

## An ethnobotanical survey of medicinal plants in Karlıova (Bingöl-Turkey)

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This study aims to identify wild plants collected for medical purposes by the local people of Karlıova District located in the Eastern Anatolia region of Turkey and to determine the uses and local names of these plants. A field study had been carried out for a period of approximately 4 years (2013–2016). During this period, 99 vascular plant specimens were collected. Among them, 91 species are wild and 8 species are cultivated plants. Demographic characteristics of participants, names of the local plants, their utilized parts and preparation methods were investigated and recorded. 99 plants were found to be used for medical purposes before in the literature analysis of the plants used in our study, while 9 plants were found to have no literature records. In Turkey, local plant names display differences especially due to local dialects. The plants used in Karlıova are known by the same or different local names in various parts of Anatolia. In the research area, local people were found to use 99 plants from 26 families for curative purposes. The medicinal uses of *Stenotaenia macrocarpa* Freyn & Sint., *Inula helenium* L., *Scorzonera incisa* DC., *Tripleurospermum caucasicum* (Willd.) Hayek, *Astragalus chamaephaca* Freyn, *Geranium libanoticum* Schenk, *Rhinanthus serotinus* subsp. *aestivalis* (N.W.Zinger) Dostál, *Verbascum songaricum* Schrenk. and *Bunium elegans* (Fenzl) Freyn that we found were used in our study area and recorded for the first time. These plants, used for the treatment of various diseases, are abundantly found in this region. Drying of the medicinal plants enabled the local people to use them in every season of the year.

**Keywords:** Bingöl, Ethnobotany, Informant consensus factor, Karlıova, Medicinal plants, Use value

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Located in the temperate zone, Turkey is notable for its diversity in terms of plant diversity. The number of plant species spreading in Turkey is close to the number of plant species spreading throughout Europe. With the addition of the discoveries made in recent years, around 3,000 plants of Turkey, including 12,000 endemic plants (at the level of species, subspecies or varieties)<sup>1-2</sup>. It is one of the richest countries of Europe in terms of endemic species diversity with an endemism rate of 34.4%<sup>3</sup>. This feature of Turkey is due to the diversity of geographical factors. Changes in climate characteristics resulting from short distances lead to a wide variety of geographical factors such as diversity due to morphological characteristics, differences in soil types, differentiation of plant formations and diversification of species<sup>4</sup>.

The plants have been used in therapy since the beginning of human history. With the progress of the technology and scientific research methods, various

studies related to the materials used in the plants, their purpose of using these materials and their qualities have been made. The substances in these plants are isolated and offered in various pharmaceutical forms, dosages and packaging in accordance with the pharmacopoeia.

Turkey has a great knowledge of a very rich flora and folkloric medicine and is thus a potential source for such studies<sup>5</sup>. The majority of Turkish people living in rural areas traditionally use plants. In general, they use plants for nutrition and medical purposes. In recent years, the traditional use of medical-oriented disease has attracted the attention of researchers in our country<sup>6-17</sup>.

The ethnobotanic term can be briefly explained as the human plant relationship. Since humanity has existed, this relationship has been going on<sup>18</sup>. Ethnobotanical researches, which have increased in number in our country in recent years, are mostly focused on plants used as medical and food<sup>19</sup>.

No previous floristic and ethnobotanic studies are reported to have been conducted in Karlıova (Bingöl).

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This study identified not only the wild plants collected for medical purposes by local people of Karlıova District in the Eastern Anatolia Region (Bingöl-Turkey) but also the uses and local names of these plants. Besides, it will contribute to the protection and sustainment of our herbal resources.

## Materials and methods

### Study area

Karlıova (Fig. 1) district is located in the Upper Euphrates section of the Eastern Anatolia Region, on the North-east of Bingöl Province, between the Bingöl and Satan Mountains. Şerafettin and Karaboğa Mountains in the South, Erzurum-Tekman in the North, Erzurum-Tekman in the North, Bingöl-Solhan in the South, Muş-Varto in the South, Bingöl-Cilic in the West and Bingöl in the South. Karlıova district is located at the intersection of 41°02' East longitude and 39°21' North latitude. Karlıova has a surface area of 1392 km and covers 16.6% of Bingöl province. The altitude at sea level is 1940 m. Mountains and rugged terrain cover a large area. Flat areas are only around 7.5%. According to the data obtained from the website of Karlıova District Administration (<http://www.karliova.gov.tr/>), Karlıova has 47 villages and 26 sub-village. Of the districts, 83% are covered with mountains. Located in the Upper Euphrates part of the Eastern Anatolia Region, Bingöl is located between 41° 20' and 39° 54' North latitudes with 38°27' and 40° 27' Eastern longitude. Bingöl is in the East Mus in the North Erzurum and Erzurum in the West Tunceli and Elazığ in the South Diyarbakır is the neighbor with the province. 22.82% of Bingöl's surface area belongs to the central district.

According to the address-based population census results conducted in 2013, (<http://tuikapp.tuik.gov.tr/adnksdagitapp/adnks.zul>) total population of Karlıova is 32.212. Some people live a nomadic life. In the study, information was gathered about the people of Kurdish and Zaza origin. The vast majority of people

living in the region were found to be Kurds. The main language of Zazas speaks of Zazaki, a member of the Iranian Indo-European language family. Most of the Zazas live in Eastern Anatolia<sup>20</sup>.

Before starting to work, a study permit was issued from the Karlıova District Administration and Gendarmerie College for the survey to be conducted in the study.

### Plant materials

We carried out the field study for approximately over a period of 4 yrs (2013–2016). During this period, we collected 91 wild plants taxa and 8 cultivated plants. We pressed the plants in the field and prepared them for identification. Standard tests were used to identify the plants. These tests were carried out in the "Flora of Turkey and the East Aegean Islands"<sup>1,21</sup> and the other floras; Flora of USSR<sup>22</sup>, Flora Europaea<sup>23</sup>, Flora Iranica<sup>24</sup>, Flora of Iraq (Towsend and Guest, 1966-1985)<sup>25</sup>, and we compared them with the specimens in the Herbarium of Bingöl University Bingöl, Turkey (BIN).

The plants collected in the study were examined and described by the authors mentioned above. These plants are rendered herbarium materials; and the plants are kept in the BIN.

Taxonomic ordering of plants was made by alphabetical order. After the taxonomic classification of plants, categories were made according to endemic and toxic conditions<sup>26,27</sup>. It has been researched whether or not literature studies have been done before about these plants. In the study, domestic literature studies and then foreign publications were analyzed.

