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ECOLOGICAL DIFFERENTIATION OF SPECIES OF THE GENUS *Lathyrus* L. IN EARLY SPRING FLORA

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ЭКОЛОГИЧЕСКАЯ ДИФФЕРЕНЦИАЦИЯ ВИДОВ РОДА *Lathyrus* L. ВО ФЛОРЕ РАННЕЙ ВЕСНОЙ

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Abstract. This article analyzes the ecological differentiation of species of the genus *Lathyrus* L., which are widespread in the early spring flora of the Nakhchivan Autonomous Republic. The study examined the distribution characteristics, life forms, ecological groups, altitudinal distribution, and phytocenotic relationships of four species of the genus (*Lathyrus aphaca* L., *L. chloranthus* Boiss. & Balansa, *L. cicera* L., and *L. hirsutus* L.). It was established that the species are distributed in different biotopes and exhibit distinct ecological characteristics. Most species of the genus are distributed on plains, in foothills, and in lowland mountain zones; only Lathyrus chloranthus is found in the upper mountain and subalpine zones. The main objective of the study was to determine the distribution range, phytocenotic relationships, and mechanisms of ecological adaptation of the *Lathyrus* species found in the region. The results demonstrate that species of the genus *Lathyrus* L. are distinguished by their ability to adapt to various environmental conditions and are also important components of early spring phytocenoses.

Аннотация. В представленной статье проанализирована экологическая дифференциация видов рода *Lathyrus* L., распространённых во флоре Нахчыванской Автономной Республики в ранневесенний период. В ходе исследований были изучены особенности распространения, жизненные формы, экологические группы, распределение по высотным поясам и фитоценотическая приуроченность 4 видов данного рода (*Lathyrus aphaca* L., *L. chloranthus* Boiss. & Balansa, *L. cicera* L. и *L. hirsutus* L.). Установлено, что виды произрастают в различных биотопах и характеризуются специфическими экологическими особенностями. Основная часть видов рода встречается в равнинном, предгорном и нижнегорном поясах, тогда как только *Lathyrus chloranthus* распространён в среднегорном, верхнегорном и субальпийском поясах. Целью исследования является определение ареалов распространения видов чины (*Lathyrus*), их фитоценотических связей и механизмов экологической адаптации в регионе. Результаты исследования показывают, что виды рода *Lathyrus* L. являются важными ценозообразующими компонентами ранневесенних фитоценозов и отличаются высокой способностью к адаптации в различных экологических условиях.

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Keywords: Lathyrus L., early spring phytocenoses, ecological differentiation, life forms, mesophyte, hygrophyte.

Ключевые слова: Lathyrus L., ранневесенние фитоценозы, экологическая дифференциация, жизненные формы, мезофиты, гигрофиты.

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The Nakhchivan Autonomous Republic is one of the most important phytogeographic regions of Azerbaijan, distinguished by its rich biodiversity, complex geomorphological structure, and sharply continental climate. The diverse altitudinal zones, variability of climate, and soil conditions have created the ideal environment for the development of rich and colorful vegetation. The legume family (Fabaceae Lindl.) occupies a special place among the region's diverse flora. Representatives of this family, demonstrating high ecological flexibility, are found in various life forms — trees, shrubs, and herbs — and play a vital role in the formation of natural phytocenoses. Furthermore, species of this family enrich the soil with nitrogen, contributing to increased ecosystem productivity. The taxonomic and ecological richness of the legume family ensures its widespread distribution in a variety of biotopes. Within the family, the genus *Lathyrus* L. is represented primarily by perennial and annual herbaceous plants and is distinguished by its ability to adapt to a variety of environmental conditions. Representatives of this genus are widespread in phytocenoses exposed to natural and anthropogenic influences, playing a significant role in the structure of the vegetation cover. Their distribution, relationship to environmental factors, and phytocenotic roles are particularly important for studying the development of the region's flora. The study of species belonging to the genus *Lathyrus* L. provides a scientific basis for a more in-depth understanding of the structural and functional characteristics of the vegetation cover of the Nakhchivan Autonomous Republic, as well as for assessing the phytogeographic and ecological features of the region [18].

