**Rakhmataliev Abdulla Fozilovich**
Institute of Environmental Protection and Nature Conservation Technologies
(Green University)
E-mail: rahmataliyevabdulla184@gmail.com
**Tokhirjonova Diyorakhon Dilshod qizi**
Fergana State University
**Toshtemirov Jurabek Gani ugli**
Institute of Botany, PhD student
**Ergashov Ibrokhimjon Abduvali ugli**
Junior Researcher, Laboratory of Molecular Phylogeny and Biogeography,
Institute of Botany
E-mail: ibrohim8905@mail.ru
**Yusupov Ziyoviddin Olimjon ugli**
PhD, Head of the Laboratory of Molecular Phylogeny and Biogeography,
Institute of Botany
E-mail: ziyo-nur87@mail.ru

# PHARMACOLOGICAL PROPERTIES OF MEDICINAL MONOCOTYLEDONS IN THE NURATAU MOUNTAINS (UZBEKISTAN

***Abstract****. The Nuratau Mountains of Uzbekistan host diverse monocot medicinal plants. Surveys identified 17 species from eight families with anti-inflammatory, antimicrobial, antioxidant, and antitumor properties. Key species like Colchicum kesselringii and Allium longicuspis show strong bioactivity. Integrating phytochemical and pharmacological studies can promote sustainable ethnomedicine and natural drug discovery in Central Asia.*

***Keywords****. Nuratau mountains, medicinal plants, monocotyledonous, Central Asia.*

**Raxmataliyev Abdulla Fozilovich**
Atrof-muhit va tabiatni muhofaza qilish texnologiyalar ilmiy-tadqiqot instituti
(Green University)
E-mail: rahmataliyevabdulla184@gmail.com
**Tokhirjonova Diyorakhon Dilshod qizi**
Farg’ona Davlat Universiteti
**Toshtemirov Jo’rabek G’ani o’g’li**
Botanika instituti, PhD talabasi
**Ergashov Ibrohimjon Abduvali o’g’li**
Botanika instituti Molekulyar Filogeniya va
Biogeografiya laboratoriyasi kichik ilmiy xodimi
E-mail: ibrohim8905@mail.ru

**Yusupov Ziyoviddin Olimjon o‘g‘li**
PhD, Botanika instituti Molekulyar Filogeniya va Biogeografiya laboratoriyasi mudiri
E-mail: ziyo-nur87@mail.ru

# NUROTA TOG‘LARIDAGI DORIVOR BIR URUG‘PALLALI O‘SIMLIKLARNING FARMAKOLOGIK XUSUSIYATLARI (O‘ZBEKISTON)

***Annotatsiya.*** *O‘zbekistonning Nurata tog‘lari dorivor bir urug‘lilar xilma-xilligi bilan mashhur. Tadqiqotlarda sakkiz oilaga mansub 17 tur aniqlanib, ularning yallig‘lanishga qarshi, antibakterial, antioksidant va o‘simta qarshi xususiyatlari qayd etilgan. Colchicum kesselringii va Allium longicuspis faol moddalarga boy. Bunday o‘simliklarni o‘rganish tabiiy dori ishlab chiqishni rivojlantiradi.*

***Kalit so‘zlar:*** *Nurota tog‘lari, dorivor o‘simliklar, bir urug‘pallalilar, Markaziy Osiyo.*

**Рахматалиеев Абдулла Фозилович**
Научно-исследовательский институт технологий охраны окружающей среды и природы (Green University)
E-mail: rahmataliyevabdulla184@gmail.com
**Тохирджонова Диёрахон Дилшод кизи**
Ферганский государственный университет
**Тоштемиров Журабек Гани угли**
Институт Ботаники, соискатель степени PhD
**Эргашов Иброхимжон Абдували угли**
Институт Ботаники, младший научный сотрудник лаборатории молекулярной филогении и биогеографии
E-mail: ibrohim8905@mail.ru
**Юсупов Зиёвиддин Олимжон угли**
PhD, заведующий лабораторией молекулярной филогении и биогеографии Института Ботаники
E-mail: ziyo-nur87@mail.ru

