

## Accepted Manuscript

Title: Ethnobotanical study on medicinal plants in Bingöl (Turkey)

Authors: Rıdvan Polat, Uğur Çakılçioğlu

PII: S2210-8033(18)30008-3  
DOI: <https://doi.org/10.1016/j.hermed.2018.01.007>  
Reference: HERMED 211

To appear in:

Received date: 13-12-2015  
Revised date: 25-2-2016  
Accepted date: 28-1-2018

Please cite this article as: Polat, Rıdvan, Çakılçioğlu, Uğur, Ethnobotanical study on medicinal plants in Bingöl (Turkey). *Journal of Herbal Medicine* <https://doi.org/10.1016/j.hermed.2018.01.007>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Title: Ethnobotanical study on medicinal plants in Bingöl (Turkey)

**Rıdvan Polat, Uğur Çakılciöđlu**

First Author: Rıdvan Polat, PhD.

Order of Authors: Rıdvan Polat, PhD.; Uğur Çakılciöđlu, PhD.

<sup>1</sup> Giresun University, Espiye Vocational School, Programme of Medicinal and Aromatic Plants, Espiye, Giresun 28600, Turkey; [rpolat10@hotmail.com](mailto:rpolat10@hotmail.com)

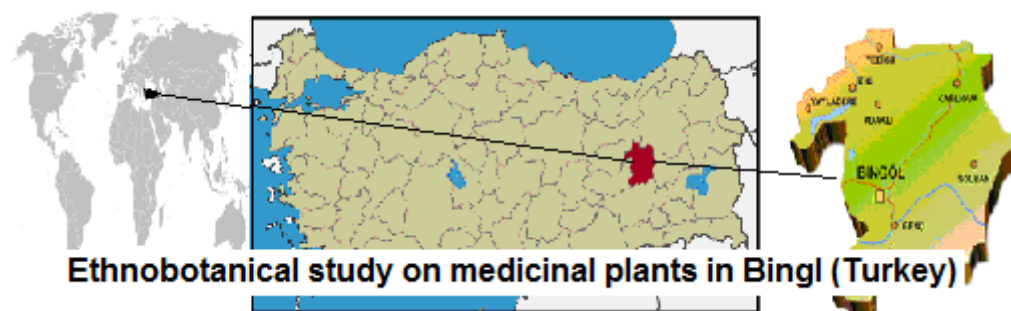
<sup>2</sup> Tunceli University, Pertek Sakine Genç Vocational School, Pertek, 62500 Tunceli, Turkey; Phone: +905067937709 Fax: +90 4242332020 [ucakilcioglu@hotmail.com](mailto:ucakilcioglu@hotmail.com)

**Uğur Çakılciöđlu, PhD.**

**Journal of Herbal Med**

**Editorial Board**

Graphical abstract



**Abstract:** This paper illustrates the result of an ethnobotanical study carried out in the Bingöl region of Turkey. The aim of this study was to document the medicinal uses of plants in the district of Bingöl province. The ethnobotanical results contain quantitative information on the diversity of medicinal plants documented in the region. This study, conducted between 2010 - 2012, gathered information on the medicinal plant species traditionally used in Bingöl, Turkey and the local names of these plants.

In the scope of the study, medicinal plant species and related information was collected; herbarium materials were prepared; and the specimens were labelled. The information was collected through semi-structured interviews, questionnaires and personal observations. Results were analyzed using quantitative indices of information consent factor (ICF/FIC), fidelity level (FL) and use value (UV). A total of 93 medical plants belonging to 38 families were identified

in the region. Among these, 80 species grew wild and 13 species were cultivated. The most common medicinal plant families were Asteraceae (14), Rosaceae (12), Lamiaceae (10) and Apiaceae (7). The most common preparations were infusion and decoction. A total of 220 medicinal uses (remedies) were recorded. The use of traditional medicine was still widespread among the people in Bingöl. However, due to the increasing health service facilities in the area, herbal medicine seemed to be more related to health care and disease prevention than cure. There is a gradual loss of traditional knowledge regarding the use of medicinal plants in the younger generations.

Keywords: Medicinal plants; UV; IFC; FL; Bingöl; Turkey.

## 1. Introduction

Medicinal plants are used by millions of people worldwide, not only by rural inhabitants from the south with little access to modern healthcare, but also increasingly by urban citizens in both developing and developed countries (Brandão et al., 2006; Shanley and Luz, 2003; Sheldon et al., 1997; WHO, 2002). The World Health Organization (WHO), estimated that about 60% of the world's population in developing countries rely on plants for the treatment of various diseases, due to lack of modern healthcare facilities (Calixto, 2005; WHO, 2010). Wild edible plants have always been important in the folk traditions of the Mediterranean region.

Turkey has a rich flora with approximately 11,000 species. Local people use the rich flora for different purposes. Along with its flora, it also has a wide diversity of habitats. However, these have been threatened and have declined rapidly over the last 40 years. Rare and sensitive habitats such as coastal dunes, peatlands, wetlands, heath lands, grasslands and old growth forests are under immense threat and declining fast, including many areas that have yet to be surveyed (Özhatay, 2006). Medical folklore can provide information about diseases for which herbal remedies are used in Turkey, their effects and names have been documented since the Republican period began in 1923 (Baytop, 1999). Nearly 500 plants are used for medicinal purposes in Turkey (Güneş and Özhatay, 2011). During the past decade, several studies have systematically analysed the consumption and gathering of wild medicinal and edible plants in Turkey (Ertuğ, 2000; Tuzlacı and Tolon, 2000; Duran et al., 2001; Dogan et al., 2004; Kültür, 2007; Cansaran and Kaya, 2010; Koyuncu et al., 2010; Uysal et al., 2010; Doğan and Bağcı, 2011; Çakılcıoğlu et al., 2011; Ugulu, 2011; Özgen et al., 2012; Polat and Satil, 2012; Tetik et al., 2013; Hayta et al., 2014; Kaval et al., 2015; Mükemre et al., 2015; Babacan et al., 2017; Erdem et al., 2017; Erecevit and Kırbağ, 2017).

East Anatolia of Turkey has rich flora due to its variable climate and high number of ecological zones. This diversity in flora provides a rich source of medicinal plants, which has long been utilized by Anatolian cultures, and hence account for the accumulation of remarkable medicinal folk knowledge in the region (Özgökçe and Özçelik, 2004). In the Eastern Anatolia Region (Turkey), most of the ethnobotanic studies have been conducted in Elazığ Erzurum and Van provinces (Polat et al., 2012). There are just two prior studies that have been conducted on the medicinal plants growing in Bingöl District (Polat et al., 2011; 2013). There are also some studies about the herbs around the bordering areas (Cakilcioglu and Turkoglu, 2007; 2008; 2009; Bagci et al., 2010; Tuzlacı and Doğan, 2010; Polat et al., 2011; 2017; Cakilcioglu et al.,

2011; Khatun et al., 2012; Tetik et al., 2013; Kaval et al., 2014; Hayta et al., 2014a; Akgül, 2016).

The aim of this study is to collect information about the use of traditional medicinal plants in human therapy in Bingöl province. Additionally, the cultural importance of plant taxa, families, local names, usage parts - methods and use categories will be assessed.

## 2. Materials and methods

### 2.1. Study area

Eastern Anatolia is the largest geographical region of Turkey. Since the area is surrounded by coastal mountain ranges, it is shielded from the effect of sea breezes (Tabata et al., 1994). Bingöl, which is located in the Upper Euphrates Section of Eastern Anatolian Region, lies between 38° 27' and 40° 27' eastern longitudes and 41° 20' and 39° 54' northern latitudes (Figure 1). In the region, Bingöl is known as Çewlig and Çolig. Bingöl is neighbour to Muş in the east, Erzincan and Erzurum in the north, Tunceli in west and Diyarbakır in the south. Mean daily temperature is 12.1 °C. Annual rainfall is 873.7 mm. and the number of days on which it snows is 24.5 days (Bakoğlu, 2004). The study area was located on the east of the Anatolian diagonal, in the skirts of the South-Eastern Taurus Mountains (Cakilcioglu et al., 2008), in the Upper Euphrates Region of the Eastern Anatolia Region (Şengün, 2007). It belongs to the Iran-Turan Plant Geography Region and falls within the B8 grid square according to the Grid classification system developed by Davis (Davis, 1965–1985).

According to the data obtained from the website of Bingöl Province Administration (<http://www.bingol.gov.tr/>). Bingöl region is very mountainous. There are mountain heights that reach 3000 meters (Bingöl mountains 3250 m, Çötele mountains 2940 m, Şeytan mountains 2906 m). The altitudes of the plateaus and plains on the mountains are not less than 2000 meters. Even places like meadows are no lower than 1000 meters. Climax and glacial lakes cover the highest parts of the mountains; the skirts of the mountains are covered by moraine. Mountains are generally covered by straggly forests; some parts of the south regions are stark. Oak forests are found at parts lower than 1800 meters. The total population is 256,000, while the central population is around 90,000 according to a population census in 2009.

According to data from the Turkish Statistical Institute (<http://tuikapp.tuik.gov.tr/adnksdagitapp/adnks.zul>) Turkey's population was 73,722,988 and Bingöl's population was 255,170 as of 31<sup>st</sup> December 2010. The Zazas are the major ethnic

group in the region, with small minorities of Turkish and Kurdish groups in the province. The Zazas' native language is Zazaki, which belongs to the Iranian group of the Indo-European family of languages. The Zazas mostly live in the Eastern Anatolia Region of Turkey (Arakelova, 1999-2000). There are approximately 50 million people of Turkish origin and 12.5 million people of Kurdish and Zazaish origin (Demirtaş, 2008). Today, the precise number of people of Zazaish origin is not known (Kuzu, 2010). Zazaish people are a community who have honourably preserved their own identity. However a significant part of Zazaish people adopt Kurdish upper identity today (Önder, 1999).

