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## An ethnobotanical review on medicinal plants of the Lamiaceae family in Turkey

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**Abstract:** Medicinal plants have been used by humans for the treatment of various diseases for thousands of years from past to present. Members of the Lamiaceae family are among the most preferred medicinal plants due to the wide variety of secondary components they contain, particularly essential oils. In this review, Master's and PhD theses and books based on ethnobotanical studies investigated between 1960 and 2021 as well as internationally recognized databases (PubMed, Scopus, Google Scholar, Web of Science, SciFinder, Springer and Elsevier) were used to determine the medicinal uses of Lamiaceae taxa among the people in Turkey. As a result of the study, it was found that a total of 221 taxa (192 species) belonging to 29 genera, 51 of which are endemic, have medicinal/therapeutic uses. The local names of these taxa, the usage which are used among the people, the diseases in which they are used, and the geographical regions given in the present study. The genera of taxa most commonly used for medicinal purposes by the local people are *Salvia* (37 taxa), *Sideritis* (25 taxa), *Stachys* (22 taxa), *Thymus* (16 taxa) and *Origanum* (13 taxa). It was observed that the most frequently used two methods while preparing these plants for use was infusion (61%), and decoction (24%). Studies conducted on National (TURK, BHP), Regional (EU) and International Pharmacopoeias (WHO) and various monographs (AHP, COMMISSION E, EMA, ESCOP, PDR) have revealed that there are 29 taxa included in these pharmacopoeias and monographs whose purpose of use are similar to the diseases that local people are trying to treat. Diseases that people use plants for therapeutic purposes are grouped into 12 categories. It was determined that these plants were widely used for therapeutic purposes in gastric disorders as well as otolaryngology and respiratory system diseases. This review briefly discusses whether some taxa commonly used by the local people in the treatment of diseases can be useful in the treatment of the disease in question, in the light of scientific studies.

**Key words:** Lamiaceae, medicinal plants, essential oil, pharmacopoeia, Turkey

### 1. Introduction

Plants play significant roles in human nutrition, shelter, clothing and treatment. The number of plant species known today is around 250–300 thousand. While human beings currently benefit from around 70,000 plant species, the number of plant species cultivated by humans is around 7000. Only 30 plants meet 90% of the world's nutritional needs (Arslan, 2014). Anatolia (Asian part of Turkey) has hosted many civilizations for thousands of years, from the Paleolithic era to the present day. There is a rich history lying underneath every corner of Anatolia. At the same time, Anatolia has been a region where many civilizations have developed due to its geographical location on the crossroads regulating world trade, and its geological, floral, faunal significance (Baytop, 1999; Zohary and Hopf, 2000).

The oldest report on archaeobotanical plant remains in Turkey was published by the Berliner botanist L. Wittmack in the 1880s. Wittmack conducted studies on field crops in Troy and Bozhöyük archaeological sites (Nesbitt, 1995). The earliest archaeological artifacts of early inhabitants of Anatolia known from the surveys and excavations related to Paleolithic communities. In the coastal area of the Mediterranean territory, long-term excavations conducted in caves such as Karain, Beldibi and Öküzeni. Yarımburgaz cave nearby İstanbul also provided important faunal remains and stone tools, but due to the fragile characteristics of the plant material we do have very limited information about their plant use (Martinoli and Jacomet, 2004; Taşkıran, 2018).

First systematic archaeobotanical studies were carried out in the 1960s, on sites such as Beycesultan, Çatalhöyük,

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and Hacilar. These early studies focused on known and recognizable carbonized domesticated crops. In the last few decades archaeobotanical studies were enriched by further developments in the flotation methods, and systematic excavation techniques. Archaeobotanical soil samples were collected systematically from all excavation units, while some units correspond to well-defined structures and contexts inside buildings, such as hearths, floors, pits and platforms; others come from activity, storage and working areas or middens (Ergun et al., 2018). As a result of systematic flotation, and comparisons with reference material; charred and/or mineralized seeds, fruit stones, and wood remains carefully studied, identified and listed. These lists do not only provide information on crops, but also wild and weedy plants that the humans gathered from the surrounding landscape of their settlements. Archaeobotanical studies are particularly important in Anatolia and the Near East, as this region is one of the main centres of domestication of wheat and legumes such as lentil and chickpea. DNA analysis indicated that all domesticated wheat varieties with a caryopsis (*Triticum monococcum* L. subsp. *monococcum*) are closely linked to the wild variety of the same species, documented in the Karacadağ Region (Zohary and Hopf, 2000; Ulaş, 2002).

Archaeobotanical information do not only give clues about food plants, but various uses as fodder, fuel, medicine, and aromatics. One of the early settlements of Southeastern Turkey, Körtik Tepe near Batman, dated to tenth millennium BC, provided well preserved plant remains and well exploited wild taxa, which also include *Lallemantia* L. species (Özkaya and Coşkun, 2009; Riehl et al, 2012). Another well-known site of Southeastern Turkey, Göbeklitepe near Urfa, provided monumental buildings with stone pillars, but only scarce plant material, which preliminary results indicate wild plant exploitation (Neef, 2003). Ongoing excavations and recent studies over pollen and high number of grinding and pounding stones of Göbeklitepe, indicated a very intense cereal food processing in early Neolithic levels of 10th millennium BC (Dietrich et al., 2019).

Long-term excavations in early Neolithic Aşıklı, Çatalhöyük and other sites provided detailed lists of cereals, legumes, grasses and various wild seeds. Within these lists, we find out that the Neolithic inhabitants of Aşıklı Höyük, utilised species such as *Teucrium* L., *Ajuga* L., *Ziziphora* L. and *Mentha* L. from Lamiaceae family during the 9th millennium BC (Ergun et al. 2018). Within the archaeobotanical reports of Çatalhöyük Neolithic levels, *Sideritis* L., *Teucrium*, and *Ziziphora* species are also available as part of the weed assemblage (Filipovic, 2014).

Medicinal plants have been used by humans for the treatment of various diseases for thousands of years from past to present. About 10,000 of about 270,000 terrestrial

plants classified taxonomically in the world are currently used for medicinal purposes (Kinghorn et al., 2011). Beneficial effects of certain botanicals on the body have been observed and these botanicals have been used primarily for promoting health and in treatments, resulting in an extensive and long history of use (Anton et al., 2019). The number of plants used for medicinal purposes in Anatolia is not known for certain, but there are some estimations between 500 and 1000, and approximately 200 medicinal and aromatic plants with export potential have been determined. In addition to archaeobotanical studies, earliest written documents of second millennium BC from Kültepe, Boğazköy, and other cuneiform tablet archives of Hittite settlements, mention plant names, which used in treatments, magic, and rituals (Ertem, 1987; Öz Kiriş, 2014).

The richness of the biocultural heritage of Turkey in terms of medicinal plants is increasing even more, thanks to the increasing number of ethnobotanical studies (Baytop, 1999; Tuzlacı, 2006; Faydaoğlu and Sürücüoğlu, 2011; Ertuğ 2014).

Ethnobotany is the study of the direct interaction between plants and man in his culture. Man's preliminary interest in plants started from his need for food, shelter, protection and then his attention shifted to the remedies for injuries and diseases (Inayat et al., 2019; Aziz et al., 2021).

The ethnobotany of the Old World Labiatae covers the different fields involved in the interaction between Labiatae and man: uses for food (vegetables, tubers, edible oils, flavourings and beverages), perfumery and cosmetics, dyes, toxins, medicines (nervous, circulatory, respiratory, digestive, reproductive systems, etc.), hallucinating drugs, insecticides, insect repellents and ornamentals (Rivera-Núñez and Castro, 1992a). One of the most important plant families used for medicinal purposes among the people from ancient times to the present is the Lamiaceae family (Rivera-Núñez and Castro, 1992b). In the light of archaeological excavations and ancient texts, we know that many species belonging to the Lamiaceae family were cultivated during the Ancient Greek and Roman periods. A Greek physician, pharmacologist, native of Anazarbus in Kilikia, Dioscorides' *Materia Medica* provides information about the use of 40 Labiatae/Lamiaceae species in the Roman period (Rivera-Núñez and Castro, 1992a).

