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Ethnobotanical study of medicinal plants used by Qizilbash Tribe in North of Iran

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Abstract

Iran is recognized as one of the regions abundant in plant diversity, particularly medicinal plants, which are globally acknowledged for their significant role in maintaining human health. This study seeks to identify medicinal plants extensively utilized by the Qizilbash tribe in Northern Iran, document the indigenous knowledge related to the use of medicinal plants by local communities, and gather information about the diseases treated by these plants. An ethnobotanical survey was conducted over a two-year period (2018-2020) to document the indigenous knowledge of medicinal plants among the local population in Northern Iran. Data collection involved field observations, participant interactions, and semi-structured interviews with 41 individuals (11 males, 30 females). The interviewees were selected using a snowball sampling technique. The gathered information was categorized based on local names, consumed plant parts, medicinal properties, consumption habits, and other uses of wild edible plants. The study identified 84 plant species from 27 families in the research area. Lamiaceae (20 species), Compositae (12 species), and Leguminaceae (6 species) were the most prevalent families based on the number of plant species. The findings indicated that medicinal plants were primarily employed for addressing gastrointestinal problems (34%), coughs and colds (18%), and respiratory diseases (13%). The presence of diverse medicinal plant species and extensive indigenous knowledge in the Khosh Yeylagh rangelands highlights the richness of this region. Further research on these plants has the potential to uncover new treatments and contribute to the preservation of these valuable resources, preventing the loss and destruction of herbal species.

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Introduction

Indigenous knowledge of medicinal plant consumption has gained significance because of its considerable importance in human societies (Alimirzaei, 2017). Numerous studies are currently being conducted with the aim of transforming such oral knowledge into academic ones (Sevgi & Kizilarslan, 2013). Scholars have discovered that local people, contrary to what was previously thought, are not ignorant. The profound and comprehensive understanding held by indigenous people about their natural and social surroundings has not been acquired through scholarly writings; rather, it has been gleaned from keen observation, contemplation, and the transmission of knowledge from one generation to the next. The breadth and depth of insights into both natural and social dimensions surpass what can typically be attained within the confines of academic institutions (Jome poor, 2006).

The widespread use of plant-based remedies and the adverse effects associated with chemical medicines, stemming from their side effects, have prompted increased attention to the traditional knowledge held by local communities regarding medicinal plants. In contemporary industrialized societies, both developed and developing countries have witnessed a rising reliance on traditional medicine and plants, driven by a growing trust in their efficacy (Flores-Sanchez & Verpoorte, 2008). According to the World Health Organization (WHO), traditional medicine encompasses a body of knowledge, skills, and practices rooted in the theories, beliefs, and experiences of indigenous cultures. This knowledge is applicable not only to health but also to the prevention, diagnosis, recovery, and treatment of physical and mental illnesses. The global trend toward traditional medicine and natural remedies is evident, reflecting an increasing preference for these approaches (Gaffari et al., 2010).

Communities engage with surrounding plants in diverse ways, but local communities often rely on plants as a means of ensuring their survival (Barani et al., 2012; Pola et al., 2013). Indigenous knowledge, shaped by trial and error over time, addresses the social and natural environment and is predominantly transmitted orally and without a written record (Barani, 2003). The scientific literature employs various terms such as "traditional knowledge," "lay beliefs," and "common-sense beliefs" to describe indigenous knowledge, all seeking to elucidate knowledge formed within a social context aimed at solving everyday problems in human societies. While indigenous knowledge has ancient roots, the term "ethnobotany" was first coined by the American botanist Harshberger (1986), who studied plants used by local people. Ethnobotany delves into the traditional knowledge of communities regarding plants, aiming to understand how they are utilized for food, shelter, treatment, clothing, hunting, and religious ceremonies (Arshad et al., 2014).

Recognizing ethnobotany as a logical use of nature, the collection of information from local communities becomes crucial for plant production. Thus, the study, identification, preservation, and maintenance of plant species, particularly valuable and rare medicinal species, by local communities hold significant importance. These efforts contribute valuable insights into the discovery of new medicinal plants and herbal medicines (deSantayana et al., 2010). Given the critical nature of medicinal plants and the necessity for public awareness regarding their natural benefits and minimal side effects compared to chemical medicines, attitudes toward these drugs can play a constructive role in scientific planning. Additionally, the indigenous knowledge associated with medicinal plants, accumulated over centuries, is rapidly fading into obscurity.

Beyond conservation, rangelands serve essential roles in recreation, environmental preservation, genetic diversity, and as sources of medicinal and industrial plants (National Document of Medicinal Products and Traditional Medicine, 2013). Natural rangelands host numerous species rich in secondary metabolites with medicinal properties. The identification and study of these properties open new avenues for

scientists and researchers in various disciplines, offering a foundation for treating various diseases. Many regions still harbor unknown species that have served as remedies for centuries (Jome poor, 2006).

In ethnobotanical studies, a significant portion of information derives from the knowledge held by a community about its relationship with plants (Omidi et al., 2012). Despite the considerable growth in scientific information about medicinal species today, this knowledge remains limited to a specific number of species. Therefore, acknowledging the indigenous knowledge of these species is crucial for leveraging these valuable resources optimally. The ecological diversity and the general community approach toward medicinal plants and traditional medicine underscore the need for extensive research in the field of medicinal plants in this region.

