REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

of the dissertation submitted for the degree of Doctor of Philosophy

ECOBIOLOGICAL STUDY AND RESTORATION OF THE FLORA AND VEGETATION COVER OF YENIKEND WATER BASIN

Speciality: 2417.01 – Botany

Field of science: Biology

Applicant: **Narmin Ilham Sadigova**

Baku – 2024

The dissertation work was performed at the Department of Biology of the Azerbaijan State Agrarian University.

Scientific supervisor: Doctor of Biological Sciences, Professor **Sayyara Jamshid Ibadullayeva**

Official opponents: Doctor of Biological Sciences, Active member of ANAS, Honored Scientist, Professor **Tariyel Huseynali Talibov**

Doctor of Biological Sciences, Corresponding member of ANAS, Professor **Novruz Mahammad Guliyev**

Doctor of Philosophy in Biology, Associate Professor **Kamala Kamal Asadova**

Dissertation council of ED 1.26 of the Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at the Institute of Botany, MSE RA

Deputy Chairman of the dissertation council: Doctor of Biological Sciences, Professor **Eldar Novruz Novruzov**

Scientific secretary of the dissertation council: Doctor of Philosophy in Biology **Nuri Vagif Movsumova**

Chairman of scientific seminar: Doctor of Biological Sciences, Associate Professor **Naiba Pirverdi Mehdiyeva**

INTRODUCTION

Relevance and degree of development of the topic. Since gaining its independence, the Republic of Azerbaijan has set itself initial strategic goals aimed at promoting integration into the international community. One of these goals was an action plan developed for the correct and targeted use of biological diversity[1]. The study of the water bodies that are the habitat of waterfowl, the protection of migratory species of animals, nature and natural habitats are also included[2] in the strategic national plan for the regulation of biodiversity. To set priorities in this area, conservation was put forward as a commitment. A number of studies have been conducted in our republic and abroad towards studying the flora and vegetation cover of water bodies and interesting results have been obtained [3, 4].

The study of modern flora and vegetation of specific areas, the determination of changes there, and the conduct of studies against the background of environmental, anthropogenic and zoogenic influences are of greater importance, both theoretically and experimentally. Nowadays, the study of biological diversity found in any geographical region and genetic variability, as well as the prevention of instability in the ecological system based on the negative effects of anthropogenic factors on the plant-soil surface for environmental protection, are urgent problems. One of these unique places is the Yenikend water basin. Given that the surface of a biogeographic region is a

[1] Azərbaycan Respublikasının Biomüxtəliflik üzrə Ölkə Tədqiqatı. Bioloji Müxtəliflik Komissiyası üzrə Birinci Milli Məruzə. –Bakı: –2004. –160 s.

[2] Azərbaycan Respublikasında bioloji müxtəlifliyin qorunmasına və davamlı istifadəsinə dair 2017-2020-ci illər üçün Milli Strategiya [Elektron resurs] //Azərbaycan Respublikası Prezidentinin 2016-cı il 3 oktyabr tarixli 2358 nömrəli Sərəncamı ilə təsdiq edilmişdir, – Bakı: Qanun, – 2016. http://www.e-qanun.az/framework/33817

[3] Qurbanov, E.M. Naxçıvançay hövzəsinin florası, bitkiliyi və onun fitomeliorativ əhəmiyyəti: /Biologiya üzrə fəlsəfə doktoru elmi dərəcəsi almaq üçün təqdim edilmiş diss.../ -Bakı, 1984. -s. 248.

[4] İsmayılov, A.H. Naxçıvan Muxtar Respublikasında Gilançay hövzəsinin florası, bitkiliyi və onların fitomeliorativ əhəmiyyəti:/ Biologiya üzrə fəlsəfə doktoru elmi dərəcəsi almaq üçün təqdim edilmiş diss... avtoreferatı/ -Bakı, 2009. -s.23.

continuously developing area, it is important to study the basin as a biogeographic region with distinct biodiversity.

The territory of the Yenikend water basin is connected to the Kura River, the Ganjachay and Goshgarchay valleys. The frequent rise and fall of water here and other anthropogenic impacts have led to the washing of slopes, increased erosion processes, and changes in the composition, structure and productivity of flora and vegetation in a word, succession. As a result, the number of grasses and shrubs gradually declined, many disappeared completely, and local wild species have created jungles in its place. Therefore, it is important to restore the eroded areas of the reservoir and make them useful from a scientific point of view.

It should be taken into account that the some phytocoenoses of vegetation play the role of the main food for livestock. Since there is too much grazing and trampling here, a number of changes have occurred in the composition and structure of phytocoenoses. From this point of view, the productivity of formations, the quality of feed have decreased, the capacity of pastures has reduced, and the distribution area of important forage plants in phytocoenoses has narrowed, as well as the number of unnecessary plants that cattle cannot eat has increased. For this reason, it is considered important to make recommendations to improve the quality and forage properties of the existing vegetation, as well as to protect endemic, rare and endangered species found in the area and those included in the “Red Data”.

In this regard, geobotanical-ecological studies were conducted on a scientific-theoretical and methodical basis for the multi-directional (botanical, anatomical, molecular biological, etc.) study and protection of the various species found in the surrounding vegetation of the Yenikend water basin located in the territory of the Samukh district of the Lesser Caucasus, the proper use of the vegetation cover of the area, the genetic study of xerophytic plants adapting to the water environment, as well as for the restoration of the fertility and primary phytocoenosis of the polluted areas.

The object and subject of the research. The research object of the work is the vegetation cover of Yenikend reservoir surroundings. The

subject of the research was the bioecological, anatomical, molecular, and cenological assessment of some species found in the flora diversity of the Yenikend reservoir basin.

The purpose and objectives of the research. The main purpose of the research is to study the current flora and vegetation cover of the Yenikend water basin, to determine the taxonomic composition of endemic and rare, as well as endangered species, to investigate the adaptation of xerophytic plants in wetlands at the molecular-anatomical level, to give an ecological classification of vegetation, as well as to develop recommendations on scientifically-methodologically based measures for the protection, efficient use, improvement and restoration of phytocoenoses.

To achieve the goal of the research, the following tasks were set:

- To make ecobiomorphological and geographical analysis of the study area, a complete description of its flora, identification of their endemic, rare and endangered species;
- To determine the ecological characteristics of the studied area-the physical-geographical location, geomorphological structure and relief, climatic conditions and hydrological network, as well as the soil cover;
- To classify phytocoenoses at the level of type, formation and association by studying the species composition and structure of vegetation;
- To compile a map of routes traveled using a QGIS software and decoding the distributed vegetation in the territory using the Earth remote sensing (ERS) method;
- To characterize the bioecological characteristics of the main useful, endemic and rare as well as endangered plants distributed in the area;
- To investigate the adaptive capabilities of some xerophyte species common in the flora of the territory at the molecular and anatomical level.

Research methods. The naming of taxa was based on the APG IV and IPNI (International Plants Name Index) systems developed by the Angiosperm Phylogeny Group, and the identification of species was

carried out with reference to the works “Flora Azerbaijan”, and “Synopsis of the Flora of the Caucasus”. During floristic analyses, life forms and eco-biomorphs were analyzed, geographic-phylogenetic relationships were investigated. During the study of vegetation, numerous geobotanical descriptions were recorded and important indicators of coenoses were assessed. Phenological analysis of some species was given, coenopopulations (CPs) were evaluated, discrete description of ontogenesis, age and efficiency index were studied. The features of adaptive adaptation of some xerophyte species were revealed by morphoanatomical studies, and polymorphism among them was revealed as a result of molecular analysis. The protection status of rare species is given according to the IIUCN “Red data Book” criteria and the “Red Book” of Azerbaijan. The route map of the territory was compiled using QGIS software, the vegetation distributed in the territory was decoded using the ERS method.

Main provisions for defence.

- Compiling a synopsis of the flora of the Yenikend water basin, studying the bioecological characteristics of taxa, and determining distribution patterns provide the basis for the protection and inventory of the plant gene pool;
- The diagnostic signs determined as a result of morphoanatomical studies are important in the systematic determination of wormwood genus species;
- Polymorphism found among population samples of *Artemisia* species is considered important for the identification, evaluation and differentiation of genotypes.
- Maps of vegetation cover of area can become the basis for solving environmental problems.

Scientific novelty of the research. For the first time, a synopsis of the flora of Yenikend water basin was compiled, the distribution of 594 species belonging to 81 families and 316 genera was confirmed, the bioecological characteristics of the taxa were studied, and their distribution patterns were determined. An ecobiomorphological analysis of the flora was carried out, it was found that 44.94% of the total flora in the study area is occupied by hemicryptophytes, and

31.98% by therophytes. According to their life forms, 45.95% of the total flora are grasses and 9.25% are shrubs. When analyzing the area flora on the ecological groups, the life conditions of plant samples with different humidity levels were taken into account. It was found that mesoxerophytes with 117 species make up 19.7%, and xeromesophytes with 92 species make up 15.5% of the total flora. The percentage indicator of hygrophyte species found in the wetland vegetation type in the area was 0.84%, and hydrophytes - 0.16%. By geographically analyzing the species in the flora of the area, 86 classes included in 9 range types were determined. The statuses of rare and endemic species have been determined.