Lamiaceae, the sixth largest Angiosperm family, contains more than 245 genera and 7886 species, and distributed worldwide. It includes many economically and medicinally important species (IPNI, 2020; Zhao et al., 2021). In Lamiaceae, Harley et al. (2004) recognized seven subfamilies as Ajugoideae, Lamioideae, Nepetoideae, Prostantheroideae, Scutellarioideae, Symphorematoideae and Viticoideae. Recently, five new additional

subfamilies have been described, namely Cymarioideae, Peronematoideae, Premnoideae, Callicarpoideae, and Tectonoideae (Li et al., 2016; Li and Olmstead, 2017). In the family, the largest genera are *Salvia* L. (945 species), *Scutellaria* L. (360 species), *Stachys* L. (300 species), *Plectranthus* L'Hér. (300 species), *Hyptis* Jacq. (280 species), *Teucrium* (250 species), *Vitex* L. (250 species), *Thymus* L. (220 species) and *Nepeta* L. (200 species) (Harley et al., 2004). In Turkey, there are five subfamilies as Ajugoideae, Lamioideae, Nepetoideae, Scutellarioideae, and Viticoideae (Harley et al., 2004; Li et al., 2016; Celep and Dirmenci, 2017; Li and Olmstead, 2017).

Lamiaceae is the third largest family based on the taxon number and fourth largest family based on the species number in Turkey. The family has 48 genera and 782 taxa (603 species, 179 subspecies and varieties), 346 taxa (271 species, 75 subspecies and varieties) of which are endemic (ca. 44%) (data updated 1th February 2017) in the country. There are also 23 hybrid species, 19 of which are endemic (82%). The results proven that Turkey is one of the centres of diversity for Lamiaceae in the Old World. In

addition, Turkey has about 10% of all Lamiaceae members in the World. The largest five genera in the country based on the taxon number are *Stachys* (118 taxa), *Salvia* L. (107 taxa), *Sideritis* (53 taxa), *Phlomis* L. (53 taxa) and *Teucrium* (48 taxa). According to taxon number, five genera with the highest endemism ratio are *Dorystaechas* Boiss. & Heldr. ex Benth. (1 taxon, 100%), *Lophanthus* Adans. (1 taxon, 100%), *Sideritis* (53 taxa, 75%), *Marrubium* L. (27 taxa, 59%), and *Phlomis* L. (53 taxa, 57%) (Table 1). In addition, there are two monotypic genera in Turkey as *Dorystaechas* and *Pentapleura* Hand.-Mazz (Güner et al. 2012; Bizimbitkiler, 2013; Celep and Dirmenci, 2017).

Turkey sits on the junction of three phytogeographic regions with highly diverse climate and the other ecologic features. Phytogeographic distribution of Turkish Lamiaceae taxa are 293 taxa in the Mediterranean (37.4%), 267 taxa in the Irano-Turanian (36.7%), 90 taxa in the Euro-Siberian (Circumboreal) phytogeographic region, and 112 taxa in Unknown or Multiregional (14.3%) phytogeographical elements. In the Mediterranean phytogeographic region 61% of the taxa, in the Irano-

**Table 1.** The genus and taxa numbers with the highest endemism rate in Turkey (Celep and Dirmenci, 2017).

No	Genus	Taxon number		Endemism ratio (%)
		Total taxon	Endemic taxon	
1	<i>Dorystaechas</i> Boiss. & Heldr. ex Benth.	1	1	100
2	<i>Lophanthus</i> Adans.	1	1	100
3	<i>Sideritis</i> L.	53	40	75
4	<i>Marrubium</i> L.	27	16	59
5	<i>Phlomis</i> L.	53	30	57
6	<i>Salvia</i> L.	107	58	54
7	<i>Ballota</i> L.	17	9	53
8	<i>Origanum</i> L.	32	15	47
9	<i>Stachys</i> L.	118	52	44
10	<i>Nepeta</i> L.	45	19	42
11	<i>Scutellaria</i> L.	40	16	40
12	<i>Thymus</i> L.	44	17	39
13	<i>Clinopodium</i> L.	32	12	38
14	<i>Micromeria</i> Benth.	14	5	36
15	<i>Cyclotrichium</i> (Boiss.) Manden. & Scheng.	6	2	33
16	<i>Ajuga</i> L.	22	7	32
17	<i>Satureja</i> L.	16	5	31
18	<i>Teucrium</i> L.	48	14	29
19	<i>Thymbra</i> L.	5	1	20
20	<i>Dracocephalum</i> L.	5	1	20

Turanian phytogeographic region 50% of the taxa, and in the Euro-Siberian (Circumboreal) phytogeographic region 13% of the taxa are endemic. Some endemic taxa are widely distributed in the country, so their phytogeographic elements are not clearly defined, the endemism ratio of these taxa are 13%. In time, species of Lamiaceae genera are migrated from one phytogeographic region to another one and specialised in specific habitats in the country. *Stachys*, *Salvia*, *Sideritis*, *Phlomis*, *Teucrium*, *Nepeta*, *Thymus*, *Scutellaria*, *Origanum* and *Clinopodium* are species rich genera in Turkey (Table 1). These genera have also quite high endemism ratio. Due to high taxon number and endemism ratio, different habitats, climates and soil types, high altitudinal range and diverse pollinators, it is clear that Turkey is a very good example for evolution and speciation of Lamiaceae family in the Old World (Celep and Dirmenci, 2017).

The oldest written records about the use of Lamiaceae members as medicine in Anatolia belong to Dioscorides. In his work called *De Materia Medica*, Dioscorides included the medicinal use of 107 Lamiaceae members (Dioscorides et al., 2000). Baytop (1999) included the medicinal use of 74 taxa belonging to the Lamiaceae family in his work titled “Türkiyede Bitkilerle Tedavi”, which is renowned as one of the most comprehensive ethno-medicinal studies. He mentioned that the most commonly used genera are *Salvia*, *Sideritis* and *Origanum* (Baytop 1999). A total of 52 taxa have been approved for use as medicinal drugs in world pharmacopoeias and various other pharmacopoeias (WHO, 2010; EMA, 2012; PDR, 2014).

Due to the adverse effects of synthetic drugs in the body, interest in natural treatments and medicinal plants is increasing day by day. This study explains plant taxa, which are traditionally used in the treatment of various diseases, particularly gastro-intestinal and microbial diseases. This review also enlists the medicinal uses of taxa belonging to the Lamiaceae family in detail from Turkey. The study further explains the parts of the taxa that were found to be used for medicinal purposes, their patterns and purposes of use; the distribution according to phytogeographic regions and the geographical regions where it is used are also exhibited in the table. We hope that this study will be a significant reference source for further scientific studies to be conducted on Lamiaceae family, particularly for ethnopharmacological, ethnozoological and ethnomedicinal studies.

## 2. Methodology

### 2.1. Literature review

Books published as well as Master's and PhD theses written based on ethnobotanical studies investigated between 1960 and 2021 for the purpose to determine the medicinal uses of Lamiaceae taxa by the local people in Turkey as

well as internationally recognized databases (PubMed, Scopus, Google Scholar, Web of Science, SciFinder, Springer and Elsevier) were searched while preparing this review. Data were searched in search engines by entering various words and their combinations such as “ethnobotany”, “ethnobotany + Turkey”, “ethnobotanical + Turkey”, “ethnopharmacology + Turkey”, “ethnobotany + Lamiaceae + Turkey”, “Lamiaceae + medicinal plants”. Literature review have also revealed therapeutic uses of Lamiaceae taxa on National (TURK (2016, 2018), BHP, 2009), Regional (EU) and International pharmacopoeias (WHO) and various monographs (AHP, COMMISSION E, EMA, ESCOP, PDR). Current names of plant taxa were verified using IPNI (2020). Turkish names of taxa were provided in accordance with Güner et al. (2012).

