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Medicinal and Aromatic Plants of Esenli (Giresun) Forest Planning Unit

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Abstract: Turkey is an extraordinary country in terms of plant species diversity. Besides this diversity, Anatolian lands were hosted by many civilizations. The combination of these two factors has also contributed to a wealth of human-plant use. The plants have been used for different purposes in different civilizations such as food, medical, instrument construction, fuel, paint, feed, incense. The use of plants today, especially medical and aromatic plants, continues to increase. According to the Flora of Turkey, which plant is known to grow in which region. However, there is insufficient information on the status of plant populations. Plant sociology studies can give us satisfactory information about plant populations. In this study, Medicinal and aromatic plants of Esenli (Giresun) Forest Planning Unit, located between Alucra and Yağlıdere districts, were investigated based on plant sociology. During this study; 20 sample plots were taken. The vegetation study was carried out according to Braun-Blanquet's method. Totally, 226 naturally growing plant taxa were identified. Of these plants, 10 taxa (%4,4) belong to Pteridophyta division and 216 taxa belong to Spermatophyta division. 3 taxa (%1,3) belong to Gymnospermae subdivision, while the others 213 (%94,3) are Angiospermae subdivision. As a result of this study, 110 plant taxa which have medicinal and aromatic traits were determined in the area. These plants are 3 taxa Pteridophyta, 3 taxa from Gymnospermae and the rest from Angiospermae (104 taxa). Families, scientific names, Turkish names, usable parts and traditional uses were given in the presentation.

Keywords: Medicinal and Aromatic Plants, Inventory, Plant Sociology, Giresun, Flora

1. INTRODUCTION

Turkey is one of the most important and rich centres of the world in terms of plant resources due to its geographical location, topographic structure, water resources, micro-climate zone diversity, geological structure and plant geography [1]. These factors make our country home to forest, steppe, wetland, sea and coastal, mountain ecosystems [2] and have a very rich biological diversity with a wide variety of habitats. As a matter of fact, this habitat diversity enabled our country to have 11.707 plant taxa and 3.649 endemic taxa [3].

In addition to this diversity, many civilizations hosted from the past to the present Anatolian lands. This hostage brought the civilizations' culture to Anatolia. The combination of these two factors has also contributed to a wealth of human-plant use. The plants have been used in different civilizations for different purposes (food, medical, ware, firewood, paint, feed, incense etc.) [4]. Today, the use of plants, especially medical and aromatic plants, continues to increase.

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Many plant taxa, containing volatile oils, flavonoids, alkaloids, glycosides, various vitamins [5], are accepted as medical and aromatic plants. In addition to the continuity of vital activities in the ecosystem, these plants are used in cosmetics, dye, textile, food, etc., [6]. Furthermore, the increasing use of natural products in place of synthetic products has increased the importance of medicinal and aromatic plants.

The total number of plant species known on the earth is 374.000 [7]. Approximately 80.000 of these plant species are subject to medical purposes [8-10]. The presence of 2.000 plant species traded in Europe, is mentioned [9]. In Turkey, the number of plants used for medical purposes is around 1.024 [4] and about 200 of them have export potentials [11]. In another publication, 337 plant species have been reported to using for commercial purposes [12].

On the other hand, the increasing world population with urbanization and industrialization, have caused the increase of the pressure of human beings on nature. As a consequence of this pressure, it is accepted the fact that natural resources can be exhausted every part of the world [13]. Approximately, 500.000 tons of medicinal and aromatic herb are traded annually in the world [9]. As of 2014, this value has become around 63.500 tons in our country [14]. 90% of the medical and aromatic plants which is traded in Europe [13] are obtained from the nature, while in our country this rate is higher.

A plan to be made in medical and aromatic plants mainly consists of 4 steps. These are: (1) determination of species and populations, (2) selection of sampling method, (3) decision of sample area, and (4) decision of counting method according to product [15]. According to the Flora of Turkey, it is known that which plant species are growing in which vegetation type. However, there is no sufficient information on the status of plant populations (except taxonomic revisions). Plant sociology studies can give us enough information about the populations of medicinal and aromatic plants. In this study, a sample inventory study related with medicinal and aromatic plants is given based on plant sociology.

1.1. General Introduction of Research Area

Esenli Forest Planning Unit is located within the boundaries of Yağlıdere and Alucra (Giresun) provinces. The research area is geomorphologically mountainous and steep, and the average height from the sea level is 1600 m. The area lies within the G41d1, G41d2, G41d3, G41d4 and H41a1 ranges from 1 / 25.000 topographic maps and consists of a total area of 12.573.4 ha. The research area is covered by 4.940 ha of productive forest and 1.410,1 ha of degraded forest areas [16]. There are three settlements (Akpınar, Çakrak and Güllüce villages) within the scope of the planning unit (Figure 1).

The climate assessments of the Esenli Forest Planning Unit were made according to observations between 1964 and 2015 at Şebinkarahisar meteorological station data. The annual average temperature in the region is 7.7 ^{o}C according to Şebinkarahisar Meteorology Station data, while the maximum temperature is measured in July and it is 38.1 ^{o}C. On average annual rainfall measurements, the average annual precipitation in Esenli is 689,1 mm. A majority part of this amount has been recorded in April-May-September.

Looking at the graph drawn for Esenli (Figure 2), it is seen that the highest potential evapotranspiration [PET] values in the area are reached in June, July and August, with the highest rainfall in April. Within the planning unit, water shortage is observed between the end of May and the first weeks of October. The research area is dominated by Oceanic Climate type, which is in the moist, medium temperature (Mesothermal), water deficit in the summer season and medium level.

