Ethnobotanical studies of wild edible plants in some regions of Azerbaijan

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Research

Abstract

Background: Before the advent of agriculture, people survived relying on wild plants found in nature. Most of the wild plants that are important for food are wild edible plants. In times of economic crises, wild edible plants came to the aid of the population. During wars, the population consumed dishes prepared from both the underground and aboveground parts of wild edible plants, including raw plant parts.

Methods: The research was conducted using ethnobotanical materials personally collected by the author during surveys in various regions of Azerbaijan, especially among the older generation. Field studies were conducted in villages across 14 regions and the ethnobiological knowledge of local population were recorded. A total of 349 people were interviewed during these surveys. The frequency of citation (FC) of each plant species reported by local communities was calculated and the resulting data were analyzed using Relative Frequency of Citation (RFC).

Results: The taxonomic analysis of wild edible plants in the biodiversity of the geographical regions of Azerbaijan revealed the distribution of 119 species belonging to 97 genera, grouped into 2 classes and 36 families. In terms of species distribution, the Asteraceae family occupies the leading position with 13 genera (13%) and 13 species (11%); followed by Apiaceae family with 11 genera (11%) and 11 species (9%); Brassicaceae family with 12 genera (12%), 12 species (10%); Lamiaceae family with 10 genera (10%), 10 species (8,4%); Polygonaceae family with 3 genera (3%), 10 species (8.4%). The majority of the flora in the study area consists of 80 (67%) perennial species. The remaining species are annuals-26 (22%), biennials-11 (9%), semi-shrubs -1 (1%) and lianas-1 (1%). Vegetable characteristics, collection times and ethnopharmacological properties in folk medicine have been documented for 13 species of the Asteraceae family, 11 of the Apiaceae family, 12 of the Brassicaceae family, 10 of the Lamiaceae family and 10 of the Polygonaceae family. The commodity forms were identified for 30 species of economic importance: 24 species are sold fresh , 6 species are preserved salted and 10 species are sold dried.

Conclusions: During the research, ethnobotanical data on plants were collected. It should be noted that a significant part of the material collected through oral information is quickly forgotten, and its preservation in written form is considered one of the key priorities. Analysis of the collected materials revealed that to identify the patterns of distribution of individual plant species across the region, it is important first toexamine the interaction of human activity with vegetation. Information on the use of individual plant species was obtained both from local knowledge and field surveys.

Keywords: Ethnobotany, Folk medicine, Local population,Edible plant

Background

Wild food and medicinal herbs have played a significant role in the development of human society. Throughout history, along with other food plants, they have been among the main factors shaping the modern human physical type, regulating the functioning of the nervous system, overall health, and working capacity (Gurbanova 2024b; Gurbanova 2025). Increasing the production of wild edible plants (WEPs) restoring valuable, productive local rare species that are being forgotten and disappearing, and conducting research of great economic, social, and political importance to ensure the continuous supply of plant-based foods are among the most urgent and critica issues of the day (Ibadullayeva & Huseynova 2021). It is recognized that the Caucasus, including Azerbaijan, is one of the richest regions in the distribution and reserves of wild-growing fruits and berries, nuts, vegetables, dye plants (Novruzov et al.2021).

We should especially note that WEPs grow widely, are easy to access, which makes them a reliable source of food (Ray et al.2020). Almost all WEPs are cold-resistant and most of them are perennial plants (Gahramanova & Ibadullayeva 2017; Gasimov et al.2018). WEPs are rich in proteins, fats, minerals, microelements, vitamins and other substances. For this reason, plants provided by nature are a more valuable food source (Agayeva et al.2020). According to their classification, WEPs are also used as dyes, spices, essential oils, honey, medicine, feed, decoration, etc. (Korkmaz & Alpaslan 2014; Bhatia *et al.* 2018). The use of WEPs for food, medicine, fodder and decoration shows that it is possible to sustain society with WEPs alone, without relying on many cultivated vegetable species used for these purposes. If they were cultivated, the variety of plants would increase significantly (Babakishiyeva & Ibadullayeva 2021).

V.S. Novruzov has made great contributions to the study of both lower and higher plants of the Lesser Caucasus flora (Novruzov & Aslanova 2013). A number of researchers have studied various useful plant droups in Azerbaijan:the vegetable species of the Polygonaceae family(Shiraliyeva 2017); the biomorphological characteristics of legumes and especially fodder plants in the Lesser Caucasus and Bozgir plateau (Akhundova *et al.* 2017); the economic importance of the Lamiaceae family, distinguished by its aromatic and spicy species of the area (Guliyeva 2018); and the ethnobotanical analyses of the Tovuz-Gazakh region(Abbasova 2019); and the Goygol region, which provide information on wild food, vegetables, medicinal and fodder plants (Shahmuradova 2013). Asilbekova worked on the introduction of wild vegetable plants and studied their cultivation methods using new agrotechnical measures (Asilbekova 2006). The uses of various species of these plants in food, vegetables, essential oils, and folk medicine have been extensively studied by researcher S.C. Ibadullayeva (Ibadullayeva et al.2021). M.A. Gasimov studied the species of the genera *Rumex* L. and *Rheum* L. of the Polygonaceae family, as well as the species *Urtica dioica* L., *Capparis herbacea* Willd, *Portulaca oleracea* L. as dye plants of Azerbaijan, and also reported on their use for food purposes. In his other works, he also provided extensive information about many vegetable plants that are wild in our flora in Azerbaijan (Gasimov & Gadirova 2004). While studying the medicinal flora of Azerbaijan, N.P. Mehdiyeva also analyzed the medicinal plant flora of the Lesser Caucasus and classified the plants according to their uses (Mehdiyeva 2011). F.G. Movsumova made significant contributions to the study of desert and semi-desert vegetation of Azerbaijan, studying the life forms and nutritional value of wild plants adapted to salinity conditions (Movsumova 2007).

