

REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

**BIOECOLOGICAL-PHYTOCENOLOGICAL
CHARACTERISTICS AND USAGE PERSPECTIVES OF
LEGUME PLANTS OF THE BOZGIR PLATEAU**

Specialization: 2417.01 – Botany

Field of Science: Biology

Applicant: **Gunay Mubariz gizi Nasibova**

Baku - 2023

The dissertation work was carried out at the Biology Department of Azerbaijan State Agrarian University


Scientific supervisor: Doctor of Biological Sciences, Professor
Sayara Jamshid gizi Ibadullayeva


Official opponents: Doctor of Biological Sciences, Associate
Professor **Aydin Musa oglu Askarov**


Doctor of Biological Sciences, Professor,
Corresponding member of ANAS
Ibrahim Vahab oglu Azizov

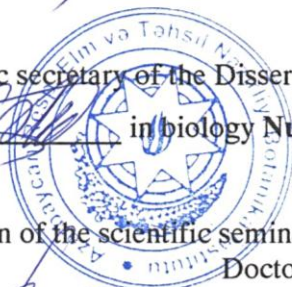
Doctor of philosophy in biology, Associate
Professor **Sevinj Gadir gizi Guliyeva**

Dissertation Council ED 1.26 of the Higher Attestation Commission under the President of the Republic of Azerbaijan, operating under the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan

Deputy Chairman of the Dissertation Council: Doctor of Biological

Sciences, Professor **Eldar Novruz oglu Novruzov**

Scientific secretary of the Dissertation Council: Doctor of philosophy

in biology **Nuri Vagif gizi Movsumova**

Chairman of the scientific seminar:

Doctor of biological sciences, Assistant
of Professor **Naiba Pirverdi gizi Mehdiyeva**



INTRODUCTION

The relevance of the work and degree of development. A number of measures in the direction of efficient use of land, water and other natural resources, improvement of animal husbandry and agriculture development have been implemented to "The state Program on the effective use of summer and winter pastures and hayfields and prevention of desertification in the Republic of Azerbaijan", approved by the Order No. 222 of the President of the Republic of Azerbaijan dated May 22, 2004¹. However, about 20 years have passed since then. Currently, as a result of global climate changes and anthropogenic effects, the vegetation of natural landscapes has undergone fundamental changes or been destroyed. Taking this into account, conducting monitoring in Azerbaijan's pastures and meadows, and studying the characteristics of vegetation and the productivity of important botanical groups has become one of the main issues. One such important botanical group is legumes. Leguminous plants are the most promising species according to the directions of use in all botanical-geographical regions of Azerbaijan. However, the leguminous plants of the Bozgir plateau have not been studied as a separate research object from the botanical-geographical regions.

The Bozgir Plateau created conditions for the formation of a colorful flora due to their exceptional relief and unique soil-climate conditions. Based on the regularity of vertical zonation of the steppe plateau, the formation of vegetation is intrazonal, extrazonal and azonal. Natural complexes of the desert, semi-desert, steppe, tugay type and other rare formations characterized by the floristic richness of the area, dominants and edificers, endemics, rare plant groups that formed them have been exposed to anthropogenic influences. Natural negative processes in the

¹ "The State Program on effective use of summer and winter pastures, hayfields and prevention of desertification in the Republic of Azerbaijan" [Electronic resource] //Approved by Decree No. 222 of the President of the Republic of Azerbaijan dated May 22, 2004, - Baku: Ganun, -2004. <https://e-ganun.az/framework/5994>

study area - water erosion, defoliation, salinization, destruction of pastures and meadows due to anthropogenic effects resulting in degradation² created the basis for conducting significant research in the area. Fundamental change in vegetation has occurred due to the threat of a complete disruption of the ecological balance in the region. All this provides conditions for the inspection of local flora and then-in-depth study of important botanical groups. Leguminous plant species present in the area, their role in natural ecosystems, changes due to ecological, anthropogenic and zoogenic factors, the composition and structure of their phytocenoses, their importance in the national economy, their efficient and long-term use, as well as their restoration and protection have not been fully studied. On the other hand, as a result of inefficient use, some species have become extinct, and many have been threatened with reduced range^{3,4}.

Leguminous plant species of the region are mainly distributed in summer pastures, hayfields, and rural meadows, which are the natural fodder base of livestock. Nevertheless, they are not used properly and are intensively and excessively grazed by livestock, grazing techniques and rules are not strictly followed, and little attention is paid to improvement and restoration works. As the root system of leguminous plants is very well developed, it is closely involved in preventing mountain slopes from being washed away by rain and helps to prevent erosion on the slopes. Therefore, the protection and increase of leguminous plant species in the eroded areas of steep mountain slopes is relevant.

² Garibov, Y.E. Anthropogenic transformation of semi-desert landscapes of the Republic of Azerbaijan // - Baku: Soil Science and Agrochemistry, -2013. -Volume 21, -No.1, -p. 657-663.

³ Babakishiyeva, T. "Rare plants of Ganja-Kazakh region"/ T. Babakishiyeva, S.J. Ibadullayeva, -Ganja: -2021. 228 p.

⁴ The Red Book of the Republic of Azerbaijan. Flora: [Volume III]// Ed.hey. - Baku: 2023. - 512 p.

Legumes are not very demanding on the soil. They grow in many different soils and play a very important role in the fertilization of those soils. Most of the legumes absorb the free nitrogen from the air with their green mass and give it to the roots through the trunk, forming tuber (root tumors) - azotobacteria in the roots, which also participate in increasing the soil's nitrogen reserve⁵. Due to this feature, legumes are used as green manure in various places⁶.

Legumes are also considered a very valuable forage crop⁷. The abundance of leguminous plants increases the feed value and productivity of summer pastures, improves the botanical composition and in strengthening the natural fodder base of livestock in contrast to winter pastures are important. Therefore, one of the important issues to increase the valuable species of leguminous plants in summer pastures and to use them in the radical improvement of pastures and meadows is considered. Taking all this into account, a complex study on the study of leguminous plants in the Bozgir plateau has been started.

The object and subject of the research. The study of the modern condition of leguminous plants common in the Bozgir plateau botanical-geographical region of the Azerbaijan was chosen as the object of the research. Leguminous plants differing in their usefulness were selected as research subjects, and their resources, economic efficiency and populations were evaluated.

Purpose and objectives of the study. Studying the taxonomic composition, bioecological characteristics of leguminous plants in the Bozgir plateau on scientific basis, phytocenological assessment

⁵ Raveendar, S. Cross-Amplification of *Vicia sativa* subsp. *sativa* *microsatellites* across 22 other *Vicia* species / S.Raveendar, G.A. Lee, Y.A. Jeon [et al.] // *Molecules* -2015. –is.20, -p.1543-1550.

⁶ Safia, El-Bok. *Vicia sativa* subsp. *Sativa* (*Fabaceae*): New taxonomic division in Tunisia based on karyological data. / El-Bok Safia, A.Zoghلامي-Khélil, R. Dougari [et al.] // *Pakistan Journal of Agricultural Sciences*, -2015.- 52(2), -p.279-283.

⁷ Huang, Y. F. Potential value of the common vetch (*Vicia sativa* L.) as an animal feedstuff: a review / H.Y.F.uang, X.L.Gao, Z.B.Nan [et al.] // *Journal of Animal Physiology and Animal Nutrition*, -2017. - 101. -p. 807–823.

of important resources and calculating their reserves are the main goals of the research work.

Many important tasks have been set for this:

- Collection of seeds for the purpose of maintaining the gene pool of leguminous plants in the Bozgir plateau;
- Determination of species composition, preparation and analysis of taxonomic classification;
- Identification of endemic, rare and endangered species;
- Scientifically studying the abundance and vitality of useful resources in phytocenoses;
- Studying the regular of distribution of leguminous plants in summer pastures and meadows of natural ecosystems, bioecological characteristics;
- Study of phytocenological features and reserves of leguminous fodder plants;
- Determining the possibilities of improving, restoring and increasing the productivity of pastures;
- Elaboration of proposals and recommend.

Research methods. Classical and modern methods were used during the research in the direction of floristic, bioecological, phenological, geobotanical, assessment of resource potential and fodder productivity, study of cenological condition of populations.

Presented arguments for the defense:

- The Bozgir plateau of Azerbaijan has a wide source of raw materials for leguminous plants;
- The use of some plants has created the basis for conducting ecobiological and phytocenological studies on them;
- Research conducted in area flora revealed the resource potential and economic efficiency of legumes.

