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BIODIVERSITY AND PROTECTION OF *IRIDACEAE* IN THE WESTERN PART OF AZERBAIJAN

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SYNOPSIS

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INTRODUCTION

The actuality of the subject. Biodiversity is important for all ecosystems on the planet, and there has been a sharp decline in biodiversity over the millennia, as a result of recent anthropogenic impacts around the world. As a result of the massive destruction of ecosystems and the destruction of some natural systems, an important element of the stability of the biosphere - species diversity - is endangered [8]. The Convention on Biological Diversity was first adopted in 1992 at the UN Conference on Environment and Development in Rio de Janeiro. According to the results of the UN Conference, the development of biodiversity, which ensures the sustainability of the biosphere, as well as the survival of human civilization on Earth, has been recognized as a key factor. Conservation of biodiversity means ensuring the future of the population whose lives and existence depend on its resources [8]. As in the world, natural ecosystems in Azerbaijan are exposed to anthropogenic impact. As a result of this effect, the biological diversity formed over thousands of years is being disrupted. Preservation of biological diversity means ensuring and preserving the natural conditions in which organisms have adapted for thousands of years, and keeping all objects of nature in a state of interaction. In order to expand international cooperation in the field of biodiversity conservation, the Republic of Azerbaijan acceded to the UN Convention on Biological Diversity in 2000. The State Commission on Genetic Resources of Biological Diversity was established by the Decree of the President of the Republic of Azerbaijan No. 848 of December 21, 2001 to ensure the implementation of comprehensive measures to fulfill the obligations undertaken by the country in accordance with this Convention. On March 24, 2006, by the Order No. 1368 of the President of the Republic of Azerbaijan Ilham Aliyev, the National Strategy and Action Plan for the Protection and Sustainable Use of Biodiversity of the Republic of Azerbaijan was approved [1]. In this regard, the conduct of scientific research on the conservation of biological diversity importance is noted. There are plans to expand specially

protected natural areas and establish botanical gardens in major cities. One of the important issues in the plan is to clarify the list of rare and endangered plant species, to ensure the protection of their gene pool and to create conditions for their storage in specially protected natural areas and botanical gardens. Rare and endangered plant species should be protected and restored outside their natural habitats (ex-situ). Given the urgency of the above issues, our research is devoted to the study of the systematic structure, bioecology and distribution of the species of iris, a unique, rare plant species found in the western region of Azerbaijan. The western region of the Republic of Azerbaijan occupies one of the main places not only in Azerbaijan, but also among the botanical and geographical regions of the Caucasus due to the richness of flora. Although the flora of the western part of Azerbaijan has recently been studied in general, there are some species about which very little is known. The role of the Iridaceae Juss family, known as an ornamental plant, in Azerbaijani plants and their cultivation in local conditions have not yet been fully studied, and no selection work has been carried out on them. Most of the species are useful and are used in various areas of the economy, such as food, dyes, medicines, etc. are plants used for purposes. It is widely used by the population for landscaping due to its beautiful appearance. Such use, in turn, has few benefits and many harms. Thus, the threat of extinction of the already declining, rare, endemic and relict, ephemeroid - iris, a symbol of beauty of the western region of Azerbaijan, is accelerating. Most iris species are widespread in the flora of the western region of Azerbaijan. The effective use, range, bioecological features and genesis of these species have not been studied. One of the most important issues is the study and protection of these ephemeroid plants, whose numbers are constantly declining and are in danger of extinction. Taking into account the above, research has been conducted on the bioecological characteristics, role and introduction of plant species of irises belonging to the genus Iridaceae Juss in the biodiversity of the western region of Azerbaijan.
Object and subject of research. Biodiversity, geographical distribution and anatomical structure of irises.

The purpose and objectives of the study. The main purpose of the study was to determine the tolerance and ecological valence of iris species to soil and climatic factors on the ecological scale of D. Siganov in the western region of Azerbaijan, and to identify adiaptic features in the anatomical structure of leaves and roots according to their ecological group. In order to achieve the set goal, the following tasks were considered important:

- Comparative study of the studied species under the influence of soil and climatic factors;
- Distribution of species by ecological valence fraction;
- Estimation of real ecological valence and tolerance index of species;
- Assessment of the environmental efficiency of species;
- Study of morphological and anatomical structure of vegetative organs of species according to ecological group;
- Scientific organization of effective use of ornamental iris species and their use in landscaping.

Research methods. The iris (Iris L.) of the iris family in the western part of Azerbaijan was used as research material. Containing rare and endangered species of these plants, irises are also the main genus of the season. The surveys were conducted in 2014-2019 at altitudes of 200 m to 1500 m above sea level and in various plant groups. In order to determine the nature of the distribution of the studied species in the study area, more than 100 geobotanical descriptions were made at the end of the species and herbarium materials were collected. The following route method was used for geobotanical research:

Plant samples of Iris L species were collected and herbariumed according to generally accepted rules copies were prepared. In order to study the species that make up the genus Iris L in the western part of Azerbaijan, the literature covering the history of the species was first studied. Geobotanical researches were carried out in Ganja suburban, Gazakh, Aghstafa, Shamkir, Dashkasan, Gadabay, Goranboy, Goygol and Samukh districts by route-reconnaissance method and the distribution of iris (Iris L.) representatives in phytosenoses was determined. Also, in order to organize the biological diversity and protection of the gene pool of irises in the western region of Azerbaijan, their origin and ways of formation, compliance with the law of distribution were studied. The relief and geomorphology of the area were studied, the exact location of the populations was determined by GPS, the altitude and exposure were determined. When the research work was carried out in the Special Protected Areas (Goygol National Park, "Eldar Shami" State Nature Reserve, Korchay State Nature Reserve, "Garayazi" State Nature Reserve), the species studied were used as examples; Classical morphological-anatomical, floristic-systematic, ecological-geographical methods were used in the collection and processing of research materials [27, 43, 48, 88, 164]. The International Code of Botanical Nomenclature was used to identify species and to provide botanical descriptions of plants. A special map of the research areas was compiled [11, 13, 14, 83, 108, 112, 162]. A special map of the research area was compiled and phenological observations were made and the locations of plant samples were shown. The morphological features of the vegetative organs of the plant were studied with the help of MBS-2 binocular magnifying glass, and the prepared preparations were studied and photographed under a microscope NLCD-307B.

