Ethnobotanical survey of plants used in Afyonkarahisar-Turkey

Süleyman Arı¹, Mehmet Temel¹, Mustafa Kargıoğlu¹ and Muhsin Konuk²*

Abstract

Background: The traditional knowledge about plants and their uses in Turkey is disappearing in recent years because the new generations of villagers migrate to big cities for a better life. Afyonkarahisar located at the intersection of roads and phytogeographical regions (Mediterranean, Iran-Turan, and Euro-Siberian) has more than 2500 plant species. This richness of plant diversity promotes the indigenous community for the traditional use of wild plants. The aim of the study is to show wild plants’ ethnobotanical usages associated with medicinal, food, fodder, and household goods in 31 settlements within the boundaries of Afyonkarahisar province.

Methods: The ethnobotanical data were collected from 46 informants by means of semi-structured interviews from 2012 to 2014. Ethnobotanical uses of plants of the study area were conducted in the vicinity of Afyonkarahisar (5 districts, 8 towns, 15 villages, and 3 neighborhood centers).

Results: One hundred and thirty plant taxa belonging to 39 families were recorded and collected. Hundred and seventy-eight different uses of these plants were documented and used generally for medicinal (84), food (68), fodder (16), household goods (3), dyes (3), handicrafts (3) and religious (1).

Conclusion: This study provides interesting uses of plants in the local community of Afyonkarahisar and its surrounding area, in what purpose they make use of plants, how they make use of them and obtained results will contribute to economy of villagers. Since the local people, especially in villages, are poor and do not have health care, they use the plants to treat illnesses, food, fodder, household goods and other uses (evil eye). Also this study will light the way for posterity for next generations.

Keywords: Afyonkarahisar, Ethnobotany, Food plants, Medicinal plants

Background

People have interacted with plants since ancient times. This interaction has contributed to flourishing of scientific fields such as ethnobotany and paleoethnobotany [1]. Ethnobotanical studies began in the early 1800s when John W. Harsberger, a famous botanist, proposed ethnobotanical study for the first time [2]. The scope of plant use has changed since the 1800s to this day. The frequency and purpose of use of plants by people vary in regard to social, cultural, and economic needs. Plants are used for purposes of food, medicine, fuel, industry, ornament, and effects. Purposes of use also vary in regard to people’s priority of needs [1, 3–9]. Turkey, with more than 11,000 taxa is a flora-rich country due to its climate and phytogeographical positions (Mediterranean, Iran-Turan, and Euro-Siberian) is a significant position as being a flora-rich country. The endemic plants in its flora occupy 1/3 of total taxa. Anatolian people have been using these plants as food and medicine since Paleolithic times [10, 11]. Approximately 1000 taxa are used for medicinal purposes and 350 plant species are used in internal and external trade [12]. Afyonkarahisar is located where the three regions intersect. This makes Afyonkarahisar a flora rich region, people use the plants around their environment for different purposes. Turkish people living in rural areas use especially wild plants. Generally, the usage of plants are for food and medical purposes. In recent years, traditional ethnobotanical knowledge and prevalence of medicinal plants have been investigated by researchers in different areas of Turkey [13–41]. As a results of these studies a great

* Correspondence: mkonuk@gmail.com

¹Department of Molecular Biology and Genetics, Faculty of Engineering and Natural Sciences, USKUDAR University, 34662 Istanbul, Turkey

Full list of author information is available at the end of the article

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increase on the level of traditional knowledge of plants occurred. On the other hand, more detailed studies are needed to focus region by region. Therefore this study was carried out to extend Afyonkarahisar's ethnobotanical knowledge due to a limited ethnobotanical studies [42–46] conducted in the near region; living in suburbs and in villages; protecting and maintaining their traditional culture and customs and rich uses of plants by local people. The aims of this study were: (1) to determine the local and scientific names of the plants, (2) to document and analyse the traditional ethnobotanical knowledge herited by local people living in Afyonkarahisar and its surrounding area.

Methods
Study Area
Afyonkarahisar is 1034 m above sea level. It is located 38° 45' N latitude and 30° 32' E longitude. The total area of Afyonkarahisar is 14,295 km² and it occupies 1.8 % of Turkey's land. In north of Eskişehir, northwest of Kütahya, east of Konya, south of Isparta, west of Uşak, southwest of Denizli and Burdur are located (Fig. 1) [46]. Despite the fact that Afyonkarahisar is located in the Aegean region, its climate is similar to that of the central Anatolia region. Winters are cold and tough with intense snow, summers are hot and dry, and spring and autumn months feature rain. Precipitation is raining in spring and autumn [47]. According to Erinç [48], the index value of Afyonkarahisar is 23.9 lm. In the vegetation of Afyonkarahisar, cedar and blackpine are found along with various species including relict ones. However, blackpine forests, the dominant factor of forest formation, have been significantly destroyed and oak groups have replaced them. The destruction is greater especially in fields around settlements, and these fields have turned into anthropogenic steppe [47]. The main livelihoods of the local community in the research area are tree felling, sheep and cattle husbandry, and agriculture. Animal husbandry consists of small numbers of cattle per household (average one), kept for meat and milk, with dairy products being sold in local bazaars. Since the area consists largely of forested hillsides, crop production is restricted to small fields, and annual incomes from agriculture are therefore relatively low. Monthly incomes are in the region of US $230–350 for workers and shepherds, and $350 for agricultural workers in those months that they work. On average, 50 % of the population is young (under 30 years), 30 % are middle-aged (30–50 years), and 20 % are old (50+ years). Although 80 % of the middle-aged and nearly 80 % of the older generation is not literate, almost all young people are literate.