Based on our research, surveys among the local population, and materials obtained from extensive literature sources, the use of WEPs in both scientific and folk medicine has been studied .

During the pandemic, the economic crisis in the world market, as well as the increasing demand for food products, placed even developed countries at risk of food shortages (Sytar et al.2021). On the other hand, due to the shortages in some countries, one in six people goes to bed hungry or eats only once a day. Taking this into account, in recent times, to partially eliminate the problem, scientists around the world have been studying the ethnobotanical research and modern application of vegetables and medicinal plants found in the wild flora, putting forward new proposals for their use (Munir et al.2018; Mustafayeva et al.2015). Extensive scientific research is being carried out in these areas, and remains of great interest today due to its relevance.

Materials and Methods

Study area

The research was devoted to ethnobotanical studies of WEPs distributed in some geographical regions of Azerbaijan. For this purpose, both short and long-term expeditions were conducted during 2024-2025. The expeditions followed the routes shown in the table and on the map (Fig. 1; Table 1). Of the 14 administrative districts and villages survered, 5 (Ganja, Goygol, Gazakh, Gadabay, Dashkasan) belong to the botanical-geographical region of the Northern Lesser Caucasus; the remaining 6 (Goranboy, Tovuz, Shamkir, Agstafa, Naftalan, Samukh) belong to the botanical-geographical region of the Kur Plain , 2 (Tartar, Aghdam) to the Kur-Araz Lowland and 1 (Jeyranchol) to the Plateau Steppe (Gurbanov 2024). Within Azerbaijan, the

Lesser Caucasus is notable for by its climatic characteristics. The complexity of the relief has led to the formation of cold and mountain-tundra climate types with dry winters. In general, the manifestation of individual climatic elements in the area is also diverse.

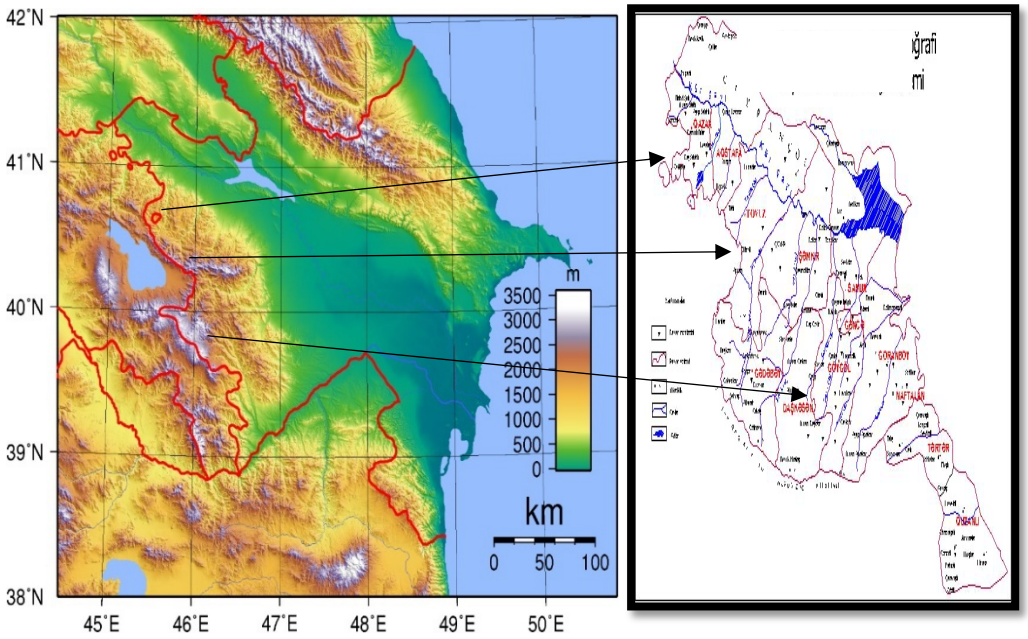

Figure 1. Map of Azerbaijan showing the study area

The characteristics of the geographical position and the complex relief cause variations in the number of sunny hours across the region with the highest values recorded in Gazakh (390 m) and Ganja (312 m). Approximataly 35% of annual sunny hours occur during the summer months, while 18% falls in the winter months. The average annual air temperature in the study area of the Lesser Caucasus ranges from 14.4 °C (Naftalan) to 1.8 °C (Goygol - Shamkir). In areas with an absolute altitude of up to 1200 m, the average annual air temperature is above 10 °C, while in areas above 1800 m it falls below 5 °C observed.

Table 1 The geographical coordinates in the study area.

Name of Locality	latitude, longitude	Altitude (amsl)
Goranboy district Buzlug village	40°24’55”N , 46°25’59”E	339
Ganja city outskirts	40°40’58” N,46°21’38” E	408
Tovuz district, Asrik village	40°52’02”N,45°37’41” E	337
Goygol district, Hajimelik village	40°37’57”N,46°24’29”E	1358
Gazakh district, Garapapag village	41°04’48”N, 45°21’34”E	396
Gadabay district, Artepe village	40°38’38” N,45°53’55” E	1849
Shamkir district Seyfali village	40° 45’ 23”N ,46° 6’ 51” E	331
Agstafa district, Kolayir village	41°10’03”N,45°22’17” E	340
Dashkasan district, Bayan village	40°33’16”N, 46°09’22”E	1700
Naftalan district Gasimbeyli village	40°30’ N, 46°51’ E	251
Tartar district, Agkend village	40°22’47”N, 46°54’05”E	237
Samukh district, Garayeri village	40°47’12”N,46°19’00” E	210
Aghdam district, Guzanli village	40°09’31” N,47°09’39” E	216
Jeyranchol area	41°15’ N, 45°26’ E	425

In the northern part of the province, specifically the Ganja-Gazakh plain and Jeyranchol, atmospheric precipitation ranges from 300 to 400 mm, on the northern slopes of Murovdag it reaches 700–800 mm and more, while on the southern slope it exceeds 700 mm and more (Hasanov & Rahimov 2015). The average annual air temperature in the Tovuz region varies between 8–13 °C, with temperatures between 1 and 4 °C in January and 18 to 25 °C in July. The average annual relative humidity is 71% and annual amount of precipitation ranges from 400 to 700 mm. The average annual wind speed is 3.4 m/s. The climate in Agstafa district is characterized by harsh winters and hot summers with annual precipitation between 350 and 700 mm. Samukh and Goranboy experience moderately hot, dry subtropical climate. The average temperature fluctuates between -1.5 and -1°C in January,and between 22 and 26.5°C in July,while the average annual precipitation is 300-600 mm.

