘ quvchi va talabalarning elektr yurituvchi kuch (EYK) va potensial farqi tushunchalariga oid noto‘ g‘ ri tasavvurlari o‘ qitish jarayonida yangi o‘ quv dasturi va mos metodik materiallar joriy etilmasa, uzoq vaqt saqlanib qoladi. Bu topilma an’anaviy formulaga asoslangan o‘ qitishning yetarli emasligini va tushunchaviy o‘ zgarishga (conceptual change) yo‘ naltirilgan metodikaning zarurligini yana bir bor tasdiqlaydi.

Muammoga asoslangan ta’limning tanqidiy fikrlashga ta’siriga bag‘ ishlangan tizimli sharh (systematic review) shuni ko‘ rsatadiki, an’anaviy o‘ qitish usullari tanqidiy fikrlash ko‘ nikmalarini rivojlantirish uchun yetarli emas va zamonaviy ta’lim tizimlari o‘ quvchilarni faol jalb qiluvchi, hamkorlikka asoslangan strategiyalarni tanlashi lozim. Xususan, kichik guruhlarda muammoni birgalikda tahlil qilish va yechim topish jarayoni nafaqat kognitiv, balki metakognitiv ko‘ nikmalarni — o‘ z fikrlash jarayonini kuzatish, baholash va tartibga solish qobiliyatini — rivojlantirishga xizmat qilishi ta’kidlanadi.

Boshqa tadqiqotlarda nomuvofiq topshiriqlar bilan muntazam ishlagan o‘ quvchilarning yechim jarayonini asoslashda va olingan natijani izohlashda ko‘ proq ijodkorlik va tanqidiylik namoyon etishi qayd etiladi; bunday o‘ quvchilarda matematik-texnik mulohaza yuritish va muammoni samarali yechish qobiliyati yaxshiroq rivojlangan. Shu bilan birga, real hayotiy kontekstga asoslangan strategiyalar o‘ quvchilarning dalillarni baholash va tegishli g‘ oyalarni murakkab, real vaziyatlarga tatbiq etish borasidagi tanqidiy fikrlash qobiliyatini sezilarli darajada oshirishi statistik jihatdan tasdiqlangan.

Shunga qaramay, adabiyotlar tahlili ko‘ rsatadiki, aynan Kirxgof qoidalariga xos, muhandislik amaliyotiga yaqinlashtirilgan nostandart topshiriqlarning tizimli taksonomiyasi va uni bosqichma-bosqich joriy etish metodikasi bo‘ yicha alohida, yaxlit ishlanmalar hozircha yetarli emas: mavjud tadqiqotlar ko‘ proq umumiy PBL yondashuvlariga

yoki matematik nomuvofiq masalalarga bag‘ ishlangan bo‘ lib, elektrotexnika sohasidagi fanga xos (domain-specific) didaktik vositalarni yetarlicha yoritmaydi. Bu holat ushbu tadqiqotning ilmiy nishasini (research gap) belgilaydi va Kirxgof qoidalariga ixtisoslashgan taksonomiya ishlab chiqish zaruriyatini asoslaydi.

3. TADQIQOT METODOLOGIYASI

Tadqiqot metodologiyasi ikki bosqichda amalga oshirildi: (1) nazariy-analitik bosqich va (2) metodik-loyihalash bosqichi.

3.1. Nazariy-analitik bosqich

Ushbu bosqichda 2012–2026-yillar oralig‘ ida chop etilgan, muammoli ta’lim, nomuvofiq topshiriqlar nazariyasi va Kirxgof qoidalarini o‘ qitish metodikasiga bag‘ ishlangan ilmiy manbalar (jurnal maqolalari, konferensiya materiallari, monografiyalar) tizimli tahlil qilindi. Manbalarni izlash Google Scholar, ScienceDirect, Springer, MDPI, ResearchGate va arXiv platformalarida amalga oshirildi. Tanlov mezonlari sifatida quyidagilar belgilandi: (a) muammoli/nomuvofiq topshiriqlarga asoslangan ta’lim mavzusiga bevosita aloqadorlik; (b) muhandislik yoki fizika ta’limi konteksti; (c) o‘ zaro tekshiruvdan (peer review) o‘ tgan nashr sifatida chop etilganlik.

3.2. Metodik-loyihalash bosqichi

Adabiyotlar tahlili natijalari asosida nostandart topshiriqlarning didaktik taksonomiyasi ishlab chiqildi (1-jadvalga qarang). Taksonomiya quyidagi mezonlar bo‘ yicha shakllantirildi: kognitiv murakkablik darajasi (Bloom taksonomiyasiga moslashtirilgan holda), ma’lumot to‘ liqligi (yetarli/yetarli emas/ortiqcha), zanjir topologiyasining murakkabligi va amaliy-muhandislik kontekstga yaqinligi. Har bir topshiriq turi uchun namunaviy stsenariy, kutilayotgan kognitiv faoliyat turi va tavsiya etiladigan baholash usuli belgilandi.

Ishlab chiqilgan modelning ichki mantiqiy izchilligini tekshirish uchun ekspert baholash usulidan foydalanildi: model tuzilishi elektrotexnika fanlari o‘ qituvchilari doirasida muhokama qilinib, taksonomiya tarkibi va bosqichlar ketma-ketligi aniqlashtirildi. Metodikaning amaliy joriy etilishini kuzatish uchun sinov-nazorat (pilot) sxemasi ishlab chiqildi: u boshlang‘ ich diagnostika, aralashuv (nostandart topshiriqlar tizimini joriy etish) va yakuniy baholash bosqichlaridan iborat bo‘ lib, natijalarni o‘ lchash uchun quyidagi ko‘ rsatkichlar tavsiya etiladi: masala yechish to‘ g‘ riligi, yechim yo‘ lining asoslanganlik darajasi, mustaqil xato topish qobiliyati va topshiriqni bajarishga sarflangan vaqt. 2-jadvalda ushbu ko‘ rsatkichlar bo‘ yicha kutilayotgan natijalarning nazariy (model) namunasi keltirilgan; ushbu raqamlar to‘ liq miqyosli empirik tadqiqot o‘ tkazilgunga qadar faqat baholash sxemasini ko‘ rsatish maqsadida keltirilgan bo‘ lib, real tajriba-sinov ma’lumotlari bilan almashtirilishi lozim.

3.3. Kutilayotgan tadqiqot dizayni (empirik bosqich uchun tavsiya)

Metodikani real sharoitda tekshirish uchun kvazi-eksperimental dizayn tavsiya etiladi: ikkita parallel guruh (nazorat va tajriba guruhlari) tanlanib, ular boshlang‘ ich bilim darajasi bo‘ yicha tenglashtiriladi (masalan, umumiy fizika yoki matematika fani bo‘ yicha o‘ zlashtirish ko‘ rsatkichlari asosida). Nazorat guruhida an’anaviy uslubda, tajriba guruhida esa taklif etilgan taksonomiya asosida darslar olib boriladi. Ta’lim davri yakunida ikkala guruhda ham bir xil yakuniy nazorat ishi o‘ tkazilib, natijalar statistik jihatdan (masalan, Styudent t-testi yoki Mann-Uitni U-testi yordamida) qiyoslanadi. Namunaviy hajm sifatida kamida 30–40 nafar talabadan iborat ikkita guruh tavsiya etiladi, bu esa statistik ishonchlilikni ta’minlashga xizmat qiladi.

Ma’lumotlarni yig‘ ish vositalari sifatida quyidagilardan foydalanish mumkin: (a) yakuniy nazorat ishi (bir xil qiyinlik darajasidagi standart va nostandart masalalar aralashmasi); (b) talabalarning yechim yo‘ lini yozma asoslashini baholovchi rubrika (0–3 ball tizimida); (c) o‘ qituvchi kuzatuv varag‘ i, unda darsdagi faollik, savol berish chastotasi va hamkorlikdagi ishtirok qayd etiladi; (d) ixtiyoriy so‘ rovnoma, unda talabalarning metodikaga nisbatan sub’ektiv munosabati (Likert shkalasi, 1–5 ball) o‘ lchanadi.

Tadqiqotda qo‘ llanilgan asosiy metodlar quyidagilar:

- ilmiy-pedagogik adabiyotlarni tizimli tahlil qilish va sintez qilish;
- didaktik modellashtirish (taksonomiya va bosqichli model yaratish);
- qiyosiy tahlil (an’anaviy va nostandart yondashuvlarni solishtirish);
- ekspert baholash (model tuzilishini pedagoglar bilan muhokama qilish);
- pedagogik kuzatuv va o‘ z-o‘ zini baholash sxemasini loyihalash.

4. NATIJALAR VA TAHLIL

Tadqiqot natijasida Kirxgof qoidalariga oid nostandart topshiriqlarning yetti turdan iborat taksonomiyasi ishlab chiqildi (1-jadval). Har bir tur o‘ ziga xos kognitiv talab darajasiga ega bo‘ lib, ular reproduktiv darajadan ijodiy darajaga qadar bosqichma-bosqich joylashtirilgan.

1-jadval. Kirxgof qoidalariga oid nostandart topshiriqlar taksonomiyasi

Topshiriq turi	Mohiyati	Rivojlantiriladigan ko‘ nikma	Kognitiv daraja

Yetarli bo‘ lmagan ma’lumot	Zanjirda bitta parametr (masalan, EYK) berilmaydi, uni nazariy yo‘ l bilan topish talab etiladi	Tahliliy xulosa chiqarish	Qo‘ llash / Tahlil
Ortiqcha ma’lumot	Barcha kattaliklar berilgan, lekin ba’zilari hisobga zarur emas	Tanqidiy saralash	Tahlil
Ko‘ p konturli murakkab tuzilma	Kub qirralari, ko‘ prik sxemasi kabi nosimmetrik tarmoqlar	Simmetriya asosida soddalashtirish	Tahlil / Sintez
Teskari masala	Tok/kuchlanish qiymatlaridan noma’lum qarshilik yoki topologiyani tiklash	Teskari mantiqiy fikrlash	Sintez
Xatoli sxema	Qasddan xato yechilgan misolni tahlil qilish	Xatoni diagnostika qilish	Baholash
Amaliy-muhandislik konteksti	Real qurilma (masalan, quyosh paneli tizimi) misolida masala	Natijani amaliy talqin qilish	Baholash / Yaratish
Kompyuter modellashtirish bilan uyg‘ unlashgan	Qo‘ lda hisoblash va simulyatsiya (masalan, LTspice) natijalarini solishtirish	Model va real natija farqini tahlil qilish	Tahlil / Baholash

Taksonomiya asosida topshiriqlarni darsga joriy etishning bosqichma-bosqich (uch bosqichli) modeli taklif etildi: (1) reproduktiv bosqich — standart zanjir va aniq algoritm; (2) qisman izlanuvchan bosqich — o‘ zgartirilgan shart yoki noodatiy topologiya; (3) ijodiy bosqich — ochiq masala, muhandislik qarori talab qilinadigan vaziyat. Ushbu model L. S. Vygotskiyning "yaqin rivojlanish zonasi" tamoyiliga mos ravishda talabani asta-sekin mustaqil faoliyatga o‘ tkazishga yo‘ naltirilgan.

An’anaviy va taklif etilgan nostandart yondashuvni bir necha mezon bo‘ yicha qiyoslash 2-jadvalda keltirilgan. Qiyosiy tahlil adabiyotlar tahlili (2-bo‘ lim) asosida shakllantirilgan nazariy modelni aks ettiradi.

2-jadval. An’anaviy va nostandart yondashuvlarning qiyosiy tahlili

Mezon	**An’anaviy yondashuv**	**Nostandart topshiriqlar tizimi**
Topshiriq tuzilishi	Yopiq, bitta to‘ g‘ ri javobli	Ochiq yoki ko‘ p yechimli
Talaba faoliyati	Algoritmni takrorlash	Mustaqil tahlil va qaror qabul qilish
Xatolarga munosabat	Xato — salbiy natija	Xato — o‘ rganish manbai (diagnostika)
Baholash predmeti	Yakuniy javob to‘ g‘ riligi	Yechim yo‘ lining asoslanganligi
Amaliyotga yaqinlik	Past (mavhum sxemalar)	Yuqori (real muhandislik konteksti)
Rivojlanadigan ko‘ nikma	Hisoblash tezligi	Tanqidiy va tizimli fikrlash

Pedagogik samaradorlikni kuzatish uchun taklif etilgan baholash sxemasi asosida quyidagi ko‘ rsatkichlar model tarzida taqdim etiladi (3-jadval). Ta’kidlash lozimki, quyidagi qiymatlar real tajriba-sinov natijalari emas, balki adabiyotlar tahlilida qayd etilgan tendentsiyalar (PBL va nomuvofiq topshiriqlarning ijobiy ta’siri) asosida shakllantirilgan illyustrativ modeldir va ular metodikani amaliyotda qo‘ llagan tadqiqotchi tomonidan real o‘ lchov natijalari bilan almashtirilishi shart.

3-jadval. Baholash ko‘ rsatkichlari va ularning nazariy (model) dinamikasi — namuna

Ko‘ rsatkich	**An’anaviy guruh (model)**	**Nostandart topshiriqlar guruhi (model)**
Masalani mustaqil tahlil qilish darajasi	Past–o‘ rta	O‘ rta–yuqori
Yechim yo‘ lini asoslash sifati	Formal, qisqa	Batafsil, mantiqiy izchil
Xatoni mustaqil aniqlash qobiliyati	Cheklangan	Sezilarli darajada yaxshilangan
Amaliy kontekstga moslashuvchanlik	Past	Yuqori

Olingan nazariy natijalar shuni ko‘ rsatadiki, taklif etilgan taksonomiya va bosqichma-bosqich model adabiyotlarda qayd etilgan muammoli ta’lim va nomuvofiq topshiriqlarning ijobiy ta’siriga oid umumiy tendentsiyalarga mos keladi. Xususan, ko‘ p konturli va teskari masalalar turi talabani Kirxgof ikkinchi qoidasini nafaqat bitta konturga, balki tarmoqning barcha mumkin bo‘ lgan konturlariga nisbatan qo‘ llashga majbur qiladi, bu esa adabiyotlar tahlilida qayd etilgan asosiy tushunchaviy qiyinchilikni bevosita bartaraf etishga yo‘ naltirilgan. Xatoli sxema va ortiqcha/yetarli bo‘ lmagan ma’lumot turlari esa talabaning tanqidiy tahlil va o‘ z-o‘ zini nazorat qilish ko‘ nikmalarini rivojlantirishga xizmat qiladi.

4.1. Topshiriq tiplarining o‘ zaro bog‘ liqligi va darsga taqsimlanishi

Amaliyotda taksonomiyaning yetti turini bir semestr davomida qanday taqsimlash kerakligi metodik jihatdan muhim masaladir. Tavsiya etilgan yondashuvga ko‘ ra, semestrning birinchi uchdan bir qismida (kirish mavzulari davrida) "ortiqcha ma’lumot" va "yetarli bo‘ lmagan ma’lumot" turidagi topshiriqlar ustuvor bo‘ ladi, chunki ular talabani asosiy tenglamalar tizimini ongli ravishda tuzishga o‘ rgatadi va hali murakkab topologik tahlilni talab qilmaydi. O‘ rta bosqichda (ko‘ p konturli zanjirlar mavzusi o‘ rganilganda) "ko‘ p konturli murakkab tuzilma" va "xatoli sxema" turidagi topshiriqlar kiritiladi. Semestrning yakuniy bosqichida esa "teskari masala", "amaliy-muhandislik konteksti" va "kompyuter modellashtirish bilan uyg‘ unlashgan" topshiriqlar orqali talaba oldingi bosqichlarda egallagan bilimlarni sintez qilishga yo‘ naltiriladi.

Bunday taqsimot nafaqat mavzuning mantiqiy ketma-ketligiga, balki talabaning kognitiv yuklanishini bosqichma-bosqich oshirish tamoyiliga ham asoslanadi: har bir yangi topshiriq turi oldingi bosqichda shakllangan ko‘ nikmalar ustiga quriladi, bu esa "kognitiv yuklanish nazariyasi" (cognitive load theory) nuqtai nazaridan ham oqilona hisoblanadi — talaba bir vaqtning o‘ zida haddan tashqari ko‘ p yangi elementni qayta ishlashga majbur bo‘ lmaydi.

4.2. Metodikani joriy etishda uchraydigan mumkin bo‘ lgan qiyinchiliklar

Taklif etilgan metodikani amaliyotga joriy etishda bir qator amaliy qiyinchiliklar yuzaga kelishi mumkin. Birinchidan, nostandart topshiriqlarni tayyorlash o‘ qituvchidan an’anaviy misollarga nisbatan ko‘ proq vaqt va metodik tayyorgarlik talab qiladi. Ikkinchidan, dastlabki bosqichda talabalar ochiq va noaniq shartli masalalarga psixologik jihatdan tayyor bo‘ lmasligi, hatto ma’lum darajada qarshilik ko‘ rsatishi mumkin, chunki ular "bitta to‘ g‘ ri javob" mavjud bo‘ lgan an’anaviy formatga o‘ rganib qolgan bo‘ ladi. Uchinchidan, baholash tizimini yakuniy javobdan yechim yo‘ lining sifatiga qarab baholashga o‘ tkazish o‘ qituvchidan aniq va shaffof rubrikalar ishlab chiqishni talab qiladi, aks holda baholashning sub’ektivligi oshishi mumkin.

Ushbu qiyinchiliklarni bartaraf etish uchun quyidagi amaliy tavsiyalar berilishi mumkin: o‘ qituvchilar uchun metodik seminarlar va namunaviy topshiriqlar bankini yaratish; talabalarni yangi formatga bosqichma-bosqich, kichik "isinish" (warm-up) topshiriqlari orqali moslashtirish; baholash uchun oldindan aniq mezonlar (rubrikalar) ishlab chiqib, ularni talabalarga dars boshida e’lon qilish.

5. XULOSA

O‘ tkazilgan tadqiqot natijasida quyidagi xulosalarga kelindi. Birinchidan, an’anaviy o‘ qitish usuli Kirxgof qoidalarini formal o‘ zlashtirishni ta’minlasa-da, talabalarning bilimni nostandart va amaliy-muhandislik vaziyatlarga tatbiq etish qobiliyatini yetarli darajada rivojlantirmaydi. Ikkinchidan, muammoli ta’lim va nomuvofiq topshiriqlar nazariyasiga asoslangan yetti turdan iborat taksonomiya (yetarli bo‘ lmagan/ortiqcha ma’lumot, ko‘ p konturli tuzilmalar, teskari masalalar, xatoli sxemalar, amaliy-muhandislik konteksti va kompyuter modellashtirish bilan uyg‘ unlashtirilgan topshiriqlar) Kirxgof qoidalarini o‘ qitishning metodik salohiyatini kengaytiradi. Uchinchidan, taklif etilgan uch bosqichli (reproduktiv — qisman izlanuvchan — ijodiy) model talabani asta-sekin mustaqil tahliliy faoliyatga yo‘ naltirishga xizmat qiladi.

Tadqiqotning cheklovi shundaki, taklif etilgan model va baholash ko‘ rsatkichlari hozircha nazariy-metodik xarakterga ega bo‘ lib, keng miqyosli empirik (tajriba-sinov) tekshiruvni talab qiladi. Shu sababli, kelgusi tadqiqotlar quyidagi yo‘ nalishlarda davom ettirilishi tavsiya etiladi: (1) taklif etilgan taksonomiyani amaliyotga joriy etib, nazorat va tajriba guruhlari o‘ rtasida statistik ishonchli qiyosiy tahlil o‘ tkazish; (2) raqamli simulyatsiya vositalari (Multisim, LTspice, Proteus) bilan integratsiyalashgan topshiriqlar samaradorligini alohida baholash; (3) metodikani boshqa fizik-texnik fanlar (masalan, Kirxgof qoidalariga o‘ xshash tarmoq tenglamalari qo‘ llaniladigan gidravlika yoki issiqlik tarmoqlari) uchun moslashtirish imkoniyatlarini o‘ rganish.

Umuman olganda, ushbu tadqiqotda taklif etilgan metodika oliy ta’lim muassasalarida elektrotexnika fanlarini o‘ qitish sifatini oshirish, bo‘ lajak muhandislarda tizimli va tanqidiy fikrlashni shakllantirish uchun amaliy asos bo‘ lib xizmat qilishi mumkin.

MUALLIFLAR HISSASI BAYONOTI

[TO‘ LDIRILISHI SHART] Bir nechta muallif bo‘ lgan taqdirda, har bir muallifning hissasini CRediT taksonomiyasiga muvofiq ko‘ rsating, masalan: F.I.Sh.1 — kontseptsiya va tadqiqot dizayni, adabiyotlar tahlili, matnni yozish; F.I.Sh.2 — metodologiyani ishlab chiqish, ma’lumotlarni tahlil qilish, matnni tahrirlash. Yakka muallif bo‘ lsa: "Maqolaning barcha bosqichlari (kontseptsiya, adabiyotlar tahlili, metodologiya, yozish va tahrirlash) muallif tomonidan mustaqil bajarilgan."

MANFAATLAR TO‘ QNASHUVI BAYONOTI

Mualliflar ushbu maqolaning nashr etilishi bilan bog‘ liq har qanday moliyaviy, kasbiy yoki shaxsiy manfaatlar to‘ qnashuvi mavjud emasligini bildiradilar.

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ICHKI ISHLAR ORGANLARI XODIMLARINING KASBIY MALAKASINI OSHIRISHNING MEXANIZMLARI

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Annotatsiya: *Mazkur maqolada ichki ishlar organlari xodimlarining kasbiy malakasini oshirishning tashkiliy, pedagogik, kompetensiyaviy va raqamli mexanizmlari tadqiq etilgan. Kasbiy malaka nazariy bilimlar bilan cheklanmay, huquqni qo‘llash, xizmat vaziyatida qaror qabul qilish, kommunikativ, jismoniy-jangovar, axborot-texnologik va boshqaruv kompetensiyalarining amaliy uyg‘unligi sifatida yoritiladi. O‘zbekistondagi amaldagi normativ-huquqiy baza, jumladan PQ-3413, PQ-5076 va 2026-yildagi PQ-303-son qarorlar tahlil qilinib, xodimlarni tayyorlash, qayta tayyorlash va malakasini oshirishni uzluksiz kasbiy rivojlanish tizimiga aylantirish bo‘yicha takliflar ishlab chiqilgan. Shuningdek, Singapur va Finlandiya politsiya ta’limi tajribasi o‘rganilib, individual ehtiyoj, amaliy kompetensiya va o‘qitishdan keyingi monitoringga asoslangan model taklif etilgan.*

Kalit so‘zlar: *ichki ishlar organlari, kasbiy malaka, malaka oshirish, kompetensiya, uzluksiz ta’lim, qayta tayyorlash, kasbiy rivojlanish, raqamli ta’lim, individual ta’lim trayektoriyasi, monitoring.*

МЕХАНИЗМЫ ПОВЫШЕНИЯ ПРОФЕССИОНАЛЬНОЙ КОМПЕТЕНТНОСТИ СОТРУДНИКОВ ОРГАНОВ ВНУТРЕННИХ ДЕЛ

Аннотация: *В статье рассматриваются организационные, педагогические, компетентностные и цифровые механизмы повышения профессиональной компетентности сотрудников органов внутренних дел. Профессиональная компетентность трактуется не просто как совокупность теоретических знаний, а как практическая интеграция компетенций в сферах правоприменения, принятия решений в оперативных ситуациях, коммуникации, физической и боевой подготовки, информационных технологий и управления. В статье анализируется действующая нормативно-правовая база Узбекистана (в частности, постановления PQ-3413, PQ-5076 и PQ-303) и формулируются предложения по трансформации процессов подготовки, переподготовки и повышения квалификации персонала в систему непрерывного профессионального развития. Кроме того, рассматривается опыт подготовки полицейских кадров в Сингапуре и Финляндии, а также предлагается модель, основанная на учете индивидуальных потребностей, развитии практических компетенций и мониторинге результатов обучения.*

Ключевые слова: *органы внутренних дел, профессиональная компетентность, профессиональное развитие, компетенция, непрерывное образование, переподготовка, профессиональный рост, цифровое образование, индивидуальная траектория обучения, мониторинг.*

MECHANISMS FOR ENHANCING THE PROFESSIONAL COMPETENCE OF INTERNAL AFFAIRS PERSONNEL

Abstract: *This article examines the organizational, pedagogical, competency-based, and digital mechanisms for enhancing the professional competence of internal affairs personnel. Professional competence is portrayed not merely as theoretical knowledge, but as a practical integration of competencies in law enforcement, decision-making in operational situations, communication, physical combat, information technology, and management. The article analyzes the current regulatory framework in Uzbekistan—specifically Resolutions PQ-3413, PQ-5076, and PQ-303 (2026)—and develops proposals to transform the training, retraining, and professional development of personnel into a system of continuous professional development. Additionally, the article reviews police training practices in Singapore and Finland and proposes a model based on individual needs, practical competencies, and post-training monitoring.*

Keywords: *internal affairs bodies, professional competence, professional development, competence, continuous education, retraining, professional growth, digital education, individual learning trajectory, monitoring.*

KIRISH

Ichki ishlar organlari faoliyatining samaradorligi, avvalo, xizmat vazifalarini professional darajada bajarishga qodir bo‘lgan xodimlarning bilim, ko‘nikma va kompetensiyasiga bog‘liq. Xodim xizmatga qabul qilinganidan keyin uning

kasbiy rivojlanishi yakunlanmaydi. Qonunchilikdagi o‘ zgarishlar, yangi turdagi huquqbuzarliklar, raqamli texnologiyalar, jamoatchilik bilan muloqot talablari va xizmat vaziyatlarining murakkablashuvi xodimdan doimiy ravishda yangi bilim va ko‘ nikmalarni egallashni talab qiladi.

PQ-3413-son qarori bilan tasdiqlangan Nizomda xodimlarni tayyorlash, qayta tayyorlash va ularning malakasini oshirishga bag‘ ishlangan alohida bob mavjud. 2021-yildagi PQ-5076-son qarori esa professional kadrlar tayyorlashning yangi tizimini va ichki ishlar organlaridagi uzluksiz o‘ quv-karyera jarayonini nazarda tutgan.

2026-yil 26-avgustdagi PQ-303-son qarorida professional kadrlarni tayyorlash, qayta tayyorlash va malakasini oshirishning maqsadli o‘ quv mexanizmlarini joriy etish, zamonaviy texnologiyalar va raqamli yechimlardan foydalanish hamda ta’lim tizimini transformatsiya qilish vazifalari belgilangan. Qarorda rahbar kadrlarni baholash va malakasini oshirish, pedagogik kompetensiyalarni rivojlantirish hamda rivojlanishni raqamli monitoring qilish yo‘ nalishlari ham nazarda tutilgan.

Shu sababli tadqiqotning maqsadi IIO xodimlarining kasbiy malakasini oshirishni kursga yuborish bilan cheklanmaydigan, xodimning lavozimi, xizmat tajribasi, kompetensiya bo‘ shlig‘ i va kelgusidagi xizmat vazifalariga moslashtirilgan uzluksiz boshqaruv mexanizmi sifatida asoslashdan iborat.

MATERIALLAR VA METODLAR

Tadqiqotda normativ-huquqiy hujjatlarni tahlil qilish, tizimli yondashuv, qiyosiy tahlil, kompetensiyaviy yondashuv, jarayonlarni modellashtirish va amaliy takliflarni shakllantirish usullaridan foydalanildi. Asosiy manbalar sifatida PQ-3413, PQ-5076 va PQ-303-son qarorlarining amaldagi mazmuni o‘ rganildi. Xorijiy tajriba sifatida Singapore Police Force va Finlandiya Police University College rasmiy materiallari tahlil qilindi.

Tahlil mezonlari: malaka oshirish ehtiyojini aniqlash; o‘ quv mazmunini lavozim va xizmat vazifalariga moslashtirish; nazariy bilimni amaliy kompetensiya bilan bog‘ lash; o‘ quv natijalarini baholash; o‘ qitishdan keyingi xizmat faoliyatidagi natijalarni monitoring qilish; raqamli vositalardan foydalanish; rahbar va pedagoglarning kasbiy rivojlanishini boshqarish.

NATIJALAR

Tadqiqot natijasida IIO xodimlarining kasbiy malakasini oshirish mexanizmini besh o‘ zaro bog‘ langan bosqichdan tashkil topgan tizim sifatida ko‘ rish taklif etiladi: diagnostika →individual rejalashtirish →o‘ qitish →kompetensiyani baholash →xizmatdagi natijani monitoring qilish.

Birinchi mexanizm — kasbiy ehtiyojlarni diagnostika qilish. Xodimni kursga yuborishdan oldin uning lavozimi, xizmat staji, avvalgi ta’limi, attestatsiya natijalari, xizmat faoliyatidagi xatolar va kelgusidagi vazifalari asosida kompetensiya bo‘ shlig‘ i aniqlanadi. Natijada “hamma uchun bir xil kurs” modelidan “xodimga zarur kompetensiya” modeliga o‘ tish imkoniyati yaratiladi.

Ikkinchi mexanizm — individual kasbiy rivojlanish rejasini shakllantirish. Diagnostika natijasida xodim uchun majburiy va tanlov modullaridan iborat rivojlanish rejasi tuziladi. Masalan, profilaktika inspektori uchun huquqiy bilim, nizoli vaziyatlarda muloqot, profilaktik ishlar va raqamli ma’lumotlar bilan ishlash; tergov yo‘ nalishidagi xodim uchun protsessual hujjatlar, dalillar, raqamli izlar va suhbat o‘ tkazish kompetensiyalari ustuvor bo‘ lishi mumkin.

Uchinchi mexanizm — aralash ta’lim. Nazariy materiallarni elektron shaklda mustaqil o‘ zlashtirish, auditoriyada muammoli vaziyatlar va keyslarni tahlil qilish, mashg‘ ulotlarda amaliy ko‘ nikmalarni shakllantirish va yakunda kompleks baholash bir tizimga birlashtiriladi.

To‘ rtinchi mexanizm — kompetensiyani baholash. Malaka oshirish natijasini faqat test balli bilan aniqlash yetarli emas. Nazariy test bilan bir qatorda keys yechish, huquqiy vaziyatga qaror ishlab chiqish, hujjat tayyorlash, muloqot vaziyatini modellashtirish, jismoniy va jangovar tayyorgarlik bo‘ yicha amaliy topshiriqlar ham baholanishi lozim.

Beshinchi mexanizm — o‘ qitishdan keyingi monitoring. Xodim kursni tugatganidan keyin uning olgan bilim va ko‘ nikmalari xizmat faoliyatida qo‘ llanayotganini 3, 6 va 12 oy oralig‘ ida kuzatish mumkin. Shu tariqa malaka oshirishning haqiqiy samarasi “kursni tugatdi” emas, “xizmatdagi kompetensiyasi rivojlandi” mezoni orqali aniqlanadi.

1-jadval. IIO xodimlari kasbiy malakasini oshirishning taklif etilayotgan mexanizmlari

Mexanizm	Mazmun	Natija	Indikator
Diagnostika	Kompetensiya bo‘ shlig‘ ini aniqlash	Individual ehtiyojlar kartasi	Aniqlangan bo‘ shliqlar
Rejalashtirish	Individual rivojlanish rejasi	Lavozimga mos trayektoriya	Reja bajarilishi

O‘ qitish	Elektron kurs + keys + amaliy mashg‘ ulot	Bilim va ko‘ nikma rivoji	O‘ zlashtirish natijasi
Baholash	Test + amaliy vazifa + simulyatsiya	Kompetensiya darajasi	Nazariy/amaliy natija
Monitoring	3/6/12 oylik kuzatuv	Xizmatdagi qo‘ llanish	Natijadagi o‘ zgarish

XORIJ TAJRIBASI

Singapur tajribasi. Singapore Police Force Training & Capability Development Department xodimlarni aynan bajaradigan ishiga mos tayyorlash, ta’limni istalgan vaqtda va joyda amalga oshirish, xodimning o‘ z ta’limi uchun mas’uliyatini oshirish va rahbarlarning ish joyidagi o‘ qishni qo‘ llab-quvvatlash tamoyillarini ilgari suradi. Home Team Learning Management System xodimlarga e-learning orqali o‘ z sur’atida o‘ qish imkonini beradi. Politsiya tayyorgarligida field training, scenario-based training va experiential learning ham qo‘ llanadi.

Singapurda tergov xodimlari uchun e-courseware, mustaqil onlayn o‘ qish, scenario-based lessons, case studies va individual hamda jamoaviy taqdimotlar qo‘ llanadi; muntazam baholash orqali xodimlarning bilim, ko‘ nikma va kompetensiyalari nazorat qilinadi.

Finlandiya tajribasi. Police University College politsiya xodimlari uchun qo‘ shimcha va davomiy ta’limni tashkil etadi. 2024-yilda onlayn davomiy ta’lim imkoniyatlarini kengaytirish asosiy yo‘ nalishlardan biri bo‘ lgan.

2026-yil avgustidan Finlandiyada yangi modulga asoslangan o‘ quv dasturi joriy etilib, alohida fanlardan ko‘ ra o‘ zaro bog‘ langan kompetensiya majmualari va ish faoliyatiga asoslangan real vaziyatlar markazga qo‘ yilgan.

2-jadval. Xorijiy tajriba va O‘ zbekiston IIO uchun foydalanish yo‘ nalishlari

Davlat	Tajriba elementi	IIO uchun moslashtirish	Kutiladigan natija
Singapur	Individual e-learning, scenario-based training, baholash	Elektron kurs + xizmat vaziyati + amaliy baholash	Ta’limning xizmatga yaqinlashuvi
Finlandiya	Modulli, ish faoliyatiga asoslangan va davomiy ta’lim	Lavozim kompetensiyalari bo‘ yicha modullar	Kasbiy rivojlanish uzluksizligi

MUHOKAMA

Xorijiy tajriba IIO xodimlarining malakasini oshirishda uchta muhim yo‘ nalishni ko‘ rsatadi: malaka oshirish xizmat vazifalaridan ajralmasligi; ta’lim mazmuni lavozim va kompetensiyalarga moslashtirilishi; kurs yakunidagi baholash bilan cheklanmasdan, xodimning keyingi xizmat faoliyatidagi rivojlanishini monitoring qilish.

O‘ zbekiston sharoitida bu yondashuv PQ-303-son qarorda belgilangan professional kadrlarni tayyorlash, qayta tayyorlash va malakasini oshirishning maqsadli mexanizmlari hamda raqamli yechimlarni joriy etish vazifalari bilan uyg‘ unlashadi. Qarorda rahbar kadrlar faoliyati samaradorligini baholash, ularning kompetensiyalari va liderlik salohiyatini monitoring qilish, shuningdek pedagogik kompetensiyalarni uzluksiz rivojlantirish mexanizmlari nazarda tutilgan.

Shu asosda IIOda “malaka oshirish kursi” tushunchasini “uzluksiz kasbiy rivojlanish” tizimiga kengaytirish mumkin. Xodimning ta’lim tarixi, kompetensiya diagnostikasi, kurslari, attestatsiya va amaliy rivojlanish natijalari yagona elektron profilga birlashtirilishi kadrlar bilan ishlashda ma’lumotlarga asoslangan qarorlar qabul qilishga sharoit yaratadi.

AMALIY TAKLIFLAR

1. Har bir xodim uchun “Kasbiy rivojlanish elektron profili”ni joriy etish.
2. Malaka oshirishga yuborishdan oldin qisqa raqamli kompetensiya diagnostikasini o‘ tkazish.
3. Elektron kurs, xizmat vaziyatiga asoslangan keys, amaliy mashg‘ ulot va yakuniy baholashni yagona modulga birlashtirish.
4. Har bir kurs uchun real xizmat vaziyatiga asoslangan kamida bitta amaliy topshiriq joriy etish.
5. Kurs tugaganidan keyin 3, 6 va 12 oyda xizmatdagi natijani monitoring qilish.
6. Rahbarlar uchun qaror qabul qilish, jamoani boshqarish, nizolarni hal etish va xodimlar rivojini boshqarish modullarini kuchaytirish.
7. Pedagoglar uchun uzluksiz professional rivojlanish tizimini rivojlantirish; PQ-303da bu yo‘ nalish alohida belgilangan.

8. Malaka oshirish samaradorligini kursni tugatganlar soni bilan emas, kompetensiya o‘ zgarishi va xizmatdagi qo‘ llanish ko‘ rsatkichlari bilan baholash.

XULOSA

IIO xodimlarining kasbiy malakasini oshirish bir martalik o‘ quv kursi emas, balki xodimning butun xizmat faoliyati davomida amalga oshiriladigan uzluksiz kasbiy rivojlanish jarayoni sifatida qaralishi lozim. PQ-3413 va PQ-5076 bilan shakllangan kadrlar tayyorlash va uzluksiz o‘ quv-karyera yondashuvi 2026-yildagi PQ-303 bilan professional kadrlarni tayyorlash tizimini transformatsiya qilish, maqsadli o‘ quv mexanizmlari va raqamli yechimlar bilan rivojlantirilmoqda.

Tadqiqotda taklif etilgan diagnostika →individual rejalashtirish →o‘ qitish →baholash →xizmatdagi monitoring modeli xodimning real ehtiyojlarini aniqlash va ta’lim natijasini xizmat faoliyati bilan bog‘ lash imkonini beradi. Singapur va Finlandiya tajribalaridan kelib chiqib, elektron ta’lim, amaliy keyslar, modulli o‘ qitish va davomiy kasbiy rivojlanish mexanizmlarini milliy tizimga moslashtirish IIO xodimlarining kasbiy tayyorgarligini tizimli tashkil etishga xizmat qilishi mumkin.

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BADIIY ASAR MATNLARNI O‘ QITISH JARAYONIDA BOSHLANG‘ ICH SINF O‘ QUVCHILARINING NUTQIY KO‘ NIKMALARNI RIVOJLANTIRISH

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Annotatsiya: *Mazkur maqolada bugungi kunda ona tili va o‘ qish savodxonligi darslarida o‘ quvchilarning badiiy asar matn ustida ishlashda nutqiy ko‘ nikmalarni rivojlantirishning metodik usullari, mazmuni va ahamiyati haqida bayon etiladi. Ayniqsa boshlang‘ ich sinfda nutqni rivojlantirishda badiiy asar matnlari orqali o‘ quvchilarda axborot almashish, hayotiy vaziyatlarda olingan bilimlarni qo‘ llash kabi malakalarni shakllantirishga qaratilgan topshiriqlar keltirilgan.*

Kalit so‘ zlar: *nutq, savodxonlik, badiiy asar matni, matnni tushunish, o‘ qib tushunish, til ko‘ nikmalari, kompetensiya, lingvistik, o‘ qib anglash ko‘ nikmasi, muallif g‘ oyasi.*

РАЗВИТИЕ РЕЧЕВЫХ НАВЫКОВ У УЧАЩИХСЯ НАЧАЛЬНЫХ КЛАССОВ ПОСРЕДСТВОМ ИЗУЧЕНИЯ ХУДОЖЕСТВЕННЫХ ТЕКСТОВ

Аннотация: *В данной статье излагаются содержание и значение методических приёмов развития речевых навыков учащихся при работе с текстом художественного произведения на уроках родного языка и читательской грамотности. В частности, приводятся задания, направленные на формирование у учащихся начальных классов таких умений, как обмен информацией и применение полученных знаний в жизненных ситуациях посредством работы с текстами художественных произведений.*

Ключевые слова: *речь, грамотность, текст художественного произведения, понимание текста, понимание прочитанного, языковые навыки, компетенция, лингвистический, навык осмысления прочитанного, авторская идея.*

DEVELOPING PRIMARY SCHOOL STUDENTS’ SPEECH SKILLS THROUGH THE STUDY OF LITERARY TEXTS

Abstract: *This article describes the content and significance of methodological methods for developing students’ speech skills when working on the text of a literary work in native language and reading literacy classes today. Tasks aimed at forming skills such as information exchange and applying acquired knowledge in life situations through literary texts are presented, especially in primary school speech development.*

Keywords: *speech, literacy, text of a work of art, text comprehension, reading comprehension, language skills, competence, linguistic, reading comprehension skills, author’s idea.*

KIRISH VA DOLZARBLIGI

O‘ zbekistonda so‘ nggi yillarda ona tili ta’limini takomillashtirish, o‘ quvchilarning nutqiy ko‘ nikmalarini rivojlantirish bo‘ yicha keng qamrovli islohatlar amalga oshirilmoqda. Xususan tilni rivojlantirish va egallanadigan ko‘ nikmalarning o‘ quvchilarning til bilimlarini o‘ zlashtirishida muhim ahamiyat kasb etishini taqoza etadi.

O‘ zbekiston Respublikasi Prezidentining PF-6094 sonli “Ta’lim tizimini raqamlashtirish bo‘ yicha chora-tadbirlari to‘ g‘ risida”gi Farmonida raqamli ta’limni rivojlantirishga qaratilgan chora tadbirlar belgilanadi[1]. Farmonga ko‘ ra o‘ quvchilarda ona tili ta’limini takomillashtirish, o‘ rgatish uchun zamonaviy texnologiyalar joriy qilish, shu jumladan elektron darsliklar, video-audio darsliklar va interaktiv o‘ quv materiallarini ishlab chiqish vazifasi belgilanadi. Bu jarayonlar o‘ quvchilarning ona tili va o‘ qish savodxonligi darslarida og‘ zaki va yozma nutqini yanada rivojlantirishga xizmat qiladi.

Pedagogik va psixologik nuqtayi nazardan qaraydigan bo‘ lsak bilish va tafakkurning muhim quroli bo‘ lgan nutqni takomillashtirmasdan turib, har tomonlama rivojlangan shaxsni tarbiyalash imkonsizdir. Nutq inson muloqotining asosiy vositasi bo‘ lib, u nafaqat axborot almashish, balki hissiy-irodaviy ta’ sir ko‘ rsatish, tafakkurni shakllantirish va ijtimoiy

moslashuv funksiyalarini ham bajaradi. Shu sababli nutqiy rivojlanish boshlang‘ ich ta’ limning strategik yo‘ nalishlaridan biri sifatida belgilanadi.

METODLAR VA O‘ RGANILISH DARAJASI.

Boshlang‘ ich sinflarda nutqiy rivojlanishning asosiy tarkibiy qismlaridan biri bog‘ lanishli nutqni shakllantirishdir. Bu jarayon nafaqat til birliklarini o‘ zlashtirish, balki matnni idrok etish, tahlil qilish, qayta hikoyalash va ijodiy ifodalash kabi murakkab aqliy faoliyat turlarini qamrab oladi. Bir qator tadqiqotchilar, tilshunoslar, psixologlar, pedagog olimlar so‘ nggi yillarda boshlang‘ ich maktab o‘ quvchilarining nutq madaniyati umumiy darajasining pasayish tendensiyasini qayd etmoqdalar. Bu holat ijtimoiy muhit, ommaviy axborot vositalarining ta’ siri hamda ta’ lim jarayonidagi uslubiy kamchiliklar bilan izohlanadi. Rus olimi Lvov va boshqada metodistlar matnda nutq va tafakkur o‘ rtasidagi uzviy bog‘ liqlikni isbotlab, nutqiy faoliyatni rivojlantirishning psixologik va lingvistik mexanizmlarini ochib berganlar [2]. Biroq, mavjud nazariy asoslarga qaramay, boshlang‘ ich sinf o‘ quvchilarining nutqiy rivojlanish darajasi amaliyotda ko‘ plab hollarda yetarli emas. Shu nuqtai nazardan, nutqni rivojlantirishning ilmiy asoslangan, tizimli va uslubiy jihatdan puxta ishlab chiqilgan metodikasiga ehtiyoj ortib bormoqda.

Til ta’limi tadqiqotchi olimlardan Mavlonova K., Umarova I., Eshniyazova N., Majidova S., Tuychieva M.B., Kurbonova Nodiralar tomonidan “Integration of Artificial Intelligence and Digital Technologies in Language Education (Til ta’limida sun’iy intellekt va raqamli texnologiyalar integratsiyasi) nomli maqolasida[3] til ta’limida badiiy matnlarni Sun’iy intellect texnologiyalaridan foydalanish orqali o‘ quvchilarda til ko‘ nikmalarini rivojlantirish asoslari masalalariga alohida to‘ xtalib o‘ tgan.

TADQIQOT NATIJALARI.

Badiiy asarlarni o‘ qish darslari esa bu borada alohida imkoniyatga ega: ular o‘ quvchilarda obrazli idrok, hissiy kechinma, so‘ z boyligini oshirish va ifodali nutqni shakllantirish uchun samarali vosita hisoblanadi. Aynan badiiy matn bilan ishlash jarayonida o‘ quvchi sintaktik tuzilmalarni o‘ zlashtiradi, matn mazmunini chuqur anglaydi, muallif pozitsiyasini tushunadi va o‘ z fikrini izchil, mantiqiy, badiiy-ifodali tarzda bayon etishga o‘ rganadi[4]. Boshlang‘ ich sinf o‘ quvchilari uchun quyida keltirilgan badiiy matn o‘ quvchilarda nutqiy ko‘ nikmalarni rivojlantirishda yanada keng imkoniyat yaratadi.

ERTAKLAR OLAMI: MEHRIBONLAR MAMLAKATIDA

Bu qanday joy bo‘ ldi? Qayerga kelib qoldim? Asta-sekin xotiram joyiga kela boshladi. Shoshma, men sirli kalit tilsimini izlab, zamon va makon sarhadidan o‘ tib ketdim-ku. Bu joy qaysi zamon, qaysi olam, qaysi mamlakat ekan? Eh, u yoqda do‘ stlarim qolib ketdi-ku. Uydagilar meni deb xavotirga tushadigan bo‘ lishdi-da. Ha, mayli, Doniyor, Turg‘ un bor-ku. Bir yo‘ lini topib turishar. Eng keraklisi, qaytish uchun kalit so‘ z esimda.

Shu kabi o‘ y-xayollar bilan bo‘ lib, ust-boshimni changlardan qoqib tursam, bir otaxonning ovozi eshitildi:

- Hoy, bo‘ talog‘ im, kimsan?

Yo Xudoyim, ovoz xuddi amakimkiniga o‘ xshardi. Xursand bo‘ lganimdan yig‘ lab yuboray dedim. Ne ko‘ z bilan ko‘ rayki, qarshimda xuddi amakimga o‘ xshagan oppoq kiyimli Xizrsifat bir bobo turardi. Soqollari ko‘ ksiga tushgan, qo‘ lida tayog‘ i bor edi.

- Assalomu alaykum, bobojon! – deya unga ta’zim qilib, yoniga bordim.

- Va alaykum assalom, mullo bo‘ ling! Turishingizdan bizning yurt bolasiga o‘ xshaymiz! Ammo so‘ zlashingiz bizning tilga ancha yaqin. Qaysi yurtlardan bo‘ lasiz? Bu hech kimsa yo‘ q joyda qayerdan paydo bo‘ ldingiz?

- Men kelajakdan kelib qoldim, bobo. Ismim Olimjon. Sizniki-chi?

- Mening ismim To‘ qsonboy. Yoshim ham to‘ qsonda. Mana shu adirlarda qo‘ y-u echki boqib yuraman.

- Bu qaysi olam, qaysi yurt, bobo? O‘ rganish ishimda bir sirli kalit tilsimini izlab, o‘ tmish yo ertaklar olamiga kirib qoldim, shekilli.

- Ha bolam, har bir inson o‘ tmish va ertaklar olamidan, umuman, bu sakkiz ming olam qa’ridan istalgan savoliga javob topishi mumkin. Zero, Yaratgan Egam bandalariga ilm berib, ularni behad mukofotlagan. Bu sen kelgan olamning mehribonlar o‘ lkasi hisoblanadi. Yurtimizga kelsak, hamma odamlar mehribon va rahmdil. Podshohimizdan tortib, bu elda barcha ilmli, kasb-hunarga mehr qo‘ ygan. Bu yerning eli faqat tinchlik istaydi. Shu sabab, yurtimiz sardori urushlarga ruju qo‘ ymagan. O‘ zga ellarni talab, boylik orttirishni o‘ ziga or deb biladi. Aksincha, qo‘ shni ellar bilan do‘ st bo‘ lib yashaylik, deydi. Ammo necha yillardan beri Bag‘ ritoshlar diyorining johil shohi yurtimizga ko‘ z olaytirib kelmoqda. Podshohimiz ancha yillardan beri u bilan do‘ stona ish tutishga harakat qiladilar, ammo nafi bo‘ lmadi. Oxir-oqibat, o‘ rtadagi munosabatlarga putur yetdi. Eshitishimcha, u endi qo‘ shin to‘ plab, yurtimizni istilo qilish uchun yo‘ lga chiqqanmish.

Men bir munkayib qolgan chol bo‘ lsam, qani yigitlik davrimga qaytsam-u, dushmanning boplab dodini bersam, ammo qo‘ limdan mana shu suruvni boqishdan o‘ zga ish kelmaydi.

- Bobo, bu mol-u qo‘ y, suruvlar kimga tegishli, deb so‘ radim qiziqib.

- Ha, bu suruv saltanatning mulki sanaladi.

- Saltanatingiz ancha obod, cheki-chegarasi yo‘ q bir makonga o‘ xsharkan, bobo. Ammo shunday jannatmakon o‘ lkani yovga berib qo‘ yish yaxshi emas.

- Bu gaplaringdan dono bolaga o‘ xshaysan? - bobo dasturxon yozib mehmon qilarkan, men bilan qiziqa boshladi.

- Bobo, nega xalqni yig‘ ib, dushmanga qarshi kurashga chiqmayapsizlar?

- Podshohimiz: agar dushman bizdan necha barobar ko‘ p bo‘ lsa ham kurashsak, xalqimizning mard o‘ g‘ lonlaridan ayrilishimiz va aziz o‘ lkamiz vayronaga aylanishi mumkin. Bu esa yurtimiz ravnaqini necha yillar ortga surib yuboradi. Rivojlanish to‘ xtab qoladi, balki birinchi galda, vaqtincha bo‘ lsa ham, muzokara yo‘ lini tanlash lozimdir, deb fikr qilib turibdilar.

- Bobo, haqiqatan ham, el-yurt tinchligini o‘ ylash oliy fazilat. Biroq muzokara qilganingiz bilan johil odamlar hech qachon o‘ z so‘ zida turmaydilar. Maqsadlariga yetishgach, yurtingizda istagan bezoriligini qilishi, insonlarni esa xo‘ rlashi mumkin.

- Bu gaplarni qaydan bilasan? – so‘ radi bobo hayratlanib mendan.

- Buni men tarix va ertak kitoblaridan o‘ qiganman.

Bobo gaplarimdan ta’sirlana boshlagandi. Mendan ko‘ z uzmay so‘ zlarimni tinglar edi. Balki ichida: “bu tirrancha bir qarich bo‘ lgani bilan, baloga aqli yetarkan”, deyayotgan bo‘ lsa ajab emas.

- Xo‘ sh, unda nima qilish kerak deb o‘ ylaysan?

- Bobo, dushmanni mag‘ lub etishda harbiy hiylaning zo‘ r foydasi bor. Dushman johil ekanmi, unga shafqat qilish kerak emas. Harbiy hiyla bilan uni yengish va jazosini berish kerak.

- Men bir cho‘ pon bo‘ lsam, yur, yaxshisi, seni podshohimizning oldiga olib boray. O‘ sha yerda aytadigan gapingni ayt. Balki shohimizga ma’qul bo‘ lib qolar. Ayganingdek qilinsa, yurtimiz yov changalidan qutular, - dedi boboning qalbida allaqanday ishonch paydo bo‘ lib…[5].

MATN YUZASIDAN SAVOL VA TOPSHIRIQLAR

1. Hikoyaning birinchi xatboshisiga e’tibor bering. Hikoya qahramonning o‘ z-o‘ ziga savol berishidan boshlanishi qahramon bilan bog‘ liq qanday holatni ifodalamoqda?

A. Muallif hikoya qahramonining qiziquvchanligini ifodalamoqchi

B. Muallif hikoya qahramonining boshqa bir qahramonga savol bilan murojaat etayotganini ifodalamoqchi

D. Muallif hikoya qahramonining hayronligini ifodalamoqchi

E. Muallif hikoya qahramoning qayg‘ uda ekanini ifodalamoqchi

2. Hikoya qahramoni va boboning o‘ rtasidagi munosabat qanday edi? O‘ z fikringizni hikoyadagi biror jumla yordamida asoslang.

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_____

3. Hikoyaning bosh qahramoni boboni o‘ z so‘ zlari bilan ta’sirlantirayotganini aytadi. Ayting-chi, qahramon buni qayerdan bildi?

A. Bobo bolani diqqat bilan tinglar edi.

B. Bobo bolaning so‘ zlaridan hayratlanayotganini aytgan edi.

D. Bola xuddi kattalardek gapirar edi.

E. Bobo boladan ko‘ z uzmay, uni tinglar edi.

4. Podshohning fikri asosida dushman bilan urushish natijasida yuzaga keladigan oqibatlarni aniqlang. Eng to‘ g‘ ri javobni belgilang.

A. Xalqning mard o‘ g‘ lonlaridan ayrilishi, o‘ lkaning vayronaga aylanishi, yurt ravnaqining ortga surilishi.

B. Xalqning mard o‘ g‘ lonlaridan ayrilishi, yurt ravnaqining ortga surilishi, boyliklarning talon-taroj qilinishi

D. Xalqning mard o‘ g‘ lonlaridan ayrilishi, o‘ lkaning vayronaga aylanishi, muzokara qila olmaslik

E. Xalqning mard o‘ g‘ lonlaridan ayrilishi, boyliklarning talon-taroj qilinishi, yurt ravnaqining ortga surilishi

5. Matndan olingan quyidagi jumlaga e’tibor bering. Unda ajratib ko‘ rsatilgan qism orqali muallif nimani nazarda tutyapti deb o‘ ylaysiz?

***Men bir cho‘ pon bo‘ lsam**, yur, yaxshisi, seni podshohimizning oldiga olib boray.*_____

_____

6. Matndan olingan gapda ajratib ko‘ rsatilgan so‘ zni qaysi so‘ z bilan almashtirib qo‘ llash mumkin?

*Eshitishimcha, Bag‘ ritoshlar diyorining johil shohi endi qo‘ shin to‘ plab, yurtimizni **istilo** qilish uchun yo‘ lga chiqqanmish.*

A. bosib olish

B. urush qilish

D. yo‘ q qilish

E. vayron etish

7. Hikoya qahramoni tomonidan mehribonlar o‘ lkasiga berilgan ta’rifni toping va yozing._____

8. Hikoyani o‘ qish orqali boboning qanday inson ekanligini bilib oldingiz. Uning sifatlaridan birini yozing. Bunday xulosaga kelganingizga boboning qaysi harakati sabab bo‘ lganligini yozing. _____

Havola etilgan topshiriqlar aynan o‘ quvchilarda badiiy tajriba orttirish, axborot almashish kabi vazifalarni bajaradi hamda badiiy savodxonligini oshiradi.

XULOSALAR.

Metodik tahlillar asosida shuni ta’kidlash mumkinki, badiiy asar ustida ishlash jarayonida o‘ quvchilarning nutqiy ko‘ nikmalarini rivojlantirish matnni shunchaki o‘ qib, mazmunini qayta hikoya qilib berish bilan cheklanmasligi lozim. Mazkur berilgan topshiriqlar o‘ quvchining matnni anglash, undagi asosiy va qo‘ shimcha fikrlarni farqlash qahramonlarning xatti-harakatlariga munosabat bildirish, voqealar rivojini izohlash, muallif g‘ oyasini aniqlash va o‘ z nuqtayi nazarini dalilllar asoida ifodalash kabi faol nutqiy harakatlarni qamrab olishi zarur.

Umuman olganda, badiiy asar matnlarini o‘ qish darslarida nutqiy ko‘ nikmalarni rivolantirish tizimli, izchil, bosqichma-bosqich o‘ quvchilarning yosh va individual xususiyatlarini hisobga olgan holda tashkil etilgandagina samaradorlilikka erishish mumkin.

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MAMLAKATIMIZDA BASKETBOL O‘ YININING RIVOJLANISH BOSQICHLARI

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Annotatsiya: *Ushbu maqolada O‘ zbekiston Respublikasida basketbol o‘ yinining rivojlanish bosqichlari yoritilgan. Basketbolning dastlabki tarixi, Sovet davridagi shakllanishi, mustaqillikdan so‘ nggi rivojlanishi va hozirgi zamonaviy bosqichdagi holati tahlil qilinadi. Maqolada tarixiy voqealar, federatsiya faoliyati, musobaqalardagi ishtirok, sport infratuzilmasi va yoshlar basketboli haqidagi ma’lumotlar tizimli tarzda keltirilgan. Shuningdek, xalqaro hamkorlik, 3x3 basketbol, maktab ligalari va kelajakdagi istiqbolli yo‘ nalishlar ham yoritilgan. Maqola sportshunoslar, o‘ qituvchilar, talabalar va basketbol ixlosmandlari uchun mo‘ ljallangan bo‘ lib, O‘ zbekistonda basketbol taraqqiyotining bosqichlarini chuqur o‘ rganishga yordam beradi.*

Kalit so‘ zlar: *Basketbol, O‘ zbekiston sporti, Basketbol federatsiyasi, 3x3 basketbol FIBA Asia, Sport maktablari, Yoshlar sporti, Basketbol tarixi, Mustaqillikdan keyingi sport, Sport infratuzilmasi, Maktab ligase, Murabbiylar tayyorlash.*

STAGES OF BASKETBALL DEVELOPMENT IN OUR COUNTRY

Abstract: *This article outlines the stages of basketball development in the Republic of Uzbekistan. It analyzes the early history of the sport, its formation during the Soviet era, its development following independence, and its current status. The article systematically presents information regarding historical events, the activities of the federation, participation in competitions, sports infrastructure, and youth basketball. It also covers international cooperation, 3x3 basketball, school leagues, and promising future directions. The article is intended for sports specialists, educators, students, and basketball enthusiasts, offering an in-depth look at the evolution of basketball in Uzbekistan.*

Keywords: *Basketball, Uzbekistan sports, Basketball Federation, 3x3 basketball, FIBA Asia, sports schools, youth sports, history of basketball, post-independence sports, sports infrastructure, school leagues, coach training.*

ЭТАПЫ РАЗВИТИЯ БАСКЕТБОЛА В НАШЕЙ СТРАНЕ

Аннотация: *В данной статье рассматриваются этапы развития баскетбола в Республике Узбекистан. Анализируется ранняя история баскетбола, его формирование в советскую эпоху, недавнее развитие после обретения независимости и современное состояние. В статье систематически представлена информация об исторических событиях, деятельности федерации, участии в соревнованиях, спортивной инфраструктуре и юношеском баскетболе. Также рассматриваются международное сотрудничество, баскетбол 3x3, школьные лиги и перспективные направления развития. Статья предназначена для спортивных ученых, преподавателей, студентов и любителей баскетбола и поможет глубоко изучить этапы развития баскетбола в Узбекистане.*

Ключевые слова: *Баскетбол, Спорт Узбекистана, Федерация баскетбола, баскетбол 3x3 FIBA Asia, Спортивные школы, Юношеский спорт, История баскетбола, Спорт после обретения независимости, Спортивная инфраструктура, Школьные лиги, Подготовка тренеров.*

KIRISH.

Basketbol O‘ zbekiston Respublikasida so‘ nggi yillarda jadal rivojlanayotgan sport turlaridan biridir. U mamlakatimizda asosan mustaqillikdan so‘ ng ommalasha boshlagan bo‘ lib, bugungi kunda maktabgacha yoshdagi bolalardan tortib professional sportchilargacha bo‘ lgan qatlamlarda keng targ‘ ib qilinmoqda. Quyida basketbolning O‘ zbekistonda bosqichma-bosqich rivojlanish jarayoni haqida so‘ z yuritamiz.

Asosiy qism. 1. Dastlabki bosqich (Sovet davri – 1991-yilgacha). Sovet Ittifoqi tarkibida bo‘ lgan O‘ zbekiston hududida basketbol 1950 -yillardan boshlab bosqichma-bosqich rivojlana boshlagan. Bu davrda sport maktablari, jismoniy tarbiya institutlari va texnikumlarda basketbol dars sifatida o‘ qitilar edi. Respublikalararo musobaqalarda o‘ zbekistonlik sportchilar ham qatnashgan. Biroq bu davrda basketbol keng ommaga emas, asosan professional sportchilar doirasida mashhur bo‘ lgan.

2. Mustaqillikdan keyingi davr (1991 – 2000). O‘ zbekiston 1991-yilda mustaqillikka erishganidan so‘ ng sport sohasi mustaqil rivojlanishni boshladi. Shu jumladan, basketbol ham alohida sport turi sifatida rivojlana boshladi. 1992- yilda O‘ zbekiston Basketbol Federatsiyasi tashkil etildi. Yurtimiz basketbolchilari Osiyo chempionatlarida ishtirok etishni boshladi. Shu yillarda turli yosh toifalari bo‘ yicha jamoalar shakllantirildi.

3. Taraqqiyot bosqichi (2000 – 2010). Bu davrda mamlakatda sport inshootlari soni ko‘ paydi, shuningdek, viloyatlarda ham basketbolga e’tibor oshdi. Yoshlar sport maktablarida basketbol bo‘ yicha mashg‘ ulotlar yo‘ lga qo‘ yildi. O‘ zbekistonlik hakamlar va murabbiylar xalqaro darajadagi malaka oshirish kurslarida qatnashdi. Bu bosqichda ayollar basketboli ham rivojlana boshladi.

4. Faollashuv davri (2010 – 2020). Basketbol bo‘ yicha maktab va o‘ quv yurtlari o‘ rtasida turnirlar, chempionatlar tashkil etila boshlandi. Yoshlar va talabalar o‘ rtasida milliy chempionatlar yo‘ lga qo‘ yildi. O‘ zbekistonlik basketbolchilar Osiyo o‘ yinlari, Jahon chempionatining saralash bosqichlarida qatnashdi. FIBA (Xalqaro Basketbol Federatsiyasi) bilan hamkorlikda turli loyihalar amalga oshirildi. Basketbol sport maktablari soni oshdi.

5. Zamonaviy bosqich (2020 – hozirgi vaqtgacha). Bugungi kunda basketbol O‘ zbekistonda yanada rivojlanmoqda. Yoshlar o‘ rtasida 3x3 basketbol ommalashmoqda. Sport maktablarida zamonaviy texnologiyalar asosida mashg‘ ulotlar olib borilmoqda. FIBA bilan hamkorlikda hakamlar va murabbiylar tayyorlash, yangi formatdagi ligalarni tashkil etish bo‘ yicha ishlar olib borilmoqda. 2025 - yilgi Osiyo yoshlar o‘ yinlariga tayyorgarlik doirasida yangi inshootlar qurilmoqda.

Xulosa. O‘ zbekistonda basketbol bosqichma-bosqich rivojlanib, bugungi kunga kelib xalqaro darajadagi sport turi sifatida shakllandi. Davlatning sportga bo‘ lgan e’tibori, yoshlarning qiziqishi va murabbiylar mehnati tufayli basketbol kelajakda yanada ommalashib, jahon sahnasida o‘ zbekistonlik sportchilarning muvaffaqiyatlari ortishiga xizmat qiladi.

Boshlanish davri: 1913 – 1920.

O‘ zbekiston hududida basketbol 1913-914 yillarda tarqala boshlagani aytiladi ammo haqiqiy joriy etilishi 1920-yillarga to‘ gri keladi.

1920-yil sentabrda Farg‘ onada L.Barxash Farg‘ ona basketbol jamoasini tashkil qilib, to‘ p va qoidalar bilan tanishtirdi.

Toshkentdagi dastlabki basketbol jamoasi S.Starshiy tomonidan harbiy maktabda tuzilgan.

Rivojlanish davri: 1922 – 1945.

1922-yildan Sirdaryoda sport olimpiadasiga basketbol kiritildi; jamoalar 5 nafar o‘ yinchidan iborat edi. 1934-yilda birinchi Markaziy Osiyo spartakiadasida O‘ zbekiston erkak va ayollar jamoalari birinchi o‘ rinni qo‘ lga kiritdi.

1945-yilda Andijonda birinchi Respublika chempionati bo‘ lib o‘ tdi; 4 jamoa ishtirok etgan va Samarqand birinchi bo‘ ldi.

Mustaqillikka yaqinlashish: 1946 – 1990.

1951-yilda o‘ smirlar o‘ rtasidagi O‘ rta Osiyo birinchiligida Toshkent jamoalari g‘ oliblikni qo‘ lga kiritdi.

1961-1966 yillar davomida Toshkent “Mehnat” jamoasi Sovet Ittifoqi “A” toifasida muvaffaqiyatli qatnashdi .

1973-yildan boshlab kuchli erkaklar jamoasi o‘ zoq vaqt “A” toifasida ishtirok etdi.

1979-1980 yillarda oliy ligaga chiqdi .

1992-yilda mustaqillikdan so‘ ng tashkil etilgan O‘ zbekiston Basketbol Federatsiyasi (FIBA a’zoligi) basketbol faoliyatini markazlashgan tarzda boshqarishni boshladi.

O‘ zbekiston 1995, 1999, 2001-yillarda FIBA Asia Championshipda qatnashdi va eng yaxshi natija 1995-yildagi 7-o‘ rin bo‘ ldi.

1997-yilda Malayziyada bo‘ lib o‘ tgan xalqaro turnirda O‘ zbekiston terma jamoasi uchinchi o‘ rin oldi.

FIBA bilan hamkorlik doirasida milliy hakamlar va murabbiylar malaka oshirish kurslarida qatnashdi.

2012-yilda FIBA va Vazirliklar bilan maktab basketboli bo‘ yicha Milliy maktab ligasi ishga tushdi: o‘ quvchi jamoalar tizimli ravishda musobaqalarga jalb qilindi. FIBA memorandum imzoladi.

Hozirgi vaqtga kelib O‘ zbekiston ayollar terma jamoasi ham FIBA Asia Championshipda qatnashmoqda, so‘ nggi reytinglar bo‘ yicha ularning o‘ rni 90-100 oralig‘ ida.

3x3 basketbol varianti maktab va universitetlarda ommaviylashmoqda: yoshlar sport kampuslari va yuqori sinflarda ushbu yo‘ nalishda turli tadbirlar o‘ tkazilmoqda.

Bugungi kunda O‘ zbekistonda yuzlab sport zallari va yuzdan ortiq talabga javob beradigan basketbol maydonchalari mavjud. Murabbiy tayyorlash OTMlarning jismoniy madaniyat fakultetlarida amalga oshiriladi, malakali trenerlar xalqaro kurslarda ishtirok etadi . FIBA ko‘ magida hakamlar va murabbiylar uchun xorijiy stajirovkalar tashkil etilmoqda.

Bosqichma-bosqich rivojlanish: respublikaning dastlabki rudimentar tashkilotlaridan to mustaqillik davridagi milliy federatsiyagacha, O‘ zbekiston basketboli ko‘ p bosqichda taraqqiy etdi.

Xalqaro integratsiya: FIBA a’zoligi, Osiyo chempionatlari, maktab ligalari va 3x3 basketbol orqali O‘ zbekiston global maydonga chiqmoqda.

Kelajak rejalar: murabbiylar malakasini oshirish, maktab ligalari va infratuzilmani rivojlantirish – asosiy yo‘ nalishlar hisoblanadi.

Erkaklar terma jamoasi. **Tashkil topgan**: 1992-yilda (FIBA a’zosi).

Murabbiy: hozirda Oleg Levin.

Xalqaro natijalar: Asosiy muvaffaqiyatlar 1990-2000 yillarda bo‘ lib, 1995-yilda FIBA Asia chempionatida 7-o‘ rinni egallagan (Eron va Filippindan ustun). Umumiy olganda 6 marta Osiyo chempionatida ishtirok etgan: 1995 (7-o‘ rin), 1999 va 2001 (9-o‘ rin), 2003(14-o‘ rin), 2005 (11-o‘ rin), 2009 (14-o‘ rin), 2011 (12-o‘ rin).

Turnir reytinglari: Olimpiada va jahon chempionatiga yo‘ llanma olmadi. Osiyo o‘ yinlariga ham kam ishtirok etgan – 1998 (9-o‘ rin), 2006 (11-o‘ rin), 2010 (11-o‘ rin).

Raqamlar: 1994-2014 oralig‘ ida 45 rasmiy o‘ yin o‘ tkazilib, 17 g‘ alaba va 28 mag‘ lubiyat qayd etilgan.

Ayollar terma jamoasi. **FIBAga qo‘ shilgan**: 1992-yilda.

Oxirgi reyting (9 fevral 2025): 94-o‘ rin.

Turnir ishtiroki: FIBA Asia Cupga 5 marotaba qatnashgan; hali medal olmayapti.

Murabbiy: Stepan Lebedev.

Jamoa tarkibi (2017): Qator nomli o‘ yinchilar: Yuliya Kashuba, Anastasiya

Sevastyanova, Dlyara Asanova va boshqalar. U16 yoshdagilar terma jamoasi 16 yoshgacha bo‘ lgan erkak jamoasi FIBA U16 Osiyo musobaqalarida qatnashadi.

2025-yil mayda Navoiyda bo‘ lgan FIBA U16 ASIA Cup CABA saralashida

Qirg‘ izistonni 85–50 hisobida mag‘ lub etdi. U16 jamoa CABA mintaqasida ikkinchi o‘ rinlarni egallagan. Masalan, 2022-yilda ikkinchi o‘ rinni qo‘ lga kiritgan.

O‘ **zbekiston Basketbol Federatsiyasi (UBF)** Tashkentda joylashgan va FIBA Asia a’zosi hisoblanadi. Prezident va Bosh kotibning nomlari ham e’lon qilingan.

Xalqaro hamkorliklar: Yo‘ nalishda maktab ligalari, 3x3 format, murabbiy va hakamlar tayyorlash dasturlari faol bajarilmoqda.

O‘ zbekiston terma jamoalari ayniqsa, Osiyo miqyosida izchil qatnashib kelmoqda. Ularning eng kuchli natijalari 1990–2000 yillarga to‘ g‘ ri keladi. U16 jamoasi esa yoshlar basketbolida ijobiy o‘ sish ko‘ rsatmoqda. Kelajakda jahon darajasida muvaffaqiyat uchun ilmiy yondashuv va infratuzilma yanada mustahkamlanishi muhim.

Xulosa. Umuman olganda basketbol sport turi bugungi kunda ulkan rivoj topayotgan, mamlakatimiz sportini dunyoga tanitishda yetakchi ro‘ l o‘ ynayotgan sport o‘ yinlari sirasiga kirib borayotganligi quvonarli holdur. Bu esa basketbol sport turini kundan-kunga rivoj topayotganligining dalilidir.

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OLIY TA'LIM MUASSASALARIDA CHET TILI DARSLARIDA TALABALARNING OG' ZAKI IJODIYLIGINI RIVOJLANTIRISHNING METODIK ASOSLARI

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Annotatsiya: *Ushbu kengaytirilgan ilmiy maqolada oliy ta'lim muassasalarida chet tili (nemis tili) mashg' ulotlarida talabalarning og' zaki ijodiyligini (oral creativity) rivojlantirishning metodik, lingvodidaktik hamda psixologik-pedagogik asoslari muallifning shaxsiy ilmiy konsepsiyasi va chuqur nazariy tahlillari negizida izchil yoritib berilgan. Tadqiqotda og' zaki nutqiy kreativlikning konseptual-nazariy mohiyati, spontan va improvizatsion nutqni shakllantirishning psixolingvistik mexanizmlari, kognitiv-kreativ to' siqlarni bartaraf etish hamda sotsiolingvistik erkinlikni ta'minlovchi pedagogik omillar atrofliroq tahlil qilingan. Shuningdek, talabalarda nemis tilida improvizatsiya qilish, og' zaki argumentatsiyani noan'anaviy shakllantirish va nutqiy to' siqlarni yengishga qaratilgan mualliflik uch bosqichli kompleks metodik modeli, og' zaki ijodiy topshiriqlar tipologiyasi hamda ko' rshatkichli baholash kriteriyalari taqdim etiladi.*

Kalit so' zlar: *og' zaki ijodiylik (oral creativity), chet tili o' qitish metodikasi, nemis tili, lingvodidaktika, mualliflik konsepsiyasi, spontan nutq, sotsiolingvistik improvizatsiya, psixolingvistik mexanizmlar, metodik model, pragmatik erkinlik.*

МЕТОДОЛОГИЧЕСКИЕ ОСНОВЫ РАЗВИТИЯ УСТНОЙ ТВОРЧЕСКОЙ АКТИВНОСТИ СТУДЕНТОВ НА ЗАНЯТИЯХ ПО ИНОСТРАННОМУ ЯЗЫКУ В ВУЗАХ

Аннотация: *В данной исследовательской статье на основе личных научных концепций и глубокого теоретико-методологического анализа автора подробно и систематически освещаются методические, лингводидактические и психолого-педагогические основы развития устной креативности (oral creativity) студентов на занятиях по иностранному (немецкому) языку в вузах. В работе глубоко проанализированы концептуальная суть устно-речевой креативности, психолингвистические механизмы спонтанной речи и речевой импровизации, а также факторы преодоления когнитивно-речевых барьеров и достижения социолингвистической автономии. Представлена авторская трехэтапная методическая модель, развернутая типология творческих устно-речевых заданий и детальные критерии оценивания.*

Ключевые слова: *устная креативность (oral creativity), методика преподавания иностранных языков, немецкий язык, лингводидактика, авторская концепция, психолингвистические механизмы, спонтанная речь, методическая модель.*

METHODOLOGICAL FOUNDATIONS FOR DEVELOPING STUDENTS' ORAL CREATIVITY IN FOREIGN LANGUAGE CLASSES AT HIGHER EDUCATION INSTITUTIONS

Abstract: *Based on the author's theoretical and conceptual framework, this scientific article systematically examines the methodical, linguodidactic, and psychological-pedagogical foundations of developing students' oral creativity in foreign language (German) classes within higher education. The study presents an in-depth analysis of the conceptual nature of oral creativity, the psycholinguistic mechanisms underlying spontaneous speech production, oral improvisation, and strategies for overcoming cognitive-communicative barriers to achieve sociolinguistic autonomy. A comprehensive three-stage author-designed methodical model, an expanded typology of creative speaking tasks, and detailed assessment criteria are presented.*

Keywords: *oral creativity, foreign language teaching methodology, German language, linguodidactics, author's conception, psycholinguistic mechanisms, spontaneous speech, methodical model, pragmatical autonomy.*

Oliy ta'lim tizimini tubdan isloh qilish, raqobatbardosh mutaxassislar tayyorlash va xalqaro ta'lim standartlariga integratsiyalashuv sharoitida talabalarning chet tilida, xususan nemis tilida muloqot qilish kompetensiyasini shakllantirish sifat jihatidan yangi bosqichga ko' tarilmoqda. An'anaviy ta'lim modelida asosiy e'tibor grammatik qoidalarni mexanik ravishda yodlash, berilgan o' quv matnlarini reproduktiv shaklda (shunchaki qayta aytib berish) ijro etish va tayyor shablonlardan foydalanishga qaratilgan edi. Biroq zamonaviy lingvodidaktika va pedagogik amaliyot o' quv jarayonining

markaziga talabalarning og‘ zaki ijodiyligini (oral creativity) hamda kognitiv-kommunikativ erkinligini qo‘ yishni ustuvor vazifa qilib belgilamoqda.

Bizning ko‘ p yillik pedagogik va ilmiy kuzatishlarimiz hamda tadqiqotlarimiz shuni ko‘ rsatmoqdaki, talabalarning grammatik qoidalarni mukammal bilishi yoki nazariy bilimlarga ega bo‘ lishi ularning real muloqotiy muhitda erkin, ta’sirchan, original va kreativ so‘ zlay olishini avtomatik ravishda kafolatlamaydi. Tayyor lisoniy andozalarga (Klischees) bog‘ lanib qolgan talabalar kutilmagan muloqotiy vaziyatga tushib qolganlarida, ruhiy-nutqiy to‘ siqlarga (speaking anxiety/language barrier) duchor bo‘ ladilar.

Bizning qat’iy ilmiy pozitsiyamizga ko‘ ra, zamonaviy mehnat bozori hamda xalqaro kasbiy va ilmiy muhit bo‘ lajak mutaxassislardan quyidagi hayotiy ko‘ nikmalarni talab etmoqda:

Kutilmagan va nostandart muloqotiy vaziyatlarda nemis tilida tezkor, izchil va mantiqiy og‘ zaki munosabat bildirish salohiyati;

O‘ z fikr-mulohazalarini faqat qoliplashgan birikmalar bilan emas, balki original va ta’sirchan iboralar, stilistik figuratizm, metafora va idiomalardan o‘ z o‘ rnida foydalanib bayon etish;

Nutqiy to‘ siqlarni va xato qilish qo‘ rquvini yengib, sotsiolingvistik, pragmatik hamda emotsional erkinlikni namoyon etish.

Shu ma’noda, oliy ta’lim muassasalarida nemis tili mashg‘ ulotlarida talabalarning og‘ zaki ijodiyligini rivojlantirishning lingvodidaktik va psixopedagogik mexanizmlarini kengaytirilgan shaklda ilmiy asoslash hamda zamonaviy metodik modelini ishlab chiqish g‘ oyat dolzarb hisoblanadi.

2. Og‘ zaki ijodiylikning nazariy-lingvodidaktik va psixolingvistik asoslari

2.1. Og‘ zaki ijodiylik tushunchasining ilmiy-konseptual tahlili

Bizning ilmiy konsepsiyamizga ko‘ ra, talabalarning og‘ zaki ijodiyligi (oral creativity) — bu shunchaki muloqot tezligi yoki lug‘ at boyligining miqdoriy ko‘ rsatkichi emas. Bu — lisoniy va ekstra-lingvistik vositalardan samarali foydalangan holda, kutilmagan muloqot vaziyatlarida original, mantiqiy, emotsional va pragmatik jihatdan to‘ g‘ ri og‘ zaki matn yaratish hamda pedagogik-kasbiy improvizatsiya qilish salohiyatidir. Biz qat’iy ta’kidlaymizki, og‘ zaki ijodiylik talabaning nemis tilida mustaqil va tanqidiy fikrlash darajasi, kognitiv moslashuvchanligi hamda emotsional intellektining bevosita mahsulidir.

Biz tomonidan taklif etilayotgan og‘ zaki-ijodiy nutqiy zanjir:

Kognitiv lisoniy baza – longrightarrow - Emotsional-psixologik erkinlik -longrightarrow – text - spontan improvizatsiya - longrightarrow – text - Original og‘ zaki nutq.

E.I. Passov va D. Nunan kabi olimlarning kommunikativ konsepsiyalariga tayangan holda xulosa qilamizki, og‘ zaki nutqda kreativlik uchta asosiy mezonning uyg‘ unligida namoyon bo‘ ladi: nutqiy moslashuvchanlik (flexibility), nutqiy ravonlik (fluency) hamda nutqiy originalizm (originality).

2.2. Spontan va improvizatsion nutqning psixolingvistik mexanizmlari

Og‘ zaki ijodiylikning negizida spontan nutqiy faoliyat yotadi. Psixolingvistik nuqtai nazardan, spontan nutq jarayonida inson miyasi bir vaqtning o‘ zida uchta murakkab operatsiyani bajaradi:

1. Kognitiv rejalashtirish (Mental Conceptualization): Aytilmoqchi bo‘ lgan fikrning ichki mazmuni va mantig‘ ini shakllantirish.
2. Lisoniy kodlashtirish (Formulation & Lexical Access): Ichki fikrga mos keluvchi nemis tili leksik birliklari va grammatik konstruksiyalarini tezkorlik bilan xotiradan chaqirib olish.
3. Artikulyatsion va intonatsion ijro (Articulation): Fikrni ovozlantirish, kerakli urg‘ u va intonatsion bo‘ yoqlar berish.

An’anaviy darslarda talabalar tayyor o‘ quv matnlarini aytib berayotganda kognitiv rejalashtirish va lisoniy kodlashtirish bosqichlari aylanib o‘ tiladi (chunki matn tayyor). Oqibatda, real muloqotda lisoniy kodlashtirish mexanizmi sekinlashadi va talabada "to‘ xtalishlar" (fluency breakdown) yuzaga keladi. Og‘ zaki ijodiylik esa ushbu uch bosqichning parallel va lahzalik tezlikda ishlashini ta’minlaydi.

2.3. Sotsiolingvistik hamda pragmatik erkinlik tamoyillari

Bizning shaxsiy ilmiy qarashlarimizga ko‘ ra, og‘ zaki ijodiylikni rivojlantirishda quyidagi lingvodidaktik tamoyillar hal qiluvchi ahamiyatga ega:

1. Spontaneity and Improvisation (Spontanlik va improvizatsiya): Darsda talabalarga oldindan yodlangan matnlarni aytib berish emas, balki tayyorgarliksiz, kutilmagan va muammoli vaziyatlarda nutq so‘ zlash imkoni yaratilishi shart.
2. Sociolinguistic Freedom (Sotsiolingvistik erkinlik): Talaba nemis tilining turli registrlari (Hochdeutsch, Umgangssprache, Fachsprache) va uslubiy imkoniyatlaridan muloqotiy kontekstga qarab erkin hamda o‘ z o‘ rnida foydalana olishi kerak.
3. Cognitive Risk-Taking (Kognitiv tavakkalchilik): Muloqot jarayonida xato qilishdan qo‘ rqmaslik, tilning noaniqliklaridan cho‘ chimaslik va yangi lisoniy konstruksiyalarni amalda qo‘ llashga intilish.

4. Pragmatic Autonomy (Pragmatik avtonomiya): Suhbatdoshining emotsional holati va nutqiy uslubiga mos ravishda o‘ z og‘ zaki taktikasi hamda strategiyasini o‘ zgartira olish ko‘ nikmasi.

3. Og‘ zaki ijodiylikni rivojlantiruvchi omillar tizimi

Bo‘ lajak nemis tili mutaxassislarida og‘ zaki ijodiylikni shakllantirish bir-biri bilan uzviy bog‘ liq bo‘ lgan to‘ rtta asosiy omillar guruhiga tayanadi.

1-jadval. Og‘ zaki ijodiylikni shakllantiruvchi omillar va ularning lingvodidaktik mazmuni

Omillar guruhi	Amaliy-pedagogik ko‘ rinishi	Lingvodidaktik va kasbiy samaradorligi
Lingvodidaktik-metodik omillar	Improvizatsion rolli o‘ yinlar, debatlar, simulatsiyalar, "Speaking Stations" va keys-stadi.	Talabalarda spontan fikrlash, tezkor javob qaytarish va og‘ zaki argumentatsiyani shakllantiradi [7, 88-b.].
Kognitiv-psixologik omillar	"Error-tolerant" (xatolarga bag‘ rikeng) muhit, emotsional erkinlik va do‘ stona dialogik muhit.	Nutqiy to‘ siqlar (speaking anxiety) hamda muloqotiy komplekslarni bartaraf etadi [9, 245-b.].
Raqamli va interaktiv omillar	Podkastlar (Deutsche Welle), audio-vizual simulyatsiyalar, raqamli taqdimotlar va video-bloging.	Og‘ zaki nutqning intonatsion, fonetik hamda uslubiy rang-barangligini ta’minlaydi [8, 45-b.].
Sotsiokulturolojik omillar	Nemis madaniyatiga oid idiomatika, verbal/noverbal vositalar hamda lingvo-madaniy tahlil.	Pragmatik moslikni va sohiblar (Native Speakers) kabi muloqot qilish ko‘ nikmasini oshiradi [11, 168 p.].

4. Og‘ zaki ijodiylikni rivojlantirishning mualliflik uch bosqichli metodik modeli

Talabalarning og‘ zaki-nutqiy kreativligini izchil hamda bosqichma-bosqich oshirish uchun shaxsiy tadqiqotimiz doirasida uch bosqichli kompleks metodik model ishlab chiqildi.

1-bosqich: Motivatsion-perseptiv (Audio-vizual)
- Perseptiv idrok va emotsional motivatsiyani uyg‘ otish
- Autentik resurslar (DW, Podcasts) tahlili

2-bosqich: Improvizatsion-faoliyatli (Spontan nutq)
- Kutilmagan va muammoli situativ topshiriqlar
- Spontan bahs, rolli simulyatsiyalar va debatlar

3-bosqich: Refleksiv-analitik (Metakognitiv tahlil)
- Og‘ zaki nutq natijalarini video/audio tahlil qilish
- Peer-feedback va nutqiy o‘ z-o‘ zini anglash

4.1. Motivatsion-perseptiv bosqich

Muallif nuqtai nazaridan maqsadi: Talabalarda nemis tilida og‘ zaki erkin fikrlashga bo‘ lgan ichki ehtiyojni, emotsional intellektni hamda audio-vizual idrokni shakllantirish.

Vazifalari: Nemis tilidagi autentik audio va video materiallarni (Podcasts, Talkshows, TED Talks in German) eshitish hamda tomosha qilish orqali nemis sohiblarining nutqiy uslubi, intonatsiyasi, emotsional urg‘ ulari hamda sotsiolingvistik iboralarini tahlil qilish. Ular asosida fikr-mulohaza bildirishga tayyorgarlik ko‘ rish.

4.2. Improvizatsion-faoliyatli bosqich

Muallif nuqtai nazaridan maqsadi: Modelning markaziy hamda amaliy bosqichi bo‘ lib, tayyorgarliksiz spontan nutq va og‘ zaki ijodkorlikni amalda namoyon etish.

Vazifalari: Mashg‘ ulotda muammoli va kutilmagan muloqotiy vaziyatlarni modellashtirish. Talabalar berilgan topshiriqlar bo‘ yicha nemis tilida bahslashadilar, improvizatsiya qiladilar hamda o‘ z kasbiy va shaxsiy pozitsiyalarini og‘ zaki ravishda erkin va ta’sirchan himoya qiladilar.

4.3. Refleksiv-analitik bosqich

Muallif nuqtai nazaridan maqsadi: Og‘ zaki nutq natijalarini va sifatini ob’ektiv metakognitiv tahlil qilish hamda nutqiy o‘ z-o‘ zini anglashni rivojlantirish.

Vazifalari: Talabalarning og‘ zaki chiqishlari va dialoglarini audio/video tasvirga olgan holda birgalikda tahlil qilish (Peer-feedback va Self-reflection). Bizning qat’iy pozitsiyamizga ko‘ ra, grammatik kichik xatolar uchun nutq bo‘ linmaydi va jarayonda talabaning shavqi so‘ ndirilmaydi, balki fikrning originalizmi va ta’sirchanligi birinchi o‘ ringa qo‘ yiladi.

5. Nemis tili mashg‘ ulotlarida og‘ zaki ijodiy topshiriqlarning kengaytirilgan mualliflik tipologiyasi

Chet tili darslarida talabalarning og‘ zaki ijodiyligini oshirish uchun shaxsiy metodik tajribamiz va izlanishlarimizdan kelib chiqib, topshiriqlar tizimini 4 ta asosiy blok va ularning amaliy mexanizmlariga ajratdik:

5.1. Spontane Sprachproduktion und Improvisation (Spontan nutq va improvizatsiya bloki)

60-Sekunden-Improvisation: Talaba tasodifiy tanlangan kartochkadagi mavzu bo‘ yicha (z.B. "Wenn ich der Kanzler von Deutschland wäre...", "Ein Tag ohne Smartphone") 1 daqiqa davomida to‘ xtovsiz, tayyorgarliksiz va mantiqiy ravishda nemis tilida gapiradi.

Assoziationskette und Storytelling: Bitta tayanch so‘ z yoki kutilmagan rasm beriladi. Har bir talaba oldingi talabaning fikrini mantiqiy davom ettirgan holda nemis tilida yaxlit va mazmunli hikoya yaratadi.

Magische Box (Sehrli quti): Qutidan o‘ zaro bog‘ liq bo‘ lmagan 3 ta obyekt yoki so‘ z olinadi (masalan: Kaffeemaschine, Mond, Philosophie). Talaba 2 daqiqa ichida ushbu tushunchalarni bitta og‘ zaki nutqda mantiqiy bog‘ lab berishi kerak.

5.2. Rollenspiele und Simulationen (Rolli va simulyatsion o‘ yinlar bloki)

Gerichtsverhandlung (Sud simulyatsiyasi): Dolzarb ijtimoiy-ekologik yoki axloqiy muammo bo‘ yicha sudyalar, ayblovchilar hamda himoyachilar rolida nemis tilida qizg‘ in og‘ zaki bahs va argumentatsiya olib boriladi.

Talkshow-Simulation: Turli qarashlarga ega bo‘ lgan mashhur shaxslar rolida nemis tilida ochiq muloqot va intervyu uyushtiriladi.

Krisensitzung (Inqirozli majlis): Talabalarga kompaniyadagi favqulodda muammoli vaziyat beriladi va ular 15 daqiqa ichida nemis tilida og‘ zaki kelishuv hamda yechim topishlari talab etiladi.

5.3. Argumentative Debatten (Muammoli debatlar bloki)

Fishbowl-Debatte: Ichki (faol debat qiluvchilar) va tashqi (kuzatuvchilar) davralarga bo‘ lingan holda nemis tilida munozarali mavzularni ("Künstliche Intelligenz im Studium: Hilfe oder Gefahr?", "Globalisierung vs. Tradition") muhokama qilish.

Pro-und-Kontra-Duell: Ikki talaba bir-biriga qarama-qarshi pozitsiyani egallaydi va nemis tilida 3 daqiqa davomida faqat mantiqiy argument va raddiyalar beradi.

5.4. Kreative Präsentationen (Kreativ taqdimotlar bloki)

PechaKucha (20x20): 20 ta slaydning har biriga 20 soniya davomida nemis tilida tezkor, aniq va ta’sirchan og‘ zaki sharh berish.

Elevator Pitch: O‘ z g‘ oyasini, loyihasini yoki kitobini 90 soniya ichida nemis tilida auditoriyaga "sotish" va ularni ishontirish.

6. Og‘ zaki ijodiylikni baholash mezonlari va strategiyalari

Bo‘ lajak nemis tili mutaxassislarining og‘ zaki ijodiyligini ob’ektiv va ilmiy jihatdan baholash uchun 5 ta asosiy o‘ lchov mezonini taklif etamiz:

2-jadval. Og‘ zaki ijodiylikni baholashning mualliflik ko‘ rsatkichlari

Mezon nomi	Indikatorlar va lingvistik namoyon bo‘ lishi	Baholash darajasi
1. Nutqiy spontanlik (Spontaneität)	Tayyorgarliksiz, uzoq pauzalarsiz, tabiiy sur’atda va erkin fikr bildira olish ko‘ rsatkichi.	Yuqori O‘ rta Qoniqarsiz
2. Nutqiy originalizm (Originalität)	Fikr bildirishda noan’anaviy yondashuv, o‘ zgacha stilistik figuratizm va original metaforalarni qo‘ llash [3, 142-b.].	Yuqori O‘ rta Qoniqarsiz
3. Lisoniy moslashuvchanlik (Flexibilität)	Muloqot jarayonida synonymlar, antonymlar hamda rephrase (qayta ifodalash) ko‘ nikmasiga ega bo‘ lish [10, 90-b.].	Yuqori O‘ rta Qoniqarsiz
4. Pragmatik moslik (Pragmatische Angemessenheit)	Muloqotiy kontekst, suhbatdoshning mavqeyi hamda vaziyatga mos til uslubini (Register) to‘ g‘ ri tanlay olish.	Yuqori O‘ rta Qoniqarsiz

Mezon nomi	Indikatorlar va lingvistik namoyon bo‘ lishi	Baholash darajasi
5. Emotsional ta’sirchanlik (Ausdruckskraft)	Intonatsiya, emotsional urg‘ ular, mimika va jestlardan og‘ zaki nutqda ta’sirchan foydalanish.	Yuqori O‘ rta Qoniqarsiz

7. Nutqiy to‘ siqlarni yengish va emotsional erkinlikni ta’minlash metodikasi

Talabalarda og‘ zaki ijodiylikni rivojlantirishdagi eng katta g‘ ov bu psixologik-nutqiy to‘ siqlar (speaking anxiety) va xato qilishdan qo‘ rqish hissiyotidir. Bizning ilmiy konsepsiyamizga ko‘ ra, mashg‘ ulotlarda ushbu to‘ siqlarni yengish uchun quyidagi pedagogik shart-sharoitlar yaratilishi shart:

1. "Error-Tolerant Atmosphere" (Xatolarga bag‘ rikeng muhit): O‘ qituvchi talaba og‘ zaki so‘ zlayotgan vaqtda uning nutqini grammatik xatolar uchun bo‘ lmasligi kerak. Xatolar nutq yakunlangach, umumiy va anonim tarzda tahlil qilinishi lozim.
2. Focus on Content, Not Just Form (Shakldan ko‘ ra mazmunga urg‘ u berish): Darsda talabaning nechoqli to‘ g‘ ri grammatik shakl ishlatgani emas, balki qanchalik original, mantiqiy va ta’sirchan fikr bildirgani birinchi o‘ ringa qo‘ yilishi zarur.
3. Encouragement of Non-Verbal Means (Noverbal vositalarni rag‘ batlantirish): Nemis tilida mos so‘ z topilmay qolganda, talabalarga mimika, jest va paraphrasing (boshqa so‘ zlar bilan tushuntirish) kabi strategiyalardan foydalanishiga ruxsat beriladi va bu ijodiy qobiliyat sifatida baholanadi.

8. Xulosa va amaliy mualliflik tavsiyalari

Oliy ta’lim muassasalarida chet tili (nemis tili) darslarida talabalarning og‘ zaki ijodiyligini (oral creativity) rivojlantirish — bu bo‘ lajak mutaxassislarning kasbiy, muloqotiy va intellektual raqobatbardoshligini ta’minlovchi strategik hamda lingvodidaktik omildir. Maqolada ilgari surilgan mualliflik konsepsiyasi, psixolingvistik tahlillar hamda uch bosqichli metodik model talabalarni sun’iy, shablonli va qoliplashgan nutqdan xalos etib, nemis tilida erkin, ta’sirchan, mantiqiy va kreativ so‘ zlash imkoniyatini ta’minlaydi.

Bizning konseptual va amaliy-metodik tavsiyalarimiz:

1. O‘ quv mashg‘ ulotlari strukturasini transformatsiya qilish: Darslarda tayyor o‘ quv matnlarini qayta aytib berish (reproduktiv nutq) hajmini keskin kamaytirib, tayyorgarliksiz spontan, improvizatsion va muammoli topshiriqlar ulushini kamida 40-50% ga yetkazish lozim.
2. "Error-tolerant" ta’lim muhitini bosqichma-bosqich qaror toptirish: Og‘ zaki nutq jarayonida talabaning har bir grammatik xatosiga darhol aralashmaslik, aksincha, fikrning originalizmi, mazmuni hamda sotsiolingvistik erkinligini rag‘ batlantirish zarur.
3. Interaktiv, simulyatsion va debat texnologiyalarini kengaytirish: Mashg‘ ulotlarga debatlar, sud va talk-shou simulyatsiyalari, PechaKucha taqdimotlari va keys-stadilarni izchil joriy etishni tavsiya qilamiz.
4. Audio-vizual hamda raqamli resurslardan unumli foydalanish: Zamonaviy nemis tili podkastlari, video-bloglar hamda multimedia resurslari orqali talabalarning og‘ zaki nutq uslubi hamda intonatsion boyligini oshirib borish maqsadga muvofiqdir.

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O‘ ZBEKISTONDA OLIY TA’LIM MUASSASALARI BOSHQARUVI KENGASHLARI: VAKOLATLARI VA VAZIFALARI

Yakubov Azizjon Tojiboyevich
Oliy ta’lim fan va innovatsiyalar vazirligi Axborot tahlili va ijro intizomi bo‘ limi boshlig‘ i

Annotatsiya: *Ushbu maqolada O‘ zbekistonda oliy ta’lim muassasalari boshqaruvi kengashlarining shakllanishi, ularning oliy ta’lim tizimidagi institutsional o‘ rni, asosiy vakolatlari va funksional vazifalari ilmiy-pedagogik nuqtai nazardan tahlil qilingan. Boshqaruv, kuzatuv va vasiylik kengashlarining faoliyati oliy ta’lim muassasasining strategik rivojlanishi, ta’lim sifatini ta’minlash, moddiy va inson resurslaridan samarali foydalanish, professor-o‘ qituvchilar faoliyatini qo‘ llab-quvvatlash hamda jamoatchilik bilan aloqalarni mustahkamlash bilan bog‘ liq holda yoritilgan. Kengashlarning vakolatlari va vazifalarini farqlash asosida ularning qaror qabul qilish, muvofiqlashtirish, monitoring va nazorat funksiyalarining pedagogik jarayonga ta’siri ochib berilgan. Shuningdek, O‘ zbekiston oliy ta’lim tizimida boshqaruv kengashlari faoliyati samaradorligini oshirishga qaratilgan tashkiliy-pedagogik takliflar ishlab chiqilgan.*

Kalit so‘ zlar: *oliy ta’lim, boshqaruv kengashi, kuzatuv kengashi, vasiylik kengashi, vakolat, vazifa, ta’lim sifati, strategik rivojlanish, kollegial boshqaruv, institutsional boshqaruv, monitoring, professor-o‘ qituvchi, jamoatchilik nazorati.*

GOVERNING BOARDS OF HIGHER EDUCATION INSTITUTIONS IN UZBEKISTAN: POWERS AND FUNCTIONS

Abstract: *This article analyzes the formation, institutional role, powers, and functional responsibilities of governing councils of higher education institutions in Uzbekistan from a scientific and pedagogical perspective. The activities of governing, supervisory, and boards of trustees are examined in relation to strategic institutional development, educational quality assurance, effective use of material and human resources, support for academic staff, and strengthening cooperation with stakeholders. By distinguishing between the powers and responsibilities of governing councils, the study reveals how their decision-making, coordination, monitoring, and oversight functions may influence educational processes. The article also proposes organizational and pedagogical measures aimed at increasing the effectiveness of governing councils within the higher education system of Uzbekistan.*

Keywords: *higher education, governing council, supervisory board, board of trustees, authority, responsibility, educational quality, strategic development, collegial governance, institutional management, monitoring, academic staff, public accountability.*

УПРАВЛЕНЧЕСКИЕ СОВЕТЫ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ УЗБЕКИСТАНА: ПОЛНОМОЧИЯ И ФУНКЦИИ

Аннотация: *В статье с научно-педагогической точки зрения анализируются становление, институциональная роль, полномочия и функциональные задачи советов управления высшими образовательными учреждениями Узбекистана. Деятельность советов управления, наблюдательных и попечительских советов рассматривается во взаимосвязи со стратегическим развитием образовательной организации, обеспечением качества образования, эффективным использованием материальных и кадровых ресурсов, поддержкой профессорско-преподавательского состава и укреплением взаимодействия с заинтересованными сторонами. На основе разграничения полномочий и задач советов раскрывается влияние функций принятия решений, координации, мониторинга и контроля на образовательный процесс. Разработаны организационно-педагогические предложения по повышению эффективности деятельности советов управления в системе высшего образования Узбекистана.*

Ключевые слова: *высшее образование, совет управления, наблюдательный совет, попечительский совет, полномочия, задачи, качество образования, стратегическое развитие, коллегиальное управление, институциональное управление, мониторинг, профессорско-преподавательский состав, общественный контроль.*

KIRISH.

O‘ zbekistonda oliy ta’lim tizimini modernizatsiya qilish jarayonlari universitetlarning boshqaruv mexanizmlarini takomillashtirish, ularning institutsional mas’uliyatini oshirish va boshqaruvga manfaatdor tomonlarni kengroq jalb

etishni talab qilmoqda. Oliy ta'lim muassasalarining vazifalari kengaygani sari boshqaruv qarorlarining sifati, ularning ochiqligi va ta'lim muassasasining strategik maqsadlariga muvofiqligi alohida ahamiyat kasb etmoqda.

Mazkur sharoitda oliy ta'lim muassasasini boshqarishda kollegial organlarning o' rni kuchayib bormoqda. Boshqaruv, kuzatuv yoki vasiylik kengashlari shaklidagi tuzilmalar oliy ta'lim muassasasi faoliyatining muhim masalalarini muhokama qilish, rivojlanish yo' nalishlarini belgilash, resurslardan foydalanish samaradorligini kuzatish hamda muassasa va tashqi manfaatdor tomonlar o' rtasidagi institutsional aloqalarni rivojlantirish imkonini beradi.

Boshqaruv kengashlarining oliy ta'lim tizimidagi ahamiyati ularning faqat ma'muriy yoki moliyaviy vakolatlari bilan belgilanmaydi. Kengash doirasida qabul qilinadigan qarorlar ta'lim dasturlarini rivojlantirish uchun yaratiladigan sharoitlar, professor-o' qituvchilarni rag' batlantirish, moddiy-texnik bazani takomillashtirish, talabalar manfaatlarini hisobga olish va ta'lim sifatini monitoring qilish kabi pedagogik jarayonlar bilan ham bog' liq.

Shu nuqtai nazardan, boshqaruv kengashining "vakolati" va "vazifasi" tushunchalarini farqlash muhimdir. Vakolat kengashga tegishli masalalar yuzasidan qaror qabul qilish yoki ularni ko' rib chiqish imkonini beruvchi institutsional-huquqiy doirani ifodalasa, vazifa mazkur vakolatlar orqali erishilishi lozim bo' lgan tashkiliy, strategik va pedagogik natijalarni anglatadi. Ularning o' zaro uyg' unligi kengash faoliyatining amaliy samaradorligini belgilaydi.

Mazkur maqolaning maqsadi O' zbekistonda oliy ta'lim muassasalari boshqaruvi kengashlarining institutsional o' rnini tahlil qilish, ularning asosiy vakolatlari va vazifalarini tizimlashtirish hamda ushbu faoliyatning ta'lim sifatini ta'minlashdagi pedagogik ahamiyatini ochib berishdan iborat.

Mavzuga oid adabiyotlarning tahlili. Oliy ta'lim boshqaruviga bag' ishlangan ilmiy tadqiqotlarda boshqaruv organlarining vakolatlarini aniq belgilash universitetning institutsional barqarorligi va javobgarligini ta'minlovchi muhim omillardan biri sifatida qaraladi. Universitet murakkab akademik tashkilot bo' lgani sababli undagi strategik, akademik va ma'muriy qarorlarni bir boshqaruv subyektida jamlash zamonaviy boshqaruv talablariga to' liq javob bermaydi.

B. Clark tomonidan ilgari surilgan oliy ta'lim tizimlarini boshqarish konsepsiyasida universitet faoliyatiga davlat, akademik hamjamiyat va tashqi ijtimoiy-iqtisodiy muhitning ta'siri alohida ko' rsatiladi. Mazkur yondashuv oliy ta'lim boshqaruvida turli subyektlarning manfaatlari va vakolatlari o' rtasida muvozanatni ta'minlash zarurligini asoslaydi.

M. Shattock tadqiqotlarida universitet boshqaruvining samaradorligi vakolat va javobgarlikning to' g' ri taqsimlanishi bilan bog' lanadi. Bunda strategik boshqaruv organlari bilan kundalik ijro faoliyatini amalga oshiruvchi ma'muriy tuzilmalar funksiyalarining farqlanishi muhim hisoblanadi. Ushbu yondashuv boshqaruv kengashining universitet ma'muriyatini takrorlovchi organ emas, balki strategik va nazorat funksiyalariga ega kollegial institut bo' lishi kerakligini anglatadi.

Manfaatdor tomonlar nazariyasi ham oliy ta'lim boshqaruvi kengashlarining mazmunini tushuntirish uchun muhim metodologik asos yaratadi. Universitet faoliyati talabalar, professor-o' qituvchilar, ish beruvchilar, davlat, bitiruvchilar va keng jamoatchilik manfaatlari bilan bog' liq bo' lganligi sababli strategik qarorlarni ishlab chiqishda mazkur guruhlarning ehtiyojlarini hisobga olish institutsional boshqaruv sifatini oshiradi.

O' zbekistonda oliy ta'lim boshqaruviga oid institutsional yondashuvning rivojlanishi universitetlarning mustaqilligini oshirish, moliyaviy va akademik mas'uliyatni kuchaytirish hamda boshqaruvning kollegial mexanizmlarini rivojlantirish jarayonlari bilan bog' liq. Bunda boshqaruv kengashlarining strategik rivojlanish, resurslardan samarali foydalanish va ta'lim sifatini ta'minlashdagi ishtiroki tobora muhimlashmoqda.

Shu bilan birga, boshqaruv kengashining mavjudligi o' z-o' zidan samarali boshqaruvni ta'minlamaydi. Uning real ta'siri vakolatlarning aniqligi, qarorlarning bajarilish mexanizmi, kengash a'zolarining kompetensiyasi, muhokama qilinadigan masalalarning mazmuni va faoliyat natijalarini monitoring qilish tizimiga bog' liq.

TADQIQOT METODOLOGIYASI.

Tadqiqot O' zbekistonda oliy ta'lim muassasalari boshqaruvi kengashlarining vakolatlari va vazifalarini pedagogik-institutsional jihatdan o' rganishga qaratilgan nazariy-tahliliy yondashuvga asoslandi.

Tadqiqot jarayonida normativ-huquqiy tahlil, funksional tahlil, tizimlashtirish, qiyosiy tahlil va ilmiy umumlashtirish metodlaridan foydalanildi. Boshqaruv kengashlarining faoliyatiga oid normalar ularning strategik boshqaruv, ta'lim sifati, inson resurslari, moddiy-moliyaviy ta'minot, monitoring va manfaatdor tomonlar bilan hamkorlik yo' nalishlaridagi funksiyalari bo' yicha guruhlashtirildi.

Funksional tahlilda kengash faoliyatining "vakolat – qaror – ijro – natija – monitoring" bog' liqligiga alohida e'tibor qaratildi. Mazkur yondashuv kengash vakolatining faqat huquqiy jihatini emas, balki uning oliy ta'lim muassasasidagi real pedagogik va institutsional natijaga aylanish jarayonini tahlil qilish imkonini berdi.

Shuningdek, kengashning strategik boshqaruv organi sifatidagi vazifalari bilan oliy ta'lim muassasasi rahbariyatining ijro funksiyalari o' rtasidagi munosabat nazariy jihatdan tahlil qilindi. Bunda vakolatlarning bir-birini takrorlamasligi va ular o' rtasidagi funksional muvozanat samarali boshqaruvning muhim sharti sifatida qabul qilindi.

Tahlil va natijalar. O' zbekistonda oliy ta'lim muassasalari boshqaruvi kengashlarining faoliyatini tahlil qilish ularning vazifalarini bir nechta funksional yo' nalishlarga ajratish imkonini beradi.

Strategik rivojlanishni belgilash va muvofiqlashtirish. Boshqaruv kengashining muhim vazifalaridan biri oliy ta'lim muassasasining uzoq muddatli rivojlanish yo' nalishlarini muhokama qilish va strategik maqsadlarni institutsional imkoniyatlar bilan muvofiqlashtirishdan iborat.

Strategik vazifaning pedagogik mazmuni shundaki, universitet rivojlanishi faqat yangi binolar qurish, moliyaviy ko' rsatkichlarni yaxshilash yoki talabalar sonini oshirish bilan chegaralanmasligi kerak. Strategik qarorlarda ta'lim dasturlarining rivojlanishi, professor-o' qituvchilar salohiyati, ilmiy faoliyat, talabalar uchun yaratiladigan akademik imkoniyatlar va ta'lim natijalari ustuvor yo' nalish sifatida namoyon bo' lishi lozim.

Ta'lim sifatini ta'minlashdagi ishtirok. Boshqaruv kengashining pedagogik ahamiyati, avvalo, uning ta'lim sifatini oshirishga yo' naltirilgan qarorlar qabul qilishdagi ishtirokida namoyon bo' ladi. Bunda kengash o' quv mashg' ulotlarini bevosita tashkil etuvchi tuzilma emas, balki sifatli ta'lim uchun zarur institutsional sharoitlarning yaratilishiga ta'sir qiluvchi boshqaruv subyekti sifatida faoliyat ko' rsatadi.

Ta'lim sifati bilan bog' liq vazifalar o' quv dasturlarini takomillashtirish uchun sharoit yaratish, professor-o' qituvchilarning kasbiy rivojlanishini qo' llab-quvvatlash, zamonaviy ta'lim infratuzilmasini rivojlantirish va ta'lim natijalarini monitoring qilish bilan bog' lanishi mumkin.

Moliyaviy va moddiy resurslardan samarali foydalanishga ko' maklashish. Ta'lim sifatining barqarorligi tegishli resurs bazasi bilan bevosita bog' liq. Zamonaviy auditoriyalar, laboratoriyalar, axborot-resurs markazlari, raqamli platformalar va ilmiy infratuzilma pedagogik jarayonning moddiy asosini tashkil qiladi.

Shu sababli boshqaruv kengashining resurslardan foydalanish samaradorligiga oid faoliyatini pedagogik jarayondan ajratib bo' lmaydi. Moliyaviy ustuvorliklarni belgilashda ta'lim va ilmiy faoliyat ehtiyojlarini hisobga olish kengash qarorlarining pedagogik yo' naltirilganligini ta'minlaydi.

Inson resurslari va professor-o' qituvchilar salohiyatini qo' llab-quvvatlash. Oliy ta'lim sifatini belgilovchi asosiy omillardan biri professor-o' qituvchilarning ilmiy-pedagogik salohiyatidir. Shu bois boshqaruv kengashi faoliyatida inson kapitalini rivojlantirish masalasi strategik ahamiyat kasb etadi.

Bunda pedagoglarning malakasini oshirish, ilmiy faoliyatini rag' batlantirish, xorijiy tajribani o' rganish imkoniyatlarini kengaytirish, yosh pedagoglarni qo' llab-quvvatlash va samarali mehnat uchun tegishli institutsional sharoit yaratish muhim yo' nalishlarni tashkil qiladi.

Manfaatdor tomonlar bilan hamkorlikni rivojlantirish. Boshqaruv kengashi oliy ta'lim muassasasining ichki akademik muhiti va tashqi ijtimoiy-iqtisodiy muhit o' rtasidagi institutsional bog' lovchi mexanizmlardan biri bo' lishi mumkin.

Ish beruvchilar, soha mutaxassislari, bitiruvchilar va boshqa hamkorlarning kengash faoliyatidagi ishtiroki mehnat bozoridagi o' zgarishlarni universitet boshqaruviga yetkazish imkonini beradi. Bu esa ta'lim dasturlarini takomillashtirish, amaliy tayyorgarlikni kuchaytirish va bitiruvchilarning kasbiy kompetensiyalarini rivojlantirish uchun muhim axborot manbai vazifasini bajaradi.

Monitoring va hisobdorlikni ta'minlash. Boshqaruv kengashining yana bir muhim funksional yo' nalishi qabul qilingan strategik qarorlarning bajarilishi va erishilgan natijalarni kuzatib borish bilan bog' liq.

Bunda monitoringning maqsadi kamchiliklarni aniqlash bilangina cheklanmasligi kerak. Monitoring natijalari yangi boshqaruv qarorlarini shakllantirish, mavjud dasturlarga tuzatish kiritish va resurslarni qayta yo' naltirish uchun asos bo' lishi lozim.

Shu nuqtai nazardan kengash faoliyatining samarali modeli quyidagi sikl asosida namoyon bo' ladi:

Muammoni aniqlash →kengash muhokamasi →qaror qabul qilish →mas'ullar va resurslarni belgilash →ijroni ta'minlash →natijani monitoring qilish →kengashda qayta ko' rib chiqish.

Mazkur sikl boshqaruv kengashining faqat maslahat beruvchi organ sifatida emas, balki qarorlarning natijadorligini kuzatishga yo' naltirilgan kollegial boshqaruv instituti sifatida rivojlanishi zarurligini ko' rsatadi.

Tahlil asosida boshqaruv kengashining vakolatlarini uchta funksional darajaga ajratish mumkin.

Birinchisi – **strategik vakolatlar** bo' lib, ular universitetning uzoq muddatli rivojlanishi, ustuvor yo' nalishlari va institutsional maqsadlari bilan bog' liq.

Ikkinchisi – **muvofiqlashtiruvchi vakolatlar** bo' lib, ta'lim, ilmiy faoliyat, resurslar va manfaatdor tomonlarning ehtiyojlarini umumiy rivojlanish maqsadlari doirasida uyg' unlashtirishni nazarda tutadi.

Uchinchisi – **monitoring va nazorat vakolatlari** bo' lib, qabul qilingan qarorlar ijrosi, resurslardan foydalanish va belgilangan natijalarga erishish holatini kuzatishni qamrab oladi.

Mazkur tasnifdan kelib chiqib, boshqaruv kengashining pedagogik funksiyasini quyidagicha ifodalash mumkin:

Boshqaruv kengashining pedagogik funksiyasi – oliy ta'lim muassasasining strategik, moddiy, inson va tashkiliy imkoniyatlarini sifatli ta'lim uchun zarur shart-sharoitlarni yaratishga yo' naltirish hamda erishilgan ta'lim natijalarini boshqaruv qarorlari bilan o' zaro bog' lashdan iborat.

Bunday yondashuv kengash faoliyatining samaradorligini faqat o‘ tkazilgan yig‘ ilishlar yoki qabul qilingan qarorlar soni bilan baholash yetarli emasligini ko‘ rsatadi. Asosiy mezon qabul qilingan qarorlarning universitet faoliyati va, ayniqsa, ta’lim jarayonida qanday sifat o‘ zgarishlarini yuzaga keltirganligi bo‘ lishi kerak.

Xulosa va takliflar.O‘ zbekistonda oliy ta’lim muassasalari boshqaruvi kengashlarining rivojlanishi universitet boshqaruvining kollegialligi, institutsional javobgarligi va strategik yo‘ naltirilganligini kuchaytirishga xizmat qiluvchi muhim jarayon hisoblanadi. Boshqaruv kengashi universitet rahbariyatining kundalik ijro funksiyalarini takrorlovchi tuzilma emas, balki muassasaning rivojlanish istiqbollarini muhokama qilish, resurslar va ustuvorliklar o‘ rtasidagi muvozanatni ta’minlash hamda natijalarni monitoring qilishga yo‘ naltirilgan institutsional mexanizm sifatida faoliyat yuritishi maqsadga muvofiq.

Tahlil natijalari boshqaruv kengashlarining vakolatlari strategik, muvofiqlashtiruvchi hamda monitoring-nazorat yo‘ nalishlarini qamrab olishini ko‘ rsatadi. Ushbu vakolatlarning ta’lim sifatiga ta’siri esa strategik qarorlarning pedagogik jarayon uchun real sharoitlarga aylanish darajasi bilan belgilanadi.

Shundan kelib chiqib quyidagi takliflarni ilgari surish mumkin:

1. **Boshqaruv kengashi vakolatlari va ijro rahbariyati vazifalari o‘ rtasidagi chegaralarni aniqlashtirish.** Kengashning strategik va nazorat funksiyalari bilan rektoratning operativ boshqaruv funksiyalari o‘ zaro takrorlanmasligi lozim.
2. **Kengash faoliyatida ta’lim sifati masalalarining ulushini oshirish.** Yig‘ ilishlarda moliyaviy va xo‘ jalik masalalari bilan bir qatorda ta’lim natijalari, o‘ quv dasturlari sifati, talabalar qoniqishi va professor-o‘ qituvchilar rivojlanishi muntazam muhokama qilinishi zarur.
3. **Qarorlar ijrosini kuzatishning natijaga asoslangan mexanizmini joriy etish.** Har bir muhim qaror bo‘ yicha mas’ul subyekt, amalga oshirish muddati va natijani baholash indikatori belgilanishi maqsadga muvofiq.
4. **Kengash tarkibida manfaatdor tomonlarning mazmunli ishtirokini ta’minlash.** Ish beruvchilar, soha ekspertlari, professor-o‘ qituvchilar, bitiruvchilar va zarur hollarda talabalar vakillarining fikrlaridan strategik qarorlarni ishlab chiqishda foydalanish zarur.
5. **Boshqaruv kengashi faoliyatini baholash mezonlarini ishlab chiqish.** Bunda yig‘ ilishlar sonidan ko‘ ra qabul qilingan qarorlarning ta’lim sifati, resurslardan foydalanish, professor-o‘ qituvchilar salohiyati va universitetning strategik rivojlanishiga ta’siri ustuvor mezon sifatida olinishi kerak.
6. **Kengash qarorlari va ta’lim sifati ko‘ rsatkichlari o‘ rtasida qayta aloqa mexanizmini shakllantirish.** Monitoring natijalari keyingi kengash yig‘ ilishlarida muhokama qilinib, zarur hollarda strategik qarorlarga tuzatishlar kiritilishi lozim.

Umuman olganda, O‘ zbekistonda oliy ta’lim muassasalari boshqaruvi kengashlarining samaradorligini oshirish ularning vakolatlarini kengaytirish bilangina emas, balki ushbu vakolatlarni aniq vazifalar, o‘ lchanadigan natijalar va ta’lim sifati bilan bog‘ lash orqali ta’minlanadi. Boshqaruv kengashining strategik qarorlari pedagogik jarayonning real ehtiyojlariga yo‘ naltirilgan taqdirdagina kollegial boshqaruv oliy ta’lim sifatini rivojlantirishning samarali institutsional mexanizmiga aylanishi mumkin.

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МЕЖКУЛЬТУРНАЯ КОММУНИКАЦИЯ В СОВРЕМЕННОМ ОБРАЗОВАТЕЛЬНОМ ПРОСТРАНСТВЕ: ТРАНСФОРМАЦИЯ ФОРМ, БАРЬЕРОВ И СТРАТЕГИЙ ВЗАИМОДЕЙСТВИЯ

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Аннотация: *В статье рассматривается трансформация межкультурной коммуникации в современном образовательном пространстве под влиянием интернационализации образования и развития цифровых технологий. Анализируются очные, цифровые и гибридные формы взаимодействия, а также языковые, социокультурные, интерпретационные и цифровые коммуникативные барьеры. Особое внимание уделяется педагогическим стратегиям формирования межкультурной коммуникативной компетентности студентов посредством анализа проблемных ситуаций, виртуального обмена, международных проектов и рефлексивных заданий. Обосновывается переход от передачи знаний о другой культуре к приобретению практического опыта межкультурного взаимодействия.*

Ключевые слова: *межкультурная коммуникация, образовательное пространство, межкультурная компетентность, коммуникативные барьеры, цифровая коммуникация, виртуальный обмен, академическая мобильность, стратегии взаимодействия, рефлексия.*

ZAMONAVIY TA’LIM MAKONIDA MADANIYATLARARO KOMMUNIKATSIYA: O‘ ZARO HAMKORLIK SHAKLLARI, TO‘ SIQLARI VA STRATEGIYALARINING TRANSFORMATSIYASI

Annotatsiya: *Maqolada ta’limning internatsionallashuvi va raqamli texnologiyalarning rivojlanishi ta’sirida zamonaviy ta’lim makonida madaniyatlararo kommunikatsiyaning transformatsiyasi ko‘ rib chiqiladi. O‘ zaro hamkorlikning an’anaviy (yuzma-yuz), raqamli va gibrid shakllari, shuningdek, lisoniy, sotsiomadaniy, interpretatsion va raqamli kommunikativ to‘ siqlar tahlil qilinadi. Muammoli vaziyatlarni tahlil qilish, virtual almashinuv, xalqaro loyihalar va refleksiv topshiriqlar vositasida talabalarning madaniyatlararo kommunikativ kompetentligini shakllantirishga qaratilgan pedagogik strategiyalarga alohida e’tibor qaratiladi. Boshqa madaniyat haqidagi bilimlarni yetkazishdan madaniyatlararo o‘ zaro hamkorlikning amaliy tajribasini egallashga o‘ tish zarurati asoslab beriladi.*

Kalit so‘ zlar: *madaniyatlararo kommunikatsiya, ta’lim makoni, madaniyatlararo kompetentlik, kommunikativ to‘ siqlar, raqamli kommunikatsiya, virtual almashinuv, akademik mobillik, o‘ zaro hamkorlik strategiyalari, refleksiya.*

INTERCULTURAL COMMUNICATION IN THE CONTEMPORARY EDUCATIONAL SPACE: TRANSFORMATION OF FORMS, BARRIERS, AND INTERACTION STRATEGIES

Abstract: *The article examines the transformation of intercultural communication in the contemporary educational space under the influence of the internationalization of education and the development of digital technologies. Face-to-face, digital, and hybrid forms of interaction are analyzed, along with linguistic, sociocultural, interpretative, and digital communication barriers. Particular attention is paid to pedagogical strategies for developing students’ intercultural communicative competence through the analysis of problem situations, virtual exchange, international projects, and reflective tasks. The article substantiates the need to move from transmitting knowledge about other cultures to acquiring practical experience of intercultural interaction.*

Keywords: *intercultural communication, educational space, intercultural competence, communication barriers, digital communication, virtual exchange, academic mobility, interaction strategies, reflection.*

ВВЕДЕНИЕ

Современное образовательное пространство становится всё более открытым для межкультурного взаимодействия. Академическая мобильность, международные образовательные программы, совместные научные проекты, сетевое сотрудничество университетов, видеоконференции и цифровые платформы значительно

расширяют возможности непосредственного и опосредованного общения представителей различных языков и культур. В этих условиях межкультурная коммуникация перестаёт быть эпизодической ситуацией, возникающей преимущественно при поездке в другую страну, и становится повседневной составляющей образовательной и профессиональной деятельности.

Актуальность данной проблемы подтверждается современными исследованиями высшего образования. N. Guillén-Yparrea и M. S. Ramírez-Montoya отмечают значимость межкультурных компетенций в условиях расширения международного, виртуального и коллаборативного взаимодействия студентов [6]. Межкультурная компетентность при этом всё чаще понимается не как сумма отдельных сведений о другой культуре, а как способность личности продуктивно действовать в культурно неоднородной коммуникативной среде.

Проблема межкультурного взаимодействия рассматривалась нами ранее применительно к культурной обусловленности коммуникации, формам межкультурного общения и причинам возникновения коммуникативных барьеров [1]. Однако произошедшие за последние годы изменения образовательной среды требуют развития данного направления. Непосредственное общение всё активнее дополняется цифровыми и гибридными формами взаимодействия, а традиционные языковые и социокультурные барьеры сочетаются с новыми интерпретационными трудностями.

Сегодня студент может ежедневно взаимодействовать с представителями другой культуры, физически не покидая своей страны. Он участвует в международном вебинаре, выполняет совместное задание с зарубежным партнёром, обсуждает проект в мессенджере, получает комментарий преподавателя во время видеоконференции. В каждой из этих ситуаций он сталкивается не только с языковыми, но и с интерпретационными задачами.

Представим обычную ситуацию. Участник международного студенческого проекта предлагает заранее распределить обязанности, определить точные сроки и практически не изменять утверждённый план. Другой студент предпочитает обсуждать решения по мере выполнения работы и считает допустимой корректировку первоначальных договорённостей. Первый может воспринимать партнёра как недостаточно организованного, второй - первого как чрезмерно формального и негибкого. Между тем проблема может заключаться не в личностных качествах участников, а в несовпадении привычных моделей организации совместной деятельности.

Именно способность не торопиться с оценкой, видеть несколько возможных объяснений поведения партнёра и при необходимости изменять собственную коммуникативную стратегию становится важным показателем межкультурной компетентности.

Цель исследования - выявить основные направления трансформации межкультурной коммуникации в современном образовательном пространстве, систематизировать возникающие коммуникативные барьеры и определить педагогические стратегии формирования межкультурной коммуникативной компетентности студентов.

Научная новизна исследования заключается в рассмотрении межкультурного коммуникативного барьера не только как препятствия, требующего устранения, но и как потенциальной точки межкультурной рефлексии, запускающей переосмысление первоначальной интерпретации поведения партнёра. Кроме того, традиционная модель адаптации дополняется идеей совместного конструирования коммуникативной нормы, при которой участники разных культур согласовывают приемлемые для совместной деятельности правила взаимодействия.

МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЯ

Методологическую основу исследования составили коммуникативно-деятельностный, компетентностный, межкультурный и рефлексивный подходы. Использовались методы теоретического анализа современных отечественных и зарубежных исследований, сравнительно-сопоставительного анализа традиционных и цифровых форм межкультурного взаимодействия, классификации коммуникативных барьеров, педагогического моделирования и интерпретации типичных ситуаций образовательной коммуникации. При анализе учитывались исследования межкультурной коммуникативной компетентности студентов, академической мобильности, телесотрудничества, виртуального обмена и цифрового образовательного взаимодействия. Особое внимание уделялось работам, в которых межкультурная компетентность рассматривается не как статический набор сведений, а как развивающаяся способность личности действовать в изменяющихся коммуникативных обстоятельствах.

Y. Hang и X. Zhang на основании систематического обзора предлагают рассматривать развитие межкультурной компетентности студентов как процесс последовательных переходов и изменений, а не как однократно достигнутое состояние [7]. Такой подход представляется принципиально важным для педагогической интерпретации: студент не просто «получает» межкультурную компетентность, а постепенно изменяет способы восприятия, интерпретации и организации взаимодействия.

МЕЖКУЛЬТУРНАЯ КОММУНИКАЦИЯ: ОТ ЗНАНИЯ ДРУГОЙ КУЛЬТУРЫ К ИНТЕРПРЕТАЦИИ СИТУАЦИИ

В широком понимании межкультурная коммуникация представляет собой взаимодействие участников, культурно обусловленный опыт которых оказывает влияние на создание, передачу и интерпретацию сообщения.

Однако само наличие культурных различий ещё не означает неизбежного непонимания. Культурное различие становится коммуникативно значимым тогда, когда влияет на ожидания участников, понимание намерений собеседника и оценку его поведения. Существенное значение в данном контексте приобретает коммуникативная направленность обучения. В одной из ранее опубликованных работ была обоснована необходимость такой организации обучения, при которой языковые знания реализуются непосредственно в речевой деятельности и моделируемых коммуникативных ситуациях [2]. В межкультурном образовательном пространстве этот принцип получает дальнейшее развитие: студенту необходимо не только грамотно построить высказывание, но и соотнести его с адресатом, коммуникативным намерением, конкретной ситуацией и возможными культурно обусловленными способами интерпретации.

В этом заключается существенное отличие знания культуры от межкультурной компетентности. Студент может знать национальные праздники, традиции, нормы этикета и исторические факты, но оказаться неподготовленным к конкретной ситуации, в которой поведение партнёра не соответствует его ожиданиям.

Рассмотрим пример. Студент привык демонстрировать уважение к преподавателю внимательным слушанием и отсутствием публичных возражений. Во время обучения в другой академической среде он оказывается на занятии, где преподаватель ожидает вопросов, дискуссии и аргументированного несогласия. Студент молчит, считая такое поведение корректным. Преподаватель, напротив, может воспринять его молчание как недостаточную подготовленность или отсутствие заинтересованности.

Возможна и обратная ситуация: студент, привыкший свободно вступать в дискуссию, попадает в среду, где публичное возражение преподавателю предполагает более осторожную речевую форму.

В обоих случаях проблема возникает не потому, что кто-либо из участников не знает правил языка. Причиной становится несовпадение интерпретаций одного и того же коммуникативного действия. E. Gutiérrez-Santiuste и M. Ritacco-Real рассматривают межкультурную коммуникативную компетентность через взаимосвязь когнитивного, аффективного и поведенческого измерений и показывают значение реального взаимодействия участников телесотрудничества для её развития [8]. Такой подход позволяет отказаться от сведения межкультурной компетентности исключительно к знаниям о другой стране или культуре.

Применительно к современному образовательному пространству межкультурную коммуникативную компетентность целесообразно понимать как интегративную способность личности распознавать культурно обусловленные особенности коммуникативной ситуации, интерпретировать позицию партнёра, соотносить её с собственной системой культурных координат, выбирать адекватную стратегию взаимодействия и корректировать её на основе обратной связи.

При таком подходе меняется и основной педагогический вопрос. Вместо вопроса «Что студент знает о другой культуре?» более значимым становится другой: «Как студент действует в ситуации культурной и коммуникативной неоднозначности?»

ТРАНСФОРМАЦИЯ ФОРМ МЕЖКУЛЬТУРНОЙ КОММУНИКАЦИИ

В современном образовании можно выделить три взаимосвязанные формы межкультурного взаимодействия: непосредственную, цифровую и гибридную.

Непосредственная коммуникация традиционно реализуется во время академической мобильности, международной конференции, стажировки, совместного обучения, культурно-образовательного мероприятия. Её существенным преимуществом является наличие относительно полного коммуникативного контекста: участник слышит интонацию, наблюдает мимику и жесты, видит непосредственную реакцию собеседника и может быстро уточнить непонятное.

Цифровая коммуникация значительно расширяет пространство взаимодействия, одновременно изменяя его условия. F. Helm характеризует виртуальный обмен как образовательный подход, объединяющий с помощью технологий географически и культурно удалённых участников в продолжительном онлайн-взаимодействии [9]. При этом выделяются сравнительный, проблемно-ориентированный и диалогический подходы к его организации. Для межкультурного образования особенно существенен диалогический потенциал виртуального обмена: студент не просто получает информацию о другой культуре, а вступает в непосредственное взаимодействие с её представителем.

Особую значимость проблема интерпретации приобретает в условиях двуязычия. Ранее при рассмотрении коммуникативного метода в узбекско-русской билингвальной среде была показана необходимость перехода от усвоения языкового материала к его практическому использованию в реальных речевых ситуациях [3]. В межкультурной коммуникации данное положение приобретает дополнительное значение: успешность

взаимодействия определяется не только языковой правильностью высказывания, но и способностью распознавать его прагматическое содержание, учитывать позицию партнёра и при необходимости изменять речевую стратегию.

Рассмотрим простую ситуацию цифрового взаимодействия. Студент отправляет зарубежному партнёру подготовленный материал для совместного проекта и получает ответ: **«ОК».**

С информационной точки зрения коммуникация состоялась: материал получен. Однако отправитель может интерпретировать краткость ответа как недовольство или холодность: «Я долго готовил материал, а мне ответили только одним словом». Для партнёра же «ОК» могло означать исключительно: «Получил, всё понятно».

Коммуникативное затруднение в данном случае возникает не в содержании сообщения, а в приписываемом ему отношении. Подобная неоднозначность характерна и для электронной переписки. Фраза «Пришлите материал до пятницы» для одного участника является нейтральной деловой формой, а для другого может звучать категорично. Напротив, формулировка «Не могли бы Вы прислать материал до пятницы?» одним коммуникантом воспринимается как вежливая просьба, другим - как указание на необязательность действия.

Следовательно, грамматически правильное сообщение не всегда является прагматически однозначным. Особые трудности возникают при видеокоммуникации. Например, после вопроса преподавателя иностранный студент делает паузу в несколько секунд. Она может восприниматься как отсутствие ответа или неуверенность. Однако пауза способна быть связана с необходимостью сформулировать мысль на неродном языке, привычкой не перебивать собеседника или технической задержкой связи.

Не менее неоднозначна ситуация с выключенной камерой. Преподаватель может увидеть в этом недостаточную вовлечённость. Однако причиной могут быть технические ограничения, домашние условия, психологический дискомфорт или иное понимание границ приватности.

Таким образом, цифровая среда создаёт своеобразный парадокс: она увеличивает количество межкультурных контактов, одновременно сокращая часть контекстуальных сигналов, необходимых для их интерпретации.

Гибридная коммуникация объединяет непосредственное и цифровое взаимодействие. Например, знакомство участников международного проекта начинается онлайн, затем продолжается во время очной академической программы, а после возвращения студентов в свои страны вновь переходит в цифровую среду.Межкультурный контакт в данном случае перестаёт быть единичным событием и становится продолжительным процессом.

Трансформация коммуникативных барьеров. Расширение форм общения закономерно приводит к усложнению системы коммуникативных барьеров. Наряду с традиционным языковым барьером особое значение приобретают социокультурный, стереотипный, интерпретационный и цифровой барьеры.

Языковой барьер наиболее очевиден при недостаточном владении языком общения. Однако значительно сложнее ситуации, когда участники понимают значение слов, но по-разному интерпретируют намерение.

Например: - Вы согласны с этим предложением?

- В принципе, это интересный вариант.

Вторая реплика может означать положительную оценку, осторожное несогласие или желание продолжить обсуждение. Участник, ориентированный исключительно на буквальное содержание, способен принять её за согласие.

Следовательно, языковая подготовка к межкультурной коммуникации должна включать не только лексико-грамматическую правильность, но и прагматическую интерпретацию высказывания.

Социокультурный барьер возникает при несовпадении норм и ожиданий. Международная студенческая группа договаривается начать онлайн-встречу в 15.00. Часть участников подключается заранее, один студент появляется в 15.07. Для одних семь минут означают нарушение договорённости, для другого - допустимое отклонение.

Если ситуация немедленно объясняется личностными качествами - «безответственность», «неуважение», - вероятность конфликта возрастает. Если же группа обсуждает различия и устанавливает собственное правило, культурное несовпадение становится предметом переговоров.

Стереотипный барьер возникает, когда единичный коммуникативный опыт переносится на всю культурную группу. Встретившись с одним сдержанным собеседником, студент может сформулировать вывод: «представители этой культуры холодны». Последующее общение уже будет интерпретироваться через готовую схему.

Именно поэтому перечисление преподавателем якобы неизменных «черт национального характера» не всегда способствует развитию межкультурной компетентности и при некритическом использовании способно, напротив, укреплять стереотипные представления.

Интерпретационный барьер, на наш взгляд, приобретает особое значение в современном образовательном пространстве. Во время обсуждения проекта студент говорит: «Я бы сделал эту часть немного иначе».

Для одного участника это приглашение к дискуссии. Другой слышит критику выполненной работы. Третий воспринимает реплику как смягчённое выражение несогласия. Коммуникативный факт один, однако его значения конструируются участниками по-разному.

Цифровой барьер связан не только с доступом к технологиям. В межкультурной коммуникации особую роль играют различия в интерпретации скорости ответа, длины сообщения, эмодзи, знаков препинания, голосовых сообщений, статуса «прочитано», использования камеры.

Например, студент видит, что партнёр прочитал сообщение, но несколько часов не отвечает. Возникает соблазн заполнить информационный пробел собственным объяснением: «игнорирует», «не заинтересован», «недоволен». В действительности причина может вообще не иметь отношения к межличностной оценке. Поэтому цифровая межкультурная компетентность предполагает способность выдерживать определённую степень коммуникативной неопределённости и не подменять отсутствующую информацию поспешной интерпретацией.

R. Zhou, A. Samad и T. Perinpasingam связывают развитие межкультурной коммуникативной компетентности с языковой подготовкой, межкультурной осведомлённостью, критическим мышлением и коммуникативными способностями обучающихся [10]. Это подтверждает необходимость комплексного подхода: преодолеть межкультурный барьер одним только увеличением объёма страноведческой информации невозможно.

От коммуникативного барьера к межкультурной рефлексии.

Традиционно коммуникативный барьер рассматривается как негативное явление, которое следует предупредить или устранить. Представляется целесообразным дополнить данный взгляд: в педагогически организованной среде коммуникативное затруднение способно стать ресурсом развития межкультурной компетентности.

Изменение характера образовательной коммуникации непосредственно связано и с цифровой трансформацией обучения. В ранее проведённом исследовании моделей смешанного обучения было показано, что цифровая образовательная среда расширяет возможности организации речевой и интерпретационной деятельности обучающихся [5]. В контексте межкультурной коммуникации это положение позволяет сделать следующий шаг: цифровая среда выступает не только каналом передачи информации, но и пространством интерпретации, в котором студент учится распознавать коммуникативную неоднозначность, проверять первоначальные предположения и корректировать собственную стратегию взаимодействия.

Рассмотрим ситуацию. Студент говорит преподавателю: «Вы неправильно объяснили задание».

С точки зрения грамматики фраза правильна. Коммуникативное намерение также может быть конструктивным: студент хочет сообщить, что не понял условие. Однако категорическая оценка действий преподавателя в определённой академической среде может восприниматься как нарушение статусной дистанции. Предложим другие варианты:

«Я не совсем понял задание. Не могли бы Вы ещё раз пояснить этот момент?»

«Правильно ли я понял, что необходимо…?»

«Возможно, я неправильно понял условие. Можно уточнить…?»

Задача студентов заключается не в механическом выборе «самой вежливой» реплики, а в определении того, как изменение языковой формы перестраивает отношения участников общения.

Другой пример: - Вы сможете выступить первым?

- Наверное, сегодня это будет немного сложно.

Является ли вторая реплика отказом? Просьбой дать время?

Предложением изменить порядок выступлений?

Вместо требования угадать единственно правильный ответ целесообразно предложить студенту найти несколько интерпретаций и сформулировать корректный уточняющий вопрос. На основании такого анализа предлагаем следующую модель:

коммуникативная ситуация → первичная интерпретация → альтернативные объяснения → уточнение →выбор стратегии →обратная связь →рефлексия.

Центральным звеном является переход от первой интерпретации к альтернативным объяснениям. Именно здесь возникает точка межкультурной рефлексии - момент, когда участник перестаёт воспринимать собственное объяснение как единственно возможное и начинает рассматривать коммуникативную ситуацию с позиции другого человека.

Академическая мобильность как пространство межкультурного опыта. Академическая мобильность создаёт благоприятные условия для развития межкультурной компетентности, поскольку студент оказывается

внутри реального образовательного и социокультурного пространства. Однако сама поездка ещё не гарантирует развития соответствующих способностей.

Студент может провести несколько месяцев за рубежом, преимущественно общаясь с соотечественниками, и вернуться с большим количеством впечатлений, но с минимальными изменениями способов понимания другой культуры. И наоборот, сравнительно непродолжительная программа может стать значимым опытом, если возникающие коммуникативные ситуации становятся предметом осмысленной рефлексии.

Например, в первые дни обучения студент замечает, что преподаватель предлагает обращаться к нему менее формально, чем принято в привычной академической среде. Первоначальная интерпретация может быть следующей: «здесь практически отсутствует дистанция между преподавателем и студентом».

Позднее выясняется, что менее формальная форма обращения сочетается с высокой академической требовательностью и ответственностью.

Значимым результатом становится не сам факт обнаружения различия, а изменение первоначального объяснения. Для сопровождения академической мобильности может использоваться рефлексивный дневник межкультурных наблюдений:

Ситуация	**Первая интерпретация**	**Другие возможные причины**	**Что выяснилось**	**Что изменилось в моём понимании**
Студенты открыто возражают преподавателю	Недостаток уважения	Иная норма академической дискуссии	Преподаватель сам стимулирует обсуждение	Несогласие может быть проявлением академической активности
Партнёр долго не отвечает на сообщение	Игнорирование	Занятость, иная норма цифровой доступности	Ответ поступил позднее с объяснением	Скорость ответа не всегда выражает отношение
Участник изменяет первоначальный план	Безответственность	Гибкая модель планирования	Изменение улучшило результат	Корректировка плана не обязательно означает нарушение обязательств
Участник изменяет первоначальный план	Безответственность	Гибкая модель планирования	Изменение улучшило результат	Корректировка плана не обязательно означает нарушение обязательств

Такой дневник превращает бытовое впечатление в материал для анализа и позволяет студенту увидеть изменение собственной интерпретационной позиции.

Виртуальный обмен и межкультурное взаимодействие. Одним из перспективных направлений интернационализации образования становится виртуальный обмен. Его принципиальное отличие от обычного использования цифровых ресурсов состоит в том, что студент взаимодействует не с информацией о другой культуре, а с реальным человеком, представляющим иной языковой и культурный опыт.

Вопросы взаимосвязи языкового обучения, двуязычия, цифровых технологий и коммуникации рассматривались нами ранее применительно к преподаванию русского языка [4]. Проведённый анализ показал расширение возможностей речевой практики обучающихся в цифровой среде. В межкультурном аспекте это положение приобретает новое содержание: цифровой формат требует не только передачи сообщения, но и интерпретации коммуникативного намерения партнёра в условиях частичного сокращения невербального и ситуационного контекста.

Исследование E. Gutiérrez-Santiuste и M. Ritacco-Real демонстрирует возможности телесотрудничества для развития поведенческих, аффективных и когнитивных компонентов межкультурной коммуникативной

компетентности [8]. F. Helm, в свою очередь, обращает внимание на то, что образовательный результат виртуального обмена зависит от педагогического дизайна взаимодействия и от того, каким образом в нём актуализируется культурная проблематика [9].

Само подключение двух групп студентов к видеоконференции ещё не создаёт полноценного межкультурного обучения. Если участники лишь по очереди рассказывают о национальных праздниках, кухне или достопримечательностях, взаимодействие может остаться на уровне обмена информацией. Иная ситуация возникает, когда студентам предлагается решить общую проблему.

Например, смешанная международная группа должна разработать правила цифрового общения для совместного проекта. Сразу обнаруживаются вопросы: Как быстро необходимо отвечать на сообщение?

Допустимо ли писать преподавателю вечером?

Обязательно ли включать камеру?

Можно ли использовать голосовые сообщения?

Как выражать несогласие?

Кто принимает окончательное решение?

Теперь культура проявляется не как заранее подготовленный рассказ, а в процессе реального согласования поведения. Именно такие ситуации обладают высоким образовательным потенциалом.

Педагогические стратегии формирования межкультурной компетентности. Современная подготовка к межкультурному взаимодействию должна создавать условия, в которых студент не только получает информацию, но и учится действовать в ситуации неоднозначности. Одной из продуктивных стратегий является анализ межкультурного кейса.

Кейс 1. «Молчание после вопроса»

Во время международного онлайн-занятия преподаватель задаёт студенту вопрос. Студент молчит пять-семь секунд.

Первая реакция участников обычно предполагает ограниченный набор объяснений: «не знает ответа», «не понял», «боится говорить».

Затем предлагается найти другие варианты: студент обдумывает формулировку; переводит вопрос; считает необходимым выдержать паузу; ждёт завершения реплики преподавателя; возникла техническая задержка.

Цель задания заключается не в установлении «правильной» причины, а в формировании привычки не превращать первое объяснение в окончательный вывод.

Кейс 2. «Слишком прямое сообщение»

Участник международной группы пишет партнёру: «Исправьте эту часть и отправьте мне сегодня». Студентам предлагается преобразовать сообщение для трёх адресатов: близкого партнёра по группе, нового зарубежного коллеги и преподавателя. Затем обсуждается, почему одна и та же просьба требует различного языкового оформления.

В результате становится очевидным, что коммуникативная адекватность определяется не только культурой, но и статусом, дистанцией, целью и конкретной ситуацией.

Кейс 3. «Выключенная камера»

Участник международного занятия регулярно оставляет камеру выключенной.

Задача студентов - предложить не менее пяти возможных объяснений, не используя оценок личности.

Такое простое ограничение - **сначала объяснить, потом оценивать** - формирует важную межкультурную установку.

Кейс 4. «Международная проектная группа»

Четыре участника должны подготовить совместную презентацию. Первый предлагает назначить руководителя. Второй считает, что все решения должны приниматься коллективно. Третий предлагает немедленно распределить части работы. Четвёртый хочет сначала подробно обсудить общую концепцию.

Задача группы - не определить, чья модель правильнее, а разработать пятую модель, которая позволит организовать совместную деятельность.

В таком задании проявляется принципиально важный переход - от адаптации к готовой норме к совместному созданию нормы взаимодействия.

От адаптации к совместному конструированию коммуникативной нормы. Традиционное представление о межкультурной адаптации нередко предполагает, что один участник должен изучить правила другой культуры и приспособить к ним своё поведение. Такая стратегия действительно необходима во многих ситуациях, однако современное международное образование демонстрирует и другую возможность.