This study aims to discover and introduce local medicinal plants and their uses, assessing the potential of the study area in terms of genetic resources and as a platform for future research. The Qizilbash people, more numerous than the Turkmen who migrated to Iran from Anatolia and Asia Minor, settled in East Khorasan during the 18th century, later extending into Afghanistan. The term "Qizilbash" is a compound of two Turkish words, "qzıl" (qızıl), meaning red, and "bash" (baş), meaning head (Sajjadi, 2017). The Safavid Sufis' distinctive headgear led to their identification as Qizilbash by the Turks, signifying those with redheads. However, the Qizilbash took pride in this name (Kaempfer, 1984). This research focuses on the Qizilbash tribe in the north of Iran, residing in the Khosh Yeylagh rangeland in Golestan province. They sustain their livelihood through animal husbandry and agriculture, with some farmers spending their winters in the rangelands of Gonbad-e Kavus in Golestan province. Their summer extends from June 1st to the end of September, and winter lasts from December 1st to the end of April. The Qizilbash people derive their income from the sale of dairy products, raw and wholesale medicinal plants, as well as agriculture.

The objectives of this research encompass the following:

1. Documenting cultural information and knowledge regarding the utilization of medicinal plants, particularly within the Qizilbash tribe. Given the diverse customs associated with various medicinal plants, the exploration of traditional botany provides valuable approaches for discovering new medicinal plants and herbal remedies (Iran Manesh et al., 2010).
2. Ethnobotany, encompassing indigenous knowledge of plants, integrates traditional wisdom into the rational use of nature. Consequently, gathering insights from local communities across different ethnic groups assumes a pivotal role in plant production. Therefore, the investigation, identification, preservation, and maintenance of plant species, especially those that are useful and rare, hold significant importance.
3. Indigenous knowledge pertaining to medicinal and aromatic plants, accumulated over centuries, is at risk of being forgotten and lost. Despite the rapid growth of knowledge about medicinal species today, it remains confined to a limited number of species. Thus, leveraging the indigenous knowledge of the Qizilbash tribe concerning these species is crucial to tapping into these valuable resources for optimal management of these God-given and precious assets.

Ethnobotanical studies in different regions and provinces of Iran have a rich history, but such studies have been conducted mostly for only a few provinces of Iran. Without doubt, indigenous knowledge can have both similarities and differences between cultures and at global scales, so in this study, the indigenous knowledge of the Qizilbash, a rarely studied tribe, is addressed.

Materials and Method

Study area

Golestan Province, an area of about 2.2 million hectares, is located in the north of Iran, southeast of the Caspian Sea. Khosh Yeylagh rangeland, an area of 2705 hectares, is located in Golestan Province in Iran. The geographical position is "14, '18° 55 to" 17, '28° 55 eastern longitudes and "59, '48° 36 to" 20, '54° 36 northern latitudes (Figure 1). In general, Khosh Yeylagh rangeland can be divided into two parts: plains and mountains, which have temperate and cool climates and the average minimum and maximum annual rainfall are 208 and 367 mm, respectively, which occurs in November to May. The wind direction is from southwest to northeast and blows mostly in autumn and winter. The altitude is between 1600 and 2700 meters above sea level, and the average annual temperature varies from 10.7 to 17.9 degrees Celsius. The region is classified as cold semi-arid in climate patterns of Embereger and De Martonne Methods (Figure 2). Ecologically, the area is considered a summer pasture. The plants are mostly in the form of grass, shrubs, and trees with a relatively different distribution. Although Qizilbash people have indigenous knowledge about the properties of plants, but livestock and agriculture are the main sources of livelihood. Due to the change in the living conditions and migration to the cities, cattle-breeding has become less and less common, and today the predominant livestock in the village are goats and sheep. According to the surveys, the dominant plant species were in Type 1 (*Poa bulbosa* + *Artemisia aucheri*), Type 2 (*Artemisia aucheri* + *Stachys inflata*), and Type 3 (*Artemisia aucher i* + *Bromus tomentellus*) (Golestan general department of natural resources and watershed management, 2015).