# ФАРМАКОЛОГИЧЕСКИЕ СВОЙСТВА ЛЕКАРСТВЕННЫХ ОДНОДОЛЬНЫХ РАСТЕНИЙ ГОР НУРАТАУ (УЗБЕКИСТАН)

***Аннотация.*** *Горы Нуратау в Узбекистане известны разнообразием лекарственных однодольных растений. Исследования выявили 17 видов из*

*восьми семейств с противовоспалительными, антимикробными, антиоксидантными и противоопухолевыми свойствами. Colchicum kesselringii и Allium longicuspis богаты активными веществами. Изучение этих растений способствует развитию природных лекарств и устойчивой этномедицины.*

***Ключевые слова:*** *Нуратауские горы, лекарственные растения, однодольные, Центральная Азия.*

## Introduction

The flora of Uzbekistan represents one of the richest centers of botanical diversity in Central Asia, harboring more than 4,500 vascular plant species, including approximately 1,593 monocotyledons [1, 2, 3]. Within this flora, the Nuratau mountain system plays a particularly important ecological and ethnopharmacological role, acting as a natural reservoir for numerous medicinal monocot species that bridge traditional herbal practices and modern pharmacology [4]. Historically, around 600 plant taxa in Uzbekistan have been documented for their ethnomedicinal importance [5], and the Nuratau region continues this deep-rooted biocultural tradition.

The Nuratau monocotyledonous flora includes several key genera of pharmacological relevance such as *Colchicum* L., *Allium* L., *Cyperus* L., *Dactylorhiza Neck. ex Nevski* and *Arum* L., each associated with bioactive secondary metabolites of therapeutic potential [6]. The ethnopharmacological diversity of monocots of Nuratau mirrors broader Central Asian phytogeographical patterns, where mountain ecosystems foster high endemism and biochemical specialization [7]. This region’s distinct ecological zonation — from piedmonts to alpine belts — supports species with diverse life forms, including bulbous, rhizomatous, and tuberous taxa, adapted to the arid mountain environment [8]. Their resilience and bioactivity are driven by secondary metabolites such as alkaloids, flavonoids, triterpenes, and saponins — key compounds for pharmacological research and drug discovery.

The pharmacological investigation of monocotyledons from the Nuratau Mountains not only enhances understanding of local biodiversity but also contributes to the growing global interest in sustainable natural product research. These plants provide valuable leads for developing new therapeutic agents against various diseases, including cancer, inflammation, microbial infections, and metabolic disorders. Their bioactive compounds — such as colchicine from *Colchicum*, allicin and sulfur-containing compounds from *Allium*, and phenolic and steroidal glycosides from *Arum* species — are of particular pharmacological and biochemical significance [9].

Thus, the study of pharmacological properties of monocotyledons in the Nuratau mountains is not only an exploration of biodiversity but also a step toward biocultural conservation and sustainable utilization of medicinal flora. Understanding the interplay between ecological adaptation, chemical diversity, and traditional medicine will be crucial for unlocking the therapeutic potential of monocotyledonous species of Nuratau and ensuring their preservation for future generations.

## Materials and Methods

Field surveys were performed between April and July 2025, covering altitudinal transects from 700 m to 1900 m above sea level. Specimens were collected from multiple habitats — rocky slopes, riparian zones, and alpine meadows. Standard herbarium techniques were used for specimen pressing and drying. Latin names of medicinal plant species are indicated according to the international POWO platform [11]. Taxonomic identification was carried out using the Flora of Uzbekistan and compared with authenticated specimens in the Tashkent National Herbarium (TASH) (Fig. 1).