### Interviews with local people

Questionnaires applied to local people were conducted face to face in the study (Appendix A). Interviews were carried out on the busy hours of the public areas (gardens, markets, parks, coffee houses, etc.) which are visited by the residents of



Fig. 1 — Geographical location of the study area

Karlıova. Talks were held with the people who were observed to have knowledge about plants of every class in city center, town and village. Before the questionnaire was applied, these people were informed about the research and the questionnaires were made after their approval. They were visited at least twice to get more information from the people who had knowledge of plants; and one of these visits was made especially at home. During the interviews, information about the demographic information, the local names of the plants, how they used it and how they kept it was obtained. They were asked to show the wild plants they used.

#### Category of ailments

According to the information obtained from interviewees; diseases included in the study are categorized into 10 categories (Cardiovascular, Diabetes, Dermatological, Gastrointestinal disorders, Hemorrhoids, Oral health, Female problems, Respiratory tract diseases, Rheumatic pain, Urogenital and kidney problems).

#### Calculations

(1) Informant consensus factor<sup>28</sup>: it was calculated according to the following formula:  $FIC = \frac{Nur - Nt}{Nur - 1}$ , where Nur refers to the number of use citations in each category and Nt to the number of the species used.

In this method, which is used to control the homogeneity of the information obtained, if the informants do not have enough information about the use of the plant and the plants are randomly selected, the FIC value will be low (close to 0) as a result of the analysis. If the expressions given by plants and informants are correct, then the FIC value will be higher (close to 1)<sup>29-31</sup>.

(2) Utilization value<sup>28</sup>, which is a quantitative method that indicates the relative importance of locally and locally known species, is also calculated according to the following formula:  $UV = U / N$ , Number of citations per U type; and N is informative.

## Results and discussion

#### Demographic characteristics of study participants

The demographic data of the individuals participating in the study were obtained as face-to-face interviews. A total of 60 people over 30 yrs of age were included in the study. Zaza and Kurdish ethnic descendants of the individuals included in the study were identified. The demographic

characteristics of the individuals according to the results obtained in the research are shown in Table 1.

#### Interviews with locals and literature review

The experiences of the local people were recorded during the interviews. We compared some of the information we obtained with the information from previous studies. In this way, we tried to verify the comments.

*Thymus kotschyanus* Boiss. & Hohen. are being traditionally and very commonly used for tonsillitis, colds and flu in Karlıova. The preparations including thyme extract alleviate cough following common cold<sup>32</sup> and decrease the severity and duration of bronchitis symptoms<sup>33</sup>.

Endemic *Stenotaenia macrocarpa* Freyn & Sint. plant is traditionally used in Karlıova for the treatment of gastrointestinal disorders. Endemic *Malabaila lasiocarpa* Boiss. plant is traditionally used in Karlıova for the treatment of headache. *Malabailasecacul* (Mill.) Boiss. has major components of  $\alpha$ -phellandrene and p-cymene with insecticide activity<sup>34-35</sup>.

Afitap Borak (65) who lives in Cilligöl village (Karlıova), told that he uses *Eryngium billardieri* Delile against tooth decay. *E. billardieri* was reported to have antioxidant and anti-inflammatory activities<sup>36-37</sup>.

Sabrinaz Nadiroğlu (55) who lives in Karlıova told that he uses *Inula helenium* L. for gastric cancer. In the literature review we conducted, we found that *Inulahelenium* L. subsp. *pseudoheleniu* has anthelmintic, antitussive, diuretic and tonic effect being helpful against backache<sup>38</sup>.

49 yr old Fethi Korkmaz, who lives in Göynük village, told that he uses *Urtica dioica* L. for anti-inflammatory. *U. dioica* was reported to have **antifungal and antidermatophytic activities**<sup>39-40</sup>.

Table 1 — Demographic characteristics of the individuals' (n=60)

Demographical characteristics	Number	%
Age		
31-49	34	56.7
50 and above	26	43.3
Sex		
Male	33	55.0
Female	27	45.0
Educational level		
Literate	31	51.7
Primary and Secondary school	26	43.3
High school	1	1.7
University	1	1.7

38 yrs-old Murat Yeşilova, who lives in Karlıova/Boncukgöze village, told that he used *Arum elongatum* Steven plant for the treatment of cancer and diabetes. This plant is reported for the second time as being used within the scope of traditional therapies. The first report was notified as a result of a research that was conducted in a field near this region in 2013<sup>41</sup>. *Arum* species are abundant amounts of poisonous plants containing calcium oxalate crystals, oxalic acid, soluble oxalates and volatile substances with strong local activity<sup>42</sup>.

In terms of toxicity, the nutritional and medical uses of plants are very important. In particular, high nitrate and nitrite contents of wild plants are of importance in the assessment of toxicity. Various plants that grow naturally in Samsun and Elazığ and are widely consumed are examined in terms of nitrate content. It has been found that nitrate content of these plants varies with some correlations<sup>43,44</sup>. When nitrate uptake is over 8-15 g, stomach pain, intestinal hemorrhage and diseases such as urinary system and syncope are developed while low doses cause dyspepsia, depression and dizziness<sup>45</sup>.

When examining previous laboratory studies in Karlıova and other regions, it stated that some medical plants were active and that these drugs were also reported in the current study: *Achillea* sp. (antioxidant and antispasmodic activity)<sup>46,47</sup>, *Hypericum scabrum* L. (antibacterial activity)<sup>48</sup>, *Rosa canina* L. (anti-inflammatory and antinociceptive activity)<sup>49</sup>, *Rumex acetosella* L. (antioxidant activity)<sup>50</sup>, *Thymus kotschyanus* Boiss. & Hohen. (antimicrobial activities)<sup>51</sup>, *Urtica dioica* L. (antioxidant, antimicrobial, antiulcer and analgesic activities)<sup>52</sup>.

#### Taxonomic identification

Family name, scientific name, sample of plug (MN: Muharrem Nadiroğlu), endemism (END.), local name, preparation and usage methods, usage categories of medical plants used in Karlıova are shown in Table 2.

As a result of interviews with the local people living in the Karlıova district and in the villages, 99 plants were used for treatment purposes in the study area.

The most common families are: Asteraceae (12 plants), Rosaceae (10 plants), Lamiaceae (9 plants). Asteraceae (13 plants), Lamiaceae (9 plants), and Rosaceae (8 plants). In a study carried out in Çatak-Van, it was seen that plants belonging to the families of Asteraceae, Apiaceae, Lamiaceae<sup>53</sup>; Asteraceae,

Apiaceae, Lamiaceae, in Geçitli-Hakkari<sup>54</sup>; Asteraceae, Lamiaceae, and Brassicaceae in Maden-Elazığ<sup>55</sup>; Lamiaceae, Rosaceae, and Asteraceae, in Ulukışla<sup>56</sup> are used commonly by the people of the regions.