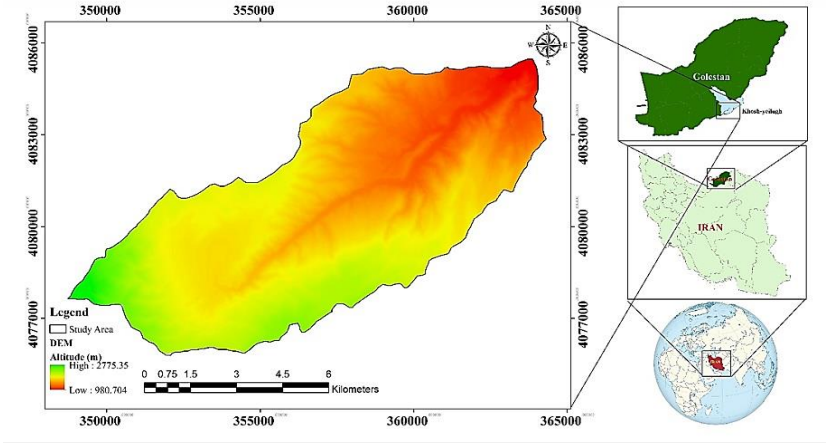

Figure 1. Location of the study area in Iran and Golestan province

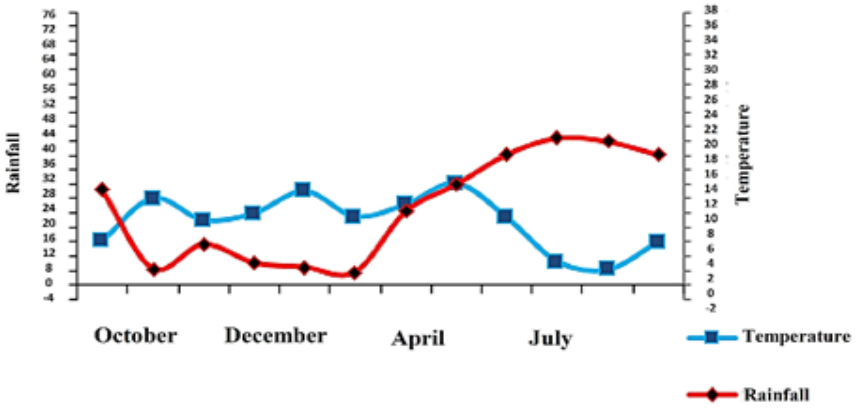

Figure 2. Embrometric curve of the study area

Method

The exploration of ethnobotany and indigenous knowledge of medicinal plants employed a methodology comprising free-form interviews and participatory observation. Data collection unfolded across four distinct stages of field operations, involving multiple visits to the study area. Initially, local experts and elders were engaged in completing questionnaires and interviews concerning indigenous lists of plant species. Through collaborative observations, local names for the identified plant species were ascertained. Subsequently, with the assistance of natural resource staff, local experts were identified among residents, and information was collected through the snowball method. This involved successive identification and interviews, with each person interviewed aiding in identifying the next until no new information emerged. In the final stage, four experienced individuals, well-acquainted with the medicinal species in the region, were selected from among the interviewees. Participants in this study included traditional healers, older individuals, and shepherds, known for their extensive knowledge in the area. The information gathered on medicinal plants encompassed the local name of the plant, its vegetative form, the timing of collection, harvesting methods, healing properties, useful medicinal organs, and other applications of the plant. Establishing a friendly and amicable relationship with the local people is paramount for successful indigenous knowledge research. Therefore, an ethnobotanical researcher must strive to resemble the natives in appearance, behavior, and morality to foster a deeper sense of intimacy and friendship with the interviewees. The researcher's interviews persisted until repetitive answers provided stability and accuracy to the information gathered. A total of forty-one individuals participated in this study, comprising 11 males and 30 females. Thirty-five individual interviews and four group interviews (consisting of 3-6 participants across one to three sessions) were conducted. A group interview convened following an announcement by the village council in the mosque of the study area. The age range of interviewees spanned from 25 to 85 years, and individuals were categorized into six age classes (refer to Figure 3).

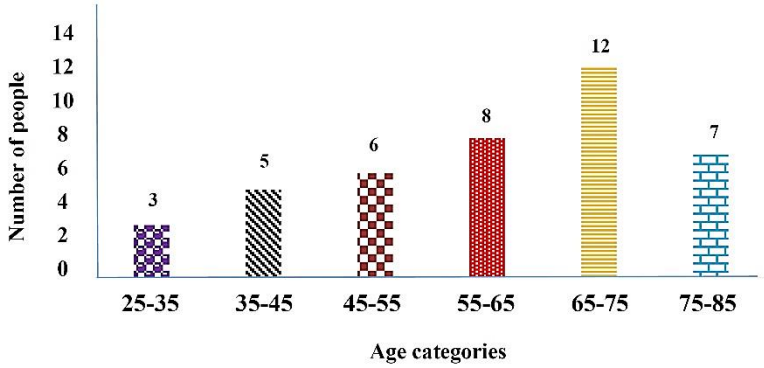

Figure 3. Age categories of interviewees

Results

The categorization based on age and educational level reveals a higher representation of elderly individuals compared to the younger generation, with a predominant prevalence of illiteracy among these individuals (refer to Table 1). Subsequently, plant samples were gathered during the spring and summer of 2018-19. Following initial preparations, identification was carried out by experienced botanists and experts in medicinal plants affiliated with Gorgan University of Agricultural Sciences and Natural Resources, utilizing reputable botanical references (Mozaffarian, 1996).

Table 1. Specifications of the respondents in the area

Level of Education	illiterate	The third guide	Diploma	AA	BA
man	12	3	0	12	2
woman	14	8	1	14	1

Table 3 shows the list of medicinal plants. In general, 84 species of medicinal plants belonging to 27 plant families were identified in the study area, including Lamiaceae with 20 species, Compositae with 12 species, Legominaceae with 6 species, Brassicaceae with 5 species, and Rosaceae and Apiaceae, with 4 species that occupied most of the rangeland in the study area (Figure 4).