В международной проектной группе ни одна сторона не обязана полностью переходить на коммуникативную модель другой.

Например, участники по-разному относятся к срокам выполнения задания. Вместо выбора одной из двух моделей они устанавливают общий окончательный срок и несколько промежуточных контрольных точек.

При различном отношении к лидерству группа может договориться о смене координатора на разных этапах проекта.

При разных представлениях о допустимой скорости ответа на сообщения участники заранее устанавливают правило: срочные вопросы отмечаются отдельно, а обычный ответ ожидается в течение определённого периода. Возникающая норма первоначально могла не принадлежать ни одной из сторон. Она создаётся в процессе взаимодействия.

Именно поэтому современная модель межкультурной коммуникации может быть выражена не только формулой: «Я понимаю Ваши правила и приспосабливаюсь к ним», но и более диалогической: «Мы осознаём различия наших правил и создаём способ взаимодействия, приемлемый для совместной деятельности».

Такое понимание особенно важно для международных образовательных проектов, виртуального обмена и академического сотрудничества.

РЕЗУЛЬТАТЫ И ОБСУЖДЕНИЕ

Проведённый анализ позволяет определить несколько взаимосвязанных направлений трансформации межкультурной коммуникации.

Первое связано с изменением **пространства взаимодействия**. Межкультурный контакт больше не ограничен физическим присутствием участников в одном месте. Он разворачивается одновременно в очной, цифровой и гибридной среде.

Второе направление связано с изменением **структуры коммуникативного барьера**. Языковые различия сохраняют значение, однако всё более заметную роль приобретают интерпретационные трудности: участники понимают слова, но неодинаково воспринимают намерение, степень категоричности, эмоциональную окраску или социальный смысл высказывания.

Третье направление - изменение отношения к **коммуникативной ошибке**. В педагогическом процессе она может рассматриваться не только как нежелательный результат, но и как диагностическая ситуация, выявляющая несовпадение интерпретационных моделей.

Четвёртое направление связано с изменением **позиции преподавателя**. Его задача выходит за пределы передачи сведений о культурных различиях. Преподаватель становится организатором межкультурного опыта: создаёт проблемную ситуацию, побуждает студентов искать несколько интерпретаций, организует уточнение и последующую рефлексию.

Пятое направление касается понимания **адаптации**. Наряду с приспособлением к существующей культурной норме современная образовательная коммуникация допускает совместное конструирование правил взаимодействия.

Обобщая результаты анализа, предлагаем следующую последовательность развития продуктивной межкультурной стратегии:

осознание различия → отказ от поспешной оценки → альтернативная интерпретация → уточнение → согласование → взаимодействие → рефлексия → корректировка стратегии.

В отличие от линейной модели передачи знаний, данная последовательность носит циклический характер. Новый межкультурный опыт способен изменить первоначальные представления студента, а сформированная стратегия вновь проверяется в последующем взаимодействии.

Таким образом, результатом межкультурного образования становится не набор готовых рецептов поведения, а интерпретационная гибкость личности. Это позволяет сформулировать основное положение исследования: современная подготовка к межкультурной коммуникации должна быть направлена не столько на запоминание перечня культурных различий, сколько на формирование способности распознавать коммуникативную неоднозначность, рассматривать несколько возможных объяснений поведения партнёра, проверять собственную интерпретацию во взаимодействии и осознанно корректировать коммуникативную стратегию.

ЗАКЛЮЧЕНИЕ

Современное образовательное пространство существенно изменяет содержание и формы межкультурной коммуникации. Интернационализация высшего образования, академическая мобильность, виртуальный обмен и цифровые технологии расширяют возможности взаимодействия представителей разных культур и одновременно создают новые коммуникативные задачи.

Проведённый анализ показывает, что традиционное понимание межкультурной подготовки преимущественно как накопления знаний о другой культуре уже недостаточно. Информация о традициях, нормах и ценностях остаётся необходимой, однако она приобретает педагогическую значимость тогда, когда помогает участнику интерпретировать конкретную ситуацию и выбирать адекватную стратегию поведения.

Наряду с языковыми и социокультурными барьерами возрастает значение интерпретационных и цифровых затруднений. Причиной коммуникативной неудачи всё чаще становится не отсутствие информации, а поспешное приписывание поведению партнёра единственного значения.

В связи с этим межкультурная коммуникативная компетентность должна рассматриваться как динамическая способность личности распознавать культурную неоднозначность, анализировать ситуацию с нескольких позиций, уточнять коммуникативное намерение партнёра, выбирать соответствующую стратегию взаимодействия и корректировать её на основе обратной связи.

Особое педагогическое значение приобретает работа с реальными и моделируемыми ситуациями межкультурного непонимания. Кейс-анализ, виртуальный обмен, международные проекты, академическая мобильность и рефлексивные задания позволяют перенести обучение из области описания культурных различий в пространство практического взаимодействия.

Одним из результатов исследования является положение о продуктивной функции коммуникативного барьера. При педагогически организованной рефлексии ситуация непонимания способна стать **точкой развития**: студент обнаруживает ограниченность первоначального объяснения, рассматривает альтернативные интерпретации и приобретает опыт изменения собственного коммуникативного поведения.

Вторым значимым положением является переход от исключительно адаптационной модели к **совместному конструированию межкультурной** коммуникативной нормы. Участники международного взаимодействия способны не только приспосабливаться к правилам друг друга, но и создавать новые согласованные способы организации совместной деятельности. Таким образом, перспективная логика межкультурного образования может быть представлена следующим образом:

- от знания о другой культуре - к пониманию;
- от понимания - к интерпретации конкретной ситуации;
- от интерпретации - к взаимодействию;
- от взаимодействия - к рефлексии;
- от рефлексии - к осознанной корректировке коммуникативной стратегии.

Именно такое движение позволяет рассматривать межкультурную коммуникацию не как дополнительный компонент языковой или профессиональной подготовки, а как значимый ресурс современного образования, обеспечивающий готовность личности к диалогу, сотрудничеству и продуктивному взаимодействию в культурно неоднородной среде.

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NEYROPEDAGOGIK YONDASHUV ASOSIDA ZAMONAVIY TA'LIM JARAYONINI TAKOMILLASHTIRISH

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Annotatsiya: *Mazkur maqolada neyropedagogikaning zamonaviy ta'lim tizimidagi o' rni, mazmun-mohiyati va asosiy tamoyillari yoritilgan. Neyropedagogika inson miyasining faoliyati, kognitiv jarayonlar, emotsional holat hamda ta'lim jarayoni o' rtasidagi o' zaro bog' liqlikni o' rganib, o' qitish samaradorligini oshirishga xizmat qiluvchi ilmiy-amaliy yo' nalish sifatida tahlil qilinadi. Maqolada miyaning plastiklik xususiyati, tajriba va amaliy faoliyat asosida o' rganish, emotsional xavfsiz ta'lim muhiti, shaxsiylashtirilgan ta'lim, kognitiv va emotsional jarayonlarning uyg' unligi hamda faol o' rganish metodlarining ahamiyati ochib berilgan. Shuningdek, zamonaviy ta'limda neyrotexnologiyalar, sun'iy intellekt va neyropsixologiya yutuqlaridan foydalanish imkoniyatlari ko' rib chiqilgan. Neyropedagogikaning o' quvchilarning individual xususiyatlarini hisobga olish, ularning intellektual va ijodiy salohiyatini rivojlantirishdagi imkoniyatlari asoslab berilgan.*

Kalit so' zlar: *neyropedagogika, ta'lim, miya faoliyati, neyropsixologiya, kognitiv rivojlanish, miyaning plastiklik xususiyati, emotsional intellekt, shaxsiylashtirilgan ta'lim, faol o' rganish, neyrotexnologiyalar.*

СОВЕРШЕНСТВОВАНИЕ СОВРЕМЕННОГО ОБРАЗОВАТЕЛЬНОГО ПРОЦЕССА НА ОСНОВЕ НЕЙРОПЕДАГОГИЧЕСКОГО ПОДХОДА

Аннотация: *В данной статье освещаются роль нейропедагогики в современной системе образования, её содержание, сущность и основные принципы. Нейропедагогика рассматривается как научно-практическое направление, изучающее взаимосвязь между функционированием человеческого мозга, когнитивными процессами, эмоциональным состоянием и образовательным процессом, а также анализируются её возможности в повышении эффективности обучения. В статье раскрывается значение пластичности мозга, обучения на основе опыта и практической деятельности, создания эмоционально безопасной образовательной среды, персонализированного обучения, гармоничного сочетания когнитивных и эмоциональных процессов, а также методов активного обучения. Кроме того, рассматриваются возможности использования в современном образовании нейротехнологий, искусственного интеллекта и достижений нейропсихологии. Обосновываются возможности нейропедагогики в учёте индивидуальных особенностей обучающихся, развитии их интеллектуального и творческого потенциала.*

Ключевые слова: *нейропедагогика, образование, деятельность мозга, нейропсихология, когнитивное развитие, пластичность мозга, эмоциональный интеллект, персонализированное обучение, активное обучение, нейротехнологии.*

IMPROVING THE MODERN EDUCATIONAL PROCESS BASED ON A NEUROPEDAGOGICAL APPROACH

Abstract: *This article highlights the role of neuropedagogy in the modern education system, its content, essence, and fundamental principles. Neuropedagogy is considered as a scientific and practical field that studies the interrelationship between the functioning of the human brain, cognitive processes, emotional states, and the educational process, as well as analyzes its potential for improving the effectiveness of learning. The article reveals the importance of brain plasticity, learning through experience and practical activities, creating an emotionally safe educational environment, personalized learning, the harmonious integration of cognitive and emotional processes, and active learning methods. In addition, the possibilities of using neurotechnologies, artificial intelligence, and advances in neuropsychology in modern education are examined. The potential of neuropedagogy to take into account the individual characteristics of learners and to develop their intellectual and creative potential is substantiated.*

Keywords: *neuropedagogy, education, brain activity, neuropsychology, cognitive development, brain plasticity, emotional intelligence, personalized learning, active learning, neurotechnologies.*

KIRISH.

Inson ongi doimiy ravishda rivojlanishga, yangi bilimlarni egallashga va yangi imkoniyatlarni kashf etishga intiladi. Bilishga bo‘lgan ehtiyoj inson tabiatining muhim xususiyatlaridan biri bo‘lib, ta’lim jarayonining mazmuni va samaradorligini belgilovchi omillardan hisoblanadi. Shu nuqtayi nazardan, zamonaviy ta’lim jarayonini faqat bilimlarni uzatish jarayoni sifatida emas, balki inson miyasining faoliyati, psixologik holati va ijtimoiy muhit bilan uzviy bog‘liq bo‘lgan murakkab tizim sifatida ko‘rib chiqish zarur. Aynan shu ehtiyoj neyropedagogikaning dolzarbligini belgilaydi. Neyropedagogika pedagogika, psixologiya va neyrofanlar kesishmasida shakllanayotgan yo‘nalish bo‘lib, ta’lim jarayonini inson miyasining ishlash mexanizmlari va kognitiv imkoniyatlariga moslashtirishni nazarda tutadi. Mazkur yondashuv o‘quvchilarning individual xususiyatlarini hisobga olish, o‘rganish jarayonini optimallashtirish hamda ular uchun psixologik jihatdan qulay va sog‘lom ta’lim muhitini yaratishga xizmat qiladi. Bugungi kunda ta’lim tizimida sifat va samaradorlik o‘rtasidagi muvozanatni ta’minlash muhim vazifalardan biri hisoblanadi. Ayniqsa, axborot texnologiyalari sohasida umumiy ta’lim maktablari, oliy ta’lim muassasalari va qo‘shimcha ta’lim kurslari o‘rtasidagi hamkorlikni kuchaytirish zarur. Ularning o‘zaro raqobatidan ko‘ra, o‘quvchilar uchun yaxlit ta’lim ekotizimini shakllantirish va ta’lim jarayonini yagona pedagogik hamda neyropedagogik tamoyillar asosida tashkil etish muhim ahamiyat kasb etadi.

Sun’iy intellekt, neyropsixologiya va neyrotexnologiyalarning jadal rivojlanishi ham ta’limga yangi yondashuvlarni joriy etishni talab qilmoqda. Shu jihatdan neyropedagogika zamonaviy ta’limning istiqbolli yo‘nalishlaridan biri sifatida inson miyasining faoliyat mexanizmlarini chuqurroq anglash va ushbu bilimlardan ta’lim jarayonida samarali foydalanish imkonini beradi.

ASOSIY QISM. Neyropedagogikaning asosiy tamoyillari. Neyropedagogika ta’lim jarayonini inson miyasining tabiiy imkoniyatlari va funksional xususiyatlari asosida tashkil etishga yo‘naltiriladi. Ushbu yo‘nalish bir qator muhim tamoyillarga tayanadi.

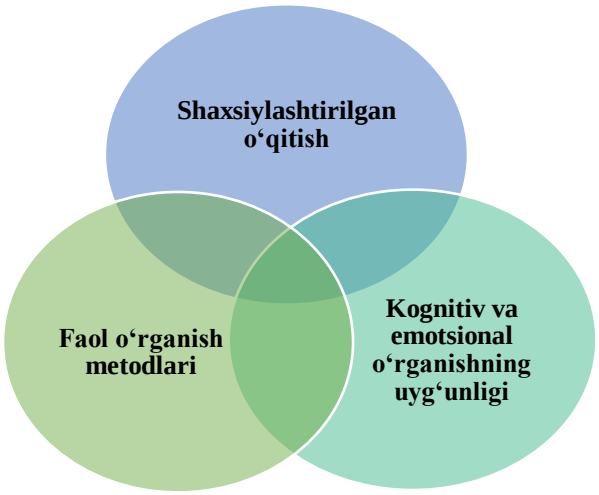
Miyaning plastiklik xususiyati uning yangi tajriba va axborot ta’sirida o‘zgarishi hamda rivojlanishini anglatadi. Inson miyasi yangi bilim va ko‘nikmalarni egallash jarayonida o‘zining neyron aloqalarini qayta tashkil etishi mumkin. Shu sababli ta’lim jarayonida o‘quvchilarning individual imkoniyatlari, rivojlanish sur’ati va ehtiyojlarini hisobga olish muhimdir. Mazkur tamoyil shaxsiylashtirilgan ta’limning ilmiy asoslaridan biri sifatida qaralishi mumkin. Har bir o‘quvchining bilimni qabul qilishi, qayta ishlashi va mustahkamlashi turlicha kechishi sababli yagona standart yondashuv o‘rniga individual va differensial yondashuvlardan foydalanish ta’lim samaradorligini oshiradi.

O‘quv materiallarini amaliy faoliyat bilan bog‘lash bilimlarning chuqurroq o‘zlashtirilishiga yordam beradi. Amaliy mashg‘ulotlar, tajribalar, loyiha ishlari, muammoli vaziyatlarni hal qilish va real hayotiy topshiriqlar o‘quvchining faol ishtirokini ta’minlaydi. Faol ishtirok etish jarayonida o‘quvchi nafaqat tayyor ma’lumotni qabul qiladi, balki uni tahlil qiladi, amaliyotda qo‘llaydi va yangi xulosalar chiqaradi. Bu esa bilimlarning uzoq muddatli xotirada mustahkamlanishiga yordam beradi.[4]

Ta’lim samaradorligi o‘quvchining emotsional holati bilan ham bevosita bog‘liq. Psixologik jihatdan xavfsiz, qo‘llab-quvvatlovchi va ijobiy muhit o‘quvchilarning ta’lim jarayonidagi faolligini oshiradi. Aksincha, haddan tashqari stress, qo‘rquv va xavotir diqqatni jamlash hamda axborotni qayta ishlash jarayonlariga salbiy ta’sir ko‘rsatishi mumkin. Shu sababli o‘qituvchi nafaqat o‘quv materialining mazmuniga, balki o‘quvchilarning hissiy holatiga ham e’tibor qaratishi lozim. Emotsional intellektni rivojlantirish ham zamonaviy ta’limning muhim tarkibiy qismi hisoblanadi.

Ta’lim samaradorligini oshirishga qaratilgan neyropedagogik yondashuvlar mavjud bo‘lib qiyida ularni ko‘rib chiqamiz.

1-rasm



1-rasm: Ta'lim samaradorligini oshirishga qaratilgan neyropedagogik yondashuvlar

Shaxsiylashtirilgan o‘ qitish. Har bir insonning miyasi o‘ ziga xos individual xususiyatlarga ega. O‘ quvchilarning qiziqishlari, qobiliyatlari, bilim darajasi, o‘ rganish sur'ati va psixologik xususiyatlarini hisobga olish ta'limning individual yo‘ nalishini ta'minlaydi.

Shaxsiylashtirilgan o‘ qitish o‘ quvchining kuchli tomonlarini rivojlantirish bilan birga, undagi qiyinchiliklarni aniqlash va bartaraf etishga imkon beradi.

Kognitiv va emotsional o‘ rganishning uyg‘ unligi. Kognitiv jarayonlar va emotsional holat bir-biridan mustaqil emas. O‘ quvchining qiziqishi, motivatsiyasi, o‘ ziga bo‘ lgan ishonchi va ruhiy holati uning bilimlarni o‘ zlashtirishiga ta'sir ko‘ rsatadi. Shuning uchun zamonaviy o‘ qituvchi ta'lim jarayonida faqat bilim berish bilan cheklanmasdan, o‘ quvchilarning ijobiy emotsional holatini qo‘ llab-quvvatlashi, ularning motivatsiyasini oshirishi va ijodiy faolligi uchun qulay sharoit yaratishi lozim.

Faol o‘ rganish metodlari. Faol o‘ rganish metodlari neyropedagogikaning muhim tarkibiy qismi hisoblanadi. Amaliy mashqlar, loyiha ishlari, guruhli faoliyat, muammoli ta'lim, munozara va interaktiv metodlar o‘ quvchilarning ta'lim jarayonidagi bevosita ishtirokini ta'minlaydi. Bunday metodlar o‘ quvchining mustaqil fikrlashi, muammoni tahlil qilishi, qaror qabul qilishi va bilimlarni amaliy vaziyatlarda qo‘ llash ko‘ nikmalarini rivojlantiradi.[5,1]

ADABIYOTLAR SHARHI. Bugungi kunda axborot texnologiyalarini egallash maktab, kollej va oliy ta'lim muassasalari bitiruvchilarining mehnat bozoridagi raqobatbardoshligini ta'minlovchi muhim omillardan biridir. Shu bilan birga, zamonaviy ta'lim mazmuni texnologik ko‘ nikmalar bilan bir qatorda insonning kognitiv, emotsional va ijodiy imkoniyatlarini rivojlantirishni ham talab qilmoqda.

A.V. Tsvetkovning neyropedagogikaga oid qarashlarida bolaning rivojlanishi faqat maktab davri bilan cheklanmasligi, balki maktabgacha ta'limdan boshlab maktab, oliy va qo‘ shimcha ta'limgacha davom etuvchi uzluksiz jarayon ekanligi ta'kidlanadi. Ushbu qarash neyropedagogik yondashuvni uzluksiz ta'lim tizimining barcha bosqichlarida qo‘ llash zarurligini ko‘ rsatadi.[2]

Neyrofanlar, xususan, markaziy asab tizimini o‘ rganish borasida sezilarli ilmiy yutuqlarga erishilgan bo‘ lsa-da, ushbu bilimlarni ta'lim amaliyotiga tizimli tatbiq etish masalasi hanuz dolzarb bo‘ lib qolmoqda. Neyropedagogika ko‘ pincha neyropsixologiya bilan bog‘ liq holda talqin qilinadi. Biroq uning vazifasi faqat rivojlanishida muayyan qiyinchiliklar mavjud bo‘ lgan shaxslar bilan ishlashdan iborat emas. Neyropedagogika inson miyasining faoliyati va kognitiv imkoniyatlariga asoslangan ta'lim metodlari hamda pedagogik yondashuvlarni ishlab chiqishga qaratilgan kengroq yo‘ nalish sifatida qaralishi lozim.

MUHOKAMA. Neyropedagogik yondashuv insonning ijtimoiy hayotidagi emotsional jarayonlarni ham ta'lim bilan bog‘ liq holda ko‘ rib chiqadi. Tadqiqotlarda o‘ quv materiali psixologik jihatdan qulay va qo‘ llab-quvvatlovchi muhitda taqdim etilganda uning samaraliroq o‘ zlashtirilishi ta'kidlanadi.

Emotsional intellektning rivojlanishi o‘ quvchilarning ijodiy tafakkuri, ijtimoiy moslashuvi va mustaqil fikrlash qobiliyatlari uchun muhim ahamiyatga ega. Shu sababli ta'lim jarayonida IQ bilan bir qatorda EQni rivojlantirishga ham e'tibor qaratish zarur.[3]

Neyropsixologik yondashuvlar inson miyasining axborotni bir vaqtning o‘ zida yaxlit va tarkibiy qismlar asosida qayta ishlash imkoniyatlarini ko‘ rsatadi. Shu nuqtayi nazardan, ta'lim jarayonida tahlil va sintez, umumlashtirish va aniqlashtirish usullarining uyg‘ unligidan foydalanish maqsadga muvofiq.

Ta'lim jarayonida vizual materiallardan foydalanish ham muhim ahamiyatga ega. Tasvirlar, sxemalar, diagrammalar, jadvallar, videomateriallar va boshqa ko‘ rgazmali vositalar o‘ quv ma'lumotlarini tizimlashtirish va eslab qolishni yengillashtirishi mumkin.

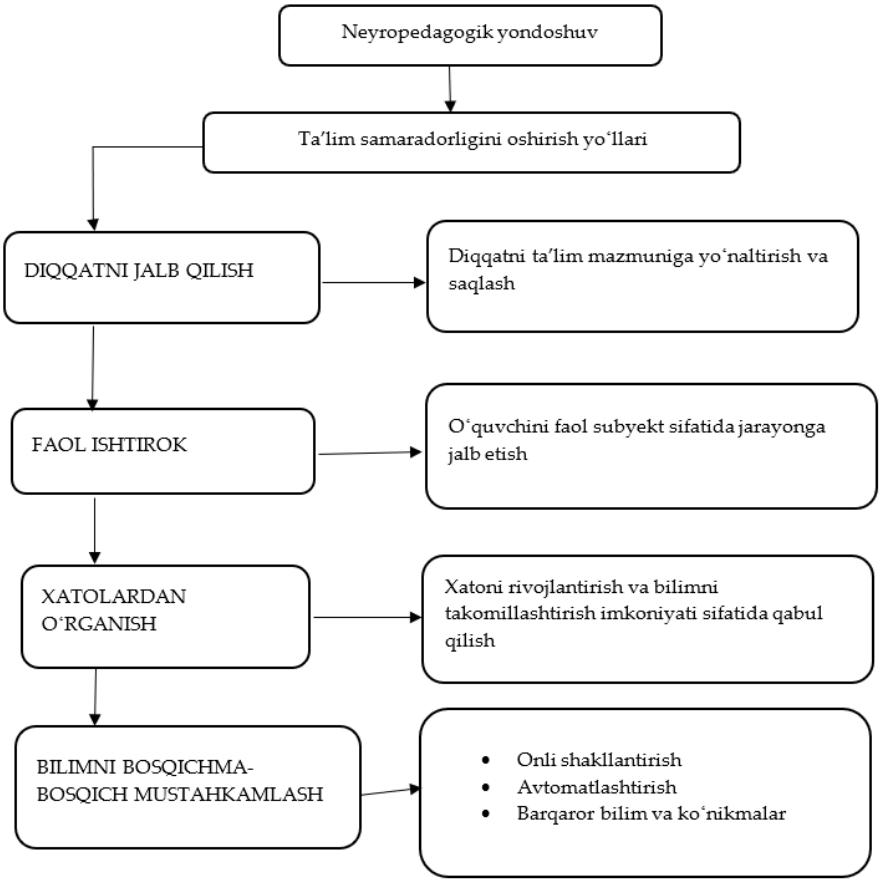
Neyropedagogikaning yana bir muhim jihati — o‘ quvchining individual xususiyatlarini hisobga olishdir. Har bir inson miyasi o‘ ziga xos bo‘ lganligi sababli ta'lim jarayonida barcha o‘ quvchilarga bir xil usulni qo‘ llash har doim ham kutilgan natijani bermaydi. Shuning uchun differensial va shaxsga yo‘ naltirilgan ta'lim yondashuvlaridan foydalanish maqsadga muvofiq.

Ijodkorlikni rivojlantirish uchun esa zo‘ ravonlik va ortiqcha bosimga asoslangan qat'iy muhitdan ko‘ ra, o‘ quvchi o‘ z fikrini erkin ifoda eta oladigan, xatolarini tahlil qilish orqali ulardan saboq chiqaradigan va yangi g‘ oyalarni ilgari suradigan ta'lim muhiti zarur.[1]

METODOLOGIYA. Neyropedagogik tadqiqotlarda o‘ quvchilarning individual va guruhiy munosabatlarini o‘ rganish, ularning psixologik xususiyatlarini aniqlash hamda ta'lim jarayonini ushbu xususiyatlarga moslashtirish muhim metodologik yo‘ nalishlardan hisoblanadi.

Shuningdek, o‘ qituvchilar uchun psixodiagnostik va psixokorreksion texnologiyalarni ishlab chiqish va amaliyotga joriy etish neyropedagogik yondashuvning samaradorligini oshirishi mumkin.

Neyropedagogikaning asosiy samarali tamoyillarini quyidagicha umumlashtirish mumkin:



2-rasm: Ta'lim samaradorligini oshirish yo' llari

1. **Diqqatni jalb qilish**- o' quvchining diqqatini ta'lim mazmuniga yo' naltirish va uni saqlab turish.
2. **Faol ishtirok**- o' quvchini bilimni passiv qabul qiluvchi emas, balki faol subyekt sifatida ta'lim jarayoniga jalb etish.
3. **Xatolardan o' rganish**- xatoni jazolash vositasi emas, balki bilim va ko' nikmalarni rivojlantirish imkoniyati sifatida ko' rish.
4. **Bilimni bosqichma-bosqich mustahkamlash-** dastlab bilim va ko' nikmalarni ongli ravishda shakllantirish, keyinchalik ularni avtomatlashtirish.

Mazkur tamoyillarni ta'lim amaliyotida uyg' un holda qo' llash o' quvchilarning bilish faolligini oshirish, mustaqil fikrlashini rivojlantirish va o' quv materiallarini samarali o' zlashtirishga yordam beradi.[2,4]

XULOSA.

Neyropedagogika inson miyasining o' ziga xos kognitiv imkoniyatlari va neyrofiziologik xususiyatlariga asoslangan holda ta'lim jarayonini yangi ilmiy bosqichga olib chiqish imkoniyatini beradi. Ushbu yo' nalish didaktik, psixologik va zamonaviy texnologik komponentlarning o' zaro uyg' unligini ta'minlab, ta'limning yaxlit va shaxsga yo' naltirilgan tizimini shakllantirishga xizmat qiladi.

Neyropedagogik yondashuv faqat rivojlanishida muayyan qiyinchiliklari mavjud bo' lgan o' quvchilar bilan ishlashga emas, balki har bir o' quvchining individual funksional xususiyatlarini hisobga olgan holda uning o' rganish salohiyatini to' liq ro' yobga chiqarishga yo' naltirilishi lozim.

Hozirgi bosqichda neyropedagogikani pedagogikaning dinamik rivojlanayotgan istiqbolli yo' nalishlaridan biri sifatida qarash maqsadga muvofiq. U zamonaviy ta'lim tizimining murakkab talablariga javob berish bilan birga, sun'iy intellekt, neyropsixologiya va neyrotexnologiyalar sohasidagi yangi yutuqlar bilan boyib bormoqda.

Oliy ta'lim tizimida neyropedagogika bo' yicha maxsus kurs va dasturlarni joriy etish pedagoglarning kasbiy kompetensiyasini oshirish, ta'lim jarayonini ilmiy asosda tashkil etish hamda o' quvchilarning individual imkoniyatlarini samarali rivojlantirishga xizmat qiladi.

Xulosa qilib aytganda, neyropedagogika ta'lim kelajagini inson miyasining keng imkoniyatlari asosida qurishga yo' l ochuvchi istiqbolli yo' nalishdir. Mazkur yondashuvdan samarali foydalanish har bir shaxsning intellektual, kognitiv va ijodiy salohiyatini to' liq namoyon etish uchun muhim shartlardan biri bo' lib xizmat qiladi.

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EKOLOGIYA YO‘ NALISHI TALABALARINING INGLIZ TILIDA KASBIY NUTQ KO‘ NIKMALARINI RAQAMLI TA’LIM TEXNOLOGIYALARI ASOSIDA RIVOJLANTIRISH USULLARI

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Annotatsiya: *Maqolada ekologiya yo‘ nalishi talabalarining ingliz tilida kasbiy nutq ko‘ nikmalarini raqamli ta’lim texnologiyalari asosida rivojlantirish usullari maxsus maqsadlar uchun ingliz tili (ESP) va kompyuter yordamida til o‘ rgatish (CALL) nazariyalari doirasida tadqiq etiladi. Kasbiy nutq kompetensiyasining beshta tarkibiy komponenti — terminologik, diskursiv, janr-uslubiy, interaktiv va strategik komponentlar — ajratildi hamda ularning ekologiya sohasidagi namoyon bo‘ lish shakllari aniqlandi. Raqamli vositalar didaktik vazifasiga ko‘ ra besh guruhga tasniflandi: manba-korpus vositalari, mashq va nazorat platformalari, sinxron va asinxron muloqot vositalari, nutq texnologiyalari hamda modellashtirish va vizualizatsiya vositalari. Shu asosda retseptiv-tayyorgarlik, reproduktiv-mashq va produktiv-kommunikativ bosqichlardan iborat uch bosqichli metodik model ishlab chiqildi. Model samaradorligini tekshirish uchun nazorat va tajriba guruhlari ishtirokidagi tajriba-sinov ishi dizayni hamda CEFR deskriptorlariga asoslangan besh mezonli baholash tizimi taklif etiladi. Tadqiqot natijalari oliy ta’lim muassasalarida ekologiya yo‘ nalishi uchun ESP kurslarini loyihalashda qo‘ llanilishi mumkin.*

Kalit so‘ zlar: *maxsus maqsadlar uchun ingliz tili, ESP, kasbiy nutq kompetensiyasi, raqamli ta’lim texnologiyalari, CALL, ekologiya ta’limi, terminologik kompetensiya, korpus, CEFR, aralash ta’lim, tajriba-sinov ishi.*

МЕТОДЫ РАЗВИТИЯ НАВЫКОВ ПРОФЕССИОНАЛЬНОЙ РЕЧИ НА АНГЛИЙСКОМ ЯЗЫКЕ У СТУДЕНТОВ ЭКОЛОГИЧЕСКОГО НАПРАВЛЕНИЯ НА ОСНОВЕ ЦИФРОВЫХ ОБРАЗОВАТЕЛЬНЫХ ТЕХНОЛОГИЙ

Аннотация: *В статье в рамках теорий английского языка для специальных целей (ESP) и компьютерного обучения языку (CALL) исследуются методы развития навыков профессиональной речи на английском языке у студентов экологического направления на основе цифровых образовательных технологий. Выделены пять структурных компонентов профессиональной речевой компетенции — терминологический, дискурсивный, жанрово-стилистический, интерактивный и стратегический — и определены формы их проявления в экологической сфере. Цифровые средства классифицированы по дидактической функции на пять групп: ресурсно-корпусные средства, платформы упражнений и контроля, средства синхронной и асинхронной коммуникации, речевые технологии, а также средства моделирования и визуализации. На этой основе разработана трёхэтапная методическая модель, включающая рецептивно-подготовительный, репродуктивно-тренировочный и продуктивно-коммуникативный этапы. Для проверки эффективности модели предложены дизайн опытно-экспериментальной работы с контрольной и экспериментальной группами и пятикритериальная система оценивания, основанная на дескрипторах CEFR. Результаты исследования могут быть использованы при проектировании ESP-курсов для экологического направления в высших учебных заведениях.*

Ключевые слова: *английский для специальных целей, ESP, профессиональная речевая компетенция, цифровые образовательные технологии, CALL, экологическое образование, терминологическая компетенция, корпус, CEFR, смешанное обучение, опытно-экспериментальная работа.*

METHODS OF DEVELOPING ENGLISH PROFESSIONAL SPEAKING SKILLS IN ECOLOGY STUDENTS THROUGH DIGITAL EDUCATIONAL TECHNOLOGIES

Abstract: *The article investigates, within the frameworks of English for Specific Purposes (ESP) and Computer-Assisted Language Learning (CALL), the methods of developing English professional speaking skills in ecology students through digital educational technologies. Five structural components of professional speaking competence are distinguished — terminological, discursive, genre-stylistic, interactive and strategic — and the forms in which they manifest themselves in the ecological domain are*

identified. Digital tools are classified by didactic function into five groups: resource-and-corpus tools, practice and assessment platforms, synchronous and asynchronous communication tools, speech technologies, and modelling and visualisation tools. On this basis a three-stage methodological model is developed, comprising receptive-preparatory, reproductive-practice and productive-communicative stages. To verify the effectiveness of the model, a design for experimental work involving control and experimental groups is proposed, together with a five-criterion assessment system based on CEFR descriptors. The findings may be applied in designing ESP courses for ecology programmes in higher education institutions.

Keywords: *English for Specific Purposes, ESP, professional speaking competence, digital educational technologies, CALL, ecological education, terminological competence, corpus, CEFR, blended learning, experimental work.*

1. KIRISH

Iqlim o‘ zgarishi, biologik xilma-xillikning kamayishi, suv resurslari taqchilligi va chiqindilarni boshqarish kabi ekologik muammolar o‘ z tabiatiga ko‘ ra transmilliy xarakterga ega bo‘ lib, ularni hal etish xalqaro hamkorlikni taqozo etadi. Ushbu hamkorlikning asosiy vositasi — ingliz tili: bugungi kunda ekologiya, atrof-muhitni muhofaza qilish va barqaror rivojlanish sohasidagi ilmiy nashrlar, xalqaro hisobotlar, grant loyihalari va konferensiyalarning katta qismi aynan shu tilda amalga oshiriladi. Shu bois ekologiya yo‘ nalishi bitiruvchisining kasbiy salohiyati uning ingliz tilida mutaxassislik doirasida erkin muloqot qila olish darajasi bilan bevosita bog‘ liq.

Ayni paytda oliy ta’lim amaliyotida chet tili o‘ qitishning natijasi ko‘ pincha umumiy til bilimi darajasida qolib ketmoqda. Talaba grammatik jihatdan to‘ g‘ ri gap tuza olsa-da, o‘ z sohasidagi ma’ruzani izchil bayon qilish, ilmiy munozarada o‘ z pozitsiyasini himoya qilish yoki dala tadqiqoti natijalarini xalqaro auditoriyaga taqdim etishda qiynaladi. Boshqacha aytganda, umumiy kommunikativ kompetensiya bilan kasbiy nutq kompetensiyasi o‘ rtasida uzilish yuzaga keladi.

Bu uzilishni bartaraf etishning istiqbolli yo‘ li — raqamli ta’lim texnologiyalarini ESP kursiga tizimli integratsiya qilishdir. Raqamli vositalar talabaga, birinchidan, tirik kasbiy diskurs namunalariga (ilmiy ma’ruzalar, hisobotlar, ekspert suhbatlari) bevosita kirish imkonini beradi; ikkinchidan, auditoriyadan tashqarida ham nutq amaliyoti uchun muhit yaratadi; uchinchidan, individual traektoriya va tezkor qayta aloqani ta’minlaydi. Biroq bu imkoniyatlar o‘ z-o‘ zidan ro‘ yobga chiqmaydi — ular metodik jihatdan asoslangan tizimni talab qiladi.

Mavzuning dolzarbligi ikki jihat bilan izohlanadi. Birinchidan, mavjud ESP tadqiqotlarida asosiy e’tibor o‘ qish va yozish ko‘ nikmalariga hamda terminologiya o‘ zlashtirishga qaratilgan bo‘ lib, og‘ zaki kasbiy nutq nisbatan kam o‘ rganilgan. Ikkinchidan, raqamli vositalar odatda alohida-alohida tavsiflanadi; ularni nutq ko‘ nikmasi rivojlanishining muayyan bosqichiga bog‘ lovchi yaxlit metodik model taklif etilmagan.

Tadqiqotning maqsadi — ekologiya yo‘ nalishi talabalarining ingliz tilida kasbiy nutq kompetensiyasi tarkibini aniqlash, raqamli ta’lim texnologiyalarini didaktik vazifasiga ko‘ ra tasniflash hamda shu asosda bosqichma-bosqich metodik modelni ishlab chiqishdan iborat.

Tadqiqotning obyekti — ekologiya yo‘ nalishi talabalariga ingliz tilini o‘ qitish jarayoni; predmeti esa raqamli ta’lim texnologiyalari asosida kasbiy nutq ko‘ nikmalarini rivojlantirishning usul va vositalaridir.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda kasbiy nutq kompetensiyasining besh komponentli tuzilishi ekologiya sohasi materiali asosida konkretlashtiriladi, raqamli vositalarning besh guruhli didaktik tasnifi taklif etiladi hamda har bir vosita guruhi nutq faoliyatining muayyan bosqichi va rivojlantiriladigan komponent bilan bog‘ lanadi.

Maqola quyidagicha tuzilgan: ikkinchi bo‘ limda mavzuga oid nazariy adabiyot tahlil qilinadi; uchinchi bo‘ limda tajriba-sinov ishining dizayni va baholash mezonlari tavsiflanadi; to‘ rtinchi bo‘ limda natijalar jadvallarda umumlashtiriladi; beshinchi bo‘ limda xulosa va amaliy tavsiyalar beriladi.

2. MAVZUGA OID ADABIYOTLAR TAHLILI

Maxsus maqsadlar uchun ingliz tili yo‘ nalishining nazariy asoslari T. Hutchinson va A. Waters ishlarida yaratilgan: mualliflar ESPni alohida til turi emas, balki o‘ quvchining ehtiyojidan kelib chiqadigan yondashuv sifatida ta’riflaydilar va ehtiyojlar tahlilini (needs analysis) kurs loyihalashning boshlang‘ ich nuqtasi deb belgilaydilar. T. Dudley-Evans va M. J. St John ushbu konsepsiyani rivojlantirib, ESPni akademik (EAP) va kasbiy (EOP) yo‘ nalishlarga ajratadilar hamda mutaxassislik diskursi janrlarini o‘ rganishning ahamiyatini asoslaydilar. H. Basturkmen esa ESP kursi mazmunini tanlashning variantlarini tizimlashtiradi.

Kommunikativ kompetensiya nazariyasi M. Canale va M. Swain modelida to‘ rt komponentga — grammatik, sotsiolingvistik, diskursiv va strategik kompetensiyaga — ajratilgan. L. Bachman ushbu modelni takomillashtirib, til qobiliyatining tashkiliy va pragmatik qatlamlarini farqlaydi. Yevropa Kengashining “Chet tillar bo‘ yicha umumevropa kompetensiyalari” hujjati va uning 2020-yilgi to‘ ldirilgan nashri og‘ zaki nutq uchun darajali deskriptorlar tizimini — nutq diapazoni, aniqligi, ravonligi, o‘ zaro ta’siri va izchilligi mezonlarini — taqdim etadi. Ushbu deskriptorlar mazkur tadqiqotda baholash tizimining asosi sifatida olindi.

Raqamli texnologiyalarning til o‘ qitishdagi o‘ rni CALL yo‘ nalishida o‘ rganilgan. M. Warschauer va D. Healey CALL taraqqiyotining uch bosqichini — bixevioristik, kommunikativ va integrativ bosqichlarni — ajratadilar. C. Chapelle texnologik muhitda til o‘ zlashtirishning shartlarini ta’riflaydi. A. Kukulska-Hulme va L. Shield mobil qurilmalar yordamida til o‘ rganishning (MALL) imkoniyat va cheklovlarini tahlil qiladilar. Pedagogik jihatdan texnologiya, fan mazmuni va metodikaning birikuvi P. Mishra va M. J. Koehlerning TPACK modelida umumlashtirilgan; aralash ta’lim tamoyillari esa D. R. Garrison va N. D. Vaughan ishida asoslangan.

Nutq ko‘ nikmalarini shakllantirish metodikasi I. S. P. Nation va J. Newton hamda S. Thornbury ishlarida batafsil yoritilgan: mualliflar og‘ zaki nutqni rivojlantirishning bosqichliligini — tayyorgarlik, nazorat ostidagi mashq va erkin ishlab chiqarish ketma-ketligini — ta’kidlaydilar. Terminologiyani o‘ zlashtirishda korpus lingvistikasi vositalari (COCA, AntConc kabi) so‘ zning real qo‘ llanish konteksti va kollokatsiyalarini ko‘ rsatgani bois samarali hisoblanadi. O‘ zbek chet til o‘ qitish metodikasida esa J. J. Jalolov va boshqa mualliflarning ishlarida kommunikativ yondashuvning milliy ta’lim sharoitiga moslashuvi masalalari ishlab chiqilgan.

Mavjud adabiyot tahlili ikki muhim bo‘ shliqni ko‘ rsatadi. Birinchidan, ESP bo‘ yicha tadqiqotlarning aksariyati texnika, iqtisodiyot va tibbiyot yo‘ nalishlariga bag‘ ishlangan bo‘ lib, ekologiya va atrof-muhit muhofazasi sohasi uchun kasbiy nutq materiali va janrlari maxsus tavsiflanmagan. Ikkinchidan, raqamli vositalar odatda ro‘ yxat tarzida sanab o‘ tiladi; ularni nutq ko‘ nikmasining muayyan komponenti va o‘ zlashtirish bosqichi bilan bog‘ lovchi tizimli model taklif etilmagan. Ushbu maqola aynan shu bo‘ shliqni to‘ ldirishga qaratilgan.

3. TADQIQOT METODOLOGIYASI

Tadqiqot aralash (sifatiy-miqdoriy) dizayn asosida amalga oshirildi. Sifatiy tahlil kasbiy nutq kompetensiyasi tarkibini aniqlash va raqamli vositalarni tasniflash uchun, miqdoriy tahlil esa taklif etilgan modelning samaradorligini tajriba-sinov yo‘ li bilan tekshirish uchun qo‘ llanildi.

Tajriba-sinov ishi nazorat va tajriba guruhlari ishtirokidagi “boshlang‘ ich kesim — yakuniy kesim” (pretest–posttest) sxemasi bo‘ yicha tashkil etildi. Nazorat guruhida mashg‘ ulotlar an’anaviy metodika asosida, tajriba guruhida esa ishlab chiqilgan uch bosqichli model asosida olib borildi. Har ikki guruhda soatlar hajmi, o‘ quv mavzulari va baholash shakllari bir xil bo‘ lib, faqat metodik yondashuv farq qildi — bu natijalarning qiyoslanuvchanligini ta’minlaydi.

Tadqiqot materialini ekologiya va atrof-muhitni muhofaza qilish yo‘ nalishidagi autentik matnlar tashkil etdi: xalqaro tashkilotlarning hisobotlari, ilmiy maqolalarning muhokama qismlari, ekologiya mavzusidagi ommabop-ilmiy ma’ruzalar va ekspert suhbatlari. Ushbu materiallardan kasbiy terminologiya minimumi, tipik nutqiy qoliplar va janr namunalari ajratib olindi.

Tadqiqotda quyidagi metodlardan foydalanildi: nazariy tahlil va umumlashtirish — kompetensiya tarkibini modellashtirish uchun; ehtiyojlar tahlili — talabalar va soha mutaxassislarining kommunikativ ehtiyojlarini aniqlash uchun; pedagogik kuzatish — mashg‘ ulot jarayonini qayd etish uchun; test va nutq topshirig‘ i — nutq darajasini o‘ lchash uchun; so‘ rovnoma — talabalarning motivatsiyasi va raqamli vositalarga munosabatini aniqlash uchun; matematik-statistik ishlov — natijalar farqining ishonchliligini baholash uchun.

Talabalarning kasbiy nutqi CEFR deskriptorlariga asoslangan besh mezon bo‘ yicha baholandi. Har bir mezon 0–4 ball oralig‘ ida, jami 20 ball miqyosida baholanadi (1-jadval).

1-jadval. Kasbiy nutqni baholash mezonlari va ball taqsimoti

Mezon	Nimani baholaydi	Maksimal ball
Terminologik aniqlik	soha atamalarini to‘ g‘ ri va o‘ rinli qo‘ llash, kollokatsiyalarga rioya qilish	4
Nutq diapazoni	leksik va grammatik vositalarning boyligi, sinonimik almashtirish imkoniyati	4
Ravonlik	nutq sur’ati, uzilishlar va to‘ xtalishlar chastotasi	4
Izchillik va diskursiv tashkiliylik	fikrning mantiqiy ketma-ketligi, bog‘ lovchi vositalardan foydalanish	4
O‘ zaro ta’sir va strategik ko‘ nikma	savol-javob, pozitsiyani himoya qilish, kommunikativ uzilishni bartaraf etish usullari	4
Jami		20

Tadqiqotning cheklovlari. Birinchidan, tajriba-sinov ishi bitta oliy ta’lim muassasasi materialida olib borilgan bo‘ lib, natijalarni umumlashtirishda talabalarning boshlang‘ ich til darajasi va texnik ta’minot sharoiti hisobga olinishi lozim. Ikkinchidan, nutqni baholashda ekspert talqini elementi saqlanib qoladi; buni kamaytirish uchun har bir javob ikki mustaqil baholovchi tomonidan tekshirildi. Uchinchidan, yozma kasbiy nutq (ilmiy maqola, hisobot yozish) alohida tadqiqot predmeti hisoblanadi va mazkur ishga kiritilmagan.

4. NATIJALAR VA TAHLIL

4.1. Kasbiy nutq kompetensiyasining tarkibi

Ehtiyojlar tahlili va autentik material tahlili ekologiya yo‘ nalishi bitiruvchisining kasbiy nutq kompetensiyasini beshta o‘ zaro bog‘ liq komponentga ajratish imkonini berdi (2-jadval).

2-jadval. Kasbiy nutq kompetensiyasining komponentlari va ularning ekologiya sohasidagi namoyon bo‘ lishi

Komponent	Mazmuni	Ekologiya sohasidagi namoyon bo‘ lishi
Terminologik	soha atamalari, qisqartmalar va ularning kollokatsiyalarini bilish	biodiversity loss, carbon footprint, waste management, environmental impact assessment (EIA), greenhouse gas emissions
Diskursiv	fikrni izchil bayon qilish, sabab-oqibat va qiyoslash munosabatlarini ifodalash	tadqiqot natijalarini bayon qilish, muammo–sabab–yechim zanjirini tuzish, grafik ma’lumotlarni izohlash
Janr-uslubiy	nutq janriga mos til vositalarini tanlash	konferensiya ma’ruzasi, poster taqdimoti, dala hisoboti, ekologik ekspertiza xulosasi, ommaviy ma’ruza
Interaktiv	muloqotni boshqarish, savol berish va javob qaytarish	ilmiy munozara, ekspert intervyusi, xalqaro loyiha muzokaralari, mahalliy aholi bilan ishlash
Strategik	kommunikativ uzilishni bartaraf etish usullari	atamani izohlab berish (parafraz), umumlashtiruvchi so‘ z bilan almashtirish, vizual materialga murojaat qilish

Tahlil ushbu komponentlarning rivojlanish darajasi bir tekis emasligini ko‘ rsatdi. Terminologik komponent an’anaviy o‘ qitishda ham nisbatan yaxshi shakllanadi, chunki u leksik minimumni o‘ zlashtirish bilan bevosita bog‘ liq. Eng zaif bo‘ g‘ in esa interaktiv va strategik komponentlardir: talaba tayyorlangan matnni bayon qila oladi, ammo kutilmagan savolga javob berish yoki noaniqlik yuzaga kelganda muloqotni davom ettirish ko‘ nikmasiga ega bo‘ lmaydi. Aynan shu bo‘ shliq raqamli vositalarning ustuvor qo‘ llanish sohasini belgilaydi.

4.2. Raqamli ta’lim texnologiyalarining didaktik tasnifi

Raqamli vositalarni turi bo‘ yicha emas, balki bajaradigan didaktik vazifasi bo‘ yicha tasniflash maqsadga muvofiqdir: bu yondashuv muayyan dastur eskirgan taqdirda ham modelning barqarorligini ta’minlaydi (3-jadval).

3-jadval. Raqamli ta’lim texnologiyalarining didaktik tasnifi

Guruh	Didaktik vazifasi	Vosita turlari	Rivojlantiriladigan komponent
1. Manba va korpus vositalari	autentik kasbiy diskurs namunalarini taqdim etish, atamaning real qo‘ llanishini ko‘ rsatish	ilmiy nashrlar bazasi, ochiq korpuslar (COCA), konkordans dasturlari (AntConc), xalqaro tashkilot hisobotlari	terminologik, janr-uslubiy
2. Mashq va nazorat platformalari	leksikani mustahkamlash, tezkor qayta aloqa berish	interaktiv mashq va test tizimlari, elektron kartochkalar, video asosidagi topshiriqlar	terminologik, diskursiv

Guruh	Didaktik vazifasi	Vosita turlari	Rivojlantiriladigan komponent
3. Muloqot vositalari	sinxron va asinxron nutq amaliyoti uchun muhit yaratish	videokonferensiya platformalari, forum va munozara taxtalari, ovozli izoh vositalari	interaktiv, strategik
4. Nutq texnologiyalari	talaffuz va ravonlikni individual mashq qilish, o‘ z nutqini tahlil qilish	nutqni matnga aylantirish tizimlari, talaffuz baholash ilovalari, ovoz yozish va o‘ z-o‘ zini baholash vositalari	ravonlik, terminologik aniqlik
5. Modellashtirish va vizualizatsiya	kasbiy vaziyatni qayta yaratish, ma’lumotni ko‘ rgazmali izohlash	ekologik simulyatsiya va monitoring dasturlari, xarita va infografika xizmatlari, taqdimot platformalari	diskursiv, janr-uslubiy

Tasnifning amaliy qiymati shundaki, u o‘ qituvchiga vositani “zamonaviy” bo‘ lgani uchun emas, balki muayyan metodik vazifani hal etish uchun tanlash imkonini beradi. Masalan, terminologik komponentni shakllantirishda konkordans dasturi elektron kartochkalarga qaraganda samaraliroq, chunki u atamani izolyatsiyada emas, tipik kollokatsiya va kontekstda ko‘ rsatadi. Aksincha, interaktiv komponentni faqat muloqot vositalari orqali rivojlantirish mumkin — hech qanday test platformasi jonli muzokara tajribasining o‘ rnini bosa olmaydi.

4.3. Uch bosqichli metodik model

Nutq ko‘ nikmasining shakllanish qonuniyatlariga muvofiq model uch bosqichdan iborat qilib loyihalandi. Har bir bosqichda vosita guruhi, topshiriq turi va kutilayotgan natija bir-biriga muvofiqlashtiriladi (4-jadval).

4-jadval. Kasbiy nutq ko‘ nikmalarini rivojlantirishning uch bosqichli modeli

Bosqich	Maqsad	Topshiriq turlari	Yetakchi vosita guruhi
I. Retseptiv-tayyorgarlik	kasbiy diskurs namunasi bilan tanishish, terminologik bazani shakllantirish	autentik ma’ruzani tinglash va konspektlashtirish; korpusda atamaning kollokatsiyalarini aniqlash; janr tuzilishini tahlil qilish	1-guruh (manba va korpus)
II. Reproduktiv-mashq	nutqiy qoliplarni nazorat ostidagi sharoitda mustahkamlash	qolip asosida gap tuzish; matnni qayta bayon qilish (summary); grafikni izohlash; ovoz yozib, o‘ z talaffuzini tahlil qilish	2- va 4-guruh (mashq platformalari, nutq texnologiyalari)
III. Produktiv-kommunikativ	erkin kasbiy muloqotni amalga oshirish	mini-konferensiya taqdimoti; ekologik loyiha himoyasi; rolli o‘ yin (ekspert–jurnalist, loyiha muzokarasi); onlayn munozara	3- va 5-guruh (muloqot vositalari, modellashtirish)

Modelning asosiy tamoyili — bosqichlarni almashtirib bo‘ lmasligi. Amaliyotda tez-tez uchraydigan xato shundaki, talabaga terminologik va qolip bazasi shakllanmasdan turib erkin munozara topshirig‘ i beriladi; natijada u ona tilida o‘ ylab, tarjima qilishga o‘ tadi va nutq sun’iy tus oladi. Aksincha, faqat birinchi va ikkinchi bosqich bilan cheklanish talabani “tayyor matn aytuvchi”ga aylantiradi. Shu bois har bir mavzu bo‘ yicha uchala bosqich ham to‘ liq bosib o‘ tilishi lozim.

Modelning yana bir muhim jihati — auditoriya va auditoriyadan tashqari ishning taqsimlanishi. Birinchi va ikkinchi bosqich topshiriqlarining katta qismi mustaqil, raqamli platformalar orqali bajarilishi mumkin; auditoriya vaqti esa uchinchi bosqich — jonli muloqot uchun ajratiladi. Bu aralash ta’lim (blended learning) tamoyiliga mos keladi va cheklangan kontakt soatlaridan eng samarali foydalanish imkonini beradi.

4.4. Tajriba-sinov ishining natijalari

Modelning samaradorligini tekshirish maqsadida nazorat va tajriba guruhlarida boshlang‘ ich va yakuniy kesimlar o‘ tkazildi. Natijalar 5-jadvalda keltirilgan.

5-jadval. Tajriba-sinov ishi natijalari (o‘ rtacha ball, 20 ballik tizimda)

Mezon	Nazorat guruhi (n = ___)		Tajriba guruhi (n = ___)		Farq
	boshlang‘ ich	yakuniy	boshlang‘ ich	yakuniy	
Terminologik aniqlik					
Nutq diapazoni					
Ravonlik					
Izchillik va diskursiv tashkiliylik					
O‘ zaro ta’sir va strategik ko‘ nikma					
Umumiy ko‘ rsatkich					

Jadval kataklari tajriba-sinov ishi ma’lumotlari asosida to‘ ldiriladi. Natijalar farqining statistik ishonchliligini baholash uchun Styudent t-mezonidan foydalanish tavsiya etiladi; $p < 0,05$ qiymati farqning tasodifiy emasligini ko‘ rsatadi. Shuningdek, talabalarning CEFR darajalari bo‘ yicha taqsimoti (A2, B1, B2 va undan yuqori) dinamikasini alohida ko‘ rsatish maqsadga muvofiq.

4.5. Natijalarning muhokamasi

Taklif etilgan model bir necha nazariy qoidaga tayanadi. Birinchidan, u M. Canale va M. Swain ajratgan kompetensiya komponentlarini ESP kontekstida konkretlashtiradi: umumiy grammatik kompetensiya o‘ rnini terminologik aniqlik, umumiy sotsiolingvistik kompetensiya o‘ rnini esa janr-uslubiy muvofiqlik egallaydi. Ikkinchidan, u M. Warschauer ta’riflagan CALL taraqqiyotining integrativ bosqichiga mos keladi: texnologiya alohida mashq vositasi emas, o‘ quv jarayonining tabiiy muhitiga aylanadi.

Tahlil ko‘ rsatadiki, raqamli vositalarning samaradorligi ularning texnik imkoniyatiga emas, metodik joylashtirilishiga bog‘ liq. Bir xil videokonferensiya platformasi birinchi bosqichda qo‘ llanilsa, oddiy ma’ruza tinglash vositasiga aylanadi; uchinchi bosqichda esa u kommunikativ vaziyat modeliga aylanadi. Bu kuzatuv TPACK modelining asosiy tezisini — texnologik bilim pedagogik va mazmuniy bilim bilan birgalikdagina samara berishini — empirik jihatdan qo‘ llab-quvvatlaydi.

Ekologiya yo‘ nalishining o‘ ziga xosligi ham alohida e’tiborni talab qiladi. Bu sohaning kasbiy diskursi ikki qatlamli: bir tomondan, u qat’iy ilmiy terminologiyaga tayanadi; ikkinchi tomondan, ekolog ko‘ pincha nomutaxassis auditoriya — mahalliy aholi, jurnalistlar, qaror qabul qiluvchilar — bilan ishlashga majbur bo‘ ladi. Shu bois modelda ilmiy-akademik janrlar bilan bir qatorda ommabop-ilmiy nutq janrlari ham ko‘ zda tutilgan, strategik komponentga esa alohida urg‘ u berilgan: murakkab atamani sodda tilda izohlab bera olish ushbu soha mutaxassisi uchun ixtiyoriy emas, balki majburiy ko‘ nikmadir.

Natijalarning amaliy ahamiyati ikki yo‘ nalishda namoyon bo‘ ladi. Kurs loyihalash amaliyoti uchun ular vosita tanlashning aniq mezonini beradi: har bir vosita muayyan komponent va bosqichga biriktiriladi. O‘ qituvchini tayyorlash amaliyoti uchun esa natijalar ESP kursi mazmuni bilan raqamli kompetensiyani birgalikda shakllantirish zaruratini ko‘ rsatadi.

5. XULOSA

O‘ tkazilgan tadqiqot quyidagi xulosalarga olib keladi.

Birinchidan, ekologiya yo‘ nalishi talabasining ingliz tilidagi kasbiy nutq kompetensiyasi beshta komponentdan iborat: terminologik, diskursiv, janr-uslubiy, interaktiv va strategik. An’anaviy o‘ qitishda birinchi komponent nisbatan yaxshi shakllansa-da, interaktiv va strategik komponentlar eng zaif bo‘ g‘ in bo‘ lib qoladi.

Ikkinchidan, raqamli ta’lim texnologiyalarini didaktik vazifasiga ko‘ ra besh guruhga — manba va korpus vositalari, mashq va nazorat platformalari, muloqot vositalari, nutq texnologiyalari hamda modellashtirish va vizualizatsiya vositalariga — tasniflash vositani metodik vazifa asosida tanlash imkonini beradi.

Uchinchidan, kasbiy nutq koʻ nikmalarini rivojlantirish retseptiv-tayyorgarlik, reproduktiv-mashq va produktiv-kommunikativ bosqichlar ketma-ketligida amalga oshirilishi lozim. Bosqichlarni almashtirish yoki birortasini tushirib qoldirish nutqning sun'iyligiga yoki "tayyor matn aytish" koʻ nikmasining shakllanishiga olib keladi.

Toʻ rtinchidan, model aralash ta'lim tamoyiliga tayanadi: birinchi va ikkinchi bosqich topshiriqlari mustaqil, raqamli platformalar orqali bajariladi, cheklangan auditoriya vaqti esa jonli kasbiy muloqot uchun ajratiladi.

Beshinchidan, ekologiya sohasi kasbiy diskursining ikki qatlamliligi — ilmiy va ommabop-ilmiy muloqot zarurati — strategik komponentga alohida urgʻ u berishni taqozo etadi: murakkab atamani nomutaxassis auditoriyaga sodda tilda izohlab bera olish ushbu soha mutaxassisining majburiy koʻ nikmasidir.

Amaliy tavsiyalar: (a) ESP kursini loyihalashni ehtiyojlar tahlilidan boshlash va terminologik minimumni autentik korpus materialidan ajratib olish; (b) har bir raqamli vositani muayyan komponent va bosqichga biriktirish, uni "umumiy foydalanish" uchun emas, aniq vazifa uchun joriy etish; (c) baholashni CEFR deskriptorlariga asoslangan koʻ p mezonli tizim orqali amalga oshirish; (d) uchinchi bosqich topshiriqlarida real kasbiy vaziyatlarni — loyiha himoyasi, ekspert intervyusi, jamoatchilik muhokamasini — modellashtirish.

Tadqiqot istiqbollari sun'iy intellekt asosidagi suhbat vositalarining nutq ravonligiga ta'sirini oʻ lchash, ekologiya sohasi uchun ixtisoslashgan oʻ quv korpusini shakllantirish hamda modelning boshqa tabiiy-ilmiy yoʻ nalishlarda qoʻ llanilishini sinovdan oʻ tkazish bilan bogʻ liq.

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RAQAMLI TA'LIM VOSITALARI ASOSIDA BO' LAJAK TEXNOLOGIK TA'LIM O' QITUVCHILARINING METODIK KOMPETENSIYASINI RIVOJLANTIRISH

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Annotatsiya: *Maqolada bo' lajak texnologik ta'lim o' qituvchilarining metodik kompetensiyasini raqamli ta'lim vositalari asosida rivojlantirish masalasi kompetensiyaviy yondashuv va TPACK modeli doirasida nazariy jihatdan tadqiq etiladi. Tadqiqot materialini oliy ta'limning texnologik ta'lim yo' nalishi o' quv-normativ hujjatlari, mavzuga oid ilmiy adabiyot hamda amaliyotda qo' llanilayotgan raqamli vositalar majmui tashkil etdi. Nazariy tahlil, tizimli yondashuv va modellashtirish metodlari asosida metodik kompetensiyaning beshta tarkibiy komponenti — gnostik-nazariy, loyihalash-konstruktorlik, texnologik-amaliy, raqamli-kommunikativ va diagnostik-reflektiv komponentlar — ajratildi hamda ularning texnologik ta'lim o' qituvchisi faoliyatidagi namoyon bo' lish shakllari aniqlandi. Raqamli vositalar didaktik vazifasiga ko' ra besh guruhga tasniflandi: loyihalash va modellashtirish, virtual laboratoriya va simulyatsiya, o' quv kontenti va jarayonni boshqarish, baholash va qayta aloqa hamda hamkorlik va loyiha vositalari. Shu asosda motivatsion-diagnostik, nazariy-metodik, amaliy-loyihaviy va refleksiv-baholash bosqichlaridan iborat to' rt bosqichli model, komponent–vosita muvofiqlik matritsasi hamda kompetensiya rivojlanishining uch darajali (reproduktiv, adaptiv, ijodiy-innovatsion) baholash shkalasi taklif etildi.*

Kalit so' zlar: *metodik kompetensiya, texnologik ta'lim, bo' lajak o' qituvchi, raqamli ta'lim vositalari, TPACK, kompetensiyaviy yondashuv, loyiha asosida ta'lim, virtual laboratoriya, CAD-modellashtirish, elektron portfolio, refleksiya.*

РАЗВИТИЕ МЕТОДИЧЕСКОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ УЧИТЕЛЕЙ ТЕХНОЛОГИЧЕСКОГО ОБРАЗОВАНИЯ НА ОСНОВЕ ЦИФРОВЫХ ОБРАЗОВАТЕЛЬНЫХ СРЕДСТВ

Аннотация: *В статье в рамках компетентностного подхода и модели TPACK теоретически исследуется проблема развития методической компетентности будущих учителей технологического образования на основе цифровых образовательных средств. Материалом исследования послужили учебно-нормативные документы направления технологического образования, научная литература по теме, а также совокупность применяемых на практике цифровых средств. На основе теоретического анализа, системного подхода и моделирования выделены пять структурных компонентов методической компетентности — гностико-теоретический, проектно-конструкторский, технолого-практический, цифрово-коммуникативный и диагностико-рефлексивный — и определены формы их проявления в деятельности учителя технологии. Цифровые средства классифицированы по дидактической функции на пять групп: средства проектирования и моделирования, виртуальные лаборатории и симуляции, средства учебного контента и управления процессом, средства оценивания и обратной связи, а также средства сотрудничества и проектной работы. На этой основе предложены четырёхэтапная модель, матрица соответствия «компонент — средство» и трёхуровневая шкала оценивания (репродуктивный, адаптивный, творческо-инновационный уровни).*

Ключевые слова: *методическая компетентность, технологическое образование, будущий учитель, цифровые образовательные средства, TPACK, компетентностный подход, проектное обучение, виртуальная лаборатория, CAD-моделирование, электронное портфолио, рефлексия.*

DEVELOPING THE METHODOLOGICAL COMPETENCE OF FUTURE TECHNOLOGY EDUCATION TEACHERS THROUGH DIGITAL LEARNING TOOLS

Abstract: *The article provides a theoretical examination, within the competence approach and the TPACK model, of how the methodological competence of future technology education teachers can be developed through digital learning tools. The research material comprises the curricular and normative documents of technology education programmes, the relevant scholarly literature, and the set of digital tools currently used in practice. Theoretical analysis, a systemic approach and modelling made it possible to distinguish five structural components of methodological competence — gnostic-theoretical, design-and-construction, technological-practical,*

digital-communicative and diagnostic-reflective — and to identify how each manifests itself in the work of a technology teacher. Digital tools are classified by didactic function into five groups: design and modelling tools; virtual laboratories and simulations; learning content and process management tools; assessment and feedback tools; and collaboration and project tools. On this basis the article proposes a four-stage model (motivational-diagnostic, theoretical-methodological, practical-project and reflective-evaluative), a component-to-tool correspondence matrix, and a three-level assessment scale (reproductive, adaptive and creative-innovative).

Keywords: *methodological competence, technology education, pre-service teacher, digital learning tools, TPACK, competence approach, project-based learning, virtual laboratory, CAD modelling, e-portfolio, reflection.*

1. KIRISH

Ta’lim tizimining raqamli transformatsiyasi o‘ qituvchi kasbiy faoliyatining mazmuniga ham, unga qo‘ yiladigan talablarga ham sezilarli ta’sir ko‘ rsatmoqda. Bugungi o‘ qituvchidan nafaqat o‘ z fanini bilish, balki raqamli muhitda o‘ quv jarayonini loyihalash, moslashuvchan metodik yechimlar tanlash va o‘ z faoliyati natijasini tahlil qila olish ham talab etiladi. Bu talablar majmui pedagogika fanida metodik kompetensiya tushunchasi orqali ifodalanadi.

Texnologik ta’lim yo‘ nalishida ushbu masala alohida murakkablik kasb etadi. Texnologiya fani o‘ qituvchisi, bir tomondan, nazariy bilim beruvchi, ikkinchi tomondan, amaliy ko‘ nikmani shakllantiruvchi mutaxassisdir: uning darsi materiallarni qayta ishlash, asbob-uskuna bilan ishlash, buyum loyihalash va tayyorlash kabi predmetli-amaliy faoliyatga tayanadi. Shu bois bu yo‘ nalishda raqamli vositalarni joriy etish an’anaviy fanlarga qaraganda ko‘ proq metodik asoslashni talab qiladi: monitor ortidagi simulyatsiya ustaxonadagi amaliy mashg‘ ulotning o‘ rnini bosa olmaydi, ammo unga tayyorgarlik bosqichini sezilarli darajada samaralashtiradi.

Mavzuning dolzarbligi ikki jihat bilan izohlanadi. Birinchidan, o‘ qituvchining raqamli kompetensiyasi bo‘ yicha mavjud tadqiqotlarda, asosan, umumpedagogik yondashuv ustunlik qiladi; texnologik ta’lim yo‘ nalishining moddiy-amaliy o‘ ziga xosligi hisobga olinmaydi. Ikkinchidan, raqamli vositalar odatda ro‘ yxat tarzida taqdim etiladi; ularni metodik kompetensiyaning muayyan komponenti va shakllanish bosqichi bilan bog‘ lovchi model taklif etilmagan.

Tadqiqotning maqsadi — bo‘ lajak texnologik ta’lim o‘ qituvchisining metodik kompetensiyasi tarkibini aniqlash, raqamli ta’lim vositalarini didaktik vazifasiga ko‘ ra tasniflash hamda shu asosda kompetensiyani bosqichma-bosqich rivojlantirish modelini ishlab chiqishdan iborat.

Tadqiqotning obyekti — bo‘ lajak texnologik ta’lim o‘ qituvchilarini kasbiy tayyorlash jarayoni; predmeti esa raqamli ta’lim vositalari asosida ularning metodik kompetensiyasini rivojlantirishning mazmuni, shakl va vositalaridir.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda metodik kompetensiyaning besh komponentli tuzilishi texnologik ta’lim materiali asosida konkretlashtiriladi, raqamli vositalarning besh guruhli didaktik tasnifi taklif etiladi, komponent va vosita guruhi o‘ rtasidagi muvofiqlik matritsasi tuziladi hamda kompetensiya rivojlanishining uch darajali baholash shkalasi asoslanadi.

Maqola quyidagicha tuzilgan: ikkinchi bo‘ limda mavzuga oid nazariy adabiyot tahlil qilinadi va tadqiqot bo‘ shlig‘ i aniqlanadi; uchinchi bo‘ limda material va metodlar tavsiflanadi; to‘ rtinchi bo‘ limda natijalar jadvallarda umumlashtirilib izohlanadi; beshinchi bo‘ limda xulosa va amaliy tavsiyalar beriladi.

2. MAVZUGA OID ADABIYOTLAR TAHLILI

Kompetensiyaviy yondashuvning nazariy asoslari A. V. Xutorskoy va I. A. Zimnyaya ishlarida ishlab chiqilgan: mualliflar kompetensiyani bilim, ko‘ nikma va shaxsiy tajribaning faoliyatda namoyon bo‘ luvchi birligi sifatida ta’riflab, uni ta’lim natijasining yangi o‘ lchov birligi deb belgilaydilar. Kasb ta’limi o‘ qituvchisini kasbiy shakllantirishning nazariy-metodik asoslari o‘ zbek pedagogikasida N. A. Muslimov va boshqa tadqiqotchilar ishlarida yoritilgan.

O‘ qituvchi bilimining o‘ ziga xos tuzilishi L. S. Shulman tomonidan asoslangan: u fan mazmuni bilimi (Content Knowledge) va pedagogik bilim (Pedagogical Knowledge) o‘ rtasida oraliq qatlam — pedagogik-mazmuniy bilim (Pedagogical Content Knowledge, PCK) mavjudligini ko‘ rsatdi. P. Mishra va M. J. Koehler ushbu modelni texnologik bilim (Technological Knowledge) bilan to‘ ldirib, TPACK ramkasini taklif etdilar. TPACK modelining asosiy tezisi mazkur tadqiqot uchun kalit ahamiyatga ega: texnologik bilim pedagogik va mazmuniy bilimdan ajratilgan holda samara bermaydi.

O‘ qituvchining raqamli kompetensiyasi xalqaro ramkalarda tizimlashtirilgan. Yevropa Ittifoqining DigCompEdu ramkasi (C. Redecker) pedagogning raqamli kompetensiyasini olti sohaga ajratadi va uning rivojlanishini olti darajali shkalada tavsiflaydi. ISTE ta’lim beruvchilar uchun standartlari hamda YUNESKOning o‘ qituvchilar uchun AKT kompetensiyalari ramkasi ham shunga o‘ xshash tuzilishga ega. Bu hujjatlar raqamli kompetensiyani texnik ko‘ nikmalar majmui sifatida emas, pedagogik qaror qabul qilish qobiliyati sifatida talqin qiladi.

Texnologik ta’limning metodik asoslari konstruksionizm g‘ oyalariga yaqin turadi. S. Papert bilim o‘ rganuvchi tomonidan yaratilgan real obyekt ustida ishlash jarayonida eng samarali shakllanishini ta’kidlaydi; bu qoida texnologiya fani uchun bevosita amaliy ahamiyatga ega. Loyiha asosidagi ta’lim samaradorligi J. W. Thomas va P. C. Blumenfeld

ishlarida umumlashtirilgan; STEM/STEAM yondashuvi esa R. W. Bybee tomonidan asoslangan. Texnologiyaning o‘ quv jarayoniga joriy etilishidagi to‘ siqlar — tashqi (uskuna, vaqt) va ichki (e’tiqod, malaka) to‘ siqlar — P. A. Ertmer va A. T. Ottenbreit-Leftwich tadqiqotida tahlil qilingan.

Mavjud adabiyot tahlili ikki muhim bo‘ shliqni ko‘ rsatadi. Birinchidan, o‘ qituvchining raqamli kompetensiyasi bo‘ yicha ramkalar universal xarakterga ega bo‘ lib, muayyan fan yo‘ nalishining o‘ ziga xosligini hisobga olmaydi; texnologik ta’limning predmetli-amaliy tabiati esa alohida metodik yechimlarni taqozo etadi. Ikkinchidan, raqamli vositalarni metodik kompetensiyaning muayyan komponenti bilan bog‘ lovchi, ya’ni “qaysi vosita nimani rivojlantiradi” degan savolga javob beruvchi operatsional model taklif etilmagan. Ushbu maqola aynan shu bo‘ shliqni to‘ ldirishga qaratilgan.

3. TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-metodik xarakterga ega bo‘ lib, sifatiy dizayn asosida amalga oshirildi. Ishning asosiy natijasi empirik o‘ lchov emas, balki nazariy jihatdan asoslangan model va uni amaliyotga tatbiq etish mexanizmi hisoblanadi.

Tadqiqot materialini uch guruh manba tashkil etdi: (a) texnologik ta’lim yo‘ nalishi bo‘ yicha oliy ta’limning o‘ quv rejalari, fan dasturlari va malaka talablari; (b) o‘ qituvchi kompetensiyasi, TPACK va raqamli ta’lim bo‘ yicha ilmiy adabiyot hamda xalqaro kompetensiya ramkalari; (v) texnologik ta’lim amaliyotida qo‘ llanilayotgan raqamli vositalar majmui.

Tadqiqotda quyidagi metodlardan foydalanildi: nazariy tahlil va sintez — kompetensiya tuzilishini aniqlash uchun; tizimli yondashuv — komponentlar o‘ rtasidagi bog‘ liqlikni ochib berish uchun; modellashtirish — rivojlantirish bosqichlarini loyihalash uchun; tasniflash — raqamli vositalarni didaktik vazifasi bo‘ yicha guruhlash uchun; qiyosiy tahlil — xalqaro kompetensiya ramkalarini chog‘ ishtirish uchun; ekspert baholash — taklif etilgan modelning ichki izchilligini tekshirish uchun.

Kompetensiya komponentlarini ajratishda uch mezon qo‘ llanildi: komponentning o‘ qituvchi real faoliyatida mustaqil vazifa sifatida namoyon bo‘ lishi; uni kuzatish va baholash imkoniyati; hamda uni rivojlantirish uchun alohida metodik vositaning zarurligi. Ushbu mezonlarga javob bermagan belgilar mustaqil komponent sifatida ajratilmadi.

Tadqiqotning cheklovlari. Birinchidan, ish nazariy-metodik xarakterga ega bo‘ lib, taklif etilgan model tajriba-sinov yo‘ li bilan tekshirilmagan — bu keyingi bosqich vazifasi hisoblanadi. Ikkinchidan, raqamli vositalar konkret dastur nomlari bilan emas, funksional guruhlar darajasida tavsiflangan, chunki dasturiy mahsulotlar tez yangilanadi. Uchinchidan, moddiy-texnik ta’minot va internet imkoniyati bo‘ yicha hududiy tafovutlar hisobga olinmagan.

4. NATIJALAR VA TAHLIL

4.1. Metodik kompetensiyaning tarkibi

Metodik kompetensiya deganda o‘ qituvchining o‘ quv jarayonini maqsadga muvofiq loyihalash, amalga oshirish va natijasini baholash bo‘ yicha nazariy bilim, amaliy ko‘ nikma hamda kasbiy tajribasining yaxlit birligi tushuniladi. Tahlil natijasida uning beshta tarkibiy komponenti ajratildi (1-jadval).

1-jadval. Texnologik ta’lim o‘ qituvchisi metodik kompetensiyasining komponentlari

Komponent	Mazmuni	Texnologik ta’limdagi namoyon bo‘ lishi
Gnostik-nazariy	fan mazmuni, o‘ qitish qonuniyatlari va metodik yondashuvlarni bilish	materialshunoslik, mehnat xavfsizligi, texnologik jarayonlar bo‘ yicha bilimni o‘ quvchi yoshiga moslab tanlash
Loyihalash-konstruktorlik	dars va o‘ quv modulini loyihalash, didaktik material ishlab chiqish	amaliy mashg‘ ulot texnologik kartasini tuzish, buyum namunasi va chizmasini tayyorlash, bosqichlarni vaqt bo‘ yicha taqsimlash
Texnologik-amaliy	predmetli-amaliy faoliyatni namoyish eta olish va boshqarish	asbob-uskuna bilan ishlash usulini ko‘ rsatish, materialni qayta ishlash operatsiyalarini bajarish, ustaxona ishini tashkil etish
Raqamli-kommunikativ	raqamli vositalarni metodik maqsadga muvofiq qo‘ llash va muloqotni tashkil etish	3D-model orqali buyum tuzilishini tushuntirish, virtual simulyatsiyada xavfli operatsiyani oldindan mashq qildirish, onlayn loyiha ishini boshqarish

Komponent	Mazmuni	Texnologik ta’limdagi namoyon bo‘ lishi
Diagnostik-reflektiv	natijani baholash, xatolik sababini aniqlash va o‘ z faoliyatini tahlil qilish	tayyor buyumni rubrika asosida baholash, o‘ quvchi xatosining texnologik sababini aniqlash, o‘ z darsini video yozuv orqali tahlil qilish

Komponentlar ierarxik emas, balki o‘ zaro bog‘ liq tarzda joylashgan. Ayni paytda ular orasida bir yo‘ nalishli bog‘ liqlik mavjud: loyihalash-konstruktorlik komponenti gnostik-nazariy bazaga tayanadi, diagnostik-reflektiv komponent esa qolgan to‘ rttasining natijasini baholaydi va shu orqali ularning takomillashuviga xizmat qiladi. Raqamli-kommunikativ komponent alohida o‘ rin tutadi: u mustaqil qiymatga ega bo‘ lmay, boshqa komponentlarni amalga oshirish vositasi sifatida namoyon bo‘ ladi — bu TPACK modelining asosiy qoidasiga mos keladi.

4.2. Texnologik ta’lim yo‘ nalishining o‘ ziga xosligi

Texnologik ta’lim o‘ qituvchisi tayyorlashning o‘ ziga xosligi uch jihatda namoyon bo‘ ladi. Birinchidan, o‘ quv natijasi moddiy shaklda — tayyor buyum yoki loyiha ko‘ rinishida — ifodalanadi; bu baholashni obyektivroq qiladi, ammo baholash mezonini ham murakkablashtiradi, chunki bir vaqtda ham jarayon, ham mahsulot baholanishi lozim. Ikkinchidan, mashg‘ ulotlar xavfsizlik talablari bilan chegaralangan: ayrim operatsiyalarni boshlang‘ ich bosqichda real uskunada mashq qilish xavfli yoki qimmat bo‘ lishi mumkin. Uchinchidan, soha texnologiyalari jadal yangilanadi, shu bois o‘ qituvchidan uzluksiz kasbiy yangilanish talab etiladi.

Aynan shu uch jihat raqamli vositalarning ushbu yo‘ nalishdagi asosiy vazifasini belgilaydi. Ular real amaliy faoliyatning o‘ rnini bosmaydi, balki unga tayyorgarlik bosqichini ta’minlaydi: xavfli yoki resurs talab qiladigan operatsiya avval virtual muhitda mashq qilinadi, loyiha esa avval raqamli modelda tekshiriladi va shundan keyingina materialda bajariladi. Bu yondashuv xato narxini keskin kamaytiradi va talabaga tajriba to‘ plash uchun ko‘ proq urinish imkonini beradi.

4.3. Raqamli ta’lim vositalarining didaktik tasnifi

Vositalarni dastur nomi bo‘ yicha emas, bajaradigan didaktik vazifasi bo‘ yicha tasniflash maqsadga muvofiqdir: bu yondashuv muayyan dasturiy mahsulot eskirgan taqdirda ham modelning barqarorligini ta’minlaydi (2-jadval).

2-jadval. Raqamli ta’lim vositalarining didaktik tasnifi

Guruh	Didaktik vazifasi	Vosita turlari
1. Loyihalash va modellashtirish	buyum va konstruksiyani raqamli shaklda yaratish, o‘ lchov va materialni oldindan hisoblash	2D/3D CAD muharrirlari, parametrik modellashtirish dasturlari, 3D-bosib chiqarishga tayyorlash (slicer) vositalari
2. Virtual laboratoriya va simulyatsiya	xavfli, qimmat yoki takrorlanishi qiyin operatsiyani xavfsiz muhitda mashq qildirish	elektr zanjiri simulyatorlari, fizik-texnik jarayon simulyatorlari, virtual ustaxona va AR/VR muhitlari
3. O‘ quv kontenti va jarayonni boshqarish	o‘ quv materialini taqdim etish, mustaqil ishni tashkil etish va kuzatib borish	ta’lim boshqaruv tizimlari (LMS), video darslik va ekran yozuvi vositalari, interaktiv taqdimot platformalari
4. Baholash va qayta aloqa	natijani mezon asosida baholash, tezkor va shaxsiylashtirilgan qayta aloqa berish	onlayn test va so‘ rov tizimlari, elektron rubrika, elektron portfolio, formativ baholash vositalari
5. Hamkorlik va loyiha ishi	jamoaviy loyihani rejalashtirish, hujjatlashtirish va taqdim etish	bulutli hujjat va jadval xizmatlari, onlayn taxta, loyiha vazifalarini boshqarish tizimlari

4.4. Komponent va vosita muvofiqligi

Tasnifning amaliy qiymati u kompetensiya komponentlari bilan bog‘ langandagina namoyon bo‘ ladi. Quyidagi matritsa har bir vosita guruhining qaysi komponentni rivojlantirishga xizmat qilishini ko‘ rsatadi (3-jadval).

3-jadval. “Kompetensiya komponenti — raqamli vosita guruhi” muvofiqlik matritsasi

Komponent	1-guruh	2-guruh	3-guruh	4-guruh	5-guruh
Gnostik-nazariy	+	++	++	+	
Loyihalash-konstruktorlik	++	+	++	+	+
Texnologik-amaliy	++	++	+		+
Raqamli-kommunikativ	++	++	++	++	++
Diagnostik-reflektiv	+	+	+	++	++

Izoh: “++” — vosita guruhi ushbu komponentni rivojlantirishda yetakchi vazifani bajaradi; “+” — yordamchi vazifani bajaradi; “–” — bevosita ta’sir ko‘ rsatmaydi.

Matritsa tahlili ikki muhim kuzatuvni beradi. Birinchidan, texnologik-amaliy komponentni faqat birinchi va ikkinchi guruh vositalari orqali qo‘ llab-quvvatlash mumkin, ammo ular ham real ustaxona mashg‘ ulotining o‘ rnini bosmaydi — bu komponent uchun raqamli vosita faqat tayyorgarlik funksiyasini bajaradi. Ikkinchidan, diagnostik-reflektiv komponent to‘ rtinchi va beshinchi guruh vositalari bilan eng kuchli bog‘ langan; amaliyotda esa aynan bu guruhlar kam qo‘ llaniladi, chunki ular natijani emas, jarayonni hujjatlashtirishni talab qiladi. Shu bois refleksiv komponent ko‘ pincha eng zaif bo‘ g‘ in bo‘ lib qoladi.

4.5. Metodik kompetensiyani rivojlantirishning to‘ rt bosqichli modeli

Kompetensiyaning shakllanish qonuniyatlariga muvofiq model to‘ rt bosqichdan iborat qilib loyihalandi. Har bir bosqichda maqsad, faoliyat turi va yetakchi vosita guruhi bir-biriga muvofiqlashtiriladi (4-jadval).

4-jadval. Metodik kompetensiyani rivojlantirishning bosqichlari

Bosqich	Maqsad	Talaba faoliyati	Yetakchi vosita guruhi
I. Motivatsion-diagnostik	boshlang‘ ich darajani aniqlash, kasbiy qiziqishni uyg‘ otish	o‘ z-o‘ zini baholash so‘ rovnomasi; ilg‘ or dars namunalarini tahlil qilish; muammoli vaziyat muhokamasi	3- va 4-guruh
II. Nazariy-metodik	metodik bilim tizimini shakllantirish	metodik yondashuvlarni qiyoslash; dars tuzilishini tahlil qilish; texnologik karta namunalarini o‘ rganish	3-guruh
III. Amaliy-loyihaviy	metodik yechimni mustaqil loyihalash va sinab ko‘ rish	buyumni 3D-modellashtirish; virtual simulyatsiyada operatsiyani mashq qilish; dars loyihasini ishlab chiqish va mikroo‘ qitish	1-, 2- va 5-guruh
IV. Refleksiv-baholash	natijani baholash va kasbiy o‘ sish traektoriyasini belgilash	o‘ z darsini video yozuv orqali tahlil qilish; elektron portfolioni to‘ ldirish; o‘ zaro (peer) baholash	4- va 5-guruh

Modelning asosiy tamoyili — bosqichlarni almashtirib bo‘ lmasligi. Amaliyotda ko‘ p uchraydigan xato shundaki, talabaga metodik bilim bazasi shakllanmasdan turib mustaqil dars loyihasi topshiriladi; natijada u o‘ zi ko‘ rgan darslarni takrorlash bilan cheklanadi va metodik tanlov qilishni o‘ rganmaydi. Aksincha, faqat birinchi va ikkinchi bosqich bilan cheklanish nazariy bilimning amaliy ko‘ nikmaga aylanmasligiga olib keladi.

4.6. Kompetensiya rivojlanishining darajalari

Metodik kompetensiyaning rivojlanish darajasini baholash uchun uch pog‘ onali shkala taklif etiladi (5-jadval). Shkala mezoni sifatida talabaning metodik qaror qabul qilishdagi mustaqillik darajasi olindi.

5-jadval. Metodik kompetensiya rivojlanishining darajalari

Daraja	Metodik qaror	Raqamli vositadan foydalanish	Refleksiya
Reproduktiv (past)	tayyor namuna yoki qo‘ llanma bo‘ yicha ish yuritadi, o‘ zgartirish kiritmaydi	vositani ko‘ rsatilgan tartibda, an’anaviy usul o‘ rniga qo‘ llaydi	natijani bayon qiladi, sababini tahlil qilmaydi
Adaptiv (o‘ rta)	tayyor yechimni sinf va sharoitga moslashtiradi, muqobil variant tanlaydi	vazifaga qarab vosita tanlaydi, uni o‘ quv maqsadi bilan bog‘ laydi	xatolik sababini aniqlaydi, keyingi darsga tuzatish kiritadi
Ijodiy-innovatsion (yuqori)	yangi metodik yechim ishlab chiqadi, uni asoslaydi va sinovdan o‘ tkazadi	vositalarni birlashtirib, yangi o‘ quv vaziyati loyihalaydi	o‘ z faoliyatini tizimli tahlil qiladi, kasbiy o‘ sish rejasini tuzadi

4.7. Natijalarning muhokamasi

Taklif etilgan model bir necha nazariy qoidaga tayanadi. Birinchidan, u L. S. Shulman ajratgan pedagogik-mazmuniy bilim tushunchasini texnologik ta’lim materialida konkretlashtiradi: gnostik-nazariy va texnologik-amaliy komponentlarning kesishuvida o‘ qituvchining o‘ ziga xos metodik bilimi shakllanadi. Ikkinchidan, model TPACK ramkasining asosiy tezisini amaliy shaklga keltiradi: matritsa har bir vositani mavhum “raqamli kompetensiya” bilan emas, aniq metodik komponent bilan bog‘ laydi.

Tahlil ko‘ rsatadiki, texnologik ta’lim yo‘ nalishida raqamli vositaning o‘ rni boshqa fanlardagidan farq qiladi. Ko‘ pgina fanlarda raqamli vosita o‘ quv faoliyatining o‘ zini amalga oshirish muhiti bo‘ lsa, bu yerda u, asosan, tayyorgarlik va tahlil vositasi vazifasini bajaradi: real material bilan ishlash bosqichi o‘ z qiymatini saqlab qoladi. Bu kuzatuv S. Papert ilgari surgan konstruksionizm g‘ oyasiga mos keladi — bilim real obyekt yaratish jarayonida mustahkamlanadi.

Modelni amaliyotga tatbiq etishda P. A. Ertmer va A. T. Ottenbreit-Leftwich aniqlagan ichki to‘ siqlar — o‘ qituvchining texnologiyaga munosabati va o‘ z kuchiga ishonchi — tashqi to‘ siqlardan (uskuna, internet, vaqt) kam ahamiyatli emasligini hisobga olish lozim. Shu bois modelning birinchi bosqichiga motivatsion tarkib ataylab kiritilgan: talaba vositaning metodik foydasini o‘ zi ko‘ rmaguncha, uni faqat majburiy topshiriq sifatida qabul qiladi.

Natijalarning amaliy ahamiyati ikki yo‘ nalishda namoyon bo‘ ladi. Kasbiy tayyorgarlik dasturlarini loyihalash uchun ular vosita tanlashning aniq mezonini beradi: har bir vosita muayyan komponent va bosqichga biriktiriladi. Baholash amaliyoti uchun esa uch darajali shkala talabaning metodik o‘ sishini kuzatib borish imkonini beradi.

5. XULOSA

O‘ tkazilgan nazariy tadqiqot quyidagi xulosalarga olib keladi.

Birinchidan, bo‘ lajak texnologik ta’lim o‘ qituvchisining metodik kompetensiyasi beshta komponentdan iborat: gnostik-nazariy, loyihalash-konstruktorlik, texnologik-amaliy, raqamli-kommunikativ va diagnostik-reflektiv. Raqamli-kommunikativ komponent mustaqil qiymatga ega bo‘ lmay, qolgan komponentlarni amalga oshirish vositasi sifatida namoyon bo‘ ladi.

Ikkinchidan, raqamli ta’lim vositalarini didaktik vazifasiga ko‘ ra besh guruhga — loyihalash va modellashtirish, virtual laboratoriya va simulyatsiya, o‘ quv kontenti va jarayonni boshqarish, baholash va qayta aloqa hamda hamkorlik va loyiha vositalariga — tasniflash vositani metodik vazifa asosida tanlash imkonini beradi.

Uchinchidan, komponent va vosita guruhi o‘ rtasidagi muvofiqlik matritsasi ikki muhim holatni ochib beradi: texnologik-amaliy komponent uchun raqamli vosita faqat tayyorgarlik funksiyasini bajaradi, diagnostik-reflektiv komponent esa amaliyotda eng kam qo‘ llab-quvvatlanadigan, shu bois eng zaif bo‘ g‘ in hisoblanadi.

To‘ rtinchidan, metodik kompetensiyani rivojlantirish motivatsion-diagnostik, nazariy-metodik, amaliy-loyihaviy va refleksiv-baholash bosqichlari ketma-ketligida amalga oshirilishi lozim; bosqichlarni almashtirish tayyor namunani takrorlash ko‘ nikmasining shakllanishiga olib keladi.

Beshinchidan, kompetensiya rivojlanishini reproduktiv, adaptiv va ijodiy-innovatsion darajalar bo‘ yicha baholash mumkin; darajani ajratuvchi asosiy mezon — talabaning metodik qaror qabul qilishdagi mustaqillik darajasidir.

Amaliy tavsiyalar: (a) texnologik ta’lim yo‘ nalishi o‘ quv dasturlariga raqamli vositalarni alohida fan sifatida emas, metodika kurslari ichiga integratsiyalangan holda kiritish; (b) har bir vositani muayyan komponent va bosqichga biriktirib, uni aniq metodik vazifa uchun joriy etish; (v) amaliy-loyihaviy bosqichda “raqamli model — real buyum” ketma-ketligini majburiy qilib belgilash; (g) elektron portfolio va video-refleksiyani baholash tizimining doimiy elementiga aylantirish orqali diagnostik-reflektiv komponentni mustahkamlash.

Tadqiqot istiqbollari taklif etilgan modelni tajriba-sinov yo‘ li bilan tekshirish, kompetensiya darajalarini o‘ lchash uchun diagnostik metodikani ishlab chiqish hamda modelning boshqa amaliy yo‘ nalishdagi pedagogik ta’lim sohalarida qo‘ llanilishini o‘ rganish bilan bog‘ liq.

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BO‘ LAJAK TARJIMONLARNING KASBIY-YO‘ NALTIRILGAN MULOQOT KOMPETENSIYASINI TESOL METODIKASI ASOSIDA RIVOJLANTIRISHNING PEDAGOGIK MEXANIZMLARI

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Annotatsiya: *Maqolada bo‘ lajak tarjimonlarning kasbiy-yo‘ naltirilgan muloqot kompetensiyasini TESOL metodikasi asosida rivojlantirishning pedagogik mexanizmlari kompetensiyaviy yondashuv va ijtimoiy konstruktivizm nazariyasi doirasida tadqiq etiladi. Tadqiqot materialini tarjimon kompetensiyasining xalqaro modellari (PACTE, EMT), TESOL metodikasining nazariy manbalari hamda tarjimonlik yo‘ nalishi o‘ quv-normativ hujjatlari tashkil etdi. Nazariy tahlil, tizimli yondashuv, qiyosiy tahlil va modellashtirish metodlari asosida kasbiy-yo‘ naltirilgan muloqot kompetensiyasining oltita tarkibiy komponenti — lingvistik-diskursiv, madaniyatlararo, kasbiy-terminologik, interaktiv-mediativ, strategik-refleksiv va deontologik-etik komponentlar — ajratildi. TESOL metodikasining tarjimon tayyorlashga tatbiq etilishi mumkin bo‘ lgan yettita tamoyili aniqlanib, ular asosida oltita pedagogik mexanizm asoslandi: kommunikativ vaziyatni modellashtirish, topshiriq asosidagi ta’lim, skaffolding va mustaqillikni bosqichma-bosqich oshirish, hamkorlikdagi loyiha ishi, konstruktiv qayta aloqa va xato tahlili hamda refleksiv amaliyot. Mexanizm va komponent o‘ rtasidagi muvofiqlik matritsasi, to‘ rt bosqichli model hamda kompetensiya rivojlanishining uch darajali baholash shkalasi taklif etildi.*

Kalit so‘ zlar: *kasbiy-yo‘ naltirilgan muloqot kompetensiyasi, tarjimon tayyorlash, TESOL metodikasi, kommunikativ yondashuv, topshiriq asosidagi ta’lim, skaffolding, refleksiv amaliyot, madaniyatlararo muloqot, mediatsiya, deontologiya, pedagogik mexanizm.*

ПЕДАГОГИЧЕСКИЕ МЕХАНИЗМЫ РАЗВИТИЯ ПРОФЕССИОНАЛЬНО ОРИЕНТИРОВАННОЙ КОММУНИКАТИВНОЙ КОМПЕТЕНЦИИ БУДУЩИХ ПЕРЕВОДЧИКОВ НА ОСНОВЕ МЕТОДИКИ TESOL

Аннотация: *В статье в рамках компетентностного подхода и теории социального конструктивизма исследуются педагогические механизмы развития профессионально ориентированной коммуникативной компетенции будущих переводчиков на основе методики TESOL. Материалом исследования послужили международные модели переводческой компетенции (PACTE, EMT), теоретические источники методики TESOL, а также учебно-нормативные документы переводческого направления. На основе теоретического анализа, системного подхода, сравнительного анализа и моделирования выделены шесть структурных компонентов профессионально ориентированной коммуникативной компетенции — лингвистико-дискурсивный, межкультурный, профессионально-терминологический, интерактивно-медиативный, стратегическо-рефлексивный и деонтологическо-этический. Определены семь принципов методики TESOL, применимых к подготовке переводчиков, и на их основе обоснованы шесть педагогических механизмов: моделирование коммуникативной ситуации, обучение на основе заданий, скаффолдинг и поэтапное повышение самостоятельности, совместная проектная работа, конструктивная обратная связь и анализ ошибок, а также рефлексивная практика. Предложены матрица соответствия «механизм — компонент», четырёхэтапная модель и трёхуровневая шкала оценивания.*

Ключевые слова: *профессионально ориентированная коммуникативная компетенция, подготовка переводчиков, методика TESOL, коммуникативный подход, обучение на основе заданий, скаффолдинг, рефлексивная практика, межкультурная коммуникация, медиация, деонтология, педагогический механизм.*

PEDAGOGICAL MECHANISMS FOR DEVELOPING THE PROFESSIONALLY ORIENTED COMMUNICATIVE COMPETENCE OF FUTURE TRANSLATORS THROUGH TESOL METHODOLOGY

Abstract: *The article examines, within the competence approach and social constructivist theory, the pedagogical mechanisms for developing the professionally oriented communicative competence of future translators through TESOL methodology. The research*

material comprises international models of translator competence (PACTE, EMT), the theoretical sources of TESOL methodology, and the curricular and normative documents of translation programmes. Theoretical analysis, a systemic approach, comparative analysis and modelling made it possible to distinguish six structural components of professionally oriented communicative competence: linguistic-discursive, intercultural, professional-terminological, interactive-mediative, strategic-reflective and deontological-ethical. Seven principles of TESOL methodology applicable to translator training are identified, and on their basis six pedagogical mechanisms are substantiated: modelling communicative situations, task-based learning, scaffolding with the gradual transfer of autonomy, collaborative project work, constructive feedback and error analysis, and reflective practice. A mechanism-to-component correspondence matrix, a four-stage model and a three-level assessment scale are proposed.

Keywords: *professionally oriented communicative competence, translator training, TESOL methodology, communicative approach, task-based learning, scaffolding, reflective practice, intercultural communication, mediation, deontology, pedagogical mechanism.*

1. KIRISH

Xalqaro hamkorlikning kengayishi, chet el investitsiyalarining o‘ sishi va axborot almashinuvi hajmining ortishi tarjimonlik kasbiga bo‘ lgan talabni ham, unga qo‘ yiladigan mezonlarni ham o‘ zgartirdi. Bugungi tarjimon faqat matnni bir tildan boshqasiga o‘ girishi emas, balki turli madaniy va kasbiy muhitga mansub tomonlar o‘ rtasidagi muloqotni ta’minlovchi vositachi — mediator sifatida faoliyat yuritishi lozim. Bu esa uning tayyorgarligida til bilimidan tashqari muloqot ko‘ nikmalari ham hal qiluvchi ahamiyat kasb etishini anglatadi.

Ayni paytda tarjimonlik yo‘ nalishida ta’lim amaliyoti an’anaviy ravishda yozma matn ustida ishlashga yo‘ naltirilgan. Talaba lingvistik jihatdan puxta tayyorgarlikka ega bo‘ lsa-da, real kasbiy vaziyatda — muzokara jarayonida, ish uchrashuvida yoki jonli tadbirda — muloqotni boshqarish, noaniqlikni bartaraf etish va tomonlar o‘ rtasidagi madaniy tafovutni yumshatishda qiynaladi. Boshqacha aytganda, til kompetensiyasi bilan kasbiy-yo‘ naltirilgan muloqot kompetensiyasi o‘ rtasida uzilish yuzaga keladi.

Ushbu uzilishni bartaraf etishning istiqbolli yo‘ llaridan biri — TESOL (Teaching English to Speakers of Other Languages) metodikasining pedagogik arsenalidan foydalanishdir. TESOL doirasida o‘ nlab yillar davomida kommunikativ ko‘ nikmalarni shakllantirishning samarali mexanizmlari — kommunikativ vaziyatni modellashtirish, topshiriq asosidagi ta’lim, skaffolding, hamkorlikdagi ish va refleksiv amaliyot — ishlab chiqilgan va sinovdan o‘ tkazilgan. Ushbu mexanizmlar til o‘ rgatish uchun yaratilgan bo‘ lsa-da, ularning didaktik mohiyati tarjimon tayyorlash vazifalariga ham javob beradi.

Mavzuning dolzarbligi ikki jihat bilan izohlanadi. Birinchidan, tarjimon kompetensiyasining mavjud xalqaro modellarida (PACTE, EMT) og‘ zaki kasbiy muloqot komponenti mustaqil element sifatida yetarlicha ajratilmagan — u ko‘ proq xizmat ko‘ rsatish yoki shaxslararo kompetensiya doirasida qayd etiladi. Ikkinchidan, TESOL metodikasi til o‘ rganuvchi uchun ishlab chiqilgan bo‘ lib, uni bo‘ lajak tarjimon tayyorlashga moslashtirishning pedagogik mexanizmlari maxsus tadqiq etilmagan.

Tadqiqotning maqsadi — bo‘ lajak tarjimonlarning kasbiy-yo‘ naltirilgan muloqot kompetensiyasi tarkibini aniqlash, TESOL metodikasining tarjimon tayyorlashga tatbiq etilishi mumkin bo‘ lgan tamoyillarini ajratish hamda shu asosda pedagogik mexanizmlar tizimini asoslashdan iborat.

Tadqiqotning obyekti — bo‘ lajak tarjimonlarni kasbiy tayyorlash jarayoni; predmeti esa TESOL metodikasi asosida ularning kasbiy-yo‘ naltirilgan muloqot kompetensiyasini rivojlantirishning pedagogik mexanizmlaridir.

Tadqiqotning ilmiy yangiligi shundan iboratki, unda kasbiy-yo‘ naltirilgan muloqot kompetensiyasining olti komponentli tuzilishi tarjimonlik faoliyati materiali asosida asoslanadi, TESOL tamoyillari bilan tarjimon kompetensiyasi modellari qiyosiy tahlil qilinadi, oltita pedagogik mexanizm ajratiladi hamda “mexanizm — komponent” muvofiqlik matritsasi tuziladi.

Maqola quyidagicha tuzilgan: ikkinchi bo‘ limda mavzuga oid nazariy adabiyot tahlil qilinadi va tadqiqot bo‘ shlig‘ i aniqlanadi; uchinchi bo‘ limda material va metodlar tavsiflanadi; to‘ rtinchi bo‘ limda natijalar jadvallarda umumlashtirilib izohlanadi; beshinchi bo‘ limda xulosa va amaliy tavsiyalar beriladi.

2. MAVZUGA OID ADABIYOTLAR TAHLILI

Kommunikativ kompetensiya tushunchasi D. Hymes tomonidan kiritilib, M. Canale va M. Swain modelida to‘ rt komponentga — grammatik, sotsiolingvistik, diskursiv va strategik kompetensiyaga — ajratilgan. L. Bachman ushbu modelni takomillashtirib, til qobiliyatining tashkiliy va pragmatik qatlamlarini farqlaydi. Yevropa Kengashining “Chet tillar bo‘ yicha umumevropa kompetensiyalari” hujjatining 2020-yilgi to‘ ldirilgan nashri esa mediatsiya (vositachilik) kompetensiyasini mustaqil kategoriya sifatida ajratadi — bu qoida tarjimon tayyorlash uchun bevosita ahamiyatga ega.

Tarjimon kompetensiyasining tuzilishi bo‘ yicha ikki nufuzli model mavjud. Barselona PACTE tadqiqot guruhi tarjima kompetensiyasini bilingval, ekstralingvistik, tarjima bo‘ yicha bilim, instrumental va strategik

subkompetensiyalarga hamda psixofiziologik komponentlarga ajratadi; bunda strategik subkompetensiya markaziy o‘ rin tutadi. Yevropa Ittifoqining EMT (European Master’s in Translation) kompetensiya ramkasi til va madaniyat, tarjima, texnologiya, shaxsiy va shaxslararo hamda xizmat ko‘ rsatish sohalarini ajratadi. Har ikki modelda og‘ zaki kasbiy muloqot alohida komponent sifatida emas, boshqa sohalar ichida tarqoq holda qayd etilgan.

Tarjimon tayyorlash didaktikasida ijtimoiy konstruktivistik yondashuv D. Kiraly tomonidan asoslangan: muallif tarjimonlik ko‘ nikmasi auditoriyada emas, real yoki realga yaqin loyiha ustidagi hamkorlikda shakllanishini ta’kidlaydi va o‘ qituvchining vazifasini bilim uzatuvchidan jarayonni qo‘ llab-quvvatlovchiga o‘ zgartiradi. Bu qoida L. S. Vigotskiyning yaqin rivojlanish zonasi nazariyasiga hamda J. Bruner ilgari surgan skaffolding g‘ oyasiga tayanadi.

TESOL metodikasining nazariy asoslari kommunikativ yondashuv doirasida ishlab chiqilgan. J. C. Richards va T. S. Rodgers kommunikativ metodikaning tamoyillarini tizimlashtirgan; R. Ellis va J. Willis topshiriq asosidagi ta’lim (Task-Based Language Teaching) modelini asoslagan; D. Nunan o‘ quvchi markazli o‘ quv dasturini loyihalash tamoyillarini ta’riflagan. Refleksiv amaliyot konsepsiyasi D. Schön ishlarida yoritilgan bo‘ lib, kasbiy ta’limning barcha sohalarida keng qo‘ llaniladi. Madaniyatlararo kompetensiya masalalari esa M. Byram modelida umumlashtirilgan.

Mavjud adabiyot tahlili ikki muhim bo‘ shliqni ko‘ rsatadi. Birinchidan, tarjimon kompetensiyasi modellari matn bilan ishlashga yo‘ naltirilgan bo‘ lib, ularda jonli kasbiy muloqotni boshqarish ko‘ nikmasi mustaqil o‘ lchov birligi sifatida ajratilmagan. Ikkinchidan, TESOL metodikasi vositalari til o‘ rganuvchi uchun ishlab chiqilgan bo‘ lib, ularni tarjimon tayyorlash vazifalariga moslashtirishning shart-sharoitlari va chegaralari aniqlanmagan: tarjimon uchun til maqsad emas, kasbiy faoliyat quroli hisoblanadi va bu didaktik yechimlarni ham o‘ zgartiradi. Ushbu maqola aynan shu bo‘ shliqni to‘ ldirishga qaratilgan.

3. TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-metodik xarakterga ega bo‘ lib, sifatiy dizayn asosida amalga oshirildi. Ishning asosiy natijasi empirik o‘ lchov emas, balki nazariy jihatdan asoslangan mexanizmlar tizimi va uni amaliyotga tatbiq etish modeli hisoblanadi.

Tadqiqot materialini uch guruh manba tashkil etdi: (a) tarjimon kompetensiyasining xalqaro modellari va ramkalari (PACTE, EMT) hamda CEFR ning mediatsiya bo‘ yicha deskriptorlari; (b) TESOL metodikasi va kommunikativ yondashuv bo‘ yicha nazariy adabiyot; (v) tarjimonlik yo‘ nalishi bo‘ yicha oliy ta’limning o‘ quv rejalari, fan dasturlari va malaka talablari.

Tadqiqotda quyidagi metodlardan foydalanildi: nazariy tahlil va sintez — kompetensiya tuzilishini aniqlash uchun; qiyosiy tahlil — TESOL tamoyillari bilan tarjimon kompetensiyasi modellarini chog‘ ishtirish uchun; tizimli yondashuv — mexanizmlar o‘ rtasidagi bog‘ liqlikni ochib berish uchun; modellashtirish — bosqichli modelni loyihalash uchun; ekspert baholash — taklif etilgan mexanizmlarning ichki izchilligini tekshirish uchun.

Pedagogik mexanizm deganda muayyan kompetensiya komponentining shakllanishini ta’minlovchi, maqsad, faoliyat mazmuni, tashkiliy shakl va qayta aloqadan iborat yaxlit didaktik birlik tushuniladi. Mexanizmni ajratishda uch mezon qo‘ llanildi: uning muayyan komponent bilan bevosita bog‘ liqligi; amaliyotda takrorlanadigan tashkiliy shaklga ega bo‘ lishi; hamda natijasining kuzatilishi va baholanishi mumkinligi.

Tadqiqotning cheklovlari. Birinchidan, ish nazariy xarakterga ega bo‘ lib, taklif etilgan mexanizmlar tizimi tajriba-sinov yo‘ li bilan tekshirilmagan — bu keyingi bosqich vazifasi hisoblanadi. Ikkinchidan, tahlil, asosan, og‘ zaki kasbiy muloqotga qaratilgan; yozma tarjima kompetensiyasi alohida tadqiqot predmeti sanaladi. Uchinchidan, sinxron tarjima kabi ixtisoslashgan yo‘ nalishlarning o‘ ziga xos talablari batafsil ko‘ rib chiqilmagan.

4. NATIJALAR VA TAHLIL

4.1. Kasbiy-yo‘ naltirilgan muloqot kompetensiyasining tarkibi

Kasbiy-yo‘ naltirilgan muloqot kompetensiyasi deganda tarjimonning turli til va madaniyatga mansub tomonlar o‘ rtasidagi muloqotni kasbiy me’yorlar doirasida samarali ta’minlash qobiliyati tushuniladi. Tahlil natijasida uning oltita tarkibiy komponenti ajratildi (1-jadval).

1-jadval. Kasbiy-yo‘ naltirilgan muloqot kompetensiyasining komponentlari

Komponent	Mazmuni	Tarjimonlik faoliyatidagi namoyon bo‘ lishi
Lingvistik-diskursiv	ikki tilda janr va uslubga mos matn hosil qilish	rasmiy uchrashuv nutqini tegishli registrda yetkazish; bayonot va savol-javob strukturasini saqlash
Madaniyatlararo	madaniy farqlarni anglash va ularni muloqotda hisobga olish	murojaat shakllari, muomala masofasi, rad javobini yumshatish usullaridagi tafovutlarni yumshatish

Komponent	Mazmuni	Tarjimonlik faoliyatidagi namoyon bo‘ lishi
Kasbiy-terminologik	soha atamalari va predmetli bilimga ega bo‘ lish	huquqiy, tibbiy, texnik yoki iqtisodiy sohaga oid atamani kontekstga mos tanlash
Interaktiv-mediativ	muloqot jarayonini boshqarish va tomonlar o‘ rtasida vositachilik qilish	navbatni tartibga solish, tushunmovchilikni aniqlashtirish, ma’lumotni qisqartirmasdan soddalashtirish
Strategik-refleksiv	kommunikativ uzilishni bartaraf etish va o‘ z faoliyatini tahlil qilish	noma’lum atamani izohlab berish, parafraz qilish, aniqlashtiruvchi savol berish, topshiriqdan keyin xatolarni tahlil qilish
Deontologik-etik	kasbiy odob me’yorlariga rioya qilish	betaraflikni saqlash, maxfiylikni ta’minlash, o‘ z fikrini qo‘ shmaslik, kompetensiya chegarasini tan olish

Ajratilgan komponentlar orasida interaktiv-mediativ va deontologik-etik komponentlar alohida ahamiyatga ega, chunki aynan ular tarjimonni til biluvchi shaxsdan kasbiy vositachiga ajratib turadi. Shu bilan birga, an’anaviy ta’lim amaliyotida bu ikki komponent eng kam metodik qo‘ llab-quvvatlanadi: ular yozma topshiriq orqali shakllanmaydi va faqat jonli, ko‘ p tomonlama muloqot vaziyatida rivojlanadi.

4.2. TESOL metodikasining tarjimon tayyorlashga tatbiq etiladigan tamoyillari

TESOL metodikasi tamoyillarining tarjimon tayyorlashga tatbiq etilishi to‘ g‘ ridan-to‘ g‘ ri ko‘ chirish emas, balki maqsadga muvofiq moslashtirish yo‘ li bilan amalga oshiriladi. Asosiy farq shundaki, til o‘ rganuvchi uchun til — o‘ zlashtirish obyekti, tarjimon uchun esa kasbiy faoliyat quroli (2-jadval).

2-jadval. TESOL tamoyillari va ularning tarjimon tayyorlashdagi moslashtirilishi

TESOL tamoyili	Til o‘ qitishdagi mazmuni	Tarjimon tayyorlashdagi moslashtirilishi
Kommunikativ yo‘ naltirilganlik	shaklga emas, ma’noni yetkazishga urg‘ u berish	baholash mezoni — grammatik xatoning yo‘ qligi emas, muloqot maqsadining amalga oshishi
Autentiklik	real hayotdan olingan material va vaziyatlar bilan ishlash	haqiqiy muzokara, brifing va ish uchrashuvi yozuvlari asosida topshiriq tuzish
O‘ quvchi markazlilik	o‘ quvchi ehtiyoji va darajasidan kelib chiqish	talabaning ixtisoslashuv sohasi (huquq, tibbiyot, texnika) bo‘ yicha individual traektoriya
Topshiriq asosidagi ta’lim	til aniq natijali vazifani bajarish jarayonida o‘ zlashtiriladi	topshiriq natijasi — bajarilgan tarjima xizmati (muzokara, brifing, ekskursiya)
Interaktivlik va hamkorlik	juftlik va guruhda ishlash orqali muloqot amaliyoti	ko‘ p rolli vaziyat: buyurtmachi — tarjimon — xorijiy hamkor ishtirokidagi simulyatsiya
Skaffolding	qo‘ llab-quvvatlashni bosqichma-bosqich kamaytirish	tayyorlangan lug‘ atdan tayyorgarliksiz jonli tarjimaga o‘ tish ketma-ketligi
Formativ baholash va qayta aloqa	jarayon davomida konstruktiv qayta aloqa berish	video yozuv asosida tahlil, o‘ zaro (peer) baholash, xato turlarini tasniflash

4.3. Pedagogik mexanizmlar tizimi

Yuqoridagi tamoyillar asosida oltita pedagogik mexanizm ajratildi. Har bir mexanizm maqsad, tashkiliy shakl va kutilayotgan natijaning yaxlit birligi sifatida tavsiflanadi (3-jadval).

3-jadval. Kasbiy-yo‘ naltirilgan muloqot kompetensiyasini rivojlantirishning pedagogik mexanizmlari

Mexanizm	Mohiyati	Amalga oshirish shakli	Kutilayotgan natija
1. Kommunikativ vaziyatni modellashtirish	real kasbiy vaziyatni auditoriyada qayta yaratish	rolli o‘ yin, ish uchrashuvi va muzokara simulyatsiyasi, matbuot anjumani modeli	yangi vaziyatda yo‘ qolib qolmaslik, muloqotni boshqara olish
2. Topshiriq asosidagi ta’lim	aniq natijaga yo‘ naltirilgan vazifalar zanjiri	tayyorgarlik – bajarish – tahlil sxemasi bo‘ yicha topshiriqlar tizimi	bilimning amaliy ko‘ nikmaga aylanishi
3. Skaffolding va mustaqillikni bosqichma-bosqich oshirish	qo‘ llab-quvvatlashni asta-sekin kamaytirish	tayyor glossariy →qisman tayyorgarlik → tayyorgarliksiz tarjima ketma-ketligi	kasbiy mustaqillik va o‘ ziga ishonchning shakllanishi
4. Hamkorlikdagi loyiha ishi	jamoada real yoki realga yaqin buyurtma ustida ishlash	guruh loyihasi: terminologik baza tuzish, tadbirni tarjima bilan ta’minlash	jamoada ishlash va kasbiy muloqot ko‘ nikmasi
5. Konstruktiv qayta aloqa va xato tahlili	xatoni jazolash emas, uning sababini aniqlash	video yozuv tahlili, xato turlarini tasniflash, o‘ zaro baholash	xatoni takrorlamaslik, o‘ z-o‘ zini nazorat qilish
6. Refleksiv amaliyot	o‘ z faoliyatini tizimli tahlil qilish	kasbiy kundalik, portfolio, topshiriqdan keyingi o‘ z-o‘ zini baholash anketasi	kasbiy o‘ sish traektoriyasini mustaqil belgilash

4.4. Mexanizm va komponent muvofiqligi

Mexanizmlar tizimining amaliy qiymati ular kompetensiya komponentlari bilan bog‘ langandagina namoyon bo‘ ladi. Quyidagi matritsa har bir mexanizmning qaysi komponentni rivojlantirishga xizmat qilishini ko‘ rsatadi (4-jadval).

4-jadval. “Pedagogik mexanizm — kompetensiya komponenti” muvofiqlik matritsasi

Komponent	1-mex.	2-mex.	3-mex.	4-mex.	5-mex.	6-mex.
Lingvistik-diskursiv	+	++	++	+	++	+
Madaniyatlararo	++	+	+	++	+	+
Kasbiy-terminologik	+	++	++	++	+	
Interaktiv-mediativ	++	++	+	++	+	+
Strategik-refleksiv	++	+	++	+	++	++
Deontologik-etik	++		+	++	+	++

Izoh: “++” — mexanizm ushbu komponentni rivojlantirishda yetakchi vazifani bajaradi; “+” — yordamchi vazifani bajaradi; “–” — bevosita ta’sir ko‘ rsatmaydi.

Matritsa tahlili uchta muhim kuzatuvni beradi. Birinchidan, birinchi mexanizm — kommunikativ vaziyatni modellashtirish — eng keng qamrovga ega bo‘ lib, olti komponentdan to‘ rttasi uchun yetakchi hisoblanadi; bu uning

tizimdagi markaziy o‘ rnini tasdiqlaydi. Ikkinchidan, deontologik-etik komponent faqat modellashtirish, hamkorlik va refleksiya orqali shakllanadi: kasbiy odob me’yorini ma’ruza shaklida bayon qilish mumkin, ammo uni faqat tanlov qilish zarurati tug‘ ilgan vaziyatda o‘ zlashtirish mumkin. Uchinchidan, refleksiv amaliyot terminologik komponentga bevosita ta’sir ko‘ rsatmaydi, ammo strategik komponentning asosiy quvvat manbai hisoblanadi.

4.5. Mexanizmlarni joriy etishning bosqichli modeli

Mexanizmlar bir vaqtda emas, ketma-ketlikda joriy etilishi lozim. Modelning to‘ rt bosqichi talabaning mustaqillik darajasi ortib borishiga muvofiq loyihalangan (5-jadval).

5-jadval. Pedagogik mexanizmlarni joriy etishning bosqichlari

Bosqich	Maqsad	Yetakchi mexanizmlar	Talaba mustaqilligi darajasi
I. Yo‘ naltiruvchi-diagnostik	boshlang‘ ich darajani aniqlash, kasbiy vaziyat tasavvurini shakllantirish	1-, 5-mexanizmlar	namuna kuzatiladi va tahlil qilinadi
II. Nazorat ostidagi mashq	nutqiy va terminologik bazani mustahkamlash	2-, 3-mexanizmlar	tayyorgarlik va qo‘ llab-quvvatlash bilan ishlaydi
III. Loyihaviy-amaliy	realga yaqin sharoitda kasbiy vazifani bajarish	1-, 4-mexanizmlar	jamoada mustaqil ishlaydi
IV. Refleksiv-baholovchi	natijani tahlil qilish va kasbiy o‘ sishni rejalashtirish	5-, 6-mexanizmlar	o‘ z faoliyatini mustaqil baholaydi

Modelning asosiy tamoyili — bosqichlarni almashtirib bo‘ lmasligi. Amaliyotda tez-tez uchraydigan xato shundaki, talaba terminologik va nutqiy bazasi shakllanmasdan turib jonli tarjima topshirig‘ iga jalb etiladi; natijada u muvaffaqiyatsizlikni ko‘ nikma yetishmasligi emas, shaxsiy qobiliyatsizlik deb qabul qiladi va kasbiy o‘ ziga ishonchi pasayadi. Aksincha, faqat ikkinchi bosqich bilan cheklanish talabani auditoriya sharoitidan tashqarida ishlay olmaydigan mutaxassisga aylantiradi.

4.6. Kompetensiya rivojlanishining darajalari

Kasbiy-yo‘ naltirilgan muloqot kompetensiyasining rivojlanish darajasini baholash uchun uch pog‘ onali shkala taklif etiladi (6-jadval). Shkala mezoni sifatida talabaning kutilmagan kommunikativ vaziyatda mustaqil qaror qabul qila olish darajasi olindi.

6-jadval. Kasbiy-yo‘ naltirilgan muloqot kompetensiyasining darajalari

Daraja	Muloqotni boshqarish	Strategik xatti-harakat	Kasbiy pozitsiya
Reproduktiv (past)	tayyorlangan vaziyatda ishlaydi, kutilmagan burilishda to‘ xtaladi	noma’lum atamada muloqotni uzadi yoki so‘ zma-so‘ z o‘ giradi	o‘ z fikrini qo‘ shib yuboradi, betaraflikni saqlay olmaydi
Adaptiv (o‘ rta)	vaziyat o‘ zgarganda sur’at va registrni moslashtiradi	parafraz va aniqlashtiruvchi savoldan foydalanadi	kasbiy me’yorlarni biladi, ammo murakkab holatda ikkilanadi
Ijodiy-innovatsion (yuqori)	muloqotni oldindan rejalashtiradi va faol boshqaradi	strategiyani vaziyatga qarab tanlaydi va uni asoslay oladi	betaraflik, maxfiylik va kompetensiya chegarasini izchil saqlaydi

4.7. Natijalarning muhokamasi

Taklif etilgan mexanizmlar tizimi bir necha nazariy qoidaga tayanadi. Birinchidan, u D. Kiraly asoslagan ijtimoiy konstruktivistik yondashuvni operatsional shaklga keltiradi: uchinchi bosqichdagi hamkorlikdagi loyiha ishi aynan “real

buyurtma ustida birgalikda ishlash” tamoyilining amaliy ifodasidir. Ikkinchidan, uchinchi mexanizm — skaffolding va mustaqillikni bosqichma-bosqich oshirish — L. S. Vigotskiyning yaqin rivojlanish zonasi nazariyasiga bevosita mos keladi.

Ayni paytda TESOL metodikasini tarjimon tayyorlashga tatbiq etishning chegaralarini ham qayd etish lozim. Til o‘ qitishda xato o‘ zlashtirish jarayonining tabiiy bosqichi sifatida qaraladi va ko‘ pincha atayin tuzatilmay qoldiriladi; tarjimonlik faoliyatida esa xato bevosita kommunikativ yoki huquqiy oqibatga olib kelishi mumkin. Shu bois beshinchi mexanizm — qayta aloqa va xato tahlili — tarjimon tayyorlashda TESOL amaliyotidagidan ko‘ ra qat’iyroq va tizimliroq qo‘ llanilishi kerak. Xuddi shunday, TESOLda ravonlik aniqlikdan ustun qo‘ yilishi mumkin, tarjimonlikda esa bu ikki mezon teng ahamiyatga ega.

Tadqiqotning yana bir muhim natijasi deontologik-etik komponentga oid kuzatuvdir. Kasbiy odob me’yorlari an’anaviy ravishda alohida nazariy kurs doirasida bayon qilinadi, ammo matritsa tahlili ko‘ rsatadiki, ular faqat tanlov zarurati tug‘ iladigan vaziyatda — masalan, tomonlardan biri tarjimondan o‘ z fikrini bildirishni yoki ma’lumotni yumshatishni so‘ raganda — real o‘ zlashtiriladi. Shu bois etik dilemma vaziyatlarini simulyatsiya topshiriqlariga ataylab kiritish maqsadga muvofiqdir.

Natijalarning amaliy ahamiyati ikki yo‘ nalishda namoyon bo‘ ladi. Kasbiy tayyorgarlik dasturlarini loyihalash uchun ular mexanizm tanlashning aniq mezonini beradi: har bir mexanizm muayyan komponent va bosqichga biriktiriladi. Baholash amaliyoti uchun esa uch darajali shkala talabaning kasbiy o‘ sishini kuzatib borish imkonini beradi.

5. XULOSA

O‘ tkazilgan nazariy tadqiqot quyidagi xulosalarga olib keladi.

Birinchidan, bo‘ lajak tarjimonning kasbiy-yo‘ naltirilgan muloqot kompetensiyasi oltita komponentdan iborat: lingvistik-diskursiv, madaniyatlararo, kasbiy-terminologik, interaktiv-mediativ, strategik-refleksiv va deontologik-etik. Ular orasida oxirgi ikki komponent tarjimonni til biluvchi shaxsdan kasbiy vositachiga ajratib turadi, biroq an’anaviy ta’limda eng kam metodik qo‘ llab-quvvatlanadi.

Ikkinchidan, TESOL metodikasining yettita tamoyili — kommunikativ yo‘ naltirilganlik, autentiklik, o‘ quvchi markazlilik, topshiriq asosidagi ta’lim, interaktivlik va hamkorlik, skaffolding hamda formativ baholash — tarjimon tayyorlashga to‘ g‘ ridan-to‘ g‘ ri ko‘ chirish yo‘ li bilan emas, maqsadga muvofiq moslashtirish orqali tatbiq etiladi.

Uchinchidan, ushbu tamoyillar asosida oltita pedagogik mexanizm asoslandi: kommunikativ vaziyatni modellashtirish, topshiriq asosidagi ta’lim, skaffolding va mustaqillikni bosqichma-bosqich oshirish, hamkorlikdagi loyiha ishi, konstruktiv qayta aloqa va xato tahlili hamda refleksiv amaliyot. Ular orasida kommunikativ vaziyatni modellashtirish eng keng qamrovga ega bo‘ lib, tizimning markaziy bo‘ g‘ ini hisoblanadi.

To‘ rtinchidan, mexanizmlar bir vaqtda emas, yo‘ naltiruvchi-diagnostik, nazorat ostidagi mashq, loyihaviy-amaliy va refleksiv-baholovchi bosqichlar ketma-ketligida joriy etilishi lozim; bosqichlarni almashtirish talabaning kasbiy o‘ ziga ishonchiga salbiy ta’sir ko‘ rsatadi.

Beshinchidan, TESOL metodikasini tatbiq etishning chegaralari mavjud: til o‘ qitishda xato o‘ zlashtirishning tabiiy bosqichi sanaladi, tarjimonlik faoliyatida esa u bevosita kommunikativ oqibatga olib keladi. Shu bois qayta aloqa va xato tahlili mexanizmi tarjimon tayyorlashda qat’iyroq va tizimliroq qo‘ llanilishi kerak.

Amaliy tavsiyalar: (a) tarjimonlik yo‘ nalishi o‘ quv dasturlariga kommunikativ vaziyat simulyatsiyasini muntazam amaliyot shakli sifatida kiritish; (b) etik dilemma vaziyatlarini simulyatsiya topshiriqlariga ataylab joylashtirish; (v) video yozuv asosidagi tahlil va o‘ zaro baholashni baholash tizimining doimiy elementiga aylantirish; (g) talabaning ixtisoslashuv sohasi bo‘ yicha individual terminologik bazasini portfolio doirasida to‘ playdigan tartib joriy etish.

Tadqiqot istiqbollari taklif etilgan mexanizmlar tizimini tajriba-sinov yo‘ li bilan tekshirish, kompetensiya darajalarini o‘ lchash uchun diagnostik metodikani ishlab chiqish hamda mexanizmlarning sinxron tarjima va maxsus sohalarga ixtisoslashgan tayyorgarlikdagi o‘ ziga xosligini o‘ rganish bilan bog‘ liq.

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OLIY TA'LIMNING RAQAMLI EKOTIZIMIDA BO' LAJAK FILOLOGLARNING TRANSPROFESSIONAL KROSS-MADANIY KOMPETENSIYASINI RIVOJLANTIRISH METODIKASINI TAKOMILLASHTIRISH

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Annotatsiya: *Ushbu maqolada oliy ta'limning raqamli ekotizimi sharoitida bo' lajak filologlarning transprofessional kross-madaniy kompetensiyasini rivojlantirish metodikasini takomillashtirish masalasi ko' rib chiqilgan. Tadqiqotning dolzarbligi O' zbekistonda amalga oshirilayotgan raqamlashtirish islohotlari, filolog-mutaxassislarga qo' yilayotgan transprofessional talablar hamda mavjud metodik ta'minotning ushbu ehtiyojlarga to' liq javob bermasligi bilan izohlanadi. Tadqiqot maqsadi — Hymes, Canale va Swain, Byram, Deardorff hamda Hofstedening nazariy modellariga, shuningdek Godwin-Jones, Warschauer va Chapellening raqamli ta'lim texnologiyalari borasidagi ishlariga tayangan holda, kross-madaniy kompetensiyaning transprofessional komponentini rivojlantiruvchi bosqichli metodikani ishlab chiqish va uning samaradorligini eksperimental tekshirishdan iborat. Tadqiqotda aralash metodologiya — sifat tahlili va pedagogik eksperiment (dastlabki va yakuniy diagnostika) qo' llanildi, tajribada 64 nafar bo' lajak filolog talaba (nazorat va tajriba guruhlari) ishtirok etdi. Natijalar tajriba guruhida barcha kompetensiya komponentlari, ayniqsa "savoir s'engager" va raqamli-transprofessional komponentlar bo' yicha statistik ahamiyatli o' sish kuzatilganini ko' rsatdi. Ishlab chiqilgan to' rt bosqichli metodika (diagnostik, integrativ-raqamli, madaniyatlararo simulyatsion va reflektiv bosqichlar) oliy ta'lim muassasalarining ingliz tili va tarjimashunoslik yo' nalishlari o' quv dasturlariga tatbiq etilishi mumkin.*

Kalit so' zlar: *transprofessional kompetensiya; kross-madaniy kommunikatsiya; raqamli ta'lim ekotizimi; bo' lajak filologlar; interkulturaliy kompetensiya; metodika; pedagogik eksperiment.*

СОВЕРШЕНСТВОВАНИЕ МЕТОДИКИ ФОРМИРОВАНИЯ ТРАНСПРОФЕССИОНАЛЬНОЙ МЕЖКУЛЬТУРНОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ ФИЛОЛОГОВ В ЦИФРОВОЙ ЭКОСИСТЕМЕ ВЫСШЕГО ОБРАЗОВАНИЯ

Аннотация: *В статье рассматривается проблема совершенствования методики развития транспрофессиональной кросс-культурной компетенции будущих филологов в условиях цифровой экосистемы высшего образования. Актуальность исследования обусловлена цифровыми реформами в Узбекистане и недостаточной методической разработанностью транспрофессиональных требований к филологам. Цель работы — на основе моделей Хаймса, Канале и Свейна, Байрама, Дардорф и Хофстеде, а также исследований Годвин-Джонса, Уоршауэра и Чапелл в области цифровых образовательных технологий, разработать поэтапную методику и экспериментально проверить её эффективность. Использована смешанная методология: качественный анализ и педагогический эксперимент с участием 64 студентов (контрольная и экспериментальная группы). Результаты показали статистически значимый рост по всем компонентам компетенции в экспериментальной группе, особенно по компонентам "savoir s'engager" и цифро-транспрофессиональной компетенции. Разработанная четырёхэтапная методика может быть внедрена в учебные программы направлений английского языка и переводоведения.*

Ключевые слова: *транспрофессиональная компетенция; кросс-культурная коммуникация; цифровая образовательная экосистема; будущие филологи; межкультурная компетенция; методика; педагогический эксперимент.*

IMPROVING THE METHODOLOGY FOR DEVELOPING THE TRANSPROFESSIONAL CROSS-CULTURAL COMPETENCE OF FUTURE PHILOLOGISTS WITHIN THE DIGITAL ECOSYSTEM OF HIGHER EDUCATION

Abstract: *This article addresses the improvement of methodology for developing transprofessional cross-cultural competence among prospective philologists within the digital ecosystem of higher education. The relevance of the study is grounded in Uzbekistan's ongoing digitalization reforms and the insufficient methodological grounding of transprofessional requirements placed on philology graduates. The aim of the research is to develop a staged methodology, informed by the theoretical models of Hymes, Canale and Swain, Byram, Deardorff, and Hofstede, together with the digital-education scholarship of Godwin-Jones, Warschauer, and Chapelle, and to*

experimentally verify its effectiveness. A mixed-methods design was employed, combining qualitative content analysis with a pedagogical experiment (pre- and post-diagnostics) involving 64 prospective philology students divided into control and experimental groups. The findings revealed statistically significant gains across all competence components in the experimental group, most notably in the "savoir s'engager" component and in digitally mediated transprofessional competence. The resulting four-stage methodology — diagnostic, integrative-digital, intercultural-simulation, and reflective stages — is proposed for implementation in English language and translation studies curricula.

Keywords: *transprofessional competence; cross-cultural communication; digital educational ecosystem; prospective philologists; intercultural competence; methodology; pedagogical experiment.*

1. KIRISH

So‘ nggi o‘ n yillikda oliy ta’lim tizimining raqamlashtirilishi nafaqat texnik-texnologik, balki chuqur metodologik o‘ zgarishlarni ham talab qilmoqda. O‘ zbekiston Respublikasida qabul qilingan "Raqamli O‘ zbekiston – 2030" strategiyasi va oliy ta’limni isloh qilish bo‘ yicha davlat dasturlari ta’lim jarayonining barcha bosqichlarida raqamli vositalarning integratsiyalashuvini nazarda tutadi. Ushbu jarayon filologik ta’lim yo‘ nalishlarini ham chetlab o‘ tmaydi: bo‘ lajak filolog-mutaxassislar endilikda nafaqat til va adabiyot sohasidagi chuqur bilimlarga, balki turli kasbiy sohalar (huquq, tibbiyot, iqtisodiyot, axborot texnologiyalari) bilan chegaradosh vaziyatlarda samarali kommunikatsiya olib borish, ya’ni transprofessional kompetensiyaga ega bo‘ lishlari talab etilmoqda.

Globallashuv sharoitida kasbiy chegaralar tobora shartli tus olmoqda: tarjimon huquqiy hujjat bilan, til o‘ qituvchisi xalqaro loyiha hujjatlari bilan, filolog-tahririyat xodimi turli madaniy kontekstlardagi matnlar bilan ishlashga majbur bo‘ lmoqda. Bunday sharoitda kross-madaniy kompetensiya endi alohida fan sifatida emas, balki barcha kasbiy faoliyat turlarini kesib o‘ tuvchi integrativ sifat sifatida namoyon bo‘ ladi. Shu bilan birga, mavjud o‘ quv dasturlari va metodik qo‘ llanmalarda transprofessional va kross-madaniy komponentlarning uzviy bog‘ liqligi, ayniqsa raqamli ta’lim muhitida, yetarlicha aks etmagan.

Muammoning dolzarbligi quyidagi uch omil kesishmasida namoyon bo‘ ladi: birinchidan, davlat siyosati darajasidagi raqamlashtirish talablari; ikkinchidan, bo‘ lajak filologlarga nisbatan kuchayib borayotgan transprofessional talablar; uchinchidan, mavjud kross-madaniy kompetensiya modellarining (Bayram, Dirdorf) an’anaviy, ko‘ pincha auditoriya-markazlashgan formatda qolib ketayotgani va ularning raqamli ekotizim sharoitlariga moslashtirilmaganligi. Ushbu uchlik ziddiyat tadqiqot muammosini keltirib chiqaradi: bo‘ lajak filologlarning transprofessional kross-madaniy kompetensiyasini oliy ta’limning raqamli ekotizimi sharoitida rivojlantirishning ilmiy asoslangan metodikasi yetarlicha ishlab chiqilmagan.

Tadqiqotning maqsadi — nazariy modellarni tahlil qilish asosida bo‘ lajak filologlarning transprofessional kross-madaniy kompetensiyasini raqamli ta’lim ekotizimi sharoitida rivojlantiruvchi bosqichli metodikani ishlab chiqish va uning samaradorligini pedagogik eksperiment orqali asoslashdan iborat.

Ushbu maqsadga erishish uchun quyidagi vazifalar belgilandi: (1) kross-madaniy va transprofessional kompetensiya tushunchalarining nazariy-kontseptual asoslarini tahlil qilish; (2) mavjud metodik yondashuvlardagi bo‘ shliqlarni aniqlash; (3) raqamli ta’lim vositalariga asoslangan bosqichli metodikani ishlab chiqish; (4) metodikaning samaradorligini pedagogik eksperiment orqali tekshirish va statistik tahlil qilish.

Tadqiqotning ilmiy yangiligi shundaki, unda kross-madaniy kompetensiyaning an’anaviy komponentlari (Bayram modeli asosida) birinchi bor transprofessional o‘ lchov bilan uyg‘ unlashtirilgan holda, raqamli ta’lim ekotizimiga xos to‘ rt bosqichli (diagnostik, integrativ-raqamli, madaniyatlararo simulyatsion, reflektiv) metodik model sifatida taqdim etiladi. Tadqiqotning amaliy ahamiyati ishlab chiqilgan metodikaning oliy ta’lim muassasalarining filologiya, tarjimashunoslik va chet tillar ta’limi yo‘ nalishlari o‘ quv dasturlariga, shuningdek malaka oshirish kurslari mazmuniga tatbiq etilishi mumkinligi bilan belgilanadi.

2. ADABIYOTLAR TAHLILI

Kommunikativ kompetensiya nazariyasining metodologik negizi D. Hymes tomonidan yaratilgan bo‘ lib, u tilni nafaqat grammatik jihatdan to‘ g‘ ri, balki ijtimoiy-madaniy jihatdan mos qo‘ llash qobiliyati sifatida talqin qilgan. Keyinchalik M. Canale va M. Swain ushbu g‘ oyani grammatik, sotsiolingvistik, diskursiv va strategik komponentlardan iborat to‘ rt qismli modelga aylantirdilar, bu model kross-madaniy kompetensiya nazariyasining shakllanishiga asos bo‘ lib xizmat qildi.

M. Byramning madaniyatlararo kommunikativ kompetensiya (Intercultural Communicative Competence) modeli ushbu tadqiqot uchun markaziy nazariy asos hisoblanadi. Byram kompetensiyani beshta o‘ zaro bog‘ liq komponent — savoir (madaniy bilim), savoir comprendre (talqin va bog‘ lash malakasi), savoir apprendre/faire (o‘ zlashtirish va o‘ zaro ta’sir malakasi), savoir-être (munosabatlar — ochiqlik, mahalliy va boshqa madaniyatga nisbatan tanqidiy bo‘ lmagan

qiziqish) va savoir s’engager (tanqidiy madaniy ongni baholash) orqali izohlaydi. Ushbu model tadqiqotda diagnostika va o‘ lchov instrumentlarini ishlab chiqishning asosiy nazariy tayanchi bo‘ lib xizmat qildi.

D. Deardorff madaniyatlararo kompetensiyaning protsessual (Process Model) va piramidasimon (Pyramid Model) modellarini taklif etib, kompetensiyani statik holat emas, balki uzluksiz rivojlanuvchi jarayon sifatida ko‘ rib chiqadi. Deardorff modeli munosabat (attitude) darajasidan boshlab bilim va malaka (knowledge and skills), ichki natija (internal outcome) va tashqi natija (external outcome, ya’ni samarali va mosligi jihatdan kommunikatsiya)gacha bo‘ lgan bosqichlarni o‘ z ichiga oladi. Ushbu model tadqiqotda metodikaning bosqichma-bosqich tuzilishini asoslashda qo‘ llanildi.

G. Hofstedening madaniy o‘ lchovlar nazariyasi (kuch masofasi, individualizm-kollektivizm, noaniqlikdan qochish, erkaklik-ayollik, uzoq muddatli yo‘ naltirilganlik va boshqalar) o‘ zbek va ingliz tilli madaniyatlar o‘ rtasidagi kross-madaniy farqlarni tahlil qilish uchun tahliliy asos sifatida qo‘ llanildi, ayniqsa transprofessional vaziyatlarda (masalan, xalqaro loyihalarda muzokara olib borish) yuzaga keladigan madaniy ziddiyatlarni izohlashda foydali bo‘ ldi.

Raqamli ta’lim texnologiyalari sohasida R. Godwin-Jonesning yangi paydo bo‘ layotgan texnologiyalar (mobil ta’lim, sun’iy intellekt asosidagi til o‘ rganish vositalari) borasidagi tadqiqotlari, M. Warschauerning raqamli savodxonlik va texnologiya orqali ijtimoiy inklyuzivlik masalalari, shuningdek C. Chapellening kompyuter yordamida til o‘ rganishni (CALL) baholash mezonlari bo‘ yicha ishlari metodikaning texnologik komponentini loyihalashda tayanch manba bo‘ lib xizmat qildi. Xususan, Chapelle tomonidan taklif etilgan texnologiya-vositachiligidagi topshiriqlarni baholash mezonlari (til o‘ rganish salohiyati, ma’no e’tiborga olinishi, autentiklik, ta’sir va amaliylik) tadqiqotda ishlab chiqilgan raqamli topshiriqlarni loyihalashda qo‘ llanildi.

Yuqoridagi manbalar tahlili shuni ko‘ rsatadiki, kross-madaniy kompetensiya nazariyasi (Bayram, Dirdorf) va raqamli ta’lim texnologiyalari nazariyasi (Godwin-Jons, Uorshauer, Chapell) alohida-alohida yaxshi ishlab chiqilgan bo‘ lsa-da, ular o‘ rtasidagi uyg‘ unlik, xususan bo‘ lajak filologlarning transprofessional ehtiyojlariga moslashtirilgan integrativ metodik model sifatida deyarli o‘ rganilmagan. Aynan mana shu bo‘ shliq ushbu tadqiqotning nazariy-metodologik zaruratini belgilaydi.

3. TADQIQOT METODOLOGIYASI

Tadqiqotda aralash metodologiya (mixed-methods design) qo‘ llanildi, unda sifat tahlili miqdoriy pedagogik eksperiment bilan uyg‘ unlashtirildi. Sifat tahlili bosqichida mavjud o‘ quv dasturlari, darsliklar va metodik qo‘ llanmalar kontent-tahlil usulida o‘ rganildi, bu orqali transprofessional kross-madaniy komponentlarning mavjud ta’lim mazmunida qanday aks etganligi aniqlandi.

Pedagogik eksperiment Toshkent kimyo-texnologiya xalqaro universitetining filologiya yo‘ nalishi talabalari orasida o‘ tkazildi. Tadqiqotga jami 64 nafar bo‘ lajak filolog talaba jalb qilindi, ular tasodifiy tanlov asosida ikki teng guruhga — nazorat guruhi (32 nafar) va tajriba guruhi (32 nafar) — bo‘ lindi. Guruhlar boshlang‘ ich diagnostika natijalari bo‘ yicha statistik jihatdan bir-biriga yaqin ekanligi t-test yordamida tasdiqlandi ($p > 0,05$).

Tadqiqot uch bosqichda amalga oshirildi. Aniqlovchi (diagnostik) bosqichda ikkala guruhda ham Byram va Deardorff modellari asosida moslashtirilgan diagnostik so‘ rovnoma va vaziyatli topshiriqlar (case-based tasks) yordamida boshlang‘ ich daraja aniqlandi. Shakllantiruvchi bosqichda tajriba guruhida ishlab chiqilgan to‘ rt bosqichli metodika (diagnostik, integrativ-raqamli, madaniyatlararo simulyatsion, reflektiv) joriy etildi, nazorat guruhi esa an’anaviy dastur bo‘ yicha ta’lim oldi. Nazorat bosqichida ikkala guruhda ham yakuniy diagnostika o‘ tkazildi va natijalar Styudent t-testi yordamida statistik qayta ishlandi.

Metodikaning integrativ-raqamli bosqichida ʋики-texnologiyalar, LMS platformalari va onlayn hamkorlik vositalaridan foydalangan holda transprofessional topshiriqlar (masalan, xalqaro shartnoma matnini madaniy jihatdan moslashtirish, ko‘ p tilli axborot xabarini turli madaniy auditoriya uchun qayta ishlash) taqdim etildi. Madaniyatlararo simulyatsion bosqichda talabalar rol o‘ yinlari va virtual muzokara simulyatsiyalari orqali Hofstede o‘ lchovlariga asoslangan madaniy ziddiyat vaziyatlarini hal qilishni mashq qildilar. Reflektiv bosqichda talabalar elektron kundalik (reflective e-journal) yuritish orqali o‘ z tajribalarini tahlil qildilar, bu Deardorff modelidagi "ichki natija" bosqichiga mos keladi.