Material for the study was taken from plants growing in the lower and middle mountainous zones of the western region of Azerbaijan, as well as in the semi-desert natural zone. Due to the fact that most of the irises are rare, endangered plants, they were not herbariumed and only photographed. Samples were collected during the flowering period, and in some cases before and after flowering. The collected material is fixed in 70% alcohol. 15-30 μm thick microtome and manual incisions were made from fresh and fused material. The drugs were prepared using various staining methods in accordance with generally accepted anatomical methods, followed by treatment with solid hydrochloric acid; starch-iodine + iodine-potassium; oils, fungi and cuticles - Sudan III; vaccines - solid solution of iron chloride and two chromium acids Tutayug, Barikina, Humbatov, Aliyev, Aliyeva; The description of the epidermis was made using the terminology of Anelin, Zakharevich and Esau [25, 27, 48, 66, 97, 174].

During geobotanical research, the distribution of some species (those in more dangerous conditions) in phytocenoses, the degree of stratification, the relationship to edificators, the abundance of the area of distribution, the role of cenosis in the formation of vegetation, etc. was observed. Cenopopulation studies have also been conducted on these species. According to the classification of AA Uranov, the place of material collection, the numbers of the senopolation, and their age were allocated [160]. Germination-c, juvenile-y, immatur-im, virginil-v, young generative-g1, middle-aged generative-g2, old-fashioned gene-g3, senil -s, subsenil-ss, endangered plant-sc has been identified. At the initial stage, the ontogenetic features of the species were clarified and individuals were divided into categories according to their age. To study the age structure, elongated transects were constructed at each sample site. Sample sites of 1 m2 (40 sample sites) have been established in the transect, depending on the relief every 30-50 m. The slope of the slopes was also taken into account in the construction of the trenches. At each sample site, age limits for all individuals were calculated according to age [100, 170].

In order to study productivity, the number of boxes in each exposition, the average number of real seeds formed determined by the number. Abundance of plants in natural conditions O. Drude and I. İ. It was determined on the Braun-Blanke scale [140].

For an ecological assessment of the areas where senopopulations are distributed, D.N. Siganov's ecological range scale was used. Taking into account Siganov's scale, LA Zhukova's method of estimating the potential and real ecological valence of species was used [94, 95, 165].

According to the results of the research, the protection status of rare species is given according to the criteria of IUCN "Red data Book" and the "Red Book" of Azerbaijan [175].

The main provisions of the defense:

1. Study of bioecological features and species diversity of irises (Iridaceae Juss) distributed in the western region of Azerbaijan;

2. Calculation of ecological valence and tolerance index of iris species distributed in the study area;

3. Identification of diagnostic features in the morphological and anatomical structure of different ecological groups of iris species;

4. Introduction of iris species and identification of ways to protect the gene pool.

Scientific novelty of the research. For the first time, ecological scales of environmental factors affecting 11 species of irises distributed in the western region of Azerbaijan have been compiled. The real ecological valence, tolerance to environmental factors and the coefficient of ecological efficiency of rare and endangered iris species of the iris family (Iridaceae Juss) distributed in the area were assessed. Constant signs of diagnostic significance were found in the anatomical structure of the species belonging to the three ecological groups for the area.

Theoretical and practical significance of the research. Scientific results, development and use of ecological scales allow an objective assessment of the ecological characteristics of the habitats of the species.

The results of the study were to determine the potential and real ecological valence of the species and to monitor the tolerance index of populations and plant communities; optimal of environmental factors, populations and critical condition; It can also be used to determine the potential species richness of the phytocenosis and to identify ways to preserve and restore biodiversity and ecosystems. Diagnostic features of the anatomical structure of iris species can also be used to determine plant species. Recently, as a result of climate change, xerophytic irises, which require less water, can be used for landscaping in extremely hot and dry weather. Due to its decorative properties, the following species - Iris imbricata Lindl., Iris alexeenkoi Grossh., Iris carthaliniae Fomin can be used to enrich the assortment of greenery in urban and other habitats.

The results of the study can also be used in the preparation of new editions of the regional "Flora" and "Determinants", the "Red Book" of Azerbaijan.

Approbation and application of research. The main provisions of the dissertation were presented at the International Scientific-Practical and International Conferences on "Actual problems of modern biology and chemistry" (Ganja, GSU, 2015, 2016), International Conference on "Innovative Development of Agrarian Science and Education: World Experience and Modern Priorities" (Ganja, ADAU , 2015), was discussed at the Eurasiaascience International Scientific-Practical Conference (Moscow, 2019), at the enlarged seminar of the Faculty of Agronomy of the Azerbaijan State Agrarian University (2016), at the annual report meetings and joint enlarged meeting of the Department of Ecology and Forestry.

Name of the organization where the dissertation work is carried out: Department of "Ecology and Forestry" of Azerbaijan State Agrarian University.

The structure and scope of the dissertation. The dissertation consists of an introduction, 6 chapters, results, recommendations, 192 bibliography, 2 maps, 23 diagrams, 25 figures, 257,470 characters, 31 tables, 160 pages of printed material, abbreviations and a list of symbols.

Personal presence of the author. The author set the problem in the dissertation, conducted experimental experiments, analyzed and summarized the obtained results.

Not to be published. On the basis of research materials, 14 scientific articles and theses reflecting the main provisions of the dissertation were published. 3 of them articles and 1 thesis were published abroad.

The introduction shows the relevance of the forthcoming problems related to the conservation of biological diversity and gene pool, their solutions, the purpose of the work, scientific innovation, practical significance and substantiated.

The first chapter provides information on the geographical location, relief, geological and geomorphological structure, hydrography, climate and soil and vegetation of the study area.

The second chapter provides an analysis of the literature on the Iridaceae family and determines the level of study of the chapter.

The third chapter describes in detail the ways of formation and systematic structure of the Iris family (Iridaceae Juss.), Bioecological, morphobiological features, life forms, geographical analysis, endemism and relictability in different natural-geographical areas and plant groups.

In the fourth chapter, DN Siganov's amplitude scales were used to assess the characteristics of environmental factors. Based on ecological scales, the age-limiting structure of ontogeny in natural plant groups and factors limiting its distribution were determined for each species.

In the fifth chapter, on the basis of the anatomical structure of the vegetative organs of the plant, the adaptive features of the species specific to any ecological group were discovered. Variations and deformations in the structure of the anatomical structure of the vegetative organs make it possible to determine the mechanisms of resistance to environmental factors affecting the plant.

The sixth chapter is devoted to the study of the introduction of the species of iris (Iris L) and the protection of its gene pool.

At the end of the dissertation the results reflecting the essence of the researches, the list of the referenced literature, the list of abbreviations and symbols are given.