Data collection
Specimens were collected by the authors in Afyonkarahisar and its surrounding area in the years between 2012 and 2014. Thirty-one settlements were visited for field research. Two hundred people were contacted, and 46 of them accepted to become our informants who have ethnobotanical experience. Thirty-five of them were male and 11 of them were female. Data were collected from nine informants between the ages of 35 and 50, 17 informants between the ages of 50–65, and 20 informants over the age of 65. Interviews with the men were usually carried out in the teahouses where they come together, and with women in their homes, bazaars and gardens. A questionnaire was administered to the informants through face-to-face interviews. Information that had been carried to the region from the outside and that was not used or confirmed were not included and recorded. During the interviews, the below questions were asked to the participants.

(1) Name and surname
(2) Age and sex
(3) Educational level
(4) Are plants collected in your region?
(5) Do you have any contact with plants?
(6) Can you show the plants you use in your region?
(7) Can you tell the local names of the plants you use in your region?
(8) In which season do you collect the plants you use in your region?
(9) When collecting plant, which parts of the plant do you collect and how do you collect them?
(10) Which parts of the plants do you use? (Flower, fruit, leaves, root, tuber, young shoots, branch, galbula, cupula, stem, above ground parts etc.).
(11) How do you prepare and administrate the plants’ parts?

Answers given above questions with doubt were not recorded. Specimens were collected and identified by the authors according to Davis [49] and the studies related to the flora Afyonkarahisar by Kargıoğlu et al. [44, 45]. Plants were photographed as well as being observed in the research field. Voucher specimens are saved in the Herbarium of Afyon Kocatepe University (AKUH). Herbarium numbers of the plant taxa were given in Table 1.