*Malabailalasiocarpa* Boiss. and *Stenotaenia macrocarpa* Freyn & Sint. were found to be the endemic plants used for medical purposes in Karlıova (Bingöl-Turkey). *M. lasiocarpa* Boiss. is grouped under “least concern” category, *S. macrocarpa* Freyn & Sint. is categorized as “near threatened”<sup>26</sup>.

In the literature analysis of the plants used in our study, 99 plants were found already being used for medical purposes, where as 9 plants presented no literature records. The medicinal uses of *Stenotaenia macrocarpa* Freyn & Sint., *Inula helenium* L., *Scorzonera incisa* DC., *Tripleurospermum caucasicum* (Willd.) Hayek, *Astragalus chamaephaca* Freyn, *Geranium libanoticum* Schenk, *Rhinanthus serotinus* subsp. *aestivalis* (N.W.Zinger) Dostál, *Verbascum songaricum* Schrenk. and *Bunium elegans* (Fenzl) Freyn which were found being used in our study area were recorded for the first time.

*Urtica dioica* L. was used anti-inflammatory, cancer, rheumatism, and embolism; *Rosa canina* L. appetizing, colds and flu, cough, digestive, high fever, kidney pain, tonsillitis, and stress; *Malva neglecta* Wallr. was used antihypertensive, cough, gastrointestinal disorders rheumatism, infertility, urinary inflammations, cancer, diabetes disease, high cholesterol, anti-inflammatory, urinary inflammations, infertility, abdominal pain, and wound healing; *Mentha longifolia* (L.) L. was used shortness of breath, abdominal ache, anti-inflammatory, cold and flu, headache, tonsillitis; *Reheum ribes* L. was used diabetes disease, rheumatism, anti-inflammatory, cardiac disorder, diabetes disease, and intestinal pain.

#### Mode of preparation–utilization method

The most common medicinal plant families in the Karlıova region are Asteraceae, Rosaceae, Lamiaceae, Fabaceae, Liliaceae and Polygonaceae. The most commonly prepared preparations are obtained by liquid and boiling. People living in the region have used wild plants to determine their medical preparations for treatment in primitive and simple forms. Preparation methods include infusion, boiling, drying, crushing of parts, fruiting, crushing of flowers, gallus crushing; the latex is removed and crushed.

Local people used medical plants most frequently for the treatment of antihypertensive, cardiac disorder,

Table 2 — List of wild medicinal plants investigated with their related information

Family, plant species, voucher specimen, endemism	Vernacular name of Karlıova	Plant part(s) used <sup>a</sup>	Preparations <sup>b</sup>	Utilization method <sup>c</sup>	Use	UV
<b>Acanthaceae</b>						
<i>Acanthus dioscoridis</i> L. MN-77	<i>Gerik</i>	Aer	Dec	Doa	Diarrhea	0.02
<b>Amaryllidaceae</b>						
<i>Allium cepa</i> L. MN-119	<i>Pivaz</i>	Bul	Dec	Doa	Menstruation pain	0.32
<i>Allium sativum</i> L. MN-122	<i>Sir</i>	Bul	-	Raw	Colds and flu, headache	
<i>Allium vineale</i> L. MN-3	<i>Sirm, Sirmok, Sira Çole</i>	Who	-	Raw	Antihypertensive	0.27
			Boi	Eat	Anti-inflammatory	0.02
<b>Apiaceae</b>						
<i>Bunium elegans</i> (Fenzl) Freyn MN-93	<i>Gilok</i>	Rhi	-	Raw	Headache	0.05
<i>Eryngium billardieri</i> Delile MN-88	<i>Kereng nebi, Kerenge kera</i>	Bra	-	Raw	Antihypertensive,	0.03
				Com	Against tooth decay	
<i>Ferula orientalis</i> L. MN-105	<i>Kinkor</i>	Roo	Ms+Tail oil	Ext	Antiseptic	0.09
<i>Malabaila lasiocarpa</i> Boiss. MN-125 END.	<i>Pariye miye, Nane miye</i>	Lea	Dec	Doa	Headache	0.03
<i>Petroselinum crispum</i> (Mill.) Fuss MN-118	<i>Maydanoz</i>	Lea	In	Doa	Abdominal ache	0.13
			-	Raw	Shortness of breath	
<i>Prangos pabularia</i> Lindl. MN-18	<i>Zıvrık, Cağ</i>	Lea	In	Doa	Antihypertensive, diabetes disease	0.10
<i>Stenotaenia macrocarpa</i> Freyn & Sint. MN-116 END.	<i>Piltan</i>	Lea	In	Doa	Gastrointestinal disorders	0.06
<b>Araceae</b>						
<i>Arum rupicola</i> Boiss. MN-33	<i>Kardi</i>	Aer	In	Doa	Cardiac disorder	0.03
<i>Arum elongatum</i> Steven MN-32	<i>Kardi, Karı</i>	Aer	Boi	Eat	Diabetes disease, cancer	0.14
		Lea	In	Doa	Rheumatism, cancer, guatr, cardiac disorder	
<b>Asteraceae</b>						
<i>Achillea arabica</i> Kotschy MN-41	<i>Gihaye Zer</i>	Cap	In	Doa	Antitussive, chest pain	0.05
<i>Achillea millefolium</i> L. MN-70	<i>Gihaye Zer</i>	Lea, Flo	Dec	Doa	Antitussive, chest pain	0.08
<i>Achillea vermicularis</i> Trin. MN-42	<i>Çiçeka çekel</i>	Bra, Lea, Flo	In	Doa	Abdominal pain	0.10
<i>Chondrilla juncea</i> L. MN-106	<i>Benişt</i>	Lat	Lr	Lex	Mounth wounds	0.03
<i>Cichorium intybus</i> L. MN-90	<i>Tahlık</i>	Roo	In	Doa	Bowel cancer	0.02
<i>Gundelia tournefortii</i> L. MN-11	<i>Kinger, kereng</i>	Lat	Lr	Lex	Antiseptic	0.32
		Roo	In	Doc,	Gastrointestinal disorders	
				Raw		
<i>Inula helenium</i> L. MN-87	<i>Tituna beci</i>	Ste	-	Raw	Gastric cancer	0.02
<i>Inula montbretiana</i> DC. MN-84	<i>Gihaye basure</i>	Aer	Boi	Doc	Hemorrhoids	0.04
<i>Matricaria chamomilla</i> L. MN-26	<i>Papatya, Beybun</i>	Aer, Cap	Dec	Dpt	Diuretic, kidney pain	0.18
<i>Scorzonera incisa</i> DC. MN-67	<i>Nane miyê</i>	Lea	-	Raw	Diabetes disease, headache	0.03
<i>Scorzonera latifolia</i> (Fisch. & C.A.Mey.) DC. MN-68	<i>Qanike benişt</i>	Lat, Tub	Lr	Lex	Mounth wounds	0.16
<i>Senecio leucanthemifolius</i> subsp. <i>vernalis</i> (Waldst. & Kit.) Greuter MN-48	<i>Gihazzer, Sari papatya</i>	Cap	Dec	Doa	Colds	0.07
<i>Tragopogon dubius</i> Scop. MN-378	<i>Marşing, Sıping</i>	Who	Ms	Com	Eczema	0.22
		Aer	-	Raw	Cancer, constipation, gastrointestinal disorders, headache, intestinal worm	
<i>Tripleurospermum disciforme</i> (C.A.Mey.) Sch.Bip. MN-73	<i>Papatya, Beybun</i>	Cap, Lea	In	Doa	Wound healing	0.02
<i>Tripleurospermum transcaucasicum</i> (Manden.) Pobed. MN-60	<i>Beybun</i>	Cap, Lea	In	Ext	Acne	0.07
				Doa	Diabetes disease, headache	