### 2.2. Data analysis

The significant essential oil compounds of Turkish Lamiaceae taxa are given in Table 2. The scientific (Latin name), Turkish and local names, parts used, patterns of use and phytogeographical regions of the plants found to be used for medicinal purposes in ethnobotanical studies are presented in Table 3 in alphabetical order (according to their scientific names). In addition, taxa that are used for medicinal purposes in our country and included in pharmacopoeia and monographs are given in Table 4. The genera with ethnobotanical use and their taxa numbers, the genera with the highest number of taxa, their distribution by phytogeographic regions, usage patterns, organs used, symptoms and diseases to which they are applied, and endemic taxa are presented graphically (Figures 1–4).

## 3. Phytochemistry of Turkish Lamiaceae taxa

The phytochemistry of Lamiaceae is very complex because several groups and subgroups coexist in it, and each of them has its own phytochemical characteristics and peculiarities. As first differentiation within the family, species belonging to Lamiaceae can be distinguished into two major groups that both produce secondary metabolites: the first one comprises all those species that are known to mainly produce volatile terpenoids, found in the essential oil, whereas the second one comprises all those species that are known to mainly produce nonvolatile metabolites in the polar fraction and are poor essential oil producers (Frezza et al., 2019). The phytochemicals observed in the Turkish Lamiaceae family are mainly composed of terpenoids, phenols, iridoid glycosides, tannins, and fatty acids.

### 3.1. Terpenoids

Terpenoids, or terpenes, comprise one of the most important groups of active compounds in plants with over 20,000 known structures. The Lamiaceae are a rich source of terpenoids which possess antiinsect, antibacterial and antifungal activity. Terpenoid compounds the most



**Table 2.** Essential oil components of Lamiaceae taxa in Turkey (Baser et al., 1998; Baser and Kirimer, 2006; Başer and Kirimer, 2018; Frezze et al., 2019).

Genus	Main compounds
<i>Ajuga</i>	1-octen-3-ol, caryophyllene oxide, cubenol, dodecanoic a, germacrene-D, heptacosane hexahydrofarnesyl acetone, Linalool, n-hexadecanoic acid, nonacosane, p-cymene, phytol tetradecanoic acid, viridiflorol, $\alpha$ -phellandrene, $\alpha$ -pinene, $\beta$ -pinene, $\beta$ -terpineol
<i>Ballota</i>	bisabolene, caryophyllene oxide, germacrene D, hexadecanoic acid, hexenal, $\beta$ -caryophyllene
<i>Clinopodium</i>	caryophyllene, caryophylleneoxide, cis-piperitone epoxide, cis-piperitone oxide isomenthone, limonene, menthone, piperitenone oxide, pulegone, terpinen-4-ol, trans-piperitone oxide,
<i>Cyclotrichium</i>	isomenthol, isomenthone, pulegone
<i>Dorystaechas</i>	1,8-cineole, borneol, camphor
<i>Hyssopus</i>	isopinocampnone, pinocampnone pinocarvone, terpinene-4-ol, $\beta$ -myrcenepinocarvone, $\beta$ -phellandrene, $\beta$ -pinene
<i>Lamium</i>	4-hydroxy-4-methyl-2-pentanone, 6,10,14-trimethyl-2-pentadecanone, hexadecanoic acid, hexahydrofarnesyl acetone, methyl hexadecanoate, methyl linolenate, n-tetracosane, octadecanol, pentanol, trans-phytol
<i>Lavandula</i>	linalool, linalyl acetate, isoborneol, $\alpha$ -fenchone, 1,8-cineole, camphor, myrtenyl acetate, $\alpha$ -thujone, L-camphor, T-cadinol, borneol, $\delta$ -3-carene, lavandulyl acetate
<i>Leonurus</i>	epi-cedrol, dehydro-1,8-cineole, germacrene D, spathulenol, $\alpha$ -humulene
<i>Marrubium</i>	$\beta$ -farnesene, $\beta$ -caryophyllene, hexadecanoic acid, hexahydrofarnesyl asetone, spathulenol, $\beta$ -caryophyllene
<i>Melissa</i>	citral, citronellal, geranial, linalool, neral
<i>Mentha</i>	1,8-cineole, carvone, cis-piperitone oxide, dihydrocarvone, eucalyptol, isomenthone limonene, menthofuran, menthol, menthone, menthyl acetate, neomenthol, piperitone, piperitenone oxide, pulegone, $\alpha$ -pinene, $\beta$ -caryophyllene,
<i>Micromeria</i>	isomenthone, piperitenone, piperitone piperitone oxide, pulegone, $\beta$ -caryophyllene, $\beta$ -pinene
<i>Nepeta</i>	1,8-cineole, borneol, camphor, eucalyptol, germacrene D, linalool, naphthalenone, nepetalactone, p-cymene, sabinene, T-cadinol
<i>Ocimum</i>	1,8-cineole, apiole, estragole, eugenol, limonene, linalool, methyl chavicol, methyl cinnamate, p-cymene, $\beta$ -sesquiphellandrene, $\gamma$ -cadinene
<i>Origanum</i>	carvacrol, $\gamma$ -terpinene, linalool, myrcene, p-cymene, thymol
<i>Phlomis</i>	bicyclogermacrene, germacrene D, heptacosane, hexadecanoic acid, hexahydrofarnesyl acetone, hexenal, limonene, manoyl oxide, pentacosane, spathulenol, vinyl amyl carbinol $\alpha$ -cedrene, $\alpha$ -cubebene, $\alpha$ -curcumene, $\alpha$ -eudesmol, $\alpha$ -pinene, $\beta$ -caryophyllene, $\beta$ -caryophyllene, $\beta$ -curcumene, $\beta$ -eudesmol, $\beta$ -farnesene.
<i>Prunella</i>	decane, dodecane, ethyl caprinate, germacrone, myristic acid, nonacosane, spathulenol, squalene, tetradecane, viridiflorol
<i>Rosmarinus</i>	1,8-cineole, borneol, bornyl acetate, camphene, camphor, verbenone, $\alpha$ -pinene, $\alpha$ -terpineol
<i>Salvia</i>	1,8-cineole, borneol, camphene, camphor, germacrene-D, ledol, p-cymene, spathulenol, $\alpha$ / $\beta$ thujone, viridiflorol,, $\alpha$ -copaene, $\alpha$ -cubebene, $\alpha$ -limonene, $\alpha$ -pinene,, $\alpha$ -terpineol, $\beta$ -myrcene, $\beta$ -pinene, $\delta$ -cadinene
<i>Satureja</i>	carvacrol, cyclohexanone, $\gamma$ -terpinene, p-cymene, phenol-2-methyl, thymol
<i>Scutellaria</i>	bicyclogermacrene, caryophyllene oxide, germacrene D, hexadecanoic acid, palmito- $\gamma$ -lactone, tetradecanoic acid, $\beta$ -caryophyllene
<i>Sideritis</i>	1-octen-3-ol,3-carene, $\alpha$ -copaene, $\beta$ -bourbonene bicyclogermacrene, carvacrol, caryophyllene oxide, germacrene D, limonene, linalool, myrcene, naphthalene, nonanal, sabinene, spathulenol, valeranone, $\alpha$ -bisabolol, $\alpha$ -cadinene, $\alpha$ -pinene, $\beta$ -caryophyllene, $\beta$ -farnesene, $\beta$ -phellandrene, $\beta$ -pinene
<i>Stachys</i>	benzaldehyde, bicyclogermacrene, carvacrol, dodecanoic acid, farnesyl acetate, geranyl acetate, germacrene D, hexadecanoic acid, limonene, linalool, linalyl acetate, phytol, sabinene, spathulenol, thymoquinone, valeronone, verbenol, $\alpha$ -bisabolol, $\alpha$ -cadinene, $\alpha$ -cadinol, $\alpha$ -copaene, $\alpha$ -ledrene, $\alpha$ -pinene, $\alpha$ -terpineol, $\beta$ -bourbonene, $\beta$ -caryophyllene, $\beta$ -myrcene, $\beta$ -ocimene, $\beta$ -phellandrene, $\beta$ -pinene, $\gamma$ -muurolene

Table 2. (Continued).