A study permit was obtained from the Bingöl Province Administration and for the questionnaire administered to the citizens of the towns and villages affiliated to Bingöl.

**Figure. 1. Geographical location of the study area.**

## **2.2. Data collection**

Field research was conducted by collecting ethnobotanical information during structured and semi-structured interviews with knowledgeable people native to 19 villages and city centres. Shepherds, healers, agricultural government officers of the region, woodsmen, teachers and people collecting herbs and plants, namely a total of 182 people were interviewed as information sources. 106 of the interviewees were women (c. 60 %) while the remaining 76 were men. The majority of the interviewees were older than middle age. For each recorded plant one questionnaire was filled. The basic information needed was taken during the conversations. Whenever possible the conversations were recorded on cassettes.

A questionnaire was administered to the local people, through face to face interviews (Appendix A). The mean age of the respondents was 55 years (ranging from 18–97 years). Interviews were conducted during the busy hours in common areas (bazaars, tea houses, farms, gardens, etc.) visited by the citizens of Bingöl and its villages. In Bingöl, people we selected from the city centres and villages were first informed about our research and only upon their consent did the interviews take place. During these interviews, only those people who were observed to have knowledge regarding medicinal plants were invited to a survey study. In order to obtain detailed information from people who had knowledge of plants, they were visited at least twice, and one of these visits took place in their house. During the interviews, demographic characteristics of the study participants, and local names, utilized parts and preparation methods of the plants were recorded.

Local weekly markets in the region of Bingöl were visited regularly. The villages and their products were defined in each of these weekly markets. The herbalists in the markets were also visited and several interviews were conducted.

160 students in local schools of the region were surveyed on “remedy herbs” used in Bingöl. First, various local useful plants, were introduced with slides and then questionnaires on medicinal plants were given to the students. In the field of research, a survey was undertaken in town centres, and in the village schools on medicinal plants. During the survey, the students were asked which local medicinal plants their parents and grandparents used and which parts of the plants, for which purpose, and how they used them (Appendix B). A total of 126 forms were returned by students, with information on medicinal plants. After the forms were evaluated, some of the families were visited and more detailed information was obtained. These presentations and written surveys with students not only provided valuable information and the possibility for the quantification of most commonly used herbs, but also provided a bridge between school children and their families (Ertuğ et al., 2003).

### **2.3. Plant materials**

The field study was carried out over a period of approximately three years (2010–2012). Special attention was paid to conduct the field trips together with the resource people (Abdulsamet Vergi and Yakup Polat) on most of the field visits. Plant identification was carried out from the samples prepared for the herbarium. The plants were pressed in the field and prepared for identification. Plants were identified using the standard text, ‘Flora’ of Turkey and the East Aegean Islands” (Davis, 1965–1985; Davis et al., 1988). The names of plant families were listed in alphabetic order. Scientific names of plant species were identified according to the plant list (<http://www.theplantlist.org>). After the taxon names were identified, instances of endemism and hazard categories (Ekim et al., 2000) were specified.

We examined whether the plants used had literature records or not. Primarily focus was on domestic studies rather than foreign studies.

## **2.4. Ethnobotanical indices**

### **2.4.1. Informant consensus factor**

Informant Consensus Factor (ICF) was originally developed by Trotter and Logan (1986) and then readapted by Heinrich (2000). This indicates how homogenous the ethnobotanical information is. It was calculated according to the following formula:  $ICF = \frac{Nur - Nt}{Nur - 1}$ , where Nur refers to the number of use report in each category and Nt to the number of the species used. Consensus methodology provides an estimate of the importance of each plant species in traditional knowledge (Amiguet et al., 2005). A high ICF indicates the informants agreement about the taxa used for the treatment of ailments of a certain use category (Table 3).

### **2.4.2. Use value**

The use value (UV) demonstrates the relative importance of plants known locally. The formula used for estimation of UV was  $UV = \frac{\sum U_i}{N}$ , where  $U_i$  is the number use report cited by an informant for a taxon and N to the number of informants (Trotter and Logan, 1986; Tardio and Pardo-de-Santayana, 2008; Bano et al., 2014).

### **2.4.3. Fidelity level**

The fidelity level (FL) index, developed by Friedman et al. (1986), estimates the most preferred taxon for the treatment of a certain ailment within a use category. In other words, it estimates the percentage of the informants who propose a particular taxon for the treatment of a specific ailment. The FL value is calculated:  $FL (\%) = \frac{N_p}{N} \times 100$ .  $N_p$  is the number of informants that claimed use of a plant species to treat a particular illness and N is the number of informants that used plants as a medicine to treat any given illness (Friedman et al., 1986; Alexiades, 1996).

## **3. Results and discussion**

### **3.1. Demographic characteristics of study participants**

A total of 182 participants (76 male, 106 female) were interviewed. 19 were aged between 30 and 40, 42 were aged between 41 and 50, 53 were aged between 51 and 60, 33 were aged



between 61 and 70, and 35 were aged over 71. A total of 138 informants were living in villages and countryside, 44 were living in Bingöl Province. Most of the informants had primary and secondary school education. 38 of the informants had never received regular education. Most of the informants had Kurd-Zaza origins. The interviews with these informants were carried out in Kurdish-Zazaish and Turkish, which are commonly spoken in the region. Most of females who used these plants were housewives, whereas most of the males were farmers; 18 of them were unemployed and others had various occupations (Table 1).

**Table 1.** Demographic characteristics of the informants

**3.2. General figures and most represented families and species**

A total of 93 medicinal plant taxa were collected in the Bingöl region. These taxa belong to 38 plant families. Among them, 80 species are wild and 13 species are cultivated plants. Table 2 shows the 93 plants identified in the area arranged in alphabetical order of their family and botanical names. *Achillea magnifica*, *Centaurea saligna*, *Origanum acutidens* and *Prunus kurdica* were determined to be endemic plants used for medicinal purposes in Bingöl. According to the Red Data Book of Turkish Plants and Red List Categories (Ekim et al., 2000), *Prunus kurdica* is listed under "endangered (EN)", *Achillea magnifica* is "near threatened (NT)", whereas *Centaurea saligna* and *Origanum acutidens* are categorised as "least concern" (LC). The most common medicinal plant families were Asteraceae (14), Rosaceae (12), Lamiaceae (10), Apiaceae (7), Polygonaceae (5), Malvaceae (3) and Fabaceae (3) (Fig. 2).

**Figure 2.** Most represented families

In ethnobotanical studies conducted in Bingöl province, the data belonging to 82 plant species, 4 of which were endemic, was collected in the study conducted by Polat et al. (2013) in Solhan region. Some of these plants are the same as our study. The rate of similarity is about 40%. All endemic plants identified in this study were different from our study. In the second study conducted in the region, Polat et al. (2012) collected ethnobotanical data on 32 plant species which were sold in local markets.

It was observed that some medicinal plant taxa were extensively used for commercial purposes as a result of the research conducted in Bingöl. *Rosa canina* (sırgul, şilan), *Hypericum scabrum* (vıla zer), *Rhus coriaria* (sumax), *Gundelia tournefortii* (kingir, kereng), *Crataegus*

ssp. (sinz, sez, gunc), *Eremurus spectabilis* (yelıg, gulık), *Malva neglecta* (xemazek, tollık, veraruejık), *Anchusa azurea* (gelzun), *Plantago major* (pel hewes, omulwaş), *Urtica dioica* (derzinik, gerzinik, yeğıç), *Tribulus terrestris* (gwerçal), *Rheum ribes* (ribes, rıwes, rewas), *Onopordum acanthium* (kinger heron), and *Stachys lavandulifolia* (Çaye qwe, Çaye çiya, Deme çole, Deme biri) are among the herbs extensively collected and sold in the area. Collecting and trading these species that grow in vast localities in the region has become the source of income for hundreds of local people.

The results of this study revealed some interesting information on plant use in the region. The *Arum* plant, which is usually known to be poisonous, is used for treatment of various diseases in the region. The leaves of *Arum* are picked, boiled and consumed, as it is believed that it cures hypertension and diabetes. The *Hypericum* plant, which has been mentioned in numerous studies due to its antidepressant properties, is infused in olive oil and used for abdominal pain. It is believed that the oil stops the pain when applied to the abdomen area.

According to the results of the students questionnaires (Appendix B), the most used taxons are *Malva neglecta* (xemazek, tollık, veraruejık), *Plantago major* (pel hewes, omulwaş), *Anchusa azurea* (gelzun), *Urtica dioica* (derzinik, gerzinik, gezok, yeğıç), *Tribulus terrestris* (gwerçal), *Rosa canina* (sırgul, şilan), *Crataegus* spp. (sinz, sez, gunc), *Arum* sp. (kardun, kardu), *Gundelia tournefortii* (kinger, kereng), *Eremurus spectabilis* (yelıg, gulık), *Rheum ribes* (ribes, rıwes, rewas), *Rhus coriaria* (sumax), *Heracleum pastinacifolium* (helelg), and *Stachys lavandulifolia* Vahl. (Çaye qwe, Çaye çiya, Deme çole, Deme biri).

