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SPECIES OF THE GENUS *Plantago* L., GROWING IN THE TERRITORY OF THE NAKHCHIVAN AUTONOMOUS REPUBLIC

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ВИДЫ РОДА *Plantago* L., ПРОИЗРАСТАЮЩИЕ НА ТЕРРИТОРИИ НАХЧЫВАНСКОЙ АВТОНОМНОЙ РЕСПУБЛИКИ

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Abstract. The present study was carried out during 2024–2025 in different floristic regions of the Nakhchivan Autonomous Republic. The research focused on the taxonomic composition, ecological characteristics, distribution patterns, altitudinal ranges, and economic significance of species belonging to the genus *Plantago* L. occurring in the regional flora. Species identification and taxonomic verification were performed using major floristic references for Azerbaijan, alongside current taxonomic databases and revisions. A total of 13 Plantago species are reported for Azerbaijan, of which seven were identified within the flora of the Nakhchivan Autonomous Republic: *Plantago atrata, P. lanceolata, P. major, P. maritima, P. media, P. minuta*, and *P. saxatilis*. Ecological analysis demonstrated that mesophytic species constitute the largest group, accounting for 57.14% of the recorded taxa. Xerophytes, mesoxerophytes, and halophytes each represent 14.29%. The investigated species are associated with several geographical distribution classes, including Iranian, Caucasian, Mediterranean, Mediterranean–Turanian, and European–Asian elements, while the distribution class of one species remains undetermined. The occurrence of Plantago species in mountain meadows, rocky habitats, semi-desert areas, plains, and sites influenced by human activity demonstrates their considerable ecological tolerance and adaptability. The findings also indicate that *Plantago* species contribute to soil stabilization, erosion reduction, maintenance of phytocenotic stability, and conservation of plant diversity. Several species possess considerable traditional medicinal and pharmacological value and may also serve as fodder, melliferous, and phytomeliorative plants. Further research into their bioecological, phytochemical, and pharmacological characteristics is therefore warranted.

Аннотация. Настоящее исследование проводилось в 2024–2025 годах в различных флористических районах Нахчыванской Автономной Республики. В рамках работы были изучены таксономический состав, экологические характеристики, особенности распространения, высотные диапазоны и хозяйственное значение видов рода *Plantago* L., представленных во флоре региона. Идентификация видов и их таксономическая верификация осуществлялись на основе основных флористических источников по Азербайджану, а также современных таксономических баз данных и научных ревизий. В Азербайджане отмечено 13 видов рода *Plantago*, из которых во флоре Нахчыванской Автономной Республики выявлено семь: *Plantago atrata, P. lanceolata, P. major, P. maritima, P. media, P. minuta* и *P. saxatilis*.

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Экологический анализ показал, что наибольшую группу составляют мезофитные виды, доля которых составляет 57,14% от общего числа исследованных таксонов. На долю ксерофитных, мезоксерофитных и галофитных видов приходится по 14,29% соответственно. Исследованные виды относятся к нескольким географическим ареальным классам, включая иранский, кавказский, средиземноморский, средиземноморско-туранский и европейско-азиатский элементы, тогда как ареальная принадлежность одного вида остается неуточненной. Распространение видов *Plantago* в горных лугах, скалистых местообитаниях, полупустынных районах, равнинных территориях и местах, подвергающихся антропогенному воздействию, свидетельствует о значительной экологической толерантности и высокой адаптивной способности представителей данного рода. Полученные результаты также показывают, что виды Plantago участвуют в стабилизации почв, снижении эрозионных процессов, поддержании устойчивости фитоценозов и сохранении растительного разнообразия. Несколько видов обладают значительной ценностью в традиционной медицине и фармакологии, а также могут использоваться в качестве кормовых, медоносных и фитомелиоративных растений. В связи с этим дальнейшее изучение биоэкологических, фитохимических и фармакологических характеристик представителей рода Plantago представляется перспективным направлением научных исследований.

Keywords: Nakhchivan Autonomous Republic, flora, bioecology, taxonomy, phytocenosis, medicinal plants.

Ключевые слова: Нахчыванская Автономная Республика, флора, биоэкология, таксономия, фитоценоз, лекарственные растения.