Scientific novelty. For the first time, as a result of the research conducted, leguminous plants distributed in the Bozgir plateau were studied in detail on the scientific basis and they are represented by 154 species belonging to 1 department, 1 class, 1 order, 1 family and 28 genus. The role of leguminous fodder plants in the formation of

flora and vegetation, bioecological and phytocenological characteristics were studied in summer pastures and hayfields of the area. A phytogeographical, taxonomical, ecobiomorphological analysis of leguminous fodder plants was carried out, endemic, rare and endangered species were identified, their distribution patterns in altitude zones were studied, species composition was determined and a bioecological overview was compiled. The modern phytocenological classification of vegetation in semi-desert, meadows and steppes of summer pastures was given, in general, 6 types, 9 formation classes, 17 formations and 30 associations of legumes were determined. 17 formations and 30 associations are newly described for the vegetation of the Bozgir plateau. The cenosis formation factors were noted by studying their species composition, distribution, structures, interrelationships of their components. The grasslands of the researched pastures exposed to natural and anthropogenic influences were identified, appropriate suggestions and recommendations were made for plant restoration, improvement, productivity increase, and protection. Productivity and reserves of main resources were studied in 16 types of pastures in the region using experimental research methods.

Theoretical and practical significance. The results of the study of leguminous plants, which form the flora and vegetation of the Bozgir plateau and play a major role in strengthening the natural fodder base of livestock, can be applied to other summer pastures of the Republic of Azerbaijan. Leguminous plants of summer pastures can be used in the implementation of the State Program on the efficient use of summer-winter pastures of the Bozgir plateau and the prevention of desertification. The seeds of rare and endemic species, which are important for farming, can be transferred to cultural culture, over to the seed bank of the Institute of Botany were collected and handed. The obtained results will be used in the preparation of geobotanical maps, in the assessment of land and summer pastures, and in passports. The conducted research will help to prevent negative situations in summer pastures, will provide an opportunity to strengthen the fodder base of livestock, efficient,

sustainable use, restoration, increase and preservation of pastures and meadows. Numerous plant samples collected during field research were transferred to the Herbarium of the Institute of Botany of the MSE of the Republic of Azerbaijan, Azerbaijan State Agrarian University, and had a certain role in their enrichment.

Approbation and application of work. The main provisions of the dissertation are local - ASAU 8th International Scientific and Practical Conference (Ganja-2016); Scientific conference of the Institute of Botany of ANAS (Baku - 2018); Conference of young scientists and students "Innovations in biology and agriculture to solve global challenges" (Baku – 2018); In international conferences - The 3rd International Symposium on EuroAsian Biodiversity (Minsk-Belarus – 2017); The 4th International Symposium on EuroAsian Biodiversity (Kyiv–Ukraine – 2018); The 5 th Symposium on EuroAsian Biodiversity (Kazakhstan - Turkey – 2021) was discussed at the expanded meeting of ASAU and at the seminar of the Institute of Botany.

14 scientific works containing the main propositions of the thesis were published, 8 of which are papers (2 in publications included in international indexing bases abroad, 2 by a single author), and 6 are conference materials and abstracts.

Name of the institution where the work was performed: The dissertation work was performed at the Department of Biology of the Azerbaijan State Agrarian University.

Structure and scope of dissertation The total volume of the dissertation work is 175 pages, it consists of 6 chapters, conclusions, recommendations and appendices, and a list of literature with 173 titles. The total volume of the dissertation with marks - 210129 marks (introduction - 11340, chapter I - 34896, chapter II - 23547, chapter III - 8677, chapter IV - 18566, chapter V - 84833, chapter VI -25098, conclusion - 2028, recommendations - 1144) content. The work includes 29 tables, 2 maps, 18 pictures and appendices.

CHAPTER I. LITERATURE REVIEW ON THE DEVELOPMENT HISTORY AND STUDY OF THE BOZGIR PLATEAU FLORA

The research of various scientists conducted in the direction of studying the flora and vegetation of the Bozgir plateau and evaluating the grazing areas were analyzed and extensive comments were given in this chapter.

CHAPTER II. PHYSICAL AND GEOGRAPHICAL CONDITIONS OF THE BOZGIR PLATEAU AREAS

2.1. Geographical conditions, boundaries and orography. The height of the Bozgir plateau is 200-800 above sea level. The territory is located between the southern macroslopes of the Greater Caucasus and the Alazan-Haftaran valley, its northern border is the Ganikh (Alazan)-Haftaran valley, which approaches the monoclinal ridge, the southern border is the Kur coast, the sword-shaped ridge of Jeyranchol is in the West, and Bozdag is in the East. The Bozgir plateau includes the Jeyranchol and Acinohur plains⁸. The northern coast of the plateau covers a part of the Agstafa, Tovuz, Shamkir administrative districts and the entire territory of the Samukh district.

2.2. Flora of the Bozgir plateau. The distribution of 1018 Higher spore, Gymnosperm and flowering plant species grouped into 94 families and 495 genus in the Bozgir plateau was known based on available monographic literature materials, camera analysis of herbarium copies and plant samples collected from the region.

CHAPTER III. MATERIAL AND METHODOLOGY OF THE RESEARCH

3.1. Botanical methods. The research work was carried out in 2016-2020 in the botanical-geographical area of the Bozgir plateau. Field studies were carried out in scientific missions, expeditions, phenological observations, in stationary and semi-stationary

⁸ Azərbaycan Respublikası Ümümcoğrafi Məlumat Xəritəsi [Xəritə] /1:500 000/ – Bakı: DTXK, –2005.

conditions. "Flora of the USSR", "Flora of the Caucasus" by A.A. Grossheim, "Flora of Azerbaijan" and other numerous designations were used during the identification of plants. The latest taxonomic changes are based on actual materials in the Herbarium funds of the Institute of Botany of MSE of AR and the Azerbaijan State Agrarian University and the "Conspekt flora of the Caucasus"⁹ work. It was carried out in accordance with the international botanical nomenclature code¹⁰. The work of A.M.Askarov was used for writing plant names¹¹.

The works of eminent research geobotanists referred to the composition of plant communities for the study of leguminous plants in summer pastures was given according to the systems of L.G.Ramensky (1971), the vital form of plants given according to the systems of K.Ranunkier (1934) and I.G.Serebyakov (1964). In conducting phenological observations on plants, I.N.Beydeman (1974) and "The method of phenological observations in botanical research", in the study of the succession of vegetation, in the assessment of vegetation in general, P.D.Yaroshenko (1969), L.I.Prilipko (1970) and others works were used. V.J.Hajiyev¹², E.M.Gurbanov¹³, etc. among Azerbaijani scientists in the study of flora and vegetation of ecosystems, classification and geobotanical regionalization of vegetation studies have been cited. Comparative floristic analysis and flora genesis study, identification of geographical elements were carried out according to generally accepted methods.

⁹ Conspect of the flora of the Caucasus: In 3 volumes / Ed. Yu.L. Menitsky, T.N. Popova. -SPb.: St. Petersburg. un-ta, -2003-2006.

¹⁰ International Code of Botanical Nomenclature / Editorial Col. - L. : Nauka, - 1974. - 269 p.

¹¹ Askarov, A.M. The plant world of Azerbaijan / A.M. Askarov, - Baku: Teas Press, - 2016. - p. 444.

¹² Hajiyev, V.J. Geobotanical research methodology of natural fodder areas / V.J. Hacıyev, V.V. Hatamov, E.M. Gurbanov, - Baku: BSU, -1995. -51 p.

¹³ Gurbanov, E.M. Geobotany / E.M. Gurbanov, -Baku: BSU, -2017, -320 p.

The 6-point scale of O.Druden was used in determining the abundance of plants forming phytocenoses in summer pastures and meadows and the comparative taxonomic composition was calculated using the similarity coefficient using the biometric method.

3.2. Methods of studying plant resources and productivity. 185 routes with a length of 100 m and a width of 10 m were made in 10 areas with 25 m² of concrete thicket in each of the studied regions in order to evaluate the supply, productivity and density of plants studied according to method of I.Y.Krylova and A.I.Schroeter's¹⁴. Evaluation of the feed quality of plants is based on the fractional structure of phytomass, nitrogen, sol element, productivity in above-ground phytomass, etc. The analysis was carried out based V.A.Tayshin¹⁵ and others methods. The analysis of feed qualities of the applied species was calculated according to international standards.