### 3.3. Parts of the plants used

The most commonly used plant organs to prepare the remedies were aerial parts (27), leaves (24), flowering branches and flowers (17), fruits (16) and roots (7), but seeds and bulbs were also used in some of the remedies (Fig. 3). Sometimes the local people also used other ingredients, such as olive oil, honey or milk to prepare the remedies. In many cases, more than one organ of the same species is used in the preparation of different remedies.

### Figure. 3. Parts of the plants used

### 3.4. Drug preparation methods and drug activities

There are various methods of preparation and application for different types of ailments and they have various preparation forms like infusion, decoction, fresh application, powdering, chewing, crushing and water suspension. Infusion (37), decoction (33), fresh (17) and cooked (7) are the methods mostly used for the preparation of the remedies. In the research conducted, it was determined that some plants such as *Urtica dioica* L. (derzinik, gerzinik, yeğiç) and *Onopordum acanthium* L. (kinger heron) are often used mixed with honey.

The dosage of the medicinal preparations is not very precise. The informants mostly do not specifically report the amount of plant used every time. They usually use one “pinch” (the amount of plant that fits in one – two spoons).

During interviews with people in the region, various uses of medicinal plants were recorded. *Malva* spp. (xemazek, tollik, veraruejik) is used in infertility treatments and as an anti-inflammatory. Usually it is the old women who prescribe plants for these illnesses. The aerial parts of *Malva* spp. are picked and boiled and then cooled a little before being put into a cloth and wrapped around a woman’s abdomen. This practice is repeated in a row for 2–3 nights before sexual intercourse. It is believed that this practice softens the womb, cleans the inflammation and helps conception. Another prescription used by the local women is that they prepare a meal by boiling *Arum elognatum* (kardun, kardu, kardı) and serve it to the women who have just had a baby delivered and they serve this meal for 2–3 days. They believe that this meal cleans the “dirty blood” in the body and relieves after pains.

In the region, seeds of *Urtica dioica* (derzinik, gerzinik, yeğiç) are used in cancer treatment. The seeds of this plant are mixed with honey and served to the patient in the morning and in the evening for a month. They believe that this prescription inhibits the spread of cancer. Another important prescription recorded during our interviews with people is that prepared from *Tribulus terrestris* (gwerçal) aerial parts and fruits. This prescription which is prepared by infusion is used in the treatment of cardiovascular disease and asthma.

### 3.5. Folk remedies

During the study a total of 223 medicinal uses were obtained. Informants used medical plants most frequently for the treatment of gastrointestinal disorders (31 of the use reports), respiratory and throat diseases (30), internal and external inflammatory problems (22), diabetes (19), cardiovascular problems (15), urogenital and kidney problems (12), and cuts and wounds (8). Hypertension (7), rheumatic pain (7), haemorrhoids (7), hepatitis (7), insomnia (5) and infertility (4), are other common complaints treated with herbal remedies (Fig. 4).

Gastrointestinal disorders, coughs and colds, and diabetes were treated with the highest diversity of medicinal plant species.

#### **Figure. 4. Folk remedies**

### **3.6. Other uses of medicinal plants**

Aerial parts, branches, flowers, fruits, leaves, roots, seeds, stems and tubers of wild plants are used as food. Approximately 60 taxa of those taxa which were found to be used in the region for medicinal purposes are at the same time consumed in various ways as food. The wild medicinal plants existing in the region of our study are quite widely consumed raw, as salad, in pickles, preserves and as fruits, as well as being boiled and fried in a meal. *Anchusa azurea* (gelzun), *Amaranthus retroflexus* (tar, leğendur), *Chenopodium album* (selmı), *Gundelia tournefortii* (kinger, kereng), *Eremurus spectabilis* (yelıg, gullık) *Crataegus* spp. (sinz, sez, risok, roğık), *Malva neglecta* (xemazek, tollık, veraruejık), and *Rheum ribes* (ribes, riwes, rewas) were the plants most used as food by the local people.

Furthermore, during our study we found out that some medicinal plants are used as spices. This case is more widespread in rural areas. Flavouring and aromatic properties of wild plants enable their use as spices. *Anthriscus* sp. (mendu, mendwe, mendık), *Gundelia tournefortii* (kenger, kereng), *Mentha longifolia* (pune), *Mentha spicata* (pune), *Origanum acutidens* (onıx, anıx), *Rhus coriaria* L. (sumax), *Thymus sipleus* Boiss. (anıx, onıx) and *Thymus kotschyanus* (onıx, anıx) are consumed as spices. In the region, some of the wild edible plants are also consumed as tea. *Anthemis* sp. (elik - fatık), *Origanum acutidens* (onıx, anıx), *Rosa* spp. (sırgul, şilan) and *Stachys lavandulifolia* (çaye qwe, çaye çiya, deme çole, deme bri) are used as herbal tea in the region.

### **3.7. Review of local plant names**

As a result of the examination of the plant names, it was seen that most of the plant names were found to be derived from Kurdish-Zazaish and some of the names derived from Turkish. Many plant names were adopted from Persian (badem, çiriş, goz, dut, kenger, ışgın), some from Arabic (nane, hatmi, mışmış and sumak) and some from Armenian (lazut, madımak) languages. However, probably these names were adopted for centuries and some of these names are known commonly as Turkish names, no one refers to them as Persian, Arabic or Armenian.

Tunceli, Elazığ, Malatya, Erzurum and Kars are close to our field of study. However, names of some local plants used in these areas are different. These are *Plantago major* L. (yara otu), *Centaurea hyalolepis* Boiss. (belhok), *Iris caucasica* Hoffm. (sarı nevroz) in Ovacık-Tunceli (Tuzlacı and Doğan, 2010), *Hypericum scabrum* L. (mayasıl otu), *Helichrysum plicatum* DC. (solmaz çiçek), *Teucrium polium* L. (ürper) in Elazığ (Cakilcioglu et al., 2011), *Achillea biebersteinii* Afan. (ğirtkesan), *Hypericum scabrum* L. (kulika zar, sancı otu), *Plantago major* L. (ca hevaz, gaz yağı otu), *Thymus kotschyanus* Boiss. & Hohen (catır, catri), *Urtica dioica* L. (gazık), in Kürecik - Malatya (Yeşil and Akalın, 2009), *Thymus sipyleus* Boiss. (keklik otu), *Hyoscyamus niger* L. (batbat) in Ilıca-Erzurum and *Malva neglecta* Wallr. (ebe kümece), *Rosa canina* L. (gül tonik) and *Urtica dioica* L. (ısırgan) in Kars (Güneş and Özhatay, 2011).

Some of the plants used in Bingöl are known by the same or different local names in the other parts of Anatolia. For example, the local names of *Rhus coriaria* L. in Elazığ, in Kapıdağ – Çanakkale, in Edremit-Balıkesir (Cakilcioglu et al., 2011, Uysal et al., 2010; Polat and Satıl, 2012); *Gundelia tournefortii* L. in Birecik, Maden and Ovacık (Akan et al., 2008; Konak and Aktar, 2009; Cakilcioglu et al., 2011); *Rheum ribes* L. Ilıca and Kars (Güneş and Özhatay, 2011; Cakilcioglu and Turkoglu, 2010; Özgen et al., 2011); and *Urtica dioica* L. Edremit Gulf, Gümüşhacıköy, Konya, Rize, Şile, Sivas and Yozgat (Tuzlacı and Tolon, 2000; Cansaran et al., 2007; Yıldız et al., 2010; Özüdoğru et al., 2011; Tulukcu and Sağdıç, 2011) are the same as local names used in Bingöl. Some plants used in Bingöl are known by different local names in other parts of Anatolia. While *Nasturtium officinale* R.Br. plants is known as “germede” in Kapıdağ, is known as “su teresi” in Haymana, Edremit Gulf (Uysal et al., 2010; Sarper et al., 2009; Polat and Satıl, 2012), *Nasturtium officinale* R.Br. plant is known as “qji” in Bingöl. While *Crataegus szovitsii* Pojark. and *Crataegus* spp. are known as “alıç” in Haymana, Çatalca and Sivrice (Sarper et al., 2009; Genç and Özhatay, 2006; Cakilcioglu and Turkoglu, 2010), *Crataegus* spp. are known as “sinz, sez” in Bingöl.

### 3.8. Calculations

The reported ailments were grouped into 11 categories based on the information gathered from the interviews. Table 3 indicates FIC values of the category of ailment. Cuts and wounds had the highest FIC score (0.85). *Plantago major* (pel hewes, omulwaş), *Malva neglecta* (xemazek, tollık, veraruejik) and *Anchusa azurea* (gelzun) were reported to be among the plant remedies indicated for these problems. Blood pressure diseases were recorded to have the second highest

FIC value (0.60). *Rhus coriaria* (sumax), *Allium sativum* (sir, sirek), *Rumex acetosella* (tırşık) and *Nasturtium officinale* (kiji, qiye, tujik) were reported within the plant remedies indicated for this use. Respiratory diseases (cough, asthma, bronchitis, respiratory problems, colds and flu, etc.) made up the group with the third largest FIC value (FIC was 0.69), while the fourth highest FIC value (0.67) was recorded for urogenital and kidney stone problems. Gastrointestinal disorders were ranked as the fifth ailment with an FIC value of 0.62. An FIC value of 0.40 was recorded for internal and external inflammatory problems (Table 3).

**Table 3.** IFC values of category of ailments

*Malva neglecta* (0.70), *Plantago major* (0.67), *Urtica dioica* (0.63), *Rosa canina* (0.55), *Anchusa azurea* (0.53), *Gundelia tournefortii* (0.47), *Eremurus spectabilis* (0.47), *Tribulus terrestris* (0.43), *Rheum ribes* (0.41) and *Crataegus* spp (0.41) had the highest UVs (Table 2).