The Nakhchivan Autonomous Republic represents an important botanical area of Azerbaijan owing to its rich flora, complex topography, and highly variable vegetation cover. Differences in elevation, continental climatic conditions, soil characteristics, and geomorphological structure have contributed to the development of a diverse range of plant communities. The presence of more than 2,000 higher plant species emphasizes the considerable botanical importance of Nakhchivan within the Caucasian floristic region. Consequently, the conservation, sustainable utilization, and scientific investigation of plant genetic resources represent important components of biodiversity protection in the region. Among the widespread plant genera occurring in the flora of the Nakhchivan Autonomous Republic is *Plantago* L. (plantain), a member of the family Plantaginaceae Juss. The genus is broadly distributed, particularly throughout temperate and subtropical climatic regions. Species of *Plantago* exhibit considerable ecological adaptability and occur in a variety of habitats, including mountain meadows, steppe and semi-desert vegetation, river valleys, and areas subjected to anthropogenic disturbance. Several species are naturally distributed throughout Azerbaijan, with a substantial proportion also occurring in different floristic districts of the Nakhchivan Autonomous Republic [1].

Species of Plantago are characterized by a diverse phytochemical composition that includes iridoid glycosides, flavonoids, phenolic compounds, polysaccharides, mucilaginous substances, organic acids, and mineral elements. These biologically active constituents contribute to the medicinal potential of the genus and have been associated with anti-inflammatory, antimicrobial, antioxidant, wound-healing, immunomodulatory, and expectorant activities. In addition to their medicinal value, *Plantago* species have practical importance in soil protection, forage production, phytomelioration, and other areas of economic activity. Considering these characteristics, an integrated assessment of the taxonomic composition, ecological and geographical distribution, bioecological features, and

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practical significance of Plantago species occurring in the Nakhchivan Autonomous Republic is relevant to contemporary botanical research and plant conservation [2, 5].

Research Material and Methodology

The research was conducted during 2025–2026 in several floristic regions of the Nakhchivan Autonomous Republic. The study material consisted of Plantago species collected or observed in rocky habitats, roadside areas, meadows, and other representative habitats of the region. Identification and taxonomic verification of the investigated species were performed using major floristic references, including A. Asarov's, Plant World of Azerbaijan and Flora of Azerbaijan, together with other relevant botanical publications [1, 4].

Current nomenclatural and taxonomic information was additionally checked against the World Flora Online database (worldfloraonline.org).

The recorded species were analyzed according to their taxonomic position, ecological group, geographical distribution class, altitudinal range, and flowering and fruiting periods.

Discussion and Results of the Research

The genus *Plantago* represents an important component of the diverse flora of the Nakhchivan Autonomous Republic. According to the available floristic data, 13 species of the genus occur in Azerbaijan, while seven species have been recorded from the Nakhchivan Autonomous Republic. These include *Plantago atrata, P. lanceolata, P. major, P. maritima, P. media, P. minuta*, and *P. saxatilis.* The ecological characteristics, distribution classes, altitudinal ranges, and phenological periods of the recorded species are summarized in Table.

Table

TAXONOMIC COMPOSITION OF SPECIES BELONGING TO THE GENUS *Plantago L.*

Species name	*Environmental groups*	*Areal class*	*Altitude zone*	*Flowering and fruiting phase*
Plantago atrata Hoppe	Mesophyte	Unknown	Meadows of the subalpine and alpine zones	V,VII-VII,IX
P. lanceolata L.	Mesophyte	Caucasus	Meadows of the mid-mountain and subalpine belt	V,VIII-VI,X
P. major L	Mesophyte	Mediterranean-Turanian	Meadows of the middle and subalpine zone	V,IX-VI,X
P. maritima L.	Halophyte	Europe-Asia	Plain	V,VIII-VI, I X
P. media L	Mesophyte	Mediterranean Sea	Meadows of the middle and subalpine zone	V,VII-VII,IX
P. minuta Pall	Xerophyte	Iran	Mid-mountainous	V,VII-VI, VII
P. saxatilis Bieb	Mesoxerophyte	Iran	Meadows and rocks of the subalpine and alpine zones	V,VII-VII,IX

Analysis of the ecological groups revealed a predominance of mesophytic species. Four of the seven recorded taxa belong to this group, representing 57.16% of the total number of species. Xerophytes, mesoxerophytes, and halophytes are each represented by one species, corresponding to 14.28% respectively. The predominance of mesophytes, together with the presence of species adapted to dry, moderately dry, and saline habitats, demonstrates the broad ecological amplitude of the genus in Nakhchivan. Such diversity is consistent with the considerable variation in climatic conditions, soil properties, and topography across the region.