3.3. Methodology of phytocenological assessment of populations. More than 10 population assessments were carried out during the study in plots or established transects located in scattered and sequential ways in different phytocenoses. Using A.A. Uranov's¹⁶ concept of the discrete description of ontogenesis, the stages of development in plant individuals were characterized. The obtained results were analyzed with the χ^2 comparison criterion.

The density of the cenopopulation was estimated by its number per 1 m² by calculating the limits of all individuals according to their age in the sample plots, and at this time, population indicators such

¹⁴ Krylova, I.L. Guidelines for the study of stocks of wild medicinal plants / I. L. Krylova, A. I. Shreter, - M.: VILR, - 1971. -31 s.

¹⁵ Taishin, V.A., Botonova, A.S. Methodological aspects in the economic assessment of pasture resources // Modern problems of science and education. - 2006. No. 5, - S. 86-87.

¹⁶ Uranov, A.A. Age spectrum of phytosenopopulations as a function of time and energetic processes // Biol. Sci.2.-1975. -p. 7-34.

as the recovery index (I_r), replacement index (I_{rp}), age index (Δ), efficiency index (ω) were used.

CHAPTER IV. FLORISTIC, BIOMORPHOLOGICAL AND BOTANICAL-GEOGRAPHICAL ANALYSIS OF LEGUMES IN THE BOZGIR PLATEAU

154 species belonging to 28 genus are distributed in the flora of the Bozgir plateau, of which 22 genus¹⁷ and 148 species are wild, and 6 genus and 6 species belong to cultivated flora. 105 wild species form the basis of fodder crops in summer pastures were determined based on the actual materials collected during the expedition and field research.

It should be noted that they are not the same according to altitude zones. Thus, 28 of the species are typical for the high mountain zone and are found in zones above 1800 m: *Astragalus eugenii* Grossh., *A. sevangensis* Grossh., *A. goktschaicus* Grossh., *A. falcatus* Lam., *A. uraniolimneus* Boiss., *A. aureus* Willd., *Oxytropis pilosa* (L.) DC., *Securigera varia* (L.) Lassen, *Onobrychis cadmea* Boiss, *Trifolium pratense* L., *Vicia balansae* Boiss., *V. elegans* Guss., *V. variabilis* Freyn et Sint., *V. hololasia* Woronov, *V. abbreviata* Fisch. ex Spreng., *Lathyrus laxiflorus* (Roth) Roth and etc. Other species are mainly characteristic of plains (semi-desert), low and medium highlands. 126 species of legumes are found in the plains, foothills, lower and middle zones. In semi-deserts, mainly *Pseudosophora alopecuroides* (L.) Sweet, *Ononis arvensis* L., *O. antiquorum* L., *O. pusilla* L., *Lagonychium farctum* (Banks et Soand.) Borb. are common.

4.1. Taxonomic analysis. 154 species of leguminous plants in 28 genus in the territory of the Bozgir plateau were found. About 50%

¹⁷ Nasibova, G.M., Ibadullayeva, S.J. About the flora and vegetation of the Bozghir plateau // -Ganja: ANAS Ganja Section, Proceeding Collection, Medicine and Biology Section, -2016. No. 3(65), p. 9-16.

of them are cultivated plants distributed in plains, foothills, low and middle mountain zones and are the basis of fodder resources.

9 genus of leguminous plants, distinguished by the number of species, unite 119 species. Species in this genus range from 5 to 31. In the remaining 19 genus, species range from 1 to 4 and have a total of 35 species. Also, from the results of the conducted analysis, it can be seen that the large breeds, which are superior in terms of the number of species are different from each other.

Thus, the *Astragalus* genus ranks first with 31 (20.13%) species, *Vicia* ranks second with 18 (11.69%) species, and *Medicago* ranks third with 15 (9.74%) species. The species of the remaining 6 genus vary from 5 to 13. Not all species of 28 genus present in the local flora are fodder plants. There is genus that has dozens of species and play a significant role in the formation and development of vegetation. Such genus: *Astragalus*, *Trifolium*, *Lathyrus*, *Medicago*, *Onobrychis*, *Vicia*, etc. an example can be shown (fig. 1).

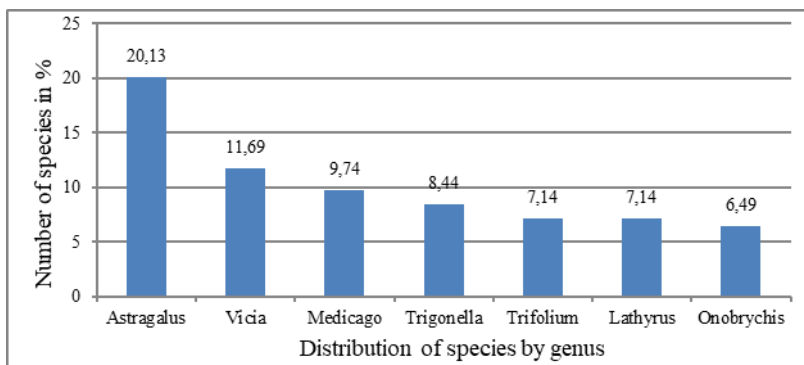


Figure 1. Percentage index of fodder species of summer pastures

Breeds also differ in the forage importance of the species they possess. Fodder is important species: *Astragalus* L., *Alhagi pseudalhagi* (Bieb.) Fisch., *Chrysacpis* Desv., *Cicer* L., *Dorycnium* Mill., *Glycyrrhiza* L., *Hedysarum* L., *Lathyrus* L., *Lotus* L., *Medicago* L., *Melilotus* Hill, *Onobrychis* Hill, *Ononis* L., *Oxytropis* DC., *Securigera* DC., *Trifolium* L., *Amoria* C.Presl, *Trigonella* L.,

Melilotoides Heist. ex Fabr., *Radiata* Medik., *Vavilovia* Fed., *Vicia* L.

The representatives of the genus with a small number of species also play no small role in the formation and development of phytocenoses in vegetation types in addition to the main leading genus. In this regard, breeds are divided into 5 groups according to the number of species. 10 breeds belong to monodominant breeds.

That is, each genus has only 1 species. To them for example: *Alhagi* Hill, *Melilotoides* Heist. ex Fabr, *Vavilovia* Fed., *Caragana* Fabr. and etc., and 6 genus are classified as small-species genus. The number of species in them varies between 2-3 and includes 13 species. The number of species in the 5 genus ranges from 4-5 and includes 22 species, so this group of genus belongs to the middle genus. The number of species in 5 genus ranges from 10 to 15 and includes 60 species, this group of genus belongs to polymorphic genus. The number of species of 2 genus is high and ranges from 18 to 31. They belong to superpolymorphic breeds.

4.2. Ecobiomorphological analysis. The division of plants into ecological groups makes it possible to assess their adaptation to different living conditions, the modern state of habitations, the normal growth and development of each species, as well as the characteristics, composition and structure of plant groups formed by them. The results of the analysis of leguminous plant species in the area according to their relationship to light show that they can be divided into 3 groups: light-demanding (Heliophytes), shade-demanding (Schiophytes) and shade-tolerant. Among them, the group of light-demanding plants dominates with 108 species (70.13%). Shade-demanding, plants are in second place - with 40 species (25.97%), shade-tolerant plants are less, occupying the last place with 6 species (3.90%) (Fig. 2). Moisture is crucial in the life of plants. Xerophytic plants have an advantage in the flora of the area due to their relation to humidity. Thus, xerophytes are represented in the area with 78 species. Mesophytes have 31 species, mesoxerophytes are second with 41 species. Xeromesophytes include 4 species.

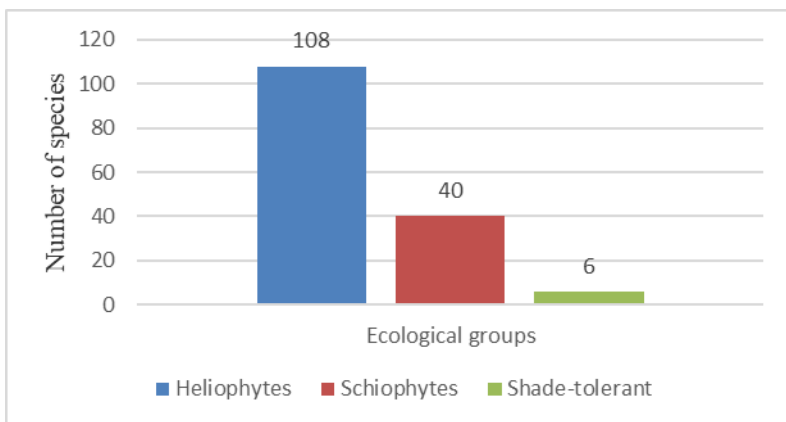


Figure 2. Persistence of legumes according to their relationship to light

As is known, subalpine and alpine zones are the ecosystems where plants are most supplied with water or humidity. Hydrophytes and hygrophytes have not been found here, as there are no ecosystems of this type in the Bozgır plateau. However, some mesophytes are found since there are meadow and forest ecosystems.