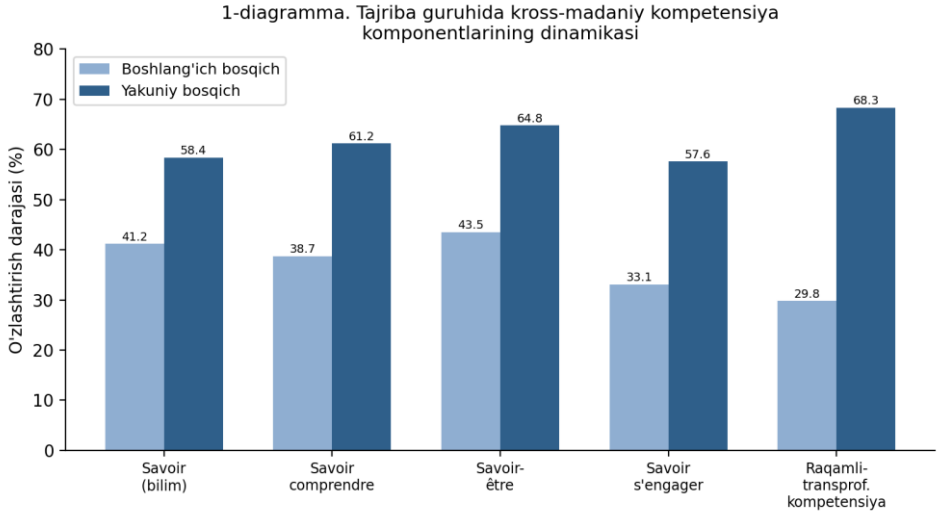
4. NATIJALAR VA TAHLIL

Pedagogik eksperiment natijalari 1-jadvalda keltirilgan. Jadvaldan ko‘ rinib turibdiki, boshlang‘ ich bosqichda nazorat va tajriba guruhlari o‘ rtasida sezilarli farq kuzatilmagan (o‘ rtacha ko‘ rsatkichlar mos ravishda 37,3% va 37,3%). Yakuniy bosqichda esa tajriba guruhida o‘ rtacha ko‘ rsatkich 62,1% ga yetgan bo‘ lsa, nazorat guruhida bu ko‘ rsatkich atigi 42,9% ni tashkil etdi.

Kompetensiya komponenti	Nazorat guruhi (boshlang‘ ich), %	Nazorat guruhi (yakuniy), %	Tajriba guruhi (boshlang‘ ich), %	Tajriba guruhi (yakuniy), %
Savoir (madaniy bilim)	40.5	47.1	41.2	58.4
Savoir comprendre (talqin qilish)	39.0	44.6	38.7	61.2
Savoir-être (munosabat)	44.0	49.3	43.5	64.8
Savoir s’engager (tanqidiy ongli baholash)	32.8	38.0	33.1	57.6
Raqamli-transprofessional kompetensiya	30.1	35.4	29.8	68.3
O‘ rtacha ko‘ rsatkich	**37.3**	**42.9**	**37.3**	**62.1**

1-jadval. Nazorat va tajriba guruhlarida kross-madaniy kompetensiya komponentlarining dinamikasi

Eng yuqori o‘ sish dinamikasi "raqamli-transprofessional kompetensiya" komponentida qayd etildi (29,8% dan 68,3% gacha, ya’ni 38,5 foiz punktga o‘ sish), bu metodikaning raqamli-integrativ bosqichi eng samarali bosqich ekanligini ko‘ rsatadi. "Savoir s’engager" (tanqidiy ongli baholash) komponenti bo‘ yicha ham sezilarli o‘ sish (33,1% dan 57,6% gacha) kuzatildi, bu esa madaniyatlararo simulyatsion va reflektiv bosqichlarning ushbu komponentni rivojlantirishdagi rolini tasdiqlaydi.



1-diagrammada tajriba guruhidagi barcha besh komponent bo‘ yicha boshlang‘ ich va yakuniy natijalar solishtirma tarzda taqdim etilgan. Diagrammadan ko‘ rinib turibdiki, o‘ sish dinamikasi barcha komponentlarda bir tekis emas: bilim komponentlari (savoir, savoir comprendre)da o‘ sish nisbatan yumshoqroq, munosabat va faoliyatga yo‘ naltirilgan komponentlar (savoir-être, savoir s’engager)da, ayniqsa raqamli-transprofessional komponentda esa keskinroq bo‘ lgan. Bu holat raqamli vositalar orqali amaliy, vaziyatga asoslangan mashg‘ ulotlarning nazariy ma’ruzalarga qaraganda transprofessional ko‘ nikmalarni shakllantirishda ancha samaraliroq ekanligidan dalolat beradi.

Guruhlararo farqning statistik ahamiyatini tekshirish uchun mustaqil namunalar uchun Styudent t-testi qo‘ llanildi. Yakuniy bosqichdagi natijalar bo‘ yicha guruhlararo farq statistik jihatdan ahamiyatli bo‘ lib chiqdi ($t = 6,42$; erkinlik darajasi = 62; $p < 0,01$), bu esa ishlab chiqilgan metodikaning an’anaviy yondashuvga nisbatan sezilarli ustunligini tasdiqlaydi. Shu bilan birga, tajriba guruhi ichidagi "oldin – keyin" natijalarni solishtirish bog‘ liq namunalar uchun t-testi orqali tekshirildi va bu yerda ham statistik ahamiyatli farq ($t = 11,8$; $p < 0,001$) aniqlandi.

Sifat tahlili natijalari, xususan talabalarning reflektiv kundaliklaridagi yozuvlar, miqdoriy natijalarni tasdiqladi: talabalarning aksariyati raqamli hamkorlik topshiriqlari o‘ zlarida "nazariy bilim bilan real vaziyat o‘ rtasidagi

bog‘ liqlikni" ko‘ rishga yordam berganini qayd etishdi, bu Deardorff modelidagi bilim-munosabat-natija zanjirining amalda ishlashini ko‘ rsatadi.

5. XULOSA

O‘ tkazilgan tadqiqot natijalari oliy ta’limning raqamli ekotizimi sharoitida bo‘ lajak filologlarning transprofessional kross-madaniy kompetensiyasini rivojlantirish uchun ishlab chiqilgan to‘ rt bosqichli metodikaning (diagnostik, integrativ-raqamli, madaniyatlararo simulyatsion, reflektiv) yuqori pedagogik samaradorligini statistik jihatdan tasdiqladi. Tajriba guruhida barcha kompetensiya komponentlari bo‘ yicha nazorat guruhiga qaraganda sezilarli darajada yuqori o‘ sish qayd etildi, bu esa Byram va Deardorff nazariy modellarini raqamli ta’lim texnologiyalari (Godwin-Jons, Uorshauer, Chapell asoslarida) bilan uyg‘ unlashtirishning ilmiy-metodik asoslanganligini isbotlaydi.

Tadqiqot natijalaridan kelib chiqib, quyidagi tavsiyalar ilgari suriladi: oliy ta’lim muassasalarining filologiya va tarjimashunoslik yo‘ nalishlari o‘ quv dasturlariga transprofessional topshiriqlar tizimini integratsiya qilish; o‘ qituvchilar uchun raqamli-transprofessional topshiriqlar bankini yaratish; talabalarning reflektiv kompetensiyasini rivojlantirish maqsadida elektron portfolio va reflektiv kundalik amaliyotini joriy etish.

Tadqiqotning cheklovlari qatoriga tanlanma hajmining nisbatan cheklanganligi (bitta oliy ta’lim muassasasi doirasida) va eksperiment muddatining bir o‘ quv semestri bilan chegaralanganligi kiradi. Kelgusi tadqiqotlar uchun bir nechta oliy ta’lim muassasalarini qamrab oluvchi kengroq tanlanma asosida uzoq muddatli (longitudinal) tadqiqot o‘ tkazish, shuningdek sun’iy intellekt asosidagi shaxsiylashtirilgan ta’lim vositalarining transprofessional kompetensiya rivojlanishiga ta’sirini alohida o‘ rganish istiqbolli yo‘ nalish sifatida belgilandi.

MUALLIFLAR BAYONOTI

Mualliflar hissasi: Maqolaning konsepsiyasi, tadqiqot metodologiyasi, ma’lumotlar to‘ plash va tahlili, matnni yozish — Musayeva G.A. tomonidan yakka tartibda amalga oshirilgan.

Manfaatlar to‘ qnashuvi: Muallif manfaatlar to‘ qnashuvi mavjud emasligini bildiradi.

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INGLIZ XALQ OG‘ ZAKI IJODIDAGI SOTSIOMADANIY REALIYALARNI O‘ QITISH ASOSIDA TALABALARNING MADANIYATLARARO MULOQOT KOMPETENSIYASINI TAKOMILLASHTIRISH

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Annotatsiya: *Maqolada ingliz xalq og‘ zaki ijodi matnlarida mujassam bo‘ lgan sotsiomadaniy realiyalarni chet tilini o‘ qitish mazmuniga metodik integratsiya qilishning nazariy asoslari tahlil qilinadi. Tadqiqotning maqsadi folklor matnidagi madaniy markirlangan birliklarni aniqlashdan ularni madaniyatlararo muloqotda izohlashgacha olib boradigan didaktik mexanizmni asoslashdan iborat. Metodologik jihatdan konseptual differensiatsiya, funksional tahlil, qiyosiy tahlil, didaktik transformatsiya va integrativ sintez usullaridan foydalanildi. Tahlil natijasida sotsiomadaniy realiyalarni o‘ qitishning besh bosqichli mexanizmi — identifikatsiya, kontekstualizatsiya, interpretatsiya, qiyosiy-relatsion tahlil va kommunikativ mediatsiya — ishlab chiqildi. Mazkur mexanizm realiyani oddiy tarjima birligi sifatida emas, balki ijtimoiy norma, qadriyat, kommunikativ kutilma va madaniy perspektivani birlashtiruvchi didaktik birlik sifatida o‘ rganishga imkon beradi. Taklif etilgan yondashuv talabalarning madaniy ma’noni matn dalillari asosida anglash, o‘ z madaniy tajribasi bilan qiyoslash, stereotipik umumlashtirishdan qochish va madaniy ma’noni boshqa suhbatdosh uchun tushunarli tarzda qayta ifodalash ko‘ nikmalarini rivojlantirishga yo‘ naltirilgan.*

Kalit so‘ zlar: *madaniyatlararo muloqot kompetensiyasi, ingliz folklori, sotsiomadaniy realiya, lingvodidaktika, madaniy interpretatsiya, qiyosiy tahlil, madaniy mediatsiya, sotsiomadaniy kontekst.*

СОВЕРШЕНСТВОВАНИЕ МЕЖКУЛЬТУРНОЙ КОММУНИКАТИВНОЙ КОМПЕТЕНЦИИ СТУДЕНТОВ НА ОСНОВЕ ОБУЧЕНИЯ СОЦИОКУЛЬТУРНЫМ РЕАЛИЯМ АНГЛИЙСКОГО УСТНОГО НАРОДНОГО ТВОРЧЕСТВА

Аннотация: *В статье теоретически анализируются методические основы интеграции социокультурных реалий, представленных в текстах английского фольклора, в содержание обучения иностранному языку. Цель исследования состоит в обосновании дидактического механизма, обеспечивающего переход от выявления культурно маркированной единицы в фольклорном тексте к ее объяснению в межкультурном общении. Методология включает концептуальную дифференциацию, функциональный и сопоставительный анализ, дидактическую трансформацию и интегративный синтез. В результате разработан пятиэтапный механизм обучения: идентификация, контекстуализация, интерпретация, сравнительно-реляционный анализ и коммуникативная медиация. Такой подход позволяет рассматривать реалию не как единицу прямого перевода, а как дидактическую единицу, объединяющую социальную норму, ценность, коммуникативное ожидание и культурную перспективу. Предлагаемый механизм направлен на развитие у студентов умений аргументированно интерпретировать культурные значения, сопоставлять их с собственным опытом, избегать стереотипных обобщений и понятно объяснять культурный смысл собеседнику другой культуры.*

Ключевые слова: *межкультурная коммуникативная компетенция, английский фольклор, социокультурная реалия, лингводидактика, культурная интерпретация, сопоставительный анализ, культурная медиация, социокультурный контекст.*

ENHANCING STUDENTS’ INTERCULTURAL COMMUNICATIVE COMPETENCE THROUGH TEACHING SOCIOCULTURAL REALIA IN ENGLISH FOLKLORE

Abstract: *The article theoretically examines the methodological foundations for integrating sociocultural realia represented in English folklore into foreign-language teaching. The study aims to substantiate a didactic mechanism that moves learners from identifying culturally marked elements in folklore texts to explaining their meanings in intercultural communication. The methodology combines conceptual differentiation, functional and comparative analysis, didactic transformation, and integrative synthesis. The analysis results in a five-stage mechanism consisting of identification, contextualization, interpretation, comparative-relational*

analysis, and communicative mediation. This mechanism treats sociocultural realia not as items requiring direct translation but as didactic units connecting social norms, values, communicative expectations, and cultural perspectives. The proposed approach is intended to develop learners' ability to interpret cultural meanings through textual evidence, compare them with their own cultural experience, avoid stereotypical generalizations, and reformulate cultural meanings in ways that are accessible to interlocutors from different cultural backgrounds.

Keywords: *intercultural communicative competence, English folklore, sociocultural realia, language pedagogy, cultural interpretation, comparative analysis, cultural mediation, sociocultural context.*

KIRISH

Zamonaviy chet tilini o‘ qitishda kommunikativ natija grammatik, leksik va fonologik me’yorlarni egallash bilangina cheklanmaydi. Nutqiy harakat ijtimoiy vaziyat, madaniy norma, kommunikativ kutilma va suhbatdoshning perspektivasi bilan uyg‘ unlashgandagina mazmunli muloqot yuzaga keladi. Shu sababli madaniyatlararo muloqot kompetensiyasi chet tilidagi bilimlar majmui emas, balki boshqa madaniy tajribani anglash, farqni dalil asosida izohlash, o‘ z pozitsiyasini qayta ko‘ rib chiqish va vaziyatga mos kommunikativ strategiyani tanlash qobiliyatini ham o‘ z ichiga oladi. Byram interkultural kommunikativ kompetensiyani bilim, munosabat, interpretatsiya va aloqadorlik ko‘ nikmalari, o‘ zaro ta’sir hamda tanqidiy madaniy anglashning o‘ zaro bog‘ langan tizimi sifatida izohlaydi [1]. Bu yondashuv til darsidagi madaniy materialni faktlarni yodlashdan ko‘ ra ma’no bilan ishlash jarayoniga aylantirish zaruratini ko‘ rsatadi.

Sotsiomadaniy realiyalar mazkur jarayonda alohida metodik ahamiyatga ega. Ular muayyan jamiyatga xos predmet, marosim, ijtimoiy rol, murojaat shakli, turmush tarzi, qadriyat yoki tarixiy tajribani ifodalovchi, lekin faqat lug‘ aviy ekvivalent bilan to‘ liq ochilmaydigan birliklardir. Realiya til birligining nominativ ma’nosidan tashqari, muayyan vaziyatda kimning qanday harakat qilishi, nima maqbul yoki nomaqbul sanalishi, qanday ijtimoiy munosabat nazarda tutilishi kabi pragmatik ma’nolarni ham tashiydi. Shuning uchun realiyani o‘ qitish jarayoni “bu so‘ zning tarjimasi nima?” savolidan “bu detal ushbu vaziyatda qanday madaniy ma’no hosil qilmoqda?” savoliga o‘ tishi lozim.

Ingliz xalq og‘ zaki ijodi bu vazifani amalga oshirish uchun samarali matniy makon yaratadi. Folktale, legend, ballad, proverb va riddle kabi janrlarda kundalik turmush, hokimiyat va ijtimoiy maqom, oilaviy munosabat, mehnat, adolat, saxiylik, mehmondo‘ stlik, qo‘ rquv va jasorat singari tushunchalar narrativ voqea hamda obrazlar orqali kodlanadi. Folklor matnining didaktik qiymati uning “milliy madaniyatni to‘ liq aks ettirishi”da emas, balki talaba uchun muhokama qilinadigan, qiyoslanadigan va turli perspektivalardan qayta talqin qilinadigan madaniy vaziyat yaratishidadir. Lwin va Marlina folktalelardan ingliz tilini xalqaro til sifatida o‘ qitish paradigmasini amaliyotga tatbiq etishda foydalanish mumkinligini ta’kidlaydi [6].

Mavzuning metodik muammosi shundaki, folklor darsda ko‘ pincha syujetni tushunish, yangi so‘ zlarni o‘ rganish yoki axloqiy xulosani aniqlash bilan chegaralanadi. Bunday ishlash usuli matndagi madaniy ma’noni faol kommunikativ resursga aylantirmaydi. Talaba realiyani taniydi, biroq uning ijtimoiy funksiyasini izohlash, o‘ z madaniy tajribasi bilan funksional qiyoslash yoki boshqa madaniyat vakiliga tushuntirish bosqichiga yetib bormasligi mumkin. Shu bois maqolada sotsiomadaniy realiyalar bilan ishlashni ketma-ket didaktik amallar tizimi sifatida tashkil etish masalasi markazga qo‘ yiladi.

Tadqiqotning maqsadi ingliz folklori matnlaridagi sotsiomadaniy realiyalarni o‘ qitish asosida talabalarning madaniyatlararo muloqot kompetensiyasini rivojlantirishga xizmat qiluvchi bosqichli didaktik mexanizmni nazariy jihatdan asoslashdir. Mazkur maqsad doirasida realiyaning lingvodidaktik xususiyatlari aniqlanadi, interkultural ta’lim va folklor tadqiqotlaridagi yondashuvlar qiyoslanadi, realiya bilan ishlashning o‘ quv amallari ishlab chiqiladi hamda ushbu amallarning kutiladigan kognitiv va kommunikativ natijalari tizimlashtiriladi.

ADABIYOTLAR TAHLILI

Interkultural ta’lim nazariyasida madaniyat tayyor faktlar to‘ plami sifatida emas, balki ma’nolar, perspektivalar va ijtimoiy amaliyotlar tizimi sifatida ko‘ riladi. Byramning qayta ko‘ rib chiqilgan modelida o‘ quvchi boshqa madaniyat haqidagi bilimni o‘ zlashtirish bilan birga, hujjat yoki hodisani interpretatsiya qilish, uni o‘ z tajribasi bilan bog‘ lash, yangi vaziyatda bilimni qo‘ llash va madaniy amaliyotni tanqidiy baholashga tayyor bo‘ lishi kerak [1]. Mazkur model sotsiomadaniy realiyani statik “country fact” emas, balki interpretatsiya qilinadigan va kommunikativ vazifada qo‘ llanadigan birlik sifatida o‘ qitish uchun nazariy asos beradi.

Folklor matnlarining interkultural imkoniyatlari bo‘ yicha tadqiqotlar ularni faqat madaniy reprezentatsiya sifatida ko‘ rish yetarli emasligini ko‘ rsatadi. De Bruijn folktalelar bilan ishlashda reprezentatsiyadan ishtirokka o‘ tish, ya’ni o‘ quvchini tayyor madaniy obrazni qabul qiluvchi emas, balki matn ma’nosini muhokama qiluvchi subyekt sifatida jalb etish zarurligini asoslaydi [2]. Muallif, shuningdek, folklorni bir butun xalq yoki madaniyatning “haqiqiy” va o‘ zgarmas vakili sifatida taqdim etish othering xavfini kuchaytirishi mumkinligini ko‘ rsatadi [2]. Bu xulosa realiyalarni kontekstga bog‘ liq va ko‘ p talqinli birlik sifatida o‘ qitish zaruratini kuchaytiradi.

Heggernesning ingliz tili darsida matnlarning interkultural kommunikativ kompetensiyani rivojlantirishdagi roli bo‘ yicha tanqidiy sharhi badiiy va autentik matnlarning qiymatini ularning o‘ zidan ko‘ ra ular asosida yaratiladigan dialogik faoliyat bilan bog‘ laydi [3]. Matn turli perspektivalarni ko‘ rish, dalil keltirish, stereotipni savol ostiga olish va madaniy ma’noni muzokara qilishga undaganda interkultural resursga aylanadi. Demak, ingliz folklori tanlanganda ham syujetning mashhurligi yoki lingvistik soddaligi bilan cheklanmay, matndan qanday didaktik affordans hosil qilish mumkinligi e’tiborga olinishi lozim.

Hidayah va Ali folktale-mediated tasks orqali EFL o‘ rganuvchilarining interkultural anglashini rivojlantirish imkoniyatlarini ko‘ rsatadi [4]. Ularning tadqiqotida folklor topshiriqlari madaniy ramz, norma va qadriyatlarni aniqlash hamda muhokama qilishga yo‘ naltiriladi. Ushbu yondashuv maqolada taklif qilinayotgan identifikatsiya va interpretatsiya bosqichlari bilan metodik jihatdan uyg‘ un: talaba avvalo madaniy markirlangan elementni topadi, keyin uning narrativ va ijtimoiy funksiyasini izohlaydi.

Lwinning Osiyo folktalelarini qiyosiy tahlil qilishga bag‘ ishlangan tadqiqoti madaniyatlararo anglashni “o‘ xshash/farqli” juftligi bilan cheklamasdan, hodisalarning funksional va qadriy asoslarini qiyoslash muhimligini ko‘ rsatadi [5]. Lwin va Marlina esa folktalelarni English as an International Language doirasida o‘ quvchining turli madaniy tajribalarni ingliz tilida ifodalashi va muzokara qilishi uchun resurs sifatida talqin qiladi [6]. Bu ikki yondashuv birgalikda qiyosiy-relatsion tahlil va kommunikativ mediatsiya bosqichlarini asoslash imkonini beradi.

Tahlil qilingan adabiyotlarda uchta umumiy metodik yo‘ nalish kuzatiladi: birinchidan, madaniy mazmun kontekst va perspektiva bilan bog‘ liq holda talqin qilinadi; ikkinchidan, o‘ quvchi passiv qabul qiluvchi emas, balki ma’no yaratuvchi va qiyoslovchi subyekt sifatida qaraladi; uchinchidan, yakuniy natija boshqa madaniyat haqidagi faktni aytib berish emas, balki madaniy ma’noni tushuntirish va muloqotda vositachilik qilishdir. Shu bilan birga, sotsiomadaniy realiya bilan ishlashning ushbu yo‘ nalishlarini yagona ketma-ket didaktik mexanizmga birlashtirish masalasi alohida ishlab chiqishni talab qiladi.

TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-konseptual xarakterga ega. Maqolada empirik tajriba va statistik tekshiruv natijalari keltirilmaydi; asosiy vazifa mavjud ilmiy yondashuvlarni tizimlashtirish va ularni ingliz folkloridagi sotsiomadaniy realiyalarni o‘ qitishga mos didaktik amallarga transformatsiya qilishdan iborat. Manbalar uch mezon asosida tanlandi: chet tili yoki interkultural ta’limga bevosita aloqadorligi; folklorning madaniy ma’no yaratish funksiyasini izohlashi; o‘ quvchining interpretatsiya, qiyoslash yoki mediatsiya faoliyatini tashkil etishga imkon beruvchi metodik kategoriyalarni taklif etishi.

Nazariy tahlilda konseptual differensiatsiya, funksional tahlil, qiyosiy tahlil, didaktik transformatsiya va integrativ sintez usullaridan foydalanildi. Konseptual differensiatsiya yordamida “madaniy bilim”, “sotsiomadaniy realiya”, “madaniy perspektiva”, “interpretatsiya” va “mediatsiya” tushunchalarining o‘ qitishdagi vazifalari ajratildi. Funksional tahlil realiyaning matndagi semantik va narrativ rolini uning ijtimoiy-pragmatik funksiyasi bilan bog‘ lashga xizmat qildi. Qiyosiy tahlil o‘ rganilayotgan hodisani talabaning o‘ z madaniy tajribasi bilan funksional munosabatda ko‘ rish tamoyilini aniqladi. Didaktik transformatsiya nazariy kategoriyalarni kuzatiladigan o‘ quv amallariga aylantirish uchun qo‘ llandi, integrativ sintez esa ushbu amallarni yagona bosqichli mexanizmga birlashtirdi.

Har bir sotsiomadaniy realiya uch o‘ zaro bog‘ liq analitik mezon bo‘ yicha ko‘ rib chiqildi: birinchisi — matndagi semantik-narrativ vazifa; ikkinchisi — ijtimoiy-madaniy vaziyatdagi pragmatik funksiya; uchinchisi — boshqa madaniy tajriba bilan qiyoslash va tushuntirish imkoniyati. Mazkur mezonlar realiyani faqat predmet yoki nom sifatida tasniflashdan ko‘ ra uning qanday kognitiv, refleksiv va kommunikativ harakatni yuzaga keltirishini aniqlashga qaratildi.

Tahlil birligi sifatida folklor matnidagi madaniy markirlangan element va u bilan bog‘ liq kommunikativ vaziyat qabul qilindi. Natijalarni tizimlashtirishda har bir bosqich uchun o‘ qituvchining yo‘ naltiruvchi savoli, talabaning asosiy amali, kutiladigan o‘ quv mahsuli va madaniyatlararo muloqot kompetensiyasiga qo‘ shadigan hissasi ajratildi. Shu asosda besh bosqichli didaktik mexanizm shakllantirildi.

NATIJALAR VA ULARNING TAHLILI

Nazariy tahlil natijasida sotsiomadaniy realiyani o‘ qitish besh o‘ zaro bog‘ langan didaktik amal asosida tashkil etilishi aniqlandi: 1) identifikatsiya, 2) kontekstualizatsiya, 3) interpretatsiya, 4) qiyosiy-relatsion tahlil, 5) kommunikativ mediatsiya. Ketma-ketlikning metodik mantig‘ i realiyani ko‘ rishdan uning vaziyatdagi ma’nosini tushuntirishga, undan esa madaniyatlararo muloqotda qayta ifodalashga o‘ tishdan iborat. Bosqichlar mustaqil mashqlar majmui emas; har bir keyingi amal oldingi bosqichda yaratilgan ma’noga tayangan holda murakkablashadi.

Jadval 1

Sotsiomadaniy realiyalarni o‘ qitishning bosqichli didaktik mexanizmi

Bosqich	Asosiy savol	Talabaning amali	Kutiladigan natija

1. Identifikatsiya	Qaysi detal madaniy jihatdan markirlangan va nega muhim?	Realiyani ajratadi, matn dalilini belgilaydi	Madaniy signalni tanish
2. Kontekstualizatsiya	U qaysi tarixiy, ijtimoiy yoki kommunikativ vaziyatda ma’no kasb etadi?	Kontekstni tiklaydi, stereotipik umumlashtirishni cheklaydi	Kontekstga sezgir anglash
3. Interpretatsiya	Realiya qahramon qarori, maqom yoki normani qanday izohlaydi?	Sabab va madaniy ma’no o‘ rtasidagi aloqani asoslaydi	Madaniy inferensiya
4. Qiyosiy-relatsion tahlil	Boshqa madaniyatdagi o‘ xshash hodisa bilan funksional munosabat qanday?	Funksiya, qadriyat va vaziyatni qiyoslaydi	Perspektivalararo bog‘ lanish
5. Kommunikativ mediatsiya	Bu ma’noni boshqa madaniyat vakiliga qanday tushuntirish mumkin?	Qayta ifodalaydi, izohlaydi, noto‘ g‘ ri talqinni oldini oladi	Madaniy ma’noni vositachilik bilan yetkazish

Birinchi bosqich — identifikatsiya — matndagi madaniy markirlangan elementni ajratishga qaratiladi. Bu bosqichda asosiy savol “bu so‘ z nimani anglatadi?” emas, “bu detal voqea, qahramon yoki ijtimoiy munosabatni tushunishda nega muhim?” shaklida qo‘ yiladi. Predmet, kiyim, taom, marosim, unvon, murojaat shakli yoki makon belgisi o‘ zining semantik va narrativ vazifasi bilan birga aniqlanadi. Hidayah va Ali folktale asosidagi topshiriqlarda ramz, norma va qadriyatlarni aniqlash o‘ quvchini syujet darajasidan madaniy ma’no darajasiga olib chiqishini ko‘ rsatadi [4]. Shuning uchun identifikatsiya “realiyani topish” bilan tugamaydi; talaba nima uchun aynan shu birlik madaniy tahlilga loyiq ekanini matn dalili bilan asoslaydi.

Ikkinchi bosqich — kontekstualizatsiya — realiyani tarixiy, ijtimoiy va kommunikativ sharoit bilan bog‘ liq holda ochishni talab qiladi. Bir xil predmet yoki xatti-harakat turli davr, guruh va vaziyatlarda turlicha ma’no kasb etishi mumkin. Shu sababli realiya o‘ zgarmas “milliy belgi” emas, muayyan folklor vaziyatidagi kontekstual birlik sifatida talqin qilinadi. Masalan, ijtimoiy maqomni bildiruvchi murojaat shakli lug‘ aviy jihatdan tushunarli bo‘ lsa ham, qahramonlar o‘ rtasidagi masofa, hurmat, hokimiyat yoki kinoyani anglamasdan uning pragmatik funksiyasi ochilmaydi. De Bruijnning folktalelarni butun madaniyatning to‘ liq vakili sifatida taqdim etish otheringni kuchaytirishi mumkinligi haqidagi xulosasi aynan shu bosqichning ehtiyotkorlik tamoyilini asoslaydi [2].

Uchinchi bosqich — interpretatsiya — realiya va madaniy ma’no o‘ rtasidagi bog‘ lanishni dalil asosida tushuntirishga qaratiladi. Talaba realiyaning qahramon qarori, ijtimoiy maqom, axloqiy baho, o‘ zaro munosabat yoki kommunikativ kutilmaga ta’sirini izohlaydi. Bu yerda “nima sodir bo‘ ldi?” savoli “bu harakatning madaniy mantig‘ i nimada?” savoliga ko‘ chadi. Interpretatsiya jarayoni bitta “to‘ g‘ ri” madaniy javobni yodlash emas; aksincha, matn dalili, kontekst va alternativ perspektivalar asosida asoslangan xulosa chiqarishdir. Heggernes ta’kidlagan dialogik ma’no yaratish tamoyili bunday topshiriqlarning nazariy tayanchidir [3].

To‘ rtinchi bosqich — qiyosiy-relatsion tahlil — o‘ rganilayotgan realiyani talabaning o‘ z madaniyatidagi hodisa bilan mexanik tenglashtirishni emas, ular o‘ rtasidagi funksional munosabatni aniqlashni nazarda tutadi. Talaba tashqi o‘ xshashlik yoki farqni sanab o‘ tish bilan cheklanmay, hodisalar qaysi vaziyatda qo‘ llanishi, qanday qadriyatni ifodalashi, ishtirokchilar xulqiga qanday ta’sir ko‘ rsatishi va ularni tushuntirish uchun qaysi kontekst zarurligini solishtiradi. Lwinning qiyosiy folktale tahliliga doir ishlari madaniyatlararo anglashda bunday qiyoslashning imkoniyatlarini ko‘ rsatadi [5]. Natijada qiyoslash “bizda bunday emas” tipidagi baholashdan sabab va funksiyani tushuntirishga o‘ tadi.

Beshinchi bosqich — kommunikativ mediatsiya — avvalgi bosqichlarda anglangan madaniy ma’noni boshqa suhbatdosh uchun tushunarli shaklda qayta ifodalashga qaratiladi. Talaba realiyani so‘ zma-so‘ z tarjima qilish bilan kifoyalanmay, uning vaziyatdagi ma’nosi, ijtimoiy funksiyasi va ehtimoliy noto‘ g‘ ri talqinlarini hisobga olgan holda izoh beradi. Masalan, marosim, murojaat shakli yoki ramziy predmetni boshqa madaniyat vakiliga tushuntirish topshirig‘ i aniqlashtirish, misol keltirish, analogiya qurish, perspektivani moslashtirish va zarur bo‘ lsa stereotipni rad etish

strategiyalarini talab qiladi. Lwin va Marlina folktalelarni turli madaniy tajribalarni ingliz tilida ifodalash va muzokara qilish resursi sifatida ko‘ rishi ushbu bosqichning kommunikativ yo‘ nalishini qo‘ llab-quvvatlaydi [6].

Besh bosqichning o‘ zaro aloqasi sotsiomadaniy realiyani lug‘ at birligidan kommunikativ resursga aylantiradi. Identifikatsiyasiz talaba nimani tahlil qilayotganini aniq belgilay olmaydi; kontekstualizatsiyasiz ma’no stereotipga aylanishi mumkin; interpretatsiyasiz qiyoslash yuzaki qoladi; qiyosiy-relatsion tahlilsiz o‘ z va boshqa madaniyat o‘ rtasidagi bog‘ lanish shakllanmaydi; mediatsiyasiz esa anglangan ma’no real muloqotga ko‘ chmaydi. Shu jihatdan mexanizm kognitiv, refleksiv va kommunikativ faoliyatni bitta didaktik zanjirga birlashtiradi.

1-rasm



Sotsiomadaniy realiyani o‘ qitishning didaktik ketma-ketligi

1-rasmda ko‘ rsatilgan ketma-ketlik chiziqli nazorat algoritmi emas, balki pedagogik yo‘ naltirishning asosiy trayektoriyasidir. Murakkab matnlarda o‘ quvchi interpretatsiyadan kontekstga qaytishi yoki mediatsiya jarayonida qiyosiy tahlilni qayta ko‘ rib chiqishi mumkin. Biroq dars dizaynida besh amalning mavjudligi realiyani faqat tarjima va izoh bilan cheklab qo‘ ymaslik uchun metodik nazorat vazifasini bajaradi.

Jadval 2

Folklor realiyasi bilan ishlash uchun topshiriq konstruktorlari

Didaktik maqsad	Topshiriq formulasi	Baholanadigan dalil
Madaniy signalni aniqlash	Matndan madaniy jihatdan markirlangan 2–3 detalni toping va ularning syujetdagi vazifasini izohlang.	Matnga tayangan asoslash
Kontekstni tiklash	Realiya qanday ijtimoiy munosabat yoki tarixiy sharoit bilan bog‘ langanini tushuntiring.	Kontekstning relevanti
Interpretatsiya	Qahramonning qarorini ushbu realiya orqali qanday tushuntirish mumkin?	Sabab–ma’no bog‘ lanishi
Qiyoslash	O‘ z madaniyatingizdagi funksional jihatdan yaqin hodisa bilan qiyoslang; o‘ xshashlik va farq sabablarini ko‘ rsating.	Funksional qiyoslash
Mediatsiya	Bu realiyani ingliz tilida boshqa madaniyat vakiliga stereotipsiz tushuntiring.	Aniqlik, kontekst, perspektivani moslashtirish

MUHOKAMA

Taklif etilgan mexanizmning asosiy metodik farqi sotsiomadaniy realiyani “madaniyat haqidagi ma’lumot”dan “madaniy ma’no bilan bajariladigan faoliyat”ga ko‘ chirishidadir. An’anaviy yondashuvda o‘ qituvchi realiyaning izohini beradi, talaba esa uni eslab qoladi. Bosqichli yondashuvda esa talaba matn dalilini topadi, kontekstni tiklaydi, ma’noni asoslaydi, boshqa perspektiva bilan bog‘ laydi va yakunda uni kommunikativ shaklda qayta ifodalaydi. Shu sababli o‘ qituvchining roli ham o‘ zgaradi: u folklordagi madaniy mazmunning yagona talqinini beruvchi manba emas, balki dalil, kontekst va perspektiva asosida xulosa chiqarishni boshqaruvchi moderatorga aylanadi.

Folklor materialini tanlash ham metodik qaror sifatida ko‘ rilishi kerak. Har qanday mashhur ertak yoki ballada avtomatik ravishda interkultural materialga aylanmaydi. Matnda talaba ajrata oladigan madaniy markirlangan birlik, muhokama qilinadigan ijtimoiy vaziyat, alternativ perspektiva va qiyoslash imkoniyati mavjud bo‘ lishi zarur. Heggernesning matn qiymatini undan hosil qilinadigan didaktik affordans bilan bog‘ lash haqidagi xulosasi bu mezonni qo‘ llab-quvvatlaydi [3]. Demak, matn tanlashda til darajasi bilan bir qatorda “qaysi madaniy savolni ochadi?” va “qanday kommunikativ mahsulga olib keladi?” savollari ham qo‘ yilishi lozim.

Yana bir muhim masala — stereotiplashtirish xavfi. Folklor tarixiy va ijtimoiy tajribani aks ettiradi, biroq u zamonaviy jamiyatning barcha a’zolari uchun yagona norma sifatida taqdim etilmasligi kerak. “English people believe…”,

“British culture always…” kabi mutlaq formulalar o‘ rniga “ushbu matnda”, “ushbu davr yoki vaziyatda”, “qahramonlar o‘ rtasidagi munosabatda” kabi kontekstual formulalar qo‘ llanishi maqsadga muvofiq. De Bruijnning reprezentatsiyadan ishtirokka o‘ tish haqidagi yondashuvi o‘ quvchini tayyor milliy obrazni qabul qilishdan ko‘ ra uni savol ostiga olish va muhokama qilishga undaydi [2].

Kommunikativ mediatsiya bosqichi mexanizmning yakuniy, lekin alohida ahamiyatga ega qismidir. Madaniyatlararo muloqotda suhbatdosh ko‘ pincha muayyan realiyaning nomini emas, uning vaziyatdagi ma’nosini tushunishga ehtiyoj sezadi. Shuning uchun talaba izoh berishda “ekvivalent topish”dan ko‘ ra ma’noni moslashtirish, zarur kontekstni tanlash va ehtimoliy noto‘ g‘ ri talqinni oldindan ko‘ rishga o‘ rgatiladi. Bu faoliyat ingliz tilini faqat target-culturega kirish vositasi emas, balki turli madaniy tajribalar o‘ rtasida vositachilik qiluvchi til sifatida qo‘ llashga imkon beradi [6].

Mazkur nazariy modelning cheklovi shundaki, maqolada uning samaradorligini ko‘ rsatuvchi empirik tajriba natijalari berilmagan. Shu sababli modelning keyingi bosqichdagi verifikatsiyasi nazorat va tajriba guruhlarida sotsiomadaniy realiyani aniqlash, kontekstual izohlash, qiyoslash va mediatsiya ko‘ rsatkichlarini oldingi va keyingi o‘ lchovlar orqali solishtirishni talab qiladi. Bunday empirik tekshiruv bosqichlarning qaysi biri talabalarda ko‘ proq qiyinchilik tug‘ dirishini va topshiriq dizaynining qaysi elementlari madaniyatlararo muloqot kompetensiyasi rivojiga kuchliroq ta’sir ko‘ rsatishini aniqlash imkonini beradi.

Bosqichli mexanizmni amaliy mashg‘ ulotga ko‘ chirishda topshiriqlarning o‘ zaro davomiyligi alohida ahamiyat kasb etadi. Bir matn doirasida identifikatsiya topshirig‘ i keyingi kontekstualizatsiya uchun dalil beradi; interpretatsiya esa qiyoslash uchun tayanch fikrni yaratadi. Shu sababli topshiriqlar alohida, bir-biridan uzilgan savollar ko‘ rinishida emas, yagona kommunikativ muammo atrofida qurilishi maqsadga muvofiq. Masalan, talaba avval qahramonning murojaat shakli yoki marosimga oid detalni aniqlaydi, keyin bu detal qaysi ijtimoiy munosabatni ko‘ rsatayotganini izohlaydi, o‘ z madaniyatidagi funksional jihatdan yaqin holat bilan qiyoslaydi va yakunda ushbu farqni chet ellik suhbatdoshga tushuntirish uchun qisqa mediatsion matn yaratadi. Bunday dizayn til faoliyatini madaniy tahlildan ajratmaydi; aksincha, o‘ qish, gapirish va yozish amallari madaniy ma’noni aniqlash va qayta ifodalash vositasiga aylanadi.

Baholash nuqtayi nazaridan ham faqat realiyani to‘ g‘ ri nomlash yoki tarjima qilish yetarli ko‘ rsatkich bo‘ la olmaydi. Topshiriq mahsulida kamida to‘ rtta sifat belgisi kuzatilishi mumkin: matn daliliga tayanish, kontekstning adekvatligi, qiyoslashning funksionalligi va izohning kommunikativ tushunarliligi. Talaba madaniy farqni umumlashtirib yuborsa, kontekstdan uzilgan hukm bersa yoki o‘ z madaniy tajribasini universal me’yor sifatida qo‘ llasa, javob lingvistik jihatdan to‘ g‘ ri bo‘ lsa ham interkultural nuqtayi nazardan yetarli emas. Aksincha, ehtiyotkor modal formulalar, alternativ talqinni tan olish va suhbatdosh uchun zarur fon ma’lumotini tanlay bilish mediatsiyaning sifatini ko‘ rsatadi. Shu tariqa baholash til aniqligi bilan bir qatorda perspektivaga sezgirlikni ham qamrab oladi.

Mexanizmning yana bir didaktik afzalligi o‘ quvchining o‘ z madaniy tajribasini ham tahlil obyektiga aylantirishidir. Interkultural ta’limda “boshqa” madaniyatni kuzatishning o‘ zi yetarli emas; o‘ quvchi o‘ z odati, normasi va bahosini ham izohlashga majbur bo‘ lganda refleksiv masofa yuzaga keladi. Qiyosiy-relatsion tahlil aynan shu vazifani bajaradi: talaba ikki hodisani kim yaxshiroq yoki to‘ g‘ riroq degan mezon bilan emas, ularning qanday ijtimoiy funksiya bajarishi bilan bog‘ laydi. Natijada madaniy farq muammo yoki ekzotika sifatida emas, turli tarixiy va ijtimoiy sharoitlarda shakllangan ma’no tizimlari o‘ rtasidagi munosabat sifatida ko‘ riladi. Bu esa kommunikativ mediatsiya bosqichida izohning neytral, dalilli va suhbatdoshga mos bo‘ lishiga zamin yaratadi.

Darsning yakuniy kommunikativ mahsuli sifatida qisqa izoh, dialog, madaniy sharh, taqqoslovchi yozuv yoki vaziyatli role-playdan foydalanish mumkin. Muhimi, mahsul realiya haqidagi ensiklopedik ma’lumotni takrorlamasdan, muayyan suhbatdosh ehtiyojiga mos tushuntirishni talab qilishi kerak. O‘ qituvchi topshiriqni murakkablashtirish uchun auditoriyani o‘ zgartirishi mumkin: bir holatda talaba realiyani kursdoshiga, boshqa holatda ingliz tilida so‘ zlashuvchi mehmon yoki xalqaro guruh a’zosiga tushuntiradi. Auditoriyaning o‘ zgarishi qaysi fon ma’lumoti zarurligini, qaysi terminni izohlash va qaysi analogiyadan foydalanishni qayta tanlashga majbur qiladi. Shunday qilib, kommunikativ vazifa madaniy bilimning mavjudligini emas, undan vaziyatga mos foydalanish qobiliyatini namoyon etadi. Bu prinsip folklor materialining darsdagi funksiyasini mazmun manbaidan interkultural faoliyatni tashkil etuvchi metodik resurs darajasiga ko‘ taradi. Natijada madaniy mazmun til amaliyoti, refleksiya va muloqot bilan uzviy bog‘ lanadi.

Xulosalar

Ingliz folkloridagi sotsiomadaniy realiyalarni o‘ qitish madaniyatlararo muloqot kompetensiyasining mazmuniy va jarayonli komponentlarini birlashtirish imkonini beradi. Realiya tarjimaviy ekvivalent emas, balki madaniy ma’no, ijtimoiy norma, kommunikativ kutilma va perspektivani birlashtiruvchi didaktik birlik sifatida talqin qilinishi lozim.

Nazariy tahlil asosida identifikatsiya, kontekstualizatsiya, interpretatsiya, qiyosiy-relatsion tahlil va kommunikativ mediatsiyadan iborat besh bosqichli mexanizm ishlab chiqildi. Ushbu ketma-ketlik talabaning madaniy signalni tanishidan boshlab uni boshqa madaniyat vakiliga tushunarli tarzda izohlashigacha bo‘ lgan o‘ quv harakatlarini tizimlashtiradi.

Mexanizm folklor matnini tayyor madaniy faktlar manbai sifatida emas, balki dalil, kontekst, perspektiva va dialog asosida ma'no yaratish maydoni sifatida qo‘ llashni nazarda tutadi.

Amaliy jihatdan o‘ qituvchi folklor materialini tanlashda realiyaning madaniy markirlanganligi, kontekstual izohlash imkoniyati, qiyosiy potensiali va kommunikativ mediatsiyaga olib kelish xususiyatiga e'tibor qaratishi kerak. Keyingi tadqiqotlarda taklif etilgan mexanizmning empirik samaradorligini tajriba-sinov asosida tekshirish, bosqichlar uchun baholash mezonlarini ishlab chiqish va turli folklor janrlarida ularning differensial ta'sirini aniqlash maqsadga muvofiq.

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METHODOLOGICAL STRATEGIES BASED ON THE INTEGRATION OF TBLT ELEMENTS AND A SYSTEM OF COMMUNICATIVE TASKS IN ORAL SPEECH CLASSES

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Abstract: *The article examines methodological strategies for integrating task-based language teaching (TBLT) elements into oral speech classes of future English teachers with the specific aim of developing intercultural communicative competence. The study is based on theoretical and methodological analysis of task-based language teaching, intercultural communicative competence, mediation, authentic materials, task complexity and task repetition. A distinction is established between a language exercise and an intercultural communicative task. The latter is characterized not only by meaning-oriented interaction, a gap, reliance on learners' linguistic resources and a non-linguistic outcome, but also by a culturally conditioned discrepancy that requires interpretation, negotiation and justification. The article systematizes cultural comparison, critical incident analysis, role-play and simulation, problem-based negotiation, mediation, debate, reflective dialogue and microteaching, and proposes a three-dimensional task typology according to competence component, cognitive level and organizational form. Attention is also given to authentic material adaptation and controlled task complexity. The proposed framework connects oral language practice with intercultural interpretation, pragmatic adjustment, mediation and professional-methodological transfer.*

Keywords: *TBLT; oral speech; intercultural communicative competence; communicative tasks; mediation; authentic materials; task complexity; future English teachers*

OG‘ ZAKI NUTQ DARSLARIDA TBLT ELEMENTLARI INTEGRATSIYASIGA ASOSLANGAN METODIK STRATEGIYALAR VA KOMMUNIKATIV TOPSHIRIQLAR TIZIMI

Annotatsiya: *Maqolada bo‘ lajak ingliz tili o‘ qituvchilarining og‘ zaki nutq darslarida madaniyatlararo muloqot kompetensiyasini rivojlantirish maqsadida topshiriqqa asoslangan til o‘ qitish (TBLT) elementlarini integratsiyalashga doir metodik strategiyalar tahlil qilinadi. Tadqiqot topshiriqqa asoslangan ta’lim, madaniyatlararo kommunikativ kompetensiya, vositachilik, autentik materiallar, topshiriq murakkabligi va topshiriqni takrorlashga oid nazariy-metodik manbalarni tahlil qilishga asoslangan. Til mashqi bilan madaniyatlararo kommunikativ topshiriq o‘ rtasidagi farq aniqlanib, topshiriq uchun ma’noga yo‘ naltirilgan faoliyat, bo‘ shliq, talabaning o‘ z lisoniy resurslariga tayanishi va til bilan cheklanmaydigan natija bilan bir qatorda madaniy tafovutning mavjudligi mezon sifatida taklif etiladi. Madaniy taqqoslash, kritik hodisa tahlili, rolli o‘ yin va simulyatsiya, muammoli vaziyat va muzokara, vositachilik, munozara, reflektiv suhbat hamda mikroo‘ qitish strategiyalari tizimlashtiriladi. Shuningdek, topshiriqlar kompetensiya komponenti, bilish faoliyati darajasi va tashkil etish shakliga ko‘ ra tipologiyalashtiriladi.*

Kalit so‘ zlar: *TBLT; og‘ zaki nutq; madaniyatlararo muloqot kompetensiyasi; kommunikativ topshiriqlar; vositachilik; autentik materiallar; topshiriq murakkabligi; bo‘ lajak ingliz tili o‘ qituvchilari*

МЕТОДИЧЕСКИЕ СТРАТЕГИИ НА ОСНОВЕ ИНТЕГРАЦИИ ЭЛЕМЕНТОВ TBLT И СИСТЕМА КОММУНИКАТИВНЫХ ЗАДАНИЙ НА ЗАНЯТИЯХ ПО УСТНОЙ РЕЧИ

Аннотация: *В статье рассматриваются методические стратегии интеграции элементов обучения иностранному языку на основе заданий (TBLT) в занятия по устной речи будущих учителей английского языка с целью развития межкультурной коммуникативной компетенции. Исследование основано на теоретико-методическом анализе проблемно-ориентированного обучения, межкультурной коммуникативной компетенции, медиации, аутентичных материалов, сложности и повторения заданий. Уточняется различие между языковым упражнением и межкультурным коммуникативным заданием. Последнее предполагает не только ориентацию на смысл, наличие коммуникативного дефицита, использование собственных языковых ресурсов обучающегося и нелингвистический результат, но и наличие культурно обусловленного расхождения, требующего интерпретации, переговоров и обоснования выбора. Систематизированы стратегии культурного сравнения, анализа критических инцидентов, ролевой игры и симуляции,*

проблемной ситуации и переговоров, медиации, дискуссии, рефлексивного диалога и микропреподавания. Предложена типология заданий по компоненту компетенции, уровню познавательной деятельности и форме организации.

Ключевые слова: *TBLT; устная речь; межкультурная коммуникативная компетенция; коммуникативные задания; медиация; аутентичные материалы; сложность задания; будущие учителя английского языка*

INTRODUCTION

The development of oral communicative competence in the preparation of future English teachers cannot be reduced to vocabulary accumulation and grammatical accuracy. In intercultural communication, speakers must interpret meanings, recognize differences in communicative norms, adjust their speech and negotiate meaning when expectations diverge. Research on second-language interaction indicates that speaking proficiency and interactional competence are related but not identical constructs; some interactional abilities do not develop automatically from general proficiency.[1]

The present study therefore treats task-based language teaching (TBLT) as a methodological basis for organizing oral interaction, while intercultural communicative competence is the developmental target. The central methodological problem is how to design a task so that students do not merely talk about culture but use English to interpret culturally conditioned meanings, respond appropriately and reach a meaningful outcome. This is particularly relevant in teacher education because future teachers need both communicative competence and the ability to transfer task design principles to their own classrooms.

The purpose of the article is to substantiate a system of methodological strategies and communicative tasks integrating TBLT with intercultural development in oral speech classes. The objectives are to define the boundary between an exercise and an intercultural task; establish principles for selecting and adapting authentic linguocultural materials; systematize methodological strategies; construct a task typology; and determine practical parameters for increasing task complexity.

LITERATURE REVIEW

TBLT conceptualizes a task as a central pedagogical unit in which learners primarily use language to achieve a meaningful outcome. Ellis identifies meaning, a gap, reliance on learners' own linguistic resources and a non-linguistic outcome among the defining characteristics of a task.[2] The distinction is important because an activity may require English production while functioning mainly as a controlled language exercise. The present framework retains these criteria but adds a fifth: culturally conditioned discrepancy. When participants rely on different cultural expectations, successful completion requires interpretation and adjustment in addition to linguistic production.

Ellis, Skehan, Li, Shintani and Lambert view TBLT as an approach involving task design, implementation, sequencing and attention to language rather than as a single classroom technique.[3] Willis and Willis describe a task-based sequence built around preparation, a task cycle and subsequent attention to language.[4] In the proposed adaptation, the post-task stage additionally examines cultural meaning and communicative choices, not only formal language errors.

Byram's model places knowledge, attitudes, skills of interpreting and relating, skills of discovery and interaction, and critical cultural awareness at the centre of intercultural communicative competence.[5] Liddicoat and Scarino conceptualize intercultural language learning as a process of interpreting, comparing and reconsidering meanings rather than simply acquiring information about another culture.[6] The CEFR Companion Volume gives mediation a prominent role by describing activities through which learners facilitate understanding, adapt information to a new audience and manage communicative difficulties.[7]

Authenticity concerns both the origin of a material and the way learners use it. Mishan distinguishes authenticity of the material from authenticity of use.[8] An authentic recording followed by mechanical retelling may provide authentic input without creating an authentic communicative purpose. Accordingly, the proposed principle is to simplify task demands rather than substantially simplify the cultural meaning contained in the material.

Empirical studies support the pedagogical value of culture-oriented materials and critical incidents. Smaoui found positive changes in knowledge, attitudes and skills after an intervention combining cultural awareness, critical incidents and cultural misunderstanding materials.[9] Eren reported significant development in critical cultural awareness among pre-service English teachers through sustained interaction with different cultural perspectives.[10] These studies support combining exposure, interaction and reflection rather than relying on cultural information alone.

Task complexity and repetition provide an additional theoretical dimension. Skehan's limited attentional capacity perspective suggests possible trade-offs among complexity, accuracy and fluency as demands increase.[11] Robinson's cognition hypothesis proposes that particular increases in task complexity may stimulate more complex production under appropriate conditions.[12] The present framework reconciles these positions operationally: complexity is increased gradually and, where possible, one parameter at a time. Repetition is used to allow learners to reuse content under changed

audience or time conditions; task-repetition research identifies repeated encounters as a potential mechanism linking task performance and learning.[13]

METHODS

The study employs theoretical analysis, comparative analysis, systematization, modelling and methodological interpretation. The source base consists of works on TBLT, intercultural communicative competence, mediation, authentic materials, critical incidents, task complexity and task repetition. The methodological object is the organization of oral speech instruction for future English teachers; the analytical unit is the communicative task implemented within a task cycle.

The analysis proceeded in four stages. First, established TBLT task criteria were compared with requirements arising from intercultural communication. Second, methodological strategies were mapped against six competence components used in the dissertation framework: linguocultural-cognitive, value-attitudinal, communicative-functional, sociopragmatic adaptation, reflexive-analytical and professional-methodological. Third, tasks were classified by cognitive level and organizational form. Fourth, parameters for controlled increases in task complexity were specified.

The article is theoretical-methodological and does not claim statistical effectiveness of the proposed system. Its contribution is the construction and justification of a design framework that can subsequently be tested through classroom experimentation.

RESULTS AND DISCUSSION

The first result is an operational distinction between an exercise and an intercultural communicative task. An exercise primarily reinforces a linguistic form and generally has a predetermined answer. An intercultural communicative task requires learners to make decisions when culturally conditioned expectations may differ. Its outcome is therefore a negotiated decision, explanation, recommendation or mediated understanding.

The fifth criterion—cultural discrepancy—is central. "Describe Navruz" can be completed by reproducing information. By contrast, a situation in which a foreign colleague repeatedly declines an invitation to a Navruz celebration and is surprised by the host's reaction requires the learner to explain a culturally specific interpretation, reconstruct another perspective and propose an appropriate response. Culture thus becomes part of the problem to be solved rather than decorative content.

The second result concerns authentic linguocultural materials. The proposed set includes interviews and podcasts; problem narratives describing misunderstandings; everyday communication samples such as service encounters and telephone conversations; comparative cultural pairs; national cultural texts; and professional-methodological materials such as lesson fragments and assessment rubrics. A practical selection principle is that one material should, where possible, activate at least two competence components.

Material adaptation follows the principle "simplify the task, not the cultural meaning." If cultural content is heavily rewritten, the ambiguity that makes interpretation necessary may disappear. Instead, the teacher can change the task demand: learners first identify what happened, then explain possible reasons, evaluate consequences and finally propose alternative behaviour. Such staging allows the same material to serve different levels of proficiency and experience.

The third result is the systematization of methodological strategies. Cultural comparison provides an accessible entry point: learners identify a difference, hypothesize why it may exist and discuss its communicative consequences. The third question is essential because comparison without consequences may become simple country-study information. Teachers should also redirect binary evaluations such as "better" or "worse" toward explanation.

Critical incident analysis is more problem-oriented. Learners examine a short misunderstanding and reconstruct the perspectives of the participants. The absence of a ready-made solution creates a need for interpretation and discussion. Evidence from higher education contexts indicates that critical-incident-oriented materials can support intercultural knowledge, attitudes and skills.[14] For future teachers, the strategy additionally models how culturally sensitive classroom events can be analysed pedagogically.

Role-play and simulation create interaction under culturally differentiated expectations. An intercultural role card should specify not only who the participant is but also which communicative norm the participant follows. For example, one participant may belong to a context in which an invitation is conventionally repeated before acceptance, while another interprets the first refusal as final. The mismatch then emerges through interaction. To avoid excessive theatricality, speech formulas should not be pre-written; only the situation and relevant norm should be provided.

Problem-based negotiation develops sociopragmatic adaptation and communicative-functional competence. Participants clarify, reformulate, summarize positions and reach a shared decision. This is important because interactional competence cannot be assumed to develop automatically from general speaking proficiency.[15] Negotiation tasks therefore make interactional work an explicit instructional object.

Mediation occupies a special position. The learner acts between interlocutors or audiences and makes one side's culturally embedded meaning understandable to another. The CEFR Companion Volume describes mediation in relation

to texts, concepts and communication, including adapting information to a new audience and facilitating understanding.[16] Byram's skills of interpreting and relating and discovery and interaction provide a complementary intercultural foundation.[17] In teacher education, mediation may involve explaining culturally embedded Uzbek concepts in English, such as mahalla, hashar or the ustoz-shogird tradition. Literal translation is insufficient; the learner must explain social function, offer an accessible analogue where appropriate and monitor understanding.

Debate and discussion provide a structured context for value-attitudinal development. Discussion permits relatively open expression, whereas debate may require a participant to defend a position that is not personally held. This creates an opportunity for decentring: learners distinguish their own position from the logic of another position. Topics should follow a pedagogical safety principle; educational practices, family interaction, workplace communication, time orientation and communicative distance are suitable starting points.

Reflective dialogue connects task performance with conscious intercultural learning. Reflection should be structured: What happened? What did I feel? How might the interlocutor have interpreted the situation? What other response could have been possible? The Council of Europe's work on intercultural encounters similarly emphasizes reflection on events, feelings, perspectives and conclusions.[18] This sequence turns a speaking performance into an experience that can influence later communicative choices.

Microteaching provides the professional-methodological dimension. Future teachers adapt a completed task for their prospective learners, identify its objective, anticipate cultural difficulties and conduct a short classroom fragment. The strategy prevents the system from becoming merely a collection of speaking activities: the student must transfer task design into professional practice. Research on intercultural competence in foreign-language teacher education also emphasizes the connection between teachers' own intercultural development and classroom practice.[19]

The fourth result is a three-dimensional typology. The first dimension is the competence component; the second is the cognitive level—reproductive, productive-reconstructive and creative-research; the third is the organizational form—individual, pair, small-group, plenary or out-of-class. Tasks can therefore be located simultaneously along all three dimensions, which turns a list of activities into a system.

At the reproductive level, learners may describe a cultural reality, select appropriate expressions or answer a guiding reflective question. At the productive-reconstructive level, they compare practices, analyse stereotypes, adapt speech in role-play or redesign an existing task. At the creative-research level, they conduct a mini-inquiry, mediate meaning between audiences, maintain a reflective portfolio or design a rubric for microteaching. Progression therefore involves increasing autonomy, interpretation and responsibility for communicative outcomes, not simply more difficult vocabulary.

The fifth result concerns task complexity. Seven parameters are proposed: cultural distance, contextual clarity, preparation time, number of participants, outcome form, degree of independence and role complexity. A less complex task may involve a familiar cultural context, a fully described situation, planning time, pair work, an oral explanation and model support. A more complex task may involve an unfamiliar context, incomplete information, real-time performance, multi-party negotiation, a justified decision and an independent response. Role complexity may also increase from a single clear role to roles with conflicting interests.

A key design principle is to increase one parameter at a time whenever possible. Simultaneously raising cultural distance, time pressure, participant number and role conflict can overload learners and make performance changes difficult to interpret. Controlled progression is therefore more diagnostically useful and consistent with the competing perspectives on task complexity.[20]

Task repetition provides an additional mechanism. The same communicative content can be reused first in a small group, then with a new partner and finally in a plenary presentation. The content remains relatively stable while the audience, time condition or interactional demand changes. Research on task repetition identifies repeated encounters as relevant to changes in complexity, accuracy and fluency and to the creation of learning opportunities.[21] In an intercultural framework, repetition also enables learners to reconsider a previous cultural interpretation rather than merely repeat the same linguistic performance.

The resulting task-cycle model can be summarized as follows: pre-task preparation activates relevant cultural knowledge and clarifies the communicative problem; during-task interaction requires learners to interpret, negotiate, mediate or adapt; post-task reflection focuses on cultural meaning, pragmatic choices and alternative responses; professional transfer asks future teachers to redesign or teach the task for another group. This structure connects TBLT procedures with the developmental needs of intercultural communicative competence.

CONCLUSIONS

The analysis demonstrates that TBLT integration in oral speech classes becomes methodologically meaningful only when tasks are organized around communicative outcomes and genuine interpretive problems. For intercultural development, cultural information should not function as an illustrative supplement to speaking practice; culturally conditioned differences should form part of the task problem itself.

The proposed framework combines cultural comparison, critical incident analysis, role-play and simulation, problem-based negotiation, mediation, debate and discussion, reflective dialogue, and microteaching as the strategy securing professional-methodological transfer. The communicative task system is organized through competence component, cognitive level and organizational form. Complexity is controlled through cultural distance, contextual clarity, preparation time, participant number, outcome type, independence and role complexity.

The scientific contribution is the methodological specification of the intercultural task: alongside established TBLT criteria, cultural discrepancy is introduced as a design criterion creating a need for interpretation and adjustment. The practical contribution is a structured set of strategies and task-design parameters for oral speech courses for future English teachers. The framework is theoretically grounded; its empirical effectiveness should be established through subsequent classroom experimentation.

Table 1. Exercise and intercultural communicative task: comparative characteristics

Criterion	Exercise	Intercultural communicative task
Primary focus	Language form	Meaning and cultural appropriateness
Response	Predetermined	Dependent on participant choices
Gap	Linguistic	Difference in cultural norms/expectations
Outcome	Correct form	Negotiated decision or explanation
Assessment	Accuracy	Appropriateness, mediation and justification
Closure	Error correction	Reflection and professional transfer

Table 2. Typology of intercultural communicative tasks

Component	Reproductive	Productive-reconstructive	Creative-research
Linguocultural-cognitive	Describe a cultural reality	Compare two cultural practices	Mini-inquiry and presentation
Value-attitudinal	Select attitude expressions	Analyse a stereotype	Justify a position not personally held
Communicative-functional	Repeat a prepared explanation	Simplify a complex concept	Mediate meaning between audiences
Sociopragmatic adaptation	Apply etiquette formulas	Adapt speech in role-play	Multi-stage simulation
Reflexive-analytical	Answer a guiding question	Analyse a critical incident	Reflective portfolio
Professional-methodological	Evaluate a ready task	Adapt a task for learners	Microteaching and rubric design

Table 3. Parameters for increasing intercultural task complexity

Parameter	Less complex	More complex
Cultural distance	Familiar cultural context	Unfamiliar or contrasting context
Context clarity	Situation fully described	Information incomplete; inference required
Preparation time	Planning time provided	Real-time performance
Participants	Pair work	Multi-party negotiation

Outcome	Oral explanation	Justified decision or recommendation
Independence	Model-supported	Fully independent
Role complexity	Single clear role	Conflicting-interest role

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SUN'IY INTELLEKT VOSITALARIDAN FOYDALANISH ASOSIDA DASTURLASH FANLARINI O' QITISH SAMARADORLIGINI OSHIRISHNING PEDAGOGIK IMKONIYATLARI

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Annotatsiya: *Mazkur maqolada oliy ta'limda dasturlash fanlarini o' qitishda sun'iy intellekt vositalaridan foydalanishning pedagogik imkoniyatlari tahlil qilingan. Unda sun'iy intellektning individual ta'limni tashkil etish, koddagi xatolarni aniqlash, algoritmlarni tushuntirish, tezkor teskari aloqa berish va mustaqil ta'limni qo' llab-quvvatlashdagi o' rni yoritilgan. Shuningdek, akademik halollik, AIga ortiqcha bog' lanish va noto' g' ri javoblarni tanqidiy baholash bilan bog' liq muammolar ko' rib chiqilgan. Tadqiqot natijasida "Muammo – mustaqil yechim – SI bilan muloqot – verifikatsiya – refleksiya" bosqichlariga asoslangan pedagogik model taklif etilgan.*

Kalit so' zlar: *Sun'iy intellekt, dasturlashni o' qitish, generativ sun'iy intellekt, ChatGPT, dastur kodi, algoritmik fikrlash, raqamli pedagogika, individual ta'lim, teskari aloqa, prompt, akademik halollik, raqamli kompetensiya.*

ПЕДАГОГИЧЕСКИЕ ВОЗМОЖНОСТИ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ПРЕПОДАВАНИЯ ДИСЦИПЛИН ПО ПРОГРАММИРОВАНИЮ С ИСПОЛЬЗОВАНИЕМ ИНСТРУМЕНТОВ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА

Аннотация: *В данной статье проанализированы педагогические возможности использования инструментов искусственного интеллекта при преподавании дисциплин программирования в высшем образовании. Рассмотрена роль искусственного интеллекта в организации индивидуального обучения, выявлении ошибок в программном коде, объяснении алгоритмов, обеспечении оперативной обратной связи и поддержке самостоятельного обучения. Также проанализированы проблемы, связанные с академической честностью, чрезмерной зависимостью от ИИ и некритическим восприятием ошибочных ответов. В результате исследования предложена педагогическая модель, основанная на этапах: «Проблема – самостоятельное решение–взаимодействие с ИИ–верификация – рефлексия».*

Ключевые слова: *искусственный интеллект, обучение программированию, генеративный искусственный интеллект, программный код, алгоритмическое мышление, цифровая педагогика, индивидуальное обучение, обратная связь, академическая честность.*

PEDAGOGICAL OPPORTUNITIES FOR ENHANCING THE EFFECTIVENESS OF TEACHING PROGRAMMING SUBJECTS THROUGH THE USE OF ARTIFICIAL INTELLIGENCE TOOLS

Abstract: *This article analyzes the pedagogical potential of using artificial intelligence tools in teaching programming disciplines in higher education. It examines the role of artificial intelligence in organizing personalized learning, identifying errors in program code, explaining algorithms, providing immediate feedback, and supporting independent learning. The article also discusses issues related to academic integrity, excessive dependence on AI, and the uncritical acceptance of incorrect responses. As a result of the study, a pedagogical model based on the stages of "Problem–independent solution–interaction with AI–verification – reflection" is proposed.*

Keywords: *artificial intelligence, programming education, generative SI, programming code, algorithmic thinking, digital pedagogy, personalized learning, feedback, academic integrity.*

KIRISH

Zamonaviy raqamli transformatsiya oliy ta'limda nafaqat yangi texnologiyalarni joriy etish, balki ta'lim mazmuni, metodlari va baholash mexanizmlarini qayta ko' rib chiqishni ham talab etmoqda. Ayniqsa, dasturlash, AKT va kompyuter injiniringi fanlarini o' qitishda sun'iy intellekt texnologiyalarining rivojlanishi an'anaviy pedagogik yondashuvlarni sezilarli darajada o' zgartirmoqda. Generativ sun'iy intellekt vositalari dastur kodi yaratish, mavjud kodni tushuntirish,

xatolarni aniqlash, muqobil algoritmik yechimlarni taklif qilish va talabaning bilim darajasiga mos izoh berish imkoniyatiga ega. Bu esa talabaga tezkor va individual yordam olish, o‘ qituvchiga esa ta’lim jarayonini samaraliroq tashkil etish imkonini beradi.

UNESCO sun’iy intellektni ta’limda inson manfaatlariga yo‘ naltirilgan, pedagogik jihatdan asoslangan va xavfsiz tarzda qo‘ llash zarurligini ta’kidlaydi. O‘ zbekistonda ham 2024-yilda tasdiqlangan “Sun’iy intellekt texnologiyalarini 2030-yilga qadar rivojlantirish strategiyasi” doirasida SI bo‘ yicha kadrlar salohiyatini oshirish va texnologiyalarni turli sohalarga keng joriy etish ustuvor vazifa sifatida belgilangan. Dasturlashni o‘ rganishda talaba algoritmik fikrlash, kod yozish, xatolarni aniqlash va yechimlarni optimallashtirish kabi murakkab faoliyatlarni bajaradi. Sun’iy intellekt bu jarayonda tayyor javob beruvchi vosita emas, balki talabaning mustaqil fikrlashi va muammoni hal qilish ko‘ nikmalarini qo‘ llab-quvvatlovchi pedagogik yordamchi sifatida xizmat qilishi mumkin.

Shu bilan birga, SI vositalaridan nazoratsiz foydalanish tayyor kodga ortiqcha tayanish, fundamental dasturlash ko‘ nikmalarining sustlashishi va noto‘ g‘ ri javoblarni tanqidiy baholamaslik kabi xavflarni yuzaga keltiradi. Shu sababli asosiy masala sun’iy intellektdan foydalanishning o‘ zi emas, balki undan qanday pedagogik yondashuv asosida foydalanishdir.

Mazkur tadqiqotning maqsadi—sun’iy intellekt vositalarini oliy ta’limda dasturlash fanlariga integratsiyalashning pedagogik imkoniyatlarini aniqlash hamda talabalarning mustaqil dasturlash va algoritmik fikrlash ko‘ nikmalarini rivojlantirishga xizmat qiluvchi samarali pedagogik modelni ishlab chiqishdan iborat.

TADQIQOT METODLARI

Tadqiqot ilmiy-pedagogik va qiyosiy-tahliliy xarakterga ega. Tadqiqot jarayonida dasturlash ta’limida generativ sun’iy intellekt va intellektual dasturlash yordamchilaridan foydalanishga bag‘ ishlangan so‘ nggi ilmiy ishlar, xalqaro tashkilotlarning metodik hujjatlari hamda sun’iy intellekt kompetensiyalariga oid konseptual yondashuvlar tahlil qilindi. Metodologik asos sifatida konstruktivistik ta’lim nazariyasi, faoliyatga yo‘ naltirilgan yondashuv, muammoli ta’lim, individual ta’lim, scaffolding — bosqichma-bosqich pedagogik qo‘ llab-quvvatlash hamda refleksiv ta’lim tamoyillaridan foydalanildi. Ilmiy manbalarni tanlashda uchta mezonga alohida e’tibor qaratildi: tadqiqotning dasturlash ta’limiga bevosita aloqadorligi, sun’iy intellekt vositalarining talaba faoliyatiga ta’sirini tahlil qilishi hamda pedagogik afzallik va xavflarni birgalikda yoritishi.

2024-yilda 47 ilmiy ishni o‘ rgangan tizimli adabiyotlar tahlilida generativ SI dasturlaridan dasturlashni o‘ rganishda foydalanish samaradorligiga ta’sir qiluvchi omillar va u bilan bog‘ liq imkoniyat hamda muammolar umumlashtirilgan. Boshqa tizimli tahlilda esa 2018-yildan buyon chop etilgan 21 tadqiqot asosida LLMga tayangan kod generatsiyasi modellarining dasturlashni o‘ qitish va o‘ rganishdagi imkoniyatlari hamda xavflari o‘ rganilgan.

Tadqiqotda tahlil birliklari sifatida quyidagi pedagogik jarayonlar olindi: yangi mavzuni tushuntirish, algoritm yaratish, kod yozish, debugging, individual teskari aloqa, topshiriqlarni differensiallashtirish, mustaqil ta’lim, nazorat va baholash. Tahlil natijalari asosida sun’iy intellektni dasturlash mashg‘ ulotiga integratsiyalash uchun besh bosqichdan iborat konseptual pedagogik model ishlab chiqildi. Mazkur model empirik jihatdan yakuniy tasdiqlangan metodika sifatida emas, keyingi pedagogik tajriba-sinov ishlarida tekshirilishi mumkin bo‘ lgan ilmiy-metodik taklif sifatida qaraladi.

TADQIQOT NATIJALARI

Tahlil natijalari sun’iy intellekt vositalaridan maqsadli va metodik boshqariladigan tarzda foydalanish dasturlash ta’limining bir nechta muhim komponentlarini takomillashtirish imkonini berishini ko‘ rsatdi.

An’anaviy auditoriyada barcha talabalarga bir xil tezlikda va bir xil murakkablikdagi material taqdim etiladi. Biroq talabalar dastlabki tayyorgarligi, algoritmik fikrlashi va dasturlash tajribasi jihatidan bir-biridan sezilarli farq qilishi mumkin. Sun’iy intellekt yordamida bir mavzuni turli murakkablik darajasida tushuntirish mumkin. Masalan, rekursiyani tushunmagan talaba SIga: “Rekursiyani dasturlashni endi o‘ rganayotgan talaba uchun oddiy hayotiy misol asosida tushuntir”, deb murojaat qilishi mumkin. Kuchli talaba esa shu tushunchaning vaqt va xotira murakkabligi yoki iterativ yechimdan farqini so‘ rashi mumkin. Bu imkoniyat differensial ta’limni amalga oshirish uchun muhim pedagogik asos yaratadi. 2024-yilda ishlab chiqilgan ChatGPT asosidagi PyTutor tizimiga oid 11 haftalik tajribada ayniqsa dastlabki bilim darajasi past bo‘ lgan talabalar uchun SI yordamining foydali ekanligi, ularning mashqlarni bajarish faolligi va muvaffaqiyatiga ijobiy ta’sir qilgani qayd etilgan. Shu bilan birga, tadqiqotchilar SIga ortiqcha tayanish mustaqil muammo yechish ko‘ nikmasiga zarar yetkazishi mumkinligini ham ko‘ rsatgan.

Dasturlash fanida teskari aloqa oddiy “To‘ g‘ ri” yoki “Noto‘ g‘ ri” bahosidan iborat bo‘ lmasligi kerak. Talaba nima sababdan xato qilganini tushunishi kerak.

Masalan, Python dasturida quyidagi xato yuzaga kelishi mumkin:

```
numbers = [2, 4, 6, 8]
for i in range(len(numbers)):
 print(numbers[i + 1])
```

Sun’iy intellektdan shunchaki “Kodni to‘ g‘ rilab ber” deb so‘ rash tayyor javob olishga olib keladi. Pedagogik jihatdan samaraliroq prompt quyidagicha shakllantiriladi:

“Koddagi xatoni darhol tuzatib bermang. Xato yuzaga keladigan qatorni ko‘ rsating, sababini savollar orqali tushunishga yordam bering va talabaning o‘ zi tuzatishi uchun ikki maslahat bering.”

Bu usulda SI “Tayyor kod generatori”dan “Virtual tutor”ga aylanadi. Katta guruhlarda o‘ qituvchining har bir kodga individual izoh berishi amaliy jihatdan qiyin. SI ushbu pedagogik yukning bir qismini o‘ z zimmasiga olishi va o‘ qituvchiga murakkab konseptual muammolar bilan ishlash uchun vaqt qoldirishi mumkin.

Dasturlashni o‘ rganishda xato—muvaffaqiyatsizlik emas, o‘ rganish mexanizmining tabiiy qismi hisoblanadi. Talaba xato xabari mazmunini tushunishi, sababini taxmin qilishi, kodning tegishli qismini tahlil qilishi va tuzatishni sinovdan o‘ tkazishi kerak. SI vositalari xato xabarlarini oddiy tilda tushuntirish, ehtimoliy sabablarni ko‘ rsatish va tekshirish ketma-ketligini taklif qilish imkoniyatiga ega. 82 nafar talaba ishtirok etgan 2024-yilgi kvazi-eksperimental tadqiqotda ChatGPT yordamida dasturlash rejimida ishlagan talabalar debugging, xato xabarlarini qayta ishlash va SI fikr-mulohazasini o‘ qish faoliyatlarini ko‘ proq bajargan. Biroq guruhlar o‘ rtasidagi yakuniy dasturlash natijalarida statistik jihatdan sezilarli farq kuzatilmagan. Bu holat SI bilan ko‘ proq ishlash avtomatik ravishda chuqurroq o‘ rganish degani emasligini ko‘ rsatadi. Shu sababli o‘ qituvchi debugging jarayonida “Xatoni tuzatish” emas, balki “Xatoning sababini izohlash”ni baholashi maqsadga muvofiq.

Dasturlashni o‘ rgatishning maqsadi muayyan dasturlash tilining buyruqlarini yodlash emas. Asosiy vazifa masalani formal ko‘ rinishga keltirish, uni kichik qismlarga ajratish, algoritm ishlab chiqish, yechimni tekshirish va optimallashtirish kompetensiyasini shakllantirishdir. SI vositalarini ham shu maqsadga bo‘ ysundirish zarur. Masalan, topshiriq quyidagicha tashkil qilinishi mumkin:

“Berilgan ro‘ yxatdan ikkinchi eng katta elementni topish algoritmini ishlab chiqing. Avval SI vositasidan foydalanmasdan algoritmni blok-sxema yoki pseudokod shaklida yozing. Keyin SI yordamida kamida ikki alternativ yechimni oling. Ularning vaqt murakkabligini solishtiring va eng maqbul usulni asoslang.”

Bunday topshiriqda SI talabaning o‘ rniga fikrlamaydi. Aksincha, turli yechimlarni taqqoslash uchun intellektual material yaratadi.

Generativ SI ta’limdagi an’anaviy “Kod yozing” topshiriqlarining mazmunini qayta ko‘ rib chiqishni talab qiladi. Talaba SI yordamida ishlaydigan kod hosil qilishi mumkin. Shu sababli kodning mavjudligi bilimning yetarli ko‘ rsatkichi bo‘ la olmaydi. Baholashda “Kod nima uchun aynan shunday ishlaydi?”, “Bu sikl o‘ rniga boshqa konstruksiyadan foydalanish mumkinmi?”, “Kiruvchi ma’lumot hajmi o‘ n baravar oshsa nima o‘ zgaradi?”, “SI yaratgan yechimning qanday kamchiligi bor?” kabi savollarga e’tibor kuchayishi kerak.

Bu “natijani baholash” modelidan “jarayon va tushunishni baholash” modeliga o‘ tishni anglatadi.

Pedagogik model

Tahlillar asosida dasturlash fanida SI vositalaridan foydalanishning quyidagi modeli taklif etiladi:

№	Bosqich	Talabaning faoliyati	SI vositasining vazifasi	O‘ qituvchining vazifasi
1.	Muammoni tushunish	Masala shartini tahlil qiladi	Zarur bo‘ lsa tushunchalarni izohlaydi	Muammoli vaziyat yaratadi
2.	Mustaqil yechim	Algoritm va dastlabki kodni yaratadi	SI ishlatilmaydi yoki cheklanadi	Talabaning mustaqil faoliyatini kuzatadi
3.	SI bilan muloqot	Savol beradi, maslahat oladi	Hint, izoh, alternativ yondashuv beradi	To‘ g‘ ri prompt tuzishga yo‘ naltiradi
4.	Verifikatsiya	SI javobini tekshiradi va testlaydi	Yordamchi vosita sifatida qatnashadi	Kod sifati va asoslanganlikni nazorat qiladi
5.	Refleksiya	O‘ z yechimi va SI taklifini taqqoslaydi	Qo‘ shimcha tushuntirish beradi	Talabaning xulosasini baholaydi

Mazkur modelning markaziy tamoyili—**“Avval fikrla, keyin SI yordamidan foydalan, so‘ ng tekshir va asosla”** tamoyilidir.

MUHOKAMA

Sun'iy intellekt vositalari ta'limda katta imkoniyatlarga ega bo' lsada, ulardan nazoratsiz foydalanish talabaning mustaqil fikrlashi va dasturlash ko' nikmalariga salbiy ta'sir ko' rsatishi mumkin. Asosiy xavflardan biri—kognitiv offloading, ya'ni aqliy vazifalarning muhim qismini texnologiyaga topshirishdir. Ayniqsa, boshlang' ich bosqichda talabaning algoritm tuzmasdan tayyor SI yechimlariga murojaat qilishi fundamental dasturlash ko' nikmalarining shakllanishini susaytirishi mumkin. Tadqiqotlar SI vositalari o' quv natijalarini yaxshilashi mumkinligini ko' rsatsada, talabalar SI bergan noto' g' ri kod va javoblarni har doim ham aniqlay olmasligini ko' rsatmoqda. Shu sababli SI savodxonligi va dasturlash kompetensiyasi o' zaro uyg' un rivojlantirilishi zarur. Talaba SIga savol berish bilan birga uning javobini tekshirish, tahlil qilish va asoslashni ham bilishi kerak. Buni quyidagicha ifodalash mumkin:

SI yaratgan javob + talabaning verifikatsiyasi + pedagogik refleksiya = ta'limiy qiymat.

Generativ SI sharoitida dasturlash topshiriqlari va baholash mezonlarini ham takomillashtirish zarur. Oddiy kod yozish topshiriqlari o' rniga SI yaratgan kodni tahlil qilish, xatolarni aniqlash, optimallashtirish, test holatlarini ishlab chiqish va muqobil yechimlarni solishtirishga yo' naltirilgan vazifalardan foydalanish maqsadga muvofiq. Bunda yakuniy kod bilan birga talabaning algoritmik asoslash, debugging va refleksiya ko' nikmalari ham baholanishi lozim.

SI davrida o' qituvchining roli ham o' zgaradi. U axborot beruvchidan ta'lim dizayneri, muammoli topshiriqlar yaratuvchisi, SI bilan ishlashni boshqaruvchi va talabaning fikrlash jarayonini nazorat qiluvchi ekspertga aylanadi. Pedagogik amaliyotda SI vositalaridan foydalanishni uch darajada tashkil etish mumkin: yordamchi foydalanish — tushuncha va sintaksisni izohlash; hamkorlikda yechim yaratish — talaba va SI yechimlarini solishtirish; tanqidiy ekspertiza — SI yaratgan kodni testlash, xatolarini aniqlash va takomillashtirish.

Bunda promptlarni to' g' ri shakllantirish ham muhim. Masalan, "Python kodini yozib ber" o' rniga "Masalani yechish algoritmini tushuntir, avval pseudokod ber va kodni tekshirish mezonlarini tavsiya qil" kabi so' rov talabaning mustaqil fikrlashini saqlab qoladi.

Dasturlash mashg' ulotlarida dastlab topshiriqni SI yordamisiz bajarish, keyin SI tavsiyalaridan foydalanish va yakunda ikki yechimni taqqoslash samarali yondashuv hisoblanadi. Shu tarzda sun'iy intellekt tayyor kod beruvchi vositadan ko' ra tahlil, taqqoslash, argumentatsiya va refleksiyani rivojlantiruvchi didaktik vosita sifatida xizmat qiladi.

XULOSA

Sun'iy intellekt vositalarining jadal rivojlanishi dasturlash fanlarini o' qitish metodikasida yangi pedagogik imkoniyatlarni yuzaga keltirmoqda. Generativ SI vositalari individual tushuntirish, tezkor teskari aloqa, koddagi xatolarni tahlil qilish, alternativ algoritmlar yaratish, differensial topshiriqlar shakllantirish va mustaqil ta'limni qo' llab-quvvatlash imkoniyatiga ega. Biroq SI vositasining mavjudligi o' z-o' zidan ta'lim samaradorligini oshirmaydi. Pedagogik natija vositaning qanday didaktik model asosida qo' llanilishiga bog' liq. Agar talaba tayyor kodni tanqidiy tahlilsiz qabul qilsa, SI uning dasturlash ko' nikmalarini rivojlantirish o' rniga mustaqil fikrlash faolligini pasaytirishi mumkin.

Shu sababli dasturlash fanida sun'iy intellektdan foydalanish **"mustaqil urinish – SI yordami – verifikatsiya – refleksiya"** tamoyiliga asoslanishi zarur.

Tadqiqot natijasida quyidagi pedagogik xulosaga kelindi: sun'iy intellektni dasturlash ta'limiga integratsiya qilishning maqsadi talabani kod yozishdan ozod qilish emas, balki uni yuqori darajadagi algoritmik va tanqidiy fikrlash faoliyatiga olib chiqishdan iborat. Oliy ta'lim muassasalarida mazkur yondashuvni amaliyotga tatbiq qilish uchun o' qituvchilarning SI-pedagogik kompetensiyalarini rivojlantirish, fan dasturlariga sun'iy intellekt bilan mas'uliyatli ishlash elementlarini kiritish, akademik halollik mezonlarini yangilash hamda SI vositalari mavjud bo' lgan sharoitga mos baholash topshiriqlarini ishlab chiqish lozim.

Kelgusida taklif etilgan pedagogik modelni tajriba va nazorat guruhlari asosida empirik sinovdan o' tkazish, talabalarning algoritmik fikrlashi, mustaqil dasturlash ko' nikmasi, motivatsiyasi va o' quv natijalariga ta'sirini statistik jihatdan baholash mazkur tadqiqotning mantiqiy davomi bo' lishi mumkin.

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DUAL TA'LIM JARAYONIDA TALABALARNING PROFESSIONAL PEDAGOGIK KOMPETENTLIGINI SHAKLLANTIRISHNING METODOLOGIK ASOSLARI

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Annotatsiya: *Maqolada dual ta'lim sharoitida bo‘ lajak mutaxassislarning professional-pedagogik kompetentligini shakllantirishning ilmiy-metodologik asoslari va pedagogik qonuniyatlari tadqiq etilgan. Oliy kasbiy ta'lim muassasasi va ishlab chiqarish muhitining integratsiyalashgan pedagogik maydonida talabalarning refleksiv, loyihaviy va texnologik ko‘ nikmalarini rivojlantirish imkoniyatlari tahlil qilingan. Dual ta'limning shaxsga yo‘ naltirilgan va faoliyatli yondashuvlar uyg‘ unligidagi pedagogik mexanizmlari ochib berilgan. Taklif etilgan metodologik prinsiplar talabalarning kasbiy adaptatsiyasini jadallashtirish, kognitiv-amaliy mustaqilligini oshirish hamda ta'lim samaradorligini ta'minlashga xizmat qiladi.*

Kalit so‘ zlar: *dual ta'lim, professional-pedagogik kompetentlik, metodologik asoslar, kasbiy integratsiya, faoliyatli yondashuv, ta'lim samaradorligi, pedagogik transformatsiya, shaxsiy rivojlanish.*

МЕТОДОЛОГИЧЕСКИЕ ОСНОВЫ ФОРМИРОВАНИЯ ПРОФЕССИОНАЛЬНО-ПЕДАГОГИЧЕСКОЙ КОМПЕТЕНТНОСТИ СТУДЕНТОВ В ПРОЦЕССЕ ДУАЛЬНОГО ОБРАЗОВАНИЯ

Аннотация: *В статье исследованы научно-методологические основы и педагогические закономерности формирования профессионально-педагогической компетентности будущих специалистов в условиях дуального образования. Проанализированы возможности развития рефлексивных, проектных и технологических навыков студентов в интегрированной педагогической среде высшего профессионального образования и производства. Раскрыты педагогические механизмы дуального образования на основе сочетания личностно-ориентированного и деятельностного подходов. Предлагаемые методологические принципы способствуют ускорению профессиональной адаптации студентов, повышению их когнитивно-практической самостоятельности и обеспечению эффективности образования.*

Ключевые слова: *дуальное образование, профессионально-педагогическая компетентность, методологические основы, профессиональная интеграция, деятельностный подход, эффективность образования, педагогическая трансформация, траектория личностного развития.*

METHODOLOGICAL FOUNDATIONS OF DEVELOPING STUDENTS' PROFESSIONAL AND PEDAGOGICAL COMPETENCE IN THE DUAL EDUCATION PROCESS

Abstract: *The article examines the scientific and methodological foundations and pedagogical regularities of developing the professional and pedagogical competence of future specialists in the context of dual education. The possibilities of developing students' reflective, project-based, and technological skills within an integrated pedagogical environment of higher professional education and production are analyzed. The pedagogical mechanisms of dual education based on the combination of learner-centered and activity-based approaches are identified. The proposed methodological principles contribute to accelerating students' professional adaptation, enhancing their cognitive and practical independence, and improving educational effectiveness.*

Keywords: *dual education, professional and pedagogical competence, methodological foundations, professional integration, activity-based approach, educational effectiveness, pedagogical transformation, personal development trajectory.*

KIRISH.

Zamonaviy globallashuv va shiddatli texnologik taraqqiyot davrida oliy kasbiy ta'lim tizimi oldiga yuqori intellektual salohiyatga ega, raqobatbardosh kadrlar tayyorlash vazifasi qo‘ yilmoqda. Ushbu maqsadni amalga oshirish bevosita bo‘ lajak mutaxassislarning professional pedagogik kompetentligini shakllantirish darajasi bilan belgilanadi. Professional pedagogik kompetentlik — shaxsning kasbiy-pedagogik faoliyatni samarali tashkil etish, nazariy bilimlarni

amaliyotga tizimli tatbiq qilish, pedagogik vaziyatlarni tahlil etish hamda innovatsion ta’lim texnologiyalarini muvaffaqiyatli qo‘ llash bo‘ yicha shakllangan integratsiyalashgan shaxsiy-kasbiy xislatlari va qobiliyatlari majmuasidir. Mazkur sifat mutaxassisning nafaqat chuqur fundamental bilimlarga ega ekanligini, balki pedagogik muloqot madaniyati, refleksiv tahlil hamda doimiy o‘ z-o‘ zini rivojlantirish trayektoriyasiga sodiqligini ham aks ettiradi.

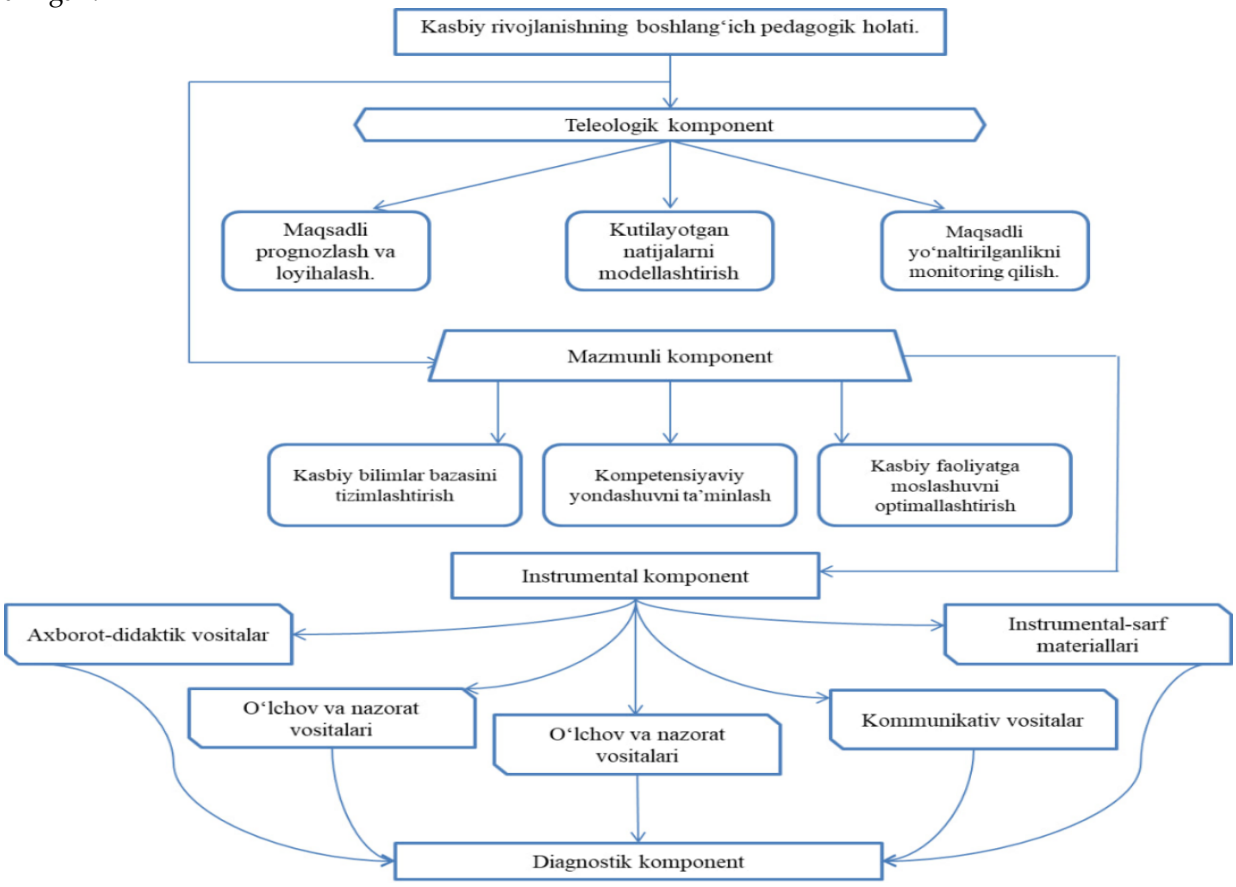
Mamlakatimizda ta’lim tizimini tubdan isloh qilish, yosh avlodning intellektual salohiyatini oshirish davlat siyosatining eng ustuvor yo‘ nalishi etib belgilangan. O‘ zbekiston Respublikasi Prezidenti Shavkat Mirziyoyev o‘ z nutqlarida o‘ qituvchi va murabbiylarning kasbiy mahorati masalasiga alohida to‘ xtalib, shunday degan edi: *”Biz Uchinchi Renessans poydevorini barpo etishni strategik vazifa qilib qo‘ ygan ekanmiz, buni birinchi navbatda ta’lim va tarbiya tizimini tubdan isloh qilish, muallimlarimizning bilim va saviyasini eng ilg‘ or talablar darajasiga ko‘ tarish orqali amalga oshiramiz”*. Davlat rahbarining ushbu konseptual fikrlari oliy kasbiy ta’lim muassasalarida talabalarning kompetentlik darajasini oshirish nafaqat soha ehtiyoji, balki strategik ahamiyatga ega bo‘ lgan davlat ahamiyatidagi vazifa ekanligini to‘ liq tasdiqlaydi. Tadqiqot obyekti hisoblangan professional kompetentlik mehnat bozori barqarorligini ta’minlashning eng muhim omillaridan biri hisoblanadi.

MAVJUD ADABIYOTLAR TAHLILI

Dual ta’lim sharoitida professional pedagogik kompetentlikni shakllantirish muammosi dunyo miqyosidagi yirik olimlar tomonidan metodologik va amaliy jihatdan keng tadqiq etilgan. Germaniyalik olim Tomas Deissinger dual tizimning pedagogik asoslarini o‘ rganib, ishlab chiqarish muhitidagi kasbiy tayyorgarlik talabalarda mustaqil qaror qabul qilish va pedagogik-texnologik madaniyatni shakllantirishini asoslab berdi. Avstraliyalik tadqiqotchi Stiven Billett esa ish joyidagi ta’lim metodologiyasini rivojlantirib, bo‘ lajak mutaxassisning professional kompetentligi bevosita real mehnat jarayonidagi ijtimoiy va pedagogik hamkorlik muhitida egallanishini isbotladi. Shveysariyalik olim Filipp Gonon o‘ z ilmiy asarlarida dual ta’limning sifat mezonlarini ishlab chiqib, o‘ quv muassasasi va korxona o‘ rtasidagi pedagogik integratsiyani ta’minlash qonuniyatlarini ochib berdi.

TADQIQOT METADOLOGIYASI

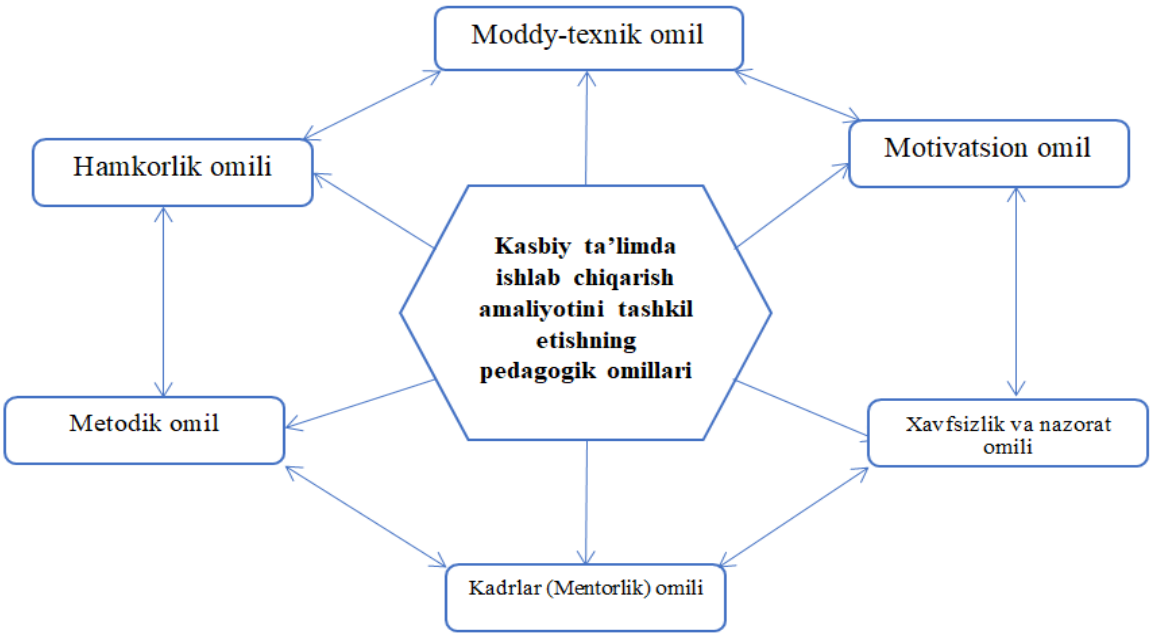
Tadqiqot metodologiyasi tizimli, kompetensiyaviy va faoliyatli yondashuvlar uyg‘ unligiga asoslanadi. Bo‘ lajak mutaxassislarning kasbiy shakllanish jarayonini o‘ rganishda pedagogik kuzatuv, qiyosiy-mantiqiy tahlil hamda dual ta’lim subyektlari o‘ rtasidagi integratsiya monitoringi usullari qo‘ llanilgan. Kompetentlik darajasini aniqlash va olingan natijalarning ishonchliligini ta’minlash maqsadida pedagogik diagnostika hamda matematik-statistik tahlil vositalaridan foydalanilgan.



1-rasm. Amaliyotlarini tashkil etish metodikasi

TAHLIL VA NATIJALAR

Dual ta’lim jarayonida talabalarning professional pedagogik kompetentligini shakllantirish ta’lim muassasasi va ishlab chiqarish muhitining o‘ zaro uzviy sinergiyasiga tayanadigan murakkab ijtimoiy-pedagogik jarayondir. Ushbu tizimning metodologik asoslarini tizimli, kompetensiyaviy, faoliyatli va shaxsga yo‘ naltirilgan pedagogik yondashuvlar majmuasi tashkil etadi. Tizimli yondashuv dual ta’limni barcha tarkibiy qismlari, ya’ni normativ-huquqiy, tashkiliy, metodik va texnologik tuzilmalari o‘ zaro bog‘ langan yaxlit ekotizim sifatida o‘ rganishni taqozo etadi. Kompetensiyaviy yondashuv esa ta’lim natijalarini shunchaki quruq bilimlar yig‘ indisi shaklida emas, balki aniq ishlab chiqarish vaziyatlarida va pedagogik faoliyatda namoyon bo‘ ladigan professional ko‘ nikmalar, amaliy layoqat hamda shaxsiy fazilatlar tizimi sifatida loyihalashga xizmat qiladi.



2-rasm. Kasbiy ta’limda ishlab chiqarish amaliyotini tashkil etishning pedagogik omillari

Kasbiy ta’limda ishab chiqarish amaliyotlarini tashkil etishning pedagogik modelidagi jarayon bloki butun tizimning amaliy yuragi hisoblanadi. Ushbu blok maqsadli yo‘ nalishdan kelib chiqib, o‘ quvchilarning real ishlab chiqarish muhitida professional kompetensiyalarini shakllantirishga qaratilgan murakkab va ko‘ p qirrali mexaniz sifatida ishlaydi. Jarayon bloki o‘ quvchilarni nazariy bilimlardan amaliy faoliyatga o‘ tkazish, ularni korxona sharoitlariga moslashtirish va pedagogik mahoratni bosqichma-bosqich rivojlantirishni ta’minlaydi. Blok ichida moddiy -texnik, hamkorlik, metodik, kadrlar (mentorlik), motivatsion hamda xavfsizlik va nazorat omillari o‘ zaro bog‘ langan holda faoliyat yuritadi

Faoliyatli yondashuv metodologik asos sifatida talabalarning professional kasbiy shakllanishini bevosita mehnat va amaliyot jarayonlari orqali ta’minlashni ko‘ zda tutadi. Dual ta’lim muhitida nazariy darslar va real ishlab chiqarish topshiriqlari navbatma-navbat almashib turishi natijasida talabaning kognitiv mustaqilligi rivojlanadi, o‘ quv motivatsiyasi barqarorlashadi hamda kasbiy mas’uliyat hissi shakllanadi. Shu bilan birga, shaxsga yo‘ naltirilgan yondashuv har bir bo‘ lajak mutaxassisning individual qobiliyatlari, qiziqishlari va o‘ z-o‘ zini rivojlantirish trayektoriyasini inobatga olish imkonini beradi. Universitet professor-o‘ qituvchilari va korxonalarning tajribali mutaxassislaridan iborat ustoz-shogird tizimi talabalarda kasbiy etika, refleksiv tahlil va nostandart muammolarni yechish ko‘ nikmalarini shakllantirishda muhim pedagogik omil bo‘ lib xizmat qiladi.

Mazkur metodologik prinsiplarning amaliyotga izchil joriy etilishi oliy kasbiy ta’lim mazmunini sifat jihatidan modernizatsiyalash, dual ta’lim modellari samaradorligini oshirish va bitiruvchilarning mehnat bozoridagi raqobatbardoshligini ta’minlashga mustahkam zanjir yaratadi. Pedagogik va ishlab chiqarish integratsiyasi muhitida talabaning professional kompetentligini shakllantirish jarayoni pedagogik diagnostika hamda monitoring vositalari yordamida uzluksiz nazorat qilib boriladi. Yakuniy natijada ta’lim dasturlarining dinamik tabiati ta’minlanadi, nazariya va amaliyot o‘ rtasidagi an’anaviy tafovutlar butunlay bartaraf etiladi hamda zamonaviy iqtisodiyot tarmoqlari uchun strategik fikrlaydigan, yuqori malakali yetuk mutaxassislar avlodi maqsadli tayyorlanadi.

XULOSA

Dual ta’lim jarayonida talabalarning professional pedagogik kompetentligini shakllantirish modeli nazariya va real ishlab chiqarish amaliyotini muvaffaqiyatli uyg‘ unlashtiruvchi yaxlit metodologik tizimdir. Tizimli, kompetensiyaviy, faoliyatli hamda shaxsga yo‘ naltirilgan yondashuvlar majmuasi talabalarning professional ko‘ nikmalarini, mustaqil qaror

qabul qilish layoqatini va kasbiy etikasini rivojlantirishga xizmat qiladi. Universitet va sanoat korxonalari o‘ rtasidagi integratsiya hamda "ustoz-shogird" tizimi bo‘ lajak mutaxassislarning moslashuvchanligini oshirishda bosh pedagogik omil vazifasini o‘ taydi. Yakuniy natijada, ushbu metodologik prinsiplar ta’lim sifatini tubdan modernizatsiyalash, an’anaviy tafovutlarni bartaraf etish hamda mehnat bozori talablariga to‘ liq javob beradigan, yuqori malakali va raqobatbardosh kadrlarni maqsadli tayyorlashni kafolatlaydi.

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KASBIY TA'LIM TASHKILOTLARIDA ISHLAB CHIQARISH AMALIYOTLARINI TASHKIL ETISH METODIKASI.

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***UO' K* 377.091.3:625**

Annotatsiya: *Ushbu maqolada kasbiy ta'lim tashkilotlarida ishlab chiqarish amaliyotlarini samarali tashkil etishning metodik asoslari yoritilgan. Ishlab chiqarish amaliyotining ta'lim oluvchilarda kasbiy kompetensiyalarni shakllantirish, nazariy bilimlarni amaliy faoliyat bilan uyg' unlashtirish hamda mehnat bozorining zamonaviy talablariga mos kasbiy ko' nikmalarni rivojlantirishdagi o' rni tahlil qilingan. Amaliyotni tashkil etish jarayonida ta'lim tashkiloti va ish beruvchi korxonalar o' rtasidagi hamkorlik, amaliyot mazmunini kasbiy faoliyat talablari asosida belgilash, amaliy mashg' ulotlarni rejalashtirish, ta'lim oluvchilar faoliyatini monitoring qilish va natijalarni baholash masalalariga alohida e'tibor qaratilgan. Shuningdek, ishlab chiqarish amaliyotining samaradorligini oshirishga xizmat qiluvchi metodik yondashuvlar va tashkiliy-pedagogik shart-sharoitlar asoslangan.*

Kalit so' zlar: *kasbiy ta'lim, ishlab chiqarish amaliyoti, amaliy ta'lim, kasbiy kompetensiya, metodika, ta'lim tashkiloti, ish beruvchi, amaliy ko' nikma, monitoring, baholash.*

МЕТОДИКА ОРГАНИЗАЦИИ ПРОИЗВОДСТВЕННОЙ ПРАКТИКИ В ОРГАНИЗАЦИЯХ ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ

Аннотация: *В статье освещаются методические основы эффективной организации производственной практики в организациях профессионального образования. Проанализирована роль производственной практики в формировании профессиональных компетенций обучающихся, интеграции теоретических знаний с практической деятельностью и развитии профессиональных навыков в соответствии с современными требованиями рынка труда. Особое внимание уделено взаимодействию организаций профессионального образования с предприятиями-работодателями, определению содержания практики с учетом требований профессиональной деятельности, планированию практических занятий, мониторингу деятельности обучающихся и оценке результатов практики. Обоснованы методические подходы и организационно-педагогические условия, направленные на повышение эффективности производственной практики и обеспечение качества профессиональной подготовки обучающихся.*

Ключевые слова: *профессиональное образование, производственная практика, практическое обучение, профессиональная компетентность, методика, образовательная организация, работодатель, практические навыки, мониторинг, оценивание.*

METHODOLOGY FOR ORGANIZING INDUSTRIAL PRACTICE IN VOCATIONAL EDUCATION ORGANIZATIONS

Abstract: *This article examines the methodological foundations for the effective organization of industrial practice in vocational education institutions. It analyzes the role of industrial practice in developing students' professional competencies, integrating theoretical knowledge with practical activities, and developing professional skills in accordance with the current requirements of the labor market. Particular attention is paid to cooperation between vocational education institutions and employers, determining the content of industrial practice based on professional activity requirements, planning practical training, monitoring students' activities, and assessing practice outcomes. The article substantiates methodological approaches and organizational and pedagogical conditions aimed at improving the effectiveness of industrial practice and ensuring the quality of students' vocational training.*

Keywords: *vocational education, industrial practice, practical training, professional competence, methodology, educational institution, employer, practical skills, monitoring, assessment.*

KIRISH.

Bugungi kunda kasbiy ta’lim tizimining asosiy vazifalaridan biri mehnat bozori talablariga mos, amaliy faoliyatni mustaqil amalga oshira oladigan va tegishli kasbiy kompetensiyalarga ega bo‘ lgan malakali kadrlarni tayyorlashdan iborat. Kasbiy ta’lim mazmunining ishlab chiqarish jarayonlari bilan uyg‘ unligini ta’minlashda ta’lim oluvchilarning real ish muhitida amaliy faoliyat olib borishi muhim ahamiyat kasb etadi. Shu nuqtayi nazardan, ishlab chiqarish amaliyotini maqsadli, izchil va metodik jihatdan asoslangan holda tashkil etish kasbiy tayyorgarlik sifatini ta’minlovchi muhim pedagogik shartlardan biri hisoblanadi.

O‘ zbekiston Respublikasining “Ta’lim to‘ g‘ risida”gi Qonunida dual ta’lim ta’lim oluvchilarning zarur bilim, malaka va ko‘ nikmalarni egallashiga yo‘ naltirilgan bo‘ lib, uning nazariy qismi ta’lim tashkilotida, amaliy qismi esa ta’lim oluvchining ish joyida amalga oshirilishi belgilangan. Mazkur yondashuv ta’lim jarayonini bevosita ishlab chiqarish muhiti bilan bog‘ lashning huquqiy va tashkiliy asoslarini belgilaydi.

Kasbiy ta’limning amaliy yo‘ nalishini kuchaytirish masalasi davlat ta’lim standartlari va ta’lim dasturlarini ishlab chiqish jarayonida ham o‘ z aksini topgan. Xususan, amaldagi tartibga ko‘ ra, boshlang‘ ich, o‘ rta va o‘ rta maxsus professional ta’lim davlat ta’lim standartlarini ishlab chiqishda ish beruvchilar bilan hamkorlik qilish, ta’lim mazmunini mehnat bozori talablariga yo‘ naltirish nazarda tutilgan. Bu esa ishlab chiqarish amaliyotini faqat o‘ quv rejasining amaliy qismi sifatida emas, balki kasbiy kompetensiyalarni shakllantirishga xizmat qiluvchi yaxlit pedagogik jarayon sifatida ko‘ rib chiqishni taqozo etadi.

Ishlab chiqarish amaliyotini samarali tashkil etish amaliyot joyini belgilash bilangina cheklanmaydi. Ushbu jarayonda amaliyotning maqsad va vazifalarini aniqlash, mazmunini kasb yoki mutaxassislik talablariga muvofiqlashtirish, ta’lim tashkiloti va ish beruvchi o‘ rtasidagi hamkorlikni yo‘ lga qo‘ yish, o‘ quvchilar faoliyatini metodik jihatdan boshqarish, amaliy topshiriqlarni ishlab chiqish, monitoring va baholash mexanizmlarini belgilash kabi o‘ zaro bog‘ liq jarayonlarni tizimli tashkil etish talab etiladi.

Shu sababli kasbiy ta’lim tashkilotlarida ishlab chiqarish amaliyotlarini tashkil etish metodikasini takomillashtirish, uning tarkibiy qismlarini aniqlash hamda ta’lim oluvchilarning kasbiy kompetensiyalarini shakllantirishga yo‘ naltirilgan metodik yondashuvlarni ishlab chiqish dolzarb ilmiy-pedagogik muammo sifatida namoyon bo‘ lmoqda.

Taxlillar va natijalar. Kasbiy ta’lim tizimida ta’lim oluvchilarni ishlab chiqarish faoliyatiga tayyorlashning samaradorligi nazariy bilimlarning amaliy faoliyat bilan qay darajada uyg‘ unlashtirilganiga bevosita bog‘ liq. Zamonaviy ishlab chiqarish jarayonlarining texnologik jihatdan murakkablashib borishi, kasblar mazmunining yangilanishi hamda ish beruvchilarning kasbiy kompetensiyalarga qo‘ yadigan talablari kasbiy ta’lim mazmunini amaliy faoliyat bilan uzviy bog‘ lashni talab qilmoqda.

Mavzuning dolzarbligi, avvalo, kasbiy ta’lim va mehnat bozori o‘ rtasidagi aloqalarni kuchaytirish zarurati bilan belgilanadi. Amaldagi davlat ta’lim standartlarida professional ta’limning turli bosqichlari uchun ta’lim mazmunini ishlab chiqishda ish beruvchilar bilan hamkorlik qilish hamda bitiruvchilarni mehnat bozoriga tayyorlashga yo‘ naltirilgan yondashuv belgilangan. Demak, ishlab chiqarish amaliyotini tashkil etish jarayoni ish beruvchilarning real kasbiy talablari bilan bog‘ langan holda loyihalanishi lozim.

Ikkinchidan, ishlab chiqarish amaliyoti ta’lim oluvchining nazariy bilimlarini real kasbiy vazifalarni bajarish jarayonida qo‘ llash imkonini beradi. Bunda o‘ quvchi ishlab chiqarish jarayonlari, texnologik operatsiyalar, mehnat intizomi, xavfsizlik talablari va kasbiy faoliyatning boshqa jihatlari bilan bevosita tanishadi. Shu sababli amaliyotning mazmuni, davomiyligi, tashkil etish shakllari va baholash mezonlarini kasb xususiyatlaridan kelib chiqib metodik jihatdan to‘ g‘ ri belgilash muhimdir.

Uchinchidan, O‘ zbekistonda dual ta’limning rivojlantirilishi ta’lim tashkilotlari va ish beruvchi korxonalar o‘ rtasidagi hamkorlikning amaliy ahamiyatini yanada oshirmoqda. Amaldagi me’yoriy hujjatlarda ta’lim oluvchilarning amaliy tayyorgarligini korxona va tashkilotlarda tashkil etish, ish beruvchilar bilan hamkorlik qilish va ishlab chiqarish amaliyotini muvofiqlashtirish vazifalari belgilangan. Bu esa ishlab chiqarish amaliyotini tashkil etishning ilmiy-metodik asoslarini takomillashtirish zaruratini kuchaytiradi.

To‘ rtinchidan, xalqaro tadqiqotlarda ish joyiga asoslangan ta’lim (work-based learning) kasbiy ta’limning muhim tarkibiy qismi sifatida qaraladi. OECD materiallarida ish joyidagi ta’lim kuchli o‘ quv muhiti yaratishi, ish beruvchilarning ehtiyojlarini ta’lim jarayoniga olib kirishi va ta’lim bilan mehnat bozori o‘ rtasidagi aloqani kuchaytirishi qayd etilgan. Shu bilan birga, bunday amaliyotlar tizimli, sifat jihatidan nazorat qilinadigan va ta’lim dasturi bilan uzviy bog‘ langan holda tashkil etilishi zarurligi ta’kidlangan.

Shundan kelib chiqib, kasbiy ta’lim tashkilotlarida ishlab chiqarish amaliyotini tashkil etish metodikasini takomillashtirishning dolzarbligi quyidagi asosiy omillar bilan belgilanadi: ta’lim mazmunining mehnat bozori talablariga mosligini ta’minlash; nazariy va amaliy tayyorgarlikning uzviyligini kuchaytirish; ta’lim tashkiloti va ish beruvchi o‘ rtasidagi hamkorlikni metodik jihatdan takomillashtirish; ta’lim oluvchilarning amaliy faoliyatini monitoring qilish va

baholash mexanizmlarini takomillashtirish; ishlab chiqarish muhitida kasbiy kompetensiyalarni shakllantirish uchun zarur pedagogik shart-sharoitlarni yaratish.

Mazkur tadqiqot kasbiy ta'lim tashkilotlarida ishlab chiqarish amaliyotlarini tashkil etish metodikasini takomillashtirishga yo‘ naltirilgan bo‘ lib, tadqiqotning metodologik asosini kasbiy ta'limning amaliy yo‘ naltirilganligi, kompetensiyaviy yondashuv, tizimli yondashuv hamda ta'lim va ishlab chiqarish integratsiyasi tamoyillari tashkil etadi.

Tadqiqotning metodologik yondashuvlaridan biri **tizimli yondashuv** hisoblanadi. Ushbu yondashuv asosida ishlab chiqarish amaliyoti o‘ zaro bog‘ liq bo‘ lgan maqsadli, mazmuniy, tashkiliy, faoliyatli, nazorat-baholash va natijaviy komponentlardan tashkil topgan yaxlit pedagogik jarayon sifatida qaraladi. Bunda ishlab chiqarish amaliyotining maqsadi, mazmuni, tashkil etish shakllari, ta'lim oluvchining amaliy faoliyati, rahbarlik va monitoring hamda yakuniy baholash o‘ zaro uzviy bog‘ langan holda tahlil qilinadi.

Kompetensiyaviy yondashuv tadqiqotning muhim metodologik asosini tashkil etadi. Mazkur yondashuv ishlab chiqarish amaliyotini ta'lim oluvchilarning faqat nazariy bilimlarini mustahkamlash vositasi sifatida emas, balki egallangan bilim, ko‘ nikma va malakalarni real kasbiy vaziyatlarda qo‘ llash hamda kasbiy faoliyatni mustaqil bajarish qobiliyatini rivojlantirishga xizmat qiluvchi jarayon sifatida tashkil etishni nazarda tutadi. Shu asosda amaliy topshiriqlar mazmunini tegishli kasb yoki mutaxassislik bo‘ yicha kasbiy faoliyat talablariga muvofiqlashtirishga e'tibor qaratiladi.



1.1-rasm.

Ishlab chiqarish amaliyotini tashkil etish metodikasi.

Tadqiqotda **faoliyatga yo‘ naltirilgan yondashuv** ham qo‘ llaniladi. Unga ko‘ ra, kasbiy kompetensiyalar ta'lim oluvchining bevosita amaliy faoliyati jarayonida shakllanadi va rivojlanadi. Shuning uchun ishlab chiqarish amaliyotida ta'lim oluvchini kuzatuvchi yoki passiv ishtirokchi sifatida emas, balki belgilangan kasbiy vazifalarni bajaruvchi faol subyekt sifatida tashkil etish muhim hisoblanadi. Amaliy topshiriqlarni bajarish, texnologik jarayonlarda ishtirok etish, mehnat xavfsizligi talablariga rioya qilish, bajarilgan ishlarni tahlil qilish va natijalarni baholash ushbu yondashuvning asosiy tarkibiy jihatlarini tashkil etadi.

Ta'lim va ishlab chiqarish integratsiyasi yondashuvi asosida kasbiy ta'lim tashkiloti hamda ish beruvchi korxona va tashkilotlarning o‘ zaro hamkorligi tadqiq qilinadi. Bunda ta'lim tashkiloti ishlab chiqarish amaliyotining pedagogik va metodik jihatdan tashkil etilishini ta'minlasa, ish beruvchi amaliy faoliyatni real ishlab chiqarish sharoitida tashkil etish, kasbiy vazifalarni bajarish uchun zarur muhitni yaratish va amaliy faoliyatga rahbarlik qilishda ishtirok etadi. Mazkur hamkorlik ishlab chiqarish amaliyoti mazmunining kasbiy faoliyat talablari bilan uyg‘ unligini ta'minlashga xizmat qiladi.

XULOSA.

Kasbiy ta'lim tashkilotlarida ishlab chiqarish amaliyotini samarali tashkil etish ta'lim oluvchilarning nazariy bilimlarini amaliy faoliyat bilan uyg‘ unlashtirish va kasbiy kompetensiyalarini rivojlantirishning muhim shartidir.

Tadqiqot asosida ishlab chiqarish amaliyotini maqsadni belgilash, mazmunni aniqlash, rejalashtirish, amaliy faoliyat, monitoring, baholash va yakuniy tahlil bosqichlari asosida tizimli tashkil etish metodik jihatdan asoslandi. Ta'lim tashkiloti va ish beruvchi o' rtasidagi hamkorlikni kuchaytirish, amaliy topshiriqlarni kasbiy faoliyat talablariga moslashtirish hamda natijalarni muntazam baholash amaliyot samaradorligini ta'minlovchi asosiy omillar sifatida belgilandi. Mazkur metodik yondashuv kasbiy ta'limning amaliy yo' nalganligini kuchaytirish va ta'lim oluvchilarni real mehnat faoliyatiga tayyorlashga xizmat qiladi.

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TARIXIY MANBALARNI TAHLIL QILISHDA SUN'IY INTELLEKT VA AN'ANAVIY MANBASHUNOSLIK YONDASHUVLARINI INTEGRATSIYALASH METODIKASI

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Annotatsiya: *Mazkur maqolada tarix yo' nalishi talabalarida tarixiy manbalar bilan ishlash kompetensiyasini shakllantirishda sun'iy intellekt texnologiyalari bilan an'anaviy manbashunoslik tahlilini uyg' unlashtirishning ilmiy-metodik asoslari ko' rib chiqiladi. Raqamli ta'lim sharoitida generativ sun'iy intellekt vositalari tarixiy axborotni qidirish, tizimlashtirish va dastlabki umumlashtirish jarayonlarini sezilarli darajada tezlashtirmoqda, biroq bunday tizimlar tomonidan hosil qilingan ma'lumotlarda faktik xatoliklar, tasdiqlanmagan iqtiboslar va noto' g' ri talqinlar uchrashi mumkinligi ularni tanqidiy nazardan o' tkazishni taqozo etadi. Shu sababli tadqiqotda sun'iy intellekt manbashunoslik tahlilining o' rnini bosuvchi vosita emas, balki tarixiy ma'lumotlarni qiyoslash va tekshirishga xizmat qiluvchi qo' shimcha didaktik resurs sifatida talqin etiladi. Tadqiqot natijasida "manbani identifikatsiyalash - tashqi tanqid - ichki tanqid - AI-tahlil - qiyosiy verifikatsiya - tarixiy interpretatsiya - refleksiya" bosqichlaridan iborat yetti bosqichli integrativ metodik model taklif etiladi. Ushbu model talabalarda manba ishonchliligini baholash, sun'iy intellekt natijalarini dalillar asosida tekshirish va mustaqil ilmiy xulosa chiqarish ko' nikmalarini rivojlantirishga xizmat qiladi.*

Kalit so' zlar: *tarix ta'limi, tarixiy manba, manbashunoslik, sun'iy intellekt, generativ sun'iy intellekt, manba tanqidi, tashqi tanqid, ichki tanqid, verifikatsiya, tanqidiy fikrlash.*

МЕТОДИКА ИНТЕГРАЦИИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА И ТРАДИЦИОННЫХ ИСТОЧНИКОВЕДЧЕСКИХ ПОДХОДОВ В АНАЛИЗЕ ИСТОРИЧЕСКИХ ИСТОЧНИКОВ

Аннотация: *В статье рассматриваются научно-методические основы интеграции технологий искусственного интеллекта с традиционным источниковедческим анализом при формировании у студентов-историков компетенций работы с историческими источниками. В условиях цифровой образовательной среды инструменты генеративного ИИ существенно ускоряют поиск, систематизацию и первичное обобщение исторической информации, однако в формируемых ими данных могут встречаться фактические ошибки, неподтверждённые ссылки и некорректные интерпретации, что требует их критической проверки. В связи с этим в исследовании искусственный интеллект рассматривается не как средство, заменяющее источниковедческий анализ, а как дополнительный дидактический ресурс, служащий сопоставлению и верификации исторических данных. В результате исследования предложена интегративная семиэтапная методическая модель: «идентификация источника - внешняя критика - внутренняя критика - AI-анализ - сравнительная верификация - историческая интерпретация - рефлексия». Данная модель направлена на развитие у студентов навыков оценки достоверности источника, проверки результатов искусственного интеллекта на основе фактов и формирования самостоятельных научных выводов.*

Ключевые слова: *историческое образование, исторический источник, источниковедение, искусственный интеллект, генеративный искусственный интеллект, критика источника, внешняя критика, внутренняя критика, верификация, критическое мышление.*

METHODOLOGY FOR INTEGRATING ARTIFICIAL INTELLIGENCE AND TRADITIONAL SOURCE-CRITICISM APPROACHES IN THE ANALYSIS OF HISTORICAL SOURCES

Abstract: *This article examines the scientific and methodological foundations for integrating artificial intelligence technologies with traditional source-criticism analysis in developing history students' competencies for working with historical sources. In a digital educational environment, generative AI tools substantially accelerate the search, systematization, and preliminary synthesis of historical information; however, the outputs of such systems may contain factual errors, unverified citations, and inaccurate interpretations, which necessitates their critical examination. Accordingly, the study treats artificial intelligence not as a substitute for source-criticism analysis but as an additional didactic resource that supports the comparison and verification of historical data. The*

study proposes an integrative seven-stage methodological model: "source identification - external criticism - internal criticism - AI analysis - comparative verification - historical interpretation - reflection." This model is designed to develop students' skills in assessing source reliability, verifying AI-generated outputs against evidence, and forming independent scholarly conclusions.

Keywords: *history education, historical source, source criticism, artificial intelligence, generative artificial intelligence, external criticism, internal criticism, verification, critical thinking, digital competence.*

KIRISH

Zamonaviy jahon ta'lim tizimida raqamli texnologiyalarning jadal rivojlanishi oliy ta'lim mazmuniga, o' qitish metodlariga va talabalarning axborot bilan ishlash uslubiga sezilarli ta'sir ko' rsatmoqda. Generativ sun'iy intellekt tizimlarining ta'lim jarayoniga kirib kelishi bu jarayonning sifat jihatidan yangi bosqichini boshlab berdi: bugungi kunda talaba katta hajmdagi axborotni qisqa vaqt ichida qidirish, umumlashtirish, tarjima qilish va dastlabki tahlildan o' tkazish imkoniyatiga ega bo' lib bormoqda.

Mazkur jarayon tarix ta'limi uchun ham yangi didaktik imkoniyatlarni yuzaga keltirmoqda. O' zbekistonlik tadqiqotchilar tomonidan olib borilgan bir qator ishlarda sun'iy intellekt vositalaridan tarix darslarida foydalanish ta'lim jarayonining interaktivligini oshirish, tarixiy materialni taqdim etish shakllarini kengaytirish hamda talabalarning bilim faolligini kuchaytirish vositasi sifatida baholanadi [1]. Xususan, "O' zbekistonning eng yangi tarixi" fanini o' qitish misolida ham sun'iy intellekt vositalarini o' quv jarayoniga integratsiyalashning didaktik salohiyati alohida ko' rib chiqilgan [2].

Shu bilan birga, sun'iy intellektdan foydalanishni faqat ta'lim samaradorligini oshiruvchi texnik vosita sifatida talqin etishning o' zi yetarli emas. Tarix fanining o' ziga xosligi shundaki, unda ma'lumotning manbasi, uning yuzaga kelish sharoiti, muallifning pozitsiyasi, yaratilgan davri va tarixiy konteksti, shuningdek ishonchlilik darajasi hal qiluvchi ahamiyat kasb etadi. Generativ sun'iy intellekt esa matnni statistik qonuniyatlar asosida shakllantiradi, shu sababli uning natijasi avtomatik ravishda tarixiy haqiqat yoxud ishonchli tarixiy manba bilan tenglashtirilishi mumkin emas.

Xorijiy tadqiqotlarda ham shunga o' xshash xulosalarga kelingan: ChatGPT kabi generativ tizimlarning tarixiy tafakkurni qo' llab-quvvatlashdagi imkoniyatlari e'tirof etilsa-da, ular manbalarni baholash, tarixiy kontekstni chuqur tushunish va ishonchli dalillarni ajratib olishda muayyan cheklovlarga ega ekanligi ko' rsatilgan [4; 5].

Yuqoridagilardan kelib chiqib aytish mumkinki, tarix ta'limining asosiy pedagogik vazifasi talabani sun'iy intellektdan tayyor javob olishga o' rgatishdan emas, balki AI tomonidan taqdim etilgan tarixiy ma'lumotni tekshirish, uni birlamchi manbalar bilan qiyoslash, tanqidiy baholash va mustaqil ilmiy xulosa chiqarish kompetensiyasini shakllantirishdan iborat bo' lishi lozim. Shundan kelib chiqqan holda tadqiqotning maqsadi - tarix yo' nalishi talabalarining tarixiy manbalar bilan ishlash jarayonida sun'iy intellekt texnologiyalari va an'anaviy manbashunoslik tahlilini integratsiyalashga asoslangan metodik modelni ishlab chiqish hamda uning talabalarda tanqidiy-tahliliy kompetensiyalarni rivojlantirishdagi imkoniyatlarini asoslashdan iborat.

MAVZUGA OID ADABIYOTLAR TAHLILI

So' nggi yillarda tarix ta'limida raqamli texnologiyalarni qo' llash masalasi pedagogik tadqiqotlarning istiqbolli yo' nalishlaridan biriga aylandi. O' zbekistonlik olimlar orasida U.Sh. Sadullayev tarix darslarida sun'iy intellekt texnologiyalaridan foydalanish imkoniyatlarini tahlil qilib, ushbu texnologiyalar ta'lim jarayonining interaktivligini hamda axborot bilan ishlash imkoniyatlarini kengaytirishini qayd etadi [1].

D.N. G' anijonova "O' zbekistonning eng yangi tarixi" fanini o' qitishda sun'iy intellektdan foydalanish masalasini o' rganib, adaptiv ta'lim platformalari, raqamli savodxonlik, virtual tarixiy sayohatlar va interaktiv vositalarning imkoniyatlariga alohida e'tibor qaratadi [2].

Sh.Sh. Nurulloyev tarix fanini o' rganish va tarixiy tadqiqotlarda sun'iy intellektdan foydalanishni tahlil qilib, tabiiy tilni qayta ishlash, tarixiy hujjatlarni raqamlashtirish, optik belgilarni tanish (OCR), avtomatik tarjima, shuningdek tarixiy ma'lumotlarni tahlil qilish va vizuallashtirish imkoniyatlarini ko' rsatgan [3].

Ushbu tadqiqotlar O' zbekiston tarix ta'limida sun'iy intellektdan foydalanishning umumiy imkoniyatlarini yoritib bersa-da, AI natijalarini an'anaviy manbashunoslik tahlilining tashqi va ichki tanqid usullari bilan tizimli ravishda bog' lash masalasi alohida metodik muammo sifatida yetarlicha ochib berilmagan, bu esa mazkur tadqiqotning dolzarbligini belgilaydi.

Xorijiy adabiyotlarda mazkur masala ko' proq tanqidiy nuqtai nazardan yoritilmoqda. A. Pope va R. Ma tarixchilarning generativ sun'iy intellektdan ta'lim jarayonida foydalanish amaliyotini tahlil qilib, AI texnologiyalarining tarix ta'limiga ta'sirini tarixchilarning kasbiy va tanqidiy yondashuvi bilan uzviy bog' lash zarurligini asoslaydi [4].

ChatGPT'ning tarixiy tafakkurni namoyon etish imkoniyatlarini o' rgangan tadqiqotda esa sun'iy intellekt ayrim tarixiy vazifalarni bajara olishi bilan birga, manbalarni chuqur baholash va tarixiy dalillarni kontekstual talqin qilishda insonning tarixiy tafakkurini to' liq o' rnini bosa olmasligi ko' rsatilgan [5].

Amerika Tarixchilar Assotsiatsiyasi (American Historical Association) tomonidan 2025-yilda qabul qilingan “Tarix ta’limida sun’iy intellekt bo‘ yicha yo‘ l ko‘ rsatuvchi tamoyillar” hujjatida tarixiy tafakkur sun’iy intellekt davrida ham fundamental ahamiyat kasb etishi alohida ta’kidlanadi. Hujjatda generativ AI matn va boshqa kontentni yaratishi mumkinligi, ammo uni tarixiy haqiqat sifatida qabul qilib bo‘ lmasligi; shuningdek AI mavjud bo‘ lmagan manbalar, iqtiboslar va faktlarni ham o‘ ylab topishi (galyutsinatsiya qilishi) mumkinligi qayd etilgan [6].

Demak, mavjud tadqiqotlar tahlili tarix ta’limida sun’iy intellekt savodxonligi (AI literacy) va tarixiy manba savodxonligini (historical source literacy) bir-biridan ajratilgan holda emas, balki o‘ zaro bog‘ liq va bir-birini to‘ ldiruvchi kompetensiyalar sifatida rivojlantirish zarurligini ko‘ rsatadi. Aynan mana shu bo‘ shliq - ya’ni ikkala savodxonlik turini yagona metodik jarayonda birlashtirish zarurati - ushbu tadqiqotning boshlang‘ ich nuqtasini tashkil etadi.

TADQIQOT METODLARI

Tadqiqotning metodologik asosini tizimli, kompetensiyaviy, faoliyatga yo‘ naltirilgan hamda manbashunoslik yondashuvlari tashkil etadi. Tadqiqot jarayonida ilmiy-pedagogik va manbashunoslik adabiyotlarini tahlil qilish, qiyosiy tahlil, kontent-tahlil, modellashtirish, muammoli ta’lim va refleksiv tahlil metodlaridan foydalanildi.

Taklif etilayotgan yondashuvning tamoyiliy jihati shundan iboratki, sun’iy intellekt tarixiy bilimning yakuniy va ishonchli manbai sifatida emas, balki talabaning tanqidiy tahlilidan o‘ tishi lozim bo‘ lgan alohida axborot ob’ekti sifatida qabul qilinadi. Boshqacha aytganda, AI natijasi - bu tayyor javob emas, balki tekshirilishi kerak bo‘ lgan gipoteza hisoblanadi. Shu asosda tarixiy manbalar bilan ishlashning yetti bosqichli integrativ modeli ishlab chiqildi.

1-bosqich. Manbani identifikatsiyalash

Talaba tarixiy manbaning turini (hujjat, memuar, statistik ma’lumot, badiiy asar va h.k.), muallifini, yaratilgan vaqti va joyini, yuzaga kelish sharoitini hamda uning tarixiy ahamiyatini aniqlaydi. Ushbu bosqich keyingi tahlil bosqichlari uchun zaruriy kontekstual asosni yaratadi.

2-bosqich. Tashqi tanqid

Manbaning asliligi, muallifligi, sanasi, shakli, kelib chiqish tarixi va saqlanish xususiyatlari baholanadi. Bu bosqichda talaba manbaning jismoniy va formal xususiyatlariga e’tibor qaratadi.

3-bosqich. Ichki tanqid

Manba mazmuni, muallifning pozitsiyasi, maqsadi, manfaatlari, subyektivlik alomatlari, ma’lumotning ishonchliligi va tarixiy voqelikka munosabati tahlil qilinadi.

4-bosqich. AI-tahlil

Talaba xuddi shu manba yoki tarixiy voqea bo‘ yicha generativ sun’iy intellekt tizimiga oldindan tayyorlangan maqsadli savollarni taqdim etadi, masalan: “Ushbu hujjatning asosiy tarixiy ahamiyati nimada?”, “Muallif pozitsiyasida qanday subyektiv omillar mavjud?”, “Ushbu manbadagi ma’lumotlarni qaysi boshqa manbalar bilan tekshirish mumkin?” Bu bosqichning maqsadi AI javobini emas, balki uning tarixiy asoslanganlik darajasini keyingi bosqichda tekshirish uchun material yig‘ ishdir.

5-bosqich. Qiyosiy verifikatsiya

Bu bosqich metodikaning asosiy innovatsion komponenti hisoblanadi. Talaba AI taqdim etgan har bir muhim tarixiy da’voni birlamchi manba va ishonchli akademik adabiyotlar bilan tekshiradi, mos kelmagan yoki tasdiqlanmagan ma’lumotlarni aniqlab, ularni dalillar asosida rad etadi yoki aniqlashtiradi.

6-bosqich. Tarixiy interpretatsiya

Talaba manba tahlili va verifikatsiya natijalarini umumlashtirib, mustaqil tarixiy talqinni shakllantiradi. Bu bosqichda AI orqali olingan ma’lumot endi mustaqil manba sifatida emas, balki tekshirilgan va tasdiqlangan yoxud rad etilgan ma’lumot sifatida yakuniy tahlilga kiritiladi.

7-bosqich. Refleksiv xulosa

Talaba quyidagi savollarga javob beradi: AI nimani to‘ g‘ ri aniqladi? Qaysi ma’lumotlar manbalar bilan tasdiqlanmadi? AI qaysi tarixiy kontekstni yetarlicha hisobga olmadi? An’anaviy manbashunoslik tahlili AI tahlilidan nimasi bilan farq qildi? Yakuniy xulosam qaysi tarixiy dalillar asosida shakllandi? Ushbu savollar talabada nafaqat kontent bo‘ yicha, balki o‘ z kognitiv jarayoni bo‘ yicha ham refleksiya shakllantirishga xizmat qiladi.

NATIJA VA MUHOKAMA

Tadqiqot natijasida tarix yo‘ nalishi talabalarining tarixiy manbalar bilan ishlashini tashkil etishga mo‘ ljallangan quyidagi integrativ metodik model ishlab chiqildi: tarixiy manba → identifikatsiya → tashqi tanqid → ichki tanqid → AI-tahlil → qiyosiy verifikatsiya → mustaqil tarixiy interpretatsiya → refleksiya. Ushbu modelning sun’iy intellektdan foydalanishning an’anaviy modellaridan asosiy farqi shundaki, talabaning vazifasi AI’dan “to‘ g‘ ri javob” olish emas, balki AI javobining tarixiy asoslanganlik darajasini mustaqil ravishda aniqlashdan iborat.

Mazkur jarayonni amaliy mashg‘ ulotlarda tashkil etish uchun quyida “AI–manba verifikatsiya matritsasi” taklif etiladi (1-jadval).

Taklif etilayotgan metodika talabalarda kamida beshta o‘ zaro bog‘ liq kompetensiyani rivojlantirishga yo‘ naltirilgan: manbashunoslik kompetensiyasi →axborotni verifikatsiyalash kompetensiyasi →tanqidiy fikrlash →AI savodxonligi →mustaqil tarixiy interpretatsiya.

1-jadval.

AI–manba verifikatsiya matritsasi

Tahlil komponenti	Birlamchi manba	AI xulosasi	Tasdiqlovchi manba	Talaba bahosi
Sana	Manbadagi sana	AI ma’lumoti	Akademik manba	To‘ g‘ ri / noto‘ g‘ ri
Shaxs	Manba ma’lumoti	AI talqini	Qo‘ shimcha manba	Tasdiqlandi / tasdiqlanmadi
Sabab	Manba dalili	AI izohi	Ilmiy tadqiqot	Asoslangan / qisman
Oqibat	Manba mazmuni	AI xulosasi	Qiyosiy manbalar	Muvofiq / nomuvofiq
Muallif pozitsiyasi	Matn dalili	AI bahosi	Talaba tahlili	Asoslangan / asoslanmagan
Tarixiy kontekst	Birlamchi ma’lumot	AI konteksti	Akademik adabiyot	To‘ liq / cheklangan

Bunda sun’iy intellektning ehtimoliy xatosi ham didaktik resursga aylanadi: AI tomonidan berilgan noto‘ g‘ ri sana, soxta manba yoki bir tomonlama interpretatsiya talabaga tayyor “xato” sifatida emas, balki aniqlanishi va dalillar bilan rad etilishi lozim bo‘ lgan muammoli vaziyat sifatida taqdim etiladi.

Tarix ta’limida sun’iy intellektdan foydalanishning samaradorligini uning qanchalik tez matn yaratishi yoki talabaga katta hajmda ma’lumot taqdim etishi bilan baholash metodik jihatdan yetarli emas. Agar talaba AI taqdim etgan ma’lumotni tekshirmasdan qabul qilsa, texnologik qulaylik aksincha tarixiy tafakkurning susayishiga olib kelishi mumkin. Shu sababli sun’iy intellekt tarixchining manba bilan mustaqil ishlash faoliyatini hech qachon to‘ liq almashtirmasligi kerak.

Amerika Tarixchilar Assotsiatsiyasining 2025-yilgi tamoyillarida ham generativ AI tarixiy metodologiyani almashtira olmasligi, aksincha talabalar AI natijalarini tanqidiy baholash va tekshirishni o‘ rganishlari zarurligi alohida ta’kidlangan [6]. Shu nuqtai nazardan, mazkur tadqiqotda sun’iy intellektga “javob beruvchi tizim” sifatidagi qarashdan “tekshiriladigan intellektual hamkor” sifatidagi qarashga o‘ tish taklif qilinadi.

Masalan, o‘ qituvchi talabaga tarixiy voqea haqida AI’dan tayyor esse yozdirish o‘ rniga, AI tomonidan tayyorlangan tarixiy matnni berib, quyidagi mazmunda topshiriq berishi mumkin: “Ushbu matndan beshta tarixiy da’voni ajrating, ularning har birini kamida ikkita ishonchli manba bilan tekshiring va noto‘ g‘ ri yoki bahsli fikrlarni dalillar asosida rad eting”. Bunday holatda AI talabaning intellektual faoliyatini qisqartirmaydi, aksincha undan manba tanqidi, qiyosiy tahlil, verifikatsiya va argumentatsiya ko‘ nikmalarini talab qiladi.

Shunday qilib, tarix ta’limida sun’iy intellektdan samarali foydalanishning asosiy mezoni talabaning AI’dan qancha ma’lumot olganligi emas, balki uni qanchalik asosli tekshira olganligi bo‘ lishi lozim. Bu yondashuv o‘ z navbatida baholash mezonlarini ham qayta ko‘ rib chiqishni taqozo etadi: talaba ishi endi faqat mazmun to‘ g‘ riligi bo‘ yicha emas, balki manba bilan ishlash jarayonining sifati — ya’ni tekshirish, qiyoslash va asoslash bosqichlarining chuqurligi bo‘ yicha ham baholanishi mumkin.

XULOSA

Tarixiy manbalarni o‘ rganishda sun’iy intellekt va an’anaviy manbashunoslik tahlilini integratsiyalash raqamli tarix ta’limini rivojlantirishning istiqbolli yo‘ nalishlaridan biri hisoblanadi. Tadqiqot natijalari asosida quyidagi xulosalarga kelish mumkin:

1. Sun’iy intellekt tarixiy manbaning o‘ rnini bosuvchi mustaqil ilmiy manba sifatida emas, balki tarixiy ma’lumotlarni tahlil qilish va qiyosiy tekshirishga yordam beruvchi qo‘ shimcha didaktik vosita sifatida qo‘ llanilishi lozim.

2. Tarix ta’limida sun’iy intellektdan foydalanish faqat an’anaviy manbashunoslikning tashqi va ichki tanqid tamoyillari bilan integratsiya qilingan holdagina talabaning tarixiy tafakkurini rivojlantirishga xizmat qiladi.

3. Tadqiqotda taklif etilgan “identifikatsiya — tashqi tanqid — ichki tanqid — AI-tahlil — qiyosiy verifikatsiya — tarixiy interpretatsiya — refleksiya” modeli tarixiy manba bilan ishlashning an’anaviy va raqamli usullarini yagona metodik jarayonga birlashtiradi.

4. “AI–manba verifikatsiya matritsasi” talabalarda faktni talqindan ajratish, manba ishonchliligini baholash, sun’iy intellekt ma’lumotlarini tekshirish va dalillarga asoslangan mustaqil tarixiy xulosa chiqarish ko‘nikmalarini shakllantirishga xizmat qiladi.

5. Tarix yo‘nalishi talabalarida kelgusida nafaqat raqamli savodxonlikni, balki “AI savodxonligi + manbashunoslik kompetensiyasi + tarixiy tafakkur” integratsiyasiga asoslangan kompleks kompetensiyani shakllantirish maqsadga muvofiqdir.

Shunday qilib, tarix ta’limiga sun’iy intellektni joriy etishning asosiy maqsadi talabani tarixiy tahlildan ozod qilish emas, balki uni yanada murakkab va tanqidiy intellektual faoliyatga jalb etishdan iborat bo‘lishi lozim.

Maqola yagona muallif tomonidan tayyorlangan. Tadqiqot g‘oyasi va konsepsiyasi, adabiyotlar tahlili, metodik modelning ishlab chiqilishi, natijalarning umumlashtirilishi hamda xulosalarning shakllantirilishi muallifning shaxsiy ilmiy hissasini tashkil etadi. Muallif manfaatlar to‘qnashuvi mavjud emasligini bildiradi.