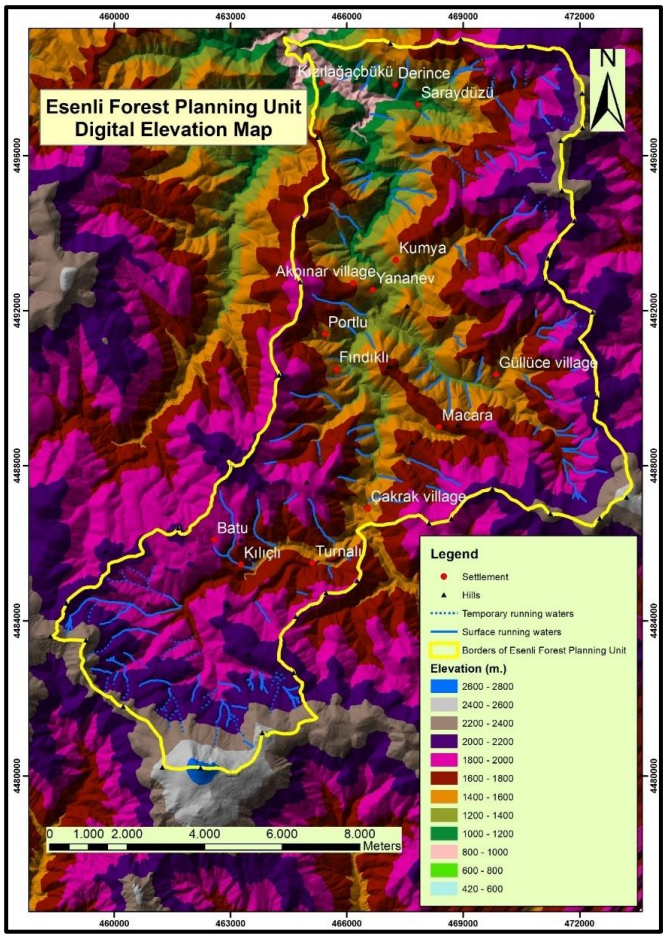

Figure 1. Digital Elevation Map of Research Area

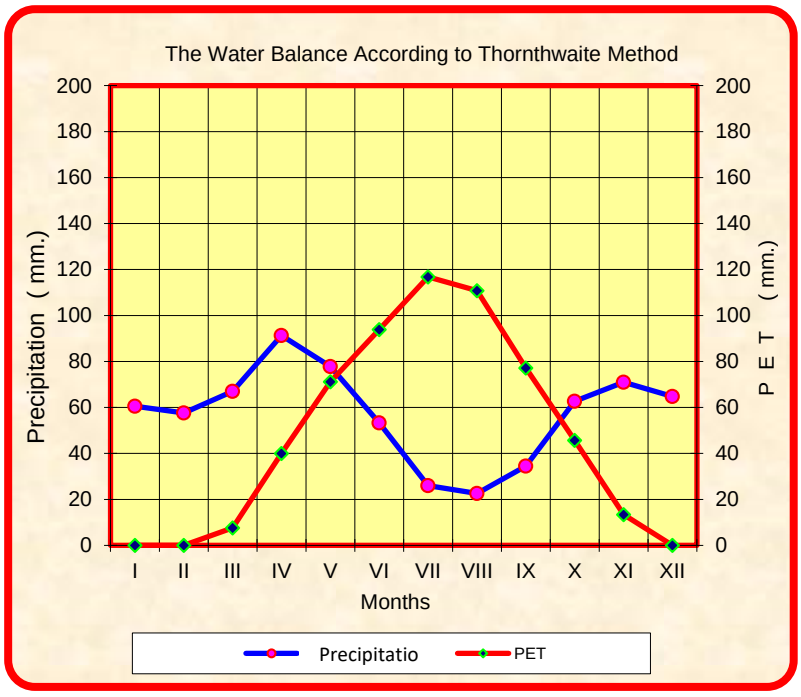

Figure 2. The water balance of research area according to Thornthwaite (interpolated)

1.2. Plant Geography of Research Area

Esenli Forest Planning Unit is located in the Euro-Siberian Floristic Region. The Euro-Siberian flora area encompasses the Black Sea region and is represented by the Euxine (Black Sea) province. Eastern Black Sea region which is also covering the study area is in the Colchic sector which is separated from the west Black Sea region in terms of precipitation from Euxine province [17]. The Colchic sector is characterized by sub-tropical humid forests which are comprise mixed or pure stands of broadleaved deciduous forest, coniferous forest communities. Esenli Forest Planning Unit is located on the A7 of the Eastern Black Sea Region, where Davis [18] divides Turkey's flora in terms of latitude and longitude ratings.

1.3. Vegetation Structure of Research Area

The vegetation types within Esenli Forest Planning Unit are spread between 850-2700 m elevations. At low elevations, there is a mixed forest structure formed by broadleaved deciduous forest. This mixture contains some taxa such as *Carpinus betulus, Fagus orientalis, Castanea sativa, Tilia rubra, Corylus avellana, Cerasus avium, Euonymus europaeus, Quercus petraea* subsp. *iberica*. After this vegetation zone, pure or mixed forest communities formed by *Carpinus betulus* and *Fagus orientalis* together with the elevation are dominant. *Picea orientalis* after 1000 m in the area shows itself and is a dominant species up to 1700 m. From this elevation (1700 m), *Pinus sylvestris* species began to dominate with the influence of the surrounding climate and spreads to about 2000 m. In the higher parts of the study area, subalpine and alpine vegetation are dominant.

2. MATERIAL and METHODS

In order to reveal the floristic structure of the research area, both observation and plant sociology studies were carried out in April-September 2015. For the vegetation studies, 20 samples with an area of 400 m^2 were taken from the areas which were homogeneous in terms of the floristic composition and structure. The cover-abundance values of each plant taxon forming the vegetation in these selected parcels (Table 1) were determined according to Braun-Blanquet [19] method. The identification of the plant species taken from these sample areas was made according to the Turkish Flora [18, 20, 21].

The current status of the plants that have been diagnosed have controlled from the Turkish Plant List [22]. Within the scope of this study, the literature on the utilization of the plant taxa was examined and the plants evaluated within the scope of medical and aromatic plant were determined. Braun-Blanquet cover-abundance values have re-calculated based on the mean values indicated by van der Maarel [23] (Table 1) in order to find the weighted average covers of the medical and aromatic plants determined in the study area.

Table 1. Conversiton cover-abundance values.

Braun-Blanquet Scale	Range of cover [%]	Midpoint of Cover range [%]
5	75-100	87,5
4	50-75	62,5
3	25-50	37,5
2	10-25	15
1	1-10	2,5
+	various individual	0,1
r	Rare	0,05

3. RESULTS and DISCUSSIONS

In this study, 20 sample areas of various vegetation types were taken from the Esenli Forest Planning Unit (Figure 3.). A total of 226 plant taxa were recorded from the 20 sample areas taken within the scope of the study. 10 (4,4%) of these taxa are belonged in division Pteridophyta, 3 (1,3%) Gymnospermae sub-division and 213 (94,3%) Angiospermae sub-division. As a result of the literature research, 110 plant taxa with naturally grow, medicinal and aromatic properties were determined in the field. Three of these taxa belong to the division Pteridophyta, three to the Gymnospermae subdivision and 104 to the Angiospermae subdivision (Table 2.). Rosaceae family is represented 13 taxa and Lamiaceae family is with 9 taxa. These families are followed by Asteraceae (8 taxa), Fabaceae (7 taxa) and Apiaceae and Brassicaceae (5 taxa) respectively.

