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ORIGINAL ARTICLE / ÖZGÜN MAKALE

ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN AĞRI PROVINCE, TÜRKİYE: EXPLORING TRADITIONAL KNOWLEDGE AND THERAPEUTIC POTENTIAL

TÜRKİYE'NİN AĞRI İLİNDE TIBBİ BİTKİLERİN ETNOBOTANİK ÇALIŞMASI: GELENEKSEL BİLGİ VE TEDAVİ POTANSİYELİNİN KEŞFEDİLMESİ

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ABSTRACT

Objective: *This study was conducted to systematically document the use of plants, plant parts and preparation methods used by people in eight districts and sixty villages in Ağrı province.*
Material and Method: *The medicinal plant species employed by the indigenous population for therapeutic purposes were systematically gathered and identified. Comprehensive data on traditionally utilized information were compiled, and herbarium materials were prepared. These materials have been deposited at the Iğdır National Wild Life Museum (INWM), affiliated with Iğdır University.*
Result and Discussion: *This research identified a total of 58 taxa of medicinal plants belonging to 31 families. Among these, 50 species were found to grow naturally, while 8 species were cultivated. The predominant plant families included Asteraceae (8), Apiaceae (4), Lamiaceae (4), and Rosaceae (4). Infusion emerged as the most widely employed preparation method. The practice of traditional medicine remained prevalent among the population in Ağrı. Nevertheless, with the increasing availability of health services in the region, herbal medicine appeared to be more closely associated with healthcare and illness prevention than with curative purposes. The influx of new immigrants also contributed to the erosion of traditional knowledge. Notably, there is a discernible decline in traditional knowledge regarding the use of medicinal plants, both among younger generations and due to migration. Furthermore, this research serves as a foundational resource for prospective scientific inquiries aimed at the development of novel commercial drugs derived from plant sources.*
Keywords: *Ağrı, ethnobotany, medicinal plants, Türkiye*

ÖZ

Amaç: *Bu araştırma, Ağrı ilinin 8 ilçesi ve 60 köyünde yaşayan insanların yararlandıkları tıbbi bitkilerin kullanımı, bu bitkilerin kullanılan kısımlarını ve hazırlanma yöntemlerini kayıt altına almak amacıyla yapılmıştır.*
Gereç ve Yöntem: *Yöre halkının tedavi amacıyla kullandığı şifalı bitki türleri toplanarak, tanımlanmıştır. Geleneksel olarak kullanılan tüm bilgiler kayıt altına alınmış olup, herbaryum materyalleri hazırlanmış ve herbaryum örnekleri Iğdır Üniversitesi yaban hayatı müzesinde (INWM) depolanmıştır.*
Sonuç ve Tartışma: *Bu araştırmada 31 familyaya ait toplam 58 tıbbi bitki taksonu tanımlanmıştır.*

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Bunlardan 50 türün doğal, 8 türün ise kültür bitkisi olduğu tespit edilmiştir. En çok rastlanılan bitkilerin Asteraceae (8), Apiaceae (4), Lamiaceae (4), Rosaceae (4) familyalarına ait olduğu gözlenmiştir. En yaygın hazırlıklama şekli infüzyondur. Ağrı'da halk arasında geleneksel tıbbın kullanımı hâlâ yaygındır. Bununla birlikte, bölgedeki artan sağlık tesisleri sayesinde, bitkisel ilaçların daha çok sağlık bakımı ve hastalıkların önlenmesinde kullanıldığı tespit edilmiştir. Bölgede yeni göç ve genç nufüsun artuğı gözlenmiştir. Hem genç nesillerde hem de göç nedeniyle şifalı bitkilerin kullanımına ilişkin geleneksel bilgide kademeli bir kayıp olduğu gözlenmiştir. Ayrıca, bu araştırma, bitkisel kaynaklı yeni ticari ilaçlar geliştirmeyi amaçlayan gelecekteki bilimsel araştırmalar için temel bir kaynak görevi görecektir.
Anahtar Kelimeler: *Ağrı, etnobotani, tıbbi bitkiler, Türkiye*

INTRODUCTION

Throughout human history, plants have served as a resource, functioning both as a protective/therapeutic agent and as a tool [1]. In Türkiye, recognized as one of the world's significant biodiversity hotspots, more than 30% of the approximately 12.000 vascular plant taxa are endemic (about 4.000), surpassing the number of endemic species in European countries (1352) [2-4]. Türkiye encompasses diverse ecosystems owing to factors such as its geographical location, climate, geology, soil and water resources, and ecological advantages, including its position along bird migration routes [5-7]. The Anatolian population has accrued a wealth of knowledge in folk medicine over an extended period, attributable to the diversity of flora and fauna in the region, providing abundant sources of medicinal plants and animal remedies in both urban and rural areas. [8].