Data collection

The available literature on the species was searched and critically analyzed, and a list of species occurring in the area was compiled. The species composition was determined using keys from floras (Grossheim 1945; Flora of Azerbaijan 1952; Flora a of the Caucasus 1939). Local knowledge on the use of individual plant species was documented through surveys and observations conducted in villages across 14 regions, involving 349 respondents. During fieldwork extensive data was collected on the methods and forms of application of various species. Ethnobotanical methods and techniques were employed during the interviews. Field research and observations were conducted in various regions of Azerbaijan, recording ethnobiological knowledge of both rural and urban populations. Ethnobotanical research methods employed included ethnography,observation,surveys, questionnaires, interviews, the method of remains, comparative-historical analysis, component analysis (Gurbanova 2024a). During observations, technical recording tools such as a dictaphone, movie camera and video recorder were frequently used.Voucher specimens were collected during field research and prepared according to standard botanical methods.Voucher numbers are listed in Table(4,5).

During the interviews, information was first collected regarding the local names, distribution areas and usage rules, as well as methods of collection and drying of plants used for treating common diseases and as vegetables. Specific forms were then prepared for the questionnaires.

Plant identification

The nomenclature of wild species was determined based on the fundamental floras of Azerbaijan, APG IV (2024), the WFO (2025) system and the International Plant Names Index (IPNI)database(2025).

The analysis of the main life forms of wild edible plants in the flora of the botanical-geographical regions of Azerbaijan was conducted according to the classification system of I.G. Serebryakov (1964).

Data analysis

Consensus Informative Factor (Fic)

The consensus (Fic) factor, an informative factor, was used to test the homogeneity of plant knowledge (Gazzaneo *et al.* 2005).

Fic is calculated as follows:

$$Fic = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

Where “nur” is the number of uses for a given use category, and “nt” is the number of taxa used by all informants for a given use category. (Martin 2001)

Relative Frequency of Citation (RFC)

The data was analyzed for Relative Frequency of Citation (RFC) following Vitalini *et al.* (2013) by the following formula.

$$RFC = FC/N \ (0 < RFC < 1)$$

Where FC shows the number of informants citing a plant species and N is the total number of informants.

Results and Discussion

As a result of this research, a systematic review of WEPs occuring in the flora of some regions of Azerbaijan was compiled for the first time. A total of 119 taxa belonging to 97 genera, grouped into in 2 classes and 36 families were, recorded (Table 2). In the studied areas, 119 wild plants species were registered, across 36 families and 97 genera. Of these, 25(69%) families, 85 (88%) genera, and 100 (84%)species belong to the Eudicots class. The class Monocots includes 11(31%) families, 12 (12%)genera, 19 (16%)species .As shown in Table 2, the Asteraceae family is dominant with 13 genera (13%) and 13 species

(11%); followed by the Brassicaceae 12 genera (12%), 12 species (10%); Apiaceae 11 genera (11%), 11 species (9%); Lamiaceae 10 genera (10%), 10 species (8,4%); Polygonaceae 3 genera (3%), 10 species (8.4%).

Table 2. Plant Families, Number of Genera and Species

Families	**Genera**	**Species**
Eudicots		
Amaranthaceae	1	2
Apiaceae	11	11
Asteraceae	13	13
Boraginaceae	1	1
Brassicaceae	12	12
Campanulaceae	2	3
Capparaceae	1	1
Caryophyllaceae	2	2
Chenopodiaceae	3	6
Crassulaceae	2	2
Dipsacaceae	1	1
Fabaceae	6	6
Lamiaceae	10	10
Malvaceae	2	3
Onaqraceae	2	2
Plantaginaceae	1	1
Polygonaceae	3	10
Portulacaceae	1	1
Primulaceae	1	1
Ranunculaceae	2	2
Rosaceae	4	5
Scorophulariaceae	1	1
Solanaceae	1	1
Urticaceae	1	2
Cannabaceae	1	1
Monocots		
Alliaceae	1	6
Alismataceae	1	1
Araceae	1	1
Asparagaceae	1	2
Asphodelaceae	1	1
Cyperaceae	2	3
Iridaceae	1	1
Poaceae	1	1
Liliaceae	1	1
Orchidaceae	1	1
Typhaceae	1	1
Classes-2, families- 36, genera- 97, speciess 119		

Life Forms of WEPs

According to the biomorphological analysis conducted using I.G. Serebryakov system, it was determined that the majority of the studied flora consists of grasses. Most of them are perennial 80 (67%) species. The remaining species include 26 (22%) annual grasses, 11(9%) biennial grasses, 1 (1%)semi-shrubs and lianas -1 (1%) (Fig. 2)

The study area contains sufficient reserves of edible plants and many of which are valued by their medicinal properties in the regions and can provide for the local population. However these plants are collected in large quantities and sold in the markets, putting some species at risk of extinction. Therefore, cultivating certain species used as medicines and vegetables prevents their depletion. It should be noted that herbal medicines are generally safe and cause no harm. During our

expeditions and field trips, we enageged in conversations with the local population to study the various uses of these plants in the regions.