MAIN CONTENT OF THE WORK

Natural and geographical conditions of the western region of Azerbaijan

From the north-eastern slope of the Lesser Caucasus to the foothills to the right bank of the Kura River, the Ganja-Gazakh sloping plain stretches for a long distance from the west to the Incasu River and Armenia, from the south to the Shahdag and Murovdagh ranges, and from the east to the Karachay gorge. It covers Gadabay, Shamkir, Dashkasan and Goy-Gol districts [51]

Orographically, the foothills are located between 400-700 m, cover a very small belt and are mainly characterized by moderate and strong fragmentation of the relief. The erosion base for this zone varies between 200-400 m. Relief formation conditions created conditions for the development of erosion-denudation relief 57, p. 192; s.250

According to the relief features, the territory of the region is divided into 4 zones: sloping plains, foothills, middle mountains (1000-2000 m above sea level), high mountains (2000 m above sea level) [181].

The rocks of the north-eastern slope of the Lesser Caucasus are distinguished by their petrographic and mineralogical diversity. Studies of Sh.A. Azizbekov [54, p.24-31], MA Gashgay [114, p.24-45], and others have shown that the volcanic and Cretaceous period of the Jurassic and Cretaceous periods on the north-eastern slope of the Lesser Caucasus sedimentary rocks, as well as sediments of the third and fourth periods. The Lesser Caucasus structural zone is a huge uplift zone, bordered by the collapse of the Kura Mountains to the north and northeast [67].

Crystalline limestones and marls from sedimentary rocks are also widespread on the north-eastern slope of the Lesser Caucasus. Carbonate alluvium and deluvium of these rocks are widespread in Ganjachay, Shamkirchay, Goshgarchay basins, Gazakh, Tovuz regions and Agkilsachay in Gadabay [154, p.]

The Ganja-Gazakh sloping plain and the Jeyranchol part of the western region of Azerbaijan are dominated by a semi-desert arid steppe with hot dry summers and mild winters. AM Shikhlinsky [155, p.14] divided the Lesser Caucasus as a separate climatic region according to soil and vegetation conditions. Based on its climatic zoning, three climatic zones (subalpine, mountain-forest and dry-steppe) can be distinguished on the north-eastern slope of the Lesser Caucasus in vertical zoning: the climate of the sloping plains on the right bank of the Kura. belongs to the type of dry steppes. The lowland and partly mid-mountainous zone (400-1500 m) is dominated by temperate-hot climate with dry winters. This climate is characterized by a slight amount of precipitation (annual precipitation is 50-100% of the possible evaporation.) In the lowlands and midlands, the total annual radiation is 125-130 kcal / cm2. Starting at 400-500 m above sea level, total radiation increases by 0.8 kcal / cm2 per 100 m, while the radiation balance decreases by

1 kcal / cm2 per 100 m. The annual radiation balance in the dry-steppe zone is 45.3-49.7 kcal / cm2, in the middle mountain forest zone it is 39.0-40.0 kcal / cm2 □155, p.15 □.

The average annual temperature in the foothills is 12-130 C, and decreases with increasing altitude, ranging from 11 to 130 C, depending on the altitude, direction and slope of the slopes in the lowlands and midlands. The coldest month of the year is December-January, and the hottest is July-August. The average January temperature in the foothills varies from -0.7 to + 1.50C, depending on the altitude and relief, and in the middle mountainous zone (1000-2000m) -2 to -60C. The lower part of the economic region is characterized by a hot and dry climate. Here the total active temperature fluctuates between 3500-4500˚C [155, p.110-116□. The average annual rainfall in the region is 246-393 mm, and the annual evaporation is 1000-1200 mm. The average annual rainfall in the region is 246-393 mm, and the annual evaporation is 1000-1200 mm. The lack of moisture is 700-900 mm. In the foothills (300-600 m) the snow cover is unstable, the average maximum thickness is 15-20 cm. At altitudes of 1200-1400 m, the average maximum thickness of snow cover is 20 cm and more, and above 1500 m thick snow cover is characteristic □115, p. 198□.

The western region of Azerbaijan is well supplied with water resources. Kura, Agstafachay, Tovuzchay, Shamkirchay, Zayamchay, Ganjachay, Goshgarchay, Kurekchay, Garachay, etc., Shamkir, Yenikend, Agstafachay, Cogaz reservoirs. Goygol, Chandargol, Maralgol and others. Artesian waters are the main sources of fresh water. The river network is relatively poorly developed in the foothills, lowlands and highlands and varies between less than 0.05 km / km2 in the foothills, 0.10-1.15 km / km2 in the lowlands and 0.30-0.60 km2 / km2 in the highlands. The development of soil and land cover, as well as the formation of fertility, is closely linked to the influence of natural factors that affect the soil. V.V. According to Dokuchayev, 5 factors are involved in soil formation, such as climate, flora and fauna, soil-forming rocks, relief and time [35].

Living organisms, especially green plants and microorganisms, have a special role in soil formation. Under their influence, important processes related to the conversion of mountain rocks into soil and the formation of fertility, including the concentration of ash elements and nitrogen compounds that form the basis of plant food, the synthesis and decomposition of organic matter, the products of plant life and microorganisms. interaction of mineral compounds of rocks, etc. occurs [35].

Gray-brown (chestnut) soils. This type of land covers 2200.6 thousand hectares or 25.5% of the territory of Azerbaijan and is distributed in the foothills and low mountainous belt at an altitude of 200 m. Depending on the conditions of soil formation and deposition, the nature of the rocks and vegetation that form the soil, there are the following subtypes of gray-brown soils: dark gray-brown, ordinary gray-brown, light gray-brown, "late" gray-brown soils [9, 154, 155].

Dark gray-brown soils subtype. These soils are relatively limited in area compared to other subtypes. Dark gray-brown soils are bordered by steppe brown soils at an altitude of 500-550 m in the upper part, and the lower border is about 200-300 m high. The amount of humus in the described soils varies from 3 to 3.5%, total nitrogen from 0.2 to 0.25%. Although carbonates are observed on the soil surface, they are partially washed away in dark chestnut soils. Due to their granulometric composition, these soils are mainly clayey. The largest amount of clay particles (40-50%) is observed at a depth of 20-70 cm of the profile. These soils are characterized by high absorption capacity. In the upper horizons, which are rich in humus, this figure is 100 grams. in the soil is 30-40 mg-eq. In the sum of absorbed bases Ca is 60-80%, Mg 10-15%, metabolic Na is 1-4%.

Ordinary gray-brown (chestnut) soils subtype. These soils are one of the most common subtypes of gray-brown soils. Soils belonging to this subtype are distributed in the surrounding parts of the Kur-Araz lowland between 200-400 meters.