The flora of Eastern Anatolia varies depending on different ecological regions, geographical differences and different climates. The province of Ağrı, located in eastern Turkey, stands out for its rich biodiversity and cultural heritage, which provides a favorable environment for researching the traditional use of medicinal plants by indigenous communities [9]. With a land area of 11,376 km², Ağrı province encompasses around 1.4% of Anatolian and ranks as the 26th largest province in Türkiye in terms of surface area. [10].

The number of ethnobotanical studies conducted in Ağrı province is limited. Previous studyies have been confined to specific regions or mauontains rather than providing a comprehensive overview of Ağrı province [9,11-15]. This study aims to conduct a comprehensive ethnobotanical survey in Ağrı province, documenting and analyzing traditional knowledge and therapeutic practices, especially regarding medicinal plants. By collaborating closely with the inhabitants Diyadin (8 villages), Doubayazt (8 villages), Eleşkirt (7 villages), Hamur (7 villages), Patnos (8 villages), Taşlıçay (7 villages), Tutak (8 villages), and the center (7 villages) of Ağrı province, We aim to investigate the diversity of medicinal plants, identify plant species, document preparation methods, and understand the traditional uses of these plants for treating various ailments.

MATERIAL AND METHOD

The Study Area

Ağrı province, situated in the Eastern Anatolia Region of Türkiye, group into the B9 and B10 squares and is classified within the Iran-Turanian Plant Geography Region. As of 2022, it represents an Eastern Anatolian province with a population of 510.626 and covers a land area of 11.376 km². [9,16]. Iran to the east, Kars to the north, Erzurum to the northwest, Muş and Bitlis to the southwest, Van to the south, and Iğdır to the northeast surround Ağrı province (Figure 1).

Data collection

This study was supported within the scope of the 'Recording Traditional Knowledge Based on Biological Diversity in Ağrı Province Project' by the Ministry of Agriculture and Forestry. The villages where the study data were collected were determined by the ministry. During the visits to the villages, standardized and valid survey forms for each province were used in accordance with the technical specifications prepared by the ministry.