Demographic information

To study the patterns of WEPs usage information was obtained mainly from literature sources and surveys conducted among the local population. Based on this research the scientific basis of new opportunities and methods of using WEPs were studied.

The research work was carried out using the collected ethnobotanical materials (Table 3).

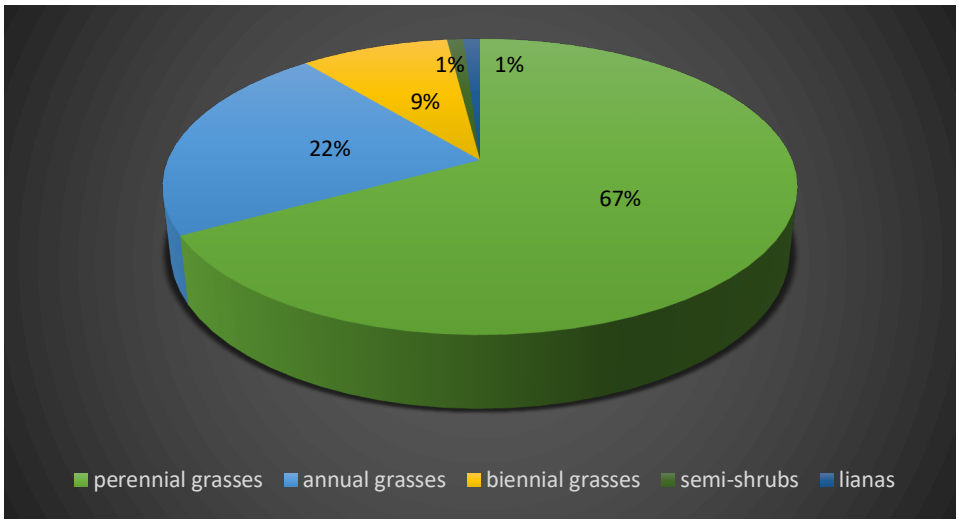

Figure 2. Life forms of the reported edible plants

Table 3. Demographic features of informants selected from the study area:

Factors	Categories	Number of participants	Percentage (%)
Age	15-25	20	6
	25-45	40	11.4
	45-65	110	31.5
	65-85	149	42.6
	85 years old	30	8.5
Gender	male	164	47
	female	185	53
Profession	Biology teacher	118	34
	doctor	115	33
	pharmacist	116	33

The interviews were conducted among individuals of all age groups, with the largest number of respondents aged 65-85. A total of 349 people were interviewed. The informants categorized based on age, gender and profession. By gender 164 (47%) informants were male while 185 (53%) were female. By age group, 20 (6%) were between 15-25 years old, 40(11,4%) between 25-45, 110 (31,5%) between 45-65, 149 (42.6%) between 65-85, and 30 (8,5%) were over 85 years old. By profession, the largest group of informants were biology teachers- 118 (34%), followed by doctors-115(33%) and pharmacists- 116 (33%)(Table 3).

To obtain information about local medicinal plants, the district administration first registered local doctors practicing phytotherapy. Due to their low income and distance from health facilities, the rural population remains dependent on the traditional use of local plants for treating various diseases.

Taking this into account, the data collected from different regions were analyzed. The number of responses given by families regarding the properties of the plants and the use of medicinal products prepared from them was quantified. The collected data were refined using percentages and ratios. The frequency of citation (FC) for each type of plant used reported by local communities was also calculated.

During the, the ways in which wild vegetables are used in ethnopharmacology and culinary were examined, as summarized in Table 4.

Table 4 Dominant wild edible plants (WEPs) traditionally used by the local population in some regions of Azerbaijan

Botanical name of WUPs, Voucher #	Local name	Season of collection	Medicinal uses	The edible part, mode of consumption	FC	RFC
Asteraceae						
Echinops sphaerocephalus L. LG067	Toppuztikan	**June-Sep.,**	The infusion of the above-ground parts of the plant has a stimulating effect on the central nervous system and a soothing effect on skin diseases. Its roots are used in the treatment of tuberculosis. The fruits of the plant contain tonic and generally strengthening substances, they are used to treat nervous system weakness, paralysis and diseases of the prostate gland.	**Roots, receptacle, above-ground parts of the plant;** The fleshy receptacle of this species is eaten in a variety of dishes. It is also eaten raw after the buds have been removed.	66	0,18
Onopordum acanthium L. LG042	Cakkal qanqali	**May-Aug.,**	Its ointment fromthis plant is used to treat malignant tumors, purulent wounds, skin cancer, tuberculosis and gonorrhea. In scientific medicine, its preparations are used to regulate cardiac activity and increase blood pressure.	**Roots, young shoots;** Prepared in salads, minced meat dishes, soup, various beverages, etc.	20	0,05
Inula helenium L. LG068	Andiz	**June-Oct.**	In folk medicine, it is taken internally in the form of an infusion or extract as an expectorant, anti-inflammatory, choleretic agent, as well as for gastrointestinal disorders,diabetes, rheumatism and goiter diseases.	**Root, stem;** The young stems are used for make soup, while the roots are added to dishes for their aroma. The roots are also used to prepare-compote with apples. The crushed roots are mixed with starch to make jelly.	200	0,57
Lapsana communis L. LG003	Ziyilsebet	**June-Aug.**	The plant is used for treating constipation and also serves as a diaphoretic and pain reliever	**Leaves and shoods**; The leaves and shoots are eaten raw and can also be added to salads.	90	0,25
Carduus thoermeri Weinm. LG114	Jeytanqanqali	**June-Aug.**	Herbal preparations are used to regulate heart activity, constrict peripheral vessels, increase arterial pressure, normalize smooth muscle tone, and also act as a hemostatic agent.	**Roots, young shoots, receptacle** Young stems, flower beds and leaf petioles are used in salads, minced meats, soups, various drinks, etc.	43	0,12
Tragopogon graminifolius L. LG048	Yemlik	**Apr.-June**	The plant organs have a diuretic and antiseptic effect and are used in treatment of skin diseases and for wound healing.	**Roots and leaves;** The roots and leaves are sticky and juicy. The leaves are grated, salted and eaten. The roots are used to prepare steamed dishes, meat, salads, green soup and other dishes.	85	0,24
Centaurea cyanus L. LG089	Gulavar	**May-June**	The plant's decoction has an astringent effect. Its solution is used in the treatment of nervous diseases.	**Young shoots;** Young shoots are cleaned and added to various salads.	30	0,08
Cichorium intybus L. LG110	Kasni	**May-Aug**	In folk medicine, decoction and extract are prescribed to improve digestion, to treat gastric	**Leaves and roots;**	170	0,48