The nutrient requirements of legumes are not the same. So, they are very demanding of nutrients like eutrophic and megatrophic grains in the participate phytocenoses. From this group, mesotrophs in the area: achyiphiles, basophils *Phleum phleoides* Karst., *Bromopsis inermis* Holub and others. spread. They live in fertile soils where nutrients are richer, especially in flocs-lands meadows, low swamps, etc. spread out. Indifferent plants: *Agrostis stolonifera* L., *Lamium album* L., *Sambucus ebulus* L. and others. species included in this group thrive in a wide range of Ph, more precisely, in both alkaline and acidic soils.

The life forms of plants have been studied according to the classification given by various scientists. 77 species (50.00%) of perennial grasses are the basis of leguminous plants in the area according to the classification of I. G. Serebryakov. Annual grasses are in second place with 58 species (37.66%) according to the number of species (Fig. 3).

Leguminous plants distributed in the study area were distinguished by taking into account the height of plant regeneration shoots from the soil surface as the main feature referring to the classification of life forms of plants by Raunkier (Fig. 4).

Life forms of legumes in the flora of the Bozgir plateau

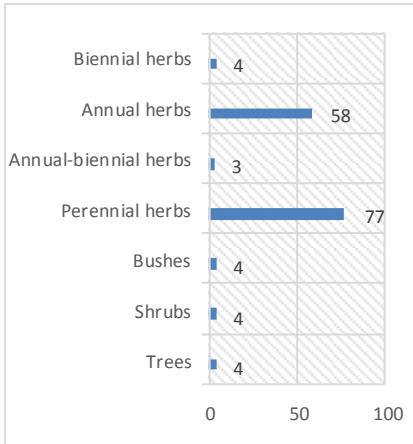


Figure 3. According to Serebryakov

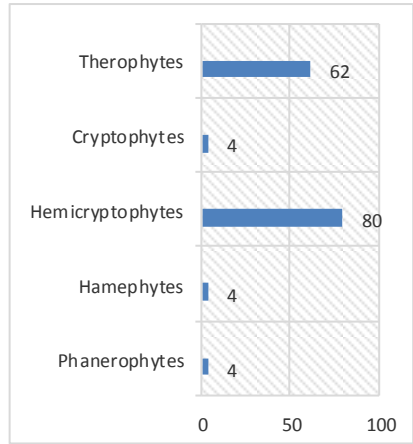


Figure 4. According to Raunkier

Among the leguminous plants developed in the summer pastures of the area, hemicryptophytes are in first place with 80 species (51.92%) was determined as a result of the analysis. Therophytes are in second place with 62 species (40.26%), while the others are represented by 4 species each.

4.3. Botanical geographical analysis. Geographical elements of leguminous plants were determined and analyzed based on the results obtained during the research and literature sources. The flora of the Bozgir plateau includes 8 areal types were found. The xerophytic areal type combines most of the species. 74 out of 154 species (48.05%) are included in this habitat type. The second place by the number of species is the boreal (northern) areal type - 29 species (18.83%), the third place is the Ancient Mediterranean elements with 15 species (9.74%), the Caucasian areal type with 12 species

(7.79%). The remaining areal types were represented by very few species. So, Desert areal type - 2 species (1.30%), Steppe - 9 species (5.84%), Adventive - 4 species (2.60%), Ancient (Tertiary) - 4 species (2.6 %). It was known that there are 5 (3.25%) plant species in the flora of the area whose geographical area type is not determined.

Main geographical elements of the species belonging to the Legumes family distributed in the Bozgir plateau (Mediterranean, Iran, Asia Minor, Front Asia, Atropatan, etc.) and most of them are divided into small elements have been determined. The study of geographical elements will allow us to study the flora from a genetic or historical point of view, or rather, where, when and in what ways the species came to this area.

Among the leguminous plants found in the Bozgir plateau, there are some species that are found everywhere, some of them are found only in the Sheki, Gakh districts of the Greater Caucasus, and some species are found in Samukh, Shamkir, Tovuz and Aghstafa districts belonging to the Ganja-Gazakh region (Fig. 5).

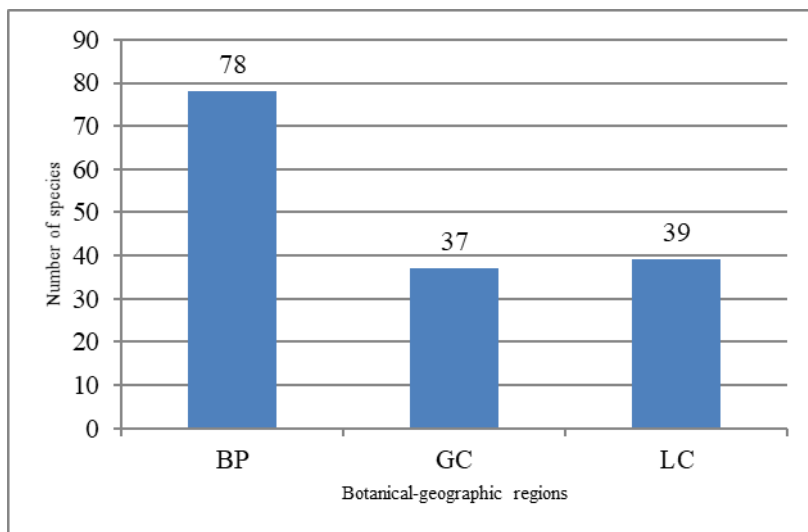


Figure 5. Distribution of leguminous plants in the Bozgir plateau regions

78 species are found everywhere in the botanical-geographic region of the Bozgir plateau as can be seen from the diagram. 39 species of leguminous plants are encountered in Samukh, Shamkir, Tovuz and Aghstafa districts, while only 37 species are distributed in the lowland-Bozgir part of Sheki and Gakh districts of the Greater Caucasus.

4.4. Analysis of rare and endemic species. 5 species from Azerbaijan endemics and 10 species from Caucasian endemics were found in the Bozgir plateau (table 1).

Table 1. Endemic species of the Bozgir plateau belonging to Legumes

Endemics of Azerbaijan	Caucasian endemics
<i>Trifolium bobrovii</i> Khalilov	<i>Astragalus brachypetalus</i> Trautv.
<i>Trifolium zardabii</i> Challov	<i>A. eugenii</i> Grossh.
<i>Astragalus dzhebraiilicus</i> Grossh.	<i>A. johannis</i> Boiss.
<i>Onobrychis schuschajensis</i> O.D.Agayeva	<i>A. prilipkoanus</i> Grossh.
<i>Vicia hololasia</i> Woronow	<i>Medicago caucasica</i> Vass.
	<i>M. glutinosa</i> Bieb.
	<i>Onobrychis atropatana</i> Boiss.
	<i>O. vaginalis</i> C.A.Mey.
	<i>Trifolium echinatum</i> M.Bieb.
	<i>Vicia loiseleurii</i> (Bieb.) Litv.

9 species of *Astragalus* L. from leguminous plants are included in the Red list of Azerbaijan (*A. backuenses* Bunge., *A. prilipkoanus* Grossh., *A. zangelanus* Grossh., *A. badamliensis* Challov, *A. paradoxus* Bunge., *A. kubensis* Grossh., *A. nachitschevanus* Rzazade, *A. regelii* Trautv., *A. szovitsii* Fisch.et Meyer) area of 1 species - *Astragalus aureus* Willd. is gradually shrinking, its biology is poorly studied, and is included in the Red Book of Nakhchivan AR with the status of "Near Threatened - NT" ¹⁸. Natural erosion and soil degradation in the distribution area have led to a decrease in

¹⁸ Talibov, T.H. Red Book of the Nakhchivan Autonomous Republic (Plants with higher spores, gymnosperms and angiosperms) / T.H. Talibov, A.S. Ibrahimov, - Nakhchivan: -2010, -677 p.

plant individuals. We believe that the taxon may be critically endangered in the near future, therefore the NT criterion is considered appropriate and included in the "Red Book" of Azerbaijan is recommended. Small populations of the *Vicia grandiflora* species distributed in the area are evaluated under the VU D2 category and included in the "Red Book" of Azerbaijan as a rare species found in a limited area is recommended.