Among the plants naturally grow in the study area, most of them (111 taxa) can be used for the diseases of the digestive system which used in the literature in terms of the main disease group. This group is followed by treatment methods such as skin diseases, respiratory system diseases, urinary tract diseases (Table 3.).

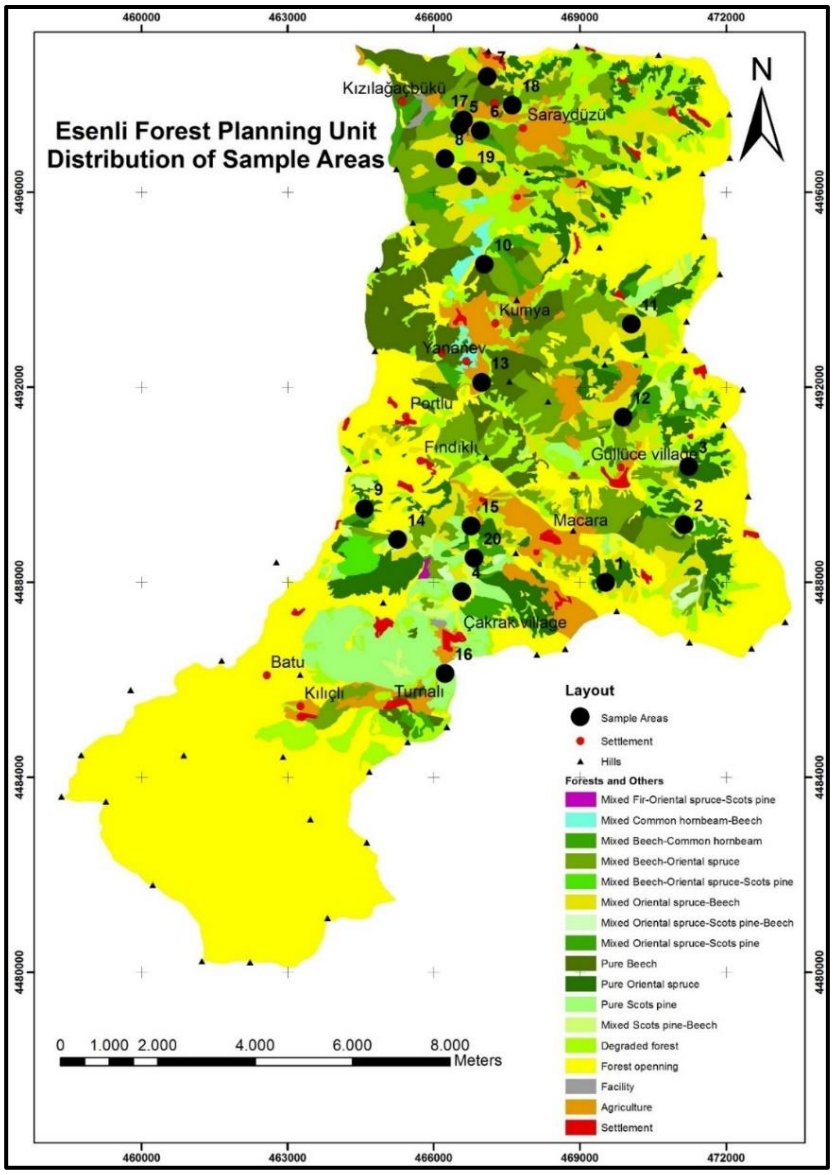

Figure 3. Distribution of sample areas

The result of investigating the literature is that the determined taxa can be used in the treatment of 80 different medicinal purposes (Table 3.). The most important of these forms of treatment are listed following. Diuretic (37), constipation therapy (34 taxa), stomach ache (30 taxa), wound healings (27 taxa), rheumatism (16 taxa), diabetes (15 taxa), haemorrhoids treatment and tonic (14 taxa) and sedative (13 taxa). In addition, 12 of these taxa were found to be poisonous or harmful. When evaluating in terms of protection of biodiversity the plant species distributed in Esenli Forest Planning Unit, it is useful to examine the parts of the plants which are found to be used in the literature. When examined in Table 2, leaves are the first rank in the plant parts used. The leaf organ is followed by flowers (30 taxa), fruit (19 taxa), root (17 taxa), whole plant parts (15 taxa) and finally aerial parts (14 taxa). Plant use in the form of flowers, roots, aerial parts and whole plants is important for biodiversity conservation. Such patterns of use can cause the population of plant species to decrease and species to be destroyed. The disappearance of species will mean the loss of the benefits derived from plant resources. For this reason, sustainable utilization of plants is of importance in terms of conservation biology. In other words, protection-use balance in natural resource use should not be ignored.

In order to determine the average cover of medicinal and aromatic plants within the study area, Braun-Blanquet values were transformed using the median values of mean cover values (Table 4.). With the help of these values, total cover values and weighted average cover values of plant species were calculated. When these values are examined depending on the vegetation structure of the study area, *Picea orientalis* (34,625%), *Fagus orientalis* (11,285%), *Rhododendron ponticum* (6,875%) and *Pinus sylvestris* (6,13%) are in the first ranks in terms of their cover values. These families are followed by *Galium odoratum*, *Oxalis acetosella*, *Sanicula europaea*, *Carpinus betulus*, *Primula veris* subsp. *columnae*, *Vaccinium arctostaphylos*, *Rubus hirtus*, *Fragaria vesca*, *Clinopodium vulgare* subsp. *arundanum*, *Viola sieheana*, *Phedimus stoloniferus*, *Pteridium aquilinum*, *Trifolium repens* var. *repens* respectively.

Within the scope of the study, the existence of 12 more medical and aromatic plants were observed in Esenli Forest Planning Unit as well as observations made on the vegetation studies. These taxa are; *Brassica oleracea*, *Caltha palustris*, *Capsella bursa-pastoris*, *Cerasus avium*, *Hedera helix* f. *Helix*, *Helleborus orientalis*, *Laurocerasus officinalis*, *Mespilus germanica*, *Sambucus nigra*, *Thymus pseudopulegionides*, *Vaccinium myrtillus* and *Zea mays* subsp. *mays*. Since these taxa are not covered by vegetation studies, no information is given in this section on the values of cover.

Today, the importance of medicinal and aromatic plants is increasing day by day. This increase is accompanied by excessive use. In our country, these plants are mostly obtained from the nature by collecting, which endangers natural populations. These attempts, which take place in the form of unconscious gathering (early gathering, excessive gathering, gathering unnecessary parts of plants, etc.), should be avoided. Good quality and standardization should be ensured and products with high added value should be produced instead of raw material sales. Another important issue in our country about medicinal and aromatic plants is that the inventories of these plants are missing. According to the Flora of Turkey, which plant is known to grow in which region. However, there is insufficient information on the status of plant populations. There are many plant sociology studies in almost every region of our country. In this context, plant sociology studies should be used in determining the populations of medicinal and aromatic plants.