			ulcer, gastritis, enterocolitis, liver cirrhosis, cholangitis, hepatitis, gallstones, rickets.	Its leaves are used to make a salad rich in vitamin C, which is very beneficial for diabetics. Additionally, rubbing the underground parts produces a coffe substitute.		
Podospermum calcitrapifolium (Vahl)DC. LG031	Takasakkali	**Apr-Jule**	The roots of the species are used medicinally and may benefit for diabetics due to their insulin content.The plants milky sap can be used to strengthen the roots of teeth and stop bleeding.	**Leaves and tubers;** All parts of the plant are edible except for the flowers. The tubers of the oleander are used both fresh and canned. Salads and soups are prepared from its leaves and tubers.	56	0,16
Tussilago farfara L. LG021	Davadabani	**Mar-June**	It is used in the treatment of acute upper respiratory tract infections and influenza.	**Leaves and flowers** Young leaves are grated, fried with oil and onions and used in the preparation of dolma. The leaves are used impart golden-yellow color to meat dishes.	280	0,80
Arctium tomentosum Mill. LG017	Atpitraqi	**Jule-Aug**	In folk medicine, infusions and extracts from the root powder are used as a diuretic, to reduce fever, to dissolve kidney stones, to treat tuberculosis and skin diseases.	**Young roots ;** The roots can be used to make a sweet puree. Young shoots and young leaves are also used as a salad and added to soup.	74	0,21
Taraxacum officinale Willd. LG065	Zancirotu	**Apr-June**	In medicine, root extracts are widely used to increase appetite, improve digestion, reduce stomach acidity in gastritis, regulate kidney and biliary tract function.	**Young leaves and flowers** Since the tender leaves of the plant are richer in vitamins in early spring, they are considered particularly beneficial for the body. The leaves are used in the preparation of various salads.	160	0,45
Sonchus arvensis L. LG020	Guzukokaldan	**June-Sep**	It is used to treat various conditions, including diseases of the liver, kidneys, heart and digestion	**Young leaves;** Fresh and young leaves are used to make soup and used to prepare vitamin-rich salads.	20	0,057
Apiaceae						
Prangos ferulacea (L.) Lindl. LG034	Chashir	**May-June**	In ethnopharmacology, it is used for its anti-cancer properties and improving the gastrointestinal function.	**Young shoots in early spring;** Young shoots are collected and boiled, and salted, or consumed as boiled dish.	200	0,57
Pimpinella saxifraga L. LG050	Chira	**Jule-Aug**	Its infusion is used as a stomach tonic, to relieve chest pain, and to reduce fever, while its ointment is applied for headaches and to heal boils.	**Vegetative and generative organs;** Fresh leaves are used to make salads and soups. The aromatic roots and seeds are added to meat and vegetable dishes as a spice.	74	0,21

Eryngium billardieri Delaroche LC055	Zimbirtikan	**May-June**	The aboveground parts of the plant are used to treat while the roots for coughs and urinary bladder diseases. The decoction of the plants organs are employed in the treatment of liver diseases, epilepsy, headaches and rheumatism.	**Young shoots and roots;** Young,non-flowering shoots are peeled and eaten fresh. The young juicy roots are also used fresh are abundant.	35	0,10
Bifora radians Bieb LG028	Daqkeshnishi	**May-June**	It is used in various forms as a folk medicine for lung inflammation.	**Young aboveground parts;** Young plants are used fresh in salads and also dried for use in various dishes. Due to their fragrant and pleasant smell, they are added to soups, and traditional dishes such as "dovga" and "bughlama" . They also impart a special flavor to "keta" and "qutab".	238	0,68
Falcaria vulgaris Bernh. LG046	Gazayaqi	**June-Aug**	Extracts prepared from the aboveground parts in the treatment of kidney diseases.	**Young shoots and leaves;** After boiling in water, they are fried in oil and mixed with beaten with eggs. They are also dried and used during the winter.	280	0,80
Carum carvi L. LG040	Zira	**May-June**	The seeds, used as an infusion in powder form, improve digestion, reduce intestinal gas and prevent putrefaction in the intestines. The fruits have bactericidal, spasmolytic, choleretic, and anti-inflammatory effects. They are used to treat in kidney diseases and pancreatitis.	**Young shoots;** The fragrant seeds are added to dishes, and soup is prepared from the young stems.	235	0,67
Daucus carota L. LG032	Kok	**June-Oct**	The rhizomes are rich in micro and macro elements, vitamins and physiologically active substances. The seeds are used against cancer	**Rhizomes;** The rhizomes of the plant are eaten raw or added to dishes. The natural supply is sufficient	250	0,71
Heracleum chorodanum Hoffm. LG076	Baldirgan	**May-June**	The stem, leaves and roots of the plant have been used in folk medicine to increase appetite and treat nervous diseases. Fresh shoots and leaves are used as an infusion against gastritis. It is possible to treat wounds on the skin with the powder obtained from its dried leaves.	**The stems and shoots;** Various salads and soups are prepared and eaten. Additionally, these parts are salted and used as pickles.	175	0,50
Cachrys microcarpos M.Bieb. LG025	Atboyanasi	**May-June**	It improves digestion, strengthens the immune system, has anti-inflammatory properties	**Stems and shoots;** They are chopped and pickled or used fresh in salad. The plant is sold in markets both fresh and salted.	25	0,071
Echinophora sibthorpiana Guss. LG012	Tikanburun	**June-Sep**	It is considered an appetite stimulant due to its vitamin C content. The above-ground parts of the	**Stems and shoots;** The collected parts are cleaned of leaves and used fresh	20	0,057