(Contd.)

Table 2 — List of wild medicinal plants investigated with their related information (*Contd.*)

Family, plant species, voucher specimen, endemism	Vernacular name of Karlıova	Plant part(s) used <sup>a</sup>	Preparations <sup>b</sup>	Utilization method <sup>c</sup>	Use	UV
<i>Tripleurospermum caucasicum</i> (Willd.) Hayek MN-21	<i>Beybun</i>	Cap	In -	Doa Che Com	Diabetes disease, headache Toothache Callus	0.05
<i>Turanecio eriospermus</i> (DC.) Hamzaoğlu MN-80	<i>Melle</i>	Lea	Boi	Eat+Yogh urt	Milk enhancer	0.03
<b>Brassicaceae</b>						
<i>Aethionema grandiflorum</i> Boiss. & Hohen. MN-78	<i>Gihaye bırına</i>	Flo	Fc	Ext	Acne	0.02
<i>Bunias orientalis</i> L. MN-55	<i>Dıvrıka beci</i>	Ste	-	Raw	Abdominal ache, gastric cancer	0.02
<i>Cardamine uliginosa</i> M.Bieb. MN-2	<i>Kıji, Kıçı</i>	Aer	-	Raw	Antihypertensive, cancer, diabetes disease, migraine	0.05
<b>Campanulaceae</b>						
<i>Legousia pentagonia</i> L. MN-62	<i>Anığ</i>	Aer	Dec	Dpt	Colds	0.02
<b>Colchicaceae</b>						
<i>Colchicum szovitsii</i> Fisch & C.A.Mey. MN-1	<i>Pivok</i>	Aer	-	Raw	Tonic	0.04
<b>Cucurbitaceae</b>						
<i>Cucurbita maxima</i> Duchesne MN-120	<i>Kundur</i>	Fru	Fr	Com	-Headache	0.06
<b>Cupressaceae</b>						
<i>Juniperus oxycedrus</i> L. MN-107	<i>Çekem</i>	Roo, Con	In	Doa	Antihypertensive, diabetes disease, shortness of breath	0.03
<b>Dipsacaceae</b>						
<i>Cephalaria procera</i> Fisch. & Avé-Lall. MN-100	<i>Zıwan</i>	Aer	Ms	Com	For bleeding, wound healing	0.02
<b>Fabaceae</b>						
<i>Astracantha longifolia</i> (Lam.) Podl. MN-85	<i>Guniye şırık</i>	Roo	In	Doa	Cardiac disorder	0.04
<i>Astracantha muschiana</i> (Kotschy & Boiss.) Podlech MN-86	<i>Gunni</i>	Roo	In	Doa	Cancer	0.02
<i>Astragalus chamaephaca</i> Freyn MN- 4	<i>Gunêye çene</i>	Roo	In	Grg	Mouth wounds	0.02
<i>Lathyrus rotundifolius</i> Willd. MN-7	<i>Fiğ</i>	See	Boi	Eat	Diarrhea	0.03
<i>Ononis spinosa</i> L. MN-101	<i>Goştberğık</i>	Lea	In	Doa	Anti-inflammatory	0.05
<i>Trifolium pratense</i> L. MN-35	<i>Nefera sor</i>	Aer	De	Doa	Menstruation pain	0.02
<i>Trifolium repens</i> L. MN-36	<i>Nefera sıpi</i>	Aer	De	Doa	Menstruation pain	0.02
<i>Trifolium resupinatum</i> L. MN-45	<i>Nefer</i>	Aer	In	Doa	Icterus	0.03
<i>Trifolium trichocephalum</i> M.Bieb. MN-71	<i>Nefer</i>	Aer	In	Doa	Icterus	0.03
<i>Vicia cracca</i> L. subsp. <i>tenuifolia</i> Roth MN-74	<i>Ğıyarok</i>	Flo, Lea	In	Doa	Kidney stones, liver diseases	0.04
<b>Fagaceae</b>						
<i>Quercus petraea</i> (Matt.) Liebl. subsp. <i>pinnatiloba</i> (K.Koch) Menitsky MN-19	<i>Mazi</i>	Gal	Gll	Com	Antifungal (foot)	0.03
<b>Geraniaceae</b>						
<i>Geranium libanoticum</i> Schenk	<i>Gilok</i>	Lea	In	Doa, Raw	Intestinal pain	0.03
<b>Hypericaceae</b>						
<i>Hypericum scabrum</i> L. MN-122	<i>Batov</i>	Aer	In	Com	Scabies	0.02

(Contd.)