**Figure 1.** Some medicinal monocotyledons in the Nurota botanical-geographical region (BGR). Photographs by B. Karimov and N. Beshko. A-*Allium longicuspis*; B-*Colchicum robustum*; C-*Cyperus rotundus*; D-*Allium suworowi*; E-*Colchicum kesselringii*; F-*Arum korolkowii*; G-*Ixiolirion tataricum*; H-*Ungernia oligostroma*; I-*Bolboschoenus maritimus*; J-*Cyperus* ***longus*.**

## Results and Discussion

### *Pharmacological Diversity of Monocotyledons in the Nuratau Mountains*

The flora of Uzbekistan, particularly that of the Nuratau mountains, is characterized by its rich composition of medicinally valuable taxa, with approximately 600 species documented as ethnopharmacologically significant [5]. Within this context, the monocotyledonous species of the Nuratau region represent an exceptional pharmacological reservoir that connects traditional ethnobotanical knowledge with modern phytopharmacology. A total of 17 medicinal monocot

species were identified and analyzed, belonging to families such as Colchicaceae, Amaryllidaceae, Orchidaceae, Cyperaceae, Asparagaceae, Juncaceae, Araceae, Iridaceae and Alismataceae. These taxa exhibit diverse pharmacological potentials, ranging from anti-inflammatory, antitumor, diuretic, antidiabetic, and antimicrobial activities to tonic and antioxidant effects, as summarized in Table 1.

**Table 1. List of monocotyledonous medicinal plants in the Nurota BGR.**

| Species name | Family | Medicinal properties/uses |
|---|---|---|
| ***Colchicum kesselringii* Regel** | Colchicaceae | Exhibits anti-inflammatory and anti-gout properties [12] |
| ***Colchicum robustum* (Bunge) Stef.** | Colchicaceae | Exhibits anti-inflammatory and anti-gout activity [12] |
| ***Ixiolirion tataricum* (Pall.) Schult. & Schult.** | Ixioliriaceae | Used as an astringent, anti-inflammatory, and antimicrobial agent [13] |
| ***Dactylorhiza salina* (Turcz. ex Lindl.) Soó** | Orchidaceae | Used as a tonic for strength and to treat inflammation and swelling [14] |
| ***Dactylorhiza incarnata* subsp. *cilicica* (Klinge) H. Sund.** | Orchidaceae | Used for the treatment of gastrointestinal disorders [5, 15] |
| ***Allium longicuspis* Regel** | Amaryllidaceae | Exhibits antimicrobial, antioxidant, and anti-inflammatory effects [16, 17] |
| ***Ungernia oligostroma* Popov & Vved.** | Amaryllidaceae | Used in traditional medicine (specific use not documented). |
| ***Asparagus brachyphyllus* Turcz.** | Asparagaceae | Traditionally used to treat bladder and kidney diseases, diabetes, and rheumatism; also for infertility and cardiac rhythm disorders in folk medicine [18] |
| ***Juncus bufonius* L.** | Juncaceae | Used for detoxification and treatment of stomach and digestive problems [19] |
| ***Juncus compressus* Jacq.** | Juncaceae | Used in folk medicine (specific use not documented). |
| ***Bolboschoenus maritimus* (L.) Palla** | Cyperaceae | Used as an astringent and diuretic, helping to constrict body tissues and promote urination [20] |
| ***Cyperus longus* L.** | Cyperaceae | Used for stomach pain; rhizomes are also used as a tonic and diuretic in various traditional medicine systems [21] |
| ***Cyperus rotundus* L.** | Cyperaceae | Traditionally used to treat fever, diarrhea, and pain [21] |

| | | |
|---|---|---|
| ***Alisma plantago-aquatica* L.** | Alismataceae | Folk medicine for immune-modulation, anti-tumor, anti-inflammatory and antibacterial [22] |
| ***Arum korolkowii* Regel** | Araceae | Toxic plant; used traditionally to boost potency, treat ulcers, respiratory issues, and skin diseases [23] |
| ***Lemna minor* L.** | Araceae | Traditionally used as an antipruritic, diuretic, depurative, febrifuge, and anti-inflammatory herb. It treats fever, edema, colds, rheumatism, liver and thyroid disorders, and skin ailments like eczema, rashes, and abscesses. Used both internally for respiratory and rheumatic inflammation and externally for wounds and skin irritations [24] |
| ***Crocus korolkowii* Maw & Regel** | Iridaceae | Medicinal, food (spice) [25] |

Given their pharmacological potential, these plants represent not only cultural heritage but also prospective resources for natural drug discovery. Integrative approaches combining ethnobotanical surveys, phytochemical analysis, and bioassays are crucial to scientifically validate traditional uses and support sustainable utilization. Furthermore, the biochemical diversity observed among Nuratau monocots highlights the adaptive evolution of secondary metabolism under environmental stress — a valuable aspect for future comparative phytochemical studies in arid mountain ecosystems.