Results and discussion
As seen in Table 1 and Fig. 2, the number of plant taxa used by the indestigous community of Afyonkarahisar and the surrounding area is 130 that belong to 93 genera and 39 families, and a total of 178 ethnobotanical uses (remedies) were recorded. Medicinal use occupies the first place with 84 types of use. The others are food with 68, fodder with 16, handicrafts, painting and effects with three types of use each, and other (evil eye) with one. According to results, the percentage of species in
families are Asteraceae (14%), Lamiaceae (10%), Rosaceae (8%), Caryophyllaceae (5%), Chenopodiaceae (5%), Polygonaceae (5%), Boraginaceae (4%), Brassicaceae (4%), Fabaceae (4%), and 41% of them are composed of other subgroups. The richest subgroup rate in terms of frequency of ethnobotanical uses is 15% Asteraceae, followed by 10% Lamiaceae, 9% Rosaceae, 4% Brassicaceae, 4% Caryophyllaceae, 4% Chenopodiaceae, 4% Fabaceae, 3% Boraginaceae, and 42% other subgroups. The richest genus in terms of ethnobotanically significant is *Rumex* L. with 5 taxa, followed by *Quercus* L. with 4 taxa. Seven other 7 genera share third place with three taxa each. When we compare the studies of other researchers [5, 7, 30, 35, 38, 41], the families of Asteraceae, Lamiaceae, Rosaceae are the most common families. But in the study of Doğan [11] the usage order of the families was a bit different than our findings. He reported that the highest number of taxa is similarly Asteraceae, but others were as Boraginaceae, Apiaceae, Lamiaceae, Caryophyllaceae and Geraniaceae. *Rumex* and *Erodium* are the most represented genera.
| Species                                      | Plant Family | Local Name                  | Parts Used     | Uses                | Preparation and Administration                                      |
|----------------------------------------------|--------------|-----------------------------|----------------|---------------------|----------------------------------------------------------------------|
| Acanthus hirsutus Boiss. (AKUH 7506)          | Acanthaceae  | Ayıpaycısı                  | Stem, Leaf     | Fodder              | Stem and leaf are consumed by animals for fodder.                    |
| Amaranthus retroflexus L. (AKUH 7509)        | Amaranthaceae| Paşa pancan, kızılbaçak       | Leaf           | Food                | The plant’s leaves are fried in oil and consumed.                   |
| Conium maculatum L. (AKUH 7520)              | Apiaceae     | Yilan kamyı, gumarak ot       | Flower         | Infection           | The plant oil were removed and the stem is driven to kill germs in the stem structure. |
| Eryngium campestre L. var. virens Link. (AKUH 7528) | Apiaceae     | Çakırdıkeni                  | Stem           | Infection           | Infusion as tea.                                                     |
| Arum elongatum Steven subsp. elongatum Steven (AKUH 7542) | Araceae      | Basur otu                   | Root, Tuber    | Hemorrhoid          | Plant tuber part turned into powder by in effect simulating the board. The capsule was consumed. |
| Dracunculus vulgaris Schoot. (AKUH 7564)     | Araceae      | Yilan biçağı                 | Leaf           | Infection           | The leaf part is used as a salve on a wound.                        |
| Muscaria camosum (L.) Mill. (AKUH 7597)      | Asparagaceae | Dağ soğanı, ada soğanı      | Above ground parts | Circulatory system | Infusion as tea.                                                     |
| Tragopogon latifolius Boiss. var. angustifolius Boiss. (AKUH 7514) | Asteraceae   | Tekesakalı, yemlik           | Leaf           | Stomach disease     | The leaves are directly consumed.                                    |
| Helianthus tuberosus L. (AKUH 7521)          | Asteraceae   | Yerelması                   | Root, Stem     | Food                | Root and stem parts are directly consumed.                          |
| Anthemis tinctoria L. var. tinctoria L. (AKUH 7545) | Asteraceae   | Papatya                      | Flower         | Respiratory system  | Infusion as tea.                                                     |
| Hieracium pannosum Boiss. (AKUH 7548)        | Asteraceae   | Sakoz otu                   | Root           | Oral and dental health | The root of the plant is suspended in the sun, the resulting liquid such as milk dry up like chewing gum is for chewing. |
| Anthemis wallii Hub.-Mor. et Reese (AKUH 7501) | Asteraceae   | Papatya                      | Flower         | Asthma and shortness of breath | Infusion as tea.                                                     |
| Chondrilla juncea L. var. juncea. (AKUH 7504) | Asteraceae   | Karakavuk, çıtkık, çengel sakız | Leaf           | Painkiller and stomach disease | The leaves are used in salad.                                       |
| Lactuca semioila L. (AKUH 7502)              | Asteraceae   | Tarı marul, acı marul, dilli tura | Leaf           | Diet and attenuator  | The leaves of the plant are consumed as part of a salad.             |
| Achillea millefolium L. subsp. millefolium. (AKUH 7534) | Asteraceae   | Ayva denesi                  | Leaf, Flower   | Diseases of the digestive system | Infusion as tea.                                                     |
| Achillea terentifolia Willd. (AKUH 7532)     | Asteraceae   | Yaraotu                     | Above ground parts | Diseases of the digestive, skin and acne disease | The plant’s above ground parts boiled water by putting a quantity of 15 min is suspended. Tea mixed with oil is applied on acne and wounded regions. |
| Centaurea depressa M. Bieb. (AKUH 7560)      | Asteraceae   | Gökbケアş                  | Leaf           | Food                | The leaves of the plant are consumed by making a taco.              |
| Chichorium intybus L. (AKUH 7557)            | Asteraceae   | Aci güneş, çıtkık otu         | Leaf           | Painkiller and stomach diseases | The plant’s leaves are made of salad and rolls.                      |
| Scolymus hispanicus L. (AKUH 7503)           | Asteraceae   | Diken                        | Stem           | Digestive diseases  | The fleshy parts of the stem of the plant is consumed directly in the blister pack |
| Bellis perennis L. (AKUH 7511)               | Asteraceae   | Çayır papatyaşısı            | Flower         | Medical, respiratory diseases | Flower of the plant is dried, boiled water for 3–5 min by joining strength, juice drink. |
| Plant Species                          | Part Used       | Medicinal Use                                                                 | Notes                                                                                           |
|---------------------------------------|-----------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| *Doronicum orientale* Hoffm. (AKUH 7513) | Sanç içek, Flower, Leaf | Fodder                                                                        | The plant flowers and leaves parts exposed to animals as bait.                                   |
| *Onopordum anatolicum* Boiss. Eieg. (AKUH 7562) | Galgan, Stem     | Digestive tract, stomachache, kidney stones                                   | The meaty parts in the stem of the plant is removed, directly from the defeated are consumed. Decoction as tea. |
| *Gundelia toumefortii* L. var. toumefortii (AKUH 7556) | Ken ger, Fruit   | Skin disorders, eczema, hemorrhoids                                           | After roasting, the fruit portion is consumed.                                                   |
| *Artemisia campestris* L. (AKUH 7589) | Pelin, Young shoots and Leaves | Appetizer                                                                     | Decoction as tea.                                                                               |
| *Achillea biebersteinii* Afin. (AKUH 7573) | Civanperçem Leaf, Flower | Pain relievers, stomach, respiratory distress, shortness of breath disorders | Decoction as tea.                                                                               |
| *Inula anatolica* Boiss. (AKUH 7576) | Basur otu Leaf, Flower | Hemorrhoids                                                                    | Flower is boiled in water. It is used as a treatment for hemorrhoids district.                  |
| *Anchusa leptophylla* Roemer & Schultes subsp. leptophylla (AKUH 7505) | Ballık Otu, Kuzu dili, Stem, Flower, Food |                                                                 | Leaves are effective for preventing kidney stones when they are consumed 15–20 days as salad. The fruit of the plant part (grape) is consumed directly. |
| *Cerinthe minor* L. subsp. auriculata (Ten.) Domac (AKUH 7558) | Sanç içek, Flower, Leaf | Fodder                                                                        | Stem and flowers are put into the dough.                                                        |
| *Anchusa undulata* L. subsp. *hybrida* (Ten.) Coutinho (AKUH 7552) | Sağr dilli Leaf | Diabetes                                                                      | Leaves and flower parts are exposed to animals.                                                  |
| *Alkanna tinctoria* (L) Tausch subsp. glandulosa Hub.-Mor. (AKUH 7561) | Havac wa otu Root | Hemorrhoids                                                                    | The plant’s leaves are boiled and are consumed by joining into the dough.                       |
| *Anchusa azurea* Mill. var. azurea. (AKUH 7553) | Kuzu dili, Ballık otu Leaf | Food                                                                         | Decoction as tea, the region also has a therapeutic equivalent of hemorrhoids.                  |
| *Alyssum desertorum* Stapf. var. desertorum Stapf. (AKUH 7554) | Yozm erçimek Fruit | Food                                                                          | Fresh leaves of the plant are boiled and put into dough.                                        |
| *Sisymbrium altissimum* L. (AKUH 7590) | Hardal otu Leaf, Flower | Food, Fodder                                                                  | Consumed directly by shepherds.                                                                 |
| *Barbarea* sp. (AKUH 7583) | Açı te re Leaf | Body resistance, vitamin                                                      | Leaf of the plant parts consumed in the form of rolls wrapped in phyllo dough. Leaves and flowers of the plant are given to animals. |
| *Capsella bursa-pastoris* (L) Medik. (AKUH 7507) | Pastariz, bicibici Leaf | Food                                                                          | The plant’s leaves are made of salad.                                                           |
| *Sinapis arvensis* L. (AKUH 7508) | Hardal Leaf | Food                                                                          | The plant fresh leaves are consumed in the form of pastry wrapped into rolls.                    |
| *Silene dichotoma* Ehrh. subsp. dichotoma Ehrh. (AKUH 7512) | Toklubaği Leaf | Food                                                                          | Boiled fresh leaves is consumed in taco.                                                         |
| *Stellaria media* (L) Vill. subsp. media. (AKUH 7510) | Kuş ek m eği, urgancık, kazayağı Leaf | Food                                                                          | The plant’s leaves are made of salad.                                                            |
| *Silene vulgaris* (Moench) Garcke var. vulgaris (AKUH 7515) | Toklubaği Leaf | Food                                                                          | The leaves of the plant is consumed wrapped in dough.                                           |
| Plant Name                        | Part Used | Purpose                  | Preparation Method                                                                 |
|----------------------------------|-----------|--------------------------|-------------------------------------------------------------------------------------|
| Agrostemma githago L. (AKUH 7628) | Flower    | Digestive disorder       | Infusion as tea.                                                                    |
| Dianthus zonatus Fenz. var. aristatus (Boiss.) Reeve (AKUH 7620) | Basur otu | Flower, Hemorrhoids      | Flower part is boiled in water in 3–5 min. It is drunk for hemorrhoidal disease by the use of 10–15 sessions |
| Dianthus zonatus Fenz. var. zonatus (AKUH 7598) | Siğilotu | Flower, Skin diseases, warts | Infusion as tea.                                                                     |
| Vaccaria pyramidata Medik. var. grandiflora (Fisch. ex DC) Cullen (AKUH 7623) | Mor çiçek | Flower, Leaf, Fodder     | It is consumed as fresh by animals.                                                  |
| Chenopodium album L. (AKUH 7588) | Sirken    | Leaf, Food               | The plant’s leaves are boiled, consumed in dough.                                    |
| Chenopodium album L. subsp. album var. album (AKUH 7582) | San sirken | Leaf, Food               | The plant’s leaves are roasted and the eggs are added on to it.                    |
| Chenopodium foliosum (Moench) Asch. (AKUH 7630) | İt üzümü | Fruit, Food              | Fruits are eaten in fresh.                                                          |
| Kochia scoparia (L.) Schrad. (AKUH 7626) | Kir ispanaği | Leaf                     | Fried in oil and eaten by shepherds.                                                |
| Atriplex sp. (AKUH 7627) | Süpürge   | Branch, Stem, Household goods | Turned into a broom is used as household goods.                                      |
| Cistus laurifolius L. (AKUH 7624) | Tellice   | Flower                   | Infusion as tea.                                                                    |
| Cupressaceae | Gili gili | Leaf, Galbula | Cholesterol, diabetes                                                                 |
| Juniperus oxycedrus L. subsp. oxycedrus (AKUH 7622) | Gili gili | Leaf, Galbula | Cholesterol, diabetes                                                                 |
| Juniperus excelsa M. Bieb. (AKUH 7621) | Katran ağacı | Stem, Stern | Digestive and infection diseases                                                    |
| Juniperus foetidissima Willd. (AKUH 7619) | Kokar ardacı | Leaf, Stern | Skin diseases, warts                                                               |
| Equisetum ramosissimum Desf. (AKUH 7617) | Kırk kilit | Stem, Crafts, coloring, digestive | Decoction as tea.                                                                   |
| Euphorbia macroclada (Boiss.) (AKUH 7616) | Sütleğen | Stem, Infection | The plant is removed from the body in the form of liquid milk. Liquid bread into the stained area and ingested for treatment malaria. |
| Vicia cracca L. subsp. stenophylla Velen. (AKUH 7613) | Efek      | Flower, Fruit, Food, fodder | Flowers and fruits are consumed directly.                                           |
| Astragalus flavescens Boiss. (AKUH 7618) | Eşek geveni | Leaf, Flower, Fodder     | The plant’s leaves and flower parts are consumed directly by animals                |
| Astragalus microcephalus Willd. (AKUH 7615) | Geven     | Above ground parts, Fodder | Spiny part is burned by shepherds. A hammer or mallet were crushed for animals to eat. |
| Coronilla varia L. subsp. varia (AKUH 7611) | Burçak    | Flower, Leaf, Respiratory diseases | Infusion as tea.                                                                   |
Table 1 List of plants used as foodstuff or medicinal purposes in Afyonkarahisar (Inner-West Anatolia) (Continued)