The plants in the research area with a high FL were *Malva neglecta* for inflammatory conditions (94), *Urtica dioica* for rheumatism (92), *Plantago major* for wound healing (90), *Rosa canina* for cold and flu disorders (85), *Tribulus terrestris* for cardiac disorders (84), *Anchusa azurea* for stomach pain (84) and *Crataegus* spp. for cardiac disorder (78) (Table 4).

**Table 4.** Fidelity Level (FL)

**4. Conclusion**

In this study, 93 medicinal plant species belonging to 38 families were found in the research area. Among them, 80 species were wild and 13 species were cultivated plants. These plants are used in the treatment of many diseases. By drying and making infusions or decoctions of these plants, local people use them over the course of the whole year.

In all the ethnobotanical studies carried out in villages of Bingöl and its surroundings, it has been observed that people living in rural areas have more information about the use of medicinal plants, compared to the people living in the centre. Even the lowland villagers have less information than the mountain villagers, so we obtained the most information from the mountain villagers. While the number of remedies being consciously used by individuals in mountain villages in the region is 162, the number of traditional remedies being used by individuals in areas where the access is easy is 58. Women over 50 years old make up the most important group in terms of obtaining ethnobotanical information. People in the study area

under the age of 40 were found to be less knowledgeable on the use of medicinal plants as compared to those over 50, due to the higher level of exposure of the former ones to modernization. Examining the interviews that were conducted, it is observed that individuals older than 50 gave information about approximately 74 plants and 182 traditional remedies. In addition to this, examining the data of individuals younger than 40, it is observed that there is information about 19 plants and 28 usage remedies. It is observed that individuals younger than 40 in the region generally gave information about plants with higher UVs and FLs. Similar results were reported in the studies conducted in Turkey (Ertuğ et al., 2003, Cakilcioglu and Turkoglu, 2010).

Evaluating the questionnaires that were performed via students in the study area; it is observed that the plants being frequently written in the questionnaires include *Malva neglecta*, *Plantago major*, *Anchusa azurea*, *Urtica dioica*, *Tribulus terrestris* and *Gundelia tournefortii*. These plants also have an extensive usage in the area and higher UVs and FLs.

Taxa such as *Iris caucasica*, *Acantholimon armenum*, *Ajuca chamaepitys* subsp. *laevigata* etc. had documented medical use, but were not recorded in the nearby areas. *Achillea magnifica* Heimerl ex Hub.-Mor., *Centaurea saligna* (C. Koch), *Origanum acutidens* (Hand-Mazz.) letsvaart and *Prunus kurdica* Fenzl ex Fristsch were found to be the endemic plants used for medicinal purposes in Bingöl, Turkey.

The data showed that the main illnesses treated by traditional medicine in Bingöl are gastrointestinal disorders, respiratory diseases and inflammatory problems, and there is also a consensus about the plants to treat these ailments. Traditional medicine is used to treat “daily” health problems in the region, and people think traditional medicine better treats simple health problems. In this region, people over 50 have a very low standard of education. Those people who speak Kurdish and Zazaish as their mother tongues, cannot speak Turkish, which is the official language of the country and therefore results in very limited use of mass communication means (such as TV, radio, newspaper, magazines, etc.). Yet, this disadvantage plays a great role in preserving the knowledge of traditional medicinal plant usage. The usage of medicinal plants, which pass down to the children from their parents has a very important place in treating illnesses in the region

In this study ICF values range from 0.40 to 0.85 and FLs range from 65 to 95%. ICF shows a high degree of agreement in healing cuts and wounds, blood pressure diseases, and respiratory disorders. It was found that in the study area where there are many mountainous villages, various plants are used to cure the same illness. In the region, 10 plant taxa for treating different ailment categories have a high FL and the majority of these have high UVs too.

There are very few studies involving the names of plants across the Turkish landscape in the Kurdish - Zaza language. This study has recorded the names of a number of plants in the region in Kurdish - Zaza language for the first time. From this aspect, this study is of particular importance.

The immediate and serious threat to the local traditional medicine practice in the study area seems to have come from the increasing influence of modernization, deforestation due to anthropogenic activities, and migration of the younger generations to urban areas leaving a gap in the cultural beliefs and practices of indigenous society. As a result of the studies being conducted in the area, it was determined that some of the prescriptions regarding the use of plants were only known and applied by older individuals. Individuals who gave interviews throughout the study were observed to have no precise information about some of the prescriptions. As the elder individuals die in the region, the heritage of using plants will rapidly disappear. Therefore it is urgent to explore this traditional ethnobotanical knowledge and their potential for pharmacological importance.

Due to geographical structure and local problems faced in Eastern Turkey, there are hardly any studies carried out on plants. Therefore, this study may be an important and suggestive source for further ethnobotanical studies in the region.

## **ACKNOWLEDGEMENTS**

Thanks to all the informants who were willing to share with us their time and knowledge of plants. Thanks to Yakup POLAT and Abdulsamet VERGİ for the valuable information and support provided to the present study.

## **Appendix A**

- 1 Name and surname of the participant
- 2 Age and sex of the participant
- 3 Telephone and address of the participant
- 4 Educational level of the participant
- 5 Date of interview
- 6 Place of residence of the participant
- 7 Duration of residence of the participant
- 8 What is the local name of the plant used?
- 9 For which diseases do you use the plant?



- 10 Which parts of the plant do you use? (root, stem, flower, leaves, fruit etc.)
- 11 How do you prepare the plant for use?
- 12 How and when do you use the plant?
- 13 Approximately what dose do you use?
- 14 How long does the convalescence period take?
- 15 Did any complication occur from the plants you used?

## **Appendix B.**

- 1 Which pharmaceutical local plants their parents and grandparents use?
- 2 Which parts of the pharmaceutical plants they use?
- 3 For which purpose are they used? (for which diseases)
- 4 How they use them?

## **REFERENCES**

- Akan H, Korkut MM, Balos MM. An ethnobotanical study around Arat Mountain and its surroundings (Birecik, Sanliurfa). *Firat Univ J Sci Engin* 2008;20:67–81.
- Akgül G, Yılmaz N, Celep A, Celep F, Çakılcıoğlu U. Ethnobotanical purposes of plants sold by herbalists and folk bazaars in the center of Cappadocica (Nevşehir, Turkey). *Indian J Trad Knowl* 2016;15:103-8.
- Alexiades MN. Selected Guidelines for Ethnobotanical Research: A Field Manual. *Advances in Economic Botany*, The New York Botanical Garden, Bronx P. 1996;10.
- Al-Qura'n S. Ethnopharmacological survey of wild medicinal plants in Showbak, Jordan. *J Ethnopharmacol* 2009;123:45–50.
- Arakelova V. The Zaza people as a new ethno-political factor in the region. *Iran and the Caucasus* 1999-2000;3:397–408.
- Babacan YE, Vitek E, Çakılcıoğlu U. Contributions to the Flora of Tunceli (Turkey). *Int J Nature Life Sci* 2017;1:39–66.
- Bano A, Ahmad M, Hadda TB, Saboor A, Sultana S, Zafar M, Khan MPZ, Arshad M, Ashraf MA. Quantitative ethnomedicinal study of plants used in the skardu valley at high altitude of Karakoram-Himalayan range, Pakistan. *J Ethnobiol Ethnomed* 2014;10:1–17.

- Brandão MGL, Acúrcio FA, Montemor RLM, Marlière LDP. Complementary/alternative medicine in Latin America: use of herbal remedies among a Brazilian metropolitan area population. *J Complem Int Med* 2006;3:1–10.
- Baytop T. *Therapy with Medicinal Plants in Turkey (Past and Present)*. Nobel Medicine Publication, (2nd ed.) Istanbul; 1999.
- Cakilcioglu U, Turkoglu I. Plants used for cholesterol treatment by the folk in Elazığ. *Phytologia Balcanica* 2007;13:239–45.
- Cakilcioglu U, Turkoglu I. Çitli Ovası (Elazığ) ve çevresinin etnobotanik özellikleri. *NWSA - Ecol Life Sci* 2009;4:81–5.
- Cakilcioglu U, Turkoglu I. Plants used for pass kidney stones by the folk in Elazığ. *Herb J Systematic Bot* 2008;14:133–44.
- Cakilcioglu U, Turkoglu I, An ethnobotanical survey of medicinal plants in Sivrice (Elazig, Turkey). *J Ethnopharmacol* 2010;132:165–75.
- Çakılcioglu U, Khatun S, Türkoğlu İ, Hayta Ş. Ethnopharmacological survey of medicinal plants in Maden (Elazig-Turkey). *J Ethnopharmacol* 2011;137:469–86.
- Calixto JB. Twenty five years of research on medicinal plants in Latin America: a personal review. *J Ethnopharmacol* 2005;100:131–4.
- Cansaran A, Kaya, ÖF. Contributions of the ethnobotanical investigation carried out in Amasya district of Turkey (Amasya-Center, Bağlarüstü, Boğaköy and Vermiş villages; Yassıçal and Ziyaret towns). *Biol Diver Conser* 2010;3:97–116.
- Davis PH. (Ed.). *Flora of Turkey and the East Aegean Islands*, vol.1-9. Edinburgh University Press, Edinburgh; 1965–1985.
- Davis PH, Mill RR, Tan K. (Eds.). *Flora of Turkey and the East Aegean Islands*, vol. 10. Edinburgh University Press, Edinburgh; 1988.
- Demirtaş B. The determination and comparison of the opinions and tendencies of Isparta and Brno publics regarding to the whole membership of Turkey to European Union. *Institution of Social Sciences*, Suleyman Demirel University Press, Isparta; 2008.
- Dogan Y, Baslar S, Ay G, Mert HH. The use of wild edible plants in Western and Central Anatolia (Turkey). *Econ Bot* 2004;58:684–90.
- Doğan G, Bağcı E. Elazığ’ın bazı yerleşim alanlarında halkın geleneksel ekolojik bilgisine dayanarak kullandığı bitkiler ve etnobotanik özellikleri. *Fırat Univ J Sci* 2011;23:77–86.
- Duran A, Satıl F, Tümen G.. The edible wild fruits in Balıkesir and their ethnobotanical features. *Herb J Systematic Bot* 2001;8:87–94.