Light gray-brown (chestnut) soils subtype. These soils are distributed in the drier areas of the dry steppe landscape, on the southern slopes and sloping areas. The profile of these soils, especially the topsoil, is slightly lighter than in ordinary gray-brown soils. The soil profile, especially the layers below 60-70 cm, is poorly differentiated.

The amount of humus is not higher than 2.1-2.3%. At a depth of 60-70 cm, its content decreases to 0.6%. All light gray-brown (chestnut) soils are carbonate. Sometimes the amount of CaCO3 in 30 cm of the profile reaches 15-18%. The total amount of absorbed bases in these soils is 27.9-43.4 mg-eq per 1 meter layer of soil profile.

Despite the fact that these lands have been irrigated for a long time, the formation of swamps has not been observed.

The volume mass of light gray-brown soils in the plowed layer is 1.18 g / cm3, in the northern layer 1.43 g / cm3, porosity is 54.8-62.4%. Humus reserves in these soils are relatively small and vary between 1.85-2.8% in the sowing layer.

The amount of nitrogen that is easily hydrolyzed varies between 45-70 mg per 1 kg of soil.

The amount of total phosphorus in the sowing layer varies from 0.14 to 0.17%, the amount of mobile phosphorus varies from 12.5 to 16.8 mg, and the amount of metabolized potassium varies between 300-500 mg. The amount of total nitrogen in the plowed layer of gray-brown soils is 0.16-0.19% (2.31-2.47 t / ha), in light-chestnut soils 0.12-0.14% (1.50-1.85) t / ha). In these soils, nitrogen is mainly in the non-hydrolyzed form (132-1086 mg / kg in the soil), which is 68-70% of its total amount. Very little and very little nitrogen (6-8%) is easily hydrolyzed. The amount of hardly hydrolyzed N is very high and varies between 317-450 mg / kg in the soil, which is 23-29% of its amount. The amount of mineral forms of nitrogen in the soil is very small. Contains 5-7 mg / kg nitrates and 14-17 mg / kg absorbed ammonia nitrogen. The total amount of phosphorus in the plowed soil varies between 0.15-0.17%, and the reserves are 3.6-5.1 t / ha. The amount of total potassium is 2.20-3.42% or 2.6-5.6 t / ha. However, the amount of potassium that can be assimilated is not so great and is around 140-242 mg / kg. Potassium was found in 242-1237 mg / kg in the most chestnut soils in the exchanged soils. In light gray-brown (chestnut) soils used in kaim, its content is very small, 120-180 mg / kg.

Gray gray-brown (chestnut) soils subtype. Gray-brown soils are distributed in a limited area compared to other subtypes of gray-brown soils. These soils are formed on the sulphate and carbonate erosion crust and are observed as a whole strip from Shamkir to Ganja, as well as in the Gazakh region, in the Arazboyu strip in the form of separate spots in the Karabakh plain. Akimsev V.V., who studied in detail the sedimentary lands in Ganja massif. (1928) considered coarse-grained sulphurous rocks to be the main source of gypsum, an important component of late and late soils. He noted that gypsum was formed under specific natural conditions [49].

In light gray-brown soils, the amount of humus usually does not exceed 2.2-2.8. The amount of nitrogen in the upper layers varies between 0.20-0.28%. The C / N ratio is wider. The composition and absorption capacity of the absorbed bases indicate that these soils are saturated with bases. The amount of Ca + 2 and Mg + 2 absorbed is also high. These soils vary in granulometric composition. While the upper horizons have a heavy granulometric composition, coarse fractions (physical sand) predominate in the lower horizons, especially in the soil-forming rocks. The main part of the loess fractions (40-65%) falls on the "late" horizon. In heavy clayey and loamy soils, species diversity predominates. There are no signs of salinization in the described soils. The amount of dry residue in the upper horizons is 0.2-0.8%, while in the lower horizons it increases to 1.75% due to the high level of gypsum. There are hard, carbonate, saline, irrigated and underdeveloped types of gray-brown soils. Biological factors, especially vegetation, play a leading role in soil formation. Vegetation is mainly distributed on the basis of the law of vertical zoning, but also intrazonal, extrazonal and azonal vegetation types are found [7, 13, 14, 138].

In place of the destroyed forests, there are forests of hawthorn (Crataegus orientalis Pall.), Mulberry (Mespilus germanica L.), hips (Rosa canina L), and garatikan (Paliurus spina-christi Mill.). Among the mesophilic grasses on the slopes are Erodium cicutarium L'Hér. Ex Ait., Asperula petraea V. Krecz.ex Klok, Euphorbia condylocarpa

M. Bieb., Potentilla argentea (Festuca rupicola Heuff.), Stonemason (Bothriochloa ischaemum (L) Keng), bright amber (Malva neglecta Wallr.), Etc. By dominating the grass cover of plants, they play an important role in soil formation, increasing soil fertility, as well as protecting soils from erosion. Abundance of grass condition depends more on soil moisture conditions. Therefore, on the north-western slopes of the relief there are wormwood-lame, and on the southern slopes there are lame-lame-grain-lame, lame-lame-thyme-grass, lame-lame-lame steppe. In these formations, various species of wormwood (Artemisia lerchiana Web Artemisia absinthium L, Artemisia caucasica Willd., Artemisia campestris L, Artemisia scoparia Waldst.), Stoneworm (Bothriochloa ischaemum L.) Japanese thrush (Bromus. berg.), slender (Koeleria albovii Domin.), shepherd's purse (Dactylis glomerata L), desert fox (Agropyron desertorum (Fisch. ex Link) Schult.) meadow foxtail (Alope¬curus pratensis L), more common. All vegetation is made up of associations with various plants, which are formed by the edificability of wormwood. Wormwood can adapt to drought by absorbing water from the lower layers through its deep-rooted roots. However, due to precipitation in spring and autumn, they form a cover with grains and other ephemerals [51]. The botanical composition of wormwood formations varies greatly depending on soil moisture and slope slope. In saline soils, the cover is thinning. The permanent satellites of wormwood are the onion bulb (Poa bulbosa L) and the earthworm (Colpodium humile (Bieb.) Griseb.). As the slope increases, their presence in the pasture decreases, sometimes disappearing completely. In the steppes with wormwood, along with grains, the number of species of Caucasian thyme (Astragalus caucasicus Pall.), Caucasian thyme (Thymus grossheimii Ronn.) Increases. Wormwood-saline deserts are found almost exclusively in areas unsuitable for cultivation. Most of them have been replaced by cultural or agro-phytocenoses.

