REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

BIOECOLOGICAL CHARACTERISTICS AND RESOURCE POTENTIAL OF WILD VEGETABLES SPREADING IN THE BOTANICAL-GEOGRAPHICAL REGIONS OF THE LESSER CAUCASUS (INSIDE AZERBAIJAN)

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INTRODUCTION

The relevance of the topic and degree of elaboration. Ever since mankind became aware of itself, it has started to use wild plants for various purposes. 5,000 species of edible plants are known in the world flora, of which 1,200 species belonging to 78 families are vegetable plants, half of which are wild flora[1]. Wild vegetables are foods that have a unique effect on the human body.

Up to 2000 species of plants are distributed in the territory of the Lesser Caucasus within the borders of Azerbaijan, most of them are useful and widely used in various fields of the national economy. A number of scientific studies have been conducted on the study of the populations and bioecological characteristics of some useful plants used in the region's biodiversity and the application of their traditional use, but these studies have only covered certain species and the western regions of the Lesser Caucasus[2,3]. Other areas were generally not studied because were under Armenian occupation for many years. Some of the wild vegetables have been cultivated and research have been conducted on the cultivation of the species, but the wild vegetables of the region have not been a separate research object so far.

A reliable food supply is one of the main conditions of economic stability and social sustainability. Therefore, appropriate measures are continuously implemented to fully meet the needs of each member of society for basic food products. Thus, on August 25, 2008, the President of the Republic of Azerbaijan approved the "State Program on the reliable supply of food products to the

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[1]Thomas Elias. Edible Wild Plants: A North American Field Guide to Over 200 Natural Foods / Thomas Elias, Peter Dykeman, –Publ.: Union Square & Co., – 2009. – p. 288.

[2]Babakishiyeva, T. "Rare plants of Ganja-Kazakh region"/ T. Babakishiyeva, S.C. Ibadullayeva, - Ganja: - 2021. - p. 225 p.

[3] Novruzov, V.S., Bayramova, A.A., Tagiyeva, Z.I. The Role of The Specially Protected Natural Territories of The Small Caucasus In the Protection of Ancient Relics // Journal of Multidisciplinary Engineering Science and Technology, – 2019. – Vol. 6, – Issue 3, – p.9597-9599.

population in the Republic of Azerbaijan in 2008-2015"[4]. One of the main directions of this program is the protection, maintenance and use of biodiversity, enrichment of the national gene pool. Wild vegetables have a special place among the tasks arising from the program.

The economic crisis in the world market, as well as the increase in the population's demand for food products, etc during the pandemic. Due to these reasons, even in advanced countries, food shortages have threatened people. On the other hand, due to famine in some countries, one in six people goes to bed hungry or eats only once a day. Taking this into account, in recent times, in order to partially eliminate the problem, world scientists are studying ethnobotanical research and the modern application of vegetables and medicinal plants spread in the wild flora, and new proposals for their use are put forward. Massive scientific research works are being conducted in these directions, which is of interest even today due to its relevance[5].

Vegetables, medicinal, technical, and generally plants rich in biologically active substances can be considered as a source of raw materials in the flora of LC. Taking into account that two of the botanical-geographical regions of the LC have been invaded and looted for nearly 30 years, in this regard, to study the current state of wild vegetables that are eaten or used as a food supplement in the flora biodiversity of the area, and to investigate new possibilities and ways of their traditional use is very important. It is one of the most urgent and important issues of the day to carry out research of great economic, social and political importance in order to increase the

[4] Decree on the approval of the "State Program on the reliable supply of food products to the population in the Republic of Azerbaijan in 2008-2015" // Approved by the Decree of the President of the Republic of Azerbaijan dated August 25, 2008, - Baku: Law, -25 August, - 2008. - No. 3004

[5] Sytar, O. COVID-19 Prophylaxis Efforts Based on Natural Antiviral Plant Extracts and Their Compounds / O. Sytar, M. Brestic, S.Hajihashemi [et al.] // Molecules, – 2021. –26, – 727. https://doi.org/10.3390/molecules26030727.

production of wild vegetables, restore valuable, productive local rare plants that are being forgotten and disappear, and provide the population with uninterrupted vegetable products. Thus, by restoring our locally valuable wild plants, whose names have been changed, especially in the territory of Karabakh, we will return their historical names and glory, and we will prevent Armenians from appropriating the names of our vegetable plants. The above-mentioned State Program has set specific tasks before us. This is also a valuable contribution to the reliable, continuous supply of vegetable products to the population, the training of qualified personnel and the development of the non-oil sector.

In order to provide the population with ecologically pure and clean vegetable products, as well as to improve their material well-being, to protect the biodiversity of the flora, to study the flora of the LC in depth for its effective use, to identify its useful plants, to protect rare and endangered wild vegetables of great importance, to restore the gene pool and discovering new uses is very important. At the same time, it is one of our main priorities to instill the possibility of using wild vegetables by refreshing the memory of the younger generations during the "Great Return". In particular, there is a great need to develop a scientific basis for the correct use of wild and cultivated vegetable plants in the area. Considering all this, the research work was carried out in the following directions.

The object and subject of the research. The main object of the research was wild vegetables common in the botanical-geographical regions of the Lesser Caucasus. The purpose of re-delivering information about the wild vegetables of our liberated territories to the population returning to their villages has been carried out.

Purpose and objectives of the research. The main purpose of the research work is to analyze taxonomically, areologically, phytocenologically, morpho-anatomically and ethnobotanically, and evaluate the resources and economic importance of wild vegetable plants distributed in the administrative regions of the Lesser Caucasus. To realize this, the following tasks have been set.

- Analysis of the taxonomic composition of wild vegetable plants distributed in the territory of the LC;
- Study of biomorphological, comparative-anatomical and ecological characteristics of species;
- Study of the regularity of distribution of wild vegetable plants;
- Study of the population structure of wild vegetable plants;
- Monitoring, introduction, restoration of the gene pool of rare and endangered species;
- Calculation of resource assessments of wild vegetable plants, development of commodity characteristics and economic efficiency.
- Preparation of proposals for the preservation and efficient use of economically important species.

Research methods. Identification of species is based on herbarium funds, fundamental flora, naming of taxa was carried out in accordance with the International nomenclature code. Life forms, phenological observations, floristic-geobotanical indicators, an abundance of plants, and areological studies were carried out with reference to classical and modern methods. During the conducted expeditions, the cenopopulations of some species were evaluated, a discrete description of ontogeny, age and efficiency index was studied. The protection status of rare species is given according to the "Red Data Book" criteria and the "Red Books" of Azerbaijan. Cultivation of promising and endangered species was recommended to protect the gene pool, and biological resources were calculated using the generally accepted methodology.

Presented arguments for the defense:

- Analyzing wild vegetables by ethnobotanical methods and restoring their local names provides a basis for enriching information about the beneficial properties of vegetation, which is our natural resource;
- The presence of high resource potential of vegetable plants in the flora of the LC is important in terms of ensuring food safety and increasing economic efficiency;

➢ Recommendations regarding the organization of natural restoration and cultivation of rare and endemic species are an important conditions for the preservation of the plant gene pool.