- Ekim T, Koyuncu M, Vural M, Duman H, Aytaç Z, Adıgüzel N. Red Data Book of Turkish Plants (Pteridophyta and Spermatophyta). Turkish Association for the Conservation of Nature, Ankara; 2000.
- Erdem F, Doğan G, Kıran Y, Evren H. Morphological, anatomical, palynological and karyological characters of endemic *Sideritis vulcanica* (Lamiaceae) from Turkey. Int J Nature Life Sci 2017;1:1–11.
- Erecevit P, Kırbağ S. Determination of some biological properties over *Kluyveromyces lactis* 1 of *Rheum ribes* L. (Rhubarb) as a traditional medicinal and food plant. Int J Nature Life Sci 2017;1:22–31.
- Ertuğ F. An ethnobotanical study in Central Anatolia (Turkey). Econ Bot 2000;54:155–82.
- Ertuğ F. Etnobotanik Fiş Örneği ve Çerçeve Soruları, Türkiye Kültür Envanteri Kılavuzu. TUBA- TUKSEK Yayınları. İstanbul; 2003.
- Ertuğ F, Tümen G, Çelik A. Buldan (Denizli) Etnobotanik Alan Araştırma Raporu, Türkiye Bilimler Akademisi, TUBA-TUKSEK Türkiye Kültür Envanteri Pilot Bölge Çalışmaları. İstanbul; 2003.
- Friedman J, Yaniv Z, Dafni A, Palewitch D. A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. J Ethnopharmacol 1986;16:275–87.
- Genç GE, Özhatay N. An ethnobotanical study in Çatalca (European part of Istanbul) II. Turkish J Pharmaceut Sci 2006;3:73–89.
- Güneş F, Özhatay N. An ethnobotanical study from Kars (Eastern) Turkey. Biol Diver Conserv 2011;4:30–41.
- Hayta S, Taşar N, Cakilcioglu U, Gedik O. Morphological, karyological features and pollen morphology of endemic *Ebenus haussknechtii* Bornm. ex Hub.-Mor. from Turkey: A traditional medicinal herb. J Herbal Med 2014;4:141–6.
- Hayta S, Polat R, Selvi S. Traditional uses of some medicinal plants in Elazığ (Turkey). J Ethnopharmacol 2014a.;154:613–23.
- Heinrich M. 2000. Ethnobotany and its role in drug development. Phytotherapy Res 14:479–488.
- Kaval I, Behçet L, Cakilcioglu U. Ethnobotanical study on medicinal plants in Geçitli and its surrounding (Hakkari-Turkey). J Ethnopharmacol 2014;155:171-184.
- Kaval İ, Behçet L, Çakılcioglu U. Survey of wild food plants for human consumption in Geçitli (Hakkari, Turkey). Indian J Trad Knowl 2015;14:183–90.
- Khatun S, Parlak KU, Polat R, Cakilcioglu U. The endemic and rare plants of Maden (Elazig-Turkey) and their uses in traditional medicine. J Herbal Med 2012;2:68–75.

- Konak A, Aktar O. Medikal antropoloji çerçevesinde Tunceli / Ovacık'ta geleneksel sağaltma yöntemleri. *Cumhuriyet Üniv Sosyal Bilimler Dergisi* 2009;3:156–87.
- Koyuncu O, Yaylacı ÖK, Öztürk D, Erkara İP, Savaroğlu F, Akçoşkun Ö, Ardıç M. Risk categories and ethnobotanical features of the Lamiaceae taxa growing naturally in Osmaneli (Bilecik/Turkey) and environs. *Biol Diver Conserv* 2010;3:31–45.
- Kuzu D. A self-governing group or equal citizens? Kurds, Turkey and the European union. *Journal on Ethnopolitics and Minority Issues in Europe* 2010;9:32–65.
- Kültür Ş. Medicinal plants used in Kırklareli province (Turkey). *J Ethnopharmacol* 2007;111:341–64.
- Mükemre M, Behçet L, Çakılcıoğlu U. Ethnobotanical study on medicinal plants in villages of Çatak (Van-Turkey). *J Ethnopharmacol* 2015;166:361–74.
- Okello SV, Nyunja RO, Netondo GW, Onyango JC. Ethnobotanical study of medicinal plants used by Sabaots of Mt. Elgon Kenya. *Afr J Trad Compl Altern Med* 2010;7:1–10.
- Owour BO, Kisangau DP. Kenyan medicinal plants used as antivenin: a comparison of plant usage. *J Ethnomed* 2006;2:7.
- Önder AT. Türkiye'nin etnik yapısı. Önderler Publication, Ankara, 1999;3.
- Özgen U, Kaya Y, Houghton P. Folk medicines in the villages of Ilıca District (Erzurum), Turkey. *Turk J Biol* 2012;36:93–106.
- Özhatay N. Türkiye'nin BTC boru hattı boyunca önemli bitki alanlar (important plant areas along the BTC pipeline in Turkey), BTC Şirketi, İstanbul; 2006.
- Özüdoğru B, Akaydın G, Erik S, Yesilada E. Inferences from an ethnobotanical field expedition in the selected locations of Sivas and Yozgat provinces (Turkey). *J Ethnopharmacol* 2011;137:85–98.
- Polat R, Çakılcıoğlu U, Ertuğ F, Satıl F. An evaluation of ethnobotanical studies in Eastern Anatolia. *Biol Diver Conserv* 2012;5:23–40.
- Polat R, Çakılcıoğlu U, Ulusan MD, Paksoy MY. Survey of wild food plants for human consumption in Elazığ (Turkey). *Indian J Trad Knowl* 2015;1:69–75.
- Polat R, Satıl F. Havran ve Burhaniye (Balıkesir) yörelerinde etnobotanik araştırmaları. *TUBA Kültür Envanter Dergisi* 2010;8:65–100.
- Polat R, Satıl F. An ethnobotanical survey of medicinal plants in Edremit Gulf (Balıkesir-Turkey). *J Ethnopharmacol* 2012;139:626–41.
- Polat R, Satıl F, Cakilcioglu U. Medicinal plants and their use properties of sold in herbal market in Bingöl (Turkey) district. *Biol Diver Conserv* 2011;4:25–35.

- Polat R, Cakilcioglu U, Satil F. Traditional uses of medicinal plants in Solhan (Bingöl-Turkey). *J Ethnopharmacol* 2013;148:951–63.
- Polat R, Cakilcioglu U, Selvi S, Türkmen Z, Kandemir A. The anatomical and micromorphological properties of three endemic and medicinal *Salvia* species (Lamiaceae) in Erzincan (Turkey). *Plant Biosystems* 2017;151:63-73.
- Rokaya MB, Münzbergova Z, Timsina B. Ethnobotanical study of medicinal plants from the Humla district of Western Nepal. *J Ethnopharmacol* 2010;130:485–504.
- Sarper F, Akaydın G, Şimşek I, Yeşilada E. 2009. An ethnobotanical field survey in the Haymana district of Ankara province in Turkey. *Turk J Biol* 33, 79–88.
- Shanley P, Luz L. 2003. The impacts of forest degradation on medicinal plant use and implications for health care in Eastern Amazonia. *BioScience* 53, 573–584.
- Sheldon JW, Balick MJ, Laird SA. Medicinal plants: can utilization and conservation coexist? *Adv Econ Bot* 1997;12:1–104.
- Tabata M, Sezik E, Honda G, Yeşilada E, Goto K, Ikeshiro Y. Traditional medicine in Turkey III. Folk medicine in East Anatolia; Van and Bitlis provinces. *J Pharmacog* 1994;32:3–12.
- Tardio J, Pardo-de-Santayana M. 2008. Cultural importance indicates: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain), *Economic Botany*. 62, 24–39.
- Tetik F, Civelek S, Cakilcioglu U. Traditional uses of some medicinal plants in Malatya (Turkey). *J Ethnopharmacol* 2013;146:331–46.
- Amiguet VT, Arnason JT, Maquin P, Cal V, Vindas PS, Poveda L. A Consensus ethnobotany of the Qechi Maya of Southern Belize. *Econ Bot* 2005;59:29–42.
- Maquin P, Cal V, Vindas PS, Poveda L. 2005. A consensus ethnobotany of the Q'eqchi' Maya of Southern Belize. *Econ Bot* 59(1): 29-42.
- Trotter RT, Logan MH. Informant consensus: a new approach for identifying potentially effective medicinal plants. In: Etkin NL. (Ed.), *Plants in Indigenous Medicine and Diet, Behavioural Approaches*. Redgrave Publishing Company, Bredford Hills, New York; 1986.
- Tulukcu E, Sağdıç O. Konya'da aktarlarda satılan tıbbi bitkiler ve kullanılan kısımları. *Erciyes Üniv Fen Bil Enst Der* 2011;27:304–8.
- Tuzlacı E, Doğan A. Turkish folk medicinal plants, IX: Ovacık (Tunceli). *Marmara Pharmaceut J* 2010;14:136–143.
- Tuzlacı E, Tolon E. Turkish folk medicinal plants, part III: Şile (İstanbul). *Fitoterapia* 2000;71:673–85.