Astragalus dzhebrailicus Grossh. is the only Azerbaijani endemic that spreads in the Ganja-Kazakh territory. It has a limited range in the area. 1-2 copies were observed around Goyazan, Gazakh district, the taxon may be critically endangered in the near future, therefore the NT criterion is considered suitable. It was included in the "Red Book" of Azerbaijan.

Securigera parviflora (Desv.) Lassen (= *Coronilla parviflora* Willd.) is a rare plant with a limited range and one of the interesting and rare species of the family. The local biotype is found only in the bush around Jeyranchol on the Bozgir plateau in the studied area. With this in mind, a regional assessment was conducted and LC was assessed as a less threatened taxon. If control of the subpopulation is not strengthened, it is likely to be close to the danger level in the near future. Individual protection should be organized in the phytocenoses where it spreads in order to preserve the plant.

Scorpiurus muricatus L. – rare leguminous plant. It is rarely found on the dry grassy slopes of Jeyranchol. The number of its individuals is gradually decreasing since the species is spread over a small area due to the influence of anthropogenic factors. Since it is likely to be endangered in the near future, it was evaluated according to the NT criterion and included in the III edition of the "Red Book" of Azerbaijan.

Halimodendron halodendron (Pall.) Druce. - one of the rare species distributed in the Ganja-Kazakh territory. Common on dry gravelly slopes. Being a species sensitive to environmental conditions, poor natural recovery has led to a decline in individuals

within the population. For this reason, according to the IUCN Red List, in the III edition of the "Red Book", VU has been assessed as category D2 (table 2).

Table 2. Rare and endangered species of legumes of the Bozgir plateau

№	Plant names	Assessment of IUCN
1.	<i>Astragalus aureus</i> Willd.	NT
2.	<i>A.dzhebrailicus</i> Grossh.	NT
3.	<i>Securigera parviflora</i> (Desv.) Lassen	LC
4.	<i>Vicia grandiflora</i> Scop.	VU D2
5.	<i>Halimodendron halodendron</i> (Pall.) Druce.	VU D2
6.	<i>Scorpiurus muricatus</i> L.	NT

CHAPTER V. THE ROLE AND PHYTOCENOLOGICAL CHARACTERISTICS OF LEGUMES IN THE VEGETATION OF THE BOZGIR PLATEAU

The research works covered the entire territory of the Bozgir plateau with field searches and recessions. The plants collected during the expeditions were determined, and their relation to environmental factors was studied. The modern ecological-phytocenological classification of vegetation types, the main formation classes created by the dominance of legumes, the composition of formations and associations have been clarified¹⁹.

5.1. The role of legumes in deserts and semi-deserts. Formation classes of semi-shrub - motley grass - semi-desert, motley grasses–leguminous–ephemeral semi-deserts, ephemeral - semishrub saline desert, the annual salty desert were discovered in the desert and semi-deserts vegetation of the Bozgir plateau²⁰:

¹⁹ Nesibova, G. Geobotanical description of leguminous plants on dry steppes of steppe plateau //International Journal of Research and Review, - 2020. Vol.7, Is. 3, -p. 453-457.

²⁰ Nesibova, G., Movsumova, N., Ibadullayeva, S. The role of legumes in the desert and semi-desert of the steppe plateau (Republic of Azerbaijan)//International Journal of Botany Studies, –2020. Volume 5, Issue 4, -p. 190-195.

Semi-desert vegetation type

Formation class: Semi-shrub - motley grass - semi-desert

Formation groups: *Artemisieta*

Formation: *Artemisieta szowitziana*

Association: *Artemisia szowitziana* + *Glycyrrhiza glabra* + *Salsola dendroides*

Formation: *Artemisieta fragransae*

Formation class: Motley grasses–leguminous–ephemeral semi-deserts

Formation groups: *Artemisieta*

Formation: *Artemisieta fragransae*

Association: *Artemisia fragrans-Ephemerae*

Association: *Artemisia fragrans* + *Caragana arboroscens*

Formation: *Artemisieta scoparia*

Association: *Artemisia scoparia* + *Astragalus igniarius* - *Artemisia arenaria*

Association: *Artemisia scoparia* + *Astragalus caucasicus-Herbosa*

Association: *Artemisia scoparia*+*Alhagi pseudoalhagi-Herbosa*

Saline Desert vegetation type

Formation class: Ephemeral - semishrub saline desert

Formation groups: *Salsoleta*

Formation: *Salsoleta dendroides*

Association: *Salsoleta dendroides*+*Halimodendron halodendron*

Formation: *Salsoleta nodulosae*

Association: *Salsola nodulosa*+*Artemisia fragrans –Ephemerae*

Formation groups: *Suaedeta*

Formation: *Suaeda dendroides*

Association: *Suaeda dendroides* - *Argyrolobium trigonelloides-Salsola dendroides*

Formation class: the annual salty desert

Formation groups: *Petrosimoneta*

Formation: *Petrosimoneta brachiatae*

Association: *Petrosimonia brachiata*+ *Alhagi pseudoalhagi*

In moist areas in desert vegetation *Juncus acutus* + *Astragalus igniarius* - *Herbosa* association.

5.2. The role of legumes in steppe vegetation. The classification of dry steppe vegetation in the vegetation of the Bozgir plateau botanical-geographical region is limited to 2 formation classes, 3 formation groups, 3 formations and 4 associations were found out from the conducted research:

Formation class: Cereal-motley grass-dry stepper

Formation groups: *Stipeta*

Formation: *Stipeta capillatae*

Assosiation: *Stipa capillata* + *Astragalus mollis* + *Ephemereta*

Formation groups: *Festuceta*

Formation: *Festuceta ovinae*

Associations: *Festuca ovina* + *Onobrychis vaginalis* + *Ephemereta*

Associations: *Festuca ovina* - *Onobrychis iberica* - *Festuca gigantea*

Formation class: Motley grass - scrubby dry stepper

Formation groups: *Astragaleta*

Formation: *Astragalus microcephala* – *Artemisieta fragransae*

Association: *Astragalus microcephala*- *Artemisia fragrans* -*Herbosa*

5.3. The role of legumes in grassland, wetland and forest vegetation. Grass, wetland vegetation and shrub-meadow-like vegetation are poorly developed in the study area.

Four formations formed by legumes are noted in the grassland vegetation in the area: *Alhageta pseudoalhagi*, *Glycyrrhizeta glabrae*, *Cynodeta dactylonae*, and *Trifolieta pratensae*. Each formation is represented by an association: *Alhagi pseudalhagi* – *Ephemereta* (ephemeral - common sedum), *Cynodon dactylon*-*Alhagi pseudalhagi* -*Herbosa* (motley grass - common sedum - meadow), *Glycyrrhiza glabra* - *Herbosa* (motley grass - licorice), *Trifolium pratensis* - *Herbosa* (motley grass-cereal-alfalfa). Leguminous plants form 2 formations in the shrub-grass vegetation of the area and participate in dominant and component statuses in sodominant and ephemeral synusion in 9 associations.

Leguminous plant species are not found in wetland plant associations on the Bozgir plateau. However, some introduced tree species are found on the shores of lakes and rivers: *Cercis*

siliquastrum L., *Gleditsia tricanthos* L. create a background together with other water-loving trees.

Tugay vegetation type stretches along the Bozgir plateau along the Kur and Gabyrri rivers. Numerous shrubs, semi-shrub groupings and arid forests joining them can be found throughout the entire territory of this plant type. *Arundo donax* L. in the Tugai forest around the Iorri piver is found in all areas and forms large forests. Close to it, you can find the formations of astragalus (*Astragalus uraniolimneus* Boiss. and *A. odoratus* Lam.) bushes. *Legonichium farctum* (Banks et Soand.) Borb from legumes in Tugai forests in only one place.

5.4. Bioecological and phytocenological characteristics of the main leguminous fodder plants of the area.

5.4.1. Phytocenotic and ontogenetic characteristics of species of *Melilotus* L. genus. There are 4 species of the *Melilotus* genus (*M. dentatus* (Waldst. et Kit.) Desf., *M. albus* Medik., *M. neapolitanus* Ten., *M. officinalis* (L.) Pall.) in the botanical-geographical area of the Bozgir plateau. *Melilotus neapolitanus* was assigned by us for the first time to Bozgir plateau. Phytocenological studies were carried out in the flower and seed phases of the plant for all species. The phenology and ontogenetic structure of each species was studied ²¹. However, since there is no significant difference in the phenological indicators of the species, information was given about *M. albus* and *M. neapolitanus* species (Fig. 6-7).