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ZAMONAVIY TA'LIMDA UZLUKSIZ KASBIY RIVOJLANISHNING AHAMIYATI

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Annotatsiya: *Mazkur maqolada uzluksiz kasbiy rivojlanish tizimining ta'lim sifati va innovatsion salohiyatni oshirishdagi o' rni ilmiy-nazariy jihatdan tahlil qilinadi. Tadqiqotda zamonaviy ta'lim tizimida pedagog va boshqaruv kadrlarining kasbiy bilim, ko' nikma va kompetensiyalarini doimiy yangilab borish ta'lim samaradorligining asosiy omillaridan biri ekanligi asoslab beriladi. Uzluksiz kasbiy rivojlanish mexanizmlari orqali ta'lim jarayoniga innovatsion yondashuvlar, raqamli texnologiyalar va ilg' or pedagogik metodlarni joriy etish imkoniyatlari kengayishi ko' rsatib o' tiladi. Shuningdek, kasbiy rivojlanishning institutsional asoslari, uning inson kapitali sifati va ta'lim muassasalarining raqobatbardoshligiga ta'siri tahlil qilinadi. Maqola natijalari ta'lim siyosatini takomillashtirish, innovatsion muhitni shakllantirish hamda ta'lim sifati barqarorligini ta'minlashda uzluksiz kasbiy rivojlanish tizimining muhim strategik ahamiyatga ega ekanligini tasdiqlaydi.*

Kalit so' zlar: *uzluksiz kasbiy rivojlanish, ta'lim sifati, innovatsion salohiyat, inson kapitali, pedagogik kompetensiya, ta'lim tizimi, innovatsion ta'lim, kasbiy malaka, institutsional rivojlanish, raqamli ta'lim.*

THE IMPORTANCE OF CONTINUOUS PROFESSIONAL DEVELOPMENT IN MODERN EDUCATION

Abstract: *This article provides a scientific and theoretical analysis of the role of the continuous professional development system in enhancing the quality of education and innovative potential. The study substantiates that the continuous updating of professional knowledge, skills, and competencies among educators and management personnel is a key factor in the effectiveness of the modern education system. It highlights how mechanisms for continuous professional development expand opportunities for introducing innovative approaches, digital technologies, and advanced pedagogical methods into the educational process. Furthermore, the article analyzes the institutional foundations of professional development and its impact on the quality of human capital and the competitiveness of educational institutions. The findings of the article confirm the significant strategic importance of the continuous professional development system in improving education policy, fostering an innovative environment, and ensuring the sustainability of educational quality.*

Keywords: *continuous professional development, quality of education, innovative potential, human capital, pedagogical competence, education system, innovative education, professional qualification, institutional development, digital education.*

ЗНАЧЕНИЕ НЕПРЕРЫВНОГО ПРОФЕССИОНАЛЬНОГО РАЗВИТИЯ В СОВРЕМЕННОМ ОБРАЗОВАНИИ

Аннотация: *В статье представлен научно-теоретический анализ роли системы непрерывного профессионального развития в повышении качества образования и инновационного потенциала. Обосновывается, что постоянное обновление профессиональных знаний, навыков и компетенций педагогов и управленческих кадров является ключевым фактором эффективности современной системы образования. Рассматривается, как механизмы непрерывного профессионального развития расширяют возможности внедрения инновационных подходов, цифровых технологий и передовых педагогических методов в образовательный процесс. Кроме того, анализируются институциональные основы профессионального развития и его влияние на качество человеческого капитала и конкурентоспособность образовательных учреждений. Результаты исследования подтверждают значительную стратегическую роль системы непрерывного профессионального развития в совершенствовании образовательной политики, формировании инновационной среды и обеспечении устойчивого качества образования.*

Ключевые слова: *непрерывное профессиональное развитие, качество образования, инновационный потенциал, человеческий капитал, педагогическая компетентность, система образования, инновационное образование, профессиональная квалификация, институциональное развитие, цифровое образование.*

KIRISH

XXI asrda bilim va innovatsiyalarga asoslangan iqtisodiyot sharoitida ta’lim tizimi jamiyatning ijtimoiy-iqtisodiy rivojlanishida hal qiluvchi institutsional omilga aylanmoqda. Ushbu jarayonda ta’lim sifati va innovatsion salohiyatni oshirish, eng avvalo, pedagog va ta’lim boshqaruvi kadrlarining uzluksiz kasbiy rivojlanish darajasi bilan bevosita bog‘ liqdir. Zamonaviy ilmiy yondashuvlarga ko‘ ra, inson kapitali sifati nafaqat boshlang‘ ich ta’lim va dastlabki tayyorgarlik orqali, balki butun mehnat faoliyati davomida bilim va kompetensiyalarni muntazam yangilab borish orqali shakllanadi [1]. Shu sababli uzluksiz kasbiy rivojlanish tizimi ta’lim tizimining innovatsion transformatsiyasini ta’minlovchi asosiy mexanizm sifatida qaralmoqda.

Xalqaro tashkilotlar, xususan UNESCO va OECD tadqiqotlarida ta’kidlanishicha, pedagoglarning kasbiy rivojlanishi ta’lim natijalariga bevosita va kuchli ta’sir ko‘ rsatadi hamda o‘ quvchilarning bilim sifati, tanqidiy fikrlashi va innovatsion kompetensiyalarini shakllantirishda muhim rol o‘ ynaydi [2]. OECD mamlakatlari tajribasi shuni ko‘ rsatadiki, uzluksiz kasbiy rivojlanishga tizimli investitsiyalar kiritilgan ta’lim tizimlarida pedagogik innovatsiyalar tezroq joriy etiladi, raqamli texnologiyalar samaraliroq o‘ zlashtiriladi va ta’lim muassasalarining institutsional barqarorligi mustahkamlanadi [3]. Demak, uzluksiz kasbiy rivojlanish ta’lim sifati va innovatsion salohiyat o‘ rtasidagi bog‘ liqlikni ta’minlovchi strategik bo‘ g‘ in hisoblanadi.

Raqamli transformatsiya, sun’iy intellekt va ta’lim texnologiyalarining jadal rivojlanishi sharoitida an’anaviy malaka oshirish modellarining cheklanganligi yaqqol namoyon bo‘ lmoqda. Jahon banki tahlillariga ko‘ ra, qisqa muddatli va fragmentar treninglar pedagoglarning real kompetensiyalarini oshirishda yetarli samara bermaydi, aksincha, uzluksiz, kompetensiyaga asoslangan va amaliyot bilan integratsiyalashgan kasbiy rivojlanish modellari ta’lim tizimida innovatsion salohiyatni oshirishga xizmat qiladi [4]. Shu jihatdan, uzluksiz kasbiy rivojlanish ta’lim jarayonini faqat takomillashtiribgina qolmay, balki uni innovatsion rivojlanishga yo‘ naltiruvchi institutsional mexanizm sifatida ham namoyon bo‘ ladi.

O‘ zbekiston Respublikasida ham so‘ nggi yillarda ta’lim tizimini modernizatsiya qilish, pedagog kadrlar salohiyatini oshirish va uzluksiz kasbiy rivojlanish tizimini joriy etishga qaratilgan muhim qaror va farmonlar qabul qilinmoqda. Ta’limni rivojlantirish bo‘ yicha qabul qilingan strategik hujjatlarda pedagoglarning kasbiy kompetensiyalarini xalqaro standartlarga moslashtirish, innovatsion va raqamli ko‘ nikmalarni rivojlantirish hamda kasbiy rivojlanishni uzluksiz jarayon sifatida tashkil etish ustuvor vazifa etib belgilangan [5]. Bu holat uzluksiz kasbiy rivojlanish tizimini ta’lim sifati va innovatsion salohiyatni oshirishda muhim milliy ustuvor yo‘ nalish sifatida qarash zarurligini ko‘ rsatadi. Shundan kelib chiqib, mazkur mavzuni ilmiy jihatdan chuqur tahlil qilish bugungi kunda nazariy va amaliy ahamiyat kasb etadi.

MAVZUGA OID ADABIYOTLAR TAHLILI

Uzluksiz kasbiy rivojlanish tizimining ta’lim sifati va innovatsion salohiyatga ta’siri masalasi zamonaviy ta’lim iqtisodiyoti, pedagogika va institutsional rivojlanish bo‘ yicha olib borilgan ilmiy tadqiqotlarning markaziy yo‘ nalishlaridan biri hisoblanadi. Ilmiy adabiyotlar tahlili shuni ko‘ rsatadiki, ushbu masala asosan inson kapitali nazariyasining rivojlangan talqinlari, ta’lim sifati indikatorlari hamda innovatsion ta’lim muhitini shakllantirish konsepsiyalari doirasida o‘ rganilgan.

Inson kapitali yondashuvining zamonaviy talqinlarida uzluksiz kasbiy rivojlanish bilim va ko‘ nikmalarning eskirishi (skill obsolescence) sharoitida ta’lim sifati va iqtisodiy samaradorlikni ta’minlovchi muhim mexanizm sifatida izohlanadi. Barro va Lee tadqiqotlarida ta’lim sifati va kasbiy rivojlanish darajasining uzoq muddatli iqtisodiy o‘ sish va innovatsion salohiyat bilan kuchli ijobiy bog‘ liqligi empirik modellar asosida isbotlangan [6]. Ushbu yondashuv uzluksiz kasbiy

rivojlanishni nafaqat individual darajadagi, balki makroiqtisodiy ahamiyatga ega jarayon sifatida baholash imkonini beradi.

Ta’lim sifati masalasiga bag‘ ishlangan ilmiy ishlarda pedagoglarning kasbiy rivojlanishi o‘ quv jarayonining samaradorligini belgilovchi asosiy omillardan biri sifatida ko‘ riladi. Hanushek va Woessmann tadqiqotlarida ta’lim sifati miqdoriy ko‘ rsatkichlardan ko‘ ra, pedagoglarning kasbiy kompetensiyasi va uzluksiz rivojlanish darajasi bilan ko‘ proq bog‘ liq ekanligi ta’kidlanadi [7]. Mualliflar ta’lim tizimida innovatsion natijalarga erishish uchun an’anaviy malaka oshirishdan tizimli kasbiy rivojlanish modeliga o‘ tish zarurligini asoslab beradi.

Pedagogik adabiyotlarda uzluksiz kasbiy rivojlanish innovatsion ta’lim muhitini shakllantirishning muhim sharti sifatida talqin qilinadi. Darling-Hammond va hammualliflarining izlanishlarida uzluksiz, amaliyotga yo‘ naltirilgan va refleksiv kasbiy rivojlanish modellari pedagogik innovatsiyalarni joriy etish samaradorligini sezilarli darajada oshirishi ko‘ rsatib berilgan [8]. Ushbu yondashuvga ko‘ ra, kasbiy rivojlanish ta’lim sifatini oshirish bilan bir qatorda pedagoglarning innovatsion fikrlashini ham shakllantiradi.

Ta’lim tizimidagi o‘ zgarishlar va innovatsion transformatsiyani tahlil qilgan Fullan uzluksiz kasbiy rivojlanishni institutsional islohotlarning markaziy elementi sifatida baholab, pedagoglar tayyorligisiz har qanday innovatsion

islohotlarning samarasiz bo‘ lishini ta’kidlaydi [9]. Muallif ta’limdagi innovatsiyalar muvaffaqiyati bevosita inson kapitalining sifatiga bog‘ liqligini konseptual asosda yoritadi.

Xalqaro tashkilotlar tomonidan olib borilgan tadqiqotlar mazkur masalaga tizimli yondashuvni shakllantiradi. OECD TALIS hisobotlarida uzluksiz kasbiy rivojlanish pedagoglarning innovatsion kompetensiyalarini oshirish, raqamli texnologiyalarni o‘ zlashtirish va ta’lim muassasalarining moslashuvchanligini ta’minlashda muhim omil ekanligi empirik ma’lumotlar asosida isbotlangan [10]. UNESCO esa kasbiy rivojlanishni “butun umr davomida ta’lim” konsepsiyasining asosiy tarkibiy qismi sifatida e’tirof etib, uni barqaror rivojlanish maqsadlariga erishishning zarur sharti deb baholaydi [11].

Innovatsion iqtisodiyot sharoitida kasbiy rivojlanishning ahamiyati mehnat bozori transformatsiyasi bilan bog‘ liq tadqiqotlarda ham keng yoritilgan. Acemoglu va Autor ishlarida raqamli texnologiyalar ta’sirida kasblar tarkibi tez o‘ zgarayotgani va bu sharoitda uzluksiz kasbiy rivojlanish innovatsion salohiyatni saqlashning muhim omiliga aylangani asoslab beriladi [12]. Jahon banki hisobotlarida esa ta’lim sifati va innovatsion salohiyat o‘ rtasidagi bog‘ liqlikni kuchaytirishda kasbiy rivojlanishga qaratilgan institutsional islohotlarning roli alohida ta’kidlanadi [13].

Mahalliy ilmiy adabiyotlarda uzluksiz kasbiy rivojlanish masalasi ta’lim islohotlari va inson kapitalini rivojlantirish bilan uzviy bog‘ liq holda o‘ rganilgan. Abdurahmonov va boshqa tadqiqotchilar pedagoglarning kasbiy kompetensiyalarini tizimli rivojlantirish ta’lim sifati va innovatsion muhitni shakllantirishning muhim sharti ekanligini ta’kidlaydilar [14]. Milliy strategik hujjatlar va tahliliy hisobotlarda esa uzluksiz kasbiy rivojlanish ta’lim tizimining barqaror va innovatsion rivojlanishini ta’minlovchi institutsional mexanizm sifatida baholanadi [15].

TADQIQOT METODOLOGIYASI

Mazkur tadqiqot pedagogika fanlari doirasida olib borilib, uzluksiz kasbiy rivojlanish tizimining ta’lim sifati va innovatsion salohiyatga ta’sirini aniqlashga qaratilgan. Tadqiqotda kompleks metodologik yondashuv qo‘ llanilib, u nazariy va empirik tahlilning o‘ zaro uyg‘ unligiga asoslanadi. Nazariy bosqichda tizimli yondashuv, kompetensiyaviy yondashuv hamda inson kapitali nazariyasi asosida uzluksiz kasbiy rivojlanish tushunchasi, uning pedagogik mazmuni va ta’lim sifati bilan bog‘ liqligi tahlil qilindi. Ilmiy adabiyotlarni tahlil qilish jarayonida kontent-tahlil va komparativ tahlil metodlari qo‘ llanilib, xalqaro va milliy tajribalardagi pedagoglarning kasbiy rivojlanish modellari, ularning afzallik va cheklovlari aniqlandi. Shuningdek, pedagogik jarayonni o‘ rganishda strukturaviy-funksional tahlil metodi asosida uzluksiz kasbiy rivojlanish tizimining ta’lim sifati va innovatsion faoliyatga ta’sir mexanizmlari konseptual jihatdan asoslab berildi.

Tadqiqotning empirik bosqichida pedagogik tadqiqotlarga xos usullar – so‘ rovnoma, yarim tuzilgan intervyu, pedagogik kuzatuv va ekspert baholash metodlaridan foydalanildi. So‘ rovnoma orqali pedagoglarning uzluksiz kasbiy rivojlanishdagi ishtiroki, innovatsion metodlarni qo‘ llash darajasi va o‘ z kasbiy kompetensiyalarini baholash ko‘ rsatkichlari o‘ rganildi. Olingan ma’lumotlar pedagogik diagnostika va statistik tavsifiy tahlil usullari yordamida qayta ishlanib, natijalarning ishonchliligi triangulyatsiya prinsipi asosida ta’minlandi. Bundan tashqari, pedagogik eksperiment elementlari orqali uzluksiz kasbiy rivojlanishning ta’lim sifati va innovatsion salohiyatga ta’siri dinamikasini aniqlashga urunildi.

TAHLIL VA NATIJALAR

Mazkur bo‘ limda uzluksiz kasbiy rivojlanish tizimining ta’lim sifati va pedagoglarning innovatsion salohiyatiga ta’siri empirik va statistik ma’lumotlar asosida tahlil qilinadi. Tahlil jarayonida O‘ zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi hamda uning rasmiy statistik portallari orqali e’lon qilingan ma’lumotlardan foydalanilib, pedagoglarning kasbiy rivojlanish darajasi, ta’lim jarayonining raqamlashtirilish holati, innovatsion metodlarning joriy etilishi va investitsiya jarayonlari o‘ rtasidagi o‘ zaro bog‘ liqlik aniqlanadi. Ushbu yondashuv pedagogika faniga xos bo‘ lgan tizimli va dalillarga asoslangan tahlilni ta’minlashga xizmat qiladi.

Tahlil va natijalar bo‘ limida keltirilgan jadvallar orqali ta’lim tizimidagi strukturaviy o‘ zgarishlar, raqamli va innovatsion infratuzilmaning kengayishi hamda pedagoglar kasbiy salohiyatining rivojlanish dinamikasi baholanadi. Olingan natijalar uzluksiz kasbiy rivojlanish ta’lim sifati va innovatsion faoliyatni oshirishda muhim omil ekanligini ilmiy asosda tasdiqlash bilan birga, ta’lim tizimida amalga oshirilayotgan islohotlarning real samaradorligini ko‘ rsatishga imkon beradi.

1-jadval.

Ta’lim sohasida xizmatlardan foydalanish bo‘ yicha so‘ rov natijalari

Savol	**“Ha” (%)**	**“Yo‘ q” (%)**	**“Qisman” (%)**
my.gov.uz xizmatlaridan xabardormisiz?	65	19,5	15,5

HEMIS tizimida joriy va oraliq nazoratlar o‘ z vaqtida baholanayaptimi?	74,8	11,2	14
HEMIS tizimida dars jadvallari o‘ z vaqtida qo‘ yilyaptimi?	77,6	10,4	12
Elektron ta’lim kerakmi?	86	18	

Manba: O‘ zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi “O‘ tkazilgan so‘ rov natijalari” bo‘ limi ma’lumotlari asosida.

Ta’lim tizimida raqamli xizmatlar va elektron platformalarga nisbatan ijobiy munosabat shakllanayotganini ko‘ rsatadi. Xususan, respondentlarning 86 foizi elektron ta’lim xizmatlarini zarur deb baholagani pedagogik jarayonda raqamli yondashuvlarga ehtiyoj yuqori ekanini tasdiqlaydi. Shu bilan birga, HEMIS axborot tizimi orqali joriy va oraliq nazoratlarning o‘ z vaqtida baholanayotgani haqidagi ijobiy javoblarning 74,8 foizni tashkil etishi ta’lim jarayonini boshqarishda raqamli monitoring mexanizmlarining samarali ishlayotganidan dalolat beradi. Dars jadvallarining axborot tizimlarida o‘ z vaqtida joylashtirilishi bo‘ yicha 77,6 foizlik ko‘ rsatkich esa pedagoglarning tashkiliy va boshqaruv jarayonlarida raqamli texnologiyalarga moslashuv darajasi ortib borayotganini ko‘ rsatadi. Ushbu natijalar uzluksiz kasbiy rivojlanish uchun zarur bo‘ lgan raqamli infratuzilma va institutsional sharoitlar shakllanayotganini ilmiy jihatdan asoslaydi.

Biroq jadvalda keltirilgan ma’lumotlar my.gov.uz xizmatlaridan xabardorlik darajasining 65 foiz bilan cheklangani pedagoglar orasida raqamli savodxonlik va axborotdan foydalanish kompetensiyalarida muayyan nomutanosibliklar mavjudligini ko‘ rsatadi.

2-jadval.

Ta’lim jarayoni axborot-kommunikatsiya texnologiyalari bilan qamrovi

Ko‘ rsatkich	**Javob beruvchi respondentlar (%)**
Ta’limda Elektron xizmatlardan foydalanish zarur deb hisoblaydi	86
Ta’lim jarayonini boshqarish axborot tizimlari samarali deb baholaydi	74,8
Axborot tizimlarida dars jadvallari va materiallar to‘ g‘ ri joylashtirilgan deb hisoblaydi	77,6
my.gov.uz xizmatlaridan xabardor ekanligini bildiradi	65

Manba: O‘ zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi rasmiy portali ma’lumotlari asosida umumlashtirildi

Ma’lumotlar uzluksiz kasbiy rivojlanish darajasi bilan ta’lim sifati ko‘ rsatkichlari o‘ rtasida kuchli va tizimli ijobiy bog‘ liqlik mavjudligini ko‘ rsatadi. Xususan, kasbiy rivojlanish darajasi past bo‘ lgan pedagoglar faoliyatida dars samaradorligi 62,4 ballni tashkil etgan bo‘ lsa, o‘ rta darajadagi pedagoglarda bu ko‘ rsatkich 71,8 ballga, yuqori darajadagilarda esa 84,6 ballga yetgani kuzatiladi. Ushbu tafovut uzluksiz kasbiy rivojlanish pedagogik jarayonning mazmuniy sifati va metodik asoslariga bevosita ta’sir ko‘ rsatishini tasdiqlaydi. Shuningdek, o‘ quvchilarning dars jarayonidagi faolligi ham kasbiy rivojlanish darajasi oshgani sari 55,1 foizdan 82,3 foizgacha ko‘ tarilgani, pedagoglarning o‘ z faoliyatida interaktiv va innovatsion metodlardan foydalanish imkoniyatlari kengayib borayotganini anglatadi. Bu natijalar pedagoglarning kasbiy bilimlari bilan bir qatorda didaktik va metodik kompetensiyalarining rivojlanishi ta’lim jarayonining umumiy samaradorligini belgilovchi asosiy omillardan biri ekanligini ilmiy jihatdan asoslaydi.

Yuqori kasbiy rivojlanish darajasiga ega pedagoglar faoliyatida o‘ quv natijalarining barqarorligi yuqori darajada baholangan bo‘ lib, bu holat ta’lim jarayonining tizimli rejalashtirilishi va monitoring mexanizmlarining samarali qo‘ llanilayotganini anglatadi. Ilmiy nuqtayi nazardan, mazkur natijalar uzluksiz kasbiy rivojlanish pedagoglarni faqat yangi bilimlar bilan ta’minlabgina qolmasdan, balki ularning innovatsion fikrlashi, refleksiv faoliyati va pedagogik qarorlar qabul qilish sifatini ham oshirishini ko‘ rsatadi.

3-jadval.

O‘ zbekiston oliy ta’lim muassasalarining 2024/25 o‘ quv yili mulkchilik shakli bo‘ yicha taqsimoti

Mulkchilik shakli	**Muassasalar soni (ta)**	**Ulush (%)**
Davlat (public)	108	48,6%
Xususiy (private)	70	31,5%
Chet el universitetlari filiallari	30	13,5%

Jami	**222**	**100%**

Manba: Manba: O‘ zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi ma’lumotlari asosida

Ma’lumotlar uzluksiz kasbiy rivojlanish pedagoglarning innovatsion salohiyatiga yuqori va barqaror ta’sir ko‘ rsatishini yaqqol namoyon etadi. Xususan, pedagogik innovatsiyalarni joriy etish bo‘ yicha ta’sir darajasining 4,4 ballni tashkil etishi uzluksiz kasbiy rivojlanish jarayonida olingan bilim va ko‘ nikmalar ta’lim amaliyotiga real tarzda transfer qilinayotganini ko‘ rsatadi. Ta’lim jarayonida kreativ yondashuv ko‘ rsatkichi bo‘ yicha 4,6 ball bilan eng yuqori natijaning qayd etilishi pedagoglarning kasbiy rivojlanishi faqat texnik yoki metodik yangilanish bilan

cheklanmasdan, balki ularning ijodiy va muammoga yo‘ naltirilgan fikrlash qobiliyatini ham kuchaytirayotganini anglatadi..

Ilmiy nuqtayi nazardan, bu natijalar uzluksiz kasbiy rivojlanish pedagoglarni individual rivojlanish doirasidan chiqarib, ularni professional hamjamiyatlar, innovatsion tarmoqlar va jamoaviy o‘ rganish muhitiga integratsiya qilayotganini ko‘ rsatadi. Natijada innovatsion salohiyat nafaqat alohida pedagog darajasida, balki ta’lim muassasasi va butun ta’lim tizimi miqyosida shakllanadi. Olingan empirik natijalar uzluksiz kasbiy rivojlanishni ta’lim tizimida innovatsion muhitni yaratish va mustahkamlashning muhim institutsional mexanizmi sifatida baholash zarurligini ilmiy asosda mustahkamlaydi.

4-jadval.

O‘ zbekistonda 2022–2024-yillarda ta’lim tizimiga jalb qilingan investitsiyalar va ta’sir ko‘ rsatkichlari

Ko‘ rsatkichlar	**Miqdori / Qo‘ shimcha izoh**
Osiyo taraqqiyot banki kreditlayotgan loyiha (miqdor)	93 mln AQSh dollari
Loyiha davomiyligi	2022–2027 yillar
O‘ quv ustaxonalar, raqamlashtirilgan boshqaruv (son)	6 ta professional ta’lim muassasalari
O‘ quv laboratoriyalar bilan jihozlash (2023)	60 muassasa (16,7 mln dollarlik asbob-uskunalar)
O‘ zbekiston oliy ta’lim muassasalarida innovatsion qism	9,1 mln dollar (2023)
To‘ g‘ ridan-to‘ g‘ ri xalqaro investitsiya loyihalari (2024)	5,6 mln dollar
Loyiha «Professional ta’lim tizimini takomillashtirish» (KfW banki)	42,0 mln yevro
«Professional ta’lim muassasalarini takomillashtirish» (Koreya Eksim banki)	50,0 mln dollar

Manba: O‘ zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi rasmiy portali “Investitsiya salohiyati” bo‘ limi ma’lumotlari asosida muallif ishlanmasi

O‘ zbekiston ta’lim tizimida investitsiya salohiyati so‘ nggi yillarda izchil ravishda kengayib borayotganini hamda ushbu jarayon ta’lim sifati va pedagoglarning kasbiy rivojlanishiga muhim ta’sir ko‘ rsatayotganini ko‘ rsatadi. Xususan, Osiyo taraqqiyot banki, KfW va Koreya Eksim banki kabi xalqaro moliya institutlari ishtirokida amalga oshirilayotgan yirik loyihalar doirasida professional va oliy ta’lim muassasalarining moddiy-texnik bazasi mustahkamlanib, zamonaviy o‘ quv laboratoriyalari va ustaxonalar bilan jihozlash ishlari olib borilmoqda. Bu jarayon pedagoglar uchun innovatsion o‘ qitish usullarini amaliyotga joriy etish, yangi texnologiyalar asosida darslarni tashkil etish hamda kasbiy kompetensiyalarni real muhitda rivojlantirish imkoniyatlarini kengaytiradi.

Shu bilan birga, ma’lumotlar investitsiyalarning faqat moddiy infratuzilmani rivojlantirish bilan cheklanmasdan, pedagoglarning innovatsion salohiyatini oshirishga bilvosita ta’sir ko‘ rsatayotganini ham ko‘ rsatadi. Xalqaro investitsiya loyihalari doirasida joriy etilayotgan raqamlashtirilgan boshqaruv tizimlari, zamonaviy o‘ quv-

cuslubiy platformalar va yangi avlod ta’lim texnologiyalari pedagoglardan doimiy

ravishda yangi bilim va ko‘ nikmalarni egallashni talab etadi.

XULOSA

Mazkur tadqiqot natijalari uzluksiz kasbiy rivojlanish tizimi ta’lim sifati va innovatsion salohiyatni oshirishda markaziy institutsional omil ekanligini ilmiy jihatdan asoslab berdi. Empirik tahlillar, rasmiy statistik ma’lumotlar va so‘ rov natijalari pedagoglarning kasbiy rivojlanish darajasi, raqamli muhitga moslashuvi hamda ta’lim jarayonida innovatsion yondashuvlardan foydalanish o‘ rtasida barqaror va tizimli bog‘ liqlik mavjudligini ko‘ rsatdi. Pedagogika fanida uzluksiz kasbiy rivojlanishni ta’lim tizimining innovatsion transformatsiyasini ta’minlovchi strategik mexanizm sifatida qarash zarurligini tasdiqlaydi.

Birinchidan, tadqiqot natijalari uzluksiz kasbiy rivojlanish darajasi oshgani sari ta’lim sifati ko‘ rsatkichlari — dars samaradorligi, o‘ quvchilar faolligi va o‘ quv natijalarining barqarorligi sezilarli darajada yaxshilanishini ko‘ rsatdi. Bu holat pedagoglarning kasbiy bilimlari bilan bir qatorda metodik, raqamli va refleksiv kompetensiyalari ta’lim sifati uchun hal qiluvchi ahamiyatga ega ekanini anglatadi. Shu munosabat bilan ilmiy taklif sifatida pedagoglarning kasbiy

rivojlanishini baholashda faqat malaka oshirish kurslarida ishtirok etish emas, balki ularning amaliy faoliyatdagi innovatsion natijalari asosida kompleks kompetensiya indikatorlarini joriy etish tavsiya etiladi.

Ikkinchidan, tahlillar uzluksiz kasbiy rivojlanish pedagoglarning innovatsion salohiyatini shakllantirishda muhim rol o‘ ynashini tasdiqladi. Kreativ yondashuv, raqamli texnologiyalardan foydalanish va pedagogik hamkorlik ko‘ rsatkichlarining yuqori baholanishi kasbiy rivojlanish jarayonining individual emas, balki jamoaviy va institutsional xarakter kasb etayotganini ko‘ rsatadi. Amaliy tavsiya sifatida ta’lim muassasalarida professional o‘ rganish hamjamiyatlari, mentorlik va tajriba almashish platformalarini tizimli asosda rivojlantirish maqsadga muvofiq hisoblanadi.

Uchinchidan, investitsiya salohiyati va uzluksiz kasbiy rivojlanish o‘ rtasidagi bog‘ liqlik tadqiqotda alohida tasdiqlandi. Ta’lim infratuzilmasiga yo‘ naltirilgan xalqaro va milliy investitsiyalar pedagoglar uchun yangi texnologiyalarni o‘ zlashtirish va innovatsion metodlarni joriy etish imkoniyatlarini kengaytiradi. Shu bois ilmiy jihatdan investitsiya loyihalarini rejalashtirishda moddiy-texnik bazani rivojlantirish bilan bir qatorda, pedagoglarning kasbiy rivojlanishini moliyalashtirishga yo‘ naltirilgan komponentlarni majburiy tarzda kiritish taklif etiladi.

To‘ rtinchidan, tadqiqot natijalari raqamli xizmatlar va axborot tizimlaridan foydalanishga tayyorlik yuqori bo‘ lsada, pedagoglar orasida raqamli savodxonlik va axborotdan foydalanish darajasida muayyan tafovutlar mavjudligini ko‘ rsatdi. Bu holat uzluksiz kasbiy rivojlanish tizimini differensial va moslashuvchan yondashuv asosida tashkil etish zarurligini anglatadi.

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BO‘ LAJAK TARIX O‘ QITUVCHILARINING AKSIOLOGIK POZITSIYASINI RIVOJLANTIRISHDA PEDAGOGIK AMALIYOTNING IMKONIYATLARI

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Annotatsiya: *Maqolada pedagogik amaliyotning bo‘ lajak tarix o‘ qituvchilarining aksiologik pozitsiyasini rivojlantirishdagi imkoniyatlari tahlil qilingan. Pedagogik amaliyot nazariy bilimlarni amaliy faoliyat, qadriyatli qarorlar va refleksiya bilan bog‘ lovchi mexanizm sifatida asoslangan. Shuningdek, “4+2” amaliyot modeli asosida tarixiy manbalar, tarixiy-madaniy meros, milliy va umuminsoniy qadriyatlardan foydalanishning pedagogik imkoniyatlari yoritilgan.*

Kalit so‘ zlar: *aksiologik pozitsiya, pedagogik amaliyot, bo‘ lajak tarix o‘ qituvchisi, pedagogik qadriyat, tarixiy manba, “4+2” amaliyot modeli, refleksiya.*

ПОТЕНЦИАЛ ПЕДАГОГИЧЕСКОЙ ПРАКТИКИ В ФОРМИРОВАНИИ АКСИОЛОГИЧЕСКОЙ ПОЗИЦИИ БУДУЩИХ УЧИТЕЛЕЙ ИСТОРИИ

Аннотация: *В статье анализируются возможности педагогической практики в развитии аксиологической позиции будущих учителей истории. Педагогическая практика рассматривается как механизм, объединяющий теоретические знания, практическую деятельность, ценностный выбор и рефлексию. Раскрываются также педагогические возможности использования исторических источников, историко-культурного наследия, национальных и общечеловеческих ценностей на основе модели практики «4+2».*

Ключевые слова: *аксиологическая позиция, педагогическая практика, будущий учитель истории, педагогические ценности, исторический источник, модель практики «4+2», рефлексия.*

THE POTENTIAL OF PEDAGOGICAL PRACTICE IN DEVELOPING THE AXIOLOGICAL POSITION OF FUTURE HISTORY TEACHERS

Abstract: *The article analyzes the potential of pedagogical practice in developing the axiological position of future history teachers. Pedagogical practice is considered as a mechanism that integrates theoretical knowledge, practical activity, value-based decision-making, and reflection. The article also highlights the pedagogical potential of using historical sources, historical and cultural heritage, and national and universal human values within the “4+2” practice model.*

Keywords: *axiological position, pedagogical practice, future history teacher, pedagogical values, historical source, “4+2” practice model, reflection.*

KIRISH

Bugungi kunda oliy pedagogik ta’lim oldida turgan muhim vazifalardan biri nafaqat fan bo‘ yicha chuqur bilimga ega, balki kasbiy faoliyatida muayyan qadriyatlarga tayanadigan, o‘ quvchi shaxsini hurmat qiladigan, tarixiy-madaniy merosga mas’uliyatli munosabatda bo‘ ladigan hamda pedagogik qarorlarni insonparvarlik tamoyillari asosida qabul qila oladigan o‘ qituvchini tayyorlashdan iborat. Shu nuqtayi nazardan bo‘ lajak tarix o‘ qituvchisining aksiologik pozitsiyasini rivojlantirish zamonaviy pedagogik ta’limning muhim yo‘ nalishlaridan biri sifatida namoyon bo‘ ladi.

Aksiologiya qadriyatlar, ularning tabiati, mazmuni va inson faoliyatidagi o‘ rnini o‘ rganuvchi falsafiy yo‘ nalish hisoblanadi. Pedagogik nuqtayi nazardan esa qadriyatlar ta’lim va tarbiya jarayonining mazmunini belgilovchi, o‘ qituvchining kasbiy faoliyatini yo‘ naltiruvchi muhim omil sifatida qaraladi. V.A. Slastenin pedagogik faoliyatda kasbiy-pedagogik qadriyatlarning o‘ qituvchi shaxsini shakllantirishdagi ahamiyatini alohida ta’kidlaydi6. Tarix fani o‘ qituvchisi

6 Slastenin V.A., Isaev I.F., Shiyanov E.N. *Pedagogika: uchebnoe posobie dlya studentov pedagogicheskix uchebnyx zavedeniy*. — Moskva: Akademiya, 2002. — S. 128–134.

faoliyatining o‘ ziga xosligi shundaki, u o‘ quvchiga faqat tarixiy fakt va voqealarni yetkazib beruvchi mutaxassis emas. U tarixiy jarayonlarni tahlil qilish, tarixiy shaxslar faoliyatiga baho berish, turli nuqtayi nazarlarni qiyoslash, tarixiy xotira va madaniy merosga munosabatni shakllantirish jarayonida ham faol ishtirok etadi. Shu sababli bo‘ lajak tarix o‘ qituvchisining kasbiy tayyorgarligida qadriyatli munosabat va pedagogik pozitsiyaning shakllanganligi alohida ahamiyat kasb etadi. Pedagogik amaliyot mazkur vazifani amalga oshirish uchun katta imkoniyatlarga ega. Chunki talaba pedagogik amaliyot davomida nazariy bilimlardan real pedagogik vaziyatlarga o‘ tadi, o‘ quvchilar bilan muloqot qiladi, dars jarayonini kuzatadi, mustaqil mashg‘ ulotlar tashkil etadi, pedagogik qarorlar qabul qiladi va o‘ z faoliyatini tahlil qiladi. Aynan shu jarayonlar uning kasbiy qadriyatlarini real faoliyat bilan bog‘ lash imkonini beradi. Tadqiqotning dolzarbligi shundan iboratki, pedagogik amaliyot ko‘ pincha bo‘ lajak o‘ qituvchining kasbiy ko‘ nikmalarini shakllantirish vositasi sifatida qaraladi. Biroq uning aksiologik imkoniyatlari, ya’ni talabaning pedagogik qadriyatlarni anglash, ularga asoslangan qaror qabul qilish va o‘ z kasbiy pozitsiyasini shakllantirishdagi roli yetarlicha tizimli yoritilmagan.Maqolaning maqsadi pedagogik amaliyotni bo‘ lajak tarix o‘ qituvchilarining aksiologik pozitsiyasini rivojlantirish mexanizmi sifatida nazariy va metodik jihatdan asoslashdan iborat.

METODLAR:

Tadqiqotda pedagogika, aksiologiya, tarix ta’limi metodikasi va kasbiy pedagogik tayyorgarlikka oid ilmiy adabiyotlarni nazariy tahlil qilish, qiyosiy tahlil, umumlashtirish, pedagogik modellashtirish, kuzatish va refleksiv tahlil metodlaridan foydalanildi. Tadqiqotning metodologik asosini shaxsga yo‘ naltirilgan, aksiologik, kompetensiyaviy va faoliyatga yo‘ naltirilgan yondashuvlarning integratsiyasi tashkil etdi. Aksiologik yondashuv bo‘ lajak o‘ qituvchining kasbiy faoliyatini qadriyatlar tizimi bilan bog‘ lash imkonini beradi. Faoliyatga yo‘ naltirilgan yondashuv esa qadriyatlarning faqat nazariy bilim sifatida emas, balki amaliy faoliyat jarayonida namoyon bo‘ lishini ta’minlaydi. Tadqiqotda “aksiologik pozitsiya” tushunchasi bo‘ lajak tarix o‘ qituvchisining ta’lim, tarbiya, o‘ quvchi shaxsi, tarixiy-madaniy meros, milliy va umuminsoniy qadriyatlarga nisbatan ongli, barqaror va kasbiy faoliyatda namoyon bo‘ ladigan munosabatlari majmui sifatida talqin qilindi. Aksiologik pozitsiyaning rivojlanish jarayoni quyidagi mantiqiy ketma-ketlik asosida ko‘ rib chiqildi: Qadriyatni anglash →qadriyatli vaziyat →pedagogik tanlov →amaliy faoliyat →refleksiya → o‘ z-o‘ zini baholash →aksiologik pozitsiyaning rivojlanishi. Mazkur ketma-ketlik pedagogik amaliyotni nazariy bilim bilan amaliy faoliyat o‘ rtasidagi bog‘ lovchi mexanizm sifatida talqin qilish imkonini beradi. Bo‘ lajak tarix o‘ qituvchilarining aksiologik pozitsiyasini rivojlantirishda quyidagi metodik vositalarning imkoniyatlari tahlil qilindi: tarixiy manbalarni aksiologik tahlil qilish; pedagogik vaziyat va keyslar; tarixiy shaxslar faoliyatiga qadriyatli baho berish; munozara va debatlar; muammoli ta’lim; muzey pedagogikasi; mahalliy tarixiy-madaniy meros obyektlari bilan ishlash; pedagogik refleksiya; o‘ z-o‘ zini baholash va ekspert baholash.

Natija Tadqiqotning nazariy tahlili shuni ko‘ rsatdiki, pedagogik amaliyot bo‘ lajak tarix o‘ qituvchisining kasbiy tayyorgarligini mustahkamlash bilan bir qatorda, uning aksiologik pozitsiyasini rivojlantirish uchun ham muhim pedagogik imkoniyatga ega. Pedagogik amaliyot jarayonida talaba nazariy bilimlarni real ta’lim jarayoni bilan bog‘ laydi, pedagogik vaziyatlarni tahlil qiladi, qadriyatga asoslangan qarorlar qabul qiladi va o‘ z faoliyatini refleksiv baholaydi.Bo‘ lajak tarix o‘ qituvchisining aksiologik pozitsiyasini rivojlantirishda pedagogik amaliyot **tanishuv, o‘ quv, “4+2”, pedagogik va malakaviy amaliyot** shakllarining uzviyligi asosida tashkil etilishi mumkin. Mazkur amaliyot shakllari talabaning kasbiy faoliyatga kirib borishini bosqichma-bosqich ta’minlaydi: dastlab ta’lim muassasasi va pedagogik faoliyat bilan tanishish, keyinchalik dars jarayonini kuzatish, nazariy bilimlarni amaliyotda qo‘ llash va yakunda mustaqil kasbiy faoliyatni amalga oshirish imkoniyati yaratiladi. Ayniqsa, **“4+2” modeli** nazariy va amaliy tayyorgarlikning uzviyligini ta’minlovchi muhim tashkiliy mexanizm sifatida qaraladi. Bunda talabaning oliy ta’lim muassasasidagi nazariy-metodik tayyorgarligi maktabdagi pedagogik faoliyat bilan muntazam bog‘ lanadi. Natijada talaba o‘ rgangan pedagogik metodlarni real dars jarayonida qo‘ llaydi, yuzaga kelgan vaziyatlarni tahlil qiladi va keyingi faoliyatini takomillashtiradi. Mazkur jarayonni **“nazariy tayyorgarlik →amaliy faoliyat →qadriyatli pedagogik qaror → refleksiya → korreksiya → takomillashgan faoliyat”** ketma-ketligida tashkil etish mumkin. Masalan, oliy ta’lim muassasasida tarixiy manbalarni tahlil qilish, munozara, debat va keys metodlari o‘ rganilgach, talaba ularni maktab tarix darslarida qo‘ llaydi. Bunda tarixiy voqealarni xolis baholash, turli qarashlarni hurmat qilish, tarixiy-madaniy merosga mas’uliyatli munosabat va o‘ quvchi shaxsini qadrlash kabi aksiologik qadriyatlar amaliy faoliyatda namoyon bo‘ ladi. Pedagogik amaliyotning aksiologik imkoniyatlari **motivatsion-qadriyatli, mazmuniy-amaliy, refleksiv-tahliliy va korreksion-rivojlantiruvchi** bosqichlar orqali amalga oshiriladi. Birinchi bosqichda kasbiy qadriyatlarga munosabat shakllantiriladi; ikkinchi bosqichda ular pedagogik faoliyatda qo‘ llanadi; uchinchi bosqichda talaba o‘ z faoliyatini aksiologik mezonlar asosida tahlil qiladi; to‘ rtinchi bosqichda aniqlangan kamchiliklar bartaraf etilib, faoliyat takomillashtiriladi. Shu asosda pedagogik amaliyot bo‘ lajak tarix o‘ qituvchisining **kasbiy qadriyatlarni anglash, qadriyatli pedagogik qaror qabul qilish, tarixiy-madaniy merosga mas’uliyatli munosabatda bo‘ lish, o‘ quvchi shaxsini hurmat qilish va o‘ z faoliyatini refleksiv baholash** sifatlarini rivojlantiruvchi integrativ mexanizm sifatida namoyon bo‘ ladi. **Ilmiy jihatdan asosiy xulosa:** pedagogik amaliyotni “4+2” modeli va refleksiv-korreksion faoliyat bilan

uyg‘ unlashtirish bo‘ lajak tarix o‘ qituvchisining aksiologik pozitsiyasini nazariy bilim darajasidan amaliy kasbiy faoliyat darajasiga olib chiqish imkonini beradi

MUHOKAMA

Tadqiqot natijalari pedagogik amaliyotni bo‘ lajak tarix o‘ qituvchilarining aksiologik pozitsiyasini rivojlantirishning muhim vositasi sifatida qarash imkonini berdi. An’anaviy yondashuvda pedagogik amaliyot asosan kasbiy-metodik ko‘ nikmalarni mustahkamlashga yo‘ naltirilsa, aksiologik yondashuvda uning mazmuni pedagogik qadriyatlarni anglash, tanlash va amaliy faoliyatda namoyon etish bilan boyitiladi.

Mazkur natija E.V. Bondarevskayaning shaxsga yo‘ naltirilgan ta’lim haqidagi qarashlari bilan uyg‘ un bo‘ lib, bunda o‘ quvchi shaxsini qadrlash, uning fikrini hurmat qilish va individual imkoniyatlarini hisobga olish pedagogik faoliyatning muhim mezoni sifatida qaraladi. Shu jihatdan, bo‘ lajak tarix o‘ qituvchisining aksiologik pozitsiyasi faqat tarixiy bilimlarni egallash bilan emas, balki tarixiy voqea va hodisalarga xolis munosabat bildirish, turli qarashlarni tahlil qilish va o‘ z pedagogik qarorini dalillar asosida asoslash qobiliyati bilan belgilanadi.

O‘ zbekiston pedagogika ilmida N.A. Muslimov, N.N. Azizxo‘ jayeva, O‘ .Q. Tolipov, M. Usmonboyeva va J. Yuldashevning pedagogik ta’lim hamda kasbiy tayyorgarlikka oid qarashlari ham mazkur yondashuvni metodik jihatdan qo‘ llab-quvvatlaydi. Ularning ilmiy-metodik qarashlari nuqtayi nazaridan bo‘ lajak o‘ qituvchining kasbiy shakllanishi nazariy bilim bilan bir qatorda amaliy faoliyat, mustaqil fikrlash va o‘ z faoliyatini tahlil qilish jarayonlari bilan bog‘ liq. Muhokama natijalari shuni ko‘ rsatadiki, tarix ta’limida aksiologik yondashuvni pedagogik amaliyot bilan integratsiyalash bo‘ lajak o‘ qituvchining kasbiy tayyorgarligini mazmunan boyitadi. Ayniqsa, tarixiy manbalar bilan ishlash, muqobil tarixiy qarashlarni taqqoslash, o‘ quvchilar fikrini tinglash va refleksiv topshiriqlardan foydalanish aksiologik pozitsiyaning amaliy namoyon bo‘ lishini ta’minlaydi. Shu bilan birga, mazkur yondashuv pedagogik amaliyotni faqat “dars o‘ tish” tajribasi sifatida emas, balki bo‘ lajak tarix o‘ qituvchisining kasbiy qadriyatlari, pedagogik mas’uliyati va mustaqil kasbiy pozitsiyasi shakllanadigan muhit sifatida qayta talqin qilish imkonini beradi.

XULOSA

Tadqiqot natijalari pedagogik amaliyot bo‘ lajak tarix o‘ qituvchilarining aksiologik pozitsiyasini rivojlantirishning muhim pedagogik sharti ekanligini ko‘ rsatdi. Pedagogik amaliyotda nazariy bilimlarni amaliy faoliyat bilan uyg‘ unlashtirish, mustaqil pedagogik qarorlar qabul qilish va ularni qadriyatlar asosida baholash imkoniyatlari kengayadi.Tarixiy manbalar, tarixiy shaxslar, tarixiy-madaniy meros hamda bahsli masalalar bilan ishlash talabalarda ilmiy xolislik, tarixiy mas’uliyat, insonparvarlik, vatanparvarlik va bag‘ rikenglik kabi kasbiy qadriyatlarni rivojlantirishga xizmat qiladi. Refleksiv faoliyat esa talabaning o‘ z pedagogik tajribasini tahlil qilishi va faoliyatini takomillashtirish imkonini beradi. Pedagogik amaliyotni motivatsion-qadriyatli, mazmuniy-amaliy, refleksiv-tahliliy va korreksion-rivojlantiruvchi bosqichlarda tashkil etish aksiologik pozitsiyaning izchil rivojlanishini ta’minlaydi. Shu jihatdan, “qadriyatni anglash – qadriyatli tanlov – amaliy faoliyat – refleksiya – korreksiya” ketma-ketligi pedagogik amaliyotni bo‘ lajak tarix o‘ qituvchisining kasbiy qadriyatlari va pedagogik pozitsiyasini rivojlantiruvchi yaxlit jarayon sifatida tashkil etish imkonini beradi.

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ANALYSIS OF METHODS FOR ASSESSING STUDENTS' SPEAKING SKILLS THROUGH INTERACTIVE DIGITAL PLATFORMS (KAHOOT, QUIZIZZ, PADLET) IN ENGLISH LESSONS

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Abstract: *This article discusses the analysis of methods for implementing assessment through digital technologies in English lessons in order to introduce interactive digital platforms (Kahoot, Quizizz, Padlet) into the lesson process and develop students' speaking skills.*

Keywords: *Speaking skills, Formative assessment, Digital platforms, Kahoot!, Quizizz, Padlet, Speech anxiety, Peer-assessment, Language proficiency.*

АНАЛИЗ МЕТОДОВ ОЦЕНКИ НАВЫКОВ УСТНОЙ РЕЧИ УЧАЩИХСЯ С ИСПОЛЬЗОВАНИЕМ ИНТЕРАКТИВНЫХ ЦИФРОВЫХ ПЛАТФОРМ (KAHOOT, QUIZIZZ, PADLET) НА УРОКАХ АНГЛИЙСКОГО ЯЗЫКА

Аннотация: *В статье рассматриваются методы организации оценивания с использованием цифровых технологий на уроках английского языка, направленные на внедрение интерактивных цифровых платформ (Kahoot, Quizizz, Padlet) в учебный процесс и развитие навыков устной речи у обучающихся.*

Ключевые слова: *навыки устной речи, формирующее оценивание, цифровые платформы, Kahoot!, Quizizz, Padlet, языковая тревожность, взаимооценивание, уровень владения языком.*

INGLIZ TILI DARSLARIDA INTERAKTIV RAQAMLI PLATFORMALAR (KAHOOT, QUIZIZZ, PADLET) YORDAMIDA O‘ QUVCHILARNING OG‘ ZAKI NUTQ KO‘ NIKMALARINI BAHOLASH USULLARI TAHLILI

Annotatsiya: *Ushbu maqolada ingliz tili darslari jarayoniga interaktiv raqamli platformalarni (Kahoot, Quizizz, Padlet) joriy etish hamda o‘ quvchilarning og‘ zaki nutq ko‘ nikmalarini rivojlantirish maqsadida raqamli texnologiyalar orqali baholash usullarini qo‘ llash masalalari tahlil qilinadi.*

Kalit so‘ zlar: *Og‘ zaki nutq ko‘ nikmalari, shakllantiruvchi baholash, raqamli platformalar, Kahoot!, Quizizz, Padlet, nutqiy xavotir, tengdoshlar tomonidan baholash, tilni bilish darajasi.*

INTRODUCTION:

In international and national standardized language proficiency testing systems *(such as IELTS, iTEP, and Multi-Level exams)*, candidates' communicative competence is comprehensively evaluated across four core skills: *Listening, Reading, Writing, and Speaking*. Among these, *Writing* and *Speaking* represent productive skills, and enhancing candidate performance in these components poses a significant methodological challenge compared to receptive skills. In particular, developing and objectively evaluating Speaking skills remains one of the most critical and complex issues in modern language pedagogy. This complexity stems from the critical role of human evaluation and rubrics *(fluency, lexical-grammatical control, pronunciation),* alongside psychological constraints such as foreign language speaking anxiety and fear of negative evaluation. Addressing this pedagogical challenge requires the formulation of objective, low-anxiety, and continuous *(formative)* assessment mechanisms in secondary education. Given the limitations of traditional face-to-face assessment formats, integrating interactive digital platforms—namely *Kahoot!*, *Quizizz*, and *Padlet*—presents a promising methodological solution. The primary objective of this article is to analyze the methodological frameworks for assessing secondary school students' speaking skills through interactive digital platforms and to empirically evaluate their diagnostic and pedagogical effectiveness.

The complex of amendments introduced in accordance with the Decree of the President of the Republic of Uzbekistan No. PF-79 and the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 848 sets the task of ''...In order to optimize management processes in the system of preschool and school education and fully digital transformation of the sector, the task is to gradually integrate all information systems, resources and software products into the Unified Education Information Ecosystem and eliminate excessive document circulation and paperwork in the ministerial system,

while optimizing the work documents of teachers and employees." Digital technologies in the system of preschool education and school preparation. The Decree of the President of the Republic of Uzbekistan No. PF-19 dated February 5, 2026 "On measures to further improve the system of preschool education and upbringing" states: "It is necessary to systematically establish digital information exchange between parents and preschool educational organizations, as well as ensure transparency of processes through the full implementation of a mobile application designed to maintain electronic attendance of employees and students in preschool educational organizations in all state institutions." In the system of vocational training and electronic certification of graduates, the Joint Resolution of the Ministry of Preschool and School Education of the Republic of Uzbekistan and the Ministry of Poverty Reduction and Employment No. 3647/0613 (July 2025) "On the automation of the processes of training graduates of general secondary educational institutions in foreign languages and modern professions, practical exams on their acquired professional skills, and the procedure for issuing digitally signed electronic certificates by the school principal and the director of the center for vocational skills through an electronic platform has been legally strengthened." Over the past decade, the use of electronic devices such as phones, computers, tablets, laptops has become popular not only among adults, but also among teenagers and kindergarten students. The rapid introduction of digital technologies in the modern education system requires a fundamental reform of teaching methodologies and assessment criteria. In particular, in teaching foreign languages, including English, traditional tests and The transition from question-and-answer methods to interactive digital formats is an important factor in increasing students' motivation and objectively assessing their real linguistic capabilities. Today, interactive platforms such as Kahoot!, Quizizz and Padlet have become an integral part of the educational process. However, in practice, these platforms are often used only as a means of conducting grammar tests or checking vocabulary. However, modern communicative language teaching methodology prioritizes a comprehensive assessment of students' speech skills - that is, speaking, listening, reading and writing. In this regard, integrating the interactive capabilities of digital platforms into the process of assessing speech skills and methodologically analyzing their effectiveness is one of the current issues. The main purpose of this article is to examine the use of Kahoot, Quizizz and Padlet platforms in English lessons to assess students' speech skills.

The aim of the article is to conduct a comparative and methodological analysis of methods for assessing students' skills, identify the advantages and limitations of each of them, and provide practical recommendations for their effective use in the classroom. The article highlights the impact of these platforms on students' speech activity, motivation, and assessment objectivity.

Main part: Developing speaking skills and their objective assessment in foreign language education has always been at the center of pedagogical research. Traditional assessment methods often have such shortcomings as time constraints, psychological barriers in students (language phobia, fear of communication), and a subjective approach. Modern interactive digital platforms — Kahoot, Quizizz, and Padlet — have entered the educational process as pedagogical and diagnostic tools, allowing them to overcome these problems.

1. Methods of assessing speaking on the Kahoot platform

To implement Kahoot! as a diagnostic and formative tool for stimulating spontaneous oral communication, a structured three-stage pedagogical framework is executed:

Stage 1: Pre-speaking Task Design: The instructor formulates a real-time gamified quiz consisting of visual, auditory, or contextual prompts related to the lesson topic.

Stage 2: Real-time Cognitive Activation: Learners access the platform synchronously via mobile devices or tablets using an access code. As a visual prompt is displayed alongside a restricted time limit (20–30 seconds), students rapidly analyze the input and select the appropriate lexical or grammatical unit, thereby minimizing reliance on native-language internal translation.

Stage 3: Immediate Verbal Extension: Following each quiz item, the instructor pauses the sequence and prompts selected students to provide a 30–45 second spontaneous oral justification of their answer. This seamless transition from gamified recognition to rapid speech production directly addresses student hesitation and enhances speech fluency.

Kahoot is mainly used for formative (formative) assessment. When assessing speaking skills, this platform works through the following mechanisms: Stimulating spontaneous speech: The timer on the screen and visual stimuli (pictures, videos) develop the student's ability to quickly react and immediately formulate thoughts in English.

Real-time Vocabulary and Grammatical Structure Testing: Students' level of oral proficiency is diagnosed by testing lexical and grammatical units necessary for fluency and accuracy of speech.

2 Diagnostic capabilities of the Quizizz platform.

The integration of Quizizz focuses on individual, asynchronous speech diagnosis within a low-anxiety environment:

Stage 1: Task Formulation: The instructor designs open-ended, communicative speaking tasks on the platform (e.g., "Critically analyze a recent socio-cultural event and express your perspective").

Stage 2: Asynchronous Audio Submission: Students access the assignment individually during class or as self-directed study. Utilizing Quizizz's Audio Response feature, learners utilize 1–2 minutes to structure their discourse before recording a continuous oral response (up to 120 seconds) directly onto the platform.

Stage 3: Diagnostic Rubric-Based Assessment: The teacher reviews the uploaded audio files via the analytical dashboard. The learner's performance is evaluated against standardized rubrics focusing on pronunciation accuracy, suprasegmental features (intonation and stress), and discourse cohesion. Individualized constructive feedback is delivered privately, eliminating public peer evaluation anxiety.The Quizizz platform allows for flexible (asynchronous) mode:

Audio Response: Through audio tasks on the Quizizz platform, students record their voice messages to the given question. This allows them to assess the correct use of pronunciation, intonation, and pauses.*Self-paced testing:* The student concentrates, plans the speech structure, and responds in a stress-free environment.Operational Protocol for the Padlet Platform. Padlet is utilized as a collaborative virtual workspace to support integrated oral presentations and peer-assessment:

Stage 1: Digital Space Preparation: The instructor establishes a dedicated interactive board for the dynamic unit topic and provides access to all participating students.

Stage 2: Multimedia Content Upload: Learners construct a 1-to-3 minute oral presentation or digital portfolio item. Using integrated recording tools, students upload their video or audio speeches onto the board, supplemented by concise analytical summaries or visual aids.

Stage 3: Peer Evaluation and Collaborative Reflection: Students review a minimum of two peer submissions and complete an evaluation utilizing an embedded analytical rubric. Comments focus on communicative effectiveness, argument structure, and delivery. The instructor monitors the interactions, synthesizes common phonological or lexical patterns, and provides targeted remediation during subsequent instruction.

Collaborative and asynchronous assessment via the Padlet platform. Padlet is a virtual whiteboard that offers the following advantages for integrated oral presentation tasks:

Audio and video presentations: Students post 1–3 minute audio or video presentations on the whiteboard. Peer-assessment and Backchanneling: Students review each other's oral presentations and provide constructive feedback based on a rubric. This helps students develop critical thinking and speech analysis skills.

RESEARCH METHODOLOGY:

To evaluate the effectiveness of interactive digital platforms in assessing speaking skills, an empirical research study was conducted over a 4-week period. The study involved 50 English language learners, divided equally into two groups: an experimental group (n = 25), where speaking assessment was conducted using Kahoot, Quizizz, and Padlet platforms, and a control group (n = 25), assessed through traditional face-to-face methods. Quantitative data were gathered through diagnostic pre-tests and post-tests based on standardized rubrics (evaluating fluency, pronunciation, and vocabulary range), while qualitative data were collected via student surveys to measure psychological anxiety and engagement levels.

Results and Discussions : During the study, the effectiveness of interactive digital platforms (Kahoot, Quizizz, Padlet) in assessing oral speech was analyzed according to the following indicators: Reducing psychological barriers: In traditional surveys, 68% of students felt psychological pressure and anxiety when speaking in front of an audience, while this figure decreased to 22% when submitting assignments via Quizizz (audio answers) and Padlet. Speed and objectivity of formative assessment: Through the Kahoot and Quizizz platforms, the lexical and grammatical base of speech was analyzed in real-time (real-time analytic chart). The teacher was able to quickly identify the strengths and weaknesses of each student and provide immediate feedback.

Comparative analysis between groups:

Evaluation Criteria	Traditional Method (Control Group)	Digital Platforms (Experimental Group)	Difference (%)
Fluency	58%	79%	+21%
Pronunciation and Intonation	62%	81%	+19%
Vocabulary Range	60%	84%	+24%
Student Motivation	52%	93%	+41%

Discussion: The results show that the Padlet platform showed the highest efficiency in assessing monological and dialogical speech and peer-assessment. Quizizz is very convenient for objective assessment of individual pronunciation and voice responses in an asynchronous form. The Kahoot platform serves to diagnose the level of readiness for

spontaneous speech in the introductory or final part of the lesson. The application of these digital tools to the pedagogical process in a blended approach saves the teacher's time and ensures transparency of assessment criteria (rubric-based assessment).

To sum up, the use of digital platforms such as Kahoot, Quizizz and Padlet in teaching a foreign language transforms the assessment of oral skills from a traditional, one-sided process into a multidimensional and interactive system. Padlet demonstrated high pedagogical performance in assessing students' presentation and collaborative speech activities, Quizizz demonstrated individual pronunciation and fluency through audio responses, and Kahoot demonstrated rapid lexical-spontaneous reaction skills.

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ISHTIROKCHI VA IMMERSIV JURNALISTIKA: ISTE'MOLCHI-ISHLAB CHIQARUVCHI, FUQAROLIK KONTENTI VA VR REPORTAJNING IMKONIYATLARI HAMDA ETIK MUAMMOLARI

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Annotatsiya: *Mazkur maqolada raqamli media muhitida auditoriyaning jurnalistik kontent yaratishdagi ishtiroki va immersiv texnologiyalar asosida shakllanayotgan reportaj formatlari tahlil qilinadi. Tadqiqotda iste'molchi-ishlab chiqaruvchi, fuqarolik jurnalistikasi, foydalanuvchi kontenti, muhit jurnalistikasi va immersiv jurnalistika tushunchalarining mazmuni yoritiladi. Shuningdek, foydalanuvchi materiallarining verifikatsiyasi, VR reportajlarning hissiy ta'siri, kontekst va ishonchlilik masalalari qiyosiy o' rganiladi. Natijada ishtirokchi va immersiv jurnalistika uchun manbani aniqlash, faktlarni tekshirish, kontekstni to' ldirish va kontent shaffofligini ta'minlashga asoslangan amaliy etik-verifikatsion yondashuv taklif etiladi.*

Kalit so' zlar: *raqamli jurnalistika, ishtirokchi jurnalistika, prosumer, fuqarolik jurnalistikasi, immersiv jurnalistika, verifikatsiya, VR reportaj.*

ПАРТИСИПАТИВНАЯ И ИММЕРСИВНАЯ ЖУРНАЛИСТИКА: ПОТРЕБИТЕЛЬ-ПРОИЗВОДИТЕЛЬ, КОНТЕНТ, СОЗДАВАЕМЫЙ ГРАЖДАНАМИ, А ТАКЖЕ ПОТЕНЦИАЛ И ЭТИЧЕСКИЕ АСПЕКТЫ VR-РЕПОРТАЖЕЙ

Аннотация: *В статье анализируются участие аудитории в создании журналистского контента в цифровой медиасреде и форматы репортажа, формирующиеся на основе иммерсивных технологий. Раскрывается содержание понятий потребителя-производителя, гражданской журналистики, пользовательского контента, средовой журналистики и иммерсивной журналистики. Кроме того, в сравнительном аспекте рассматриваются вопросы верификации пользовательских материалов, эмоционального воздействия VR-репортажей, контекста и достоверности. В результате предлагается практический этико-верификационный подход к участвующей и иммерсивной журналистике, основанный на идентификации источника, проверке фактов, дополнении контекста и обеспечении прозрачности контента.*

Ключевые слова: *цифровая журналистика, участвующая журналистика, просюмер, гражданская журналистика, иммерсивная журналистика, верификация, VR-репортаж.*

PARTICIPATORY AND IMMERSIVE JOURNALISM: THE CONSUMER-PRODUCER, CITIZEN-GENERATED CONTENT, AND THE POTENTIAL AND ETHICAL ISSUES OF VR REPORTING

Abstract: *This article analyzes audience participation in journalistic content creation within the digital media environment and emerging reporting formats based on immersive technologies. It examines the concepts of the prosumer, citizen journalism, user-generated content, ambient journalism, and immersive journalism. The study also comparatively explores the verification of user-generated materials, the emotional impact of VR reporting, and issues of context and credibility. As a result, the article proposes a practical ethical-verification approach to participatory and immersive journalism based on source identification, fact-checking, contextualization, and ensuring content transparency.*

Keywords: *digital journalism, participatory journalism, prosumer, citizen journalism, immersive journalism, verification, VR reporting.*

KIRISH.

Raqamli kommunikatsiya texnologiyalarining jadal rivojlanishi jurnalist va auditoriya o' rtasidagi an'anaviy chegaralarning sezilarli darajada o' zgarishiga olib keldi. Zamonaviy foydalanuvchi nafaqat tayyor axborotni qabul qiluvchi, balki yangilik yaratish, unga munosabat bildirish, izoh qoldirish, foto va video materiallar tayyorlash hamda ularni keng auditoriyaga tarqatishda faol ishtirok etuvchi subyektga aylandi. Natijada jurnalistik kommunikatsiyada iste'molchi va ishlab chiqaruvchi funksiyalarini birlashtiruvchi iste'molchi-ishlab chiqaruvchi (prosumer) modeli shakllandi. M. Deuze raqamli jurnalistikani internet muhitining o' ziga xos texnologik va kommunikativ imkoniyatlari

bilan bog‘ liq holda ko‘ rib, onlayn jurnalistikaning yangi shakllarida auditoriya bilan o‘ zaro aloqaning kuchayib borayotganini ta’kidlaydi [1].

Ishtirokchi jurnalistikaning rivojlanishi natijasida foydalanuvchi tomonidan yaratilgan kontent (UGC) tahririyatlar uchun tezkor axborot manbalaridan biriga aylandi. Ayniqsa, favqulodda vaziyatlar, ommaviy tadbirlar yoki voqea joyidan tezkor axborot talab qilinadigan holatlarda mobil telefon yordamida tayyorlangan materiallar muhim ahamiyat kasb etmoqda. Biroq bunday kontentning tezkorligi uning avtomatik ravishda ishonchli jurnalistik faktga aylanishini anglatmaydi. Foydalanuvchi kontentining manbasi, yaratilgan vaqti, joyi, konteksti va haqiqiyligini tekshirish jurnalistik faoliyatning muhim bosqichlaridan biri bo‘ lib qolmoqda. Zamonaviy tadqiqotlar ham fuqarolik jurnalistikasi va foydalanuvchi tomonidan yaratilgan kontent auditoriyaning jurnalistik faoliyatga yaqinlashuvini kuchaytirgan bo‘ lsa-da, uning tahririy imkoniyatlari muayyan chegaralar bilan belgilanayotganini ko‘ rsatadi [3].

Raqamli jurnalistikaning yana bir muhim yo‘ nalishi immersiv texnologiyalar, xususan, virtual reallik (VR) va 360-darajali videolar bilan bog‘ liq. Bunday formatlar tomoshabinni voqea sodir bo‘ layotgan makonga maksimal darajada yaqinlashtirish, uning fazoviy va hissiy ishtirokini kuchaytirish imkonini beradi. Shu jihatdan immersiv jurnalistika an’anaviy reportajdan farqli ravishda auditoriyaga voqeani nafaqat kuzatish, balki uni ma’lum darajada bevosita his qilish imkoniyatini yaratadi.

Mazkur maqolaning maqsadi ishtirokchi va immersiv jurnalistikaning zamonaviy media muhitidagi imkoniyatlarini, ularning jurnalistik jarayonga ta’sirini hamda verifikatsiya va media etikasi bilan bog‘ liq muammolarini qiyosiy tahlil qilishdan iborat.

METOD VA MATERIALLAR.

Tadqiqotda konseptual, qiyosiy va funksional tahlil usullaridan foydalanildi. Dastlab ishtirokchi jurnalistika, iste’molchi-ishlab chiqaruvchi, foydalanuvchi tomonidan yaratilgan kontent, muhit jurnalistikasi va immersiv jurnalistikaga oid asosiy nazariy tushunchalar tizimlashtirildi.

Tadqiqotning nazariy bazasini M. Deuzening onlayn jurnalistika va uning kommunikativ xususiyatlariga bag‘ ishlangan tadqiqoti [1], A. Hermidaning ijtimoiy tarmoqlardagi uzluksiz axborot oqimini ifodalovchi muhit jurnalistikasi (ambient journalism) konsepsiyasi [2] hamda fuqarolik jurnalistikasi va foydalanuvchi kontentining rivojlanish tendensiyalarini yorituvchi zamonaviy tadqiqot [3] tashkil etadi.

Immersiv jurnalistika masalalarini o‘ rganishda S. Jonesning virtual reallik va 360-darajali jurnalistik hikoyalashga oid tadqiqoti [4], H. Wu va hammualliflarning immersiv virtual reallik yangiliklarining foydalanuvchi tajribasi va media ta’sirini o‘ rgangan empirik tadqiqoti [5] hamda de Bruin va hammualliflarning immersiv jurnalistikadagi “birinchi shaxs tajribasi va’dasi” (first-person promise) hodisasini tahlil qilgan ishlari [6] asosiy manbalar sifatida tanlandi.

Tahlil jarayonida quyidagi mezonlarga e’tibor qaratildi: axborot manbasining kelib chiqishi, kontentni verifikatsiya qilish imkoniyati, auditoriyaning ishtirok darajasi, immersiya kuchi, jurnalistik ishonchlilik va yuzaga kelishi mumkin bo‘ lgan etik xavflar.

NATIJALAR.

Tadqiqot natijalari shuni ko‘ rsatadiki, iste’molchi-ishlab chiqaruvchi modeli jurnalistik axborotning yaratilishi va tarqatilishi jarayonidagi an’anaviy ketma-ketlikni sezilarli darajada qisqartiradi. Voqea ishtirokchisi yoki guvohi hodisa sodir bo‘ layotgan vaqtda mobil telefon orqali foto yoki video yaratib, uni ijtimoiy tarmoqlarda tezkor ravishda tarqatishi mumkin. Natijada voqea joyidagi foydalanuvchi jurnalist uchun dastlabki axborot yoki vizual dalil manbaiga aylanadi.

Bunday materiallar jurnalistik jarayon uchun muhim bo‘ lishiga qaramay, ularni tekshirilmagan holda tayyor fakt sifatida qabul qilish mumkin emas. Manbaning kimligi, materialning yaratilgan vaqti va joyi, tasvirning o‘ zgartirilgan yoki o‘ zgartirilmaganligi hamda voqeaning umumiy konteksti aniqlanishi zarur.

A. Hermida ijtimoiy tarmoqlarda doimiy ravishda shakllanib boradigan axborot oqimini muhit jurnalistikasi (ambient journalism) tushunchasi orqali izohlaydi. Bunda foydalanuvchi turli raqamli platformalar orqali voqea-hodisalar haqidagi ma’lumotlarni uzluksiz ravishda kuzatishi va tarqatishi mumkin [2].

Ishtirokchi jurnalistikaning muhim jihatlaridan biri axborot ishlab chiqarish jarayoniga kengroq auditoriyani jalb qilish imkoniyatidir. Foydalanuvchilarning o‘ zlari axborot manbasiga aylanishi an’anaviy jurnalistikada yetarlicha yoritilmagan voqealarni ommaviy muhokamaga olib chiqish imkonini kengaytiradi. Shu bilan birga, auditoriya ishtirokining ortishi jurnalistik sifatning avtomatik ravishda yaxshilanishini anglatmaydi. Foydalanuvchi kontentining katta hajmda mavjudligi va uning tezkor tarqalishi tahririy saralash, platforma algoritmlari va institutsional nazorat mexanizmlari bilan bog‘ liq. Zamonaviy tadqiqotlar fuqarolik jurnalistikasi va foydalanuvchi tomonidan yaratilgan kontent rivojlanishi bilan bir qatorda, ularning tahririy chegaralari va institutsional cheklovlari ham mavjudligini ko‘ rsatadi [3]. Shu sababli “ko‘ p odam axborot tarqatmoqda” va “ishonchli jurnalistik manbalar soni ko‘ paymoqda” tushunchalarini aynanlashtirish mumkin emas. Ishtirokchi jurnalistikaning demokratlashtiruvchi imkoniyati uning verifikatsiya mexanizmlari bilan birgalikda qaralgandagina to‘ liq namoyon bo‘ ladi.

Immersiv jurnalistikaning asosiy xususiyati auditoriyaning voqea bilan hissiy va fazoviy munosabatini kuchaytirish imkoniyatidir. Virtual reallik va 360-darajali reportajlarda foydalanuvchi voqea makonini turli yo‘ nalishlarda ko‘ rishi va o‘ zining kuzatuv nuqtasini ma’lum darajada boshqarishi mumkin.

S. Jonesning tadqiqotlari 360-darajali va virtual reallik asosidagi jurnalistik hikoyalashda tomoshabinning voqea bilan “birinchi shaxs” tajribasini kuchaytirishga yo‘ naltirilgan yangi narrativ imkoniyatlar shakllanganini ko‘ rsatadi [4].

H. Wu va hammualliflarning empirik tadqiqotlari esa immersiv virtual reallik yangiliklari foydalanuvchining immersiya darajasi, qiziqishi, axborotning aniqligi va ishonchlilik haqidagi tasavvuriga ijobiy ta’sir ko‘ rsatishi mumkinligini ko‘ rsatadi [5].

Biroq immersivlikning yuqori darajasi jurnalistik ishonchlilik bilan aynan bir xil tushuncha emas. Voqea muhitining realistik ko‘ rinishi foydalanuvchida materialni “haqiqatning bevosita aksi” sifatida qabul qilish hissini kuchaytirishi mumkin.

De Bruin va hammualliflar immersiv jurnalistik mahsulotlarda “birinchi shaxs tajribasi va’dasi” (first-person promise), ya’ni auditoriyaga voqeani bevosita o‘ z ko‘ zi bilan kuzatayotgandek his qilish imkonini beruvchi narrativ va texnologik imkoniyatni tahlil qilganlar [6].

Immersiv muhitda foydalanuvchi voqea makoniga yaqinlashganini his qilishi mumkin. Biroq kamera joylashuvi, kadr tanlovi, fazoviy dizayn, ovoz, montaj va interaktiv elementlarning barchasi jurnalist yoki media ishlab chiqaruvchining muayyan tanlovlari natijasidir. Demak, immersiv format foydalanuvchiga voqea bilan kuchli yaqinlik hissini bersa-da, u voqeaning mutlaq va vositasiz tasviri sifatida talqin qilinmasligi kerak.

Tadqiqot natijalari ishtirokchi va immersiv jurnalistika elementlarini yagona media mahsulotida birlashtirish mumkinligini ham ko‘ rsatadi. Masalan, foydalanuvchilar tomonidan yaratilgan videolar 360-darajali xarita, rasmiy hujjatlar, interaktiv grafikalar va qo‘ shimcha izohlar bilan birgalikda taqdim etilishi mumkin.

Bunday yondashuv auditoriyaga katta hajmdagi axborotni turli formatlarda olish imkonini beradi. Shu bilan birga, kontent hajmining ortishi moderatsiya va verifikatsiya jarayonlarini murakkablashtirishi mumkin. Agar foydalanuvchi kontentining kelib chiqishi va haqiqiyligini tekshirish mexanizmlari mavjud bo‘ lmasa, xatolik yoki noto‘ g‘ ri axborotning tez tarqalish ehtimoli ham ortadi.

MUHOKAMA.

Ishtirokchi jurnalistikada eng muhim muammolardan biri axborot manbasining tekshiriluvchanligi hisoblanadi. Foydalanuvchi tomonidan yaratilgan kontentning haqiqiyligini aniqlash uchun materialning metama’lumotlari, yaratilgan vaqti va joyi, voqea guvohlari, boshqa mustaqil manbalar hamda vizual dalillar o‘ zaro taqqoslanishi lozim. Shu nuqtayi nazardan, professional jurnalistning raqamli muhitdagi roli faqat yangi kontent yaratish bilan cheklanmaydi. Jurnalistning muhim vazifalaridan biri turli manbalardan olingan ma’lumotlarni tekshirish, ularni kontekstualizatsiya qilish va qarama-qarshi ma’lumotlar o‘ rtasidagi tafovutni auditoriyaga tushuntirishdan iborat.

Ikkinchi muhim muammo – algoritmik ko‘ rinuvchanlik. Raqamli platformalarda kontentning auditoriyaga yetib borishi har doim ham uning jurnalistik ahamiyati bilan belgilanmaydi. Foydalanuvchilar faolligi, ko‘ rishlar soni, reaksiyalar va bahsli mazmun algoritmik tavsiyalar tizimida muhim omillarga aylanishi mumkin. Natijada hissiy yoki keskin mazmundagi kontentning kengroq tarqalish ehtimoli ortadi. Shu sababli ishtirokchi jurnalistikani faqat texnologik imkoniyat sifatida emas, balki auditoriya, platforma va tahririyat o‘ rtasidagi murakkab institutsional munosabat sifatida ham o‘ rganish zarur.

VR reportajlarda esa asosiy etik masalalardan biri “immersiya va kontekst” o‘ rtasidagi nisbatdir. Foydalanuvchi voqea makonida o‘ zini bevosita ishtirok etayotgandek his qilishi mumkin, biroq voqeaning tarixiy, siyosiy yoki ijtimoiy sabablari yetarlicha yoritilmasa, immersiv tajriba mazmuniy kontekstning o‘ rnini bosib qolishi mumkin. Shu sababli immersiv jurnalistik materiallarda qo‘ shimcha matnlar, hujjatlar, manba kartalari, statistik ma’lumotlar va faktlarni tushuntiruvchi axborot qatlamlaridan foydalanish maqsadga muvofiq. Bunday elementlar immersiv tajribani saqlagan holda, auditoriyaning voqeani kengroq kontekstda tushunishiga yordam beradi.

Yuqoridagi tahlillar asosida ishtirokchi va immersiv jurnalistika uchun to‘ rt bosqichli etik-verifikatsion modelni taklif etish mumkin:

1. Manbani identifikatsiya qilish – kontent muallifi, yaratilish vaqti va joyini aniqlash.
2. Faktni mustaqil tekshirish – ma’lumotni boshqa ishonchli manbalar va dalillar bilan solishtirish.
3. Kontekstni to‘ ldirish – voqeaning sabab va oqibatlarini tushuntiruvchi qo‘ shimcha ma’lumotlarni taqdim etish.
4. Kontent kelib chiqishini shaffof ko‘ rsatish – auditoriyaga material qanday yaratilgani, tanlangani va qayta ishlangani haqida ma’lumot berish.

Bu yondashuv sun’iy intellekt va avtomatlashtirilgan jurnalistika rivojlanayotgan sharoitda yanada muhim ahamiyat kasb etadi. Zamonaviy tadqiqotlarda sun’iy intellektning jurnalistik amaliyotga kirib kelishi yangi avtomatlashtirish imkoniyatlari bilan bir qatorda, narrativ, mualliflik, verifikatsiya va etik masalalarni ham yuzaga keltirayotgani qayd etiladi [7].

Demak, ishtirokchi va immersiv jurnalistikaning kelajakdagi rivojlanishida asosiy masala faqat texnologik yangiliklarni joriy etish emas, balki kontentning kelib chiqishi, aniqligi, ishonchliligi va shaffofligini ta'minlash bilan bog‘ liq bo‘ ladi.

XULOSA.

Ishtirokchi va immersiv jurnalistika raqamli media rivojlanishining o‘ zaro bog‘ liq ikki muhim yo‘ nalishini tashkil etadi. Ishtirokchi jurnalistika auditoriyani axborot yaratish va tarqatish jarayoniga faol jalb qilsa, immersiv jurnalistika foydalanuvchining voqea bilan hissiy va fazoviy aloqasini kuchaytiradi. Har ikkala yo‘ nalishda ham jurnalistikaning fundamental tamoyillari – aniqlik, verifikatsiya, kontekstual yondashuv va etik mas'uliyat – o‘ z ahamiyatini saqlab qoladi. Aksincha, texnologik imkoniyatlarning kengayishi ushbu tamoyillarni yanada qat'iy qo‘ llashni talab etadi.

Iste'molchi-ishlab chiqaruvchi va foydalanuvchi tomonidan yaratilgan kontent modeli axborot ishlab chiqarish jarayonini demokratlashtirish uchun yangi imkoniyatlar yaratadi, biroq foydalanuvchi kontentining ko‘ pligi uning avtomatik ravishda ishonchli bo‘ lishini anglatmaydi. VR va immersiv formatlar esa auditoriyaga kuchli hissiy tajriba berishi mumkin, ammo immersiya jurnalistik haqiqatning mutlaq kafolati sifatida talqin qilinmasligi kerak. Shu bois kelajak jurnalistikasi uchun asosiy mezon “ko‘ proq kontent” emas, balki “tekshirilgan, kontekstli va shaffof kontent” tamoyili bo‘ lishi lozim.

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TIBBIYOT SOHASIDAGI LOTIN TERMINLARINI O‘ QITISH TEXNOLOGIYASI

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Annotatsiya: *Ushbu maqolada tibbiyot yo‘ nalishida tahsil olayotgan talabalarga lotin tili va tibbiy terminologiyani o‘ qitishda zamonaviy pedagogik, interfaol hamda raqamli texnologiyalardan foydalanish masalalari tahlil qilinadi. Tadqiqotda elektron lug‘ atlar, terminologik ma’lumotlar bazalari, multimedia vositalari, onlayn ta’lim platformalari, mobil ilovalar, virtual laboratoriyalar, simulyatsiyalar va elektron baholash vositalarining didaktik imkoniyatlari yoritilgan. Shuningdek, terminologik kompetensiyani shakllantirishning reproduktiv, produktiv, qisman izlanishli va ijodiy bosqichlari hamda uni baholashning motivatsion, kognitiv, operatsion va refleksiv mezonlari tavsiflangan. O‘ rganish natijalari zamonaviy texnologiyalarni amaliyotga yo‘ naltirilgan, integrativ va shaxsga yo‘ naltirilgan yondashuvlar bilan uyg‘ unlashtirish talabalarning kasbiy terminologiyani o‘ zlashtirish samaradorligini oshirish imkonini berishini ko‘ rsatadi.*

Kalit so‘ zlar: *lotin tili, tibbiy terminologiya, terminologik kompetensiya, raqamli texnologiyalar, virtual laboratoriya.*

МЕТОДИКА ПРЕПОДАВАНИЯ ЛАТИНСКОЙ МЕДИЦИНСКОЙ ТЕРМИНОЛОГИИ

Аннотация: *В статье анализируются вопросы использования современных педагогических, интерактивных и цифровых технологий при обучении студентов медицинских специальностей латинскому языку и медицинской терминологии. В исследовании раскрываются дидактические возможности электронных словарей, терминологических баз данных, мультимедийных средств, онлайн-образовательных платформ, мобильных приложений, виртуальных лабораторий, симуляций и электронных средств оценивания. Также характеризуются репродуктивный, продуктивный, частично поисковый и творческий этапы формирования терминологической компетенции, а также мотивационные, когнитивные, операциональные и рефлексивные критерии её оценки. Результаты исследования показывают, что сочетание современных технологий с практико-ориентированным, интегративным и личностно-ориентированным подходами позволяет повысить эффективность освоения студентами профессиональной терминологии.*

Ключевые слова: *латинский язык, медицинская терминология, терминологическая компетенция, цифровые технологии, виртуальная лаборатория.*

METHODOLOGY FOR TEACHING LATIN MEDICAL TERMINOLOGY

Abstract: *This article analyzes the use of modern pedagogical, interactive, and digital technologies in teaching Latin and medical terminology to medical students. The study examines the didactic potential of electronic dictionaries, terminological databases, multimedia tools, online learning platforms, mobile applications, virtual laboratories, simulations, and electronic assessment tools. It also describes the reproductive, productive, partially exploratory, and creative stages of developing terminological competence, as well as the motivational, cognitive, operational, and reflective criteria for its assessment. The findings indicate that combining modern technologies with practice-oriented, integrative, and student-centered approaches can improve the effectiveness of students’ acquisition of professional terminology.*

Keywords: *Latin language, medical terminology, terminological competence, digital technologies, virtual laboratory.*

KIRISH

Zamonaviy ta’lim jarayonida axborot-kommunikatsiya texnologiyalarining jadal rivojlanishi o‘ qitish mazmuni va metodlarini yangilashni talab qilmoqda. Tibbiyot ta’limida bu jarayon ayniqsa muhim, chunki bo‘ lajak mutaxassis nafaqat nazariy bilimlarni, balki professional terminlarni to‘ g‘ ri anglash, talaffuz qilish, yozish va amaliy faoliyatda qo‘ llash ko‘ nikmalarini ham egallashi kerak. Lotin tili tibbiy terminologiyaning muhim asoslaridan biri bo‘ lib, shu sababli uni o‘ qitish metodikasini zamonaviylashtirish kasbiy tayyorgarlik sifatiga bevosita ta’sir ko‘ rsatadi.

Terminologik kompetensiya muayyan fan yoki kasbiy sohaga oid atamalarni tushunish, ularning mazmunini anglash va amaliy vaziyatda to‘ g‘ ri qo‘ llash qobiliyati bilan tavsiflanadi [3]. Maqolada ushbu tushuncha bilim, ko‘ nikma,

malaka va ularni real faoliyatda qo‘ llash qobiliyatlarining birligi sifatida qaraladi. Tadqiqot materiallarida kompetensiya tushunchasining turli fan vakillari tomonidan turlicha talqin qilinishi qayd etilgan bo‘ lib, terminologik kompetensiya terminologik mazmunni anglash va uni amaliyotga tatbiq etish bilan bog‘ lanadi.

Raqamli texnologiyalar mazkur jarayonni faqat axborot uzatish bilan cheklamay, talabaning mustaqil ishlashi, izlanishi, topshiriqlarni takroran bajarishi va bilimini nazorat qilishi uchun ham imkon yaratadi. Elektron lug‘ atlar, interaktiv dasturlar, onlayn kurslar va mobil ilovalar terminologik ma’lumotlarni vizual va audial shaklda qabul qilish, qayta ishlash va amaliyotda qo‘ llashga sharoit yaratadi [2].

Tadqiqotning maqsadi tibbiyot yo‘ nalishida lotin tili va tibbiy terminologiyani o‘ qitishda zamonaviy pedagogik hamda raqamli texnologiyalarning imkoniyatlarini aniqlash va terminologik kompetensiyani rivojlantirishga yo‘ naltirilgan metodik yondashuvlarni umumlashtirishdan iborat.

METODOLOGIYA

Tadqiqotda lotin tili va tibbiy terminologiyani o‘ qitishga oid metodik materiallar, terminologik kompetensiyani shakllantirish bosqichlari va zamonaviy ta’lim texnologiyalarining didaktik imkoniyatlari tahlil qilindi. Shuningdek, tizimli, integrativ, shaxsga yo‘ naltirilgan, kommunikativ, muammoli va texnologik yondashuvlardan foydalanish imkoniyatlari ko‘ rib chiqildi.

Tizimli yondashuv terminologik kompetensiyani o‘ zaro bog‘ liq bilim va ko‘ nikmalar majmui sifatida tashkil etishni nazarda tutadi. Integrativ yondashuv lotin tili va tibbiy terminologiyani anatomiya, fiziologiya, patologiya kabi boshqa tibbiy fanlar bilan bog‘ lashga imkon beradi. Shaxsga yo‘ naltirilgan yondashuvda talabaning individual imkoniyatlari, qiziqishi va ta’lim ehtiyojlari hisobga olinadi. Kommunikativ va muammoli yondashuvlar esa terminlarni real yoki modellashtirilgan kasbiy vaziyatlarda qo‘ llashga yo‘ naltiriladi [1].

Tadqiqotda 2023–2024, 2024–2025 va 2025–2026-o‘ quv yillarida bo‘ lajak tibbiyot xodimlarining terminologik kompetensiyasini rivojlantirish bilan bog‘ liq mavjud holat o‘ rganilgani ko‘ rsatilgan. Mazkur tahlil asosida terminlarni o‘ rganish metodikasi mazmunining rivojlanish bosqichlari va mezonlari aniqlangan.

Terminologik kompetensiyani shakllantirishda reproduktiv, produktiv, qisman izlanishli va ijodiy bosqichlar ajratiladi [4]. Reproduktiv bosqichda talaba tayyor namuna asosida bilimlarni o‘ zlashtiradi. Produktiv va qisman izlanishli bosqichlarda terminlarni turli topshiriqlarda mustaqil qo‘ llash, matn tuzish, matnni qisqartirish yoki qayta ishlash kabi faoliyatlar amalga oshiriladi. Ijodiy bosqichda esa talaba topshiriqni bajarish usuli va til vositalarini mustaqil tanlay oladi.

Baholash jarayonida motivatsion, kognitiv, operatsion va refleksiv mezonlarga tayaniladi. Bunda talabaning kasbiy terminologiyaga qiziqishi, nazariy bilim darajasi, terminlarni amaliyotda qo‘ llay olishi va o‘ z faoliyatini mustaqil tahlil qila bilishi asosiy ko‘ rsatkichlar sifatida qaraladi.

NATIJALAR

Tadqiqot natijalari tibbiyot ta’limida terminologik kompetensiyani rivojlantirishda interfaol pedagogik texnologiyalar va raqamli vositalarning o‘ zaro uyg‘ unligi muhimligini ko‘ rsatadi. Interfaol metodlar orasida kichik guruhlarda ishlash, aqliy hujum, rolli o‘ yinlar, case-study va muammoli ta’lim alohida o‘ rin tutadi. Klinik vaziyatlarni tahlil qilish jarayonida talabalar kasallik nomlari, simptomlar, tashxis va boshqa tibbiy tushunchalarni ifodalovchi lotin terminlarini bevosita qo‘ llaydilar. Bu esa terminlarning faqat yodlanishiga emas, balki ularning amaliy mazmunini anglashga yordam beradi.

Raqamli texnologiyalarning birinchi muhim yo‘ nalishi elektron ta’lim resurslaridan foydalanishdir. Elektron lug‘ atlar va terminologik ma’lumotlar bazalari yangi atamalarning ma’nosini tez topish, ularni kontekstda ko‘ rish va mustaqil takrorlash imkonini beradi. Elektron resurslardan foydalanish o‘ quv jarayonini individuallashtirish uchun ham qulay sharoit yaratadi. Talaba o‘ zlashtirish darajasiga qarab materialni takrorlashi yoki qo‘ shimcha topshiriqlarni bajarishi mumkin.

Multimedia materiallari ham terminlarni o‘ zlashtirish jarayonini boyitadi. Audio materiallar terminlarning talaffuzini to‘ g‘ ri shakllantirishga, videomateriallar esa terminlarning professional kontekstdagi qo‘ llanishini ko‘ rsatishga xizmat qiladi. Interaktiv videodarslar orqali terminning mazmuni va amaliy vaziyatdagi ishlatilishi bir vaqtda kuzatiladi. Bu usul ayniqsa o‘ quv materialini ko‘ rish va eshitish orqali qabul qiladigan talabalar uchun muhimdir.

Virtual laboratoriyalar va simulyatsiyalar yordamida talaba nazariy bilimni modellashtirilgan amaliy muhitda sinab ko‘ rishi mumkin. Tibbiyot ta’limida virtual bemorlar bilan ishlash, klinik vaziyatlarni modellashtirish va kasbiy muloqot stsenariylarini bajarish terminlarni real professional faoliyat bilan bog‘ laydi. Bunday yondashuv terminni alohida birlik sifatida emas, balki kasbiy kommunikatsiyaning tarkibiy qismi sifatida o‘ zlashtirish imkonini beradi.

Onlayn hamkorlik vositalari ham muhim natija beradi. Google Classroom, Moodle va Zoom kabi platformalarda guruh bilan topshiriqlar bajarish, loyihalar yaratish, terminologik materiallarni muhokama qilish va o‘ zaro baholash mumkin. Bu jarayon terminologik kompetensiya bilan birga kommunikativ va jamoaviy ishlash ko‘ nikmalarini ham rivojlantiradi.

Mobil ilovalar va interaktiv testlar terminologik materialni takrorlash hamda o‘ zlashtirish darajasini tezkor aniqlash imkonini beradi. Talaba terminlarni istalgan vaqtda takrorlashi, test topshiriqlarini bajarishi va xatolarini ko‘ rib chiqishi mumkin. O‘ qituvchi esa elektron baholash vositalari orqali bilimdagi bo‘ shliqlarni aniqlab, individual tuzatish ishlarini tashkil eta oladi.

Tadqiqotda terminologik kompetensiyani shakllantirishning mazmuniy yo‘ nalishlari ham aniqlangan. Talaba kasbiy bilimlarning ahamiyatini anglash, tibbiy terminlarning kasbiy kompetensiyadagi o‘ rnini tushunish, ularni amaliyotda qo‘ llash, zamonaviy ta’lim loyihalarini ishlab chiqish, elektron o‘ quv modullaridan foydalanish, virtual ta’lim muhitini tashkil etish va amaliy mashg‘ ulotlar bazasini takomillashtirish kabi ko‘ nikmalarga ega bo‘ lishi kerak.

MUHOKAMA

Olingan natijalar raqamli texnologiyalarning samarasi ularni darsga oddiy qo‘ shish bilan emas, balki aniq metodik vazifaga mos ravishda tashkil etish bilan belgilanadi, degan xulosaga kelish imkonini beradi. Elektron lug‘ atning o‘ zi terminni o‘ zlashtirishni kafolatlamaydi; terminni kasbiy matn, muloqot yoki amaliy vaziyat bilan bog‘ lash zarur. Shu sababli raqamli vositalar interfaol va amaliyotga yo‘ naltirilgan metodlar bilan birgalikda ishlatilishi lozim.

Amaliyotga yo‘ naltirilgan yondashuv tibbiyot ta’limida ayniqsa muhimdir. Retseptlar, kasallik tarixi, tashxis xulosalari va boshqa tibbiy hujjatlar bilan ishlash orqali talabalar nazariy terminologik bilimlarni amaliy vazifalarga ko‘ chira oladilar. Tibbiyot mutaxassislari bilan kasbiy muloqot stsenariylarini modellashtirish ham terminlarni vaziyatga mos tanlash va qo‘ llash ko‘ nikmasini rivojlantiradi.

Terminologik kompetensiyaning yuqori darajasi turli vaziyatlarda o‘ zlashtirilgan bilim va ko‘ nikmalarni mustaqil qo‘ llashga tayyorlik bilan tavsiflanadi. Shu nuqtai nazardan, kompetensiyani baholashda faqat test natijalariga tayanish yetarli emas. Talabaning mustaqil fikrlashi, kasbiy vaziyatda terminlardan foydalanishi, o‘ z xatolarini aniqlashi va o‘ z faoliyatini baholashi ham hisobga olinishi kerak. Tadqiqotda motivatsion, kognitiv, operatsion va refleksiv mezonlarning ajratilishi aynan mana shu kompleks yondashuvni ifodalaydi.

Metodik ta’minotni takomillashtirish ham muhim masala sifatida belgilanadi. O‘ quv adabiyotlarini yangilash, zamonaviy tibbiy terminologiyani elektron resurslarda aks ettirish, o‘ qituvchilarning raqamli kompetensiyasini oshirish va lotin tili fanini boshqa tibbiy fanlar bilan integratsiyalash zarur. Shuningdek, talabalar ehtiyojlarini hisobga olgan differensial metodik materiallarni ishlab chiqish taklif etiladi.

Maqolada kelajakdagi istiqbolli yo‘ nalishlar qatorida sun’iy intellekt, virtual va kengaytirilgan reallik hamda adaptiv ta’lim tizimlaridan foydalanish imkoniyatlari ham qayd etilgan. Bunday vositalar terminologik materiallarni individuallashtirish, amaliy vaziyatlarni modellashtirish va o‘ quv topshiriqlarini talabaning darajasiga moslashtirish uchun yangi imkoniyatlar yaratishi mumkin.

XULOSA

Tadqiqot natijalari tibbiyot sohasidagi lotin terminlarini o‘ qitishda zamonaviy pedagogik va raqamli texnologiyalardan foydalanish terminologik kompetensiyani rivojlantirish uchun muhim imkoniyat yaratishini ko‘ rsatdi. Elektron lug‘ atlar, terminologik bazalar, multimedia materiallari, mobil ilovalar, virtual laboratoriyalar, simulyatsiyalar, onlayn platformalar va elektron baholash vositalari o‘ quv jarayonini interaktiv, amaliy va talaba faoliyatiga yo‘ naltirilgan shaklda tashkil etishga yordam beradi.

Terminologik kompetensiyani rivojlantirish reproduktiv bosqichdan produktiv, qisman izlanishli va ijodiy bosqichga tomon izchil rivojlanishi kerak. Bunda motivatsion mezon kasbiy qiziqishni, kognitiv mezon bilimni, operatsion mezon amaliy qo‘ llashni, refleksiv mezon esa o‘ z faoliyatini tahlil qilishni ifodalaydi.

Lotin tili va tibbiy terminologiyani o‘ qitishda interfaol metodlar, raqamli texnologiyalar va amaliyotga yo‘ naltirilgan yondashuvni integratsiyalash bo‘ lajak tibbiyot xodimlarining kasbiy tayyorgarligini takomillashtiradi. Shu bilan birga, metodik ta’minotni muntazam yangilash, o‘ qituvchilarning raqamli kompetensiyasini oshirish va fanlararo integratsiyani kuchaytirish ushbu yo‘ nalishdagi muhim vazifalar bo‘ lib qoladi.

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BOSHLANG‘ ICH TA’LIMDA INGLIZ TILINI O‘ QITISHDA VALDORF PEDAGOGIKASIDAN FOYDALANISHNING NAZARIY-METODOLOGIK ASOSLARI

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Annotatsiya: *Mazkur maqolada boshlang‘ ich ta’lim bosqichida ingliz tilini o‘ qitishda Valdorf pedagogikasidan foydalanishning nazariy va metodologik asoslari tahlil qilinadi. Zamonaviy ta’lim jarayonida chet tilini erta yoshdan o‘ rgatish masalasi muhim pedagogik vazifalardan biri bo‘ lib, bunda bolaning yosh va psixologik xususiyatlarini hisobga oluvchi ta’lim texnologiyalarini tanlash alohida ahamiyat kasb etadi. Valdorf pedagogikasi bolaning intellektual rivojlanishi bilan bir qatorda uning hissiy, ijtimoiy, ijodiy va estetik rivojlanishiga ham e’tibor qaratishi bilan boshlang‘ ich chet tili ta’limi uchun muhim metodologik imkoniyatlarni taqdim etadi. Maqolada Valdorf pedagogikasining yaxlitlik, ritm, taqlid, faoliyat orqali o‘ rganish, san’at va ijodkorlik, bolaning tabiiy rivojlanishini qo‘ llab-quvvatlash kabi tamoyillari ingliz tilini o‘ qitish kontekstida tahlil qilinadi. Shuningdek, hikoya, qo‘ shiq, she’r, harakatli o‘ yinlar, dramatizatsiya, rasm chizish va kundalik kommunikativ vaziyatlardan foydalanishning metodik imkoniyatlari ochib beriladi. Tadqiqot natijasida boshlang‘ ich sinflarda ingliz tilini Valdorf pedagogikasi asosida tashkil etishning konseptual-metodik modeli taklif etiladi.*

Kalit so‘ zlar: *boshlang‘ ich ta’lim, ingliz tili, Valdorf pedagogikasi, Rudolf Steiner, chet tilini o‘ qitish, til ta’limi, bolalar pedagogikasi, o‘ yin, hikoya, ijodkorlik, kommunikativ faoliyat.*

ТЕОРЕТИКО-МЕТОДОЛОГИЧЕСКИЕ ОСНОВЫ ПРИМЕНЕНИЯ ВАЛЬДОРФСКОЙ ПЕДАГОГИКИ ПРИ ОБУЧЕНИИ АНГЛИЙСКОМУ ЯЗЫКУ НА НАЧАЛЬНОЙ СТУПЕНИ ОБРАЗОВАНИЯ

Аннотация: *В статье анализируются теоретико-методологические основы использования вальдорфской педагогики при обучении английскому языку в начальном образовании. В условиях современного образования особое значение приобретает раннее обучение иностранному языку с учетом возрастных, психологических, эмоциональных и социальных особенностей детей. Вальдорфская педагогика, ориентированная на целостное развитие личности ребенка, создает определенные методические возможности для организации обучения английскому языку в начальной школе. Рассматриваются такие принципы вальдорфской педагогики, как целостность образовательного процесса, ритм, обучение через подражание и деятельность, использование искусства и творчества, эмоциональная вовлеченность и поддержка естественного развития ребенка. Особое внимание уделяется использованию рассказов, песен, стихотворений, двигательных игр, драматизации, рисования и повседневных коммуникативных ситуаций в обучении английскому языку. В статье предлагается концептуально-методическая модель организации начального обучения английскому языку на основе отдельных принципов вальдорфской педагогики.*

Ключевые слова: *начальное образование, английский язык, вальдорфская педагогика, Рудольф Штайнер, обучение иностранному языку, языковое образование, детская педагогика, игра, рассказ, творчество, коммуникативная деятельность.*

ТЕОРЕТИКО-МЕТОДОЛОГИЧЕСКИЕ ОСНОВЫ ПРИМЕНЕНИЯ ВАЛЬДОРФСКОЙ ПЕДАГОГИКИ ПРИ ОБУЧЕНИИ АНГЛИЙСКОМУ ЯЗЫКУ НА НАЧАЛЬНОЙ СТУПЕНИ ОБРАЗОВАНИЯ

Abstract: *This article examines the theoretical and methodological foundations of applying Waldorf pedagogy to English language teaching in primary education. Early foreign language learning has become an important component of contemporary education, requiring teaching approaches that correspond to children’s cognitive, emotional, social, and developmental characteristics. Waldorf pedagogy, originally developed within the educational ideas of Rudolf Steiner, emphasizes the holistic development of the child and provides a number of pedagogical principles that can be meaningfully adapted to primary foreign language education. The article analyses such principles as rhythm, learning through imitation and activity, artistic and creative expression, storytelling, play, emotional engagement, and age-appropriate development. Particular attention is paid to the methodological potential of songs, poems,*

movement activities, stories, role-play, drawing, dramatization, and everyday communicative situations in English language teaching. The article proposes a conceptual and methodological model for integrating selected Waldorf principles into primary English language education. It is argued that the pedagogically appropriate adaptation of Waldorf-inspired practices can contribute to creating an emotionally supportive, creative, and meaningful language-learning environment. At the same time, the article emphasizes that Waldorf pedagogy should not be mechanically transferred to contemporary primary education but should be critically adapted to national curricula, learning outcomes, digital realities, and the developmental needs of learners.

Keywords: *primary education, English language teaching, Waldorf pedagogy, Rudolf Steiner, foreign language education, child development, storytelling, play-based learning, creativity, language teaching methodology.*

KIRISH

Bugungi globallashuv va xalqaro kommunikatsiya jarayonlari xorijiy tillarni, xususan, ingliz tilini erta yoshdan o‘ rgatishga bo‘ lgan ehtiyojni kuchaytirmoqda. Ingliz tili nafaqat xalqaro muloqot vositasi, balki zamonaviy ilm-fan, texnologiya, ta’lim va madaniyatlararo aloqalarning muhim vositasi sifatida namoyon bo‘ lmoqda. Shu sababli boshlang‘ ich ta’lim bosqichidayoq o‘ quvchilarda ingliz tiliga ijobiy munosabatni shakllantirish, tinglab tushunish va og‘ zaki nutqning dastlabki ko‘ nikmalarini rivojlantirish muhim pedagogik vazifalardan hisoblanadi.

Biroq boshlang‘ ich sinf o‘ quvchilariga ingliz tilini o‘ rgatish yuqori sinflardagi chet tili ta’limidan tubdan farq qiladi. Kichik yoshdagi bolalarda abstrakt tafakkur hali to‘ liq shakllanmagan bo‘ lib, ular bilimni ko‘ proq bevosita tajriba, harakat, takrorlash, taqlid, obraz va hissiy taassurotlar orqali o‘ zlashtiradilar. Shu nuqtayi nazardan, bolani faqat grammatik qoidalar va yodlashga asoslangan o‘ qitish usullari bilan cheklash samarali natija bermasligi mumkin.

Mazkur sharoitda bolaning tabiiy rivojlanishi, ijodkorligi, hissiy holati va faoliyatini ta’limning markaziga qo‘ yuvchi pedagogik yondashuvlarni o‘ rganish dolzarbdir. Shunday pedagogik yo‘ nalishlardan biri — Rudolf Steiner tomonidan XX asr boshlarida shakllantirilgan Valdorf pedagogikasidir.

Valdorf pedagogikasida bolaning intellektual rivojlanishi uning hissiy, ijtimoiy, jismoniy va ijodiy rivojlanishidan ajratib qaralmaydi. Ta’lim mazmunini bolaning rivojlanish bosqichlariga muvofiq tashkil etish, san’at, hikoya, musiqa, harakat va amaliy faoliyatdan foydalanish ushbu yondashuvning muhim jihatlaridan biridir.

Shu sababli Valdorf pedagogikasining barcha qoidalarini boshlang‘ ich ingliz tili ta’limiga to‘ liq ko‘ chirish emas, balki uning metodik jihatdan samarali elementlarini zamonaviy chet tili ta’limi bilan integratsiya qilish masalasi alohida ilmiy qiziqish uyg‘ otadi.

Tadqiqotning asosiy maqsadi boshlang‘ ich ta’limda ingliz tilini o‘ qitishda Valdorf pedagogikasining nazariy-metodologik imkoniyatlarini aniqlash hamda uning samarali elementlarini zamonaviy chet tili metodikasi bilan integratsiya qilishning pedagogik asoslarini ishlab chiqishdan iborat.

Mazkur maqsadga erishish uchun quyidagi vazifalar belgilandi:

Valdorf pedagogikasining nazariy asoslarini o‘ rganish;

boshlang‘ ich yoshdagi bolalarning ingliz tilini o‘ zlashtirish xususiyatlarini aniqlash;

Valdorf pedagogikasining asosiy tamoyillarini chet tili ta’limi nuqtayi nazaridan tahlil qilish;

hikoya, musiqa, o‘ yin, harakat va san’atning til o‘ rganishdagi metodik imkoniyatlarini aniqlash;

Valdorf pedagogikasi elementlarini kommunikativ va faoliyatga yo‘ naltirilgan ingliz tili ta’limi bilan integratsiya qilish yo‘ llarini belgilash;

boshlang‘ ich ingliz tili ta’limi uchun konseptual-metodik model taklif qilish.

Tadqiqotda nazariy tahlil, pedagogik modellashtirish, qiyosiy tahlil, tizimli yondashuv va metodik umumlashtirish usullaridan foydalanildi.

Tizimli yondashuv Valdorf pedagogikasi va ingliz tilini o‘ qitish metodikasining o‘ zaro bog‘ liq komponentlarini yaxlit pedagogik tizim sifatida ko‘ rib chiqishga imkon beradi.

Shaxsga yo‘ naltirilgan yondashuv bolaning individual rivojlanish sur’ati, qiziqishi, ehtiyoji va psixologik xususiyatlarini hisobga olishni nazarda tutadi.

Faoliyatga yo‘ naltirilgan yondashuv tilni faqat nazariy bilim sifatida emas, balki amaliy faoliyat jarayonida o‘ zlashtirishga urg‘ u beradi.

Kommunikativ yondashuv esa ingliz tilidan real yoki modellashtirilgan muloqot vaziyatlarida foydalanishni asosiy metodik maqsadlardan biri sifatida belgilaydi.

Valdorf pedagogikasi Rudolf Steinerning antropozofik falsafiy qarashlari bilan bog‘ liq holda XX asr boshlarida shakllangan. Birinchi Valdorf maktabi 1919-yilda Germaniyaning Stuttgart shahrida tashkil etilgan.

Ushbu pedagogik tizimning markazida bolaning yaxlit rivojlanishi g‘ oyasi turadi. Ta’lim jarayonida bolaning intellektual imkoniyatlari bilan bir qatorda uning hissiy, ijtimoiy, estetik va amaliy faoliyatiga ham e’tibor qaratiladi.

Valdorf pedagogikasining asosiy metodologik xususiyatlarini quyidagicha umumlashtirish mumkin:

yaxlit rivojlanish tamoyili;
yosh va rivojlanish bosqichlariga moslik;
ta’limda ritm va takroriylik;
taqlid va namuna orqali o‘ rganish;
o‘ yin va faoliyat orqali bilim olish;
san’at va ijodkorlikdan foydalanish;
hikoya va obrazlarning pedagogik imkoniyatlaridan foydalanish;
hissiy jihatdan qo‘ llab-quvvatlovchi ta’lim muhiti.

Ushbu tamoyillarning bir qismi zamonaviy boshlang‘ ich chet tili metodikasi bilan hamohangdir. Xususan, kichik yoshdagi bolalarni tilga jalb etishda qo‘ shiq, she’r, o‘ yin, harakat, hikoya va dramatizatsiyadan foydalanish keng qo‘ llanadi.

1. Ritm va takrorlash

Boshlang‘ ich yoshdagi bolalar uchun muntazam takrorlanadigan faoliyatlar o‘ quv jarayonini tushunarli va oldindan taxmin qilinadigan qiladi.

Masalan, ingliz tili darsining boshlanishida har kuni bir xil qisqa salomlashuv qo‘ shig‘ idan foydalanish mumkin:

“Good morning, good morning, how are you today?”

Keyinchalik ushbu ritmik faoliyatga:
weather;
days of the week;
feelings;
classroom objects
kabi mavzular kiritiladi.

Bunday takrorlash mexanik yodlash emas, balki kontekstual va hissiy takrorlash shaklida tashkil etilganda til birliklarining tabiiy o‘ zlashtirilishiga yordam beradi.

Valdorf pedagogikasida hikoya muhim pedagogik vositalardan biri hisoblanadi. Boshlang‘ ich ingliz tili ta’limida qisqa va obrazli hikoyalardan foydalanish o‘ quvchilarning tinglab tushunish, lug‘ at boyligi va tasavvurini rivojlantirishga xizmat qilishi mumkin.

Masalan, “A Little Red Bird” mavzusida qisqa hikoya beriladi:

“This is a little red bird. The bird lives in a tree. Every morning, the bird sings.”

O‘ qituvchi hikoyani rasmlar, imo-ishoralar va ovoz ohangi orqali ifodalaydi. O‘ quvchilar esa ayrim so‘ zlarni harakat bilan ko‘ rsatadilar.

Shunday qilib, yangi so‘ z:
bird —ko‘ rish + eshitish + harakat + obraz
orqali o‘ zlashtiriladi.

3. Qo‘ shiq va musiqa

Musiqa kichik yoshdagi bolalarning hissiy faolligini oshirish va til birliklarini ritmik tarzda takrorlash imkonini beradi.

Masalan:
Hello – hello!
How are you?
I’m happy,
How about you?
kabi qisqa qo‘ shiq orqali salomlashish va his-tuyg‘ ularni ifodalash birliklari o‘ rgatiladi.

Musiqiy faoliyat quyidagi ko‘ nikmalarni rivojlantirishga xizmat qilishi mumkin:
pronunciation;
listening;
vocabulary;
rhythm;
memory;
emotional engagement.

4. Harakatli o‘ yinlar

Valdorf yondashuvining faoliyatga asoslangan xususiyatlari boshlang‘ ich ingliz tili darslarida harakatli o‘ yinlar bilan uyg‘ unlashadi.

Masalan, “Touch and Say” o‘ yinida o‘ qituvchi:

“Touch the door!”

desa, o‘ quvchilar eshik yoniga borib, “door” so‘ zini takrorlaydilar.

Shuningdek:

“Stand up!”

“Sit down!”

“Walk!”

“Jump!”

“Turn around!”

“Touch the window!”

kabi buyruqlar orqali ingliz tili jismoniy faoliyat bilan birlashtiriladi.

Bunday yondashuv ayniqsa kichik yoshdagi o‘ quvchilar uchun muhim, chunki ularning diqqatini uzoq vaqt davomida faqat og‘ zaki tushuntirish orqali ushlab turish qiyin.

Valdorf pedagogikasida san’at ta’limning yordamchi vositasi emas, balki uning muhim tarkibiy qismi sifatida qaraladi. Ingliz tili darslarida rasm chizish, rang berish, qo‘ l mehnati va dramatizatsiyadan foydalanish mumkin.

Masalan, “My Family” mavzusida o‘ quvchilar oila a’zolarining rasmini chizadilar va:

This is my mother.

This is my father.

This is my brother.

kabi sodda gaplardan foydalanadilar.

Natijada ingliz tili lug‘ ati o‘ quvchining shaxsiy tajribasi bilan bog‘ lanadi.

Boshlang‘ ich yoshdagi bolalar rolli vaziyatlarga tez kirishadi. Shu sababli ingliz tilidagi oddiy dialoglarni dramatizatsiya qilish samarali metodik vosita bo‘ lishi mumkin.

Masalan:

At the shop

A: Hello!

B: Hello!

A: Can I have an apple, please?

B: Here you are.

A: Thank you.

B: You’re welcome.

O‘ quvchilar xaridor va sotuvchi rollarini bajaradilar.

Bu jarayonda til materiali abstrakt qoidalar orqali emas, balki faoliyat va muloqot orqali o‘ zlashtiriladi.

Valdorf pedagogikasining zamonaviy ingliz tili ta’limiga integratsiyasi uning barcha nazariy qoidalarini to‘ liq ko‘ chirishni anglatmaydi. Aksincha, boshlang‘ ich ta’limning davlat standarti, o‘ quv dasturi, zamonaviy kommunikativ metodlar va bolalarning individual ehtiyojlari bilan mos keladigan elementlarni tanlab olish zarur.

Quyidagi integratsion modelni taklif etish mumkin:

Valdorf elementi	Ingliz tili ta’limidagi vosita	Kutiladigan natija
Ritm	qo‘ shiq, chant, takrorlash	lug‘ at va talaffuzni mustahkamlash
Hikoya	story-based learning	listening va vocabulary
Harakat	action games, TPR	so‘ zlarni amaliy o‘ zlashtirish
San’at	drawing, colouring	ijodkorlik va vocabulary
Dramatizatsiya	role-play	speaking
Takrorlash	daily routines	avtomatlashgan til birliklari
Taqlid	teacher modelling	talaffuz va nutq namunalarini o‘ zlashtirish
Erkin ijod	storytelling, drawing	mustaqil fikrlash

Ushbu integratsiya orqali Valdorf pedagogikasining bolaning tabiiy rivojlanishiga yo‘ naltirilganligi zamonaviy chet tili metodikasining kommunikativ va faoliyatga asoslangan tamoyillari bilan uyg‘ unlashtiriladi.

XULOSA

Boshlang‘ ich ta’limda ingliz tilini o‘ qitishda Valdorf pedagogikasidan foydalanish bolaning yosh, psixologik, hissiy va ijodiy xususiyatlarini hisobga oluvchi ta’lim muhitini shakllantirish uchun muhim metodik imkoniyatlarga ega.

Tadqiqot natijasida Valdorf pedagogikasining ritm, takrorlash, taqlid, hikoya, san’at, musiqa, harakat va ijodkorlikka asoslangan elementlari boshlang‘ ich ingliz tili ta’limi bilan mazmunan uyg‘ unlashtirilishi mumkinligi aniqlandi.

Taklif etilgan metodik model maqsadli, mazmuniy, jarayonli va natijaviy bloklardan tashkil topib, ingliz tilini bolaning faol ishtiroki, ijodkorligi va real kommunikativ faoliyati orqali o‘ zlashtirishga yo‘ naltiriladi.

Valdorf pedagogikasining asosiy pedagogik qiymati ingliz tilini faqat grammatik va leksik birliklar yig‘ indisi sifatida emas, balki bola faoliyati, tasavvuri, hissiyoti va ijtimoiy tajribasi bilan bog‘ langan ta’lim mazmuni sifatida tashkil etish imkoniyatida namoyon bo‘ ladi.

Shu bilan birga, ushbu pedagogik yondashuvni O‘ zbekiston boshlang‘ ich ta’lim tizimiga tatbiq etishda uning tarixiy-falsafiy asoslarini mexanik tarzda ko‘ chirishdan ko‘ ra, ilmiy asoslangan va metodik jihatdan mos elementlarini milliy o‘ quv dasturlari, kompetensiyaviy yondashuv va zamonaviy ingliz tili o‘ qitish texnologiyalari bilan integratsiya qilish maqsadga muvofiqdir.

Kelgusidagi tadqiqotlarda taklif etilgan metodikaning tajriba-sinov asosida samaradorligini aniqlash, boshlang‘ ich sinf o‘ quvchilarining ingliz tiliga bo‘ lgan motivatsiyasi, lug‘ at boyligi, tinglab tushunish va og‘ zaki nutq ko‘ rsatkichlaridagi o‘ zgarishlarni empirik jihatdan o‘ rganish muhim ilmiy vazifa hisoblanadi.

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MAKTAB O‘ QUVCHILARINING SOG‘ LOM TURMUSH TARZINI SHAKLLANTIRISHDA GIMNASTIKA MASHG‘ ULOTLARINING O‘ RNI

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Annotatsiya: *Mazkur maqolada maktab o‘ quvchilarida sog‘ lom turmush tarzini shakllantirishda gimnastika mashg‘ ulotlarining pedagogik, jismoniy va tarbiyaviy imkoniyatlari ilmiy-nazariy jihatdan tahlil qilingan. Tadqiqotning asosiy e’tibori gimnastika mashqlarining o‘ quvchilarning jismoniy sifatlari, harakat faolligi, qad-qomati, muvozanat, chaqqonlik, egiluvchanlik, kuch va chidamlilik ko‘ rsatkichlariga ta’siri bilan bir qatorda, muntazam jismoniy faoliyatga bo‘ lgan ehtiyojni shakllantirish masalasiga qaratilgan. O‘ zbekistonlik olimlar T.S.Usmonxo‘ jayev, I.I.Morgunova, A.Abdullayev, Sh.Xonkeldiyev, K.Mahkamjonov, S.Uraimov va boshqa tadqiqotchilarning jismoniy tarbiya hamda sog‘ lomlashtirishga oid ilmiy-metodik qarashlari tahlil qilindi. Muallif tomonidan ushbu yondashuvlar umumlashtirilib, gimnastika mashg‘ ulotlarini faqat jismoniy sifatlarni rivojlantirish vositasi sifatida emas, balki o‘ quvchida kundalik sog‘ lom hayot odatlarini shakllantiruvchi pedagogik vosita sifatida qarash taklif etiladi. Tadqiqot natijasida maktab sharoitida gimnastika mashg‘ ulotlarini sog‘ lom turmush tarzi komponentlari bilan integratsiyalashgan holda tashkil etishning metodik jihatlari asoslab berilgan.*

Kalit so‘ zlar: *gimnastika, maktab o‘ quvchisi, sog‘ lom turmush tarzi, jismoniy tarbiya, jismoniy faollik, jismoniy sifatlar, qad-qomat, harakat faolligi, sog‘ lomlashtirish, pedagogik jarayon*

РОЛЬ ЗАНЯТИЙ ГИМНАСТИКОЙ В ФОРМИРОВАНИИ ЗДОРОВОГО ОБРАЗА ЖИЗНИ У ШКОЛЬНИКОВ

Аннотация: *В статье научно-теоретически анализируются педагогические, физические и воспитательные возможности гимнастических занятий в формировании здорового образа жизни школьников. Основное внимание уделено влиянию гимнастических упражнений на развитие физических качеств, двигательной активности, осанки, равновесия, ловкости, гибкости, силы и выносливости учащихся, а также формированию устойчивой потребности в регулярной физической активности. Рассмотрены научно-методические взгляды узбекских ученых в области физического воспитания и оздоровления. Автором обобщены существующие подходы и предложено рассматривать гимнастику не только как средство развития физических качеств, но и как педагогический инструмент формирования повседневных навыков здорового образа жизни.*

Ключевые слова: *гимнастика, школьники, здоровый образ жизни, физическое воспитание, физическая активность, физические качества, осанка, двигательная активность, оздоровление.*

THE ROLE OF GYMNASTICS TRAINING IN SHAPING A HEALTHY LIFESTYLE AMONG SCHOOLCHILDREN

Abstract: *The article presents a scientific and theoretical analysis of the pedagogical, physical and educational potential of gymnastics training in developing a healthy lifestyle among school students. Particular attention is paid to the influence of gymnastics exercises on physical qualities, motor activity, posture, balance, agility, flexibility, strength and endurance, as well as on the formation of a sustainable need for regular physical activity. The scientific and methodological views of Uzbek scholars in the field of physical education and health promotion are reviewed. The author summarizes these approaches and proposes considering gymnastics not only as a means of developing physical qualities but also as a pedagogical tool for developing everyday healthy lifestyle habits among school students.*

Keywords: *gymnastics, school students, healthy lifestyle, physical education, physical activity, physical qualities, posture, motor activity, health promotion.*

KIRISH

Bugungi ta’lim jarayonida o‘ quvchining faqat bilim olishi emas, balki uning jismoniy, ruhiy va ijtimoiy jihatdan barkamol rivojlanishi ham muhim pedagogik vazifalardan biri sifatida qaralmoqda. Ayniqsa, maktab yoshida shakllangan kundalik odatlar insonning keyingi hayot tarziga bevosita ta’sir ko‘ rsatishi sababli o‘ quvchilarda sog‘ lom turmush tarzi madaniyatini tarkib toptirish alohida ahamiyat kasb etadi. Sog‘ lom turmush tarzi faqat kasalliklarning oldini olish yoki sport bilan shug‘ ullanish bilangina chegaralanmaydi. U kundalik harakat faolligi, to‘ g‘ ri ovqatlanish, mehnat va dam olish tartibi, gigiyena, yetarli uyqu, psixologik barqarorlik hamda jismoniy faollikka ongli munosabat kabi bir-biri bilan bog‘ liq omillar majmuasini tashkil etadi.

Shu nuqtayi nazardan, umumiy o‘ rta ta’lim maktablarida jismoniy tarbiya darslarining mazmuni va tashkil etilishiga qo‘ yiladigan talablar yanada ortib bormoqda. O‘ zbekistonda gimnastika sport turlarini rivojlantirish bo‘ yicha davlat siyosatida ham maktab yoshidagi bolalarni gimnastikaga jalb etish masalasiga alohida e’tibor berilgan. Xususan, Prezidentning 2022-yil 23-dekabrdagi PQ-449-son qarorida umumiy o‘ rta ta’lim maktablarining boshlang‘ ich sinf o‘ quvchilari uchun “Bolalar uchun gimnastika” dasturini joriy etish belgilangan. Hujjatda gimnastikani sog‘ lom turmush tarzining muhim tarkibiy qismi sifatida targ‘ ib qilish vazifasi ham ko‘ rsatilgan [1].

Demak, gimnastikani maktab jismoniy tarbiyasi tizimida qo‘ llash masalasiga faqat sport natijalari nuqtayi nazaridan yondashish yetarli emas. Gimnastikaning tarbiyaviy va sog‘ lomlashtiruvchi imkoniyatlarini o‘ quvchining kundalik hayot tarzini shakllantirish bilan bog‘ lash masalaning muhim jihatlaridan biridir.

Bizningcha, ushbu yondashuvning maktab o‘ quvchilari uchun ham muhim jihati shundaki, jismoniy mashq bolaning hayotida bir martalik faoliyat emas, balki muntazam ehtiyojga aylanishi kerak. Ya’ni, o‘ quvchi gimnastika mashg‘ ulotida mashqni bajarganligi bilan emas, balki undan tashqari vaqtda ham harakatlanishga intilishi bilan sog‘ lom turmush tarzining faol subyektiga aylanadi [2]. O‘ zbekistonda jismoniy tarbiya nazariyasi va metodikasining rivojiga katta hissa qo‘ shgan olimlardan biri T.S.Usmonxo‘ jayev hisoblanadi. Uning “Maktabgacha yoshdagilar sog‘ lom turmush tarzi jismoniy madaniyatida, gimnastika va massaj” o‘ quv qo‘ llanmasida gimnastika va jismoniy mashqlarni sog‘ lom turmush tarzi bilan bog‘ liq holda tashkil etish masalalariga e’tibor qaratilgan.

Biz I.I. Morgunovaning metodik yondashuvini sog‘ lom turmush tarzi nuqtayi nazaridan davom ettirib, gimnastika mashqlarini o‘ quvchiga shunchaki bajariladigan harakatlar yig‘ indisi sifatida emas, balki harakat madaniyatini shakllantiruvchi vosita sifatida baholash zarur, deb hisoblaymiz. Chunki mashqni to‘ g‘ ri bajarish, nafas olishni nazorat qilish, gavdani to‘ g‘ ri tutish va harakatlar ketma-ketligiga rioya qilish bolaning kundalik hayotidagi jismoniy xulq-atvoriga ham ko‘ chadi [3].

Gimnastika mashg‘ ulotlarini sog‘ lom turmush tarzini shakllantirish bilan bog‘ lashda metodik asos bo‘ lib xizmat qiladi. Chunki haftada bir necha marotaba o‘ tkaziladigan jismoniy tarbiya darsi o‘ quvchining barcha kunlarini qamrab ololmaydi. Shu sababli gimnastik mashqlarni ertalabki badantarbiya, tanaffusdagi harakatli mashqlar, to‘ garak mashg‘ ulotlari va uy sharoitidagi oddiy mashqlar bilan bog‘ lash maqsadga muvofiq [4]. S.Uraimovning umumta’lim maktablarida jismoniy tarbiya tizimini shakllantirish va rivojlantirishga bag‘ ishlangan tadqiqotlarida majburiy jismoniy tarbiya mashg‘ ulotlarini darsdan tashqari sog‘ lomlashtirish ishlari bilan to‘ ldirish masalasiga e’tibor qaratilgan. Olim jismoniy tarbiya mashg‘ ulotlarini metodik jihatdan to‘ g‘ ri tashkil etish o‘ quvchilarning jismoniy tayyorgarligini oshirishga xizmat qilishi mumkinligini ta’kidlaydi.

TADQIQOTNING MAQSADI

Tadqiqotning maqsadi maktab o‘ quvchilarida sog‘ lom turmush tarzini shakllantirishda gimnastika mashg‘ ulotlarining o‘ rni va pedagogik imkoniyatlarini ilmiy-nazariy jihatdan asoslash hamda maktab jismoniy tarbiyasi jarayonida gimnastika vositalaridan foydalanishning metodik yo‘ nalishlarini aniqlashdan iborat.

TADQIQOT VAZIFALARI:

1. Sog‘ lom turmush tarzi va jismoniy faollik tushunchalarining o‘ zaro bog‘ liqligini aniqlash.
2. Gimnastikaning o‘ quvchilar jismoniy rivojlanishiga ta’sirini tahlil qilish.
3. O‘ zbek olimlarining jismoniy tarbiya va gimnastika bo‘ yicha ilmiy-metodik qarashlarini umumlashtirish.
4. Gimnastika mashg‘ ulotlarining sog‘ lom turmush tarzi ko‘ nikmalarini shakllantirishdagi pedagogik imkoniyatlarini aniqlash.
5. Maktab sharoitida gimnastika mashg‘ ulotlarini tashkil etishning amaliy yo‘ nalishlarini ishlab chiqish.

TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-tahliliy xarakterga ega bo‘ lib, unda ilmiy-metodik adabiyotlarni tahlil qilish, qiyosiy tahlil, tizimlashtirish, umumlashtirish, pedagogik kuzatuvga oid ilmiy qarashlarni tahlil qilish va ilmiy manbalarni kontent jihatdan o‘ rganish metodlaridan foydalanildi.

Tadqiqotning nazariy asosini O‘ zbekistonlik olimlarning jismoniy tarbiya, sport, gimnastika va sog‘ lomlashtirishga oid ilmiy-metodik qarashlari tashkil etdi. Jumladan, T.S. Usmonxo‘ jayev, I.I. Morgunova, A. Abdullayev, Sh. Xonkeldiyev, K. Mahkamjonov, S. Uraimov kabi mutaxassislarning ishlari tahlil qilindi.

Shuningdek, zamonaviy ilmiy maqolalarda maktab o‘ quvchilarining sog‘ lom turmush tarzini jismoniy madaniyat vositalari orqali shakllantirish masalalari ham ko‘ rib chiqilgan. Xususan, 2026-yilda S. Uraimov va I. Akramov tomonidan chop etilgan tadqiqotda sog‘ lom turmush tarzi o‘ quvchining ongli va tizimli faoliyati sifatida talqin qilinib, jismoniy madaniyat shaxsning umumiy madaniy rivojlanishidagi integrativ omil sifatida qaralgan [5].

Mazkur tadqiqot uchun muhim metodologik tamoyil shundan iboratki, sog‘ lom turmush tarzini shakllantirishni faqat jismoniy ko‘ rsatkichlarning o‘ zgarishi bilan chegaralab bo‘ lmaydi. O‘ quvchining jismoniy mashqqa munosabati, muntazamlik, o‘ z-o‘ zini nazorat qilish, intizom, xavfsizlik qoidalariga rioya qilish va harakat faolligiga bo‘ lgan ichki ehtiyoji ham mazkur jarayonning muhim ko‘ rsatkichlari sifatida qaralishi lozim.

TADQIQOT NATIJALARI

Tadqiqot davomida o‘ rganilgan ilmiy-metodik manbalarni umumlashtirish natijasida gimnastika mashg‘ ulotlarining maktab o‘ quvchilarida sog‘ lom turmush tarzini shakllantirishga ta’sirini bir necha o‘ zaro bog‘ liq yo‘ nalishlarga ajratish mumkin.

1. Gimnastika va jismoniy sifatlarning rivojlanishi

Gimnastikaning eng muhim imkoniyatlaridan biri uning turli jismoniy sifatlarni kompleks rivojlantirish imkonini berishidir. Mashqlar mazmuniga qarab kuch, egiluvchanlik, chaqqonlik va chidamlilikni rivojlantirish mumkin.

Gimnastika mashqlarining xilma-xilligi maktab o‘ quvchilarining yosh va individual xususiyatlariga mos ravishda mashg‘ ulot mazmunini o‘ zgartirish imkonini beradi. Masalan, kichik yoshdagi o‘ quvchilarda oddiy muvozanat mashqlari, egilishlar, saf mashqlari, yurish va yengil sakrashlardan foydalanish mumkin bo‘ lsa, yuqori sinflarda murakkabroq koordinatsion mashqlar, kuch va egiluvchanlikni rivojlantiruvchi mashqlar qo‘ llanadi.

2. Gimnastika va qad-qomat

Maktab yoshida bolaning tayanch-harakat tizimi faol rivojlanadi. Shu sababli gavdani to‘ g‘ ri tutish, umurtqa pog‘ onasiga tushadigan yuklamani me’yorlash va mushaklar faoliyatini uyg‘ un rivojlantirish muhimdir.

K.Mahkamjonovning boshlang‘ ich sinflar jismoniy tarbiyasiga oid materiallarida organizmni chiniqtirish, to‘ g‘ ri qad-qomatni shakllantirish va jismoniy mashqlarni bajarishda to‘ g‘ ri nafas olishga oid nazariy bilimlarga e’tibor berilgan [6].

Zamonaviy tadqiqotlarda ham o‘ smirlar, xususan, qizlarda jismoniy faollik, gigiyena, ovqatlanish va boshqa omillarning qad-qomat shakllanishi bilan bog‘ liqligi ko‘ rsatilmoqda.

3. Gimnastika va harakat faolligi

Sog‘ lom turmush tarzining asosiy belgilaridan biri muntazam harakat faolligidir. Maktab o‘ quvchilarining kundalik hayotida o‘ quv yuklamasi, kompyuter va mobil qurilmalardan foydalanish hamda uzoq vaqt o‘ tirib qolish jismoniy faollikning kamayishiga sabab bo‘ lishi mumkin. Shu sababli gimnastika mashg‘ ulotlarini maktabdagi jismoniy tarbiya darslari bilangina bog‘ lab qo‘ ymasdan, darsdan tashqari faoliyatga ham olib chiqish muhimdir. Ertalabki gimnastika, jismoniy tarbiya daqiqalari, tanaffusdagi yengil mashqlar, sport to‘ garaklari va uy sharoitidagi oddiy mashqlar bir butun tizimni tashkil etishi mumkin.

4. Gimnastika va psixologik farovonlik

Gimnastikaning ahamiyatini faqat fiziologik yoki jismoniy ko‘ rsatkichlar bilan izohlash masalaning bir tomoninigina ko‘ rsatadi. Jismoniy mashqlar o‘ quvchining o‘ ziga bo‘ lgan ishonchi, intizomi, o‘ z-o‘ zini boshqarishi va jamoada faol ishtirok etishiga ham pedagogik jihatdan ijobiy sharoit yaratishi mumkin.

Muallifning avvalgi tadqiqotida ham gimnastika mashg‘ ulotlarining psixologik sog‘ lomlashtirishdagi o‘ rni, stressning oldini olish, ruhiy barqarorlik, ijobiy kayfiyat, intizom va o‘ z-o‘ zini boshqarish masalalari tahlil qilingan [7]. O‘ quvchi mashqni mustaqil bajarib, natijasini kuzatib va asta-sekin murakkabroq harakatlarni o‘ zlashtirib borgani sari unda “men bajara olaman” degan ichki ishonch shakllanadi. Bu esa jismoniy faollikni majburiyatdan ehtiyojga aylantirish uchun muhim pedagogik shartlardan biridir.

5. Gimnastika va intizom

Gimnastika mashg‘ ulotlari muayyan tartib asosida tashkil etiladi. Safga turish, mashg‘ ulotni boshlash, qizdirish mashqlarini bajarish, asosiy mashqlarga o‘ tish, xavfsizlik talablariga rioya qilish va mashg‘ ulotni yakunlash kabi jarayonlar o‘ quvchidan intizomni talab qiladi. Bunday tartib o‘ quvchida faqat sportga oid ko‘ nikmalarni emas, balki o‘ z faoliyatini rejalashtirish va nazorat qilish ko‘ nikmalarini ham shakllantirishi mumkin. Shu jihatdan gimnastikani sog‘ lom turmush tarzi bilan bog‘ lashda “mashq bajarish” va “mashq qilish madaniyati” tushunchalarini farqlash lozim [8].

XULOSA

Maktab o‘ quvchilarining sog‘ lom turmush tarzini shakllantirish bugungi ta’lim tizimining muhim vazifalaridan biridir. Mazkur jarayonda gimnastika mashg‘ ulotlari o‘ zining ko‘ p qirrali imkoniyatlari bilan alohida ahamiyat kasb etadi.

Tadqiqot natijalari asosida quyidagi xulosalarga kelindi:

1. Gimnastika o‘ quvchilarning jismoniy sifatlarini kompleks rivojlantirish imkonini beradi. Mashqlar orqali kuch, chidamlilik, egiluvchanlik, chaqqonlik, muvozanat va koordinatsiyani rivojlantirish mumkin.

2. Gimnastika harakat faolligini oshirishning samarali vositalaridan biridir. Uni maktab darslari bilan bir qatorda ertalabki badantarbiya, tanaffus mashqlari va darsdan tashqari to‘ garaklar bilan bog‘ lash mumkin.

3. Gimnastika qad-qomatni shakllantirishga xizmat qilishi mumkin. Ayniqsa, maktab yoshida gavdani to‘ g‘ ri tutish, harakatlarni nazorat qilish va to‘ g‘ ri nafas olish ko‘ nikmalarini shakllantirish muhimdir.

4. Gimnastika psixologik-tarbiyaviy imkoniyatlarga ham ega. Muntazam mashg‘ ulotlar orqali intizom, o‘ z-o‘ zini nazorat qilish, mas’uliyat va o‘ z kuchiga ishonch kabi sifatlarni tarbiyalash uchun pedagogik sharoit yaratiladi.

Shunday qilib, gimnastika mashg‘ ulotlarini maktab jismoniy tarbiya tizimida to‘ g‘ ri metodik asosda tashkil etish o‘ quvchilarning jismoniy rivojlanishiga xizmat qilish bilan bir qatorda, ularda harakatga bo‘ lgan ijobiy munosabat, o‘ z salomatligiga mas’uliyatli yondashuv va sog‘ lom turmush tarziga oid barqaror odatlarning shakllanishiga zamin yaratadi.

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METHODS FOR DEVELOPING ANALYTICAL THINKING IN HISTORY STUDENTS THROUGH HISTORICAL SOURCES

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Abstract: *This article examines a system of methods for developing analytical thinking in undergraduate history students through purposeful work with historical sources. The study treats analytical thinking not as a generic ability to criticize information, but as a disciplinary competence integrating source attribution, contextualization, corroboration, causal-temporal reasoning, perspective recognition, and evidence-based argumentation. An integrative qualitative design was used to compare Uzbek source-study and history-teaching scholarship with internationally established models of historical thinking.*

Keywords: *historical sources; analytical thinking; history students; source criticism; historical inquiry; corroboration; contextualization; evidence-based argumentation.*

МЕТОДЫ РАЗВИТИЯ АНАЛИТИЧЕСКОГО МЫШЛЕНИЯ У СТУДЕНТОВ-ИСТОРИКОВ НА ОСНОВЕ ИСТОРИЧЕСКИХ ИСТОЧНИКОВ

Аннотация: *В данной статье рассматривается система методов развития аналитического мышления у студентов-историков посредством целенаправленной работы с историческими источниками. В исследовании аналитическое мышление рассматривается не как общая способность критически оценивать информацию, а как дисциплинарная компетенция, интегрирующая атрибуцию источников, контекстуализацию, подтверждение, причинно-следственное и временное рассуждение, распознавание перспектив и аргументацию, основанную на доказательствах. Для сравнения узбекской источниковедческой и педагогической практики в области истории с общепринятыми на международном уровне моделями исторического мышления использовался интегративный качественный подход.*

Ключевые слова: *исторические источники; аналитическое мышление; студенты-историки; критика источников; историческое исследование; подтверждение; контекстуализация; аргументация, основанная на доказательствах.*

TARIXIY MANBALAR ASOSIDA TARIX TALABALARIDA ANALITIK FIKRLASHNI RIVOJLANTIRISH USULLARI

Annotatsiya: *Ushbu maqola tarixiy manbalar bilan maqsadli ishlash orqali bakalavr darajasidagi tarix talabalarida analitik fikrlashni rivojlantirish usullari tizimini o‘ rganadi. Tadqiqot analitik fikrlashni axborotni tanqid qilishning umumiy qobiliyati sifatida emas, balki manba atributi, kontekstualizatsiya, tasdiqlash, sabab-vaqtinchalik mulohaza yuritish, nuqtai nazarni aniqlash va dalillarga asoslangan argumentatsiyani birlashtirgan intizomiy kompetentsiya sifatida ko‘ rib chiqadi. O‘ zbek manbashunosligi va tarix o‘ qitish ilmiy tadqiqotlarini xalqaro miqyosda tan olingan tarixiy fikrlash modellari bilan taqqoslash uchun integrativ sifatli dizayn qo‘ llanildi.*

Kalit so‘ zlar: *tarixiy manbalar; analitik fikrlash; tarix talabalari; manba tanqidi; tarixiy tadqiqot; tasdiqlash; kontekstualizatsiya; dalillarga asoslangan argumentatsiya*

INTRODUCTION

Contemporary higher education can no longer define successful history learning as the accurate reproduction of a settled narrative. Students encounter the past through textbooks, archival documents, material objects, oral testimony, maps, photographs, statistical records, newspapers, memoirs, and digitized collections whose claims differ in purpose, scale, reliability, and representativeness. A history graduate must therefore determine what a source says, who produced it, for which audience, what it omits, how it relates to other evidence, and how far an inference is warranted. Developing such judgment is essential because the quality of historical knowledge depends on disciplined interpretation rather than the mechanical accumulation of facts. Analytical thinking in history is a domain-specific configuration of intellectual operations. It includes decomposing a complex problem into investigable questions; distinguishing event, process,

structure, and interpretation; identifying assertions and assumptions; comparing accounts; establishing temporal sequence; reasoning about causation and consequence; recognizing change and continuity; and constructing a defensible explanation from incomplete evidence. These operations are related to general critical thinking, yet they cannot be reduced to generic logic. A statement may be internally coherent and still be historically weak if it ignores provenance, chronology, genre, or the unequal survival of evidence. Wineburg's research demonstrated that expert historical reading involves sourcing, contextualization, and corroboration rather than immediate acceptance of surface meaning [3; 4]. Historical sources possess distinctive didactic potential because they expose students to the evidentiary basis and constructed character of historical knowledge. A textbook normally compresses competing traces into a continuous account, whereas a source preserves discontinuity, perspective, silence, and ambiguity. When students compare an administrative decree with a private letter, a tax register with a memoir, or an official photograph with oral testimony, they must negotiate differences between intention and reception, norm and practice, individual experience and structural tendency. Seixas and Morton's framework clarifies that evidence is inseparable from historical significance, continuity and change, cause and consequence, historical perspectives, and the ethical dimension [5]. Source work can therefore connect close reading with explanation when tasks require students to show how traces support, qualify, or contradict a claim.

Nevertheless, merely placing primary sources before students does not automatically produce analytical thinking. Novices often read documents as transparent containers of facts, judge credibility solely by whether an author was present, substitute moral approval for contextual interpretation, or select only evidence that confirms an initial opinion. Linguistic difficulty, unfamiliar scripts, incomplete background knowledge, and the authority assigned to printed texts can intensify these tendencies. Digital abundance adds a paradox: access expands while authentication of origin, metadata, editing history, and representativeness becomes more demanding. Effective pedagogy must therefore make the procedures of historical inquiry explicit and gradually transfer responsibility for them from teacher to student. The most productive methods organize source analysis as a sequence of questions rather than as an invitation to express impressions. Sourcing prompts identify authorship, genre, date, audience, purpose, and conditions of production. Contextualization locates the document within contemporaneous institutions, concepts, conflicts, and possibilities, thereby limiting presentist readings. Corroboration requires comparison across sources that vary in position and form, while close reading examines vocabulary, rhetoric, contradictions, and silences. Reisman's document-based curriculum shows how repeated engagement with these routines can transform reading when embedded in coherent lessons rather than isolated exercises [6]. Nokes frames the connection between source reading and evidence-based interpretation as historical literacy [9]. These core routines should be combined with problem-based and dialogic methods. A document laboratory asks groups to reconstruct an event from an incomplete dossier; an evidence jigsaw distributes contrasting sources so no group can solve the problem independently; a structured academic controversy requires competing explanations before a revised synthesis; and a causal map ranks conditions, catalysts, decisions, and consequences. Timeline reconstruction, source annotation, microhistory, archival simulation, and claim-evidence-reasoning writing make analytical operations visible. VanSledright's inquiry-oriented work supports this shift from coverage to investigation by showing that students can participate in historical problem solving when disciplinary procedures are scaffolded [7].

LITERATURE REVIEW

Within Uzbek scholarship, the works of Abdumajid Madraimov and Uktamjon Mansurov provide two complementary foundations for designing source-based analytical learning, and both scholars' publications are traceable in Google Scholar. Madraimov, together with Gavhar Fuzailova, systematizes the disciplinary foundations of source studies in the textbook Manbashunoslik [1]. Its importance for the present problem lies in the treatment of a historical source as an object that must be identified, classified, described, and critically interpreted before it can support a historical conclusion. The authors distinguish the theoretical tasks of source studies from the practical examination of materials relating to different periods of Uzbekistan's history and draw attention to the conditions of origin, authorship, form, content, transmission, and scholarly use of evidence. Pedagogically interpreted, this framework supplies the architecture of analytical thinking: students must move from external attributes and provenance to internal meaning, compare the information capacity of different source types, identify limitations, and avoid equating a surviving record with the totality of the past. Madraimov's contribution is consequently epistemic and procedural; it disciplines the transition from document to claim and makes source criticism an explicit sequence of reasoned decisions. Mansurov, in collaboration with A. R. Raxmatullayeva, approaches the issue from the organization of history teaching in Tarix o‘ qitish metodikasi [2]. Their methodological position emphasizes the interdependence of educational aims, historical content, teaching methods, learning activities, and demonstrable outcomes. The work consolidates practical experience in history instruction and discusses ways of increasing effectiveness through purposeful lesson design, visual and documentary materials, independent activity, and methodologically justified selection of techniques. For analytical-thinking development, Mansurov's central value is the insistence that a method is productive only when it activates a specific cognitive action: comparison should disclose similarity and difference; problem questions should generate an evidentiary search; and

independent work should culminate in explanation rather than transcription. More specifically, their combined logic supports three levels of student work. At the descriptive level, learners identify a source and extract relevant information; at the analytical level, they relate form, origin, and context to evidentiary value; at the interpretive level, they compare sources and justify a conclusion. This progression connects technical source description with movement from guided performance to independent reasoning while keeping national historical materials at the centre of instruction. Read together, the two scholars establish a productive division of labour. Madraimov specifies what responsible work with sources requires from the standpoint of historical knowledge, while Mansurov clarifies how those requirements can be converted into goals, tasks, instructional sequences, and assessment within the educational process. Yet a gap remains between the source-critical operation and the observable student competence.