Table 2 — List of wild medicinal plants investigated with their related information (*Contd.*)

Family, plant species, voucher specimen, endemism	Vernacular name of Karlıova	Plant part(s) used <sup>a</sup>	Preparations <sup>b</sup>	Utilization method <sup>c</sup>	Use	UV
<b>Iridaceae</b>						
<i>Gladiolus atroviolaceus</i> Boiss. MN-47	<i>Gilsosık</i>	Aer	-	Raw	Immunostimulant	0.02
<i>Iris reticulata</i> M.Bieb. MN-6	<i>Gulsosın</i>	Aer	In	Doa	Asthma, shortness of breath	0.06
<b>Juglandaceae</b>						
<i>Juglans regia</i> L. MN-99	<i>Guz</i>	Lea	Boi In	Com Ext	Burn Anti-dandruff	0.08
<b>Lamiaceae</b>						
<i>Lamium amplexicaule</i> L. MN-14	<i>Pung</i>	Aer, Lea	In	Doa	Colds	0.14
<i>Mentha longifolia</i> (L.) L. subsp. <i>typhoides</i> (Briq.) Harley MN-28	<i>Pung, Pınge</i>	Lea	In -	Raw Doa	Shortness of breath Abdominal ache, anti-inflammatory, cold and flu, headache, tonsillitis	0.39
<i>Ocimum basilicum</i> L. MN-110	<i>Ruhan</i>	Aer	In	Doa	Abdominal pain	0.11
<i>Phlomis armeniaca</i> Willd. MN-57	<i>Pazağ</i>	Flo, Lea	In, Boi	Doa -	Milk enhancer	0.06
<i>Phlomis herba-venti</i> L. MN-82	<i>Gihareşik</i>	Lea	In	Doa	Diabetes disease	0.03
<i>Prunella vulgaris</i> L. MN-79	<i>Sosın</i>	Aer	In -	Doa Raw	Gastric pain, menstruation pain	0.07
<i>Salvia multicaulis</i> Vahl MN-22	<i>Punga reş</i>	Aer	In	Doa	Gastric pain, migraine	0.06
<i>Salvia virgata</i> Jacq. MN-102	<i>Pengi</i>	Flo, Lea	In	Doa	Muscle pain	0.04
<i>Stachys iberica</i> M. Bieb. MN-91	<i>Gihaye zerke</i>	Aer	In	Doa	Icterus	0.02
<i>Stachys lavandulifolia</i> Vahl MN-63	<i>Çaya beci, Çaya çiyeye</i>	Aer	In	Doa	Cancer, colds and flu, diabetes disease, digestive	0.13
<i>Teucrium chamaedrys</i> subsp. <i>sinuatum</i> (Celak.) Rech.f. MN-66	<i>Çaya şivanan</i>	Aer	In	Dpt	Cough, gastric pain	0.05
<i>Thymus kotschyanus</i> Boiss. & Hohen. MN-65	<i>Anığ</i>	Aer, lea	In	Doa	Colds and flu, tonsillitis	0.15
<b>Liliaceae</b>						
<i>Tulipa armena</i> Boiss. MN-16	<i>Gul, Lale</i>	Bul	-	Che	Halitosis	0.02
<b>Malvaceae</b>						
<i>Alcea apterocarpa</i> Boiss. MN-94	<i>Hiro</i>	Aer See, Lea Flo	In In Fc	Dpt Doa Ext	Menstruation pain Uterine cyst Anti-inflammatory, wound healing	0.14
<i>Malva neglecta</i> Wallr. MN-50	<i>Toluk</i>	Who Aer, Who	In	Ext Doa	Wound healing Antihypertensive, cough, gastrointestinal disorders, rheumatism, infertility, urinary inflammations, cancer, diabetes disease, high cholesterol, anti-inflammatory, urinary inflammations, infertility, abdominal pain	0.41
<b>Orchidaceae</b>						
<i>Anacamptis laxiflora</i> (Lam.) R.M.Bateman, Pridgeon & M.W.Chase MN-72	<i>Şapır, Sahlep</i>	Bul	In+honey	Doa	Colds, cough	0.02

*(Contd.)*

Table 2 — List of wild medicinal plants investigated with their related information (*Contd.*)

Family, plant species, voucher specimen, endemism	Vernacular name of Karlıova	Plant part(s) used <sup>a</sup>	Preparations <sup>b</sup>	Utilization method <sup>c</sup>	Use	UV
<b>Plantaginaceae</b>						
<i>Plantago lanceolata</i> L. MN-39	<i>Pelhewes</i>	Lea	Ms Dec	Com Doa	Wound healing Gastric ulcer	0.18
<i>Plantago major</i> L. MN-38	<i>Pelhawes</i>	Lea	In	Doa, Com	Anti-inflammatory, abscess, wound healing	0.23
<b>Poaceae</b>						
<i>Hordeum bulbosum</i> L. MN-13	<i>Şirome</i>	Rhi	-	Raw	Cancer	0.04
<i>Zea mays</i> L. MN-117	<i>Lazut, Mısır</i>	Sty	In	Doa	High cholesterol	0.05
<b>Polygonaceae</b>						
<i>Polygonum cognatum</i> Meisn. MN-96	<i>Levlevik</i>	Who	In	Doa	Kidney stones	0.07
<i>Rheum ribes</i> L. MN-20	<i>Rıbez, İçkın</i>	Roo Stem	In	Dct Raw	Diabetes disease, rheumatism Anti-inflammatory, cardiac disorder, diabetes disease, intestinal pain	0.34
<i>Rumex acetosella</i> L. MN-37	<i>Tırşo, Tırşık</i>	Lea	Dec	Doa	Antiemetic	0.10
<i>Rumex scutatus</i> L. MN-23	<i>Tırşık, Tırşo</i>	Aer	-	Raw	Antihypertensive	0.08
<i>Rumex tuberosus</i> L. MN-27	<i>Tırşoye ga, Pelle ga</i>	Aer, Lea	-	Raw	Antihypertensive, antiemetic, headache	0.08
<i>Rumex tuberosus</i> L. MN-27	<i>Tırşoye ga, Pelle ga</i>	Lea	-	Raw	Expectorant	0.05
<b>Portulacaceae</b>						
<i>Portulaca oleracea</i> L. MN-111	<i>Pımpar, Semizotu</i>	Aer	In	Doa	Migraine	0.18
<b>Rosaceae</b>						
<i>Alchemilla pseudocartalinica</i> Juz. MN--30	<i>Goye boci</i>	Aer	In	Doa	Bronchitis, asthma	0.04
<i>Prunus mahaleb</i> L. MN-113	<i>Kener</i>	Fru	Dec	Doa	Respiratory tract problem	0.03
<i>Cotoneaster nummularius</i> Fisch & C. Mey. MN-49	<i>Dara çuke</i>	Fru	Dec	Doa	Analgesic	0.02
<i>Crataegus orientalis</i> Pall. ex M. Bieb. MN-46	<i>Guvij, Sez</i>	Flo	Dec	Dpt	Cardiac disorder, high cholesterol	0.12
<i>Cydonia oblonga</i> Mill. MN-95	<i>Ayva</i>	Flo, Lea	Dec	Doa	Bronchitis, asthma	0.10
<i>Geum urbanum</i> L. MN-114	<i>Kurfil</i>	Roo	Dec	Dct	Abdominal pain, headache	0.04
<i>Malus sylvestris</i> (L.) Mill. MN-58	<i>Sev</i>	Fru	-	Raw	Diabetes disease	0.04
<i>Prunus cerasifera</i> Ehrh. MN-17	<i>Mamoğ, Hurluşık</i>	Fru	In -	Doa Raw	Colds and flu, antipyretic	0.07
<i>Pyrus elaeagnifolia</i> Pall. subsp. <i>kotschyana</i> (Boiss. Ex Decne.) Browicz MN-25	<i>Hurmi</i>	Fru	-	Raw	Diarrhea	0.03
<i>Rosa canina</i> L. MN-34	<i>Şilan</i>	Roo Fru	In	Ext Dpt	Sedative Appetizing, colds and flu, cough, digestive, high fever, kidney pain, tonsillitis	0.38
<i>Rosa heckeliana</i> Tratt. MN-120	<i>Şilan</i>	Fru	In	Dpt	Bronchitis, colds and flu, cough	0.19
<i>Rubus caesius</i> L. MN-112	<i>Dirık, Böğürtlen</i>	Fru	-	Raw	Tonic	0.06
<i>Sanguisorba minor</i> Scop. MN-56	<i>Çera basur</i>	Aer	In	Doa	Hemorrhoids	0.02
<i>Sorbus torminalis</i> (L.) Crantz MN- 121	<i>Kırmıt</i>	Fru	-	Raw	Gastric pain, for fatigue, immunostimulant	0.08