According to the geobotanical and ecological study of the vegetation cover of the area, 4 types (semi-desert, shrub, wetland, oasis), 4 formation classes, 8 formation groups, 8 formations and 21 associations were determined.

As a result of the molecular analysis, high genetic polymorphism was found among wormwood samples of Azerbaijani origin by cluster and principal component analysis methods based on RAPD markers.

As a result of the conducted morphoanatomical studies, a number of characteristic signs of wormwood species were determined. Root passes into the second structure very early. The main reason for this is that wormwood species uses the spring moisture to complete rhizogenesis in a short period. Since there is little humidity in summer and autumn in arid zones, the root develops very intensively in the humid period. Conducting bundles in the stem are observed with mechanical tissues (collenchyma, sclerenchyma and sclereid cells). This provides the mechanical strength and flexibility of wormwood.

For the first time, a route map of the studied area was developed with QGIS software, and the vegetation spread in that area was decoded using the method of Earth remote sensing.

Theoretical and practical significance of research.

- for the protection of the natural gene pool, the implementation of surface improvement measures by sowing the seeds of valuable fodder plants in areas subject to erosion and succession will further strengthen the use of land in forage farming;

- during the implementation of complex measures, including phytomeliorative studies for the protection of soils from erosion, selected trees and shrubs can also be used in other areas to prevent soil degradation and erosion;
- establishment of protective forest belts for relatively strong mountain slopes, carrying out restoration works in large areas of rivers and valleys, landslide-prone areas, and strict adherence to the reserve regime when using resources should be taken into account;
- the obtained results can be used during the study of other basin bioresources.

Approbation and application. The materials related to the dissertation were presented at the conferences and symposiums "Symposium on Euroasian biodiversity" (Türkiye, 2016), "The 4th International symposium on Euroasian biodiversity" (Ukraine, 2018), Conference "New challenges in botanical research" dedicated to the 90th anniversary of academician Vahid Jalal Hajiyev as well as in the scientific seminars of the Institute of Botany, MSE RA (Baku, 2018).

12 scientific works containing the main sections of the dissertation have been published, four (4) of them are conference materials. Four articles, two (2) conference materials were published in foreign journals. Three (3) articles were published in international databases.

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

The scope and structure of the dissertation work. Dissertation work is 167 pages with computer writing, consists of introduction, 6 chapters, results, proposal and recommendations, appendices and 153 bibliography (including 111 foreign bibliography) and contains of two hundred thousand characters in total (introduction – 1,547 characters, Chapter I– 15659 characters, Chapter II– 29435 characters, Chapter III– 37914 characters, Chapter IV– 37945 characters, Chapter V– 32648 characters, Chapter VI– 30116 characters, result – 2142 characters, proposal and recommendations – 961 characters). The work consists of 16 tables, 27 figures and 5 map-schemes.

CHAPTER I. LITERATURE REVIEW ON THE STUDY OF WATER BASINS IN AZERBAIJAN

This section of the dissertation examined research work carried out in the water basins of the republic, and provided brief comments and references.

CHAPTER II. PHYSICAL-GEOGRAPHICAL CONDITION OF YENIKEND WATER BASIN, OBJECT AND METHODOLOGY OF RESEARCH

2.1. Physical-geographical condition of the study area. The Yenikend reservoir was built in 2000 for the purpose of generating electricity. Yenikend reservoir is located between Shamkir and Mingachevir reservoirs, its basin covers an area of 23.2 km^2 in Samukh district. One city, 6 settlements, 28 villages in the region use the Yenikend reservoir for irrigation. The Kura, Gabirri, Ganikh, Ganja and Goshgar rivers passing through the area, a number of ditches and underdrains, including the upper part of the Mingachevir reservoir, collect in the Yenikend water basin.

The soils around the basin of the area are represented mainly by mountain gray-brown (chestnut) soils, characterized by low humus content and severe erosion. Normal mountain gray-brown, dark mountain gray-brown and light mountain gray-brown semi-types of mountain gray-brown soils are common in the area.

The climate of the studied area is temperate hot, temperate continental, semi-desert and dry steppe. The average temperature is highest in July -26.2°C. On average, the coldest month of the year is January - 2.6°C (tab. 1).

Table 1.

Average annual values of the main climate indicators of the area (for the years 2015-2017-Bureau of Hydrometeorological Forecasts)

By years	Meteorological elements			
	Average air temperature, ^{0}C	Average amount of precipitation, mm	Average wind speed, m/sec	Continuity of sunshine, hour
2015	15,1	295,9	2	2249,9
2016	14,7	331,1	2	2229,8
2017	15,1	246,4	2	2435,7

2.2. The object and methods of the research. In the spring, summer and autumn seasons of 2014-2019, short-term and long-term expeditions were carried out along 25 routes to the territory of the reservoir, and about 300 herbarium materials were collected. The research was mainly carried out by semi-stationary and stationary methods, more than 50 geobotanical notes were made on the structure of phytocenoses, and photographs of formations were taken separately. Herbarium of all collected species was prepared and transferred to the Herbarium funds of the Institute of Botany of the MSE RA and the Faculty of Biology of ASAU.

A map of the studied area was drawn up using QGIS software and route locations were indicated (fig. 1). At the same time, the layout of the route map that developed by us was placed in the WGS 84 coordinate system.

"Flora of Azerbaijan" [5], "Key of plants of the Caucasus" [6] and other determination keys were used when processing materials collected in the reservoir.

The names of taxa and nomenclatural changes are given according to the latest classifications, and the protection status of rare species according to the "Red Book" [7] of the Republic of Azerbaijan. Life forms of plants were classified according to I.G.Serebyakov[8] and C.R.Raunkiaer[9], ecological groups according to A.R.Shennikov[10], type, class and groups of the habitat according to A.A.Grossheim[11],

[5] Флора Азербайджана: [в 8 томах] / –Баку: АН Азерб. ССР, 1950-1961, т. I-VIII.

[6] Гроссгейм, А.А. Определитель растений Кавказа / А.А. Гроссгейм. – М.: Гос. Изд. Сов. наука, –1949. – 747 с.

[7] Azərbaycan Respublikasının Qırmızı Kitabı. Nadir və nəsli kəsilməkdə olan bitki və göbələk növləri: [3 cilddə]. –Bakı:"Imak", –c.3. –2023. – 507 s.

[8] Серебряков, И.Г. Полевая геоботаника [в 3-х т.] / И.Г. Серебряков, – М.-Л.: Изд. АН СССР, т. 3, – 1962. – 181 с.

[9] Raunkiaer, C. The life forms of plante and statistical plant deodrahy / C. Raunkiaer, – Oxford: – 1934. – p.48-154.

[10] Шенников, А.П. Введение в геоботанику / А.П.Шенников. – Л.: Изд-во. ЛГУ, –1964. –447 с.

[11] Гроссгейм, А.А. Флора Кавказа: [в 7-х т.] / А.А. Гроссгейм. –Баку: АзФАН СССР, – Т.1-7, – 1939-1967.

endemism according to A.Asgarov's[12] latest information and works of individual researchers.

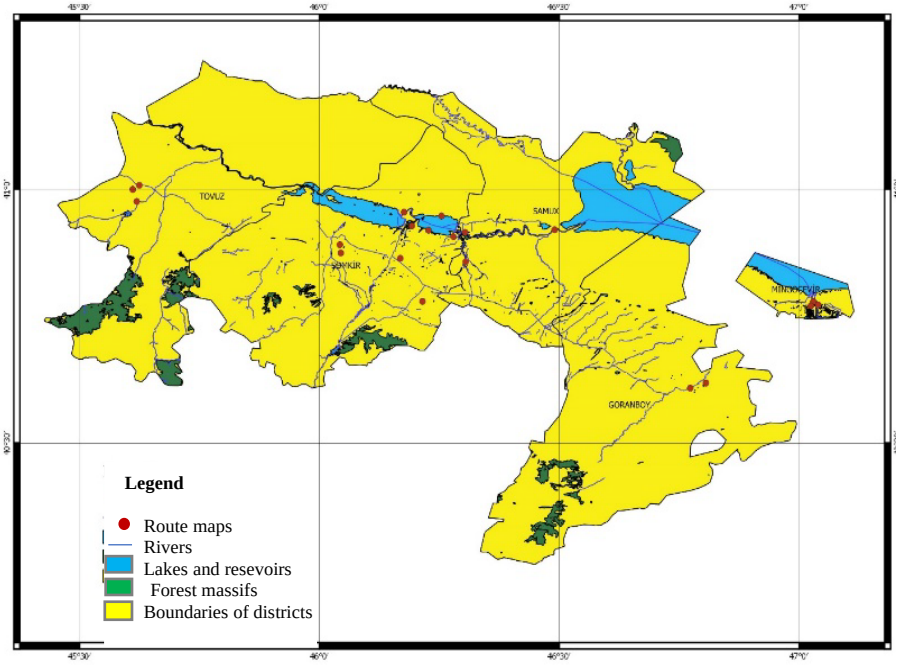


Figure 1. The route map of the area drawn up with QGIS software

In the classification of vegetation, geobotanical methods were used, taking into account the ecological, phytocoenological and dominance principles.

The composition and structure of the vegetation cover, the number of species there, dominants and edificators, in short, the floristic-geobotanical indicators of the areas were studied, the richness of the flora was recorded according to Druden's[13] 5-point scale.