The species composition of these formations is not rich. In the lower parts of the relief, salt-tolerant plant species are widespread in areas where groundwater is close to the surface. Karaganda deserts form the basis of the desert phytocenoses of the region. Limonium meyeri (Boiss.) O. Kuntze, Aeluropus repens (Desf.) Parl., Bromus yaponicus Thunberg. Fl, Alhagi pseudalhagi (Bieb.)., Glycyrrhiza glabra L, Zerna rubens (L.) Grossh. perennial herbs such as, Tamarix ramosissima shrubs like Ledeb, Suaeda microphylla Pall. hemispheres such as Artemisia lerchiana Weber, Salsola ericoides M. Bieb., Lagonychium farctum Bobr, Kochia prostrata L. and others. The plants are the main plant species in the deserts of Karagan. Halo¬cnemum strobilaceum (Pall. M. M. Bieb), tree saline (Salso¬la dendroides Pall), saline meadow (Aeluropus litto¬ralis (Gouan) are the most concentrated in areas with high salinity. Parl.), Kochia prostrata (L.) Schrad), vinegar (Atriplex turcomanica (Mog.) Boiss.), Rabbit barley (Hordeum leporinum. Link.), Leafless killer (Anabasis aphylla L), desert partition (Agropyron). salt-tolerant plant species such as desertorum (Fisch. ex Link) Schult.), reptiles (Acroptilon repens L) are widespread. In the western part of Azerbaijan, semi-desert and desert plant types have almost no natural features. Wormwood-ephemeral (Artemisia lerchiana Weber), gentian (Salsola nodulosa (Mog.) Iljin, Kalidietum caspicae), personality (Halostac¬hyietum belan gerianae), blackberry (Salsoletum dendroides) formations have lost their characteristics and remained anthropogenic for centuries. , remained only in the form of local fibers.

History of the study of the Iridaceae family

In addition to being an ornamental plant, the iris family also has useful medicinal, fodder, dye, etc. has always been in the focus of scholars. The chapter analyzes the literature on the Iridaceae chapter and determines the level of study of the chapter.

Bioecological features of irises (Iridaceae juss) in the western region of Azerbaijan

The dissertation describes the ways of formation and systematic structure of iris (Iridaceae Juss.) Widespread in the western region of Azerbaijan, bioecological, morphobiological features, life forms, geographical analysis, endemism and relictability in different natural-geographical areas and plant groups.

Ecological features of the distribution areas of iris species (Iris l) in the western region of Azerbaijan, assessment and tolerance of ecological valence of irises and age structure of senopopulations of some rare irises

It is known that the plant world is very sensitive to environmental factors. The occurrence of a species in a senopopulation exists in the range of ecological factors of the ecotope's condition.

DN Siganov's (1983) amplitude scales were used to estimate ecological parameters in plant communities. Characteristics of environmental factors in phytocenoses can be obtained from the following scales: Tm - thermoclimatic factor; Kn - continental climate; Om - ombroclimatic factor of climate (aridity / humidity); Cr is the cryoclimatic factor of climate; Hd - soil moisture; Tr - soil salinity regime; Nt - nitrogen richness of the soil; Rc - soil reaction (acidity / alkalinity); fH - variable soil moisture; Lc - lighting / shading regime of the area. Based on ecological scales, limiting factors for the distribution of each species have been identified. Iris is a stenobiont due to its narrow range of ecological and climatic indicators. Therefore, ecological climatic factors (TM, KN, OM, Cr) have a limiting effect on the distribution of the iris species studied in the area. The following scales are used for the potential ecological valence of the soil: humidity (Hd); acidity (Tr); soil nitrogen richness (Nt); salinity (Rc); variable humidity (Lc). It is a rare and endangered species for the region and needs special protection measures.

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Table 1.

Potential and real ecological valences (PEV, REV), coefficient of ecological efficiency (Ek. Ef. Koef) and tolerance index of iris species according to Siganov's climate scale

№	Species	TM			KN			OM			Cr			I
		PEV	REV	Ek ef. koef	Ek ef. koef	PEV	REV	PEV	REV	Ek ef. koef	PEV	REV	Ek ef. koef	
1	Iris germanica L	0,58	0,53	91,3	0,61	0,53	88,3	0,61	0,5	88	0,42	0,3	83	0,55
2	Iris pseudacorus	0,47	0,29	87,2	0,66	0,6	90,9	0,53	0,5	87	0,53	0,5	87	0,55
3	Iris alexeencoi Fomin	0,23	0,17	73,9	0,26	0,13	50	0,13	0,1	46	0,2	0,1	65	0,20
4	Iris lineolata (Trautv) Grossh	0,35	0,29	82,8	0,2	0,13	65	0,33	0,3	100	0,2	0,1	65	0,27
5	Iris carthaliniae Fomin	0,35	0,29	82,8	0,26	0,2	76,9	0,4	0,3	83	0,33	0,3	79	0,33
6	Iris imbricata Lindl	0,41	0,29	82,8	0,4	0,26	78,8	0,26	0,3	79	0,33	0,2	74	0,35
7	Iris camillae Grossh.	0,35	0,29	82,6	0,33	0,26	78,8	0,33	0,3	79	0,27	0,2	74	0,32
8	İ. shelkownikowii Fomin	0,35	0,29	82,9	0,33	0,3	79	0,33	0,3	79	0,27	0,2	74	0,32
9	Iris ibericaHoff	0,24	0,18	75	0,33	0,3	82	0,4	0,3	83	0,27	0,2	74	0,31
10	Iris annaeGrossh.	0,35	0,29	82,9	0,33	0,3	79	0,4	0,3	83	0,2	0,1	65	0,32
11	Iris paradoxStev	0,35	0,29	82,9	0,26	0,2	77	0,26	0,2	77	0,33	0,3	79	0,30
12	Iris acutiloba C.A.Meyer	0,35	0,29	82,9	0,33	0,3	79	0,4	0,3	83	0,4	0,3	83	0,37
13	Iris grossheymii Woronow ex Grossh.	0,35	0,29	82,9	0,33	0,3	79	0,4	0,3	83	0,2	0,1	65	0,32

Table 2.