| Plant Name | Family | Common Name | Parts Used | Medical Uses | Preparation |
|------------|--------|-------------|------------|--------------|-------------|
| Astragalus pisidicus Boiss. & Heldr. (AKUH 7612) | Fabaceae | Söğüt geveni | Above ground parts | Body resistance, immune system, cancer | Infusion as tea. |
| Quercus ithaburensis Decne. subsp. macrolepis (Kotsch) Hedge&Yalt. (AKUH 7614) | Fagaceae | Palamut | Cupula of the plant | Crafts, painting | Cupula of the plant by boiling chickpea yolk color is obtained for rug weaving. |
| Quercus cerris L. var. cerris (AKUH 7608) | Fagaceae | Kızılağaçağı | Fruit | Infection, hemorrhoids, Skin disorders, eczema | It is boiled in water and two spoons of juice is consumed on an empty stomach. |
| Quercus cerris L. var. cerris (AKUH 7608) | Fagaceae | Tüylü meşe | Leaf | Fodder | The leaves of the plant are eaten by animals. |
| Hypericum perforatum L. (AKUH 7566) | Hypericaceae | Binbir otu | Above ground parts | Painkillers | Decoction as tea. |
| Juglans regia L. (AKUH 7607) | Juglandaceae | Ceviz kabığı | Fruit Peel | Skin cancer, crafts and coloring | Decoction as tea. It is boiled to obtain dark brown collors and tones for rug weaving. |
| Tymus longicaulis C. Presl subsp. longicaulis var. subisophyllus (Borbas) Jalas (AKUH 7601) | Lamiaceae | Dağ kekiği | Flower | Lowering cholesterol and sugar. | The plant is consumed in the form of oregano oil. Infusion as tea. |
| Mentha longifolia (L.) Huds. subsp. typhoides (Briq.) Harley var. typhoides (AKUH 7600) | Lamiaceae | Yabanı nane, Doğuma | Leaf | Body resistance, vitamin, respiratory diseases | The plant’s leaves are consumed in salad Infusion as tea. Dried leaves of the plant are used for spices. Plant leaves are mixed to the dough. |
| Teucrium chamaedrys L. subsp. chamaedry. (AKUH 7603) | Lamiaceae | Bodurmanmut, sancotu | Leaf, Flower | Painkillers, stomach and hemorrhoid disease | Infusion as tea. |
| Origanum vulgare L. subsp. hirtum (Link) letsw. (AKUH 7599) | Lamiaceae | Dağ çayı | Flower | Digestive and stomach diseases | Infusion as tea. |
| Thymus zygoides Griseb. var. lycaonicus (AKUH 7606) | Lamiaceae | Mor kekik | Flower | Heart and vascular diseases | Infusion as tea. |
| Salvia cryptantha Montbret & Aucher ex Bentham (AKUH 7602) | Lamiaceae | Kir çayı, yapla | Leaf, Flower | Respiratory and colds | Infusion as tea. |
| Marrubium glabosum Montbret et Aucher ex Bentham (AKUH 7602) | Lamiaceae | Oğul otu | Leaf | Cardiac, vascular diseases | Infusion as tea. |
| Salvia tomentosa Mill. (AKUH 7579) | Lamiaceae | Karakekik | Leaf, Flower | Food | Decoction as tea. |
| Salvia virgata Jacq. (AKUH 7592) | Lamiaceae | Kir kekği | Flower | Food | Dried flowers are used for spices by joining tarhana soup |
| Phlomis armeniaca Willd. (AKUH 7593) | Lamiaceae | Zorlatma otu | Flower | Painkillers | Flower oil is applied to the pain region. |
| Thymus sipyleus Boiss. subsp. sipyleus var. sipyleus (AKUH 7604) | Lamiaceae | Beyaz kekik | Flower | Respiratory diseases shortness of breath, influenza | Infusion as tea. |
| Mentha pulegium L. (AKUH 7605) | Lamiaceae | Yarpuz | Flower | Food | Dried flowers of the herb is consumed as spices. Infusion as tea. |
| Teucrium polium L. (AKUH 7591) | Lamiaceae | Aci ot | Stem | Hemorrhoids | Infusion as tea. |
| Linaceae | Keten | Flower | Food | The flowers of the plant are consumed directly. |
| Plant Name | Family | Part Used | Medical Uses | Preparation |
|------------|--------|-----------|--------------|-------------|
| Linum hirsutum L. subsp. anatolicum (Boiss.) Hayek var. anatolicum (AKUH 7596) | Santalaceae | Leaf, Young shoots | Respiratory, cough, digestive, intestinal gas reliever | Infusion as tea. |
| Viscum album L. subsp. album (AKUH 7594) | Santalaceae | Leaf | Respiratory, cough, digestive, intestinal gas reliever | Infusion as tea. |
| Arceuthobium oxycedri (Dc.) M. Bieb. (AKUH 7584) | Santalaceae | Stem | Neurological diseases | Decoction as tea. |
| Malva sylvestris L. (AKUH 7587) | Malvaceae | Leaf | Food | After roasting in oil, it is consumed in the form of food. |
| Malva neglecta Wallr. (AKUH 7586) | Malvaceae | Leaf | Painkiller | Infusion as tea. Fresh leaves of the plant participates in the dough. |
| Morus nigra L (AKUH 7585) | Moraceae | Fruit | Infection, aphthae | Marmalade is made from fruit. |
| Peganum harmala L. (AKUH 7572) | Nitrariceae | Above ground parts | The evil eye | It is believed to prevent for the evil eye to strike the bride and son-in-law. |
| Chelidonium majus L. (AKUH 7563) | Papaveraceae | Above ground parts | Digestion, hemorrhoids, liver, jaundice, eye diseases, skin diseases | Infusion as tea (1–2 cups a day) |
| Fumaria asepala Boiss. (AKUH 7543) | Plantaginaceae | Flower | Infection, fungus | Infusion as tea. The plant’s water is applied to fungal region. |
| Papaver dubium L. (AKUH 7551) | Plantaginaceae | Leaf | Food | The leaves of the plant are consumed by making a salad. |
| Pinus nigra Arn. subsp. pallasiana (Lamb.) Holmboe var. pallasiana (AKUH 7565) | Pinaceae | Stem | Infection | Tar in water is drunk for infection. |
| Plantago lanceolata L. (AKUH 7525) | Plantaginaceae | Leaf | Infection | Leaf of the plant part is driven directly to the inflamed area. It is used for cleaning of the infection. |
| Plantago major L. subsp. intermedia (Gilib.) Lange (AKUH 7531) | Plantaginaceae | Leaf | Infection | Leaf of the plant part affected area to be wrapped, provides to outside infection. |
| Acantholimon ulicinum (Willd. & Schultes) Boiss. subsp. lycaonicum (Boiss. & Heldr.) Bokhari & Edm. (AKUH 7580) | Plumbaginaceae | Flower, Leaf | Household goods | Used in homes as decorative items. |
| Acantholimon acerosum subsp. lycaonicum (Willd.) Boiss. var. acerosum (AKUH 7581) | Plumbaginaceae | Flower | Household goods, infection, tuberculosis | Infusion as tea (1–2 cups a day) |
| Rumex scutatus L. (AKUH 7569) | Polygonaceae | Leaf | Vitamin needs | The leaves of the plant are consumed directly. Phyllo dough is made between the rolls. Salad is made. It is consumed directly with salt. |
| Rumex patientia L. (AKUH 7571) | Polygonaceae | Leaf | Food | The leaf part is consumed as wheat wrapped (sarma). Leaf of the plant part participates in the dough. |
| Rumex acetosella L. (AKUH 7574) | Polygonaceae | Leaf | Food | Leaves are eaten directly. Rolls are made, It is eaten. |