			plant are used to treat urinary bladder and gallstone diseases.			
Laser trilobum Borkh. ex Gaertn. LG071	Razyana	**May-Aug**	Its roots, leaves and fruits are used for medicinal purposes. In folk medicine, tea made from its fruits is consumed as sedative for heartache. Infusions and decoctions are prepared and used as a fever reducer and pain reliever for malaria and colds.	**Root, leaf, fruit;** In early spring, various salads are prepared from its green parts.	280	0,80
Polygonaceae						
Oxyria digyna Hill (= *O.elatior* R.Br. ex Meissen.) LG045	Turshmaza	**Apr-June**	It is traditionally applied to alleviate symptoms of tooth inflammation.	**Leaves and shoots;** The leaves and shoots of the “turshmez” are eaten fresh. The leaves have long been used in the preparation of various dishes. When added to dishes such as soups and stews, they impart a delicious flavor. Local collect dries and store them for use during the winter.	170	0,48
Rumex acetosella L. LG041	Avalik	**June-Aug**	Its above-ground parts are mainly used as a wound-healing agent. Infusions made from its leaves and stems are used as a remedy for various diseases.	**Stem and leaves;** The stem and leaves of the species are used to make salads and cook soups. The stems and leaves are eaten raw. They have a sour taste and are used both dried and salted.	200	0,57
Rumex acetosa L. LG052	Avalik	**May-June**	It is used in the treatment of polyarthritis and various infectious wounds. Its juice serves as a choleretic, anti-itch and anti-rheumatism agent.	**Leaves;** Its leaves are used as a vegetable. Various dishes are prepared from its dried form during winter.	180	0,51
Rumex crispus L. LG061	Avalik	**May-June**	An ointment made from its roots and leaves is used to treat for tuberculosis, cancer, tooth decay, and alcoholism.	**Root ;** The dried parts of the plant are chopped and added to various dishes.	160	0,45
Rumex arifolius All. LG078	Avalik	**May-June**	An infusion of the roots and leaves is used for wound-healing, serves as a stimulant, and antipyretic.	**Leaves and stems;** Salads are made from the freshly picked leaves and stems of the plant and "kête" is prepared using them.	155	0,44
Rumex alpinus L. LG099	Avalik	**May-June**	Root extract treats diarrhea, as well as benign and malignant tumors. Its infusion is used in folk medicine.	**Leaves;** The leaves are consumed food. Salads and "kate" are prepared using the leaves. The above-ground parts of the plant are dried and stored for use during the winter.	160	0,45
Rumex tuberosus L. LG103	Avalik	**May-June**	It is used in the treatment of gastrointestinal diseases.	**Leaves;** The leaves are used as food. Dried and twisted leaves are cooked and fried with oil	176	0,21

				and onions, added to various dishes and used in preparing fried "pilaf".		
Rumex confertus Willd. LG009	Avalik	**May-June**	It helps to improve the gastrointestinal function.	**Leaves;** Local people prepare various dishes from dried aveliki in winter, such as "aveliki pilaf," "aveliki umac," "qındı," etc.	160	0,45
Polygonum aviculare L. LG018	Girxbugum	**Apr-May**	The infusion and extracts made from the herb are used as both a painkiller and anti-inflammatory agent in the treatment of stomach and intestinal diseases. The plant is applied as a poultice for fractures, dislocations, and boils. In its dried form as a hemostatic agent for internal bleeding, while its extract is used as a diuretic.	**Stems and leaves;** The stems and leaves are harvested before flowering and can be consumed both raw and cooked.	290	0,83
Polygonum alpestre C.A.Mey. LG100	Girxbugum	**Apr-May**	The above-ground parts are used for medicinal purposes. An infusion made from the herb is used as an anti-inflammatory agent in the treatment of stomach and intestinal diseases.	**Leaves;** The pulp is dried and ground into flour. The leaves are eaten raw.	320	0,91
Brassicaceae						
Capsella bursa-pastoris Medik. LG022	Kushappeyi	**Apr-Jule**	Used for treating rheumatism, gastritis, diarrhea and bleeding.	**Stem and leaves;** They are consumed raw and are also used in salads.	40	0,11
Barbarea vulgaris subsp. *arcuata* (Opiz) Hayek. LG043	Vazarak	**Apr-Jule**	Has a diuretic effect and stimulates appetite.	**Young leaves;** "Buğlama", "siyıq" and "kete" are prepared from its leaves. Its young leaves are harvested and used to prepare fresh salads.	218	0,62
Conringia orientalis (L.) Dumort. LG014	Konringiya	**May-Aug**	Used to treat cardiovascular and respiratory diseases (bronchi, lungs) as well as gastrointestinal disorders.	**Stems and leaves;** The young stems and leaves are used as vegetables. The young leaves and shoots are mixed with salt, vinegar, onion, and oil to make a salad.	10	0,02
Lepidium sativum L. LG075	Bozalag	**Apr-June**	A decoction made from fresh and green plant is used to clear the respiratory tract of lung cancer patients, to open the bronchi of heavy smokers and individuals with congested bronchi, and to treat inflammatory rheumatism, as well as to treat benign prostatic hyperplasia.	**Stems and leaves;** The fresh green parts of the plant is used in a salad, sauce and spice. Yellowed plants should never be used.	185	0,53
Nasturtium officinale R.Br. LG088	Giji	**May-Aug**	The above-ground parts of the plant are used as decoction and extract to treat atherosclerosis and thyroid diseases.	**Stems and leaves;** Salads are prepared from the young stems and leaves which are also consumed cooked.	80	0,22