Scientific novelty of the research. For the first time, a systematic overview of wild vegetable plants distributed in the flora of the LC was compiled, and it was determined that 152 species belonging to 120 genus, united in 3 classes, 12 semi-classes, 25 superorders, 36 orders, and 42 families are distributed as a result of the conducted research. The morpho-anatomical structural features of controversial species have been studied. 32 plants have abundant resources and their perspective of use is multifaceted is clear from the study of bioecological characteristics. Cenopopulations of some species were evaluated, and phytocenological studies were carried out. *Amaranthus albus* L., *Tragapogon gramminifolius* L., *Crocus speciosus* Bieb. and *Eremurus spectabilis* Bieb. species were recorded for the first time in the area. The species composition and varieties of commercial wild vegetable plants were determined and the economic efficiency of priority plants was studied.

Theoretical and practical significance of the research. The results of scientific research can be used for food safety and the reliable provision of food products to the population. The supply of wild vegetable plants for commercial purposes can be implemented, mini-markets can be created in areas with abundant resources, and for consumption, it is advisable to create small markets and national kitchens in central cities. The research materials can be used in the writing of the "Encyclopedia of Useful Plants" and in the preparation of the new edition of "Flora of Azerbaijan".

Approbation and application. The main provisions of the dissertation work are international - SEAB 2021, The 5th Symposium on EuroAsian Biodiversity, Almaty - Kazakhstan, Muğla - Turkey: July 1-3, 2021;

local - "New challenges in botanical research", conference material dedicated to the 90th anniversary of Acad.V.C.Hajiyev of ANAS, IB and SB, - Baku: 2018; Materials of the Republican scientific-practical conference dedicated to the 90th anniversary of

Academician J.Aliyev, - Ganja: 2018; Materials of the conference "Main problems of UTECA University rating issues"; It was discussed at the ASAU general meeting and at the scientific seminar of the Institute of Botany of MSE of AR.

11 papers containing the main sections of the dissertation (3 of them abroad, 7 by a single author) and 4 abstracts (1 abroad) were published.

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. The dissertation is 227 pages with computer writing, consisting of an introduction, 6 chapters, a conclusion, production proposals, appendices and 210 bibliographies (including 129 foreign bibliographies), totaling two hundred and seventy-six thousand seven hundred and fifty-three marks (introduction - 9201 marks, chapter I - 21645 marks, chapter II - 13798 marks, chapter III - 57599 marks, chapter IV - 102579 marks, chapter V - 28381 marks, chapter VI - 36208 marks, results - 3710 marks, suggestions and recommendations - 590 signs). The work is enriched with 26 tables, 26 pictures and 1 map-scheme. In the appendices, the analysis of vegetable crops distributed in LC is given.

CHAPTER I. LITERATURE REVIEW: ETHNIC AND MODERN METHODS OF STUDYING WILD VEGETABLE PLANTS

One of the ways to strengthen the economic and social structure of the Republic of Azerbaijan is the purposeful use of resources and natural resources, including important plants. Therefore, different types of useful plants should be investigated and the extent and ways of their use by different ethnic groups not only as vegetables but also in other fields should be studied.

A brief comment on local and world literature containing the basics of ethnobotany and the use of wild vegetables is given, and

their similar and comparative aspects are explained in this chapter of the dissertation.

CHAPTER II. MATERIAL AND METHODOLOGY OF THE RESEARCH

The research work was devoted to the study of the biodiversity of wild vegetable plants distributed in the botanical-geographical regions of the Lesser Caucasus. For this purpose, in the spring, summer and autumn seasons of 2018-2021, short and long-term expeditions were made on 29 routes, and more than 100 materials were collected. Research were carried out by semi-stationary and stationary methods, more than 20 geobotanical notes on the structure of phytocenoses were taken, and photos of associations and formations created by individual species were taken. Herbariums of all collected species were prepared and handed over to the herbarium of the Azerbaijan State Agrarian University, and the identical forms of the herbariums of the genus and species of new areas for the flora of the territory were handed over to the Herbarium of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan. Species to the fundamental flora of Azerbaijan; nomenclature of taxa is done with reference to APG IV, "WFO" system. Life forms were assigned to Raunkier (1934) and Serebryakov (1964), phenological observations to Lapina (1975) and Beideman, floristic-geobotanical indicators to Kamelin (1973) and Kapten (1983),, and abundance to Grossheim (1929, 1932). Vegetation classification was carried out based on ecological-phytocenological and dominance principles widely used in modern geobotany. Areological studies were carried out according to Kuznetsov (1902) and Portenier (2000) classifications. Cenopopulations of some species were evaluated, discrete descriptions of ontogeny, age and efficiency index were studied[6]. Biological resources were carried out using the generally accepted

[6]Uranov, A.A. Age spectrum of phytocenopopulations as a function of time and energy wave processes // Biol. Sciences. –1975. n.2, -c. 7–34.

methodology[7]. The consensus factor, use value, and cultural importance index of the data were evaluated based on the surveys during the ethnobotanical studies. The degree of similarity of the taxonomic composition compared for the groups was calculated using the Serensen-Chekanovsky formula (Ksc=a+b/2c).

CHAPTER III. TAXONOMIC ANALYSIS, BIOMORPHOLOGICAL CHARACTERISTICS AND FLORAGENESIS OF WILD VEGETABLE PLANTS OF THE LESSER CAUCASUS FLORA

3.1. Taxonomic spectrum of wild vegetable plants. For the first time, a taxonomic analysis of wild vegetable plants common in the botanical-geographical regions of the Lesser Caucasus was conducted[8] (table 1) . Wild vegetable plants are united in three classes (*Equisetopsida*, *Magnoliopsida*, and *Liliopsida*) has been found. *Equisetopsida* with one order, one family, one genus and one species, *Magnoliopsida* - 102 genus (86%), 125 species (86%), 26 families (63%), 21 orders (60%), 18 sub-orders (72%) , 8 subclasses (67%) and Liliaceae represented by 4 subclasses (33%), 7 superorders (28%), 14 orders (40%), 15 families (37%) in 17 genus (14%), 26 species (17%).

By families, the *Asteraceae* family has 20 genus (17%), with 23 species (15.3%), the *Apiaceae* family with 14 genus (12%), with 19 species (13%), *Brassicaceae* with 14 genus (12%), with 15 species (10%), *Lamiaceae* 11 genus (9.2%), 12 species (8%), *Polygonaceae* family 5 genus (4.2%), 11 species (7.4%), *Fabaceae* family 6 genus (5%), 6 species (4%), *Rosaceae* family 4 genus (3.6%), 5 species (3.3%) occupy the main place. The rest of the families consist of 1-3 genus and make up 37%.

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[7]Budantsev, A.L. Resource studies of medicinal plants: Methodological guide to industrial practice for students of the Faculty of Pharmacy / A.L. Budantsev, N.P. Kharitonova, Ed. G.P. Yakovleva, - St. Peters.: SPKhFA Publ.House, - 2003. - 86 p.

[8]Kurbanova, L.Z. Taxonomic, ecobiomorphological and areological analysis of wild vegetable plants of the Lesser Caucasus flora // Bulletin of Science and Practice, - 2021. V.7, No. 5, - p.52-60.