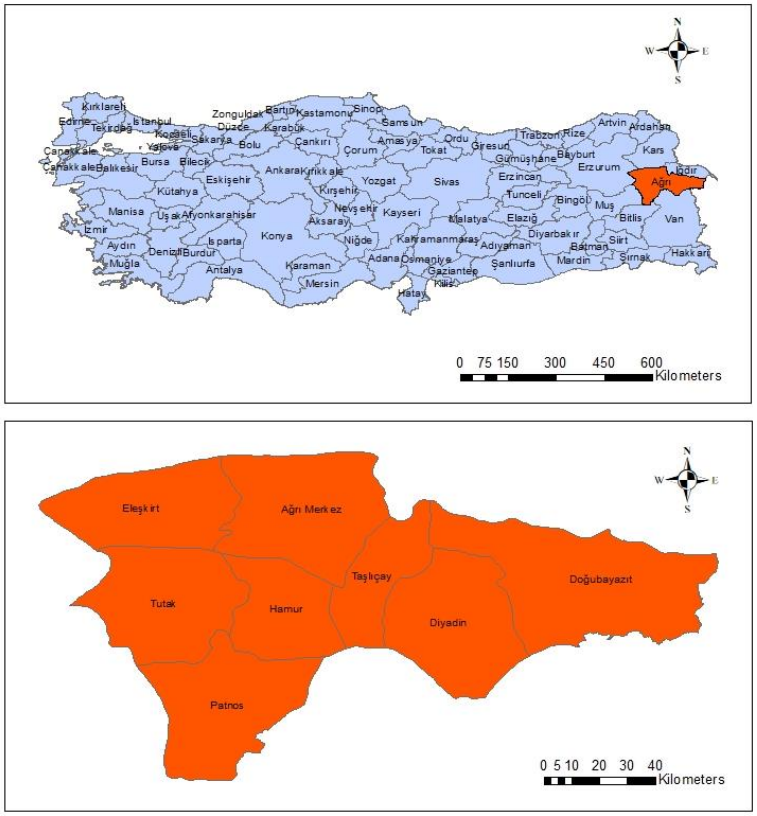

Figure 1. Geographical location of the investigation region

Ehnobotanical information was systematically collected through fieldwork, involving structured and semi-structured interviews with knowledgeable individuals from 60 villages, namely Sarca (1), Dumanlı (2), Soğancumaçay (3), Aşağıkent (4), Uçarkaya (5), Güneysu (6), Sarıharman (7), Armutlu (8), Güvercinli (9), Özdemir (10), Koçaklar (11), Kızkapan (12), Hasandolu (13), Akdilek (14), Yukarıgöçmez (15), Kılıçgediği (16), Mızrak (17), Uzunöz (18), Çukurkonak (19), Şekerbulak (20), Yenikent (21), Taşbudak (22), Otluca (23), Hayrangöl (24), Aşağıcihanbey (25), Tahir Beldesi (26), Gözaydın (27), Akyumak (28), Abdiköy (29), Söbetaş (30), Karlıca (31), Danakıran (32), Soğanlıtepe (33), Yuvacık (34), Sağlıksuyu (35), Karakazan (36), Gümüşkuşak (37), Uğurtaş (38), Gündoğdu (39), Yeltepe (40), Gözucu (41), Yukarıesen (42), Yukarıtoklu (43) Tanyolu (44), Kumluca (45), Dedebulak (46), Yanıkçukur (47), Karataş (48), Günbuldu (49), Toklucak (50), Batıbeyli (51), Pirali (52), Yukarıtütek (53), Bezirhane (54), Karaşeyh (55), Çalıköy (56), Kızılkaya (57), Çetenli (58), Üzengili (59), and Örtülü (60). A total of 158 individuals, encompassing midwives, shepherds, foresters, farmers, healers, beekeepers, housewives, teachers, village headmen, and plant collectors, were subjected to face-to-face interviews. Of the total informants, 38 were female (24.05%), while the remaining 120 were male (75.95%). A questionnaire was administered to gather information from the participants, and video photographs and audio recordings were obtained during the interviews, all conducted with the participants' consent. The interviews were conducted at random locations, including tea houses, mosque gardens, homes, fields, plateaus, etc. Throughout the study, Information regarding the local name of the plant, the therapeutic effects of the plant, the specific part(s) of the plant used, and the methods of preparation/application were documented based on the participants' responses.

Plant Materials

In 2021 and 2022, plant samples were systematically collected from various villages. The authors, Belkıs Muca YİĞİT, pressed and described the scientific names of the collected specimens, referencing authoritative botanical resources such as the Flora of Turkey and the East Aegean Islands, the Turkish Plants List (Vascular Plants), the Flora of the USSR, Flora Europaea, Flora Iranica, Flora of Iraq, and

Flora Palaestina [17-23]. The Plant List was used to determine the scientific names of plant species. [24]. Voucher specimens were meticulously preserved and archived at the Iğdır National Wildlife Museum (INWM).

Ethnobotanical Index

The Use Value (UV) index was calculated using the formula UV=ΣUi/N, where Ui represents the number of use reports indicating a taxon with a significant percentage, and N indicates the total number of information sources [25-28].

RESULT AND DISCUSSION

Interviews were conducted to determine the demographic characteristics of participants involved in the field research. A total of 158 individuals, representing diverse occupations including beekeepers, construction foremen, farmers, headmen, janitors, retirees, religious officers, engineers, teachers, housewives, managers, shepherds, as well as individuals engaged in herb and plant collection, were subjected to face-to-face interviews. Out of the total 158 participants contacted, 120 were male (75.95%), and the remaining 38 were female (24.05%). The age distribution of the participants is as follows: 3 informants under the age of 19, 21 informants between the ages of 19-35, 52 informants between the ages of 36-49, 52 informants between the ages of 50-70, and 30 informants above the age of 70. Furthermore, 15 participants reported having never attended a formal educational institution (Table 1).

Table 1. The demographic profile of the participants

Demographic characteristics	Number
Age Range	
Below 19	3
19-35	21
36-49	52
50-70	52
70 and above	30
Sex	
Women	38
Men	120
Educational levels	
Illiterate	15
Literate	17
Primary school	83
Secondary school	24
High school	13
University	6

All the interviewed people currently reside in the districts of Eleşkirt, Tutak, Patnos, Hamur, Taşlıçay, Diyadin, and Doğubayazıt in Ağrı, Türkiye. It was observed that many persons who benefit from medicinal plants are between the ages of 36 and 70 (104 people). Additionally, it has been observed that the predominant users of medicinal plants are males with primary school education or below (Table 1). Erzurum and Van are among the provinces where Ağrı has the most socio-cultural and economic interaction. Additionally, it has been revealed that people over the age of 50 benefit most from medicinal plants in Erzurum and Van [25,29]. A similar condition has been recorded in ethnobotanical research done on the surrounding provinces of Kars, Muş, and Iğdır [25,29-32]. In the Eastern Anatolia provinces (Erzurum, Van, Kars, Iğdır, Elazığ, Bingöl, Erzincan, and Tunceli) and the Eastern Black Sea Region (Bayburt, Gümüşhane, and Trabzon), the utilization of medicinal plants is predominantly observed among women, whereas in Ağrı, a higher prevalence is noted among men [25,29-37].