As a result of these determinations, it should not be forgotten that all plant species carry chemicals at certain rates in their organs. As the use of medicinal plants may have different effects on each individual person, excessive or some uses other than medical advice can cause poisoning.

Table 2. Medically and aromatic plants grown naturally in the Esenli Forest Planning Unit

No	Family	Plant name	Turkish name	Used Part	Purpose of using
1	Adoxaceae	*Sambucus ebulus*	Mürver otu	Leaves, Fruit, Root	Constipation, joint aches, itch, diuretic, diaphoretic [24], rheumatism [25, 28, 33], hemorrhoids [26].
2	Adoxaceae	*Sambucus nigra*	Ağaç mürver	Flowers, Fruit, Leaves	Diaphoretic, diuretic, constipation [24], hemorrhoids [25], cough [28], stomache ache, cold, flu, dizziness, nausea [30], abscess [32], prostate, hypoglycemia [33].
3	Apiaceae	*Anthriscus nemorosa*	Peçek	Fruit	Carminative [42].
4	Apiaceae	*Anthriscus sylvestris*	Gımı	Fruit	Carminative [42].
5	Apiaceae	*Grammosciadium platycarpum*	Yassı kami	Aerial parts	Stomache ache [31].
6	Apiaceae	*Oenanthe pimpinelloides*	Deli maydanoz	Aerial parts	Burn, hypertension, painkiller [31].
7	Apiaceae	*Sanicula europaea*	Derman otu	Leaves, Root	Constipation, stomache ache, wound healings [24] Shortness of breath, body relaxation, stomache ache [25].
8	Araliaceae	*Hedera helix f. helix*	Orman sarmaşığı	Flowering and Leafy branches	Constipation, intestinal parasites, diaphoretic, callus and abscess, burn [24], stomache ache [25], kidney stone, kidney diseases [28]. Poisonous plant.
9	Asparagaceae	*Muscari neglectum*	Arap sümbülü	Whole plant	Rheumatism [27].
10	Asparagaceae	*Polygonatum multiflorum*	Mührü süleyman	Rizom	Constipation, gout, rheumatism, diabetes, abscess [24].
11	Aspleniaceae	*Asplenium adiantum-nigrum*	Kara saçakotu	Whole plant	Eczema [26], hemorrhoids [28].
12	Aspleniaceae	*Asplenium trichomanes*	Saçakotu	Whole plant	Stomache ache, hemorrhoids [25], eczema [26].
13	Asteraceae	*Achillea millefolium subsp. millefolium var. millefolium*	Civan perçemi	Flowering branches	Diuretic, orexigenic, carminative, women's diseases, wound healing, hemorrhoids [24], shortness of breath [25], nephritis, weight loss [30], kidney stone, blood purifier, liver purifier [37].
14	Asteraceae	*Cota tinctoria*	Boyacı papatyası	Flowers	Wound healing, throat ache, hairpin [24], women's diseases, shortness of breath [25], cold [28] stomache ache, bronchitis [33, 35].
15	Asteraceae	*Bellis perennis*	Koyun gözü papatya	Flowers	Diuretic, diaphoretic, tonic, constipation, pectoral (softener), stomache ache [24], cold [25, 29].
16	Asteraceae	*Centaurea jacea*	Çayır peygamber çiçeği	Aerial parts	Antipyretic, women's diseases, constipation, orexigenic [24].
17	Asteraceae	*Cirsium hypoleucum*	Vişne kangalı		Cardiac disorder, diabetes, rheumatism, eczema [36].
18	Asteraceae	*Leontodon hispidus var. hastilis*	Oklu gulikazer	Leaves	Hematischesis [26].
19	Asteraceae	*Petasites hybridus*	Kabalak	Aerial parts	Carminative, digestive system [29].

20	Asteraceae	*Tanacetum parthenium*	Beyaz papatya	Leaves, Flowering branches	Tonic, antipyretic, headache [24], women's diseases [25].
21	Betulaceae	*Alnus glutinosa subsp. barbata*	Sakallı kızılağaç	Seed, Leaves, Bark	Tonsillitis, intestinal bleeds, diuretic, constipation, tonic, wound healings [24], wound purify [25], hematischesis [26], stomache ache, hemorrhoids [25, 29].
22	Betulaceae	*Carpinus betulus*	Adi gürgen	Leaves	Blood regulator, wound healing, astringent [24], cholesterol [26].
23	Betulaceae	*Corylus avellana var. avellana*	Adi fındık	Leaves, Seed	Diuretic, tonic [24), cough [25, 29], anemia [26], hypertension [29].
24	Boraginaceae	*Cerinthe minor subsp. minor*	Cüce gözü	Aerial parts	Fodder [42].
25	Boraginaceae	*Echium vulgare subsp. vulgare*	Engerek otu	Whole plant, Root	Diuretic, expectorant [24], wound healings [32, 37].
26	Boraginaceae	*Symphytum asperum*	Kaba kafesotu	Root	Cough, pectoral (softener) [25].
27	Boraginaceae	*Trachystemon orientalis*	Kaldirik	Whole plant	Itch, injury, diaphoretic, blood purifier, antipyretic [24], diuretic, Intestinal diseases [25], Inflammatory wounds [26].
28	Brassicaceae	*Brassica oleracea*	Kara lahana	Leaves	Stomach ache, earache, wound healings [26], abscess, stomache ache, rheumatism [33].
29	Brassicaceae	*Capsella bursa-pastoris*	Çoban çantası	Leaves, Flowering branches, Stem	Women's diseases, constipation, diuretic [24], intestinal diseases [26], impotence [29], urinary tract diseases [35], kidney stone [40].
30	Brassicaceae	*Cardamine bulbifera*	Dişli kök	Root	Constipation [24].
31	Brassicaceae	*Nasturtium officinale*	Su teresi	Aerial parts	Blood regulator, kidney diseases, tonic, vitamin supply, diuretic, orexigenic [24], hemorrhoids, prostate [25], stomache ache [25, 29], diabetes [41].
32	Brassicaceae	*Microthlaspi perfoliatum*	Giyle	Leaves	Foodstuff [35].
33	Campanulaceae	*Campanula rapunculus subsp. lambertiana*	Büyük köklü çançiçeği	Leaves	Wound healing, constipation [24].
34	Caprifoliaceae	*Scabiosa columbaria subsp. columbaria var. columbaria*	Küçük uyuz otu	Whole plant	Constipation, diuretic, wound healings [24].
35	Caprifoliaceae	*Valeriana alliariifolia*	Pisot	Rhizome	Sedative, antispasmodic [24].
36	Celastraceae	*Euonymus europaeus*	İğcik ağacı	Fruit	Constipation, diuretic, emetic [24].
37	Cistaceae	*Helianthemum nummularium subsp. nummularium*	Güngülü	Whole plant	Constipation, hematischesis [24].
38	Convolvulaceae	*Calystegia silvatica*	Bürük	Leaves	Wound healings [29].
39	Crassulaceae	*Sedum pallidum*	Koyunörmece	Leaves	Wound healings [43].
40	Crassulaceae	*Phedimus stoloniferus*	Pisikulağı	Leaves	Rennet [41].