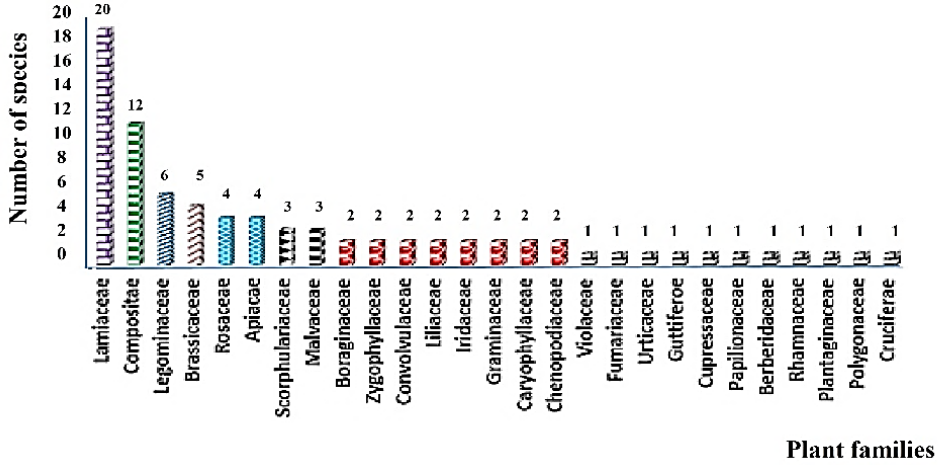

Figure 4. The abundance of plant genera in the study area

In addition to medicinal aspects, some species have edible properties, like *Rumex elbursensis*, *Lepidium latifolium*, *Allium ursinum*, *Satureja mutica*, *Camphorosma monspeliaca*, *Tragopogon collinus that* are often eaten as fresh vegetable with food. A group of plants such as *Bunium cylindricum* and *Glycyrrhiza glabra* are dried and powdered, and then the plant powder is used differently depending on the application. Plant species such as *Thymus kotschyanus*, *Ziziphora clinopodioides*, and *Glycyrrhiza glabra* are also used as herbal tea to treat colds, cough, sore throats, and as a condiment. In this study, medicinal plants were predominantly employed for addressing gastrointestinal issues (34%), followed by applications for coughs and colds (18%) as well as respiratory tract disorders (13%). The least common uses were associated with antiseptic purposes (4%) and the treatment of skin inflammations (5%) (see Figure 5).

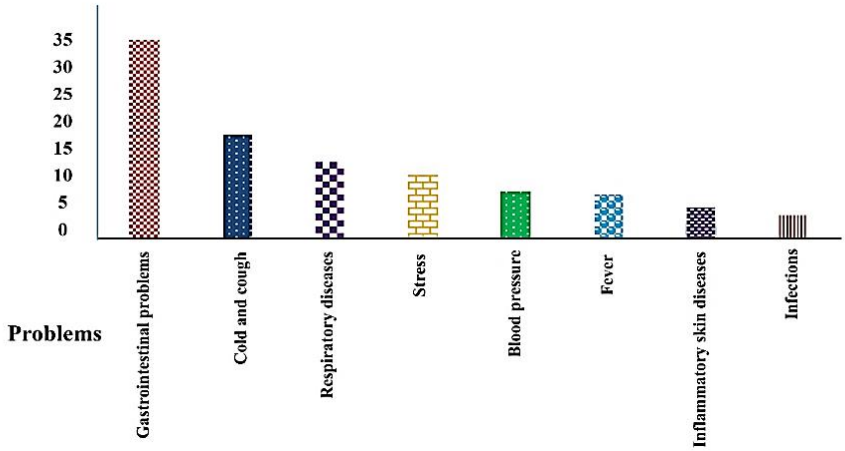

Figure 5. Frequency of use of medicinal plants in the region for all kinds of diseases in terms of percentage

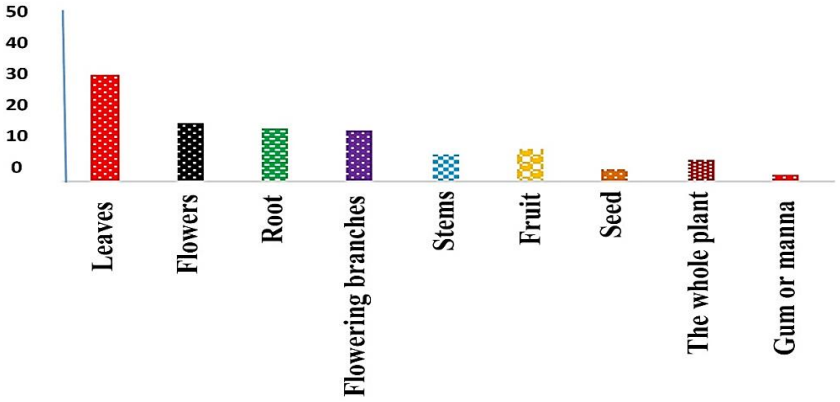

Figure 6. Frequency of use of medicinal plants in the pleasant region for a variety of diseases by percentage

Local people used various organs of the medicinal plants (e.g. the leaves 28%, the flowers 16% and the roots 14 %) (Figure 6).

The biological forms of the most medicinal plants in the region belong to the group of Hemicryptophytes, Terrophytes, Geophytes, and Chamaeophytes, respectively. In vegetative form, forbs (73%) ranked first, shrubs (14%), and wheat have the lowest percentage. Regarding the biological period, most of the plants are perennial (67%) (Table 2).

Table 2. Percentage of biological form, vegetative form and biodiversity of plant species in the region

	Variable	Number	Percentage
Biological form	Terrophytes	25	30
	Geophyte	12	14
	Chamaephytes	12	15
	Hemicryptophyte	26	31
	Cryptophytes	2	2
	Phanerophytes	7	8
Vegetative form	Forb	61	73
	Bush	12	14
	Wheat	2	2
	Trees and shrubs	9	11
Biological period	Ephemeral	26	31
	Biennial	2	2
	Perennial	56	67
	Total in each variable	84	100

Table 3. Ethnobotany of medicinal plants in the study area

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
Apiaceae	*Heracleum persicum* Desf. ex Fisch., C.A. Mey. & Avé-Lall.	Fruit	Anti-flatulence, stomach tonic, memory booster	Powder, herbal tea, poultice, food flavoring, and use in pickling (edible, medicinal)	1130
	Eryngium billardieri Delile	Roots and fruits	Diuretic, urea repellent, and shortness of breath, relieve facial acne and diabetes	pharmaceutical	1125
	Bunium cylindricum (Boiss. & Hohen.) Drude	Fruit	Anti-flatulence, regularizer, sedative, and anti-nausea	Flavor, herbal tea, pharmaceutical (edible, medicinal)	1121
	Falcaria vulgaris Bernh.	Plant limbs	Stomach tonic, astringent, and treatment of skin diseases	topical application (powder), edible (brewed)	1128