Analysis of literature sources and field observations showed that the recorded *Plantago* species belong to several geographical distribution classes. On the basis of zonal and regional distribution

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principles, five principal areal groups were identified: Iranian, Caucasian, Mediterranean, Mediterranean–Turanian, and European–Asian.

The Iranian element is represented by *P. minuta* and *P. saxatilis*, while *P. lanceolata* represents the Caucasian element. *P. media* belongs to the Mediterranean distribution class, and *P. major* represents the Mediterranean–Turanian element. *P. maritima* is associated with the European–Asian distribution class. The geographical classification of *P. atrata* remains uncertain based on the sources considered.

The occurrence of species with different geographical affinities reflects the complex floristic history and ecological diversity of the Nakhchivan region.

Species of *Plantago* L. are annual or perennial herbaceous plants. Their flowers are generally bisexual and are arranged in dense, spike-like inflorescences. The calyx is typically four-parted, while the corolla is membranous and four-lobed. The flowers usually possess four stamens, and the fruit is a two-seeded capsule.

Seven species are currently recorded from the Nakhchivan Autonomous Republic, while four species have been reported from the relevant protected area according to the cited sources.

Plantago saxatilis is characterized by lanceolate or narrowly lanceolate leaves that may be densely covered with silvery hairs or nearly glabrous. The leaf margins may be entire or finely toothed. The flowering stem usually exceeds the length of the leaves, and the inflorescence is ovate to oblong. The bracts and sepals vary from brown to greenish and may be hairy or glabrous.

The species occurs mainly in subalpine and alpine meadows and rocky habitats. In traditional medicine, the leaves and aerial parts have been used for wound treatment and as anti-inflammatory and antiseptic remedies. Ecologically, the species contributes to soil stabilization and the preservation of vegetation cover in mountain-meadow ecosystems.

The leaves of *P. lanceolata* form a basal rosette and are generally petiolate, lanceolate, and three- to seven-veined, with entire or slightly toothed margins. The flowering stems may reach approximately 10–60 cm in height. The inflorescence is relatively short and may be ovate or elongated-cylindrical.

The species is widely distributed in middle-mountain and subalpine meadows. It is among the best-known medicinal members of the genus. Its leaves have traditionally been used for their anti-inflammatory, expectorant, antitussive, wound-healing, hemostatic, and antibacterial properties. Preparations such as teas, infusions, syrups, and extracts have been traditionally employed for respiratory and gastrointestinal disorders and for the treatment of skin injuries. The species is also valuable as a forage and melliferous plant.

Plantago major is a herbaceous perennial that generally reaches 15–40 cm in height. It develops a basal rosette of broad, rounded green leaves with entire or slightly irregular margins. Its small brownish flowers are arranged in elongated spike-like inflorescences.

The species commonly occurs in middle-mountain and subalpine meadows and is one of the most widely utilized species of the genus. Leaves and seeds have traditionally been associated with wound-healing, anti-inflammatory, antiseptic, diuretic, and hemostatic applications. They have also been used traditionally for respiratory, gastrointestinal, and dermatological conditions. In some regions, young leaves are consumed as food.

Plantago media generally reaches 15–30 cm in height. Its leaves are oblong to rounded and form a basal rosette. The margins are generally entire, and the leaves gradually narrow toward the petiole. The species produces small, pale-colored flowers arranged in elongated spikes.

It is primarily distributed in middle-mountain and subalpine meadows. In traditional medicine, it has been used for wound healing and as an anti-inflammatory, expectorant, and antitussive remedy.

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From an ecological perspective, the species forms part of meadow plant communities and provides forage resources for livestock and nectar resources for insects.

Plantago atrata is a herbaceous species approximately 15–30 cm tall, with green, linear or linear-lanceolate leaves. Its inflorescence is generally ovate or oblong and relatively inconspicuous in coloration.

The species is characteristic of subalpine and alpine meadows. Compared with several other *Plantago* species, its medicinal applications are relatively limited. Nevertheless, it is of considerable floristic and ecological interest as a component of high-mountain plant communities. Traditional uses reported for some regions include limited application as an anti-inflammatory and wound-healing plant.