Ugulu I. Traditional ethnobotanical knowledge about medicinal plants used for external therapies in Alasehir, Turkey. *Int J Med Arom Plants* 2011;1:1–6.

Upadhyay B, Singh KP, Kumar A. Ethno-veterinary uses and informants consensus factor of medicinal plants of Sariska region, Rajasthan, India. *J Ethnopharmacol* 2011;133:14–25.

Uysal İ, Onar S, Karabacak E, Çelik, S. Ethnobotanical aspects of Kapıdağ Peninsula (Turkey). *Biological Diversity and Conservation* 2010;3:15–22.

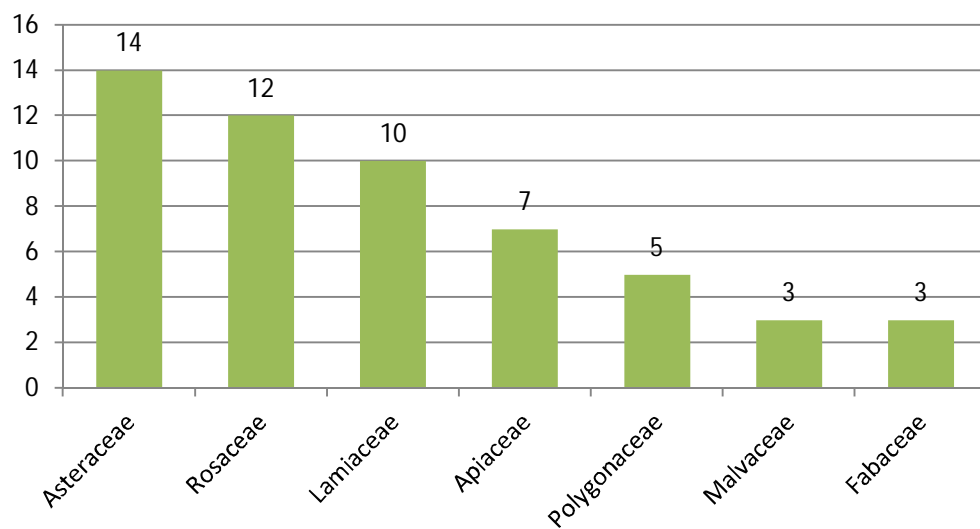
WHO, Traditional Medicine Strategy 2002–2005. World Health Organization, Geneva; 2002.

WHO, Monographs on Medicinal Plants Commonly used in the Newly Independent States (NIS); 2010.

Yaldız G, Yüksek T, Şekeroğlu N. Rize ili orman ve kıyı köylülerinin kalkındırılmasında tıbbi ve aromatik bitkilerin önemi. III. Ulusal Karadeniz Ormanlık Kongresi, 1176–86, Artvin; 2010.

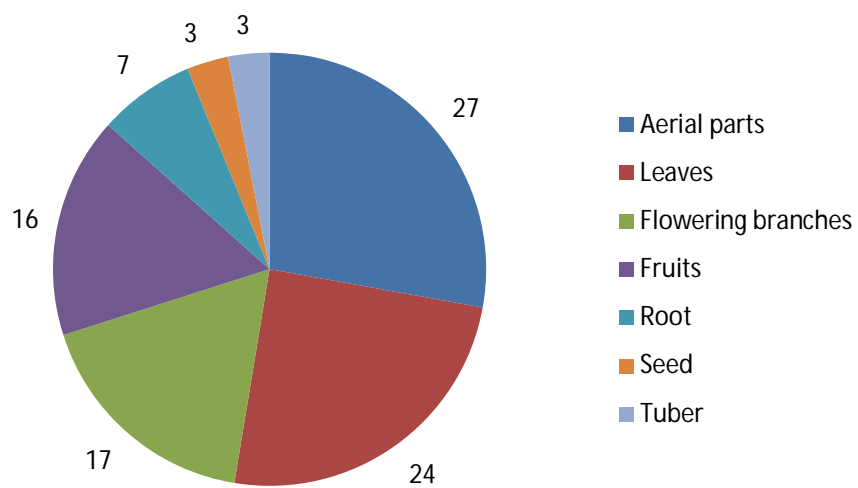


**Fig. 1.** Geographical location of the study area (Bingöl, Turkey)

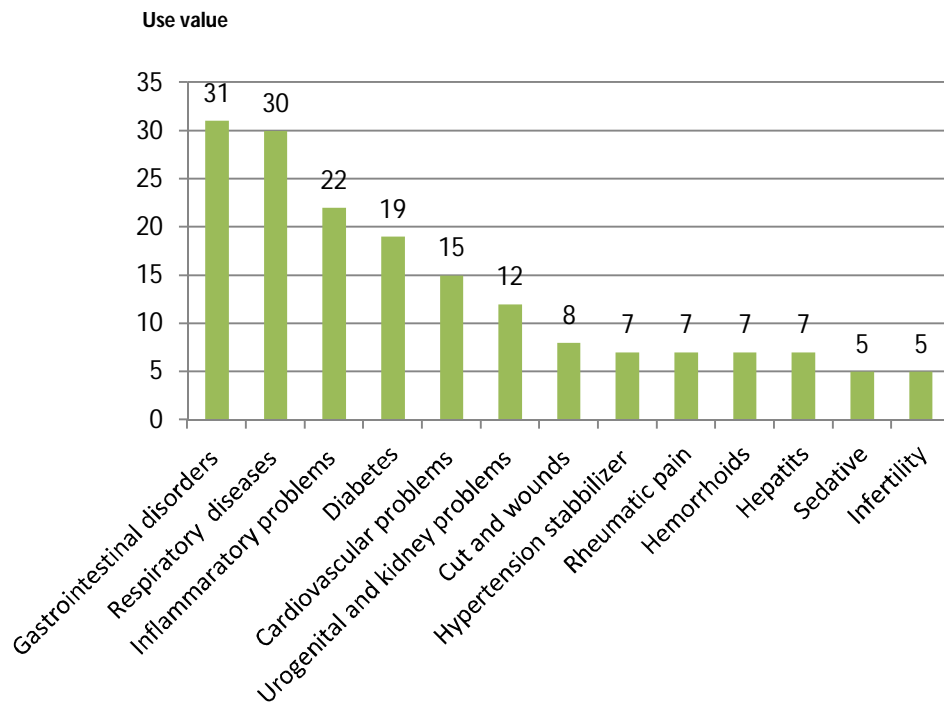


**Fig. 2.** Most represented families.





**Fig. 3.** Parts of the plants used.



**Fig. 4.** Folk remedies.

**Table 1**

Demographic characteristics of the informants.

<b>Demographic characteristics</b>	<b>Number</b>
<b>Age</b>	
30-40	19
41-50	42
51-60	53
61-70	33
70 and above	35
<b>Sex</b>	
Male	76
Female	106
<b>Educational level</b>	
Illiterate	38
Primary school	68
Secondary school	42
High school	30
University	4
<b>Residential status</b>	
Villages	138
City centre	44
<b>Employment status</b>	
Pensioned	16
Farmer	62
Housewife	69
Unemployed	18
Other jobs	17
<b>Total</b>	<b>182</b>

**Table 2**

Medicinal plants of the research area (Bingöl, Turkey).

No	Family	Plant species, voucher specimen, endemism	Vernacular name of Bingöl	Plant part(s) used <sup>a</sup>	Preparations <sup>b</sup>	Utilization method <sup>c</sup>	Use	UV
	Amaranthaceae	<i>Amaranthus retroflexus</i> L. RP-370	Tar, Tar gor, Tar gec, Leğendur	Aer	Dec	Dgo, Raw	Digestive, stomach-ache, diarrhoea	0.14
	Amaryllidaceae	* <i>Allium sativum</i> L. RP-471	Sir, Sirik	Bra	Raw	Raw	Antihypertensive	0.52
		<i>Allium</i> sp.-RP-472	Kahar, Kar	Bra	Ms	Boi	Bronchitis, pain killer	0.09
	Anacardiaceae	<i>Rhus coriaria</i> L. RP-492	Sumax, Sumak	Fru	Dec	Dgo, Raw	Antihypertensive	0.23
	Apiaceae	<i>Ferula orientalis</i> L. RP-493	Kırkor, Kinkor, Kafkorik	Ste, Roo	Dec	Dte	Psoriasis, digestive, vertigo, nausea, diabetes	0.14
		<i>Ferula rigidula</i> Fisch. ex DC. RP-494	Heliz	Ste, Roo	Raw	Raw	Kidney stones, cholesterol	0.14
		* <i>Heracleum pastinacifolium</i> C. Koch RP-491	Helelg, Lerg	Ste, Lea	Dec	Dgo	Asthma, bronchitis	0.34
		<i>Pastinaca</i> sp. RP-339	Elbık, Pilton, Piltan	Aer	In	Ext	Anti-inflammatory	0.13
		<i>Anthriscus</i> sp. RP-490	Mende, Mendu, Menda	Lea	Boi	Eat	Stomach-ache	0.12
		<i>Sium sisarum</i> L. RP-381	Vınyek, Vınık, Tırwaş	Aer	Boi	Eat	Digestive	0.10
		* <i>Pimpinella olivieroides</i> Boiss. & Hausskn. RP-489	Maydanoz	Aer	Dec	Dte	Anti-inflammatory	0.39
	Araceae	<i>Arum elongatum</i> Steven RP-334, RP-396	Kardun, Kardu, Kardı	Lea	Boi, In	Eat	Goitre, diabetes disease, abdominal pain, rheumatism, antihypertensive, birth pains	0.28
	Asparagaceae	<i>Asparagus acutifolius</i> L. RP-483	Melcü, Melji, Kuşkonmaz	Aer	Boi	Eat	Cardiac disorder	0.17