*(Contd.)*



Table 2 — List of wild medicinal plants investigated with their related information (*Contd.*)

Family, plant species, voucher specimen, endemism	Vernacular name of Karliova	Plant part(s) used <sup>a</sup>	Preparations <sup>b</sup>	Utilization method <sup>c</sup>	Use	UV
<b>Scrophulariaceae</b>						
<i>Rhinanthus serotinus</i> subsp. <i>aestivalis</i> (N.W.Zinger) Dostál MN-64	<i>Tahlık</i>	Lea	Dec	Doa	Gastric pain	0.02
<i>Verbascum songaricum</i> Schrenk MN-53	<i>Mazijanık</i>	Flo	Dec	Doa	Emmenagogue, infertility	0.03
<i>Hyoscyamus niger</i> L. MN-129	<i>Beng</i>	See	-	Ext	Toothache	0.02
<b>Urticaceae</b>						
<i>Urtica dioica</i> L. MN-15	<i>Gezgezok</i>	Lea	Dec	Doa	Anti-inflammatory, cancer	0.42
		Lea	In	Ext	Rheumatism	
		Fru	In		Embolism	
<b>Xanthorrhoeaceae</b>						
<i>Eremurus spectabilis</i> M.Bieb. MN-5	<i>Gullık, Yelıng</i>	Roo	In	Dte Doa	Diabetes disease Intestinal pain	0.09

<sup>a</sup>Plant part(s) used: Aer, aerial parts; Bra, branches; Bul, bulb; Cap, capitulum; Con, cones; Flo, flowers; Fru, fruits; Gal, gallus; Lat, latex; Lea, leaves; Rhi, rhizomes; Roo, roots; See, seeds; Ste, Stems; Sty, stylus; Tub, tuber; Who, whole plant.

<sup>b</sup>Preparations: Boi, aerial parts boiled, Dec, decoction; Fc, the flowers are crushed; Fr, the fruits are crushed; Gll, the gallus is crushed; In, infusion; Lr, latex is removed; Ms, mash.

<sup>c</sup>Utilization method: Com, compress; Che, Chew, Doa, drink one cup after meals; Doc, drink one glass of the plant on an empty stomach in the morning; Dpt, drink one cup of the plant two times a day; Dct, drink one cup of the plant three times a day; Dte, drink one glass of the plant two times a day on an empty stomach; Eat, Eaten as meal; Ext, externally; Grg, gargle; Lex, latex is used externally; Raw, the plant is eaten raw.

diabetes disease, digestive, colds and flu, hemorrhoids, rheumatism, respiratory tract problem, wound healing etc. (Table 2).

It was found that local people living in Karliova and in its villages used 25% of these wild plants after drying. Drying enabled regional people to use medicinal treatment plants during all seasons of the year.

#### Data analysis

According to the calculation made on the basis of the use-value UV<sup>28</sup>; *Urtica dioica* L. (0.42), *Malva neglecta* Wallr. (0.41), *Mentha longifolia* (L.) L. (0.39), *Rosa canina* L. (0.38), *Rheum ribes* L. (0.34), *Gundelia tournefortii* L. (0.32), *Allium cepa* L. (0.32), *Allium sativum* L. (0.27), *Plantago major* L. (0.23), *Tragopogon dubius* Scop. (0.22), was found to be the highest use value (Table 2). Knowledge of the use value in such studies may be useful in determining the safety and pharmacological properties of the treated plant<sup>57</sup>. It may be more useful to conduct an activity study with these plants which are used by the people of the region and whose usage value is very high.

The reported ailments were grouped into 10 categories based on the information gathered from the interviewees. Diabetes had the highest FIC score

(0.51), respiratory tract diseases was recorded to have the second highest FIC value (0.48), urogenital and kidney problems recorded by its all images like the third group (FIC was 0.42), while the fourth level of FIC values (0.36) was recorded Cardiovascular category. Gastrointestinal disorders were ranked as the fifth ailment with FIC value of 0.35. An FIC value of 0.33 was recorded female problems. At the end of this sequence, dermatological, rheumatic pain, hemorrhoids, and oral health treatments with the values of 0.31, 0.26, 0.22 and 0.20 FIC were reported. Karliova has not done any research that previously calculated FIC value.

#### Conclusion

Geographical structure of our study area, insufficient facilities of health and transportation in the past, stockbreeding and nomad lifestyle of the local community have all necessitated them to use wild plants. Information about plant use culture has rapidly started to be forgotten due to the increasing migration from rural to urban areas in recent years. It has been determined that the rate of plant use is lower in villages on Bingöl-Erzurum highway within our study area and higher in villages far from the

highway, which might support our claim on the plant use culture. Thus, it is very important to record this culture which has been merely shaped within centuries.

The average age of the participating individuals was 53 years and they were Turkish citizens with Kurdish, Zaza and Turkish ethnic backgrounds. This shows that the young generation does not have sufficient interest and information about the plant use culture.

It was determined that 26 families residing as local residents used a total of 99 plants for medical treatment purposes in this research conducted in the Karliova district. As a kind of treatment for many health problems it is used. The locals use the water of these plants to dry their leaves and dry them all the year round when needed.

Most commonly used plants are *Allium cepa* L., *Mentha longifolia* (L.) L., *Malva neglecta* Wallr., *Rosa canina* L., *Rheum ribes* L. and *Urtica dioica* L. Most of these plants used for treatment, aerial parts (33 of use-reports), leaves (24), flowers (11) roots (11) and fruits (10). A lot of plants are used for the treatment of diabetes disease, pulmonary and respiratory diseases, urogenital and kidney problems, cardiovascular disorders, gastrointestinal disorders, female problems, dermatological, and rheumatic pain, etc.

