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CONCLUSIONS OF BOTANICAL RESEARCH. DISCUSSION AND ANALYSIS OF THE RESULTS OBTAINED

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ВЫВОДЫ БОТАНИЧЕСКИХ ИССЛЕДОВАНИЙ. ОБСУЖДЕНИЕ И АНАЛИЗ ПОЛУЧЕННЫХ РЕЗУЛЬТАТОВ

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Abstract. This scientific research presents the studies conducted from 2021 to 2025 and the results obtained from those studies. The materials of the research obtained in different years can be used in the teaching of "Systematics of Higher Plants", "Systematics of Plants", "Medicinal Plants of Nakhchivan Autonomous Republic", and "Local Flora" courses in the Master's and Doctoral programs at the Biology and Biology Teaching specialties.

Аннотация. Представлены исследования, проведенные с 2021 г по 2025 г. Материалы исследований, полученные в разные годы, могут быть использованы при преподавании курсов «Систематика высших растений», «Систематика растений», «Лекарственные растения Нахчыванской Автономной Республики», «Местная флора» в магистратуре и докторантуре по специальностям «Биология» и «Преподаватель биологии».

Keywords: research, phenological observations, bioecology.

Ключевые слова: исследования, фенологические наблюдения, биоэкология.

In the modern era, the conservation of the plant kingdom's gene pool is one of the priority directions for the development of humanity at its current stage. Currently, significant reductions in vegetation cover are observed under the active and intensive use of natural resources. These processes occur as a result of global ecological changes, active anthropogenic impacts, and inefficient use of plant resources. In recent years, due to the complexity of the ecological situation worldwide, greater attention is being given to the greening of cities and towns. However, due to the abundance of automobile traffic and the impact of other anthropogenic factors, the ecological environment of cities and towns has become quite aggressive for plants.

The main goal of the research was to identify the taxonomic composition of the species spread in the flora of Nakhchivan State University, to collect herbarium materials, to study the bioecological characteristics of some species, and to prepare measures for their effective use and conservation.

Thus, it is considered important to study species in urban environments that are more resistant not only to climatic factors but also to anthropogenic factors, which require in-depth scientific research.

Materials and Methods of the Research

The research has been conducted since 2021 in the area of the Nakhchivan State University campus. The material for the study consists of species found within the university campus area. Regular phenological observations were made in the studied area, and the natural conditions of the habitats where the species spread were examined. During the research period, regular expedition routes were carried out in the areas covering the Nakhchivan State University campus, and herbarium samples collected from these areas were identified and transferred to the Herbarium collection of the Department of Biology. The research utilized biomorphological, ecological, taxonomic, floristic-systematic, and phytosociological methods. Through various expeditions along selected routes, populations of the species chosen for detailed study were determined, and their detailed descriptor data were recorded.

The identification of species was based on works such as A. A. Grossheim's Flora of the Caucasus [9], Flora of Azerbaijan [11], L. I. Prilipko's [10], S. K. Cherepanov's [12], and others. The most recent taxonomic changes were verified using the World Flora Online (<https://www.worldfloraonline.org/>).

Discussion and Results of the Study

Biodiversity conservation is one of the key demands of our modern era. The emergence of new nomenclatures and flora conspectuses lays the foundation for the study of plant systematics, ecology, and geography in regions. Plants from various families play a significant role in the formation of the flora of the studied area. Additionally, these plants have contributed to the creation of quality variations in nature and the atmosphere, influencing the formation of the biosphere.

During the research, plants found in the territory of Nakhchivan State University campus are represented by 74 species belonging to 63 genera from 25 families. Below is the distribution of these species according to their family and genus.

Table 1

THE RATIO OF THE DISTRIBUTION OF PLANTS FOUND IN THE TERRITORY OF NAKHCHIVAN STATE UNIVERSITY CAMPUS BY FAMILY, GENUS, AND SPECIES

Seasons	Genera		Species	
	Number	Percentage of the total number of genera	Number	Percentage of the total number of species
<i>Brassicaceae</i> Burnett.	11	17,4	15	20,27
<i>Asteraceae</i> Dumort.	9	14,28	14	18,91
<i>Fabaceae</i> Lindl.	7	11,11	7	9,45
<i>Boraginaceae</i> Adans	5	7,93	5	6,75
<i>Ranunculaceae</i> Adans.	3	4,76	4	5,40
<i>Chenopodiaceae</i> Vent.	3	4,76	3	4,05
<i>Poaceae</i> Barnhart (<i>Gramineae</i> Adans.)	3	4,76	3	4,05
<i>Caryophyllaceae</i> Juss.	2	3,17	2	2,70
<i>Zygophyllaceae</i> R.Br.	2	3,17	2	2,70
<i>Lamiaceae</i> Lindl.	2	3,17	2	2,70
<i>Malvaceae</i> Juss.	2	3,17	2	2,70
<i>Euphorbiaceae</i> Juss	1	1,58	2	2,70
<i>Capparaceae</i> Juss.	1	1,58	1	1,35
<i>Scrophulariaceae</i> Juss.	1	1,58	1	1,35
<i>Geraniaceae</i> Adans.	1	1,58	1	1,35