[12] Əsgərov, A.M. Azərbaycanın bitki aləmi (Ali bitkilər-Embryophyta) /A.M.Əsgərov. –Bakı: TEAS Press, –2016. s.411-443

[13] Drude, O. Über die Prinzipien in der Unterscheidung von Vegetations formationen, erläutert an der erläutern an der zentraleuropäischen Flora // Botanische Jahrbuch. –1890. Bd 11. –p. 21–51.

Along with topographic relative moisture index[14] of plants, the erosion index was also studied.

Phenological observations were made to study the morpho-anatomical characteristics of wormwood species. Samples were taken from stems, leaves and roots (after reaching their full morphological maturity) of plants that exist in natural conditions in the studied area. To study the anatomical structure features of leaf stalks of a number of species, samples were taken from juvenile plants and for this purpose sections were prepared from different parts of the stalk. The prepared anatomical preparations were studied in Biolam C, "MBU-3", "MBU-6", "MBR-1", "MBI-3", as well as the German-made Motic brand XSP 91 06-DN digital (modern microscopes) microscopes. The morphological structure of leaves, stems, roots and other parts was studied under an "MBC-9", "MBC-1" microscope and a binocular magnifying glass. Anatomical and morphological images were taken using XSP 91-06-DN brand monitor microscope and "PA-4", "PA-6" (Abbe system) apparatus.

In order to detect genetic polymorphism of wormwood species, RAPD analysis was used as an express method and as a source of unique locus-specific markers, and cluster analysis was performed.

The compiled maps were developed with QGIS software and the vegetation was decoded using the method of Earth remote sensing.

CHAPTER III. ANALYSIS OF FLORA OF YENIKEND WATER BASIN

3.1. Taxonomic analysis of flora. During the research, 594 species belonging to 5 divisions, 81 families and 316 genera, were identified[15] in the flora of the Samukh district and surrounding areas of the Yenikend reservoir, which constitutes 12.6% of the flora of

[14] Zobeck, T.Scaling up from field to region for wind erosion prediction using a field-scale wind erosion model and GIS/ T. Zobeck, N. Parker, S. Haskell [et al/] // Agriculture, Ecosystems and Environment, -2000. 82, -p.247–259.

[15] Ibadullayeva, S.J., Sadigova, N.I. Flora of the surrounding of the Yenikend reservoir and its analysis// Journal of Life Sciences and Biomedicine. -2022. V 4. (77), n.1. - p. s.68-70.

Azerbaijan.

13 families of angiosperms (Magnoliales) (with 5-26 genera each) in the area flora is dominated by with 207 genera (65.5%) and 395 (66.5%) species. Each of the remaining 68 families was represented by only 1-4 genera (tab. 2).

Among the families with few genera are genera that are of greater importance in a phytocenosis with a larger number of species than others. *Carex* L. genus species which belongs to the family *Cyperaceae* Juss., is the main satellite of the vegetation of the river vicinities, the basin, as well as the Yenikend reservoir. The *Verbascum* L. genus species (4 species) of the family Scrophulariaceae Juss. are noticeable in the area flora throughout the summer, etc.

Table 2

Number dynamics of genera and species by families in the area flora

№	Families	Genera		Species	
		Number	By %	Number	By %
1.	*Asteraceae* Martinov	26	8,22	50	8,12
2.	*Fabaceae* Lindl.	19	6,01	68	11,5
3.	*Brassicaceae* Burnett	23	7,27	31	5,24
4.	*Poaceae* Barnhart	30	9,49	60	10,15
5.	*Caryophyllaceae* Juss.	22	6,96	34	5,75
6.	*Lamiaceae* Martinov	14	4,43	21	3,55
7.	*Rosaceae* Juss.	17	5,37	41	6,93
8.	*Apiaceae* Lindl.	18	5,69	19	3,21
9.	*Boraginaceae* Juss.	11	3,48	16	2,70
10.	*Chenopodiaceae* Vent.	8	2,53	22	3,72
11.	*Ranunculaceae* Juss.	7	2,21	8	1,35
12.	*Polygonaceae* Juss.	5	1,58	12	2,03
13.	*Papaveraceae* Juss.	7	2,21	13	2,19
Total:		207 genera	65,5	395 species	66,5
Remanining 68 families (1-4)		109 genera	34,5	199 species	33,5

In the area flora, 13 genera have 5 or more species, and 4 genera have 10 or more species, which are polymorphic plants (fig. 2).

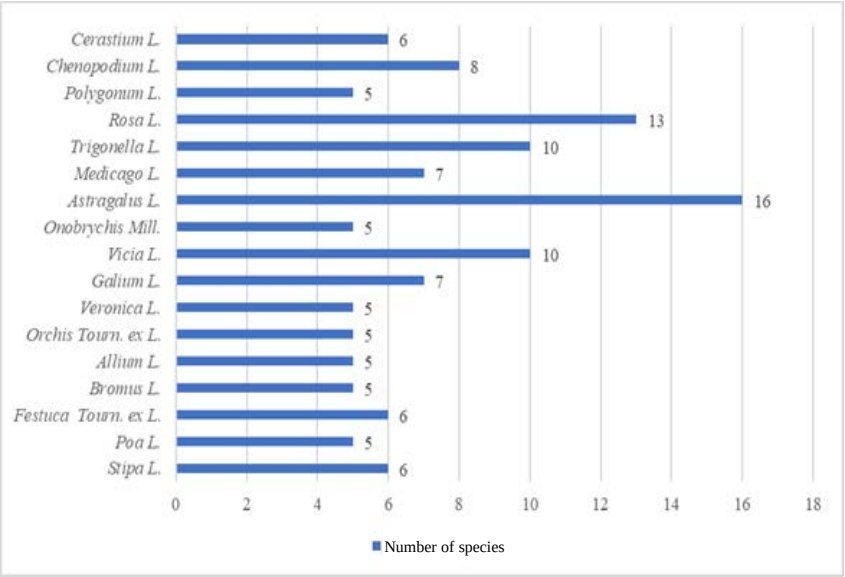


Figure 2. Genera represented by the most species in the area flora

3.2. Biomorphological and ecological analysis of flora. The ecobiomorphological analysis of plants in the flora of the study area was carried out mainly according to the life forms and ecological groups of plants. From the analysis of life forms according to the systems of I.G.Serebryakov and C.R.Raunkiaer, it was found that forbs are widespread in the local flora (fig.3-4).

Taking into account the living conditions of plants with different levels of humidity, the flora of the area was also analyzed by ecological groups (tab. 3).

When analyzing the studied plants by ecological groups, it was found that these plants have different levels of humidity. In the area flora, an important role in the formation of the general flora is played by xerophytes with 281 species (47.3%), xeromesophytes with 92 species (15.84%), mesoxerophytes with 117 species (19,69%) and mesophytes with 96 species (16,16%).

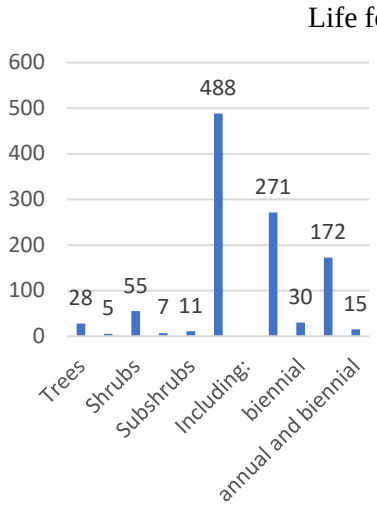


Figure 3. According to Serebryakov (1964)

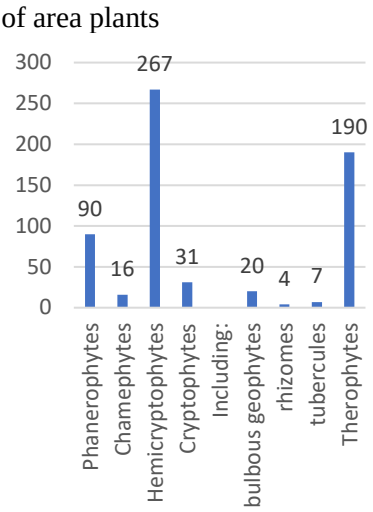


Figure 4. According to Raunkiaer systems (1934)

Table 3.

Ecological groups of area plants according to humidity (Shennikov, 1964)

№	Ecological groups	Species	
		Number	In % of the total number
1.	Xerophytes	281	47,3
2.	Mesoxerophytes	117	19,69
3.	Xeromesophytes	92	15,84
4.	Mesophytes	96	16,16
5.	Hygrophytes	5	0,84
6.	Hydrophytes	1	0,16
Total:		594	100

The northern part of the area is distinguished by rich landscape diversity. This is mainly related to the region's geological structure, rock structure and unique relief features (fig. 5).