Table 1. The systematic structure of wild vegetable plants in the flora of the Lesser Caucasus

№	Department and class	Subclasses		Suborder		Order	
		Number	%	Number	%	Number	%
1.	*Magnoliophyta*	12	100	25	100	35	100
a	*Magnoliopsida*	8	67	18	72	21	60
b	*Liliopsida*	4	33	7	28	14	40
2.	*Equisetophyta*	-	-	-	-	1	100
a	*Equisetopsida*	-	-	-	-	1	100
Total:		12	100	25	100	36	100
№	Department and class	Family		Genus		Species	
		number	%	number	%	number	%
1.	*Magnoliophyta*	41	100	119	100	151	100
a	*Magnoliopsida*	26	63	102	86	125	83
b	*Liliopsida*	15	37	17	14	26	17
2.	*Equisetophyta*	1	100	1	100	1	100
a	*Equisetopsida*	1	100	1	100	1	100
Total:		42	100	120	100	152	100

3.2. Ecobiomorphological analysis and florogenesis of wild vegetable plants. The analysis of the main life forms of wild vegetable plants in the flora of the botanical-geographical regions of the Lesser Caucasus was carried out based on the classification system of I.G.Serebryakov and J.Raunkier. Ecological-cenotic, morphological regularities should be taken as the basis for determining the life forms of plants according to I.G. Serebryakov (Fig. 1). As can be seen, in this classification, perennial grasses are superior to other forms with 99 species (65.13%), biennials 14 species (9.21%) and annuals 31 species (20.39%). Classification of life forms of plants based on the principle of the placement and renewal of cells was arranged according to the Raunkier system (Fig. 2).

Classification of life forms of wild vegetable plants

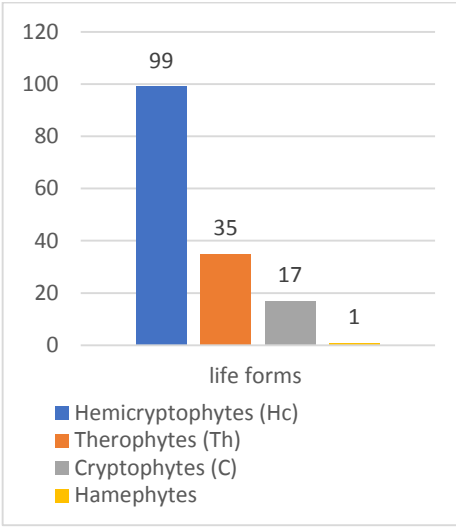

Figure 1. According to the Raunkier system

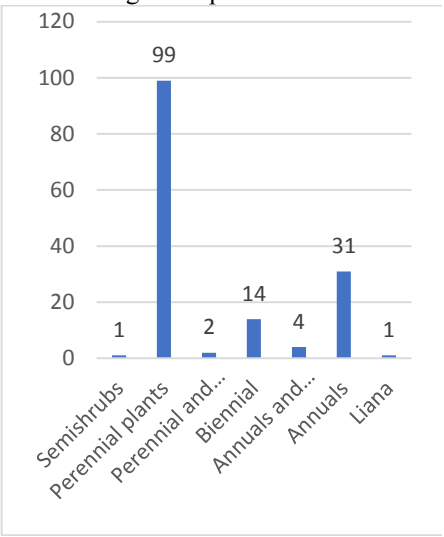

Figure 2. According to Serebryakov's system

Wild vegetables belonging to hemicryptophytes are represented by 99 species (65.13%), therophytes by 35 species (23.04%), cryptophytes by 17 species (11.18%), chamephytes by 1 species in the local flora.

Some of the polycarp grass plants have acquired various adaptation signs in the root system or in the structure of some above-ground organs and have adapted very well to the conditions they live in. In general, these plants are divided into groups of taproots, rhizomes, bulbs, succulents, vines, etc., according to the characteristics of their underground and aboveground organs and the signs of adaptation.

Adaptation of plants to habitats with different degrees of humidity, acquired characteristics due to adaptation separate them into different ecological groups. Plants are divided into three major ecological types, which include hygrophytes, mesophytes, and xerophytes according to their relationship with water. Ecological types of wild vegetables in the local flora are shown in Table 2.

Table 2. Ecological groups of wild vegetable plants in the botanical-geographic regions of the LC (Shennikov, 1964)

№	Ecological groups	Number of species	In % of the total number
1	Xerophytes	40	26,31
2	Mesoxerophytes	49	32,23
3	Mesophytes	51	33,55
4	Xeromesophytes	7	4,63
5	Mesohydrophytes	2	1,31
6	Hydrophytes and hygrophytes	3	1,97
Total		152	100

Mesophytic plants (51 species or 33.55%) of wild vegetables in the area are superior to other plants as can be seen from the table. These plants are mainly distributed in forests, bushes, subalpine and alpine meadows. Mesoxerophytes are 49 species and 32.23% of the total flora, xerophytes are 40 species and 26.31% of the total flora. There are few wild vegetable plants in other ecological groups.

One of the important issues in modern times is the preparation of the historical and botanical geographic systems of plants, the analysis of the genesis and distribution of species, and the specification of areal types of species. The areal type of the species reflects the relationship between the flora of the studied region and the flora of large areas surrounding this region, allowing us to determine the migration routes of the species from a historical point of view.

The history of the mountain ranges of the LC area shows that the processes of mountain formation in the Tertiary period caused the nature of this region to have a number of common features with the nature of Iran and Anterior Asia since ancient times and at the present time. Therefore, the plants of the territory are close to the plants of Anterior Asia in terms of their genesis, structure and formation.

9 species of wild vegetable plants belong to Caucasian species, which make up 5.91% of wild vegetable plants. In addition, desert,

steppe, unknown, adventive, cosmopolitan areal types were represented by a small number of species. Palearctic (35 species or 23.02%), Mediterranean xerophilic elements (23 species or 15.1%), Iranian and Anterior Asia elements prevailed in terms of geographical classes. There are 63 species of xerophilic plants that make up 41.44% of the wild vegetable plants, of which 10 species (6.5%) are from Anterior Asia, 23 species (15.1%) are from the Mediterranean and 1 species (0.65%) belongs to Central Asian elements. The steppe area type, characterized under the name of the Pontic flora province, includes the areas of species that are distributed in the vast steppe area, extending from the southeastern part of Europe to North Kazakhstan and South Siberia. This type includes 2 types of plants among the wild vegetable plants, which make up 1.3% of the wild vegetable plants. 2 species of vegetable plants spread in the area - *Crocus speciosus* Bieb. - Beautiful saffron, *Eremurus spectabillis* Bieb. - Prominent chiris is included in the Red list of Azerbaijan. The *Crocus speciosus* species and *Eremurus spectabillis* are indicated by us for the first time in the region.

3.3. Morpho-anatomical features of some wild vegetable plants. *Eremurus spectabilis* M.Bieb., *Alliaria petiolata* (M.Bieb.) Cavara & Grande, *Sinapis arvensis* L. and *Asparagus polyphyllus* Steven (=*A.officinalis* L.) were studied morpho-anatomically in the local flora [9, 10].

Xylem rays of *Eremurus spectabilis* are polyarch type (Fig. 3). Each beam has 4-5 water pipes. Phloem is located in the form of islands between xylem rays. Phloem (cells) are weakly developed and are composed of small, polygonal cells with thin sheaths. The formation of a double-layered transmission ball with parallel lines in the mesophyll, the location of the nozzles on both surfaces, the

[9]Gurbanova, L.Z. Morpho-anatomical analysis of Cholkhardali (*Sinapis arvensis*) plant // – Ganja: ANAS Ganja Brunch Proceeding Collection, – 2019, – №2(76), – pp. 10-15.

[10] Gurbanova, L.Z. Bioecological and morpho-anatomical characteristics of garlic (*Alliaria petiolata*) species //– Ganja: UTECA Scientific news collection, – 2021.– No. 3, – p.150-157.

strong development of the spongy parenchyma in the anatomical structure of the leaf, as well as the strong development of the absorbent parenchyma in the anatomical structure of the root, the single-layer endoderm, the polyarch type of xylem rays, etc. are characteristic only for that species and is of diagnostic importance[11].