A comprehensive collection of 58 medicinal plant taxa covering 31 plant families was documented in the Ağrı province of Türkiye (Table 2). Asteraceae (8), Apiaceae (4), Lamiaceae (4) and Rosaceae (4) are the most common medicinal plant families. In total, 158 medicinal plant taxa were identified in Ağrı, distributed across 31 diffirent plant families, with 50 classified as wild species and 8 as cultivated plants. Table 2 provides an alphabetical listing of the 58 herbs identified in the region, organized by family and botanical name. Based on our findings, the most frequently utilized taxa include *Achillea arabica*, *Alcea calvertii*, *Beta vulgaris* var. *altissima*, *Malva neglecta*, *Plantago major*, *Rheum ribes*, and *Urtica dioica*. In the field of ethnobotany, various studies have been conducted in different regions to systematically document the wide diversity of plant species and their traditional uses. In the Van province, Mükemre et al. conducted a comprehensive ethnobotanical study, identifying a total of 73 taxa from 23 families [29]. Similarly, in the Bitlis province, Demir et al., undertook ethnobotanical research, documenting 71 taxa that represented 29 distinct families [38]. Furthermore, in Elazığ, another survey revealed the presence of 41 taxa spanning 17 different families [39]. Likewise, in the Erzurum province, an ethnobotanical study recorded 99 taxa belonging to 38 distinct families [25]. On the other hand, when studies in the Eastern Anatolia and Southeastern Anatolia regions are examined, it has been determined that *Helichrysum* sp., *Malva* sp., *Cephalaria* sp., *Rumex* sp., *Crataegus* sp., *Urtica dioca*, and *Rheum ribes* are mostly used in folk medicine [9-14,28-34].

Table 2. Traditional uses of plants in Ağrı (Türkiye)

Family	Plant species, and location	Local name	Used part of the plant[a]	Prep.[b]	Adm.[c]	Use	UV
Gymnospermae							
Pinaceae	*Pinus sylvestris* L.	Çam (INWM-0000059)	Res	Hea	Che	Peptic Ulcer	0.02
Angiospermae							
Amaranthaceae	*Beta vulgaris* var. *altissima* Döll.	Sılk, Sılkog, Hilog, Şekerpancarı (INWM-0000061)	Lea	Raw	Eat	Hypertension, Diabetes	0.06
Amaranthaceae	*Chenopodium album* L.	Selemask (INWM-0000080)	Lea	Inf	Ext	Wound	0.01
Amaryllidaceae	**Allium sativum* L.	Sarımsak (INWM-0000062)	Bul	Raw	Eat	Hypertension, Toothache	0.03
Amaryllidaceae	**Allium cepa* L.	Pivaz, Soğan (INWM-0000063)	Bul	Hea	Inh	Epilepsy	0.01
			Bul	Cru	Ext	Earache	0.03
Apiaceae	*Ammi visnaga* (L.) Lam.	Ziyan (INWM-0000064)	Fru	Raw	Che	Toothache	0.02
Apiaceae	*Ferula orientalis* L.	Helis, Heliz, Çakşır, Çaşır (INWM-0000065)	Roo	Raw	Eat	Urinary Tract İnfection	0.03
			Aer	Dec	Int	Nausea, Prostate, Asthma, Immunostimulant	0.01
Apiaceae	*Heracleum platytaenium* Boiss.	So, Sö, Söh (INWM-0000066)	Aer	Raw	Eat	Diabetes, Anti-İnflammatory, Analgesic	0.01
Apiaceae	*Prangos ferulacea* (L.) Lindl.	Deliçaşır (INWM-0000067)	Aer	Gar	Ext	Toothache	0.03
Asphodelaceae	*Eremurus spectabilis* M. Bieb.	Gurik, Gulig, Gülik (INWM-00000116)	Lea	Cru	Int	Peptic Ulcer	0.01
			Aer	Inf	Int	Immunostimulant, Constipation,	0.04
Asteraceae	*Artemisia absinthium* L.	Havşan, Gziyahavşan, Havaju (INWM-0000068)	Aer	Inf	Int	Diabetes, Urinary Tract İnfection, Diarrhea	0.04
			Flo	Raw	Int	Immunostimulant, Sedative	0.01
Asteraceae	*Achillea arabica* Kotschy	Gılikakiçik, Sarı çiçek, Civanperçemi (INWM-0000069)	Aer	Inf	Int	Peptic Ulcer, Hagi-nitis, Hemorrhoids, Antihelmintic, Wounds	0.07

Table 2 (*continue*). Traditional uses of plants in Ağrı (Türkiye)