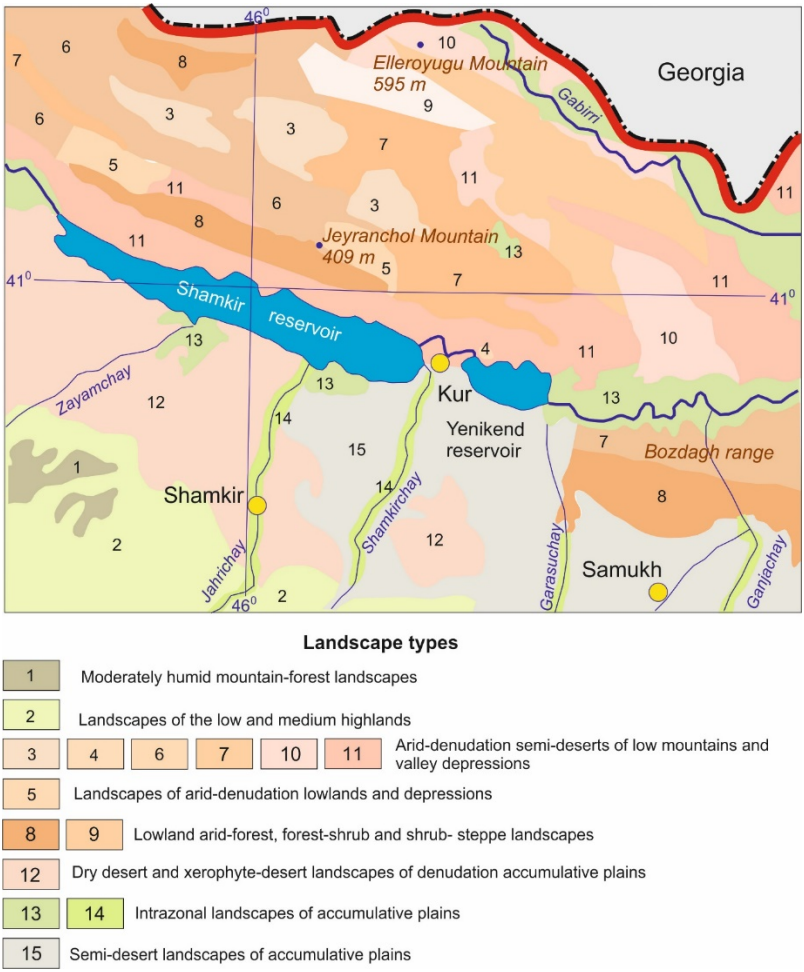


Figure 5. Major landscapes common in the area

According to the structure and richness of flora and vegetation cover, the area is divided into 6 characteristic parts: coastal landscapes with dense tamarix and reedy area; landscapes formed by sparsely scattered perennial and ephemeral plants dominated by the species *Atraphaxis spinosa*; formations consisting of *Pistacia mutica* and other tree-shrub vegetation; various shrubs spread along the course of ditches, valleys and watersheds; remnants of tugai forests;

agrocenoses consisting of vegetable plantations.

3.3. Geographical analysis of flora. By geographically analyzing the species in the flora of the area, 86 classes included in 9 range types were identified (Fig. 4). From the phytogeographical analysis it is clear that in the Yenikend flora the xerophilic and boreal range types are represented by a large number of species. It was found that the flora of the area was composed of species originating from the Caucasus, Anterior Asia, the Mediterranean Sea, Palearctic, Europe, Holarctic and Central Asia.

Table 4.

Geographical range types and classes of Yenikend flora

No.	Range		Species	
	Types	Classes	Number	By number in %
I	Ancient (Tertiary)	5	16	2,7
II	Boreal	25	211	35,5
III	Steppe	9	32	5,4
IV	Xerophil	39	234	39,4
V	Desert	3	9	1,5
VI	Caucasus	3	71	12
VII	Adventive	1	5	0,84
VIII	Cosmopolitan	1	7	1,16
IX	Undetermined		9	1,5
Total:		86	594	100

3.4. Endemic and rare species of the area. As a result of the studies, it was established that the vegetation cover is sharply thinned, the composition of the flora become poor, saline and desertified areas occupy large areas of water sources, forests, shrubs, grazing, hayfields and pastures. Tugai forests, lowland forests and forest thickets, which were once very common along the river, have reached complete extinction. As a result, some plants have undergone physiological changes and adapted to the environment, while some have reached the danger of extinction. Currently, dozens of endangered species in the area are no exception (tab. 5).

Table 5.
Categories and criteria of some rare species included in the "Red Book".

№	Name of taxa	Assessment according to the IUCN Red List (Red Book of RA, 2023)
1.	*Taxus baccata* Thunb.	VU A2c+3c
2.	*Celtis caucasica* Wiild.	NT
3.	*Orchis purpurea* Huds.	EN B2ab(iii,iv)
4.	*Epipactis palustris* (L.) Crantz.	VU B1ab(iii) + 2ab(iii)
5.	*İris caucasica* Hoffm.	NT
6.	*Cachrys microcarpos* Bieb.	VU C2a(i); D2
7.	*Pistacia mutica* Fisch & C.A.Mey	NT
8.	*Scabiosa columbaria* L.	NT
9.	*Stipa caucasica* Schmalh.	EN B2a
10.	*Veronica multifida* L.	CR B2a
11.	*Acantholimon fominii* Kusn.	VU A2ab

When the flora of the area was analyzed, it was determined that there were 14 species of Caucasus and 1 species of Azerbaijan endemic (*Trifolium caucasicum* Tausch.).

CHAPTER IV. ANALYSIS OF THE AREA VEGETATION

4.1. Ecological-geobotanical classification of vegetation. Based on the geobotanical study of the vegetation of the area, 4 types (desert and semi-desert, shrubland, wetland, oasis), 4 formation classes, 8 formation groups, 8 formations and 21 associations were determined. Among the vegetation cover, semi-desert and shrub vegetation are zonal, and others are intrazonal. Their classification was drawn up, their distribution, soil climate conditions, species composition, structure, and the interrelationships between their components were studied, coenosis producers, dominant and subdominant species, as well as edificators and subedificators were determined in the existing types of vegetation[16].

[16] Ibadullayeva, I.J., Sadigova, N.I. Current Vegetation Situation of "YENİ KEND" Reservoir (Azerbaijan Republic) Surroundings //International Journal of Agriculture Innovations and Research. -2016. V.5., i.5. -p.914-916.

Natural vegetation types and anthropogenic objects (agrophytocoenoses and residential areas) were decoded by us during the research (fig.6).

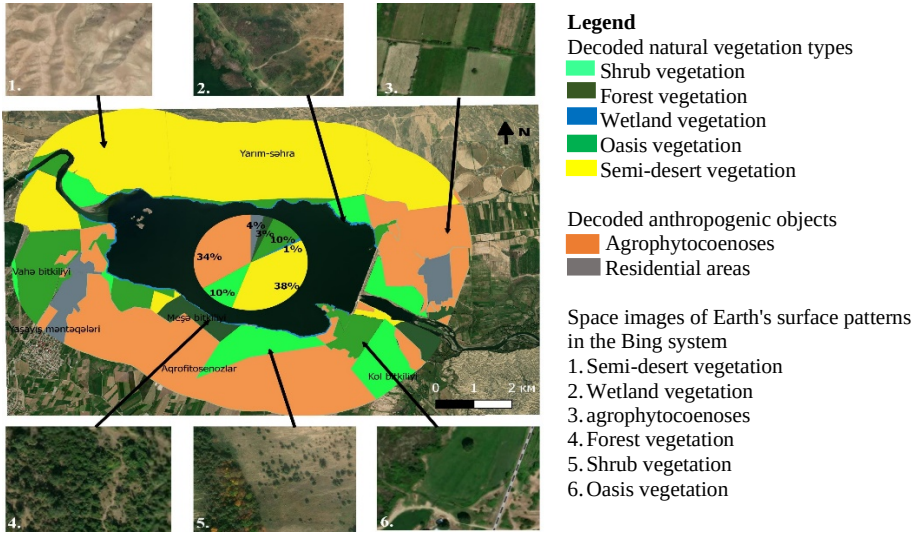


Figure 6. Decoded map-scheme of the buffer zone taken in a radius of 2500 m of Yenikend reservoir basin

For this, a Bing satellite map of the studied area was obtained using SAS.Planet software. During decoding, 5 natural vegetation types were identified: semi-desert vegetation, wetland vegetation, shrub vegetation, oasis vegetation, forest vegetation and 2 anthropogenic objects: agrophytocoenoses and residential areas. The maps obtained by the method of Earth remote sensing were decoded using QGIS software.

The results obtained as a result of decoding are reflected in the table of attributes, respectively (tab.6).

As a result of decoding, it was found that semi-desert vegetation from natural vegetation types, and agrophytocenoses from anthropogenic objects make up 72.22% of the total area of the studied area. Wetland vegetation is located mainly on the shoreline of the reservoir and occupies 0.85% of the total area.

Table 6.

Quantitative indicators of decoded areas according to vegetation types

N	Vegetation types	Area (ha)	Area (%)
1.	Semi-desert vegetation	2548,3670	38,04
2.	Wetland vegetation	56,8254	0,85
3.	Shrub vegetation	701,4291	10,47
4.	Oasis vegetation	669,4918	9,99
5.	Forest vegetation	189,9578	2,84
7.	Residential areas	243,1315	3,63
8.	Agrophytocoenoses	2289,3670	34,18

4.2. Assessment of eroded areas in the study area. It has been established that the main factors causing erosion here are the degree of inclination of the study area, salinity, geostructure, relative topographic moisture and etc. The degree of erosion sensitivity of the area was studied and it was found that, especially in the surroundings of the reservoir, severe erosion is typical due to the increase in water content, and at the same time, as a result of regular irrigation in agricultural fields, the soil has been highly eroded (tab.7).