Descurainia sophia (L.) Webb ex Prantl LG027	Dekuran	**May-Aug**	It is used to treat inflammatory processes, dysentery, malaria, and kidney diseases	**Fruit;** The fruits have a pungent taste and are used as a mustard substitute.	20	0,05
Sinapis arvensis L. LG006	Xardal	**May-Aug**	It improves digestion, stimulates blood circulation and is used for rheumatism and colds.	**Seeds and leaves;** It is used as a seasoning, in sauces, marinades, and for making mustard oil	170	0,48
Bunias orientalis L. LG062	Tapaotu	**Apr-June**	It has an antiulcer effect on the gastrointestinal tract, protects the liver from fatty degeneration, and helps with allergic diseases	**Stems and leaves;** The leaves of the plant are consumed cooked. The bark of the young stems is peeled and eaten with a smell and taste resembling cabbage.	150	0,42
Eruca sativa Mill. LG005	Indau	**Apr-June**	It lowers cholesterol and blood sugar levels, improves eyesight and normalizes the work of the gastrointestinal tract	**Leaves;** Its leaves are used in salads as food and added to soups as a spice.	25	0,07
Alliaria petiolata (M.Bieb.) Cavara & Grande LG082	Sarimsagotu	**Apr-Aug**	It is used to treat bronchial asthma, colitis, diarrhea, as well as for ulcers and cancer	**Stems and leaves;** The plant has a specific garlic smell. The above-ground parts of the plant are used to make a vitamin-rich salad and as a substitute for garlic in dishes.	200	0,57
Cardamine uliginosa Bieb. LG060	Urekotu	**May-Sep**	It is used to treat toothache, diabetes, venereal diseases and inflammation of the respiratory tract	**Young sprouts;** Fresh sprouts are eaten with boiled eggs and used in salad.	25	0,07
Thlaspi arvense L. LG008	Yarganotu	**Apr-Aug**	It is known as a diaphoretic, anti-inflammatory agent and is also used to improves potency.	**Leaves;** The leaves of the plant are used to make soup and fish dishes. The leaves are cooked with nettle and roots, then topped with sour cream and served plain.	30	0,08
Lamiaceae						
Nepeta cataria L. LG080	Pishiknanasi	**June-Sept**	In folk medicine, its infusion is used for inflammatory conditions due to its antipyretic, anti-gastritis, carminative appetite-enhancing, choleretic, and expectorant effects.Additionally, it is applied externally for bronchitis and bronchial asthma due to its spasmolytic effect, and to promote healing of itching and purulent wounds.	**Leaves;** Due to their aromatic essential oil content, they are added to dishes.	220	0,63
Betonica officinalis (L.) LG101	Marcanotu	**June-Aug**	In folk medicine, it is used as an infusion and extract for treating epilepsy, hypertension, cardiovascular system insufficiency, biliary tract diseases, and for washing wounds.	**Leaves and flowers;** The fresh leaves are used as food. The flowers are brewed and drunk as tea.	20	0,05

Lamium album L. LG092	Dalamaz	**May-Sept**	In folk medicine, it is used for its astringent, expectorant, sedative, diuretic and wound-healing effects.The infusion is used to treat dysentery, liver and kidney diseases,while the flowers and leaves are used for diabetes and healing external wounds.	**Leaves and flowers;** The leaves and young shoots are used to make soup. The aromatic leaves are dried and used as an ingredient in dishes.	190	0,54
Ziziphora tenuior L. LG058	Dagnanasi	**May-Aug**	The plant is collected during its flowering stage and dried in the shade. Its infusions normalize the functioning of the stomach and intestines, digestive system and enzyme-secreting glands.	**Leaves;** The leaves are used as a spice in dishes.	245	0,70
Satureja hortensis L. LG038	Bagnanasi	**Jule-Aug**	The extract prepared from the aboveground parts of the plant is used to treat stomach aches, bloating, and to expel intestinal worms. Preparations made from the essential oils in the leaves are used as a painkiller, anticonvulsant, and a cooling agent for fever.	**Leaves;** The leaves are used as a spice in dishes.	165	0,47
Mentha longifolia (L.) Huds. LG095	Yarpiz	**Jule-Oct**	It is used in medicine for cardiovascular diseases.	**Leaves;** The leaves are used to prepare national dishes such as "dovga," "kuku," "qutab," and others. The plant is also used in its dried form.	300	0,85
Origanum vulgare L. LG105	Garaginiq	**May-Oct**	In folk medicine, it is brewed and used as a diuretic, diaphoretic, digestive aid, and antitussive.It is also used to relieve inflammation and spasm associated with insomnia, gastritis, biliary tract diseases, angina, and other gastrointestinal diseases.	**Leaves;** It is added to dishes because it contains essential oil. The leaves are added to soups.	168	0,48
Salvia sclarea L. LG010	Surva	**June-Aug**	Its infusion is prescribed for oral and dental diseases, sore throat, and inflammation of the upper respiratory tract.	**Leaves;** The leaves are used as a spice in dishes.	174	0,49
Teucrium scordioides Schreb. LG036	Maryamnoxudu	**June-Sept**	The aboveground parts of the plant are used to treat dysfunctions of the gastrointestinal system.	**Leaves;** The leaves are added to soup.	34	0,09
Thymus collinus Bieb. LG053	Kaklikotu	**June-Aug**	The plant has antibacterial and antioxidant properties. It is used as a heat-reducing agent in respiratory diseases.	**Leaves;** The leaves are used as a spice in dishes.	290	0,83

Table 4 shows the ethnobotanical information of the five dominant families (Asteraceae, Apiaceae, Polygonaceae, Brassicaceae, Lamiaceae) comprising a total of 56 species. .Among them some species like *Bifora radians* ,*Falcaria vulgaris, Carum carvi ,Daucus carota, Heracleum chorodanum, Laser trilobum, Oxyria digyna , Rumex acetosa, Rumex crispus, Polygonum aviculare , Bunias orientalis, Alliaria petiolata ,,Mentha longifolia ,Ziziphora tenuior* and *Origanum vulgare* were commonly known. In contrast, other species like *Teucrium scordioides, Cachrys microcarpos, Stachys officinalis, Thlaspi arvense, Conringia orientalis, Eryngium billardieri, Cardamine uliginosa* ,*Eruca sativa and Sonchus arvensis* were recognized as edible plants by a limited number of informants (Table 4). More than 150 informants identified 36 of the most popular species, demonstrating their widespread use and sustainability as food sources among local communities. Some reported edible plant species are used exclusively as condiments to enhance the flavor of other foods.