The medicinal uses of *Stenotaenia macrocarpa* Freyn & Sint., *Inula helenium* L., *Scorzonera incisa* DC., *Tripleurospermum caucasicum* (Willd.) Hayek, *Astragalus chamaephaca* Freyn, *Geranium libanoticum* Schenk, *Rhinanthus serotinus* subsp. *Aestivalis* (N.W.Zinger) Dostál, *Verbascum songaricum* Schrenk. and *Bunium elegans* (Fenzl) Freyn that we found were used in our study area and recorded for the first time.

Comparison of the data obtained from the plants growing in Karliova within the scope of this study with experimental data obtained in previous laboratory studies confirmed most of the ethnobotanical usages. Literature review indicated that curative plants found in Karliova are used in different parts of the Turkey for the treatment of the same or similar diseases.

The plant flora of Karliova is threatened by such factors as grazing, expansion of new agricultural lands, and unsustainable picking of plants for the purpose of generating income. Immediate steps should be taken to ensure the inclusion of relevant flora within conservation designations.

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### 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?

### References

- 1 Davis PH, *Flora of Turkey and the East Aegean Islands*, Vol1-9, (Edinburgh: Edinburgh University Press), 1965–1985.
- 2 Güner A, Özhatay N, Ekim T, Başer & KHC, *Flora of Turkey and the East Aegean Islands*, Vol 11, (Edinburgh: Edinburgh University Press), 2000.
- 3 Ugulu I, Aydın H, Yorek N & Dogan Y, The impact of endemism concept on environmental attitudes of secondary school students, *Natura Montenegrina*, 7(2008) 165–173.
- 4 Baytop T, *Therapy with Medicinal Plants in Turkey (Past and Present)*, 2 edn, (Nobel Medicine Publication, Istanbul), 1999.
- 5 Hudson JB, Lee MK, Sener B&Erdemoglu N, Antiviral activities in extracts of Turkish medicinal plants, *Pharmaceut Biol*, 38(2000) 171–175.
- 6 Satıl F, Selvi S & Polat R, Ethnic uses and of pine resin production from *Pinus brutia* by native people on the Kazdağ Mountain (Mt. Ida) in Western Turkey, *J Food Agric Environ*, 9(2011) 1059–1063.
- 7 Civelek Ş & Turkoğlu I, Unknown medicinal plants in vicinity of Elazığ, *Firat Univ Medical J Health Sci*, 14 (2000) 379–388.
- 8 Özgökçe F & Özçelik H, Ethnobotanical aspects of some taxa in East Anatolia (Turkey), *Econ Bot*, 58 (2004) 697–704.
- 9 Tuzlacı E & Doğan A, Turkish folk medicinal plants, IX: Ovacık (Tunceli), *Marmara Pharmaceut J*, 14 (2010) 136–143.
- 10 Polat R, Satıl F&Cakilcioglu U, Medicinal plants and their use properties of sold in herbal market in Bingöl district, *Biol Divers Conserv*, 4 (2011) 25–35.