Constant signs (strong development of the transmitting tissue and the main parenchyma, accumulation of substances in the form of reserves, etc.) were recorded for the first time in the *Alliaria petiolata* species (Fig. 4).

Anatomical structure of plant roots

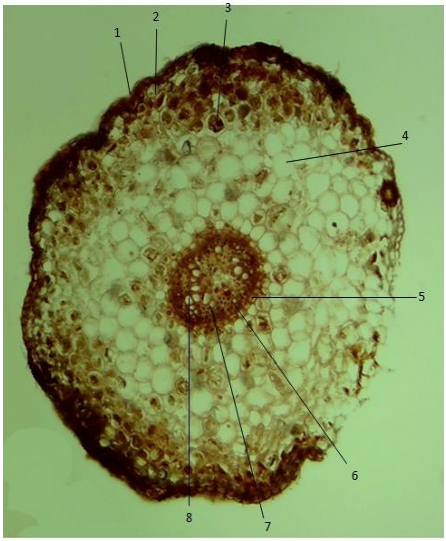

Figure 3. ***Eremurus spectabilis***
1-epiblem, 2-exoderm, 3-eremuran polysaccharide, 4-mesoderm, 5-endoderm, 6-periscle, 7-phloem, 8-xylem

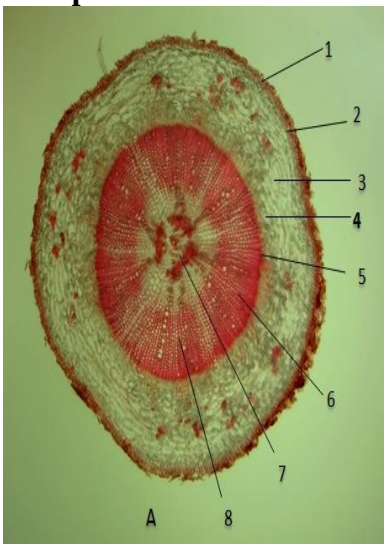

Figure 4. ***Alliaria petiolata***
1-rubbed epiblem cells, 2-periderm, 3-bark parenchyma, 4-phloem, 5-cambium, 6- xylem, 7- xylem trace I, 8- core rays

[11] Gurbanova, L.Z. Microscopic analysis of constant and different anatomical structural indicators of the *Eremurus spectabilis* species // UTECA Scientific news collection, - Ganja: - 2021. №4, - p.108-114.

Dorsoventral structure of the mesophyll, the thickening of the outer sheaths of the cuticle and skin cells, and the presence of the nozzles only on the lower surface of the leaf is characterized in the anatomical structure of the leaf. The balls are sparsely arranged in the stem. Balls are collateral type. Their number is 12-14 pieces. The number of water pipes in the ball varies from 3 to 25 pieces. Studies have shown that in the central part of the stem, a hollow stem is formed as a result of the general process of cell tension and growth.

Chlorenchyma consisting of 1-2 layers has developed from the cuticle to the inside in *Sinapis arvensis* species. The strong development of the main parenchyma in the stem attracts attention at first glance. These cells are densely packed with a circular shape. One large main ball is formed in the part directed to the lower part of the stem, and 8 balls are formed in the part directed to the upper surface. The shell part is larger than the central cylinder (Fig. 5).

A trace of the pericycle is visible. Phloem and xylem alternate. There are primary tubes and neighboring cells in the phloem. The well-developed parenchyma cells of the root found in the anatomical structure of the species, the large number of transmitting balls in the root, the large number of spaces between cells, and the fact that the central cylinder in the cross-section of the root occupies less space than the shell part were evaluated as the characteristics gained by the species in evolution.

Parenchyma elements in the root of the *Asparagus polyphyllus* (=*A.officinalis*) plant and the reserve nutrients collected there are almost 2 times more than other species was determined as a result of anatomical studies (Fig. 6). Not only the absorbing zone of the root but also the transmission zone, the cells of the endoderm remained alive was determined during the analysis. The amount of these substances in the root increases mainly in the winter season after the above-ground part of the plant dries up. The transmission balls are determined to penetrate deep into the stem from the leaf in the stem of the plant.

Anatomical structure of plant roots

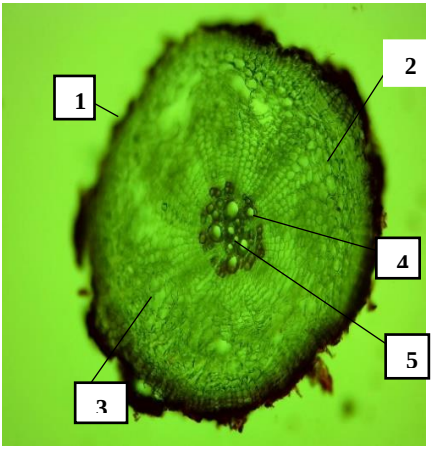

Figure 5.*Sinapis arvensis*
1- epiblem, 2- exoderm,
3- mesoderm, 4-phloem, 5-xylem

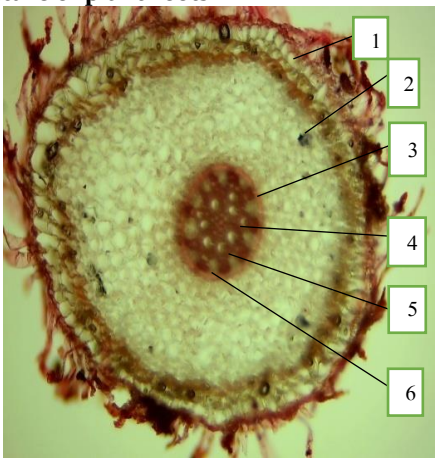

Figure 6. *Asparagus polyphyllus*
1-epiblem, 2-mesoderm, 3-endoderm,
4-pericycle, 5-xylem, 6-phloem

This type of comparative morpho-anatomical study were carried out in all organs of all four plants.

CHAPTER IV. MORPHOLOGICAL CHARACTERISTICS, DISTRIBUTION AND UTILIZATION PERSPECTIVES OF WILD VEGETABLE PLANTS

One of the ways to strengthen the economic and social structure of our republic is the efficient and purposeful use of natural resources and resources, including useful plants. Therefore, different types of useful plants were investigated and it was found that they can be used not only as vegetables but also in other fields. Some of the vegetables are medicinal (*Tussilago farfara, Thalictrum minus, Capparis herbacea, Ononis arvensis, Arum rupicola, Urtica dioica, Plantago major, Malva sylvestris* and etc.), essential oil (*Mentha aquatica, Achillea tenuifolia, Chaerophyllum bulbosum, Heracleum trachyloma* and etc.), technical (*Eremurus spectabilis* and etc.), yem (*Lathyrus miniatus, Polygonum aviculare, Tragopogon graminifolius, T. leptophylla, Scorzonera latifolia, Capsella bursa-pastoris, Heracleum pastinacifolium* and etc.), spice (*Daucus carota,*

Mentha longifolia, Crocus speciosus, Bifora radians, Satureja hortensis, Ziziphora tenuior and etc.) plants. Some species are of particular importance as additives in the food industry.

4.1. Biomorphological analysis of wild vegetable plants. The families with the most species of wild vegetable plants in the botanical-geographical regions of the Lesser Caucasus have been determined. The distribution and use of each species have been studied and extensively explained in the dissertation.