41	Dennstaedtiaceae	*Pteridium aquilinum*	Kartal eğreltisi	Leaves	Eczema [28], incense [41].
42	Dioscoreaceae	*Dioscorea communis*	Dolangaç	Root	Painkiller [25], wound healings [28], rheumatism [30].
43	Dryopteridaceae	*Dryopteris filix-mas*	Erkek eğrelti	Rizom, Leaves	Intestinal parasitic [24], stomache ache [25].
44	Ericaceae	*Rhododendron ponticum*	Mor çiçekli orman gülü	Leaves	Painkiller, diuretic, rheumatism [24], eczema [25], itch [26], headache [29].
45	Ericaceae	*Vaccinium arctostaphylos*	Likarpa	Fruit, Leaves	Constipation, shortness of breath [24].
46	Ericaceae	*Vaccinium myrtillus*	Ayı üzümü	Fruit, Leaves	Stomache ache, embolism, antiseptic, tonic [24], bronchitis [25], tooth ache, digestive system [26], diabetes, constipation [24, 29].
47	Euphorbiaceae	*Euphorbia amygdaloides subsp. amygdaloides*	Zerena	Seed, Leafy branches (fresh), latex	Constipation, curing warts. Harmful if used overdose [24], water purifier [33].
48	Euphorbiaceae	*Mercurialis perennis*	Yer fesleğeni	Flowering branches	Diuretic, constipation [24].
49	Fabaceae	*Anthyllis vulneraria subsp. pulchella*	Renkli çoban gülü	Flowering branches	Constipation, wound healings[24].
50	Fabaceae	*Securigera orientalis subsp. orientalis*	Ala körigen	Flowers, Juvenil Leaves	Foodstuff [35], nephritis [42].
51	Fabaceae	*Securigera varia*	Körigen	Whole plant	Fodder [42].
52	Fabaceae	*Lotus corniculatus var. corniculatus*	Gazal boynuzu	Whole plant	Sedative [24].
53	Fabaceae	*Trifolium pratense var. pratense*	Çayır üçgülü	Flowers	Expectorant, antiseptic, sedative [24].
54	Fabaceae	*Trifolium repens var. repens*	Ak üçgül	Flowering branches	Tonic, rheumatism [24].
55	Fabaceae	*Vicia cracca subsp. stenophylla*	Kuş fiği	Seed, Aerial parts	Urinary tract diseases, tonic, epilepsy, jaundice [24], fodder [35].
56	Fagaceae	*Castanea sativa*	Anadolu kestanesi	Leaves, branch braks, Flowers	Constipation, antihypertensive [24], cough [25], shortness of breath, cardiovascular disease [26].
57	Fagaceae	*Fagus orientalis*	Doğu kayını	Brak	Constipation, antipyretic [24], stomache ache, intestinal parasites [25].
58	Gentianaceae	*Gentiana asclepiadea*	Sütlü güşad	Aerial parts	orexigenic, antipyretic [24].
59	Geraniaceae	*Geranium robertianum*	Dağ ıtırı	Whole plant	Hematischesis, diuretic, tonic, diabetes, constipation, stomache ache [24].
60	Hypericaceae	*Hypericum androsaemum*	Kamaniça	Leafy branches	Stomache ache, gall bladder [24].
61	Hypericaceae	*Hypericum olympicum f. olympicum*	Uludağ Kantaronu	Flowers	Stomache ache, wound healing, burn [39].

62	Hypericaceae	*Hypericum perforatum subsp. perforatum*	Kantaron	Flowering branches	Sedative, intestinal parasites, shortness of breath, wound healing, constipation [24], regulation of blood pressure, hemorrhoids, diuretic [25], women's diseases, rheumatism, stomache ache [28], ulcer [29]. Poisonous plant (if used overdose).
63	Lamiaceae	*Ajuga orientalis*	Dağ mayasılı	Aerial parts	Skin diseases [41].
64	Lamiaceae	*Clinopodium grandiflorum*	Kaba fesleğen	Leaves	spice, tea [25].
65	Lamiaceae	*Clinopodium vulgare subsp. arundanum*	Kamış fesleğen	Leaves, Flowers	spice [41].
66	Lamiaceae	*Origanum vulgare subsp. viridulum*	İstanbul kekiği	Flowering and Leafy branches	Diuretic, diaphoretic, carminative, sedative [24], cold [25], cholesterol, flu [29], tooth ache, headache, [30].
67	Lamiaceae	*Prunella vulgaris*	Erik otu	Flowering branches, Leaves	Expectorant, cold [24, 25], gastric ulcer [26], wound healings [41].
68	Lamiaceae	*Salvia glutinosa*	Yapışkan Adaçayı	Leaves	Wound healing, burn [25].
69	Lamiaceae	*Stachys annua subsp. annua var. annua*	Hacıosmanotu	Aerial parts	Somniferous, women's diseases [41].
70	Lamiaceae	*Teucrium chamaedrys subsp. chamaedrys*	Kısa mahmut	Aerial parts	Eczema [28], kidney diseases [30], pneumonia, swelling [33], stomache ache [30, 34], hemorrhoids [33, 41].
71	Lamiaceae	*Thymus pseudopulegioides*	Anzer çayı	Flowering branches	Sedative, intestinal parasites, blood regulator, stomache ache, throat ache [24], Cold [25].
72	Malvaceae	*Tilia rubra subsp. caucasica*	Kafkas Ihlamuru	Flowers, Leaves, bark	Diuretic, diaphoretic, sedative, somniferous, pectoral (softener) [24], cough, asthma, stomache ache, wound healings [25], cold, intestinal diseases [28].
73	Melanthiaceae	*Veratrum album*	Dokuztepeli	Rhizome	Skin diseases, itch [24]. Poisonous plant.
74	Orobanchaceae	*Euphrasia pectinata*	Göz otu	Flowering branches	Wound healings [24].
75	Oxalidaceae	*Oxalis acetosella*	Ekşi yonca	Leaves, Root	Astringent, diuretic, hematischesis, expectorant, wound healings [24].
76	Pinaceae	*Abies nordmanniana subsp. nordmanniana*	Doğu Karadeniz Göknarı	Cone resin, Leaves	Antiseptic, expectorant, constipation [24], wound healing, abscess [32].
77	Pinaceae	*Picea orientalis*	Doğu ladini	Resin, stamen	Muscle pain, stomache ache, lung diseases [24], anti-inflammatory [25].
78	Pinaceae	*Pinus sylvestris*	Sarıçam	Bud, Brak extract, resin, cone	Diuretic, expectorant [24], bronchitis, stomache ache, rheumatism [26], wound healing, snakebite [32], cold, tuberculosis [33], abdominal pain [34].
79	Plantaginaceae	*Digitalis ferruginea subsp. ferruginea*	Arıkovanı	Leaves, Root, Seed	Diuretic, expectorant, cardiac enhancer, itch, wound healings [24]. Poisonous plant.