<i>Teucrium</i>	2-methyl cumarone, bicyclogermacrene, caryophyllene oxide, germacrene D, hexadecanoic acid, nonacosane, $\alpha$ -humulene, $\alpha$ -pinene, $\beta$ -caryophyllene, $\beta$ -pinene
<i>Thymbra</i>	carvacrol, $\gamma$ -terpinene, p-cymene, thymol, $\alpha$ -terpinene
<i>Thymus</i>	1,8-cineole, borneol, carvacrol, carvacrol methyl etherl, cymene, farnesol, $\gamma$ -terpinen, limonene, linalool, thymol, $\alpha$ -pinene
<i>Vitex</i>	1,8-cineole, bicyclogermacrene, caryophyllene, myrcene, sabinene, $\alpha$ -pinene, $\alpha$ -terpinyl acetate, $\beta$ -farnesene
<i>Ziziphora</i>	1,8-cineole, limonene, piperitone, pulegone, $\beta$ -pinene

observed in Turkish Lamiaceae taxa can be classified as monoterpene (essential oils), diterpene, sesquiterpene and triterpene. Monoterpenes are the major class of chemical compounds found in essential oils. Essential oils are odorous principles stored in special plant cell glands, glandular hairs, oil ducts or resin ducts—situated in any part of a plant or its exudations. These oils have antiseptic, antibacterial, antiviral and antifungal effects on the human body (Pengelly, 2004; Topçu et al., 2004; Brand et al., 2015; Puškárová et al., 2017). The essential oil of Lamiaceae taxa is particularly rich in volatile monoterpenes, sesquiterpenes, and diterpenes. Among monoterpenes, the main compounds are  $\alpha$ - pinene,  $\beta$ - pinene, 1,8-cineole, menthol, limonene, and gamma-terpinene (Frezza et al., 2019). Two monoterpenes of the Lamiaceae that have attracted much attention are thymol and carvacrol which are often found in *Thymus*, *Origanum*, *Satureja* and *Thymbra*. These two phenolic monoterpenes are especially known for their antiherbivore, antimicrobial, and antioxidant activities (Tümen et al., 1998; Kılıç, 2006; Naghdi et al., 2017). One of the important monoterpene compounds is pulegone. This compound is frequently observed in *Mentha*, *Ziziphora*, *Clinopodium* and *Cyclotrichium* taxa (Baser et al., 1994; Baser et al., 1996; Baser et al., 1998; Oumzil et al., 2002; Dawoud and Shebab, 2019). The significant essential oil compounds of Turkish Lamiaceae taxa are given in Table 2. Sesquiterpenes are represented by germacrene D, caryophyllene, cadinen, farnesene and spathulenol as main compounds. These components are found in more or less quantities in all taxa of the Lamiaceae family (Frezza et al., 2019). Diterpenes show antimicrobial, antifungal and antiviral activities such as monoterpene and sesquiterpene. Diterpenes are more common in *Ajuga*, *Salvia*, *Stachys*, *Teucrium*, *Marrubium* and *Sideritis* than other genera (Bisio et al., 2015; Frezza et al., 2019).

### 3.2. Phenols

Phenols are one of the largest groups of secondary plant compounds. They are aromatic alcohols since the hydroxyl group is always attached to a benzene ring. General properties of simple phenols are bactericidal, antiseptic and anthelmintic. Phenol itself is a standard for

other antimicrobial agents. The simplest phenols are C6 (Pengelly, 2004). Phenols can be divided into five group, including phenylpropanoids, flavonoids, lignans, phenolic acids, stilbenes, and coumarins (Pengelly, 2004; Deng and Lu, 2017). All phenolic compounds as they possess aromatic rings linked to hydroxyl groups are potent antioxidants with usually high redox potentials (Hýsková and Ryšlavá, 2019). Phenols found in Turkish Lamiaceae taxa mostly consist of phenylpropanoids, flavonoids, lignans, and coumarins.

#### 3.2.1 Phenylpropanoids

Phenylpropanoids are a large class of secondary metabolites synthesized from primary metabolites, phenylalanine or tyrosine, through a series of enzymatic reactions. A group of possible taxonomic significance in the family are the caffeoyl esters. The most important are the hydroxycinnamic acids: caffeic acid, *p*-coumaric acid, ferulic acid and sinapic acid. Caffeic acid, rosmarinic acid, chlorogenic acid, and lithospermic acid are the most common phenylpropanoids in Lamiaceae taxa in our country (Richardson, 1992).

#### 3.2.2 Flavonoids

Flavonoids are mainly 15- C compounds found generally throughout the plant kingdom. These compounds occur as yellow and white plant pigments. Flavonoids have been ascribed positive effects on human and animal health and the current interest is for disease therapy and chemoprevention. Experiments have proven flavonoids affect the heart and circulatory system and strengthen the capillaries. They are also known to have synergistic effects with ascorbic acid. Their protective actions are mainly due to membrane stabilising and antioxidant effects. Therapeutic effects of flavonoids such as antioxidant, antiviral, hepatoprotective, antiatheromatous, antiinflammatory and antihypertensive have been widely reported, though it must be remembered these effects are dependent on their degree of absorption (Pengelly, 2004; Rehan et al., 2014). Flavonoids are subdivided into flavones, flavonols, flavanones, flavanonols, flavanols or catechins, anthocyanins and chalcones (Panche et al., 2016). The main structure of flavonoids in the Lamiaceae family is flavones



Table 3. Lamiaceae taxa used for medicinal purposes in Turkey.

Taxon number	Scientific name	Turkish name	Vernacular name's	Used parts	Utilization methods **	Use	Recorded literature uses	Regions	Phytogeographical region
1	<i>Ajuga chamaepitys</i> (L.) Schreb. subsp. <i>chita</i> (Schreb.) Arcang.	acıgıcı	Bodur ot, bozca ot, kokar ot, mayasıl otu, yer çanı, yermeşesi	Aerial parts	Crs, Dec, Inf	Int. (analgesic, tonic); Ext. (hemorrhoid, wound healing)	Antalya (Fakir et al., 2016); Aladağlar (Özdemir and Alpınar, 2015); Andirin (Demirci and Özhatay, 2012); East Anatolia (Altundag and Ozturk, 2011); Osmanieli (Koyuncu et al., 2010)	Central Anatolia, East Anatolia, Mediterranean, Marmara	Unknown
2	<i>Ajuga chamaepitys</i> (L.) Schreb. subsp. <i>laevigata</i> (Banks & Sol.) P.H.Davis	kelmayasıl	Mayasıl otu, vaş basur	Aerial parts	Dec	Ext. (hemorrhoid)	Bingöl (Polat, 2019); Hatay, (Güzel et al., 2015)	East Anatolia, Mediterranean	Irano-Turanian
3	<i>Ajuga laxmannii</i> (Murray) Benth.	bozmayasıl	Mayasıl otu	Aerial parts	Inf, Comp	Ext. (hemorrhoid, skin diseases)	Osmanieli (Koyuncu et al., 2010).	Marmara	Euro-Siberian
4	<i>Ajuga orientalis</i> L.	dağmayasılı	Mayasıl otu	Aerial parts	Comp	Ext. (skin diseases)	Osmanieli (Koyuncu et al., 2010).	Marmara	Unknown
5	<i>Ballota acetabulosa</i> (L.) Benth.	hoşnemen	Köpek sigi	Leaves	Crs, Dec, Inf	Ext. (hemorrhoid)	Maldan (Akyol and Altan, 2013).	Aegean	East Mediterranean
6	<i>Ballota nigra</i> L. subsp. <i>anatolica</i> P.H.Davis	gripotu	Anotu, balık otu, yalancı isrgan, oğul otu, köpek otu, köpek sigeni	Leaves	Dec, Inf	Int. (analgesic, antihypertensive, asthma, burnis, cold, high cholesterol, jaundice, respiratory tract problem, urinary diseases); Ext. (wound healing)	East Anatolia (Altundag and Ozturk, 2011); Gönen (Tuzlaci and Aymaz, 2001); Malatya (Tetik et al., 2013); Manisa (Ugurlu and Secmen, 2008); Osmanieli	Aegean, East Anatolia, Marmara	Irano-Turanian

Table 3. (Continued).