METHODOLOGY

The article employed an integrative qualitative methodology designed for conceptual and pedagogical synthesis rather than for measuring an intervention with human participants. The bibliographic corpus comprised ten works selected according to four criteria: direct relevance to historical sources or historical-thinking instruction; identifiable authorship and stable publication data; scholarly traceability through Google Scholar or an established academic publisher or journal; and capacity to illuminate either the Uzbek disciplinary context or an internationally recognized method of historical reasoning. The corpus combined two Uzbek foundations in source studies and history-teaching methodology [1; 2] with research on expert source evaluation, historical-thinking concepts, document-based curriculum, inquiry learning, historical literacy, and disciplinary writing [3-10]. Qualitative content analysis was used to code each work across five categories: the epistemic purpose assigned to history education; the operations performed on sources; the architecture of learning tasks; the form and degree of instructional scaffolding; and the evidence proposed for judging student learning. Deductive codes were initially derived from recurrent constructs in the literature, including sourcing, contextualization, corroboration, evidence, causation, continuity and change, perspective, and argumentation; inductive coding was then applied to identify additional elements such as archival metadata, translation, representativeness, uncertainty, and reflective revision that are especially relevant to multilingual university source work. Comparative analysis mapped convergences and differences between Uzbek source-critical traditions and foreign models of historical cognition, while the historical-logical method was used to distinguish the disciplinary sequence by which a trace becomes evidence from the pedagogical sequence by which a novice learns to perform that transformation. Analysis and synthesis decomposed the competence into observable intellectual actions and recombined them into a coherent instructional cycle. The method of pedagogical modelling was subsequently used to construct the Source-to-Argument Cycle, align each stage with appropriate learning activities and scaffolds, and specify assessment indicators.

RESULTS

Four conceptual results emerged. First, source-based analytical thinking was operationalized as a six-stage Source-to-Argument Cycle. Stage one, problem framing, requires students to transform a broad topic into an investigable historical question and specify what kind of evidence could answer it. Stage two, provenance and sourcing, examines creator, date, place, genre, audience, purpose, archival location, transmission, and possible mediation through copying, translation, editing, or digitization. Stage three, contextualization, reconstructs the contemporaneous institutional, linguistic, social, and temporal conditions that make the source intelligible without imposing present-day categories. Stage four, corroboration, compares independent and dependent accounts, identifies convergence and contradiction, weighs representativeness, and explains why discrepancies may exist. Stage five, inferential construction, connects selected evidence to claims about causation, continuity, change, significance, or perspective and makes uncertainty explicit. Stage six, metacognitive audit, asks students to test alternative explanations, identify missing voices, distinguish fact from inference, and revise the strength or scope of the conclusion. Second, a method portfolio was aligned with this cycle. Document laboratories develop close reading and provenance analysis; mystery dossiers generate question formation; evidence jigsaws make interdependence and corroboration unavoidable; structured academic controversy exposes students to rival interpretations; causal maps differentiate long-term conditions, catalysts, agency, and consequences; synchronized timelines reveal sequence and uneven change; source annotation records claims, silences, and rhetorical choices; and claim-evidence-reasoning memoranda require a concise, auditable argument. Digital assignments add reverse-image checking, metadata inspection, repository comparison, and documentation of the chain from archival item to classroom extract. Third, the study generated a five-dimensional competency matrix for assessment. Epistemic orientation is demonstrated when a student treats sources as situated traces rather than transparent facts. Evidence processing is demonstrated through accurate attribution, classification, close reading, contextualization, and corroboration. Temporal-causal reasoning appears in the distinction between chronology and causality, the ranking of factors, and recognition of continuity alongside change. Perspectival interpretation involves reconstructing historically available meanings while avoiding both presentism and uncritical relativism. Argumentative justification is shown when claims are proportional to evidence, counterevidence is addressed, limitations are stated, and conclusions are revised. Performance in each dimension

can be described at reproductive, guided-analytical, independent-analytical, and reflexive levels, enabling teachers to provide diagnostic feedback without reducing competence to a single score. Fourth, the results identify implementation conditions.

DISCUSSION

The foreign scholarly debate relevant to these results can be reconstructed through the contrasting emphases of Sam Wineburg and Peter Seixas; this is a conceptual polemic between published frameworks, not a claim that the two authors conducted a direct personal dispute. Wineburg locates the central difficulty in the cognitive habits with which novices approach documents. Readers ordinarily seek immediate meaning, coherence, and familiarity, whereas historians interrupt comprehension to ask who produced a text, under what circumstances, and how it compares with other traces [3; 4]. Historical thinking is therefore "unnatural" in the precise sense that it resists intuitive presentism and requires learned heuristics of sourcing, contextualization, and corroboration. From this position, analytical competence develops through repeated performance of expert-like operations on carefully designed document problems. Seixas, by contrast, organizes historical thinking around a conceptual grammar: significance, evidence, continuity and change, cause and consequence, historical perspectives, and the ethical dimension [5]. His framework shifts attention from the micro-process of reading an individual document to the larger questions by which societies construct and contest meaningful accounts of the past. Evidence is indispensable, but it operates in relation to judgments about what matters, how change is characterized, whose perspective is reconstructed, and how the past enters ethical reflection. The tension is consequently threefold. First, Wineburg's heuristic emphasis risks becoming procedural ritual if students mechanically complete an author-date-purpose worksheet without understanding the historical problem, while Seixas's conceptual emphasis risks abstraction if learners discuss significance or ethical judgment without disciplined examination of provenance and corroboration. Second, Wineburg's demand for distance from familiar assumptions protects inquiry from presentism, whereas Seixas's ethical dimension insists that historical understanding cannot be sealed off from contemporary responsibility. Distance without relevance may produce technically competent but civically inert analysis; relevance without contextual restraint may collapse inquiry into retrospective judgment. Third, the frameworks imply different units of instructional design: Wineburg begins with the encounter between reader and source, while Seixas begins with second-order concepts that organize an account. The results of this study resolve rather than erase the disagreement by arranging the approaches in layers. The Source-to-Argument Cycle uses Wineburgian heuristics at the micro level to authenticate, situate, and compare evidence; it uses Seixas's concepts at the meso level to frame causal, temporal, perspectival, and significance questions; and it adds a reflexive macro level at which students disclose uncertainty, missing voices, and ethical implications. This layered design also makes the grounds of scholarly disagreement visible to students. Under this synthesis, a provenance card is not an end but a warranting device, and an ethical discussion is not free opinion but the final stage of an evidence-constrained interpretation. Reisman's curriculum research provides practical support for embedding heuristics within recurring document-based lessons [6], yet the proposed university model expands the approach through archival metadata, multilingual mediation, independent corpus construction, and explicit assessment of conceptual reasoning.

CONCLUSION

Historical sources can develop analytical thinking in history students only when they function as evidence within a structured inquiry, not as decorative supplements to a lecture or as repositories of ready-made facts. The study established that the relevant competence integrates provenance analysis, contextualization, corroboration, temporal-causal reasoning, perspective reconstruction, evidence-based argumentation, and metacognitive revision. By connecting Madraimov's source-critical foundations with Mansurov's methodological organization of history teaching and with international research on historical cognition, the article formulated a coherent bridge between disciplinary standards and observable student activity.

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METHODOLOGY FOR DEVELOPING STUDENTS' LINGUISTIC THINKING THROUGH PROVERBS AND TONGUE TWISTERS IN PRIMARY SCHOOL MOTHER TONGUE LESSONS

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Abstract: *This article discusses the use of proverbs and tongue twisters in primary school mother tongue lessons to develop students' linguistic thinking. It examines the essence of the concept of linguistic thinking and the formation of linguistic sensitivity, which involves the ability to distinguish subtle aspects of language and stylistic nuances. The article also highlights important factors and methods for developing a creative approach to text creation and editing.*

Keywords: *Principle of systematicity, cognitive approach, problem-based learning technology, cluster and analytical methods, stages of development, etc.*

BOSHLANG' ICH SINF ONA TILI DARSLARIDA MAQOL VA TEZ AYTISHLAR ORQALI O' QUVCHILAR LINGVISTIK TAFAKKURINI RIVOJLANTIRISH METODIKASI

Annotatsiya: *Ushbu maqolada boshlang' ich sinf ona tili darslarida maqol va tez aytishlar orqali o' quvchilar lingvistik tafakkurini rivojlantirishning qo' llanilishi, lingvistik tafakkur tushunchasining mohiyati, Lisoniy sezgirlik (tilning nozik qirralarini, uslubiy bo' yoqlarini farqlay olish) shakllanishi. matn yaratish va uni tahrirlashda kreativ yondashuv yuzaga kelishi kabi muhim omil va usullari aks ettirilgan.*

Kalit so' zlar: *Tizimlilik tamoyili, Kognitiv yondashuv, Muammoli ta' lim texnologiyasi, Klaster va Tahliliy turlar, Rivojlantirish bosqichlari va hk*

МЕТОДИКА РАЗВИТИЯ ЛИНГВИСТИЧЕСКОГО МЫШЛЕНИЯ УЧАЩИХСЯ НАЧАЛЬНЫХ КЛАССОВ НА УРОКАХ РОДНОГО ЯЗЫКА С ИСПОЛЬЗОВАНИЕМ ПОСЛОВИЦ И СКОРОГОВОРОК

Аннотация: *В статье рассматривается развитие языкового мышления учащихся начальных классов на уроках родного языка с использованием пословиц и скороговорок. Особое внимание уделяется ключевым факторам и методам, таким как сущность языкового мышления, формирование языковой чуткости (способности различать тонкие нюансы и стилистические оттенки языка) и становление творческого подхода к созданию и редактированию текстов.*

Ключевые слова: *принцип системности, когнитивный подход, технология проблемного обучения, кластерный и аналитический методы, этапы развития и др.*

Lingvistik tafakkurni rivojlantirish metodikasi — ta' lim jarayonida o' quvchilar (yoki bo' lajak mutaxassislar)da til birliklarini tizimli anglash, lisoniy hodisalarni mantiqiy tahlil qilish, nutqiy-ijodiy faoliyatni boshqarish hamda til va tafakkur uyg' unligini ta' minlash ko' nikmalarini shakllantirishga qaratilgan pedagogik-metodik yondashuvlar majmuidir. Lingvistik tafakkur tushunchasining mohiyati- til va tafakkur bir-biri bilan uzviy bog' liq bo' lib, lingvistik tafakkur insonning olamni lisoniy vositalar orqali idrok etishi, tahlil qilishi va umumlashtirishi jarayonida namoyon bo' ladi. Til qoidalari, fonetik, leksik va grammatik tizimni o' zlashtirish hamda ulardan amalda ongli foydalanish ko' zda tutiladi.Til hodisalarini didaktik jihatdan transformatsiya qilish, kasbiy yoki hayotiy vaziyatlarda eng maqbul nutqiy qarorlarni qabul qilish layoqati rivojlanadi.

Boshlang' ich sinf ona tili, o' qish savodxonligi darslarida maqol hamda tez aytishlardan foydalanish o' quvchilarning nutq apparatini rivojlantiradi, so' z boyligini oshiradi va lingvistik tafakkurni (til birliklarini tahlil qilish, mantiqiy bog' liqlikni anglash va fikrni aniq ifodalash yetakchiligi)ni shakllantiradi.

1. Maqollar orqali lingvistik tafakkurni rivojlantirish

Maqollar ixcham shaklda katta mantiqiy va ma'noviy yukka ega bo' lgani uchun o' quvchilarda semantik va mantiqiy tahlil ko' nikmasini o' stiradi. Maqollarning ma'no tahlili semantik yondashuv jihati maqolni shunchaki

yodlatmay, uning ko‘ chma va to‘ g‘ ri ma’nolarini solishtirib tushuntirish mumkin, Masalan*:* "Mehnatdan kelsa boylik, turmush bo‘ lar chiroylik". Maqoldagi sabab-o‘ qibat bog‘ lanishini aniqlash kerak.

Tushirib qoldirilgan so‘ zni topish (Mantiqiy-sintaktik mashq): Maqol tarkibidagi asosiy tushunchani topish orqali grammatik bog‘ liqlikni his qilish. *Topshiriq:* "Opa-singilning [...] bir, oti boshqa" (javob: *joni*). Mavzuga oid guruhlash**:** Maqollarni shakl va ma’nosiga ko‘ ra turkumlash (masalan: *ilm, mehnat, do‘ stlik* haqidagi maqollar).

2. Tez aytishlar orqali lingvistik va fonetik tafakkurni shakllantirish

Tez aytishlar o‘ quvchilarning artikulyatsiya a’zolarini charxlaydi hamda fonetik tahlil (tovush va harf mutanosibligi) qilish qobiliyatini oshiradi. Fonetik farqlash *(Alliteratsiya):* Bir xil yoki o‘ xshash unli va undosh tovushlarning takrorlanishi orqali fonetik idrokni o‘ stirish. masalan*:* "Oq choynakka oq qopqoq, ko‘ k choynakka ko‘ k qopqoq." (*Q* va *K* tovushlarini aniq talaffuz qilish). Tez aytishni nafaqat tez, balki har bir so‘ zning ma’nosini anglagan holda to‘ g‘ ri va ravon aytish mashqi. Maqol va tez aytishlar bilan ishlashni darsning "Tashkiliy qism"ida (2-3 daqiqalik fonetik va aqliy charxlov sifatida) yoki *"Yangi mavzuni mustahkamlash"* bosqichida qiziqarli musobaqa shaklida o‘ tkazish yuqori samaradorlik beradi.

Boshlang‘ ich sinf (1–4-sinf) ona tili va o‘ qish savodxonligi darslarida qo‘ llash uchun mo‘ ljallangan tez aytish va maqollar to‘ plami hamda ularning metodik qo‘ llanishi:

Tez Aytish va Metodik Izoh

1."Oq choynakka oq qopqoq, ko‘ k choynakka ko‘ k qopqoq."

Metodik izoh: **[q]** va **[k]** portlovchi va jarangsiz undosh tovushlarini farqlash va to‘ g‘ ri artikulyatsiya qilishni shakllantiradi (1-sinf uchun mos).

2."G‘ ani g‘ ildirakni g‘ izillatib g‘ ilofladi."

Metodik izoh: Chuqur til orqasi **[g‘]** tovushining to‘ g‘ ri talaffuzini mustahkamlaydi, unli va undoshlar uyg‘ unligini charxlaydi.

3."Gulla, lolam, gulla, lolam, lolam gulla, lolam."

Metodik izoh: **[l]** va **[m]** sonor undoshlarini takrorlash orqali nutqning ravonligi va ritmini oshiradi.

4."Farhod g‘ ozlarni g‘ oz-g‘ oz qilib boqdi."

Metodik izoh: **[f]**, **[g‘]**, **[z]** tovushlari almashinuvida talaffuz aniqligini oshiradi va so‘ zlarni to‘ g‘ ri bo‘ g‘ inlarga bo‘ lishga yordam beradi.

5."Bir tub tut, tutning tagida bir tub tut."

Metodik izoh: **[t]** portlovchi undoshining takrorlanishi orqali artikulyatsiya a’zolari (til va tish) harakatini chaqqonlashtiradi.

6."Sardor sumkasini stolga qo‘ ydi."

Metodik izoh: **[s]** va **[st]** unli-undosh birikmalarining ravon talaffuzini taminlaydi hamda gap ichida ot va fe’lning sintaktik bog‘ liqligini ko‘ rsatadi.

7."Qulipnay qizilmi, qirmizimi?"

Metodik izoh: **[q]** tovushi va so‘ roq ohangini to‘ g‘ ri berish hamda sifat (rang-baranglik) tushunchasini boyitishga xizmat qiladi.

8."Bo‘ ron bo‘ ri kabi bo‘ kirib esdi."

Metodik izoh: **[b]** va **[r]** tovushlari orqali o‘ xshatish va badiiy san’at elementlarini anglash, tasviriy nutqni o‘ stirish.

9."Oshni oshxonada oshpaz pishirdi."

Metodik izoh: O‘ zakdoshtir so‘ zlar (**osh, oshxona, oshpaz**) ustida ishlash va **[sh]**, **[p]** tovushlarini to‘ g‘ ri talaffuz qilish uchun.

10. "*Pichoq o‘ tkir bo‘ lsa, non yupqa kesiladi."*

Metodik izoh: Mantiqiy sabab-o‘ qibat va **[p]**, **[q]**, **[k]** tovushlarining artikulyatsiyasini charxlaydi.

*Dars jarayonida qo‘ llash bo‘ yicha qisqa tavsiya***:** Tez aytishlarni darsning *"Fonetik daqiqa"* qismida o‘ quvchilarning artikulyatsiyasini charxlash uchun, maqollarni esa *"Mavzuni mustahkamlash"* yoki *"Lug‘ at ustida ishlash"* bosqichida tahliliy savollar berish orqali qo‘ llash tavsiya etiladi.

Boshlang‘ ich sinf o‘ quvchilarining lingvistik tafakkuri va nutq apparatini rivojlantirish uchun dars jarayonida qo‘ llash mumkin bo‘ lgan 3 ta interfaol o‘ yin va topshiriq metodi:

1. "Aql charxpalagi" (Maqollarni tiklash va tahlil qilish)

O‘ quvchilarning mantiqiy fikrlashini, grammatik va semantik ko‘ nikmalarini rivojlantirishga qaratilgan jamoaviy o‘ yin.

O‘ tkazish tartibi:

1. O‘ quvchilar 2-3 jamoaga bo‘ linadi.
2. Doskaga yoki tarqatma kartochkalarga maqol so‘ zlari aralashtirib beriladi (masalan: *"kitob — manbai — bilim"* yoki *"achitib — gapirar — do‘ st"*).

3. *1-topshiriq*: Jamoalar so‘ zlardan to‘ g‘ ri gap (maqol) tuzishi kerak.

4. *2-topshiriq*: Har bir jamoa tuzilgan maqolning ma’nosini 2 ta jumla bilan tushuntirib beradi va tarkibidagi tayanch so‘ zlarga (masalan, antonimlar yoki omonimlar) izoh beradi.

O‘ yinning ahamiyati shundaki, so‘ z birikmasi va gap qurilishini to‘ g‘ ri anglash, ko‘ chma ma’nolarni tahlil qilish va mantiqiy xulosa chiqarish ko‘ nikmasi shakllanadi.

2. "Tezkor diktor" (Tez aytish musobaqasi)

O‘ quvchilarning artikulyatsiyasini, talaffuz aniqligini hamda diqqatni jamlash qobiliyatini oshiruvchi interfaol metod.

O‘ tkazish tartibi:

1. O‘ qituvchi ma’lum bir tovushga boy tez aytishni namoyish etadi (masalan: *”Oq choynakka oq qopqoq...”*).
2. O‘ yin 3 bosqichda o‘ tkaziladi:

1-bosqich (Past): Tez aytish sekin va har bir tovush pichirlab, artikulyatsiya aniq ko‘ rsatib aytiladi.

2-bosqich (O‘ rtacha): O‘ quvchilar juftlikda bir-birlariga adashmay aytib berishadi.

3-bosqich (Tezkor): Har bir jamoadan vakillar (diktorlar) chiqib, taymer ostida (10 soniya) adashmasdan, ravon va tez aytish bo‘ yicha bellashishadi.

O‘ yinning ahamiyati shundaki , murakkab undosh va unli tovushlar ([q], [g‘], [k], [sh]) artikulyatsiyasi to‘ g‘ rilanadi, nutqiy to‘ siqlar yo‘ qoladi.

3. ”Mantiqiy zanjir” (Integratsiyalashgan topqirlik o‘ yini)

Maqol va tez aytishlarni so‘ z turkumlari, grammatik qoidalar va so‘ z boyligi bilan bog‘ lab o‘ tkaziladigan individual va jamoaviy mashq.

O‘ tkazish tartibi:

1. O‘ qituvchi bitta tayanch so‘ z beradi (masalan: "**Bilim**" yoki "**Osh**").
2. *1-qadam*: O‘ quvchilar bu so‘ z qatnashgan maqol yoki tez aytishni topib aytishadi (*”Kitob — bilim manbai”* yoki *”Oshni oshxonada oshpaz pishirdi”*).
3. *2-qadam*: Shu maqol yoki tez aytish ichidan so‘ ralgan so‘ z turkumini (masalan: *ot*, *fe’l*, *sifat*) ajratib ko‘ rsatishadi.
4. *3-qadam*: Zanjir bo‘ yicha keyingi o‘ quvchi ushbu maqoldagi oxirgi so‘ zning bosh harfiga yangi tez aytish yoki maqol aytib zanjirni davom ettiradi.

O‘ yinning ahamiyati shundaki , grammatik qoidalarni amalda qo‘ llash, tezkor fikrlash va faol so‘ z boyligini oshirish ta’minlanadi. Boshlang‘ ich sinf o‘ quvchilarida lingvistik tafakkurni to‘ g‘ ri shakllantirish ularning kelgusida chuqur bilim olishi, fikrni aniq bayon etishi hamda har tomonlama rivojlangan shaxs bo‘ lib yetishishida fundamental asos bo‘ lib xizmat qiladi.

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MAKTABDA INGLIZ TILINI (EFL) O‘ QITISH AMALIYOTIDA SUN’IY INTELLEKT: MUAMMOLAR VA KASBIY RIVOJLANISHGA BO‘ LGAN EHTIYOJLAR

Gulbahor Gasanova
O‘ qituvchi, 168-maktab

Annotatsiya: *Sun’iy intellekt o‘ qituvchilarning kundalik faoliyatidan tobora kengroq o‘ rin egallamoqda, biroq uning ta’limiy qiymati o‘ qituvchilarning texnologik imkoniyatlarni til o‘ rganish maqsadlari bilan qay darajada bog‘ lay olishiga bevosita bog‘ liq. Ushbu konseptual maqolada maktablarda ingliz tilini xorijiy til sifatida o‘ qitishda sun’iy intellektdan foydalanish masalalari o‘ qituvchilarning pedagogik amaliyoti, mavjud muammolari va kasbiy rivojlanish ehtiyojlari nuqtayi nazaridan tahlil qilinadi. So‘ nggi tadqiqotlar o‘ qituvchilar generativ sun’iy intellektdan ko‘ pincha darslarni rejalashtirish, mashg‘ ulot va topshiriqlarni ishlab chiqish, o‘ quv materiallarini tayyorlash, baholash hamda fikr-mulohaza taqdim etishda foydalanayotganini ko‘ rsatadi. O‘ zbekistonda olib borilgan tadqiqotlar ham o‘ qituvchilarning sun’iy intellektga nisbatan ijobiy munosabatini aniqlash bilan birga, ularning pedagogik va axloqiy kompetensiyalarini yanada rivojlantirish zarurligini ko‘ rsatmoqda. Biroq ko‘ plab o‘ qituvchilar ushbu yo‘ nalishda yetarli darajada rasmiy tayyorgarlikdan o‘ tmagan bo‘ lib, sun’iy intellekt yaratgan ma’lumotlarning aniqligi, shaxsiy ma’lumotlar daxlsizligi, algoritmik tarafkashlik, akademik halollik, o‘ quvchilarning texnologiyaga qaram bo‘ lib qolishi va o‘ qituvchining kasbiy mulohaza yuritish qobiliyati susayishi mumkinligidan xavotirda. Maqolada sun’iy intellektni samarali integratsiya qilish faqat texnik bilim yoki ommabop vositalardan foydalanish imkoniyati bilan cheklanmasligi ta’kidlanadi. Maktab ingliz tili o‘ qituvchilariga til haqidagi bilim, topshiriqlarni loyihalash, tanqidiy baholash, axloqiy qaror qabul qilish va refleksiv amaliyotni birlashtiruvchi fanga xos sun’iy intellekt savodxonligi zarur. Amaliy, hamkorlikka asoslangan va maktab tomonidan qo‘ llab-quvvatlanadigan kasbiy ta’lim o‘ qituvchilarga ta’lim berish hamda baholash uchun mas’uliyatni o‘ zida saqlagan holda sun’iy intellektdan imkoniyatlari cheklangan yordamchi pedagogik vosita sifatida foydalanishga yordam beradi.*

Kalit so‘ zlar: *sun’iy intellekt; maktabda ingliz tilini xorijiy til sifatida o‘ qitish; o‘ qituvchilarning kasbiy rivojlanishi; sun’iy intellekt savodxonligi; pedagogik amaliyot; o‘ qituvchining kasbiy mulohazasi.*

ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ В ШКОЛЬНОЙ ПЕДАГОГИЧЕСКОЙ ПРАКТИЧЕСКОЙ ПРАКТИКЕ EFL. ПРОБЛЕМЫ И ПОТРЕБНОСТИ В ПРОФЕССИОНАЛЬНОМ РАЗВИТИИ

Аннотация: *Искусственный интеллект всё активнее входит в повседневную профессиональную деятельность учителей, однако его образовательная ценность зависит от того, насколько эффективно педагоги соотносят технологические возможности с целями обучения языку. В данной концептуальной статье рассматривается использование искусственного интеллекта при преподавании английского языка как иностранного в школе с особым вниманием к педагогической практике учителей, существующим трудностям и потребностям в профессиональном развитии. Результаты современных исследований показывают, что учителя часто применяют генеративный искусственный интеллект при планировании уроков, разработке учебных заданий и видов деятельности, подготовке материалов, оценивании и предоставлении обратной связи. Исследования, проведённые в Узбекистане, также свидетельствуют о положительном отношении учителей к искусственному интеллекту и одновременно указывают на необходимость дальнейшего развития их педагогических и этических компетенций. Однако многие педагоги не имеют достаточной формальной подготовки в данной области и выражают обеспокоенность по поводу точности генерируемой информации, конфиденциальности данных, алгоритмической предвзятости, академической добросовестности, зависимости учащихся от технологий и возможного ослабления профессионального суждения учителя. В статье утверждается, что эффективная интеграция искусственного интеллекта требует большего, чем технические знания или доступ к популярным цифровым инструментам. Учителям английского языка необходима предметно-ориентированная грамотность в области искусственного интеллекта, объединяющая языковую компетентность, проектирование заданий, критическое оценивание, принятие этически обоснованных решений и рефлексивную практику. Практическое, совместное и поддерживаемое школой профессиональное обучение может помочь педагогам использовать искусственный интеллект в качестве вспомогательного педагогического ресурса с ограниченными функциями, сохраняя при этом ответственность за преподавание и оценивание.*

Ключевые слова: *искусственный интеллект; преподавание английского языка как иностранного в школе; профессиональное развитие учителей; грамотность в области искусственного интеллекта; педагогическая практика; профессиональное суждение учителя.*

ARTIFICIAL INTELLIGENCE IN SCHOOL EFL TEACHING PEDAGOGICAL PRACTICES CHALLENGES AND PROFESSIONAL DEVELOPMENT NEEDS

Abstract: *Artificial intelligence is becoming part of teachers' everyday work, yet its educational value depends on how teachers connect technological functions with language learning goals. This conceptual article examines the use of artificial intelligence in school English as a foreign language teaching, with attention to teachers' pedagogical practices, common challenges, and professional development needs. Recent research shows that teachers often use generative artificial intelligence for lesson planning, activity design, materials, assessment, and feedback. Evidence from Uzbekistan also shows positive teacher attitudes alongside a need for stronger pedagogical and ethical competence. However, many teachers receive little formal preparation and remain concerned about accuracy, privacy, bias, academic integrity, learner dependence, and the possible weakening of professional judgement. The article argues that effective integration requires more than technical knowledge or access to a popular tool. School EFL teachers need subject-specific artificial intelligence literacy that combines language awareness, task design, critical evaluation, ethical decision-making, and reflective practice. Practical, collaborative, and school-supported professional learning can help teachers use artificial intelligence as a limited pedagogical resource while retaining responsibility for instruction and assessment.*

Keywords: *artificial intelligence; school EFL teaching; teacher professional development; AI literacy; pedagogical practices; teacher judgement.*

1 INTRODUCTION

Artificial intelligence (AI) has moved quickly from specialist research into widely available digital tools. Generative AI systems can produce texts, dialogues, explanations, exercises, images, quizzes, lesson outlines, and feedback in response to ordinary language prompts. These functions are relevant to English as a foreign language (EFL) teaching because teachers regularly create examples, adapt texts, design communicative tasks, and respond to learners with different proficiency levels. The speed of content generation can reduce preparation time and widen the range of materials available to teachers. It can also create a false impression that producing content is the same as producing good instruction.

Effective EFL teaching requires decisions about language level, accuracy, purpose, interaction, assessment, and learner development. An AI-generated worksheet may be grammatically correct but still be unsuitable for a class because it does not match the curriculum, invites only mechanical answers, or includes unfamiliar cultural assumptions. The teacher must therefore examine generated material, revise it, and decide how learners will use it. This responsibility is consistent with the Technological Pedagogical Content Knowledge framework, which explains that technology becomes useful when technological knowledge is integrated with subject knowledge and pedagogy (Mishra & Koehler, 2006). Celik's (2023) Intelligent-TPACK model extends this principle to AI and gives greater attention to ethical knowledge and informed teacher judgement.

This article reviews current evidence on AI use by language teachers and considers its implications for school EFL teaching. It focuses on three connected questions: what teachers use AI for, which problems limit responsible use, and what professional learning can help teachers make stronger pedagogical decisions. The discussion does not report a new empirical study. Instead, it offers a conceptual synthesis that can guide teacher educators, schools, and future research in emerging EFL contexts.

2 Pedagogical Uses of Artificial Intelligence in School EFL Teaching

Current AI applications support several areas of language teaching. Teachers can generate reading passages at an approximate proficiency level, create vocabulary exercises, prepare role-play prompts, design comprehension questions, and produce alternative explanations of grammar. Speech-recognition tools can provide pronunciation practice, while writing applications can offer initial feedback on grammar, organization, and word choice. Generative systems can also suggest lesson stages, assessment criteria, or differentiated versions of the same activity. Kohnke, Moorhouse, and Zou (2023) describe these possibilities but stress that language teachers and learners need the digital competence to use chatbots critically and ethically.

Recent empirical studies show that teacher use remains concentrated in preparation and content production. Barghi et al. (2026) surveyed 221 EFL teachers and practicum students in Turkiye. Among AI users, the most frequently reported practices were designing activities, lesson planning, preparing presentations, and developing assessments. The study also found that 64.6 percent of users had received no formal AI training. These findings suggest that adoption may occur before teachers have developed a clear framework for checking output or linking it to learning processes.

Evidence from higher education points to a similar pattern. Nazim and Alzubi's (2025) study of 278 EFL teachers found moderate engagement in AI-mediated professional activities alongside highly positive attitudes. Participants used AI for planning, feedback, assessment, reflection, and professional learning, but reported limited AI literacy and concerns about reliability, ethics, and professional autonomy. Although university and school settings differ, the findings show why positive attitudes should not be treated as evidence of pedagogical competence.

In school classrooms, the quality of AI use should be judged by the learning activity that follows. A dialogue generated in seconds has limited value if students only read it silently. Its value increases when learners compare expressions, identify pragmatic differences, rehearse roles, change the context, and create their own dialogue. The same principle applies to feedback. Automated comments can provide a starting point, but students should interpret the comments, decide which suggestions are useful, revise their work, and explain their choices. AI becomes pedagogically meaningful when it supports language processing and learner agency rather than replacing them.

3 Evidence from Uzbekistan

Research in Uzbekistan scholars provides direct evidence about the local educational context. Saydazimova and Saydazimova (2025) surveyed 141 EAP and ESP teachers from 34 local and international higher education institutions in five regions and interviewed 10 teachers. Participants were generally positive and familiar with AI for several pedagogical purposes. The authors classified most teachers as GenAI Adopters or GenAI Collaborators, while noting that further knowledge and experience were required for them to become GenAI Innovators. This distinction shows that frequent use and pedagogical innovation should be evaluated separately.

Mirzayev, Kamal, and Axundjanova (2025) examined seven university EFL teachers in Uzbekistan. The participants valued real-time feedback, support for autonomous learning, and grammar and spelling assistance. They also raised concerns about learner over-reliance, limited ethical knowledge, and possible harm to critical thinking. Although the sample was small and drawn from higher education, the findings identify issues that school-based professional development should address before learner-facing AI use.

Elov et al. (2025) studied 50 upper-intermediate EFL learners in Tashkent and reported stronger gains for the chatbot group in informal speaking and social-pragmatic performance than for the teacher-led comparison group. Their narrow sample limits generalization, but the study provides local evidence that AI-supported interaction can extend speaking practice. Collectively, research conducted in Uzbekistan encourages teacher-supervised experimentation with AI while emphasizing the importance of professional training in task development, content evaluation, ethical use, and the promotion of learner autonomy.

4 Teacher Judgement and Artificial Intelligence Literacy

AI literacy includes understanding what an AI system can do, recognizing its limitations, evaluating its output, and using it responsibly. Ng et al. (2021) describe AI literacy as a combination of knowing and understanding AI, using and applying it, evaluating and creating with it, and considering ethical issues. For EFL teachers, these abilities must be connected with language-specific knowledge. Teachers need to judge grammatical accuracy, register, pragmatic meaning, cultural representation, vocabulary difficulty, and the quality of feedback.

UNESCO's AI Competency Framework for Teachers organizes competence around a human-centred mindset, ethics, AI foundations and applications, AI pedagogy, and AI for professional learning (Miao & Cukurova, 2024). The framework is useful because it does not reduce competence to prompt writing. A teacher who can obtain a fluent response from a chatbot may still be unable to identify bias, protect student information, or design a learner-active task. Professional competence requires informed selection, verification, adaptation, and reflection.

Appropriate trust is also important. In a study of 508 K-12 teachers across six countries, Viberg et al. (2025) found that stronger AI understanding and self-efficacy were associated with greater perceived benefits, fewer concerns, and higher trust. The goal, however, is not unlimited trust. Teachers need calibrated trust: enough confidence to test useful applications and enough critical awareness to question generated material. Final responsibility for curriculum alignment, classroom interaction, and consequential assessment must remain with the teacher.

5 Pedagogical Ethical and Contextual Challenges

Reliability is one of the main barriers to responsible use. Generative AI can produce fluent statements that contain factual errors, invented references, inappropriate examples, or inconsistent feedback. In language teaching, output may also contain problems of register, collocation, pragmatic meaning, or cultural representation. Teachers should compare important information with reliable sources and review all learner-facing material. Fluency cannot serve as evidence of accuracy.

Privacy and data protection require particular care in schools because learners are minors. Teachers should not enter names, personal histories, identifiable student work, or sensitive assessment records into unapproved systems. They also need to understand how a platform stores or reuses data. UNESCO's guidance on generative AI recommends human agency, data protection, inclusion, and age-appropriate use (Miao & Holmes, 2023). These principles should be translated

into simple school rules that identify approved tools, prohibited information, disclosure expectations, and teacher responsibilities.

Academic integrity presents a related challenge. If students submit AI-generated text as their own, the teacher cannot determine what the learner can independently understand or produce. A complete ban may be difficult to enforce, while unrestricted use can reduce productive language practice. Assessment should therefore include visible processes such as planning notes, drafts, oral explanation, peer discussion, and revision records. Teachers can also ask students to identify errors in AI output, compare alternative responses, or justify which suggestions they accepted. These tasks make critical language use observable.

Equity and infrastructure also shape classroom practice. Stable internet, suitable devices, paid features, and high-quality support for local languages are not equally available. An activity that depends on individual access may disadvantage some learners. Teachers need alternative routes that allow participation without personal accounts or expensive subscriptions. Schools should evaluate the cost and accessibility of a tool before expecting teachers to use it.

Finally, AI can affect teacher agency. Ready-made content may save time, but repeated dependence on it can weaken teachers' own material-development skills or make pedagogical decisions less transparent. Nazim and Alzubi (2025) found concerns about professional autonomy, while Barghi et al. (2026) reported that non-users often lacked preparation rather than rejecting AI in principle. These findings indicate that schools should neither pressure teachers to adopt every new tool nor leave them to experiment without guidance.

6 Professional Development Needs

Professional development should begin with teaching problems rather than software demonstrations. A school may first identify where EFL teachers spend time, where learners need more support, and where existing materials are insufficient. Teachers can then examine whether AI offers an appropriate response. This sequence keeps pedagogy in control of technology and prevents training from becoming a list of rapidly changing tools.

A useful programme should develop four connected areas. First, teachers need foundational knowledge of how generative systems produce responses and why errors or bias occur. Second, they need practical prompting and evaluation strategies linked to EFL objectives. Third, they need ethical procedures for privacy, authorship, assessment, and disclosure. Fourth, they need opportunities to reflect on classroom evidence and improve their decisions. These areas align with Intelligent-TPACK and UNESCO's competency framework rather than with narrow technical training (Celik, 2023; Miao & Cukurova, 2024).

Subject-specific practice is essential. During training, teachers might adapt an AI-generated text to a target proficiency level, check a set of grammar examples, evaluate feedback on learner writing, or design a speaking task that preserves student-to-student interaction. They can compare the original output with their revised version and explain each change. This process makes professional judgement visible and provides a basis for peer feedback. It also shows that effective prompting cannot replace knowledge of language and pedagogy.

Training should be differentiated. Teachers who have never used AI need low-risk guided practice and clear explanations. Regular users may need deeper work on verification, assessment, learner dependence, and data protection. Teachers working with younger learners may require stricter safeguards and more teacher-mediated activities. School location, internet access, class size, and prior training should also influence programme design. A needs-sensitive approach is more useful than giving every teacher the same workshop.

Professional learning should continue after initial training. Teachers can work in small groups to plan one AI-supported activity, observe its use, collect learner work, and discuss what changed. A shared evaluation checklist can address accuracy, curriculum alignment, learner activity, privacy, accessibility, and evidence of learning. Rohmah and La Roiba (2026) reported improvements in Indonesian EFL teachers' knowledge, attitudes, and practices after structured AI training. Georgiou's (2026) study of pronunciation teaching also associated more extensive training with more frequent AI use and fewer concerns. These studies support sustained, applied professional learning.

Institutional support remains necessary. Schools should publish concise guidance, provide access to approved tools, protect time for collaborative learning, and clarify how AI may be used in assessment. Leaders should also create a reporting process for inaccurate, biased, or unsafe output. Such support allows teachers to experiment within clear boundaries and reduces inconsistent expectations across subjects or classes.

7 Principles for Responsible School Practice

Responsible AI-supported EFL teaching can be guided by a simple decision cycle. The teacher begins with a specific learning outcome and decides whether AI is necessary. The teacher then generates or selects content, verifies its language and factual quality, adapts it to the learners and curriculum, and designs an activity that requires students to think and communicate. During the lesson, the teacher monitors participation and makes AI use transparent. After the lesson, learner work and teacher reflection provide evidence for deciding whether the activity should be repeated, revised, or removed.

This cycle protects the central role of pedagogy. AI may assist with drafting, variation, or initial feedback, but the teacher determines the purpose and standard of the work. Students should know what assistance is permitted and how to acknowledge it. They should also learn that AI output is a claim to be evaluated, not an answer to be copied. In this form, AI literacy becomes part of language education and critical digital citizenship.

8 Conclusion

AI offers school EFL teachers useful support for planning, materials, differentiation, assessment, and feedback. Current research also shows a persistent gap between access and professional preparation. Teachers may use AI regularly while remaining uncertain about reliability, privacy, academic integrity, equity, and the limits of automated feedback. Positive attitudes alone cannot resolve these problems.

Effective integration depends on teachers' ability to connect AI functions with language-learning objectives, evaluate output, protect learners, and retain responsibility for pedagogical decisions. Professional development should therefore be practical, subject-specific, differentiated, collaborative, and supported by clear school policy. AI should remain a limited resource within teacher-designed instruction. Future research in emerging EFL contexts should examine classroom practices directly and evaluate how sustained professional learning changes teacher judgement and student language development.

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OLIY TA'LIM MUASSASALARI PEDAGOGLARINING AXBOROT XAVFSIZLIGI KO'NIKMALARINI SHAKLLANTIRISHNING DOLZARB MASALALARI

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Annotatsiya: *Ushbu maqolada oliy ta'lim muassasalari pedagoglarining axborot xavfsizligi ko'nikmalarini shakllantirishning dolzarb masalalari yoritilgan. Ta'lim tizimining raqamlashtirilishi natijasida pedagoglarning elektron ta'lim platformalari, axborot tizimlari, bulutli xizmatlar va turli raqamli resurslardan foydalanish ko'lami kengayib bormoqda. Bu esa pedagoglardan nafaqat raqamli texnologiyalardan samarali foydalanishni, balki axborot xavfsizligi talablariga rioya etishni ham talab qiladi. Maqolada pedagoglarning raqamli kompetensiyasi tarkibida axborot xavfsizligining o'rni, mazkur yo'nalishda uchrayotgan muammolar hamda axborot xavfsizligi ko'nikmalarini rivojlantirishning asosiy yo'llari tahlil qilingan. Pedagoglarning malakasini oshirish jarayonida nazariy bilimlarni amaliy mashg'ulotlar, muammoli vaziyatlar, keyslar va kasbiy faoliyatga yo'naltirilgan topshiriqlar bilan uyg'unlashtirish zarurligi asoslangan.*

Kalit so'zlar: *axborot xavfsizligi, pedagog kadrlar, raqamli kompetensiya, raqamli ta'lim, kiberxavfsizlik, axborot xavfsizligi ko'nikmalari, malaka oshirish.*

АКТУАЛЬНЫЕ ВОПРОСЫ ФОРМИРОВАНИЯ НАВЫКОВ ИНФОРМАЦИОННОЙ БЕЗОПАСНОСТИ У ПРЕПОДАВАТЕЛЕЙ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ

Аннотация: *В статье рассматриваются актуальные вопросы формирования навыков информационной безопасности у преподавателей высших образовательных учреждений. Цифровизация системы образования расширяет использование электронных образовательных платформ, информационных систем, облачных сервисов и различных цифровых ресурсов. В этих условиях преподавателям необходимо не только эффективно использовать цифровые технологии, но и соблюдать требования информационной безопасности. Рассматривается место информационной безопасности в структуре цифровой компетентности преподавателей, анализируются существующие проблемы и основные направления развития соответствующих навыков.*

Ключевые слова: *информационная безопасность, педагогические кадры, цифровая компетентность, цифровое образование, кибербезопасность, навыки информационной безопасности, повышение квалификации.*

PRESSING ISSUES IN DEVELOPING INFORMATION SECURITY SKILLS AMONG HIGHER EDUCATION INSTITUTION EDUCATORS

Abstract: *This article examines current issues related to developing information security skills among higher education teachers. The digitalization of education has expanded the use of electronic learning platforms, information systems, cloud services, and various digital resources. Under these conditions, teachers need not only to use digital technologies effectively but also to comply with information security requirements. The article discusses the role of information security within teachers' digital competence, identifies major challenges, and examines key directions for developing relevant skills.*

Keywords: *information security, teaching staff, digital competence, digital education, cybersecurity, information security skills, professional development.*

Bugungi kunda raqamli texnologiyalarning jadal rivojlanishi ta'lim tizimining mazmuni va uni tashkil etish shakllariga sezilarli ta'sir ko'rsatmoqda. Oliy ta'lim muassasalarida elektron ta'lim platformalari, masofaviy ta'lim texnologiyalari, bulutli xizmatlar, elektron hujjat aylanishi va turli axborot tizimlaridan foydalanish pedagoglarning kundalik kasbiy faoliyatining ajralmas qismiga aylanib bormoqda.

Ta'lim jarayonining raqamlashtirilishi yangi imkoniyatlarni yaratish bilan bir qatorda axborot xavfsizligiga oid yangi vazifalarni ham yuzaga keltiradi. Pedagoglar o'z faoliyati davomida talabalar haqidagi ma'lumotlar, o'quv-uslubiy

materiallar, nazorat va baholash natijalari, xizmat hujjatlari hamda boshqa turdagi elektron axborotlar bilan ishlaydi. Mazkur ma'lumotlarning xavfsizligini ta'minlash pedagogning raqamli muhitdagi kasbiy faoliyati bilan bevosita bog‘ liq.

Shu sababli zamonaviy pedagogdan faqat raqamli texnologiyalardan foydalana olish emas, balki raqamli muhitda xavfsiz va mas'uliyatli faoliyat olib borish ham talab etiladi. Pedagoglarning axborot xavfsizligi bo‘ yicha bilim va ko‘ nikmalarini rivojlantirish ularning umumiy raqamli kompetensiyasini takomillashtirishning muhim yo‘ nalishlaridan biri hisoblanadi.

Raqamli kompetensiya pedagogning zamonaviy axborot-kommunikatsiya texnologiyalaridan kasbiy faoliyatida maqsadga muvofiq foydalanish qobiliyatini ifodalovchi muhim tushunchalardan biridir. Uning tarkibiga axborotni izlash va qayta ishlash, raqamli kontent yaratish, elektron kommunikatsiya vositalaridan foydalanish, ta'lim jarayonini raqamli vositalar yordamida tashkil etish hamda raqamli muhitda xavfsiz faoliyat olib borish kiradi.

O‘ zbekistonlik tadqiqotchi Sh.M.Adashboyev oliy ta'lim muassasalari pedagog kadrlarining raqamli kompetentligini rivojlantirish masalalarini tadqiq etib, pedagogik faoliyatda raqamli kompetensiyalarni rivojlantirishga qaratilgan ochiq onlayn kurs mazmunini ishlab chiqqan [1; 2]. Tadqiqotda "raqamli iz", "raqamli etika" va "raqamli xavfsizlik" kabi masalalarga e'tibor qaratilishi pedagogning raqamli kompetensiyasini rivojlantirishda xavfsizlik masalasining muhimligini ko‘ rsatadi.

E.M.Alkarovning tadqiqotlari pedagog kadrlarning uzluksiz kasbiy rivojlanishini axborot-kommunikatsiya texnologiyalari asosida tashkil etish va boshqarish masalalariga qaratilgan [3]. Shu bilan birga, raqamli kompetensiya bilan axborot xavfsizligi ko‘ nikmalarini to‘ liq bir xil tushuncha sifatida qabul qilish to‘ g‘ ri emas. Pedagog raqamli vositadan foydalanishni bilishi mumkin, biroq undan foydalanishda yuzaga keladigan xavflarni aniqlash va tegishli himoya choralarini qo‘ llash bo‘ yicha yetarli tayyorgarlikka ega bo‘ lmasligi mumkin.

Oliy ta'lim pedagoglari kundalik faoliyatida katta hajmdagi raqamli axborot bilan ishlaydi. Talabalarning shaxsiy ma'lumotlari, o‘ zlashtirish ko‘ rsatkichlari, nazorat natijalari, elektron topshiriqlar, ilmiy va o‘ quv-uslubiy materiallar shular jumlasidandir.

Bunday ma'lumotlardan foydalanish pedagogdan muayyan xavfsizlik talablariga rioya etishni talab qiladi. Jumladan, elektron hisob yozuvlarini himoyalash, ishonchli parollardan foydalanish, begona shaxslarga ma'lumotlarni taqdim etmaslik, shubhali elektron xabarlarni aniqlash, elektron hujjatlarning kirish huquqlarini to‘ g‘ ri boshqarish va shaxsga doir ma'lumotlar bilan ehtiyotkor ishlash muhim ahamiyatga ega. Demak, axborot xavfsizligini ta'minlashni faqat oliy ta'lim muassasasining texnik yoki axborot texnologiyalari bo‘ limi vazifasi sifatida qarash yetarli emas. Pedagog ham axborot xavfsizligini ta'minlash jarayonining bevosita ishtirokchisi hisoblanadi.

Pedagogning axborot xavfsizligiga oid nazariy bilimga ega bo‘ lishi uning real vaziyatda doimo xavfsiz harakat qilishini anglatmaydi. Xavfsizlik qoidalarini bilish bilan ularni kundalik faoliyatda qo‘ llash o‘ rtasida muayyan farq mavjud. Axborot xavfsizligi bo‘ yicha mashg‘ ulotlarning faqat nazariy shaklda tashkil qilinishi kutilgan natijani bermasligi mumkin. Pedagogga xavf turlari haqida ma'lumot berish bilan bir qatorda ularni amaliy vaziyatlarda aniqlash va to‘ g‘ ri qaror qabul qilishni mashq qildirish zarur. Pedagoglarning raqamli tayyorgarlik darajasi ham bir xil emas. Shu sababli axborot xavfsizligi bo‘ yicha o‘ qitishda tinglovchilarning boshlang‘ ich tayyorgarligini hisobga olish muhim. Mahalliy tadqiqotlarda raqamli kompetensiya, axborot kompetentligi va pedagoglarning raqamli tayyorgarligini rivojlantirish masalalariga e'tibor ortib bormoqda [1; 5]. Xorijiy tadqiqotlarda esa pedagoglarning aynan raqamli xavfsizlik bo‘ yicha kompetensiyalarini baholash va uning indikatorlarini aniqlashga alohida e'tibor qaratilgan [6; 7].

Pedagoglarning axborot xavfsizligi ko‘ nikmalarini rivojlantirishda nazariy va amaliy tayyorgarlikni o‘ zaro uyg‘ unlashtirish muhim hisoblanadi. Pedagog axborotning maxfiyligi, yaxlitligi va undan foydalanish imkoniyati, shaxsga doir ma'lumotlarni himoyalash, autentifikatsiya, zararli dasturlar, fishing va ijtimoiy muhandislik kabi tushunchalarni bilishi kerak.

Biroq mazkur bilimlarni o‘ zlashtirishning o‘ zi yetarli emas. Pedagog ularni kasbiy faoliyatida qo‘ llashni ham bilishi kerak. Shu sababli mashg‘ ulotlarda amaliy topshiriqlardan foydalanish maqsadga muvofiq. Masalan, pedagogga bir nechta elektron xabar namunalari taqdim etilib, ular orasidan shubhali xabarni aniqlash vazifasi berilishi mumkin. Keys metodidan foydalanish ham samarali hisoblanadi. Pedagogga real kasbiy faoliyatga yaqin vaziyat taqdim etilib, undan axborot xavfsizligi nuqtai nazaridan to‘ g‘ ri qaror qabul qilish talab qilinadi. Bunday mashg‘ ulotlar pedagoglarning nazariy bilimlarini real faoliyat bilan bog‘ lash imkonini beradi.

Pedagoglarning axborot xavfsizligi bo‘ yicha ko‘ nikmalarini rivojlantirishda malaka oshirish va uzluksiz kasbiy rivojlanish tizimi alohida ahamiyatga ega.

Sh.M.Adashboyev tomonidan pedagoglarning raqamli kompetentligini uzluksiz malaka oshirish tizimida rivojlantirish masalasining o‘ rganilishi [1], shuningdek, E.M.Alkarovning pedagog kadrlarning uzluksiz kasbiy rivojlanishini AKT asosida tashkil etishga oid tadqiqotlari [3] ushbu yo‘ nalishda uzluksizlik tamoyilining muhimligini ko‘ rsatadi. Axborot xavfsizligi sohasida uzluksiz rivojlanish ayniqsa muhim. Chunki raqamli texnologiyalar va ularga

bog‘ liq tahdidlar doimiy ravishda o‘ zgarib boradi. Shu sababli malaka oshirish kurslarida axborot xavfsizligi masalalarini bir martalik mavzu sifatida emas, muntazam yangilanib boradigan yo‘ nalish sifatida tashkil qilish maqsadga muvofiq.

Axborot xavfsizligi ko‘ nikmalarini shakllantirish faqat texnik harakatlarni o‘ rgatish bilan chegaralanmasligi kerak. Pedagogda xavfsizlikka nisbatan mas’uliyatli munosabat ham shakllanishi zarur. Pedagog nima sababdan kuchli parol ishlatishi, nima uchun talaba ma’lumotlarini himoya qilishi yoki nima sababdan shubhali faylni ochmasligi kerakligini tushunishi lozim. Xavfsizlik talabi shunchaki ma’muriy qoida sifatida qabul qilinsa, unga rioya qilish barqaror odatga aylanmasligi mumkin.

Pedagogning xavfsiz raqamli xulq-atvori talabalar uchun ham namuna vazifasini bajaradi. O‘ qituvchi o‘ z faoliyatida xavfsiz raqamli xulq-atvorni namoyish qilishi orqali talabalarning raqamli madaniyatiga ham bilvosita ta’sir ko‘ rsatadi.

XULOSA

Oliy ta’lim tizimining raqamlashtirilishi pedagoglarning kasbiy faoliyatida axborot xavfsizligining ahamiyatini oshirmoqda. Zamonaviy pedagog raqamli texnologiyalardan foydalanish bilan bir qatorda o‘ zining, talabalar va ta’lim muassasasining axborot resurslariga mas’uliyat bilan munosabatda bo‘ lishi zarur.

Pedagoglarda axborot xavfsizligi ko‘ nikmalarini shakllantirish ularning raqamli kompetensiyasini rivojlantirishning muhim tarkibiy qismi hisoblanadi. Bunda axborot xavfsizligini faqat texnik bilimlar majmui sifatida emas, pedagogning kasbiy faoliyatida namoyon bo‘ ladigan bilim, amaliy ko‘ nikma va mas’uliyatli munosabat birligi sifatida qarash maqsadga muvofiq. Pedagoglarning malakasini oshirish jarayonida nazariy mashg‘ ulotlar bilan bir qatorda amaliy topshiriqlar, keyslar, muammoli vaziyatlar va real kasbiy faoliyatga yaqin mashqlardan foydalanish tavsiya etiladi. Axborot xavfsizligi bo‘ yicha tayyorgarlik bir martalik tadbir emas, balki pedagogning uzluksiz kasbiy rivojlanishining tarkibiy qismi bo‘ lishi lozim.

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YUQORI SINF O‘ QUVCHILARIDA REFLEKSIV QAROR QABUL QILISH KOMPETENSIYASINI BAHOLASH MEZONLARI VA INDIKATORLARI

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Annotatsiya: *Maqolada yuqori sinf o‘ quvchilarida axloqiy dilemmalar asosida refleksiv qaror qabul qilish kompetensiyasini baholashning mezonlari, indikatorlari va diagnostik vositalari nazariy-metodik jihatdan asoslanadi. Tadqiqotning maqsadi mazkur kompetensiyaning tarkibiy tuzilmasiga mos baholash tizimini ishlab chiqishdan iborat. Nazariy tahlil, qiyosiy tahlil, tizimlashtirish, modellashtirish va ekspert yondashuvlariga tayangan holda kompetensiyaning kognitiv, motivatsion-qadriyatli, kommunikativ va refleksiv-amaliy komponentlari ajratildi. Ularga mos ravishda kognitiv-tahliliy, motivatsion-qadriyatli, kommunikativ-dialogik va refleksiv-amaliy mezonlar belgilandi. Har bir mezon bo‘ yicha kuzatiladigan indikatorlar, ustuvor diagnostik vositalar hamda yuqori, o‘ rta va past shakllanganlik darajalarining tavsiflari ishlab chiqildi. Taklif etilgan tizim axloqiy dilemma vaziyatida o‘ quvchining faqat yakuniy tanlovini emas, balki muammoni anglash, dalillarni baholash, qadriyatlarga tayanish, boshqa pozitsiyalarni hisobga olish, qaror oqibatlarini tahlil qilish va yangi dalillar asosida o‘ z pozitsiyasini qayta ko‘ rib chiqish jarayonini kompleks baholash imkonini beradi.*

Kalit so‘ zlar: *refleksiv qaror qabul qilish, kompetensiya, axloqiy dilemma, baholash mezoni, indikator, diagnostika, refleksiya, qadriyat, dialog, yuqori sinf o‘ quvchilari.*

CRITERIA AND INDICATORS FOR ASSESSING REFLECTIVE DECISION-MAKING COMPETENCE IN HIGH SCHOOL STUDENTS

Abstract: *This article provides a theoretical and methodological substantiation of the criteria, indicators, and diagnostic tools for assessing reflective decision-making competence based on moral dilemmas among upper secondary school students. The aim of the study is to develop an assessment system aligned with the structural components of this competence. Drawing on theoretical analysis, comparative analysis, systematization, modeling, and expert approaches, the cognitive, motivational-value, communicative, and reflective-practical components of the competence were identified. Accordingly, cognitive-analytical, motivational-value, communicative-dialogical, and reflective-practical assessment criteria were established. For each criterion, observable indicators, priority diagnostic tools, and descriptions of high, medium, and low levels of competence development were elaborated. The proposed system enables a comprehensive assessment not only of the student’s final choice in a moral dilemma situation, but also of the processes of understanding the problem, evaluating arguments, relying on values, considering alternative perspectives, analyzing the consequences of decisions, and revising one’s position in light of new evidence.*

Keywords: *reflective decision-making, competence, moral dilemma, assessment criterion, indicator, diagnostics, reflection, values, dialogue, upper secondary school students.*

КРИТЕРИИ И ПОКАЗАТЕЛИ ОЦЕНКИ КОМПЕТЕНТНОСТИ СТАРШЕКЛАССНИКОВ В ПРИНЯТИИ РЕФЛЕКСИВНЫХ РЕШЕНИЙ

Аннотация: *В статье теоретически и методически обоснованы критерии, индикаторы и диагностические инструменты оценки компетентности рефлексивного принятия решений на основе моральных дилемм у учащихся старших классов. Цель исследования заключается в разработке системы оценивания, соответствующей структурным компонентам данной компетентности. На основе теоретического и сравнительного анализа, систематизации, моделирования и экспертного подхода выделены когнитивный, мотивационно-ценностный, коммуникативный и рефлексивно-практический компоненты компетентности. В соответствии с ними определены когнитивно-аналитический, мотивационно-ценностный, коммуникативно-диалогический и рефлексивно-практический критерии оценивания. По каждому критерию разработаны наблюдаемые индикаторы, приоритетные диагностические инструменты, а также характеристики высокого, среднего и низкого уровней сформированности компетентности. Предложенная система позволяет комплексно оценивать не только итоговый выбор учащегося в ситуации моральной*

дилеммы, но и процесс осмысления проблемы, оценки аргументов, опоры на ценности, учёта альтернативных позиций, анализа последствий принятого решения и пересмотра собственной позиции на основе новых аргументов.

Ключевые слова: *рефлексивное принятие решений, компетентность, моральная дилемма, критерий оценивания, индикатор, диагностика, рефлексия, ценности, диалог, учащиеся старших классов.*

KIRISH (INTRODUCTION)

Zamonaviy ta’limda o‘ quvchining tayyor axloqiy me’yorlarni bilishi bilan bir qatorda murakkab va ziddiyatli vaziyatlarda dalillangan, qadriyatlarga asoslangan hamda oqibatlari anglangan qaror qabul qila olishi muhim natija sifatida qaralmoqda. Ayniqsa yuqori sinf davrida o‘ quvchi turli nuqtayi nazarlar, manfaatlar va qadriyatlar to‘ qnashadigan vaziyatlarga duch keladi. Bunday sharoitda qarorning refleksivligi – shaxsning o‘ z fikrlash jarayonini tahlil qilishi, dalillarni qayta baholashi va zarur bo‘ lsa o‘ z pozitsiyasini asosli ravishda qayta ko‘ rib chiqishi bilan belgilanadi.

King va Kitchenerning Reflective Judgment Modeli noaniq va to‘ liq strukturallanmagan muammolar yuzasidan hukm chiqarishda dalil, bilimning ishonchliligi va qarorni asoslash usullarining rivojlanishini tushuntiradi. Mazkur modelda yuqori darajadagi refleksiv fikrlash mavjud dalillarni baholash, kontekstni hisobga olish va yangi ma’lumotlar paydo bo‘ lganda qarorni qayta ko‘ rib chiqishga tayyorlik bilan tavsiflanadi [1–3]. Axloqiy rivojlanish nazariyalarida esa axloqiy dilemma o‘ quvchining axloqiy mulohazasi va qarorni asoslash usullarini namoyon etuvchi samarali pedagogik vaziyat sifatida qaraladi [4–6].

Shu bilan birga, refleksiv qaror qabul qilish kompetensiyasini baholashda faqat to‘ g‘ ri yoki noto‘ g‘ ri javobga, yoxud yakuniy tanlovga tayanish yetarli emas. Baholash o‘ quvchining muammoni anglash va tahlil qilishini, qadriyatlarga asoslangan ichki motivatsiyasini, dialogik muloqotdagi pozitsiyasini hamda qaror va uning oqibatlarini refleksiv qayta baholash qobiliyatini bir butun jarayon sifatida qamrab olishi lozim. Mazkur holat refleksiv qaror qabul qilish kompetensiyasiga mos mezonlar, kuzatiladigan indikatorlar va diagnostik vositalar tizimini ishlab chiqish zaruratini yuzaga keltiradi.

Tadqiqotning maqsadi – yuqori sinf o‘ quvchilarida axloqiy dilemmalar asosida refleksiv qaror qabul qilish kompetensiyasining tarkibiy tuzilmasiga mos baholash mezonlari, indikatorlari, diagnostik vositalari va shakllanganlik darajalarini nazariy-metodik jihatdan asoslash.

TADQIQOT METODOLOGIYASI (METHODS)

Tadqiqot nazariy-metodik xarakterga ega bo‘ lib, unda pedagogik va psixologik manbalarni nazariy tahlil qilish, qiyosiy tahlil, tizimlashtirish, modellashtirish va mezon-indikatorlarni mazmuniy muvofiqlashtirish usullaridan foydalanildi. Refleksiv hukm va qarorni asoslashning nazariy tayanchi sifatida King va Kitchenerning refleksiv hukm modeli [1–3], metakognitiv monitoringga oid qarashlar [7], axloqiy mulohaza va axloqiy harakatning tarkibiy mexanizmlarini izohlovchi yondashuvlar [4–6; 8] hamda refleksiv o‘ rganish konsepsiyalari [9] tahlil qilindi.

Baholash tizimini ishlab chiqishda uchta metodik talab asos qilib olindi: birinchidan, mezon kompetensiyaning muayyan komponentiga bevosita mos bo‘ lishi; ikkinchidan, indikator o‘ quvchi faoliyatida kuzatilishi yoki topshiriq orqali aniqlanishi mumkin bo‘ lgan xatti-harakatni ifodalashi; uchinchidan, bitta diagnostik vositaga qaramlikni kamaytirish uchun bir nechta ma’lumot manbalaridan foydalanish. Shu asosda axloqiy dilemma, keys-topshiriq, reflektiv esse, suhbat, kuzatuv, guruhiy muhokama, ekspert baholash, reflektiv kundalik va “Besh barmoq” refleksiyasi kabi vositalarning mezonlar bilan funksional muvofiqligi belgilandi.

Mazkur maqolada empirik tajriba-sinov natijalari keltirilmaydi. Natijalar bo‘ limida muallif tomonidan ishlab chiqilgan baholash konstruksiyasining nazariy-metodik natijalari taqdim etiladi.

NATIJALAR (RESULTS)

Nazariy tahlil natijasida refleksiv qaror qabul qilish kompetensiyasi o‘ zaro bog‘ liq to‘ rtta komponentning integrativ birligi sifatida tavsiflandi: kognitiv, motivatsion-qadriyatli, kommunikativ va refleksiv-amaliy. Ushbu komponentlarga mos ravishda to‘ rtta baholash mezoni ishlab chiqildi: kognitiv-tahliliy, motivatsion-qadriyatli, kommunikativ-dialogik va refleksiv-amaliy.

1-jadval.

Refleksiv qaror qabul qilish kompetensiyasining mezonlari, indikatorlari va diagnostik vositalari

Komponent	Mezon	Asosiy indikatorlar	Ustuvor diagnostik vositalar

Kognitiv komponent	**Kognitiv-tahliliy mezon**	Axloqiy muammoni aniqlaydi; sabab-oqibat aloqalarini tahlil qiladi; dalillarning ishonchliligi va ahamiyatini baholaydi; muqobil yechimlarni ishlab chiqadi va qiyoslaydi; qarorini dalillar bilan asoslaydi.	Axloqiy dilemma; keys-topshiriq; reflektiv esse.
Motivatsion-qadriyatli komponent	**Motivatsion-qadriyatli mezon**	Adolat, vijdon, halollik va insonparvarlik kabi qadriyatlarga tayanadi; axloqiy tanlovga ichki motivatsiya namoyon qiladi; qarori uchun mas'uliyatni his qiladi; boshqalarning huquq va manfaatlarini hisobga oladi.	Dilemma topshirig' i; suhbat; pedagogik kuzatuv.
Kommuni-kativ komponent	**Kommuni-kativ-dialogik mezon**	O' z fikrini aniq va izchil ifodalaydi; fikrini dalillaydi; boshqa pozitsiyalarni tinglaydi va hurmat qiladi; savol va qarshi dalillarga munosabat bildiradi; munozara va hamkorlikda faol ishtirok etadi.	Kuzatuv; guruhiy muhokama; debat; ekspert baholash.
Refleksiv-amaliy komponent	**Refleksiv-amaliy mezon**	Mustaqil qaror qabul qiladi; qarorning ehtimoliy oqibatlarini baholaydi; o' z qarorining asoslarini tahlil qiladi; xato va cheklovlarni aniqlaydi; yangi dalillar asosida qarorini qayta ko' rib chiqadi yoki uni saqlab qolish sababini asoslaydi.	Reflektiv kundalik; "Besh barmoq" refleksiyasi; esse; reflektiv suhbat.

Kognitiv-tahliliy mezon o' quvchining axloqiy vaziyatni intellektual qayta ishlash darajasini ifodalaydi. Bunda axloqiy muammoni tanib olishning o' zi yetarli hisoblanmaydi; o' quvchi sabab va oqibatlarni ajratishi, dalillarning kuchini qiyoslashi, kamida bir nechta muqobil yechimni ko' ra olishi va tanlangan qarorni asoslay olishi zarur. Shu sababli mazkur mezonni baholashda ochiq javobli dilemma va keys-topshiriqlar yopiq testlarga nisbatan ko' proq diagnostik axborot beradi.

Motivatsion-qadriyatli mezon qarorning qanday qadriyatlarga tayanganini va o' quvchining axloqiy tanlovga ichki munosabatini aniqlashga xizmat qiladi. Bu mezonda o' quvchining faqat "to' g' ri" qadriyatni nomlashi emas, balki manfaatlar to' qnashuvida adolat, vijdon, halollik, mas'uliyat va insonparvarlikni qaror asosiga aylantira olishi muhimdir.

Kommunikativ-dialogik mezon refleksiv qarorning ijtimoiy tabiatini aks ettiradi. Axloqiy dilemma ko' pincha yagona va mutlaq yechimga ega bo' lmagani uchun o' quvchining o' z pozitsiyasini dalillashi, boshqa nuqtayi nazarlarni tinglashi, qarshi dalillarni tahlil qilishi va hamkorlikdagi muhokamada qatnashishi kompetensiyaning muhim ko' rsatkichi hisoblanadi.

Refleksiv-amaliy mezon baholash tizimining yakunlovchi qismi bo' lib, o' quvchining qaror qabul qilishdan keyingi tahliliy faoliyatini ham qamrab oladi. Bunda qarorni o' zgartirishning o' zi yuqori refleksivlik belgisi sifatida baholanmaydi. O' quvchi yangi dalillarni ko' rib chiqib, avvalgi pozitsiyasini saqlab qolishi mumkin; agar u buni asosli izohlasa, oqibatlarni qayta baholasa va o' z qarorining cheklovlarini anglay olsa, bu ham yuqori darajadagi refleksiv faoliyatni ko' rsatadi.

Shakllanganlik darajalarini baholash

Mezon va indikatorlar asosida kompetensiyaning uchta shakllanganlik darajasi – yuqori, o' rta va past darajalar belgilandi. Darajalarni aniqlashda alohida indikatorlarning mexanik yig' indisidan ko' ra, ularning barqarorligi, mustaqilligi, dalillanganligi va turli axloqiy vaziyatlarga ko' chira olinishi muhim deb qaraladi.

Mezon	**Yuqori daraja**	**O' rta daraja**	**Past daraja**
Kognitiv-tahliliy	Muammoni mustaqil aniqlaydi, sabab-oqibatlarni chuqur tahlil qiladi, dalillarni qiyosiy baholaydi, muqobil yechimlarni ishlab chiqadi va qarorini asoslaydi.	Muammoni anglaydi va qaror qabul qiladi, biroq dalillar, muqobil yechimlar yoki oqibatlarni tahlil qilishda qisman yordamga ehtiyoj sezadi.	Muammoni aniqlash, dalillarni baholash va muqobil yechimlarni ishlab chiqishda qiynaladi; qarori yetarli asoslanmaydi.

Motivatsion-qadriyatli	Qarorini barqaror axloqiy qadriyatlar asosida mustaqil asoslaydi, mas'uliyatni anglaydi va boshqalarning manfaatlarini hisobga oladi.	Qadriyatli munosabat mavjud, biroq manfaatlar to‘ qnashuvida tanlov va mas'uliyatni asoslash barqaror emas.	Qadriyatli asoslash va ichki motivatsiya sust; shaxsiy manfaat ustun keladi yoki qarorning axloqiy oqibatlari yetarli anglanmaydi.
Kommuni-kativ-dialogik	Fikrini aniq va dalillangan ifodalaydi, boshqa pozitsiyalarni faol tinglaydi, qarshi dalillarga asosli javob beradi va hamkorlikni qo‘ llab-quvvatlaydi.	Fikrini ifodalaydi va boshqa pozitsiyalarni qisman hisobga oladi, biroq dalillash yoki dialogdagi faollik yetarlicha barqaror emas.	Fikrini asoslashda qiynaladi, boshqa pozitsiyalarni tinglash va hisobga olish, munozara va hamkorlik ko‘ nikmalari sust.
Refleksiv-amaliy	Qarorni mustaqil qabul qiladi, oqibatlarni chuqur baholaydi, o‘ z fikrlashini tahlil qiladi va yangi dalillar asosida pozitsiyasini asosli ravishda qayta ko‘ rib chiqadi yoki saqlab qoladi.	Qaror va uning oqibatlarini tahlil qiladi, refleksiya mavjud, biroq o‘ z xatolari, cheklovlari yoki yangi dalillarning ta'sirini chuqur baholashda yordamga ehtiyoj sezadi.	Qaror oqibatlarini baholash, o‘ z fikrini tahlil qilish va yangi dalillar asosida pozitsiyasini qayta ko‘ rib chiqishda qiynaladi.

MUHOKAMA (DISCUSSION)

Taklif etilgan baholash tizimining asosiy xususiyati refleksiv qaror qabul qilishni faqat kognitiv natija sifatida emas, balki bilish, qadriyat, dialog va refleksiv harakatning integrativ birligi sifatida baholashidadir. King va Kitchener tadqiqotlarida refleksiv hukmning markaziy belgilaridan biri dalillarga tayangan holda hukm chiqarish va yangi ma'lumotlar paydo bo‘ lganda uni qayta ko‘ rib chiqishga tayyorlik ekanligi ko‘ rsatiladi [1–3]. Bu yondashuv ishlab chiqilgan kognitiv-tahliliy va refleksiv-amaliy mezonlarning nazariy asosini mustahkamlaydi.

Biroq axloqiy qaror oddiy epistemik hukmdan kengroq bo‘ lib, unda qadriyat, mas'uliyat, boshqa shaxslarning manfaatlari va muloqot ham ishtirok etadi. Shu sababli baholash tizimiga motivatsion-qadriyatli va kommunikativ-dialogik mezonlarning kiritilishi refleksiv hukm konsepsiyasini axloqiy-tarbiyaviy kontekstga moslashtirish imkonini beradi. Rest va Narvaezga tayanuvchi axloqiy harakat modellari ham axloqiy xatti-harakatning faqat mulohaza bilan cheklanmasligini, axloqiy sezgirlik, motivatsiya va amalga oshirish jarayonlari bilan bog‘ liqligini ko‘ rsatadi [6; 8].

Diagnostik jihatdan bir nechta vositadan foydalanish alohida ahamiyatga ega. Refleksiv qaror murakkab konstrukt bo‘ lgani sababli faqat test natijasi o‘ quvchining dalillash, qadriyatli tanlov, dialog va o‘ z qarorini qayta tahlil qilish jarayonlarini to‘ liq ko‘ rsatmaydi. Shu bois dilemma va keys-topshiriqlar kognitiv tahlilni, kuzatuv va guruhiy muhokama kommunikativ xulqni, suhbat qadriyatli motivatsiyani, reflektiv kundalik va reflektiv esse esa o‘ z-o‘ zini tahlil qilish jarayonini aniqlashda o‘ zaro to‘ ldiruvchi vositalar sifatida qo‘ llanishi maqsadga muvofiq.

Taklif etilgan mezon-indikator tizimi "Tarbiya" fanida axloqiy dilemmalar bilan ishlash jarayonida boshlang‘ ich diagnostika, joriy monitoring va yakuniy baholashni bir xil konseptual asosda tashkil etishga imkon beradi. Shu bilan birga, mazkur maqola nazariy-metodik bosqich natijalarini ifodalaganligi sababli indikatorlarning empirik validligi, mezonlararo bog‘ liqlik, ekspertlararo kelishuv va baholash shkalasining ishonchliligini keyingi tajriba-sinov tadqiqotlarida statistik jihatdan tekshirish zarur.

XULOSA (CONCLUSION)

Tadqiqot natijasida yuqori sinf o‘ quvchilarida refleksiv qaror qabul qilish kompetensiyasini baholashning komponent–mezon–indikator–diagnostik vosita–daraja zanjiriga asoslangan yaxlit tizimi ishlab chiqildi. Kognitiv komponent uchun kognitiv-tahliliy, motivatsion-qadriyatli komponent uchun motivatsion-qadriyatli, kommunikativ komponent uchun kommunikativ-dialogik, refleksiv-amaliy komponent uchun refleksiv-amaliy mezon belgilandi.

Har bir mezonning kuzatiladigan indikatorlar orqali konkretlashtirilishi baholashni umumiy tavsiflardan amaliy diagnostik faoliyatga o‘ tkazadi. Baholashda o‘ quvchining yakuniy tanlovidan ko‘ ra, qarorga olib kelgan tahlil, qadriyatli asos, dialog, oqibatlarni anglash va refleksiv qayta ko‘ rib chiqish jarayonlariga ustuvor ahamiyat berilishi lozim.

Taklif etilgan tizim “Tarbiya” fanida axloqiy dilemmalar asosidagi mashg‘ ulotlarning diagnostik ta’minotini kuchaytirishi, o‘ quvchining rivojlanish dinamikasini kuzatish va pedagogik korreksiyani maqsadli tashkil etish uchun metodik asos bo‘ lib xizmat qilishi mumkin. Keyingi bosqichda mezon va indikatorlarning empirik validligi tajriba va nazorat guruhlari natijalari asosida tekshirilishi maqsadga muvofiq.

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ADABIYOT DARSLARIDA HAMKORLIKKA ASOSLANGAN TA'LIM TEXNOLOGIYALARIDAN FOYDALANISH METODIKASI

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Annotatsiya: *Maqolada adabiyot darsida hamkorlikni badiiy matnni dalillar asosida talqin qilish bilan bog‘ lash masalasi o‘ rganiladi. Nazariy manbalar tahlili asosida individual mutolaa, guruh muhokamasi va mustaqil yozma xulosani birlashtiruvchi metodik ketma-ketlik taklif etiladi. Topshiriq tuzish, rollarni almashtirish va o‘ quvchining shaxsiy hissasini baholash shartlari aniqlashtiriladi. Ish nazariy-metodik xususiyatga ega; takliflar tajriba orqali tekshirishni talab qiladi.*

Kalit so‘ zlar: *adabiy ta'lim, hamkorlikda o‘ qitish, badiiy talqin, matniy dalil, guruh muhokamasi, individual baholash.*

МЕТОДИКА ИСПОЛЬЗОВАНИЯ ТЕХНОЛОГИЙ ОБУЧЕНИЯ В СОТРУДНИЧЕСТВЕ НА УРОКАХ ЛИТЕРАТУРЫ

Аннотация: *Рассматривается организация сотрудничества при интерпретации художественного текста. На основе анализа научной литературы предлагается последовательность, объединяющая индивидуальное чтение, групповое обсуждение и самостоятельный письменный вывод. Уточняются требования к заданиям, смене ролей и оценке личного вклада ученика. Работа носит теоретико-методический характер; предложенные решения нуждаются в эмпирической проверке.*

Ключевые слова: *литературное образование, обучение в сотрудничестве, интерпретация, текстовые доказательства, обсуждение, индивидуальное оценивание.*

METHODS OF USING COOPERATIVE LEARNING TECHNOLOGIES IN LITERATURE LESSONS

Abstract: *This conceptual paper examines how cooperative learning can support evidence-based literary interpretation. A teaching sequence links individual reading, structured group discussion and independent written conclusions. It specifies task design, rotating roles and the assessment of individual contributions. The proposed approach distinguishes participation from interpretive achievement and requires empirical validation before claims about effectiveness can be made.*

Keywords: *literature education, cooperative learning, literary interpretation, textual evidence, group discussion, individual assessment.*

KIRISH

Adabiyot darsida bir asar yuzasidan turli fikrlarning tug‘ ilishi tabiiy. Muammo bu fikrlarning mavjudligida emas, ularning matn bilan qanchalik asoslanishidadir. O‘ quvchi qahramonni yoqtirishi yoki uning xatti-harakatini ma'qullamasligi mumkin, biroq shaxsiy taassurotni badiiy talqinga aylantirish uchun tafsilot, nutq, tasvir va voqealar o‘ rtasidagi aloqani ko‘ rsatishi kerak. Hamkorlikda o‘ qitish shu o‘ tishni tashkil etuvchi vosita bo‘ la oladi.

Guruhga bo‘ lishning o‘ zi adabiy tahlilni chuqurlashtirmaydi. Ba'zan umumiy javobni bir o‘ quvchi tuzadi, qolganlar esa uni takrorlaydi. Bunday holatda tayyor taqdimot jamoaviy mehnat mahsuli bo‘ lib ko‘ rinsa-da, har bir ishtirokchining asarni tushunganini bildirmaydi. Mazkur maqolaning maqsadi hamkorlikning tashkiliy shakllarini badiiy matn bilan ishlash vazifalariga moslashtirish va individual o‘ zlashtirishni ko‘ rinadigan qilishdir. Tahlil umumiy o‘ rta ta'limning 7–9-sinflaridagi nasriy asarlar muhokamasiga yo‘ naltirilgan.

ADABIYOTLAR TAHLILI

R. Gillies hamkorlikda o‘ qitishni umumiy maqsadga yo‘ naltirilgan birgalikdagi faoliyat sifatida yoritib, uning samarasi topshiriq tuzilishi va o‘ qituvchining rahbarligiga bog‘ liqligini ko‘ rsatadi [1]. Bu yondashuv adabiyot darsi uchun muhim: bir stol atrofida o‘ tirish o‘ quvchilar fikrining o‘ zaro rivojlanishini hali ta'minlamaydi. D. Johnson va R. Johnsonning ijtimoiy o‘ zaro bog‘ liqlik nazariyasiga doir tahlili umumiy natijaga intilish bilan shaxsiy javobgarlikni birga ko‘ rishga asos beradi [2].

P. Murphy va hammualliflar matn muhokamasiga oid tadqiqotlar meta-tahlilida o‘ quvchi nutqi, matnni tushunish va fikrlash natijalarini alohida ko‘ rib chiqadilar [3]. Bundan mazkur ish uchun muhim metodik xulosa kelib chiqadi: darsdagi gapirish faolligini talqin sifati bilan tenglashtirish mumkin emas. O‘ quvchi ko‘ p gapirib, matndan uzoqlashishi yoki qisqa javobda muhim badiiy aloqani ochishi mumkin.

P. Black va D. Wiliamning shakllantiruvchi baholashga oid tadqiqoti o‘ quvchining joriy tushunishini aniqlash va keyingi o‘ qitishni shu ma’lumot asosida moslashtirishga e’tibor qaratadi [4]. Ko‘ rib chiqilgan manbalar hamkorlik, muhokama va baholashning umumiy asoslarini beradi. Ushbu maqolada ular adabiy talqinning o‘ ziga xos talabi — fikrni badiiy matn orqali asoslash — atrofida birlashtiriladi. Taklif etilayotgan yechim alohida yangi texnologiya da’vosi emas, mavjud yondashuvlarning fan mazmuniga mos metodik sintezidir.

TADQIQOT METODOLOGIYASI

Ish maqsadli tanlangan to‘ rtta ilmiy manbaning nazariy-qiyosiy tahlili va dars jarayonini pedagogik modellashtirishga asoslanadi. Manbalar hamkorlik mexanizmi, matn muhokamasi hamda baholash bilan bevosita bog‘ liqligi bo‘ yicha tanlandi. Bu qamrovli tizimli sharh emas. Tahlil birliklari sifatida topshiriqning maqsadi, o‘ quvchilar o‘ rtasidagi bog‘ liqlik, individual javobgarlik va kuzatiladigan o‘ quv mahsuli olindi.

Avval manbalardagi umumiy tamoyillar ajratildi, so‘ ng ular adabiy tahlil vazifalariga moslashtirildi. Yakunda dars ketma-ketligi va baholash mezonlari ishlab chiqildi. Empirik ma’lumot yig‘ ilmagani sababli natija deganda metodik loyiha tushuniladi; o‘ zlashtirishning oshishi yoki usulning boshqa usullardan ustunligi haqida statistik da’vo bildirilmaydi.

TAHLIL VA NATIJALAR

Taklifning markazida «shaxsiy fikr — matniy dalil — muqobil talqin — qayta yozilgan xulosa» ketma-ketligi turadi. Guruh ishining vazifasi dastlabki fikrni yo‘ qotib, bitta javobga bo‘ ysundirish emas, uning asosini tekshirishdir. Shu sababli muhokamadan oldin har bir o‘ quvchi qisqa javob yozadi; muhokamadan keyin esa xulosasini mustaqil ravishda qayta tuzadi. Ikki matnni solishtirish fikrning qaysi jihati o‘ zgarganini ko‘ rsatadi.

Birinchi shart — munozaraga ochiq, ammo matn bilan chegaralangan savol. «Asar sizga yoqdimi?» savoli taassurot almashishga xizmat qiladi. «Qahramonning qarorini uning avvalgi xatti-harakati tasdiqlaydimi yoki inkor etadimi?» savoli esa voqealar orasidagi aloqani izlashga undaydi. O‘ qituvchi o‘ quvchilardan kamida ikki dalil va ulardan biriga muqobil izoh topishni so‘ rashi mumkin. Dalilning ko‘ pligi emas, xulosaga aloqadorligi asosiy talab bo‘ lib qoladi.

Ikkinchi shart — rollarning fikrlash vazifasiga xizmat qilishi. To‘ rt kishilik guruhda dalil izlovchi tegishli parchani belgilaydi, talqin qiluvchi uning mazmunini tushuntiradi, savol beruvchi izohdagi noaniqlikni ko‘ rsatadi, umumlashtiruvchi kelishilgan va ochiq qolgan fikrlarni yozadi. Keyingi topshiriqda rollar almashadi. O‘ quvchini doim yozuvchi yoki taqdimotchi qilib qo‘ yish ayrim faoliyatlarni uning imkoniyatidan tashqarida qoldirishi mumkin.

45 daqiqalik dars uchun quyidagi taqsimot taklif etiladi: muammo va mezonlarni belgilashga 5, individual qayta o‘ qish va dastlabki javobga 7, guruh tahliliga 12, guruhlararo savol-javobga 8, mustaqil xulosaga 8, yakuniy refleksiyaga 5 daqiqa. Bu qat’iy me’yor emas. Asar oldindan o‘ qilmagan bo‘ lsa, mazkur taqsimot mos kelmaydi; avval matnni tushunish va zarur so‘ zlarni izohlashga vaqt ajratiladi.

Metodik vaziyat sifatida qahramonning yordam berish yoki chetda turish orasidagi tanlovini ifodalovchi nasriy epizodni olaylik. O‘ qituvchi aniq asardan yoshga mos parchani tanlaydi. Bir o‘ quvchi qarorni ehtiyotkorlik, ikkinchisi loqaydlik deb talqin qilishi mumkin. Muhokamada «Qaysi jumla bunday xulosaga olib keldi?», «Hikoyachining bahosi bilan qahramonning o‘ zini oqlashi bir xilmi?» kabi savollar beriladi. Bu muallif tomonidan tuzilgan topshiriq namunasi bo‘ lib, real sinf kuzatuvi sifatida taqdim etilmaydi.

Guruhlararo muloqotda har bir guruh bir xulosa va uni cheklovchi bir savolni taqdim etadi. Ikkinchi guruh avval eshitgan fikrni o‘ z so‘ zi bilan qaytaradi, keyin unga munosabat bildiradi. Bunday tartib bahsni darhol rad etishdan boshlamaslikka yordam berishi mumkin. O‘ qituvchi tayyor talqinni aytishdan oldin dalilning o‘ rnini, hikoyachi nuqtayi nazarini yoki qarama-qarshi tafsilotni aniqlashtiradi. Matnga zid fakt xatosi esa ochiq tuzatiladi.

Baholash ikki yo‘ nalishda olib boriladi. Adabiy tahlil bo‘ yicha matniy dalilning aniqligi, dalil va xulosa aloqasi, muqobil talqinni ko‘ rib chiqish baholanadi. Hamkorlik bo‘ yicha sherik fikrini tinglash, mazmunli savol berish va vazifaga hissa qo‘ shish kuzatiladi. Har bir mezon uchun «hali namoyon bo‘ lmadi», «ko‘ mak bilan namoyon bo‘ ldi», «mustaqil namoyon bo‘ ldi» tavsiflari qo‘ llanishi mumkin. Bu tavsiflar validatsiyadan o‘ tgan test emas, o‘ qituvchi qaydlarini tartibga soluvchi taklifdir.

Individual yakuniy yozuvda o‘ quvchi dastlabki qarashi, uni tasdiqlagan yoki o‘ zgartirgan dalil hamda ochiq qolgan savolni ko‘ rsatadi. Guruh taqdimotining ravonligi uning shaxsiy bahosini avtomatik belgilamaydi. Masalan, og‘ zaki tortinchoq o‘ quvchining asosli yozma talqini yuqori adabiy tushunishni ko‘ rsatishi mumkin. Aksincha, faol taqdimotchining dalilsiz xulosasi qo‘ shimcha ishlashni talab qiladi.

Tatbiqda uchta cheklov e’tiborga olinadi. O‘ qish sur’ati farqli sinfda qisqartirilgan tayanch parcha va oldindan lug‘ at tayyorlanadi. Yetakchi o‘ quvchi boshqalarning javobini egallab olganda avval yozish, keyin navbat bilan fikr

bildirish tartibi kiritiladi. Guruhlar bir-birining xulosasini takrorlaganda esa matndan muqobil dalil izlash vazifasi beriladi. Yordam hajmi kamayib borishi lozim; doimiy tayyor andoza mustaqil talqinni cheklashi mumkin.

XULOSALAR

Adabiyot darsida hamkorlikning metodik qiymati jamoaviy javob tayyorlash bilangina belgilanmaydi. U o‘ quvchiga o‘ z talqinini matn asosida tekshirish, boshqa qarashni tushunish va mustaqil xulosasini aniqlashtirish imkonini berishi kerak. Buning uchun individual mutolaa, tuzilgan guruh muhokamasi va yakuniy yozma ish uzviy tashkil etiladi.

Taklif etilgan ketma-ketlikni amaliyotda tekshirishda bir xil murakkablikdagi matnlar bo‘ yicha dastlabki va yakuniy yozuvlarni solishtirish, baholovchilar mezonlarni bir xil qo‘ llashini tekshirish hamda o‘ qish saviyasidagi farqlarni hisobga olish zarur. Shundan keyingina usulning natijadorligi to‘ g‘ risida asosli xulosa chiqarish mumkin.

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PRAGMATIK TOPSHIRIQLAR ASOSIDA O‘ QUVCHILARNING ADABIY-NUTQIY KOMPETENSIYASINI RIVOJLANTIRISH

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Annotatsiya: *Ushbu maqolada umumiy o‘ rta ta’lim maktablarida adabiyot fanini o‘ qitish jarayonida pragmatik o‘ quv topshiriqlaridan foydalanishning metodik imkoniyatlari yoritilgan. Adabiy ta’limda o‘ quv topshiriqlarining o‘ rni, an’anaviy va pragmatik topshiriqlarning o‘ ziga xos jihatlari, ularning o‘ quvchilarning adabiy-nutqiy kompetensiyasini rivojlantirishdagi ahamiyati tahlil qilingan. Pragmatik topshiriqlarning real hayotiy vaziyat, kommunikativ faoliyat, badiiy matn mazmuni va o‘ quvchining mustaqil fikrlashi bilan bog‘ liqligi asoslangan. Shuningdek, topshiriqlarni Bloom taksonomiyasining bilish, anglash, qo‘ llash, tahlil, sintez va baholash darajalari asosida tashkil etish imkoniyatlari ko‘ rsatib berilgan.*

Kalit so‘ zlar: *adabiy ta’lim, adabiyot darsi, pragmatik topshiriq, o‘ quv topshirig‘ i, adabiy-nutqiy kompetensiya, nutqiy ko‘ nikma, kommunikativ faoliyat, badiiy matn, Bloom taksonomiyasi, mustaqil fikrlash, o‘ qib tushunish.*

РАЗВИТИЕ ЛИТЕРАТУРНО-РЕЧЕВОЙ КОМПЕТЕНТНОСТИ УЧАЩИХСЯ НА ОСНОВЕ ПРАГМАТИЧЕСКИХ ЗАДАНИЙ

Аннотация: *В данной статье рассматриваются методические возможности использования прагматических учебных заданий в процессе преподавания литературы в общеобразовательных школах. Проанализированы роль учебных заданий в литературном образовании, специфика традиционных и прагматических заданий, их значение в развитии литературно-речевой компетентности учащихся. Основой прагматических заданий является их связь с реальной жизненной ситуацией, коммуникативной деятельностью, содержанием художественного текста и самостоятельным мышлением учащегося. Также показана возможность организации задач на основе уровней знания, понимания, применения, анализа, синтеза и оценки таксономии Блума.*

Ключевые слова: *литературное образование, урок литературы, прагматическое задание, учебное задание, литературно-речевая компетентность, речевые навыки, коммуникативная деятельность, художественный текст, таксономия Блума, самостоятельное мышление, понимание прочитанного.ое мышление, понимание прочитанного.*

DEVELOPING STUDENTS’ LITERARY AND SPEECH COMPETENCE BASED ON PRAGMATIC TASKS

Abstract: *This article discusses the methodological possibilities of using pragmatic learning tasks in the process of teaching literature in secondary schools. The role of learning tasks in literary education, the specific aspects of traditional and pragmatic tasks, and their importance in developing students’ literary and speech competence are analyzed. The pragmatic tasks are based on their connection to real-life situations, communicative activities, the content of literary texts, and the student’s independent thinking. It also shows how tasks can be organized based on the levels of knowledge, understanding, application, analysis, synthesis, and evaluation of Bloom’s taxonomy.*

Keywords: *literary education, literature lesson, pragmatic task, educational task, literary and speech competence, speech skill, communicative activity, literary text, Bloom’s taxonomy, independent thinking, reading comprehension.*

KIRISH

Zamonaviy adabiy ta’limning asosiy vazifalaridan biri o‘ quvchiga badiiy asar mazmunini shunchaki qayta hikoya qildirish emas, balki uning matn bilan mustaqil ishlashi, obrazlar xatti-harakatiga munosabat bildirishi, muallif pozitsiyasini anglashga intilishi, o‘ z qarashlarini asoslay olishi va adabiy-estetik mazmunni real kommunikativ vaziyatlar bilan bog‘ lay olishiga sharoit yaratishdan iborat. Adabiyot darsida o‘ quvchi faqat bilimni qabul qiluvchi subyekt sifatida

emas, balki **matnni talqin qiluvchi, mazmunni qayta tashkil etuvchi va o‘ z fikrini nutq orqali ifodalovchi faol subyekt** sifatida namoyon bo‘ lishi zarur. Shu nuqtayi nazardan, o‘ quv topshiriqlarining mazmuni va tuzilishi alohida metodik ahamiyat kasb etadi.

O‘ quv topshirig‘ i ta’lim maqsadini amalga oshirishga xizmat qiluvchi pedagogik birlik bo‘ lib, u oddiy mashqdan o‘ zining maqsadga yo‘ naltirilganligi, o‘ quvchidan muayyan faoliyatni talab qilishi va natijani yuzaga chiqarishi bilan farqlanadi. Biroq zamonaviy adabiy ta’lim sharoitida topshiriqning qiymatini faqat bilimni tekshirish bilan chegaralash yetarli emas. Topshiriq o‘ quvchini fikrlashga, tanlashga, muloqotga kirishishga, muammoni hal qilishga va o‘ z qarorini izohlashga undashi lozim. Shu jihatdan pragmatik topshiriqlar alohida metodik imkoniyatga ega. Ularning mohiyati o‘ quvchini badiiy matn doirasidagi tayyor savolga javob berishdan ko‘ ra, **muayyan kommunikativ vaziyatda nutqiy harakatni amalga oshirishga** yo‘ naltirish bilan belgilanadi. Zamonaviy metodik qarashlarda topshiriqning real harakat, kommunikativlik, hayotiy vaziyat, kontekst va bir nechta ko‘ nikmalarni birgalikda rivojlantirishga yo‘ naltirilishi muhimligi qayd etiladi. Demak, pragmatik topshiriqning markazida “o‘ quvchi nimani biladi?” degan savoldan ko‘ ra, **“o‘ quvchi o‘ z bilimidan kommunikativ vaziyatda qanday foydalanadi?”** degan savol turadi.

METODOLOGIYA

Tadqiqotning metodologik asosini o‘ quvchilarning adabiy-nutqiy kompetensiyasini pragmatik topshiriqlar vositasida rivojlantirish jarayonining nazariy-metodik va pedagogik-psixologik qonuniyatlarini o‘ rganishga yo‘ naltirilgan yondashuvlar majmui tashkil etadi. Tadqiqot konsepsiyasini shakllantirishda kompetensiyaviy, kommunikativ-faoliyatli, shaxsga yo‘ naltirilgan hamda kontekstual yondashuvlarning metodologik imkoniyatlariga tayanildi. Mazkur yondashuvlar uyg‘ unligi o‘ quvchining badiiy matnni anglash, uning mazmun-mohiyatini interpretatsiya qilish, muallif va qahramon nutqining pragmatik xususiyatlarini idrok etish hamda turli kommunikativ vaziyatlarda adabiy til me’yorlariga muvofiq ravishda fikr ifodalash ko‘ nikmalarini izchil shakllantirish imkonini beradi. Yo‘ nalishini belgilashda, avvalo, “kompetensiya”, “adabiy-nutqiy kompetensiya”, “kommunikativ kompetensiya”, “pragmatik kompetensiya”, “pragmatik topshiriq” kabi tayanch tushunchalarning mazmun-mohiyati o‘ zaro aloqadorlikda tahlil qilindi. Pragmatik topshiriq o‘ quvchining badiiy matnda ifodalangan kommunikativ maqsadni anglash, nutqiy vaziyat va muloqot ishtirokchilari o‘ rtasidagi munosabatni hisobga olish, muayyan vaziyatga mos nutqiy vositalarni tanlash hamda o‘ z fikrini maqsadga muvofiq va ta’sirchan ifodalash faoliyatini faollashtiruvchi didaktik vosita sifatida talqin qilindi.

Adabiy-nutqiy kompetensiyaning mazmuni faqatgina badiiy asar mazmunini o‘ zlashtirish yoki adabiy til me’yorlarini bilish bilan chegaralanmay, balki o‘ quvchining egallagan bilim va ko‘ nikmalarini real hamda modellashtirilgan kommunikativ vaziyatlarda mustaqil qo‘ llay olish qobiliyati bilan belgilanadi. Shu nuqtayi nazardan, pragmatik topshiriqlar badiiy matn bilan o‘ quvchining amaliy nutqiy faoliyati o‘ rtasidagi metodik bog‘ liqlikni ta’minlovchi vosita sifatida tadqiq etildi.

Pragmatik topshiriqlarni ishlab chiqishda ularning mazmuni, murakkablik darajasi va kommunikativ yo‘ nalganligi izchil hisobga olindi. Xususan, o‘ quvchilarga badiiy matndagi nutqiy vaziyatni aniqlash, kommunikativ maqsadni belgilash, adresant va adresat munosabatini izohlash, qahramon nutqining mazmuniy-pragmatik xususiyatlarini tahlil qilish, muayyan vaziyatga mos dialog va monolog yaratish, matn mazmunini boshqa kommunikativ sharoitga ko‘ chirish hamda o‘ z fikrini daliliy asosda ifodalashga yo‘ naltirilgan topshiriqlar tizimi taklif etildi. Tadqiqot jarayonida pragmatik topshiriq uch asosiy talab asosida loyihalashtirildi:

birinchidan, topshiriq badiiy matnga mazmunan bog‘ langan bo‘ lishi;

ikkinchidan, o‘ quvchida muayyan kommunikativ muammoni yuzaga keltirishi;

uchinchidan, topshiriq yakunida o‘ quvchi tomonidan muayyan nutqiy mahsulot yaratilishi.

Adabiy-nutqiy kompetensiyaning tarkibiy qismi

1-jadval.

Komponent	Asosiy mazmun	O‘ quvchi faoliyatidagi ifodasi
Mazmuniy	Badiiy matn mazmunini anglash	Muhim voqea va muammoni ajratish
Interpretativ	Matnni mustaqil talqin qilish	Obraz va voqealarga munosabat bildirish
Nutqiy	Fikrni aniq va izchil ifodalash	Og‘ zaki va yozma nutq yaratish
Argumentativ	Fikrni asoslash	Matn asosida dalil keltirish
Kommunikativ-pragmatik	Vaziyatga mos nutqiy strategiya tanlash	Muloqot, bahs, tavsiya, murojaat

Refleksiv	O‘ z nutqiy faoliyatini baholash	Javobini tahlil qilish va takomillashtirish

Pragmatik topshiriqning samaradorligi uning o‘ quvchiga nechta savol berishi bilan emas, balki undan nechta **mustaqil nutqiy harakat** talab qilishi bilan belgilanadi.

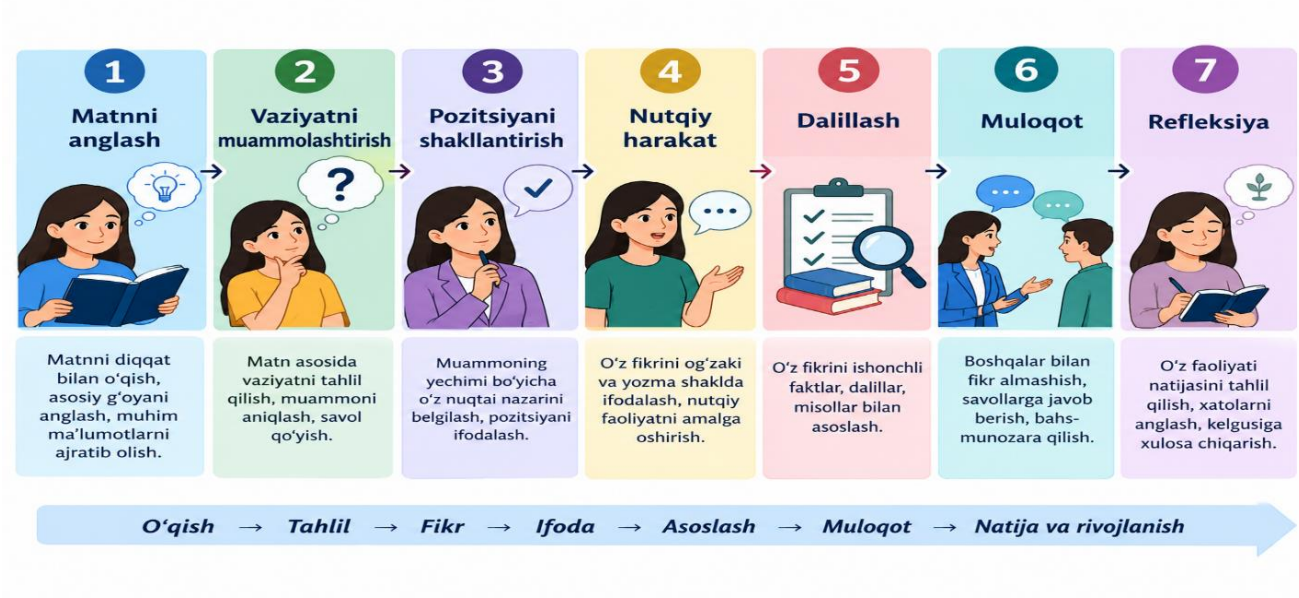
NATIJA

Tadqiqot natijalari pragmatik topshiriqlardan foydalanish o‘ quvchilarning adabiy-nutqiy kompetensiyasini rivojlantirishda samarali vosita ekanligini ko‘ rsatdi. Bunday topshiriqlar o‘ quvchilarning badiiy matn mazmunini chuqur anglash, nutqiy vaziyatni to‘ g‘ ri baholash va fikrini mustaqil ifodalash ko‘ nikmalarini rivojlantirdi.

Pragmatik topshiriqlar asosida tashkil etilgan mashg‘ ulotlarda o‘ quvchilarning darsdagi faolligi oshib, dialogik va monologik nutqdan foydalanish imkoniyatlari kengaydi. Ayniqsa, qahramon nutqining maqsadini aniqlash, kommunikativ vaziyatga mos fikr bildirish va badiiy matn asosida mustaqil nutq yaratishga yo‘ naltirilgan topshiriqlar samarali bo‘ ldi. Pragmatik yondashuv badiiy matnni o‘ rganishni amaliy nutqiy faoliyat bilan bog‘ lash, o‘ quvchilarning mustaqil fikrlashi va adabiy nutq me’yorlariga rioya qilish ko‘ nikmalarini shakllantirishga xizmat qilishini ko‘ rsatdi.

MUHOKAMA

Nazariy-metodik natijalar pragmatik topshiriqlarni adabiy ta’limning kompetensiyaviy imkoniyatlarini kengaytiruvchi vosita sifatida qarash mumkinligini ko‘ rsatadi. Bunda asosiy metodik o‘ zgarish topshiriqning mazmunida emas, balki **o‘ quvchi faoliyatining xarakterida** yuz beradi. O‘ quvchi badiiy matnni o‘ qigach, matn haqida tayyor xulosa aytish bilan cheklanmaydi. U vaziyatni qayta ko‘ rib chiqadi, o‘ z pozitsiyasini belgilaydi, nutqiy vositalarni tanlaydi va boshqa kommunikativ subyekt bilan munosabatga kirishadi. Bu jarayon adabiy-nutqiy kompetensiyaning bir nechta komponentlarini bir vaqtning o‘ zida rivojlantiradi. Pragmatik topshiriqlarning yana bir muhim jihati – **kontekstualizatsiya**dir. Badiiy asardagi muammo o‘ quvchining real hayotiy tajribasi bilan bog‘ langanda, adabiy bilim amaliy nutqiy faoliyatga ko‘ chadi. O‘ quvchi “asar nima haqida?” degan savoldan “asar ko‘ targan muammo men uchun qanday ma’noga ega?” degan savolga o‘ tadi. Shuningdek, pragmatik topshiriqlar o‘ quvchining qarama-qarshi fikr bilan ishlash kompetensiyasini rivojlantirish uchun ham qulay sharoit yaratadi. Adabiy-nutqiy kompetensiya faqat o‘ z fikrini bayon qilish emas, balki boshqa fikrni tushunish, unga munosabat bildirish va zarur hollarda o‘ z pozitsiyasini qayta ko‘ rib chiqishni ham nazarda tutadi. Shu jihatdan pragmatik topshiriqlarning samaradorligi quyidagi zanjir orqali ifodalanishi mumkin:



Mazkur zanjirda har bir keyingi bosqich avvalgisining natijasiga tayanadi. Demak, pragmatik topshiriq alohida savol yoki mashq emas, balki o‘ quvchini bosqichma-bosqich kommunikativ faoliyatga olib kiruvchi **metodik texnologiya** sifatida qaralishi mumkin.

XULOSA

Demak, adabiy-nutqiy kompetensiyani rivojlantirishda topshiriqning asosiy vazifasi bilimni nazorat qilish bilan chegaralanmasligi, o‘ quvchini mustaqil nutqiy faoliyatga jalb etishi zarur. Pragmatik topshiriq badiiy matn va real kommunikativ vaziyat o‘ rtasida metodik ko‘ prik vazifasini bajaradi. U o‘ quvchiga badiiy vaziyatni tushunish,

muammoni aniqlash, pozitsiya tanlash, fikrini ifodalash va uni dalillash imkonini beradi. Pragmatik topshiriqlarni darsning turli bosqichlariga integratsiya qilish o‘ quvchining interpretativ, nutqiy, kommunikativ, argumentativ va refleksiv faoliyatini yagona ta’limiy jarayonga birlashtirish imkonini beradi. Pragmatik topshiriqlarning samaradorligini baholashda faqat javobning mazmuniy to‘ g‘ riligini emas, balki o‘ quvchining vaziyatni anglash, mustaqil pozitsiya shakllantirish, dalillash, muloqotga kirishish va o‘ z faoliyatini baholash darajasini ham hisobga olish lozim. Demak, pragmatik topshiriqlar adabiy ta’limda o‘ quvchini **matnni o‘ zlashtiruvchi subyektdan matn asosida mustaqil fikr va nutqiy mahsulot yaratuvchi subyektga** aylantirish imkonini beruvchi samarali metodik vosita sifatida namoyon bo‘ ladi.

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ZAMONAVIY TA'LIM SHAROITIDA TALABALARNING BILISHGA QIZIQISHINI RIVOJLANTIRISHNING PEDAGOGIK IMKONIYATLARI

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Annotatsiya: *Maqolada zamonaviy oliy ta'lim sharoitida talabalarning bilishga qiziqishini rivojlantirishning nazariy asoslari va pedagogik imkoniyatlari tahlil qilingan. Tadqiqotning maqsadi bilishga qiziqish, o' quv motivatsiyasi va intellektual faollik o' rtasidagi munosabatni aniqlashtirish hamda qiziqishning davomiyligini qo' llab-quvvatlovchi pedagogik shartlarni asoslashdan iborat. Maqsadli tanlangan ilmiy manbalarning tushunchaviy, qiyosiy va tanqidiy tahlili amalga oshirilgan. Tahlil natijasida o' quv mazmunining shaxsiy-kasbiy ahamiyati, mazmunli tanlov, asoslangan intellektual murakkablik, hamkorlikdagi fikrlash, rivojlantiruvchi fikr-mulohaza va refleksiyaning o' zaro aloqadorligi ochib berilgan. Vaziyatli faollik bilan mavzuga mustaqil qayta murojaat qilishga tayyorlik farqlangan. Qiziqishni baholashda talabaning subyektiv munosabati, o' quv faoliyati mahsullari va vaqt davomida kuzatiladigan xatti-harakatlarni birgalikda o' rganish taklif etilgan. Xulosalar nazariy xususiyatga ega bo' lib, ularni muayyan ta'lim muhitida empirik tekshirish zarurati ko' rsatilgan.*

Kalit so' zlar: *bilishga qiziqish, o' quv motivatsiyasi, oliy ta'lim, vaziyatli qiziqish, individual qiziqish, intellektual faollik, mustaqil ta'lim, pedagogik qo' llab-quvvatlash, rivojlantiruvchi baholash, refleksiya.*

ПЕДАГОГИЧЕСКИЕ ВОЗМОЖНОСТИ РАЗВИТИЯ ПОЗНАВАТЕЛЬНОГО ИНТЕРЕСА СТУДЕНТОВ В УСЛОВИЯХ СОВРЕМЕННОГО ОБРАЗОВАНИЯ

Аннотация: *В статье рассматриваются теоретические основания и педагогические возможности развития познавательного интереса студентов в условиях современного высшего образования. Цель исследования заключается в уточнении взаимосвязи познавательного интереса, учебной мотивации и интеллектуальной активности, а также в обосновании педагогических условий поддержания интереса. Применены концептуальный, сравнительный и критический анализ целенаправленно отобранных научных источников. Раскрыта взаимосвязь личностно-профессиональной значимости учебного содержания, осмысленного выбора, обоснованной интеллектуальной сложности, совместного рассуждения, развивающей обратной связи и рефлексии. Разграничены ситуативная активность и готовность самостоятельно возвращаться к изучаемой теме. Предложено оценивать интерес на основе сочетания самоотчётов студентов, анализа результатов учебной деятельности и повторных наблюдений. Выводы имеют теоретический характер и требуют эмпирической проверки в конкретной образовательной среде.*

Ключевые слова: познавательный интерес, учебная мотивация, высшее образование, ситуативный интерес, индивидуальный интерес, интеллектуальная активность, самостоятельное обучение, педагогическая поддержка, формирующее оценивание, рефлексия.

PEDAGOGICAL OPPORTUNITIES FOR DEVELOPING STUDENTS' INTEREST IN LEARNING IN CONTEMPORARY EDUCATION

Abstract: *This article examines the theoretical foundations and pedagogical opportunities for developing students' interest in learning in contemporary higher education. The study aims to clarify the relationships among interest, learning motivation, and intellectual engagement and to substantiate pedagogical conditions that may sustain interest. Conceptual, comparative, and critical analyses were applied to purposively selected scholarly sources. The analysis identifies connections among the personal and professional relevance of learning content, meaningful choice, appropriately challenging tasks, collaborative reasoning, formative feedback, and reflection. Situational engagement is distinguished from students' willingness to re-engage independently with a topic. The article proposes combining student self-reports, learning products, and repeated behavioural observations when assessing interest. The conclusions are theoretical and require empirical investigation in specific educational settings.*

Keywords: *interest in learning, learning motivation, higher education, situational interest, individual interest, intellectual engagement, independent learning, pedagogical support, formative assessment, reflection.*

KIRISH.

Oliy ta’limda mutaxassis tayyorlashning sifati talabaning mavjud bilimlarni o‘ zlashtirishi bilan birga, yangi bilimlarni mustaqil egallashi, muammolarni anglab yetishi va kasbiy faoliyatini muntazam takomillashtirishga tayyorligi bilan belgilanadi. Axborot resurslarining kengayishi bilim olish imkoniyatlarini oshirayotgan bir sharoitda, ma’lumotni topish, uning ishonchliligini baholash va mazmunini chuqur tushunish turli intellektual vazifalar sifatida namoyon bo‘ lmoqda. Bu vazifalarni bajarishda talabaning o‘ rganilayotgan mazmunga faol munosabati muhim o‘ rin tutadi.

O‘ zbekiston Respublikasining “Ta’lim to‘ g‘ risida”gi Qonuni ta’limni tashkil etish va uning ishtirokchilari faoliyatining huquqiy asoslarini belgilaydi [1]. Ta’lim jarayonining pedagogik sifati esa mazkur tashkiliy imkoniyatlarning talaba rivojlanishiga qanday xizmat qilishi bilan bog‘ liq. Shu nuqtayi nazardan, bilishga qiziqishni rivojlantirish o‘ quv mashg‘ ulotining tashqi jozibadorligini oshirish doirasidan kengroq mazmun kasb etadi. U talabaning bilim olishga ongli kirishishi, savol qo‘ yishi, izlanishi va o‘ rganishni davom ettirishga tayyorligini qo‘ llab-quvvatlashni talab qiladi.

Pedagogik amaliyotda bilishga qiziqish ba’zan darsdagi jonlanish, tezkor javoblar, topshiriqlarning bajarilishi yoki yuqori baholar bilan tenglashtiriladi. Ushbu belgilar muayyan faollikni ko‘ rsatsa-da, talabaning o‘ quv mazmuniga barqaror munosabatini to‘ liq tavsiflamaydi. Faoliyat tashqi nazorat, baholash talabi yoki ijtimoiy kutish bilan ham rag‘ batlantirilishi mumkin. Qiziqishning o‘ ziga xosligi esa mazmunni anglashga intilish va unga mustaqil qayta murojaat qilishda ko‘ rinadi.

Mavzuning dolzarbligi qiziqishni uyg‘ otuvchi vositalar bilan uni davomli bilish faoliyatiga bog‘ lovchi pedagogik shartlar o‘ rtasidagi farqni aniqlashtirish zarurati bilan belgilanadi. Yangilik, tasvir yoki raqamli vosita e’tiborni jalb qilishi mumkin, biroq bu holatning mazmunli izlanishga aylanishi topshiriq, pedagogik yordam, shaxsiy ahamiyat va o‘ quv tajribasiga bog‘ liq.

Tadqiqotning maqsadi zamonaviy oliy ta’limda talabalarning bilishga qiziqishini rivojlantirishga xizmat qiladigan pedagogik imkoniyatlarni nazariy jihatdan asoslashdir. Asosiy tadqiqot savoli o‘ quv mazmuni, mustaqil tanlov, intellektual murakkablik va pedagogik yordamning qanday uyg‘ unligi talabaning mavzuni o‘ rganishni davom ettirishiga sharoit yaratishi mumkinligini aniqlashga qaratilgan.

Maqolaning nazariy hissasi qiziqishni qo‘ zg‘ atish, davom ettirish va uning barqarorlashuviga xizmat qiluvchi shartlarni o‘ zaro bog‘ liq holda talqin qilishda ifodalanadi. Shuningdek, qiziqishning bevosita namoyon bo‘ lishi bilan uning rivojlanganligi haqidagi dalil farqlanib, pedagogik baholashda turli ma’lumot manbalarini uyg‘ unlashtirish zarurati asoslanadi.

MAVZUGA OID ADABIYOTLAR TAHLILI

S. Hidi va K. A. Renninger qiziqish rivojlanishini qo‘ zg‘ atilgan vaziyatli qiziqish, qo‘ llab-quvvatlangan vaziyatli qiziqish, shakllanayotgan individual qiziqish va rivojlangan individual qiziqish bosqichlari orqali tushuntiradilar [2]. Mazkur yondashuv qiziqishning shaxs bilan o‘ quv mazmuni o‘ rtasidagi o‘ zaro ta’sirda shakllanishini ochib beradi. Dastlabki e’tiborning davomli munosabatga aylanishi bilimning kengayishi, mazmunning qadrlanishi va qayta ishtirok etish imkoniyatlari bilan bog‘ liq.

J. M. Harackiewicz, J. L. Smith va S. J. Priniski qiziqishni muayyan mavzuga yo‘ nalgan psixologik holat hamda vaqt davomida mazmunga qayta murojaat qilishga moyillik sifatida tahlil qiladilar [3]. Bu farqlash qiziqishni rivojlantirishning maqsadi faqat mashg‘ ulot paytidagi ijobiy taassurot bilan cheklanmasligini ko‘ rsatadi. Mavjud qiziqishlar bilan bog‘ lanish, muammoli faoliyat va mazmunning ahamiyatini anglash mazkur jarayonning muhim yo‘ nalishlaridir.

R. M. Ryan va E. L. Decining o‘ zini o‘ zi belgilash nazariyasiga asoslangan tahlilida mustaqillik, kompetentlik hissi va ijtimoiy aloqadorlik motivatsiyani qo‘ llab-quvvatlovchi asosiy psixologik ehtiyojlar sifatida yoritiladi [4]. Ushbu yondashuvda talabaning o‘ z qarorini ongli qabul qilishi aniq pedagogik tartib va yordam bilan uyg‘ unlashadi. Shuningdek, shaxs tomonidan qabul qilingan kasbiy maqsadga asoslangan motivatsiya ham o‘ quv faoliyatini qo‘ llab-quvvatlashi mumkin.

C. S. Hulleman va J. M. Harackiewiczning yuqori sinf o‘ quvchilari ishtirokidagi tajribasida fan mazmunini shaxsiy hayot bilan bog‘ lashga qaratilgan topshiriqlar muvaffaqiyatga erishish kutishi past bo‘ lgan o‘ quvchilarning qiziqishi va baholariga ijobiy ta’sir ko‘ rsatgan [5]. Natija mazmunning ahamiyatini o‘ rganuvchining o‘ zi izohlashi istiqbolli yo‘ nalish ekanini ko‘ rsatadi. Biroq maktab sharoitida olingan ushbu dalil oliy ta’limga bevosita umumlashtirilmasdan, talabalar xususiyatlari asosida tekshirilishi lozim.

M. T. H. Chi va R. Wylie tomonidan ishlab chiqilgan ICAP yondashuvi passiv, faol, konstruktiv va interaktiv kognitiv jalb etilishni farqlaydi [6]. Unda material bilan tashqi harakat qilish, mustaqil izoh yaratish va hamkorlikda fikrni rivojlantirish o‘ rtasidagi farqlar ko‘ rsatiladi. Ushbu yondashuv qiziqishning o‘ zini o‘ lchashdan ko‘ ra, topshiriq talab qilayotgan fikrlash faoliyatini tahlil qilish uchun muhimdir.

S. Freeman va hammualliflarning oliy ta’limdagi STEM yo‘ nalishlariga doir 225 tadqiqotni qamrab olgan metatahlilida faol o‘ qitish sharoitida imtihon va tushunchaviy test natijalarining yaxshilanishi aniqlangan [7]. Mazkur dalil

faol o‘ qitishning o‘ zlashtirishdagi imkoniyatlarini ko‘ rsatadi. Uni bilishga qiziqishning aynan shunday darajada rivojlangani haqidagi xulosa bilan almashtirish metodologik jihatdan to‘ g‘ ri bo‘ lmaydi.

J. Hattie va H. Timperley fikr-mulohazaning ta’limdagi rolini o‘ quv maqsadi, mavjud natija va keyingi harakat o‘ rtasidagi aloqani aniqlashtirish orqali tushuntiradilar [8]. B. Wisniewski, K. Zierer va J. Hattie metatahlilida esa fikr-mulohazaning ta’siri uning axborot mazmuni va o‘ lchanayotgan natija turiga qarab farqlanishi ko‘ rsatilgan [9]. Bu tadqiqotlar baholash jarayonida umumiy maqtovdan ko‘ ra o‘ quv faoliyatini yo‘ naltiruvchi aniq axborotning ahamiyatini muhokama qilishga asos beradi.

E. Panaderoning o‘ zini o‘ zi boshqarib o‘ rganishga oid sharhida rejalashtirish, faoliyatni kuzatish va natijani qayta baholashning kognitiv, motivatsion hamda hissiy jarayonlar bilan aloqasi yoritilgan [10]. Mazkur yondashuv qiziqishning mavjudligi bilan o‘ qishni izchil tashkil eta olish o‘ rtasidagi munosabatni tushuntirishga yordam beradi. Talaba mavzuga qiziqsa ham, vaqtni boshqarish yoki samarali strategiyani tanlashda pedagogik yordamga ehtiyoj sezishi mumkin.

Adabiyotlar tahlili bilishga qiziqishni birgina metod yoki texnologiya natijasi sifatida izohlash imkonini bermaydi. Qiziqish mazmunning ahamiyati, psixologik ehtiyojlar, intellektual faoliyat va o‘ quv jarayonini boshqarish bilan bog‘ liq ko‘ p omilli hodisa sifatida namoyon bo‘ ladi.

TADQIQOT METODOLOGIYASI

Tadqiqot nazariy-tahliliy yo‘ nalishda amalga oshirildi. Manbalar bilishga qiziqish, motivatsiya, kognitiv jalb etilish, fikr-mulohaza va mustaqil o‘ rganish masalalariga bevosita aloqadorligi asosida maqsadli tanlandi. Tadqiqotda konseptual maqolalar, nazariy sharhlar, eksperimental ish va metatahlillar natijalaridan foydalanildi.

Tushunchaviy tahlil bilishga qiziqish, o‘ quv motivatsiyasi va intellektual faollikning mazmuniy chegaralarini aniqlashtirishga xizmat qildi. Qiyosiy tahlilda nazariy yondashuvlarning umumiy va farqli jihatlari solishtirildi. Tanqidiy tahlil orqali manbalardagi natijalarning qaysi ta’lim bosqichiga tegishliligi, qanday ko‘ rsatkichlar bilan o‘ lchangani va ularni oliy ta’limga tatbiq etish chegaralari ko‘ rib chiqildi. Nazariy umumlashtirish asosida mashg‘ ulotni tashkil etish va qiziqishni baholashga oid takliflar ishlab chiqildi. Tahlil davomida qiziqishning qisqa muddatli namoyon bo‘ lishi, o‘ quv mazmunining qadrlanishi va mavzuga qayta murojaat qilishga tayyorlik alohida jihatlar sifatida ajratildi. Shu bilan birga, pedagogik vosita, talabaning bilish harakati va kuzatiladigan natija o‘ rtasidagi munosabat o‘ rganildi. Bunday yondashuv muayyan metodning mavjudligini uning samaradorligi bilan tenglashtirishdan saqlanishga xizmat qiladi.

Mazkur ish tizimli adabiyotlar sharhi yoki tajriba-sinov tadqiqoti sifatida taqdim etilmaydi. Muallif tomonidan respondentlar jalb qilinmagan, diagnostik o‘ lchovlar va statistik hisoblashlar bajarilmagan. Natijalar tanlangan ilmiy manbalarning nazariy umumlashtirilishiga asoslangan.

NATIJALAR VA MUHOKAMA

Nazariy tahlil asosida bilishga qiziqish talabaning muayyan mazmunni anglash, undagi bog‘ lanishlarni aniqlash va bilimini kengaytirishga yo‘ nalgan hissiy-intellektual munosabati sifatida talqin qilindi. Uning tarkibida mazmunga e’tibor, bilish jarayonining subyektiv ahamiyati va keyingi izlanishga tayyorlik o‘ zaro bog‘ lanadi. Ushbu talqin qiziqishni faoliyatdan ajratib baholashning cheklanganligini ko‘ rsatadi.

Bilishga qiziqish o‘ quv motivatsiyasining barcha shakllarini qamrab olmaydi. Talaba kelajakdagi kasbi uchun zarur mavzuni jiddiy o‘ rganishi, lekin unga kuchli qiziqish bildirmasligi mumkin. Shuningdek, qiziqish yuqori bo‘ lsa ham, tayanch bilimning yetishmasligi o‘ zlashtirishni qiyinlashtiradi. Shu sababli qiziqish, bilim va topshiriqni bajarish intizomi pedagogik kuzatuvda alohida ko‘ rsatkichlar sifatida qaralishi kerak.

Qiziqishning rivojlanishiga xizmat qiladigan asosiy imkoniyat o‘ quv mazmunini anglashga arzigulik muammo orqali ochishdir. Muammoli vaziyat talabaning mavjud tasavvuri bilan yangi dalil o‘ rtasidagi tafovutni sezishiga yordam beradi. Bunda savolning murakkabligi talaba tayyorgarligiga mos bo‘ lishi va javob izlash uchun boshlang‘ ich tayanch taqdim etilishi muhimdir. Masalan, pedagogika yo‘ nalishidagi talabalarga bir xil metod ikki guruhda turlicha natija bergan vaziyat beriladi. Ulardan metodga umumiy baho berishdan oldin guruhlarning oldingi bilimi, topshiriqlar, o‘ qitish va baholash sharoitlarini o‘ rganish talab qilinadi. Bu topshiriq nazariy bilimni dalil asosida izohlashga yo‘ naltiradi. Talaba qanday ma’lumot yetishmayotganini aniqlaydi va o‘ z xulosasining chegaralarini anglaydi.

Muammoli vaziyatni tashkil etishda yangilikning o‘ zi yetarli shart bo‘ la olmaydi. Talaba savolni tushunmasa yoki mavjud bilim bilan unga yaqinlasha olmasa, topshiriq ortiqcha qiyinchilik sifatida qabul qilinishi mumkin. Shu bois pedagogik yordam muammoni qismlarga ajratish, muhim tushunchani eslatish yoki dalil manbasini ko‘ rsatish shaklida beriladi. Talabaning mustaqilligi ortgani sari yordam hajmini mos ravishda o‘ zgartirish mumkin.

O‘ quv mazmunining shaxsiy-kasbiy ahamiyati qiziqishga yo‘ nalish beradigan omildir. Bunda o‘ qituvchining “bu bilim kelajakda kerak bo‘ ladi” degan izohi talabaga uning mazmunini mustaqil anglash imkoniyati bilan to‘ ldiriladi. Talaba tushunchaning qaysi kasbiy vaziyatni izohlashi, qanday qaror chiqarishga yordam berishi yoki qaysi xatoni oldini olishini asoslaydi. Shaxsiy aloqadorlikni shakllantirishga oid tadqiqotlar ushbu yo‘ nalishning pedagogik ahamiyatini ko‘ rsatadi [5].

Kasbiy ahamiyatni faqat tezkor amaliy foyda bilan cheklash fundamental bilimlarning rolini kamaytirishi mumkin. Nazariy tushunchalar keyingi murakkab mavzularni egallash, muammolarni umumlashtirish va yangi vaziyatga mos yechim topish uchun asos yaratadi. Shuning uchun o‘ quv mazmuni bevosita amaliy vazifa hamda uzoq muddatli intellektual rivojlanish bilan bog‘ liq holda yoritilishi lozim.

Talabaning mazmunli tanlovini ta’minlash ham muhim pedagogik imkoniyatdir. Bir xil ta’lim maqsadi doirasida muammo, manba yoki natijani taqdim etish shaklini tanlashga ruxsat berilishi mumkin. Bunda umumiy sifat mezonlari saqlanadi. Masalan, talaba muayyan pedagogik tushunchani ilmiy maqola, dars kuzatuvi yoki ta’limiy vaziyat orqali tahlil qiladi. Har bir ish dalilning ishonchliligi, tushunchaning to‘ g‘ ri qo‘ llanishi va xulosaning asoslanganligi orqali baholanadi.

Mustaqillikni qo‘ llab-quvvatlash vazifani tushuntirmasdan talabani yolg‘ iz qoldirishni anglatmaydi. Aniq maqsad, tushunarli mezon va zarur yordam talabaning qaror qabul qilishini mazmunli qiladi [4]. Ushbu shartlar mavjud bo‘ lganda tanlov o‘ quv faoliyatiga egalik hissini qo‘ llab-quvvatlovchi vosita bo‘ lishi mumkin.

Qiziqishning davomiyligini ta’minlashda talabaning o‘ z rivojlanishini ko‘ rishi muhim. Yakuniy ball vazifaning umumiy natijasini bildiradi, lekin bilish jarayonining barcha jihatlarini tushuntirmaydi. Rivojlantiruvchi fikr-mulohaza ishning kuchli tomoni, aniq kamchiligi va keyingi qadamni ko‘ rsatadi. Masalan, “Dalilingiz mavzuga mos, ammo xulosani ushbu dalil qamroviga mos ravishda aniqlashtirish kerak” degan izoh talabaning navbatdagi intellektual harakatini belgilaydi.

Fikr-mulohazaning o‘ zlashtirishga ijobiy ta’siri uning qiziqishga ta’siri bilan aynanlashtirilmasligi lozim. Ta’sirning turlicha bo‘ lishi va axborot mazmuniga bog‘ liqligi metatahlillarda ko‘ rsatilgan [9]. Shuning uchun talaba fikr-mulohazadan qanday foydalangani, ishini qayta ko‘ rib chiqqani va keyingi izlanishga munosabati alohida o‘ rganiladi. Ta’lim maqsadi, faoliyat va baholash o‘ rtasidagi muvofiqlik ham qiziqish rivojlanishi uchun zarur pedagogik sharoitdir. Mashg‘ ulotda savol qo‘ yish va dalillash rag‘ batlantirilib, nazoratda faqat ta’riflarni takrorlash talab qilinsa, talaba o‘ z kuchini asosan yodlashga yo‘ naltirishi mumkin. Shu bois yakuniy topshiriqlarda tushunchani qo‘ llash, muqobil izohlarni solishtirish va xulosani asoslashga o‘ rin berilishi kerak.

Hamkorlikdagi faoliyat boshqa nuqtayi nazar bilan uchrashish imkonini yaratadi. Biroq guruhga ajratishning o‘ zi barcha talabada mazmunli intellektual ishtirokni ta’minlamaydi. Hamkorlikda savol berish, dalil talab qilish va bir-birining izohini rivojlantirish muhimdir [6]. Buning uchun umumiy muhokamadan oldin individual tayyorgarlik, muhokama davomida aniq vazifa va yakunda shaxsiy xulosa yozish tavsiya etiladi. Pedagogik muloqotda xatoga munosabat ham talabaning tashabbusiga ta’sir qilishi mumkin. Savol berish yoki taxmin bildirish shaxsiy qobiliyatga salbiy hukm bilan bog‘ lansa, talaba o‘ z fikrini yashirishi ehtimol. Xatoni uning kelib chiqish sababi va tuzatish yo‘ li orqali tahlil qilish esa talabchanlikni saqlagan holda o‘ rganishni davom ettirishga sharoit yaratadi.

Mustaqil ta’limda qiziqishni rivojlantirish katta hajmdagi matn tayyorlash talabi bilan cheklanmasligi lozim. Talaba tekshiriladigan savol qo‘ yishi, manbalarni solishtirishi va xulosasini qayta ko‘ rib chiqishi mumkin bo‘ lgan topshiriqlar izlanish mazmunini chuqurlashtiradi. Bunda rejalashtirish, o‘ z faoliyatini kuzatish va refleksiya mustaqil o‘ rganishning muhim jihatlari hisoblanadi [10].

Raqamli vositalarning pedagogik imkoniyati ularning qaysi bilish harakatini qo‘ llab-quvvatlashi orqali baholanadi. Simulyatsiya taxminni sinashga, elektron manba dalillarni qiyoslashga, umumiy hujjat esa izohlarni birgalikda qayta ishlashga xizmat qilishi mumkin. Mazkur tahlil raqamli vositaning o‘ zi qiziqishni oshiradi degan xulosani bermaydi. Vosita, topshiriq va talabaning faoliyati o‘ rtasidagi aloqani tekshirish zarur. Sun’iy intellekt vositalaridan foydalanishda ham tayyor javobni qabul qilishdan tashqari, undagi da’volarni tekshirish va xulosalarni tahrirlash vazifalari tashkil etilishi mumkin. Talaba yaratilgan matnni ishonchli manbalar bilan solishtirib, asossiz umumlashtirishni aniqlaydi. Bu usul pedagogik taklif sifatida qaraladi; uning qiziqishga ta’siri muayyan kurs sharoitida alohida o‘ rganilishi lozim.

Qiziqishni baholashda turli dalillarni birlashtirish zarur. Talabaning “mashg‘ ulot menga yoqdi” degan javobi hissiy taassurotni ko‘ rsatishi mumkin. Mavzu bo‘ yicha yangi savol qo‘ yishi, ixtiyoriy manba izlashi va keyingi mashg‘ ulotda unga qaytishi esa boshqa jihatlarni ochadi. Ushbu belgilar ham vaziyatdan ajratib talqin qilinmaydi: qo‘ shimcha o‘ qish baholash talabi bilan, savollar ko‘ pligi esa tushunishdagi qiyinchilik bilan bog‘ liq bo‘ lishi mumkin.

Shu sababli subyektiv baho, o‘ quv faoliyati mahsuli va takroriy kuzatuvlarni uyg‘ unlashtirish taklif etiladi. Qiziqishni o‘ lchashda tayanch bilim, tashqi rag‘ bat va topshiriq shartlari haqidagi ma’lumotlar ham hisobga olinadi. Dastlabki faollik bilan vaqt davomida saqlanadigan qayta murojaatni farqlash qiziqish rivojlanganligi haqidagi xulosaning aniqligini oshiradi [2; 3].

Nazariy umumlashtirish pedagogik imkoniyatlarning izchil bog‘ lanishini ko‘ rsatadi: mazmun anglashga arzigulik savolni yuzaga keltiradi, topshiriq izlanishni tashkil etadi, yordam qiyinchilikni boshqarishga ko‘ maklashadi, fikr-mulohaza faoliyatni aniqlashtiradi, refleksiya esa keyingi bilish vazifasini belgilaydi. Ushbu bog‘ lanish muallifning nazariy talqini bo‘ lib, empirik tasdiqlangan universal sababiy qonuniyat sifatida taqdim etilmaydi. Tadqiqotning cheklovi foydalanilgan manbalarning turli ta’lim bosqichlari, fanlar va o‘ lchovlarga tegishliligidir. Keyingi tadqiqotlarda

boshlang‘ ich qiziqish va bilim, guruh xususiyati hamda o‘ qituvchi ta’sirini hisobga olish zarur. Taqqoslash guruhi, boshlang‘ ich va yakuniy o‘ lchov hamda kechiktirilgan kuzatuv qisqa muddatli yangilik taassurotini davomli o‘ zgarishdan farqlashga yordam berishi mumkin.

Xulosa. Talabalarning bilishga qiziqishi o‘ quv mazmunining ahamiyati, intellektual faoliyat, mustaqillik va pedagogik yordamning o‘ zaro ta’sirida rivojlanadigan hodisadir. Uni qo‘ llab-quvvatlashda e’tiborni jalb etish bilan birga, mazmunni tushunish, savol qo‘ yish, dalil izlash va mavzuga qayta murojaat qilish uchun davomli imkoniyatlar yaratilishi lozim.

Nazariy tahlil asosida o‘ quv topshiriqlarini mazmunli muammo atrofida tashkil etish, bilimning shaxsiy-kasbiy ahamiyatini talabaning o‘ zi izohlashiga imkon berish, murakkablikni tayyorgarlik va yordam bilan muvofiqlashtirish hamda baholashni bilish harakatlariga yo‘ naltirish tavsiya etiladi. Hamkorlik va raqamli vositalar ham aynan qanday intellektual faoliyatni yuzaga keltirishi orqali tanlanishi kerak. Qiziqishning rivojlanishi haqidagi xulosalar bir martalik taassurot yoki o‘ zlashtirish ko‘ rsatkichiga asoslanmasligi zarur. Talabaning munosabati, ish mahsuli va vaqt davomida kuzatiladigan tashabbusini birgalikda o‘ rganish ishonchliroq pedagogik baholash imkonini beradi. Taklif etilgan shartlarning samaradorligini aniqlash esa muayyan oliy ta’lim muhiti va fan doirasida empirik tekshiruvni talab qiladi.

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TA'LIM JARAYONIGA O' QITISHNING ZAMONAVIY PEDAGOGIK VA AXBOROT-KOMMUNIKATSIYA TEXNOLOGIYALARINI QO' LLASH

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Annotatsiya: *Ushbu maqolada zamonaviy ta'lim muhitida pedagogik mahorat va axborot-kommunikatsiya texnologiyalarining o' zaro sintezi masalalari tadqiq etiladi. Muallif o' qitishning innovatsion usullarini shunchaki texnik vositalar majmuasi emas, balki ta'lim oluvchining qobiliyatlarini yuzaga chiqaruvchi metodologik tizim sifatida tahlil qiladi. Maqolada AKTning dars samaradorligini oshirishdagi o' rni, o' qituvchi va o' quvchi o' rtasidagi raqamli muloqot madaniyati hamda nazariy bilimlarni amaliy ko' nikmalarga aylantirishda innovatsion texnologiyalarning ahamiyati yoritilgan. Shuningdek, dars jarayonida pedagogik texnologiyalarni tanlashda inson omili — o' quvchi psixologiyasi va individual ehtiyojlarini hisobga olishning metodik asoslari ilgari suriladi.*

Kalit so' zlar: *Metodik integratsiya, pedagogik innovatsiya, raqamli didaktika, axborot-kommunikatsiya texnologiyalari (AKT), interfaol ta'lim, dars samaradorligi, kompetensiyaviy yondashuv, o' qituvchi mahorati, zamonaviy dars, ta'lim sifatini boshqarish.*

ПРИМЕНЕНИЕ СОВРЕМЕННЫХ ПЕДАГОГИЧЕСКИХ И ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫХ ТЕХНОЛОГИЙ В ОБРАЗОВАТЕЛЬНОМ ПРОЦЕССЕ

Аннотация: *В данной статье исследуются вопросы взаимосвязи педагогического мастерства и информационно-коммуникационных технологий в современной образовательной среде. Автор анализирует инновационные методы обучения не просто как совокупность технических средств, а как методологическую систему, раскрывающую способности учащихся. В статье освещаются роль ИКТ в повышении эффективности урока, культура цифрового взаимодействия между учителем и учащимся, а также значение инновационных технологий в трансформации теоретических знаний в практические навыки. Кроме того, выдвигаются методические основы учета человеческого фактора — психологии и индивидуальных потребностей учащегося при выборе педагогических технологий в учебном процессе.*

Ключевые слова: *Методическая интеграция, педагогическая инновация, цифровая дидактика, информационно-коммуникационные технологии (ИКТ), интерактивное обучение, эффективность урока, компетентностный подход, мастерство учителя, современный урок, управление качеством образования.*

APPLICATION OF MODERN PEDAGOGICAL AND INFORMATION-COMMUNICATION TECHNOLOGIES IN THE EDUCATIONAL PROCESS

Abstract: *This article explores the synthesis of pedagogical skills and information and communication technologies (ICT) within the modern educational environment. The author analyzes innovative teaching methods not merely as a set of technical tools but as a methodological system that reveals the learner's capabilities. The article highlights the role of ICT in enhancing lesson effectiveness, the culture of digital interaction between teacher and student, and the significance of innovative technologies in transforming theoretical knowledge into practical skills. Furthermore, the methodological foundations for considering the human factor — student psychology and individual needs — when selecting pedagogical technologies for the educational process are proposed.*

Keywords: *Methodological integration, pedagogical innovation, digital didactics, information and communication technologies (ICT), interactive learning, lesson effectiveness, competency-based approach, teacher mastery, modern lesson, education quality management.*

Global axborotlashuv jarayoni bugungi kun o' qituvchisi zimmasiga nafaqat o' z fani bo' yicha chuqur bilimga ega bo' lish, balki zamonaviy raqamli dunyo bilan tillasha olish majburiyatini ham yuklamoqda. Ta'lim jarayoniga o' qitishning zamonaviy pedagogik va axborot-kommunikatsiya texnologiyalarini (AKT) qo' llash shunchaki darsning texnik jihozlanishi emas, balki ta'lim mazmunini tubdan isloh qilish demakdir.

Hozirgi davrda o‘quvchi axborotni faqat darslikdan emas, balki cheksiz internet tarmoqlaridan, ijtimoiy platformalardan va raqamli resurslardan olmoqda. Bunday sharoitda pedagogning vazifasi — axborotni shunchaki uzatish emas, balki o‘quvchida ushbu axborotlar oqimidan eng zarurini saralab olish, tahlil qilish va amaliyotda qo‘llash ko‘nikmasini shakllantirishdan iboratdir. Pedagogik texnologiyalar va AKTning o‘zaro uyg‘unligi (integratsiyasi) darsning dinamikligini ta’minlaydi, o‘quvchi e’tiborini jalb etishning yangi kanallarini ochadi va eng muhimi, individual ta’lim trayektoriyasini yaratish imkonini beradi.

Biroq, amaliyotda texnologiyalarni qo‘llashda ko‘pincha yuzaki yondashuv kuzatiladi. Ko‘p hollarda AKT shunchaki an’anaviy darsning ko‘rgazmali quroli bo‘lib qolmoqda. Ushbu maqolaning maqsadi — texnologiyalardan samarali foydalanishning metodik mexanizmlarini ochib berish, raqamli muhitda pedagogik mahoratning yangi qirralarini tahlil qilish va zamonaviy darsning optimal modelini taklif etishdan iborat.

Zamonaviy ta’limda AKT va pedagogik texnologiyalar integratsiyasi masalasi global miqyosda keng tadqiq etilayotgan yo‘nalishdir. Xususan, M. Koehler va P. Mishra tomonidan ilgari surilgan TPACK modeli texnologiyani shunchaki vosita emas, balki fanniy bilim va pedagogik mahorat bilan uyg‘unlashgan yaxlit tizim sifatida talqin etadi.

O‘zbek olimlaridan olimlarimizdan R.Ishmuhamedov va N.Sayidahmedovlarning ishlarida pedagogik texnologiyalarni loyihalashtirishda inson omili, ya’ni o‘quvchi shaxsiga yo‘naltirilgan yondashuv ustuvor ekanligi ta’kidlanadi. Adabiyotlar tahlili shuni ko‘rsatadiki, bugungi kunda “Raqamli didaktika” tushunchasi shakllanmoqda. Bunda asosiy e’tibor texnologiyaning murakkabligiga emas, balki uning o‘quvchi tomonidan qanchalik oson va samarali o‘zlashtirilishiga (user-friendly pedagogy) qaratilmoqda. Shuningdek, so‘nggi yillardagi tadqiqotlarda “Aralash ta’lim” (Blended learning) modellari o‘quvchi motivatsiyasini saqlab qolishda eng maqbul yechim sifatida ko‘rilmoqda.

Ushbu maqolani tayyorlashda nazariy tahlil va amaliy-pedagogik modellashtirish usullaridan foydalaniladi. Tadqiqot metodologiyasi quyidagi bosqichlarni o‘z ichiga oladi:

1. An’anaviy o‘qitish usullari va AKTga asoslangan metodlarning (masalan, “Flipped classroom”) o‘quvchi o‘zlashtirish ko‘rsatkichlariga ta’siri qiyoslanadi.
2. Dars jarayonida o‘quvchilarning raqamli resurslar bilan ishlash jarayoni, ularning diqqat konsentratsiyasi va qayta aloqa (feedback) tezligi kuzatiladi.
3. “Zanjir” va “Grafik organayzer” kabi interfaol metodlarni raqamli platformalar (masalan, interfaol doskalar yoki onlayn testlar) bilan integratsiya qilishning dars ssenariylari ishlab chiqiladi.
4. Texnologik vositalarni tanlashda o‘quvchilarning yosh xususiyatlari, psixologik tayyorgarligi va texnik ko‘nikmalari asosiy mezon sifatida olinadi.

Ta’lim jarayoniga o‘qitishning zamonaviy pedagogik va axborot-kommunikatsiya texnologiyalarini qo‘llash amaliyoti shuni ko‘rsatadiki, samaradorlik faqatgina texnik vositaning mukammalligiga emas, balki uning dars ssenariysiga qanchalik mahorat bilan “singdirilganiga” bog‘liqdir. Muhokama jarayonida quyidagi uchta ustuvor yo‘nalishni tahlil qilish lozim:

1. O‘quv jarayonida pedagogik texnologiya (masalan, muammoli ta’lim yoki loyihaviy o‘qitish) darsning strategiyasini belgilaydi. AKT esa ushbu strategiyani amalga oshiruvchi kuchli vosita bo‘lib xizmat qiladi. Kuzatishlarimizga ko‘ra, o‘qituvchi darsda “Zanjir” usulini qo‘llaganda, agar u interfaol doska yoki planshetlar bilan qo‘llab-quvvatlansa, o‘quvchilarning mantiqiy bog‘lanishlarni topish tezligi sezilarli darajada oshadi. Bu yerda inson omili o‘qituvchining texnologiyani darsning qaysi bosqichida qo‘llashni aniq bilishida namoyon bo‘ladi.

2. Raqamli texnologiyalar darsni qiziqarli qilsa-da, jonli muloqot va o‘qituvchining emotsional ta’siri ta’limning asosi bo‘lib qolaveradi. Muhokamada aniqlanganidek, eng yaxshi natijaga “Aralash ta’lim” (Blended learning) orqali erishiladi. Bunda AKT o‘quvchiga mustaqil izlanish va vizuallashtirish imkonini bersa, pedagogik texnologiya o‘quvchilar o‘rtasida jamoaviy hamkorlik va ijtimoiy ko‘nikmalarni shakllantiradi.

3. Zamonaviy texnologiyalar o‘quvchini passiv qabul qiluvchidan faol subyektga aylantiradi. Grafik organayzerlarni raqamli formatda qo‘llash o‘quvchiga o‘z fikrlarini tizimlashtirishga va o‘z bilimini o‘zi vizual tarzda baholashga yordam beradi. Bu esa o‘z navbatida o‘quvchining mas’uliyatini va fanga bo‘lgan shaxsiy munosabatini o‘zgartiradi.

O‘tkazilgan pedagogik tajribalar va zamonaviy AKT vositalarining dars jarayoniga tatbiq etilishi natijasida quyidagi ijobiy ko‘rsatkichlar qayd etiladi:

1. Pedagogik texnologiyalar (loyihaviy ta’lim) va AKT (multimedia resurslari) uyg‘unligida tashkil etilgan darslarda o‘quvchilarning bilim darajasi an’anaviy darslarga nisbatan 18-22% ga oshganligi kuzatiladi. Ayniqsa, vizual va interfaol kontent orqali yetkazilgan murakkab mavzularni o‘zlashtirish ko‘rsatkichi yuqori bo‘ladi.