Family	Plant species, and location	Local name	Used part of the plant[a]	Prep.[b]	Adm.[c]	Use	UV
Asteraceae	*Achillea millefolium* L.	Civanperçemi, Dermanimid, Gulilk, Dermediva (INWM-0000070)	Aer	Cru	Ext	Wounds	0.04
			Aer	Inf	Int	Anti-İnflammatory, Amenore, Diarrhea, Peptic Ulcer	0.03
Asteraceae	*Anthemis cretica* L.	Patpat, Papatya (INWM-0000071)	Aer	Inf	Int	Immunostimulant, Digestive, Peptic Ulcer, Urinary Tract İnfection	0.04
Asteraceae	*Cichorium intybus* L.	Çakçak, kajık, Kermeşo, Çekçek (INWM-0000072)	Aer	Inf	Int	Myalgia, Asthma, Allergy, Hemorrhoids, Analgesic	0.03
Asteraceae	*Gundelia tournefortii* L.	Dağ Sakızı, Kereng, Benişteganog, Kanog, Sakız otu, Geleng, Ganog, Gelengkusi, Benîştê, Kengel, Gereng, Benîştê (INWM-0000073)	Aer	Raw	Eat	Immunostimulant,	0.01
			Lat	Raw	Che	Diabetes, Toothache	0.03
			Lat	Mixed with butter	Ext	Ambustion, Wound,	0.02
			Roo	Dec	Int	Asthma	0.01
Asteraceae	*Tragopogon buphthalmoides* (DC.) Boiss.	Sping, Spitag (INWM-000074)	Lea	Raw	Eat	Diabetes	0.03
Asteraceae	*Tussilago farfara* L.	Kersim, Karşim, Sarmalık, Sarma (INWM-000075)	Lea	Inf	Int	Anti-İnflammatory	0.01
Boraginaceae	*Alkanna orientalis* (L.) Boiss.	Hewajo, Havajo, Havaju, Kök boya (INWM-000076)	Roo	Boi	Int	Anti-İnflammatory	0.02
			Roo	Boi	Ext	Wounds, Conjunctivitis, Ambustion, Scabies, Earache	0.05
			Aer	Inf	Int	Diabetes, Hypercholesteremia, Analgesic, Hemorrhoids,	0.03
Boraginaceae	*Anchusa azurea* Mill.	Tilki Otu, Mıjmıjık (INWM-0000077)	Lea	Inf	Int	Hernia	0.04
Caprifoliaceae	*Cephalaria procera* Fisch.& Lall	Pelemir, Gulinga (INWM-0000078)	Lat	Raw	Ext	Hemostatic	0.02
Cannabaceae	*Cannabis sativa* L.	Kenevir (INWM-0000079)	See	Hea	Int	Sedative-Hypnotic	0.01
Euphorbiaceae	*Euphorbia seguieriana* Neck.	Sütleğen (INWM-0000081)	Lat	Raw	Int	Constipation	0.01
Fabaceae	*Astragalus brachycalyx* Fisch. ex Boiss.	Guni, Gunig, Geven (INWM-000082)	Aer	Dec	Ext	Alopecia Areata, Wounds	0.03
			Ole	Raw	Int	Diabetes	0.01
Fabaceae	*Glycyrrhiza glabra* L.	Mayam, Sus (INWM-000083)	Roo	Dec	Int	Asthma	0.01
Fabaceae	*Onobrychis carduchorum* C.C. Tensen	Gete (INWM-000084)	Aer	Mixed with butter	Ext	Wounds	0.01
Iridaceae	*Gladiolus kotschyanus* Boiss.	Kılıç otu (INWM-000085)	Aer	Inf	Int	Peptic Ulcer	0.01
Juglandaceae	**Juglans regia* L.	Ceviz, El Cevizi (INWM-000086)	See	Cru	Int	Peptic Ulcer	0.01

Table 2 (*continue*). Traditional uses of plants in Ağrı (Türkiye)