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
Boraginaceae	*Caccinia macranthera* Brand).Banks & Sol)	Leaves branched, flowers and roots	Anti-cough, sedative and analgesic	Poultice, herbal tea (medicinal)	1201
	Onosma dichroanthum Boiss.	Leaves, stems and flowers	Anti-inflammatory and antiseptic of wound and burns, Anti cough and shortness of breath, anti-depression and insomnia treatment	Herbal tea (medicinal, edible)	1204
Berberidaceae	*Berberis integerrima* Bunge	Leaves, fruits, roots and bark	Anti-inflammatory, lower blood pressure and blood fat	Barberry juice, syrup, jam (medicinal, edible)	1404
Brassicaceae	*Descurainia Sophia* Webb ex prantl(L.)	Seeds	Diuretic, febrifuge, wound healing, treating kidney inflammation, treating acne	Juice	1230
Brassicaceae	*Sisymbrium officinale* (L.) Scop.	Seeds	Diuretic, febrifuge, wound healing, treating kidney inflammation, treating acne, relieving sore throat, and laxative	Juice	1228
	Lepidium latifolium L.	Leaves	Treatment of constipation and food digestion	Food (soup and rice)	1235
	Lepidium sativum L.	Roots, leaves and seeds	Relieving bloody diarrhea, indigestion, asthma, and cough	Raw vegetables	1232
	Thlaspi stenocarpum (Boiss.) Hedge.	Flower, branches and seeds	Anti-inflammatory, antiseptic, and diuretic	Decoction and raw	1239
Cupressaceae	*Juniperus commonis* L.	Fruit and wood	Improving stomach operation, anti-flatulence, diuretic and antiseptic and treatment of rheumatism	The plant extract, chewing fruit, and the crushed fruit in water (Medicine)	1301
Convolvulaceae	*Ipomoea purpurea* Roth (L.)	Flower	Anti-inflammatory, anti-cough and wart removal	Poultice, syrup, juice (pharmaceutical)	1332
	Ipomoea purpurea Roth (L.)	Flower	Anti-colds, sore throats, relieving measles	Dried flowers in a glass of water (medicine)	1330
Caryophyllaceae	*Dianthus Caryophyllus* L.	seeds	Relieving toothache and headache, strengthens the liver and kidneys, appetizer, and helps break the fever	Boiled	1247
	Acantophyllum squarrosum Boiss.	Hard and bony roots	The root of the plant reduces sneezing and hiccups	Washing clothes	1241
Cruciferae	*Alyssum minutum* Schltdl. ex DC	seeds	Kidney stones removal, treating dry coughs	Decoction	1150
Chenopodiaceae	*Camphorosma monspeliaca* L.	Flowering branches	Treatment of respiratory disease, anti-asthma, and phlegmatic	Spice, fragrant, and flavoring	1313
	Chenopodium botrys L.	All aerial parts	Relieving shortness of breath, lower blood sugar, and appetizer	Boiled and decoction	1309

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
Compositae	*Taraxacum montanum* (C.A. Mey.) DC.	Flowers, roots and leaves	Stomach, liver, and kidney tonic, urinary excretion, kidney stones removal, cleansing the liver, and purifying the blood	Root herbal tea, jam from its flowers, leaves in a combination of salad, and food (edible and medicinal)	1259
	Achillea millefolium L	Leaves, flowers	Antidiarrheal, digestive, and stomach pain treatment	Herbal tea (edible)	1253
	Anthemis rhodocentra Iranshahr.	Flowers	sedative, improving digestion, stomach ulcers, and gastritis treatment, diuretic, and regularizing	Herbal tea and in food (medicinal)	1237
	Artemisia aucheri Boiss.	Leaves	Treatment of stomach pain, relieves toothache	Dried and raw (medicinal)	1243
	Artemisia sieberi Besser	Roots, leaves, flowers and stems	Treatment of diabetes, relieves toothache	Dried, raw and boiled (medicinal)	1250
	Carthamus oxyacantha M.Bieb	Flowers	Treatment of bruising, treatment of gastritis, blood purifier	Decoction, food coloring (medicinal and edible)	1246
	Cichorium intybus L.	Leaves, roots	Lowering blood sugar and blood lipids, treating jaundice disease, strengthening the liver	Plant extract, cooked (edible and pharmaceutical)	1261
	Echinops orientalis Trautv.	Leaves, flowering branches	Cough relief, treatment of frequent urination, and reducing fever	Powder (medicinal)	1256
Compositae	*Centaurea iberica* Trevir. ex Spreng.	Flowers	Treatment of infections and swollen eyes, removing pimples	Decoction (medicinal)	1240
	*Cirsium echinus (*M. Bieb.*)* Hand.-Mzt.	Stem	Diuretic	Decoction (medicinal)	1264
	Arctium lappa L.	Stems, leaves, roots and fruits	Lower blood sugar, treating coughs and colds, and lowering blood pressure	Prepare pickles, decoctions, brew, and powder (edible and pharmaceutical)	1267
	Tragopogon collinus DC.	The whole plant	Treatment of gastric ulcers, eliminating warts, and treating infections	Raw and cooked vegetables (edible)	1260
Fumariaceae	*Fumaria parvi flora* L.	Aerial parts, flowers and leaves	Appetizing, removing facial pimples, and purifying the blood	Decoction (medicinal)	1311
Guttiferoe	*Hypericum scabrum* L.	Flowering branches	Sedative, disinfectant, intestinal worm removal	Brew, boiled (edible)	1307
Graminaceae	*Hordeum vulgare* L.	Seeds	Eliminating fever, reducing anemia, diarrhea, blood sugar, and fat	Decoction, barley sprouts	1314
Iridaceae	*Iris drepanophylla* Aitch. & Baker	Flowers and roots	Anti-cough, diuretic, expectorant, liver stimulant	Lily flower tea	1318
	Iris kopetdaghensis (Vved.) B. Mathew & Wendelbo	Flowers and roots	Anti-cough, diuretic, expectorant	Lily flower tea	1322