| Rumex crispus L. (AKUH 7575) | Polygonaceae | Leaf | Food | The leaf part is consumed as wheat wrapped (sarma). |
| Polygonum cognatum Meissn. (AKUH 7518) | Polygonaceae | Leaf | Body resistance | It is eaten as salad. Leaf of the plant part eaten directly. |
| Plant Name | Kingdom | Genus | Species | Habitat | Use | Description |
|------------|---------|-------|---------|---------|-----|-------------|
| Rumex tuberosus L. subsp. tuberosus L. (AKUH 7519) | Plantae | Rumex | tuberosus | Leaf | Body resistance, vitamin | It is eaten as salad. Leaf of the plant part eaten directly. |
| Portulaca oleracea L. (AKUH 7522) | Plantae | Portulaca | oleracea | Above ground parts | Food | The plant's above ground parts especially the leaves part joins into the yogurt. It is eaten as salad. |
| Lysimachia vulgaris L. (AKUH 7577) | Plantae | Lysimachia | vulgaris | Leaf | Digestive diseases | Infusion as tea (1–2 cups a day) |
| Nigella sativa L. (AKUH 7559) | Plantae | Nigella | sativa | Seed | Respiratory distress, shortness of breath, the immune diseases | The plant's seed is consumed directly. Also, it is mixed into the honey. |
| Ranunculus ficaria L. subsp. ficariiformis Rouy & F. (AKUH 7567) | Plantae | Ranunculus | ficaria | Flower | Digestion, hemorrhoids, skin diseases | Infusion as tea (3 cups a day) |
| Adonis aestivalis L. subsp. aestivalis L. (AKUH 7516) | Plantae | Adonis | aestivalis | Stem | Fodder | The stem of the plant parts are consumed by animals. |
| Rhamnus rhodopeus Velen. subsp. anatolicus (Grub.) Browicz & Zieliński (AKUH 7570) | Plantae | Rhamnus | rhodopeus | Fruit | Debilitating, diabetes | Fruits of the plant part eaten directly. |
| Pyrus elaeagnifolia Pallas subsp. elaeagnifolia Pallas (AKUH 7568) | Plantae | Pyrus | elaeagnifolia | Fruit | Cardiovascular diseases, hypertension | Infusion as tea(4 cups a day) Fruits of the plant part are eaten directly. Designated as a beverage. |
| Rosa hemisphaerica Herrm. (AKUH 7549) | Plantae | Rosa | hemisphaerica | Fruit | Food | Fruits of the plant part eaten directly. |
| Rosa canina L. (AKUH 7550) | Plantae | Rosa | canina | Fruit | Urea treatment, hemorrhoids, gastric ulcer | Dried fruit is boiled for a long time in the water to get marmelata. The fruit is boiled and it is taken orally as cold drink. Infusion as tea(3–4 cups a day) |
| Crataegus monogyna Jacq. subsp. monogyna (AKUH 7547) | Plantae | Crataegus | monogyna | Fruit | Respiratory, cold | Infusion as tea(2–4 cups a day) Dried fruit is boiled for a long time in the water to get marmelata. |
| Prunus divaricata Ledeb. subsp. divaricata (AKUH 7541) | Plantae | Prunus | divaricata | Fruit | Body resistance | Fruits of the plant part eaten directly. |
| Geum urbanum L. (AKUH 7535) | Plantae | Geum | urbanum | Root | Respiratory, influenza | Decoction as tea. |
| Crataegus aronia (L.) Bosc. ex DC. (AKUH 7546) | Plantae | Crataegus | aronia | Fruit | Food | Fruits of the plant part are eaten directly. |
| Malus sylvestris Mill. subsp. orientalis(Uglitzk.) Browicz var. orientalis (AKUH 7540) | Plantae | Malus | sylvestris | Fruit | Food | The fruit of the plant is dried, boiled and drunk as juice. |
| Crataegus orientalis Pallas ex M. Bieb. var. orientalis (AKUH 7544) | Plantae | Crataegus | orientalis | Fruit, Young shoots | Diabetes, rheumatism | The ends of the branches and shoots of the plant parts are welded, cold drink. Fruits of the plant part are eaten directly. |
| Cerasus vulgaris Mill. (AKUH 7539) | Plantae | Cerasus | vulgaris | Fruit | Kidney, diuretic | Infusion as tea(8–10 cups a day) Compote is done from fruits. |
| Prunus armeniaca L. (AKUH 7533) | Plantae | Prunus | armeniaca | Fruit | Digestive and intestinal problems | Fruits of the plant part are eaten directly. Compote is done from fruits. |
| Cotoneaster nummularia Fisch. & C.A.Mey. (AKUH 7536) | Plantae | Cotoneaster | nummularia | Fruit | Food | Fresh fruits are boiled to prepare jam. Decoction as tea. |
| Plant Species                  | Family         | Part Used     | Uses                                                                 | Preparation                  |
|-------------------------------|----------------|---------------|----------------------------------------------------------------------|------------------------------|
| *Salix alba* L. (AKUH 7538)    | Salicaceae     | Leaf          | Painkiller, stomach and respiratory diseases, shortness of breath    | Infusion as tea (2 cups a day) |
| *Linaria genistifolia* (L.) Mill. subsp. *genistifolia* (AKUH 7537) | Scrophulariaceae | Geyşenik, Meryem otu | Fodder                                                               | Animals consume directly.    |
| *Linaria genistifolia* (L.) Mill. subsp. *confertiflora* (AKUH 7517) | Scrophulariaceae | Leaf, Flower  | Skin disorders, eczema                                               | Portions of the leaves and flowers are boiled. It is applied 2–3 times a day for eczema areas. |
| *Verbascum* sp. (AKUH 7527)    | Scrophulariaceae | Oküz kuyruğu, sağırkuyruğu | Respiratory, asthma, shortness of breath, skin diseases, warts, eczema | Infusion as tea (2–4 cups a day) It is applied 2–3 times a day for eczema areas. |
| *Linaria grandiflora* Desf. (AKUH 7529) | Scrophulariaceae | Sarışın, Leaf, Flower  | Fodder                                                               | Animals consume directly.    |
| *Urtica dioica* L. (AKUH 7526) | Urticaceae      | Isrigan       | Cancer, leukemia                                                      | Decoction as tea.            |
| *Urtica urens* L. (AKUH 7530)  | Urticaceae      | Dağlayan      | Skin cancer                                                          | Decoction as tea.            |
| *Urtica pilulifera* L. (AKUH 7524) | Urticaceae    | Isrigan otu   | Food                                                                 | Decoction as tea.            |
| *Tribulus terrestris* L. (AKUH 7523) | Zygophyllaceae | Çoban çökerten, Flower, Leaf, Root  | Kidney sand, hemorrhoids                                             | Leaves are consumed to make taco. The flower oil is applied for hemorrhoids. |
When the 130 taxa’s usage types are analyzed, it can be seen that the most frequently used parts were leaves (68), flowering branches and flowers (44), fruits (22) and stem (18) (Fig. 2). The usage frequencies of plant parts are observed to be different from local to local [5, 7, 30, 35, 38, 41].