Family	Plant species, and location	Local name	Used part of the plant[a]	Prep.[b]	Adm.[c]	Use	UV
Lamiaceae	*Mentha longifolia* (L.) L.	Nane, Punk (INWM-000087)	Lea	Inf	Int	Catarrh, Asthma, Peptic Ulcer, Constipation	0.03
			Lea	Cru	Ext	Toothache, Scorpion Sting, Snakebite	0.02
Lamiaceae	*Teucrium polium* L.	Mervend, Acı Tal, Merven, Mevran, Mervent (INWM-000088)	Lea	Inf	Int	Immunostimulant, İnfertility, Diarrhea, Anti-İnflammatory, Asthma	0.04
			Lea	Cru	Ext	Wounds, Vaginitis	0.03
			Lea	Raw	Int	Peptic Ulcer, Stomachache	0.03
Lamiaceae	*Teucrium chamaedrys* L.	Kısamahmut (INWM-000089)	Aer	Inf	Int	Renal Calculi, Digestive	0.01
Lamiaceae	*Thymus fallax* Fisch. & C.A Mey.	Catri, Catiri, Dağ Kekiği (INWM-000090)	Aer	Inf	Int	Peptic Ulcer, Diabetes, Antipyretic, Asthma	0.03
			Lea	Cru	Ext	Toothache, Wound	0.02
Malvaceae	*Alcea calvertii* (Boiss.) Boiss.	Hiro, Hırabeng (INWM-000091)	Aer	Mixed with milk	Ext	Scorpion Sting, Snakebite, Wounds	0.01
			Aer	Inf	Int	Peptic Ulcer, Diabetes, Hemorrhoids, Vaginitis	0.07
			Aer	Inf	Ext	Earache, Conjunc-tivitis, Stomachache, Dermatological diseases	0.02
Malvaceae	*Malva neglecta* Wallr.	Dolık, Dolıg Tolıg, Tolık (INWM-000092)	Aer	Dec	Ext	Vaginitis	0.01
			Aer	Dec	Int	Peptic Ulcer, Anti-İnflammatory, İmmunostimulant	0.11
			Aer	Raw	Che	Toothache	0.02
			Lea	Dec	Ext	Wounds	0.03
			Lea	Coo	Int	Constipation, Derma-tological diseases	0.03
Moraceae	*Ficus carica* L.	Babesir (INWM-000093)	Fru	Raw	Eat	Hemorrhoids	0.01
Nitrariaceae	*Peganum harmala* L.	Üzerlik (INWM-000094)	Aer	Hea	Inh	Asthma, Sedative	0.01
Oleaceae	**Olea europaea* L.	Zeytin (INWM-000095)	Ole	Raw	Ext	Wounds, Anti-İnflammatory	0.01
Papaveraceae	*Papaver fugax* Poir.	Amıg, Amık (INWM-000096)	Roo	Raw	Eat	Immunostimulant, Peptic Ulcer	0.01
Papaveraceae	*Papaver somniferum* L.	Yabani haşhaş (INWM-000097)	Lat	Raw	Ext	Toothache	0.01
Plantaginaceae	*Plantago major* L.	Damar otu, Belhevis (INWM-000098)	Lea	Raw	Ext	Furoncle, Mastitis, Wounds, Anti-İnflammatory, Vaginitis, Conjunctivitis	0.09
			Lea	Inf	Int	Peptic Ulcer, Renal Calculi, Immunostimulant, Stomachache, Toothache	0.04

Table 2 (*continue*). Traditional uses of plants in Ağrı (Türkiye)