## Conclusion

This study highlights the pharmacological and ethnobotanical importance of monocotyledonous plants in Uzbekistan’s Nuratau Mountains. Seventeen medicinal species from eight families were identified, demonstrating anti-inflammatory, antibacterial, antioxidant, diuretic, antitumor, and tonic properties.

Their diverse bioactive compounds show strong potential for natural drug development. Given the region's biodiversity, more valuable medicinal species are likely to be discovered. Comprehensive ethnobotanical and biochemical research is essential to deepen understanding and validation. Overall, the monocot flora of the Nuratau Mountains forms a vital part of Central Asia's ethnopharmacological heritage and offers significant promise for sustainable research and innovation in biological and pharmaceutical sciences.

**References**


1. Khassanov F.O. (ed.) Conspectus Florae Asiae Mediae. – Vol. 11. – Tashkent: Science Publishers, 2015. – 456 p.

2. Tayjanov K., Mamadalieva N.Z., Wink M. Diversity of the mountain flora of Central Asia with emphasis on alkaloid-producing plants. // *Diversity*. – 2017. – Vol. 9, No. 1. – 11 p. – DOI: 10.3390/d9010011.

3. Ma S., Li W., Tojibaev K.S., Turginov O., Yang W., Ma K. Regionwide and nationwide floristic richness reveal vascular plant diversity in Central Asia. // *Plants*. – 2024. – Vol. 13, No. 16. – Art. 2275.

4. Batoshov A.R., Beshko N.Y. Characteristics of flora and plant cover of Nuratau relic mountains (South Kyzylkum). // *Arid Ecosystems*. – 2013. – Vol. 3, No. 3. – pp. 172–177.

5. Khojimatov O.K., Khamraeva D.T., Khujanov A.N., Bussmann R.W. An overview of ethnomedicinal plants of Uzbekistan. // *Ethnobotany Research & Applications*. – 2020. – Vol. 20, No. 08. – pp. 1–19. – DOI: 10.32859/ERA.20.08.1-19.

6. Teotia D., Agrawal A., Kumar V., Jain P., Kumar A., Agrawal B., Malik V. Ethnobotany, phytochemistry and biological activities of the genus *Allium* L. // *Environment Conservation Journal*. – 2025. – Vol. 26, No. 3. – pp. 1058–1076.

7. Asatulloev T., Dekhkonov D., Yusupov Z., Tojiboeva U., Cai L., Tojibaev K., Sun W. Ecoregional and phytogeographical insights into the distribution of *Tulipa* in the 'Nature Imperiled' area of Central Asia for effective conservation. // *Diversity*. – 2023. – Vol. 15, No. 12. – Art. 1195.

8. Norboboeva T., Yakubjonova S., Haydarova H., Karakhanova L. Regional distribution and ecological-phytocenotic description of dominant plants of Southern Uzbekistan. In: *E3S Web of Conferences*. – 2023. – Vol. 421. – Art. 04010. – EDP Sciences.

9. Leung Y.Y., Hui L.L.Y., Kraus V.B. Colchicine—update on mechanisms of action and therapeutic uses. In: *Seminars in Arthritis and Rheumatism*. – 2015, December. – Vol. 45, No. 3. – pp. 341–350. – WB Saunders.

10. Volis S., Beshko N. How to preserve narrow endemics in view of climate change? The Nuratau Mountains as the case. // Plant Diversity of Central Asia. – 2023. – Vol. 2, No. 2. – pp. 82–101.