7	<i>Clinopodium acinos</i> (L.) Kuntze	kayrakçayı	Kayrak çayı	Aerial parts	Dec	Int. (colds and flu, cough)	(Koyuncu et al., 2010). Kırklareli (Kültür, 2007).	Marmara	Euro-Siberian
8	<i>Clinopodium congestum</i> (Boiss. & Hausskn. ex Boiss.) Kuntze	başlıfesteğen	Gihaye paluk	Aerial parts	Dec, Inf	Int. (cold and flu, cough, respiratory tract problem)	Bircik (Akan et al., 2008); Edremit, (Polat and Satlı, 2012).	Aegean, Marmara, Southeastern	Irano-Turanian
9	<b><i>Clinopodium dolichodontum</i> (P.H.Davis) Braucher &amp; Heubl*</b>	dişlifesleğen	Kaya yarpuzu	Aerial parts	oint	Ext. (dyspnea, eye ailments)	Gaziantep (Şivga and Seçmen, 2009).	Southeastern Anatolia	East Mediterranean
10	<i>Clinopodium graveolens</i> (M.Bieb.) Kuntze subsp. <i>graveolens</i>	fliskin	Güvercin otu, kayrak çayı	Aerial parts	Inf	Int. (colds and flu, common cold)	Osmaneli (Koyuncu et al., 2010)	Marmara	Unknown
11	<i>Clinopodium nepeta</i> (L.) Kuntze subsp. <i>glandulosum</i> (Reich.) Govaerts	sümüklüfesteğen	Yılan otu	Aerial parts	Fresh (raw)	Ext. (snakebites)	Çatalca (Genç and Özhatay, 2006).	Marmara	Euro-Siberian
12	<i>Clinopodium serpyllifolium</i> (M.Bieb.) Kuntze subsp. <i>barbatum</i> (P.H.Davis) Bräucher	naneliçay	Taş nanesi, viks otu	Aerial parts	Dec	Int. (colic spasms); Ext. (antiseptic; wound healing)	Antakya (Güzeli et al., 2015).	Mediterranean	Mediterranean
13	<i>Clinopodium serpyllifolium</i> (M.Bieb.) Kuntze subsp. <i>brachycalyx</i> (P.H.Davis) Bräucher	şarşarçayı	Taş nanesi	Aerial parts	Inf	Int. (diuretic, antiseptic, stomachache)	Selvi et al., 2014	Mediterranean	Mediterranean
14	<i>Clinopodium serpyllifolium</i> (M.Bieb.) subsp. <i>fruticosum</i> (L.) Bräucher	unknown	Çemen, dağ kekiği	Aerial parts	Inf	Int. (cough, stomachache)	Aziye (Karakaya et al., 2020).	Mediterranean	Mediterranean
15	<i>Clinopodium vulgare</i> L. subsp. <i>vulgare</i>	ya banifeseleğen	Balıbaba	Aerial parts	Comp	Ext. (stomachache)	Izmit, (Kızılarşan and Özhatay 2012)	Marmara	Unknown
16	<b><i>Cyclotrichium niveum</i> (Boiss.) Manden &amp; Scheng.*</b>	külotu	Nane otu	Leaves	Inf	Int. (asthma, fungal infection, respiratory tract problem)	Malatya (Terik et al., 2013).	East Anatolia	Irano-Turanian
17	<i>Cyclotrichium origanifolium</i> (Labill.) Manden & Scheng	dağnanesi	Mentol, mentolnane, tüter ot	Leaves	Inf	Int. (abdominal pain, respiratory tract problem, urinary inflammations)	Aladağlar (Özdemir and Alpmar, 2015); Sarıveliler (Bağcı et al., 2016).	Central Anatolia	Mediterranean
18	<i>Cyclotrichium leucotrichum</i> (Stapf ex Rech.f.) Leblebici	karçekme	Punge tata	Leaves	Inf	Int. (asthma)	Batman (Bulut et al., 2019).	East Anatolia	Irano-Turanian
19	<b><i>Dorysmaechus hastata</i> Boiss. &amp; Heldr. ex Benth.*</b>	Devren kekiği	Unknown	Aerial parts	Dec	Int. (diuretic)	Celep and Dirmenci, 2017	West Mediterranean	East Mediterranean



Table 3. (Continued).

30	<i>Leonurus cardiaca</i> L.	aslan kuyruğu	Unknown	Aerial parts	Inf, pol.	Int. (cardiotonic); Ext. (wound healing)	2016); Karaisalı (Güneş et al., 2017); Şahin et al., 2019.	Marmara	Euro-Siberian
31	<i>Leonurus glaucescens</i> Bunge	boz aslan kuyruğu	Öküzguyruğu	Aerial parts	Inf, pol.	Int. (cardiotonic); Ext. (wound healing)	Celep and Dirmenci, 2017	East Anatolia	Irano-Turanian
32	<i>Marrubium astracanicum</i> Jacq. subsp. <i>astracanicum</i>	moryayotu	Dağ çayı	Aerial parts	Inf	Int. (antipyretic, common cold)	East Anatolia (Altundag and Öztürk, 2011).	East Anatolia	Unknown
33	<i>Marrubium catarifolium</i> Desr.	boz yayotu	Boz ot, acı ot	Aerial parts	Dec	Int. (kidney and menstruation regulator)	Kars (Güneş and Özhataç, 2011).	East Anatolia	Unknown
34	<i>Marrubium cuneatum</i> Banks & Sol.	elkurtaran	No name	Aerial parts	Inf	Int. (abdominal pain)	Malatya (Tetik et al., 2013).	East Anatolia	Irano-Turanian
35	<i>Marrubium globosum</i> Montbret & Aucher ex Benth. subsp. <i>globosum</i> *	boz caboğum	Amel otu, beyaz şabla, boz ot	Aerial parts	Inf	Int. (Colic, diuretic, analgesic)	Aladağlar (Özdemir and Alpınar, 2015); Antalya (Fakir et al., 2016).	Central Anatolia, Mediterranean	Irano-Turanian
36	<i>Marrubium parviflorum</i> Fisch. & C.A.Mey. subsp. <i>oligodon</i> (Boiss.) <b>Seybold</b> *	küllübozotu	Dağ çayı	Aerial parts	Inf	Int. (antipyretic, colds and flu)	East Anatolia, (Altundag and Öztürk, 2011).	East Anatolia	Irano-Turanian
37	<i>Marrubium parviflorum</i> Fisch. & C.A.Mey. subsp. <i>parviflorum</i>	bozotu	Köpek otu	Aerial parts	Inf	Int. (expectorant, diuretic)	Osmanlı (Koyuncu et al., 2010).	Marmara	Irano-Turanian
38	<i>Marrubium peregrinum</i> L.	yabaniderme	Boz ot	Aerial parts	Inf	Int. (expectorant, diuretic)	Osmanlı (Koyuncu et al., 2010).	Marmara	Unknown
39	<i>Marrubium rotundifolium</i> Boiss.*	kalartopu	Bozot, şeref kekiği, yabani calba	Aerial parts	Ca, Inf	Int. (carminative, colds and flu, dyspepsia); Ext. (intestinal spasm)	Sarıgöl (Manisa), (Sargın et al., 2015a).	Aegean	Mediterranean
40	<i>Marrubium vulgare</i> L.	karaderme	Boz ot, dağ çayı	Aerial parts, flowers	Inf	Int. (expectorant, carminative, diuretic)	Edremit (Polat and Satlı, 2012); Osmanlı (Koyuncu et al., 2010).	Aegean, Marmara	Mediterranean
41	<i>Melissa officinalis</i> L. subsp. <i>officinalis</i>	oğulotu	Ari otu, limon otu, limon	Leaves	Dec, fresh (raw), Inf	Int. (cardiovascular diseases, colds and flu, diabetes, earache, embolism,	Antalya, (Fakir et al., 2016); Ayvack	Aegean, Black Sea, East	Blacksea



Table 3. (Continued).