Iris species tolerance index (CI) and ecological label for climate, soil and area lighting

№	Types	Climate		Soil		Lighting	
		TI	Ecological niche	TI	Ecological niche	TI	Ecological niche
1	*İris germanica L*	0,55	Mesobiont	0,30	Stenobiont	0,44	Mesobiont
2	*İris pseudacorus L*	0,55	Mesobiont	0,62	Hemievri-biont	0,55	Mesobiont
3	*İris alexeencoi*Fomin	0,20	Stenobiont	0,26	Stenobiont	0,33	Stenobiont
4	*İris lineolata*(Trautv*)* Grossh.	0,27	Stenobiont	0,34	Hemisteno-biont	0,44	Mesobiont
5	*İris carthaliniae*Fomin	0,33	Stenobiont	0,32	Stenobiont	0,55	Mesobiont
6	*İris imbricata*Lindl	0,35	Hemisteno-biont	0,34	Hemisteno-biont	0,66	Hemievri-biont
7	*İris camillae*Grossh.	0,32	Stenobiont	0,36	Hemisteno-biont	0,44	Mesobiont
8	*İ. shelkownikowii* Fomin	0,32	Stenobiont	0,32	Stenobiont	0,44	Mesobiont
9	*İris iberica*Hoff	0,31	Stenobiont	0,30	Stenobiont	0,33	Stenobiont
10	*İris annae*Grossh.	0,32	Stenobiont	0,34	Hemisteno-biont	0,44	Mesobiont
11	*İris paradoxa*Stev	0,30	Stenobiont	0,26	Stenobiont	0,55	Mesobiont
12	*İris acutiloba*C.A.Meyer	0,37	Hemisteno-biont	0,34	Hemisteno-biont	0,44	Mesobiont
13	*İris grossheymii* Woronow ex Grossh	0,32	Stenobiont		Hemisteno-biont	0,44	Mesobiont

Table 3.

Potential and real ecological valences of iris species according to Siganov's soil scale (PEV, REV), coefficient of ecological efficiency (Ek. ef. koef) and tolerance index

№	Types	Hd			Tr			Nt			Rc			fH			TI
		PEV	REV	Ek ef. koef	PEV	REV	Ek ef. koef	PEV	REV	Ek ef. koef	PEV	REV	Ek ef. koef	PEV	REV	Ek ef. koef	
1	*İris germanica*L	0,3	0,2	81	0,2	0,2	71	0,6	0,5	86	0,4	0,3	79	-	-	-	0,3
2	*İris pseudacorus*L	0,5	0,4	91	0,6	0,5	91	0,5	0,5	83	1	0,9	92	0,5	0,4	0,4	0,62
3	*İris alexeencoi*Fomin	0,3	0,2	81	0,2	0,2	71	0,3	0,2	56	0,2	0,2	65	0,3	0,2	67	0,26
4	*İris lineolata*(Trautv*)* Grossh.	0,3	0,3	87	0,2	0,2	71	0,5	0,4	80	0,4	0,3	79	0,3	0,2	67	0,34
5	*İris carthaliniae*Fomin	0,4	0,4	91	0,2	0,2	71	0,3	0,2	67	0,2	0,2	65	0,5	0,4	80	0,32
6	*İris imbricata*Lindl	0,2	0,2	81	0,2	0,2	71	0,6	0,54	83	0,2	0,2	65	0,5	0,4	80	0,34
7	*İris camillae*Grossh.	0,3	0,2	81	0,2	0,2	71	0,5	0,4	80	0,4	0,3	79	0,4	0,3	75	0,36
8	*İ. shelkownikowii* Fomin	0,3	0,2	81	0,2	0,2	71,4	0,4	0,4	100	0,3	0,2	65	0,4	0,3	75	0,32
9	*İris iberica*Hoff	0,3	0,2	85	0,2	0,2	76,2	0,3	0,2	67	0,3	0,2	77	0,4	0,3	75	0,30
10	*İris annae*Grossh.	0,3	0,3	87	0,2	0,2	71,4	0,5	0,4	80	0,4	0,3	79	0,3	0,2	67	0,34
11	*İris paradoxa*Stev	0,2	0,2	81	0,2	0,2	71,4	0,2	0,1	50	0,2	0,2	65	0,5	0,4	80	0,26
12	*İris acutiloba C.A.Meyer*	0,3	0,3	87	0,2	0,2	71,4	0,5	0,4	80	0,4	0,3	79	0,3	0,2	67	0,34
13	*İris grossheymii* Woronow ex Grossh.	0,3	0,3	87	0,2	0,2	71,4	0,5	0,4	80	0,4	0,3	79	0,3	0,2	67	0,34

During the research, the age structure of ontogeny in natural plant groups was determined to ensure the protection of irises, and a number of specific signs and limiting factors were identified to increase tolerance to adverse conditions. The study of the age and quantity composition of the senopopulation, which is considered to be the structural unit of plant groups, provides information about the past, present and future state of the species in the cenosis, and the life cycle in general [132]. Taking all this into account, Iris imbricata Lindl, I., who participated in various plant associations in the western region of Azerbaijan in 2013-2018. lineolata (Trautv.) Grossh., Iris paradoxa Stev., age and quantity composition of senopopulations of iris grossheymii Woronow ex Grossh species were studied, types of senopopulations were identified.

The structure of the species and the intensity of ontogenetic processes differed from the influence of specific conditions in the development of I. imbricata species. Younger populations have not been identified. All populations in I SP are elderly; In SP II he was older in 2014, and in 2013 and 2015 he was transitional, in SP III he was older in 2014-2015, and in 2013 he was transitional.

Table 4.

Assessment of the prevalence of iris imbricata Lindl species

SP	SP Type	Years	Ontogenetic Age Status%								Indices	
			j	im	v	g_1	g_2	g_3	ss	s	Δ	ω
I SP	Age	2014	-	6,2	12,5	12,5	12,5	6,3	25	25	0,71	0,49
	Age	2015	3,1	-	15,6	6,3	6,3	3,1	31,2	34,4	0,71	0,48
	Age	2016	3,1	9,4	18,7	12,5	6,3	6,3	21,9	25	0,57	0,50
II SP	Transition	2014	-	19,3	15,6	12,5	-	-	25,8	25,8	0,54	0,36
	Age	2015	-	10,2	10,2	12,8	10,2	5,1	28,2	23,1	0,61	0,46
	Transition	2016	5,1	15,4	20,5	7,7	5,1	2,6	23,1	20,5	0,51	0,38
III SP	Transition	2013	8,6	11,4	22,8	5,7	5,7	2,8	22,8	20	0,51	0,38
	Age	2014	2,8	5,5	16,7	11,1	5,5	-	25	33,3	0,62	0,39
	Age	2015	5,3	-	15,8	13,1	5,3	-	26,3	34,2	0,64	0,40

Table 5.