- 11 Polat R, Çakılcıoğlu U, Ertuğ F & Satıl F, An evaluation of ethnobotanical studies in Eastern Anatolia, *Biol Divers Conserv*, 5 (2012) 23-40.
- 12 Polat R, Güner B, Yüce-Babacan E & Çakılcıoğlu U, Survey of wild food plants for human consumption in Bingöl (Turkey), *Indian J Tradit Knowledge*, 16(2017) 378-384.
- 13 Bulut G, Haznedaroğlu MZ, Doğan A & Tuzlacı E, An ethnobotanical study of medicinal plants in Acıpayam (Denizli-Turkey), *J Herbal Med*, 10 (2017) 64-81.
- 14 Demirel S & Çakılcıoğlu U, Identification of medical plants in Hititte cuneiform scripts, *Belleten*, 291 (2017) 305-328.
- 15 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*, 1 (2017) 22-31.
- 16 Tüzün F, Sümer Tüzün B & Konyalıoğlu S, Effects of *Ganoderma lucidum* in some neurological diseases, *Int J Nature Life Sci*, 2 (2018) 1-6.
- 17 Yüce Babacan E & Bağcı E, Essential oil composition of *Hypericum uniglandulosum* Hausskn. ex Bornm. and *Hypericum hydium* Boiss. from Turkey, *Int J Nature Life Sci*, 1 (2017) 12-18.
- 18 Muthu C, Ayyanar M, Raja N & Ignacimuthu S, Medicinal plants used by traditional healers in Kancheepuram district of Tamil Nadu, India, *J Ethnobiol Ethnomed*, 2 (2006) 43.
- 19 Bağcı Y, Ethnobotanical features of Aladağlar (Yahyalı, Kayseri) and its vicinity, *Herb J Syst Bot*, 7 (2000) 89-94.
- 20 Arakelova V, The Zaza people as a new ethno-political factor in the region, *Iran Caucasus*, 3(1999) 397-408.
- 21 Davis PH, Mill RR & Tan K, *Flora of Turkey and the East Aegean Islands*, Vol 10, (Edinburgh: Edinburgh University Press), 1988.
- 22 Komarov VL, *Flora of the USSR*. (English translation), Vol 1-30, (Moscow and Leningrad: Akademiya Nauk SSSR), 1933-1964.
- 23 Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM & Webb DB, *Flora Europaea*, Vol 1-5. (Cambridge Univ. Press, Cambridge), 1964-1980.
- 24 Rechinger KH, *Flora of Iranica*, (Akademisch Druck u Verlangsanstalt, Graz-Austria), 1965-1977.
- 25 Townsend CC & Guest E, *Flora of Iraq*, Vol 1-4, (Ministry of Agriculture Republic of Iraq, Baghdad), 1966-1985.
- 26 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, Van Yuzuncuyıl University Press, Ankara), 2000.
- 27 IUCN, IUCN: Species Survival Commisison, Red List Categories, Version 3.1, Gland Switzerland and Cambridge, UK.
- 28 Trotter R T & Logan M H, Informant consensus: a new approach for identifying potentially effective medicinal plants, In: *Plants in Indigenous Medicine and Diet, Behavioural Approaches*, edited by Etkin N L, (Redgrave Publishing Company, Bredford Hills, NY), 1986.
- 29 Akerele O, Medicinal plants and primary health cares: an agenda for action, *Fitoterapia*, 59 (1988) 355-363.
- 30 Kloutusos G, Balatsouras DG, Kaberos AC, Kandiloros D, Ferekidis E & Economou C, Upper airway edema resulting from use of *Ecballium elaterium*, *Laryngoscope*, 111 (2001) 1652-1655.
- 31 Abu-Irmaileh BE & Afifi FU, Herbal medicine in Jordan with special emphasis on commonly used herb, *J Ethnopharmacol*, 89 (2003) 193-197.
- 32 Büechi S, Vögelin R, Von Eiff MM, Ramos M & Melzer J, Open trial to assess aspects of safety and efficacy of a combined herbal cough syrup with ivy and thyme, *Forsch Komplement Klass Natur*, 12 (2005) 328-332.
- 33 Gruenwald J, Graubaum HJ & Busch R, Efficacy and tolerability of a fixed combination of thyme and primrose root in patients with acute bronchitis. A double-blind, randomized, placebo-controlled clinical trial, *Arzneimittelforschung*, 55(2005) 669-676.
- 34 Evergetis E, Michaelakis A & Haroutounian SA, Exploitation of Apiaceae family essential oils as potent biopesticides and rich source of phellandrenes, *Ind Crops Prod*, 41 (2013) 365-370.
- 35 Yari M, Aghjani Z, Masoudi S, Monfared A & Rustaiyan A, Essential oils of *Pycnocyclaflabellifolia* (Boiss.) Boiss. and *Malabaila secacule* (Miller) Boiss. from Iran, *Daru*, 7 (1999) 1-3.
- 36 Paşayeva L, Köngül E, Karatoprak GŞ & Tugay O, Determination of total phenolic and flavonoid contents and antioxidant effects of *Eryngium billardieri* Delar. Extracts, *J Health Sci*, 26(2017) 18-23.
- 37 Yeşilada E, Tanaka S, Tabata M & Sezik E, The antiinflammatory activity of the fractions from *Eryngium billardieri* in mice, *Phytother Res*, 3(1989) 38-40.
- 38 Altundag E & Ozturk M, Ethnomedicinal studies on the plant resources of east Anatolia, Turkey, *Procedia-Social Behavioral Sci*, 19 (2011) 756-777.
- 39 Hadizadeh I, Peivastegan B & Kolahi M, Antifungal activity of nettle (*Urtica dioica* L.), colocynth (*Citrullus colocynthis* L. Schrad), oleander (*Nerium oleander* L.) and konar (*Ziziphus spina-christi* L.) extracts on plants pathogenic fungi, *Pakistan J Biol Sci*, 12(2009) 58-63.
- 40 Mikaeili A, Karimi I, Modaresi M & Bagherinasab Z, Assessment of antidermatophytic activities of *Urticadioica* L. against *Microsporium canis* in a guinea pig model, *Trop J Pharmaceut Res*, 12(2013) 997-1002.
- 41 Polat R, Cakilcioglu U & Satıl F, Traditional uses of medicinal plants in Solhan (Bingöl-Turkey), *J Ethnopharmacol*, 148 (2013) 951-63.
- 42 Kandemir N, Ordu çevresinde yayılış gösteren *Arum* L. (Araceae) cinsinin bazı türleri üzerinde morfolojik ve anatomik incelemeler, *Biyol Bil Araş Der*, 1 (2008) 37-43.
- 43 Tosun İ, Karadeniz B Yüksel S, Samsun yöresinde tüketilen yenilebilir bazı yabancı bitkilerin nitrat içerikleri, *Ekoloji*, 12 (2003) 32-34.
- 44 Cakilcioglu U & Khatun S, Nitrate, moisture and ash contents of edible wild plants, *J Cell Plant Sci*, 2 (2011) 1-5.
- 45 Okafor PN & Ogbonna UI, Nitrate and nitrite contamination of water sources and fruit juices marketed in South-Eastern Nigeria, *J Food Comp Anal*, 16(2003) 213-218.
- 46 Barış D, Kızıl M, Aytakin Ç, Kızıl G, Yavuz M, Çeken B & Ertekin AS, In vitro antimicrobial and antioxidant activity of ethanol extract of three *Hypericum* and three *Achillea* species from Turkey, *IntJ Food Prop*, 14 (2011) 339-355.
- 47 Yaesh S, Jamal Q, Khan AU & Gilani AH, Studies on hepatoprotective, antispasmodic and calcium antagonist activities of the aqueous-methanol extract of *Achillea millefolium*, *Phytother Res*, 20(2006) 546-551.

- 48 Kızıl G, Toker Z, Özen HC & Aytekin C, The antimicrobial activity of essential oils of *Hypericum scabrum*, *Hypericum scabroides* and *Hypericum triquetrifolium*, *Phytother Res*, 18 (2004) 339–341.
- 49 Deliorman DO, Hartevioğlu A, Küpeli E & Yeşilada E, In vivo anti-inflammatory and antinociceptive activity of the crude extract and fractions from *Rosa canina* L. fruits, *J Ethnopharmacol*, 112(2007) 394–400.
- 50 Baig H, Ahmed D, Zara S, Aujla MI & Asghar MN, *In vitro* evaluation of antioxidant properties of different solvent extracts of *Rumex acetosella* leaves, *Oriental J Chem*, 27(2011) 1509–1516.
- 51 Kırbağ S & Zengin F, Antimicrobial activities of some medical plants in Elazığ region, *Yüzüncü Yıl University J Agric Sci*, 16(2006) 77–80.
- 52 Gülçin İ, Küfrevioğlu OI, Oktay M & Büyükkuroğlu ME, Antioxidant, antimicrobial, antiulcer and analgesic activities of nettle (*Urtica dioica* L.), *J Ethnopharmacol*, 90(2004) 205–215.
- 53 Mükemre M, Behçet L & Çakılcıoğlu U, Survey of wild food plants for human consumption in villages of Çatak (Van-Turkey), *Indian J Tradit Knowledge*, 15 (2016) 183-191.
- 54 Kaval İ, Behçet L & Çakılcıoğlu U, Survey of wild food plants for human consumption in Geçitli (Hakkari, Turkey), *Indian J Tradit Knowledge*, 14 (2) (2015) 183-190.
- 55 Khatun S, Parlak KU, Polat R & Cakilcioglu U, The endemic and rare plants of Maden (Elazığ) and their uses in traditional medicine, *J Herbal Med*, 2 (2012) 68–75.
- 56 Paksoy MY, Selvi S & Savran A, Ethnopharmacological survey of medicinal plants in Ulukışla (Niğde-Turkey), *J Herbal Med*, 6 (2016) 42-48.
- 57 Cakilcioglu U & Turkoglu I, An ethnobotanical survey of medicinal plants in Sivrice (Elazığ-Turkey), *J Ethnopharmacol*, 132 (2010) 165-175.