Medicinal use occupies the first place among 178 types of use with 84 remedies. The province of İzmir, Denizli, Ankara, Bilecik, Balıkesir, Muğla are close to our study area. The results of analysis showed that the percentage of the uses shows some similarities. The medicinal plants (47.2 %) are the most cited in Afyonkarahisar. This is almost in agreement with former studies by Ertuğ et al. [7] in Buldan (Denizli) with 42 %, Ertuğ [41] in Muğla with 43 %, Chimşek et al. [5] with 60 % in Ankara, Ugulu et al. [35] with 67 % in İzmir and Güler et al. [30] with 58 % in Bozüyük (Bilecik). These results revealed that local people prefer widely to use the plants for medicinal purposes. The reasons for using the plants widely could be economic, because reaching them easily in folk bazaars and actars with a small amount of money. On the other hand, cultural aspects also play an important role to use the plants for medicinal purposes.

The rate of food, fodder, others (household goods, dyes, handicrafts and religious) are 38.2, 9 and 5.6 %, respectively. The rates are similar with the studies of Ertuğ [41] in Muğla (38, 15, 5 %) and Chimşek et al. [5] in Ankara (36 %, others (4 %)). According to the data obtained from field work field, plants used by people for infection (10 %), respiration (9 %), stomachache (8 %), skin diseases, wart, eczema (7 %), digestion (7 %), hemorrhoids (6 %), painkiller (5 %), body resistance (4 %), blood sugar regulator (3 %), and other diseases (41 %) (Fig. 3, Table 1). Polat & Satılı [38] reported that various diseases are gastro-intestinal disorders, respiratory and throat diseases, diabetes, kidney ailments, healing cut and wounds, hemorrhoids, anorexia
and hypertension stabilizer in Edremit Gulf (Balikesir). This shows us that the priority of people in using medicinal plants in different localities is different to treat ailments.