2. Natijalar shuni ko‘rsatishi mumkinki, dars jarayonida raqamli grafik organayzerlar va interfaol test tizimlarining qo‘llanilishi o‘quvchilarning diqqatini barqaror saqlashga yordam beradi. Inson omili nuqtayi nazaridan, o‘quvchilarning darsdagi charchoq darajasi kamayib, ularning mustaqil fikrlash va muammoli vaziyatlardan chiqish qobiliyati 1.5 barobarga yaxshilanadi.

3. Raqamli platformalardan foydalanish o‘ qituvchi va o‘ quvchi o‘ rtasidagi teskari aloqani (feedback) lahzali (real-time) darajaga olib chiqadi. Bu esa o‘ z navbatida o‘ quvchilarda o‘ z bilimiga nisbatan mas’uliyat hissini uyg‘ otdi va o‘ z-o‘ zini baholash (self-assessment) ko‘ nikmasini shakllantiradi.

4. Tadqiqotlar natijasida pedagoglarning darsga tayyorgarlik ko‘ rish vaqtini optimallashtirishga erishiladi. AKT vositalari o‘ qituvchining “texnik” ishlarini kamaytirib, uning e’tiborini ko‘ proq o‘ quvchining shaxsiy rivojlanishi va metodik mahoratini oshirishga yo‘ naltirish imkonini beradi.

Ta’lim jarayoniga o‘ qitishning zamonaviy pedagogik va axborot-kommunikatsiya texnologiyalarini qo‘ llash bo‘ yicha olib borilgan tadqiqotlar quyidagi xulosalarga kelish imkonini beradi:

1. Tadqiqotlar shuni ko‘ rsatdiki, AKT darsda o‘ z-o‘ zidan samaradorlikni ta’minlamaydi. Eng yuqori natijaga faqatgina texnologiya va “shaxsga yo‘ naltirilgan” pedagogik metodlar (muammoli ta’lim, loyihaviy yondashuv) sintezi orqali erishiladi. Bunda o‘ qituvchi texnologiyadan maqsad emas, balki bilimlarni chuqurlashtiruvchi vosita sifatida foydalanishi lozim bo‘ ladi.

2. Texnologiyalar darsga kirib kelishi bilan o‘ qituvchi va o‘ quvchi o‘ rtasidagi muloqot shakli o‘ zgaradi. Pedagog endi “axborot uzatuvchi” dan “yo‘ naltiruvchi-fasilitator”ga aylandi. O‘ quvchilarning darsdagi faolligi va motivatsiyasining ortishi bevosita o‘ qituvchining raqamli didaktikani qanchalik to‘ g‘ ri qo‘ llashiga bog‘ liqdir.

3. AKT vositalarini darsning barcha bosqichlarida — yangi mavzuni bayon etishdan tortib, natijalarni baholashgacha tizimli ravishda qo‘ llash vaqtdan unumli foydalanish va qayta aloqani tezlashtirish imkonini beradi.

Yuqoridagilardan kelib chiqib quyidagicha tavsiyalar berish mumkin.

- o‘ qituvchilarning axborot-metodik kompetentligini doimiy oshirib borish, bunda faqat texnik ko‘ nikmalarga emas, balki texnologiyani dars ssenariysiga “singdirish” mahoratiga urg‘ u berish;

- darslarda faqat namoyish etuvchi (passiv) AKT vositalaridan emas, balki o‘ quvchini izlanishga undaydigan (interfaol) raqamli platformalar va virtual laboratoriyalardan keng foydalanish;

- har bir fan yo‘ nalishi bo‘ yicha zamonaviy pedagogik texnologiyalar bilan integratsiyalashgan elektron metodik qo‘ llanmalar bazasini boyitib borish.

Xulosa qilib aytganda, ta’limda texnologiya va inson mahoratining oqilona birlashuvi raqobatbardosh va kreativ fikrlovchi avlodni tarbiyalashning eng mustahkam poydevoridir.

FOYDALANILGAN ADABIYOTLAR RO‘ YXATI

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SUN' IY INTELLEKT TEXNOLOGIYALARI YORDAMIDA 7-SINF O' QUVCHILARINING INGLIZ TILIDA GAPIRISH KO' NIKMASINI RIVOJLANTIRISH

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Annotatsiya: *Maqolada sun' iy intellekt (SI) texnologiyalari – nutqiy chatbotlar, nutqni avtomatik tanish (ASR) tizimlari va generativ SI suhbatdoshlari yordamida 7-sinf o' quvchilarining ingliz tilida gapirish ko' nikmasini rivojlantirish masalasi tahlil qilingan. 2021–2026-yillarda nashr etilgan besh meta-tahlil va to' rt empirik tadqiqot natijalari sintez qilindi. SI vositalarining gapirishga ta' siri o' rta darajada ekani (Hedges g = 0,48–0,69), o' n sakkiz yoshgacha bo' lgan o' quvchilarda g = 0,67 ga tengligi hamda 5–8 haftalik muntazam mashg' ulotlar eng yuqori samara berishi aniqlandi. Shu asosda A2 darajasi deskriptorlariga tayangan to' rt bosqichli metodik model taklif etildi, uni maktabda qo' llashning yosh, xavfsizlik va o' qituvchi nazorati bilan bog' liq shartlari asoslab berildi.*

Kalit so' zlar: *sun' iy intellekt, gapirish ko' nikmasi, chatbot, nutqni avtomatik tanish, 7-sinf, ingliz tili, A2 darajasi, kommunikativ kompetensiya, meta-tahlil.*

РАЗВИТИЕ НАВЫКОВ ГОВОРЕНИЯ НА АНГЛИЙСКОМ ЯЗЫКЕ У УЧАЩИХСЯ 7-ГО КЛАССА С ПОМОЩЬЮ ТЕХНОЛОГИЙ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА

Аннотация: *В статье рассматривается развитие навыков говорения на английском языке у учащихся 7-го класса с помощью технологий искусственного интеллекта (ИИ): речевых чат-ботов, систем автоматического распознавания речи (ASR) и генеративных ИИ-собеседников. Обобщены результаты пяти метаанализов и четырёх эмпирических исследований, опубликованных в 2021–2026 гг. Установлено, что влияние ИИ-средств на говорение имеет средний размер эффекта (Hedges g = 0,48–0,69), для обучающихся младше 18 лет g = 0,67, а наибольший эффект дают регулярные занятия продолжительностью 5–8 недель. На этой основе предложена четырёхэтапная методическая модель, опирающаяся на дескрипторы уровня A2, и обоснованы условия её применения в школе с учётом возраста, безопасности и контроля учителя.*

Ключевые слова: *искусственный интеллект, навык говорения, чат-бот, автоматическое распознавание речи, 7-й класс, английский язык, уровень A2, коммуникативная компетенция, метаанализ.*

DEVELOPING 7TH GRADE STUDENTS' ENGLISH SPEAKING SKILLS THROUGH ARTIFICIAL INTELLIGENCE TECHNOLOGIES

Abstract: *The article examines how artificial intelligence (AI) technologies – voice chatbots, automatic speech recognition (ASR) systems and generative AI interlocutors – can support the development of English speaking skills in 7th grade students. Findings of five meta-analyses and four empirical studies published in 2021–2026 were synthesised. AI tools were found to have a moderate effect on speaking (Hedges' g = 0.48–0.69), with g = 0.67 for learners under 18, and regular practice lasting 5–8 weeks produced the strongest effect. On this basis, a four-stage instructional model aligned with A2 descriptors is proposed, and the conditions for its school use related to age, safety and teacher supervision are justified.*

Keywords: *artificial intelligence, speaking skills, chatbot, automatic speech recognition, 7th grade, English language, A2 level, communicative competence, meta-analysis.*

KIRISH

Gapirish chet tilini o' rganishdagi eng murakkab nutq faoliyati hisoblanadi: o' quvchi fikrni real vaqt ichida shakllantiradi, leksik va grammatik vositalarni tanlaydi, talaffuzni nazorat qiladi va bir vaqtning o' zida suhbatdoshning munosabatini kuzatib boradi [8]. Umumta' lim maktabida bu ko' nikma boshqalariga qaraganda sekinroq rivojlanadi. Sababi oddiy: 30 nafar o' quvchili sinfda 45 daqiqalik darsning yarmi nutqiy mashqlarga ajratilgan taqdirda ham har bir o' quvchiga o' rtacha bir daqiqa atrofida faol gapirish vaqti to' g' ri keladi. Til esa faqat gapirish orqali "ishga tushadi" –

M. Svenning chiqish gipotezasiga ko‘ ra, o‘ quvchi o‘ z nutqini ishlab chiqarish jarayonidagina bilimidagi bo‘ shliqlarni sezadi va ularni to‘ ldirishga intiladi [7].

Me’ yoriy talablar bu masalani yanada dolzarb qiladi. Vazirlar Mahkamasining 2013-yil 8-maydagi 124-son qarori bilan tasdiqlangan davlat ta’ lim standartiga ko‘ ra, 9-sinf bitiruvchisi ingliz tilini A2 darajasida egallashi, jumladan, dialogda to‘ g‘ ri ma’ lumot olib-bera olishi, tanish mavzuda sodda iboralar bilan o‘ z fikrini ifodalashi va qisqa muloqotda ishtirok eta olishi kerak [3]. Shu jihatdan 7-sinf A1 dan A2 ga o‘ tishning hal qiluvchi bosqichi hisoblanadi. Prezidentning 2021-yil 19-maydagi PQ-5117-son qarori xorijiy tillarni o‘ rganishni ommalashtirishni yangi bosqichga olib chiqishni [2], 2024-yil 14-oktabrdagi PQ-358-son qarori bilan tasdiqlangan strategiya esa sun’ iy intellekt texnologiyalarini 2030-yilgacha ta’ lim sohasiga ham keng joriy etishni nazarda tutadi [1].

Amaldagi holat esa hali maqsadlardan ancha uzoq. EF kompaniyasining ingliz tilini bilish indeksida (EF EPI) O‘ zbekiston 2021-yilda 112 mamlakat orasida 88-o‘ rinni egallagan bo‘ lsa, 2025-yilda 123 mamlakat orasida 104-o‘ ringa tushdi va 429 ball bilan “juda past” toifada qoldi [24]. Indeks kattalar o‘ rtasida o‘ tkaziladigan test natijalariga tayansa-da, u maktabda shakllanadigan og‘ zaki nutq ko‘ nikmalari yetarli emasligini bilvosita ko‘ rsatadi.

Xorijiy tadqiqotlarda SI asosidagi suhbatdoshlar aynan “gapirish vaqti tanqisligi” muammosini hal qiluvchi vosita sifatida o‘ rganilmoqda. W. Huang, K.F. Hew va L.K. Fryer 25 empirik tadqiqotni tahlil qilib, chatbotlarning uchta texnologik imkoniyatini – o‘ z vaqtidalik, foydalanish qulayligi va shaxsiylashtirishni ajratib ko‘ rsatgan, shu bilan birga yangilik effekti va kognitiv yuklama kabi xavflarni ham qayd etgan [11]. O‘ zbek mualliflari K. Erkinjonov va M. Kasimova [22], A. Kamolova [23] SI platformalarining nutq ravonligi, talaffuz va lug‘ at boyligiga ijobiy ta’ sirini tavsiflagan. Biroq mahalliy ishlarda 7-sinf o‘ quvchilarining yosh xususiyatlari, A2 deskriptorlari va dars bosqichlari bilan bog‘ langan, empirik dalillarga tayangan metodik model hali ishlab chiqilmagan.

Tadqiqot maqsadi – so‘ nggi yillardagi xalqaro empirik dalillarni tizimli tahlil qilish asosida 7-sinf o‘ quvchilarining ingliz tilida gapirish ko‘ nikmasini SI texnologiyalari yordamida rivojlantirish modelini ishlab chiqish. Maqsaddan kelib chiqib, quyidagi savollarga javob izlandi: 1) SI vositalari gapirish ko‘ nikmasiga qanchalik ta’ sir ko‘ rsatadi; 2) samaradorlik qaysi shartlarga (yosh, davomiylik, muloqot shakli) bog‘ liq; 3) olingan natijalarni 7-sinf dars jarayoniga qanday tatbiq etish mumkin.

MATERIALLAR VA METODLAR

Tadqiqot tahliliy-sintetik dizaynda olib borildi va ikki bosqichdan iborat bo‘ ldi: empirik dalillarni yig‘ ish va sintez qilish hamda ular asosida metodik modelni loyihalash. Manbalar Scite, OpenAlex, Cambridge Core, Frontiers va Google Scholar bazalarida “AI chatbot”, “speaking”, “EFL”, “automatic speech recognition”, “meta-analysis” kalit so‘ zlari birikmasi bo‘ yicha izlandi; qidiruv 2021–2026-yillar bilan chegaralandi.

Tanlov mezonlari quyidagicha belgilandi: a) tadqiqot taqqoslovchi (tajriba – nazorat) dizaynga ega yoki meta-tahlil bo‘ lishi; b) natija sifatida gapirish ko‘ nikmasi yoki uning tarkibiy qismlari (ravonlik, aniqlik, talaffuz, lug‘ at) o‘ lchangan bo‘ lishi; c) effekt hajmi yoki o‘ rtacha qiymatlar hisobotda keltirilgan bo‘ lishi; d) maqola taqrizlanadigan jurnalda chop etilgan bo‘ lishi. Natijada besh meta-tahlil [13; 14; 15; 16; 17], uch empirik tadqiqot [10; 12; 19] va maktab yoshidagi o‘ quvchilar bilan o‘ tkazilgan bitta amaliy tadqiqot [21] tahlilga olindi. Me’ yoriy asos sifatida uchta hujjat [1; 2; 3] va Yevropa umumiy kompetensiyalar doirasi (CEFR) [4] o‘ rganildi.

Effekt hajmlari Hedges g ko‘ rsatkichi bo‘ yicha taqqoslandi va J. Koenning shartli chegaralari asosida talqin qilindi: 0,2 – kichik, 0,5 – o‘ rta, 0,8 va undan yuqori – katta ta’ sir [9]. Birlamchi tadqiqotdagi o‘ rtacha ko‘ rsatkichlardan o‘ sish miqdori (yakuniy va dastlabki test farqi) hisoblab chiqildi. EF EPI ma’ lumotlari uchun nisbiy o‘ rin (egallangan o‘ rin / mamlakatlar soni × 100%) aniqlandi. Metodik model loyihalashda interaksion gipoteza [6], chiqish gipotezasi [7] va affektiv filtr nazariyasi [5; 20] nazariy asos qilib olindi.

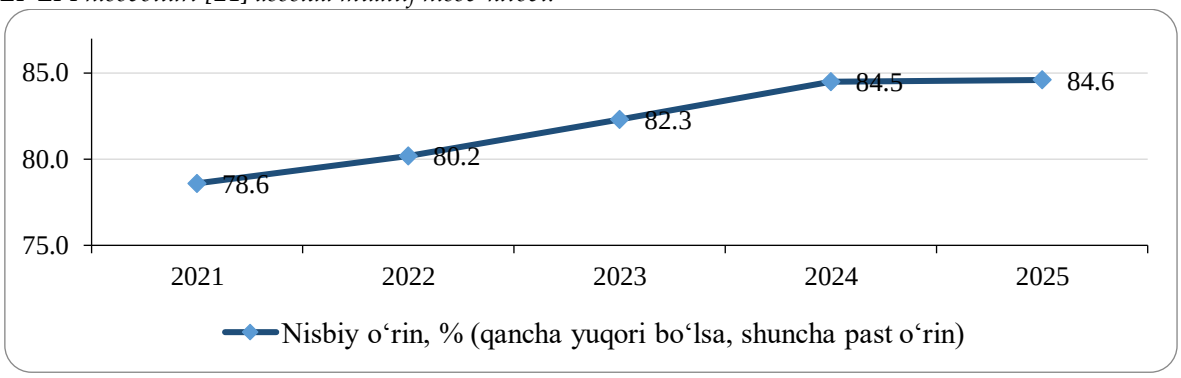
NATIJALAR

Muammoning ko‘ lami. Dastlab O‘ zbekistonda ingliz tilini bilish darajasining so‘ nggi besh yildagi dinamikasi ko‘ rib chiqildi (1-jadval, 1-diagramma).

1-jadval. O‘ zbekistonning EF EPI reytingidagi o‘ rni (2021–2025)

Yil	Egallangan o‘ rin	Mamlakatlar soni	Nisbiy o‘ rin, %	Toifa
2021	88	112	78,6	Juda past
2022	89	111	80,2	Juda past
2023	93	113	82,3	Juda past
2024	98	116	84,5	Juda past
2025	104	123	84,6	Juda past

Manba: EF EPI hisobotlari [24] asosida muallif hisob-kitobi.



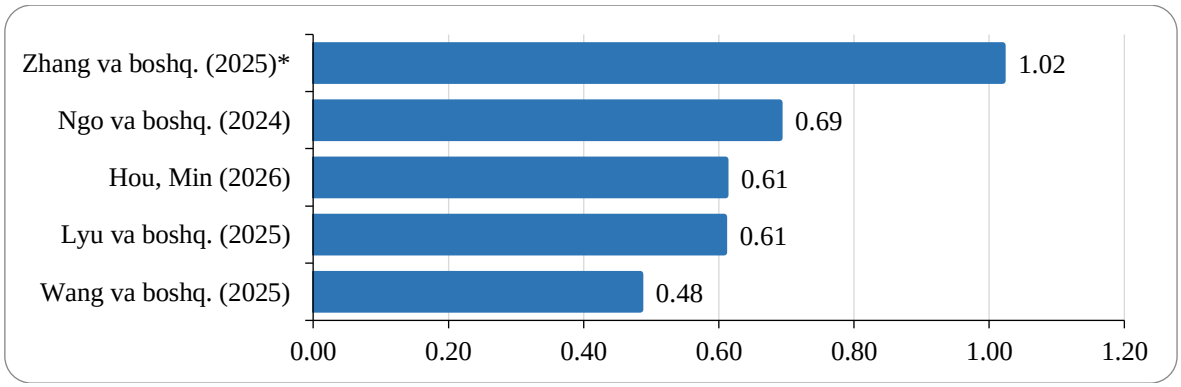
1-diagramma. O‘ zbekistonning EF EPI reytingidagi nisbiy o‘ rni dinamikasi, %

Jadvaldan ko‘ rinib turibdiki, besh yil davomida mamlakat reytingda doimiy ravishda pastlab borgan: nisbiy o‘ rin 78,6 foizdan 84,6 foizga ko‘ tarilgan, ya’ ni O‘ zbekiston ro‘ yxatning quyi beshdan bir qismiga yaqinlashgan. 2025-yilda ball oldingi yilga nisbatan 10 ballga kamaygan [24]. Bu holat an’ anaviy darslarga qo‘ shimcha ravishda o‘ quvchiga individual og‘ zaki amaliyot beradigan vositalarga ehtiyoj borligini ko‘ rsatadi.

SI vositalarining umumiy samaradorligi. Tahlilga olingan meta-tahlillarning asosiy ko‘ rsatkichlari 2-jadval va 2-diagrammada umumlashtirildi.

2-jadval. SI asosidagi til o‘ rgatish vositalari bo‘ yicha meta-tahlillar natijalari

Meta-tahlil	Yo‘ nalish	Tadqiqotlar (effektlar) soni	Umumiy effekt, g	Talqin
F. Wang va boshq., 2025 [15]	Chatbot yordamida til o‘ rganish	28 (70)	0,48	O‘ rta
B. Lyu va boshq., 2025 [16]	Chatbotlar, taqqoslovchi tadqiqotlar	31 (41)	0,61	O‘ rta
Z. Hou, S. Min, 2026 [17]	Dialogli CALL tizimlari va gapirish	16 (89)	0,61	O‘ rta
T.T.-N. Ngo va boshq., 2024 [14]	ASR va talaffuz	15 (38)	0,69	O‘ rta
J. Zhang va boshq., 2025 [13]	Chatbot va generativ SI (kichik guruh)	6	1,02	Katta

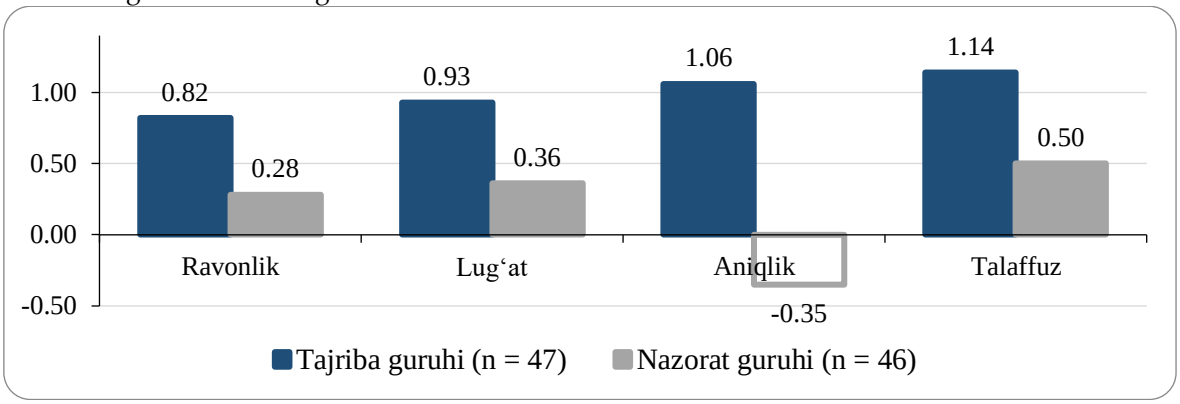


2-diagramma. SI vositalarining til o‘ rganishga ta’ siri bo‘ yicha umumiy effekt hajmlari (Hedges g)

** Zhang va boshqalar natijasi atigi olti tadqiqotdan iborat kichik guruhga tegishli.*

Yirik meta-tahlillarning barchasi o‘ rta darajadagi ijobiy ta’ sirni qayd etgan. Muhimi, ular turli davrlar, turli tizimlar va turli namunalarga asoslangan bo‘ lsa-da, natijalar 0,48–0,69 oralig‘ ida to‘ plangan. Bu natijaning barqarorligidan dalolat beradi. Faqat gapirishga yo‘ naltirilgan Z. Hou va S. Min tadqiqoti (g = 0,61) uchun ahamiyatli omillar tizim turi, ma’ no cheklanganligi va muloqot modalligi bo‘ lib chiqqan, ta’ lim bosqichi va mashg‘ ulot davomiyligi esa natijaga sezilarli ta’ sir ko‘ rsatmagan [17]. Demak, maktab o‘ quvchilari ham kattalar kabi SI bilan muloqotdan foyda ko‘ ra oladi. J. Zhang va boshqalar olgan yuqori ko‘ rsatkich (g = 1,02) istiqbolli, biroq tadqiqotlar soni kamligi sababli uni ehtiyotkorlik bilan talqin qilish lozim [13].

Gapirish ko‘ nikmasining tarkibiy qismlari. H. Qiao va A. Zhao tadqiqotida 93 nafar o‘ quvchi tasodifiy ravishda ikki guruhga ajratilgan: tajriba guruhi 13 hafta davomida nutqni tanish va shaxsiy fikr-mulohaza beruvchi SI ilovasida shug‘ ullangan, nazorat guruhi an’ anaviy usulda o‘ qitilgan [12]. Mualliflar keltirgan o‘ rtacha ball (7 ballik shkala) asosida hisoblangan o‘ sish 3-diagrammada berilgan.



3-diagramma. Gapirish tarkibiy qismlari bo‘ yicha o‘ sish (yakuniy va dastlabki test farqi, ball) [12] ma’ lumotlari asosida

Tajriba guruhida barcha to‘ rt ko‘ rsatkich bo‘ yicha o‘ sish nazorat guruhidagiga nisbatan ikki-uch baravar yuqori bo‘ lgan, eng katta farq talaffuz (+1,14) va grammatik aniqlikda (+1,06) kuzatilgan. Nazorat guruhida aniqlik hatto pasaygan (–0,35). Regressiya tahlilida SI ta’ siri to‘ rtala komponent uchun ham statistik ahamiyatli chiqqan (ravonlik uchun B = 0,65; p = 0,006) [12]. Shunga yaqin natija W. Sun tadqiqotida ham olingan: 14 haftalik ASR mashg‘ ulotlaridan so‘ ng o‘ quvchilar nutqining tushunarliligi bo‘ yicha guruhlar farqi $F(1,58) = 19,44$; $p < 0,001$; qisman $\eta^2 = 0,251$ ni tashkil etgan [19].

Maktab yoshi va samaradorlik shartlari. 7-sinf uchun bevosita ahamiyatli dalillar kam, biroq mavjudlari juda aniq. H. Yang va hamkorlari 10–15 yoshli 314 nafar koreys o‘ quvchisi bilan sinf sharoitida “Ellie” ovozli chatbotini sinovdan o‘ tkazgan: o‘ quvchilar bir mashg‘ ulotda o‘ rtacha 9,63 marta navbat bilan gapirgan, topshiriqlarni muvaffaqiyatli bajarish ulushi 88,3% ga yetgan, nutq asosan eng ko‘ p ishlatiladigan 1000 so‘ z doirasida kechgan [21]. H.-S. Kim va hamkorlari 110 nafar ishtirokchi bilan o‘ tkazgan tajribada ovozli chat guruhi fikr bildirish topshirig‘ ida yuzma-yuz va matnli chat guruhlaridan yuqori natija ko‘ rsatgan [10]. Samaradorlik shartlari bo‘ yicha eng batafsil ma’ lumot T.T.-N. Ngo va hamkorlarining meta-tahlilida keltirilgan (3-jadval).

3-jadval. ASR vositalari samaradorligining moderator omillarga bog‘ liqligi [14]

Omil	Guruh	Effekt, g	Talqin
Yosh	18 yoshgacha	0,67	O‘ rta
	18 yosh va undan katta	1,20	Katta
Til darajasi	Boshlang‘ ich	1,33	Katta
	O‘ rta	0,80	Katta
	Yuqori	0,48	Kichik–o‘ rta
Davomiylik	1–4 hafta	0,07	Sezilarsiz
	5–8 hafta	1,01	Katta
	9 hafta va undan ortiq	0,72	O‘ rta

Ushbu ma’ lumotlardan 7-sinf uchun uchta amaliy xulosa kelib chiqadi. Birinchidan, 18 yoshgacha bo‘ lgan o‘ quvchilarda ham o‘ rta darajadagi ta’ sir (g = 0,67) kuzatiladi. Ikkinchidan, boshlang‘ ich darajadagi o‘ quvchilar eng ko‘ p foyda ko‘ radi (g = 1,33), bu esa A1–A2 darajasidagi 7-sinf o‘ quvchilari uchun qulay omil. Uchinchidan, bir-to‘ rt haftalik qisqa kurslar deyarli natija bermaydi (g = 0,07), shuning uchun SI mashg‘ ulotlari kamida besh-sakkiz hafta davomida muntazam o‘ tkazilishi kerak.

MUHOKAMA

Olingan natijalarni nazariy jihatdan izohlash mumkin. M. Long interaksion gipotezasiga ko‘ ra, til egallash suhbat jarayonida ma’ noni aniqlashtirish, qayta so‘ rash va tuzatishlar orqali tezlashadi [6]. SI suhbatdoshi o‘ quvchiga aynan shu imkoniyatni cheksiz miqdorda taqdim etadi: u charchamaydi, o‘ quvchi javobini kutib turadi va savolni boshqacha shaklda

qayta beradi. Svenning chiqish gipotezasi nuqtayi nazaridan esa SI sinfdagi bir daqiqalik nutq vaqtini o‘ nlab navbatlarga ko‘ paytiradi [7; 21]. Affektiv omil ham muhim: E. Horvits va hamkorlari tavsiflagan chet tilidagi muloqot xavotiri [5] tengdoshlar oldida xato qilish qo‘ rquvi bilan kuchayadi, S. Krashenning affektiv filtr nazariyasiga ko‘ ra esa bunday xavotir kiruvchi ma’ lumotni o‘ zlashtirishga to‘ sqinlik qiladi [20]. Tizimli sharhlarda o‘ quvchilar chatbotni “kamroq tanqid qiladigan tinglovchi” sifatida qabul qilishi qayd etilgan [18]. Bu ayniqsa o‘ smirlik davriga kirayotgan 7-sinf o‘ quvchilari uchun muhim.

Shu dalillar asosida 7-sinf uchun to‘ rt bosqichli metodik model ishlab chiqildi (4-jadval). Modelda Hou va Min aniqlagan omil – ma’ noni cheklash hisobga olindi: dastlabki bosqichlarda topshiriq mavzusi va leksik doirasi aniq belgilanadi, erkin muloqotga esa keyinroq o‘ tiladi [17].

4-jadval. SI yordamida 7-sinf o‘ quvchilarining gapirish ko‘ nikmasini rivojlantirish modeli

Bosqich	SI vositasi va funksiyasi	O‘ quvchi faoliyati	A2 bo‘ yicha kutilgan natija
1. Tayyorlov (5–7 daq.)	ASR asosidagi talaffuz mashqlari; so‘ z va iboralarni ovoz chiqarib takrorlash, darhol fikr-mulohaza olish	Mavzu leksikasi va 5–6 ta tayanch iborani talaffuz qilish	Tanish so‘ z va iboralarni tushunarli talaffuz qiladi
2. Boshqariladigan dialog (10 daq.)	Mavzusi va leksikasi cheklangan topshiriqli ovozli chatbot (masalan, do‘ kondan xarid, yo‘ l so‘ rash)	Chatbot bilan 8–10 navbatli dialog; ma’ lumot so‘ rash va berish	Dialogda to‘ g‘ ri ma’ lumot oladi va beradi
3. Erkin muloqot (10 daq.)	Generativ SI suhbatdoshi rol o‘ yinida (o‘ qituvchi qurilmasi yoki sinf rejimi)	Tanish mavzuda fikr bildirish, savolga javob qaytarish	Sodda iboralar bilan o‘ z fikrini ifodalaydi
4. Refleksiya va baholash (5–8 daq.)	Suhbat transkripti; o‘ qituvchi rubrikasi asosida tahlil	Xatolarni topish, dialogni juftlikda qayta ijro etish	Qisqa muloqotda ishtirok etadi, o‘ z nutqini baholaydi

Model haftasiga ikki dars va ikki 15 daqiqalik uy mashg‘ uloti tarzida kamida 6–8 hafta davomida qo‘ llanishi tavsiya etiladi; bu Ngo va hamkorlari aniqlagan eng samarali davomiylikka mos keladi [14]. Baholash CEFR ning og‘ zaki o‘ zaro muloqot deskriptorlari [4] va davlat ta’ lim standartidagi A2 talablari [3] asosida olib boriladi.

Modelni joriy etishda bir qator cheklovlarni hisobga olish zarur. Birinchidan, YUNESKO generativ SI platformalari bilan mustaqil muloqot uchun yosh chegarasini belgilashni tavsiya qiladi va 13 yoshni minimal chegara sifatida ko‘ rsatadi [25]. 7-sinf o‘ quvchilarining bir qismi bu yoshga yetmaganini inobatga olib, uchinchi bosqichda shaxsiy akkauntlardan emas, balki o‘ qituvchi nazoratidagi qurilma yoki bolalar uchun mo‘ ljallangan maxsus platformalardan foydalanish maqsadga muvofiq. Ikkinchidan, Huang va hamkorlari ko‘ rsatganidek, yangilik effekti vaqt o‘ tishi bilan susayadi [11], shuning uchun topshiriqlar turini muntazam yangilab borish kerak. Uchinchidan, tizimli sharhlarda SI bir xil javoblarni takrorlashi va o‘ qituvchining kontekstli fikr-mulohazasini to‘ liq almashtira olmasligi qayd etilgan [18]. Shu sababli SI o‘ qituvchining o‘ rnini emas, balki darsdan tashqari og‘ zaki amaliyot hajmini oshiruvchi vosita sifatida ko‘ rilishi lozim.

Tadqiqotning cheklovi shundaki, tahlil qilingan empirik ishlarning ko‘ pchiligi oliy ta’ lim talabalari bilan o‘ tkazilgan, 12–13 yoshli o‘ quvchilar bo‘ yicha dalillar hali kam. Shu sababli taklif etilgan modelni umumta’ lim maktablarida tajriba va nazorat guruhlari ishtirokidagi pedagogik tajriba orqali tekshirish keyingi tadqiqotimizning vazifasi hisoblanadi.

XULOSA

1. So‘ nggi yillardagi meta-tahlillar SI vositalarining til o‘ rganishga, xususan, gapirish ko‘ nikmasiga o‘ rta darajadagi barqaror ijobiy ta’ sirini tasdiqlaydi (g = 0,48–0,69). Bu natija turli mamlakatlar, tizimlar va namunalarda takrorlangani uchun ishonchli dalil hisoblanadi.

2. SI ning eng kuchli ta’ siri talaffuz va grammatik aniqlikda namoyon bo‘ ladi; ta’ lim bosqichi natijaga sezilarli ta’ sir ko‘ rsatmaydi, boshlang‘ ich darajadagi o‘ quvchilar esa eng ko‘ p foyda ko‘ radi. Bu 7-sinf o‘ quvchilari uchun qulay sharoit yaratadi.

3. Samaradorlikning asosiy sharti – mashg‘ ulotlarning muntazamligi va davomiyligi: bir-to‘ rt haftalik qisqa kurslar natija bermaydi, 5–8 haftalik tizimli amaliyot esa katta ta’ sir ko‘ rsatadi.

4. Taklif etilgan to‘ rt bosqichli model (tayyorlov – boshqariladigan dialog – erkin muloqot – refleksiya) A2 darajasi talablariga, ma’ noni cheklash tamoyiliga va yosh xavfsizligi talablariga tayanadi. Uni o‘ qituvchi nazoratida, SI ni o‘ qituvchining yordamchisi sifatida qo‘ llash maktabda gapirish vaqti tanqisligini kamaytirishning real yo‘ li bo‘ la oladi.

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TASHKILIY MADANIYATNI SHAKLLANTIRISHDA RAHBARNING PSIXOLOGIK YETAKCHILIK QOBILIYATLARI

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Annotatsiya: *So‘ ngi yillarda turli jabhalarda rahbarlik, ulardagi yetakchilik qobiliyatiga bo‘ lgan qiziqishlar ortib bormoqda. Ushbu maqolada tashkiliy madaniyatni shakllantirish jarayonida rahbarning psixologik yetakchilik qobiliyatlari qanday ahamiyat kasb etishi atroflicha yoritib beriladi. Xususan, zamonaviy boshqaruv tizimida rahbar shaxsining emotsional barqarorligi, uning kommunikativ mahorati, motivatsiya berish uslublari va jamoaga ta’sirchan psixologik muhit yaratishdagi roli tahlil qilinadi. Maqolada boshqaruv psixologiyasining turli nazariy modellari asosida rahbarning xulq-atvori, qaror qabul qilish jarayonidagi psixologik omillar, hamda tashkilotning umumiy qadriyatlari va xulq me’yorlarini shakllantirishga qaratilgan amaliy yondashuvlar o‘ rganiladi. Shuningdek, jamoa ichida ishonch, mas’uliyat va hamkorlik ruhini mustahkamlashda rahbarning shaxsiy fazilatlari qanchalik muhim ekanligi ilmiy dalillar asosida ko‘ rsatib beriladi. Tadqiqotlar shuni ko‘ rsatadiki, tashkilotlarda barqaror tashkiliy madaniyatni shakllantirish uchun rahbarning psixologik yetukligi asosiy strategik omil ekanini ko‘ rsatadi.*

Kalit so‘ zlar: *tashkiliy madaniyat, rahbar psixologiyasi, yetakchilik qobiliyati, emotsional intellekt, kommunikativ kompetensiya, motivatsiya, jamoa psixologiyasi, boshqaruv madaniyati, psixologik ta’sir, tashkilot qadriyatlari, ijtimoiy-psixologik muhit, liderlik uslublari.*

ПСИХОЛОГИЧЕСКИЕ НАВЫКИ ЛИДЕРСТВА В ФОРМИРОВАНИИ ОРГАНИЗАЦИОННОЙ КУЛЬТУРЫ

Аннотация: *В данной статье всесторонне освещается значение психологических лидерских качеств руководителя в процессе формирования организационной культуры. В частности, анализируется роль эмоциональной устойчивости руководителя, его коммуникативных навыков, методов мотивации и умения создавать психологически благоприятную атмосферу в коллективе в условиях современной системы управления. На основе различных теоретических моделей психологии лидерства рассматриваются особенности поведения руководителя, психологические факторы принятия решений, а также практические подходы, направленные на формирование общих ценностей и норм поведения в организации. Кроме того, с научной точки зрения обосновано, насколько важными являются личностные качества руководителя для укрепления доверия, ответственности и духа сотрудничества внутри коллектива. Результаты исследования подтверждают, что психологическая зрелость руководителя является ключевым стратегическим фактором в формировании устойчивой организационной культуры.*

Ключевые слова: *организационная культура, психология руководителя, лидерские качества, эмоциональный интеллект, коммуникативная компетентность, мотивация, психология коллектива, управленческая культура, психологическое влияние, ценности организации, социально-психологическая среда, стили лидерства.*

THE LEADER’S PSYCHOLOGICAL LEADERSHIP SKILLS IN SHAPING ORGANIZATIONAL CULTURE

Abstract: *This article provides an in-depth analysis of the significance of a leader’s psychological leadership abilities in the process of forming organizational culture. In particular, it examines the role of a leader’s emotional stability, communicative competence, motivational strategies, and the ability to create a psychologically supportive atmosphere within a team in the context of modern management systems. Based on various theoretical models of leadership psychology, the study explores the leader’s behavior, the psychological factors influencing decision-making, as well as practical approaches aimed at shaping the organization’s core values and behavioral norms. Furthermore, the article presents scientific evidence demonstrating the importance of the leader’s personal qualities in strengthening trust, responsibility, and a spirit of cooperation within the team. The findings confirm that the psychological maturity of a leader is a key strategic factor in establishing a stable and sustainable organizational culture.*

Keywords: *organizational culture, leadership psychology, leadership competence, emotional intelligence, communicative competence, motivation, group psychology, management culture, psychological influence, organizational values, socio-psychological environment, leadership styles.*

KIRISH

Bugungi kunda tashkilotlar muvaffaqiyati nafaqat strategik rejalashtirish va texnologik resurslarga, balki rahbarlarning psixologik yetakchilik qobiliyatiga ham bog‘ liqdir. Tashkiliy madaniyat – bu xodimlar o‘ rtasidagi o‘ zaro munosabatlar, ish jarayonlari, qadriyatlar va me’yorlar majmui bo‘ lib, uning shakllanishi rahbarning psixologik kompetensiyalari, motivatsion qobiliyatlari va kommunikatsion ko‘ nikmalari bilan bevosita bog‘ liq. Zamonaviy rahbar nafaqat qaror qabul qiluvchi, balki ijtimoiy psixologik muhitni boshqaruvchi, xodimlarning ishga bo‘ lgan motivatsiyasini oshiruvchi va tashkilotda sog‘ lom madaniyatni shakllantiruvchi yetakchi sifatida harakat qiladi. Shu sababli, rahbarning psixologik yetakchilik qobiliyatlari hamda ularning tashkiliy madaniyatga ta’siri mavzusi zamonaviy boshqaruv psixologiyasida dolzarb va tadqiqotga muhtoj masala hisoblanadi. Zamonaviy tashkilotlarda muvaffaqiyatning asosiy omillaridan biri — bu boshqaruv jarayonida shakllanadigan tashkiliy madaniyatning barqaror va samarali bo‘ lishidir. Tashkiliy madaniyat nafaqat korxonaning ichki me’yorlari, qadriyatlari va xulq-atvor standartlarini belgilaydi, balki jamoaning ishga munosabati, motivatsiya darajasi hamda umumiy ruhiyatini boshqaruvchi kuch sifatida namoyon bo‘ lishi bilan yaqqol ko‘ zga tashlanadi. Bunday murakkab tizimni shakllantirish va uni to‘ g‘ ri yo‘ naltirish esa, avvalo, rahbarning psixologik yetakchilik qobiliyatiga bog‘ liq bo‘ ladi.

Yetakchilikning psixologik jihatlari rahbarning o‘ z jamoasi bilan o‘ rnatadigan ishonchli muloqoti, emotsional barqarorligi, muammoli vaziyatlarda oqilona qaror qabul qila olishi va xodimlarni bir maqsad atrofida birlashtirish mahorati orqali namoyon bo‘ ladi. Aynan shu sifatlar rahbarning tashkilot ichida ijobiy muhit yaratishiga, qadriyatlarni shakllantirishiga hamda xodimlar o‘ rtasida mas’uliyat hissini kuchaytirishiga asos bo‘ ladi. Bugungi globallashuv sharoitida tashkilotlar o‘ z oldiga qo‘ yayotgan vazifalar tobora murakkablashib borar ekan, rahbarning psixologik yetakchilik darajasi ham yangicha yondashuvni talab etmoqda. Xodimlarning ehtiyojlarini anglash, jamoada sog‘ lom kommunikatsiyani yo‘ lga qo‘ yish va zamonaviy boshqaruv uslublarini qo‘ llash tashkiliy madaniyatni mustahkamlashning eng muhim shartlaridandir. Shu bois, rahbarning psixologik yetakchilik ko‘ nikmalari nafaqat boshqaruv samaradorligiga, balki butun tashkilotning raqobatbardoshligiga ham bevosita ta’sir ko‘ rsatadi.

Mazkur maqolada tashkiliy madaniyatni shakllantirish jarayonida rahbarning ijtimoiy psixologik yetakchilik qobiliyati qanday rol o‘ ynashi, uning asosiy komponentlari va amaliy ahamiyati atroflicha yoritib beriladi.

ADABIYOTLAR TAHLILI VA METODOLOGIYA.

Tashkiliy madaniyat va yetakchilik psixologiyasi bo‘ yicha ilmiy manbalar ushbu sohaning murakkab, ko‘ p qatlamli tuzilishga ega ekanligini ko‘ rsatadi. Ilmiy adabiyotlarda tashkiliy madaniyatga turlicha yondashuvlar mavjud bo‘ lib, ularning aksariyati rahbarning shaxsiy fazilatlari va psixologik yetakchilik uslubi bilan chambarchas bog‘ liqligini ta’kidlaydi. Tadqiqotlarda rahbarning mas’uliyatni bo‘ lisha olishi, xodimlarni qo‘ llab-quvvatlashi hamda ochiq muloqot yaratishi madaniyatning shakllanishida hal qiluvchi rol o‘ ynashi qayd etiladi. Psixologik yetakchilikning fundamental tushunchalari D. Goulman, K. Levin va J. Burns kabi tadqiqotchilar ishlanmalarida keng yoritilgan. Ayniqsa, emotsional intellekt rahbarlarning yetakchilik samaradorligining muhim tarkibiy qismi sifatida e’tirof etiladi.

Adabiyotlarda stressni boshqarish, konfliktologiya, jamoaviy munosabatlar va kommunikatsion kompetensiyalar ham rahbarning madaniyatga ta’sir etuvchi eng asosiy psixologik omillar qatoriga kiritiladi. Ko‘ plab zamonaviy tadqiqotlarda transformatsion yetakchilik modeli – ya’ni xodimlarni qo‘ llab-quvvatlash, ularni rivojlanishga yo‘ naltirish va umumiy maqsad sari safarbar etish – tashkiliy madaniyatni barqarorlashtiruvchi eng samarali yondashuv sifatida ko‘ rsatilgan.

Ayni paytda mahalliy olimlar tomonidan olib borilgan tadqiqotlarda ham rahbarning insonparvar yondashuvi, ijtimoiy-psixologik muhitni boshqarish qobiliyati va xodimlar bilan hamkorlikda ishlash madaniyati tashkilotning barqaror rivojiga bevosita ta’sir qilishi ta’kidlanadi. Umuman olganda, mavjud ilmiy manbalar rahbarning psixologik yetakchilik sifatlari tashkiliy madaniyatni shakllantiruvchi asosiy omillardan biri ekanligini tasdiqlaydi.

Tashkiliy madaniyat va rahbarlik psixologiyasi bo‘ yicha tadqiqotlar keng qamrovli bo‘ lib, bir nechta asosiy yo‘ nalishlarni ajratish mumkin. Masalan:

- Tashkiliy madaniyat nazariyasi – S. Robbins, E. Schein va P. Drucker kabi olimlar tashkiliy madaniyatni tashkilotning ichki qadriyatlari, ish jarayonlari va xodimlar o‘ rtasidagi o‘ zaro munosabatlar orqali shakllanishini ta’kidlashadi.
- Psixologik yetakchilik modeli – D. Goleman, J. Kotter va B. Bass rahbarning psixologik kompetensiyalari (emotsional intellekt, motivatsion strategiyalar, kommunikatsiya) tashkilot madaniyatiga qanday ta’sir ko‘ rsatishi masalasini o‘ rganadi.

- Motivatsiya va ijtimoiy psixologik jihatlar – Maslow va Herzbergning motivatsiya nazariyalari rahbarning xodimlarga ta’siri va ularni samarali ishlashga undashdagi roli bilan bog‘ liq.
- Empirik tadqiqotlar – So‘ nggi yillarda o‘ tkazilgan tadqiqotlar rahbarning psixologik yetakchilik qobiliyatlari va tashkiliy madaniyat o‘ rtasida mustahkam korrelyatsiya mavjudligini ko‘ rsatmoqda, xususan, ijobiy psixologik muhit va xodimlarning ishga sodiqligi oshadi.

Adabiyotlar tahlili shuni ko‘ rsatadiki, rahbarning psixologik yetakchilik qobiliyatlari tashkiliy madaniyatni shakllantirishda markaziy omil sifatida muhim rol o‘ ynaydi va u samarali boshqaruvni ta’minlashning asosiy negizi hisoblanadi.

Tadqiqotning metodologik asoslari zamonaviy boshqaruv psixologiyasi, tashkiliy xulq-atvor nazariyalari va yetakchilik psixologiyasiga oid ilmiy yondashuvlarga tayangan holda shakllantirildi. Maqolada quyidagi ilmiy metodlar qo‘ llanildi:

- Nazariy tahlil metodi Tashkiliy madaniyat, yetakchilik psixologiyasi, emotsional intellekt, kommunikatsiya jarayonlari va motivatsiya nazariyalariga doir ilmiy manbalar chuqur o‘ rganildi. Ular asosida rahbarning psixologik yetakchilik kompetensiyalarini baholash uchun asosiy mezonlar ajratib olinadi.
- Qiyosiy tahlil metodi Mahalliy va xorijiy olimlarning konsepsiyalari solishtirilib, turli yondashuvlarning umumiy va farqli jihatlari aniqlab berildi. Bu usul rahbarning psixologik ta’sir mexanizmlari turli tashkiliy madaniyatlarda qanday namoyon bo‘ lishini tushunishga yordam berdi.
- Tizimli yondashuv Rahbar shaxsiy fazilatlarining tashkiliy madaniyat bilan o‘ zaro bog‘ liqligi kompleks tizim sifatida tahlil qilindi. Tashkilot ichidagi psixologik muhit, xodimlarga berilgan motivatsiya, muloqot jarayonlari va boshqaruv uslublarining o‘ zaro ta’siri yagona tizim sifatida ko‘ rib chiqildi.
- Axborot manbalarini kontent-tahlil qilish mavzuga doir ilmiy maqolalar, tadqiqotlar, statistik ma’lumotlar va amaliy tajriba materiallari tahlil qilinib, umumiy xulosalar berildi.

Ushbu metodlar orqali rahbarlarning tashkiliy madaniyatlarini oshirish jamoaviy muhitni sog‘ lomlashtirish yanada qulaylashganini ko‘ rishimiz mumkin.

- Ilmiy umumlashtirish metodi Olingan nazariy ma’lumotlar sintez qilinib, rahbarning psixologik yetakchilik qobiliyatining tashkiliy madaniyatga ta’siri bo‘ yicha umumiy ilmiy xulosalar shakllantirildi.
- Kvalitativ metodlar – Rahbarlar va xodimlar bilan intervyu o‘ tkazish, ularning tashkiliy madaniyat va rahbarlik qobiliyatlari haqidagi fikrlarini tahlil qilish.
- Kvantitativ metodlar – So‘ rovnomalar orqali xodimlarning rahbarning psixologik yetakchilik qobiliyati va tashkilotdagi madaniyatni baholash. Masalan, Likert shkalasi yordamida motivatsiya, ishonch va ishga sadoqat ko‘ rsatkichlarini o‘ lchash.
- Korrelyatsion tahlil – Rahbarning yetakchilik qobiliyati va tashkiliy madaniyat ko‘ rsatkichlari o‘ rtasidagi bog‘ liqlikni aniqlash.
- Tadqiqot obyekti va subyekti – Obyekt: tashkilotlarning ichki madaniyati; Subyekt: rahbarlar va xodimlar.
- Ma’lumotlarni tahlil usullari – Deskriptiv statistika, korrelyatsion tahlil, sifatli ma’lumotlarni kontent tahlili.

Yuqoridagi metodologiya rahbar shaxsining psixologik yetakchilik qobiliyati tashkiliy madaniyat shakllanishidagi o‘ rnini aniq va ilmiy asoslangan tarzda tadqiq qilish imkonini beradi.

Natijalar: Tadqiqotlar natijasi shuni ko‘ rsatadiki, rahbarning psixologik yetakchilik qobiliyatlari tashkilotning madaniyatiga sezilarli darajada ta’sir qiladi. Xususan:

- Rahbarning psixologik yetakchilik qobiliyati va xodimlarning motivatsiyasi: So‘ rovnoma va intervyular natijalari rahbarning emotsional intellekti yuqori bo‘ lgan tashkilotlarda xodimlar ishga yuqori motivatsiya bilan yondashishini ko‘ rsatdi. Ular o‘ z ishini qadrlashadi, tashkiliy qadriyatlar bilan uyg‘ unlashadi va samarali jamoaviy ishlashga intiladi.
- Tashkiliy madaniyatni shakllantirishdagi rahbar roli: Rahbarlar samarali kommunikatsiya va ijobiy psixologik muhit yaratish orqali xodimlar orasida ochiq fikr almashish va hamkorlikni rag‘ batlantiradi. Shu sababli, tashkilot ichidagi ishonch va qo‘ llab-quvvatlash tizimi mustahkamlanadi.
- Rahbarning motivatsion strategiyalari: Rahbar xodimlarni rag‘ batlantirishda individual yondashuvni qo‘ llaganda, ularning tashkiliy qadriyatlarni qabul qilishi va tashkilot madaniyatini rivojlantirishdagi faolligi oshadi. Masalan, shaxsiy maqsadlarni tashkilot maqsadlariga moslashtirish orqali xodimlarning ishga sadoqati kuchayadi.
- Korrelyatsion tahlil natijalari: Rahbarning psixologik yetakchilik qobiliyati va tashkiliy madaniyat o‘ rtasida ijobiy korrelyatsiyaning mavjudligi ular o‘ rtasida uzviy bog‘ liqlik borligini tasdiqlaydi.

Natijalar shuni ko‘ rsatadiki, zamonaviy rahbarning psixologik yetakchilik qobiliyatlari tashkilotning madaniyatini rivojlantirishda hal qiluvchi rol o‘ ynaydi. Samarali rahbar xodimlarning motivatsiyasi, tashkiliy qadriyatlar bilan

uyg‘ unligi va jamoaviy ishlash ko‘ rsatkichlarini sezilarli darajada oshiradi. Shu bilan birga, ijobiy psixologik muhit va muloqot tashkilotning umumiy samaradorligini kuchaytiradi.

MUHOKAMA.

Tadqiqot natijalari shuni ko‘ rsatdiki, rahbarning psixologik yetakchilik qobiliyatlari tashkilotning madaniyati shakllanishida muhim omil hisoblanadi. Bu natija S. Robbins, E. Schein va D. Golemanning ilgari surgan nazariy fikrlari bilan mos keladi. Xususan, tadqiqot shuni ko‘ rsatdiki, rahbarning emotsional intellekti va motivatsion strategiyalari xodimlarning ishga bo‘ lgan sadoqati va tashkiliy qadriyatlarni qabul qilish darajasini oshiradi. Bu Scheinning tashkiliy madaniyatni rahbar faoliyati orqali shakllanishi haqidagi fikrini tasdiqlaydi. Shuningdek, natijalar rahbarning ijobiy kommunikatsion yondashuvi va xodimlar bilan ochiq muloqot tashkil etish orqali jamoaviy ish samaradorligini oshirishini ko‘ rsatdi. Samarali rahbar faqat topshiriqlarni boshqaruvchi emas, balki ijtimoiy-psixologik muhitni shakllantiruvchi sifatida ham faol bo‘ lishi zarurligini anglatadi. Rahbarning psixologik yetakchilik qobiliyatlari tashkilot ichidagi motivatsiya va ishga sadoqatni oshiradi, bu esa o‘ z navbatida madaniyatning barqaror rivojlanishiga olib keladi. Shu bilan birga, empirik natijalar rahbarning yetakchilik qobiliyati bilan tashkiliy madaniyat o‘ rtasida sezilarli korrelyatsiya mavjudligini tasdiqladi. Bu esa, oldingi nazariy tadqiqotlar natijalarini mustahkamlaydi va zamonaviy boshqaruv psixologiyasida rahbar psixologik kompetensiyalari ahamiyatini yana bir bor ko‘ rsatadi. Muhokama natijalar shuni ta’kidlaydiki, tashkilotlarda samarali tashkiliy madaniyatni shakllantirish uchun rahbarlar nafaqat texnik va strategik qobiliyatga, balki psixologik yetakchilik qobiliyatlariga ega bo‘ lishi zarur. Shu sababli, rahbarlar uchun maxsus treninglar, emotsional intellektni rivojlantirish va kommunikatsiya ko‘ nikmalarini oshirish bo‘ yicha dasturlarni joriy etish tavsiya etiladi.

XULOSA.

Tadqiqot natijalari shuni ko‘ rsatmoqdaki, zamonaviy tashkilotlarda samarali tashkiliy madaniyatni shakllantirishda rahbarning psixologik yetakchilik qobiliyatlari markaziy o‘ rin tutadi. Rahbarning emotsional intellekti, uning motivatsion strategiyalari va kommunikatsion ko‘ nikmalari xodimlarning ishga sadoqati, tashkiliy qadriyatlarni qabul qilishi va jamoaviy ish samaradorligini oshirishga bevosita ta’sir ko‘ rsatadi. Shu bilan birga, rahbarning psixologik yondashuvi tashkilot ichidagi ijobiy muhitni mustahkamlash va xodimlar o‘ rtasida ochiq muloqot, hamkorlik va ishonchni rag‘ batlantirishga yordam beradi.

Adabiyotlar tahlili va empirik tadqiqot natijalari bir-birini tasdiqlab, rahbarning psixologik yetakchilik qobiliyatlari va tashkiliy madaniyat o‘ rtasida mustahkam bog‘ liqlik mavjudligini ko‘ rsatadi. Korrelyatsion tahlil natijalari esa rahbar psixologik kompetensiyalarining tashkilot madaniyatiga ta’sirini aniq ko‘ rsatadi. Bu esa, zamonaviy boshqaruv psixologiyasida rahbarlarni nafaqat strategik va texnik ko‘ nikmalarga, balki psixologik yetakchilik qobiliyatlarini rivojlantirishga ham e’tibor qaratish zarurligini isbotlaydi.

Amaliy jihatdan, tadqiqot natijalari rahbarlar uchun emotsional intellekt, motivatsiya va kommunikatsiya ko‘ nikmalarini yanada rivojlantirishga qaratilgan treninglar, psixologik konsultatsiya va tavsiyalar ishlab chiqish tizimlarini joriy etishni tavsiya qiladi. Shu orqali tashkilotlarda ijobiy muhit shakllanadi, xodimlar ishga yuqori motivatsiya bilan yondashadi va umumiy samaradorlik oshadi.

Shunday qilib, rahbarning psixologik yetakchilik qobiliyatlari tashkiliy madaniyatni shakllantirishda nafaqat samarali vosita, balki zamonaviy tashkilotlarning muvaffaqiyati uchun asosiy turtki sifatida ahamiyatlidir. Tadqiqotlar esa, kelajakda rahbarlik va tashkiliy madaniyat sohasida qo‘ shimcha ilmiy izlanishlar olib borish uchun mustahkam nazariy va empirik asos yaratadi.

FOYDALANILGAN ADABIYOTLAR RO‘ YXATI

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THE AIDR-V INSTRUCTIONAL MODEL FOR DEVELOPING ENGLISH WRITING COMPETENCE AMONG GRADE 7-9 GRADE LEARNERS

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Abstract: *Generative artificial intelligence enables rapid, individualised feedback on second-language writing; however, the availability of automated feedback does not in itself constitute evidence of learning. The central pedagogical issue is how adolescent learners can interpret, evaluate, and use AI-generated recommendations while retaining authorship and avoiding dependence on automated correction. This theoretical and methodological study develops a human-centred GenAI instructional model for English as a foreign language (EFL) writing in Grades 7-9. It integrates research on automated writing evaluation, GenAI-mediated feedback, feedback uptake, self-regulated learning, formative assessment, AI literacy, and teacher mediation. These principles are operationalised through the five stages of the AIDR-V model: Activation, Inquiry, Drafting, Refinement, and Verification. The model assigns complementary responsibilities to the learner, teacher, and AI system. AI functions as a provisional diagnostic resource; the learner makes criterion- and evidence-informed revision decisions; and the teacher ensures pedagogical relevance, protects learner authorship, and calibrates assessment. The principal conceptual outcome is a reproducible lesson-level protocol that connects communicative purpose, CEFR-informed criteria, feedback classification, revision logs, independent verification, and reflective justification. Designed for specialised secondary schools in Uzbekistan, the model remains transferable across platforms and comparable educational contexts. Because a complete experimental dataset is not yet available, the study advances no causal claims regarding effectiveness. It concludes by formulating testable propositions and an evaluation framework for subsequent quasi-experimental validation.*

Keywords: *human-centred generative AI, EFL writing, feedback uptake, revision, verification, learner agency.*

7-9 SINF O‘ QUVCHILARINING INGLIZ TILIDA YOZISH KOMPETENSIYASINI RIVOJLANTIRISHDA AIDR-V INSTRUKSIONAL MODELI

Annotatsiya: *Generativ sun’iy intellekt boshqa tilda yozilgan matn bo‘ yicha tezkor va individuallashtirilgan qayta aloqa olish imkonini beradi; biroq avtomatlashtirilgan qayta aloqaning mavjudligi o‘ z-o‘ zidan o‘ rganish sodir bo‘ lganini anglatmaydi. Asosiy pedagogik masala o‘ smir o‘ quvchilarning SI tomonidan yaratilgan tavsiyalarni mualliflik nazoratini saqlagan va avtomatlashtirilgan tuzatishga qaramlikni yuzaga keltirmagan holda talqin qilishi, baholashi hamda qo‘ llashidan iborat. Ushbu nazariy-metodik tadqiqot 7-9 sinflarda ingliz tilida yozma nutqni o‘ rgatishga mo‘ ljallangan inson markazli GenSI instruksional modelini ishlab chiqadi. Unda avtomatlashtirilgan yozma nutqni baholash, GenSI vositasidagi qayta aloqa, qayta aloqani o‘ zlashtirish, o‘ zini o‘ zi boshqarib o‘ rganish, formativ baholash, SI savodxonligi va o‘ qituvchi vositachiligiga oid tadqiqotlar integratsiya qilindi. Mazkur tamoyillar AIDR-V modelining besh bosqichi - faollashtirish, izlanish, qoralama yaratish, takomillashtirish va verifikatsiya - orqali operatsionallashtirildi. Modelda SI dastlabki diagnostik vosita vazifasini bajaradi; o‘ quvchi mezon va dalillarga asoslangan tahrir qarorlarini qabul qiladi; o‘ qituvchi esa pedagogik muvofiqlikni ta’minlaydi, o‘ quvchi mualliffligini himoya qiladi va baholashni muvofiqlashtiradi. Tadqiqotning asosiy konseptual natijasi kommunikativ maqsad, CEFRga asoslangan mezonlar, qayta aloqa tasnifi, tahrir jurnali, mustaqil verifikatsiya va reflektiv asoslashni o‘ zaro bog‘ laydigan takror qo‘ llash mumkin bo‘ lgan dars protokolidir. Model O‘ zbekiston ixtisoslashtirilgan umumiy o‘ rta ta’lim muassasalari uchun ishlab chiqilgan bo‘ lsa-da, muayyan platformaga bog‘ lanmagan. To‘ liq eksperimental ma’lumotlar mavjud bo‘ lmagani sababli uning samaradorligi yuzasidan sababiy xulosalar chiqarilmadi; keyingi kvazieksperimental tekshiruv uchun sinovdan o‘ tkaziladigan farazlar va baholash mezonlari belgilandi.*

Kalit so‘ zlar: *inson markazli generativ SI; ingliz tilida yozma nutq; qayta aloqani o‘ zlashtirish; matnni tahrirlash; verifikatsiya; o‘ quvchi subyektligi*

ДИДАКТИЧЕСКАЯ МОДЕЛЬ AIDR-V РАЗВИТИЯ АНГЛОЯЗЫЧНОЙ ПИСЬМЕННОЙ КОМПЕТЕНЦИИ УЧАЩИХСЯ 7-9 КЛАССОВ

Аннотация: *Генеративный искусственный интеллект обеспечивает возможность быстрой и индивидуализированной обратной связи по письменным работам на втором языке; однако наличие автоматизированной обратной связи само по себе не свидетельствует об обучении. Ключевая педагогическая проблема заключается в том, как подростки могут интерпретировать, оценивать и применять сформированные ИИ рекомендации, сохраняя авторский контроль и не формируя зависимость от автоматизированного исправления. В настоящем теоретико-методическом исследовании разработана человекоцентричная учебная модель применения ГенИИ при обучении письму на английском языке в 7–9 классах. Модель интегрирует исследования по автоматизированному оцениванию письменной речи, обратной связи с использованием ГенИИ, освоению обратной связи, саморегулируемому обучению, формативному оцениванию, ИИ-грамотности и педагогическому посредничеству. Эти положения операционализированы в пяти этапах модели AIDR-V: активация, исследование, создание черновика, доработка и верификация. ИИ выполняет функцию предварительного диагностического ресурса; ученик принимает решения о редактировании на основе критериев и доказательств; учитель обеспечивает педагогическую релевантность, защищает авторство ученика и калибрует оценивание. Основным концептуальным результатом является воспроизводимый протокол урока, объединяющий коммуникативную цель, критерии CEFR, классификацию обратной связи, журнал редактирования, независимую проверку и рефлексивное обоснование. Модель разработана для специализированных общеобразовательных учреждений Узбекистана, но не зависит от конкретной платформы. Ввиду отсутствия полного массива экспериментальных данных причинные выводы об эффективности не формулируются; определены проверяемые гипотезы и рамка последующей квазиэкспериментальной валидации.*

Ключевые слова: *человекоцентричный генеративный ИИ; письмо на английском языке; освоение обратной связи; редактирование текста; верификация; учебная субъектность*

INTRODUCTION

Generative artificial intelligence has altered the conditions under which writing support is provided by making automated explanation, reformulation, error detection, and text generation available at the point of need. These affordances are particularly relevant to EFL instruction, in which learners require repeated opportunities to produce language and receive timely, comprehensible feedback. Technological availability, however, should not be conflated with a pedagogical mechanism. An AI system may identify an error or propose a fluent reformulation without ensuring that the learner understands the underlying problem, evaluates the recommendation, or transfers the revised form to a subsequent communicative task. The relevant educational question is therefore not merely whether AI can improve a text, but whether instructional design can transform AI-generated feedback into learner-controlled noticing, evaluation, revision, and sustained language development [Kasneci et al. 2023; UNESCO 2023].

This distinction is particularly consequential during adolescence. Learners in Grades 7–9 develop linguistic competence concurrently with metacognitive regulation, critical information practices, and a stable sense of authorship. Although they may value the speed and apparent authority of AI output, they may not yet possess sufficiently developed criteria for evaluating factual accuracy, pragmatic appropriateness, register, cultural relevance, and the validity of automated scores. Emerging school-based evidence indicates that younger learners may benefit from AI-supported language practice, but their engagement with feedback varies according to proficiency, task structure, feedback focus, and the extent of teacher scaffolding [Wu & Zhao 2025]. Accordingly, treating access to AI as an intervention in itself obscures the causal sequence linking feedback, learner uptake, revision quality, and subsequent performance.

Research on second-language writing has long shown that feedback becomes pedagogically meaningful only when learners act on it. Written corrective feedback may focus attention on linguistic form, but its value is mediated by comprehensibility, timing, learner beliefs, cognitive load, and opportunities for revision. Automated writing evaluation extends the scale and immediacy of feedback, yet earlier systems often prioritised surface-level accuracy and could produce opaque or decontextualised recommendations. Generative AI broadens feedback to organisation, coherence, vocabulary, argumentation, and audience awareness; at the same time, it increases the risks of hallucination, overcorrection, homogenised style, and substitution of machine production for learner production. These tensions make feedback uptake - not feedback generation - the more appropriate unit of pedagogical analysis [Ranalli 2018; Warschauer & Grimes 2008].

Human–AI collaboration provides a more pedagogically defensible basis for instructional design than replacement-oriented approaches. Teacher mediation can align automated feedback with curricular objectives, learner age and proficiency, genre requirements, and assessment criteria. Learner verification can, in turn, transform a suggested correction into an object of inquiry: the learner compares alternatives, consults an independent descriptor or reference source, records a decision, and explains the grounds for accepting, adapting, or rejecting the recommendation. Within this arrangement,

AI is neither positioned as an autonomous tutor nor treated solely as a prohibited shortcut; it functions as a provisional analytical resource within a pedagogically governed process. Human-centred frameworks developed by UNESCO and the British Council likewise emphasise agency, accountability, transparency, and the continuing authority of professional pedagogical judgement [Miao & Shiohira 2024; Felice et al. 2025].

A further research gap lies between broad principles of responsible AI use and reproducible classroom procedures. Policy and ethical guidance frequently remain at the level of general principles, whereas empirical studies may identify the digital tool without adequately specifying prompt protocols, feedback categories, revision sequences, teacher intervention, verification requirements, or implementation-fidelity indicators. Consequently, observed outcomes cannot readily be attributed to AI, additional time on task, teacher support, novelty, or the structured revision process. A model intended for school practice must therefore define the actors, sequence, criteria, and observable evidence required to determine whether the intervention was implemented as intended.

The present article addresses this gap by developing a human-centred GenAI instructional model within the AIDR-V lesson-design architecture: Activation, Inquiry, Drafting, Refinement, and Verification. It narrows the broader productive-skills framework to adolescent EFL writing because written production renders the sequence from initial drafting to feedback, revision, and verification directly observable. The study aims to formulate a theoretically grounded and operationally reproducible protocol for specialised secondary schools in Uzbekistan. It addresses three research questions: (1) How can AI-generated feedback support rather than displace learner authorship? (2) How should responsibilities be distributed among the learner, teacher, and AI system across the AIDR-V model? (3) Which process and outcome indicators are required for subsequent empirical evaluation?

The article offers three delimited contributions. First, it integrates feedback uptake, self-regulated learning, formative assessment, and AI literacy within a single lesson-level mechanism. Second, it specifies a five-stage protocol that can be implemented across different AI systems, thereby prioritising pedagogical functions over platform-specific features. Third, it formulates testable propositions and measurement requirements for a subsequent quasi-experimental study. Because the available dissertation materials do not yet include a complete experimental dataset, the reported results are confined to conceptual and methodological outputs: an instructional model, a distribution of roles, an implementation protocol, and an empirical-validation framework.

THEORETICAL FRAMEWORK

Feedback uptake as the central learning mechanism

Feedback may be defined as information that enables learners to reduce the discrepancy between current performance and an intended standard. In writing instruction, however, this discrepancy is not reduced through exposure to comments alone. Learners must identify the problem, interpret the feedback, evaluate its relevance, select an appropriate response, implement a revision, and assess the revised version. This sequence distinguishes the receipt of feedback from its substantive uptake. Although AI increases the volume and immediacy of available feedback, it does not remove these cognitive and metacognitive demands. Excessive, contradictory, or insufficiently prioritised recommendations may instead increase extraneous cognitive load and promote superficial compliance.

For the proposed model, feedback uptake is operationalised through observable revision behaviour. Each AI suggestion is assigned one of four learner decisions: accept, adapt, reject, or defer for teacher consultation. Acceptance means that the learner agrees with the recommendation and can provide a criterion-based reason. Adaptation means that the learner uses the underlying diagnosis but produces an independently worded solution. Rejection means that the learner identifies a defensible linguistic, pragmatic, factual, or genre-related reason not to apply the recommendation. Deferral is used when the learner recognises uncertainty and seeks human mediation. These categories make learner agency visible and prevent the final text from concealing how it was produced.

The quality of feedback uptake is analytically more informative than the proportion of accepted recommendations. A high acceptance rate may reflect accurate AI feedback, but it may also indicate dependence or uncritical compliance. Conversely, a well-justified rejection may demonstrate advanced language awareness. Evaluation should therefore establish whether the learner identified the focus of feedback, consulted an appropriate criterion, improved the text without distorting the intended meaning, and transferred the relevant principle to a subsequent task. From this perspective, revision constitutes evidence of learning rather than merely evidence of textual editing.

Learner agency, authorship, and self-regulation

Learner agency refers to the capacity to act intentionally, make choices, and assume responsibility within the constraints of a learning environment. In AI-supported writing, agency is threatened when the system determines the topic, generates the argument, selects the evidence, and produces the final language. It is strengthened when the learner establishes a communicative purpose, creates the initial draft, interrogates feedback, chooses revisions, and explains the final decisions. Authorship is therefore not defined by the absence of digital assistance; it is defined by meaningful human control over content, reasoning, expression, and revision.

Self-regulated learning provides a complementary account of how this control develops. Effective writers plan, monitor, evaluate, and adapt their performance. The AIDR-V cycle externalises these processes through a task brief, a draft, a feedback map, a revision log, and a reflective note. Externalisation is particularly important for adolescents because invisible metacognitive processes are difficult to teach or assess. By requiring evidence at each stage, the model allows the teacher to diagnose whether a learner's difficulty lies in language knowledge, interpretation of feedback, selection of strategy, verification, or reflection.

The teacher's role remains decisive. Human-centred AI requires more than the physical presence of a person; human purposes, professional judgement, and accountability must govern the use of the system. The teacher defines permissible uses of AI, selects or designs the prompt framework, models critical evaluation, limits the scope and volume of recommendations, resolves disputed feedback, protects personal data, and maintains alignment between assessment and the intended construct. Accordingly, the learner retains authorship, the teacher retains pedagogical accountability, and the AI system remains a fallible support resource.

Formative assessment and CEFR-informed criteria

Formative assessment is embedded in the cycle because feedback is used to modify ongoing learning rather than merely score a completed product. The CEFR Companion Volume provides a useful reference for communicative outcomes, but descriptors must be translated into age-appropriate task and rubric criteria. For a short argumentative or explanatory text in Grades 7–9, the assessment framework may include task fulfilment, organisation and coherence, lexical range and appropriateness, grammatical control, mechanics, and audience awareness. The purpose is not to treat the CEFR as a mechanical scoring algorithm; it is to ensure that feedback serves communicative performance rather than isolated error correction [Council of Europe 2020].

Automated scores should therefore be treated as diagnostic evidence rather than final judgements. AI systems may identify patterns warranting attention, but they may misinterpret creative language, multilingual influence, task-specific meaning, or culturally situated expression. The model consequently requires triangulation among learner self-assessment, teacher rubric-based assessment, and AI-assisted analysis. Divergence among these sources can be pedagogically productive when it becomes an explicit object of inquiry. The central validity question is not which evaluator is inherently superior, but which inferences each source of evidence can legitimately support.

MATERIALS AND METHODOLOGY

The study employs a design-oriented theoretical and methodological approach. Its evidence base comprises:

(a) international frameworks for human-centred and responsible AI in education;

(b) research on automated writing evaluation and GenAI-mediated feedback in EFL writing;

(c) studies of feedback uptake, learner engagement, and teacher - AI collaboration;

(d) CEFR-informed principles for communicative writing assessment;

(e) the instructional architecture developed within the author's DSc project for Grades 7-9 in specialised schools. Documentary analysis was used to identify recurrent design problems, and functional synthesis was applied to translate theoretical principles into observable classroom procedures.

The synthesis followed four analytical questions. First, which pedagogical function is assigned to AI: generation, diagnosis, explanation, adaptation, feedback, or assessment? Second, what learner action connects AI output with learning: noticing, comparison, revision, verification, reflection, or transfer? Third, what form of teacher mediation protects validity, age appropriateness, and authorship? Fourth, what evidence would allow another researcher to reproduce and evaluate the process? A design component was retained only when it answered all four questions.

The resulting model was evaluated conceptually against six criteria: pedagogical alignment, learner agency, feedback actionability, verifiability, assessment validity, and practical feasibility. Pedagogical alignment requires every AI action to support a stated communicative outcome. Learner agency requires an initial learner-produced draft and recorded revision decisions. Feedback actionability requires suggestions to be limited, prioritised, and understandable. Verifiability requires comparison with an independent source, descriptor, rule, model text, peer judgement, or teacher explanation. Assessment validity requires final judgements to remain rubric-based and human-calibrated. Practical feasibility requires implementation within ordinary lesson sequences and available school infrastructure.

This methodology yields a conceptual model rather than an estimate of intervention effectiveness. The present study therefore reports neither participant outcomes nor percentage gains, significance tests, or effect sizes. A subsequent empirical phase should preregister the primary outcome, define the comparison condition, establish scoring reliability, document implementation fidelity, and report adjusted effects with confidence intervals. Maintaining a clear distinction between model development and outcome evaluation prevents anticipated benefits from being represented as observed findings.

CONCEPTUAL RESULTS: THE AIDR-V INSTRUCTIONAL MODEL

Stage 1. Activation

Activation establishes communicative ownership before AI is introduced. The learner analyses the audience, purpose, genre, content requirements, and assessment criteria of the task. The teacher activates relevant language and background knowledge through a model, contrastive examples, or a short diagnostic activity. AI may generate alternative contexts or questions, but it must not produce the learner's response. The evidence generated at this stage includes a task interpretation, a brief plan, and a personal content inventory. These artefacts make it possible to determine whether the final text reflects the learner's intended meaning.

Stage 2. Inquiry

Inquiry develops the language and conceptual resources required for independent drafting. Learners examine how sample texts realise organisation, cohesion, stance, register, and audience awareness. They may ask AI to explain a feature, compare two alternatives, or generate a mini-practice item. The teacher models prompt boundaries and source checking. Inquiry ends with a learner-created checklist linked to the rubric. This stage prevents AI feedback from becoming the first encounter with the relevant criterion and reduces the risk that learners accept explanations they do not understand.

Stage 3. Drafting

Drafting is completed without sentence-level generative substitution. Learners produce an initial text using their plan and checklist. Permissible assistance may include access to a bilingual or monolingual dictionary, previously taught materials, and teacher-approved reference resources. The draft is preserved before AI interaction. This requirement is essential for authorship, baseline comparison, and analysis of revision. The teacher does not correct every error at this point; instead, the draft becomes the evidence base for diagnostic feedback.

Stage 4. Refinement

During Refinement, AI provides bounded feedback according to a teacher-designed prompt. The prompt identifies the learner's grade or proficiency band, the task, the rubric, the permitted feedback categories, and the prohibition against rewriting the entire text. Feedback is prioritised into a manageable number of high-value issues. For each issue, the learner records the original segment, the feedback focus, the AI suggestion, the decision category, the revised segment, and a brief reason. The teacher intervenes selectively where the AI recommendation is inaccurate, developmentally inappropriate, or inconsistent with the assessment construct.

Stage 5. Verification

Verification converts revision into critical language learning. The learner checks important recommendations against at least one independent criterion: a CEFR-informed rubric, an authoritative dictionary, a grammar reference, a teacher explanation, a model text, or structured peer review. Factual statements require an independent content source rather than confirmation from the same AI system. The learner then prepares a short reflective justification explaining which suggestions were accepted, adapted, rejected, or deferred and why. A revised text is considered complete only when the learner can account for consequential changes.

Role distribution within the cycle

Stage	Learner action	Teacher action	AI-system function	Process evidence
Activation	Defines purpose, audience, and content	Frames task and criteria	Provides contexts or diagnostic prompts	Plan and content inventory
Inquiry	Analyses models and builds a checklist	Models critical prompting and comparison	Explains features and supplies bounded practice	Learner-created criterion checklist
Drafting	Produces an independent first draft	Protects authorship and observes needs	No full-text generation	Archived initial draft
Refinement	Classifies and acts on feedback	Calibrates and corrects misleading feedback	Diagnoses and proposes limited revisions	Feedback map and revision log
Verification	Checks, justifies, and reflects	Validates decisions and assesses by rubric	Supports comparison but cannot independently validate its output	Verified draft and reflective note

DISCUSSION

The proposed model shifts analytical attention from the mere presence of AI to the instructional sequence within which it operates. This distinction is theoretically important because comparisons between AI-generated and teacher-provided feedback may overlook the learner actions occurring between feedback receipt and post-intervention performance. Accurate feedback that is neither understood nor applied may contribute less to learning than a smaller number of recommendations subjected to sustained evaluation and revision. AIDR-V therefore treats feedback uptake, revision quality, and verification behaviour as mechanism variables rather than incidental features of classroom implementation.

The model also establishes an explicit boundary between instructional assistance and generative substitution. It does not presuppose that every instance of text generation is pedagogically detrimental; instead, it requires the initial communicative content and first draft to originate with the learner. AI may support diagnosis, comparison, and refinement of expression, but the learner must retain control over claims, examples, organisation, and final wording. This principled boundary is preferable to an undifferentiated prohibition because it supports responsible participation in AI-rich learning environments while preserving assessable evidence of learner competence.

Teacher mediation is not an ancillary safeguard but a constitutive condition of pedagogical validity. Current AI systems cannot reliably account for the curriculum, the developmental profile of a particular class, the communicative purpose of a task, a learner's prior performance, or the construct being assessed. Teachers are also better positioned to identify instances in which formally correct feedback weakens authorial voice, alters intended meaning, or exceeds the learner's developmental needs. The teacher-in-the-loop configuration is therefore required not only on ethical grounds but also to protect the validity of instruction and assessment.

For specialised schools in Uzbekistan, the model has three practical advantages. First, it is compatible with CEFR-informed outcomes already used in foreign-language education. Second, it can be implemented with variable infrastructure because the core artefacts - a plan, draft, feedback map, revision log, and reflective note - do not depend on one platform. Third, it supports multilingual and culturally situated judgement: learners and teachers can reject recommendations that are pragmatically inappropriate or that erase locally meaningful content. Localisation therefore concerns tasks, criteria, examples, privacy, and interaction norms, not simply interface language.

Implementation nevertheless depends on explicit institutional conditions. Teachers require professional development in prompt design, feedback calibration, privacy protection, bias recognition, and interpretation of automated analyses. Schools require transparent policies governing user accounts, personal data, age-appropriate access, storage of learner work, and disclosure of AI assistance. Learners require explicit instruction regarding permissible forms of assistance, procedures for acknowledging AI use where required, and the principle that an AI-generated response cannot independently validate itself. In the absence of these conditions, the same technology may intensify superficial correction, unequal access, and learner dependence.

The model generates five testable propositions. P1: learners who complete the full feedback–revision–verification sequence will demonstrate greater gains in rubric-rated writing than learners who receive equivalent AI feedback without structured verification. P2: feedback-uptake quality will mediate the relationship between exposure to the intervention and improvement in writing performance. P3: justified adaptation and rejection decisions will predict transfer more strongly than the unqualified acceptance rate. P4: teacher calibration will reduce the proportion of inappropriate automated recommendations incorporated into final texts. P5: intervention effects will vary according to baseline proficiency, thereby requiring differentiated limits and scaffolds for feedback.

A later quasi-experimental evaluation should use intact Grade 7-9 classes while accounting for baseline differences. The primary outcome should be independently rated CEFR-aligned writing performance on a parallel task completed under controlled conditions. Secondary outcomes may include coherence, grammatical control, lexical appropriateness, feedback-uptake quality, revision accuracy, and learner agency, provided that each measure is specified in advance. At least two trained raters should score a subsample or all scripts, and inter-rater reliability should be reported. The main analysis should adjust post-test performance for baseline performance and report effect sizes with 95% confidence intervals.

Process evaluation is equally necessary. Fidelity indicators should record whether learners produced an independent draft, received feedback within the specified categories, completed revision logs, verified consequential recommendations, and received teacher calibration. Logs should distinguish intervention failure from theory failure: if verification was rarely completed, an absence of outcome differences would not constitute a valid test of the full model. Qualitative analysis of learner explanations can further reveal whether verification reflects genuine reasoning or formulaic compliance.

Several limitations must be acknowledged at the model-development stage. AI systems and their outputs change rapidly, which may render platform-specific claims obsolete. Revision logs may influence learner behaviour and increase workload. The quality of teacher calibration may vary across classes, while prior experience with AI and access outside

school may contaminate comparison conditions. Moreover, improvements in a final draft do not necessarily indicate durable learning. Transfer tasks completed without AI assistance are therefore essential to any subsequent evaluation.

CONCLUSION

The educational value of AI-generated writing feedback depends on the instructional actions through which learners and teachers interpret and use it. The AIDR-V model positions AI as a provisional diagnostic resource, the learner as author and decision-maker, and the teacher as instructional designer, mediator, and final pedagogical authority. Its five stages - Activation, Inquiry, Drafting, Refinement, and Verification - connect communicative purpose with independent production, bounded feedback, documented revision, source-based verification, and reflective justification. The contribution of the model is procedural rather than platform-specific: it operationalises human-centred AI principles as a reproducible sequence of classroom actions and observable evidence. For specialised secondary schools in Uzbekistan, the model provides a theoretically grounded means of integrating technological support with CEFR-informed assessment, academic integrity, and learner agency. The next research stage requires empirical validation through controlled writing tasks, a transparent comparison condition, inter-rater reliability analysis, fidelity monitoring, and effect estimates with confidence intervals. Until such evidence is available, the anticipated advantages of the model must remain testable propositions rather than claims of demonstrated effectiveness.

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SUN’ IY INTELLEKT DAVRIDA SHAXS AVTONOMIYASINING TRANSFORMATSIYASI: ALGORITMIK QARORLAR VA INSON TANLOVI

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Annotatsiya: *Maqolada sun’ iy intellekt tizimlari kundalik tanlov jarayonlariga chuqur kirib borayotgan sharoitda shaxs avtonomiyasi qanday o‘ zgarayotgani falsafiy-ijtimoiy jihatdan tahlil qilinadi. Tavsiya algoritmlari, qaror qabul qilishni qo‘ llab-quvvatlovchi tizimlar va generativ modellarning insonning axborot olish, muqobillarni baholash va qaror qabul qilish bosqichlariga ta’ siri ko‘ rib chiqilgan. Pew Research Center, Stanford HAI (Ipsos), Reuters Instituti so‘ rovlari natijalari hamda Yevropa Ittifoqi va O‘ zbekiston me’ yoriy hujjatlari qiyosiy tahlil qilingan. Tadqiqot natijasida avtonomiyaning “delegatsiya qilingan”, “kuzatuv ostidagi” va “refleksiv” shakllarini farqlovchi konseptual model taklif etilib, raqamli muhitda inson tanlovi erkinligini himoya qilishga oid tavsiyalar asoslangan.*

Kalit so‘ zlar: *shaxs avtonomiyasi, sun’ iy intellekt, algoritmik qaror, tanlov arxitekturasi, gipernudj, avtomatlashtirish og‘ ishi, inson nazorati, raqamli etika.*

ТРАНСФОРМАЦИЯ ИНДИВИДУАЛЬНОЙ АВТОНОМИИ В ЭПОХУ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА: АЛГОРИТМИЧЕСКИЕ РЕШЕНИЯ И ЧЕЛОВЕЧЕСКИЙ ВЫБОР

Аннотация: *В статье с философско-социальных позиций анализируется трансформация автономии личности в условиях, когда системы искусственного интеллекта всё глубже проникают в повседневные процессы выбора. Рассматривается влияние рекомендательных алгоритмов, систем поддержки принятия решений и генеративных моделей на этапы получения информации, оценки альтернатив и принятия решения. Проведён сравнительный анализ данных опросов Pew Research Center, Stanford HAI (Ipsos), Института Reuters, а также нормативных актов Европейского союза и Узбекистана. Предложена концептуальная модель, различающая «делегированную», «поднадзорную» и «рефлексивную» формы автономии, и обоснованы рекомендации по защите свободы человеческого выбора в цифровой среде.*

Ключевые слова: *автономия личности, искусственный интеллект, алгоритмическое решение, архитектура выбора, гипернадж, предвзятость автоматизации, человеческий контроль, цифровая этика.*

THE TRANSFORMATION OF INDIVIDUAL AUTONOMY IN THE AGE OF ARTIFICIAL INTELLIGENCE: ALGORITHMIC DECISIONS AND HUMAN CHOICE

Abstract: *The article offers a philosophical and social analysis of how personal autonomy is being transformed as artificial intelligence systems penetrate everyday choice processes. It examines the influence of recommender algorithms, decision support systems and generative models on the stages of information seeking, evaluation of alternatives and decision making. Survey data from the Pew Research Center, Stanford HAI (Ipsos) and the Reuters Institute, together with regulatory acts of the European Union and Uzbekistan, are compared. A conceptual model distinguishing delegated, monitored and reflective forms of autonomy is proposed, and recommendations for protecting the freedom of human choice in the digital environment are substantiated.*

Keywords: *personal autonomy, artificial intelligence, algorithmic decision, choice architecture, hypernudge, automation bias, human oversight, digital ethics.*

KIRISH

Sun’ iy intellekt texnologiyalari so‘ nggi o‘ n yillikda ilmiy laboratoriyalar doirasidan chiqib, jamiyat hayotining deyarli barcha sohalariga kirib keldi. Bugun kredit berish, ishga qabul qilish, tibbiy tashxis qo‘ yish, ta’ lim yo‘ nalishini tanlash, yangiliklar va madaniy mahsulotlarni iste’ mol qilish kabi jarayonlarda qarorlarning muayyan qismi algoritmlar yordamida tayyorlanmoqda yoki bevosita ular tomonidan qabul qilinmoqda. Bu o‘ zgarish insonga qulaylik, tezlik va

aniqlik keltirishi bilan birga, falsafiy jihatdan muhim savolni ham kun tartibiga qo‘ ymoqda: tanlov imkoniyatlari algoritm tomonidan saralab berilayotgan sharoitda inson qanchalik o‘ z qarorining egasi bo‘ lib qolmoqda? Shaxs avtonomiyasi — insonning o‘ z maqsadlarini mustaqil belgilash, muqobillarni baholash va ular uchun javobgarlikni o‘ z zimmasiga olish qobiliyati — demokratik jamiyat, huquqiy davlat va zamonaviy ta’ lim tizimining tayanch qadriyatlaridan biridir. Shu bois sun’ iy intellektning inson tanloviga ta’ sirini o‘ rganish nafaqat texnologik, balki chuqur ijtimoiy-falsafiy ahamiyatga ega masala hisoblanadi.

Bu jarayonning ko‘ lami raqamlarda yaqqol ko‘ rinadi. Inson nimani tomosha qilishi, qaysi yangilikni o‘ qishi, qanday mahsulot sotib olishi va hatto qaysi kasbni tanlashi haqidagi qarorlarning katta qismi algoritmlar oldindan saralab bergan muqobillar orasida qabul qilinmoqda. Netflix muhandislari e’ lon qilgan ma’ lumotga ko‘ ra, platformada tomosha qilingan soatlarning taxminan 80 foizi tavsiya tizimi taklif etgan kontentga to‘ g‘ ri keladi [1]; YouTube rahbariyati esa foydalanuvchilar tomosha vaqtining 70 foizdan ortig‘ i tavsiyalar orqali shakllanishini ma’ lum qilgan [2]. Reuters Instituti ma’ lumotlariga ko‘ ra, 2025-yilda AQShda yangiliklarni ijtimoiy tarmoqlar va video platformalar orqali oluvchilar ulushi (54%) ilk bor televideniye (50%) va yangilik saytlaridan (48%) oshib ketdi, respondentlarning 7 foizi, 25 yoshgacha bo‘ lganlarning esa 15 foizi har hafta yangilik olish uchun sun’ iy intellekt chatbotlaridan foydalanmoqda [3].

O‘ zbekiston uchun masala amaliy ahamiyat kasb etmoqda. “Raqamli O‘ zbekiston — 2030” strategiyasi [4] va Prezidentning 2024-yil 14-oktabrdagi PQ-358-son qarori bilan tasdiqlangan Sun’ iy intellekt texnologiyalarini 2030-yilgacha rivojlantirish strategiyasi [5] davlat xizmatlarining 10 foizini sun’ iy intellektga asoslangan holda ko‘ rsatish, bu sohadagi dasturiy mahsulotlar eksportini 1,5 mlrd dollarga yetkazish va Government AI Readiness Index reytingida birinchi 50 talikka kirishni maqsad qilgan. Mamlakat ushbu indeksda 2023-yilda 87-, 2024-yilda 70-, 2025-yilda 62-o‘ rinni egallagan [6]. 2026-yil 14-martda Adliya vazirligida ro‘ yxatdan o‘ tkazilgan (3787-son) Raqamli texnologiyalar vazirligining sun’ iy intellekt yechimlariga oid etika qoidalari esa yakuniy qaror inson tomonidan qabul qilinishi shartini qat’ iy belgilab qo‘ ydi [7]. Demak, algoritmik qarorlar ko‘ lami kengayib borayotgan davrda shaxs avtonomiyasining yangi shakllarini falsafiy-ijtimoiy jihatdan tushunish dolzarb vazifaga aylanmoqda.

Masalaning nazariy asoslariga to‘ xtaladigan bo‘ lsak, avtonomiya tushunchasi Yevropa falsafasida I. Kant davridan buyon insonning o‘ z aqli bilan belgilagan qonunga bo‘ ysunish qobiliyati sifatida talqin qilib kelinadi [8]. XX asrda bu g‘ oya psixologik jihatdan boyitildi: H. Frankfurt shaxsni o‘ z istaklariga nisbatan “ikkinchi darajali” munosabat bildira oladigan mavjudot deb ta’ rifladi [9], G. Dvorkin esa avtonomiyani birlamchi xohishlarni tanqidiy baholash va ularni qabul qilish yoki rad etish qobiliyati bilan bog‘ ladi [10]. Har uchala yondashuvda bir umumiy nuqta bor: tanlov avtonom bo‘ lishi uchun u shaxsning o‘ z refleksiyasidan o‘ tishi lozim.

Muammoning o‘ tkirligi shundaki, algoritm tanlovni taqiqlamaydi, balki muqobillar maydonini sezdirmasdan toraytiradi. K. Yeung bu hodisani “gipernudj” deb atagan: katta ma’ lumotlarga asoslangan, har bir foydalanuvchiga moslashtirilgan va real vaqt rejimida o‘ zgaruvchan tanlov arxitekturasi [11]. Sh. Zuboff xulq-atvor ma’ lumotlarini bashorat mahsulotiga aylantiruvchi iqtisodiy mantiqni “kuzatuv kapitalizmi” deb tavsiflagan [12], D. Susser, B. Ryossler va H. Nissenbaum esa yashirin ta’ sir avtonomiyaga to‘ g‘ ridan-to‘ g‘ ri tahdid ekanini ko‘ rsatgan [13]. Shu bilan birga empirik tadqiqotlar insonning algoritmga munosabati bir tekis emasligini ko‘ rsatadi: bir holatda odamlar algoritm maslahatini inson maslahatidan ustun qo‘ yadi (“algoritmni afzal ko‘ rish”) [14], boshqa holatda algoritmning bitta xatosini ko‘ rgach, undan butunlay voz kechadi (“algoritmdan qochish”) [15].

Tadqiqotning maqsadi — sun’ iy intellekt davrida shaxs avtonomiyasining transformatsiya yo‘ nalishlarini aniqlash va inson tanlovi erkinligini saqlash mexanizmlarini ilmiy asoslash. Maqsadga erishish uchun quyidagi vazifalar qo‘ yildi: algoritmik vositachilik ko‘ lamini empirik ma’ lumotlar asosida baholash; jamoatchilikning sun’ iy intellektga munosabatidagi qarama-qarshiliklarni aniqlash; avtonomiya tarkibiy qismlarining o‘ zgarishini tizimlashtirish; xalqaro va milliy me’ yoriy yondashuvlarni qiyosiy tahlil qilish.

Materiallar va metodlar

Tadqiqot fanlararo xarakterga ega bo‘ lib, unda ijtimoiy falsafa, texnologiyalar etikasi va huquqshunoslik usullari uyg‘ unlashtirildi. Birinchidan, klassik va zamonaviy avtonomiya nazariyalariga konseptual tahlil qo‘ llanildi. Ikkinchidan, xalqaro tadqiqot markazlarining ochiq e’ lon qilingan so‘ rov natijalari ikkilamchi tahlil qilindi: Pew Research Center tomonidan 2025-yil iyun oyida AQShda 5 023 nafar kattalar o‘ rtasida o‘ tkazilgan so‘ rov [16], 2025-yil bahorida 25 mamlakatda o‘ tkazilgan xalqaro so‘ rov [17], Stanford HAI “AI Index 2025” hisobotida keltirilgan Ipsos so‘ rovi (32 mamlakat, 23 685 respondent, 2024-yil aprel–may) [18] hamda Reuters Institutining 48 bozorni qamragan “Digital News Report 2025” hisoboti [3]. Uchinchidan, Yevropa Ittifoqining Sun’ iy intellekt to‘ g‘ risidagi reglamenti [19], Ma’ lumotlarni himoya qilish umumiy reglamenti [20], O‘ zbekiston Respublikasining “Shaxsga doir ma’ lumotlar to‘ g‘ risida”gi Qonuni [21], PQ-358-son qaror [5], 2026-yilgi etika qoidalari [7] va YUNESKOning sun’ iy intellekt etikasi bo‘ yicha tavsiyasi [22] qiyosiy-huquqiy usulda o‘ rganildi.

Avtonomiyani tahlil qilish uchun tanlov jarayoni uch bosqichga ajratildi: axborot olish, muqobillarni baholash va qaror qabul qilish hamda uning javobgarligini o‘ z zimmasiga olish. Har bir bosqichda algoritmik vositachilikning ta’ siri

alohida baholandi. Xalqaro tadqiqot markazlarining so‘ rov natijalari raqamli transformatsiya jarayonidagi global qonuniyatlarni aks ettiruvchi ma’ lumotlar sifatida olinib, O‘ zbekistonning strategik va me’ yoriy-huquqiy hujjatlari bilan qiyoslandi. Bunday yondashuv sun’ iy intellekt sohasidagi umumjahon tendensiyalarni milliy rivojlanish ustuvorliklari bilan bog‘ liq holda talqin qilish imkonini berdi. Olingan ma’ lumotlarning ishonchliligi manbalarning metodologik ochiqligi — tanlanma hajmi, o‘ tkazilgan vaqti va qamrovi aniq ko‘ rsatilgani bilan ta’ minlandi.

Natijalar

1. Algoritmik vositachilik ko‘lami

Tanlov muhitining qay darajada algoritmlar orqali shakllanayotganini ko‘ rsatuvchi asosiy ko‘ rsatkichlar 1-jadvalda umumlashtirildi.

1-jadval. Tanlov muhitida algoritmik vositachilik ko‘ lamini tavsiflovchi ko‘ rsatkichlar

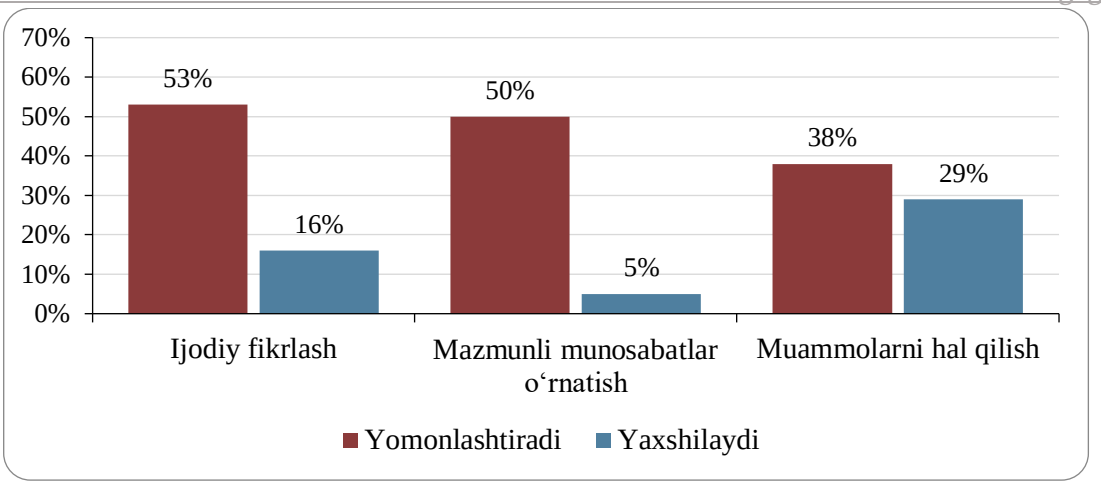
Ko‘ rsatkich	Qiymat	Manba, yil
Netflix platformasida tavsiya tizimi orqali tomosha qilingan soatlar ulushi	≈ 80%	Gomez-Uribe, Hunt, 2015
YouTube’ da tavsiyalar orqali shakllanadigan tomosha vaqti	> 70%	YouTube rahbariyati, 2018
AQShda yangiliklarni ijtimoiy tarmoq va video platformalar orqali oluvchilar	54%	Reuters Instituti, 2025
Har hafta yangilik olish uchun SI chatbotlaridan foydalanuvchilar (umumiy / 25 yoshgacha)	7% / 15%	Reuters Instituti, 2025
Onlayn yangiliklarda haqiqat va yolg‘ onni ajrata olishidan xavotirdagilar	58%	Reuters Instituti, 2025
Kontent SI yoki inson tomonidan yaratilganini aniqlay olishiga ishonmaydiganlar (AQSh)	53%	Pew Research Center, 2025

Manba: [1; 2; 3; 16] ma’ lumotlari asosida muallif tomonidan tuzilgan.

Jadval ma’ lumotlari shuni ko‘ rsatadiki, algoritmlar endi faqat texnik vosita emas, balki insonning axborot olish bosqichida “darvozabon” vazifasini bajarmoqda. Tomosha, o‘ qish va xarid qilish kabi kundalik harakatlarning aksariyati foydalanuvchi o‘ zi izlab topgan emas, balki unga taklif qilingan muqobillar orasidan tanlanadi. Bu holat avtonomiyaning birinchi bosqichi — axborot erkinligiga bevosita ta’ sir qiladi: inson ko‘ rmagan muqobilni tanlay olmaydi. Bundan tashqari, respondentlarning yarmidan ko‘ pi sun’ iy intellekt yaratgan kontentni inson ishidan ajrata olmasligini tan olmoqda, ya’ ni manbani baholash imkoniyati ham zaiflashmoqda.

2. Jamoatchilik idrokidagi “delegatsiya paradoksi”

Pew Research Center ma’ lumotlariga ko‘ ra, 2025-yilda amerikaliklarning 50 foizi sun’ iy intellektning kundalik hayotda keng qo‘ llanilishidan ko‘ proq xavotirda ekanini bildirgan (2021-yilda bu ko‘ rsatkich 37% edi), faqat 10 foizi ko‘ proq umid bog‘ lagan, 38 foizi esa ikkala hissiyotni teng darajada boshdan kechirgan [16]. Respondentlarning 61 foizi sun’ iy intellekt o‘ z hayotida qanday qo‘ llanilishi ustidan ko‘ proq nazoratga ega bo‘ lishni istaydi, joriy nazorat darajasidan qoniqqanlar esa atigi 17 foizni tashkil etadi. Avtonomiya nuqtai nazaridan eng muhim natija — sun’ iy intellektning insonning asosiy qobiliyatlariga ta’ siri haqidagi baholardir (1-diagramma).

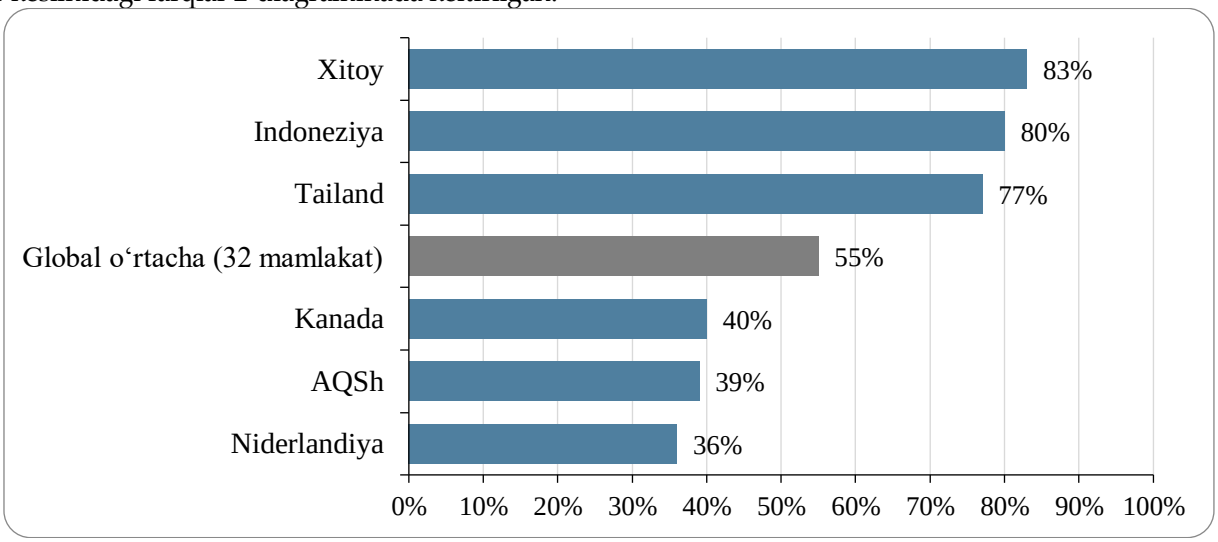


1-diagramma. Amerikaliklarning sun’ iy intellekt inson qobiliyatlariga ta’ siri haqidagi baholari, %

Manba: Pew Research Center, 2025-yil iyun, n = 5 023 [16].

Diagrammadan ko‘ rinib turibdiki, jamoatchilik sun’ iy intellektni ijodiy fikrlash va shaxslararo munosabatlar kabi aynan “insoniy” sohalarda avtonomiyaga tahdid sifatida qabul qilmoqda: bu yerda salbiy baholar ijobiylaridan 3–10 barobar ko‘ p. Muammolarni hal qilishda esa baholar nisbatan muvozanatli (38% va 29%), ya’ ni texnik vazifalarda delegatsiya ko‘ proq qabul qilinadi. Xuddi shu so‘ rovda respondentlarning 74 foizi ob-havo prognozida, 66 foizi yangi dori vositalarini ishlab chiqishda sun’ iy intellektdan foydalanishni ma’ qullagan, biroq 67 foizi tanishuv va juft tanlashda, 73 foizi diniy masalalarda uning hech qanday roli bo‘ lmasligi kerak deb hisoblagan.

Global miqyosda ham shunga o‘ xshash ikki tomonlama manzara kuzatiladi. Pew tadqiqotida 25 mamlakat bo‘ yicha mediana ko‘ rsatkichi: 34% ko‘ proq xavotirda, 16% ko‘ proq umidvor, 42% ikkala hissiyotni teng his qiladi; birorta mamlakatda ham umidvorlar ulushi eng katta guruh bo‘ lmagan [17]. Ipsos ma’ lumotlariga ko‘ ra esa sun’ iy intellekt mahsulotlari kamchiliklardan ko‘ ra ko‘ proq foyda keltiradi deb hisoblovchilar ulushi 2022-yildagi 52 foizdan 2024-yilda 55 foizga oshgan, respondentlarning 66 foizi yaqin 3–5 yilda sun’ iy intellekt kundalik hayotini tubdan o‘ zgartirishini kutadi, biroq kompaniyalar shaxsiy ma’ lumotlarni himoya qilishiga ishonuvchilar 47 foizga tushib qolgan [18]. Mamlakatlar kesimidagi farqlar 2-diagrammada keltirilgan.



2-diagramma. Sun’ iy intellekt mahsulotlari foydasi kamchiliklaridan ko‘ p deb hisoblovchilar ulushi, 2024-yil, %

Manba: Stanford HAI, AI Index 2025 (Ipsos so‘ rovi, n = 23 685) [18].

Olingan natijalar biz “delegatsiya paradoksi” deb nomlagan holatni qayd etish imkonini beradi: odamlar sun’ iy intellekt foydasini tan olib, undan tobora ko‘ proq foydalanmoqda, biroq ayni paytda uning ustidan nazoratni yo‘ qotishdan va insoniy qobiliyatlarning susayishidan xavotirlanmoqda. Boshqacha aytganda, amaliyotda tanlov algoritmga topshirilmoqda, qadriyatlar darajasida esa avtonomiyani saqlab qolish istagi kuchaymoqda.

3. Avtonomiya tarkibiy qismlarining transformatsiyasi

Konseptual tahlil natijasida avtonomiyaning beshta tarkibiy qismi algoritmik muhitda qanday o‘ zgarayotgani tizimlashtirildi (2-jadval).

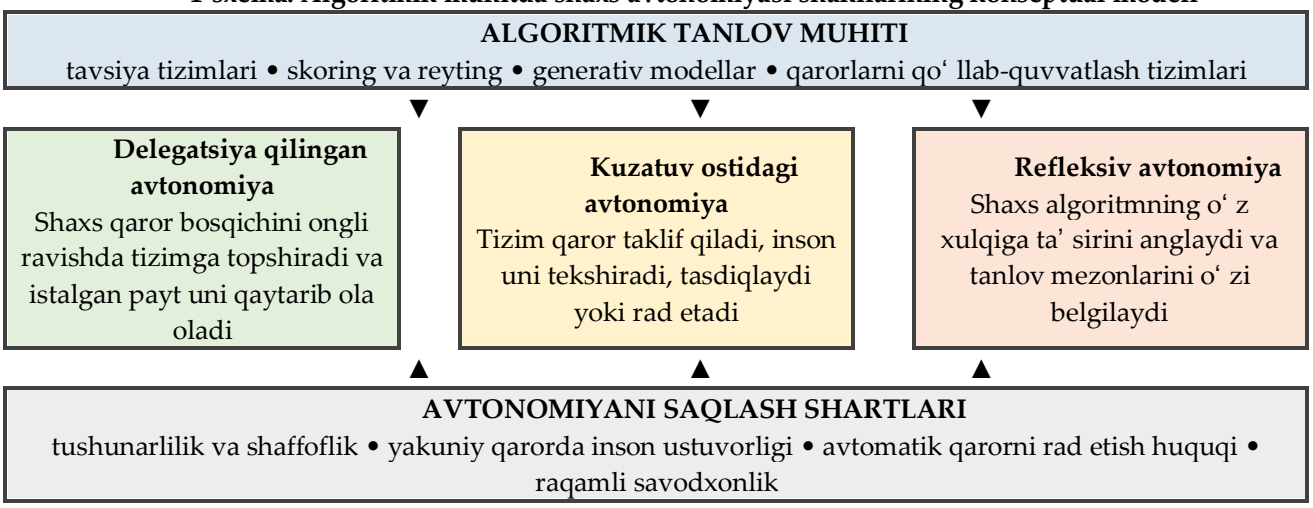
2-jadval. Algoritmik muhitda shaxs avtonomiyasi tarkibiy qismlarining o‘ zgarishi

Tarkibiy qism	Klassik talqin	Algoritmik muhitdagi o‘ zgarish	Himoya mexanizmi
Axborot erkinligi	Muqobillarni mustaqil izlash	Muqobillar tavsiya tizimi tomonidan oldindan saralanadi	Tavsiyalarni o‘ chirish, xronologik lenta
Muqobillarni baholash	Shaxsiy mezonlar asosida qiyoslash	Reyting, skoring va “eng yaxshi variant” belgilari baholashni almashtiradi	Tushuntiriladigan SI, mezonlarning ochiqligi
Irodaviy qaror	Ichki motivga tayanadi	Gipernudj va shaxsiylashtirilgan stimullar qarorni tezlashtiradi	Manipulyativ dizayn taqiqi
Javobgarlik	Qaror egasi aniq	Javobgarlik inson, ishlab chiquvchi va tizim o‘ rtasida “yoyiladi”	Inson nazorati, qayta ko‘ rib chiqish huquqi
Refleksiya	O‘ z istaklarini tanqidiy baholash	Istaklar platforma tomonidan bashorat qilinadi va mustahkamlanadi	Raqamli savodxonlik, “boosting” yondashuvi

Manba: muallif ishlanmasi [9; 10; 11; 23] asosida.

Jadvaldan ko‘ rinadiki, transformatsiya avtonomiyani yo‘ q qilmaydi, balki uning tuzilishini o‘ zgartiradi. Klassik modelda shaxs qarorning barcha bosqichlarini o‘ zi bajarar edi; algoritmik muhitda esa bosqichlarning bir qismi tizimga topshiriladi. Shu bois biz avtonomiyaning uch shaklini farqlovchi modelni taklif etamiz (1-sxema).

1-sxema. Algoritmik muhitda shaxs avtonomiyasi shakllarining konseptual modeli



Manba: muallif ishlanmasi.

Modelga ko‘ ra, delegatsiyaning o‘ zi avtonomiyani buzmaydi. L. Floridi va hammualliflari ta’ kidlaganidek, inson qaysi qarorlarni mashinaga topshirish haqida o‘ zi qaror qabul qilar ekan, u “meta-avtonomiya”ni saqlab qoladi [24]. Xavf delegatsiya qaytarib bo‘ lmaydigan, noshaffof va sezdirilmaydigan bo‘ lib qolganda paydo bo‘ ladi. Kuzatuv ostidagi avtonomiya esa “avtomatlashtirish og‘ ishi” tufayli zaiflashishi mumkin: tizimli sharhda ko‘ rsatilishicha, qarorlarni qo‘ llab-quvvatlash tizimlari noto‘ g‘ ri maslahat berganda mutaxassislar ham ko‘ pincha o‘ z to‘ g‘ ri qarorini o‘ zgartirib, tizimga ergashgan [25]. Refleksiv avtonomiya uch shakl ichida eng barqarori bo‘ lib, u shaxsdan algoritmlarning ishlash mantiqini tushunishni talab qiladi.

4. Me’yoriy-huquqiy javoblar

Avtonomiyani himoya qilishga qaratilgan xalqaro va milliy me’ yoriy yondashuvlar 3-jadvalda qiyoslandi.

3-jadval. Sun’ iy intellekt sharoitida shaxs avtonomiyasini himoya qiluvchi me’ yoriy hujjatlar

Hujjat	Avtonomiyaga oid asosiy qoida	Himoya mexanizmi
YUNESKO, SI etikasi bo‘ yicha tavsiya (2021)	“Inson nazorati va inson tomonidan belgilanishi” tamoyili	Hayotiy qarorlarda yakuniy javobgarlik insonda qoladi

Hujjat	Avtonomiyaga oid asosiy qoida	Himoya mexanizmi
Yevropa Ittifoqi Reglamenti 2016/679 (GDPR), 22-modda	Faqat avtomatlashtirilgan ishlovga asoslangan qarorga bo‘ ysunmaslik huquqi	Inson aralashuvini talab qilish, qarorga e’ tiroz bildirish
Yevropa Ittifoqi Reglamenti 2024/1689 (AI Act), 5- va 14-moddalar	Ongdan tashqari va manipulyativ usullarni qo‘ llash taqiqi; yuqori xavfli tizimlarda inson nazorati	Taqiqlar, jarimalar, nazorat talablari
O‘ zR “Shaxsga doir ma’ lumotlar to‘ g‘ risida”gi Qonuni (2019, O‘ RQ-547)	Ma’ lumotlarni sub’ ekt roziligi bilan qayta ishlash	Rozilikni qaytarib olish, ma’ lumotlardan xabardor bo‘ lish
O‘ zR Prezidentining PQ-358-son qarori (14.10.2024)	SI texnologiyalarini 2030-yilgacha rivojlantirish strategiyasi	Institutsional va infratuzilmaviy asos
Raqamli texnologiyalar vazirligining SI etika qoidalari (2026, ro‘ yxat raqami 3787)	Tushunarlilik, shaffoflik, javobgarlik; yakuniy qaror inson tomonidan qabul qilinadi	Inson tomonidan qayta ko‘ rib chiqish talabi

Manba: [22; 20; 19; 21; 5; 7] asosida muallif tomonidan tuzilgan.

Qiyosiy tahlil shuni ko‘ rsatadiki, Yevropa modeli avtonomiyani bevosita huquq sifatida himoya qiladi (avtomatlashtirilgan qarorga bo‘ ysunmaslik, manipulyatsiya taqiqi), O‘ zbekiston modeli esa hozircha asosan strategik va etik darajada shakllanmoqda. 2026-yilgi etika qoidalarida yakuniy qarorning inson tomonidan qabul qilinishi talabi muhim qadam bo‘ lsa-da, fuqaroning avtomatlashtirilgan qarorga e’ tiroz bildirish tartibi qonun darajasida alohida belgilanmagan.

MUHOKAMA

Tadqiqot natijalari algoritmik muhitda avtonomiyaning yo‘ qolishi emas, balki uning qayta taqsimlanishi sodir bo‘ layotganini ko‘ rsatadi. Bu xulosa B. Mittelshtadt va hammualliflarining algoritmlar etikasiga oid xaritasida qayd etilgan “transformativ ta’ sirlar” g‘ oyasiga mos keladi: algoritmlar nafaqat qaror qabul qiladi, balki insonning dunyoni idrok etish tarzini ham qayta shakllantiradi [26]. R. Taler va K. Sanstayn taklif etgan “nudj” konsepsiyasida tanlov arxitekturasi shaffof va jamoat manfaatiga xizmat qiluvchi vosita sifatida tasavvur qilingan edi [27]. Biroq tijorat platformalarida bu arxitektura foydalanuvchi e’ tiborini ushlab turishga yo‘ naltirilgani sababli Yeung ta’ riflagan gipernudj ko‘ rinishini oladi [11].

Ikkinchi muhim jihat — inson va algoritm o‘ rtasidagi ishonchning beqarorligi. “Algoritmni afzal ko‘ rish” [14] va “algoritmdan qochish” [15] hodisalari bir-birini inkor etmaydi: ular avtonomiyaning ikki xil buzilishini ifodalaydi. Birinchisida inson o‘ z mulohazasini ortiqcha tez tizimga topshiradi, ikkinchisida foydali vositadan asossiz voz kechadi. K. Burr, N. Kristianini va J. Ladiman intellektual agentlar va foydalanuvchilar o‘ zaro ta’ sirini tahlil qilib, agentning maqsadi foydalanuvchi maqsadi bilan mos kelmagan holatlarda “majburlash” va “aldash” xavfi paydo bo‘ lishini ko‘ rsatgan [28]. Bizning “delegatsiya paradoksi” haqidagi xulosamiz shu fikrni empirik jihatdan to‘ ldiradi: Pew va Ipsos ma’ lumotlari foydalanuvchilarning aynan maqsadlar nomuvofiqligini his qilayotganini ko‘ rsatadi.

Avtonomiyani himoya qilishda ikki strategiya mavjud. Birinchisi — me’ yoriy cheklovlar (taqiqlar, shaffoflik talablari); ikkinchisi — shaxsning kognitiv imkoniyatlarini kuchaytirish. A. Kozyreva, S. Levandovski va R. Hertvig ikkinchi yondashuvni “boosting” deb atab, u foydalanuvchini raqamli muhitdagi manipulyatsiyani mustaqil taniy oladigan qilishga qaratilganini asoslagan [23]. Bizningcha, O‘ zbekiston sharoitida bu ikki strategiyani uyg‘ unlashtirish maqsadga muvofiq. Davlat xizmatlarining 10 foizini sun’ iy intellektga o‘ tkazish rejasi [5] fuqarolarga avtomatik qarorni tushuntirishni talab qilish va uni inson tomonidan qayta ko‘ rib chiqishni so‘ rash huquqini qonun darajasida mustahkamlashni taqozo etadi. Ta’ lim tizimida esa raqamli savodxonlik mazmuniga algoritmlarning ishlash mantiqi, tavsiya tizimlari va generativ modellar cheklovlari haqidagi bilimlarni kiritish zarur.

Tadqiqot natijalari keyingi izlanishlar uchun ham istiqbolli yo‘ nalishlarni belgilaydi. Xususan, taklif etilgan avtonomiya shakllari modelini turli ijtimoiy guruhlar — talabalar, davlat xizmatchilari va keksa avlod vakillari misolida empirik sinovdan o‘ tkazish uning amaliy qiymatini yanada oshiradi.

XULOSA

O‘ tkazilgan tahlil asosida quyidagi xulosalarga kelindi:

1. Sun’ iy intellekt davrida shaxs avtonomiyasi yo‘ qolmayapti, balki transformatsiyaga uchramoqda: tanlov jarayonining axborot olish va muqobillarni baholash bosqichlari tobora ko‘ proq algoritmlarga topshirilmoqda (tomosha vaqtining 70–80 foizi tavsiyalar orqali shakllanadi).

2. Jamoatchilik idrokida “delegatsiya paradoksi” kuzatiladi: sun’ iy intellekt foydasini tan oluvchilar ulushi o‘ sib bormoqda (52% dan 55% gacha), ammo nazoratni kuchaytirish istagi (61%) va insoniy qobiliyatlar susayishidan xavotir (53%) ham ortmoqda.

3. Avtonomiyaning delegatsiya qilingan, kuzatuv ostidagi va refleksiv shakllarini farqlovchi model algoritmik muhitda inson tanlovining sifatini baholash uchun nazariy asos bo‘ la oladi; ulardan refleksiv avtonomiya eng barqaror shakl hisoblanadi.

4. O‘ zbekistonda sun’ iy intellektga oid strategik va etik asos shakllangan, biroq fuqaroning avtomatlashtirilgan qarorga e’ tiroz bildirish va uni inson tomonidan qayta ko‘ rib chiqishni talab qilish huquqini qonun darajasida mustahkamlash, shuningdek raqamli savodxonlik dasturlariga algoritmik savodxonlik modulini kiritish maqsadga muvofiq.

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TABIIY FANLAR FAKULTETLARI TALABALARINING KASBIY KOMPETENSIYALARINI INGLIZ TILI DARSLARIDA INTEGRATIV YONDASHUV ASOSIDA RIVOJLANITIRISH TEXNOLOGIYASI

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Annotatsiya: *Zamonaviy talablarga binoan ingliz tilini bilish talabalar uchun faqat kommunikatsiya vositasi emas, balki kasbiy faoliyatda ham muhim ahamiyatga ega. Oliy ta’lim tizimida ingliz tilini o‘ qitishda fanlararo yondashuvning zarurligi va uning o‘ quv jarayoniga ta’siri juda muhim ekanligi ko‘ plab tadqiqodlarda o‘ rganib chiqilmoqda. Ushbu maqolada ham tabiiy fanlar fakulteti talabalarining ingliz tili o‘ qitishda kasbiy kompetensiyalarini integrativ yondashuv asosida rivojlantirish muammolariga qaratilgan. Unda ushbu masala yuzasidan topilishi kerak bo‘ lgan yechimlar, bir qator takliflar misollari bilan keltirib o‘ tilgan. Shu bilan birgalikda, qator tadqiqodchilar fikrlari o‘ rganilgan.*

Kalit so‘ zlar: *kompetensiya, kompetentlik, kasbiy kompetensiya, tabiiy fanlar, nofilologik yo‘ nalish, integratsiya, kimyoviy terminlar, kasbiy ko‘ nikma .*

ТЕХНОЛОГИЯ РАЗВИТИЯ ПРОФЕССИОНАЛЬНЫХ КОМПЕТЕНЦИЙ СТУДЕНТОВ ЕСТЕСТВЕННО-НАУЧНЫХ СПЕЦИАЛЬНОСТЕЙ НА ЗАНЯТИЯХ ПО АНГЛИЙСКОМУ ЯЗЫКУ НА ОСНОВЕ ИНТЕГРАТИВНОГО ПОДХОДА

Аннотация: *В соответствии с современными требованиями знание английского языка является для студентов не только средством общения, но и важным в профессиональной деятельности. Необходимость междисциплинарного подхода к преподаванию английского языка в системе высшего образования и его влияние на образовательный процесс исследуются во многих исследованиях. В данной статье также рассматриваются проблемы развития профессиональных компетенций студентов факультета естественных наук в преподавании английского языка на основе интегративного подхода. В нем приводятся решения, которые необходимо найти по данному вопросу, с примерами ряда предложений. Вместе с тем были изучены мнения ряда исследователей.*

Ключевые слова: *компетентность, компетентность, профессиональная компетентность, естественные науки, нефилологическая ориентация, интеграция, химические термины, профессиональные навыки.*

TECHNOLOGY FOR DEVELOPING THE PROFESSIONAL COMPETENCIES OF NATURAL SCIENCE STUDENTS IN ENGLISH CLASSES BASED ON AN INTEGRATIVE APPROACH

Abstract: *In accordance with modern requirements, knowledge of English is not only a means of communication for students, but also important in their professional activities. The need for an interdisciplinary approach to teaching English in higher education and its impact on the educational process are explored in many studies. This article also examines the problems of developing the professional competencies of students of the Faculty of Natural Sciences in teaching English based on an integrative approach. It provides solutions that need to be found on this issue, with examples of a number of proposals. At the same time, the opinions of a number of researchers were studied.*

Keywords: *competence, competence, professional competence, natural sciences, non-philological orientation, integration, chemical terms, professional skills.*

KIRISH

Globalizatsiya va zamonaviy talablarga binoan ingliz tilini bilish talabalar uchun faqat kommunikatsiya vositasi emas, balki kasbiy faoliyatda ham muhim ahamiyatga ega. Oliy ta’lim tizimida ingliz tilini o‘ qitishda fanlararo yondoshuvning zarurligi va uning o‘ quv jarayoniga ta’siri juda muhim ekanligi ko‘ plab tadqiqodlarda o‘ rganib chiqilmoqda. Kasbiy ingliz tilini o‘ qitishning asosiy maqsadi nafaqat tilni o‘ rgatish, balki talabalarga ularning kasbiy sohalarida zarur bo‘ lgan terminologiyani, muloqot uslublarini va ish jarayonlari bilan bog‘ liq ko‘ nikmalarni

rivojlantirishdir. Fanlararo munosabatlar o‘ qitish jarayonida bir nechta fan sohalari o‘ rtasidagi integratsiya va o‘ zaro aloqalarni ifodalaydi. Bu usulda o‘ qituvchi, tilni faqat yakkama-yakka, alohida fan sifatida emas, balki boshqa fanlar, masalan, iqtisodiyot, huquq, tibbiyot va boshqa kasbiy sohalar bilan birgalikda o‘ rgatadi.

Oliy ta’lim muassasalarining nofilologik yo‘ nalishlarida ingliz tilini o‘ rganish nafaqat til bilimlarini, balki turli sohalarda kasbiy kompetensiyalarni rivojlantirishni ham ta’minlaydi. Tabiiy fanlar fakultetlari misolida ko‘ radigan bo‘ lsak, ta’lim olayotgan talabalar uchun ingliz tilini o‘ rganish, ularning ilmiy-tadqiqot faoliyatini va kasbiy sohada muvaffaqiyatli ishlashini ta’minlashda muhim ahamiyatga ega. Integrativ yondashuv bu turli fanlar va tilni birlashtirish metodi bo‘ lib, talabalar uchun ko‘ p jihatdan sharoitlar yaratadi. Ayniqsa, talabaning kasbiy kompetensiyasini ingliz tili darslarida integrativ yondashuv asosida takomillashtirish uning kelgusida nafaqat o‘ z kasbi balkim ingliz tilini mukammal bilish imkonini beradi.

Kasbiy ingliz tili o‘ qitish jarayonida fanlararo munosabatlarning ahamiyati tobora ortib bormoqda. Bugungi kunda globalizatsiya va texnologiyalarning tez rivojlanishi, shuningdek, mehnat bozoridagi talablarning o‘ zgarishi kasbiy ingliz tiliga bo‘ lgan ehtiyojni oshirgan. Talabalarga faqatgina ingliz tilini o‘ rgatish emas, balki ularning kasbiy sohada ingliz tilida erkin muloqot qilish imkoniyatini yaratish muhimdir.

ADABIYOTLAR TAHLILI

Zamonaviy tendensiyalar va hayotga yangi qarashlar nofilologik o‘ quv yurtlarda, xususan tabiiy fanlar fakultetida malakaviy chet tili o‘ qituvchilariga ma’lum talablarni qo‘ ydi. Ko‘ pgina olimlar aniq bir fan bilimlarining boshqa fanlar bilan o‘ rganishda foydalanishning maqsadga muvofiqligi to‘ g‘ risida g‘ oyalarni ilgari surdilar, chunki fanlarning integratsiyasi talabalarning kasbiy kompetensiyalarini va aqliy qobiliyatlarini rivojlantirishga yordam beradi.

Hozirgi vaqtda zamonaviy pedagogik o‘ quv jarayonda fanlararo aloqalarni rivojlantirish muammosi keng muhokama qilinmoqda. N.A.Menchinskaya, E.I.Monoszon, V.N.Maksimova, N.A.Churilin, N.A.Sorokin va V.N.Fedorova kabi ko‘ plab tadqiqotchilarning fikriga ko‘ ra, integrativ yondashuv ya’ni fanlararo aloqalarning beshta asosiy – uslubiy, tarbiyaviy, rivojlantiruvchi, tarbiyaviy va funksional funksiyalarga ajratib olish odatiy holdir. Agar fanlararo aloqalarning uslubiy funksiyasi bo‘ lsa talabalarga bilimga tizimli yondashuv nuqtai nazaridan zamonaviy fan tushunchalarini yaxshiroq o‘ zlashtirishga, fanlararo aloqalarning tarbiyaviy funksiyasi jihatidan muvofiqlik, chuqurlik, xabardorlik va moslashuvchanlik fazilatlarini shakllantirishga yordam beradi [1].

Rus olimlarining tadqiqotlariga ko‘ ra, ingliz tili darslarida integrativ yondashuv asosida kasbiy kompetensiyani rivojlantirish texnologiyasi talabalarni nafaqat til ko‘ nikmalarini, balki ilmiy va kasbiy bilimlarini ham rivojlantirishga yordam beradi. Ushbu yondashuv orqali talabalar o‘ z kasbiy faoliyatida muvaffaqiyatli bo‘ lishlari uchun zarur bo‘ lgan bilim, ko‘ nikma va malakalarni o‘ zlashtiradilar. Shu bilan birga, integrativ metodlar talabalarni ilmiy fikrlashga, muloqotga va kasbiy faoliyatda to‘ g‘ ri qarorlar qabul qilishga tayyorlaydi.

G.G.Belovaning so‘ zlariga ko‘ ra: “Interaktiv metodlar talabalarga o‘ z bilimlarini amaliyotda qo‘ llash imkonini beradi, bu esa ularning kasbiy kompetensiyalarini samarali rivojlantirishga yordam beradi”. Uning fikricha, interaktiv metodlar talabalar o‘ rtasida o‘ zaro muloqot va hamkorlikni rivojlantirishga yordam beradi, bu esa kasbiy vazifalarni samarali bajarishga tayyorlaydi. Shuningdek, interaktiv metodlar talabalarni turli kasbiy vazifalarni hal qilishda va ingliz tilida ilmiy materiallarni sintez qilishda faol ishtirok etishga undaydi [2].

So‘ nggi o‘ n yil Ichida bu sohada yana ko‘ plab o‘ zbek tadqiqodchi olimlarimiz ilmiy-tadqiqot ishlarini amalga oshirdilar. Jumladan, Sh.Yusupova va D.Rejapova integratsion darslarni tashkil qilish metodikasi ustida [4.7], Z.Bahodirova iqtisodiy ta’lim sohasida axborot texnologiyalarini integratsiyalash muammolarini o‘ rganish masalasida, U.Musaev integratsiyani umumiy ta’lim sohasiga jalb qilish jarayoni borasida [5.6.] tadqiqot ishlarini olib borishdi. O.G‘ ozieva, R.Ismoilov [6.12], Z.Qobilova va G.Alieva kabi pedagog o‘ qituvchilar integratsion ta’lim usullaridan foydalanishning turli ko‘ rin0069shlarini ishlab chiqishdi. K.Turdieva fanni amaliyotga integratsiya sifatida, O.Hayitova elektron vositalarni tatbiq etish orqali fanlararo integratsiyani ta’minlash yo‘ nalishlari bo‘ yicha o‘ z fikrlarini e’lon qilishgan. N.Taylaqov va A.Suyarovlar o‘ quv fanlarini integratsiyalashning ayrim jixatlarini ishlab chiqishgan.

TADQIQOT METODOLOGIYASI

Tadqiqotda integrativ va fanlararo yondashuv, tahlil, taqqoslash, umumlashtirish hamda pedagogik kuzatish metodlaridan foydalanildi. Tabiiy fanlar fakulteti talabalarining ingliz tili darslarida kasbiy kompetensiyalarini rivojlantirish imkoniyatlari o‘ rganilib, ingliz tili va mutaxassislik fanlarini uyg‘ unlashtirishga asoslangan topshiriqlar hamda interaktiv metodlar tahlil qilindi. Shuningdek, “Acids and Bases” mavzusi asosida integrativ dars modeli ishlab chiqilib, unda kasbiy terminologiya, ingliz tilidagi muloqot va amaliy topshiriqlarning o‘ zaro bog‘ liqligi ko‘ rib chiqildi.

Maqolada oliy ta’lim muassasalarining tabiiy fanlar fakultetida ingliz tili ta’lim sifatini baholashda ularning kasbiy kompetensiyalarini inobatga olish zarurligi muhokama qilinadi. O‘ rganish chog‘ ida ingliz tili darslarida integrativ yondashuvdan foydalanish talabaning kabiy kompetensiyasini oshirishning eng samarali usullaridan biri etib topildi va ushbu yondashuvning ahamiyatiga kengroq urg‘ u berildi.

Natija

Talabaning kasbiy kompetensiyasini oshirishni tahlil qilishdan oldin kompetensiya va kasbiy kompetensiya o‘ zi nima ekanligini yoritib berish joiz.

Kompetentsiya – bu shaxsning turli vaziyatlarda, shu jumladan, yangi sharoitlarda harakat qila olishiga yordam beradigan bilimlar, ko’ nikmalar va malakalar hamda shaxsning o’ ziga xos fazilatlari yig’ indisidir. [3]

Kasbiy kompetensiya — bu shaxsning o‘ z kasbiy faoliyatini samarali va sifatli bajarish uchun zarur bo‘ lgan bilimlar, ko‘ nikmalar va malakalarning yig‘ indisidir. Kasbiy kompetensiya faqat bilimlar bilan cheklanmaydi, balki amaliy ko‘ nikmalar, tajriba, professional axloq va muloqot qobiliyatlarini ham o‘ z ichiga oladi. Hozirgi zamon mehnat bozorida kasbiy kompetensiya mutaxassislarning muvaffaqiyatli faoliyat yuritishlari uchun muhim omil hisoblanadi .

Kasbiy kompetensiyaning o‘ ziga xos asosiy tarkibiy qismlari mavjud bo‘ lib ular quyidagilar hisoblanadi:

- kasbiy bilimlar — sohaga doir bilimlar va nazariy tushunchalar.
- kasbiy ko‘ nikmalar — o‘ z kasbini bajarishda talab etiladigan amaliy ko‘ nikmalar.
- kasbiy malakalar — to‘ g‘ ri qarorlar qabul qilish, samarali ish usullarini topish kabi yuqori darajadagi ko‘ nikmalar.
- kasbiy tajriba — mutaxassisning real kasbiy muhitida o‘ rganilgan tajriba va amaliyot.

Kasbiy kompetensiya o‘ qitish va ta’lim jarayonida o‘ rganiladigan asosiy tushunchalar sifatida ko‘ rib chiqiladi. Zamonaviy ta’lim tizimida o‘ quvchilarni nafaqat bilimlar bilan ta’minlash, balki ularga kasbiy ko‘ nikmalarni o‘ rgatish ham zarur. Ta’lim dasturlari va o‘ quv rejalari kasbiy kompetensiyalarni rivojlantirishga qaratilgan bo‘ lishi kerak.

R.B.Rubin va S.Savignon o’ z tadqiqotlarida kompetentsiyani bilim, tajriba, qadriyatlar, intilishlar asosida ta’ lim olish jarayonida erishilgan umumiy layoqat sifatida ta’ riflaydi. [4]

Kompetentsiya xususida filologiya va psixologiya fanlari doktori, akademik A.A.Leontev shunday yozadi: “Kompetentsiya tushunchasining paydo bo’ lishi mutaxassis tayyorlash tarixi bilan bog’ liq. Bunda kompetentsiya bilim, ko’ nikma va umumiy malakalarni ish faoliyatiga safarbar qila olish layoqati sifatida tushuniladi”. [5]

Integrativ yondashuv turli fanlarni yoki bilim sohlarini o‘ zaro bog‘ lash orqali dars jarayonida talabalarni yanada samarali o‘ qitish va ularga yanada kengroq bilim va ko‘ nikmalarni taqdim etish usuli ekanligini va ingliz tilida tabiiy fanlarni o‘ qitishda integrativ yondashuvni til va kasbiy bilimlarni birlashtirib, talabalarni ilmiy sohada ishlashga tayyorlay olish sifatida tasvirlab berdik.

Quyida biz tabiiy fanlar fakulteti talabalarining ingliz tili darslarida kasbiy kompetensiyalarini integrativ yondashuv asosida rivojlantirishga qaratilgan ushbu jadvalni tuzdik.

1-jadval. Kasbiy kompetensiyalarini integrativ yondashuv asosida rivojlantirish

Integrativ yondashuv komponentlari	Kasbiy kompetensiyani rivojlantirishdagi o‘ rni	Metodlar va texnologiyalar	Natijalar
Ingliz tili va tabiiy fanlarni o‘ zaro bog‘ lash	Ingliz tili va mutaxassislik fanlarni birlashtirish orqali talaba kasbiy sohada ilmiy muloqot terminlarini o‘ rganadi.	Aniq reja bo‘ yicha ta’lim berish, interaktiv metodlar	Talaba ingliz tilida o‘ z kasbiga oid topshiriqlarni bajarishga tayyorlanadi
Interaktiv metodlar	Talaba o‘ z bilimlarini amaliyotda qo‘ llay olishi orqali duch kelishi mumkin bo‘ lgan muammolarni hal qilishni o‘ rganadi.	Mutaxassislik fanlar mashg‘ ulotlari paytida muammolani guruh bo‘ lgan holda jamoaviy hal qilish	Talaba tanqidiy fikrlash va tez qarorlar qabul qilish ko‘ nikmalarini rivojlantiradi
Kasbiy muloqot va kommunikatsiya	Talaba ingliz tilida o‘ z kasbi yuzasidan muloqot qilishni o‘ rganadi.	Muhokamalar, intervyu o‘ tkazish, kasbiy taqdimotlar	Talaba ingliz tilida aniq va to‘ g‘ ri kasbiy muloqot qilish ko‘ nikmalarini rivojlantiradi.

Ushbu jadvalda taqdim etilgan komponentlar ingliz tili darslarida kasbiy kompetensiyani integrativ yondashuv asosida rivojlantirishning samarali usullarini ko‘ rsatadi.

Tabiiy fanlar fakultetlarida ingliz tilini integrativ yondashuv asosida o‘ qitish, talabalarni kasbiy kompetensiyalarini rivojlantirishda samarali usul bo‘ lishi mumkin. Bu yondashuv talabalarga ilmiy va kasbiy bilimlarni birlashtirib, ularning fikrlash, yozish, va muloqot qilish ko‘ nikmalarini oshiradi. Talabalar ilmiy materiallarni ingliz tilida o‘ rganib, o‘ z kasbiy

sohalarida muvaffaqiyatga erishish uchun zarur bo‘ lgan kompetensiyalarni egallaydilar. Shundan kelib chiqqan holda tabiiy fanlar oilasiga mansub kimyo fanidan mavzu tanlagan holda dars ishlanmasini ishlab chiqdik. Mavzu sifatida "Acids and Bases" (Kislotalar va Asoslar) tanlab olindi.

Darsning maqsadi talabalarga kislotalar va asoslar haqida ilmiy ma’lumotlarni ingliz tilida taqdim etish, kislotalar va asoslarning xususiyatlari, turli reaksiyalar va pH ning rolini tushuntirish hamdam talabalarga kimyo bo‘ yicha kasbiy atamalarda ingliz tilida so‘ zlashish va yozish ko‘ nikmalarini rivojlantirish kabi bo‘ ldi.

Darsning vazifalari sifatida quyidagilar belgilab olindi:

1. Talabalarga kislotalar va asoslarning ta’riflari, xususiyatlari va misollarini taqdim etish.
2. Kislotalar va asoslar bilan bog‘ liq kimyoviy reaksiyalarni ingliz tilida tushuntirish.
3. Talabalar bilan amaliy mashqlar orqali kislotalar va asoslar haqida bilimlarni mustahkamlash.
4. pH o‘ lchovlari, kislota va asoslarning o‘ zaro ta’sirini tushuntirish.

Darsning boshlanishida talabalarga ingliz tilida mavzuga oid savollar berildi:

"What is an acid?" (Kislotaning ta’rifi nima?), "What is a base?" (Asosning ta’rifi nima?), "Can you give an example of an acid and a base?" (Kislota va asosning misollarini keltiring?). Keltirib o‘ tilgan savollar talabalar tomonidan kasbiy so‘ zlashuvga tayyorlanishga yordam beradi va darsning davomida tushuntiriladigan muhim tushunchalarga yo‘ l ochadi.

Mashg‘ ulot mobaynida mavzuga oid kimyoviy terminlarning izohini talabalarga doskada yozib tushuntirib berish ularning yodda mustahkam saqlanishiga ko‘ mak beradi:[6]

Ta’rif: "Acids are substances that donate protons (H^+ ions) when dissolved in water" - (Kislotalar – bu suvda eriganida proton (H^+ ionlarini) beradigan moddalar).

Misollar: Hydrochloric acid (HCl); Sulfuric acid (H_2SO_4);Citric acid ($C_6H_8O_7$).

Ta’rif: "Bases are substances that accept protons (H^+ ions) or donate hydroxide ions (OH^-) when dissolved in water." (Asoslar – bu suvda proton (H^+ ionlarini) qabul qiladigan yoki gidroksid ionlarini (OH^-) beradigan moddalar).

Misollar: Sodium hydroxide (NaOH), Potassium hydroxide (KOH), Ammonia (NH_3)

Ta’rif: "When an acid reacts with a base, they neutralize each other and form water and a salt." (Kislota va asos reaksiyaga kirishganda, ular bir-birini neytrallashadi va suv hamda tuz hosil qiladi).

Reaksiya misoli: $HCl + NaOH \rightarrow NaCl + H_2O$

Ta’rif: "Hydrochloric acid reacts with sodium hydroxide to form sodium chloride and water." (Tuzli kislota natriy gidroksidi bilan reaksiyaga kirishib, natriy xlorid va suv hosil qiladi). Darsning nazariy qismidan so‘ ng amaliy qismga o‘ tiladi. Amaliy qismda interaktiv mashg‘ ulotlarga murojaat qilindi. Topshiriqlarni bajarishda guruh bo‘ lib ishlash ma’qul degan xulosaga kelindi:

Reaksiyalarni keltiring: Talabalar bilan quyidagi reaksiyalarni ingliz tilida muhokama qiling: 1) $HCl + NaOH \rightarrow ?$ (Tuzli kislota bilan natriy gidroksidi reaksiyasi)

$H_2SO_4 + KOH \rightarrow ?$ (Sulfat kislotasi bilan kaliyning asosiy reaksiyasi);

2) "What would happen if you mix hydrochloric acid with ammonia?" (Agar siz tuzli kislota bilan ammiakni aralashtirsangiz, nima bo‘ ladi?)

Javob: "A toxic gas, ammonia gas (NH_3), may be produced." (Zararsiz gaz, ammiak gazining (NH_3) hosil bo‘ lishi mumkin.)

MUHOKAMA

Olib borilgan tahlillar shuni ko‘ rsatadiki, tabiiy fanlar fakulteti talabalariga ingliz tilini o‘ qitishda integrativ yondashuvdan foydalanish til kompetensiyasi bilan bir qatorda kasbiy bilim va ko‘ nikmalarning shakllanishiga ham ijobiy ta’sir ko‘ rsatadi. Mazkur yondashuvning asosiy afzalligi ingliz tili mashg‘ ulotlarini talabaning kelajakdagi kasbiy faoliyati bilan bevosita bog‘ lash imkoniyatining mavjudligidir. Bunda ingliz tili alohida o‘ quv predmeti sifatida emas, balki mutaxassislik fanlarini o‘ zlashtirish, ilmiy axborotni izlash, tushunish va undan foydalanish vositasi sifatida namoyon bo‘ ladi.

Integrativ ta’lim jarayonida fanlararo bog‘ liqlikning izchil tashkil etilishi talabalarning turli fanlardan egallagan bilimlarini yagona mazmuniy tizimda qo‘ llashiga imkon beradi. Xususan, tabiiy fanlarga oid terminlar, ilmiy tushunchalar va amaliy vazifalarning ingliz tilidagi materiallar bilan uyg‘ unlashtirilishi talabaning yangi bilimni o‘ zlashtirish jarayonini mazmunan boyitadi. Natijada talaba nafaqat muayyan termin yoki grammatik birlikni o‘ rganadi, balki uni kasbiy vaziyatda qo‘ llash, tushuntirish va muloqot jarayonida foydalanish imkoniyatiga ega bo‘ ladi.

Muhokama jarayonida dars mazmunining yagona g‘ oyaga yo‘ naltirilishi ham muhim omil sifatida namoyon bo‘ ldi. Agar til materiali mutaxassislik mazmuni bilan uzviy bog‘ langan holda berilsa, talabaning o‘ quv faoliyatidagi motivatsiyasi kuchayadi. Chunki talaba o‘ rganayotgan ingliz tili birliklarining kelajakdagi kasbiy faoliyatida qanday ahamiyatga ega ekanligini anglay boshlaydi. Ayniqsa, tabiiy fanlarga oid ilmiy matnlarni o‘ qish, kasbiy terminlarni izohlash, tajriba yoki jarayonlarni ingliz tilida tavsiflash kabi topshiriqlar til o‘ rganishni amaliy faoliyat bilan bog‘ lashga xizmat qiladi.

Integrativ yondashuvning yana bir muhim jihati talabalarning kommunikativ faolligini oshirishidir. An'anaviy mashg' ulotlarda til birliklarini o' zlashtirish ko' pincha nazariy bilimlarni egallash bilan chegaralanishi mumkin. Integrativ mashg' ulotlarda esa talabalar o' z bilimlarini muhokama, savol-javob, guruhli topshiriqlar, taqdimot va kasbiy vaziyatlarni modellashtirish orqali amaliyotda qo' llaydilar. Bunday faoliyat ularning fikrini ingliz tilida izchil ifodalash, kasbiy terminlardan o' rinli foydalanish va o' z nuqtayi nazarini asoslash ko' nikmalarini rivojlantiradi.