Asteraceae	<i>Achillea biebersteinii</i> Hub.-Mor. RP-496	Waşzerik, Vılıka çeker, Gihaye çexer, Wilazerd	Flo	In	Dtt	Rheumatism, hepatitis, sinusitis, toothache, anti- inflammation, menstruation pain	0.1 2
	** <i>Achillea magnifica</i> Heimerl ex Hub.-Mor. Near threatened (NT). RP- 495	Gihaye çexer, Wilazerd	Bra	In	Dtt	Hepatitis, menstruation pain	0.1 2
	<i>Anthemis</i> sp. RP-497	Elk Fatık, Papatya	Bra	In	Dtt	Antitussive, cough, colds and flu	0.2 3
	** <i>Centaurea saligna</i> (K. Koch) Wagenitz. Least concern (LC). RP- 360	Waş guen	Lea	Lc	Com, Ext	Stypsis	0.1 2
	<i>Centaurea calcitrapa</i> L. RP-498	Twelu	Aer	Dec	Dte	Cardiac disorder, embolism	0.1 1
	<i>Chaerophyllum bulbosum</i> L. RP-488	Pueşma, Şomek	Rhi	Raw	Raw	Diabetes, cholesterol	0.0 6
	<i>Gundelia tournefortii</i> L. RP-380	Kenger, Kinger, Geleng	Lat	Lr, Raw	Eat	<b>Digestive, aphrodisiac</b>	0.4 7
	<i>Helichrysum plicatum</i> DC. RP-352, RP-354	Sesum	Flo	In	Dgo	Diabetes disease, hepatitis, kidney stones	0.3 2
	* <i>Helianthus tuberosus</i> L. RP-487	Say erd, Say bin erd, Yerelması	Tub	Raw	Raw	Diabetes	0.2 1
	<i>Scorzonera mollis</i> M. Bieb RP-385	Şing, Vıl	Tub	Raw	Raw	Diabetes	0.1 6
	<i>Scorzonera cinerea</i> Boiss RP- 393	Şing, Vıl	Tub	Raw	Raw	Diabetes	0.1 6
	<i>Tragopogon reticulatus</i> Boiss. & Huet RP- 378	Marşing, Sıping	Lea	Raw	Raw	Intestinal inflammation	0.1 2

		<i>Onopordum acanthium</i> L. RP-486	Kinger heron	See	Dec, Ts+Honey	Doc	Hepatic diseases, haemorrhoids	0.2 3
		<i>Xanthium spinosum</i> L. RP-485	Gurnik	Bra	Dec	Dpt	Anti-inflammatory, embolism, cardiac disorder	0.0 8
	Boraginaceae	<i>Anchusa azurea</i> Mill. RP-392	Gelzun, Gelezun	Aer	Dec, Boi	Eat, Dgo	Digestive, carminative, wound healing, rheumatism	0.5 3
	Brassicaceae	<i>Nasturtium officinale</i> R.Br. RP-303	Kiji, Qije, Tujik	Aer	In	Dgo	Inflammation, carminative, diabetes, antihypertensive, stomach-ache	0.2 7
		<i>Capsella bursa-pastoris</i> (L.) Medik. RP-433	Pironek, Puronek, Non mirçikon	Lea	Lc	Com, Ext	Headache	0.1 0
	Caryophyllaceae	<i>Telephium oligospermum</i> Steud. Ex Boiss RP-484	Waş astare	Aer	Lr	Lex, Ext	Papilloma	0.0 6
	Chenopodiaceae	<i>Chenopodium album</i> L. RP-505	Selmi, Silmastik	Aer	Boi	Eat	Digestive	0.3 2
	Elaeagnaceae	<i>Elaeagnus angustifolia</i> L. RP-482	İğde	Fru	Dec	Dte	Constipation	0.1 2
	Equisetaceae	<i>Equisetum ramosissimum</i> Desf. RP-481	Not name	Aer	Dec	Dgo	Anti-hair loss	0.1 2
	Euphorbiaceae	<i>Euphorbia armena</i> Prokh. RP-480	Dualek, Dile	Lat	Lr	Lex, Ext	Eczema, wounds	0.1 1
	Fabaceae	<i>Astragalus brachycalyx</i> Phil. RP-341	Gewen	Roo	Dec	Dgo	Diabetes, cancer	0.1 1
		<i>Glycyrrhiza glabra</i> L.RP-479	Meyan	Roo	Ma	Dgo	Digestive, stomach-ache	0.1 3
		* <i>Trifolium</i> sp. RP-478	Argud, Nefil	Aer	Raw	Raw	Rheumatism, hepatitis	0.1 8

	Fagaceae	<i>Quercus petraea</i> (Matt.) Liebl. RP-335	Mazer, Welg,	Fru	Hea	Ext	Wounds, inflammation	0.12
		<i>Quercus libani</i> G.Olivier RP-477	Azgiller, Welg	Fru	Hea	Ext	Wounds, inflammation	0.12
	Iridaceae	<i>Iris reticulata</i> M. Bieb. RP-383	Kilozık, Kuelbiza, Gul sosin	Flo	Raw	Raw	Appetizer	0.09
		<i>Iris caucasica</i> Hoffm. RP-405	Kuelbiza, Tumane Keku, Tumane Gew	Flo	Raw	Raw	Appetizer	0.07
	Juglandaceae	* <i>Juglans regia</i> L. RP-476	Goz, Guaz, Ceviz	Bra	Dec	Doc, Ext, Raw	Diabetes, cholesterol, haemorrhoids, psoriasis, respiratory tract problem, anti-lubrication for hair, antifungal, anti-hair loss, psoriasis	0.39
	Hypericaceae	<i>Hypericum scabrum</i> L. RP-302	Waş zerık, Kantaron	Aer	In	Dte	Abdominal ache, digestive	0.27
		<i>Hypericum perforatum</i> L. RP-320	Waş zerık, Kantaron	Aer	In	Dte	Abdominal ache, digestive	0.29
	Lamiaceae	<i>Ajuga chamaepitys</i> (L.) Schreb. subsp. <i>laevigata</i> (Banks & Sol.) P.H. Davis RP-475	Waş basur	Aer	Dec	Dtt	Diabetes	0.10
		<i>Mentha longifolia</i> (L.) L. subsp. <i>typhoides</i> (Briq.) Harley RP-332	Pune, Punı, Nane	Lea	Dec	Dtt	Abdominal ache, colds and flu	0.34
		<i>Mentha spicata</i> L. RP-343	Pune, Punı, Nane	Lea	Dec	Dam	Colds and flu, respiratory problems	0.34

		* <i>Ocimum basilicum</i> L. RP-499	Rihon, Rihan, Rehan, Reyhan	Lea	In	Dot	Colds and flu	0.2 2
		** <i>Origanum acutidens</i> (Hand-Mazz.) letsvaart. Least concern (LC). RP- 474	Anık, Onıx, Anıx	Lea	In	Doc	Colds and flu, sedative	0.1 7
		<i>Stachys lavandulifolia</i> Vahl. RP- 473	Çaye qwe, Çaye çiya, Deme çole, Deme biri	Bra	Dec	Dgo	Insomnia, colds and flu, sedative, insomnia	0.1 9
		<i>Teucrium polium</i> L. RP-500	Meyremxort	Lea	Dec, In	Dgo, Doc	Antihypertensive, diabetes, diarrhoea, headache, stomach-ache, colds and flu	0.2 2
		<i>Teucrium chamaedrys</i> subsp. <i>sinuatum</i> (Celak.) Rech. f. RP- 361	Çaye qwe, Çaye çiya	Aer	In	Dot	Insomnia, colds and flu, sedative	0.3 3
		<i>Thymus sipyleus</i> Boiss. RP- 308	Onıx, Anıx, Kekik	Lea	Dec	Dam	Colds and flu, sedative	0.1 4
		<i>Thymus kotschyanus</i> Boiss. & Hohen. RP- 301	Onıx, Anıx, Kekik	Aer	In	Dgo	Colds and flu, sedative	0.1 2
	Malvaceae	<i>Alcea pallida</i> (Willd.) Waldst. & Kit. RP- 470	Hiro, Hiri	Flo	In	Dtt, Ext	Antitussive, bronchitis, infertility, wounds and cuts	0.1 7
		<i>Malva neglecta</i> Wallr. RP- 469	Xemazek, Veraruejk, Tollık, Ebegümeçi, Duelık	Aer	Dec, In, Ms	Com, Doc Ext	Anti- inflammatory, urinary inflammations , abdominal pain, infertility, wounds and cuts	0.7 0
		<i>Malva sylvestris</i> L. RP-432	Xemazek, Veraruejk, Tollık,	Aer	Dec, In, Ms	Com, Doc Ext	Anti- inflammatory, urinary inflammations	0.6 4