4.2. The role of wild vegetable plants in vegetation. Wild vegetables are distributed in various vegetation types in the botanical-geographical regions of the Lesser Caucasus, including in the Karabakh zone. Some of them are satellites of plant associations: belonging to meadow vegetation - grasses and sedges (small grasses); grass steppes (species of *Festuca* L., *Dactylis* L., *Alopecurus* L., *Trifolium* L., *Lathyrus* L. genus); swampy meadows (*Typha angustifolia* L., *Sparganium* L., *Phragmites australis* (Cav.) Trin.ex Steud. and so on); forests (*Fagus orientalis* Lipsky, *Quercus iberica* Stev., *Fraxinus caucasica* və s. meşə ağacları altında*)*; shrubs (among the bushes *Paliurus spina-christa* Mill., *Amygdalus* L., *Spigaea* L., *Crataegus* L., *Rosa* L., *Juniperus* L.) and elements of Tugai forests (both shrubs and wild vegetables forming botanical groups with motley grass-cereals); steppes - among cultivated plants restored in place of mountain steppe vegetation; stipa-festuca-mat grass-motley grasses and thyme steppes, thorn-sprouts, dry steppes with cereals and motley grass and mountain grass-like steppes with leguminous-motley grass steppes (*Bothriochloa, Glycyrrhiza, Alhagi, Artemisia* in mixed phytocenoses formed by species of genus); deserts and semi-deserts - a mixture of useless sedges, deserts dominated by halostachys grass, and restored agrophytocenoses can be found in the place of wormwood-phryganoid, wormwood-sedge, thicket-meadow vegetation.

The territory creates a vertical zonation starting from the bottom to the alpine and consists of 6 zones. According to the conducted

studies, 67 species of wild vegetable plants were found in the plains and semi-deserts, 101 in the foothills and low highlands, 113 in the middle highlands, 40 in the high highlands, 33 in the subalpine, and 10 in the alpine zone. There are 24 species of wild vegetable plants in one zone, 41 in two zones, 58 in three zones, 7 in four zones, and 11 in five zones. The similarity coefficient of the belts was calculated and reflected in Table 3. The degree of similarity of the distribution of vegetable plants in the zones was higher in the subalpine, alpine and the plain compared to the middle highlands: K_{sc}=0.48; 0.45; 0.37. The main reason for this is the mountainous part of the area, where forest-bush, mountain xerophyte and grass plants are widespread. Also, in semi-deserts and plains, vegetable crops dominate with 12.8%, which is reflected in the similarity coefficient of the plain with the average highlands - 0.45.

Table 3. Similarity coefficient of floristic composition compared by zones

Belts	Plains	Foothills	Low mountain	Middle mountain	High mountain	Subalpine	Alps
Plains	-	0,09	0,22	0,45	0,09	0,10	-
Foothills		-	0,02	0,04	0,01	0,03	-
Low mountain			-	0,37	0,09	0,06	0,01
Middle highlands				-	0,02	0,10	0,01
High mountain					-	0,10	0,07
Subalpine						-	0,48
Alps							-

CHAPTER V. RESEARCH AND RESOURCE POTENTIAL OF CENOPOPULATIONS OF SOME WILD VEGETABLE PLANTS

5.1. Survey of cenopopulations of some important species. Phytocenological features of the *Zizifora tenuior* L., *Mentha longifolia* (L.) Huds, *Eremurus spectabilis* Bieb. species, evaluation and introduction of cenopopulations were carried out. In order to

determine the growth dynamics and age period of all species in the selected cenopopulations, all individuals found from the juvenile period to the senile period were recorded and the resulting indicators were calculated according to the methodology. *Zizifora tenuior* species spreads in the Lesser Caucasus, Bozgir plateau, Shamkir, Goygol, Dashkasan; Gadabay, Goranboy and Karabakh, from the lowland to the highlands, in clayey, sandy-gravelly places, sometimes on the banks of rivers, and is mainly considered as an element of mountain-xerophyte vegetation. The type of vegetation in which the *Z. tenuior* species is distributed in the Bozgir plateau (CP 1), Shamkir (CP2; 3), Goranboy (CP 4), Dashkasan (CP 5), Goygol (CP 6; 7) and Gadabey (CP 8; 9) districts, formation and associations are assigned during the investigation of the cenological condition. The ontogenetic structure of the plant was evaluated within these groupings. The number of individuals belonging to the generative development phase is more in all cenoses was found. The most plants were found in individual CP3 (95 plant samples) and the least in CP 9 (42). The large efficiency index in the 1st, 2nd and 9th populations was determined (fig.7).

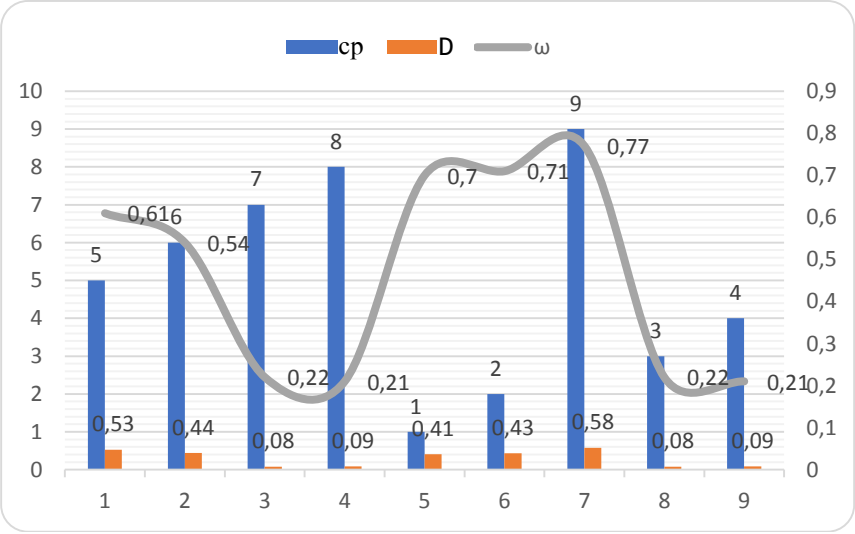

Figure 7. Age and efficiency coefficients in cenopopulations

The stock of the plant was studied in each population during the study. Largest stock of Ziziphora tenuior species was in the 4th (268.3 kg/h in the flowering phase; 141.3 kg/h in the seed phase) and 7th (respectively 340 kg/h; 261.4 kg/h) cenopopulations was not coincidental.

Phytocenological assessment of 11 populations was carried out in tall grass meadows, post-forest sug meadows, thicket meadows and flood-lands of the forest and mid-mountainous areas where the Mentha longifolia species is widespread in the LC during the research years. The highest index in the *M. longifolia* species is in the generative development stages (225-243 units) was found. The efficiency coefficient of *M. longifolia* was higher (ω = 0.70-0.77) at 6, 7 and 10 CP. This is related to the fact that in these populations the number of dynamics of plants belonging to the juvenile and immature phases before the generative development phases were high, and the individuals belonging to the aging (s, ss) phases were low (Fig. 8).