İ. lineolata (Trautv.) Assessment of the prevalence of the genus Grossh

SP	SP Type	Years	Ontogenetic Age Status%								Indices	
			j	im	v	g_1	g_2	g_3	ss	s	Δ	ω
I SP	Age	2014	-	17,8	17,8	15,6	13,3	8,9	15,6	11,1	0,45	0,52
	Transition	2015	5,5	3,7	14,8	13	14,8	16,7	16,7	14,8	0,56	0,55
	Age	2016	-	15,9	15,9	13,6	9,1	9,1	18,2	18,2	0,51	0,47
II SP	Age	2014	1,8	11,1	14,8	14,8	7,4	3,7	20,4	25,9	0,55	0,36
	Transition	2015	4,2	17	14,9	6,4	6,4	4,2	25,5	21,3	0,66	0,39
	Age	2016	-	11,9	16,4	10,4	10,4	13,4	20,9	16,4	0,54	0,50
III SP	Age	2014	6	12	17,9	12	8,9	7,5	20,9	14,9	0,48	0,45
	Age	2015	2,6	10,4	18,2	11,7	7,8	5,2	23,4	20,8	0,54	0,44
	Age	2016	6,1	21,2	18,2	9,1	7,6	6,1	18,2	13,6	0,44	0,41

According to the results of the study (Table 5) I. lineolata type Noaeato-Agropyrumsetum association (I SP) senopopulation-type transition in 2014 and 2016, adult in 2016, Agropyrumeto-Stipasetum association (II SP) adult-type population in 2015, others transition type; All populations of Agropyrumeto-Stipasetum (III SP) were transitional.

Table 6.

Evaluation of the prevalence of senopopulation of the iris paradox Stev

SP	SP Type	Years	Ontogenetic Age Status%								Indices	
			j	im	v	g_1	g_2	g_3	ss	s	Δ	ω
I SP	Yaşlı	2014	-	22,2	-	16,7	-	-	33,3	27,8	0,61	0,36
	Age	2015		13,3	23,3	13,3	6,7	3,3	23,3	16,7	0,49	0,45
	Transition	2016	3,6	11,5	15,4	13,5	11,5	7,7	19,2	17,3	0,51	0,41
II SP	Transition	2014	2,3	20,9	25,6	13,9	-	-	20,9	16,3	0,39	0,35
	Transition	2015	-	15,7	13,7	13,7	11,8	9,8	17,6	17,6	0,52	0,41
	Age	2016	4,4	8,8	20,6	5,9	7,3	11,8	20,6	20,6	0,56	0,42
III SP	Age	2014	5,5	-	22,2	11,1	5,5	2,8	22,8	25	0,59	0,42
	Transition	2015	-	20	27,5	7,5	7,5	-	20	17,5	0,44	0,40
	Age	2016	2,6	23,7	28,9	-	-	-	23,7	21	0,56	0,30

Based on the results obtained, the age and efficiency indices of the population were calculated, and the types of the population were identified. The iris paradox was dominated by the older senopopulation type in Stev. (Table 6) The efficiency indices were low.

Anatomical features of the species of iris (iris l.) Based on the anatomical structure of the vegetative organs of the plant, the adaptive features of the species specific to any ecological group were revealed. Variations and deformations in the structure of the anatomical structure of the vegetative organs make it possible to determine the mechanisms of resistance to environmental factors affecting the plant. The findings assessed the condition of the species and the plant community.

The anatomical structure of the vegetative organs of the species taken for study was studied. Signs of adaptation of each species to different environmental conditions were identified and analyzed. It was found that the good development of stem parenchyma cells, the large number of transmitting balls in the leaves and roots, the large size of the intercellular spaces, the small space in the cross section relative to the central cylindrical shell, confirm that the species belongs to the mesophyte ecological group.

The small size of the parenchymal cells, the thickening and dense placement of the sheaths, the small intercellular spaces, the thick cuticle layer of the roots and leaves, the small number of conductive balls, the strong development of the sclerenchyma tissue, the location of the oral apparatus in the lower epidermis of the leaf is.

The presence of large air cavities in the leaves and roots, the strong development of the central cylinder in the cross section of the root, the location of the oral apparatus on both the lower and upper sides of the epidermis confirm that the species belongs to the hygrophytic ecological group.

Iris imbricata Lindl. The description of the vegetative organs of the species is given below. Radix - Remains of root hairs appear on the epiblem layer. The cells have ligninized shells.

The exoderm layer consists of 3-4 densely packed small cells. The cells of the cells are covered with suberin. The cells of the epiblem are polygonal.

Mesoderm cells are large circles with intercellular spaces between them. The cells are large, shrinking towards the center, the shells are slightly thickened.

The cells of the endoderm are rich in suberin, densely packed, and between them are non-thickened cells that transmit a solution of water and minerals through these cells to the xylem and phloem clusters in the central cylinder. (Figure 1.)

The central part (stella) is surrounded by a layer of pericycle cells. Its cells are alive and divide, giving rise to lateral roots. In the central cylinder, 8 beams alternate with xylem and phloem tubes. The inner part of the central cylinder consists of thick-grained suberinized cells.

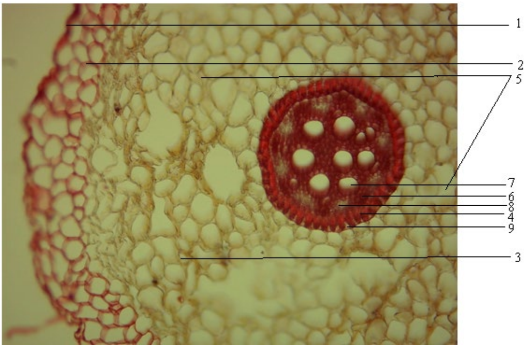

Figure 1. Iris imbricata Lindl. anatomical structure of the root
1 - epiblem; 2 - exoderm; 3 - mesoderm; 4 - endoderm; 5 - intercellular spaces; 6 - phloem; 7 - xylem; 8 - pericycle; 9 - releasing cell.

The leaf (Folium) has an amphistomatic structure. The cells of the lower and upper epidermis are covered on the outside with a thick cuticle layer, the cells are rectangular or occasionally round. Inside (mesophyll) there is a small mouthpiece and there is an air space under it. Mesophilic cells are relatively small under the epidermis, rich in chlorophyll grains. In the center of the leaf, large air cavities form a strip. The transmission balls are located mainly under the mouthpiece. Beneath them, the transmitting balls are surrounded by surrounding cells, which are small in size. Inside is the transmission ball. The xylem is at the bottom and the phloem is at the top. (Figure 2.)