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
Legominaceae	*Astragalus verus* Olivier.	Flowers, gums	treating toothache	Water-soluble gum, decoction (pharmaceutical, industrial)	1338
	Astragalus gossypinus Fisch.	The leachate inside the stem	Respiratory disorders and animal paralysis	Raw (pharmaceutical)	1342
	Acantholimon bodeanum Bunge.	Flower and bush	-	Industrial, used in the preparation of honey (pharmaceutical)	1340
	Medicago lupulina L.	Flowering leaves and branches	Wound healing, fattening, anti-inflammatory blood purification	The plant extract, alfalfa soup (edible, medicinal)	1335
Legominaceae	*Glycyrrhiza glabra* L.	Root	Treatment of stomachache, sore throat, cold	Drink, powder, use in curd and cranberry (medicinal, edible)	1348
	*Onobrychis Cornuta (*L.*)*Desv.	Nectar - pollen	-	Preparation of honey (medicinal)	1343
Liliaceae	*Allium ursinum* L.	Leaves, onions	Abdominal laxative and shortness of breath treatment	Bread, cutlet	1401
	Alium helicophyllum Vved.	Leaves, onions	Treatment of rheumatism, bile cleanser	Eat as a vegetable (edible and pharmaceutical)	1409
Lamiaceae	*Hymenocrater calycinus (*Boiss.*)* Benth	Flowering branches	Anti-rheumatic, anti-spasm, anti-cold, anti-flatulence, and skin diseases including pimples	Decoction (edible)	1411
	Marrubium astracanicum Jacq.	Flowering branches	Eliminating gallstones, regulates gastric function, blood purify	Plant extract, dried (medicinal)	1413
	Marrubium parviflorum Fisch. & C. A. Mey	Flowering branches	Eliminating gallstones, regulates gastric function, purifies the blood	Plant extract, dried (medicinal)	1423
	Marrubium vulgare L.	Flowering branches	Eliminating gallstones, regulates gastric function, blood purify	Sweat, dried (medicinal)	1432
	Thymus kotschyanus Bioss. & Hohen	Leaves, flowering branches	Relieving bloating, inflammation of the airways, and gastric diseases	Drink, plant extract, powder (edible, medicinal)	1440
	Stachys byzantina C. koch.	Flowering leaves and branches	Sleeping, sedative, lowering blood pressure, wound healing, stopping bleeding, increasing bile secretions, antitussives and sore throats, kidney infections	Drink, plant extract (medicinal)	1437
	Stachys inflata Benth.	Flowering leaves and branches	Relieving colds, sore throats, skin injuries, sedatives, and lowering blood pressure	Decoction, dried and fresh leaves (medicinal)	1416

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
Lamiaceae	*Phlomis cansellata* Bunge	Flowering leaves and branches	Eliminating toothache and head lice, anti-nausea, treating diabetes	Raw, boiled (medicinal)	1430
	Nepeta menthoides Boiss.& Buhse	Leaves and flowers	Anti-flatulence, nausea, and menstrual cramps	Drinking, drying, and eating vegetables (edible, medicinal)	1438
	Onopordum heteracanthum C.A.Mey.	Fruits, roots, leaves and stems	Treatment of fever, warts, stomach ache, and liver disease	Decoction, dried, poultice (medicinal)	1435
	Tanacetum polycephalum schultz-Bip.	Flowering branches	Anti-infective, antibacterial, antitussive, anti-inflammatory, and bile cleanser	Dried (medicinal)	1418
	Teucrium polium L.	Flowering branches, aerial parts	Colds, heartburn and diarrhea, diabetes treatment	Herbal tea, plant extract, making honey (edible, pharmaceutical)	1427
	Melissa officinalis L.	Leaves, flowering branches, and essential oils	Soothing and calming, treating headaches, and treating stress	Drink, eat vegetables (edible, pharmaceutical)	1425
	Savia officinalis L.	Roots, stems, leaves and flowers	Reducing blood sugar, sedatives, colds and liver disorders	Decoction, dried (medicinal)	1429
	Stachys acerosa Boiss.	Flower nectar	-	Making honey (edible)	1414
	Stachys annua (L)	Leaves and flowers	Relieving colds, sleep relax	Dried, boiled (medicinal)	1441
	Stachys lavandulifolia Vahl	Aerial parts	Relieving fatigue, sedative, treating colds, and eliminating diarrhea	Dry, drink (medicinal)	1419
Lamiaceae	*Ziziphora clinopodioides* Lam.	Aerial parts (leaves and flowers)	Antitussive, anti-inflammatory, treatment of diarrhea and heartburn, prevention of nosebleeds, gastrointestinal treatment	Herbal tea, food flavoring, spice, dried and eaten leaves in the dough (medicinal)	1443
	Salvia Sclarea L.	Flowering leaves and branches	Febrifuge, regulating, lowering blood pressure and blood sugar and nerve comforting	Herbal tea, food flavoring, used in the perfume industry (pharmaceutical, edible, industrial)	1447
	Satureja mutica Fisch.	Leaves	Treatment of diabetes, heart disease, Alzheimer's, and cancer	Eating fresh and dried (edible)	1445
Malvaceae	*Althaea officinalis* L.	Roots	Anti-respiratory and gastrointestinal problems, relieving inflammation of the mouth and throat, anti-cough	Decoction (edible)	1456
	Alcea rosea L.	Flowers	Anti-respiratory and gastrointestinal problems, relieving inflammation of the mouth and throat, anti-cough	Decoction (edible)	1460