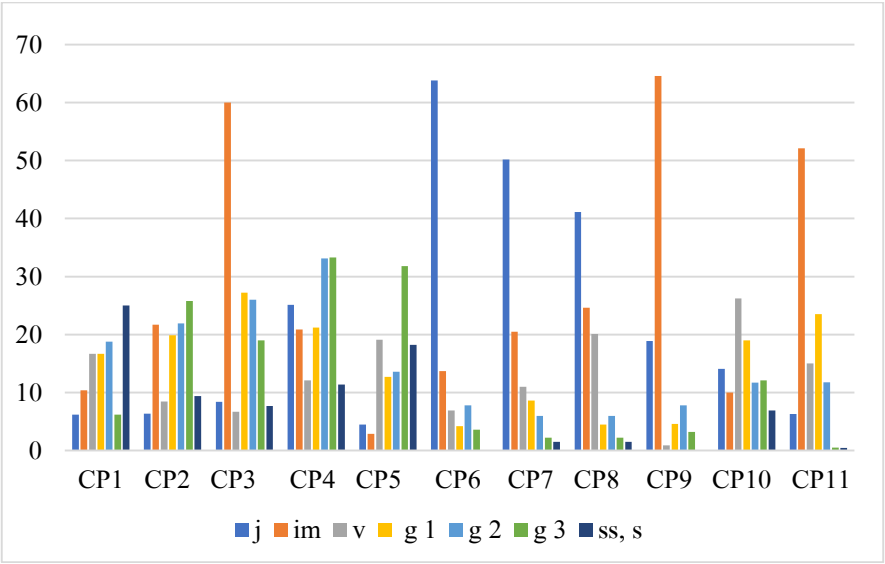

Figure 8. Ontogenetic structure of *Mentha longifolia* species

The vitality of each individual of the *Eremurus spectabilis* species is characterized by its rise in ontogeny during the conducted research. As a result, seeds of different quality can be produced, which are resistant to germination time and competition. CP of the species is dominated by individuals with moderate vitality. One group of them goes through ontogeny completely, and the other does not go through a certain part of the age state. As a result, when they reach the level of destruction, they have low vitality. Plants with a low level of vitality quickly pass into a senile state in ontogeny.

Bioecological and phytocenological characteristics of *E.spectabilis* species were studied during the research period. At the same time, a plan of measures related to its protection as a rare species was prepared. For this purpose, cenopopulations (CP) were first selected in the areas where the plant is spread: CP I- Tovuz district, Esrik mountain range, CP II- Gazakh district, village surrounding mountain range, CP III- Shamkir district Seyfali mountain range and ontogenetic periods were followed. In the population evaluations, the effectiveness of the 3rd population (ω=0.74) was high. This is due to the fact that the population has a large number of all individuals of ontogeny. Unlike them, the efficiency of the 1st population was low (ω= 0.22), the main reason for this is that those populations are young. The 2nd population is also a fully mature population (ω=0.54). As a result, the reason for the extinction process of the species is the rapid aging of the population in drought years was found. It should also be noted that negative observation of fluctuation changes in a wide range may cause the species to be unable to take a firm position among other populations in the future.

The vitality of each individual of the *Eremurus spectabilis* species is characterized by its rise in ontogeny during the conducted research[12]. As a result, seeds of different quality can be produced,

[12] İbadullayeva, S. New areal bioecological-phytosenological features and ethnobiology of the *Eremurus spectabilis* Bieb. species in the flora of Azerbaijan / S.İbadullayeva, H.Gasimov, L.Gurbanova [etc. al] // ANAS Reports, -Baku: "ELM", -2022. - pp. 25-31

which are resistant to germination time and competition. CP of the species is dominated by individuals with moderate vitality. One group of them goes through ontogeny completely, and the other does not go through a certain part of the age state. As a result, when they reach the level of destruction, they have low vitality. Plants with a low level of vitality quickly pass into a senile state in ontogeny.

The destruction process accelerated with the beginning of the second peace period in *Achillea millefolium+Astragalus regelii+ Conyza canadensis+Tulipa confusa+Erigeron venustus+Prongos ferulaceae+Muscari caucasicum* association of *Eremurus spectabilis* species in Shamkir districts was found. The development of individuals of *Eremurus spectabilis* species was evaluated at a low level in CP I and III, with vitality in a critical state (table 4).

Table 4. *Eremurus spectabilis* species viability assessment

CP	Years	Number of individuals in CP in %			$İ_a$	Q	Vitality of CP
		A	b	C			
I CP	2019	40	35	27	0,72	29,5	Crisis situation
	2020	19	41	36	0,86	31	-//-
III CP	2020	43	39	19	0,79	31	-//-
	2021	38	19	42	0,68	28,5	-//-

Note: a, b, c - vitality classes, I_Q - aging index, Q – vitality

5.2. Resource potential of useful plants. The stock of wild vegetable plants was not the same in the studied regions. Thus, some plants were registered only in 1-2 districts. However, there are wild vegetable plants that are eaten and mass marketed, which can be found in all regions from lowland to alpine. Such plants can be mentioned as mint (watermelon), goosefoot, charophylle, sorrel. The calculations of some wild vegetable plants whose resources have been studied in the Lesser Caucasus shows in Table 5.

Table 5. Availability of some wild vegetable plants in the flora of the Lesser Caucasus

Name of species	Districts	Spread area (ha)	Biological reserve (tons)	Annual operating reserve (ton)
1	2	3	4	5
Zizifora tenuior	Goygol, Dashkasan Goranboy, Shamkir Gadabey, Samukh	1597	140,38+8,35	112,96± 6,75
Mentha longifolia	All districts	2654	606,20±39,21	266,90±16,96
Allium rubellum	Gadabey, Dashkasan, Shamkir	95	48,03+ 1,55	24,61+ 1,55
Pimpinella aromatica	Goranboy, Tovuz	283	4,20+0,23	0,42+0,023
Eremurus spectabilis	Goygol	205	5,21+0,19	3,21+0,18
Capparis herbacea	Samukh,	50	148+1,8	50,94+0,05
Rumex euxinus	Tovuz, Goychay	75	51,2± 1,86	25,1± 0,88
Rumex acetosella	Samukh	71	40,0 ± 22,6	24,0 ± 2,26
Rumex acetosa	Goygol	100	45± 1,32	24,5±1,72
Rumex scutatus	Tovuz	71	31±1,67	15,1±0,37
Rumex patientia	Dashkasan	70	40,8±3,0	17,4±1,0
Rumex alpinus	Dashkasan	87	36,25±4,4	18,12+0,7
Rumex crispus	Dashkasan	1	70,64±8,4	158,32±24,2
Oxyria digyna	Gadabey, Goygol	128	123,28±15,8	81,64±78,4
Aconogonon alpinum	Dashkasan, Gadabey	105	71,35±2,30	37,15± 0,93
Polygonum alpestre	All districts	403	814±21,68	412, 4±1,87
Puschkinia scilloides	Tovuz, Dashkasan Goygol	345	42,2±3,05	21± 1,89
Prangos acaulis	Samukh,	759	795± 3,42	362± 3,44
Bifora radians	Shamkir	611	305,8± 26,42	30,58±2,64
Falcaria vulgaris	All districts	33	168± 16,58	85± 7,15
Laser trilobum	Tartar	39,5	197± 19,86	97± 9,18

Continues of Table 5

1	2	3	4	5
Alliaria petiolata	Tovuz	225,0	112,5±10,16	11,25±0,10
Capsella bursa-pastoris	Tartar, Beylagan	328,0	128,5±5,86	64,1±0,58
Portulaca oleracea	Oguz	3169	1584,8±120,1	158,48±12,0
Asparagus officinalis	All districts	1934,9	2280,2±171,1	1140,1±85,55
Ornithogalum ponticum	All districts	1895,6	1470,4±119,1	735,2±59,5
Pimpinella aromatica	Göygöl, Tovuz, Gədəbəy	1007,5	12,10±1,3	6,5±0,7
Cachrys microcarpos	Tərtər, Goranboy, Beyləqan, Tovuz, Ağstafa	784,9	305,8±20,0	153,4±11,1
Urtica dioica	Bütün inzibati r-da	20675,7	2980,4±220,5	1490,2±110,3

Biological reserve of *Asparagus officinalis* (2280,2 t), *Urtica dioica* (2980,4t), *Ornithogalum ponticum* (1470,4t), *Portulaca oleracea* (1584,8t), *Polygonum alpestre* (814t), *Mentha longifolia (*606,20 t) species were determined to be higher among all other studied species in the region. Although the resource potential is estimated in the areas where the plants are distributed, this is not all. *Mentha longifolia, Polygonum alpestre, Urtica dioica, Asparagus officinalis, Bifora radians*və *Portulaca oleracea* were studied in all regions.