The age spectrum of CPs in different species has different degrees of dynamism. The population wave (quantity wave) gradually occurs in the plateau in 2017 in the *M. albus* species, in 2016 in the *M. neapolitanus* species, as a result, the age spectrum does not change, remains in full force.

²¹ Nesibova, G. M., Ibadullayeva, S. J., Movsumova, N.V. Phytocenology assessment of *Melilotus* Hill types in Bozgyr plateau //Azerbaijan National Academy of Sciences Proceedings of the Institute of Botany - 2017. XXXVII, - p.58-63.

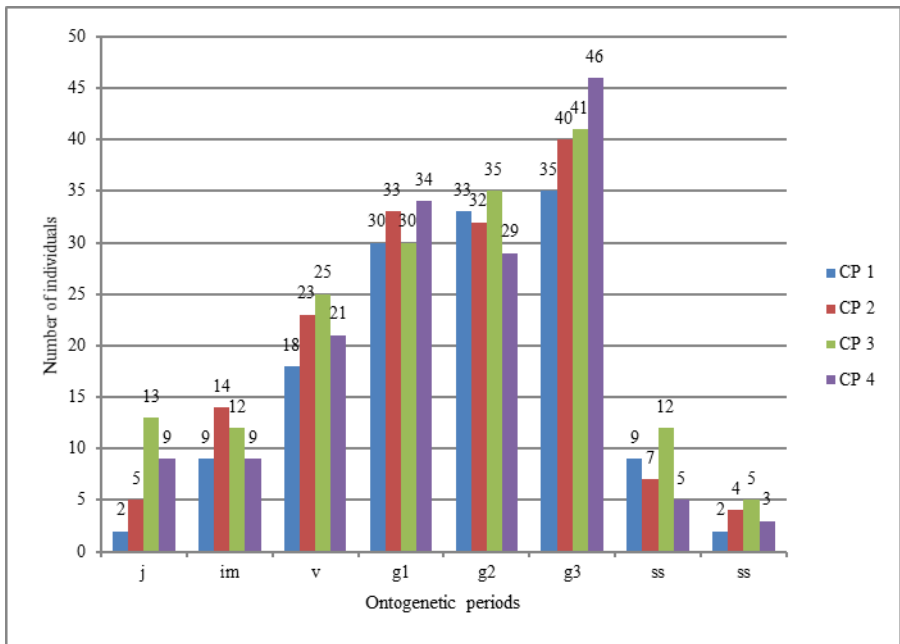


Figure 6. Ontogenetic status of the *M. neapolitanus* Ten. species

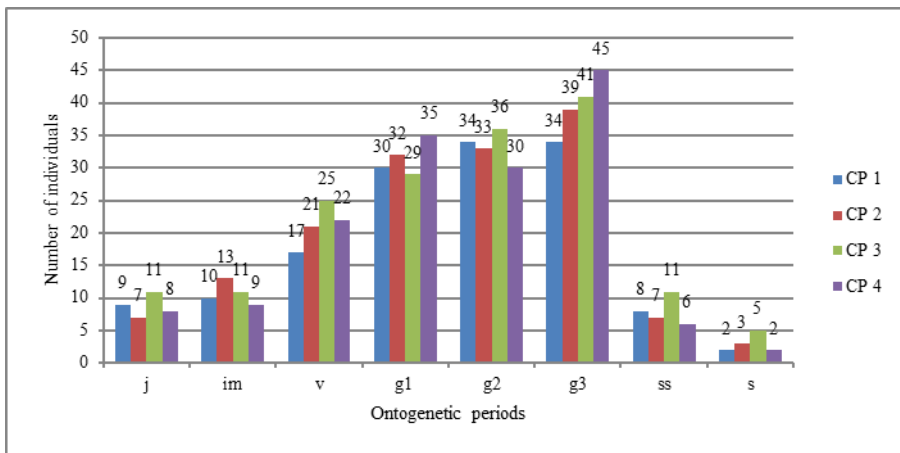


Figure 7. Ontogenetic status of the *M. albus* Medic. species

In order to preserve the natural plant grouping of the Bozgir plateau, the composition, structure, and continuity of the cenoses, along with their reproductive development were also studied (table 3).

The seed yield depends on the number of flowers in the generative panicles, their viability and the mode of use. The number of generative pods per 1 m² was 150-170, and 6000-7000 seeds were taken from them during the normal growing season (in the studied species). There was a doubling of the amount due to the deterioration of the vitality of the species and the decrease in abundance in the late-planted areas.

Table 3. Average seed yield of species of *Melilotus* genus found in the Bozgir plateau (2016-2017)

Names of plants	Number of individuals	The number of generative sprouts in an individual	Height, cm	The number of seeds in a sprout	Number of seeds per individual	Weight of 1000 Seeds	Percentage of seed germination
<i>M. dentatus</i>	7	3	90-100	15	46	0,13	71
<i>M. albus</i>	8	5	170	16	55	0,16	76
<i>M.neapolitanus</i>	10	4	20-45	27	95	0,25	76
<i>M.officinalis</i>	8	4	110-125	33	116	0,37	81

5.4.2. Phytocenotic and ontogenetic characteristics of species of *Medicago* L. genus. 14 species of *Medicago* L. genus are found in the Bozgir plateau. Phytocenological features and resources of annual alfalfa species (*Medicago arabica* (L.) Huds., *M. truncatula* Gaertn., *M.rigidula* (L.) All.) found in the steppe plateau were studied. The project cover of 1-4 cenopopulations is 40% as known from the studies conducted in 6 cenopopulations (CP), but it reaches 60-70% in other CPs., The age period of the species and the type of cenopopulation (CP) were determined in each area. Registrations

were made to determine the integral number of the demographic structure (Fig. 8).

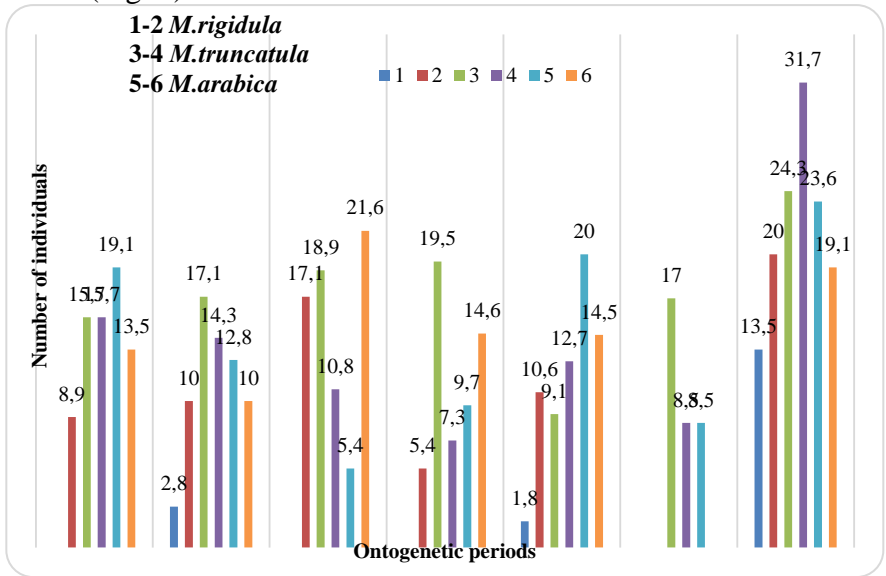


Figure 8. Ontogenetic structure of species of *Medicago* genus.

Only 2 populations were evaluated for each species and their base spectrum gave the following result as can be seen from the diagram (table 4).

Table 4. Evaluation of some representatives of the *Medicago* genus at the cenopopulation level

Name of species	CP	Indexes			
		I_r	I_{rp}	Δ	ω
<i>Medicago arabica</i> All.	1	1,1	0,58	0,48	0,51
	2	0,76	0,38	0,52	0,50
<i>M. truncatula</i> Gaertn.	3	0,5	0,23	0,63	0,52
	4	0,46	0,33	0,49	0,61
<i>M.rigidula</i> (L.) All.	5	0,34	0,19	0,58	0,59
	6	0,78	0,43	0,49	0,51

The efficiency indices of plants are very high (0.50-0.61) as can be seen from the table. This is an example of the continuous development of alfalfa species.