We have seen that the culture and ethnobotanical informations that people have gained with centuries of traditional methods are disappearing. Especially today, we can say that increasing of purchasing power and the wealth level has led to a decrease in the use of plants, with more people buying convenience foods, to use cultivated plants, and supplying their medication needs by buying pharmaceuticals from a pharmacy. We determined that in areas where purchasing power is low, people are more prone to ethnobotanical culture.

Particularly, the facts that there are no pharmacies in villages and towns, economic power is low, increased contact with plants, and success in solving some medicinal problems with culture they gained over generations promoting ethnobotanical culture. In comparison to some studies conducted in near areas (in Anatolia), there are some differences in local naming, purpose of use, and how to use plants.

While Agrostemma githago “Sakızlık otu” is used in medicinal purposes especially in digestive and alvine conditions in the study region. It is used as ornament along with medicinal purposes [23]. We saw that the plant Amaranthus retroflexus was used both as food and for medicinal purposes, especially to treat conditions such as influenza or cold [23]. It was also observed that the plant is called different names such as “Paşa pancari” and “Kızılbaçak” in different localities. Bellis perennis, which is called as “Çayır papatya”, is used for medicinal purposes to treat respiratory diseases. It is also used for cold and flu, stomach-ache, strengthen hair [19]. It is noted that Capsella bursa-pastoris “Coban çantasi” is consumed as food by informants, it is also used as food and fodder [1], as food, medicine, fodder and other [23] and as food and medicine [50]. People eat it in meal, roast, soup, or salads [11], cooked as meal with rice and eaten with garlic-yogurt [22]. We note that the purpose of use as food is common in the compared studies.

Cerinthe minor subsp. auriculata is given to the animals as fodder; people are also reported to use it as food in times of famine [1]. Chelidonium majus, called “Kurlangıç otu”, is used especially as food and medicine by locals, and it is reported that it benefits conditions related to liver and hemorrhoids. Previous study showed that Chelidonium majus is used to treat wart [23] in some regions, its medicinal uses and purposes differ.

It was reported that Dianthus zonatus was used to treat wart by the studies [1, 23, 50] as we found the same purpose. On the other hand, Ficus carica L. is used to treat wart in Bozüyük (Bilecik–Turkey) [30]. Dracunculus vulgaris is called “Deli otu” and is used for infections, and the same aim was reported in the previous studies [1, 23, 50]. It is called as “Yılan birçağı, köpekşiyen” in Edremit (Balikesir-Turkey) and used for hemorrhoids, carminative (for animal) [38]. Hypericum perforatum shows the same usage as painkiller in the study region and this was reported in the previous studies [1, 23, 50]. It is also used for stomachache by the report of Güler et al. [30]. While Portulaca oleracea, “temizlik otu”, is greatly consumed as food in Afyonkarahisar, it is used as salad, pickle and jam in Mersin and Adana provinces (Turkey) [18]. Urtica dioica, called “İsrgan”, is used to treat cancer and leukemia by informants. In the other studies, it is used for medicinal purposes [1, 23, 50] and for dye [20, 27]. The plant Vaccaria pyramidata var. grandiflora is used as fodder in the study region.