Table 7.

Susceptibility to Erosion-Index (SEI)

N	Variability	Values	Minimum^0	Maximum^0
1	Angle of inclination a	0, 15, **(30)**, 45, 60	0	60
2	Height	0, 5, **(10),** 15, 20	0	20
3	Angle of inclination b	0-10 **(10)**	0	10
4	Location	0-15-20 **(15)**	0	20
5	Topographic location	0, 5, 10, 15, 20 **(20)**	0	20
6	Ascent form	0, 2, 5, 8, 10 **(10)**	0	10
7	Solid base	0, 20, 40 **(20)**	0	40
Total		Obtained value **115**	0	180^0

The variations on the 7 indicators presented in the table for the surrounding areas of the Yenikend reservoir were taken into account, and based on the collected results, the erosion index was calculated using the following formula:

$$SEI = \frac{\text{the number of values obtained} \times 100}{\text{Total of max.units}}$$

$$SEI = \frac{115}{180} x100 = 64$$

According to the methodology, the value of low danger is 0–33, medium danger is 34–67, and high danger is 68–100. Then, after studying 7 variables in the populations recorded both in the Yenikend reservoir area and in the areas of Samukh district that are constantly used by farms, the fact that erosion is equal to 64 indicates the existence of the maximum limit of the average danger indicator. This situation leads to the destruction of most plant groupings of the area flora.

The maximum values accepted based on the properties and indicators studied are as given below:

- Angle of inclination: max.60
- Height and solid base: together max.30
- Additional TRMI: together max.60

The maximum value of the angle of inclination (a) is 60^0, but in the studied area this indicator was 30, from other indicators, the angle of inclination (b) reached the maximum limit of -10. The topographical location and the solid base are equal to the maximum limit of 200. The total value obtained was equal to 115^0 in the area, while the maximum limit was 180^0. This, in turn, leads to a decrease in the number dynamics of plant individuals and, in some cases, to their complete destruction. As a result, the winter pastures in the surrounding area were completely destroyed, and in their place, eroded gray bare soils were formed. We consider that reserves should be created for the protection of the natural gene pool, and surface improvement measures should be implemented for sowing seeds of valuable forage plants in areas subject to degradation and succession.

Along with the erosion index, the topographic relative moisture index was also studied in the area. According to modern methods, the maximum value of the Topographic Relative Moisture Index (TRMI) is 60, but the value of this indicator in the summer months in this area is quite low. While studying the Topographic Relative Moisture Index (TRMI) it was found that due to the increase of arid areas, reductions

in plant communities have occurred, and at the same time, the formation of alien plants for the area has also been noticed.

CHAPTER V. PHYTOCENOLOGICAL ANALYSIS OF SOME XEROPHYTIC PLANTS AND IDENTIFICATION OF ADAPTATION POSSIBILITIES BY MOLECULAR-ANATOMICAL METHODS

The species *Artemisia fragrans* and *Artemisia szowitziana*, which are the more widespread and adaptive species in Azerbaijan, are distributed in mixed form with other species in arid zones and have mainly xerophytic structure characteristics. The molecular genetic and morphoanatomical characteristics of samples collected from different populations were studied, taking into account both the perspectivity of these species and their adaptation ability to all stress conditions.

5.1. Phytocoenological analysis of *Artemisia fragrans* species common in Azerbaijan and the structure of coenopopulations. In 10 coenopopulations of *A. fragrans* species, calculations were made for different periods of ontogenesis. Mature, young and transitional coenopopulation types of *A. fragrans* were observed. A mature coenopopulation was not found here. It was determined that most of the studied populations belong to the transitional coenopopulation type. It was found that efficiency index (ὠ) was higher in CP II, III and X of the studied coenopopulations. The highest indicator of the age index (Δ) was 0.55 in the coenopopulation IV, and the lowest indicator was 0.19 in the coenopopulation VII. The recovery index (Ib) varied between 0.04 and 0.21.

In coenopopulations 5, 6, 7, 8, 9 and 10 of *A. Fragrans* species, the aging index changed between Ia-0.46-1.44, respectively..

5.2 Phytocoenological analysis of *Artemisia szowitziana* common in Azerbaijan and structure of coenopulations. Coenopopulations in which *Artemisia szowitziana* was recorded were of young, transitional and mature types. In the studied habitats, unlike *A.fragrans*, young and mature coenopopulation types of *A. szowitsiana* species individuals were more common. Young types predominated in coenopopulations I, VI and X, and mature types in

coenopopulations V, VII and IX. The growth rate of individuals was high in coenopopulations VIII, IX and X during the g_1 period, in coenopopulation III during g_2 period and coenopopulations V and VII in g_3 period. In the studied distribution areas of *A.szowitziana* species, mature type CP was not found. This, in turn, can be explained by the fact that subsenile and senile periods are observed less frequently. It was determined that among the studied coenopopulations, the efficiency index (ώ) was higher in CPs III, V and IX. The highest value of the age index (Δ) was found in the coenopopulations V and IX, and the recovery index ($I_в$) in the coenopopulation V.

In the coenopopulations 1, 2, 4 and 6 of *A. szowitziana*, the index of aging varied between Ia-1.2-2.81, respectively.

5.3.Molecular genetic analysis of different populations of *Artemisia szowitziana* and *Artemisia fragrans* species common in Azerbaijan with RAPD markers. In this study, phylogenetic relationships and genetic structure of 10 genotypes of *Artemisia szowitziana* and *Artemisia fragrans* species collected from different regions of Azerbaijan were studied[17] using RAPD samples. A total of 94 amplicons were amplified with selected RAPD markers, among which 3 bands were amplified with OPA-02 marker and 12 bands with OPW-17 marker (Fig. 7).

Among the studied RAPD markers, the highest polymorphism was obtained by OPW-17, OPT-19 and OPT-20 primers and was 100, 90.91 and 90%, respectively (tab. 8). However, the calculated average value of polymorphism based on 10 different RAPD markers was high at 72.79%. The mean PIC value of 0.864 indicated a rich genetic diversity among the studied samples. Multivariate analysis using the Jaccard similarity index and the UPGMA method classified all *Artemisia* samples into 6 main groups. Principal component analysis (PCA) justified 74.22% of the total indicator. Based on the

[17] Sadigova, N. Genetic structure and Moleculyar Analysis of Azerbaijan *Artemisia* L. (*Asteraceae* Giseke) Genus Species/ N. Sadigova, Z. Suleymanova, J. Ojaghı, S. Ibadullayeva [et al.] //International Journal of Secondary Metabolite, -2024. Vol. 11, No. 2, -p. 57-62.

obtained results, a comparison was made between the population of *A. szowitziana* (1-2 and 4-6 samples) and *A. fragrans* (5, 6, 7 and 8, 9, 10 samples).

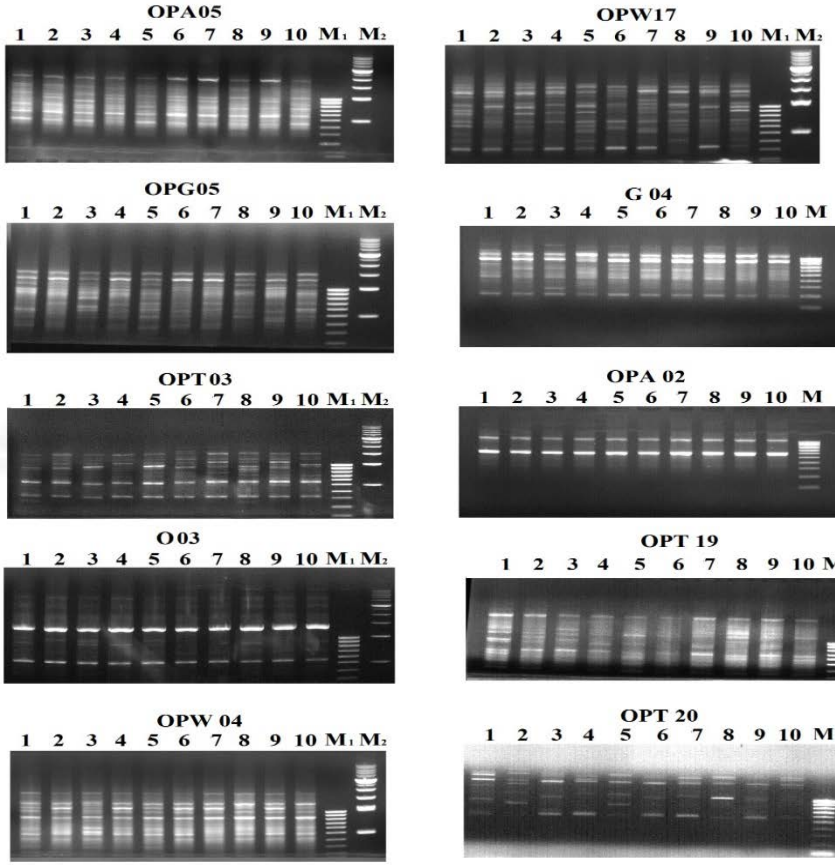


Figure 7. Analysis of DNA fragments amplified by 10 different RAPD primers on chromosomal DNA isolated from different population samples of *Artemisia szowitziana* and *Artemisia fragrans* species common in Azerbaijan in 1% agarose gel. M_1-DNA-marker (100-1000 n.c.); M_2-DNA marker (500-10000n.c.): 1-*A.szowitsiana* (arid area, Shamkir), 2-*A. szowitsiana* (arid area, Shamkir), 3-*A.fragrans* (arid area, Shamkir), 4-*A. szowitsiana* (roadside, Shamkir), 5-*A.fragrans* (water surroundings, Shamkir), 6-*A. szowitsiana* (Tovuz), 7-*A.fragrans* (Tovuz), 8-*A.fragrans* (Mingachevir), 9-*A.fragrans* (Goranboy), 10-*A.fragrans* (Lerik, Talysh).