In order to determine productivity, the stock of above-ground and underground organs was calculated in all ontogenetic phases of *M. truncatula*, *M. rigidula* and *M. arabica* species (table 5).

Table 5. Annual exploitation stock of species of *Medicago* genus.

Name of species	Number of plants per 1m ²	Stock of the ground part (h/kg)	Reserve of the underground part (h/kg)
<i>M. truncatula</i>	6±0,7	336,00 ± 20,00	44,0±5,4
<i>M. rigidula</i>	8±1,2	402,70 ± 24,28	62,4±4,6
<i>M. arabica</i>	5 ±0,5	205,80 ±12,24	33,3±2,9

The stock of the plant reaches its maximum during the generative development stage: *M. truncatula*-336.00 h/kg, *M. rigidula* 402.70 h/kg, and *M. arabica* - 205.80 h/kg were found. Among these species, the annual reserve of *M. rigidula* (402.7 kg) was higher.

5.4.3. Phytocenotic and ontogenetic characteristics of *Vicia* L. genus. The distribution of 18 species of the genus was observed in the Bozgir plateau. Of these, the more common *Vicia grandiflora* Scop. Phytocenological studies of the species were studied in 3 CPs. Complete and incomplete ontogeny was observed in CP I, II and III of *Vicia grandiflora* species. Thus, juvenile and senile individuals were not found in 2018 and immature individuals in 2019 in I CP, the maximum increase in the number of mature individuals was observed (ss+s=7)²².

Juvenile and immature individuals were not found in II CP in 2018. The growth rate of individuals in 2019 was low, and the

²² Nasibova, G.M. Phytocenological assessment of *Vicia grandiflora* scop. on the steppe plateau (Azerbaijan) // Scientific Journal "Bulletin of Science and Practice". -2021. V.7, Is. 6, -p. 22-29. (AGRIS <https://doi.org/10.33619/2414-2948/67.>)

decrease between g_2 and g_3 was determined to be 50% (g_2 and $g_3=4$) in III CP. As a result, the absence of juvenile and immature individuals in the ontogeny, the increase in the number of subsenile and senile individuals is an indicator of the lack of development of cenosis and the decline of the population. As a result of the evaluation of cenopopulations of *Vicia grandiflora* species, young, old and transitional cenopopulations were determined (Fig. 9).

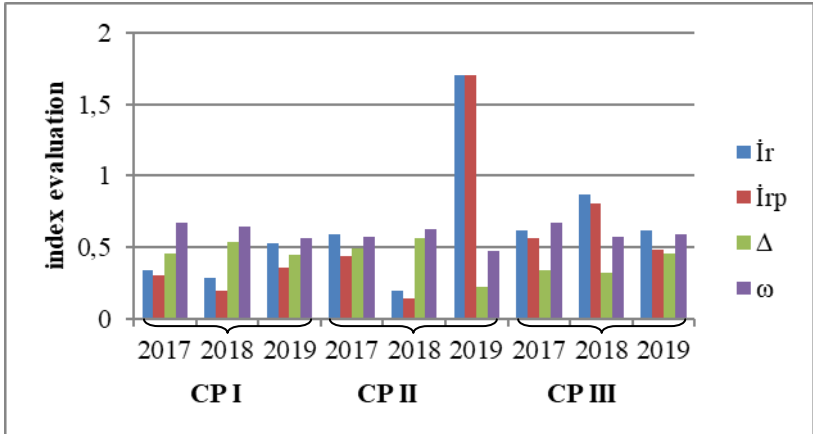


Figure 9. The demographic structure of *Vicia grandiflora* species in 2017-2019

Recovery index I_r , replacement index I_{r_p} , age index Δ , efficiency index ω calculated for all 3 populations are given. As a result of the development of juvenile and immature individuals in II CP in 2017 ($\Delta-\omega=0.22-0.45$), in III CP in 2018, the cenopopulation type was young ($\Delta-\omega=0.32-0.57$). Elderly type ($\Delta-\omega=0.56-0.63$) cenopopulation was found in II CP in 2018. The type of cenopopulation in the II CP was an old type, which showed that the population was not satisfactory in 2018.

CHAPTER VI. UTILIZATION OF LEGUMES

6.1. Classification of beneficial properties of legumes. Many of the species of the legume family are valuable technical and medicinal plants with abundant natural resources. Taking these into account,

leguminous plants distributed in the Bozgir plateau were classified according to their usefulness (Fig. 10).

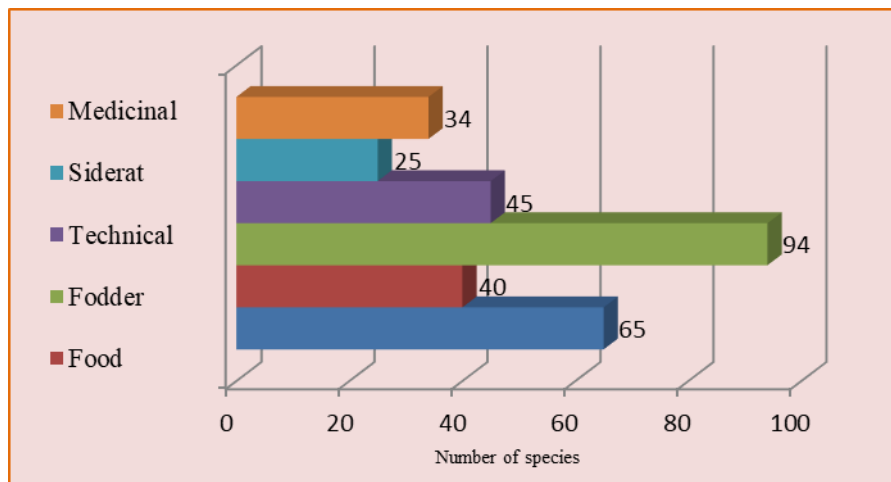


Figure 10. Classification of leguminous plants according to the fields of use

More than 70% of the leguminous plants distributed in the flora of the area are both valuable for animal feed and medicinal plants as can be seen from the diagram.

6.2. The role of legumes in efficient use of feed resources and protection of pastures. The successful development of animal husbandry depends primarily on the availability of a solid fodder base. Therefore, creating alternative fodder sources along with the correct and efficient use of existing summer pastures and hayfields on scientific grounds is important. Cattle are kept in summer pastures for 5-6 months of the year (May-October) and in winter pastures for the rest of the months in the area. However, summer and winter pastures, which are an invaluable fodder base in the current farm, are a minority according to the norm. It should be noted that not all modern summer pastures of the region are suitable for grazing. In addition, as a result of keeping more livestock in the summer pastures, the vegetation of the pastures is significantly changed and its place is taken by secondary plant grouping.

6.3. Comparative analysis of productivity of leguminous forage crops. The productivity of Bozgir plateau was determined in the spring, summer and winter-autumn months²³. Legumes are the basis of pastures in spring pastures, although they are not assimilated in summer and winter like other fodder group crops was found (Fig. 11).

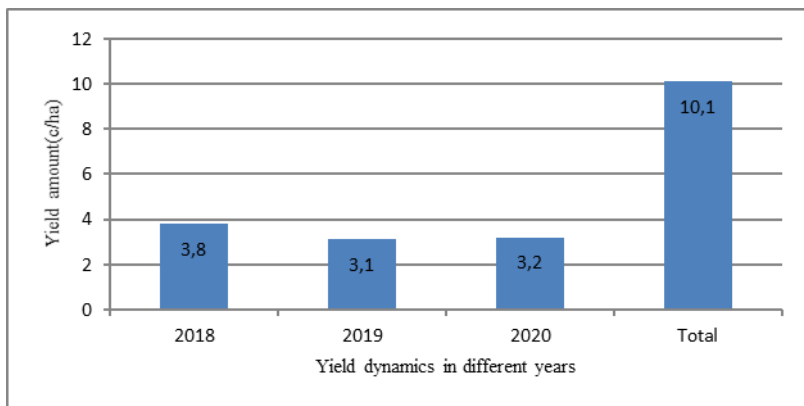


Figure 11. Productivity of spring aspects of leguminous plants in the Bozgir plateau

Compared to other groups of plants, although legumes are superior in terms of fodder quality, they are less utilized because they do not yield more than 0.9-1.2 centners per hectare, and we must take into account that they are eaten in spring and early summer. Cereals and motley grasses are assimilated and used more in the second vegetation in winter.