46	<i>Mentha longifolia</i> (L.) L. subsp. <i>longifolia</i>	pünk	Eşek nanesi, köpek nanesi, nane, pune, puni, pung, püng	Leaves	Dec, Inf	Int. (abdominal ache, colds and flu); Ext. (hemorrhoid, rheumatism)	Turkoglu, 2010); Solhan (Polat et al., 2013). Akçakoca (Doğru Koca and Yıldırım, 2000); Aladağlar, (Özdemir and Alpınar, 2015); Bingöl, (Polat et al., 2012); Çatak, (Mükemre et al., 2015); Edremit, (Polat and Satıl, 2012); Geçitli, (Kaval et al., 2014); (Yeşil and Inal, 2019).	Aegean, Black Sea, Central Anatolia, East Anatolia, Marmara	Unknown
47	<i>Mentha pulegium</i> L.	yarpuz	Nane, filskin, mentollü adaçayı, yarpuz	Flowers Aerial parts	Dec, Inf	Int. (appetizer, colds and flu, gallbladder, menstruation, stomachache, vulnerary)	Antalya, (Fakir et al., 2016); East Anatolia (Altundag and Ozturk, 2011); Edremit (Polat and Satıl, 2012); Esiye, (Polat et al., 2015b); Osmanieli (Koyuncu et al., 2010).	Aegean, Marmara, Black Sea, East Anatolia, Mediterranean	Unknown
48	<i>Mentha spicata</i> L. subsp. <i>condensata</i> (Briq.) Greuter & Burdet	kıvrıknane	Yabani nane, yarpuz	Leaves	Inf	Int. (headache, hypertension, respiratory tract problem)	Osmanieli (Koyuncu et al., 2010); Sarıveliler (Bağcı et al., 2016).	Central Anatolia, Marmara	Mediterranean
49	<i>Mentha spicata</i> L. subsp. <i>spicata</i>	eşeknanesi	Nane, eşek nanesi, köpek nanesi, narpuz, pune	Leaves, Aerial parts	Dec, Inf	Int. (antispasmodic, colds and flu, hemorrhoid, respiratory tract problem, stomachache)	Akçakoca (Doğru Koca and Yıldırım, 2000); Maden (Çakılcıoğlu et al.,	Black Sea, East Anatolia, Mediterranean	Unknown



Table 3. (Continued).

50	<i>Mentha x piperita</i> L.	nane	Nane	Leaves	Dec	Int. (antispasmodic, colds and flu, digestive, halitosis, kidney diseases, nausea, stomach diseases)	Malatya (Tetik et al., 2013); Karaisalı (Güneş et al., 2017); Sivrice (Çaklıoğlu and Turkoglu, 2010). Malatya (Tetik et al., 2013); Manisa (Uğurlu and Secmen, 2008); Ordu (Türkan et al., 2006); Ürgüp, (Tuzlacı and Şenkardeş, 2011).	Aegean, Black Sea, East Anatolia, Central Anatolia	Unknown
51	<i>Micromeria cristata</i> (Hampe) Griseb. subsp. <i>orientalis</i> P.H.Davis	kayaboyumcuğu	Kekik	Aerial parts	Dec.	Int. (bronchitis, common colds, diabetes, headache, stomachache, kidney diseases, prostrate)	Kelkit, (Korkmaz and Karakurt, 2015)	East Black Sea	Irano-Turanian
52	<i>Micromeria juliana</i> (L.) Benth. ex Rchb.	topukçayı	Kekik, taş kekiği	Aerial parts	Inf	Int. (stomachache)	Bayramiç, (Bulut and Tuzlacı, 2009).	Marmara	Mediterranean
53	<i>Micromeria myrtilifolia</i> Boiss. & Hohen.	boğumluçay	Dağçayı, kıkıboğum, yeşil çay	Aerial parts	Inf	Int. (colds and flu, stomachache, throat disease)	Adana, (Everest and Öztürk, 2005); Bayramiç, (Bulut and Tuzlacı, 2009); Aydıncık (Mersin), (Sargin et al., 2015b); Osmaniye, (Koyuncu et al., 2010).	Marmara, Mediterranean	Unknown
54	<i>Nepeta betonicifolia</i> C.A.Mey. subsp. <i>betonicifolia</i>	sivripisikotu	Hakiki nojda, nojda	Aerial parts	Inf, Pow	Int. (cancer, coughing, diabetes); Ext. (rheumatism, wound healing)	Çatak, (Mükemre et al., 2015); Van, (Dalar, 2018).	East Anatolia	Irano-Turanian
55	<i>Nepeta cataria</i> L.	kedinanesi	Kedinanesi	Aerial parts, leaves	Dec	Int. (stomachache, stimulant)	East Anatolia, (Altundag and Öztürk, 2011).	East Anatolia	Euro-Siberian

Table 3. (Continued).

56	<i>Nepeta italica</i> L.	eşekçayı	Böğmace otu, nezle otu	Aerial parts, leaves	Inf	Int. (bronchitis, common colds)	Aladağlar, (Ozdemir and Alpınar, 2015); Torosdağları, (Yeşilada et al., 1995). Van, (Dalar, 2018). Çelep and Dirmenci, 2017 Karaisalı, (Güneş et al., 2017). Çelep and Dirmenci, 2017	Central Anatolia, Mediterranean East Anatolia East Anatolia Mediterranean East Anatolia	Mediterranean Irano-Turanian Irano-Turanian Unknown Irano-Turanian
57	<i>Nepeta lamifolia</i> Willd.	dağpırisikotu	Nojda	Aerial parts	Inf	Int. (diabetes)	Van, (Dalar, 2018).	East Anatolia	Irano-Turanian
58	<i>Nepeta meyeri</i> Benth.	çorbaotu	Unknown	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Çelep and Dirmenci, 2017	East Anatolia	Irano-Turanian
59	<i>Nepeta nuda</i> L. subsp. <i>albiflora</i> (Boiss.) Gams	karaktüncü	Kese otu	Aerial parts	Inf	Int. (fever); Ext. (wound healing)	Karaisalı, (Güneş et al., 2017).	Mediterranean	Unknown
60	<i>Nepeta racemosa</i> Lam.	pisikotu	Unknown	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Çelep and Dirmenci, 2017	East Anatolia	Irano-Turanian
61	<i>Ocimum basilicum</i> L.	fesleğen	Reyhan, rihon, rihan, rehan, fesleğen, oğul otu	Leaves	Fresh (raw), Inf	Int. (abdominal pain, cold and flu, cough, dizziness, heart disease, kidney diseases, pertussis); Ext. (earache, hemorrhoid, indigestion, sedative)	Edremit, (Polat and Sarı, 2012); Elazığ, (Hayta et al., 2014); Kapadokya, (Akgül et al., 2016); Karaisalı, (Güneş et al., 2017); Malatya, (Tetik et al., 2013); Solhan (Polat et al., 2013).	Agean, East Anatolia, Central Anatolia, Marmara, Mediterranean	Unknown
62	<i>Origanum acutidens</i> (Hand.-Mazz.) Ietsw.*	zemu	Anık, onux, amux	Flowers	Inf	Int. (colds and flu, sedative)	Bingöl, (Polat, 2019).	East Anatolia	Irano-Turanian
63	<i>Origanum bilgeri</i> P.H.Davis*	çingilli kekik	Kekik	Aerial parts, flowers	Inf	Int. (colds and flu)	Antalya, (Senkardeş and Tuzlaç, 2014).	West Mediterranean	East Mediterranean
64	<i>Origanum hypericifolium</i> O.Schwarz & P.H.Davis*	delikmercan	Acımlık, Kozalı kekik	Aerial parts	Inf	Int. (abdominal pain)	Acıpayam, (Bulut et al., 2017)	Agean	East Mediterranean
65	<i>Origanum majorana</i> L.	mercanköşk	Balkotu, fesleğen, mercanköşk, nane kebği	Aerial parts, flowers	Ca, Fresh (raw), Inf	Int. (antitussive, asthma, atherosclerosis, bronchial, calmative, colds and flu, diaphoretic, diuretic, sedative, stomachic)	Adana, (Everest and Öztürk, 2005); Ayvacık (Uysal et al., 2012); East Anatolia, (Altundag and	Agean, East Anatolia, Marmara, Mediterranean	East Mediterranean

Table 3. (Continued).