Mode of utilization of WEPs

During travels across various regions of Azerbaijan, it was observed that primarily young people and elderly women sell dried wild vegetables along the roads. Market observations were conducted in various study area starting in early spring throughout the research period. Based on these observations, the species composition of wild edible plants sold for commercial purposes was determined (Table 5).

Table 5. Species composition of commercial wild edible plants

Families	**Species** **Voucher #**	**Commodity forms**		
		fresh	**salted**	**dried**
Portulacaceae	*Portulaca oleracea* L. LG026	+	+	
Caryphyllaceae	*Stellaria media* (L.)Vill. LG072	+		
Chenopodiaceae	*Spinacia tetrandra* Stev. LG004	+		
Polygonaceae	*Rumex acetosa* L. LG052	+		+
	Rumex tuberosus L. LG103	+		+
	Rumex acetosella L. LG041	+		+
Capparidaceae	*Capparis herbaceae* Willd. LG016	+	+	
Brassicaceae	*Capsella bursa – pastoris* Medik. LG022	+		
	Alliaria petiolata (M.Bieb.) Cavara & Grande LG082	+		
Urticaceae	*Urtica dioica* L. LG056	+		
	Urtica urens L. LG063	+		
Fabaceae	*Lathyrus miniatus* M.Bieb.ex Steven LG011	+		
Apiaceae	*Chaerophyllum aureum* L. LG085	+		
	Prangos ferulacea (L.)Lindl. LG034	+	+	
	Bifora radians Bieb. LG028	+		
	Cachrys microcarpos M.Bieb. LG025	+	+	
	Falcaria vulgaris Bernh. LG046	+		+
	Heracleum chorodanum (Hoffm.) LG076		+	
Asteraceae	*Tragopogon graminifolius* L. LG048	+		

	Cichorium intybus L. LG110			+
Lamiaceae	*Salvia sclarea* L. LG010	+		
	Ziziphora.tenuior L. LG058			+
	Mentha longifolia (L.) Huds. LG095	+		+
	Origanum vulgare L. LG105			+
Asphodelaceae	*Eremurus spectabilis* M.Bieb. LG093	+		
Asparagaceae	*Ornithogalum ponticum* Zahar. LG054	+		
	Puschkinia scilloides Adams. LG047			+
	Asparagus officinalis L. LG108	+		
Araceae	*Arum rupicola* Boiss. LG007			+
Alliaceae	*Allium rotundum* L. LG069	+	+	
15	**30**	**24**	**6**	**10**

As shown in Table 5, 30 species of wild vegetable plants belonging to 15 families and 27 genera are sold as commodities in the markets. By genus: Rumex is represented by 3 species, Urtica by 2 species each, and the remaining 25 genera are represented by a single species each. Wild edible plants are sold in the market in various forms including fresh, salted and dried. These products are sold fresh between March and May when they are young, while salted and dried form are available almost year- round. According to Table 5, 24 species of are sold fresh, 6 species are salted, and 10 species are dried. Salted and dried products hold significant commercial value due to their long shelf life without the need for refrigeration or special storage conditions. Since the same species product can be sold in different forms, product variety can increase, enabling higher net income through diversified sales.

These plants are harvested by local population and sold without any consideration of ecological balance. Consequently, substantial results have been obtained leading to specific recommendations aimed at managing the commercial exploitation of these plants, preventing their depletion, and promoting their sustainability use in trade.

Conclusion

Many years of research have shown that understanding the interaction between human activity and vegetation, requires an initial ethnobotanical analysis of the region to first analyze the region exploring the positive aspects of traditional medicine, it is possible to lay the foundation for developing an industry based on individual production processes, which requires further extensive research.

Wild edible plants widespread in the study area are used as commodities. Since growing vegetables in greenhouses is expensive, demand for vegetable products is increasing. Domestic demand is partially met by poor-quality products imports. Local products enter the markets in April and May but since cultivated vegetable products do not fully satisfy domestic demand, wild edible plants begin to appear in markets as early as be March. The dominant plant families (Asteraceae, Apiaceae, Polygonaceae, Brassicaceae, Lamiaceae) were identified, as well as plant species with market value (30 species). These species are well known to almost all residents of the studied areas. The culinary use of certain species, such as *Teucrium scordioides, Cachrys microcarpos, Stachys officinalis, Thlaspi arvense, Conringia orientalis, Eryngium billardieri, Cardamine uliginosa*, *Eruca sativa*, *Sonchus arvensis* is novel to local gastronomy.

For the first time, wild vegetable plants in the biodiversity of the Azerbaijans botanical-geographical regions have been taxonomically analyzed. The life forms, vegetable characteristics, harvesting periods, and ethnopharmacological properties of these wild species in the study areas flora were determined. The registration of reference samples enhances the scientific rigor of this botanical research, providing reliable reference data.

Declarations

Ethics approval: Before commencement of interviews, prior informed consent was obtained individually from all the informants.
Availability of data and materials: All the data obtained from informants during the study are included in the manuscript.
Consent for publication: Not applicable as no personal data is included in the paper.
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