As a result of the analytical calculations, there were more old individuals in the populations where polymorphism was observed (*A.fragrans* sp-5,6,7,8,9,10; Ia-0,46-1,44; *A.szowitsiana* sp -1,2,4,6; Ia-1,2-2,81). Here, it was determined that molecular genetic diversity is higher in young populations.

Table 8.

Genetic parameters obtained based on RAPD markers

RAPD primers	Sequences (5'-3')	AOF	PFS	PFF	PIC
OPA-05	AGGGGTCTTG	9	5	55.55	0.77
OPW-17	CTCCTGGGTT	12	12	100	0.88
OPG-05	CTGAGACGGA	10	8	80	0.88
G-04	AGCGTGTCTG	9	6	66.67	0.83
OPT-03	TCCACTCCTG	10	7	70	0.88
OPA-02	TGCCGAGCTG	3	1	33.33	0.95
O-03	CTGTTGCTAC	9	7	77.78	0.89
OPT-19	GTCCGTATGG	10	9	90	0.9
OPW-04	CAGAAGCGGA	11	7	63.64	0.77
OPT-20	GACCAATGCC	11	10	90.91	0.89
Total	-	94	72	-	-
Minimum	-	3	1	33.33	0.77
Maximum	-	12	12	100	0.95
Mean value	-	9.4	7.2	72.79	0.864

Note: AOF – the number of amplified DNA fragments (number of bands); PFS – z number of polymorphic g DNA fragments; PFF- share of polymorphic o DNA fragments in M percent; PC- indicates the polymorphic X information content.

In our experiment, high polymorphic information content (PIC) values of 0.95 and 0.9 were observed in OPA-02 and OPT-19 markers. At the same time, the value of PIC quantity calculated in both by O-03 and OPT-20 markers was determined to be 0.89, and the value of PIC quantity calculated by OPW-17, OPG-05 and OPT-03 RAPD markes was determined to be 0.88.

Cluster analysis was performed based on the presence (1) and absence (0) of DNA bands synthesized with each primer, Jaccard genetic similarity index was determined between the studied wormwood genotypes, and using the UPGMA (unweighted VII pair

group # with arithmetic average) method, a dendrogram with a graphical description of the cluster analysis was drawn up (fig. 8). As observed, the cluster analysis classified the studied wormwood samples into 6 main groups.

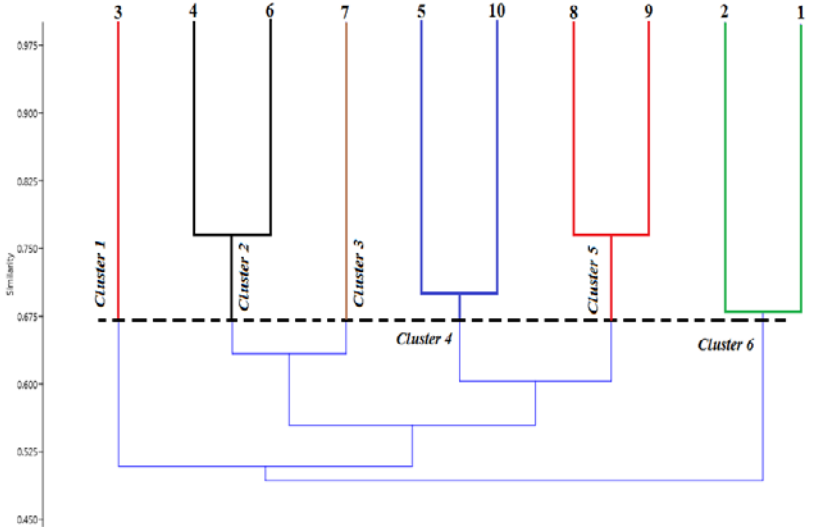


Figure 8. Dendrogram showing the genetic relatedness between samples belonging to different populations of *Artemisia szowitziana* and *A. fragrans*, based on RAPD markers: 1-*A. szowitziana* (arid area, Shamkir), 2-*A. szowitziana* (arid area, Shamkir), 3-*A.fragrans* (arid area, Shamkir), 4-*A. szowitziana* (roadside Shamkir), 5-*A.fragrans* (water surroundings Shamkir), 6-*A. szowitziana* (Tovuz), 7-*A.fragrans* (Tovuz), 8-*A.fragrans* (Mingachevir), 9-*A.fragrans* (Goranboy), 10-*A.fragrans* (Lerik, Talysh)

Looking at the dendrogram, it is clear that the first and third clusters were one group consisting of only one sample each, and the current cluster grouped genotypes numbered 3 (first cluster) and seven (third cluster), respectively. The fact that these two samples are in a separate cluster shows that the current wormwood sample is at a significant genetic distance from the other samples.

In our studies, when analyzing the genetic structure of samples belonging to *Artemisia* genus of Azerbaijan, along with cluster analysis, the principal component analysis method was also used.

During the Principal Components Analysis (PCA), 4 principal components were obtained, which explained 74.22% of the total variation. According to the current analysis, the shares of the first, second, third and fourth components were 26.05, 18.78, 15.87 and 13.51 percent, respectively. The current analysis is also described in a biplot based on two principal components (Figure 9).

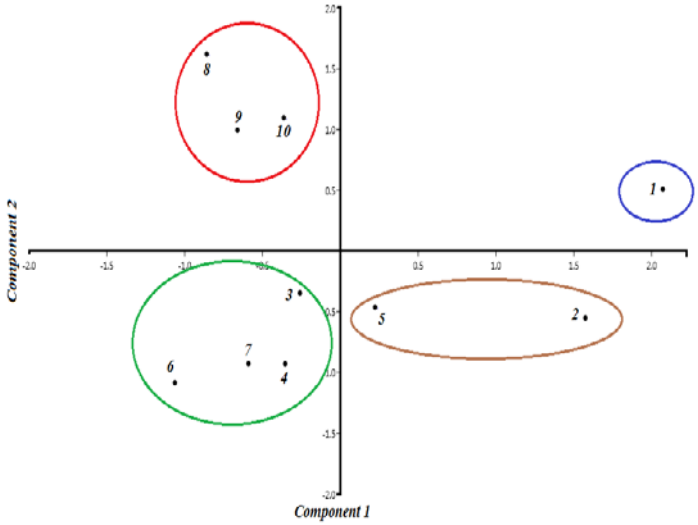


Figure 9. A bioplot constructed based on two main components: 1-*Artemisia szowitziana* (Besser) Grossh. (arid area, Shamkir), 2-*A. szowitziana* (arid area, Shamkir), 3-*A.fragrans* (arid area, Shamkir), 4-*A. szowitziana* (roadside, Shamkir), 5-*A.fragrans* (water surroundings, Shamkir), 6-*A. szowitziana* (Tovuz), 7-*A.fragrans* (Tovuz), 8-*A.fragrans* (Mingachevir), 9-*A.fragrans* (Goranboy), 10-*A.fragrans* (Lerik, Talysh)

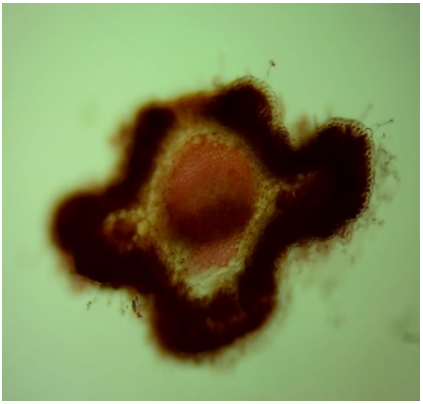
As observed, contrary to the results of cluster analysis, all wormwood samples of Azerbaijani origin included in the study were divided into 4 main groups by analyzing the principal components.

Phytocoenological assessments were carried out in populations of wormwood species collected from different regions of Azerbaijan. Molecular genetic diversity has been found to be greater among populations with high reproductive capacity.

5.4. Morpho-anatomical structural features of *Artemisia*

***fragrans* species.** The roots of the *A. fragrans* species consist of a single-layered rhizodermis and have a thickness of 50 μm. Under the rhizodermis are single-layered exoderm, cortex parenchyma, single-layered endoderm and pericycle. The diameter of the central cylinder is equal to 150 μm. As the plant ages, the parenchymatization of the root base increases; in a 5-6 year old plant, the root base is noticeably divided into particles, since the parenchyma surrounding the wood becomes suberized and disintegrates over time [18].