Seasons	Genera		Species	
	Number	Percentage of the total number of genera	Number	Percentage of the total number of species
<i>Papaveraceae</i> Adans.	1	1,58	1	1,35
<i>Polygonaceae</i> Juss.	1	1,58	1	1,35
<i>Oxalidaceae</i> R.Br.	1	1,58	1	1,35
<i>Plantaginaceae</i> Juss.	1	1,58	1	1,35
<i>Colchicaceae</i> DC.	1	1,58	1	1,35
<i>Apiaceae</i> Lindl	1	1,58	1	1,35
<i>Convolvulaceae</i> Juss	1	1,58	1	1,35
<i>Fumariaceae</i> DC	1	1,58	1	1,35
<i>Peganacea</i> Tiegh.ex Takht	1	1,58	1	1,35
<i>Hyacinthaceae</i> Batsch	1	1,58	1	1,35

It has been determined during the research that the *Brassicaceae* and *Asteraceae* families dominate the campus area, represented by 29 species. This accounts for 39.18% of the flora in the studied area. The *Fabaceae* family is represented by 7 species (9.45%), *Boraginaceae* by 5 species (6.75%), *Ranunculaceae* by 4 species, and both the *Poaceae* and *Chenopodiaceae* families each have 3 species. The *Caryophyllaceae*, *Zygophyllaceae*, *Malvaceae*, *Lamiaceae*, and *Euphorbiaceae* families are each represented by 2 species. The remaining families are monotypic [1-5].

In 2022, the research topic was the study of early spring plants in the campus area. The early spring plants of the campus area have adapted to the complex conditions of the environment they live in and feed on, acquiring characteristics in response to the complex impact of ecological factors. Since ecological factors have a complex effect on organisms, the adaptation of plants to external environmental conditions is reflected not only in physiological processes but also in external morphological features. The adaptation of plants to the entire complex of environmental conditions is also manifested in the life forms of the plants.

It has been found that from February to March 31, the early spring flora in the research area is represented by 33 species from 25 genera of 12 families. The distribution of these species by family and genus is presented below [6-8].

Table 2

TAXONOMIC COMPOSITION OF THE EARLY SPRING FLORA
 IN THE NAKHCHIVAN STATE UNIVERSITY CAMPUS AREA

Family	Genus	Species	%
<i>Colchicaceae</i> DC.	<i>Merendera</i> Romand.	<i>M. trygyna</i> Straf	3,03
<i>Ranunculaceae</i> Adans.	<i>Ceratocephala</i> Moench	<i>C. testiculata</i> (Granz) Bess.)	6,06
		<i>C. incurva</i> Steven (<i>C. falcata</i> auct. Non (L.) Pers	
<i>Caryophyllaceae</i> Juss.	<i>Holosteum</i> L.	<i>H. glutinosum</i> (Bieb.) Fisch. & C.A.Mey	6,06
	<i>Stellaria</i> L.	<i>S. media</i> (L.) Vill.	
<i>Brassicaceae</i> Burnett.	<i>Capsella</i> Medik.	<i>C. bursa-pastoris</i> (L.) Medik.	27,2
		<i>Sisymbrium</i> L.	
	<i>S. altissimum</i> L.		
	<i>S. septulatum</i> DC. [<i>S. bilobu</i> (C.Koch) Grossh.]		
	<i>S. irio</i> L.		
	<i>Strigosella</i> Boiss.	<i>S. africana</i> (L.) Botsch. [<i>Malcolmia laxa</i>	

Family	Genus	Species	%
	(<i>Malcolmia</i> aict. p. p.)	(Lam.) DS.]	
	<i>Brassica</i> L.	<i>B. campestris</i> L.	
	<i>Erysimum</i> L.	<i>E. cuspidatum</i> (Bieb.) DC.	
	<i>Alyssum</i> L.	<i>A. alyssoides</i> (L.) L. (<i>A. calycinum</i> L.)	
<i>Geraniaceae</i> Adans.	<i>Erodium</i> L' Her	<i>E. cicutarium</i> (L.) L'	3,03
<i>Asteraceae</i> Dumort.	<i>Senecio</i> L.	<i>S. vernalis</i> Waldst.& Kit	24,4
	<i>Tragopogon</i> L.	<i>T. Bupthalmoides</i> (DC.) Boiss.	
		<i>T. graminifolius</i> DC.	
		<i>T. latifolius</i> Boiss.	
		<i>T. pusillus</i> Bieb	
		<i>T. reticulatus</i> Bois. And Huet	
		<i>Taraxacum</i> Wigg.	
	<i>Sonchus</i> L.	<i>S. arvensis</i> L.	
<i>Boraginaceae</i> Adans.	<i>Nonea</i> Medik.	<i>N. rosea</i> (Bieb.) Link	12,1
	<i>Asperugo</i> L.	<i>A. procumbens</i> L.	
	<i>Lycopsis</i> L.	<i>L. orientalis</i> L.	
	<i>Buglossoides</i> Moench	<i>B. arvensis</i> (L.) Johnst. (<i>Lithospermum arvense</i> L).	
<i>Lamiaceae</i> Lindl.	<i>Lamium</i> L.	<i>L. amplexicaule</i> L.	3,03
<i>Fumariaceae</i> DC.	<i>Fumaria</i> L.	<i>F. schleicheri</i> Soy. Willem.	3,03
<i>Zygophyllaceae</i> R.Br.	<i>Tribulus</i> L.	<i>T. 1.terrestris</i> L.	6,06
	<i>Zygophyllum</i> L.	<i>Z. fabago</i> L.	
<i>Peganacea</i> Tiegh.ex Takth.	<i>Peganum</i> L.	<i>P. harmala</i> L.	3,03
<i>Hyacinthaceae</i> Batsch.	Genus : <i>Muscari</i> Mill.	<i>M. armeniacum</i> Leichtlin ex Baker (<i>M. szovitsianum</i> Baker)	3,03