The leaves of *Plantago maritima* are linear, linear-lanceolate, or narrowly ribbon-shaped. They are generally thick and succulent, with entire margins, and form a basal rosette. The flowering stem is erect, glabrous, and usually longer than the leaves. The inflorescence is dense and cylindrical or elongated-cylindrical.

The species is particularly associated with saline and coastal or otherwise salt-affected habitats. Its leaves have traditionally been used for anti-inflammatory, wound-healing, and diuretic purposes. Young leaves may also be consumed as salad or vegetables in certain regions. Ecologically, *P. maritima* contributes to the stabilization and phytomelioration of saline soils and can be important in maintaining vegetation in salt-affected ecosystems.

Plantago minuta has small, narrow lanceolate to linear-lanceolate leaves arranged in a basal rosette. The leaves are usually entire and may be glabrous or sparsely hairy. The flowering stem is slender, erect, and generally longer than the leaves. Its short inflorescence is ovate or oblong-ovate and densely flowered.

The species occurs mainly in middle-mountain areas and is associated with relatively dry environments. Its traditional medicinal use is limited but includes applications related to inflammation and wound treatment. It may also contribute to soil protection and serve as a pasture species in dry steppe and semi-desert ecosystems. Compared with better-known species such as *P. major* and *P. lanceolata*, its medicinal and agricultural potential remains comparatively understudied.

The Nakhchivan Autonomous Republic is characterized by a sharply continental climate, complex relief, and substantial environmental heterogeneity. These conditions have contributed to the development of diverse plant communities. Herbaceous species occurring in arid and semi-arid landscapes play an important role in maintaining ecosystem structure and functionality. Such plants contribute to soil formation and protection, reduce erosion, influence water retention and circulation, and support overall biodiversity. Particularly, drought-tolerant species can increase the resistance of plant communities to environmental fluctuations, anthropogenic pressure, and climatic variability [3].

Species of *Plantago* are characteristic components of a range of phytocenoses in the Nakhchivan Autonomous Republic. They occur in steppe and semi-desert vegetation, mountain meadows, forest margins, river valleys, and disturbed habitats. Their capacity to tolerate different soil and climatic conditions enables them to establish relatively stable populations across diverse floristic regions [3].

Plantago species occur in plant communities together with members of families such as Asteraceae, Fabaceae, Lamiaceae, and Rosaceae. Within these communities, they contribute to ground cover, soil stabilization, productivity, and the maintenance of ecological interactions. They can also serve as food resources for various insects and thereby participate in local trophic networks [2, 5].

The genus is also represented in forest-shrub communities, where its species occur together with other herbaceous plants along forest edges, shrublands, and mountain slopes. Such mixed

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communities contribute to biodiversity conservation, soil protection, and the continued provision of ecosystem services.

Although the taxonomy, distribution, and phytocenotic characteristics of *Plantago* species have been investigated to some extent, their bioecological characteristics, phytochemical composition, pharmacological properties, and potential uses specifically within the flora of the Nakhchivan Autonomous Republic remain insufficiently studied. Consequently, detailed investigations of species composition, distribution patterns, ecological adaptation, and practical value represent promising areas for further research.

The genus *Plantago* is widely represented in the flora of the Nakhchivan Autonomous Republic, and the taxonomic identity of its recorded species can be assessed using current classification systems.

Mesophytic species predominate among the investigated taxa, accounting for 57.16%, whereas xerophytes, mesoxerophytes, and halophytes each constitute 14.28%. This ecological composition reflects the capacity of the genus to occupy habitats with substantially different environmental conditions.

The recorded species exhibit several geographical distribution patterns, including Iranian, Caucasian, Mediterranean, Mediterranean–Turanian, and European–Asian elements. This diversity of geographical affinities reflects the complex floristic characteristics of the region.

Plantago species contribute to the functioning of mountain-meadow, subalpine, alpine, rocky, plain, and semi-desert plant communities. Their presence is particularly relevant to soil stabilization, erosion reduction, vegetation-cover maintenance, and biodiversity conservation.

Several of the investigated species possess considerable traditional medicinal value and have been associated with anti-inflammatory, wound-healing, antiseptic, expectorant, and other biological activities. Certain species also have value as forage, melliferous, and phytomeliorative plants.

The findings demonstrate the need for further systematic research into the bioecology, phytochemistry, pharmacology, resource potential, and conservation status of *Plantago* species occurring in the Nakhchivan Autonomous Republic. Such research could provide a stronger scientific basis for the sustainable use and conservation of these plant resources.

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