Shuningdek, integrativ yondashuv talabalarning mustaqil va tanqidiy fikrlash qobiliyatlarini rivojlantirish uchun ham qulay pedagogik sharoit yaratadi. Kasbiy mazmundagi topshiriqlarni bajarish jarayonida talaba tayyor ma'lumotni qabul qiluvchi emas, balki uni izlovchi, tahlil qiluvchi va amaliy vaziyatda qo' llovchi subyektga aylanadi. Ayniqsa, guruhda muammoli vazifalarni hal qilish, ilmiy ma'lumotlarni taqqoslash va berilgan savollarga ingliz tilida javob tayyorlash jarayonlari talabaning mantiqiy fikrlashi hamda qaror qabul qilish ko' nikmalarini faollashtiradi.

Tadqiqot doirasida kimyo faniga oid "Acids and Bases" mavzusining ingliz tili mashg' ulotiga integratsiya qilinishi ushbu imkoniyatlarni amaliy jihatdan namoyon etadi. Mazkur mashg' ulotda kimyoviy tushunchalar, terminlar va reaksiyalar ingliz tilidagi kommunikativ topshiriqlar bilan birgalikda qo' llanilgan. Bunday tashkil etilgan darsda talaba bir vaqtning o' zida ham mutaxassislik bilimlarini mustahkamlaydi, ham ushbu bilimlarni ingliz tilida ifodalashga o' rganadi. Shu sababli integrativ yondashuvni oddiy fanlararo bog' liqlik emas, balki til va kasbiy kompetensiyalarni parallel ravishda rivojlantirishga xizmat qiluvchi pedagogik mexanizm sifatida baholash mumkin.

Bundan tashqari, integrativ yondashuvning samaradorligi kasbiy terminologiyani o' zlashtirish jarayonida ham yaqqol ko' rinadi. Tabiiy fanlar yo' nalishida tahsil olayotgan talabalar uchun ingliz tilidagi maxsus terminlarni bilish ilmiy adabiyotlardan foydalanish, xalqaro ilmiy axborotni o' zlashtirish va kelgusidagi kasbiy muloqotda ishtirok etish imkoniyatlarini kengaytiradi. Terminlarning faqat lug' aviy ma'nosini yodlashdan ko' ra, ularni muayyan ilmiy va kasbiy kontekstda qo' llash talabaning faol lug' atini shakllantirishga ko' proq xizmat qiladi.

Shu nuqtayi nazardan, integrativ yondashuv natijasida shakllanadigan kasbiy kompetensiyani faqat ingliz tilini bilish darajasi bilan baholash yetarli emas. Unda talabaning ilmiy axborotni tushunishi, kasbiy terminlardan foydalanishi, o' z fikrini aniq ifodalashi, mutaxassislikka oid vaziyatlarda muloqotga kirishishi, muammoli topshiriqlarni hal qilishi va o' z bilimlarini amaliy faoliyatga tatbiq eta olishi kabi jihatlar ham hisobga olinishi lozim. Demak, integrativ ta'lim natijasida til kompetensiyasi va kasbiy kompetensiya bir-birini to' ldiruvchi yaxlit tizim sifatida shakllanadi.

Muhokama natijalari ingliz tili va tabiiy fanlar mazmunini uyg' unlashtirish talabalarning o' quv faoliyatini amaliy yo' nalishga yaqinlashtirishini ko' rsatadi. Bunday yondashuv ta'lim mazmunining kasbiy yo' naltirilganligini kuchaytiradi, talabaning fanlar o' rtasidagi bog' liqlikni anglashiga yordam beradi hamda ingliz tilidan real kasbiy vaziyatlarda foydalanish ehtiyojini shakllantiradi. Shu bois tabiiy fanlar fakultetlarida ingliz tili mashg' ulotlarini tashkil etishda integrativ yondashuvdan tizimli va maqsadli foydalanish talabalarning kasbiy kompetensiyalarini rivojlantirishning istiqbolli yo' nalishlaridan biri sifatida qaralishi mumkin.

XULOSA

Tabiiy fanlar o' quv jarayonida faqatgina nazariy bilimlarni olishdan tashqari, amaliy ko' nikmalarni ham rivojlantirishi kerak. Rivojlantirish texnologiyalari o' quvchilarga ilmiy tafakkur, tahlil qilish, tadqiqot qilish kabi ko' nikmalarni shakllantirishga imkon beradi. Bu texnologiyalarni qo' llash orqali o' quvchilarda mustaqil fikrlash, muloqot qilish, jamoada ishlash ko' nikmalari ham rivojlanadi. I.S.Kopylov rivojlantirish texnologiyalarini tabiiy fanlarni o' qitish jarayoniga qo' llashning muhimligini quyidagicha ta'kidlaydi: "Tabiiy fanlarni o' qitishda rivojlantirish texnologiyalari o' quvchilarning mustaqil ishlashini va ilmiy yondashuvni qo' llashini ta'minlaydi, bu esa ularga ilmiy yutuqlarni erishish imkonini yaratadi".

Tabiiy fanlar, jumladan kimyo, biologiya, fizika, matematika kabi sohalar va ingliz tilini integrativ yondashuv asosida o' qitish, talabalarning umumiy dunyoqarashi, ilmiy tafakkurini rivojlantirishda muhim rol o' ynaydi. Bugungi kunda tabiiy fanlarni o' qitish jarayonida innovatsion texnologiyalarni qo' llash nafaqat talabalarning bilimlarini mustahkamlash, balki ularni amaliy hayotda qo' llash ko' nikmalarini rivojlantirishga yordam beradi.

Ingliz tili darslarida integrativ yondashuvni qo' llash tabiiy fanlar fakulteti talabalarining kasbiy kompetensiyalarini rivojlantirish texnologiyalari talabalarga nafaqat nazariy bilimlarni, balki amaliy ko' nikmalarni ham o' zlashtirish imkonini beradi. Innovatsion metodlar va texnologiyalarni qo' llash orqali o' quvchilar ilmiy tafakkurini rivojlantiradilar, analitik fikrlash, muloqot qilish va kasbiy faoliyatda muvaffaqiyatli ishlash ko' nikmalarini o' zlashtiradilar.

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MALAKA OSHIRISH TIZIMIDA RAHBAR-KADRLARNING SOFT-KOMPETENSIYALARINI RIVOJLANTIRISHNING KORPORATIV-PEDAGOGIK SHART-SHAROITLARI

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Annotatsiya: *mazkur maqolada malaka oshirish tizimida rahbar-kadrlarning soft-kompetensiyalarini rivojlantirishning korporativ-pedagogik shart-sharoitlari ilmiy-nazariy va amaliy jihatdan tahlil qilingan. Rahbarlik faoliyati samaradorligini ta'minlovchi kommunikativ kompetentlik, jamoada ishlash, liderlik, tanqidiy va strategik fikrlash, muammoli vaziyatlarda qaror qabul qilish, nizolarni boshqarish, emotsional intellekt, kreativlik hamda o' zgarishlarga moslashuvchanlik kabi yumshoq ko' nikmalarning mazmuni yoritilgan. Shuningdek, korporativ ta'lim muhitini shakllantirish, individual ta'lim trayektoriyalarini loyihalash, interfaol va amaliyotga yo' naltirilgan metodlarni qo' llash, mentorlik va kouching mexanizmlaridan foydalanish, refleksiv faoliyatni tashkil etish hamda uzluksiz monitoring olib borish soft-kompetensiyalarni rivojlantirishning asosiy pedagogik shartlari sifatida asoslangan. Maqolada rahbar-kadrlarning kasbiy ehtiyojlari va boshqaruv tajribasini hisobga oluvchi korporativ-pedagogik yondashuvning malaka oshirish samaradorligini ta'minlashdagi ahamiyati ochib berilgan hamda mazkur jarayonni takomillashtirishga qaratilgan ilmiy-amaliy tavsiyalar ishlab chiqilgan.*

Kalit so' zlar: *malaka oshirish tizimi, rahbar-kadrlar, soft-kompetensiyalar, korporativ ta'lim, korporativ-pedagogik yondashuv, liderlik, kommunikativ kompetentlik, emotsional intellekt, strategik fikrlash, jamoada ishlash, mentorlik, kouching, individual ta'lim trayektoriyasi, refleksiya, pedagogik shart-sharoitlar.*

КОРПОРАТИВНО-ПЕДАГОГИЧЕСКИЕ УСЛОВИЯ РАЗВИТИЯ SOFT-КОМПЕТЕНЦИЙ РУКОВОДЯЩИХ КАДРОВ В СИСТЕМЕ ПОВЫШЕНИЯ КВАЛИФИКАЦИИ

Аннотация: *в статье с научно-теоретической и практической точек зрения проанализированы корпоративно-педагогические условия развития soft-компетенций руководящих кадров в системе повышения квалификации. Раскрыто содержание таких гибких навыков, обеспечивающих эффективность управленческой деятельности, как коммуникативная компетентность, командная работа, лидерство, критическое и стратегическое мышление, принятие решений в проблемных ситуациях, управление конфликтами, эмоциональный интеллект, креативность и адаптивность к изменениям. Формирование корпоративной образовательной среды, проектирование индивидуальных образовательных траекторий, применение интерактивных и практико-ориентированных методов, использование механизмов наставничества и коучинга, организация рефлексивной деятельности и непрерывного мониторинга обоснованы в качестве основных педагогических условий развития soft-компетенций. Раскрыта роль корпоративно-педагогического подхода, учитывающего профессиональные потребности и управленческий опыт руководящих кадров, в повышении эффективности их профессионального развития. Разработаны научно-практические рекомендации, направленные на совершенствование данного процесса.*

Ключевые слова: *система повышения квалификации, руководящие кадры, soft-компетенции, гибкие навыки, корпоративное обучение, корпоративно-педагогический подход, лидерство, коммуникативная компетентность, эмоциональный интеллект, стратегическое мышление, командная работа, наставничество, коучинг, индивидуальная образовательная траектория, рефлексия, педагогические условия.*

CORPORATE AND PEDAGOGICAL CONDITIONS FOR DEVELOPING MANAGERS' SOFT COMPETENCIES IN THE PROFESSIONAL DEVELOPMENT SYSTEM

Abstract: *This article provides a theoretical and practical analysis of the corporate and pedagogical conditions required for developing managers' soft competencies within the professional development system. It examines the content of soft skills that contribute to effective managerial performance, including communicative competence, teamwork, leadership, critical and strategic thinking, decision-making in challenging situations, conflict management, emotional intelligence, creativity, and adaptability to change. The*

creation of a corporate learning environment, the design of individual learning pathways, the application of interactive and practice-oriented methods, the use of mentoring and coaching mechanisms, the organization of reflective activities, and continuous monitoring are substantiated as essential pedagogical conditions for soft competency development. The article also highlights the role of a corporate and pedagogical approach that considers managers' professional needs and leadership experience in enhancing the effectiveness of professional development. Scientific and practical recommendations for improving this process are proposed.

Keywords: *professional development system, managers, managerial personnel, soft competencies, soft skills, corporate learning, corporate and pedagogical approach, leadership, communicative competence, emotional intelligence, strategic thinking, teamwork, mentoring, coaching, individual learning pathway, reflection, pedagogical conditions.*

KIRISH

Zamonaviy boshqaruv muhitining tezkor o‘ zgarishi rahbar-kadrlardan kasbiy bilim va boshqaruv tajribasi bilan bir qatorda rivojlangan soft-kompetensiyalarga ega bo‘ lishni talab etmoqda. Tadqiqotlarda shaxsning kommunikativ qobiliyati, emotsional barqarorligi, hamkorlikka tayyorligi va muammolarni hal etish ko‘ nikmalari uning kasbiy muvaffaqiyatini belgilovchi muhim omillar sifatida baholanadi [1, 451–464-b.]. Shu sababli rahbar-kadrlarning liderlik, strategik fikrlash, samarali muloqot, jamoani boshqarish, kreativlik va o‘ zgarishlarga moslashuvchanlik kompetensiyalarini uzluksiz rivojlantirish dolzarb pedagogik vazifaga aylanmoqda. An’anaviy malaka oshirish dasturlarida nazariy bilimlarni uzatishga ustuvor ahamiyat berilishi rahbarlarning real boshqaruv vaziyatlarida zarur bo‘ ladigan shaxslararo va ijtimoiy-emotsional ko‘ nikmalarini rivojlantirish imkoniyatlarini cheklaydi. D. Goulman samarali rahbarlik faoliyatida emotsional intellekt, o‘ zini boshqarish, empatiya va ijtimoiy munosabatlarni yo‘ lga qo‘ yish qobiliyatlarining alohida ahamiyatga ega ekanligini ta’kidlaydi [2, 93–102-b.]. Bu esa malaka oshirish mazmunini rahbar-kadrlarning amaliy ehtiyojlari va boshqaruv tajribasiga muvofiq takomillashtirish zaruratini yuzaga keltiradi. Korporativ-pedagogik yondashuv malaka oshirish jarayonini tashkilotning strategik maqsadlari, korporativ qadriyatlari va rahbarlarning individual kasbiy ehtiyojlari bilan uyg‘ unlashtirish imkonini beradi. Bunday yondashuv interfaol ta’lim, muammoli vaziyatlar tahlili, loyiha faoliyati, mentorlik, kouching va refleksiv metodlar orqali soft-kompetensiyalarni amaliy faoliyat bilan uzviy bog‘ liq holda rivojlantirishga xizmat qiladi. Shundan kelib chiqib, rahbar-kadrlarning soft-kompetensiyalarini rivojlantirishga ta’sir etuvchi korporativ-pedagogik shart-sharoitlarni aniqlash va ilmiy asoslash mazkur tadqiqotning asosiy maqsadini tashkil etadi.

ADABIYOTLAR TAHLILI

Rahbar-kadrlarning soft-kompetensiyalarini rivojlantirish muammosi menejment, pedagogika, psixologiya va korporativ ta’lim yo‘ nalishlarida olib borilgan tadqiqotlarda turli yondashuvlar asosida o‘ rganilgan. Dastlab rahbarning kasbiy samaradorligini belgilovchi kompetensiyalar R. Katz tomonidan texnik, insoniy va konseptual ko‘ nikmalar tizimi sifatida tasniflangan. Olimning fikricha, boshqaruv pog‘ onasi yuqorilagan sari insonlar bilan ishlash va strategik fikrlash ko‘ nikmalarining ahamiyati ortib boradi [3, 90–102-b.]. Mazkur yondashuv rahbarlik faoliyatida faqat maxsus bilimlar emas, balki shaxslararo munosabatlar va konseptual tafakkur ham muhimligini ko‘ rsatadi.

D. Goulman tadqiqotlarida samarali rahbarlik emotsional intellekt bilan bevosita bog‘ langan. Muallif o‘ zini anglash, o‘ zini boshqarish, motivatsiya, empatiya va ijtimoiy ko‘ nikmalarni rahbar faoliyati natijadorligini ta’minlovchi asosiy komponentlar sifatida ko‘ rsatadi [2, 93–102-b.]. R. Boyatzis esa kompetensiyani shaxsning muayyan kasbiy faoliyatda yuqori natijalarga erishishini ta’minlovchi o‘ zaro bog‘ liq xususiyatlar majmui sifatida izohlaydi. Uning tadqiqotlarida emotsional, ijtimoiy va kognitiv kompetensiyalarni rivojlantirish rahbarning kasbiy samaradorligiga ijobiy ta’sir ko‘ rsatishi asoslangan [4, 5–12-b.].

J. Heckman va T. Kautz soft-kompetensiyalarni shaxsning ta’limiy, kasbiy hamda ijtimoiy muvaffaqiyatiga ta’sir qiluvchi xususiyatlar sifatida baholaydi. Tadqiqotchilar qat’iyatlilik, mas’uliyat, hamkorlik, o‘ zini nazorat qilish va muloqotga kirishish qobiliyatlari kasbiy bilimlar singari muhim ekanligini ilmiy dalillar asosida ko‘ rsatgan [1, 451–464-b.]. M. Robles tomonidan o‘ tkazilgan tadqiqotda esa ish beruvchilar nuqtayi nazaridan eng muhim soft skills sifatida muloqot, halollik, xushmuomalalik, mas’uliyat, jamoada ishlash, moslashuvchanlik va kasbiy etika ajratib ko‘ rsatilgan [5, 453–465-b.]. Ushbu qarashlar soft-kompetensiyalarni rahbarlarning kasbiy tayyorgarligi va malaka oshirish dasturlariga integratsiya qilish zarurligini tasdiqlaydi.

Korporativ ta’lim masalalari P. Tynjälä tadqiqotlarida ish joyidagi nazariy, amaliy, refleksiv va ijtimoiy bilimlarning integratsiyasi bilan izohlanadi. Muallif kasbiy kompetensiyalar faqat tayyor bilimlarni o‘ zlashtirish orqali emas, balki amaliy faoliyat, tajriba almashish, muammoli vaziyatlarni hal qilish va refleksiya jarayonida rivojlanishini ta’kidlaydi [6, 130–154-b.]. M. Eraut ham norasmiy ta’lim, ish joyidagi tajriba va kasbiy muloqotni mutaxassislar kompetentligini rivojlantirishning muhim manbalari sifatida baholaydi [7, 247–273-b.]. Mazkur yondashuvlar rahbar-kadrlar malakasini oshirishda korporativ muhitning rivojlantiruvchi imkoniyatlaridan foydalanish zarurligini ko‘ rsatadi.

E. Salas va hammualliflar samarali jamoaviy faoliyatning asosiy omillari sifatida yetakchilik, o‘ zaro ishonch, jamoaviy monitoring, moslashuvchanlik va aniq kommunikatsiyani ko‘ rsatadi [8, 77–124-b.]. Bu kompetensiyalar rahbarning tashkilot ichidagi hamkorlikni yo‘ lga qo‘ yishi, nizolarni konstruktiv boshqarishi va xodimlarni umumiy maqsadlar sari safarbar etishida muhim ahamiyat kasb etadi. Shuningdek, mentorlik va kouching texnologiyalari rahbarlarning o‘ z tajribasini tahlil qilishi, individual rivojlanish maqsadlarini belgilashi hamda boshqaruv faoliyatidagi muammolarga mustaqil yechim topishiga yordam beradi.

Mavjud tadqiqotlar tahlili soft-kompetensiyalarning mohiyati, tarkibiy komponentlari va rahbarlik samaradorligiga ta’siri yetarlicha o‘ rganilganini ko‘ rsatadi. Biroq malaka oshirish tizimida mazkur kompetensiyalarni korporativ ta’lim muhiti, tashkilotning strategik maqsadlari, individual ta’lim trayektoriyasi, mentorlik, kouching va refleksiv faoliyat bilan o‘ zaro bog‘ liq holda rivojlantirish masalalari yaxlit pedagogik tizim sifatida to‘ liq tadqiq etilmagan. Shu sababli rahbar-kadrlarning soft-kompetensiyalarini rivojlantirishga xizmat qiluvchi korporativ-pedagogik shart-sharoitlarni aniqlash, ularning tarkibiy qismlarini tizimlashtirish va amaliy mexanizmlarini ishlab chiqish zarurati mavjud.

TADQIQOTNING METODOLOGIK ASOSLARI

Mazkur tadqiqotning metodologik asosini tizimli, kompetensiyaviy, faoliyatga yo‘ naltirilgan, andragogik, shaxsga yo‘ naltirilgan va korporativ-pedagogik yondashuvlar tashkil etadi. Ushbu yondashuvlar rahbar-kadrlarning soft-kompetensiyalarini o‘ zaro bog‘ langan shaxsiy, kommunikativ, ijtimoiy-emotsional va boshqaruv komponentlaridan iborat yaxlit tizim sifatida o‘ rganish imkonini beradi.

Tizimli yondashuv asosida rahbar-kadrlarning soft-kompetensiyalarini rivojlantirish jarayoni maqsad, mazmun, metod, vosita, pedagogik shart-sharoit, monitoring va natija komponentlarining o‘ zaro aloqadorligi nuqtayi nazaridan tahlil qilindi. Bunda soft-kompetensiyalar alohida ko‘ nikmalar yig‘ indisi emas, balki rahbarning boshqaruv faoliyati samaradorligini ta’minlovchi integrativ kasbiy-shaxsiy sifat sifatida talqin etildi.

Kompetensiyaviy yondashuv rahbar-kadrlarning egallagan bilimlarini amaliy boshqaruv vaziyatlarida qo‘ llashi, jamoa bilan samarali muloqot o‘ rnatishi, muammolarni hal qilishi, asoslangan qarorlar qabul qilishi va o‘ zgaruvchan sharoitlarga moslashishini nazarda tutadi. R. Boyatzis kompetensiyani samarali faoliyat natijalariga olib keluvchi o‘ zaro bog‘ liq shaxsiy xususiyatlar majmui sifatida izohlaydi [4, 5–12-b.]. Shu asosda kommunikativ kompetentlik, liderlik, strategik va tanqidiy fikrlash, emotsional intellekt, jamoada ishlash, konfliktlarni boshqarish, kreativlik va adaptivlik tadqiqotning asosiy tarkibiy mezonlari sifatida belgilandi.

Faoliyatga yo‘ naltirilgan yondashuv soft-kompetensiyalarni tayyor nazariy ma’lumotlarni o‘ zlashtirish orqali emas, balki real yoki modellashtirilgan boshqaruv vaziyatlarida amaliy faoliyatni bajarish jarayonida rivojlantirishga asoslanadi. D. Kolbning tajribaviy ta’lim konsepsiyasiga ko‘ ra, samarali o‘ rganish aniq tajriba, refleksiv kuzatish, nazariy umumlashtirish va faol tajriba bosqichlarining uzviy almashinuvi orqali amalga oshadi [9, 20–38-b.]. Shu sababli tadqiqotda keys-stadi, muammoli topshiriqlar, ishbilarmonlik o‘ yinlari, loyiha faoliyati va boshqaruv vaziyatlarini modellashtirish kabi metodlarga ustuvor ahamiyat berildi.

Andragogik yondashuv rahbar-kadrlarning hayotiy va kasbiy tajribasi, mustaqil o‘ rganishga tayyorligi, amaliy ehtiyojlari hamda ichki motivatsiyasini hisobga olishni talab qiladi. M. Noulz katta yoshdagilar ta’limining samaradorligi o‘ quv materialining ularning kasbiy ehtiyojlari va mavjud tajribasi bilan bog‘ lanishiga bevosita aloqadorligini ta’kidlaydi [10, 43–47-b.]. Mazkur yondashuv asosida tinglovchilarning individual ehtiyojlarini diagnostika qilish, individual ta’lim trayektoriyalarini ishlab chiqish va mustaqil kasbiy rivojlanishni qo‘ llab-quvvatlash muhim metodologik talab sifatida qabul qilindi.

Refleksiv yondashuv rahbarning o‘ z boshqaruv tajribasi, xatti-harakati va qarorlarini tanqidiy tahlil qilishi hamda kelgusi faoliyatini takomillashtirishiga yo‘ naltiriladi. D. Shon mutaxassisning kasbiy rivojlanishini “faoliyat jarayonidagi refleksiya” va “faoliyatdan keyingi refleksiya” mexanizmlari bilan bog‘ laydi [11, 49–69-b.]. Shunga muvofiq refleksiv kundalik, o‘ zini o‘ zi baholash, qayta aloqa, mentorlik va kouching tadqiqotning muhim pedagogik vositalari sifatida belgilandi.

Korporativ-pedagogik yondashuv malaka oshirish mazmunini tashkilotning strategik maqsadlari, korporativ qadriyatlari, boshqaruv madaniyati va rahbarning individual rivojlanish ehtiyojlari bilan uyg‘ unlashtirishga xizmat qiladi. Mazkur yondashuv doirasida ta’lim jarayonining ish joyidagi amaliy faoliyat bilan integratsiyasi, tajriba almashish, jamoaviy o‘ rganish, mentorlik, kouching va uzluksiz kasbiy rivojlanish mexanizmlari asosiy korporativ-pedagogik shartlar sifatida qaraldi.

Tadqiqotda ilmiy manbalarni nazariy tahlil qilish, qiyoslash, tasniflash, tizimlashtirish, umumlashtirish, pedagogik kuzatish, suhbat, so‘ rovnoma, ekspert baholash, o‘ zini o‘ zi baholash hamda diagnostik metodlardan foydalanish nazarda tutiladi. Soft-kompetensiyalarning rivojlanganlik darajasini aniqlashda motivatsion-qadriyatli, kognitiv, kommunikativ-faoliyatli va refleksiv-baholash mezonlari asos qilib olindi.

Shunday qilib, tanlangan metodologik yondashuvlar rahbar-kadrlarning soft-kompetensiyalarini rivojlantirish jarayonini nazariy asoslash, korporativ-pedagogik shart-sharoitlarni aniqlash hamda malaka oshirish mazmuni, metodlari va baholash mexanizmlarini yaxlit tizim sifatida ishlab chiqish imkonini beradi.

NATIJALAR VA ULARNING TAHLILI

Tadqiqot natijasida rahbar-kadrlarning soft-kompetensiyalarini rivojlantirish samaradorligi bir-biri bilan uzviy bog‘ liq bo‘ lgan korporativ-pedagogik shart-sharoitlarga bog‘ liqligi aniqlandi. Ular quyidagilardan iborat: tashkilot maqsadlariga mos korporativ ta’lim muhitini yaratish; rahbarlarning kasbiy ehtiyojlari asosida individual ta’lim trayektoriyasini belgilash; amaliyotga yo‘ naltirilgan interfaol metodlarni qo‘ llash; mentorlik, kouching, refleksiya va uzluksiz monitoringni tashkil etish. Tahlillar rahbar faoliyati uchun kommunikativ kompetentlik, liderlik, jamoada ishlash, strategik va tanqidiy fikrlash, emotsional intellekt, nizolarni boshqarish hamda o‘ zgarishlarga moslashuvchanlik eng muhim soft-kompetensiyalar ekanligini ko‘ rsatdi. Mazkur kompetensiyalarni alohida ko‘ nikmalar sifatida emas, balki o‘ zaro bog‘ langan integrativ tizim sifatida rivojlantirish zarur. Shuningdek, keys-stadi, boshqaruv vaziyatlarini modellashtirish, ishbilarmonlik o‘ yinlari, loyiha faoliyati va refleksiv topshiriqlar nazariy mashg‘ ulotlarga nisbatan rahbarlarning faol ishtiroki hamda amaliy tajribasini kuchliroq ta’minlashi asoslandi. Mentorlik va kouching esa individual rivojlanish ehtiyojlarini aniqlash, kasbiy faoliyatdagi muammolarni tahlil qilish va mustaqil qaror qabul qilish ko‘ nikmalarini takomillashtirishga xizmat qiladi. Olingan natijalar malaka oshirish dasturlarining mazmunini faqat nazariy bilim berishga emas, balki rahbarning real boshqaruv faoliyatida namoyon bo‘ ladigan kompetensiyalarni rivojlantirishga yo‘ naltirish lozimligini ko‘ rsatadi. Bunda diagnostika, amaliy mashg‘ ulot, qayta aloqa, refleksiya va yakuniy monitoringning uzviyligi ta’minlanganda korporativ-pedagogik jarayonning samaradorligi ortadi.

XULOSA

Malaka oshirish tizimida rahbar-kadrlarning soft-kompetensiyalarini rivojlantirish ularning boshqaruv faoliyati samaradorligini oshiruvchi muhim pedagogik jarayondir. Tadqiqot natijalari kommunikativ kompetentlik, liderlik, jamoada ishlash, strategik va tanqidiy fikrlash, emotsional intellekt, nizolarni boshqarish hamda o‘ zgarishlarga moslashuvchanlik rahbar faoliyati uchun ustuvor kompetensiyalar ekanligini ko‘ rsatdi.

Mazkur kompetensiyalarni samarali rivojlantirish uchun korporativ ta’lim muhitini yaratish, individual ta’lim trayektoriyalarini ishlab chiqish, amaliyotga yo‘ naltirilgan interfaol metodlardan foydalanish, shuningdek, mentorlik, kouching, refleksiya va uzluksiz monitoringni yo‘ lga qo‘ yish zarur. Malaka oshirish mazmunining tashkilot strategiyasi, korporativ qadriyatlar va rahbarlarning kasbiy ehtiyojlari bilan uyg‘ unlashtirilishi ta’lim natijadorligini oshiradi.

Shunday qilib, korporativ-pedagogik yondashuv asosida tashkil etilgan malaka oshirish jarayoni rahbar-kadrlarning nafaqat kasbiy bilimlarini, balki samarali boshqaruv uchun zarur bo‘ lgan shaxsiy va ijtimoiy kompetensiyalarini ham izchil rivojlantirish imkonini beradi.

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OLIY TA'LIM MUASSASALARI BOSHQARUV KADRLARIDA SUN'IY INTELLEKT KOMPETENSIYALARINI RIVOJLANTIRISH

Ibragimova Go' zal Ilhom qizi
Oliy ta'lim, fan va innovatsiyalar vazirligi huzuridagi Oliy ta'lim tizimi kadrlarini qayta tayyorlash va malakasini oshirish instituti
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Annotatsiya: *Ushbu maqola oliy ta'lim muassasalari (OTM) boshqaruv kadrlarida — xususan, prorektor, dekan va kafedra mudirlarida — sun'iy intellekt (SI) kompetensiyalarini rivojlantirishga qaratilgan malaka oshirish kursining pedagogik modelini taqdim etadi. Maqolada kursning maqsad-vazifasi, uch modulli tuzilmasi, loyiha-asosli yakuniy nazorat mexanizmi va baholash kriteriyalari ilmiy asoslab beriladi. Kirish qismida muammoning dolzarbligi va xalqaro kontekst yoritiladi; asosiy qismda pedagogik model va uning metodologik asoslari tavsiflanadi; natijalar qismida kursdan kutilayotgan individual va institutsional ta'sirlar muhokama qilinadi.*

Kalit so' zlar: *sun'iy intellekt, oliy ta'lim boshqaruvi, malaka oshirish, pedagogik model, kompetensiya, loyiha-asosli o' qitish.*

DEVELOPING ARTIFICIAL INTELLIGENCE COMPETENCIES AMONG MANAGEMENT PERSONNEL IN HIGHER EDUCATION INSTITUTIONS

Abstract: *This article presents a pedagogical model for a professional development course aimed at fostering artificial intelligence (AI) competencies among management personnel in higher education institutions (HEIs)—specifically vice-rectors, deans, and department heads. The article provides a scientific rationale for the course's objectives, its three-module structure, the project-based final assessment mechanism, and the evaluation criteria. The introduction highlights the relevance of the issue and the international context; the main section describes the pedagogical model and its methodological foundations; and the results section discusses the anticipated individual and institutional impacts of the course.*

Keywords: *artificial intelligence, higher education management, professional development, pedagogical model, competence, project-based learning.*

ФОРМИРОВАНИЕ КОМПЕТЕНЦИЙ В ОБЛАСТИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА У РУКОВОДЯЩИХ КАДРОВ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ

Аннотация: *В статье представлена педагогическая модель курса повышения квалификации, направленного на формирование компетенций в области искусственного интеллекта (ИИ) у руководящих кадров высших учебных заведений (вузов) — в частности, проректоров, деканов и заведующих кафедрами. Приводится научное обоснование целей курса, его трехмодульной структуры, механизма итоговой аттестации на основе проектной деятельности и критериев оценки. Во введении подчеркивается актуальность проблемы и международный контекст; в основной части описываются педагогическая модель и ее методологические основы; в разделе результатов рассматривается ожидаемое влияние курса на индивидуальном и институциональном уровнях.*

Ключевые слова: *искусственный интеллект, управление высшим образованием, повышение квалификации, педагогическая модель, компетенция, проектное обучение.*

KIRISH.

So' nggi yillarda sun'iy intellekt (SI) texnologiyalarining jadal rivojlanishi jamiyat hayotining deyarli barcha sohalariga sezilarli ta'sir ko' rsatmoqda. Ushbu jarayon oliy ta'lim tizimini ham chetlab o' tgani yo' q. Bugungi kunda dunyoning yetakchi universitetlari ma'muriy boshqaruv samaradorligini oshirish, resurslardan oqilona foydalanish hamda talabalar faoliyatiga oid ma'lumotlarni tahlil qilishda SI vositalaridan tobora kengroq foydalanmoqda. Natijada boshqaruv qarorlarini qabul qilish mexanizmlari ham an'anaviy yondashuvlardan ma'lumotlarga tayangan zamonaviy modelga o' tmoqda.

MIT, Stanford, Singapur Milliy Universiteti (NUS) va Nanyang Texnologiya Universiteti (NTU) kabi oliy ta'lim muassasalari tajribasi SI texnologiyalari nafaqat o‘ quv jarayonini, balki boshqaruv faoliyatini ham sifat jihatidan yangi bosqichga olib chiqishi mumkinligini ko‘ rsatmoqda. Xususan, talabalar muvaffaqiyatini prognozlash, hujjatlar aylanishini optimallashtirish va resurslarni boshqarish jarayonlarida SI yechimlarining amaliy natijalari kuzatilmoqda.

UNESCO ekspertlari ta'kidlaganidek, ta'lim tizimida SI texnologiyalarini joriy etishdagi asosiy muammo texnik infratuzilmaning yetishmasligidan ko‘ ra ko‘ proq inson omili bilan bog‘ liq. Boshqacha aytganda, rahbar va menejerlarning raqamli kompetensiyalari texnologik transformatsiya muvaffaqiyatini belgilovchi muhim omillardan biri hisoblanadi.

Mazkur masala O‘ zbekiston oliy ta'lim tizimi uchun ham dolzarb ahamiyat kasb etadi. Mamlakatda raqamli transformatsiyani jadallashtirishga qaratilgan strategik hujjatlar qabul qilingan bo‘ lsa-da, oliy ta'lim muassasalari boshqaruv kadrlarini SI texnologiyalaridan samarali foydalanishga tayyorlash bo‘ yicha tizimli mexanizmlar hali to‘ liq shakllanmagan. Shu sababli prorektorlar, dekanlar va kafedra mudirlari uchun maqsadli kompetensiyalarni rivojlantirishga qaratilgan malaka oshirish dasturlarini ishlab chiqish amaliy ehtiyojga aylanmoqda.

Mavjud ilmiy manbalar tahlili shuni ko‘ rsatadiki, boshqaruv xodimlarining SI savodxonligi muassasaning innovatsion salohiyati, raqobatbardoshligi va xalqaro maydondagi mavqeiga bevosita ta'sir ko‘ rsatadi. Shundan kelib chiqib, ushbu maqolada oliy ta'lim muassasalari boshqaruv kadrlarida sun'iy intellekt kompetensiyalarini rivojlantirishga mo‘ ljallangan malaka oshirish kursining pedagogik modeli taklif etiladi hamda uning metodologik asoslari yoritiladi.

Taklif etilayotgan modelning ilmiy yangiligi shundaki, unda O‘ zbekiston oliy ta'lim tizimining amaliy ehtiyojlari hisobga olingan holda uch modulli, loyiha-asosli va natijaga yo‘ naltirilgan yondashuv ishlab chiqilgan. Muallifning fikricha, bunday model boshqaruv kadrlarini raqamli transformatsiya jarayonlarining faol ishtirokchisiga aylantirishga xizmat qilishi mumkin.

ASOSIY QISM.

Taklif etilayotgan pedagogik model oliy ta'lim muassasalari boshqaruv kadrlarida sun'iy intellekt kompetensiyalarini tizimli ravishda rivojlantirishga qaratilgan bo‘ lib, u bir-biri bilan uzviy bog‘ langan bir nechta metodologik yondashuvlarga tayanadi. Modelni ishlab chiqishda zamonaviy pedagogika, kattalar ta'limi hamda raqamli transformatsiya bo‘ yicha ilmiy qarashlar asos sifatida qabul qilindi.

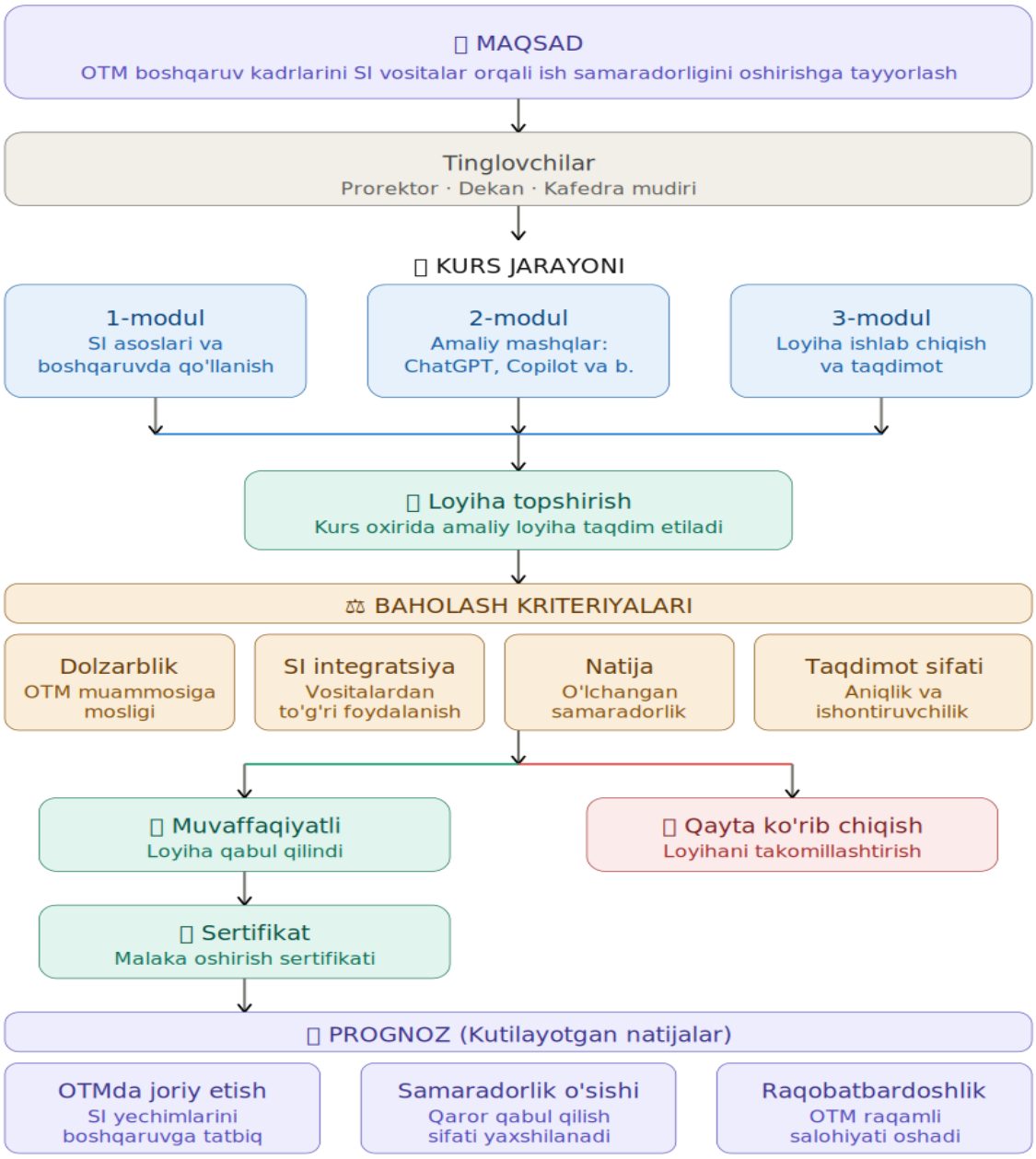
Birinchi metodologik asos kompetensiyaga yo‘ naltirilgan ta'lim (Competency-Based Education – CBE) konsepsiyasi hisoblanadi. Ushbu yondashuvga ko‘ ra, ta'lim jarayonining samaradorligi o‘ zlashtirilgan nazariy bilimlar hajmi bilan emas, balki tinglovchining amaliy faoliyatida namoyon bo‘ ladigan kompetensiyalar bilan baholanadi. Shu nuqtai nazardan, kurs mazmuni sun'iy intellekt haqidagi ma'lumotlarni o‘ rganish bilangina cheklanmaydi. Asosiy e'tibor rahbarlarning SI vositalarini real boshqaruv vaziyatlarida qo‘ llash qobiliyatini shakllantirishga qaratiladi.

Ikkinchi metodologik tayanch sifatida Koehler va Mishra tomonidan taklif etilgan TPACK modeli tanlandi. Mazkur model texnologik bilim, kasbiy mazmun va faoliyat metodikasining o‘ zaro integratsiyasiga asoslanadi. OTM boshqaruv kadrlari uchun bu yondashuv ayniqsa muhim, chunki rahbar zamonaviy texnologiyani bilish bilan bir qatorda, uning muassasa faoliyatiga qanday ta'sir ko‘ rsatishini ham tushunishi zarur. Sun'iy intellekt vositalaridan foydalanishning samaradorligi ko‘ p jihatdan ularni boshqaruv maqsadlari bilan to‘ g‘ ri bog‘ lay olishga bog‘ liq.

Modelning uchinchi nazariy komponenti loyiha-asosli o‘ qitish (Project-Based Learning – PBL) yondashuvi hisoblanadi. Mazkur yondashuv tinglovchilarga o‘ quv jarayonida olingan bilim va ko‘ nikmalarni amaliy muammolar yechimiga yo‘ naltirish imkonini beradi. Boshqaruv faoliyati doimiy ravishda murakkab va ko‘ p omilli vazifalar bilan bog‘ liq bo‘ lganligi sababli, loyiha faoliyati rahbarlarda mustaqil tahlil qilish, qaror qabul qilish va innovatsion yechimlarni ishlab chiqish kompetensiyalarini rivojlantirishga xizmat qiladi.

Kurs samaradorligini baholashda Kirkpatrickning to‘ rt darajali modeli asos qilib olindi. Ushbu model ta'lim natijalarini turli nuqtai nazardan tahlil qilish imkonini beradi. Birinchi daraja tinglovchilarning kurs mazmuni va tashkil etilishidan qoniqish darajasini aniqlashga qaratilgan bo‘ lsa, ikkinchi daraja bilim va ko‘ nikmalardagi o‘ zgarishlarni baholashni nazarda tutadi. Uchinchi darajada tinglovchilarning ish faoliyatida yangi yondashuvlarni qo‘ llash holati o‘ rganiladi, to‘ rtinchi bosqichda esa kursning muassasa faoliyatiga ta'siri tahlil qilinadi. Bunday ko‘ p bosqichli baholash tizimi natijalarni yanada ob'ektiv aniqlash imkonini beradi.

Ishlab chiqilgan pedagogik model beshta o‘ zaro bog‘ liq komponentdan tashkil topgan: maqsad, tinglovchilar kontingenti, o‘ quv jarayoni, baholash tizimi hamda kutilayotgan natijalar. Mazkur elementlarning uyg‘ unligi kursning yaxlitligini ta'minlaydi va o‘ quv jarayonini aniq natijalarga yo‘ naltiradi.



1-rasm. OTM boshqaruv kadrlarida SI kompetensiyalarini rivojlantirish pedagogik modeli

Kursning birinchi moduli «SI asoslari va boshqaruvda qo‘ llanish» deb nomlanadi. Ushbu bosqichda tinglovchilar sun’iy intellekt texnologiyalarining rivojlanish tendensiyalari, asosiy tushunchalari va amaliy imkoniyatlari bilan tanishadilar. Shuningdek, oliy ta’lim muassasalarida SI vositalaridan foydalanish bo‘ yicha xalqaro tajribalar tahlil qilinadi. Mashg‘ ulotlar davomida xorijiy universitetlarning amaliy misollari, tahliliy materiallar va muammoli vaziyatlar muhokama qilinadi. Modul yakunida tinglovchilar o‘ z muassasalarida sun’iy intellekt texnologiyalarini qo‘ llash istiqbollarini baholay olishlari hamda mavjud imkoniyat va cheklovlarni tahlil qila olishlari kutiladi.

Ikkinchi modul amaliy faoliyatga yo‘ naltirilgan bo‘ lib, unda ChatGPT, Microsoft Copilot, Google Gemini, Notion AI kabi vositalarning boshqaruv jarayonlaridagi imkoniyatlari o‘ rganiladi. Mazkur bosqich nazariy ma’lumotlarni mustahkamlashdan ko‘ ra ko‘ proq amaliy tajriba hosil qilishga qaratilgan. Laboratoriya mashg‘ ulotlari davomida tinglovchilar hujjatlarni tayyorlash va tahlil qilish, ish jarayonlarini rejalashtirish, ma’lumotlarni umumlashtirish hamda talabalar murojaatlari bilan ishlash kabi vazifalarni bajaradilar. Har bir topshiriq natijasi portfolio shaklida jamlanib boradi va tinglovchining individual rivojlanish dinamikasini aks ettiradi.

Uchinchi modul kursning yakuniy bosqichi hisoblanib, u loyiha ishlab chiqish va taqdimot faoliyatini qamrab oladi. Bu bosqichda tinglovchilar o‘ zlari faoliyat yuritayotgan oliy ta’lim muassasasidagi dolzarb muammoni tanlaydilar va uni sun’iy intellekt vositalari yordamida hal etishga qaratilgan amaliy loyiha ishlab chiqadilar. Loyihada muammoning tavsifi, tanlangan yechimning asoslanishi, amalga oshirish bosqichlari va kutilayotgan natijalar batafsil yoritilishi talab etiladi.

Yakuniy loyiha bir nechta mezonlar asosida baholanadi. Avvalo, tanlangan mavzuning dolzarbligi va muassasa ehtiyojlariga mosligi e'tiborga olinadi. Bundan tashqari, sun'iy intellekt vositalarining maqsadli hamda asoslangan tarzda qo‘ llanilganligi, taklif etilgan yechimning amaliy qiymati va natijalarni o‘ lchash imkoniyati ham muhim mezon sifatida qaraladi. Taqdimot sifati esa loyihaning mantiqiy tuzilishi, dalillarning asoslanganligi va natijalarni aniq ifodalash darajasi orqali baholanadi.

Loyihani muvaffaqiyatli himoya qilgan tinglovchilarga malaka oshirish kursini tamomlaganlik to‘ g‘ risidagi sertifikat beriladi. Shu bilan birga, ular o‘ z muassasalarida sun'iy intellekt texnologiyalarini joriy etish va targ‘ ib qilish bo‘ yicha tashabbuskor mutaxassis sifatida faoliyat yuritishlari kutiladi. Muallifning fikricha, aynan shunday yondashuv kurs natijalarining individual darajadan institutsional darajaga o‘ tishini ta'minlaydi.

Natija. Taklif etilayotgan malaka oshirish kursining asosiy natijasi sifatida oliy ta'lim muassasalari boshqaruv kadrlarida sun'iy intellekt bilan ishlashga oid kompetensiyalarning shakllanishi nazarda tutiladi. Mazkur kompetensiyalar uchta o‘ zaro bog‘ liq yo‘ nalishni qamrab oladi: sun'iy intellektning imkoniyat va cheklovlarini tushunish, amaliy faoliyatda tegishli vositalardan foydalanish hamda ularni qo‘ llash bilan bog‘ liq axloqiy va boshqaruv masalalarini baholay olish.

Kurs mazmunining nazariy va amaliy komponentlari o‘ zaro uyg‘ unlashtirilgani sababli tinglovchilar nafaqat yangi bilimlarni egallaydilar, balki ularni bevosita ish faoliyatida sinab ko‘ rish imkoniyatiga ham ega bo‘ ladilar. Xalqaro tajribalar tahlili shuni ko‘ rsatadiki, sun'iy intellekt bo‘ yicha amaliy yo‘ naltirilgan treninglarda ishtirok etgan rahbar va menejerlarning katta qismi o‘ quv jarayonidan so‘ ng kamida bitta yangi raqamli vositani o‘ z faoliyatiga tatbiq etgan. Shu nuqtai nazardan, kurs samaradorligini baholashda tinglovchilarning real ish jarayonlariga kiritgan o‘ zgarishlari muhim ko‘ rsatkich sifatida qaraladi.

Kurs davomida raqamli liderlik kompetensiyalarini rivojlantirishga ham alohida e'tibor qaratiladi. Amaliyot shuni ko‘ rsatadiki, texnologik yangiliklarning muvaffaqiyatli joriy etilishi ko‘ p jihatdan rahbarlarning tashabbuskorligi va o‘ zgarishlarni boshqarish qobiliyatiga bog‘ liq. Shu sababli tinglovchilar ma'lumotlarga asoslangan qarorlar qabul qilish, jamoani innovatsion faoliyatga jalb etish va yangi texnologiyalarni boshqaruv amaliyotiga integratsiya qilish bo‘ yicha zarur ko‘ nikmalarni egallaydilar.

Kurs natijalarining ta'siri faqat individual darajada emas, balki institutsional darajada ham namoyon bo‘ lishi mumkin. Dastlabki bosqichda boshqaruv faoliyatining ayrim yo‘ nalishlarida, xususan hujjatlar bilan ishlash, hisobot tayyorlash yoki ish jarayonlarini rejalashtirishda sun'iy intellekt vositalaridan foydalanish hisobiga vaqt va mehnat resurslarini tejash imkoniyati yuzaga keladi. Bunday o‘ zgarishlar boshqaruv jarayonlarining operativligi va aniqligini oshirishga xizmat qiladi.

O‘ rta muddatli istiqbolda sun'iy intellekt vositalaridan foydalanish amaliyotining kengayishi oliy ta'lim muassasasida ma'lumotlarga asoslangan boshqaruv madaniyatining shakllanishiga zamin yaratadi. Natijada talabalar muvaffaqiyatini tahlil qilish, resurslarni taqsimlash, byudjet xarajatlarini optimallashtirish hamda xodimlar faoliyatini baholash kabi strategik vazifalarda analitik yondashuvlarning ulushi ortadi.

Uzoq muddatli istiqbolda esa sun'iy intellekt bo‘ yicha kompetensiyalar boshqaruv faoliyatining muhim tarkibiy qismiga aylanishi mumkin. Bunday sharoitda raqamli savodxonlik alohida afzallik emas, balki zamonaviy rahbar uchun zarur professional talab sifatida qaraladi. Bu holat oliy ta'lim muassasalarining raqamli transformatsiya jarayonlarida faolroq ishtirok etishiga hamda xalqaro rivojlanish tendensiyalariga moslashishiga xizmat qiladi.

Shu bilan birga, taklif etilayotgan modelning ayrim cheklovlarini ham e'tibordan chetda qoldirib bo‘ lmaydi. Avvalo, kurs samaradorligi amaliy tajriba orqali to‘ liq sinovdan o‘ tkazilmagan. Shu sababli kelgusida eksperimental tadqiqotlar tashkil etish, kursdan oldingi va keyingi natijalarni qiyosiy tahlil qilish maqsadga muvofiq hisoblanadi. Bundan tashqari, tinglovchilarning boshlang‘ ich raqamli kompetensiyalari turlicha bo‘ lishi o‘ quv jarayonida differensial yondashuvni talab etadi. Sun'iy intellekt texnologiyalarining tez sur'atlarda rivojlanishi esa kurs mazmunini muntazam ravishda yangilab borish zaruratini yuzaga keltiradi.

Umuman olganda, taklif etilayotgan kurs modeli boshqaruv kadrlarining individual kasbiy rivojlanishini qo‘ llab-quvvatlash bilan bir qatorda, oliy ta'lim muassasalarida raqamli transformatsiya jarayonlarini jadallashtirishga ham xizmat qilishi mumkin.

Xulosa. Tadqiqot natijalari oliy ta'lim muassasalari boshqaruv kadrlarida sun'iy intellekt kompetensiyalarini rivojlantirish uchun maqsadli malaka oshirish dasturlarini ishlab chiqish zarurligini tasdiqlaydi. Ishlab chiqilgan pedagogik model boshqaruv faoliyatining amaliy ehtiyojlarini hisobga olgan holda shakllantirilgan bo‘ lib, u rahbarlarning zamonaviy raqamli texnologiyalar bilan ishlash salohiyatini izchil rivojlantirishga qaratilgan.

Modelning asosiy afzalligi uning amaliy yo‘ naltirilganligidadir. Kurs mazmuni prorektorlar, dekanlar va kafedra mudirlarining kasbiy vazifalariga moslashtirilgan bo‘ lib, nazariy bilimlarni real boshqaruv jarayonlari bilan bog‘ lash imkonini beradi. Uch bosqichli o‘ quv tuzilmasi tinglovchilarni sun'iy intellekt asoslari bilan tanishtirishdan boshlab, amaliy vositalardan foydalanish va yakuniy loyiha ishlab chiqishgacha bo‘ lgan izchil rivojlanish trayektoriyasini

ta’minlaydi. Baholash tizimining Kirkpatrick modeli asosida tashkil etilgani esa o‘ quv natijalarini kompleks va ob’ektiv tahlil qilish imkoniyatini yaratadi.

Muhimi, mazkur model faqat alohida tinglovchilarning kasbiy rivojlanishiga emas, balki oliy ta’lim muassasalarida boshqaruv madaniyatini takomillashtirishga ham xizmat qiladi. Sun’iy intellekt vositalaridan oqilona foydalanish boshqaruv qarorlarining sifatini oshirish, ma’lumotlarga asoslangan yondashuvlarni kengaytirish hamda muassasalarning raqamli transformatsiya jarayonlariga moslashuvchanligini kuchaytirish uchun qo‘ shimcha imkoniyatlar yaratadi.

Shu nuqtai nazardan, sun’iy intellekt kompetensiyalari zamonaviy OTM rahbari uchun qo‘ shimcha ko‘ nikma emas, balki professional faoliyat samaradorligini belgilovchi muhim omillardan biri sifatida qaralishi lozim. Taklif etilgan pedagogik model ushbu yo‘ nalishda amaliy va ilmiy asoslangan yechim sifatida xizmat qilishi, shuningdek, O‘ zbekiston oliy ta’lim tizimining raqamli rivojlanish strategiyalarini qo‘ llab-quvvatlashga hissa qo‘ shishi mumkin.

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ИННОВАЦИОННЫЕ ПОДХОДЫ К ОБУЧЕНИЮ ИНОСТРАННОМУ ЯЗЫКУ: ЦИФРОВЫЕ ТЕХНОЛОГИИ, ИНТЕРАКТИВНЫЕ МЕТОДЫ И ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ

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Аннотация: *В статье в рамках сравнительно-аналитического подхода и моделирования раскрыты научно-теоретические и методические основы применения инновационных подходов к обучению иностранному языку — цифровых технологий, интерактивных методов и искусственного интеллекта (ИИ). Исследование носит теоретико-методологический характер; его материалом послужили современная методическая литература и методические разработки по обучению иностранному языку. В результате контент-анализа инновационные подходы разделены на группы и определена доля их применения в источниках: интерактивные методы (30%), цифровые технологии (28%), ИИ-инструменты (22%), смешанное (blended) обучение (12%) и геймификация (8%). Систематизированы дидактические функции ИИ в обучении иностранному языку (персонализация, развитие речи, генерация материалов, автоматическая оценка, перевод и анализ) и предложена пятиэтапная дидактическая модель инновационного занятия, интегрирующая три компонента. Исследование обосновывает, что сочетание цифровых технологий, интерактивных методов и ИИ повышает мотивацию, коммуникативную компетенцию и индивидуализацию обучения иностранному языку.*

Ключевые слова: *обучение иностранному языку, инновационные подходы, цифровые технологии, интерактивные методы, искусственный интеллект, персонализация, смешанное обучение, геймификация, коммуникативная компетенция, дидактическая модель.*

CHET TILINI O‘ QITISHDA INNOVATSION YONDASHUVLAR: RAQAMLI TEXNOLOGIYALAR, INTERFAOL USULLAR VA SUN’IY INTELLEKT

Annotatsiya: *Maqolada chet tilini o‘ qitishda innovatsion yondashuvlar — raqamli texnologiyalar, interaktiv metodlar va sun’ iy intellekt (SI)ni qo‘ llashning ilmiy-nazariy hamda metodik asoslari qiyosiy-tahliliy va modellashtirish yondashuvi doirasida yoritilgan. Tadqiqot nazariy-metodologik xarakterga ega bo‘ lib, uning materialini chet tili o‘ qitishga oid zamonaviy metodik adabiyot va metodik ishlanmalar tashkil etdi. Kontent-tahlil natijasida innovatsion yondashuvlarning qo‘ llanilish ulushi aniqlandi: interaktiv metodlar (30%), raqamli texnologiyalar (28%), SI-vositalari (22%), aralash (blended) ta’ lim (12%) va geymifikatsiya (8%). SIning chet tili o‘ qitishdagi didaktik funksiyalari tizimlashtirilib, uch komponentni birlashtiruvchi besh bosqichli didaktik model taklif etildi. Tadqiqot raqamli texnologiyalar, interaktiv metodlar va SI uyg‘ unligi motivatsiya, kommunikativ kompetensiya va ta’ limni individuallashtirishni oshirishini asoslaydi.*

Kalit so‘ zlar: *chet tilini o‘ qitish, innovatsion yondashuvlar, raqamli texnologiyalar, interaktiv metodlar, sun’ iy intellekt, individuallashtirish, aralash ta’ lim, geymifikatsiya, kommunikativ kompetensiya, didaktik model.*

INNOVATIVE APPROACHES TO FOREIGN LANGUAGE TEACHING: DIGITAL TECHNOLOGIES, INTERACTIVE METHODS, AND ARTIFICIAL INTELLIGENCE

Abstract: *The article reveals, within a comparative-analytical and modelling framework, the scientific-theoretical and methodological foundations of applying innovative approaches to foreign language teaching — digital technologies, interactive methods and artificial intelligence (AI). The study is theoretical-methodological in nature; its material comprised contemporary methodological literature and methodological materials on foreign language teaching. Through content analysis, the innovative approaches were grouped and their share of application in the sources was determined: interactive methods (30%), digital technologies (28%), AI tools (22%), blended learning (12%) and gamification (8%). The didactic functions of AI in foreign language teaching (personalisation, speech development, material generation, automatic assessment, translation and analysis) were systematised, and a five-stage didactic model of an innovative lesson integrating the three components was proposed. The study substantiates that combining digital*

technologies, interactive methods and AI enhances motivation, communicative competence and the individualisation of foreign language teaching.

Keywords: *foreign language teaching, innovative approaches, digital technologies, interactive methods, artificial intelligence, personalisation, blended learning, gamification, communicative competence, didactic model.*

1. ВВЕДЕНИЕ

Стремительная цифровизация общества и интернационализация образования коренным образом изменили цели, содержание и технологии обучения иностранным языкам. Современная методика отказывается от репродуктивно-грамматической модели в пользу коммуникативного, деятельностного и личностно ориентированного подхода, в центре которого находится развитие способности обучающегося к реальному иноязычному общению. Достижению этой цели способствуют инновационные подходы — цифровые технологии, интерактивные методы и инструменты искусственного интеллекта (ИИ), которые расширяют образовательную среду и индивидуализируют траекторию обучения.

Актуальность темы обусловлена противоречием между традиционной методикой преподавания иностранного языка и требованиями цифрового общества к формированию коммуникативной и цифровой компетенций обучающихся. В зарубежных исследованиях доказано положительное влияние цифровых и интерактивных технологий на мотивацию и результаты обучения, а появление генеративного ИИ открыло принципиально новые дидактические возможности. Вместе с тем целостная методическая модель, интегрирующая цифровые технологии, интерактивные методы и ИИ в единую систему обучения иностранному языку, разработана недостаточно.

Цель исследования — теоретически обосновать применение инновационных подходов (цифровых технологий, интерактивных методов и ИИ) в обучении иностранному языку, систематизировать их и разработать дидактическую модель инновационного занятия.

Объект исследования — процесс обучения иностранному языку в условиях цифровизации образования; предмет — научно-методические основы применения цифровых технологий, интерактивных методов и искусственного интеллекта в обучении иностранному языку.

Научная новизна исследования состоит в том, что в нём инновационные подходы к обучению иностранному языку систематизированы в единой типологии, определена доля их применения, систематизированы дидактические функции ИИ и предложена пятиэтапная дидактическая модель инновационного занятия, интегрирующая три компонента.

Статья построена следующим образом: во втором разделе анализируется научная литература по теме и определяется исследовательский пробел; в третьем разделе описываются материал и методы; в четвёртом разделе результаты приводятся в таблицах и диаграммах и интерпретируются; в пятом разделе даются выводы и рекомендации.

2. ОБЗОР ЛИТЕРАТУРЫ

Теоретические основы применения технологий в обучении языку разрабатывались в русле нескольких направлений. Концепция компьютерно-опосредованного обучения языку (CALL — Computer-Assisted Language Learning) и её мобильного расширения (MALL) обоснована в работах M. Warschauer и G. Stockwell, показавших, что цифровая среда обеспечивает аутентичность и интерактивность языкового ввода [1; 2]. Коммуникативный подход, лежащий в основе современной методики, восходит к трудам H.D. Brown и J.C. Richards [3; 4]. Дидактический потенциал интерактивных и проектных методов раскрыт в работах Е.С. Полат, где проектная технология рассматривается как средство развития коммуникативной и познавательной самостоятельности обучающихся [5].

Роль искусственного интеллекта в обучении языку активно исследуется в последние годы. В обзорных работах по ИИ в образовании (L. Chen и др.) систематизированы функции интеллектуальных обучающих систем — адаптация, обратная связь и персонализация [6]. Дидактические возможности генеративного ИИ и чат-ботов для развития речевых навыков рассмотрены в исследованиях последних лет [7], а вопросы академической честности и корректного использования ИИ обсуждаются в связи с рисками чрезмерной зависимости обучающихся [8]. Отдельное направление составляет геймификация обучения языку [9].

Анализ литературы выявляет существенный пробел. Во-первых, большинство работ рассматривают отдельные инновационные средства (только цифровые платформы, только ИИ или только интерактивные методы) вне их взаимосвязи. Во-вторых, отсутствует целостная типология инновационных подходов и оценка доли их применения. В-третьих, не предложена интегративная дидактическая модель занятия, объединяющая три компонента. Настоящая статья направлена на восполнение этого пробела.

3. МЕТОДОЛОГИЯ ИССЛЕДОВАНИЯ

Исследование носит теоретико-методологический характер и опирается на коммуникативный, компетентностный и деятельностный подходы. Эмпирическая часть (на основе экспериментальных и контрольных групп) не предусмотрена; основное внимание уделено раскрытию научно-теоретических основ инновационных подходов, их систематизации и моделированию инновационного занятия.

Материалом исследования послужили два источника: современная методическая и научная литература по применению цифровых технологий, интерактивных методов и ИИ в обучении иностранному языку, а также методические разработки и практики преподавания иностранного языка. Единицей анализа выступили инновационный метод (средство) и его дидактическая функция. Состав материала приведён в таблице 1.

Таблица 1. Состав материала исследования

Тип материала	Источник	Единицы анализа
Научно-методическая литература	работы по CALL/MALL, ИИ в обучении языку	12
Методические разработки и практики	планы занятий, цифровые ресурсы, ИИ-инструменты	≈150 единиц
Всего		≈162

В исследовании использованы следующие теоретические методы: теоретический анализ научно-методической литературы — для определения сущности инновационных подходов; контент-анализ — для выделения и группировки инновационных методов и функций ИИ по частоте; сравнительный анализ — для сопоставления традиционного и инновационного обучения; обобщение и классификация — для систематизации подходов; моделирование — для разработки дидактической модели инновационного занятия. Проценты округлены до целых, поэтому сумма по столбцу может отличаться от 100% на ±1. Ограничение исследования состоит в том, что контент-анализ в определённой мере опирается на экспертную интерпретацию.

4. РЕЗУЛЬТАТЫ И АНАЛИЗ

4.1. Типология инновационных подходов

Теоретический анализ позволил объединить инновационные подходы к обучению иностранному языку в три базовые группы, дополняемые смешанным обучением и геймификацией. Их сущность и примеры приведены в таблице 2.

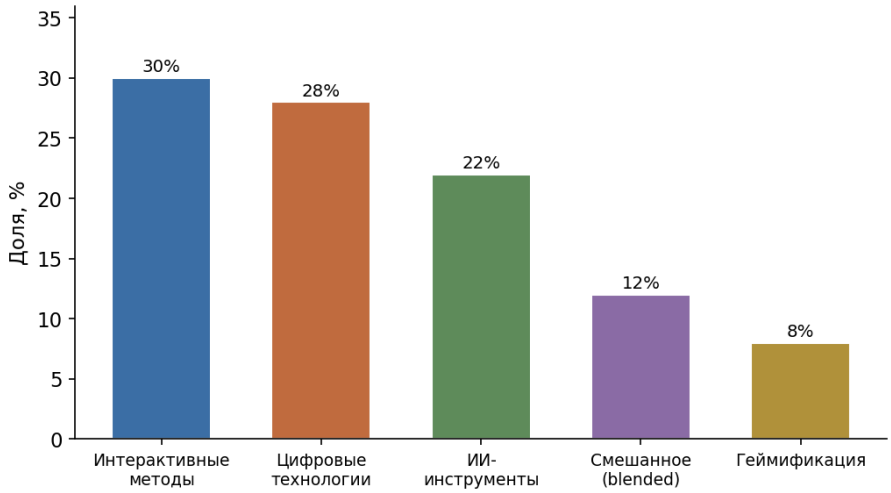
Таблица 2. Типология инновационных подходов к обучению иностранному языку

Группа подходов	Сущность	Примеры средств и приёмов
Цифровые технологии	использование электронной среды и ресурсов	LMS, мобильные приложения, мультимедиа, онлайн-платформы
Интерактивные методы	обучение через общение и сотрудничество	проектный и кейс-метод, ролевые и игровые технологии, дискуссия
Искусственный интеллект	адаптация и генерация на основе ИИ	чат-боты, генеративный ИИ, адаптивные системы, распознавание речи

4.2. Доля применения инновационных подходов

Контент-анализ методических разработок и практик позволил определить долю применения инновационных подходов. Распределение представлено на диаграмме 1.

Диаграмма 1. Доля применения инновационных подходов в обучении иностранному языку (%)



Как видно из распределения, наибольшая доля приходится на интерактивные методы (30%) и цифровые технологии (28%), что отражает коммуникативную и деятельностную направленность современной методики. ИИ-инструменты (22%) занимают уже существенную долю, демонстрируя устойчивую тенденцию роста. Смешанное обучение (12%) и геймификация (8%) выступают дополняющими форматами, усиливающими мотивацию и гибкость образовательного процесса.

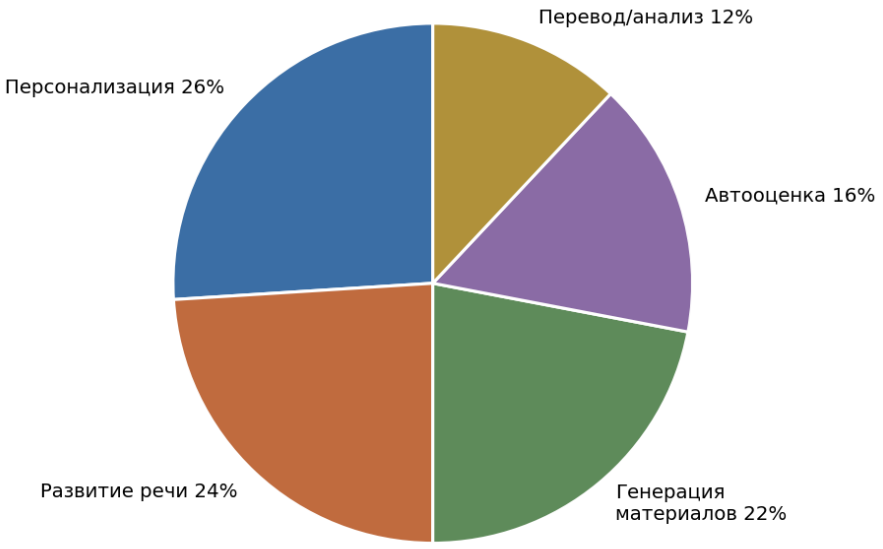
4.3. Дидактические функции искусственного интеллекта

Особое место среди инновационных средств занимает искусственный интеллект, выполняющий ряд дидактических функций в обучении иностранному языку. Эти функции систематизированы в таблице 3, а их относительная доля показана на диаграмме 2.

Таблица 3. Дидактические функции искусственного интеллекта в обучении иностранному языку

Функция ИИ	Доля, %	Инструмент / дидактический эффект
Персонализация обучения	26	адаптивные платформы — индивидуальная траектория
Развитие речевых навыков	24	чат-боты, голосовые помощники — практика говорения
Генерация материалов	22	генеративный ИИ — тексты, диалоги, упражнения
Автоматическая оценка	16	проверка письма и произношения — быстрая обратная связь
Перевод и языковой анализ	12	нейронный перевод — опора и самопроверка
Всего	100	

Диаграмма 2. Распределение дидактических функций ИИ в обучении иностранному языку (%)



Данные показывают, что ведущими функциями ИИ являются персонализация обучения (26%) и развитие речевых навыков (24%): адаптивные системы выстраивают индивидуальную траекторию, а чат-боты обеспечивают безопасную и регулярную практику говорения. Генерация материалов (22%) экономит время преподавателя, автоматическая оценка (16%) ускоряет обратную связь, а перевод и анализ (12%) служат опорой и средством самопроверки. При этом применение ИИ требует педагогического сопровождения во избежание чрезмерной зависимости обучающихся.

4.4. Дидактическая модель инновационного занятия

На основе проведённого анализа разработана пятиэтапная дидактическая модель инновационного занятия по иностранному языку, интегрирующая цифровые технологии, интерактивные методы и ИИ (таблица 4).

Таблица 4. Дидактическая модель инновационного занятия по иностранному языку

Этап	Дидактическая цель	Деятельность	Инновационное средство
Мотивационный	вовлечение и постановка задачи	проблемная ситуация, видео	мультимедиа
Презентация материала	ввод языкового материала	интерактивная презентация	цифровая платформа
Интерактивная практика	закрепление в общении	ролевая игра, проект, дискуссия	интерактивные методы
ИИ-поддержка	персонализация и практика	чат-бот, адаптивные задания	ИИ-инструменты
Рефлексия и оценка	обратная связь и оценивание	автооценка, портфолио	цифровые/ИИ-средства

4.5. Обсуждение результатов

Полученные результаты подтверждают, что инновационные подходы наиболее эффективны не по отдельности, а в интеграции. Преобладание интерактивных методов и цифровых технологий (в сумме 58%) отражает коммуникативно-деятельностную парадигму, а растущая доля ИИ (22%) свидетельствует о переходе к адаптивному и персонализированному обучению. Это согласуется с выводами M. Warschauer [1] и L. Chen и др. [6] о том, что цифровая и интеллектуальная среда усиливает аутентичность и индивидуализацию обучения.

Предложенная модель показывает, что три компонента выполняют взаимодополняющие роли: цифровые технологии обеспечивают ресурс и среду, интерактивные методы — коммуникацию и сотрудничество, а ИИ — персонализацию и обратную связь. Вместе с тем внедрение инновационных подходов требует от преподавателя цифровой компетентности, методической подготовки и материально-технической базы, а использование ИИ — внимания к вопросам академической честности [8]. Это составляет основное практическое ограничение подхода.

5. ЗАКЛЮЧЕНИЕ

Проведённый теоретико-методологический анализ позволяет сделать следующие выводы.

Во-первых, инновационные подходы к обучению иностранному языку образуют единую систему, включающую цифровые технологии, интерактивные методы и искусственный интеллект, дополняемые смешанным обучением и геймификацией.

Во-вторых, контент-анализ определил долю применения подходов: интерактивные методы (30%), цифровые технологии (28%), ИИ-инструменты (22%), смешанное обучение (12%) и геймификация (8%). Преобладание интерактивных и цифровых подходов отражает коммуникативную направленность методики.

В-третьих, дидактические функции ИИ распределяются следующим образом: персонализация (26%), развитие речи (24%), генерация материалов (22%), автоматическая оценка (16%) и перевод/анализ (12%); ведущей функцией выступает персонализация обучения.

В-четвёртых, предложенная пятиэтапная дидактическая модель (мотивация, презентация, интерактивная практика, ИИ-поддержка, рефлексия и оценка) даёт теоретическую основу для проектирования инновационного занятия, интегрирующего три компонента.

Практические рекомендации: (a) сочетать цифровые технологии, интерактивные методы и ИИ в единой системе занятия; (b) использовать ИИ-инструменты для персонализации и развития речи при педагогическом сопровождении; (c) формировать цифровую компетентность преподавателей; (d) учитывать вопросы академической честности при работе с генеративным ИИ.

Перспективы исследования связаны с разработкой критериев оценки эффективности предложенной модели, её эмпирической апробацией, а также с изучением этических и методических аспектов применения генеративного ИИ в обучении иностранному языку.

ЗАЯВЛЕНИЯ АВТОРОВ

Вклад авторов. Статья подготовлена единственным автором. Автор самостоятельно выполнил разработку концепции исследования, сбор и анализ материала, интерпретацию результатов и написание текста.

Конфликт интересов. Автор заявляет об отсутствии конфликта интересов.

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СОВЕРШЕНСТВОВАНИЕ МЕХАНИЗМОВ РАЗВИТИЯ КОРПОРАТИВНОЙ ЭТИКИ ПЕДАГОГОВ

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Аннотация: *В статье в рамках сравнительно-аналитического подхода и моделирования раскрыты научно-теоретические и методические основы совершенствования механизмов развития корпоративной этики педагогов. Исследование носит теоретико-методологический характер; его материалом послужили научно-методическая литература по педагогической этике, профессиональной морали и организационной культуре, а также нормативные документы. В результате анализа выделены структурные компоненты корпоративной этики педагога (ценностно-нормативный, профессионально-поведенческий, коммуникативно-коллегиальный и репутационный) и пять групп механизмов её развития. Определена доля применения механизмов: методические (24%), нормативно-правовые (22%), организационно-институциональные (20%), мотивационные (18%) и саморегуляция (16%). Обоснованы направления совершенствования механизмов и предложена пятиэтапная организационно-педагогическая модель развития корпоративной этики. Исследование обосновывает, что интеграция механизмов в единую систему укрепляет профессиональную ответственность, коллективную культуру и репутацию педагогов.*

Ключевые слова: *педагогическая этика, корпоративная этика, профессиональная мораль, этический кодекс, организационная культура, механизм развития, профессиональная ответственность, коллективная культура, репутация, организационно-педагогическая модель.*

СОВЕРШЕНСТВОВАНИЕ МЕХАНИЗМОВ РАЗВИТИЯ КОРПОРАТИВНОЙ ЭТИКИ ПЕДАГОГОВ

Annotatsiya: *Maqolada pedagoglarning korporativ etikasini rivojlantirish mexanizmlarini takomillashtirishning ilmiy-nazariy va metodik asoslari qiyosiy-tahliliy hamda modellashtirish yondashuvi doirasida yoritilgan. Tadqiqot nazariy-metodologik xarakterga ega bo‘ lib, uning materialini pedagogik etika, kasbiy odob-axloq va tashkiliy madaniyatga oid ilmiy-metodik adabiyot hamda normativ hujjatlar tashkil etdi. Tahlil natijasida pedagog korporativ etikasining tarkibiy komponentlari (qadriyat-me’ yoriy, professional xulq-atvor, kommunikativ-kollegial va reputatsion) hamda uni rivojlantirish mexanizmlarining besh guruhi ajratildi. Mexanizmlarning qo‘ llanilish ulushi aniqlandi: metodik (24%), normativ-huquqiy (22%), tashkiliy-institutsional (20%), motivatsion (18%) va o‘ z-o‘ zini boshqarish (16%). Mexanizmlarni takomillashtirish yo‘ nalishlari asoslanib, korporativ etikani rivojlantirishning besh bosqichli tashkiliy-pedagogik modeli taklif etildi.*

Kalit so‘ zlar: *pedagogik etika, korporativ etika, kasbiy odob-axloq, etika kodeksi, tashkiliy madaniyat, rivojlantirish mexanizmi, kasbiy mas’ uliyat, jamoaviy madaniyat, reputatsiya, tashkiliy-pedagogik model.*

SOVERSHENSTVOVANIE MEKHANIZMOV RAZVITIYa KORPORATIVNOY ETIKI PEDAGOGOV

Abstract: *The article reveals, within a comparative-analytical and modelling framework, the scientific-theoretical and methodological foundations of improving the mechanisms for developing teachers’ corporate ethics. The study is theoretical-methodological in nature; its material comprised scholarly-methodological literature on pedagogical ethics, professional morality and organisational culture, as well as normative documents. The analysis identified the structural components of a teacher’s corporate ethics (value-normative, professional-behavioural, communicative-collegial and reputational) and five groups of mechanisms for its development. The share of application of the mechanisms was determined: methodological (24%), normative-legal (22%), organisational-institutional (20%), motivational (18%) and self-regulation (16%). Directions for improving the mechanisms were substantiated, and a five-stage organisational-pedagogical model for developing corporate ethics was proposed.*

Keywords: *pedagogical ethics, corporate ethics, professional morality, code of ethics, organisational culture, development mechanism, professional responsibility, collective culture, reputation, organisational-pedagogical model.*

1. ВВЕДЕНИЕ

В современной системе образования профессиональная деятельность педагога определяется не только передачей знаний, но и способностью быть нравственным образцом, поддерживать коллегиальное сотрудничество и сохранять репутацию. Именно эти аспекты воплощаются в понятии корпоративной этики педагога. Корпоративная этика — это совокупность профессиональных ценностей, нравственных норм и правил поведения, действующих в коллективе образовательного учреждения; она регулирует взаимоотношения педагогов, их связи с обучающимися и общественностью и формирует положительный имидж учреждения.

Актуальность темы обусловлена несколькими обстоятельствами. Во-первых, повышение качества образования и укрепление институциональной культуры требуют высокой профессиональной этики педагогов. Во-вторых, в условиях цифровой среды и социальных сетей возросли требования к репутации и профессиональному поведению педагога. В-третьих, в существующей практике развитие корпоративной этики нередко осуществляется в рамках отдельных, несистемных мероприятий (разовые тренинги или нормативный документ); научно-методические основы её развития в целостной системе механизмов разработаны недостаточно.

Цель исследования — теоретически обосновать механизмы развития корпоративной этики педагогов, систематизировать их и разработать организационно-педагогическую модель их совершенствования.

Объект исследования — процесс развития корпоративной этики педагогов; предмет — механизмы развития данной этики, их структура и направления совершенствования.

Научная новизна исследования состоит в том, что в нём структурные компоненты корпоративной этики педагога и механизмы её развития систематизированы в единой типологии, определена доля их применения и предложена пятиэтапная организационно-педагогическая модель совершенствования механизмов.

Статья построена следующим образом: во втором разделе анализируется научная литература по теме и определяется исследовательский пробел; в третьем разделе описываются материал и методы; в четвёртом разделе результаты приводятся в таблицах и диаграммах и интерпретируются; в пятом разделе даются выводы и рекомендации.

2. ОБЗОР ЛИТЕРАТУРЫ

Проблема профессиональной и педагогической этики изучается на пересечении философии, педагогики и менеджмента. Теоретические основы педагогической этики разработаны в трудах E. Campbell [1] и D. Carr [2], где учитель рассматривается как нравственный субъект, носитель профессиональных ценностей и ответственности. Вопросы организационной (корпоративной) этики и управления ею систематизированы L.K. Treviño и K.A. Nelson в контексте бизнес-этики [3], а теория организационной культуры обоснована в работах E.H. Schein [4]; эти положения применимы и к коллективу образовательного учреждения.

В узбекской педагогике вопросы профессиональной этики педагога, компетентности и воспитания изучены в определённой мере [5; 6]. Требования к профессиональному поведению педагогических работников закреплены в нормативных документах и правилах этики [7]. Вместе с тем организационные и мотивационные механизмы развития корпоративной этики, в частности вопросы стимулирования и саморегуляции, освещены в теории организационного поведения [8].

Анализ литературы выявляет существенный пробел. Во-первых, большинство работ рассматривают педагогическую этику на уровне личной морали, тогда как её корпоративно-коллективное измерение и связь с институциональной культурой раскрыты недостаточно. Во-вторых, отсутствует целостная классификация механизмов развития корпоративной этики и оценка их доли. В-третьих, не предложена целостная организационно-педагогическая модель их совершенствования. Настоящая статья направлена на восполнение этого пробела.

3. МЕТОДОЛОГИЯ ИССЛЕДОВАНИЯ

Исследование носит теоретико-методологический характер и опирается на системный, аксиологический (ценностный) и организационно-культурный подходы. Эмпирическая часть (на основе экспериментальных и контрольных групп) не предусмотрена; основное внимание уделено раскрытию научно-теоретических основ механизмов развития корпоративной этики, их систематизации и моделированию.

Материалом исследования послужили два источника: научно-методическая литература по педагогической и корпоративной этике и организационной культуре, а также правила этики педагогических работников и институциональные практики. Единицей анализа выступили механизм развития корпоративной этики и его структурный элемент. Состав материала приведён в таблице 1.

Таблица 1. Состав материала исследования

Тип материала	Источник	Единицы анализа
Научно-методическая литература	работы по педагогической/корпоративной этике и культуре	12
Нормативные документы и практики	правила этики, институциональный опыт	≈100 единиц
Всего		≈112

В исследовании использованы следующие теоретические методы: теоретический анализ научно-методической литературы — для определения сущности и компонентов корпоративной этики; контент-анализ — для выделения и группировки механизмов развития по частоте; сравнительный анализ — для сопоставления возможностей и ограничений механизмов; обобщение и классификация — для систематизации механизмов; моделирование — для разработки организационно-педагогической модели развития корпоративной этики.

Под механизмом развития понимается совокупность взаимосвязанных средств, мер и процедур, направленных на формирование и укрепление корпоративной этики. Механизмы операционально разделены на пять групп — нормативно-правовые, организационно-институциональные, методические, мотивационные и саморегуляция. Проценты округлены до целых, поэтому сумма по столбцу может отличаться от 100% на ±1. Ограничение исследования состоит в том, что контент-анализ в определённой мере опирается на экспертную интерпретацию.

4. РЕЗУЛЬТАТЫ И АНАЛИЗ

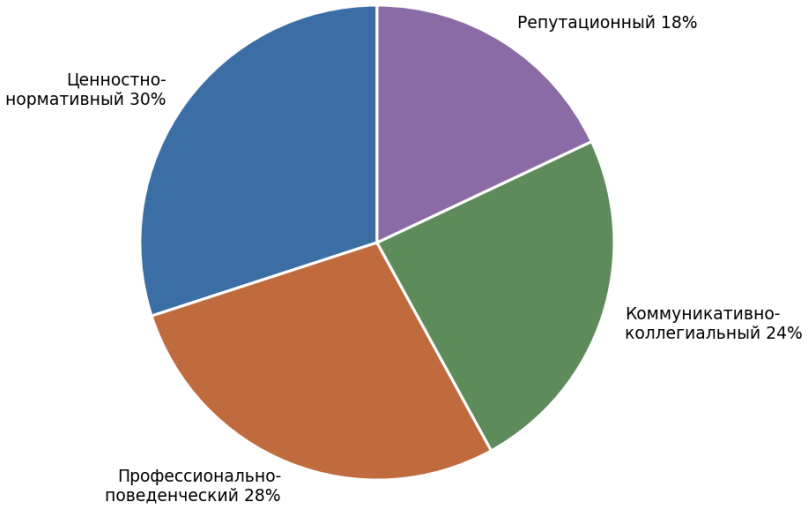
4.1. Структурные компоненты корпоративной этики педагога

Теоретический анализ позволил выделить четыре структурных компонента корпоративной этики педагога. Их сущность приведена в таблице 2, а относительная доля в структуре корпоративной этики — на диаграмме 2.

Таблица 2. Структурные компоненты корпоративной этики педагога

Компонент	Сущность
Ценностно-нормативный	система профессиональных ценностей, нравственных норм и принципов
Профессионально-поведенческий	ответственность, честность, справедливость, верность долгу
Коммуникативно-коллегиальный	уважительные отношения с коллегами, культура сотрудничества
Репутационный	личный и институциональный авторитет, доверие общественности

Диаграмма 2. Относительная доля компонентов корпоративной этики педагога (%)



Анализ показывает, что в структуре корпоративной этики ведущее место занимают ценностно-нормативный (30%) и профессионально-поведенческий (28%) компоненты: именно они определяют нравственную позицию и профессиональную ответственность педагога. Коммуникативно-коллегиальный (24%) компонент обеспечивает коллективную культуру, а репутационный (18%) — имидж учреждения. Эти компоненты взаимосвязаны, поэтому развитие корпоративной этики должно охватывать их все.

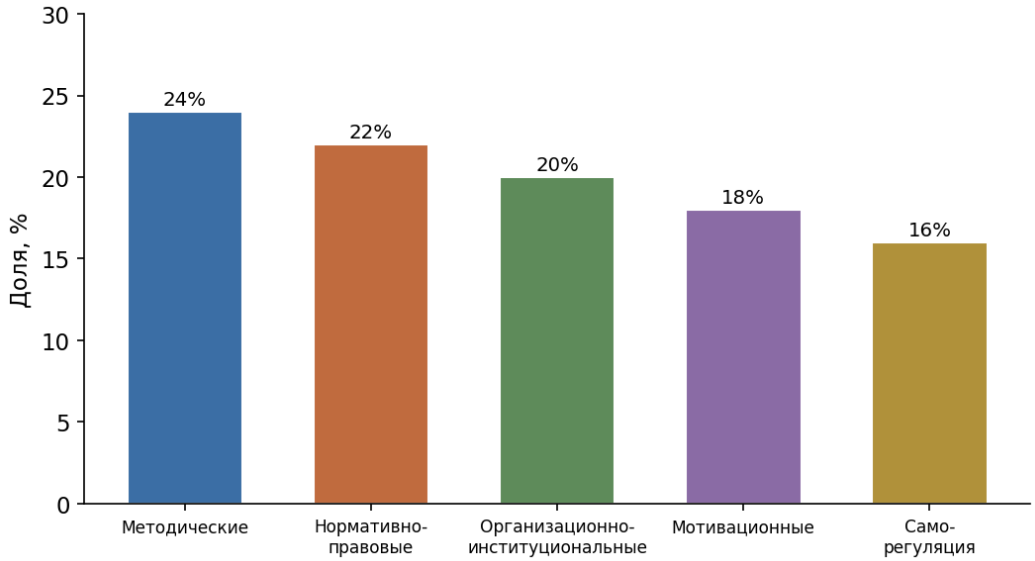
4.2. Классификация и доля механизмов развития

Механизмы развития корпоративной этики разделены на пять основных групп. Их сущность и средства приведены в таблице 3, а доля применения — на диаграмме 1.

Таблица 3. Механизмы развития корпоративной этики педагога

Группа механизмов	Доля, %	Основные средства
Методические	24	тренинги, семинары, повышение квалификации, разбор этических кейсов
Нормативно-правовые	22	кодекс этики, положение, профессиональный стандарт
Организационно-институциональные	20	комиссия по этике, корпоративная культура, наставничество
Мотивационные	18	стимулирование, признание, авторитет и рейтинг
Саморегуляция	16	рефлексия, самооценка, профессиональное портфолио
Всего	100	

Диаграмма 1. Доля механизмов развития корпоративной этики (%)



Из распределения видно, что наибольшая доля приходится на методические (24%) и нормативно-правовые (22%) механизмы: тренинги-семинары и кодекс этики выступают основными средствами формирования корпоративной этики. Организационно-институциональный (20%) механизм действует через корпоративную культуру и комиссии по этике, мотивационный (18%) — через стимулирование и авторитет, а саморегуляция (16%) — через рефлексию и самооценку. Каждый механизм эффективен не по отдельности, а при системном применении.

4.3. Направления совершенствования механизмов

Контент-анализ позволил выявить существующие недостатки каждого механизма и направления их совершенствования (таблица 4).

Таблица 4. Направления совершенствования механизмов развития

Механизм	Существующий недостаток	Направление совершенствования
Нормативно-правовой	кодекс формален, слабо связан с практикой	обогащение кодекса реальными ситуациями и кейсами
Методический	тренинги эпизодичны, разовые	система регулярного, поэтапного повышения квалификации
Организационно-институциональный	комиссии по этике малоактивны	усиление наставничества и корпоративной культуры
Мотивационный	этичное поведение не стимулируется	внедрение признания, рейтинга и материально-морального стимула
Саморегуляция	рефлексия несистемна	профессиональное портфолио и критерии самооценки

4.4. Организационно-педагогическая модель развития корпоративной этики

На основе проведённого анализа разработана пятиэтапная организационно-педагогическая модель развития корпоративной этики, охватывающая целостный процесс от диагностики до мониторинга и оценки (таблица 5).

Таблица 5. Организационно-педагогическая модель развития корпоративной этики

Этап	Цель	Деятельность / механизм
Диагностика	выявление этического состояния и потребностей	опрос, наблюдение, анализ
Нормативная основа	определение ценностей и правил	кодекс этики, стандарт
Учебно-методический	развитие этической компетенции	тренинг, семинар, разбор кейсов
Практическое внедрение	внедрение норм в деятельность	наставничество, корпоративная культура, стимул
Мониторинг и оценка	оценка результата и коррекция	рефлексия, рейтинг, самооценка

4.5. Обсуждение результатов

Теоретический анализ обосновывает, что механизмы развития корпоративной этики эффективны не по отдельности, а при системном применении. Ведущая роль методических и нормативно-правовых механизмов (в сумме 46%) показывает важность знаний и нормативной основы в формировании корпоративной этики, а наличие мотивационных механизмов и саморегуляции отражает необходимость превращения этики во внутреннюю ценность. Это согласуется с положениями E. Campbell [1] и E.H. Schein [4]: профессиональная этика устойчива тогда, когда она переходит с уровня внешнего требования на уровень внутренней культуры.

Предложенная модель объединяет механизмы в целостную поэтапную систему и превращает развитие корпоративной этики из разового мероприятия в непрерывный процесс. Вместе с тем внедрение модели требует воли руководства, институциональной культуры и постоянного мониторинга — это основное практическое ограничение.

5. ЗАКЛЮЧЕНИЕ

Проведённый теоретико-методологический анализ позволяет сделать следующие выводы.

Во-первых, корпоративная этика педагога представляет собой целостную систему из четырёх структурных компонентов — ценностно-нормативного (30%), профессионально-поведенческого (28%), коммуникативно-коллегиального (24%) и репутационного (18%).

Во-вторых, механизмы развития корпоративной этики разделяются на пять групп, доля применения которых определена следующим образом: методические (24%), нормативно-правовые (22%), организационно-институциональные (20%), мотивационные (18%) и саморегуляция (16%).

В-третьих, выявлены существующие недостатки и направления совершенствования каждого механизма: связь кодекса с практикой, регулярность повышения квалификации, усиление наставничества и корпоративной культуры, стимулирование этичного поведения и систематизация самооценки.

В-четвёртых, предложенная пятиэтапная организационно-педагогическая модель (диагностика, нормативная основа, учебно-методический этап, практическое внедрение, мониторинг и оценка) даёт теоретическую основу непрерывного развития корпоративной этики.

Практические рекомендации: (a) обогатить кодекс этики реальными кейсами и связать его с практикой; (b) внедрить систему регулярных тренингов по развитию этической компетенции; (c) усилить деятельность наставничества и комиссий по этике; (d) разработать критерии стимулирования этичного поведения и самооценки.

Перспективы исследования связаны с разработкой критериев оценки эффективности предложенной модели, её апробацией в условиях различных образовательных учреждений, а также с вопросами управления репутацией педагога в цифровой среде.

ЗАЯВЛЕНИЯ АВТОРОВ

Вклад авторов. Статья подготовлена единственным автором. Автор самостоятельно выполнил разработку концепции исследования, сбор и анализ материала, интерпретацию результатов и написание текста.

Конфликт интересов. Автор заявляет об отсутствии конфликта интересов.

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SHAXSGA YO‘ NALTIRILGAN TA’LIM VA SHAXSGA XOS UNIVERSAL TA’LIMIY FAOLIYATLARNING NAZARIY-QIYOSIY TAHLILI

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Annotatsiya: *Ushbu maqolada zamonaviy ta’lim tizimidagi global o‘ zgarishlar, axborot texnologiyalarining jadal rivojlanishi asosida o‘ quv jarayonini takomillashtirish masalalari yoritilgan. “Shaxsga yo‘ naltirilgan ta’lim” va “shaxsga xos universal ta’limiy faoliyatlar” (UTF) tushunchalari pedagogik-psixologik jihatdan nazariy-qiyosiy tahlil qilingan. Maqolada o‘ quvchining shaxsiy tajribasiga tayanish, individual ta’lim uslublarini topish, mustaqil o‘ qish, tanqidiy fikrlash, ijodkorlik hamda ma’naviy-qadriyat yo‘ nalishlarni shakllantirish mexanizmlari ochib berilgan. Shuningdek, an’anaviy ta’limdan hamkorlikka asoslangan yondashuvga o‘ tish zaruriyati ilmiy asoslangan bo‘ lib, u o‘ quvchilarni zamonaviy jamiyat talablariga javob beradigan raqobatbardosh kadrlar qilib tayyorlashga xizmat qilishi ko‘ rsatib o‘ tilgan.*

Kalit so‘ zlar: *Shaxsga yo‘ naltirilgan ta’lim, shaxsga xos universal ta’limiy faoliyatlar (UTF), individual yondashuv, shaxsiy tajriba, tanqidiy fikrlash, ma’naviy-qadriyat yo‘ nalish, pedagogik-psixologik tahlil.*

ТЕОРЕТИКО-СРАВНИТЕЛЬНЫЙ АНАЛИЗ ЛИЧНОСТНО-ОРИЕНТИРОВАННОГО ОБУЧЕНИЯ И УНИВЕРСАЛЬНЫХ УЧЕБНЫХ ДЕЙСТВИЙ, ОБУСЛОВЛЕННЫХ ИНДИВИДУАЛЬНЫМИ ОСОБЕННОСТЯМИ ЛИЧНОСТИ

Аннотация: *В данной статье освещаются глобальные изменения в современной системе образования, а также вопросы совершенствования образовательного процесса на основе стремительного развития информационных технологий. Понятия «личностно-ориентированное обучение» и «универсальные учебные действия (УУД), обусловленные индивидуальными особенностями личности» подвергаются теоретико-сравнительному анализу с педагогической и психологической точек зрения. В статье раскрываются механизмы опоры на личный опыт учащегося, выявления индивидуальных стилей обучения, формирования навыков самостоятельного обучения, критического мышления, творческих способностей, а также духовно-ценностных ориентиров. Кроме того, научно обосновывается необходимость перехода от традиционного обучения к подходу, основанному на сотрудничестве, и показывается, что данный подход способствует подготовке конкурентоспособных специалистов, способных отвечать требованиям современного общества.*

Ключевые слова: *личностно-ориентированное обучение, универсальные учебные действия (УУД), обусловленные индивидуальными особенностями личности, индивидуальный подход, личный опыт, критическое мышление, духовно-ценностные ориентиры, психолого-педагогический анализ.*

THEORETICAL AND COMPARATIVE ANALYSIS OF LEARNER-CENTERED EDUCATION AND INDIVIDUALIZED UNIVERSAL LEARNING ACTIVITIES

Abstract: *This article examines global changes in the modern education system and issues related to improving the educational process through the rapid development of information technologies. The concepts of “learner-centered education” and “individualized universal learning activities (ULAs)” are analyzed from theoretical and comparative pedagogical and psychological perspectives. The article explores mechanisms for relying on learners’ personal experiences, identifying individual learning styles, developing independent learning skills, critical thinking, creativity, and spiritual and value-based orientations. Furthermore, the necessity of transitioning from traditional education to a collaborative learning approach is scientifically substantiated. It is demonstrated that such an approach contributes to preparing competitive professionals capable of meeting the demands of modern society.*

Keywords: *learner-centered education, individualized universal learning activities (ULAs), individualized approach, personal experience, critical thinking, spiritual and value-based orientations, pedagogical and psychological analysis.*

KIRISH

So‘ nggi yillarda ta’lim jarayonida ko‘ plab o‘ zgarishlar yuz bermoqda. Bu o‘ zgarishlar dunyoning deyarli barcha mamlakatlari ta’lim tizimida kuzatilmoqda. Internet, kompyuterlar, mobil qurilmalar va turli ta’lim platformalarining keng tarqalishi o‘ quv jarayonini tubdan o‘ zgartirmoqda. Buning natijasi o‘ laroq, ta’limni onlayn tarzda, istalgan vaqtda va istalgan joyda olish mumkin. Bu esa an’anaviy darsliklar va ma’ruzalardan tashqari, ko‘ plab yangi o‘ quv usullarini paydo bo‘ lishiga olib kelmoqda

Dunyoning tobora bir-biriga bog‘ liq bo‘ lib borishi turli madaniyatlar va mamlakatlar o‘ rtasida bilimlar almashinuvini kuchaytirmoqda. Bu esa o‘ quv dasturlarining xalqaro standartlarga moslashtirilishini, tillarni o‘ rganishning ahamiyatini oshirmoqda. Ishlab chiqarish va texnologiyalarning tez rivojlanishi tufayli bandlik bozorining talablari o‘ zgarib bormoqda. Zamonaviy mutaxassislar nafaqat bilimga ega bo‘ lishi, balki tanqidiy fikrlash, muammolarni hal qilish, jamoada ishlash, ijodkorlik kabi universal ko‘ nikmalarga ham ega bo‘ lishlari kerak. Bu jarayonda esa ta’lim markaziga o‘ quvchining o‘ zi, uning qiziqishlari, ehtiyojlari va individualligi qo‘ yilmoqda. Bu esa o‘ qitish usullarini individualizatsiya qilish, o‘ quvchilarning o‘ zini o‘ zi rivojlantirishiga imkoniyat yaratishga undamoqda. Bu undov an’anaviy ma’ruza va amaliy mashg‘ ulotlardan tashqari, onlayn kurslar, vebinarlar, interaktiv darslar, loyihaviy ta’lim, gamifikatsiya (o‘ yinlashtirish) kabi usullarni keng qo‘ llashni talab etmoqda. Bundan tashqari yuqoridagi faslda ta’kidlanganidek, “meta-fanni o‘ qitish”, “meta-faoliyat”, “meta-mavzu” kabi tushunchalar fanlararo aloqalarni kuchaytirish va universal ko‘ nikmalarni shakllantirishga qaratilmoqda. Bu o‘ quvchilarga bilimlarni yaxlit holda ko‘ rishga va murakkab muammolarni yechishga yordam beradi. Ushbu faoliyatlar o‘ quvchilarda mustaqil o‘ rganish, tanqidiy fikrlash, ijodkorlik, hamkorlik kabi zamonaviy jamiyat talab qiladigan ko‘ nikmalarni shakllantirishga qaratilgan.

Bu o‘ zgarishlar ta’lim tizimini yanada moslashuvchan, shaxsga yo‘ naltirilgan va kelajak talablariga javob beradigan qilishga qaratilgan. Shu o‘ rinda ikki bir-biriga o‘ xshash “shaxsga yo‘ naltirilgan ta’lim” va “shaxsga xos universal ta’limiy faoliyatlar” tushunchalar yonma-yon kelayotganligiga e’tibor qaratdik va ularni pedagogik-psixologik tomondan qiyosiy tahlil qilishni maqsad qilib oldik. Ularga quyida batafsil to‘ xtalamiz.

Adabiyotlar tahlili

Shaxsga yo‘ naltirilgan ta’lim - bu pedagogik ta’limning eng muhim yo‘ nalishlaridan biri bo‘ lib, unda o‘ quvchilarning shaxsi bilim va ko‘ nikmalarni o‘ zlashtirish uchun o‘ quvchilarning individual shaxsiy fazilatlaridan foydalangan holda rivojlanadi. Shaxsga yo‘ naltirilgan yondashuv metodologiyasi uzoq tarixga ega bo‘ lib A.N.Leontev, I.S.Yakimanskaya, K.R.Rojerslar maktabning bola shaxsini shakllantirishga ta’siri haqida ko‘ plab fikr yuritganlar.

Shaxsga yo‘ naltirilgan vaziyatni yaratish haqida so‘ z borganda, ta’limda shaxsga yo‘ naltirilgan ta’limni amalga oshirishga yordam beradigan asosiy vositalardan biri o‘ quvchining shaxsiy tajribasi ekanligini unutmaslik kerak, ya’ni subyekt tomonidan hayotiy vaziyatda xulq-atvor tajribasini anglash, bu individning shaxsiy salohiyatini qo‘ llashni, uning shaxs sifatida namoyon bo‘ lishini talab qiladi. “Shaxs bo‘ lish - bu vaziyatga bog‘ liq bo‘ lmaslik, uni o‘ zgartirishga intilish demakdir” [Serikov V.V., bet.89]. O‘ quvchining shaxsiy tajribasiga murojaat qilish motivatsiyaga tubdan ta’sir qiladi, chunki o‘ quvchining motivi va shaxsiy pozitsiyasiga u tomonidan olingan bilimlarning chuqurligi va mustahkamligi bog‘ liqdir.

Shuni ta’kidlash kerakki, ta’limning shakllangan uslubidan shaxsga yo‘ naltirilganga o‘ tish qisqa vaqt talab etmaydi. Turli texnologiyalar va ish tashkil etish shakllarini muntazam ravishda qo‘ llab, o‘ qituvchi dars tashkil etish uchun o‘ zi uchun ma’qul bo‘ lgan texnologiyalarni asta-sekin aniqlaydi, ulardan eng samaralilarini ajratib ko‘ rsatadi va vaqt o‘ tishi bilan buyruq uslubidan o‘ quvchilar bilan hamkorlik qilish uslubiga o‘ tadi.

N.A.Alekseyev o‘ z konsepsiyasining asosiga hodisaviylik prinsipini qo‘ yadi va “o‘ qitish hodisasi” tushunchasini “birga bo‘ lish” ma’nosida “shaxsga yo‘ naltirilgan o‘ qitish jarayoni” tushunchasiga aynan o‘ xshash deb ta’kidlaydi. “O‘ qitish hodisasi” deganda o‘ qituvchi va o‘ quvchining bilish vaziyatida birgalikda bo‘ lishi tushuniladi.

Tahlil va natijalar

Shaxsga yo‘ naltirilgan ta’limning muhim tarkibiy qismi o‘ quvchi faoliyatining natijalari emas, balki o‘ quv jarayonini tahlil qilishdir. Bunda o‘ quvchining pozitsiyasi o‘ zgaradi - tirishqoq ijrodan faol ijodga, uning fikrlashi boshqacha, refleksiv, natijaga yo‘ naltirilgan bo‘ ladi.

Axborot maydonining rivojlanishi ta’limning faktologik, mazmunli qismini o‘ quvchilar uchun yanada ochiqroq qilgan zamonaviy dunyoda o‘ qituvchining asosiy vazifasi o‘ zgarmoqda ya’ni o‘ quvchini bilim bilan ta’minlash o‘ rniga, uni mustaqil ravishda bilimlarni o‘ zlashtirish uchun ko‘ nikmalar va usullar to‘ plami bilan qurollantirishi kerak. O‘ qituvchi, avvalambor, har bir o‘ quvchiga o‘ zini anglash imkonini beradigan individual o‘ qitish uslubini topishga yordam berishi kerak. Ta’limning boshlang‘ ich bosqichini tugatgunga qadar o‘ quvchilar kerakli ma’lumotlarni qidirish strategiyalarini bilishlari, savollar berishni va ularga javob olishni bilishlari, mustaqil va tengdoshlari bilan hamkorlikda ishlashlari, o‘ z o‘ qishlarini rejalashtirishlari va o‘ zlari uchun muhim natijalarga erishishlari kerak.

Ba’zi o‘ qituvchilarda bunday murakkab vazifani bajarish, ayniqsa, gavjum sinflarda ularning kuchidan tashqari bo‘ lishi mumkinligi haqida xavotirlar paydo bo‘ lishi mumkin. Yaxshi yangilik shundaki, boshlang‘ ich sinflarda o‘ qish -

bu o‘ qituvchiga o‘ qitish usullarini tanlashda yetarli miqdorda erkinlik beradigan va shu bilan birga har bir o‘ quvchining qiziqish sohasini aniqlashga imkon beradigan ta’lim sohasidir. Ona tili darslarida sinf ishini tashkil etish usullaridan ba’zilarini qo‘ llagan holda, o‘ qituvchilar ulardan eng muvaffaqiyatlilarini ajratib ko‘ rsatishlari va kelajakda ularni boshqa predmet fanlariga “eksport” qilishlari mumkin.

Ko‘ p yillik amaliyot shuni ko‘ rsatadiki, o‘ qituvchi ta’limning boshlang‘ ich bosqichida kelgusi ta’lim uchun asos bo‘ ladigan yaxshi bilimlarni berishi, o‘ zini o‘ zi bilish qobiliyatini, o‘ z individualligini tushunishni rivojlantirishi, o‘ qish va o‘ zini-o‘ zi rivojlantirishga bo‘ lgan ehtiyojni shakllantirishi kerak. Shaxsga yo‘ naltirilgan ta’limning maqsadi yagona sinf jamoasida har bir o‘ quvchi bilan alohida o‘ quv imkoniyatlari, ehtiyojlari va qiziqishlarini hisobga olgan holda ishlashga imkon beradigan psixologik-pedagogik sharoitlar tizimini yaratishdan iborat.

UTF - bu boshlang‘ ich sinfda barcha darslarda shakllantirilishi kerak bo‘ lgan faoliyatlar va ularni to‘ rtta asosiy blokga guruhlash mumkin: shaxsga xos, regulyativ, kognitiv va kommunikativ. Bugungi kunda o‘ qituvchidan o‘ quvchiga oddiy bilim, ko‘ nikma va malakalarni o‘ tkazish o‘ rniga, maktab ta’limining ustuvor maqsadi o‘ quvchining mustaqil ravishda o‘ quv maqsadlarini qo‘ yish, ularni amalga oshirish yo‘ llarini loyihalash, o‘ z yutuqlarini nazorat qilish va baholash qobiliyatini rivojlantirishga aylanadi, boshqacha qilib aytganda - o‘ qish qobiliyatini shakllantirish ya’ni, o‘ quvchining o‘ zi ta’lim jarayonining “arxitektori va quruvchisi” bo‘ lishi kerak.

Xulosalar

Shunday qilib, boshlang‘ ich sinf o‘ quvchilarini o‘ qitishda qiyinchiliklarning psixologik sabablari o‘ quv faoliyatining funksional bloklarining shakllanmaganligi bo‘ lishi mumkin: motivatsion blok - harakat maqsadini ajratish, anglash, qabul qilish (regulyativ UTF) qobiliyati yo‘ qligi, shuningdek maktab o‘ quvchisining o‘ quv-bilish qiziqishlarining yo‘ qligi (shaxsga xos UTF); yo‘ naltiruvchi blok - faoliyat jarayonining motivatsiyasini ushbu jarayonning aniq yo‘ nalishini o‘ zgartirolmaydi, maqsadga erishishda va harakat rejasini, dasturini, texnologiyasini ishlab chiqishda namoyon bo‘ ladi (regulyativ UTF); operatsion blok - o‘ quvchilarda ontogenezda psixika oladigan yetarli operatsion imkoniyatlar mavjud emasligi va ko‘ nikmalar, malakalar, odatlar, mahoratda ifodalanishi (kognitiv UTF); energetik blok - o‘ qishga intilish, irodaviy faollik, darslarda e’tiborlilik mavjud emasligi (shaxsga xos UTF), shuningdek xotiradan ma’lumot olishning yo‘ qligi (kognitiv UTF); baholash bloki - harakatni nazorat qilish va uni bajarish jarayonida zarur tuzatishlar kiritish qobiliyati yo‘ qligi (regulyativ UTF). Xo‘ sh, “o‘ quv faoliyatini shakllantirish nimani anglatadi”? Bu bilan biz o‘ quv faoliyatining funksional bloklarida yetishmayotgan tarkibiy qismlarni va ularning o‘ zaro bog‘ liqligini shakllantirishni (korrektsiyalashni), va buning pirovardida - “faoliyatning psixologik tizimini shakllantirish” [Shadrikov V. D. Kasbiy faoliyatning sistemogenez muammolari. M.: Fan, 1982. 184 b.] yaxlit ta’lim sifatida tushunamiz.

Shaxsga xos UTF quyidagilarni ta’minlaydi: – shaxsiy, kasbiy, hayotiy o‘ zini o‘ zi belgilash, ma’no hosil qilish, ya’ni o‘ quvchilarning o‘ quv faoliyatining maqsadi va uning motivi o‘ rtasida ijtimoiy va shaxsiy qadriyatlardan kelib chiqib javob topa olishi kerak.

Shaxsga xos UTF o‘ quvchilarning qadriyat-ma’noviy yo‘ nalishini ta’minlaydi (faoliyatlar va voqealarni qabul qilingan axloqiy tamoyillar bilan bog‘ lash qobiliyati, axloqiy me’yorlarni bilish va xulq-atvorning axloqiy jihatini ajratish qobiliyati), shuningdek ijtimoiy rollar va shaxslararo munosabatlarda yo‘ nalish.

Shaxsga xos universal ta’limiy faoliyatlari - bu shaxsga yo‘ naltirilgan ta’lim doirasida shakllantirilishi kerak bo‘ lgan aniq ko‘ nikmalar va qobiliyatlar. Shaxsga xos universal ta’limiy faoliyatlari o‘ quvchiga o‘ z qadriyatlarini, motivlarini, maqsadlarini aniqlashga, axloqiy me’yorlarga rioya qilishga, o‘ zini o‘ zi baholashga va jamiyatda o‘ z o‘ rnini topishga yordam beradi. Shaxsga xos universal ta’limiy faoliyatlari - bu o‘ quvchining shaxsiy rivojlanishiga bevosita ta’sir qiladigan “vosita” desak ham bo‘ ladi. Shaxsga yo‘ naltirilgan ta’lim va shaxsga xos universal ta’limiy faoliyatlar zamonaviy pedagogikada o‘ quvchining shaxsini har tomonlama rivojlantirishga qaratilgan bir-birini uzviy to‘ ldiruvchi yondashuvlardir. Ularning nazariy-qiyosiy tahlili shuni ko‘ rsatadiki, shaxsga yo‘ naltirilgan ta’lim ta’lim jarayonining gumanistik, falsafiy va shaxsiy xususiyatlariga ustuvorlik qaratib, o‘ quvchining sub’ekt sifatidagi mavqei, individual qobiliyatlari hamda hayotiy tajribasini birinchi o‘ ringa qo‘ yadi. Shaxsga xos universal ta’limiy faoliyatlar esa o‘ quvchining mustaqil ravishda bilim olishi, o‘ z-o‘ zini rivojlantirishi va har qanday o‘ zgaruvchan muhitda zarur bo‘ lgan universal ko‘ nikmalarni shakllantirishning aniq faoliyatli hamda texnologik mexanizmi vazifasini bajaradi. Agar birinchi yondashuv ta’lim jarayonini o‘ quvchining ichki salohiyatiga moslashtirishga xizmat qilsa, ikkinchi yondashuv shu jarayonni amalga oshirishda kerak bo‘ ladigan amaliy usullar va kompetensiyalar tizimini ta’minlaydi. Shu bois, muvaffaqiyatli ta’lim tizimi faqatgina shaxsni hurmat qilish bilan cheklanib qolmay, balki uni amalda qo‘ llash uchun zarur bo‘ lgan universal faoliyat usullarini egallash bilan birgalikda to‘ laqonli natija beradi.

ShYTa - bu me’morning shaharsozlikka bo‘ lgan umumiy qarashi (shaharni qulay, yashashga mos va estetik jihatdan chiroyli qilish), ShUTF esa me’morning binolarni loyihalashda qo‘ llaniladigan aniq chizmalari va texnik xususiyatlari (binoning mustahkam, funktsional va qulay bo‘ lishini ta’minlash)ga o‘ xshaydi.

Shaxsga yo‘ naltirilgan ta’lim va shaxsga xos universal ta’limiy faoliyatlarining farqi qisqacha qilib aytganda, shaxsga yo‘ naltirilgan ta’lim - bu falsafa, shaxsga xos universal ta’limiy faoliyatlari - bu esa ushbu falsafani amalga oshirish uchun ishlatiladigan aniq faoliyatlardir.

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BO‘ LAJAK PEDAGOGLARDA G‘ OYAVIY-MAFKURAVIY KOMPETENTLIKNI RIVOJLANTIRISH PEDAGOGIK MUAMMO SIFATIDA

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Annotatsiya: *Maqolada bo‘ lajak pedagoglarda g‘ oyaviy-mafkuraviy kompetentlikni rivojlantirish masalasi mustaqil pedagogik muammo sifatida tahlil qilinadi. Muallif mazkur kompetentlikni muayyan qarashlar majmuini qabul qilish emas, balki g‘ oyaviy mazmunni tushunish, tahlil qilish, baholash va o‘ quvchilarning dunyoqarashi shakllanishiga pedagogik ko‘ mak ko‘ rsatish qobiliyati sifatida talqin qiladi. Tadqiqotda kompetentlikning besh komponentli tuzilmasi asoslanib, muammoning to‘ rt qiyinchiligi – tushuncha noaniqligi, indoktrinatsiya xavfi, baholash murakkabligi va deklarativ hamda real daraja o‘ rtasidagi uzilish – aniqlanadi. Shuningdek, samarasiz yondashuvlarning tipologiyasi yaratilib, ta’lim va indoktrinatsiyani farqlashning to‘ rt mezoni shakllantiriladi. Xulosada kompetentlik tayyor xulosalarni uzatish emas, mustaqil tahlil qobiliyatini shakllantirish orqali rivojlanishi asoslab beriladi.*

Kalit so‘ zlar: *g‘ oyaviy-mafkuraviy kompetentlik, bo‘ lajak pedagog, dunyoqarash, indoktrinatsiya, tanqidiy tahlil, mafkuraviy immunitet, bahsli masalalar, qadriyatlar tarbiyasi, pedagogik muammo, oliy pedagogik ta’lim.*

РАЗВИТИЕ ИДЕЙНО-МИРОВОЗЗРЕНЧЕСКОЙ КОМПЕТЕНТНОСТИ У БУДУЩИХ ПЕДАГОГОВ КАК ПЕДАГОГИЧЕСКАЯ ПРОБЛЕМА

Аннотация: *В статье проблема развития идейно-мировоззренческой компетентности у будущих педагогов анализируется как самостоятельная педагогическая проблема. Автор интерпретирует данную компетентность не как принятие определённой совокупности взглядов, а как способность понимать, анализировать и оценивать идейное содержание и оказывать педагогическую поддержку формированию мировоззрения учащихся. Обосновывается пятикомпонентная структура компетентности, выявляются четыре трудности проблемы – понятийная неопределённость, риск индоктринации, сложность оценивания и разрыв между декларативным и реальным уровнями. Создаётся типология неэффективных подходов, формулируются четыре критерия разграничения образования и индоктринации. В заключении обосновывается, что компетентность развивается не передачей готовых выводов, а формированием способности к самостоятельному анализу.*

Ключевые слова: *идейно-мировоззренческая компетентность, будущий педагог, мировоззрение, индоктринация, критический анализ, идеологический иммунитет, спорные вопросы, воспитание ценностей, педагогическая проблема, высшее педагогическое образование.*

DEVELOPING IDEOLOGICAL AND WORLDVIEW COMPETENCE IN FUTURE TEACHERS AS A PEDAGOGICAL PROBLEM

Annotation: *The article analyses the development of ideological and worldview competence in future teachers as an independent pedagogical problem. The author interprets this competence not as the acceptance of a particular set of views but as the ability to understand, analyse and evaluate ideological content and to provide pedagogical support for the formation of pupils’ worldview. A five-component structure of the competence is substantiated, and four difficulties of the problem are identified: conceptual vagueness, the risk of indoctrination, the complexity of assessment, and the gap between the declarative and the real level. A typology of ineffective approaches is created, and four criteria distinguishing education from indoctrination are formulated. In conclusion, it is substantiated that the competence develops not through the transmission of ready-made conclusions but through the formation of the capacity for independent analysis.*

Keywords: *ideological and worldview competence, future teacher, worldview, indoctrination, critical analysis, ideological immunity, controversial issues, value education, pedagogical problem, higher pedagogical education.*

KIRISH

Zamonaviy axborot muhitining asosiy xususiyati shundaki, unda turli g‘ oyaviy oqimlar yoshlarga bevosita, hech qanday oraliq bosqichsiz yetib boradi. Ilgari dunyoqarashning shakllanishi oila, maktab va mahalliy jamoa kabi nisbatan cheklangan manbalar orqali kechgan bo‘ lsa, bugun o‘ smir bir vaqtning o‘ zida bir-biriga zid ko‘ plab qarashlar bilan to‘ qnash keladi. Mazkur holat o‘ qituvchining rolini o‘ zgartiradi: u endi yagona yoki asosiy axborot manbai emas, balki o‘ quvchiga mazkur oqimda yo‘ nalish olishga yordam beruvchi shaxsdir. Bu vazifa esa undan maxsus kasbiy tayyorgarlikni talab qiladi.

G‘ oyaviy-mafkuraviy kompetentlik deganda mazkur tadqiqotda pedagogning g‘ oyaviy mazmunga ega matn va hodisalarni tushunish, ularni tahlil qilish va baholash, o‘ z qadriyatli pozitsiyasini asoslay olish hamda o‘ quvchilarning dunyoqarashi mustaqil shakllanishiga pedagogik ko‘ mak ko‘ rsatish qobiliyatlarining yaxlit birligi tushuniladi. Ushbu ta’rifning muhim jihati shundaki, u kompetentlikni muayyan qarashlar majmuini qabul qilish bilan tenglashtirmaydi. Pedagog muayyan pozitsiyaga ega bo‘ lishi tabiiy, biroq uning kasbiy kompetentligi pozitsiyasining mazmunida emas, u bilan ishlash usulida namoyon bo‘ ladi.

Mazkur masalaning pedagogik muammo maqomida ko‘ rib chiqilishi tasodifiy emas. Vazifa va muammo tushunchalari pedagogikada farqlanadi: vazifa yechimi ma’lum, faqat bajarilishi kerak bo‘ lgan topshiriqdir; muammo esa yechimi oldindan ma’lum bo‘ lmagan, qarama-qarshi talablarni o‘ z ichiga olgan holatdir. G‘ oyaviy-mafkuraviy kompetentlikni rivojlantirish aynan ikkinchi turga mansub, zero u bir-biriga zid ikki talabni birlashtiradi: bir tomondan, yoshlarda barqaror qadriyatli pozitsiyani shakllantirish, boshqa tomondan, ularning mustaqil fikrlash erkinligini saqlash.

Mazkur ziddiyat masalaning o‘ zagini tashkil etadi. Agar ta’lim jarayoni tayyor xulosalarni o‘ zlashtirishga yo‘ naltirilsa, u shakllantirilgan pozitsiyaning barqarorligini ta’minlamaydi: tashqi bosim ostida qabul qilingan qarash birinchi jiddiy sinovda yemiriladi va ko‘ pincha teskari ta’sir beradi. Agar jarayon faqat tanqidiy tahlilga yo‘ naltirilsa va hech qanday qadriyatli yo‘ nalish berilmasa, u shaxsni qadriyatli bepushtlik holatiga olib kelishi mumkin. Haqiqiy kompetentlik esa aynan ikki chekkadan ham uzoqdagi pozitsiyani – asoslangan va shu sababli barqaror ishonchni – nazarda tutadi.

Mazkur maqolaning maqsadi bo‘ lajak pedagoglarda g‘ oyaviy-mafkuraviy kompetentlikni rivojlantirish masalasining pedagogik muammo sifatidagi mohiyatini ochib berish va uning asosiy qiyinchiliklarini aniqlashdan iborat. Tadqiqot obyekti oliy pedagogik ta’lim muassasalarida bo‘ lajak pedagoglarning kasbiy tayyorgarligi jarayoni, predmeti esa g‘ oyaviy-mafkuraviy kompetentlikni rivojlantirishning muammoli jihatlaridir. Ishning ilmiy yangiligi kompetentlikning besh komponentli tuzilmasini asoslash, muammoning to‘ rt qiyinchiligini aniqlash hamda ta’lim va indoktrinatsiyani farqlashning to‘ rt mezonini shakllantirishdan iborat.

ADABIYOTLAR TAHLILI

Dunyoqarashning shakllanish mexanizmlari ijtimoiy nazariyada chuqur tadqiq etilgan. P.Berger va T.Lukman voqelikning ijtimoiy qurilishiga bag‘ ishlangan ishida shaxsning dunyoqarashi birlamchi va ikkilamchi ijtimoiylashuv jarayonlarida shakllanishini asoslab, birlamchi bosqichda o‘ zlashtirilgan tasavvurlar keyinchalik o‘ zgartirilishi ancha qiyin ekanini ko‘ rsatishgan. Ularning tahlilidan muhim pedagogik xulosa kelib chiqadi: oliy ta’lim bosqichida ish allaqachon shakllangan tasavvurlar bilan olib boriladi va shu sababli yangi bilim uzatish emas, mavjud tasavvurlarni qayta ko‘ rib chiqish vazifasi birinchi o‘ ringa chiqadi.

Yopiq va ochiq fikrlash tizimlari masalasi alohida yo‘ nalishni tashkil etadi. T.Adorno va hammualliflari avtoritar shaxs tadqiqotida qat’iy ierarxik tafakkurning psixologik asoslarini o‘ rgangan. M.Rokich ochiq va yopiq ong haqidagi ishida dogmatizmni muayyan g‘ oyaning mazmuni bilan emas, ishonchlar tizimining tuzilishi bilan bog‘ lagan: yopiq tizimga ega shaxs o‘ z qarashiga zid axborotni qabul qilmaydi va muqobil pozitsiyani tushunishga urinmaydi. Mazkur yondashuv pedagogik ish uchun hal qiluvchi ahamiyatga ega, zero u diqqatni qarashning mazmunidan uning tuzilishiga ko‘ chiradi.

Ta’lim va indoktrinatsiyani farqlash masalasi ta’lim falsafasida keskin bahsga sabab bo‘ lgan. R.S.Piters ta’lim tushunchasining o‘ zi tahlil qilinib, uning mantiqiy belgilari orasida o‘ quvchining ongli ishtiroki va bilimning asoslanish usuli muhim o‘ rin egallashini ko‘ rsatgan. I.A.Snuk indoktrinatsiyani maxsus tadqiq etib, uni usul, mazmun yoki niyat bo‘ yicha aniqlash mumkinligini ko‘ rib chiqqan va niyat mezonining ustunligini asoslagan. H.Siegel esa tanqidiy ratsionallikni ta’limning asosiy ideali sifatida ko‘ rsatib, dalilga asoslangan fikrlashni shaxs avtonomiyasining sharti deb bilgan.

Fuqarolik va qadriyat tarbiyasining zamonaviy talqinlari ham ahamiyatlidir. F.Vaynert kompetensiya tushunchasini aniqlashtirib, uni murakkab talablarni bajarishga imkon beruvchi kognitiv va motivatsion resurslar tizimi sifatida ta’riflagan. J.Vestxaymer va J.Keyn fuqaro tarbiyasining uch modelini – mas’uliyatli, ishtirok etuvchi va adolat uchun yo‘ naltirilgan fuqaro modellarini – ajratib, ular turli ta’lim natijalariga olib kelishini ko‘ rsatishgan. D.Hess esa bahsli masalalarni sinfda muhokama qilish masalasini tadqiq etib, bunday muhokamaning ta’limiy salohiyatini asoslagan.

Ko‘ rib chiqilgan manbalarning umumlashtirilgan tahlili shuni ko‘ rsatadi, mavzuning nazariy jihatlari yetarlicha yoritilgan, ammo uni aynan pedagogik muammo sifatida tahlil qilish, ya’ni muammoning tarkibiy qiyinchiliklarini,

amaliyotdagi samarasiz yondashuv turlarini va ta’lim bilan indoktrinatsiya o‘ rtasidagi amaliy chegarani belgilash masalasi alohida tadqiqot predmeti bo‘ lgan emas. Mavjud ishlarda yondashuvlar ko‘ pincha nazariy darajada qiyoslanadi, kasbiy pedagogik tayyorgarlik sharoitidagi aniq ziddiyatlar esa ochib berilmaydi. Mazkur maqolada tahlil aynan shu yo‘ nalishda olib boriladi.

TADQIQOT METODOLOGIYASI

Tadqiqotning metodologik asosini kompetensiyaviy va aksiologik yondashuvlarning uyg‘ unligi tashkil etadi. Kompetensiyaviy yondashuv g‘ oyaviy-mafkuraviy tayyorgarlikni bilimlar yig‘ indisi sifatida emas, aniq vaziyatlarda namoyon bo‘ ladigan qobiliyat sifatida ko‘ rib chiqish imkonini berdi; mazkur talqinda baholash predmeti talabaning bilimi emas, uning g‘ oyaviy mazmunga ega material bilan ishlash usulidir. Aksiologik yondashuv esa kompetentlikning qadriyatli o‘ zagini ajratishga xizmat qildi.

Ishda tushunchalarni tahlil qilish, qiyosiy tahlil, tipologik tahlil hamda analiz va sintez usullari qo‘ llanildi. Tushunchalarni tahlil qilish usuli g‘ oya, mafkura, dunyoqarash va e’tiqod atamalarining mazmunini aniqlashtirish va ular o‘ rtasidagi chegaralarni belgilashga yo‘ naltirildi, zero mazkur atamalarning chalkashtirilishi muammoni aniq qo‘ yishga to‘ sqinlik qiladi. Tipologik tahlil esa amaliyotdagi samarasiz yondashuvlarni guruhlarga ajratish va ularning umumiy belgilarini aniqlashda qo‘ llanildi.

TAHLIL VA NATIJALAR

Olib borilgan tahlil natijasida g‘ oyaviy-mafkuraviy kompetentlikning besh komponentli tuzilmasi asoslandi. Gnoseologik komponent g‘ oya, mafkura va dunyoqarash tushunchalarining mohiyati, ularning shakllanish qonuniyatlari haqidagi bilimlarni qamrab oladi. Analitik komponent matn va hodisalardagi g‘ oyaviy mazmunni ajratish, uning dalillarini baholash va manipulyativ usullarni tanib olish qobiliyatidan iborat. Aksiologik komponent shaxsning o‘ z qadriyatli pozitsiyasi va uni asoslay olishini ifodalaydi. Kommunikativ komponent zid qarashlar sharoitida muloqot olib borish ko‘ nikmasini bildiradi. Metodik komponent esa o‘ quvchilar bilan ishlash usullarini egallashni nazarda tutadi.

Ikkinchi natija muammoning to‘ rt qiyinchiligini aniqlashdan iborat. Birinchi qiyinchilik tushuncha noaniqligi bilan bog‘ liq: amaliyotda g‘ oya, mafkura, dunyoqarash va e’tiqod atamalari ko‘ pincha farqlanmasdan qo‘ llanadi, natijada pedagogik maqsad aniq belgilanmaydi. Ikkinchi qiyinchilik indoktrinatsiya xavfidir. Uchinchi qiyinchilik baholashning murakkabligida: shaxsning haqiqiy pozitsiyasi so‘ rovnoma yoki imtihon javobi orqali ishonchli aniqlanmaydi, zero baholash holatida ijtimoiy ma’qullanadigan javob berish moyilligi kuchli bo‘ ladi. To‘ rtinchi qiyinchilik deklarativ va real daraja o‘ rtasidagi uzilishdir.

Uchinchi natija amaliyotdagi samarasiz yondashuvlarning tipologiyasini yaratish bilan bog‘ liq. Deklarativ tip tarbiyaviy ishni tayyor qoidalarni e’lon qilishga qisqartiradi; bunda talaba to‘ g‘ ri javobni biladi, lekin uni asoslay olmaydi. Taqiqlovchi tip asosiy e’tiborni nomaqbul g‘ oyalarni sanab o‘ tishga qaratadi va ularning qanday ishlashini tahlil qilmaydi, natijada talaba notanish shakldagi ta’sirni tanimaydi. Rasmiy-tadbirli tip ishni soni bilan o‘ lchanadigan tadbirlarga aylantiradi. Qo‘ rqitish tipi esa tahdid obrazini kuchaytirish orqali ta’sir ko‘ rsatishga urinadi va ko‘ pincha teskari qiziqish uyg‘ otadi.

To‘ rtinchi natija ta’lim va indoktrinatsiyani farqlashning to‘ rt mezonini shakllantirishdan iborat. Birinchi mezon – asoslash usuli: ta’limda xulosa dalil bilan, indoktrinatsiyada esa obro‘ yoki hissiy bosim bilan qabul qildiriladi. Ikkinchi mezon – muqobilga munosabat: ta’lim muqobil qarashni ochiq ko‘ rib chiqadi va uning kuchli tomonlarini ham ko‘ rsatadi, indoktrinatsiya esa uni buzib yoki eng zaif shaklda taqdim etadi. Uchinchi mezon – savolga munosabat: ta’limda savol rag‘ batlantiriladi, indoktrinatsiyada u sodiqlikka shubha sifatida qabul qilinadi. To‘ rtinchi mezon – natija: ta’lim mustaqil fikrlash qobiliyatini oshiradi.

Beshinchi natija muammoni hal qilish yo‘ nalishlarini aniqlash bilan bog‘ liq. Tadqiqot uch yo‘ nalishni asoslab berdi. Birinchi yo‘ nalish – diqqatni g‘ oya mazmunidan uning ishlash mexanizmiga ko‘ chirish: talaba muayyan g‘ oyalar ro‘ yxatini emas, ta’sir usullarini – hissiy manipulyatsiya, soddalashtirish, dushman obrazini yaratish, tanlangan faktlarni ko‘ rsatish usullarini – tanishni o‘ rganishi lozim. Ikkinchi yo‘ nalish – bahsli masalalarni ochiq muhokama qilish amaliyotini joriy etish. Uchinchi yo‘ nalish – o‘ z pozitsiyasini asoslash ko‘ nikmasini muntazam mashq qilish, zero asoslanmagan ishonch barqaror bo‘ lmaydi.

Aniqlangan qiyinchiliklarning o‘ zaro bog‘ liqligi alohida e’tiborga loyiqdir. Tushuncha noaniqligi baholash mezonlarining noaniqligini keltirib chiqaradi; mezon aniq bo‘ lmasa, pedagog ish natijasini qatnashuvchilar soni bilan o‘ lchashga majbur bo‘ ladi; bu esa tadbir shaklidagi ishni ustun qo‘ yadi va natijada talabada tahlil qobiliyati emas, rasmiy muvofiqlik ko‘ nikmasi shakllanadi. Shu zanjir muammoning takrorlanuvchi tabiatini tushuntiradi: har bir bog‘ in keyingisini mustahkamlaydi. Zanjirni uzish nuqtasi esa boshida joylashgan — tushunchani va baholash obyektini aniqlashtirishda.

MUHOKAMA

Ta’lim jarayonida qadriyatlarni shakllantirishning maqbul chegaralari masalasi ta’lim falsafasida keskin polemikaga sabab bo‘ lgan. Bahsning bir qutbida R.S.Piters va I.A.Snuk asos solgan an’ana turadi. Piters ta’lim tushunchasining

mantiqiy tahlilida uni shunchaki o‘ zgartirish jarayoni emas, o‘ quvchining ongli ishtiroki va bilimning asoslanishini nazarda tutuvchi faoliyat sifatida ko‘ radi. Snuk esa indoktrinatsiyaning asosiy belgisini niyatda ko‘ rib, o‘ qituvchining o‘ quvchida muayyan ishonchni dalildan qat’i nazar shakllantirish maqsadini qo‘ yishini hal qiluvchi mezon deb biladi.

Mazkur pozitsiyaga qarshi e’tiroz ham mavjud va u jiddiydir. Uning mohiyati shundaki, har qanday ta’lim muqarrar ravishda muayyan qadriyatlarni uzatadi: o‘ quv rejasining tuzilishi, material tanlovi, baholash mezonlari va hatto o‘ qituvchining ohangi muayyan ustuvorliklarni ifodalaydi. Demak, qadriyatlardan xoli, butunlay betaraf ta’lim mavjud emas va betaraflikka da’vo qilish aslida mavjud ustuvorliklarni yashirishdan iborat. Bu e’tiroz Piters va Snukning pozitsiyasini butunlay inkor etmaydi, biroq masalani qayta qo‘ yadi: savol qadriyat uzatiladimi yoki yo‘ qmi degan savol emas, u qanday uzatilishi haqidagi savoldir.

H.Siegel va D.Hessning qarashlari mazkur savolga javob beradi. Siegel tanqidiy ratsionallikni ta’limning asosiy ideali sifatida ko‘ rsatadi: o‘ quvchida shakllantirilishi lozim bo‘ lgan asosiy sifat muayyan ishonch emas, dalilga asoslanib fikr yuritish moyilligidir. Hess esa bahsli masalalarni sinfda ochiq muhokama qilish amaliyotini asoslab, bunday muhokama o‘ quvchini turli pozitsiyalar bilan tanishtiradi va ularni qiyoslashga o‘ rgatadi. Mazkur ikki yondashuvning birikuvi Piters va Snuk qo‘ ygan talabni amalda bajarish yo‘ lini ko‘ rsatadi: qadriyat uzatiladi, biroq u dalil va muhokama orqali, o‘ quvchining ongli ishtiroki bilan uzatiladi.

XULOSA

Olib borilgan tadqiqot g‘ oyaviy-mafkuraviy kompetentlikni rivojlantirish oddiy pedagogik vazifa emas, mustaqil muammo ekanini asoslab berdi. Muammoning o‘ zagi ikki zid talabning birlashtirilishida yotadi: barqaror qadriyatli pozitsiyani shakllantirish va ayni paytda mustaqil fikrlash erkinligini saqlash. Mazkur ziddiyat chetlab o‘ tilmaydi va uni tan olmaslik amaliy xatolarga olib keladi.

Kompetentlikning gnoseologik, analitik, aksiologik, kommunikativ va metodik komponentlardan iborat tuzilmasi asoslanib, muammoning to‘ rt qiyinchiligi – tushuncha noaniqligi, indoktrinatsiya xavfi, baholash murakkabligi va deklarativ hamda real daraja o‘ rtasidagi uzilish – aniqlandi. Samarasiz yondashuvlarning to‘ rt tipi – deklarativ, taqiqlovchi, rasmiy-tadbirli va qo‘ rqituvchi tiplar – tavsiflandi.

Ta’lim va indoktrinatsiyani farqlashning to‘ rt mezoni – asoslash usuli, muqobilga munosabat, savolga munosabat va natija – shakllantirildi. Yakuniy xulosa sifatida shuni ta’kidlash lozimki, tayyor xulosalarni uzatish orqali shakllantirilgan pozitsiya barqaror bo‘ lmaydi: u birinchi jiddiy sinovda yemiriladi. Barqaror pozitsiya esa faqat mustaqil tahlil va asoslash tajribasi orqali tarkib topadi, demak g‘ oyaviy-mafkuraviy kompetentlikni rivojlantirishning asosiy yo‘ li aynan shu tajribani tashkil etishdan iborat.

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BOSHLANG‘ ICH SINFLARDA AXBOROT TEXNOLOGIYALARI FANINI O‘ QITISH UCHUN TAKOMILLASHTIRILGAN DASTURIY TA’MINOTNI JORIY ETISH METODIKASI

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Annotatsiya: *Mazkur maqolada raqamlashtirish sharoitida boshlang‘ ich sinflarda axborot texnologiyalari fanini o‘ qitishning takomillashtirilgan dasturiy ta’minotini joriy etish metodikasi yoritilgan. Unda dasturiy ta’minotni joriy etishning tahlil qilish, rejalashtirish, amalga oshirish, monitoring va ta’lim natijalarini baholash bosqichlari asoslangan. Shuningdek, ta’lim jarayonida raqamli platforma, integratsiyalashgan yondashuv hamda Case-study, SMART, SWOT va INSERT metodlaridan foydalanish imkoniyatlari tahlil qilingan. Taklif etilgan metodika bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarining raqamli kompetensiyalarini rivojlantirish, mustaqil va ijodiy faolligini oshirish hamda ta’lim samaradorligini ta’minlashga yo‘ naltirilgan.*

Kalit so‘ zlar: *raqamlashtirish, boshlang‘ ich ta’lim, axborot texnologiyalari, dasturiy ta’minot, raqamli ta’lim platformasi.*

МЕТОДИКА ВНЕДРЕНИЯ УСОВЕРШЕНСТВОВАННОГО ПРОГРАММНОГО ОБЕСПЕЧЕНИЯ ДЛЯ ОБУЧЕНИЯ ИНФОРМАЦИОННЫМ ТЕХНОЛОГИЯМ В НАЧАЛЬНЫХ КЛАССАХ

Аннотация: *В статье описывается методика внедрения передового программного обеспечения для обучения информационным технологиям в начальной школе в условиях цифровизации. Она базируется на этапах внедрения программного обеспечения: анализе, планировании, реализации, мониторинге и оценке образовательных результатов. Также анализируются возможности использования цифровой платформы, комплексного подхода и таких методов, как кейс-стади (case-study), SMART, SWOT и INSERT, в образовательном процессе. Предлагаемая методика направлена на развитие цифровых компетенций будущих учителей начальных классов, повышение их самостоятельной и творческой активности, а также на обеспечение эффективности обучения.*

Ключевые слова: *цифровизация, начальное образование, информационные технологии, программное обеспечение, цифровая образовательная платформа.*

METHODOLOGY FOR IMPLEMENTING IMPROVED SOFTWARE FOR TEACHING THE SUBJECT OF INFORMATION TECHNOLOGIES IN PRIMARY GRADES

Abstract: *This article describes the methodology for implementing improved software for teaching the subject of information technologies in primary grades in the context of digitalization. It substantiates the stages of software implementation: analysis, planning, implementation, monitoring, and assessment of educational outcomes. The article also analyzes the possibilities of using a digital platform, an integrated approach, and the Case-study, SMART, SWOT, and INSERT methods in the educational process. The proposed methodology is aimed at developing the digital competencies of future primary school teachers, increasing their independent and creative activity, and ensuring the effectiveness of education.*

Keywords: *digitalization, primary education, information technologies, software, digital educational platform.*

Raqamli texnologiyalar rivojlanayotgan hozirgi sharoitda turli fanlar, shu jumladan, “BSAT” fanini o‘ qitish metodikasini takomillashtirish davr talabiga aylandi. Yangi texnik va dasturiy vositalarning paydo bo‘ lishi esa o‘ qitish usullarini o‘ zgartirishga, reproduktiv ta’limdan produktiv ta’limga, unifitsik yondashuvdan ta’limni individuallashtirishga sharoit yaratmoqda.

Raqamlashtirish sharoitida “BSAT” fanining takomillashtirilgan dasturiy ta’minotini joriy etish metodikasi – bu ushbu fanni o‘ qitish samaradorligini oshirish va bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarining raqamli bilimlarini rivojlantirish maqsadida yangi yoki yangilangan dasturiy ta’minotni boshlang‘ ich ta’lim amaliyotiga integratsiya qilishga qaratilgan tizimli va ilmiy asoslangan yondashuv.

“BSAT” fanining takomillashtirilgan dasturiy ta’minotini joriy etish metodikasi ko‘ p bosqichli jarayon bo‘ lib, u quyidagi asosiy jihatlarni e’tiborga olinishini talab qiladi:

I. Tahlil qilish va asoslash.

1. “Joriy holat tahlilini o‘ tkazish va asoslash”: ta’lim muassasasining boshlang‘ ich ta’lim axborot texnologiyalari infratuzilmasining joriy darajasini baholash, jarayonda foydalanilayotgan dasturiy ta’minot, pedagog va talabalarning raqamli kompetensiyasi darajasi, shuningdek, yangi dasturiy ta’minot yordamida hal qilinishi lozim bo‘ lgan ehtiyoj va muammolarni xolisona baholash.

2. Dasturiy ta’minotni tanlashni asoslash: takomillashtirilgan dasturiy ta’minotni tanlash mezonlarini aniqlash (davlat ta’lim standartiga muvofiqligi, didaktik tamoyillar, texnik talablar v.b.), dasturiy ta’minotning turli xil variantlarini tahlil qilish va eng mosini tanlashni asoslash.

3. Takomillashtirilgan dasturiy ta’minotni joriy etishning maqsad va vazifalarini belgilash: dasturiy ta’minotni joriy etish maqsadlari (masalan, ATni o‘ rganish bo‘ yicha motivatsiyani oshirish, kompyuter bilan ishlashning bazaviy ko‘ nikmalarini shakllantirish, algoritmik fikrlashni rivojlantirish, ijodiy qobiliyatlarni rivojlantirish v.b.) va ushbu maqsadlarga erishish uchun hal qilinishi lozim bo‘ lgan vazifalarni aniq shakllantirish.

II. Rejalashtirish.

1. Joriy etish rejasini ishlab chiqish: dasturiy ta’minotni joriy etish bosqichlarini (tayyorgarlik, asosiy, yakuniy), ularni amalga oshirish muddatini va zarur resurslarni aniqlash.

2. O‘ quv-uslubiy ta’minotni ishlab chiqish: o‘ quv dasturi, pedagog uchun uslubiy tavsiyalar, talabalar uchun didaktik materiallar, ta’lim jarayonida dasturiy ta’minotdan foydalanish bo‘ yicha zarur bo‘ ladigan interfaol topshiriqlar, test variantlari va boshqa resurslarni yaratish yoki mavjudlarini takomillashtirish.

3. Ta’lim samaradorligini baholash mezonlarini aniqlash: dasturiy ta’minotni joriy etish natijalarini baholash tizimini ishlab chiqish (masalan, talabalar tomonidan dasturiy ta’minotni o‘ zlashtirish samaradorligini oshirish, ularning raqamli kompetensiyasini rivojlantirish, ta’limga bo‘ lgan motivatsiyani oshirish v.b.).

III. Amalga oshirish:

1. Axborot texnologiyalari infratuzilmasini tayyorlash: zarur uskunalar va dasturiy ta’minot bilan ta’minlash, ularning funksionalligi va mosligini tekshirish.

2. Ta’lim jarayonlariga dasturiy ta’minotni joriy etish: ta’lim jarayoniga dasturiy ta’minotni bosqichma-bosqich joriy etish, alohida darslar yoki mavzular kesimidan boshlab, bo‘ lajak boshlang‘ ich sinf o‘ qituvchilari tomonidan bilimlarni o‘ zlashtirganlik natijasidan kelib chiqqan holda, ulardan foydalanishni kengaytirish.

3. Bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarini qo‘ llab-quvvatlashni tashkil etish: yangi dasturiy ta’minotdan foydalanish yuzasidan konsultatsiya, texnik, metodik yordam ko‘ rsatishni ta’minlash.

4. Monitoring va sozlash: dasturiy ta’minotni joriy etish jarayonini doimiy kuzatib borish, talabalarning fikr-mulohazalarini eshitish va xulosalar chiqarish, ish rejasi va usullariga tuzatishlar kiritish.

IV. Ta’lim natijalarini baholash:

1. Ma’lumotlarni to‘ plash: turli usullar orqali dasturiy ta’minotni joriy etish samaradorligi to‘ g‘ risidagi ma’lumotlarni to‘ plash (testlash, ta’lim faoliyatini kuzatish va o‘ zlashtirilgan bilimlar tahlilini o‘ tkazish v.b.).

2. Hisobotlar tayyorlash: ta’lim jarayonlariga dasturiy ta’minotni joriy etish natijalari bo‘ yicha hisobotlar tayyorlash (xulosa va tavsiyalarni ishlab chiqish).