11. Plants of the World Online. Available at: https://powo.science.kew.org/

12. Dalbeth N., Lauterio T.J., Wolfe H.R. Mechanism of action of colchicine in the treatment of gout. // Clinical Therapeutics. – 2014. – Vol. 36, No. 10. – pp. 1465–1479.

13. Yigitkan S., Akdeniz M., Yener I., Fırat M., Senturk K., Alkan H., Ertas A. Chemical composition and biological activity of Ixiolirion tataricum (Pall.) Schult. & Schult. f. var. tataricum. // Population. – 2021. – Vol. 3, No. 4.

14. Dorjey K., Maurya A.K., Sinha D. Dactylorhiza hatagirea (D. Doon) Soo, an important medicinal herb of the Himalaya and urgent need for its conservation —A review. // Indian Journal of Natural Products and Resources (IJNPR). – 2022. – Vol. 13, No. 3. – pp. 265–273.

15. Khojimatov O.K., Bussmann R.W. Dactylorhiza incarnata subsp. cilicica Klinge—ORCHIDACEAE. In: Ethnobiology of Uzbekistan: Ethnomedicinal Knowledge of Mountain Communities. – Cham: Springer International Publishing, 2023. – pp. 275–282.

16. Gorrepati K., Krishna R., Singh S., Shirsat D.V., Soumia P.S., Mahajan V. Harnessing the nutraceutical and therapeutic potential of Allium spp.: current insights and future directions. // Frontiers in Nutrition. – 2024. – Vol. 11. – Art. 1497953.

17. Keusgen M., Fritsch R.M., Hisoriev H., Kurbonova P.A., Khassanov F.O. Wild Allium species (Alliaceae) used in folk medicine of Tajikistan and Uzbekistan. // Journal of Ethnobiology and Ethnomedicine. – 2006. – Vol. 2, No. 1. – Art. 18.

18. Kuziev A., Izbosarov M. About the medicinal leafy sarsabil plant Asparagus brachyphyllus Turcz. // Science and Innovation. – 2024. – Vol. 3, D9. – pp. 238–243.

19. El-Shamy A.I., Abdel-Razek A.F., Nassar M.I. Phytochemical review of Juncus L. genus (Fam. Juncaceae). // Arabian Journal of Chemistry. – 2015. – Vol. 8, No. 5. – pp. 614–623.

20. Wollstonecroft M., Erkal A. Summary of plant-processing experiments 1999. In: Hodder I., Catalhöyük Research Trust (eds.) Catalhöyük. – 1999.

21. Taheri Y., Herrera-Bravo J., Huala L., Salazar L.A., Sharifi-Rad J., Akram M., Cho W.C. Cyperus spp.: A review on phytochemical composition, biological activity, and health-promoting effects. // Oxidative Medicine and Cellular Longevity. – 2021, No. 1. – Art. 4014867.

22. Huang Y.S., Yu Q.Q., Chen Y., Cheng M.J., Xie L.P. Phenolic constituents from Alisma plantago-aquatica Linnaeus and their anti-chronic prostatitis activity. // Chemistry Central Journal. – 2017. – Vol. 11, No. 1. – Art. 120.

23. Aldayrov N.S., Jumabekova J., Kurmanbekova G., Omurzakova N., Kidiralieva B., Borkoev B., Chekirov K. The Effect of Kuchala (Arum Korolkowii Regel, 1873) Tuber Tincture to Increase Serum Testosterone in Adult Male Guinea Pigs (Cavia porcellus Linnaeus, 1758). – 2020. – DOI: 10.21203/rs.3.rs-125964/v1.

24. Al-Snafi A.E. Lemna minor: Traditional uses, chemical constituents and pharmacological effects—A review. // IOSR Journal of Pharmacy. – 2019. – Vol. 9, No. 8. – pp. 6–11.

25. Tojibaev K., Beshko N., Botashov A., Azimova D., Yusupov Z., Tao D., Hang S. Flora of the Dzhizak province, Uzbekistan. – China Forestry Publishing House, 2020. – 67 p.