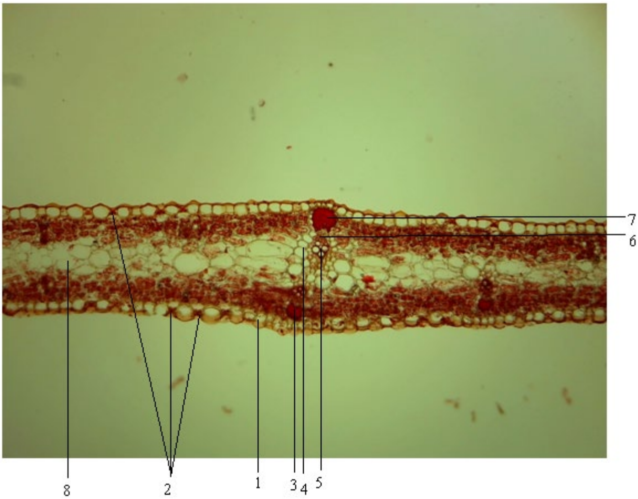

Figure 2. Iris imbricata Lindl. anatomical structure of the leaf
1 - epidermis; 2 - mouthpiece; 3 - transmission ball; 4 - surrounding cell;
5 - xylem; 6 - floem; 7 - sclerenchyma parenchyma.

The anatomical structures of other species widespread in the western region of Azerbaijan are reflected in the dissertation.

Introduction of iris species (Iris l.) And protection of gene pool

As a result of our field ecological and biological research in the western region of Azerbaijan, the condition of the populations of rare iris species has been studied. It has been established that the species and populations of irises listed in the Red Book have a strong anthropogenic impact, while the biological characteristics of the species, ie their small number and density, have an impact.

CONCLUSION

The following results have been obtained as a result of scientific research on the biological diversity and conservation of the gene pool of the Iris (IRIDACEAE JUSS.) Family, which is widespread in the western region of Azerbaijan:

1. It has been established that the soil cover in the western part of Azerbaijan consists mainly of gray-brown soils and semi-types, and in most cases developed on gravelly pomegranate, carbonate-clayey and clayey. The granulometric composition is light and medium clayey. The amount of total nitrogen is 0.20% in the upper layers, but decreases to 0.08% in the lower layers. The salts are composed of calcium sulphate, and the amount of chlorine is small, weakly saline soils. Groundwater is very deep. The reaction of the environment is weakly alkaline.
2. As a result of the research, it was determined that 13 species of irises are widespread in the western region of Azerbaijan. Of these, 8 species: Iris camillae Gross., Iris annae Gross., Iris acutiloba CA Meyer., Iris iberica Hoff., Iris lineolata (Trautv.) Gross., Iris shelkownikowii Fomin., Iris paradox Steven, Iris grossheymii Wroroncyc ex Gosya. ; 3 types: Iris imbricata Lindl., Iris alexeenkoi Grossh., Iris germanica L Iris section; Type 1: Iris carthaliniae Fomin. Xyridion belongs to the section; type 1 belongs to the section: Iris pseudacorus L Linmiris. Two species of the genus Crocus L: Crocus adamii J.Gal and Crocus speciosus M. Bieb. spread. Two species of the genus Gladiolus L: Gladiolus kotschyanus Boiss and Gladiolus halophilus Boiss et Heldr. spread.
3. According to their life form, irises belong to the group of cryptophytes: the species belonging to the Oncocyclus section belong to the root geophyte, the species of the Xyridion and Linmiris section belong to the helophytes. 5 species of iris (Iriscamillae Gross., Iris annae Gross., Iris shelkownikowii Fomin., Iris lineolata (Trautv) Gross., Iris acutiloba CA Meyer,) are endemic to Azerbaijan, and 5 species (Iris carthaliniae Fomin., Iris iberica). ., Iris alexeenkoi Grossh., Iris paradox Steven, Iris imbricata Lindl.) - are endemic plants of the Caucasus. A map of the distribution of iris species in the study area was compiled in a dotted manner.
4. Rooted iris species spread in the western region of Azerbaijan D.N. They took a narrow range of Siganov's scale in terms of climate and soil, and adapted to the complex factors that affect

them. The tolerance index and environmental efficiency coefficient of these species are low due to the influence of climatic and soil factors. Because most of the iris species distributed here are steno- and hemistenovalent, their range is small, and in the phytocenosis these species are considered assectorites.

5. According to the indicators of the climate scale, stenovalent species are 70%, hemistenovalent species 15%, mesovalent species - 15%. According to the soil scale, 54% of the iris species distributed in the area are hemistenovalent, 46% - stenovalent, mesovalent, evrivalent species are not found. According to the area lighting scale, stenovalent species are 15%, hemistenovalent species are 77%, and there are no evrivalen species.
6. Iris imbricata Lindl, İ. lineolata (Trautv.) Grossh., Iris para¬doxa Stev., age and quantity composition of senopopulations of iris grossheymii Woronow ex Grossh species were studied, seno¬population types were identified. Low age and efficiency indices are the main indicators of poor species development in the area.
7. According to the anatomical structure of the iris species distributed in the study area, constant diagnostic features belonging to three different ecological groups were revealed.
8. Constant signs found in the anatomical structure Iris imbricata Lindl, Mesophyte of Iris alexeenkoi Gros species; Iris lineolata (Trautv) Gross, Iris acutiloba C.A.Meyer, Iris paradox Stev, Iris grossheymii Woronow ex Grossh species xerophytes; Iris carthaliniae Fomin species have been evaluated as traits belonging to the hygrophyte ecological groups.
9. As a result of the research, 6 species of irises showed the following results in the introductory works: Iris imbricata Lindl, Iris lineolata (Trautv) Grossh, Iris acutiloba C.A. Meyer easily adapted to the new conditions in the introductory works (60% of cultivated plants are well developed); Iris paradoxaStev, Iris alexeencoi Grossh is moderately tolerant to similar climatic conditions (30% of planted plants are well developed); The area

where the iris carthaliniaeFomin species was introduced sprouted 10% due to the unsuitable environmental conditions in which the plant was propagated, but soon became extinct.

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PRODUCTION SUGGESTIONS

The following recommendations are recommended for the protection of rare and endangered species of irises in the study area:

1. 1VS Novruzov, LA Askerova. Bio-ecological structural features of the iris lineolata Trautw plant // Azerbaijan National Academy of Sciences. Ganja Regional Scientific Center. News bulletin 58th issue. Ganja, 2014. 8-11 p.
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12. Askerova L.A. The current state of rare species of irises in the western region of Azerbaijan / Materials of the scientific-practical conference of young researchers dedicated to the 90th anniversary of Academician Jalal Alirza oglu Aliyev. ADAU. Ganja, 2018. 32-34 p.
13. Askerova LA Anatomical adaptation of some species of irises to different ecological conditions / Proceedings of the XXIII International Scientific-Practical Conference "Eurasia Science". Moscow-Penza 2019. p. 33-37.
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The defense of the dissertation will be held at the meeting of the Dissertation Council FD 1.32 operating under the Azerbaijan National Academy of Sciences, Institute of Soil Science and Agrochemistry in "23" 06 2021 at 11.

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