66	<i>Origanum minutiflorum</i> O. Schwarz & P.H.Davis*	tokakekik	Sütçüler kekliği	Aerial parts, flowers	Inf, Ess Oil	Int. (abdominal ache, waist pain)	Antalya, (Fakir et al., 2016).	Mediterranean	East Mediterranean
67	<i>Origanum onites</i> L.	bilyalıkekik	Bilyalı kekik, incir kekliği, kaya kekliği, kekik, mercan köşk	Aerial parts, flowers	Dec (gar), Inf, oil	Int. (abdominal ache, colds and flu, headache, stomach ache); Ext. (toothache)	Antalya, (Fakir et al., 2016); Ayvacık, (Uysal et al., 2012); Edremit, (Polat and Satıl, 2012); Turgutlu, (Bulut and Tuzlaci, 2013).	Aegean, Mediterranean, Marmara	Unknown
68	<i>Origanum sipyleum</i> L.*	mormercan	Sümbüllü çay	Aerial parts	Inf	Int. (common colds)	Afyonkarahisar, (Kargıoğlu et al., 2008).	Aegean	East Mediterranean
69	<i>Origanum syriacum</i> L. subsp. <i>bevanii</i> (Holmes) Greuter & Burdet	hababa	Dağ nanesi, Dağ kekliği, kekik	Aerial parts	Inf	Int. (colds and flu, stomachache)	Karaisalı, (Güneş et al., 2017), Andırın, (Demirci and Özhatay, 2012).	Mediterranean	East Mediterranean
70	<i>Origanum vogelii</i> Greuter & Burdet*	küçükkekik	Sinek kanadı	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Celep and Dirmenci, 2017	Central Mediterranean	East Mediterranean
71	<i>Origanum vulgare</i> L. subsp. <i>gracile</i> (K.Koch) Jeltsw.	kuşzemulu	Eşek kekliği	Aerial parts	Inf, Dec (gar, pol)	Int. (asthma, cold, epilepsy, headache, hypertension, stomachache); Ext. (toothache, vulnery)	East Anatolia, (Altundag and Öztürk, 2011).	East Anatolia	Irano-Turanian
72	<i>Origanum vulgare</i> L. subsp. <i>hirtum</i> (Link) Jeltsw.	karamercan	Kekik, mercan köşk, yaşan	Aerial parts, flowers	Dec, Inf	Int. (diabetes, hemorrhoid, kidney stone, stomachache)	Aladaglar, (Özdemir and Alpnar, 2015); Ayvacık, (Uysal et al., 2012); Osmanieli, (Koyuncu et al., 2010).	Central Anatolia, Marmara	East Mediterranean
73	<i>Origanum vulgare</i> L. subsp. <i>viridulum</i> (Marttrin-Donos) Nyman	istanbulkekliği	Kekik, çay kekliği	Aerial parts	Dec	Int. (colds and flu)	Espiye, (Polat et al., 2015a).	Black Sea	Unknown

Table 3. (Continued).

74	<i>Origanum vulgare</i> L. subsp. <i>vulgare</i>	karakımık	Anık, anıks, cantirik, dağ kekigi, omx, yayla kekigi, rehan, rehane rebel	Aerial parts, flowers	Dec (gar.), Inf, fresh (raw)	Int. (colds and flu, headache, high cholesterol, urinary inflammations, sedative, stomachic); Ext. (toothache)	East Anatolia, (Altundag and Ozturk, 2011); Edremit, (Polat and Satli, 2012); Esiye, (Polat et al., 2015a); Maden, (Cakicioglu et al., 2011); Rize, (Saraç et al., 2013); Solhan, (Polat et al., 2013); (Yeşil and Inal, 2019).	Agean, Black Sea, East Anatolia, Marmara Southeastern	Euro-Siberian
75	<i>Phlomis armeniaca</i> Willd.	bozavlak	Adaçayı, bozkulak, boz şavlak, çalba, emecen, şalvarotu	Aerial parts, flowers	Dec, Fresh (raw), Inf	Int. (colds and flu, colic, milk enhancer, stomachache)	Aladağlar, (Ozdemir and Alpınar, 2015); Çatak, (Mükemre et al., 2015); Karlıova (Nadiroğlu et al., 2019).	Central Anatolia, East Anatolia	Irano-Turanian
76	<i>Phlomis bourgaei</i> Boiss.	çobançırası	Çoban çırası	Aerial parts, flowers	Dec	Int. (stomachache)	Eğirdir, (Tuzlacı and Erol, 1999).	Mediterranean	East Mediterranean
77	<i>Phlomis grandiflora</i> H.S.Thompson var. <i>grandiflora</i>	bahargülü	Bahar güli, çalba	Aerial parts, flowers	Dec, Inf, pol.	Int. (high cholesterol, pain)	Marmaris, (Gürdal and Kültür, 2013).	Agean	East Mediterranean
78	<i>Phlomis kurdica</i> Rech.f.	gubel	Sığırkuyruğu	Aerial parts, flowers	Inf	Int. (colds and flu)	Kürtalan, (Yapıcı et al., 2009).	Southeastern	Irano-Turanian
79	<i>Phlomis lycia</i> D.Don	tüyüçalba	Salba, çalba	Aerial parts	Inf, pol.	Int. (appetizing, colds and flu, constipation, stomachache); Ext. (furuncle, rheumatism)	Antalya, (Fakir et al., 2016); Marmaris (Gürdal and Kültür, 2013).	Agean, Mediterranean	East Mediterranean
80	<i>Phlomis missotii</i> L.*	öbekçalba	Sarı şalba, sarı çalba	Aerial parts, flowers	Inf	Int. (cancer)	Sarıgöl, (Sargin et al., 2015a).	Agean	Irano-Turanian

Table 3. (Continued).