CONCLUSIONS

1. For the first time, a floristic study of leguminous plants was conducted in the territory of the Bozgir plateau and 154 species of leguminous plants in 28 genus were determined. *Astragalus* L. genus ranks first with 31 (20.13%) species, *Vicia* L. with 18

²³ Mammadova Z.J., Nasibova, G.M., Ibadullaeva S.J. On the use of leguminous plants: ethnobotany, phytocenology and productivity // Intern. research journal. - 2023. No. 1 (127), -c. 1-12. DOI:10.23670/IRJ.2227-6017.

(11.69%) species, and *Medicago* L. with 15 (9.74%) species. The remaining genus is represented by 5-13 species. 10 breeds are monodominant.

2. An ecobiomorphological analysis of leguminous plants was carried out in the territory of the Bozgir plateau, and light-demanding plants with 108 species predominate was found. Shade-demanding plants - with 40 species, shade-tolerant plants with 6 species. According to humidity, xerophytes represent 51%, mesophytes 20%, mesoxerophytes 27%, and xeromesophytes 2%., 80 species of hemicryptophytes and 62 species of therophytes prevail were found as a result of the analysis of life forms. Perennial grasses were represented by 77 species (50.00%), and annual grasses by 58 species (37.66%) in the local flora.

3. 5 species from Azerbaijan endemics and 10 species from Caucasian endemics distributed in the Bozgir plateau were found. 3 species on the Red list were evaluated by us and recommended for a new edition based on the conducted phytocenological studies.

4. The autogenetic status and phytocenological characteristics of the species - *Melilotus dentatus* (Waldst. et Kit.) Desf., *M. officinalis* (L.) Pall., *M. albus* Medik. and *M. neapolitanus* Ten., *Medicago arabica* (L.) Huds., *M. truncatula* Gaertn., *M. rigidula* (L.) All. and *Vicia grandiflora* Scop. from legumes were studied, the seed productivity and reserve of some species were evaluated. Annual exploitation reserve of *Medicago* species, according to the surface and underground parts: *M. truncatula* 336.00-44.0 kg/h, *M. rigidula* 402.70- 62.4 kg/h, *M. arabica* 205.80- 33.3 kg/h were found.

5. The productivity of the grasslands of the Bozgir plateau was evaluated according to different botanical groups. The average annual productivity of vegetation according to botanical groups varies between 10.5-11.8 s/ha based on wet mass and 6.9-7.8 s/ha based on dry weight was determined.

6. The leguminous plants distributed in the Bozgir plateau were classified according to their usefulness and 65 species of oil, 40

species of food, 95 species of fodder, 34 species of medicine, 45 species of technical, and 25 species of siderite plants are distributed in the local flora were found.

RECOMMENDATIONS

1. In order to develop animal husbandry in agriculture, improve natural fodder and arable land, create a strong fodder base, high-yielding and high-quality hay is recommended to prepare protective measures for the protection of the cenoses where *Vicia grandiflora*, which is considered a valuable fodder plant, is considered to be a valuable fodder plant.
2. There should be a serious fight against the planned and efficient use of summer pastures and mowing fields, the implementation of lawn improvement works, and the creation and expansion of soil erosion. For this purpose, planting grass-forming perennial grasses and shrubs on the eroded areas, grass-clover, creeping meadow clover, blue sedge, laziston, field grass, combed sedge, furrowed lame, short lame, bulbous barley, purple barley, etc. are recommended to use species. Effective use of meadows and pastures, improving existing pastures, creating new productive artificial pastures, natural meadows, radically changing the composition of the flora of less productive pastures, and preventing the destruction of meadows as a result of erosion processes should be considered an urgent problem facing livestock farms.

List of scientific works published on the subject of the dissertation:

1. Nəşibova, G.M., İbadullayeva, S.C. Bozqır yaylasında yayılan qarayonca (*Medicago* L.) növlərinin fitosenoloji quruluşu və ehtiyatı// ADAU “Aqrar elmin inkişafı, ərzaq təhlükəsizliyi və ətraf mühitin mühafizəsində Beynəlxalq əməkdaşlıq” mövzusunda 8-ci Beynəlxalq Elmi-Praktik konfransın Materialları, II cild, -Gəncə: -03-04 oktyabr, -2016, -səh.159-162.
2. Nəşibova, G.M., İbadullayeva, S.C. Bozqır yaylasının florası və bitkiliyi barədə //-Gəncə: AMEA Gəncə Bölməsi, Xəbərlər Məcmuəsi, Təbabət və Biologiya bölməsi, -2016. №3(65), -səh. 9-16.
3. Nesibova, G., Ibadullayeva, S., Akhundova, S. Economic assessment of new feed crops resources in different ecosystems of Lesser Caucasus (within the Azerbaijan Republic) // -Berlin: Journal of Multidisciplinary Engineering Sciences and Technology (JMEST), -2017. Vol. 4, issue 3, - p.6871-6877.
4. Nesibova, G. Areal types of representative of *Fabaceae* Lindl. family spread on Bozgir Plateau of Azerbaijan // The 3rd International Symposium on EuroAsian Biodiversity, -Belarus, Minsk: -05-08 July, -2017, - p384.
5. Nesibova, G. M., Ibadullayeva, S. J., Movsumova, N.V. Phytocoenology assessment of *Melilotus* Hill species in Bozgir plateau //Azerbaijan National Academy of Sciences Proceedings of the Institute of Botany - 2017. XXXVII, -p.58-63.
6. Nesibova, G., İbadullayeva, S.C. Bozqır yaylasının paxlalı yem bitkilərinin təhlili // AMEA Botanika İnstitutu və Botaniklər Cəmiyyətinin akademik V.C.Hacıyevin 90 illiyinə həsr edilmiş “Botaniki tədqiqatlarda yeni çağırışlar” mövzusunda Konfransın materialları, -Bakı: -20-21 iyun, -2018. - səh.51-53.
7. Nesibova, G., Shahmuradova, M. Main plant groups of Bozgir Plateau of Azerbaijan //The 4th International Symposium on EuroAsian Biodiversity, - Ukraine, Kiev: - 03-06 July, -2018, -p.383.
8. Nesibova, G. Medicinal plants in the Bozgir plateau flora //Conference of young scientists and students. Innovations in biology

and agriculture to solve global challenges. Azerbaijan, - Baku: -2018, -p. 107

9. Ibadullayeva, S.J Biological reserves of liquorice (*Glycyrrhiza glabra* L.) in the Azerbaijan flora and heavy metal accumulation /S.J.Ibadullayeva, S.M.Abduyeva-Ismayilova, G.Nesibova [et al.] // Transactions of the Institute of Molecular Biology and Biotechnologies, Azerbaijan National Academy of Sciences. Special Issue. – Baku: -2018. Volume 2. -p 26-29.

10. Nesibova, G. Geobotanical description of leguminous plants on dry steppes of steppe plateau //International Journal of Research and Review, - 2020. Vol.7, Is. 3, -p. 453-457.

11. Nesibova, G., Movsumova, N., Ibadullayeva, S. The role of legumes in the desert and semi-desert of the steppe plateau (Republic of Azerbaijan)//International Journal of Botany Studies, –2020. Volume 5, Issue 4, -p. 190-195.

12. Ibadullayeva, S., Ibrahimli, S., Seyidova, L. Resource assessment of *Glycyrrhiza glabra* L. species in some regions of Azerbaijan //The 5th Symposium on EuroAsian Biodiversity. Kazakhstan-Turkey, Almata-Muğla: -2021. –p. 249.

13. Насибова, Г.М. Фитоценологическая оценка *Vicia grandiflora* scor. на степном плато (Азербайджан) // Bulletin of Science and Practice scientific journal. -2021. Volume 7, Issue 6, -p. 22-29. (AGRIS <https://doi.org/10.33619/2414-2948/67.>)

14. Маммадова З.Д., Насибова, Г.М., Ибадуллаева С.Дж. О применении бобовых растений: этноботаника, фитоценология и продуктивность// Международный научно-исследовательский журнал, -2023. №1(127), -с. 1-12. DOI:10.23670/IRJ.2227-6017.

Dissertation defense will be held on June 7, 2023 at 11:00 at the meeting of the ED 1.26 Dissertation Council operating under the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

Address: AZ 1004, Baku city, 40 Badamdar Highway.

The dissertation is accessible at the library of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

Electronic version of the dissertation and abstract are available on the official website of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan (<http://www.botany.az>).

The abstract was sent to the required addresses on May 5, 2023

Signed for print: 04.05.2023
Paper format: A5
Volume: 36635
Number of hard copies: 20