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
	Malva microcarpa Pers.	Leaves, fruit	Eliminating infections and colds	Raw and boiled (edible and pharmaceutical)	1462
Polygonaceae	*Rumex elbursensis* Boiss.	Leaves and stems	Appetizing, blood-purifying, digestive, and diuretic properties	Boiled, used in bread and food, eating vegetables (edible and pharmaceutical)	1168
Papilionaceae	*Alhagi camelorum* Fisch.	Roots, leaves	Treatment of rheumatism, treatment of kidney stones	The plant extract, leaf oil, white leachate, flavoring, and sweetener in food (medicinal)	1180
Plantaginaceae	*Plantago major* L.	Roots, leaves and seeds	Antipyretic, antitussive, antihypertensive, anti-inflammatory, anti-fever and anti-rheumatic	Drink, syrup and drops (edible and medicinal)	1157
Rhamnaceae	*Rhamnus pallasii* Fisch. & Mey	Fruit, wood, bark	Treatment of hyperlipidemia, diabetes, prostatitis, and kidney stones	Decoction and poultice (edible and pharmaceutical)	1501
Rosaceae	*Cotoneaster nummularioides* Poark	Fruit, manna	Laxative	manna	1132
	Cotoneaster discolor Pojark	Fruit, gum, or manna secreted from the plant	Eliminating neonatal jaundice, relieving fever, dry cough	Soluble in water	1123
	Mespilus germanica L.	Leaves, seeds, fresh stems, and roots	Treatment of sore throat, dental plaque, and fever	Decoction, raw fruit, syrup, and paste	1110
	Rosa canina L.	Leaves, flowers, fruits, roots, and seed oils	Treatment of eye inflammation, gout, bloating, cough, and cold	The oil and raw fruit	1139
Scorphulariaceae	*Verbascum speciosum* Sachrid	Leaves and flowers	Eliminating infection, treatment of wounds	Boiled and crushed (medicated)	1511
	Verbascum blattari L.	Leaves, flowers and stems	Eliminating infection, treatment of wounds	Boiled and crushed (medicated)	1515
	Verbascum thapsus L.	Leaves, flowers and stems	Eliminating infection, treatment of wounds disinfects	Making honey, herbal tea (edible, pharmaceutical)	1519
Urticaceae	*Urtica dioica* L.	Leaves, flowers, and flowering branches	Anti-diabetic, chest pain, gynecological disorders, skin disorders, and hemorrhoids	In food preparation, dried and boiled (edible, medicinal)	1170

Family	Scientific name	organ used	Medicinal properties	How to use	Voucher specimens
Violaceae	*Viola odorata* L.	Flowers, leaves and seeds	Laxative, expectorant, anti-inflammatory, and anti-cough	Syrup, jam and ointment (edible, and pharmaceutical)	1193
Zygophyllaceae	*Zygophyllum atriplicoides* Fisch. & C.A. Mey.	Leaves, seeds	Treatment of rheumatism, treatment of asthma, ointment for skin diseases	Plant extract (medicinal)	1523
	Peganum harmala L.	Flowering leaves and branches, seeds	Treatment of stomach pain and gastric acidity, disinfectant	Smoking (medicinal)	1524

Some plants in the area have different uses and applications, known to the Qizilbash tribe from long ago. For example, *Falcaria vulgaris* in traditional medicine has been used as a stomach tonic both in powder form and fresh, i.e. it has edible and medicinal properties. This plant in Turkish is called "bride's nail". As another example, according to the locals, the fruit of the *Juniperus communis* is used as chewing fruit and the crushed fruit in water to improve stomach function, anti-flatulence, diuretic, disinfectant, and for treatment of rheumatism. In Turkish Qizilbash, the plant has name meaning stone because of the similarity of the fruits of this tree to the stone. *Caccinia macranthera* has a name meaning "cow tongue" in Qizilbash Turkish, because of the similarity of the leaves of this plant to the cow tongue, and is used as an anti-cough, sedative, and analgesic. Also, *Thymus kotschyanus* translates into" Partridge grass" in Turkish since partridge feeds on this plant. The plant is used as a remedy for bloating, inflammation of the respiratory tract, intestinal and stomach diseases, as well as a flavoring for food, buttermilk, and dairy products.

Phlomis cansellata is called lamb ears in Turkish because its leaves are similar to the ears of lamb. In the past, the locals used the leaves and flowering branches of this plant to eliminate dandruff and head lice, as well as the decoction as an anti-nausea and diabetes treatment. Also, *Peganum harmala* is called "isfand", harvested from August by women to make decorative pendants. These pendants are hung as an anti-evil eye on the front door of the house. After full ripening, the fruit and seeds are collected and the seeds are burnt in various joy and mourning ceremonies. Locals strongly believe in the antiseptic properties and evil eye protection of this plant. *Tragopogon collinus* is another plant found around springs and fields. When this plant is picked, white water leaks out of it. According to the locals, for people who have warts on their hand or any part of their body, rubbing this water on the wart helps to cure it.