Family	Plant species, and location	Local name	Used part of the plant[a]	Prep.[b]	Adm.[c]	Use	UV
Poaceae	**Triticum aestivum* L.	Saman (INWM-000099)	Lea	Cru	Ext	Conjunctivitis	0.01
Polygonaceae	*Polygonum cognatum* Meissn.	Kuş epeleği, Nanicivigi, Gulikakiçik (INWM-00000100)	Aer	Inf	Int	Peptic Ulcer, Diabetes	0.02
Polygonaceae	*Rheum ribes* L.	Ribis, Işgın, Rabis, Reviz, Rıbiz (INWM-00000101)	Aer	Raw	Int	Diabetes, Peptic Ulcer	0.02
			Roo	Dec	Int	Diabetes, Renal Calculi	0.06
			Who	Raw	Int	Constipation	0.03
Polygonaceae	*Rumex crispus* L.	Tırşo Tırşoaga (INWM-00000102)	Lea	Cru	Ext	Toothache	0.01
			Lea	Dec	Ext	Hemorrhoids	0.02
			Lea	Dec	Int	Anti-İnflammatory	0.01
			Roo	Dec	Int	Diabetes, Acute Tonsilitis,	0.01
Ranunculaceae	*Thalictrum minus* var. *minus* L.	Katranotu, Karakatranotu (INWM-00000103)	Aer	Inf	Int	Diabetes, Anti-İnflammatory, Digestive	0.03
Rosaceae	*Armeniaca vulgaris* Lam.	Kayısı (INWM-00000104)	Fru	Raw	Eat	Hepatitis, Acute Tonsilitis, Hoarseness	0.01
Rosaceae	*Crataegus orientalis* Pall. ex M.Bieb.	Gıvij, Talik, Alıç (INWM-00000105)	Fru	Dec	Int	Cardiac Diseases, Diabetes, Asthma, Rheumatic Pain	0.02
Rosaceae	*Pyrus elaeagnifolia* Pall.	Dağ Armudu, Karçin (INWM-00000106)	Fru	Raw	Eat	Diarrhea	0.02
Rosaceae	*Sorbus persica* Hedl.	Biog (INWM-00000107)	Fru	Raw	Eat	Immunostimulant	0.01
Rutaceae	**Citrus limon* (L.) Burm.f.	Limon (INWM-00000108)	Per	Cru	Ext	Hernia	0.01
Salicaceae	*Salix alba* L.	Darabi, Söğüt (INWM-00000109)	Bar	Hea	Ext	Wounds, Hernia	0.02
Scrophulariaceae	*Verbascum oreodoxum* Hub.-Mor.	Mavjork, Majerk, Mamujark, Cavreşk, Majork (INWM-00000110)	Aer	Dec	Ext	Furoncle, Wounds	0.01
			Aer	Inf	Int	Diabetes, Hemorrhoids, Rheumatic Pain	0.03
			Lea	Inf	Int	Immunostimulant, Abortifacient	0.02
Solanaceae	*Hyoscyamus niger* L.	Delipıtpıt, Delipatpat (INWM-00000111)	Aer	Hea	Inh	Toothache, Asthma	0.01
Solanaceae	**Lycopersicon esculentum* Mill.	Domates (INWM-00000112)	Fru	Coo	Ext	Ambustion	0.01
Solanaceae	**Solanum tuberosum* L.	Patates (INWM-00000113)	Tub	Cru	Ext	Wounds, Ambustion	0.03
Urticaceae	*Urtica dioica* L.	Gezeng, Gezgezk, Kevgesk, Gezgezik, Isırgan otu, Gezgez, (INWM-00000114)	Lea	Inf	Int	Catarrh, Hemorrhoids, Asthma, Peptic Ulcer, İmmunostimulant, Antipyretic, Hypertension	0.09
			Aer	Inf	Ext	Rheumatic Pain, Vaginitis, Anti-İnflammatory, Dermatologic disorders	0.13

Table 2 (*continue*). Traditional uses of plants in Ağrı (Türkiye)

Family	Plant species, and location	Local name	Used part of the plant[a]	Prep.[b]	Adm.[c]	Use	UV
Viburnaceae	*Viburnum lantana* L.	Dendereşk, Ayı meyvesi (INWM-0000060)	Fru	Inf	Int	Hypertension, Diabetes, Anti-İnflammatory, Digestive, Immunostimulant	0.05
Zygophyllaceae	*Zygophyllum fabago* L.	Kotibun (INWM-00000115)	Roo	Cru	Ext	Rheumatic Pain	0.01
			Lea	Inf	Int	Immunostimulant	0.01

[a] Plant part(s) used: Aer: Aerial parts; Bar: Bark; Bul: Bulbus; Flo: Flowers; Fru: Fruits; Lat: Latex; Lea: Leaves; Ole: Oleum; Res: Resin; Roo: Roots; See: Seeds; Per: Pericarp; Tub: Tuber; Who: Whole plant

[b] Prep: Preparations; Boi: Boiled; Cooked: Coo; Cru: Crushed; Dec: Decoction; Hea: Heated; Inf: Infusion; Che: Chewable; Mix; Mixed

[c] Adm.: Int: Internal use; Ext: External use; Eat: Eaten as meal; Gar: Gargle; Inh: Inhalation

*Cultivated plants

The plant organs most commonly used to prepare remedies included the aerial parts (31), leaves (22), roots (9), fruits (8), latex (5), bulbus (3), seeds (2), and oleum (2), with occasional utilization of tuber, bark, pericarp, flowers, and resina in some remedies. Additionally, local inhabitants occasionally incorporated other components, such as butter and milk, in remedy preparations. Major methods for preparing drugs included infusion (26), raw application (24), decoction (13), crushing (12), and heating (11) (Table 2). Remedies were predominantly administered internally (48%). Remarkably, the dosage of medicinal preparations often lacked precision; Terms such as "pinch" or "spoonful" were commonly used.

We systematically documented the local names of plants as indicated by the informants. In certain instances, a single vernacular name was attributed to more than one plant species, potentially leading to confusion and a potential reduction in the safe use of plants. Conversely, some plants were associated with more than one vernacular name (e.g., *Salix alba*: Darabi, söğüt; *Rheum ribes*: Ribis, Işgın Rabis, Reviz, Rıbiz). While most plant names have Turkish origins, we also identified Kurdish names. [25-28].