80	Plantaginaceae	*Plantago lanceolata*	Damarlıca	Leaves	Constipation, diuretic, respiratory tract diseases [24], astringent, gastric ulcer, wound healings [29], abscess [30, 33], insect bite, apnea, bronchitis, varicose [39].
81	Plantaginaceae	*Veronica anagallis-aquatica*	Su gedemesi	Aerial parts	Stomache ache, rheumatism [33].
82	Poaceae	*Zea mays subsp. mays*	Mısır	Pistil, Seed	Diuretic [28], kidney stone [29, 32], hemorrhoids [33].
83	Polygonaceae	*Polygonum bistorta subsp. carneum*	Dağ lahanası	Rizom	Constipation, antiseptic, diuretic, hematischesis [24].
84	Polygonaceae	*Rumex acetosella*	Kuzu kulağı	Leaves, Root	Abscess, diuretic, gall bladder, antipyretic. rheumatism, Dangerous to people with gout or kidney disease [24], digestive system disaeses, tooth inflammation, stomache ache, sinusitis [25], hypertension, diabetes [29].
85	Polypodiaceae	*Polypodium vulgare var. vulgare*	Benli eğrelti	Whole plant	Kidney stone, gall bladder, headache, tonsillitis, carminative, stomache ache [30].
86	Primulaceae	*Primula veris subsp. columnae*	Tutya	Root, Leaves, Flowers	Expectorant, diuretic, sedative, pectoral (softener), abscess [24].
87	Primulaceae	*Primula acaulis subsp. acaulis*	Çuha çiçeği	Root, Leaves, Flowers	Expectorant, diuretic, pectoral (softener), abscess [24, 25], sedative, cough [29], rheumatism [41].
88	Ranunculaceae	*Caltha palustris*	Bataklık nergisi	Flowering branches, Root, Leaves	Sedative, blood enhancer. Poisonous plant [24], internal disease [37].
89	Ranunculaceae	*Helleborus orientalis*	Çöpleme	Aerial parts	Anesthetic, stimulant, heart diseases, parasites in animals. Poisonous plant [24], edema [33].
90	Ranunculaceae	*Ranunculus cappadocicus*	Yağlı çanak		Rheumatism [36].
91	Ranunculaceae	*Ranunculus repens*	Tiktakdana	Flowers, Aerial parts	Rheumatism [33, 36].
92	Rosaceae	*Cerasus avium*	Kiraz	Gövde, Fruit stem	Intestine diseases [26], diuretic [28].
93	Rosaceae	*Crataegus monogyna var. monogyna*	Adi alıç	Fruit, Flowers	Tonic [24], hypertension, bronchitis [28], cardiovascular disease [30].
94	Rosaceae	*Fragaria vesca*	Dağ çileği	Fruit, Root	Constipation, diuretic, orexigenic [24], diabetes [25].
95	Rosaceae	*Geum urbanum*	Meryem otu	Whole plant	Constipation, stomache ache, tonic [24]. Harmful if used overdose.
96	Rosaceae	*Laurocerasus officinalis*	Karayemiş, taflan	Seed, Leaves, Fruit	Goiter, asthma, bronchitis, burn, stomache ache, diabetes, cough [24], gastric ulcer [25] hemorrhoids, backache, diuretic [26], headache, hypertension [29], cardiac disorder [36].
97	Rosaceae	*Mespilus germanica*	Muşmula	Leaves, Fruit, Seed	Constipation, diarrhea, diuretic [24], kidney stone [26], diabetes, hypertension [29].
98	Rosaceae	*Pyrus communis subsp. communis*	Bey armudu	Fruit, Leaves	Foodstuff [29], diuretic [40].

99	Rosaceae	*Rosa canina*	Kuşburnu	Fruit, Seed, Flowers	Sedative, constipation, tonic [24), cold [25], cough [29], hemorrhoids [32, 33], diabetes [24, 40].
100	Rosaceae	*Rubus canescens var. glabratus*	Çoban kösteği	Fruit	Tonsillitis, anemia [29].
101	Rosaceae	*Rubus hirtus*	Akdiken	Leaves, Root	Wound healing, allergy, burn [24], hemorrhoids, diabetes [32].
102	Rosaceae	*Rubus idaeus subsp. idaeus*	Ahududu	Leaves, Fruit	constipation, orexigenic, diuretic, tonic [24], cancer, eczema [25], birth pangs [40].
103	Rosaceae	*Sanguisorba minor subsp. minor*	Küçük çayır düğmesi	Whole plant	Constipation, stomache ache, diuretic, orexigenic [24].
104	Rosaceae	*Sorbus aucuparia*	Kuş üvezi	Leaves, Fruit	Constipation, pectoral (softener) [24], hypertension [30].
105	Rubiaceae	*Galium odoratum*	Orman iplikçiği	Whole plant	Diuretic [37].
106	Solanaecae	*Atropa belladonna*	Güzel avratotu	Leaves, Fruit	Painkiller, antispasmodic. Poisonous plant [24], skin beauty [25].
107	Solanaecae	*Physalis alkekengi*	Güvey feneri	Fruit	Blood pressure, diabetes, cold [25], diuretic [41]. Poisonous plant.
108	Thymelaeaceae	*Daphne pontica subsp. pontica*	Sırımbağı	Bark	Diuretic, constipation, diaphoretic [24]. Poisonous plant.
109	Urticaceae	*Urtica dioica subsp. dioica*	Isırgan otu	Whole plant	Headache, stomache ache, kidney diseases, blood purifier, diabetes, diuretic, orexigenic, cancer, rheumatism, milk enhancer [24], hemorrhoids [25], bronchitis [26, 29], itch [28], eczema [24, 29], respiratory tract diseases [29] baldness [30], hypoglycemia, snakebite [33].
110	Violaceae	*Viola sieheana*	Çayır menekşesi	Flowers	Upper respiratory tract diseases, cough, bronchitis, sinusitis [38], skin beauty [37].