Material and Research Methods

The study was conducted in 2025–2026 along expedition routes covering various physiographic regions, including plains, foothills, and low mountain belts. The research material consists of herbarium specimens and field observations collected from natural populations of species of the genus *Lathyrus* L., common in the Nakhchivan Autonomous Republic. The species' distribution ranges, frequency of occurrence, and position within phytocenoses were directly observed and recorded in the field. During the field research, a route-expedition method was used, with selective observations conducted in biotopes with varying environmental conditions. Phenological stages of plant development (germination, vegetative development, flowering, and fruiting) were systematically monitored and recorded, beginning in early spring. The collected specimens were dried in the laboratory and prepared in accordance with herbarium standards. Classical floristic sources were used for species identification: "Flora of the Caucasus", "Flora of Azerbaijan", as well as A. Askerovs taxonomy of higher plants and a number of other works [2, 6, 9].

The latest nomenclatural and taxonomic changes were refined using the World Flora Online database (https://about.worldfloraonline.org/).

This approach ensured accurate species identification and their compliance with the internationally recognized system. The study utilized a comprehensive combination of biomorphological, ecological, taxonomic, floristic-systematic, and phytocenological methods, and the results were summarized through comparative analysis. Plant life forms were identified using K. Raunker's, system, and ecological groups were grouped according to their relationship to moisture using Shennikov's classification [16, 17].

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A comparative analysis of species distribution across altitudinal zones and geographic elements was simultaneously conducted.

Discussion and Conclusions of the Study

From the floristic studies conducted, it was established that species of the genus *Lathyrus* L. are unevenly distributed across various early spring vegetation biotopes in the Nakhchivan Autonomous Republic. Representatives of this genus were found to be predominantly found in meadows, shrublands, arable land, riverbanks, and areas subject to anthropogenic impact, forming diverse ecological characteristics. This demonstrates their broad ecological range and ability to adapt to diverse environmental conditions. The study revealed that *Lathyrus aphaca* and *Lathyrus cicera* exhibit relatively broad ecological adaptability and are more common in anthropogenic and open areas. These species form more stable populations on agricultural land, on the margins of arable land, and in areas with disturbed soil cover. This demonstrates their high ecological plasticity (Figure 1).



Figure 1. *Lathyrus aphaca*



Figure 2. *Lathyrus hirsutus*

Furthermore, *Lathyrus chloranthus* is associated with wetter and relatively stable phytocenoses and is common on riverbanks and marshy meadows. *Lathyrus hirsutus* is more common in shrub and forest biotopes, indicating its ability to ascend into the mid-mountain zone; this species was also discovered during fieldwork conducted near Agbulag (Figure 2).

Studying plant life forms is essential for determining their ecological characteristics and adaptation strategies to environmental factors. Life forms reflect plant survival strategies during adverse seasons, the location of vegetative organs relative to the soil surface, and the level of adaptation to environmental conditions. Raunkiaer's classification system was used to determine the life forms of the studied *Lathyrus* L. species.

A biomorphological analysis of life forms reveals that both therophytic and hemicryptophytic plants predominate among the studied species. This reflects the adaptive advantage of annual and perennial herbaceous plants that utilize a short growing season, especially in early spring. These characteristics are considered to be a result of adaptation to the continental climatic conditions of the

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region. The distribution of species of the genus Lathyrus L. is closely linked to the physiographic conditions of the Nakhchivan Autonomous Republic. Most species are more widespread in the plains, foothills, and low mountain belts, forming stable populations there. These regions are characterized by relatively favorable temperatures, a long growing season, and diverse soil cover, creating favorable conditions for the development of *Lathyrus* L. species [13, 14].

With increasing altitude, the influence of climatic factors increases, temperatures decrease, and the growing season shortens. As a result, the distribution of species decreases, and only species with specific ecological requirements are found in high-altitude regions. In particular, *Lathyrus chloranthus*, unlike other species, is distributed in the upper mountain and subalpine zones, demonstrating its adaptation to more humid environmental conditions. Thus, altitude plays an important role in the ecological differentiation of *Lathyrus* L. species and directly influences their distribution within phytocenoses. The concentration of the majority of the species at lower hypsometric levels indicates that the genus is better adapted to moderate temperature and favorable humidity conditions. This feature is one of the main indicators characterizing the ecological range of *Lathyrus* L. species in the flora of Nakhchivan and their potential for adaptation to various habitats (Table).