Sample survey of some plants is conducted according to compared data. We can come to the conclusion that both local names and usage purposes of the plants are either the same or vary sometimes. People’s frequency of contact with plants, relation status, passing the plant to next generation, means, and environmental conditions may cause this variety. When we compared some of the plants with some studies in Turkey and in the other countries, we found some differences. While Anchusa azurea var. azurea is used to treat stomachache, vulnerary, and female sterility as reported in other region [51, 52], we found that it is used as food in the study region. Capsella bursa-pastoris is used as an astringent; in wound burn care, for constipation and intestinal spasms, as a diuretic, a hemostatic, and for intestines, kidney swelling, rheumatism, and urinary disorders [23, 53–55], we report that it is used as food. Peganum harmala is used for the eliminating the evil eye in our study and used as an analgesic, to treat epilepsy and headache [56], rheumatic pain [44]. Papaver dubium is used to treat cold [57], while it is used as food and sedative in our study. Mentha longifolia is used to treat halitosis, constipation, common cold, fever, and general weakness and is antispasmodic [58, 59], while it is used to treat Vitamin C deficiency in this study. Morus alba is used to treat cancer in our study, while it is used to treat anemia, blood forming, dizziness, hepatitis, incontinence, insomnia, and palpitations in other locals [40, 60]. Plantago major is reported to be used by wrapping its leaf around wounded area causing suppuration to flow out. In other studies, it is used to treat, cicatrizer, constipation, hemorrhoids, and wounds [58, 61]. While Tribulus terrestris is used to treat athlete’s foot, eczema, kidney and gallstones, hemorrhoids, and warts [38, 62], our study showed that its leaves are consumed by forming wraps. Local people also drink its oil, and it is reported to benefit kidney gravel. The oil of the plant is applied to area affected by hemorrhoids.

Salix alba is reported to be used to treat athlete’s foot and vaginal itching [23], we found that it is used to treat pain, stomachache, and respiratory conditions in this study. Urtica dioica is used to treat asthma, blood sugar,
and intestinal pains, and is used as a diuretic, galactagogue, and post-partum deputative [63, 64] while it is used to treat cancer and leukemia in our study. *Crataegus monogyna* is used to treat respiratory conditions and cold while it is also used to treat arrhythmia, cardiotonic, diabetes, and is a vasodilator [23].

The majority of the *Origanum vulgare*, *Thymus* spp., *Hypericum perforatum*, *Achillea millefolium*, *Rosa canina*, *Melissa officinalis*, *Mentha longifolia* etc. species are well known in European folk medicine for their digestive properties, which is also one of the reasons cited for the selection of plants for teas to accompany meals [65, 66]. In the Russian study area, the most used medicinal herbs are *Hypericum perforatum* and *Plantago major*. The Russian respondents considered it important to use medicinal herbs during winter times to prevent flu and common colds [67]. *Amaranthus* spp. [68, 69], *Arum elongatum* and *Lactuca* spp. [70], *Atriplex* sp. [71, 72], *Malva neglecta* [73], *Malva sylvestris* [70, 74], *Morus nigra*, *Onopordum anatolicum* [70, 75], *Plantago major* [76], *Rumex patientia*, *Sinapis arvensis* [1, 11, 70–80], *Salvia* spp., *Beta trigyna* [81, 82], *Urtica dioica* [83], the leaves of taxa are used for preparing food (sarma = stuffed food etc.) in the folk cuisines of Turkey and the Balkans. In our study we observed that *Peganum harmala*’ burn incense is believed in to bring about good deed. In the wedding day, the bride and groom are being incensed to get rid off the evil’s harm. It is used in Pakistan for emotional disturbances, painful menstruation, seizures, insanity and itchy skin. Abdominal pain and smoke has insecticidal properties [84].

*Pinus nigra* in Anatolia (spoon making, animal fodder, wetland making), *Cedrus libani* (bowl and spoon making), *Salix alba* (basket weaving), *Juglans regia* (dyes), *Quercus infectoria* (dyes) are used for different purposes [85].

The local names and common families and some species were shared in Anatolia and central Asia (Uzbekistan) [18, 86, 87]. For example, yarpuz/nane for *Mentha* sp., Qoratur/dut for *Morus* sp., ibburnu/kuş burnu for *Rosa* sp. (Tablo 1) [87]. In this case, it is a sign that the culture of Anatolia common with central Asia as coming the roots from there.

**Conclusions**

This study documented and analyzed traditional ethnobotanical knowledge and 178 different remedies of 130 taxa belonging to 39 families. The results of this study indicated that the local community of the study area used the plants as medicinal (84) and food (68) fodder (16), household goods (3), dyes (3), handicrafts (3) and religious (1). The most common cited usages of plants are still folk medicine and food. Because villagers are generally migrating to big cities and benefiting from the facilities of modern medicine, the heritage of traditional ethnobotanical knowledges is decreasing dramatically. Although this relieve some of the pressures on some plant species, documenting and analyzing the indigenous wild plants’ ethnobotanical uses through ethnobotanical studies is still important for the conservation of traditional ethnobotanical knowledge.

**Competing interests**

The authors declare that they have no competing interests.

**Authors’ contributions**

SA, main author, involved in the study design, conducting of interview, field work, literature Review and general data collection and systematization. MT wrote the first draft, and MK wrote, designed figures, references and participated in fieldwork. MK diagnosed the plants, and participated in fieldwork. All authors read and approved the final manuscript.

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**Author details**

1 Department of Molecular Biology and Genetics, Science & Arts Faculty, Akyon Kocatepe University, 03200 Akyonkara, Turkey.

2 Department of Molecular Biology and Genetics, Faculty of Engineering and Natural Sciences, Uskudar University, 34662 Istanbul, Turkey.

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