Table 3. Distribution of detected plant species in main disease groups

No	Main disease groups	Treatment	Quantity	Total
		Constipation	34	
		Stomache ache	30	
		Hemorrhoids	14	
		Carminative	6	
		Intestinal diseases Intestinal	5	
		parasitic	5	
1	Digestive system	Gastric ulcer	5	111
		Digestive	4	
		Gall bladder	4	
		Nausea	1	
		Diarrhea	1	
		Obesity	1	
		Emetic	1	
		Wound healing	27	
		Abscess	9	
		Eczema	8	
		Itch	8	
2	Skin Diseases	Burn	6	63
		Skin beauty	2	
		Curing warts	1	
		Allergy	1	
		Hairpin	1	
		Cough	10	
		Bronchitis	9	
		Expectorant	9	
		Shortness of breath	7	
		Pectoral (softener)	6	
3	Respiratory system	Tonsillitis (Anjin)	3	53
		Throat ache (Faranjit)	3	
		Asthma	2	
		Sinusitis	2	
		Lung diseases	1	
		Pneumonia	1	
		Diuretic	37	
		Kidney stone	6	
4	Urinary system	Kidney diseases	4	51
		Nephritis	3	
		Urinary system	1	
		Hypertension	13	
		Embolism	4	
		Astringent	3	
5	The circulatory system	Cardiac disorder	3	29
		Blood purifier Cholesterol	3	
		Varicosis	2	
			1	
		Rheumatism	16	
		Joint aches	4	
6	Musculo-skeletal System	Injury	2	24
		Backache	1	
		Gout	1	
7	Internal secretion system	Diabetes	15	16
		Guatr	1	
		Cold	10	
8	Infectious diseases	Flu	2	13
		Hepatit	1	
9	Reproductive organs	Women’s diseases	7	9
		Prostate	2	
10	Nervous system	Epilepsy	1	1

11	Tonic	14
12	Sedative	13
13	Diaphoretic	8
14	Orexigenic	8
15	Painkiller	7
16	Antipyretic	6
17	Headache	6
18	Antiseptic	4
19	Anemia	3
20	Hematischesis	3
21	Toothache	3
22	Cancer	2
23	Somniferous	2
24	Snake bite	2
25	Hair disorders	1
26	Insect bite	1
27	Wound purify	1
28	Dizziness	1
29	Earache	1
30	Vitamin supply	1
31	Apne	1
32	Milk enhancer	1

Table 4. Cover-abundance values of species.

No	Plant taxa	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total cover	Weighted total cover
1	*Picea orientalis*	62,5	2,5	37,5	37,5	37,5	2,5	62,5	15,0	62,5	15,0	37,5	37,5	37,5	2,5	62,5	2,5	62,5	15,0	37,5	62,5	692,50	34,625
2	*Fagus orientalis*		0,1	0,1	0,1		62,5	15,0	15,0		37,5	15,0	0,1	0,1	62,5		0,1	2,5	15,0		0,1	225,70	11,285
3	*Rhododendron ponticum*			15,0		2,5	15,0	15,0	2,5		37,5	15,0		2,5				15,0	2,5	15,0		137,50	6,875
4	*Pinus sylvestris*		37,5		2,5								15,0		0,1	2,5	62,5				2,5	122,60	6,13
5	*Galium odoratum*	2,5		37,5			15,0	0,1		2,5		2,5	2,5			15,0				0,1		77,70	3,885
6	*Oxalis acetosella*	15,0				0,1		15,0		15,0	2,5	2,5				2,5					0,1	52,70	2,635
7	*Sanicula europaea*			2,5	15,0			0,1		2,5	2,5	2,5		2,5		15,0	2,5					45,10	2,255
8	*Carpinus betulus*						2,5		2,5		0,1			15,0		0,1		0,1	2,5	0,1	0,1	23,00	1,15
9	*Primula veris subsp. columnae*		15,0	0,1						0,1			2,5				0,1			0,1	0,1	18,00	0,9
10	*Vaccinium arctostaphylos*					0,1		15,0	0,1			0,1						2,5				17,80	0,89
11	*Rubus hirtus*	0,1			0,1		0,1	2,5	0,1	2,5	2,5	2,5				2,5					2,5	15,40	0,77
12	*Fragaria vesca*	2,5		0,1	0,1			0,1	2,5	0,1	0,1	0,1	0,1	0,1	2,5	0,1	0,1		0,1	2,5	2,5	13,60	0,68
13	*Clinopodium vulgare subsp. arundanum*	0,1	2,5		0,1			0,1	2,5				0,1	0,1	0,1	2,5	2,5	0,1		2,5	0,1	13,30	0,665
14	*Viola sieheana*	0,1	0,1		0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	2,5		0,1	2,5	0,1	2,5	2,5	0,1	0,1	11,40	0,57
15	*Phedimus stoloniferus*	0,1									0,1	2,5		2,5				2,5	2,5	0,1		10,30	0,515
16	*Pteridium aquilinum*			0,1			2,5	2,5	2,5	0,1				2,5								10,20	0,51
17	*Trifolium repens var. repens*		0,1										2,5	2,5	2,5		2,5			0,1		10,20	0,51
18	*Geranium robertianum*			0,1			0,1	0,1			0,1			0,1	0,1	2,5		0,1		2,5	2,5	8,20	0,41
19	*Petasites hybridus*	0,1		2,5		0,1	0,1	0,1			2,5	2,5		0,1		0,1						8,10	0,405
20	*Rubus idaeus subsp. idaeus*			2,5									2,5				2,5					7,50	0,375
21	*Dioscorea communis*				0,1		0,1	2,5	0,1		0,1					0,1	0,1	0,1	2,5		0,1	5,80	0,29
22	*Polypodium vulgare var. vulgare*					2,5					0,1					0,1		2,5		0,1	0,1	5,40	0,27
23	*Ranunculus cappadocicus*	0,1		2,5						0,1		2,5			0,1		0,1					5,40	0,27
24	*Castanea sativa*					2,5			0,1									0,1	2,5			5,20	0,26
25	*Securigera varia*								0,1						2,5				0,1		2,5	5,20	0,26
26	*Cardamine bulbifera*			2,5						0,1		2,5						0,1				5,20	0,26
27	*Dryopteris filix-max*	0,1		2,5							2,5											5,10	0,255