CHAPTER VI. COMMODITY QUALITY AND ECONOMIC EFFICIENCY OF WILD VEGETABLE PLANTS

6.1. Prospects and ethnobotanical characteristics of the use of wild vegetable plants. Information about the prospects for the use of wild vegetable plants was collected on the basis of the materials obtained during the ethnobotanical surveys conducted with the older generation in different regions of the LC. The characteristics of the plants and the number of answers given by the families with the

application of medicinal products prepared from them were calculated. The collected data were refined using percentages and proportions. The frequency of citations (FC) of each used plant species reported by local communities was counted. The relative importance and use value of plant species were calculated and evaluated. The use value (UVi) was calculated based on the ratio of the number of use reports (Ui) given by each informant for specific plant species to the total number of interviewed data (Ni) for a particular plant.20 people between the ages of 15-25, 44 between 25-45, 77 between 45-65, 191 between 65-85, and 17 people over 85 were interviewed in the conducted interviews. The medicinal properties of wild vegetables by families are also extensively explained in the dissertation. In particular, the areas where 11 species belonging to the *Polygonaceae* family are distributed were precisely studied and the characteristics of vegetables, harvesting times and the directions of ethnopharmacological effects in folk medicine were determined [13]. Representatives of the family are represented by 4 species (*Oxyria digyna, Aconogonon alpinum, Polygonum alpestre, Rumex alpinus*) in alpine and subalpine meadows, 1 species (*Rumex acetosella*) in forest vegetation and 1 species (*Polygonum monspelidense*) in wetland vegetation. The remaining species are distributed in mountain-xerophyte vegetation were found. When analyzing the national ethnobiological aspects of Azerbaijan, we decide how deep thinking and thinking our people have had since ancient times. Karabakh is an integral part of Azerbaijan and one of the ancient private settlements. As a result of the research, 101 species of medicinal plants, 44 species of wild food - fruits and berries, 28 species of wild vegetables, 10 species of dyes and 300 species of fodder plants were widely used in Karabakh were

[13]İbadullayeva, S. Ethnopharmacological use of wild vegetable plants belonging to the *Polygonaceae* Juss. family spread in the Azerbaijan flora / S. İbadullayeva, G. Shiraliyeva, L.Z. Gurbanova [et al.] // Biodiversity Journal. – 2021. 12(3), – p.733-740.

determined[14]. It should also be noted that these studies will be fully clarified during field surveys conducted after the area has been cleared of mines.

6.2. Commercial characteristics and economic efficiency of wild vegetable plants. Food security is one of the global problems in the world. People's need for clean and pure food is increasing more and more. Thus, the transitional market economy and unhealthy product consumption competition make this demand even more urgent. Growing vegetables in greenhouses is expensive, and the demand for vegetable products (table greens) are increasing. For this reason, wild vegetable plants distributed in the study area are more widely used as commodities. Domestic demand is partly met by low-quality products imported from foreign countries. The local product is brought to the markets in April and May. Since cultivated vegetable products do not meet the domestic demand, wild vegetable plants start to be sold in the markets starting in March. As we pass through the regions of the Lesser Caucasus, mostly young and old women sell dried wild vegetables on the roads. Starting from the beginning of summer, observations were made in the markets in different districts of the region and it became known that startwort, spinach, cutter oil are brought to the market first during the research years. Later, chaerophylle, eremurus, salsify, pranqos, mint, peavine, asparagus, nettle etc. are sold. These products are sold fresh in commercial networks.

The species composition of commercial wild vegetable plants was determined as a result of the reviews and observations. It became known that 30 species of wild vegetable plants are available for sale in the flora of the botanical-geographical regions of the Lesser Caucasus. Of these, spinach, chaerophylle etc. in fresh form, herbaceous cappers, stemless prangos, round onions by salted, ordinary sorrel, glomal sorrel, long-leaved mint, puschkinia, rocky

[14]İbadullayeva, S.C. Useful plants of Karabakh: Ethnobotany / S.C.Ibadullayeva, A.A.Asgarova, L.Z.Gurbanova [etc.] // Works of Azerbaijan National Committee "MAN and BIOSPHERE" (MaB, UNESCO), - 2020. p.15, - p.183-192.

arum in dried forms are sold in mass form in the markets. The economic efficiency of these plants was calculated using the indicators of the operating reserve. Among the population, it was determined that 24 species of commercial wild vegetable plants are consumed fresh, 8 species are salted, and 9 species are consumed in dried form.

CONCLUSİON

1. For the first time, wild vegetable plants were taxonomically analyzed in the biodiversity of the botanical-geographical regions of the Lesser Caucasus, and 152 species belonging to 120 genus are distributed in 3 classes, 12 semi-classes, 25 orders, 36 orders, and 42 families were determined. Among them, *Amaranthus albus, Tragapogon gramminifolius, Crocus speciosus* and *Eremurus spectabilis* are recorded by us for the first time for local flora.

2. *Asteraceae* family has 20 genus (17%), 23 species (15.3%); *Apiaceae* family with 14 genus (12%), 19 species (13%); *Brassicaceae* with 14 genus (12%), 15 species (10%); *Lamiaceae* with 11 genus (9.2%), 12 species (8%); *Polygonaceae* family with 5 genus (4.2%), 11 species (7.4%); *Fabaceae* family has 6 genus (5%), 6 species (4%); *Rosaceae* family takes the main place, represented by 4 genus (3.6%), 5 species (3.3 %) according to distribution. The rest of the families consist of 1-3 genus and make up 37%.

3. The analysis of the life forms of wild vegetable plants in the flora of the botanical-geographic regions of the Lesser Caucasus shows that the main part of the local flora is perennials or hemicryptophytes with 99 species (65.13%), 14 species (9.21%) of biennials and 31 species (20, 39 %) are superior to other forms by being annuals. Mesophytic plants (51 species or 33.55%) are superior to other plants in relation to water. Mesoxerophytes with 49 species make up 32.23% and xeromesophytes with 7 species make up 4.63% of the total flora, xerophytes occupy the third place after mesophyte plants with 40 species (26.31%).

4. Wild vegetables belong to 8 areals (xerophilous 63, boreal 55, Caucasian 9, adventive 5, cosmopolitan 3, steppe 2, desert 1, 14

species of unknown area), 13 geographical elements according to the centers of origin in the territory of the LC has been established. A bioecological study of all taxa was carried out, the ways of use were determined by ethnobotanical studies.

5. Constant signs were recorded for the first time: strong development of transmission tissue and main parenchyma, accumulation of substances in the form of reserves, etc. as a result of anatomical studies of *Eremurus spectabilis, Sinapis arvensis, Asparagus polyphyllus* and *Alliaria petiolata* species.