			Ebegümeçi, Duelik				, inflammation, infertility	
	Moraceae	* <i>Morus nigra</i> L. RP-469	Tui, Dut	Fru	Ps	Doc	Eczema, hepatitis	0.27
	Papaveraceae	<i>Papaver rhoeas</i> L. RP-468	Buk	Aer	In	Doc	Asthma, expectorant	0.21
	Plantaginaceae	<i>Plantago lanceolata</i> L. RP-467	Pel hewes, Pelonbaş, Omulwaş, Ominwaş	Lea	In	Doc, Com	Embolism, abscess, urinary inflammations , wound healing	0.57
		<i>Plantago major</i> L. RP-331	Pel hewes, Pelonbaş, Omulwaş, Ominwaş, Uminwaş	Lea	De	Com	Embolism, abscess, urinary inflammations , wound healing	0.67
	Plumbaginaceae	<i>Acantholimon armenum</i> Boiss. & A. Huet. RP-501	Gingil	Aer	Ash	Ext	Depilatory	0.06
		<i>Acantholimon sp.</i> RP-355	Gingil	Aer	Ash	Ext	Depilatory	0.06
	Poaceae	* <i>Zea mays</i> L. RP-466	Lazıt, Mısır	Sty	Dec, In	Doc	Goitre, kidney stones	0.11
		<i>Hordeum bulbosum</i> L. RP-465	Sirome, Siromek, Siyamo	Rhi	Dec	Doc	Kidney stones	0.08
	Polygonaceae	<i>Polygonum cognatum</i> Meisn. RP-502	Non mirçikon	Lea	In	Dtt	Abdominal pain, anaemia	0.11
		<i>Rheum ribes</i> L. RP-460	Ribes, Rıwes, Rewas, Kap, Işgın	Aer, Roo	In, Raw	Doc	Asthma, diabetes, kidney stones, cardiac disorder	0.41
		<i>Rumex acetosella</i> L. RP-461	Tırşık	Lea	Dec, Raw	Dgo,	Antihypertensive, diuretic	0.13
		<i>Rumex tuberosus</i> L. RP-462	Tırşık	Lea	In, Raw	Dgo	Antihypertensive, diuretic	0.11
		<i>Rumex crispus</i> L. RP-463	Tırşık, Zavil	Lea	In, Raw	Dgo	Diuretic, digestive	0.11
	Portulacaceae	* <i>Portulaca oleracea</i> L. RP-464	Parpar, pirpirim	Aer	In, Dec	Dat, Doc	Cardiac disorder, constipation,	0.27

							diabetes disease	
	Ranunculaceae	<i>Ranunculus sp</i> RP-503	Çoklek	Aer	Lc	Ext	Rheumatism, wound healing, anti-inflammation	0.16
	Rhamnaceae	<i>Paliurus spina-christi</i> Mill. RP-459	Çaltık	Fru	Dec	Doc	Diuretic	0.07
	Rosaceae	* <i>Armeniaca vulgaris</i> Lam. RP-458	Mışmış, Kayısı	Fru, Lea	Fc, Dec	Dte, Ext	Diabetes, eye diseases	0.46
		* <i>Cerasus avium</i> (L.) Moench RP-457	Kiraz	Ped	In	Doc	Kidney stones	0.22
		<i>Crataegus ambigua</i> C.A.Mey. ex A.K. Becker RP-374	Gunc	Fru	In	Doc	Cardiac disorder, embolism	0.32
		<i>Crataegus azarolus</i> L. var. <i>azarolus</i> RP-375	Sinz, Sez, Risok, Roğık	Flo, Fru	Dec, In	Dat, Dpe	Cardiac disorder, insomnia, joint pain, rheumatism, stress	0.41
		<i>Crataegus orientalis</i> subsp. <i>szovitsii</i> (Pojark.) K.I.Chr. RP-306	Sinz, Sez, Risok, Roğık	Flo	In	Doc, Ext	Cardiac disorder, asthma	0.43
		<i>Crataegus orientalis</i> Pall. ex M. Bieb. RP-377	Sinz, Sez, Risok, Roğık	Flo, Stem bark	In	Doc	Cardiac disorder, stomach-ache	0.41
		* <i>Cydonia oblonga</i> Mill. RP-456	Pel bayer, Ayva	Lea	Dec	Doc	Diabetes, respiratory tract problem	0.22
		** <i>Prunus kurdica</i> Fenzl ex Fritsch. Endangered (EN). RP-364, RP-388	Momıx, Mamıx, Lektır	Fru	Raw	Dte	Anaemia, diabetes	0.27
		<i>Rubus sanctus</i> Schreb. RP-369	Dırık, Dırkel, Tiri	Flo, Fru, Lea, Roo	In	Dat	Bronchitis, asthma, diabetes	0.43
		<i>Rubus canescens</i> DC. RP-504	Dırık, Dırkel, Tiri	Roo, Lea, Flo	In	Dat	Bronchitis, asthma, diabetes	0.43

							disease, sedative	
		<i>Rosa canina</i> L. RP-326	Sırgul, Şılan, Kuşburnu	Fru	In	Doc, Ext	Colds and flu, expectorative, haemorrhoids, relaxive	0.5 5
		<i>Rosa dumalis</i> Bechst. RP-331	Sırgul, Şılan, Kuşburnu	Fru	Dec	Dpt	Bronchitis, colds and flu	0.5 5
	Salicaceae	<i>Salix alba</i> L. RP-453	Valer, Söğüt	Lea	Dec, In, Ext	Dtt	Analgesic, sinusitis, infertility	0.1 3
	Solanaceae	<i>Hyoscyamus niger</i> L. RP-325	Waş dindon	See	Hea	Inh	Toothache, ext. inhaled into mouth	0.1 1
	Ulmaceae	<i>Celtis tournefortii</i> Lam. RP-373	Tee, Dardağan	Fru	Dec	Dte	Abdominal pain, cold, flu	0.1 1
	Urticaceae	<i>Urtica dioica</i> L. RP-454	Derzink, Gerzink, Gerzunek, Gezok, Gezgezok, Ya ğij, Yeğıç, Isırgan	Aer, See	In+Ts+Hon ey	Doc, Dam Ext	Rheumatism, arthritis, digestive, diuretic, genital disorders, haemorrhoids, hepatitis, cancer, hair loss	0.6 3
	Vitaceae	* <i>Vitis vinifera</i> L. RP-455	Engur, Rez, Üzüm	Fru	Ps	Dte	Anaemia	0.3 4
	Xanthorrhoeaceae	<i>Eremurus spectabilis</i> M. Bieb. RP-409	Yelig, Gullık, Guling, Çiriş	Aer	Ms, Boi	Eat	Digestive	0.4 7
	Zygophyllaceae	<i>Tribulus terrestris</i> L. RP-365	Gwerçal, Gerçal	Fru, Lea	In	Doc, Dpt	Cardiac disorder, asthma, kidney stones	0.4 3

\*Cultivated plants.

\*\*Endemic plants.

<sup>a</sup> Plant part(s) used: Aer, aerial parts; Bra, branches; Flo, flowers; Fru, fruits; Lat, latex; Lea, leaves; Res, resin; Rhi, rhizomes; Roo, roots; See, seeds; Who, whole plant.

<sup>b</sup> Preparations: Boi; aerial parts boiled, Dec, decoction; Fc, the fruits are crushed; Hea; heated; In, infusion; Lr, latex is removed; Lc, the leaves are crushed; Ma, maceration; Ms, mash; Ps; Paste; Ts, the seeds are crushed.

<sup>c</sup> Utilization method: Com, compress; Dat, drink one tea glass of the plant after the meal; Dgo, drink one tea glass of the plant before the meal; Doc, drink one cup of the plant on an empty stomach in the morning; Dot, drink one teacup after meals; Dpe, drink one cup of the plant in the evening; Dpt, drink one cup of the plant two times a day; Dte, drink one tea glass of the plant two times a day; Dtt, drink one tea glass of the plant three times a day; Eat; Eaten as meal; Ext, externally; Inh, inhalation; Lex, latex is used externally; Raw, the plant is eaten raw.

**Table 3**

ICF values of category of ailments.

No.	Ailments	Number of Taxa	Number of use-report	ICF
1	Blood pressure diseases	7	27	0.76
2	Rheumatic pain	7	12	0.45
3	Gastrointestinal disorders	31	82	0.62
4	Respiratory diseases	30	97	0.69
5	Diabetes	19	41	0.55
6	Healing cut and wounds	8	49	0.85
7	Cardiovascular	15	29	0.50
8	Urogenital and kidney problems	12	37	0.67
9	Internal and external inflammatory problems	22	55	0.61
10	Sedative	5	11	0.60
11	Delivery and female problems	7	11	0.40

**Table 4**

Most commonly used medicinal plants and their major uses with their fidelity level (0 = The Least, 100 = The Highest Efficiency)

<b>Species</b>	<b>Local names</b>	<b>Uses</b>	<b>Fidelity level (FL) %</b>
<i>Malva neglecta</i>	Xemazek, tollık, veraruejik	Anti-inflammatory, urinary inflammation	94
<i>Urtica dioica</i>	Derzinik, gerzinik, gezok, yeğiç	Rheumatism, arthritis, digestive, diuretic	92
<i>Plantago major</i>	Pel hewes, omulwaş	Urinary inflammations, wound healing	90
<i>Anchusa azurea</i>	Gelzun	Digestive, carminative	80
<i>Gundelia tournefortii</i>	Kinger, kereng	Digestive, aphrodisiac	73
<i>Eremurus spectabilis</i>	Yelıg, gulık	Digestive	70
<i>Rosa canina</i>	Sırgul, şilan	Colds and flu	85
<i>Rheum ribes</i>	Ribes, rıwes, rewas	Asthma, diabetes disease	65
<i>Creatagus spp.</i>	Sinz, sez, gunc	Cardiac disorder	78
<i>Tribulus terrestris</i>	Gwerçal	Cardiac disorder, asthma	84