Table

DISTRIBUTION RATES OF *Lathyrus* L. SPECIES IN DIFFERENT ALTITUDINAL ZONES

Species	*Plain*	*Low mountain*	*Middle mountain*	*Upper mountain*	*Subalpine*
Lathyrus aphaca	+	+	+	-	-
L. cicera	+	+	+	+	-
L. hirsutus	+	+	+	-	-
L. chloranthus	-	-	-	+	+

An analysis of the distribution by altitudinal zones shows that species are primarily concentrated in plains and low mountain zones. A decline in species numbers toward the mid-mountain zone is associated with a harsher climate and changes in humidity. According to the results of the areal analysis, the majority of species belong to Mediterranean and Near Asian floristic elements. This confirms the close connection of the Nakhchivan flora to these floristic regions and the predominance of xerophilous elements. At the same time, the fact that some species have a wider range indicates their high migratory capacity and adaptability [7, 10, 11, 12].

Phytocenoses formed by species of the genus *Lathyrus* L., along with other higher plants, are characterized primarily by a mixed herbaceous cover that develops in early spring. In these phytocenoses, Lathyrus species coexist with various herbaceous plants belonging to the families Fabaceae, Poaceae, Asteraceae, Rosaceae, and Brassicaceae, forming plant groups with a mixed floristic composition. In particular, *L. aphaca* and *L. cicera*, along with annual grasses and weeds, spread across cultivated fields and steppe areas subject to anthropogenic impact, participating in the formation of synanthropic phytocenoses. These groups are highly dynamic and sensitive to land use and seasonal climate changes [1, 3-5, 8].

On the other hand, *L. chloranthus* and *L. hirsutus* coexist in phytocenoses with more stable and relatively humid conditions, forming complex vegetation with various perennial grasses and shrubs in meadow and shrubland ecosystems. Interspecific competition and ecological relationships in this type of phytocenoses are more stable, leading to long-term structural stability. Thus, species of the genus *Lathyrus*, co-occurring with plants belonging to different families, play an important role in the formation of both synanthropic and natural phytocenoses and provide a mosaic structure for the region's vegetation cover. Overall, the results of the studies show that species of the genus *Lathyrus* L. have undergone ecological differentiation in the flora of Nakhchivan and developed different

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adaptation strategies in different biotopes. This confirms their stable participation in phytocenoses and their important role in shaping the region's vegetation.

The conducted research revealed that four species of the genus *Lathyrus* L. (*L. aphaca, L. chloranthus, L. cicera*, and *L. hirsutus*) were found in the early spring flora of the Nakhchivan Autonomous Republic. The ecological, biomorphological, and altitudinal analyses revealed that species of the genus *Lathyrus* L. exhibit distinct characteristics of ecological differentiation in the early spring flora of the Nakhchivan Autonomous Republic. Based on the analysis of ecological groups, 75% of the species were classified as mesophytic and 25% as hygrophytic, confirming the predominance of mesophilic characteristics within the genus. Furthermore, 75% of the species in the biomorphological spectrum belong to therophytic life forms, and 25% to hemicryptophytic life forms. An assessment of altitudinal zones revealed that 75% of species are widespread from the lowland to mid-mountain zones, while only 25% (*L. chloranthus*) are found in the upper mountain and subalpine zones. These results demonstrate that the ecological range of *Lathyrus* species is broad and that they develop differentiated adaptation strategies to different climatic and orographic conditions.

An analysis of geographical elements revealed that 75% of the species belong to floristic elements of Mediterranean origin, indicating the important role of Mediterranean phytogeographic connections in the flora of Nakhchivan.

Phytocoenotic observations revealed that *Lathyrus* L. species are distributed in early spring phytocoenoses primarily together with species belonging to the families Fabaceae, Poaceae, Asteraceae, Rosaceae, and Brassicaceae, forming plant groups with diverse floristic compositions. Species of the genus Lathyrus are an important component in the formation of these plant groups and play a significant role in the structure of early spring vegetation in the region.

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