The authors compared their findings to those of previous comprehensive ethnobotanical research carried out in the region of Ağrı [9-15]. The most frequently utilized medicinal plant species in Ağrı were identified as *Urtica dioica*, *Malva neglecta*, *Mentha longifolia*, *Rheum ribes*, *Rumex acetosella*, *Plantago major*, *Plantogo arabica*, *Achillea arabica* and *Alcea calvarii*, and these were documented in these literatures [9-15]. In addition to this information, all of the previous studies were carried out only in certain regions of Ağrı [9-15].

Alcea calvarii (0.07), *Achillea arabica* (0.07), *Beta vulgaris* var. *altissima* (0.06), *Malva neglecta* (0.11), *Plantago major* (0.09), *Rheum ribes* (0.06), *Urtica dioica* (0.13), and *Viburnum lantana* (0.05) had the highest UVs (Table 2). The informants utilized medical plants mainly for the treatment of peptic ulcer, diabetes, immunostimulation, wound healing, and asthma. It has been determined that the number of plants used for cardiovascular problems, epilepsy, prostate issues, myalgia, hypercholesterolemia, abortifacient purposes, hemostatic, and infertility are the lowest. Other studies in Eastern Anatolia have observed that medicinal plants are mostly used in cancer, diabetes, respiratory tract disorders, cardiovascular system disorder, urinary tract system disorders and gastro-intestinal disorders [9-15].

It has been reported the *Alcea calvarii* was used as ınternally as antidiabetic agent in Ağrı. In the *in vitro* study conducted in this direction, it was determined that *Alcea* sp. showed antidiabetic and antiulcer activity [45-46]. Its use as an antiulcer and antidiabetic has also been recorded in other ethnobotanical studies [13,14,29]. Again, it has also been determined that *Achillea arabica* is used at a high rate in folk medicine in Ağrı province. *In vivo* studies have also showed that *Achillea* sp. have antiulcer, antidiabetic, and wound healing activities [47-49]. Furthermore, its use as an antiulcer, antidiabetic, and wound healing agent has also been recorded in other ethnobotanical studies [13,14,25,26,28]. *Urtica dioica* is traditionally used in Ağrı in the treatment of catarrh, hemorrhoids, asthma, peptic ulcer, antipyretic, hypertension and as an immunostimulant. Local people living in Ağrı stated that they used the infusion of this plant. Again, local people reported that this plant is also used

externally for rheumatic disorders, dermatologic disorders, and vaginitis. In previous studies, it was determined that the *Urtica dioica* plant has antiasthmatic, antihemorrhoidal, antiulcer, antihypertensive, and immunostimulatory activities activity [40-44]. It has also been reported that the *Urtica dioica* species is used in folk medicine in Erzincan, Van, and Erzurum [25,27,28]. *Malva neglecta*, *Plantago major*, *Rheum ribes*, and *Viburnum lantana* are plants which are used in Türkiye and across the World [25,28-32,50].

Our study was carried out on the whole of Ağrı and compared to the previous ethbotanical studies on the province of Ağrı. *Pinus sylvestris*, *Beta vulgaris* var. *altissima*, *Ammi visnaga*, *Heracleum platytaenium*, *Achillea arabica*, *Tragopogon buphthalmoides*, *Alkanna orientalis*, *Cephalaria procera*, *Euphorbia seguieriana*, *Glycyrrhiza glabra*, *Gladiolus kotschyanus*, *Papaver fugax*, *Papaver somniferum*, *Polygonum cognatum*, *Thalictrum minus* var. *minus*, *Verbascum oreodoxum*, *Hyoscyamus niger*, and *Zygophyllum fabago* were recorded for the first time in the province of Ağrı [9-15], however it is known that these plant are used as folk medicine in other regions of Anatolia [25-39].

It has been observed that those who do not trust modern medicine give more importance to this traditional knowledge. Furthermore, due to terrorist incidents, some villages in the study area have been evacuated, leading to continued migration from other regions. New settlers may not be familiar with or may not utilize this existing knowledge. Given these challenges, there is a heightened risk of losing traditional knowledge. In a region characterized by challenging geographical conditions and local issues, this study aims to mitigate the loss of ethnobotanical knowledge, serving as an important and meaningful resource for Ağrı.

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AUTHOR CONTRIBUTIONS

Concept: B.M.Y., S.G.; Design: B.M.Y., S.G.; Control: B.M.Y., S.G.; Sources: B.M.Y., S.G.; Materials: B.M.Y., S.G.; Data Collection and/or Processing: B.M.Y., S.G.; Analysis and/or Interpretation: B.M.Y., S.G.; Literature Review: B.M.Y., S.G.; Manuscript Writing: B.M.Y., S.G.; Critical Review: B.M.Y., S.G.; Other: -

CONFLICT OF INTEREST

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

The authors declare that the ethics committee approval is not required for this study.

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