As seen in the table, the *Brassicaceae* family represents 9 species (27.27%), *Asteraceae* 8 species (24.24%), *Boraginaceae* 4 species (12.12%), and the *Zygophyllaceae*, *Caryophyllaceae*, and *Ranunculaceae* families each have 2 species (18.18%). The *Peganaceae*, *Lamiaceae*, *Geraniaceae*, *Colchicaceae*, *Fumariaceae*, and *Peganaceae* families are each represented by 1 species, making them monotypic, which accounts for 18.18% of the early spring flora of the region

In terms of water relationships, similar to other plants, the early spring plants of the university campus area are divided into three main groups: xerophytes, mesophytes, and mesoxerophytes. This classification is based on the soil and climatic conditions of the campus area (with some areas being irrigated), so the species range from xerophytes to mesoxerophytes.



Figure. Ecological Groups of Early Spring Plants in the University Campus Area

Xerophytic species include *Tribulus terrestris*, *Zygophyllum fabago*, *Peganum harmala*, *Alyssum alyssoides*, *Ceratocephala testiculata*, and others. Mesophytes include *Lamium*

amplexicaule, *Stellaria media*, *Asperugo procumbens*, etc. Mesoxerophytes include *Erysimum cuspidatum*, *Senecio vernalis*, *Capsella bursa-pastoris*, and others.

In 2023, the research topic was the study of the bioecological characteristics of plants found in the university campus area. During the research year, the bioecological features of the species spreading in the area were studied, and photographs of the plants were taken in their growth locations.

In 2024, the research topic focused on investigating the uses of plants within the Nakhchivan State University campus area. It was found that the above-mentioned species were used for treating a variety of health conditions, including gastrointestinal disorders, kidney diseases, lung bleeding, chest pain, bloody coughs, vomiting, hemorrhoids, heart palpitations, colds, liver inflammation, and diseases related to the kidneys and urinary bladder.

In 2025, the research topic was the conclusion of the study and the discussion and analysis of the obtained results.

Results

Based on the information mentioned above, the scientific research conducted from 2021 to 2025 yielded the following results.

The research revealed that the studied area is represented by 74 species belonging to 63 genera and 25 families, with 33 species encountered in the early spring flora. It was determined that in the university campus area, the families Brassicaceae and Asteraceae dominate with 29 species, accounting for 39.18% of the area's flora. The Fabaceae family is represented by 7 species (9.45%), Boraginaceae by 5 species (6.75%), Ranunculaceae by 4 species, and both Poaceae and Chenopodiaceae by 3 species each. The families Caryophyllaceae, Zygophyllaceae, Malvaceae, Lamiaceae, and Euphorbiaceae are each represented by 2 species. The remaining families are monotypic.

Based on the analysis of early spring plants, it was found that Brassicaceae is represented by 9 species (27.27%), Asteraceae by 8 species (24.24%), Boraginaceae by 4 species (12.12%), and the families Zygophyllaceae, Caryophyllaceae, and Ranunculaceae by 2 species (18.18%). The families Peganaceae, Lamiaceae, Geraniaceae, Colchicaceae, Fumariaceae, and Peganaceae are each represented by 1 species, which constitutes 18.18% of the early spring flora in the studied area.

The botanical description, growth location, and ecological characteristics of the studied species were examined, and the main synonyms and species within the genera were listed in alphabetical order for each species.

It was found that the aerial parts of the studied species are used in the treatment of gastrointestinal disorders, kidney diseases, lung bleeding, chest pain, bloody coughs and vomiting, as well as hemorrhoids, heart palpitations, colds, liver inflammation, and various diseases of the kidneys and urinary bladder.

The materials from the research can be used in the teaching of the following courses: "Systematics of Higher Plants," "Systematics of Plants," and "Medicinal Plants of Nakhchivan AR" in the Biology and Biology Education programs, as well as in the "Local Flora" course at the Master's and Doctoral Center.

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