28	*Cirsium hypoleucum*				0,1	0,1				0,1	0,1				0,1	0,1	2,5		0,1		0,1	0,1	3,40	0,17
29	*Clinopodium grandiflorum*			0,1	0,1				0,1			2,5								0,1			0,1	3,00	0,15
30	*Valeriana alliariifolia*										0,1	2,5					0,1				0,1	0,1		2,90	0,145
31	*Prunella vulgaris*									0,1	0,1				0,1						0,1	2,5		2,90	0,145
32	*Gentiana asclepiadea*				0,1		2,5					0,1	0,1											2,80	0,14
33	*Origanum vulgare subsp, gracile*													0,1				0,1			2,5			2,70	0,135
34	*Rubus canescens var. glabratus*															2,5					0,1	0,1		2,70	0,135
35	*Sedum pallidum var. pallidum*														2,5			0,1			0,1			2,70	0,135
36	*Teucrium chamaedrys subsp. chamaedrys*			0,1						2,5												0,1		2,70	0,135
37	*Abies nordmanniana subsp. nordmanniana*					2,5												0,1						2,60	0,13
38	*Daphne pontica subsp. pontica*					2,5				0,1														2,60	0,13
39	*Hypericum olympicum f. olympicum*													2,5		0,1								2,60	0,13
40	*Primula acaulis subsp. acaulis*														0,1						2,5			2,60	0,13
41	*Sambucus ebulus*				0,1				2,5															2,60	0,13
42	*Sanguisorba minor subsp. minor*			2,5						0,1														2,60	0,13
43	*Salvia glutinosa*											2,5												2,50	0,125
44	*Tilia rubra subsp. caucasica*						2,5																	2,50	0,125
45	*Digitalis ferruginea subsp. ferruginea*	0,1	0,1	0,1	0,1				0,1				0,1	0,1	0,1	0,1		0,1				0,1		1,20	0,06
46	*Corylus avellana var. avellana*					0,1	0,1		0,1			0,1			0,1		0,1			0,1	0,1	0,1		0,90	0,045
47	*Rosa canina*					0,1		0,1				0,1		0,1		0,1		0,1				0,1		0,70	0,035
48	*Leontodon hispidus var. hastilis*									0,1				0,1	0,1	0,1		0,1				0,1		0,60	0,03
49	*Tanacetum parthenium*				0,1				0,1			0,1				0,1	0,1						0,1	0,60	0,03
50	*Urtica dioica*				0,1			0,1			0,1						0,1					0,1		0,50	0,025
51	*Alnus glutinosa subsp. barbata*						0,1					0,1	0,1						0,1					0,40	0,02
52	*Asplenium trichomanes*						0,1					0,1	0,1				0,1							0,40	0,02
53	*Geum urbanum*				0,1						0,1						0,1				0,1			0,40	0,02
54	*Vicia cracca subsp. stenophylla*					0,1								0,1		0,1		0,1						0,40	0,02
55	*Anthriscus nemorosa*				0,1					0,1										0,1				0,30	0,015
56	*Asplenium adiantum-nigrum*														0,1				0,1	0,1				0,30	0,015
57	*Campanula rapunculus subsp. lambertiana*						0,1												0,1			0,1		0,30	0,015

58	*Euphorbia amygdaloides subsp. amygdaloides*	0,1							0,1			0,1						0,30	0,015
59	*Lotus corniculatus var. corniculatus*			0,1							0,1			0,1				0,30	0,015
60	*Atropa belladonna*							0,1					0,1					0,20	0,01
61	*Crataegus monogyna var. monogyna*		0,1		0,1													0,20	0,01
62	*Grammosciadium platycarpum*														0,1		0,1	0,20	0,01
63	*Hypericum perforatum subsp. perforatum*						0,1					0,1						0,20	0,01
64	*Nasturtium officinale*					0,1			0,1									0,20	0,01
65	*Plantago lanceolata*		0,1														0,1	0,20	0,01
66	*Pyrus communis subsp. communis*		0,1							0,1								0,20	0,01
67	*Ranunculus repens*		0,1		0,1													0,20	0,01
68	*Rumex acetosella*					0,1									0,1			0,20	0,01
69	*Sorbus aucuparia*					0,1			0,1									0,20	0,01
70	*Sorbus torminalis var. torminalis*						0,1				0,1							0,20	0,01
71	*Symphytum asperum*			0,1					0,1									0,20	0,01
72	*Trachystemon orientalis*	0,1		0,1														0,20	0,01
73	*Echium vulgare subsp. vulgare*										0,1						0,1	0,15	0,0075
74	*Achillea millefolium*										0,1							0,10	0,005
75	*Ajuga orientalis*									0,1								0,10	0,005
76	*Cota tinctoria*						0,1											0,10	0,005
77	*Anthyllis vulneraria subsp. pulchella*										0,1							0,10	0,005
78	*Bellis perennis*																0,1	0,10	0,005
79	*Calystegia silvatica*							0,1										0,10	0,005
80	*Centaurea jacea*						0,1											0,10	0,005
81	*Securigera orientalis subsp. orientalis*		0,1															0,10	0,005
82	*Euphrasia pectinata*																0,1	0,10	0,005
83	*Helianthemum nummularium subsp. nummularium*										0,1							0,10	0,005
84	*Hypericum androsaemum*					0,1												0,10	0,005
85	*Mercurialis perennis*		0,1															0,10	0,005
86	*Muscari neglectum*											0,1						0,10	0,005
87	*Oenanthe pimpinelloides*						0,1											0,10	0,005

88	*Physalis alkekengi*						0,1															0,10	0,005
89	*Polygonatum multiflorum*			0,1																		0,10	0,005
90	*Polygonum bistorta subsp. carneum*																0,1					0,10	0,005
91	*Scabiosa columbaria subsp. columbaria var. columbaria*		0,1																			0,10	0,005
92	*Stachys annua subsp. annua var. annua*		0,1																			0,10	0,005
93	*Euonymus europaeus*										0,1											0,10	0,005
94	*Microthlaspi perfoliatum*		0,1																			0,10	0,005
95	*Trifolium pratense var. pratense*													0,1								0,10	0,005
96	*Veratrum album*		0,1																			0,10	0,005
97	*Veronica anagallis-aquatica*			0,1																		0,10	0,005
98	*Anthriscus sylvestris*																0,1					0,05	0,0025
99	*Cerinthe minor subsp. minor*		0,1																			0,05	0,0025
	Total Number of Species in Sample Areas	**14**	**22**	**28**	**19**	**17**	**16**	**21**	**23**	**16**	**28**	**21**	**18**	**27**	**22**	**21**	**24**	**17**	**17**	**29**	**22**		

Conflict of Interests

Authors declare that there is no conflict of interests.

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