6. The distribution of 67 species of wild vegetable plants in the plains and semi-deserts, 101 in the foothills and low highlands, 113 in the middle highlands, 40 in the high highlands, 33 in the subalpine, and 10 in the alpine belt was assigned to the studies conducted on the types of vegetation of the territory of the LC were established. The similarity coefficient of zones was calculated, 24 species of wild vegetable plants were found in one zone, 41 in two zones, 58 in three zones, 7 in four zones, and 11 in five zones. Vegetable crops dominate with 12.8%, which is reflected in the similarity coefficient of the plain with the average highlands - 0.45 in the semi-deserts and plains.

7. Age and efficiency indices, phytocenological characteristics of species, structure of cenopopulations and changes in ontogeny *Zizifora tenuior* L. (ω = 0,21-0,77), *Mentha longifolia* (L.) Huds. (ω = 0,54-0,77) and *Eremurus spectabilis* Bieb. (ω = 0,20-0,74) during cultivation were determined, the productivity of the aerial part of plants was studied: *Zizifora tenuior* 4CP (268, 3 kg/ha in the flowering phase ; 141.3 kg/ha seed phase) and 7CP (340 kg/ha; 261.4 kg/ha respectively); 2.1-3.2kg/ha in early spring in the aerial part of *Eremurus spectabilis* species.

8. The resource potential of 29 species has been determined, the biological reserve used as vegetables and medicinals from wild flora *Asparagus officinalis* (2280,2t), *Urtica dioica* (2980,4t), *Ornithogalum ponticum* (1470,4t), *Portulaca oleracea* (1584,8t), *Polygonum alpestre* (412,4t), *Mentha longifolia (*266,90t) species

were determined to be more than all other studied species in the region.

9. The commercial characteristics and economic efficiency of plants were determined: 24 species were fresh, 8 species were salted, and 9 species were dried . The net income that can be obtained from the plants with the economic efficiency calculated for the operating resources *Portulaca oleracea* – 10618, *Asparagus officinalis* - 257663, *Urtica dioica* - 220550, *Rumex crispus* - 30556, *Prangos acaulis* - 40211, *Mentha longifolia* - 14976, *Allium rotundum* - 92480, *Ornithogalum ponticum* - 129425, *Polygonum alpestre* - 42479 AZN. Profitability ranges from approximately 155% to 483%.

SUGGESTIONS AND RECOMMENDATIONS

1. It is appropriate to organize their individual protection in the Seyfali middle highlands of the local Shamkir district where there is distributed taking into account the distribution of the *Eremurus spectabilis* M. Bieb.species in a limited area in the local flora.

2. Creating mini-shops and markets, including national kitchens, in the regions with abundant resources in the territory of the Lesser Caucasus is recommended in order to supply and consume wild vegetable plants for commercial purposes.

3. It is advisable to introduce rare important species and cultivate them in regions such as vegetables by farmers.

4. Local national names of vegetable species can be used in the new edition of the "Flora of Azerbaijan".

The list of published scientific works on the subject of the dissertation:

1. Qurbanova, L.Z. Yabanı tərəvəz bitkilərinin bioekoloji xüsusiyyətləri və istifadəsi // – Gəncə: ADAU –nun Elmi Əsərləri, – 2018. №3, – s.31-33.

2. Qurbanova, L.Z. Ayı soganı (*Allium ursinum)* bitkisinin bioloji xüsusiyyətləri və qidalıq dəyəri // – Gəncə: ADAU –nun Elmi Əsərləri, – 2018. №4, – s.54-56.

3. Гумбатов, З.И., Газиев, А.Т., Курбанова, Л.З. Лекарственные свойства спаржи (*Asparagus L.)* Азербайджана //Botaniki tədqiqatlarda yeni çağırışlar,AMEA BİvəBC akad.V.C.Hacıyevin 90 illiyinə həsr edilmiş konfrans materialı, – 2018,– s.185-187.

4. Курбанова, Л.З. Морфо- анатомический анализ Лука медвежьего *(Alliumursinum) //* Akademik C.Əliyevin 90 illik yubileyinə həsr olunmuş Respublika Elmi-praktik konfransının materialları, - Gəncə: - 30 noyabr, - 2018. - s.192-197.

5. Qurbanova, L.Z. Çölxardalı (*Sinapis arvensis)* bitkisinin morfo-anatomik analizi // – Gəncə: AMEAGəncə Bölməsi Xəbərlər Məcmüəsi, – 2019, №2(76), – s. 10-15.

6. Qurbanova, L.Z. Çoxyarpaqlı qulançar (*Asparagus polyphyllus*) növünün morfo -anatomik analizi // – Gəncə: UTECA Elmi xəbərlər məcmüəsi, – 2020. №2, – s.78-83.

7. İbadullayeva, S.C. Qarabağın faydalı bitkiləri: Etnobotanika / S.C.İbadullayeva, A.A.Əsgərova,L.Z.Qurbanova[və b.] // "İNSAN və BİOSFER" (MaB,UNESCO) Azərbaycan Milli Komitəsinin Əsərləri, - 2020. b. 15, - s.183-192.

8. Qurbanova, L.Z. Yabanı tərəvəz bitkilərinin dərman və yem xüsusiyyətləri // UTECA Universitet reytinqi məsələlərinin əsas problemləri. Beynəlxalq elmi-praktik konfrans materialları., – Gəncə: – 2021. – səh. 104.

9. Qurbanova, L.Z. Sarımsaqotu *(Alliaria petiolata)* növünün bioekoloji və morfo-anatomik xüsusiyyətləri //– Gəncə: UTECA Elmi xəbərlər məcmüəsi, – 2021.№ 3, – s.150-157.

10. Курбанова,Л.З. Таксономический ,экобиоморфологический и ареологический анализ дикорастущих овощных растений флоры Малого Кавказа // «Бюллетень науки и практики», – 2021. Т. 7, № 5, – с.52-60.

11. Gurbanova, L.Z. Wild vegetables of Azerbaijani flora: *Portulaca oleracea* L. // The 5th Symposium on EuroAsian Biodiversity, – Almaata- Muğla: – 2021. – p.248.

12. İbadullayeva, S. Ethnopharmacological use of wild vegetable plants belonging to the *Polygonaceae* Juss. family spread

in the Azerbaijan flora / S. İbadullayeva, G. Shiraliyeva, L.Z. Gurbanova [et al.] // Biodiversity Journal. – 2021. 12(3), – p.733-740.

13. İbadullayeva, S.J., Gurbanova, L.Z. Phytosenology, cultivation and perspectives of use of *Zizifora tenuior* L. species // İnternational Journal of Botany Studies, İmpact Factor: RJİF 5.12, - 2021. v. 6, is. 3, - p. 675-678.

14. Qurbanova, L.Z. Görkəmli çiriş-*Eremurus spectabilis* növünün konstant və fərqli anatomik struktur göstəricilərinin mikroskopik analizi // UTECA Elmi xəbərlər məcmüəsi, - Gəncə: - 2021. №4, - s.108-114.

15. İbadullayeva, S.New areal bioecological-phytosenological features and ethnobiology of the *Eremurus spectabilis* Bieb.species in the flora of Azerbaijan / S.İbadullayeva,H.Gasimov,L.Gurbanova [və b.]//AMEA Məruzələr, -Bakı: “ELM”, -2022.-s.25-31.

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