The stem of juvenile plants consists of a one- and two-axial trichome epidermis, forming a dense bend. These plants produce a ring-shaped cambium and cylindrical wood. Secondary xylem tubes are small in size. At the base of the stem, it is represented by a single-layered hyperdermis, 3-5-layered collenchyma and 5-6-layered cortex parenchyma. In the second year of development, the growth of wood continues, dilatation of radial rays occurs (Fig. 10).



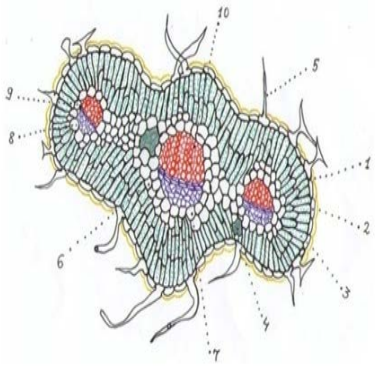


Figure 10. Anatomical structure of the leaf of *Artemisia fragrans* species: 1. Cuticle, 2. Epidermis, 3. Parenchyma, 4. Schizogenous space, 5. Filament, 6. Spongy parenchyma, 7. Covering cells, 8. Phloem, 9. Cambi, 10. Xylem

[18]Sadigova, N.I. Morphoanatomical features of *Artemisia fragrans* species// International Journal of Botany Studies www.botanyjournals.com ISSN: 2455-541X Received: 23-07-2022, Accepted: 08-08-2022, Published: 27-08-2022 Volume 7, Issue 8, 2022, Page No. 44-48.

Leaf stalk - has a partially winged protrusion that is clearly visible in cross-section. Three collateral bundles pass through the leaf stalk. The main vessel is significantly sclerificated. The central veins are few, 6-7. Venetation is loop-shaped.

5.5. Morpho-anatomical structural features of *Artemisia szowitsiana* species. The mesophyll leaves of *Artemisia szowisiana* are amphistomatic, isolateral-palisade type, the upper and lower epidermis contain small-celled palisade tissue[19] (Figure 11). The labiate tissue is composed of homogeneous cells extending along the axis of the leaf. It is here that the second and third row of conducting bundles are located. In thickened epidermal cells of the stem, there are several layers of collenchyma, homogeneous, polygonal and thin-walled cortex parenchyma (Fig. 12).

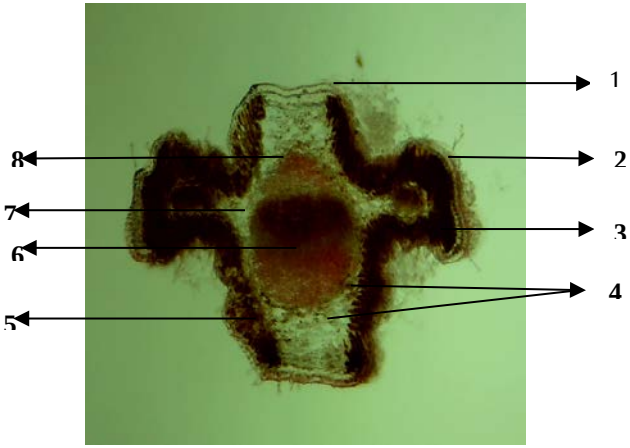


Figure 11. Cross-section of a leaf of *A. szowtsiana*: 1- epidermis, 2- cuticle, 3- septate parenchyma, 4- schizogenous space, 5- fascicular phloem, 6- fascicular cambi, 7- fascicular xylem, 8- spongy parenchyma

Mechanical tissue is alternating. Phloem fibers are found in groups in the phloem. The fringed and non-fringed cambium located between

[19] Садыгова, Н.И. Морфо-анатомическая характеристика *Artemisia szowitsiana* (Besser) Grossh.// Бюллетень науки и практики. -2023. Т.9, №6. -с.67-72.

the bundles of the 3-7th rows of ray parenchyma is clearly visible. Xylem bundles consist of metaxylem and secondary xylem.

Shoot roots are covered with a single-layered rhizoderm, beneath the rhizoderm is a single-layered exoderm, 5-6 rows of cartex parenchyma, endoderm and pericycle.

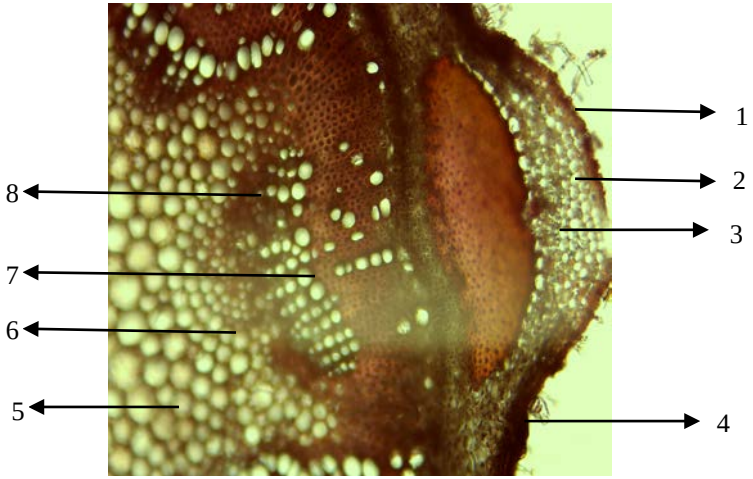


Figure 12. Cross-section of the stem of *A. Szowtsiana*: 1- epidermis, 2- glandular trichome, 3- subepidermal layer, 4- cortex parenchyma, 5- phloem of the conducting bundle, 6- fascicular cambium, 7- xylem of the conducting bundle, 8-core, 9- Casparian strips of the endoderm

The core consists of a central cylinder, diarch transmission system and metaxylem tubes. As the plant ages, the parenchymatization of the root base increases; in a 5-6 year old plant, the root base is noticeably divided into particles, since the parenchyma surrounding the wood becomes suberized and disintegrates over time.

CHAPTER VI. MEASURES FOR THE PROTECTION, IMPROVEMENT AND RESTORATION OF THE VEGETATION COVER OF THE AREA FLORA

6.1. Measures for improving the vegetation cover. The study of the facts causing erosion of vegetation cover and other natural and

anthropogenic factors in the Yenikend reservoir, and the implementation of phytomeliorative measures to restore vegetation cover are one of the pressing issues. Selecting plant species that are suitable for current environmental conditions, have a strong root system and drought resistance is a very important issue for solving these problems. Here it is important to select perspective plants in different fields of the farm for carrying out phytomelorative measures. It has been determined that due to the resistance of the root system of plants, the protective area created on the surface and other features *Festuca sclerophylla* Boiss.ex Bisch., *Poa bulbosa* Steud., *Scorzonera biebersteinii* Lipsch., *Artemisia fragrans* Eichw., *A. Szowitziana* (Besser) Grossh., *A. vulgaris* L., *A. scoparia* Waldst. et Kit., *Oxytropis pilosa* (L.) DC., *Onobrychis cyri* Grossh., *O.transcaucasica* Grossh. and others can be used as phytomeliorants against slope erosion[20].

6.2. Efficient use of vegetation cover. Failure to comply with grazing norms in natural fodder areas, non-implementation of reclamation measures, etc. have reduced productivity. This does not meet the growing livestock demand.

Depending on the natural conditions of the region, there are specific natural fodder areas (hayfields and pastures). Natural fodder plants consisting of drought-loving legumes, gramineous plants and forbs are spread here.

Saltworts are also very important in the fodder base of the basin. Saltworts are common in the saline soils on the slopes and foothills. Since saltwort is close to wormwood in its composition, ephemers and ephemeroids play a big role here.

Thistle growing area belonged to the type of river zonation and was distributed in the saline and brackish soils of the basin. Thistle growing area is often encountered in the form of saline mixed coenoses. Thistle growing area is considered one of the good types of winter pastures

[20] Ibadullayeva, S.J. Recommended Phyto-Ameliorative Restoration of Vegetation in Ganja Surrounding Rivers /S.J.Ibadullayeva, N.Ismayilzade, A.Ismayilov, N.I. Sadigova// International Journal of Advanced Research in Botany (İJARB). -2016. V.2, i.1. - p.6.

and plays a major role in increasing pasture productivity. In these types of pastures, the fodder mass consists of many annual grasses and forbs that are edificator of the coenosis. Thistle, like saltworts, are eagerly eaten by cattle in autumn and early winter.

Xerophytic perennial sod plants are the main component of the phytocenosis in the fescue-steppes of summer pastures. In the composition of fescue phytocoenoses, furrowed fescue or violet fescue, Lesser Caucasus koeleria or slim koeleria, which are considered the main fodder, play a major role as a component.

Thyme-astragal-fescue steppes are widespread formations in the middle mountain belt. When fescue steppes are overgrazed, striated fescue and some similar forage plants gradually decline in the phytocoenosis, and xerophytic elements such as astragal begin to develop in their place.

It should be noted that little attention was paid to the improvement of pastures and hayfields in the area, they were not used properly, and improvement measures were not carried out. Since grazing rules were not properly observed, the composition of forage plants was gradually changing, resulting in reduced quality and productivity. Instead, they were replaced by richly developed jungles with poisonous, toxic, smelly and completely inedible plants that are indicators of unstructured soils.