Discussion

The presence of the Qizilbash tribe, coupled with their extensive and profound knowledge of traditional medicine and medicinal plants in the region, highlights the enduring belief in using plants for treating various diseases and alleviating physical pain in areas with a longstanding history. The preference for medicinal plants over chemical drugs, owing to their fewer side effects, is steadily gaining popularity among local rural populations, especially within the Qizilbash tribes, attracting interest from individuals both within and beyond these tribes. The Qizilbash have inhabited this region for centuries, and factors such as the role of plants in daily life, the scarcity of chemical drugs, and geographical distance from urban centers have contributed to the accumulation of this knowledge over time, transmitted through oral and unwritten means. It is imperative to document the specific ethnobotanical knowledge of each region to prevent its potential extinction, as emphasized by Kargıoğlu et al. (2010). Studies by Kala (2009) and Dutta et al. (2021) in India underscore the richness of indigenous knowledge among local populations

regarding medicinal plants, a trend also observed in recent Turkish research efforts (Akgul et al., 2018; Nadiroğlu et al., 2019; Yeşil et al., 2019; Güler et al., 2020; Kaya et al., 2020; Görhan & Öztürk, 2021; Kılıç et al., 2021).

The present study identified 84 regional plant species belonging to 27 families. Notably, Lamiaceae (20 species), Compositae (12 species), and Legominaceae (6 species) emerged as the most frequent plant families (Figure 4). These plants were utilized in various forms, including decoctions and herbal teas. For instance, herbal teas from the Lamiaceae family, such as *Thymus kotschyanus, Nepeta menthoides, Stachys inflata, Teucrium polium, Ziziphora clinopodioides*, were employed to address sore throats, colds, and respiratory issues. Compositae family plants like *Achillea millefolium* and *Anthemis rhodocentra* were used for digestive purposes and inflammation relief. Additionally, decoctions and raw leaves of *Cichorium intybus*, *Artemisia sieberi*, and *Arctium lappa* were consumed to treat diabetes and lower blood sugar levels. Similar findings were reported by Alam et al. (2011) in Buner, Pakistan, where legume family plants dominated medicinal usage.

The study revealed that all plant organs, including vegetative (aerial and underground) and reproductive organs, contained effective medicinal compounds, with variations in the parts used. This aligns with research by Vafadar and Toghranegar (2020) and Mahmoud et al. (2020) in Northern Nigeria. The Qizilbash tribes predominantly utilized leaves (28%), flowers (16%), and roots (14%) of medicinal plants, with specific plants like *Achillea millefolium*, *Artemisia aucheri*, and *Cichorium intybus* being frequently employed. The connection between the natives' health and livelihood with the environment and plants underscores the integration of traditional medicine into their way of life. These results align with similar studies in Iran (Yazdanshenas et al., 2016; Noorhosseini et al., 2020), Pakistan (Alam et al., 2011), Turkey (Özgen et al., 2004), Kashmir, Pakistan (Mahmood et al., 2012), Ethiopia (Teklehaymanot et al., 2006), and South Africa (Mahwasane et al., 2013).

Furthermore, gender differences in knowledge emerged from a study among the Qizilbash tribe, indicating that women possess more comprehensive knowledge, particularly in tasks such as drying, storing, and utilizing medicinal plants—typically within their domain of responsibility. Women demonstrated expertise in collecting seeds of plants like *Descurainia sophia* and *Plantago major*, employing diverse methods for planting and drying various medicinal plants. The findings resonate with studies conducted by Saadatpour et al. (2017) in Sajarud, Hosseini et al. (2019) in Zabarkhan, and Sharififar et al. (2014) in Kerman, Iran.

Many plants in the study had multifaceted uses beyond medicinal applications. For instance, *Berberis integerrima* served not only culinary purposes but also found applications in making syrups and jams, functioning as an anti-inflammatory, blood pressure regulator, and lipid-lowering agent. This aligns with the findings of Abtahi et al. (2019).

In summary, the predominant use of medicinal plants in this study was related to addressing digestive issues, coughs, colds, and respiratory discomfort. Notably, the least utilized identified plant species were associated with disinfection problems and the treatment of skin inflammation. The varied ways in which plants were employed in different treatments highlight the diverse traditional knowledge within the Qizilbash tribes. This research reinforces the importance of documenting and preserving indigenous knowledge regarding medicinal plants, recognizing their multifaceted roles in local communities and their significant potential in promoting health and well-being.

Conclusion

Ethnobotany plays a crucial role in addressing numerous diseases, gaining increasing attention due to the recognition of side effects and the high costs associated with chemical treatments. Given the abundant variety of

medicinal plants in the study area and the extensive knowledge of the Qizilbash tribe regarding their use, it appears that further research, particularly among diverse ethnic groups, could safeguard this valuable knowledge and transform it into a rich resource. Scientifically cultivating medicinal plants and optimizing the use of their active compounds in the treatment of various diseases not only enhances the value of regional plant life but also contributes to local employment. In light of these considerations, the following suggestions are made:

1. Documenting the indigenous knowledge of local communities and establishing a comprehensive database containing information on traditional medicine, herbal remedies, edible plants, industrial plants, handicrafts, etc., with the aim of both utilizing and preserving these invaluable resources.
2. Conducting studies on indigenous knowledge in other regions with similar indigenous structures and cultural backgrounds.
3. Conducting laboratory-level studies on plants to identify effective substances and their properties.
4. Identifying rare medicinal species in the region and conducting experiments to discover new medicines.
5. Undertaking more studies in the field of industrial plants and leveraging this knowledge for the advancement of the handicraft industry.
6. Investigating local foods in terms of health and ingredients to introduce them to different segments of society.
7. Utilizing ethnoecological information from the local people of different regions in the management of natural resources.

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Author's contribution
All authors listed on the title page have contributed significantly to the work. Conceptualization, designing the study, and involvement in data collection: MRF. Data collection and writing: YK. Helping with data analysis: SZM and HNG. All authors read and approved the final manuscript.

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