“BSAT” fani dasturiy ta’minotini joriy etish metodikasining asosiy tamoyillari:

1. davlat ta’lim standarti talablarini hisobga olish;

2. bo‘ lajak boshlang‘ ich sinf o‘ qituvchilari uchun kichik yoshdagi maktab o‘ quvchilarining yoshi xususiyatlari va ularning kognitiv qobiliyatlariga mos keladigan dasturiy ta’minotni tanlash;

3. axborot vizualligi va talabalarning o‘ quv materiallari bilan faol o‘ zaro ta’sirini ta’minlaydigan dasturiy ta’minotlardan keng foydalanish;

4. bo‘ lajak boshlang‘ ich sinf o‘ qituvchilari uchun kichik yoshdagi maktab o‘ quvchilarining motivatsiyasi va faolligini oshirishga qaratilgan o‘ yinli dasturiy ta’minotdan keng foydalanshni ta’minlash;

5. talabaning individual ehtiyoji va o‘ zlashtirish tezligiga qarab ta’lim olishni moslashtirish;

6. ta’limning amaliy yo‘ naltirilganligi: ta’lim jarayonlarida kompyuter bilan ishlash va kundalik ehtiyojlarda axborot texnologiyalaridan foydalanish yuzasidan talabalarning amaliy ko‘ nikmalarini shakllantirishga yo‘ naltirish;

7. tizimlilik va izchillik: dasturiy ta’minotni bosqichma-bosqich, oddiylikdan murakkablikka qarab joriy etishni ta’minlash;

8. refleksiya va baholash: muammolarni aniqlash va kerakli tuzatishlarni kiritish maqsadida dasturiy ta’minotni joriy etish natijalarini qayd etish uchun refleksiya va baholashni amalga oshirish.

9. doimiy tarzda dasturiy ta’minotni joriy etish amaliyotini takomillashtirib borish va ta’lim samaradorligini oshirish maqsadidagi yangi imkoniyatlarni qidirish.

Ushbu bandlar va tamoyillarga rioya qilish natijasida, bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarini har tomonlama rivojlantirish va raqamli ta’lim sharoitiga moslashtirish uchun, zamonaviy ta’lim muhiti yaratiladi va “BSAT” fanining takomillashtirilgan dasturiy ta’minotini joriy etish metodikasi ma’lum darajada takomillashtiriladi.

Raqamlashtirish sharoitida boshlang‘ ich sinflar uchun axborot texnologiyalari fanini o‘ qitishda talabalar bilan individual ishlashga yo‘ naltirilgan, dasturiy vositalar asosidagi tabaqalashtirilgan va integratsiyalashgan yondashuv ishlab chiqildi. Ushbu yondashuvda “Case-study”, “SMART”, “SWOT” va “Insert” metodlarining birgalikda qo‘ llanishi ta’lim samaradorligini oshirishga xizmat qiladi.

Boshlang‘ ich sinflarda axborot texnologiyalari fanini o‘ qitishda umumiy-sohaviy, autentik, differensial integratsiyalashgan ijodiy bosqichlariga asoslangan integratsiyalashgan metodik model ishlab chiqildi (1-jadval).

1-jadval

Bosqichlar va ularga mos metodlar

Bosqich	Metodik yondashuv	Qo‘ llaniladigan metod
Umumiy-sohaviy	Asosiy bilim va tushunchalar	SMART
Autentik	Hayotiy holatga yaqinlik	Case-study
Differensial	Shaxsiy xususiyatlar asosida	SWOT
Integratsiyalashgan ijodiy	Fanlararo va ijodiy yondashuv	INSERT

Case-study — bu talabalarga real yoki o‘ ylab topilgan hayotiy vaziyatlar asosida tahlil qilish, muammo yechimini topish imkonini beradigan o‘ qitish metodidir.

Case-study metodning maqsadi tanqidiy fikrlashni rivojlantirish, muammoni hal qilish ko‘ nikmasini shakllantirish, qaror qabul qilishni o‘ rgatishdan iborat.

Case-study AKT dan tashqari ijtimoiy fanlar, menejment, huquq, tibbiyot, ta’lim va boshqa sohalarda xam qo‘ llanilishi mumkin. Shuningdek, Case-study talabalar kichik guruhlarda vaziyatni muhokama qiladi va yechimlar ishlab chiqadi.

SMART — bu maqsadlarni aniqlik bilan belgilashga yordam beradigan metod bo‘ lib har bir harf quyidagilarni anglatadi:

S-Specific (Aniq), M-Measurable (O‘ lchanadigan), A-Achievable (Erishiladigan), R-Relevant (Dolzarb), T-Time-bound (Vaqt bilan chegaralangan).

SMART metodining maqsadi maqsadlarni to‘ g‘ ri qo‘ yish va ularga erishish strategiyasini ishlab chiqish hamda loyihalarni samarali rejalashtirishdan iborat.

SMART ta’limda dars maqsadlarini aniqlashtirish, boshqaruv va rejalashtirishda ishlatiladi.

SWOT — bu tashkilot yoki loyiha kuchli va zaif jihatlari, imkoniyatlar va tahdidlarni tahlil qilishga qaratilgan metod.

S – Strengths (Kuchli tomonlar)

W – Weaknesses (Zaif tomonlar)

O – Opportunities (Imkoniyatlar)

T – Threats (Tahdidlar)

SWOT metodining maqsadi ichki va tashqi omillarni tahlil qilish hamda qaror qabul qilishda asosli yondashuvni ishlab chiqishdan iborat.

SWOT strategik rejalashtirish, shuningdek, tashkilot, loyiha, yoki shaxsiy rivojlanish bahosida qo‘ llaniladi.

INSERT (Interactive Noting System for Effective Reading and Thinking) – bu o‘ quvchilar matnni o‘ qish jarayonida belgilar qo‘ yish orqali faol fikrlash va tushunishni chuqurlashtiruvchi metod.

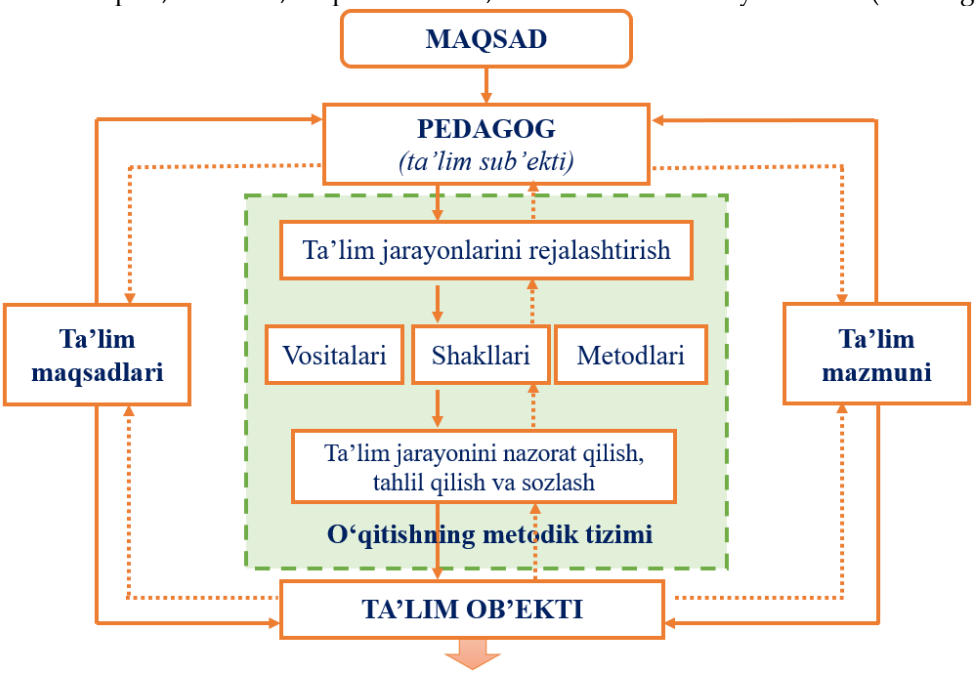
INSERT maqsadi: o‘ quvchini matn bilan faol ishlashga jalb qilish, tahliliy fikrlashni rivojlantirish, o‘ qiganini tushunish va eslab qolishni kuchaytirishdan iborat.

INSERT har qanday fan bo‘ yicha matn asosidagi darslarda, o‘ qitish jarayonida individual va guruh bilan ishlashda qo‘ llaniladi.

“Case-study”, “SMART”, “SWOT”, “Insert” metodlari boshlang‘ ich sinf o‘ quvchilarining axborot texnologiyalari bo‘ yicha mustaqil fikrlashini, mantiqiy tahlil qilishini, faol ishtirokini, darsga qiziqishini oshirishga yordam beradi.

“BSAT” fanini o‘ qitishda zamonaviy materiallarni tanlash va ularni ta’lim jarayonlariga joriy etish, o‘ z vaqtida bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarining saviyasi, xususiyatlari, qolaversa ularning tayyorgarlik darajasi, auditoriya imkoniyatlari, pedagogning mahorati, tanlangan mavzuning ahamiyatli jihatlari, zamonaviy o‘ quv-bilish jarayoni vositalari, shakllari va metodlariga uzviy jihatdan bog‘ liqdir.

“BSAT” fanini o‘ qitishning metodik tizimi, xuddi boshqa fanlardagi kabi, ierarxik jihatdan o‘ zaro bog‘ langan besh komponentlardan iborat: maqsad, mazmun, o‘ qitish usullari, vositalari va tashkiliy shakllari (1-rasmga qarang).



1-rasm. Ta’limning metodik tizimi

N.V. Kuzminaning ta’kidlashicha o‘ qitishning metodik tizimi talabalarning ta’lim olish samaradorligini oshirishga qaratilgan ta’lim jarayonlarini rejalashtirish, tashkil etish, monitoringini o‘ tkazish va tahlil qilishga qaratilgan o‘ zaro bog‘ liq usullar, shakllar va vositalarning tartiblangan majmui.

Zamonaviy ta’limning metodik tizimi xususiyatlari quyidagilarda namoyon bo‘ ladi: ta’lim jarayonlarini ilmiy asosda rejalashtirish; nazariy va amaliy mashg‘ ulotlarning birligi va o‘ zaro ta’sirini hisobga olish; yuqori qiyinchilik darajasidagi o‘ quv materiallarni o‘ zlashtirishning yuqori sur’ati; talabalarning maksimal faolligi va etarli darajadagi mustaqilligini ta’minlash; individual va jamoada faoliyat ko‘ rsatishni ko‘ zda tutish; ta’lim jarayonini zamonaviy texnik va dasturiy ta’minot bilan to‘ yintirish; turli mavzularni o‘ rganishga qaratilgan kompleks yondashuv.

O‘ tkazilgan keng qamrovli tahlillar asosida tadqiqotchi tomonidan “BSAT” fanini o‘ qitishning takomillashtirilgan mazmuni ishlab chiqildi. Bunga, ushbu fan umumiy mavzularining hajmi o‘ zgartirilmagan holda va ba’zi mavzularni birlashtirish orqali erishildi (2-jadvalga qarang).

2-jadval

“BSAT” fanining takomillashtirilgan mazmuni jadvali

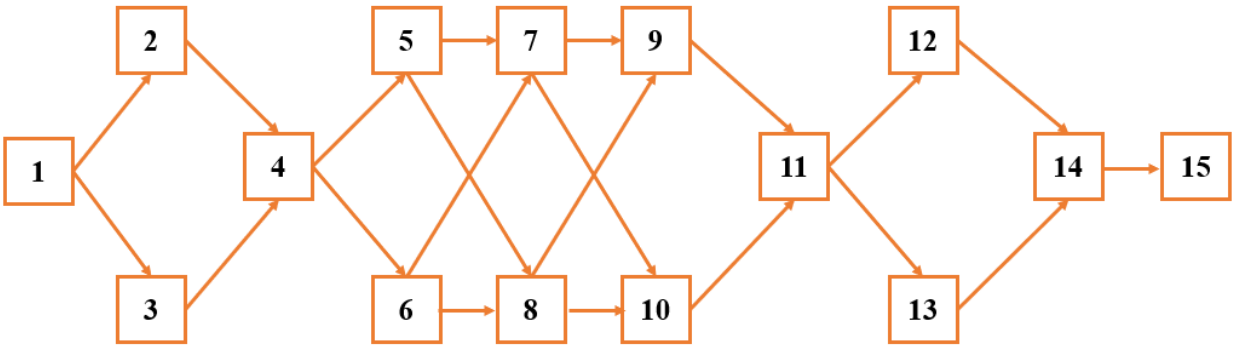
	1. Axborot texnologiyalarining konseptual asoslari
1	Ta’lim texnologiyasining tuzilishi.
2	Zamonaviy ta’lim texnologiyasining konseptual asoslari. Axborot texnologiyalari haqida tushuncha, ularning tasnifi.
3	Multimedia dasturiy ilovalari bilan ishlash. Ms.PowerPoint, FotoShOUPRO, SmartDraw, onlayn Prezi dasturiy ilovalardan foydalanish.
4	Tarmoq va Internet texnologiyalari: protokollar, web-ishlanmalar va bulutli texnologiyalar.
	2. Boshlang‘ ich ta’lim fanlarini o‘ qitishda axborot texnologiyalaridan foydalanish
5	Axborot texnologiyalarini kasbiy faoliyatda qo‘ llash. Amaliyot holatlari.
6	Boshlang‘ ich sinflarda tayanch fanlarni o‘ qitishda axborot texnologiyalaridan foydalanish metodikasi. Integratsiyalashgan ta’limdan foydalanish. Tayanch fanlarni o‘ qitishda axborot texnologiyalaridan foydalanish. Sinfdan tashqari ishlarni tashkil etish.
7	Boshlang‘ ich sinflarda ona tili va o‘ qish, matematika, texnologiya fanlarni o‘ qitishda axborot texnologiyalaridan foydalanish.

8	Axborot xavsizligi. Kriptografiya asoslari, ma'lumotlarni himoya qilish yo' llari.
9	Kodlashsiz o' yinli dasturiy mahsulotlarni yaratish (Game Maker, Construct 3 misolida). Simulyatorlar bilan ishlash.
10	Raqamli ta'lim resurslarini yaratish (fotosurat, videoparcha, video darslik, statik va dinamik modellar, virtual haqiqat ob'ektlari va interaktiv modellashtirish, grafik va kartografik materiallar, ovoz yozuvlari, audiokitoblar, turli xil ramziy ob'ektlar va grafika).
11	Boshlang' ich sinflarda koordinata burchagini o' rganishda axborot texnologiyalaridan foydalanish. PIRLS, TIMSS, PISA, TALIS xalqaro baholash dasturlarida ishtirok etishga tayyorlashda axborot texnologiyalaridan foydalanish.
	3. Kichik yoshdagi o' quvchilarning axborot kompetentsiyasini shakllantirish
12	Axborot tushunchasini o' rganish usullari, uning turlari, axborotni kodlash
13	Algoritmlash va dasturlash. (Python, Java, C++).
14	Onlayn pedagogik dasturiy vositalardan foydalanish (Google Forms, Canva.com, Mentimeter.com, Quizlet, LearningApps.org, Genial.ly, Liveworksheets.com v.b.). Boshlang' ich sinf o' qituvchilarining faoliyatida ijtimoiy tarmoqlardan foydalanishi.
15	O' qituvchining elektron portfoliosini shakllantirish.

Izoh: yuqoridagi jadvalda keltirilgan to' q qalin shriftdagi mavzular "BSAT" fanining takomillashtirilgan mavzulari hisoblanadi.

Tadqiqotchi tomonidan taklif etilayotgan "BSAT" fanining takomillashtirilgan mazmunini, o' zaro aloqadorlikda o' qitishning grafikli ketma-ketligi quyidagi rasmda keltirilgan (2-rasmga qarang).

Grafda keltirilgan ketma-ketlikka muvofiq, bo' lajak boshlang' ich sinf o' qituvchilarini "BSAT" fanini o' qitishning dastlabki bosqichida, ta'lim texnologiyasining tuzilishi, ularning konseptual asoslari, axborot texnologiyalari va ularning tasnifi bilan tanishtiriladi. So' ngra takomillashtirilgan mavzular asosida fanning dasturiy ta'minotiga tegishli bo' lgan mavzularni o' rgatishda, dastavval multimedia dasturiy ilovalari, tarmoq va Internet texnologiyalari taklif etiladi. Buning sababi, galdagi mavzularni o' rganishda ulardan turli mavzular yuzasidan taqdimot loyiha ishlarini bajarishlari, buning uchun Internet resurslaridan keng foydalanishlari hisobga olindi.



2-rasm. "BSAT" fani mazmunining graf ketma-ketligi

M.N.Mirzaeva raqamlashtirish sharoitida bo' lajak boshlang' ich sinf o' qituvchilari uchun axborot texnologiyalari fanini o' qitish metodikasini takomillashtirishda internet texnologiyalarining o' rni va afzalligini inkor etib bo' lmasligi, Internet ta'lim jarayonining ajralmas qismi sifatida virtual konferensiya, masofaviy o' qitish va hamkorlikda ta'limiy loyihalarni ishlab chiqish uchun asos bo' lishini ta'kidlaydi.

Yuqorida keltirilgan graf ketma-ketlikligi, bo' lajak boshlang' ich sinf o' qituvchilarini tayyorlash bo' yicha o' quv rejaning tarkibiy va mantiqiy-sxemasining mumkin bo' lgan ko' rinishlaridan birini ifodalaydi. Ta'lim dasturini muvaffaqiyatli amalga oshirish, oliy ta'lim muassasasining resurslar salmog' iga ham chambarchas bog' liq.

Taqdim etilgan metodikaning o' ziga xos xususiyati shundaki, bu yerda fanning dasturiy ta'minoti to' g' risidagi umumiy fikrlardan tortib, ularni batafsil o' zlashtirishgacha bo' lgan jarayonlarga, bo' lajak boshlang' ich sinf o' qituvchilarini bosqichma-bosqich jalb etishdan iborat. O' zlashtirilgan bilimlar asosida integratsiyalashgan fanlarni axborot texnologiyalari asosida o' rganish ham ta'minlanadi.

Integratsiyalashgan fanlarni axborot texnologiyalari asosida o‘ rganish, bo‘ lajak boshlang‘ ich sinf o‘ qituvchilaridan quyidagi kasbiy ko‘ nikmalarga ega bo‘ lishlikni ta’minlaydi:

1. axborot texnologiyalari asosida ta’lim jarayonlarini loyihalash va amalga oshirishni tashkil etish;
2. bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarining axborot xavfsizligini ta’minlash chora tadbirlarini ko‘ rish;
3. ta’limning sifat va samaradorligini oshirishda axborot texnologiyalaridan keng foydalanish;
4. axborot texnologiyalaridan foydalangan holda to‘ g‘ ri va teskari aloqalarni tashkil etishni amalga oshirish.

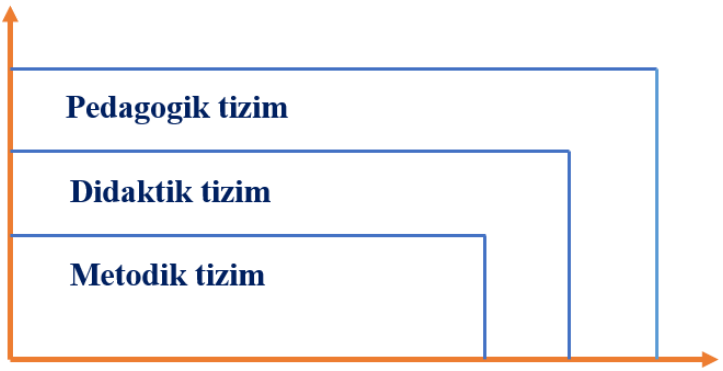
Ushbu ko‘ nikmalar bo‘ lajak boshlang‘ ich sinf o‘ qutuvchilarining kasbiy rivojlanishi va muvaffaqiyatlarga erishishlariga ko‘ maklashuvchi yuqori sifatli, zamonaviy va jozibodor ta’lim muhitini yaratish uchun axborot texnologiyalaridan samarali foydalanish imkonini beradi.

Albatta “BSAT” fanini o‘ qitishni takomillashtirishda pedagogning o‘ rni beqiyosligini ta’kidlab o‘ tish lozim. Ta’lim jarayonlarini sifatli tashkil etish, uning kasbiy mahorati va malakasiga chambarchas bog‘ liq. Zamonaviy pedagogning mahorat modeli, undan fan va amaliyot yutuqlaridan kelib chiqqan holda yangi zamonaviy fazilatlarini namoyon qilishni talab qiladi.

D.G.Levites pedagogning kasbiy kompetentligi uning ajralmas xususiyati sifatida kasbiy muammolarni aniqlash va tushunish, kasbiy faoliyatning real vaziyatlarida yuzaga keladigan kasbiy muammolarni hal qilishga tayyorligi sifatida talqin qilinishi mumkinligini ta’kidlaydi.

“BSAT” fanini o‘ qitish metodikasini takomillashtirish pedagogika, didaktika va metodik tizimning o‘ zaro aloqadorligida amalga oshiriladi va uni quyidagicha tasvirlash mumkin (3-rasmga qarang).

Raqamli platformada “BSAT” fanining takomillashgan dasturiy ta’minoti asosida o‘ quv mashg‘ ulotlarni tashkil etishda, bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarining kasbiy ko‘ nikmalarini guruhli va yakka tartibda, ish shaklining varitativ ta’lim traektoriyasiga, shuningdek, yaratilgan raqamli platformaga adaptiv moslashish ishlari amalga oshirildi.



3-rasm. BSAT fanining aloqadorlik tizimlari

Shuningdek, raqamli platformadan foydalanib ma’ruza mashg‘ ulotini tashkil etishda an’anaviy ma’ruza (axborotli model), ADDIE (tuzilmaviy yondashuv) modeli, interaktiv elementlar bilan ma’ruza (interaktiv model), ma’ruza-munozara (munozara modeli), keys yordamida ma’ruza (keys modeli) hamda Xan modeli (adaptiv model) tanlab olindi hamda ushbu modellarni o‘ zaro birlashtirish orqali foydalanish metodikasi ishlab chiqildi. Ma’ruzalarni olib borish tahlili quyidagi jadvalda keltirilgan (3-jadvalga qarang).

3-jadval

Raqamli platformada “BSAT” fanining ma’ruza mashg‘ ulotlarini olib borish modellari

Ma’ruzani tashkil etish modellari	Tavsifi
An’anaviy ma’ruza (axborotli model)	Murakkab nazariy tushunchalarni hamda katta mavzularni yoritishda foydalanish
ADDIE modeli (tuzilmaviy yondashuv)	O‘ quv dasturlari va materiallarini ishlab chiqish uchun samarali vositadir. Modeldan tizimli yondashuv, yuqori sifatli o‘ qitish talab qilinadigan hollarda foydalaniladi
Interaktiv elementlari bilan ma’ruza (interaktiv model)	O‘ quv materiallarni mustahkamlash, munozarali masalalarni muhokama qilishni rag‘ batlantirish, masalalarni yechish ko‘ nikmalarini rivojlantirish va amaliy mashg‘ ulotlarga tayyorgarlik ko‘ rishda foydalanish

Ma’ruza-munozara (munozara modeli)	Munozarali masalalarni muhokama qilish, talabalar fikrlarini tahlil qilish, tanqidiy fikrlashni rivojlantirishda foydalanish
Keys usuli yordamida ma’ruza (keys modeli)	Talabalarning turli muammolarni hal qilish ko‘ nikmalarini rivojlantirish, nazariy bilimlarni amaliyotda qo‘ llash va kasbiy faoliyatga tayyorlashda
Xan modeli (adaptiv model)	Ta’lim samaradorligini oshirish maqsadida

Bo‘ lajak boshlang‘ ich sinf o‘ qituvchilarining amaliy mashg‘ ulotlarini tashkil etish modelini tanlash, ularning kasbiy ko‘ nikmalarini rivojlantirishda hal qiluvchi ahamiyatga ega. Ma’ruza mashg‘ ulotidan farqli o‘ laroq, bu erda talabalarning aktiv faoliyatiga e’tibor qaratiladi. Raqamli platformadan foydalanib amaliy mashg‘ ulotlarni tashkil etishda muammoli ta’lim (Problem-Based Learning, PBL) modeli, loyihalar tuzishga asoslangan ta’lim (Project-Based Learning) modeli, master-klass modeli, laboratoriya ishi modeli, Ishchan o‘ yinli modellardan amaliy mashg‘ ulot ehtiyojlaridan kelib chiqqan holda foydalanishni maqsad qildik. Modellar asosida amaliy mashg‘ ulotlarni olib borish tahlili quyidagi jadvalda keltirilgan (4-jadvalga qarang).

4-jadval

Raqamli platformada “BSAT” fanining amaliy mashg‘ ulotlarni olib borish modellari

Amaliy mashg‘ ulotni tashkil etish modellari	Tavsifi
Muammoli ta’lim modeli (Problem-Based Learning, PBL)	Murakkab, fanlararo muammolarni hal qilish ko‘ nikmalarini rivojlantirish, nazariy bilimlarni mustahkamlash, loyihalar ustida ishlashga tayyorgarlik ko‘ rishda
Loyihalar tuzishga asoslangan ta’lim modeli (Project-Based Learning)	Kompleks tarzda ko‘ nikmalarni rivojlantirish, ijodkorlikni rag‘ batlantirish, ilmiy tadqiqot faoliyatiga tayyorgarlik ko‘ rishda
Master-klass modeli (Model master class)	Murakkab texnik ko‘ nikmalarni namoyish etish, uskunalarni boshqarishni o‘ rganish, tajribalar almashishda
laboratoriya ishi modeli	Nazariy bilimlarni tasdiqlash, eksperimental tadqiqot usullarini o‘ zlashtirish va texnik uskunalar bilan ishlash yuzasidan amaliy ko‘ nikmalarga ega bo‘ lish maqsadida
Ishchan o‘ yinli model	Qarorlar qabul qilish, jamoada ishlash, muloqot qilish qobiliyatini rivojlantirish, kasbiy faoliyatga tayyorlash maqsadlarida

Faol ta’lim usullari amaliy mashg‘ ulotlarning asosini tashkil etishini nazarda tutdik. Bo‘ lajak boshlang‘ ich sinf o‘ qituvchilari shunchaki tinglash va tomosha qilish emas, balki talim jarayonlarida faol ishtirok etishlari, muammolarni birgalikda hal qilishlari, loyihalar ustida ishlash, tajribalar o‘ tkazish va bir-biri bilan muloqot qilishlari lozim. Pedagog bu yerda ushbu jarayonlarni tashkilotchisi va koordinatori rolida namoyon bo‘ ladi va talabalarning kasbiy ko‘ nikmalarini rivojlantirishga sharoit yaratib beradi.

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BO‘ LAJAK BOSHLANG‘ ICH TA’LIM PEDAGOGLARIDA INKLYUZIV KOMPETENSIYANING AKSIOLOGIK-REFLEKSIV MEXANIZMLARI: KASBIY IDENTITET TRANSFORMATSIYASI KONTEKSTIDA

Jumaboyev Nurillo Xayrullo o‘ g‘ li
Toshkent Kimyo xalqaro universiteti Namangan filiali

Annotatsiya: *Maqolada bo‘ lajak boshlang‘ ich ta’lim pedagoglarida inklyuziv kompetensiyaning shakllanishi kasbiy identitet, qadriyatlar tizimi va refleksiv pozitsiyaning transformatsiyasi sifatida tahlil qilinadi. Inklyuzivlikning insonparvarlik, tenglik, subyektlilik va ta’limiy adolat tamoyillari pedagogik faoliyatning aksiologik negizi sifatida asoslanadi. Motivatsion-qadriyatli, kognitiv, operatsion-faoliyatli va refleksiv komponentlarning o‘ zaro birligi yoritilib, “qadriyatni qabul qilish – pedagogik vaziyatni qayta talqin qilish – individuallashtirilgan qaror – refleksiv baholash” sikli taklif etiladi.*

Kalit so‘ zlar: *inklyuziv kompetensiya, aksiologik yondashuv, refleksiya, kasbiy identitet, pedagogik tafakkur*

АКСИОЛОГИЧЕСКИ-РЕФЛЕКСИВНЫЕ МЕХАНИЗМЫ ИНКЛЮЗИВНОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ ПЕДАГОГОВ НАЧАЛЬНОГО ОБРАЗОВАНИЯ: В КОНТЕКСТЕ ТРАНСФОРМАЦИИ ПРОФЕССИОНАЛЬНОЙ ИДЕНТИЧНОСТИ

Аннотация: *В статье формирование инклюзивной компетентности будущих педагогов начального образования рассматривается как трансформация профессиональной идентичности, системы ценностей и рефлексивной позиции. Обосновываются гуманизм, равенство, субъектность и образовательная справедливость как аксиологические основания инклюзивной деятельности. Предлагается цикл «принятие ценности – переосмысление педагогической ситуации – индивидуализированное решение – рефлексивная оценка».*

Ключевые слова: *инклюзивная компетентность, аксиологический подход, рефлексия, профессиональная идентичность, педагогическое мышление*

AXIOLOGICAL-REFLECTIVE MECHANISMS OF INCLUSIVE COMPETENCE IN FUTURE PRIMARY EDUCATION TEACHERS: IN THE CONTEXT OF PROFESSIONAL IDENTITY TRANSFORMATION

Abstract: *The article interprets the formation of inclusive competence in future primary education teachers as a transformation of professional identity, values and reflective positioning. Humanism, equality, subjectivity and educational justice are substantiated as axiological foundations of inclusive practice. A cycle of value acceptance, reinterpretation of the pedagogical situation, individualized decision-making and reflective evaluation is proposed.*

Keywords: *inclusive competence, axiological approach, reflection, professional identity, pedagogical thinking*

Kirish

Zamonaviy inklyuziv ta’lim pedagogdan alohida ta’lim ehtiyojiga ega o‘ quvchini mavjud standartga moslashtirishni emas, balki ta’lim muhitini o‘ quvchilar xilma-xilligiga mos ravishda qayta loyihalashni talab etadi. Shu sababli bo‘ lajak boshlang‘ ich sinf o‘ qituvchisining tayyorgarligini faqat metodik bilimlar hajmi bilan o‘ lchash inklyuziv faoliyatning murakkab tabiatini to‘ liq ochib bermaydi. Pedagogning “kimni o‘ qitaman?”, “farqni qanday talqin qilaman?” va “pedagogik qarorimning axloqiy mas’uliyati nimada?” kabi savollarga bergan javobi uning kasbiy identitetini belgilaydi.

Boshlang‘ ich ta’lim ayniqsa muhim, chunki bolaning maktabga, o‘ ziga va boshqalarga munosabati, ijtimoiy ishtiroki hamda akademik o‘ ziga ishonchi aynan shu bosqichda faol shakllanadi. Demak, inklyuziv kompetensiya pedagogning tashqi texnologik tayyorgarligi bilan bir qatorda ichki qadriyatlar tizimi, empatik sezgirligi, mas’uliyati va refleksiv qobiliyatini ham qamrab oluvchi integrativ kasbiy sifatdir.

Tadqiqotning metodologik asoslari

Inklyuziv kompetensiyani falsafiy-pedagogik jihatdan anglashda insonparvarlik, aksiologik, faoliyatga asoslangan, kompetensiyaviy va refleksiv yondashuvlar o‘ zaro integratsiyada qaraladi. Insonparvarlik paradigmasi har bir bolaning qadr-qimmatini pedagogik munosabatning boshlang‘ ich nuqtasi sifatida belgilasa, aksiologik yondashuv tenglik, hurmat,

hamkorlik va pedagogik mas'uliyatni kasbiy qadriyatlarga aylantiradi. Faoliyatga asoslangan yondashuv esa qadriyatni real pedagogik qarorga ko‘ chirish mexanizmini ochib beradi.

Ainscow inklyuziyani ta'limdagi to‘ siqlarni aniqlash va kamaytirishga yo‘ naltirilgan tizimli o‘ zgarish sifatida ko‘ radi; Booth va Ainscow inklyuziv madaniyat, siyosat va amaliyotning birligini ta'kidlaydi. Florian va Black-Hawkinsning inklyuziv pedagogika konsepsiyasi individual farqlarni "muammo" emas, pedagogik rejalashtirishning tabiiy sharti sifatida talqin etishga undaydi. Mazkur qarashlar bo‘ lajak pedagogning professional dunyoqarashini transformatsiya qilish zaruratini ko‘ rsatadi.

Vigotskiyning rivojlanishning ijtimoiy tabiati haqidagi qarashlari ham inklyuziv pedagogik tafakkur uchun muhim metodologik tayanchdir. Ta'lim oluvchining imkoniyatlarini statik nuqson bilan emas, rivojlanish sharoiti, vositalar va ijtimoiy hamkorlik bilan bog‘ lash pedagogni defitsitar fikrlashdan rivojlantiruvchi fikrlashga olib o‘ tadi.

Inklyuziv kompetensiyaning aksiologik tuzilishi

Inklyuziv kompetensiyaning motivatsion-qadriyatli komponenti pedagogning inklyuziyani tashqi talab sifatida emas, kasbiy faoliyatning ichki me'yori sifatida qabul qilishini anglatadi. Bunda tolerantlik passiv "chidash" emas, balki farqlilikni pedagogik voqelikning tabiiy shakli sifatida tan olishdir. Empatiya esa hissiy hamdardlik bilangina cheklanmay, o‘ quvchining vaziyatini tushunish va unga mos pedagogik sharoit yaratish qobiliyatiga aylanadi.

Pedagogik adolat ham tenglik bilan aynan bir tushuncha emas. Barcha o‘ quvchiga bir xil topshiriq berish formal tenglikni ifodalashi mumkin, ammo inklyuziv adolat o‘ quvchining ehtiyoji, imkoniyati va ta'limiy to‘ siqlarini hisobga olgan holda turlicha vosita va qo‘ llab-quvvatlashni taqdim etishni talab qiladi. Shu ma'noda inklyuziv pedagogika "bir xil munosabat"dan "adolatli imkoniyat"ga o‘ tishni nazarda tutadi.

Kasbiy identitet transformatsiyasi

Bo‘ lajak o‘ qituvchi an'anaviy tayyorgarlikda o‘ zini ko‘ pincha bilimni yetkazuvchi va sinfni boshqaruvchi subyekt sifatida tasavvur qiladi. Inklyuziv paradigma esa uning rolini kengaytirib, pedagogni ta'limiy to‘ siqlarni aniqlovchi, individual rivojlanish trayektoriyasini loyihalovchi, ota-ona va mutaxassislar bilan hamkorlik qiluvchi hamda o‘ z qarorlarini muntazam tahlil qiluvchi mediator sifatida shakllantiradi.

Kasbiy identitet transformatsiyasining birinchi bosqichi – farqlilikni qabul qilish; ikkinchisi – pedagogik muammoni o‘ quvchining "kamchiligi"dan emas, muhit va metodning mos kelmasligidan izlash; uchinchisi – individuallashtirilgan pedagogik qaror ishlab chiqish; to‘ rtinchisi – qarorning oqibatlarini refleksiv tahlil qilishdir. Ushbu sikl takrorlangan sari inklyuziv yondashuv epizodik metod emas, pedagogning barqaror kasbiy pozitsiyasiga aylanadi.

Inklyuziv kasbiy tafakkur transformatsiyasining konseptual sikli

Refleksiya – inklyuziv kompetensiyaning metamexanizmi

Refleksiya pedagogning bilim va harakatlarini bog‘ lovchi metamexanizm sifatida namoyon bo‘ ladi. Refleksiyasiz metodika algoritmga, qadriyat esa deklaratsiyaga aylanib qolishi mumkin. Refleksiv pedagog o‘ z qarorining o‘ quvchi ishtiroki, psixologik xavfsizlik, kommunikativ faollik va akademik natijaga ta'sirini tahlil qiladi. Shu orqali u "to‘ g‘ ri metod"ni qidirishdan "muayyan vaziyat uchun asoslangan qaror" ishlab chiqishga o‘ tadi.

Elektron portfolio, refleksiv kundalik, keysdan keyingi o‘ z-o‘ zini baholash va pedagogik superviziya bo‘ lajak o‘ qituvchining refleksiv tajribasini tizimlashtirishga xizmat qiladi. Bunday vositalar raqamli muhitda talabaning qarorlar tarixini ko‘ rish, xatolarni qayta tahlil qilish va kasbiy o‘ sish dinamikasini kuzatish imkonini beradi.

Muhokama

Taklif etilgan yondashuv inklyuziv kompetensiyani alohida bilimlar yig‘ indisi sifatida emas, pedagog shaxsining qadriyat, bilim, faoliyat va refleksiya birliklarida qayta tashkil topishi sifatida ko‘ rishga imkon beradi. Bunda raqamli vositalar maqsad emas, transformatsiyani qo‘ llab-quvvatlovchi didaktik muhit vazifasini bajaradi. Shuning uchun kross-platforma texnologiyasining pedagogik qiymati uning texnik universalligida emas, balki talabaning tanlov, tahlil, hamkorlik va refleksiya faoliyatini izchil tashkil eta olishida namoyon bo‘ ladi.

Bu nuqtai nazar bo‘ lajak boshlang‘ ich ta'lim pedagoglarini tayyorlashda "inklyuziya haqida bilim berish" modelidan "inklyuziv qaror qabul qila oladigan pedagogni shakllantirish" modeliga o‘ tishni talab qiladi.

Xulosa

Inklyuziv kompetensiyaning barqaror rivojlanishi pedagogning kasbiy identiteti va qadriyatlar tizimidagi o‘ zgarish bilan uzviy bog‘ liq. Motivatsion-qadriyatli, kognitiv, operatsion-faoliyatli va refleksiv komponentlarning integratsiyasi pedagogni individual farqlarni tan oluvchi, ta'limiy to‘ siqlarni tahlil qiluvchi va moslashuvchan qaror qabul qiluvchi professional subyektga aylantiradi.

Taklif etilgan aksiologik-refleksiv sikl bo‘ lajak boshlang‘ ich ta'lim pedagoglarini tayyorlash dasturlarida keys, elektron portfolio, refleksiv kundalik va superviziya bilan uyg‘ un qo‘ llanganda inklyuziv kasbiy tafakkurni tizimli rivojlantirish uchun metodologik asos bo‘ lib xizmat qilishi mumkin.

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ZAMONAVIY TA'LIM JARAYONIDA INTERFAOL METODLARDAN FOYDALANISH TEXNOLOGIYALARI

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Annotatsiya: *Ushbu maqolada zamonaviy ta'lim jarayonida interfaol metodlardan foydalanishning pedagogik imkoniyatlari, ularning o‘ quvchilarning faolligi, mustaqil fikrlashi, ijodiy yondashuvi va hamkorlik ko‘ nikmalarini rivojlantirishdagi o‘ rni tahlil qilinadi. Interfaol metodlarni ta'lim jarayoniga joriy etishning tashkiliy-pedagogik, metodik, texnologik va psixologik jihatlari yoritiladi. Tadqiqotda pedagogik kuzatuv, suhbat, ilmiy-metodik adabiyotlarni o‘ rganish, qiyosiy tahlil va umumlashtirish usullaridan foydalaniladi. Zamonaviy ta'limda "aqliy hujum", "klaster", "BBB", "INSERT", "Jigsaw", "Case-study", "Fishbone", rolli o‘ yinlar va loyiha metodlaridan foydalanish imkoniyatlari ko‘ rib chiqiladi. Ilmiy tadqiqotlar faol va hamkorlikka asoslangan ta'lim yondashuvlari o‘ quvchilarning bilimlarni o‘ zlashtirishi va yuqori darajadagi fikrlash ko‘ nikmalarini rivojlantirishiga ijobiy ta'sir ko‘ rsatishini ko‘ rsatadi. Maqolada interfaol metodlarni mexanik qo‘ llash emas, balki ularni aniq pedagogik maqsad, o‘ quv faoliyati, baholash mezonlari va kutilayotgan natijalar bilan bog‘ lash samarali ta'limning muhim sharti sifatida asoslanadi.*

Kalit so‘ zlar: *zamonaviy ta'lim, interfaol metodlar, pedagogik texnologiya, ta'lim jarayoni, o‘ quvchi faolligi, hamkorlikda o‘ qitish, tanqidiy fikrlash, innovatsion ta'lim, raqamli texnologiyalar, faol ta'lim.*

ТЕХНОЛОГИИ ИСПОЛЬЗОВАНИЯ ИНТЕРАКТИВНЫХ МЕТОДОВ В СОВРЕМЕННОМ ОБРАЗОВАТЕЛЬНОМ ПРОЦЕССЕ

Аннотация: *В данной статье анализируются педагогические возможности использования интерактивных методов в современном образовательном процессе, их роль в развитии активности учащихся, самостоятельного мышления, творческого подхода и навыков сотрудничества. Освещаются организационно-педагогические, методические, технологические и психологические аспекты внедрения интерактивных методов в образовательный процесс. В исследовании используются методы педагогического наблюдения, беседы, изучения научно-методической литературы, сравнительного анализа и обобщения. Рассматриваются возможности применения в современном образовании таких методов, как «мозговой штурм», «кластер», «BBB», «INSERT», «Jigsaw», «Case-study», «Fishbone», ролевые игры и метод проектов. Научные исследования показывают, что активные и основанные на сотрудничестве образовательные подходы оказывают положительное влияние на усвоение знаний учащимися и развитие навыков мышления высокого уровня. В статье обосновывается, что важным условием эффективного обучения является не механическое применение интерактивных методов, а их связь с конкретной педагогической целью, учебной деятельностью, критериями оценивания и ожидаемыми результатами.*

Ключевые слова: *современное образование, интерактивные методы, педагогическая технология, образовательный процесс, активность учащихся, обучение в сотрудничестве, критическое мышление, инновационное образование, цифровые технологии, активное обучение.*

TECHNOLOGIES OF USING INTERACTIVE METHODS IN THE MODERN EDUCATIONAL PROCESS

Abstract: *This article analyzes the pedagogical potential of using interactive methods in the modern educational process, as well as their role in developing students' activity, independent thinking, creative approach, and collaboration skills. The organizational-pedagogical, methodological, technological, and psychological aspects of introducing interactive methods into the educational process are highlighted. The study employs the methods of pedagogical observation, conversation, review of scientific and methodological literature, comparative analysis, and generalization. The possibilities of applying such methods as "brainstorming," "cluster," "BBB," "INSERT," "Jigsaw," "Case-study," "Fishbone," role-playing games, and the project method in modern education are examined.*

Scientific research shows that active and collaboration-based educational approaches have a positive impact on students' knowledge acquisition and the development of higher-order thinking skills. The article substantiates that an important condition for effective teaching is not the mechanical application of interactive methods, but rather their connection with a specific pedagogical goal, learning activity, assessment criteria, and expected outcomes.

Keywords: *modern education, interactive methods, pedagogical technology, educational process, student activity, collaborative learning, critical thinking, innovative education, digital technologies, active learning.*

Kirish

Zamonaviy ta'lim tizimida o' quvchiga tayyor bilimlarni yetkazish bilan bir qatorda, uning mustaqil fikrlashi, muammoni tahlil qilishi, qaror qabul qilishi va o' z bilimini amaliy vaziyatlarda qo' llay olishini ta'minlash muhim pedagogik vazifalardan biri hisoblanadi. Shu nuqtai nazardan ta'lim jarayonida o' qituvchi va o' quvchi o' rtasidagi an'anaviy munosabatlarni takomillashtirish, o' quvchini ta'lim jarayonining faol ishtirokchisiga aylantirish zarurati ortib bormoqda [1].

Faol ta'limga oid tadqiqotlarda o' quvchini bevosita o' quv faoliyatiga jalb qilish, muhokama, hamkorlik, muammoli vaziyatlarni yechish va mustaqil fikrlashga asoslangan metodlar an'anaviy faqat ma'ruza shaklidagi yondashuvlarga nisbatan bir qator afzalliklarga ega ekanligi qayd etiladi [1]. Prince faol ta'lim, hamkorlikda o' qitish va muammoli ta'limning asosiy elementlarini ilmiy tadqiqotlar asosida tahlil qilib, ularning ta'lim samaradorligiga ta'siri bo' yicha keng, biroq bir xil bo' lmagan dalillar mavjudligini ko' rsatgan.

Interfaol ta'lim metodlari o' quvchilarning darsdagi faolligini oshirish, jamoada ishlash, o' z fikrini asoslash, boshqalarning fikrini tinglash va muammoli vaziyatlarga yechim topish ko' nikmalarini rivojlantirishga xizmat qiladi. Bunday yondashuvda o' qituvchi faqat bilim beruvchi emas, balki o' quv faoliyatini tashkil etuvchi, yo' naltiruvchi va rag' batlantiruvchi pedagog sifatida namoyon bo' ladi [2].

Freeman va hammualliflarning 225 ta tadqiqotni qamrab olgan meta-tahlili faol ta'lim qo' llanilgan sharoitlarda talabalar imtihon natijalari yaxshilanganini va an'anaviy ma'ruza asosidagi ta'limda muvaffaqiyatsizlik xavfi yuqoriroq bo' lganini ko' rsatgan [2].

Zamonaviy ta'lim jarayonida raqamli vositalarning kengayishi ham interfaol metodlarning imkoniyatlarini oshirmoqda. Elektron taqdimotlar, onlayn testlar, virtual doskalar, ta'lim platformalari va multimedia vositalari interfaol topshiriqlarni tashkil etishning yangi shakllarini yaratmoqda. Biroq texnologiyaning mavjudligi o' z-o' zidan ta'lim sifatining oshishini kafolatlamaydi. Muhim jihat - texnologiyani aniq pedagogik maqsadga muvofiq qo' llashdir.

Mazkur maqolaning asosiy maqsadi zamonaviy ta'lim jarayonida interfaol metodlardan foydalanishning samarali texnologiyalarini tizimlashtirish, ularning pedagogik imkoniyatlarini aniqlash va ta'lim amaliyotida qo' llash bo' yicha amaliy tavsiyalar ishlab chiqishdan iborat.

Adabiyotlar tahlili va tadqiqot metodologiyasi

Ta'lim metodlari bo' yicha ilmiy adabiyotlarda o' quvchining faol ishtiroki, hamkorlikda o' qitish, muammoli ta'lim va kompetensiyaviy yondashuv zamonaviy pedagogikaning muhim yo' nalishlari sifatida qaraladi. Interfaol ta'lim metodlarining asosiy xususiyati o' quvchini passiv tinglovchidan faol ta'lim subyektiga aylantirish bilan belgilanadi [1; 3].

Prince tomonidan olib borilgan ilmiy tahlilda faol ta'limning turli shakllari, jumladan, hamkorlikda va muammoli ta'limning asosiy elementlari hamda ularning samaradorligi bo' yicha mavjud tadqiqotlar ko' rib chiqilgan [3]. Mazkur tadqiqot interfaol va faol metodlarni ilmiy asosda tanlash zarurligini ko' rsatadi.

Muammoli ta'limga bag' ishlangan tadqiqotlarda esa o' quvchilar murakkab muammoni hal qilish jarayonida nafaqat fan mazmunini, balki fikrlash va muammoni yechish strategiyalarini ham egallashi mumkinligi qayd etiladi [4]. Hmelo-Silver muammoli ta'limni o' quvchilar hamkorlikda murakkab muammoni tahlil qiladigan va uni hal qilish uchun zarur bilimlarni mustaqil aniqlaydigan ta'lim yondashuvi sifatida tavsiflaydi.

Prince va Felder tomonidan olib borilgan tadqiqotda induktiv ta'lim metodlari, jumladan, inquiry learning, problem-based learning, project-based learning, case-based teaching va discovery learning kabi yondashuvlar tahlil qilingan. Mualliflar bunday yondashuvlar turli o' quv natijalariga erishishda an'anaviy deduktiv yondashuvlarga teng yoki ayrim hollarda samaraliroq bo' lishi mumkinligini ko' rsatgan [5].

Tadqiqot metodologiyasi muammoni tizimli tahlil qilishga yo' naltirilgan. Tadqiqotda ilmiy-metodik adabiyotlarni tahlil qilish, pedagogik kuzatuv, suhbat, qiyosiy tahlil va umumlashtirish usullaridan foydalaniladi. Interfaol metodlarning imkoniyatlari ta'lim maqsadi, o' quvchilarning faolligi, hamkorlik darajasi va kutilayotgan o' quv natijalari bilan bog' liq holda ko' rib chiqiladi.

Tadqiqotda interfaol metodlarni tanlashda quyidagi mezonlarga e'tibor qaratiladi: metodning dars maqsadiga mosligi, o' quvchilarning yosh va individual xususiyatlariga muvofiqligi, fan mazmuniga mosligi, vaqt va resurslardan oqilona foydalanish imkoniyati hamda natijalarni baholashning aniqligi.

Natijalar va muhokamalar

Tahlil natijalari interfaol metodlardan foydalanish ta’lim jarayonini bir necha o‘ zaro bog‘ liq yo‘ nalishda takomillashtirish imkonini berishini ko‘ rsatadi.

O‘ quvchi faolligini oshirish

Birinchi yo‘ nalish - o‘ quvchi faolligini oshirish. An’anaviy darsda o‘ quvchi ko‘ pincha tayyor ma’lumotni tinglovchi sifatida qabul qiladi. Interfaol metodlarda esa u savol beradi, fikr bildiradi, muammoni tahlil qiladi, guruh bilan muhokama qiladi va o‘ z xulosasini shakllantiradi.

“Aqliy hujum” metodi qisqa vaqt ichida o‘ quvchilarning mavzu bo‘ yicha mavjud bilimlarini aniqlash va yangi g‘ oyalarni shakllantirish imkonini beradi. Bunday faol ishtirok o‘ quvchini bilimni tayyor shaklda qabul qilishdan ko‘ ra uni muhokama va faoliyat orqali o‘ zlashtirishga yo‘ naltiradi [1; 3].

Faol ta’limning samaradorligi bo‘ yicha meta-tahlil natijalari ham faol ishtirokni kuchaytiruvchi pedagogik yondashuvlarning o‘ quv natijalariga ijobiy ta’sir ko‘ rsatishini ko‘ rsatadi [2].

Hamkorlikda o‘ qitish

Ikkinchi yo‘ nalish - hamkorlikda o‘ qitish. “Jigsaw”, kichik guruhlarda ishlash, juftliklarda topshiriq bajarish kabi metodlar o‘ quvchilarni birgalikda bilim olishga undaydi. Bunda har bir o‘ quvchining guruhdagi vazifasi va mas’uliyati aniq belgilanadi.

Hamkorlikka asoslangan ta’limda o‘ quvchilar o‘ z fikrlarini izohlash, boshqa ishtirokchilarning qarashlarini tinglash va umumiy xulosaga kelish jarayonida faol ishtirok etadi. Shu sababli interfaol metodlarning qiymati faqat bilimni o‘ zlashtirish bilan chegaralanmay, ijtimoiy va kommunikativ ko‘ nikmalarning rivojlanishida ham namoyon bo‘ ladi [1; 3].

Tanqidiy va ijodiy fikrlashni rivojlantirish

Uchinchi yo‘ nalish - tanqidiy va ijodiy fikrlashni rivojlantirish. “Case-study”, “Fishbone”, muammoli savollar va munozara metodlari o‘ quvchilarni tayyor javobni qabul qilishdan ko‘ ra muammoning sabablarini aniqlash, dalillarni taqqoslash va mustaqil xulosa chiqarishga yo‘ naltiradi [4].

Muammoli ta’lim bo‘ yicha Hmelo-Silver tadqiqotida o‘ quvchilar muammoni hal qilish jarayonida fan mazmuni bilan birga fikrlash strategiyalarini ham o‘ zlashtirishi mumkinligi asoslangan [4].

“Fishbone” metodida muammo markaziy masala sifatida belgilanadi, uning asosiy va ikkilamchi sabablari tahlil qilinadi hamda muammoni bartaraf etish yo‘ llari ishlab chiqiladi. Bunday metod muammoli vaziyatlarni sabab-oqibat bog‘ lanishida ko‘ rib chiqish imkonini beradi.

Bilimlarni amaliyot bilan bog‘ lash

To‘ rtinchi yo‘ nalish - bilimlarni amaliyot bilan bog‘ lash. Loyiha metodi, case-study va rolli o‘ yinlar o‘ quvchiga nazariy bilimlarni real yoki realga yaqin vaziyatlarda qo‘ llash imkonini beradi.

Induktiv ta’lim metodlari bo‘ yicha tadqiqotlarda case-based teaching, project-based learning va problem-based learning kabi metodlarning o‘ quvchini muayyan vaziyat, muammo yoki loyiha orqali bilim olishga jalb etishi ko‘ rsatiladi [5].

Bunda o‘ quvchi ma’lumotni faqat yodlashdan tashqari, undan amaliy vazifani hal qilishda foydalanadi. Natijada nazariy bilim bilan amaliy faoliyat o‘ rtasidagi bog‘ liqlik kuchayadi.

Raqamli texnologiyalar bilan uyg‘ unlashtirish

Beshinchi yo‘ nalish - ta’lim jarayonida raqamli texnologiyalardan foydalanish. Interfaol metodlarni raqamli vositalar bilan uyg‘ unlashtirish darsni yanada dinamik tashkil etish imkonini beradi.

Elektron testlar, interaktiv taqdimotlar, onlayn munozaralar, virtual doskalar va multimedia materiallari o‘ quvchilarning darsdagi faoliyatini tashkil etish uchun qo‘ shimcha imkoniyat yaratadi.

Biroq raqamli vositalardan foydalanishda muhim muammo - texnologiyaning maqsadga aylanishidir. Agar elektron vosita faqat an’anaviy topshiriqni boshqa shaklda taqdim etsa, uning pedagogik samarasi cheklanishi mumkin. Shuning uchun “texnologiya → topshiriq → faoliyat → natija” zanjiri asosida darsni loyihalash maqsadga muvofiq.

Interfaol metodlarni maqsadga muvofiq tanlash

Interfaol metodlarning samaradorligi ularni darsning barcha bosqichlarida bir xil qo‘ llash bilan emas, balki muayyan pedagogik vazifaga mos tanlash bilan belgilanadi [3; 5].

Masalan, dars boshida “Aqliy hujum” va “Klaster” o‘ quvchilarning avvalgi bilimlarini faollashtirish uchun, yangi mavzuni o‘ zlashtirish jarayonida “Jigsaw” yoki guruhli ish, mustahkamlash bosqichida “Case-study”, yakuniy bosqichda esa “BBB” yoki refleksiya usullaridan foydalanish mumkin.

Shunday qilib, metod tanlashda “qaysi metod zamonaviy?” degan savoldan ko‘ ra “ushbu metod mazkur ta’lim maqsadiga qanday xizmat qiladi?” degan savol ustuvor bo‘ lishi lozim.

Interfaol metodlardan foydalanish texnologiyasining amaliy modeli

Zamonaviy darsni loyihalashda interfaol metodlardan foydalanishni uch bosqichga ajratish mumkin.

Birinchi bosqich - tayyorgarlik bosqichi. O‘ qituvchi dars maqsadini, kutilayotgan natijalarni va o‘ quvchilar faoliyatini belgilaydi. Shu asosda metod tanlanadi, guruhlar shakllantiriladi va topshiriqlar ishlab chiqiladi.

Ikkinchi bosqich - interfaol faoliyat bosqichi. O‘ quvchilar individual, juftlik yoki guruh shaklida topshiriqlarni bajaradilar. O‘ qituvchi jarayonni nazorat qiladi, zarur hollarda yo‘ naltiruvchi savollar beradi va o‘ quvchilar faoliyatini muvofiqlashtiradi.

Uchinchi bosqich - tahlil va refleksiya bosqichi. Guruhlar natijalarini taqdim etadi, o‘ quvchilar o‘ z faoliyatini baholaydi va o‘ qituvchi umumiy xulosani shakllantiradi.

Mazkur model muammoli va induktiv ta’lim yondashuvlaridagi “muammo yoki vaziyat → faol izlanish → hamkorlik → yechim → refleksiya” ketma-ketligi bilan uyg‘ unlashadi [4; 5].

Interfaol mashg‘ ulotdan so‘ ng “Nimani bildim?”, “Nimani o‘ rgandim?”, “Qaysi masala qiyin bo‘ ldi?”, “O‘ z bilimimni qayerda qo‘ llay olaman?” kabi refleksiv savollardan foydalanish o‘ quvchining o‘ z ta’lim faoliyatini anglashiga yordam beradi.

Taklif va tavsiyalar

1. Har bir dars uchun interfaol metodni tanlashdan avval uning pedagogik maqsadini aniq belgilash.
2. Interfaol metodlarni o‘ quvchilarning yoshi, tayyorgarlik darajasi va individual xususiyatlariga moslashtirish.
3. Guruhli ishlarda har bir o‘ quvchining vazifasi va mas’uliyatini aniq belgilash.
4. “Aqliy hujum”, “Klaster”, “BBB”, “INSERT”, “Jigsaw”, “Case-study”, “Fishbone” va loyiha metodlaridan fan mazmuniga mos ravishda foydalanish.
5. Muammoli, loyiha va case-study metodlaridan foydalanishda o‘ quvchilarga faqat tayyor savol emas, balki mustaqil izlanishni talab qiluvchi vazifalar berish [4; 5].
6. Interfaol metodlarni raqamli ta’lim vositalari bilan uyg‘ unlashtirish, biroq texnologiyani pedagogik maqsadning o‘ rniga qo‘ ymaslik.
7. Interfaol darslarda faqat yakuniy natijani emas, balki o‘ quvchining jarayondagi faolligi, hamkorligi, mustaqil fikrlashi va dalillash qobiliyatini ham baholash.
8. Har bir interfaol mashg‘ ulotdan so‘ ng refleksiya tashkil etish va olingan natijalardan keyingi darslarni rejalashtirishda foydalanish.
9. Interfaol metodlarni keng miqyosda joriy etishdan oldin ularni alohida mavzu, sinf yoki fan doirasida sinab ko‘ rish, natijalarni tahlil qilish va aniqlangan kamchiliklarni bartaraf etish.

Xulosa

Tahlil shuni ko‘ rsatadiki, zamonaviy ta’lim jarayonida interfaol metodlardan foydalanish o‘ quvchini ta’lim jarayonining faol subyektiga aylantirish, uning mustaqil va tanqidiy fikrlashini rivojlantirish hamda nazariy bilimlarni amaliy faoliyat bilan bog‘ lash uchun muhim imkoniyat yaratadi.

Ilmiy tadqiqotlar faol ta’lim, hamkorlikda o‘ qitish va muammoli ta’limning turli shakllari o‘ quvchilarning faol ishtirokini kuchaytirishi va ayrim o‘ quv natijalarini yaxshilashi mumkinligini ko‘ rsatadi [1; 2; 3]. Freeman va hammualliflarning meta-tahlilida faol ta’limning an’anaviy ma’ruza shakliga nisbatan o‘ quv natijalariga ijobiy ta’siri empirik ma’lumotlar asosida ko‘ rsatilgan [2].

Shu bilan birga, interfaol metodlardan foydalanishning o‘ zi ta’lim sifatini avtomatik ravishda oshirmaydi. Metodning samaradorligi uning ta’lim maqsadiga mosligi, o‘ quvchi faoliyatini to‘ g‘ ri tashkil etish, o‘ qituvchining yo‘ naltiruvchi roli va baholash mexanizmining aniqligi bilan bog‘ liq [1; 3].

Muammoli va induktiv ta’lim bo‘ yicha tadqiqotlar o‘ quvchilarning murakkab vaziyatlarni tahlil qilishi, muammoni hal qilishi va bilimlarni amaliy vaziyatlarda qo‘ llashi uchun faol pedagogik yondashuvlarning muhimligini ko‘ rsatadi [4; 5].

Shu sababli zamonaviy darsni tashkil etishda asosiy e’tibor metodlar sonini ko‘ paytirishga emas, balki maqsad → metod → faoliyat → baholash → refleksiya o‘ rtasidagi uzviy bog‘ liqlikni ta’minlashga qaratilishi lozim.

Interfaol ta’limning yakuniy mezoni darsda qancha metod ishlatilgani emas, balki o‘ quvchining “nimani o‘ rgandim, qanday o‘ rgandim va olgan bilimimni qayerda qo‘ llay olaman?” degan savollarga aniq javob bera olishidir.

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STEAM – TA'LIM TEXNOLOGIYASI ASOSIDA BOSHLANG' ICH SINF O' QUVCHILARINI FAZOVIY TASAVVURLARINI RIVOJLANTIRISHNING AMALIYOTDAGI HOLATI TAHLILI

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Annotatsiya: *Ushbu maqolada STEAM ta'lim texnologiyasi asosida boshlang' ich sinf o' quvchilarining fazoviy tasavvurlarini rivojlantirishning amaliyotdagi holati tahlil qilinadi. Boshlang' ich ta'lim jarayonida o' quvchilarning fazoviy tafakkuri, obyektlarning shakli, o' lchami, joylashuvi va o' zaro munosabatlarini anglash ko' nikmalarini shakllantirishda STEAM yondashuvining imkoniyatlari yoritilgan.*

Kalit so' zlar: *STEAM ta'lim, boshlang' ich ta'lim, fazoviy tasavvur, fazoviy tafakkur, geometrik shakllar, modellashtirish, konstruksiyalash, fanlararo integratsiya, amaliy faoliyat, ijodiy topshiriqlar.*

АНАЛИЗ СОВРЕМЕННОГО СОСТОЯНИЯ РАЗВИТИЯ ПРОСТРАНСТВЕННЫХ ПРЕДСТАВЛЕНИЙ УЧАЩИХСЯ НАЧАЛЬНЫХ КЛАССОВ НА ОСНОВЕ ОБРАЗОВАТЕЛЬНОЙ ТЕХНОЛОГИИ STEAM

Аннотация: *В данной статье анализируется практическое состояние развития пространственных представлений учащихся начальных классов на основе образовательной технологии STEAM. Освещаются возможности STEAM-подхода в процессе начального образования для формирования у учащихся пространственного мышления, а также навыков понимания формы, размера, расположения объектов и взаимосвязей между ними.*

Ключевые слова: *STEAM-образование, начальное образование, пространственные представления, пространственное мышление, геометрические фигуры, моделирование, конструирование, междисциплинарная интеграция, практическая деятельность, творческие задания.*

ANALYSIS OF THE CURRENT STATE OF DEVELOPING PRIMARY SCHOOL STUDENTS' SPATIAL REPRESENTATIONS THROUGH STEAM-BASED EDUCATIONAL TECHNOLOGY

Abstract: *This article analyzes the current state of developing primary school students' spatial representations through STEAM-based educational technology. It highlights the potential of the STEAM approach in the primary education process for developing students' spatial thinking and their ability to understand the shape, size, position, and spatial relationships of objects.*

Keywords: *STEAM education, primary education, spatial representations, spatial thinking, geometric shapes, modeling, construction, interdisciplinary integration, practical activities, creative tasks.*

Kirish

Bugungi kunda ta'lim tizimida o' quvchilarning nafaqat nazariy bilimlarini, balki amaliy, ijodiy va muammoli vaziyatlarda qaror qabul qilish ko' nikmalarini rivojlantirish muhim pedagogik vazifalardan biri hisoblanadi. Ayniqsa, boshlang' ich ta'lim bosqichida o' quvchilarning atrof-muhitni anglash, predmetlarning o' zaro joylashuvini tasavvur qilish, shakl va hajmni farqlash hamda turli obyektlarni modellashtirish qobiliyatlarini shakllantirish keyingi ta'lim bosqichlari uchun muhim asos yaratadi.

Ta'lim-tarbiya tizimini tubdan o' zgartirish, barkamol insonni shakllantirish ertangi taqdirimizni belgilab beruvchi dolzarb masalalardan biriga aylandi. Buyuk islohotlar amalga oshirilayotgan O' zbekiston sharoitida mustaqil fikrlovchi yoshlarning bo' lishi davr taqozosidir, chunki shaxsiy dunyoqarashga ega bo' lgan insonlargina jamiyat taraqqiyotini ta'minlovchi muvaffaqiyatlarga erishishga qodir bo' ladilar. Respublikada olib borilayotgan siyosatning bosh omillaridan biri ham teran fikrlovchi, mustaqil dunyoqarashga ega, tasavvuri keng, iqtidorli shaxslarni kamol toptirish va tarbiyalashdir.

O' zbekistonda xorijiy tajribadan foydalanilgan holda Milliy o' quv dasturi ishlab chiqildi. Milliy o' quv dasturi haqida O' zbekiston Respublikasi Prezidentining 06.11.2020 yildagi "O' zbekistonning yangi taraqqiyot davrida ta'lim-tarbiya va ilm-fan sohalarini rivojlantirish chora-tadbirlari to' g' risidagi" PF–6108-sonli farmonida uning ishlab chiqilishi

va uni amalga oshirish to‘ g‘ risida so‘ z boradi [1]. Milliy o‘ quv dasturi amaliyotga joriy qilingungacha fan mashg‘ ulotlarida STEAM topshiriqlari asosida o‘ qitish yo‘ lga qo‘ yilmagan. 2021-2022-o‘ quv yillarida esa ayrim fan kesimlari doirasida STEAM topshiriqlari dastur rejasiga kiritildi. Endi o‘ quvchi fanni o‘ zlashtirishi uchun o‘ sha fanning mazmun-mohiyatini tushunibgina qolmay boshqa fanlar bilan bog‘ langan holda hayotiy voqeliklarga asoslangan, kichik bir lohiya ishi ustida ishni tashkillashtirish, o‘ quvchilarni qiziqqan mashg‘ ulotlari orqali fanga qiziqtirish mumkin. Yangi darslik uchun tanlangan mavzular o‘ quvchining ijtimoiy hayotga moslasha olishida ko‘ maklashadigan, mantiqiy, ham informativ, tasavvurlarni rivojlantirishga boy mavzulardan iborat.

Adabiyotlar tahlili

Yangi avlod darsliklarida o‘ quvchilarni tasavvurni, kreativ va tanqidiy fikrlash qobiliyatlarini rivojlantirish uchun har bir mavzuga alohida topshiriqlar ishlab chiqilgan. Shu paytgacha tabiiy fanlar, matematika fanlarini o‘ qitishdan maqsad mavzuga oid qoidalarni yod oldirish edi. Yangi darslikda eng muhim qoidalargina qoldirilgan. “Rang-barang tasvirlar va qiziqarli topshiriqlarga ko‘ proq urg‘ u berilgan. Ahamiyatli tomoni endi o‘ qituvchilar uchun “O‘ qituvchi kitobi”, o‘ quvchilar uchun esa “Mashq daftari” ham bo‘ ladi. Eski darsliklar til strukturasini o‘ rgatishga qaratilgan” [2]. Respublika ta’lim markazi bahoga jazo yoki rag‘ bat quroli emas, rivojlantirish vositasi sifatida qarash kerakligini qayd etdi. Bolalarni baho bilan qo‘ rqitishni bas qilish, ularga imkon qadar past baho qo‘ ymaslik, toki topshiriqni yaxshi bahoga bajarib kelmaguncha baholamay turish tavsiya qilindi. Ushbu Yangi avlod darsliklari o‘ quvchilar uchun qulay va tushunarli ta’lim muhitini yaratgan bo‘ lsa-da, ayrim holatlarda nazariy tushunchalarga nisbatan amaliy topshiriqlarning ketma-ket va takroriy tarzda berilishi kuzatilgan. Ushbu kamchiliklarni inobatga olgan holda 2023–2024-o‘ quv yili uchun “Finlandiya” o‘ quv dasturi asosida yangilangan darsliklar ishlab chiqildi. Mazkur darsliklar har bir fan yo‘ nalishi bo‘ yicha metodik qulayliklarga ega bo‘ lib, nazariy bilimlarga tayanilgan, mazmunan boy va puxta ishlab chiqilgan amaliy topshiriqlar bilan ta’minlangan.

“O‘ zbekistonning 2030-yilga borib PISA (The Programme for International Student Assessment) xalqaro baholash dasturi doirasida o‘ quvchilar natijalari bo‘ yicha dunyoning eng ilg‘ or 30 ta mamlakati qatoridan o‘ rin egallashi” strategik maqsad sifatida belgilangan [1]. Mazkur vazifani amalga oshirish doirasida belgilangan muddatga qadar innovatsion iqtisodiyot ehtiyojlariga mos, STEAM fanlari integratsiyasini inobatga olgan holda ishlab chiqilgan yangi davlat ta’lim standartlari va o‘ quv dasturlarini amaliyotga joriy etish zarurati alohida ta’kidlanadi [3].

Bugungi kunda boshlang‘ ich sinf o‘ quvchilarida tafakkurni rivojlantirish, mustaqil muammolarni hal eta olish kompetensiyalarini shakllantirish hamda fazoviy tasavvurni rivojlantirish masalalari dolzarb ilmiy-pedagogik muammolar sirasiga kiradi. Inson tasavvuri uzluksiz va bosqichma-bosqich shakllanib boradi hamda u avval o‘ zlashtirilgan nazariy bilimlar va ilgari bajarilgan amaliy faoliyat tajribasi asosida vujudga keladi.

XXI asr sharoitida voyaga yetayotgan yosh avlodning har tomonlama barkamol shaxs sifatida shakllanishi, ularning mustaqil tafakkur yurita olishi hamda kreativ va ijodiy salohiyatini rivojlantirish ta’lim-tarbiya tizimi oldida turgan ustuvor vazifalardan biri hisoblanadi. Shu nuqtayi nazardan, zamonaviy pedagogik yondashuvlar orasida STEAM ta’lim texnologiyasining boshlang‘ ich sinf o‘ quvchilari ta’lim-tarbiyasidagi o‘ rni alohida ahamiyat kasb etadi. STEAM ta’limining asosiy vazifasi o‘ quvchilarda tabiiy fanlar, texnika hamda tasviriy faoliyatga bo‘ lgan qiziqishni kuchaytirish, ularni o‘ quv mashg‘ ulotlarini real hayotiy vaziyatlar bilan uzviy bog‘ langan holda bajarishga yo‘ naltirishdan iboratdir.

Ta’lim jarayoniga mazkur innovatsion yondashuvning joriy etilishi nazariy bilimlarning amaliy faoliyat bilan uzviy integratsiyalashuvi uchun keng imkoniyatlar yaratadi. STEAM ta’lim texnologiyasi asosida ishlab chiqilgan topshiriqlar mazmunan boy va maqsadga yo‘ naltirilgan bo‘ lib, mashg‘ ulotlar jarayonida o‘ quvchilarning faol ishtiroki ta’minlanadi. Natijada o‘ quvchilar dars davomida faollikni saqlab qoladi, zerikish holatlari kamayadi. Eng muhim jihatlardan biri shundaki, jamoaviy faoliyat jarayonida o‘ quvchilar tengdoshlari hamda o‘ qituvchi bilan hamkorlikda ishlash tajribasini orttiradi, bu esa o‘ rganilgan bilim va ko‘ nikmalarning xotirada yanada mustahkamroq saqlanishiga xizmat qiladi.

Tahlillar va natijalar

Boshlang‘ ich ta’lim bosqichining ustuvor vazifalaridan biri bolada o‘ rganishga qaratilgan qobiliyatni, ya’ni ta’lim faoliyatining poydevorini shakllantirishdan iboratdir. Aynan dastlabki maktab yillari va keyingi ta’lim jarayonlari tasavvurning muhim aqliy jarayon sifatida rivojlanishiga eng kuchli ta’sir ko‘ rsatadi. Shu jihatdan, fazoviy tasavvurni izchil shakllantirish orqali fanlar doirasida egallangan bilimlarni chuqur o‘ zlashtirish hamda matematik ta’limda kompetensiyaviy yondashuvni amalga oshirish o‘ quvchilarda kasbiy faoliyatda, shaxsiy hayotda va jamiyatning kundalik ehtiyojlarida uchraydigan turli vaziyatlarda samarali faoliyat yuritish imkonini beruvchi ko‘ p qirrali malakalarni rivojlantirishni nazarda tutadi.

STEAM yondashuvining fazoviy tasavvurlarni rivojlantirishdagi imkoniyatlari.

STEAM ta’limning asosiy xususiyatlaridan biri fanlararo integratsiyadir. Masalan, o‘ quvchi oddiy geometrik shakllardan bino modelini yaratishi mumkin. Bunda matematika orqali shakl va o‘ lchamlarni aniqlaydi, texnologiya orqali materiallardan foydalanadi, muhandislik elementlari orqali konstruksiyaning mustahkamligini o‘ ylaydi, san’at orqali modelning tashqi ko‘ rinishini bezatadi.

Bunday faoliyat o‘ quvchining bir vaqtning o‘ zida bir nechta kompetensiyalarini rivojlantiradi. Jumladan:

- fazodagi obyektlarning joylashuvini aniqlash;
- geometrik shakllarni farqlash;
- shakllarning o‘ zaro bog‘ liqligini tushunish;
- obyektlarni tasavvurda aylantirish va o‘ zgartirish;
- model yaratish;
-o‘ lchash va taqqoslash;
-muammoni mustaqil hal qilish;
-ijodiy fikrlash.

Shu sababli STEAM mashg‘ ulotlari oddiy nazariy topshiriqlarga qaraganda o‘ quvchilarning faol ishtirokini ta’minlashga ko‘ proq imkon beradi.

STEAM mashg‘ ulotlarini takomillashtirish bo‘ yicha tavsiyalar

Boshlang‘ ich sinflarda STEAM asosida fazoviy tasavvurlarni rivojlantirish uchun quyidagi metodik yondashuvlardan foydalanish maqsadga muvofiq:

- Geometrik tushunchalarni imkon qadar amaliy topshiriqlar bilan bog‘ lash.
- Dars mashg‘ ulotlarida yoshga mos kichik STEAM loyihalarini ishlab chiqish.
- O‘ quvchilarni guruhlarga ajratib, hamkorlikda model yaratish faoliyatini tashkil etish.
- Model tayyorlash va tayyor modelni taqdim etishga o‘ rgatish.
- Raqamli texnologiyalar va vizual modellashtirish vositalaridan yosh xususiyatlariga mos ravishda foydalanish.
- O‘ qituvchilar uchun STEAM metodikasi bo‘ yicha amaliy seminar va treninglarni tashkil etish.

Xulosalar

Xulosa qilib aytganda, STEAM ta’lim texnologiyasi boshlang‘ ich sinf o‘ quvchilarining fazoviy tasavvurlarini rivojlantirish uchun samarali pedagogik imkoniyatlarni yaratadi. Mazkur yondashuv matematika, texnologiya, tabiiy fanlar, muhandislik va san’atni o‘ zaro integratsiyalash orqali o‘ quvchilarni faol amaliy faoliyatga jalb etadi. Fazoviy tasavvurlarni rivojlantirishda modellashtirish, konstruktorlik faoliyati, geometrik shakllar bilan ishlash, loyiha va ijodiy topshiriqlardan foydalanish o‘ quvchilarning predmetlarning shakli, hajmi, joylashuvi va o‘ zaro munosabatlarini chuqurroq anglashlariga yordam beradi. Shu bilan birga, bunday faoliyat o‘ quvchilarning mantiqiy, ijodiy va muhandislik fikrlashini rivojlantirishga xizmat qiladi.

Amaliyot tahlili shuni ko‘ rsatadiki, STEAM yondashuvini boshlang‘ ich ta’limga tizimli ravishda joriy etish uchun o‘ qituvchilarning metodik tayyorgarligini oshirish, amaliy topshiriqlar bankini yaratish va ta’lim muhitini zarur resurslar bilan ta’minlash muhim ahamiyatga ega. Natijada boshlang‘ ich sinf o‘ quvchilarining fazoviy tasavvurlari bilan bir qatorda, ularning mustaqil fikrlash, ijodkorlik, hamkorlik va muammoli vaziyatlarni hal qilish kompetensiyalari ham rivojlanadi.

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BO‘ LAJAK BOSHLANG‘ ICH TA’LIM O‘ QITUVCHILARINING REFLEKSIV KOMPETENSIYASINI RIVOJLANTIRISHNING PEDAGOGIK IMKONIYATLARI

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Annotatsiya: *Mazkur maqolada bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirishning pedagogik imkoniyatlari ilmiy-nazariy va amaliy jihatdan tahlil qilinadi. Tadqiqotda refleksiya, refleksiv kompetensiya, kasbiy-pedagogik faoliyat hamda bo‘ lajak o‘ qituvchining kasbiy rivojlanishi tushunchalarining mazmun-mohiyati, ularning o‘ zaro aloqadorligi va zamonaviy pedagogik ta’lim tizimidagi ahamiyati yoritilgan. Shuningdek, kompetensiyaviy, shaxsga yo‘ naltirilgan, faoliyatga asoslangan va refleksiv yondashuvlar asosida bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarida o‘ z pedagogik faoliyatini tahlil qilish, baholash, mavjud muammolarni aniqlash, pedagogik qarorlarni asoslash hamda kasbiy faoliyatini takomillashtirish ko‘ nikmalarini rivojlantirish mexanizmlari asoslab berilgan. Pedagogik amaliyot, refleksiv topshiriqlar, pedagogik vaziyatlarni tahlil qilish, portfolio, o‘ z-o‘ zini baholash va o‘ zaro baholash kabi vositalardan samarali foydalanish orqali bo‘ lajak o‘ qituvchilarning kasbiy o‘ zini anglash, mustaqil qaror qabul qilish va pedagogik faoliyat natijalarini tanqidiy baholash imkoniyatlari ochib berilgan. Tadqiqot natijalari refleksiv kompetensiyani rivojlantirish bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining kasbiy-pedagogik mahoratini shakllantirishning muhim omillaridan biri ekanligini ko‘ rsatadi.*

Kalit so‘ zlar: *refleksiya, refleksiv kompetensiya, bo‘ lajak o‘ qituvchi, boshlang‘ ich ta’lim, kasbiy-pedagogik kompetensiya, pedagogik mahorat, kasbiy rivojlanish, refleksiv yondashuv, o‘ z-o‘ zini baholash, pedagogik amaliyot, pedagogik faoliyat, kompetensiyaviy yondashuv.*

ПЕДАГОГИЧЕСКИЕ ВОЗМОЖНОСТИ РАЗВИТИЯ РЕФЛЕКСИВНОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ УЧИТЕЛЕЙ НАЧАЛЬНОГО ОБРАЗОВАНИЯ

Аннотация: *В статье представлен научно-теоретический и практический анализ педагогических возможностей развития рефлексивной компетентности будущих учителей начального образования. В исследовании раскрываются содержание и сущность понятий рефлексии, рефлексивной компетентности, профессионально-педагогической деятельности и профессионального развития будущего учителя, а также их взаимосвязь и значение в современной системе педагогического образования. Кроме того, на основе компетентностного, личностно-ориентированного, деятельностного и рефлексивного подходов обоснованы механизмы развития у будущих учителей начального образования умений анализировать и оценивать собственную педагогическую деятельность, выявлять существующие проблемы, обосновывать педагогические решения и совершенствовать профессиональную деятельность. Раскрыты возможности развития профессионального самосознания, самостоятельного принятия решений и критической оценки результатов педагогической деятельности будущих учителей посредством эффективного использования педагогической практики, рефлексивных заданий, анализа педагогических ситуаций, портфолио, самооценивания и взаимооценивания. Результаты исследования показывают, что развитие рефлексивной компетентности является одним из важных факторов формирования профессионально-педагогического мастерства будущих учителей начального образования.*

Ключевые слова: *рефлексия, рефлексивная компетентность, будущий учитель, начальное образование, профессионально-педагогическая компетентность, педагогическое мастерство, профессиональное развитие, рефлексивный подход, самооценивание, педагогическая практика, педагогическая деятельность, компетентностный подход..*

PEDAGOGICAL OPPORTUNITIES FOR DEVELOPING THE REFLECTIVE COMPETENCE OF PRE-SERVICE PRIMARY SCHOOL TEACHERS

Abstract: *This article provides a scientific-theoretical and practical analysis of the pedagogical opportunities for developing the reflective competence of pre-service primary school teachers. The study examines the content and essence of the concepts of reflection,*

reflective competence, professional-pedagogical activity, and professional development of pre-service teachers, as well as their interrelationship and significance within the modern system of teacher education. In addition, based on competency-based, learner-centered, activity-based, and reflective approaches, the article substantiates mechanisms for developing pre-service primary school teachers' abilities to analyze and evaluate their pedagogical activities, identify existing problems, justify pedagogical decisions, and improve their professional practice. The study highlights the possibilities of enhancing pre-service teachers' professional self-awareness, independent decision-making, and critical evaluation of pedagogical activity outcomes through the effective use of pedagogical practice, reflective tasks, analysis of pedagogical situations, portfolios, self-assessment, and peer assessment. The findings indicate that the development of reflective competence is one of the important factors in shaping the professional and pedagogical mastery of pre-service primary school teachers.

Keywords: *reflection, reflective competence, pre-service teacher, primary education, professional-pedagogical competence, pedagogical mastery, professional development, reflective approach, self-assessment, pedagogical practice, pedagogical activity, competency-based approach.*

Kirish. Bugungi globallashuv, raqamli transformatsiya va ta'lim mazmunining tezkor yangilanib borishi sharoitida pedagogning kasbiy faoliyatiga qo‘ yilayotgan talablar tubdan o‘ zgarib bormoqda. Zamonaviy o‘ qituvchidan nafaqat chuqur fan va metodik bilimlarga ega bo‘ lish, balki o‘ z pedagogik faoliyatini muntazam tahlil qilish, kasbiy yutuq va kamchiliklarini anglash, ta'lim jarayonida yuzaga keladigan muammolarga mos yechimlar ishlab chiqish hamda o‘ z faoliyatini uzluksiz takomillashtirish qobiliyati ham talab etilmoqda. Ayniqsa, boshlang‘ ich ta'lim o‘ qituvchisi faoliyatining o‘ ziga xosligi, uning kichik yoshdagi o‘ quvchilarning intellektual, ijtimoiy-emotsional va shaxsiy rivojlanishiga bevosita ta'sir ko‘ rsatishi bo‘ lajak pedagoglarni kasbiy faoliyatga tayyorlash jarayonida refleksiv kompetensiyani rivojlantirish masalasini alohida ahamiyatga ega ekanligini ko‘ rsatadi.

Pedagogik refleksiya o‘ qituvchining o‘ z faoliyati, pedagogik qarorlari, qo‘ llagan metodlari, o‘ quvchilar bilan munosabatlari va ta'lim natijalarini anglash, tahlil qilish hamda baholash jarayoni sifatida namoyon bo‘ ladi. Refleksiv kompetensiya esa mazkur jarayonni ongli, tizimli va maqsadli ravishda amalga oshirish imkonini beruvchi kasbiy sifatlar majmuasini ifodalaydi. Bo‘ lajak o‘ qituvchi uchun refleksiv kompetensiyaning shakllanganligi uning "nima qildim?" degan savol bilan cheklanib qolmasdan, "nima uchun bunday natija yuzaga keldi?", "qaysi pedagogik qarorim samarali bo‘ ldi?", "qanday jihatlarni takomillashtirishim zarur?" va "keyingi faoliyatimni qanday tashkil etishim kerak?" kabi savollarga asoslangan holda o‘ z faoliyatini tahlil qila olishida namoyon bo‘ ladi. Shu jihatdan refleksiya bo‘ lajak pedagogning kasbiy o‘ zini anglash va professional rivojlanishining muhim mexanizmlaridan biri hisoblanadi.

Zamonaviy pedagogik tadqiqotlarda o‘ qituvchining kasbiy kompetentligini rivojlantirish masalasi uning o‘ z faoliyatini baholash, pedagogik tajribani tahlil qilish va undan keyingi faoliyat uchun xulosalar chiqarish qobiliyati bilan chambarchas bog‘ liq holda qaralmoqda. Xususan, refleksiv amaliyot o‘ qituvchining kasbiy tajribasini shunchaki takrorlash emas, balki uni tahlil qilish, mavjud muammolarning sabablarini aniqlash va yangi pedagogik strategiyalarni ishlab chiqish imkonini beradi. Bu jarayon ayniqsa bo‘ lajak boshlang‘ ich ta'lim o‘ qituvchilari uchun muhimdir, chunki pedagogik oliy ta'lim jarayonida shakllangan nazariy bilimlar faqat amaliy faoliyat bilan bog‘ langan va refleksiv tahlil orqali qayta ishlangan taqdirdagina barqaror kasbiy kompetensiyaga aylanishi mumkin.

Bo‘ lajak boshlang‘ ich ta'lim o‘ qituvchilarining refleksiv kompetensiyasini shakllantirish, avvalo, pedagogik ta'lim mazmuni va o‘ quv jarayonini tashkil etish usullarini takomillashtirishni talab qiladi. An'anaviy ta'limda talaba ko‘ pincha pedagogik bilimlarni o‘ zlashtiruvchi subyekt sifatida qaralsa, zamonaviy kompetensiyaviy va shaxsga yo‘ naltirilgan ta'limda u o‘ z kasbiy rivojlanishini anglaydigan, pedagogik vaziyatlarni tahlil qiladigan, mustaqil qaror qabul qiladigan va o‘ z faoliyatiga baho bera oladigan faol subyekt sifatida namoyon bo‘ ladi. Shu nuqtayi nazardan, muammoli ta'lim, case-study, mikroo‘ qitish, pedagogik vaziyatlarni modellashtirish, loyiha asosida o‘ qitish, pedagogik portfolio, refleksiv kundalik, o‘ z-o‘ zini baholash va o‘ zaro baholash kabi vositalardan foydalanish bo‘ lajak o‘ qituvchilarning refleksiv kompetensiyasini rivojlantirishning samarali pedagogik imkoniyatlari sifatida namoyon bo‘ lishi mumkin.

Refleksiv kompetensiya faqat o‘ qituvchining o‘ z xatti-harakatlarini baholashi bilan cheklanmaydi. U kasbiy o‘ zini anglash, pedagogik vaziyatlarni tahlil qilish, tanqidiy fikrlash, o‘ z faoliyatining natijalarini baholash, muqobil pedagogik yechimlarni izlash va kelgusidagi faoliyatni rejalashtirish kabi o‘ zaro bog‘ liq jarayonlarni qamrab oladi. Shu sababli bo‘ lajak boshlang‘ ich ta'lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirish ularning nafaqat mavjud pedagogik bilimlarini mustahkamlash, balki kasbiy faoliyatga ijodiy va tanqidiy yondashish qobiliyatini ham shakllantiradi. Masalan, talaba mikro-dars o‘ tkazgandan so‘ ng faqat o‘ qituvchi yoki guruhdoshlarining bahosini olish bilan cheklanmasdan, o‘ z darsining maqsadi, metodlari, o‘ quvchilar faolligi, vaqt taqsimoti va kutilgan natijalarini mustaqil tahlil qilishi uning refleksiv faoliyatini rivojlantiradi.

Bugungi kunda O‘ zbekiston oliy pedagogik ta'lim tizimida ham bo‘ lajak o‘ qituvchilarning kasbiy kompetensiyalarini rivojlantirish, pedagogik amaliyotning samaradorligini oshirish, ta'limning nazariy va amaliy

komponentlarini integratsiyalash hamda zamonaviy pedagogik yondashuvlarni ta’lim jarayoniga tatbiq etishga alohida e’tibor qaratilmoqda.

Mavzuga oid adabiyotlar sharhi. Bo‘ lajak o‘ qituvchilarning refleksiv kompetensiyasini rivojlantirish masalasi pedagogika, psixologiya va kasbiy ta’lim metodikasining kesishgan nuqtasida shakllangan ilmiy yo‘ nalishlardan biridir. Mazkur tushunchaning nazariy asoslari, avvalo, refleksiya fenomenining falsafiy-psixologik talqinlari bilan bog‘ liq. Refleksiya shaxsning o‘ z faoliyati, fikrlashi, tajribasi va xatti-harakatlarini anglash hamda ularni tahlil qilish jarayoni sifatida izohlanadi. Shu nuqtayi nazardan, pedagogik refleksiya o‘ qituvchining ta’lim jarayonidagi faoliyati va qabul qilgan qarorlarini ongli ravishda qayta ko‘ rib chiqishi, ularning samaradorligini baholashi va keyingi pedagogik faoliyatini takomillashtirishga yo‘ naltirilgan jarayon sifatida qaraladi.

Refleksiv amaliyotning pedagogik asoslarini ishlab chiqishda D. Schonning tadqiqotlari alohida ahamiyatga ega. Olim professional faoliyatni takomillashtirishda “reflection-in-action” va “reflection-on-action” tushunchalarini ilgari surib, mutaxassisning faoliyat jarayonining o‘ zida vaziyatni anglay olishi hamda faoliyatdan keyin uning natijalarini tahlil qilishi o‘ rtasidagi farqni asoslagan [1]. Mazkur yondashuv pedagog faoliyatining mexanik ravishda takrorlanishidan ko‘ ra, har bir pedagogik vaziyatdan kasbiy tajriba va yangi bilim olish imkonini beruvchi refleksiv jarayon sifatida foydalanish zarurligini ko‘ rsatadi.

J. Dewey qarashlarida ham refleksiv fikrlash muayyan muammo yoki pedagogik vaziyatni yuzaki baholash emas, balki mavjud dalillarni izchil tahlil qilish, sabab-oqibat aloqalarini aniqlash va asoslangan xulosaga kelish jarayoni sifatida talqin qilinadi [2]. Ushbu nazariy qarashlar bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarini tayyorlash jarayonida refleksiyani mustaqil fikrlash va kasbiy qaror qabul qilish bilan integratsiyalash zarurligini asoslash imkonini beradi.

K. Zeichner va D. Liston o‘ qituvchining refleksiv faoliyatini pedagogik amaliyotni anglash va takomillashtirish vositasi sifatida tadqiq etib, refleksiv o‘ qituvchini o‘ zining pedagogik qarorlarini tanqidiy ko‘ rib chiqadigan, o‘ quvchilarning ehtiyojlarini hisobga oladigan va o‘ z tajribasini muntazam ravishda qayta baholaydigan mutaxassis sifatida tavsiflaydi [3]. Ularning tadqiqotlarida refleksiv yondashuv o‘ qituvchining kasbiy avtonomiyasi va pedagogik faoliyatga ongli munosabatini shakllantirish bilan bog‘ lanadi.

G. Gibbs tomonidan taklif etilgan refleksiv sikl esa pedagogik faoliyatni tizimli tahlil qilish uchun amaliy model sifatida keng qo‘ llaniladi. Mazkur model hodisani tavsiflash, his-tuyg‘ ularni anglash, baholash, tahlil qilish, xulosa chiqarish va keyingi harakat rejasini ishlab chiqish kabi bosqichlarni qamrab oladi [4]. Ushbu yondashuvdan bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining pedagogik amaliyoti jarayonida foydalanish ularning o‘ z faoliyatini izchil tahlil qilish va aniqlangan kamchiliklarni bartaraf etish bo‘ yicha aniq strategiyalar ishlab chiqishiga yordam beradi.

Refleksiv kompetensiyaning kasbiy kompetentlik bilan aloqasi zamonaviy pedagogik tadqiqotlarda ham muhim o‘ rin egallaydi. P. Jarvis kasbiy rivojlanish jarayonida tajribaning o‘ zi emas, balki tajribani anglash va undan yangi bilim hosil qilish muhimligini ta’kidlaydi [5]. Ushbu qarash bo‘ lajak o‘ qituvchining pedagogik amaliyotini oddiy tajriba to‘ plash jarayonidan refleksiv kasbiy rivojlanish jarayoniga aylantirish zarurligini ko‘ rsatadi.

Mahalliy pedagogik tadqiqotlarda ham bo‘ lajak o‘ qituvchilarni kasbiy faoliyatga tayyorlash, ularning pedagogik kompetensiyalarini shakllantirish, mustaqil va ijodiy fikrlashini rivojlantirish, pedagogik amaliyotning ta’lim jarayonidagi rolini kuchaytirish masalalariga katta e’tibor qaratilgan. Xususan, o‘ zbek pedagogikasida kasbiy kompetentlikni shakllantirish masalalari, pedagogik mahorat, o‘ qituvchining kasbiy tayyorgarligi, pedagogik faoliyatni tashkil etish va bo‘ lajak mutaxassisning shaxsiy-kasbiy sifatlarini rivojlantirish bilan bog‘ liq ilmiy qarashlar refleksiv kompetensiyani tadqiq etish uchun muhim nazariy asos bo‘ lib xizmat qiladi.

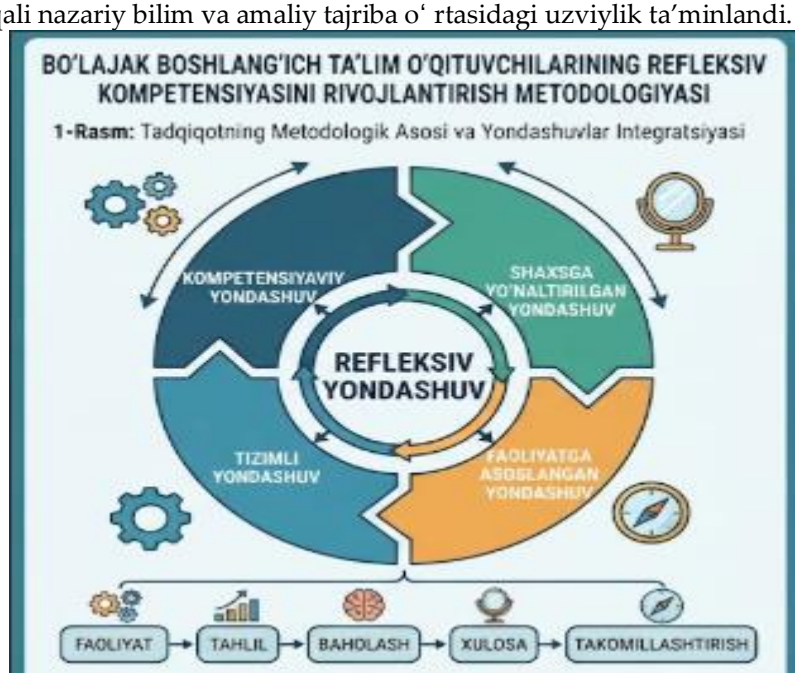
Tadqiqot metodologiyasi va metodlari. Tadqiqot metodologiyasi va metodlari. Mazkur tadqiqotning metodologik asosini bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini shakllantirish va rivojlantirish jarayonini shaxsning kasbiy rivojlanishi, faoliyatni anglash va pedagogik tajribani qayta tahlil qilish jarayoni sifatida talqin etishga imkon beruvchi zamonaviy pedagogik yondashuvlar tashkil etadi. Tadqiqotda refleksiv, kompetensiyaviy, shaxsga yo‘ naltirilgan, faoliyatga asoslangan va tizimli yondashuvlarning o‘ zaro integratsiyasiga tayanildi. Mazkur yondashuvlarning uyg‘ unligi bo‘ lajak o‘ qituvchining nafaqat pedagogik bilim va ko‘ nikmalarini, balki o‘ z faoliyatini mustaqil tahlil qilish, baholash, xulosa chiqarish va keyingi faoliyatini rejalashtirish qobiliyatlarini rivojlantirish imkonini beradi.

Refleksiv yondashuv tadqiqotning asosiy metodologik yo‘ nalishi sifatida belgilandi. Ushbu yondashuv asosida bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchisining pedagogik faoliyatga nisbatan ongli munosabati, o‘ zining kuchli va zaif jihatlarini aniqlashi, pedagogik qarorlarining natijalarini tahlil qilishi hamda kasbiy rivojlanish ehtiyojlarini belgilashi nazarda tutildi. Refleksiv yondashuv doirasida “faoliyat – tahlil – baholash – xulosa – takomillashtirish” izchilligi tadqiqotning muhim mantiqiy mexanizmi sifatida qaraldi.

Shaxsga yo‘ naltirilgan yondashuv asosida har bir bo‘ lajak o‘ qituvchining individual kasbiy tajribasi, qiziqishlari, ehtiyojlari va o‘ zini rivojlantirish imkoniyatlarini hisobga olish ko‘ zda tutildi. Bu yondashuv refleksiv kompetensiyani

tashqi talab asosida shakllantiriladigan sifat emas, balki talabaning o‘ z kasbiy rivojlanishiga ongli munosabati orqali bosqichma-bosqich rivojlanadigan kompetensiya sifatida qarash imkonini berdi.

Faoliyatga asoslangan yondashuv esa refleksiv kompetensiyani bevosita amaliy pedagogik faoliyat bilan bog‘ lashni nazarda tutdi. Bunda pedagogik amaliyot, mikroo‘ qitish, pedagogik vaziyatlarni modellashtirish, dars ishlanmalarini tahlil qilish, keys-topshiriqlar, loyiha faoliyati va pedagogik muammolarni hal etish jarayonlari refleksiv ko‘ nikmalarni rivojlantirish vositasi sifatida qaraldi. Talabaning real yoki modellashtirilgan pedagogik vaziyatdagi faoliyati keyinchalik refleksiv tahlil qilinishi orqali nazariy bilim va amaliy tajriba o‘ rtasidagi uzviylik ta’minlandi.



Tadqiqotda tizimli yondashuv ham muhim metodologik asoslardan biri sifatida qo‘ llanildi. Unga ko‘ ra, refleksiv kompetensiyani rivojlantirish o‘ zaro bog‘ liq maqsad, mazmun, metod, vosita, pedagogik shart-sharoit, faoliyat va natijalar majmuasidan iborat yaxlit pedagogik tizim sifatida ko‘ rib chiqildi. Mazkur yondashuv refleksiv kompetensiyaning alohida ko‘ nikmalar yig‘ indisi emas, balki o‘ zaro aloqador kasbiy sifatlar tizimi ekanligini asoslashga xizmat qildi.

Tadqiqot jarayonida nazariy metodlardan — ilmiy-pedagogik adabiyotlarni o‘ rganish va tahlil qilish, qiyosiy tahlil, umumlashtirish, tizimlashtirish, modellashtirish va pedagogik hodisalarni nazariy jihatdan talqin qilish metodlaridan foydalanildi. Ushbu metodlar refleksiya, refleksiv kompetensiya, kasbiy kompetentlik, pedagogik mahorat va bo‘ lajak o‘ qituvchining kasbiy rivojlanishi bilan bog‘ liq ilmiy qarashlarni umumlashtirish hamda tadqiqotning nazariy asoslarini belgilash imkonini berdi.

Empirik metodlar sifatida kuzatish, suhbat, so‘ rovnoma, o‘ z-o‘ zini baholash, ekspert baholash, pedagogik amaliyot jarayonini o‘ rganish va pedagogik vaziyatlarni tahlil qilishdan foydalanish mumkin. Xususan, kuzatish metodi orqali talabalarning pedagogik faoliyat jarayonida o‘ z xatti-harakatlari va qarorlarini tahlil qilish darajasi o‘ rganildi. Suhbat va so‘ rovnomalar orqali ularning refleksiyaga bo‘ lgan munosabati, o‘ z kasbiy imkoniyatlarini baholashi va kasbiy rivojlanish ehtiyojlari aniqlandi. O‘ z-o‘ zini baholash metodlari esa talabaning o‘ z pedagogik faoliyatiga mustaqil baho berish qobiliyatini aniqlashga xizmat qildi.

Refleksiv kompetensiyani rivojlantirish jarayonida refleksiv kundalik, pedagogik portfolio, mikroo‘ qitish, videoanaliz, “case-study”, o‘ zaro baholash va refleksiv suhbat kabi pedagogik vositalardan foydalanish nazarda tutildi. Ayniqsa, refleksiv kundalik orqali talabalar o‘ z pedagogik faoliyatidagi muhim vaziyatlarni qayd etish, ularning sabablarini tahlil qilish, yuzaga kelgan qiyinchiliklarni aniqlash va keyingi faoliyat uchun aniq takliflar ishlab chiqish imkoniyatiga ega bo‘ ladilar. Portfolio esa talabaning kasbiy rivojlanish dinamikasini tizimli ravishda kuzatish va uning yutuqlari hamda rivojlanish ehtiyojlarini aniqlash vositasi sifatida xizmat qiladi.



Tadqiqotda pedagogik modellashtirish metodidan ham foydalanilib, bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirishning maqsad, mazmun, metod, vosita, pedagogik shart-sharoit va natijalarini o‘ zaro bog‘ lovchi modelini ishlab chiqish imkoniyati ko‘ rib chiqildi. Modelning mazmuni talabalarning o‘ z pedagogik faoliyatini anglash, tahlil qilish, baholash va takomillashtirish jarayonlarini bosqichma-bosqich tashkil etishga yo‘ naltirildi. Shuningdek, tadqiqot natijalarini qayta ishlash va talqin qilishda sifat va miqdoriy tahlil usullaridan foydalanish nazarda tutildi. Olingan ma’lumotlarni qiyoslash, umumlashtirish va dinamikasini aniqlash orqali refleksiv kompetensiyaning rivojlanish darajasini baholash imkoniyati yaratildi. Shu asosda bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirishga xizmat qiluvchi pedagogik imkoniyatlar tizimlashtirildi hamda ularni pedagogik ta’lim jarayoniga integratsiyalashning ilmiy-metodik asoslari belgilandi.

Muhokama. Bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirish masalasi zamonaviy pedagogik ta’limning muhim yo‘ nalishlaridan biri sifatida namoyon bo‘ lmoqda. Chunki bo‘ lajak o‘ qituvchining kasbiy tayyorgarligi faqat nazariy bilimlarni egallash yoki pedagogik metodlarni o‘ zlashtirish bilan cheklanmaydi. U o‘ zining pedagogik faoliyatini anglash, amalga oshirilgan faoliyat natijalarini tahlil qilish, yuzaga kelgan muammolarning sabablarini aniqlash va keyingi faoliyatini takomillashtirishga qaratilgan qarorlarni mustaqil qabul qila olishi ham zarur. Shu nuqtayi nazardan refleksiv kompetensiya o‘ qituvchining kasbiy-pedagogik kompetentligini tarkib toptiruvchi muhim omillardan biri sifatida qaraladi.

Tadqiqot doirasida refleksiyani faqat dars yakunida “Nimani o‘ rgandim?”, “Nimada qiyinchilik tug‘ ildi?” kabi savollarga javob berish bilan cheklash yetarli emasligi aniqlandi. Refleksiya muntazam, maqsadli va tizimli tashkil etilgandagina bo‘ lajak o‘ qituvchining kasbiy rivojlanishiga real ta’sir ko‘ rsatishi mumkin. Bunda refleksiv jarayon “faoliyat – tahlil – baholash – xulosa – takomillashtirish” izchilligida tashkil etilishi maqsadga muvofiq. Mazkur ketma-ketlik talabaning o‘ z pedagogik faoliyatiga tashqi kuzatuvchi sifatida qarashiga, o‘ zining kuchli va zaif jihatlarini aniqlashiga hamda kelgusidagi pedagogik harakatlarini rejalashtirishiga imkon beradi.

1-jadval. Refleksiv kompetensiyaning tarkibiy komponentlari

Komponent	Mazmuni	Yetishmasa nima bo‘ladi
Motivatsion	O‘z faoliyatini tahlil qilishga ichki istak	Refleksiv faoliyat formal bo‘lib qoladi
Kognitiv	Yetarli pedagogik bilimlar	Faoliyatni chuqur tahlil qilish qiyinlashadi
Analitik	Faoliyat natijalari va muammo sabablarini tahlil qilish	Muammoli jihatlarni aniq belgilab bo‘lmaydi
Baholovchi	O‘zining kuchli va zaif jihatlarini baholash	Kamchiliklar to‘g‘ri aniqlanmaydi
Prognostik	Keyingi faoliyatni takomillashtirish strategiyasini ishlab chiqish	Tahlil natijasi amaliyotga o‘tmaydi

Olingan nazariy xulosalar D. Schönning refleksiyaning faoliyat jarayonidagi va faoliyatdan keyingi shakllari haqidagi qarashlari bilan hamohangdir [1]. Xususan, bo‘ lajak o‘ qituvchi pedagogik vaziyatning o‘ zida tezkor qaror qabul qilishni, darsdan keyin esa amalga oshirilgan pedagogik harakatlarning samaradorligini chuqur tahlil qilishni o‘ rganishi lozim. J. Dewey tomonidan ilgari surilgan refleksiv fikrlash konsepsiyasi ham pedagogik tajribani shunchaki boshdan kechirish emas, balki uni ongli ravishda tahlil qilish va undan xulosa chiqarish zarurligini ko‘ rsatadi [2]. Shu jihatdan refleksiv kompetensiya tajribani kasbiy rivojlanish manbaiga aylantiruvchi mexanizm sifatida talqin qilinishi mumkin.

Bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarida refleksiv kompetensiyani shakllantirishda pedagogik amaliyot alohida imkoniyatlarga ega. Chunki aynan pedagogik amaliyot jarayonida talaba real ta’lim muhiti, o‘ quvchilarning individual xususiyatlari, sinfdagi kommunikativ vaziyatlar va turli pedagogik muammolar bilan bevosita to‘ qnashadi. Biroq mazkur tajribaning o‘ zi refleksiv kompetensiyaning rivojlanishini avtomatik ravishda ta’minlamaydi. Tajriba maxsus refleksiv topshiriqlar, pedagogik vaziyatlarni tahlil qilish, o‘ z-o‘ zini baholash, mentor yoki rahbar bilan refleksiv suhbatlar orqali qayta ishlangandagina kasbiy bilim va ko‘ nikmalarning rivojlanishiga xizmat qiladi.

Shuningdek, refleksiv kundalik, pedagogik portfolio, mikroo‘ qitish, videoanaliz va tengdoshlar tomonidan baholash kabi vositalarning integratsiyalashuvi bo‘ lajak o‘ qituvchining o‘ z faoliyatini turli nuqtayi nazardan ko‘ rib chiqishiga sharoit yaratadi. Masalan, mikroo‘ qitish jarayonida talaba qisqa dars fragmentini tashkil etadi, keyinchalik uning mazmuni, metodikasi, nutqi, vaqt taqsimoti va o‘ quvchilar bilan muloqotini tahlil qiladi. Videoanaliz esa o‘ qituvchiga o‘ z faoliyatini bevosita kuzatish imkonini berib, o‘ zi sezmagan pedagogik jihatlarni aniqlashga yordam beradi. Shu sababli refleksiv vositalarni alohida mashg‘ ulot sifatida emas, balki pedagogik fanlar va amaliy tayyorgarlikning tarkibiy qismi sifatida tashkil etish samaraliroq hisoblanadi.

Muhokama natijalari refleksiv kompetensiyaning motivatsion, kognitiv, analitik, baholovchi va prognostik jihatlari o‘ zaro bog‘ liq holda rivojlanishi zarurligini ko‘ rsatadi. Talabada o‘ z faoliyatini tahlil qilish istagi mavjud bo‘ lmasa, refleksiv faoliyat formal xarakter kasb etadi. Yetarli pedagogik bilim bo‘ lmasa, faoliyatni chuqur tahlil qilish qiyinlashadi. Analitik va baholovchi ko‘ nikmalar rivojlanmagan holatda esa talaba o‘ z faoliyatining muammoli jihatlarini aniq belgilay olmaydi. Prognostik komponent esa aniqlangan kamchiliklar asosida keyingi pedagogik faoliyatni takomillashtirish strategiyasini ishlab chiqish imkonini beradi. Demak, refleksiv kompetensiya alohida ko‘ nikmalar yig‘ indisi emas, balki o‘ zaro bog‘ langan tarkibiy komponentlardan tashkil topgan yaxlit kasbiy sifatdir.

Xulosa. Olib borilgan nazariy tahlil va metodologik yondashuvlar asosida bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirish zamonaviy pedagogik ta’limning muhim vazifalaridan biri ekanligi aniqlandi. Refleksiv kompetensiya bo‘ lajak o‘ qituvchining o‘ z pedagogik faoliyatini anglash, tahlil qilish, baholash, yuzaga keladigan muammolarning sabablarini aniqlash hamda kelgusidagi faoliyatini takomillashtirishga yo‘ naltirilgan ongli va tizimli faoliyatini ifodalaydi. Shu jihatdan u kasbiy-pedagogik kompetentlikning muhim tarkibiy qismi sifatida namoyon bo‘ ladi.

Tadqiqot natijalariga ko‘ ra, refleksiv kompetensiyani rivojlantirish jarayoni bir martalik refleksiv mashg‘ ulotlar bilan cheklanmasligi, balki oliy pedagogik ta’limning barcha bosqichlarida izchil va tizimli tashkil etilishi lozim. Bunda refleksiv, kompetensiyaviy, shaxsga yo‘ naltirilgan, faoliyatga asoslangan va tizimli yondashuvlarning o‘ zaro uyg‘ unligi muhim metodologik asos bo‘ lib xizmat qiladi. Ayniqsa, “faoliyat – tahlil – baholash – xulosa – takomillashtirish” ketma-ketligining ta’lim jarayoniga singdirilishi talabaning o‘ z kasbiy faoliyatiga ongli munosabatini shakllantirishga imkon beradi.

Bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirishning samarali pedagogik imkoniyatlari sifatida pedagogik amaliyot, mikroo‘ qitish, pedagogik vaziyat va keyslarni tahlil qilish, refleksiv kundalik yuritish, pedagogik portfolio yaratish, o‘ z-o‘ zini va tengdoshlarini baholash, videoanaliz hamda refleksiv suhbatlardan foydalanish muhim ahamiyatga ega. Mazkur vositalarning tizimli qo‘ llanilishi talabaning o‘ z faoliyatini tashqi nuqtayi nazardan baholash, pedagogik xatolarini anglash va ularni bartaraf etishning muqobil yo‘ llarini izlash ko‘ nikmalarini rivojlantiradi.

Shuningdek, refleksiv kompetensiyaning motivatsion, kognitiv, analitik, baholovchi va prognostik komponentlarini o‘ zaro bog‘ liq holda shakllantirish zarurligi asoslandi. Mazkur komponentlarning uyg‘ un rivojlanishi bo‘ lajak o‘ qituvchida nafaqat o‘ z faoliyatini baholash, balki aniqlangan natijalar asosida kelgusidagi pedagogik faoliyatini rejalashtirish va takomillashtirish imkoniyatini ham kengaytiradi.

Umuman, bo‘ lajak boshlang‘ ich ta’lim o‘ qituvchilarining refleksiv kompetensiyasini rivojlantirish pedagogik ta’lim sifatini oshirish, bo‘ lajak mutaxassislarning mustaqil kasbiy qaror qabul qilish qobiliyatini kuchaytirish va uzluksiz kasbiy rivojlanishga tayyorligini shakllantirishning muhim shartlaridan biridir. Shu sababli pedagogik oliy ta’lim muassasalarida refleksiv ta’lim muhitini yaratish, refleksiv topshiriqlarni fanlar mazmuniga integratsiya qilish va pedagogik amaliyotni refleksiv faoliyat bilan uzviy bog‘ lash istiqboldagi muhim pedagogik vazifalardan biri sifatida qaralishi lozim.

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VIKTOR USPENSKIY PEDAGOGIK QARASHLARINING BO‘ LAJAK O‘ QITUVCHILAR KASBIY-MA’NAVIY TAYYORGARLIGINI RIVOJLANTIRISHDAGI AHAMIYATI

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Annotatsiya: *Maqolada Viktor Aleksandrovich Uspenskiy (1879–1949) pedagogik qarashlarining bo‘ lajak o‘ qituvchilar kasbiy-ma’naviy tayyorgarligini rivojlantirishdagi ahamiyati tadqiq etiladi. Muallif olimning maxsus pedagogik risola qoldirmaganini e’tirof etib, uning qarashlarini hujjatlashtirilgan amaliy faoliyat – Toshkent Xalq konservatoriyasidagi dars berish tajribasi, Buxoroda Shashmaqomni notaga olish ishi, Markaziy Osiyo bo‘ ylab ilmiy ekspeditsiyalar va milliy kadrlar tayyorlash faoliyati – asosida qayta tiklangan tamoyillar tizimi sifatida talqin qiladi. Tadqiqotda mazkur tamoyillarning besh guruhi ajratilib, ularning zamonaviy pedagogik ta’limdagi talqini asoslanadi hamda tarixiy-pedagogik merosdan foydalanishning besh shakli ishlab chiqiladi. Shuningdek, biografik materialdan foydalanishning rasmiylashuv xavfi va uni oldini olish shartlari tahlil qilinadi. Xulosada tarixiy shaxs namunasi va’z shaklida emas, tahlil obyekti sifatida taqdim etilgandagina tarbiyaviy kuchga ega bo‘ lishi asoslab beriladi.*

Kalit so‘ zlar: *Viktor Uspenskiy, pedagogik meros, kasbiy-ma’naviy tayyorgarlik, tarixiy-pedagogik rekonstruksiya, madaniyat sohibiga hurmat, milliy musiqa merosi, namuna va modellashtirish, xarakter tarbiyasi, ma’naviy tarbiya, oliy pedagogik ta’lim.*

ЗНАЧЕНИЕ ПЕДАГОГИЧЕСКИХ ВЗГЛЯДОВ ВИКТОРА УСПЕНСКОГО В РАЗВИТИИ ПРОФЕССИОНАЛЬНО-ДУХОВНОЙ ПОДГОТОВЛЕННОСТИ БУДУЩИХ УЧИТЕЛЕЙ

Аннотация: *В статье исследуется значение педагогических взглядов Виктора Александровича Успенского (1879–1949) в развитии профессионально-духовной подготовленности будущих учителей. Признавая, что учёный не оставил специального педагогического трактата, автор интерпретирует его взгляды как систему принципов, реконструированных на основе документированной практической деятельности – преподавания в Ташкентской народной консерватории, нотной записи Шашмакома в Бухаре, научных экспедиций по Средней Азии и подготовки национальных кадров. Выделяются пять групп данных принципов, обосновывается их современная педагогическая интерпретация, разрабатываются пять форм использования историко-педагогического наследия. Анализируется риск формализации биографического материала и условия его предупреждения. В заключении обосновывается, что пример исторической личности обретает воспитательную силу лишь тогда, когда предъявляется не как проповедь, а как объект анализа.*

Ключевые слова: *Виктор Успенский, педагогическое наследие, профессионально-духовная подготовленность, историко-педагогическая реконструкция, уважение к носителю культуры, национальное музыкальное наследие, пример и моделирование, воспитание характера, духовное воспитание, высшее педагогическое образование.*

THE SIGNIFICANCE OF VIKTOR USPENSKY’S PEDAGOGICAL VIEWS IN DEVELOPING THE PROFESSIONAL AND SPIRITUAL READINESS OF FUTURE TEACHERS

Annotation: *The article examines the significance of the pedagogical views of Viktor Aleksandrovich Uspensky (1879–1949) in developing the professional and spiritual readiness of future teachers. Recognizing that the scholar left no special pedagogical treatise, the author interprets his views as a system of principles reconstructed from documented practical activity: teaching at the Tashkent People’s Conservatory, the notation of Shashmaqom in Bukhara, scientific expeditions across Central Asia, and the training of national specialists. Five groups of such principles are distinguished, their contemporary pedagogical interpretation is substantiated, and five forms of using the historical-pedagogical heritage are elaborated. The risk of formalizing biographical material and the conditions for preventing it are analysed. In conclusion, it is substantiated that the example of a historical figure acquires educative power only when it is presented as an object of analysis rather than as a sermon.*

Keywords: *Viktor Uspensky, pedagogical heritage, professional and spiritual readiness, historical-pedagogical reconstruction, respect for the culture bearer, national musical heritage, example and modelling, character education, spiritual education, higher pedagogical education.*

KIRISH

Bo‘ lajak o‘ qituvchini tayyorlash jarayonining o‘ ziga xosligi shundaki, unda fan bilimlari va metodik ko‘ nikmalar bilan bir qatorda shaxsning ma’naviy qiyofasi ham kasbiy tayyorgarlikning tarkibiy qismi hisoblanadi. O‘ qituvchi o‘ quvchiga faqat bilim uzatmaydi, balki o‘ z shaxsi orqali unga munosabat, mehnat va madaniyatga nisbatan pozitsiya namunasini ham ko‘ rsatadi. Shu sababli pedagogik ta’limda tarixiy shaxslarning hayot yo‘ li va faoliyati an’anaviy ravishda tarbiyaviy manba sifatida qo‘ llanib kelinadi. Biroq bu manbadan foydalanish ko‘ pincha umumiy ulug‘ lash darajasida qolib ketadi va talabaning kasbiy pozitsiyasiga real ta’sir ko‘ rsatmaydi. Mazkur muammo milliy pedagogik ta’lim uchun ayniqsa dolzarb. O‘ zbekiston madaniyati va ma’rifati tarixida o‘ z hayotini milliy meros va xalq ta’limiga bag‘ ishlagan ko‘ plab shaxslar mavjud bo‘ lib, ularning tajribasi bo‘ lajak o‘ qituvchi uchun qimmatli ma’naviy resursdir. Biroq bu resursning pedagogik salohiyati uning qanday taqdim etilishiga bog‘ liq: agar shaxs faqat ulug‘ lanadigan obraz sifatida ko‘ rsatilsa, talaba uni o‘ zidan uzoq va erishib bo‘ lmaydigan deb qabul qiladi; agar uning faoliyati aniq qarorlar va tamoyillar darajasida tahlil qilinsa, u talaba uchun real yo‘ l ko‘ rsatkichga aylanadi. Viktor Aleksandrovich Uspenskiy (1879–1949) mazkur nuqtai nazardan alohida e’tiborga loyiq shaxslardan biri hisoblanadi. 1879-yilda Kalugada tug‘ ilgan, dastlab harbiy ta’lim olgan va 1913-yilda Peterburg konservatoriyasini A.K.Lyadov sinfi bo‘ yicha tugatgan musiqashunos 1918-yilda Toshkentga kelib, umrining qolgan qismini Markaziy Osiyo xalqlari musiqa merosini o‘ rganish va saqlashga bag‘ ishladi. U 1949-yilda Toshkentda vafot etgan va shu shaharda dafn etilgan. Uning hayot yo‘ lining mazkur burilishi tasodifiy emas edi: u o‘ zga madaniyatga nisbatan chuqur qiziqish va hurmat tufayli shu yo‘ lni ongli ravishda tanlagan. Uspenskiyning pedagogik faoliyati uning Toshkent davrining ajralmas qismini tashkil etadi. U 1918–1922-yillarda Toshkent Xalq konservatoriyasida garmoniya fanidan dars bergan, 1928–1934-yillarda musiqa bilim yurtida ishlagan, 1932-yildan San’atshunoslik instituti xodimi va musiqa kabineti mudiri bo‘ lgan, 1936-yildan esa Toshkent konservatoriyasi professori va musiqa-nazariy fakulteti dekani sifatida faoliyat yuritgan. 1943-yilda unga san’atshunoslik doktori ilmiy darajasi berilgan. Shu tariqa uning hayotining o‘ ttiz yildan ortiq qismi bevosita o‘ qituvchilik va kadrlar tayyorlash bilan bog‘ liq bo‘ lgan. Uspenskiy faoliyatining eng mashhur sahifasi Shashmaqomni notaga olish ishidir. 1923-yilda u Buxoroda o‘ sha davrning yirik maqom ustalaridan yozib olish ishini amalga oshirgan va 1924-yilda mazkur yozuv nashr etilgan. Bu ishning tarixiy ahamiyati shundaki, u an’anaviy og‘ zaki yo‘ l bilan avloddan avlodga o‘ tib kelgan murakkab musiqiy tizimni yo‘ qolib ketish xavfidan saqlab qolgan. Ishning o‘ ziga xosligi esa uning usulida: Uspenskiy maqomni o‘ z nazariy tasavvurlariga moslashtirishga urinmasdan, uni sohiblari ijro etgan shaklda qayd etishga intilgan. Uning ilmiy-ekspeditsion faoliyati ham shunga o‘ xshash tamoyilga asoslangan. Uspenskiy Markaziy Osiyo bo‘ ylab sakkizta etnografik ekspeditsiya uyushtirgan, 1925–1929-yillarda Turkmanistonga uchta folklor ekspeditsiyasini olib borgan va bu safarlarda uch yuz ellikdan ortiq qo‘ shiq hamda cholg‘ u kuyini yozib olgan, 1931-yilda esa Farg‘ ona vodiysiga musiqa-etnografik ekspeditsiya tashkil etgan. V.M.Belyayev bilan hamkorlikda tayyorlangan turkman musiqasiga oid tadqiqoti 1928-yilda Moskvada nashr etilgan. Mazkur faoliyat uning uchun bilim manbai kutubxona emas, balki xalqning o‘ zi ekanini ko‘ rsatadi. Mazkur maqolaning metodologik pozitsiyasini aniq belgilash zarur. V.A.Uspenskiy maxsus pedagogik risola yoki yaxlit nazariy ta’limot qoldirmagan; uning asarlari musiqashunoslik va musiqa etnografiyasiga oid. Shu sababli mazkur ishda uning pedagogik qarashlari tayyor konsepsiya sifatida emas, balki hujjatlashtirilgan amaliy faoliyatdan – o‘ qituvchilik tajribasi, ekspeditsiya usuli, meros bilan ishlash tarzi va kadrlar tayyorlashga munosabatidan – qayta tiklanadigan tamoyillar tizimi sifatida talqin qilinadi. Pedagogika tarixida bunday rekonstruksiya keng qo‘ llaniladigan va metodologik jihatdan asoslangan yondashuvdir, biroq u tadqiqotchidan o‘ z talqinini manbaning haqiqiy mazmunidan aniq farqlashni talab qiladi. Mazkur faoliyatdan kelib chiqadigan dastlabki tamoyil madaniyat sohibiga nisbatan hurmat tamoyilidir. Uspenskiy xalq musiqasini o‘ rganishda uning ijrochilarini tadqiqot obyekti emas, balki bilim manbai va ustoz sifatida ko‘ rgan. Bu pozitsiya o‘ sha davr uchun o‘ z-o‘ zidan tushunarli emas edi: mahalliy madaniyatga yuqoridan qarash keng tarqalgan holat bo‘ lgan. Pedagogik nuqtai nazardan mazkur tamoyil bevosita ahamiyatga ega, zero o‘ qituvchining o‘ quvchiga va uning madaniy muhitiga munosabati ham xuddi shunday tanlov oldida turadi. Ikkinchi tamoyil bilimning saqlanishi va uzatilishi uchun mas’uliyat bilan bog‘ liq. Uspenskiy yo‘ qolib borayotgan merosni qayd etishni shaxsiy ilmiy qiziqish emas, balki burch sifatida qabul qilgan. Uchinchi tamoyil ilmiy tadqiqot va o‘ qitishning birligida namoyon bo‘ ladi: u ekspeditsiyalarda to‘ plagan materialini bevosita o‘ quv jarayoniga olib kirgan. To‘ rtinchi tamoyil milliy kadrlar tayyorlashga yo‘ naltirilganlik bo‘ lib, u o‘ z ishining davom etishini shaxsiy faoliyati bilan emas, shogirdlar orqali ko‘ rgan. Beshinchi tamoyil esa uzoq muddatli, natijasi darhol ko‘ rinmaydigan mehnatga tayyorlikdir. Mazkur tamoyillarning bugungi dolzarbligi globallashuv sharoitida milliy madaniy o‘ zlikni saqlash vazifasi bilan belgilanadi. O‘ zbekiston Respublikasida moddiy va nomoddiy madaniy merosni asrash, milliy qadriyatlarni yoshlar ongiga singdirish hamda ma’naviy-ma’rifiy ishlar samaradorligini oshirish davlat siyosatining ustuvor yo‘ nalishlaridan biri sifatida belgilangan. Oliy ta’lim tizimini 2030-yilgacha rivojlantirish konsepsiyasida ham kadrlar tayyorlash sifatini oshirish bilan birga ularning ma’naviy-axloqiy tarbiyasi masalalari qayd etilgan. Mazkur vazifalarni amalga oshirishda milliy madaniyat tarixidagi real shaxslar tajribasi muhim pedagogik resurs hisoblanadi.

ADABIYOTLAR TAHLILI

Mazkur tadqiqotning birlamchi manba bazasini V.A.Uspenskiyning o‘ z ishlari tashkil etadi. Ularning eng mashhuri 1924-yilda nashr etilgan Shashmaqom nota yozuvi bo‘ lib, u an’anaviy maqom tizimini ilmiy qayd etishning birinchi yirik tajribasi hisoblanadi. V.M.Belyayev bilan hamkorlikda tayyorlangan turkman musiqasiga bag‘ ishlangan tadqiqot esa ekspeditsiya materiallarini ilmiy umumlashtirish namunasidir. O‘ zbek tadqiqotchilari A.Xojimamatov va M.Muhammadjonovaning olimning ijodiy yo‘ liga bag‘ ishlangan maqolasida uning milliy musiqa madaniyatiga qo‘ shgan hissasi tahlil qilinadi. Mazkur manbalar olim faoliyatining hujjatli asosini tashkil etib, pedagogik rekonstruksiya uchun material beradi. Shaxs namunasining tarbiyaviy ta’siri masalasi xorijiy pedagogikada keng tadqiq etilgan. T.Likona xarakter tarbiyasi konsepsiyasida axloqiy tarbiyaning uch tarkibiy qismini – axloqiy bilim, axloqiy his va axloqiy harakatni – ajratib, maktab va o‘ qituvchining namunasi orqali bu uch qismni birgalikda shakllantirish zarurligini asoslagan. K.Rayan va K.Bolin esa xarakter tarbiyasini amaliyotga joriy etishning aniq yo‘ llarini tahlil qilib, qadriyatlarning alohida fan sifatida emas, ta’lim muassasasining butun hayoti orqali uzatilishini ko‘ rsatishgan. A.Kon mazkur an’anaga jiddiy tanqid bilan chiqqan. U xarakter tarbiyasi dasturlarining ko‘ p qismi o‘ quvchida mustaqil axloqiy mulohazani rivojlantirish o‘ rniga tayyor fazilatlar ro‘ yxatini singdirishga urinishini, bu esa tarbiya emas, indoktrinatsiya ekanini ta’kidlagan. Konning fikricha, haqiqiy axloqiy rivojlanish shaxsning qadriyatlar haqida mustaqil fikr yuritishi va bahs olib borishi orqali sodir bo‘ ladi. A.Bandura ijtimoiy o‘ rganish nazariyasida esa namunaga taqlid mexanizmini tahlil qilib, kuzatish orqali o‘ rganish namuna bilan o‘ rtasida ahamiyatlilik va yaqinlik munosabati mavjud bo‘ lgandagina samarali bo‘ lishini ko‘ rsatgan. D.Xansen o‘ qituvchilik kasbini chaqiriq sifatida tahlil qilgan ishida esa kasbiy tanlovning ma’naviy o‘ lchamini ochib bergan. Milliy ilmiy maktabda ta’limning shaxs ma’naviy dunyoqarashini shakllantirishdagi roli izchil tadqiq etilmoqda. S.Ergashbayevning O‘ zbekiston sharoitida uzluksiz ta’lim tizimi orqali yoshlarning ma’naviy dunyoqarashini rivojlantirishga bag‘ ishlangan ishida uzluksiz ta’lim tizimi yoshlar dunyoqarashini shakllantirishning asosiy institutsional vositasi sifatida ko‘ rib chiqiladi. Mazkur yondashuv tarixiy-pedagogik meros masalasi uchun bevosita ahamiyatga ega: madaniy meros bilan tanishish bir martalik tadbir bo‘ lmasligi, ta’limning barcha bosqichlarida izchil davom etishi lozim. Dunyoqarashning yaxlitligi esa shaxsning o‘ z madaniy ildizlarini anglashi bilan uzviy bog‘ liq. S.Ergashbayevning uzluksiz ta’limni tashkil etish orqali yoshlarning ma’naviy-falsafiy dunyoqarashini yuksaltirishga oid tadqiqotida dunyoqarash yuksalishining mezoni sifatida qadriyatlarni mustaqil tanlash va asoslangan xulosa chiqarish qobiliyati ko‘ rsatiladi. Bu tezis mazkur maqolaning markaziy g‘ oyasi bilan uyg‘ unlashadi: tarixiy shaxs namunasi tayyor xulosa sifatida berilsa, u mustaqil tanlovni rivojlantirmaydi. M.M.Mirzaolimjon o‘ g‘ li va E.Shohbozbekning Yangi O‘ zbekistonning ta’lim siyosati va universitetlarning yangi modellariga bag‘ ishlangan ishida esa zamonaviy universitetning madaniy missiyasi kengayib borayotgani tahlil qilinadi, bu esa milliy meros bilan ishlashni universitet ta’limining tizimli vazifasi sifatida ko‘ rish imkonini beradi.

METODOLOGIK QISM

Tadqiqotning metodologik asosini tarixiy-pedagogik, aksiologik va faoliyatli yondashuvlarning uyg‘ unligi tashkil etadi. Tarixiy-pedagogik yondashuv olim faoliyatini o‘ z davrining ijtimoiy-madaniy konteksti doirasida ko‘ rib chiqish imkonini berdi. Bu muhim metodologik shart hisoblanadi: XX asr boshidagi qarorlarni bugungi mezonlar bilan baholash anaxronizmga olib keladi, o‘ z davri sharoitida esa ularning haqiqiy ma’nosi ochiladi. Shu sababli tahlilda Uspenskiy faoliyati 1920–1940-yillardagi madaniy qurilish va milliy kadrlar tayyorlash vazifalari fonida ko‘ rib chiqildi.

TADQIQOT NATIJALARI

Olib borilgan tadqiqot natijasida V.A.Uspenskiy faoliyatidan qayta tiklanadigan besh guruh pedagogik tamoyil aniqlandi. Birinchi guruh madaniyat sohibiga munosabat bilan bog‘ liq: xalq ijrochilari tadqiqot obyekti emas, bilim manbai va ustoz sifatida ko‘ riladi. Ikkinchi guruh merosga nisbatan mas’uliyatni ifodalaydi. Uchinchi guruh ilmiy tadqiqot va o‘ qitishning birligini belgilaydi. To‘ rtinchi guruh milliy kadrlar tayyorlashga yo‘ naltirilganlikni aks ettiradi. Beshinchi guruh esa natijasi darhol ko‘ rinmaydigan uzoq muddatli mehnatga tayyorlikni ifodalaydi. Mazkur tamoyillarning har biri olim faoliyatining aniq, hujjatlashtirilgan epizodlariga tayanadi.

MUHOKAMA

Shaxs namunasiga asoslangan tarbiyaning samaradorligi masalasi xorijiy pedagogik diskursda keskin polemikaga sabab bo‘ lgan. Bahsning bir qutbida T.Likona asos solgan xarakter tarbiyasi an’anasi turadi. Uning pozitsiyasiga ko‘ ra axloqiy tarbiya bilim, his va harakatning birligini talab qiladi, ta’lim muassasasi esa aniq fazilatlarni ongli va izchil shakllantirishi lozim. Likona bunda o‘ qituvchi va tarixiy shaxslar namunasiga alohida o‘ rin ajratadi: o‘ smir axloqiy me’yorni mavhum qoida sifatida emas, aniq inson timsolida ko‘ rganda qabul qiladi. K.Rayan va K.Bolin ham bu yondashuvni rivojlantirib, qadriyatlar ta’lim muassasasining butun hayoti orqali uzatilishini asoslashgan. A.Kon bu an’anaga tubdan qarshi chiqadi. Uning tahliliga ko‘ ra xarakter tarbiyasi dasturlarining ko‘ p qismi aslida itoatkorlikni shakllantirishga yo‘ naltirilgan bo‘ lib, ular yoshlarga qadriyatlar haqida mustaqil fikr yuritish imkoniyatini bermaydi. Kon tayyor fazilatlar ro‘ yxatini singdirish va namunalarni tanqidsiz taqdim etish axloqiy tarbiya emas, balki indoktrinatsiya ekanini ta’kidlaydi. Uning fikricha, haqiqiy axloqiy rivojlanish shaxsning qarama-qarshi qadriyatlar to‘ qnashgan

vaziyatlarda mustaqil qaror qabul qilishi orqali sodir bo‘ ladi. Mazkur tanqid tarixiy shaxslar merosidan foydalanishga ham bevosita tegishli. A.Banduraning ijtimoiy o‘ rganish nazariyasi bahsga psixologik asos beradi. U kuzatish orqali o‘ rganish mexanizmini tahlil qilib, namunaga taqlid avtomatik sodir bo‘ lmasligini ko‘ rsatgan: u namunaning kuzatuvchi uchun ahamiyatliligi, unga yaqinligi va uning xulq-atvori natija berishi haqidagi tasavvurga bog‘ liq. Mazkur xulosa tarixiy shaxs obrazini idealizatsiya qilishning nima uchun samarasiz ekanini tushuntiradi: erishib bo‘ lmaydigan darajada mukammal obraz kuzatuvchi uchun yaqin bo‘ lmaydi va taqlid mexanizmini ishga tushirmaydi. Aksincha, real qiyinchiliklarni yengib o‘ tgan inson obrazi ancha kuchliroq ta’sir ko‘ rsatadi. D.Xansenning o‘ qituvchilik chaqirig‘ i haqidagi tadqiqoti bahsga yana bir o‘ lcham qo‘ shadi. U kasbiy tanlovni ikki o‘ lchovning kesishuvida ko‘ radi: faoliyatning jamiyat uchun ahamiyati va uning shaxs uchun shaxsiy ma’nosi. Xansenning fikricha, kasbni chaqiriq sifatida qabul qilgan o‘ qituvchi o‘ z ishida ma’no ko‘ radi va shu sababli qiyinchiliklarga bardosh beradi. Mazkur yondashuv Uspenskiy faoliyatini tushunish uchun ham qulay ramka beradi: uning yashash sharoiti qulay bo‘ lmagan ekspeditsiyalarni yillar davomida davom ettirishi karyera mulohazalari bilan emas, aynan ma’no bilan izohlanadi. Mazkur polemikaning Uspenskiy merosiga tatbiqi aniq metodik xulosalarga olib keladi. Likona an’anasi shuni ko‘ rsatadiki, konkret shaxs timsoli mavhum nasihatdan kuchliroq ta’sir ko‘ rsatadi; demak, biografik materialdan voz kechish asossiz. Konning tanqidi esa bu materialni qanday taqdim etish kerakligini belgilaydi: agar u tanqidsiz ulug‘ lash shaklida berilsa, u haqiqatan ham indoktrinatsiyaga aylanadi. Banduraning nazariyasi obrazning yaqin va real bo‘ lishi zarurligini, Xansenning yondashuvi esa namunaning asosiy qiymati yutuqlarda emas, faoliyat ma’nosida ekanini ko‘ rsatadi.

XULOSA

Olib borilgan tadqiqot V.A.Uspenskiy maxsus pedagogik ta’limot qoldirmaganini, biroq uning o‘ ttiz yildan ortiq davom etgan o‘ qituvchilik, ilmiy-ekspeditsion va meros bilan ishlash faoliyati pedagogik tamoyillarni qayta tiklash uchun yetarli hujjatli asos berishini ko‘ rsatdi. Bunday rekonstruksiya metodologik jihatdan asoslangan, biroq u tadqiqotchidan o‘ z talqinini manbaning haqiqiy mazmunidan aniq farqlashni talab qiladi.

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THE IMPORTANCE OF DEVELOPING THE PROFESSIONAL CULTURE OF INTERNAL AFFAIRS OFFICERS IN STATE ADMINISTRATION

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Abstract: *This article describes the socio-philosophical aspects of the development of the moral culture of internal affairs managers. When talking about professional moral culture, the main attention should be paid to the philosophical analysis of the term ethics, which is its core. Professional moral culture is a product of actions based on the knowledge and experience that is directly manifested in the work of a person. Development of the professional and ethical culture of internal affairs officers in the state administration is one of the criteria for the effectiveness of internal affairs bodies.*

Key words: *professional and ethical culture, etiquette, behavior, morals, education, code.*

DAVLAT BOSHQARUVIDA ICHKI ISHLAR XODIMLARINING KASBIY MADANIYATINI RIVOJLANTIRISHNING AHAMIYATI

Annotatsiya: *Mazkur maqolada davlat boshqaruvidagi ichki ishlar xodimlari kasbiy madaniyatini rivojlantirishning ahamiyatiyoritilgan. Kasbiy axloqiy madaniyat xususida so‘z borar ekan, bunda asosiy e’tiborni uning o‘zagi bo‘lgan axloq atamasining falsafiy tahliliga qaratmoq lozim. Kasbiy axloqiy madaniyat bevosita insonning mehnat faoliyatida namoyon bo‘luvchi, uning olgan bilim va tajribasiga asoslangan harakatlar mahsulidir. Davlat boshqaruvidagi ichki ishlar xodimlarining kasbiy-axloqiy madaniyatini rivojlantirish ichki ishlar organlari faoliyati samaradorligining mezonlaridan biridir.*

Kalit so‘zlar: *kasbiy-axloqiy madaniyat, etiket, xulq, axloq, tarbiya, kodeks.*

ЗНАЧЕНИЕ РАЗВИТИЯ ПРОФЕССИОНАЛЬНОЙ КУЛЬТУРЫ СОТРУДНИКОВ ОРГАНОВ ВНУТРЕННИХ ДЕЛ В ГОСУДАРСТВЕННОМ УПРАВЛЕНИИ

Аннотация: *В данной статье рассмотрены социально-философские аспекты развития нравственной культуры руководителей внутренних дел. Говоря о профессиональной моральной культуре, основное внимание следует уделить философскому анализу термина этика, который составляет ее суть. Профессиональная моральная культура – это продукт действий, основанный на знаниях и опыте, который непосредственно проявляется в деятельности человека. Развитие профессиональной и этической культуры сотрудников органов внутренних дел в органах государственного управления является одним из критериев эффективности органов внутренних дел.*

Ключевые слова: *профессионально-этическая культура, этикет, поведение, мораль, воспитание, кодекс.*

Introduction. Professional ethical culture is an area of learning in the series of ethical sciences that studies the ethical norms and principles specific to each profession and applies them to life. There is no absolute, eternal and unchanging moral culture in society. Morality is a historically changing and relatively independent social phenomenon. With the change of times, as a result of the development of production, science and technology, and the deepening of the division of social labor, new spheres of activity began to emerge, each of which performs a specific social function. As result of the performance of that specific social duties by people working in such fields, these duties and obligations created the basis for reflection of professional ethical rules and norms of behavior. After all, as noted in the research, the emergence of professional ethical culture was formed the consequence of continuous division of labor.

Literature review. These days, every area of society is adapting to the pace of modern development. The modern society demands from the personnel who follow the rules and criteria specializing in a certain narrow specialty to observe the general moral norms and the ethical rules of the profession. French philosopher René Deckard said in his research about moral culture, "I had good teachers like everyone else. They taught me geography and physics. But no one ever taught me how to behave in society. Quoting the words "he did not teach the rules of communication education", he showed that the

formation of moral culture is related to the worldview and personal position of a person [1. p. 17]. In that, it can be seen that the need of having professional ethics is taken into account for every industry employee.

Research shows that people working on the basis of a special standard oriented of the professional field, and meeting with management or women in their work activities, find it inappropriate to shake hands first, only if they extend their hands, a person can call to exchange greetings and it is recognized that individuals may have a true professional ethical culture.

In highlighting the professional ethical culture, it is necessary to pay special attention to the following "golden rules of etiquette" presented in research:

- always looking for good things;
- creating a good impression on the team and leaders during the service activity;
- faithfully serving the Motherland;
- gaining mutual respect and trust by being friendly and kind with colleagues;
- being fair;
- being an example to others with good behavior;
- being generous, honest, kind and tolerant in personal life;
- able to keep any information or important secret;
- rules such as being an example with one's good behavior and professional skills are included among the golden rules [3. p. 194–212].

Religious views are also important in the formation and development of moral culture. For example, in Islam and its sacred sources, special attention is paid to moral rules, in which constant kindness, forgiveness, patience, politeness, respect for parents, decency, honesty, loyalty to the nation are highly valued.

Professional ethics is directly related to the science of philosophy, while the philosophy of ethics studies the history of the emergence of ethics and the laws of its development, while professional ethics analyzes its practical aspects specific to a certain profession. While philosophy deals with the theoretical issues of ethics, professional ethical culture studies ethical rules and norms used in society and social relations related to production.

When talking about moral culture, it is essential to note the philosophical analysis of the core term of the word morality. Morality is derived from the Russian "moral" or the Latin "mores", "moralis", which means "behavior", "habit". Morality is a specific form of social consciousness, a sum of people's attitudes towards each other in their social and personal life, that is, their actions. Also, the term "akhlaq", means "morals" or "habits" which is the plural expression of the Arabic word "khulq" [3. p. 7].

Philosophical analysis of morality and the science that studies its principles is called "Ethics" and is derived from the Greek and Greek words "ethos" and its meaning in translation includes the meaning of "manner" [4.p. 17].

The science of ethics is part of philosophy, and it studies moral principles, norms, as well as the source and origin of the categories of morality.

Research methodology. Professional culture is not displayed only loyalty to values, but also in providing quality social relations in accordance with people's needs. Professional culture regulates the professional duties of internal affairs officers in the state administration through the laws of the Republic of Uzbekistan. The activity of protecting human rights is closely related to professional ethical culture focusing on respecting constitutional rights and freedoms, implementing the rules and standards of professional and social relations, utilizing professional skills, complying with official regulations, adhering to principles laid down in anti-corruption laws, respecting the dignity and value of individuals, providing good service, showing politeness, maintaining physical fitness and socio-psychological well-being.

Nowadays, the attention paid by the state to the high standards of the activity of representatives of law-enforcement agencies not only shapes their professionalism, but also the qualities of the internal affairs officers related to the professional ethical culture. Therefore, the formation of the professional ethical culture of the internal affairs officers in the state administration, on the one hand, shows their respect for universal values and human qualities, and on the other hand, they become loyal, trustworthy representatives of society, who pay attention to social norms and rules, and as shown in public documents the attributive features of the activities of internal affairs officers clearly reflect in the way of protecting people's rights. Development of the professional ethical culture of the internal affairs officers in the state administration is one of the criteria for the effectiveness of work activity of the internal affairs bodies, which today is also mirrored in the public's trust and support of the citizens towards them. After all, public opinion embodies the reputation of internal affairs bodies in front of citizens.

Analysis and results. In the conditions of the new Uzbekistan, the positive attitude of the public regarding internal affairs officers under the state administration or internal affairs officers in general requires accepting not only their personality but their professional ethical culture [5].

Negative public opinion is a sign of long-term, complex problems in society, which mainly means the existence of problems such as corruption, use of official position for one's own goals, and abuse of official authority.

The manifestation of diligent performance of professional duties of the internal affairs officers in the state administration, who have long-term work experience and adherence to the principles of professional ethical culture when communicating with citizens, is expressed both in life experiences, and in many scientific studies [6. p. 9].

In today's modern studies, the development or monitoring of the professional ethical culture of internal affairs employees in the state administration is determined by conducting various sociological surveys. The low professional ethical culture of the internal affairs officers in the state administration or their unfitness for their duties is demonstrated in their inability to communicate with citizens, low communication culture, use of rude expressions in conversation, and retorts in offensive tones. This creates the basis for the violation of professionalism among internal affairs officers and the deformation of the professional ethical culture. As a result, it leads to the formation of negative perceptions about the positive image and professional ethical culture of internal affairs employees in the state administration.

In order to prevent such professional deformations, it necessitates continuous improvement of skills and professional training of internal affairs officers in the state administration and as an employee of law enforcement agencies it forms a positive attitude to the universal values that shape the foundation of professional ethical culture.

Conclusion/Recommendations. Professional ethical culture as a network in the field of general professional sciences serves to prepare comprehensively mature specialists in the future. However, it should be emphasized that in the course of professional activity, internal affairs officers encounter situations that do not correspond to the principles of universal culture due to their duties. In the multi-ethnic society like ours as different cultures live together, it involves professional professionalism and moral integrity of internal affairs officers since they may encounter citizens who disregard general cultural values, disrespect each other, have high tendency to criminal environment. After all, professional development forms an attitude based on legal, professional norms and rules and values, and determines the professional growth prospects of employees.

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