In addition, timely and improper mowing has led to a decrease in the forage productivity of hayfields. Therefore, for the intensive development of animal husbandry in the region and the constant increase in animal products, it is necessary to create a stable and strong fodder base. This problem can be solved by improving natural forage areas, increasing life cycle, as well as productivity, and regulating their effective use on a scientific basis. Therefore, it is recommended to carry out surface and fundamental improvement works 2-3 months before grazing of the pastures, and to sow seeds of natural and productive fodder plants on pastures that are not good in terms of fodder using various methods, to achieve natural regeneration of some pastures by giving them rest for a certain period of time (primarily areas with damaged forage cover), to use a shifting grazing system, to

apply organic and inorganic fertilizers based on scientific results, to uproot poisonous and noxious plants, which affect the decrease in the forage mass of the pasture and not eaten by animals until the flowering periods and etc.

Phenological observations were made to use the seeds of some fodder plants in the area (Figure 13).

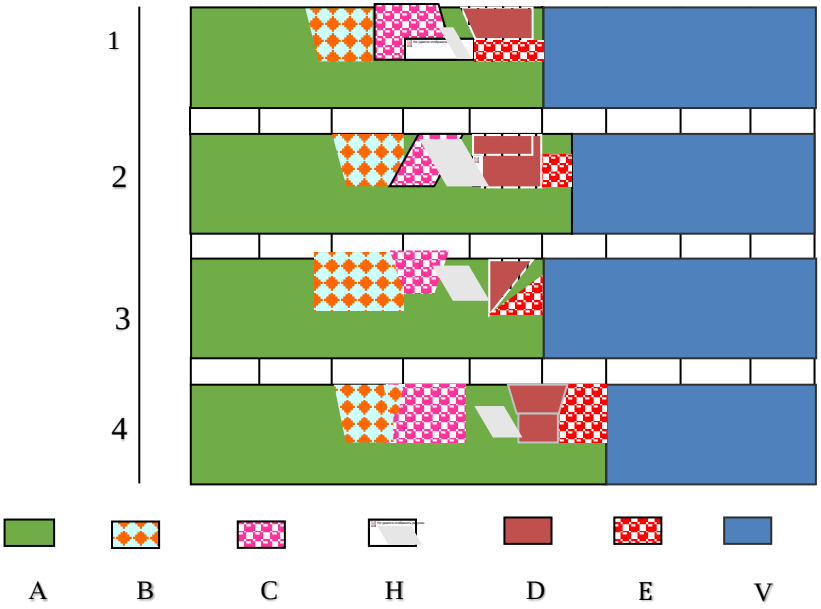


Figure 13. A-vegetation; B-bud formation; C-flowering; H- withering of flowers; D-wax period of fruit; E- full ripening of the fruit; V-release to winter: 1. *Avena persica* Steud.; 2. *Atriplex patula* L. 3. *Bromus squarrosus* L.; 4. *Salsola dendroides* Pall.

RESULTS

1. For the first time, a synopsis of the flora of the Yenikend water basin was drawn up, and it was confirmed that 594 species belonging to 316 genera and 81 families were distributed. Bioecological characteristics of all taxa have been studied.

2. An ecobiomorphological analysis of the flora was carried out, it was found that 44.94% of the total flora in the studied area is

occupied by hemicryptophytes and 31.98% by therophytes. According to their life forms, 45.95% of the total flora are grasses and 9.25% are shrubs. When analyzing the area flora by ecological groups, the life conditions of plant samples with different humidity levels were taken into account and it was found that mesoxerophytes with 117 species make up 19.7%, and xeromesophytes with 92 species make up 15.5% of the total flora. The percentage indicator of hygrophyte species found in the wetland vegetation type in the area was 0.84%, and hydrophytes - 0.16%.

3. By geographically analyzing the species in the flora of the area, 86 classes included in 9 range types were determined. The statuses of rare and endemic species have been determined.

4. According to the geobotanical and ecological study of the vegetation cover of the area, 4 types (semi-desert, shrub, wetland, oasis), 4 formation classes, 8 formation groups, 8 formations and 21 associations were determined. Among the vegetation cover, semi-desert and shrub vegetation are zonal, and others are intrazonal.

5. The presence of high genetic diversity among the samples of wormwood of Azerbaijan origin was revealed by the methods of cluster and principal components analysis based on RAPD markers. The current study showed that molecular analysis of RAPD is very useful for identifying, assessing and differentiating genotypes among population samples of *Artemisia* genera species.

6. As a result of the conducted morphoanatomical studies, a number of characteristic signs of wormwood species were determined. Since there is little humidity in arid zones in summer and autumn, the root develops very intensively in the humid period and passes into the second structure very early. The main reason for this is that the plant completes rhizogenesis in a short period of time. Conducting bundles in the stem are observed with mechanical tissues (collenchyma, sclerenchyma and sclereid cells). This provides mechanical strength and flexibility of wormwoods.

7. For the first time, a route map of the studied area was developed with QGIS software, and and the maps obtained by the method of Earth remote sensing were decoded by means of that software.

PROPOSALS AND RECOMMENDATIONS

1. In order to preserve the natural gene pool, surface improvement measures should be implemented by sowing seeds of valuable fodder plants in areas subject to erosion and succession;

2. It is important to implement comprehensive measures to prevent deterioration and weathering of vegetation and soil cover;

3. Genetic information obtained from molecular studies can be used as valuable genetic material for breeders to enhance future breeding programs.

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

1.Sadıqova, N.İ. *Medicago* L. cinsi növlərinin bioekoloji xüsusiyyətləri və təsərrüfat əhəmiyyəti haqqında// AMEA Botanika İnstitutunun Elmi Əsərləri. -Bakı: -2010. XXX cild. -s.117-120.

2.Ibadullayeva S.J., Movsumova N.V., Askerova N.A. Sadykhova N.I. etc.// Wild plants used on food purposes //ANAS Institute of Botany. "Transactions of the International Conference" -Baku: -2011. -p.47-52.

3.Gasımzade, T.E., Sadigova, N.I. Influence of Erosion process on Vegetation Cover in Shamkir-Yevlakh (Azerbaijan) District// Symposium on euroasian Biodiversity (SEAB), -Antalya: -23-27 may, - 2016. -p.232.

4.Ibadullayeva, S.J. Recommended Phyto-Ameliorative Restoration of Vegetation in Ganja Surrounding Rivers /S.J.Ibadullayeva, N.Ismayilzade, A.Ismayilov, N.I. Sadigova// International Journal of Advanced Research in Botany (İJARB). - 2016. V.2, i.1. - p.6.

5.Ibadullayeva, I.J., Sadigova, N.I. Current Vegetation Situation of "YENİ KEND" Reservoir (Azerbaijan Republic) Surroundings //International Journal of Agriculture Innovations and Research. - 2016. V.5., i.5. -p.914-916.

6.Sadigova, N.I. Determination of Plant Life Activity Indicators on the "Yeni Kend" Water Reservoir// The 4th International symposium on euroasian biodiversity. -Kiev: -2018. -p.350.

7.Sadıqova, N.İ. Yenikənd su anbarı ətrafının yovşanlıq formasiyaları// AMEA Botanika İnstitutu və Botanikllər Cəmiyyəti akademik Vahid Cəlal oğlu Hacıyevin 90 illiyinə həsr edilmiş Konfrans materialları. Bakı: -20-21 iyun, -2018. -s.264-266.

8.Ibadullayeva, S.J., Sadigova, N.I. Flora of the surrounding of the Yenikend reservoir and its analysis// Journal of Life Sciences and Biomedicine. -2022. V 4. (77), n.1. - p. s.68-70.

9.Sadigova, N.I. Morphoanatomical features of *Artemisia fragrans* species// International Journal of Botany Studies www.botanyjournals.com ISSN: 2455-541X Received: 23-07-2022, Accepted: 08-08-2022, Published: 27-08-2022 Volume 7, Issue 8, 2022, Page No. 44-48

10. Садыгова, Н.И. Морфо-анатомическая характеристика *Artemisia szowitsiana* (Besser) Grossh.// Бюллетень науки и практики. -2023. Т.9, №6. -с.67-72.

11. Sadigova, N.I., Yusifov, E.F., Ibadullayeva, S.J. The current state of plant landscapes of the surrounding areas of the Yenikend reservoir// *Plant & Fungal Research,* -2023. v. 6, n. 2, -p. 17-24.

12. Sadigova, N. Genetic structure and Moleculyar Analysis of Azerbaijan *Artemisia* L. (*Asteraceae* Giseke) Genus Species/ N. Sadigova, Z. Suleymanova, J. Ojaghı, S. Ibadullayeva [et al.] //International Journal of Secondary Metabolite, -2024. Vol. 11, No. 2, -p. 57-62.

The defense of dissertation will be held at 11:00 on April 30, 2024 at the meeting of the ED 1.26 Dissertation Council operating at the Institute of Botany of Ministry of Science and Education of the Republic of Azerbaijan

Address: Badamdar highway 40, AZ1004, Baku, Azerbaijan

Dissertation is accessible at the Library of the Institute of Botany of MSE RA.

Electronic versions of dissertation and its abstract are available on the official website of the Institute of Botany of MSE RA (http://www.botany.az).

Abstract was sent to the required addresses on March 29, 2024.

Signed for print: 28.03.2024

Paper format: A5

Volume: 40000

Number of hard copies: 20