81	<i>Phlomis pungens</i> Willd. var. <i>hispidula</i> K.Koch	silvanok	No name	Aerial parts	Inf	Int. (stomachache)	Elazığ, (Civelek and Türkoglu, 2000)	East Anatolia	Unknown
82	<i>Phlomis pungens</i> Willd. var. <i>hirta</i> Velen.	silvanok	Şalba	Aerial parts	Inf	Int. (cough)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Unknown
83	<i>Phlomis pungens</i> Willd. var. <i>pungens</i>	silvanok	Çalba, giharesiik, salba	Aerial parts	Inf	Int. (diabetes, stomachache)	Antalya, (Fakir et al., 2016); Karlova, (Nadiroglu et al., 2019).	East Anatolia, Mediterranean	Unknown
84	<b><i>Phlomis sintensis</i> Rech.f.*</b>	yanıkçalba	No name	Aerial parts	Inf	Int. (stomachache)	Elazığ, (Civelek and Türkoglu, 2000)	East Anatolia	Irano-Turanian
85	<i>Phlomis tuberosa</i> L.	yerçalbası	Bareş	Aerial parts	Comp	Int. (wound healing)	Çatak, (Mükemre et al., 2015).	East Anatolia	Unknown
86	<i>Prunella laciniata</i> (L.) L.	bodurfesleğen	Yara otu	Aerial parts	Comp	Int. (wound healing)	Osmaneli, (Koyuncu et al., 2010).	Marmara	Euro-Siberian
87	<i>Prunella orientalis</i> Bornm.	acıfesleğen	Çay otu, karabaş otu	Aerial parts	Inf	Int. (antitussive, colds and flu)	Akkus, (Badem et al., 2018).	eeee	Mediterranean
88	<i>Prunella vulgaris</i> L.	gelinciklemeotu	Belgescing, kargelincik, sosm, yara otu	Aerial parts	Comp, Inf	Int. (abdominal pain, gastric pain, menstruation pain, wound healing)	Geçitli, (Kaval et al., 2014); Karlova, (Nadiroglu et al., 2019); Osmaneli, (Koyuncu et al., 2010); Rize, (Saraç et al., 2013); Şile, (Tuzlacı and Tolon, 2000).	Black Sea, East Anatolia, Marmara	Euro-Siberian
89	<i>Rosmarinus officinalis</i> L.	biberiye	Biberiye, kuşdili	Aerial parts, flowers	Dec, Inf	Int. (blood pressure therapy, carminative, colds and flu, cholesterol management, headache, migraine, wound healing)	Alaşehir, (Ugulu, 2011); Edremit, (Polat and Satlı, 2012); Karaisalı, (Güneş et al., 2017).	Aegean, Marmara, Mediterranean	Mediterranean
90	<b><i>Salvia absconditiiflora</i> (Mombret &amp; Aucher ex Benth.) Greuter &amp; Burdet*</b>	karışalba	Boz şalba, kara şalba, karaot, yabancı adaçayı	Aerial parts, flowers	Ca, Inf, lc	Int. (asthma, bronchitis, colds and flu, diuretic, expectorant, kidney gravel,	Aladağlar, (Özdemir and Alpınar, 2015);	Aegean, Central Anatolia	Irano-Turanian

Table 3. (Continued).

	(Syn: <i>Salvia cryptantha</i> Montbret & Aucher ex Benth.)				stomachache, urethritis, cardiac diseases) Ext. (hemorrhoid)	Sargöl, (Sargın et al., 2015a); Elazığ, (Doğan and Bağcı, 2011); Ürgüp, (Tuzlacı and Şenkardes, 2011).		
91	<i>Salvia adenophylla</i> Hedge & Hub.-Mor.*	poruk	Dağ çayı	Aerial parts, flowers	Inf	Int. (abdominal pain)	Acıpayım, (Bulut et al., 2017).	Agean Mediterranean
92	<i>Salvia aethiopsis</i> L.	habesadaçayı	Tüylü adaçayı	Aerial parts, flowers	Inf	Int. (colds and flu, gastric disorders)	Elazığ, (Doğan and Bağcı, 2011); Osmanieli (Koyuncu et al., 2010).	East Anatolia, Marmara Unknown
93	<i>Salvia aramiensis</i> Rech.f.	pohur	Adaçayı, Bozot	Aerial parts	Inf	Int. (bronchitis)	Antakya, (Alay and Çelik, 2011). Antakya, (Alay and Karahan (2012)	Mediterranean Mediterranean
94	<i>Salvia argentea</i> L.	gümüştşalba	Adaçayı	Aerial parts	Inf	Int. (colds and flu)	Osmanieli, (Koyuncu et al., 2010).	Marmara Mediterranean
95	<i>Salvia bracteata</i> Banks & Sol.	çobanşalbası	Adaçayı	Aerial parts	Inf	Int. (colds and flu)	Osmanieli, (Koyuncu et al., 2010).	Marmara Irano-Turanian
96	<i>Salvia cadmica</i> Boiss. var. <i>cadmica</i> *	kayaşalbası	Adaçayı, meryemana adaçayı	Aerial parts	Inf	Int. (abdominal pain, bleeding, colds and flu)	Acıpayım, (Bulut et al., 2017); Aladağlar, (Özdemir and Alpınar, 2015); Osmanieli, (Koyuncu et al., 2010).	Agean, Marmara, Mediterranean, East Black Sea Unknown
97	<i>Salvia candidissima</i> Vahl subsp. <i>candidissima</i>	galabor	Adaçayı, galabor	Aerial parts	Inf, gargle	Int. (angina, bronchitis, colds and flu, kidney stone)	East Anatolia, (Altundag and Öztürk, 2011); Kelkit (Korkmaz and Karakurt, 2015); Osmanieli,	East Anatolia, Marmara Irano-Turanian



Table 3. (Continued).

98	<i>Salvia dichroantha</i> Stapf*	kutnu	Yağlıkara	Aerial parts	Inf	Int. (stomachache)	(Koyuncu et al., 2010). Central Anatolia, (Sezik et al., 2001). Trabzon, (Abbulut and Bayramoğlu., 2014).	Central Anatolia Black Sea	Irano-Turanian Euro-Siberian
99	<i>Salvia jorskohlei</i> L.	dolmayapağı	Adaçayı	Aerial parts	Inf	Int. (calmative, constipation, stomachache)	Ayvacık, (Uysal et al., 2012); Bayramıç, (Bulut and Tuzlacı, 2009); Manisa, (Uğurlu and Secmen, 2008); Mersin, (Everest and Ozturk, 2005); Silivri, (Bulut, 2011).	Agean, Marmara, Mediterranean	Mediterranean
100	<i>Salvia frutescens</i> Mill.	adaçayı	Adaçayı, boşboşalba, boşşıklık, moşaplı	Leaves	Inf	Int. (abdominal pain, antiseptic, carminative, colds and flu, dyspepsia, headache, prostate, sedative, stomach disorders, tonsillitis)	Rize, (Saraç et al., 2013). Eastern Black Sea. (Toksoy et al., 2010).	Black Sea	Euro-Siberian
101	<i>Salvia glutinosa</i> L.	okluşalba	Purçuma	Aerial parts	Inf	Ext. (burns wound)	Eastern Black Sea. (Toksoy et al., 2010).	Black Sea	Irano-Turanian
102	<i>Salvia huberi</i> Hedge*	meryemiye	Adaçayı	Aerial parts	Inf	Int. (calmative, constipation, stomachache)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
103	<i>Salvia hydrangea</i> DC. ex Benth.	koşalba	Çay otu, koçotu	Aerial parts	Inf	Int. (antipyretic, colds and flu, diabetes, emmenagogue, stomach disorders)	Aladağlar, (Özdemir and Alpinar, 2015); Central Anatolia, (Ertuğ, 2000).	Central Anatolia	Irano-Turanian
104	<i>Salvia hypargeia</i> Fisch. & C.A.Mey.*	siyahot	Kök çayı	Aerial parts	Inf	Int. (colds and flu)	Ilica, (Ozgen et al., 2012); Van (Dalar, 2018).	East Anatolia	Irano-Turanian
105	<i>Salvia limbata</i> C.A.Mey.	maidili	Bareşa spı, Kedi kuyruğu	Aerial parts	Dec (gar), Inf	Int. (diabetes); Ext. (toothache)	Van, (Dalar, 2018).	East Anatolia	Irano-Turanian
106	<i>Salvia macrochlamys</i> Boiss. & Kotschy	gevrekşalba	Çırcık	Aerial parts	Inf	Int. (diabetes)	Kurtalan, (Yapıcı et al., 2009); Karaisalı, (Güneş et al., 2017);	East Anatolia, Mediterranean, Southeastern	Irano-Turanian
107	<i>Salvia multicaulis</i> Vahl	kürtreyhamı	Adaçayı, dağ çayı, punga reşrihan, gya çaye	Aerial parts, flowers	Dec, Inf	Int. (appetizing, asthma, diabetes, colds and flu, digestive, migraine, tonsillitis, respiratory and urinary tract disorders)			

Table 3. (Continued).

108	<i>Salvia nemorosa</i> L.	gehareş	Gemtaş	Aerial parts	Dec, Inf	Int. (catarrh, cold, hemostatic)	East Anatolia	East Anatolia, (Altundag and Ozturk, 2011).	Karlıova, (Nadiroğlu et al., 2019); Malatya, (Tetik et al., 2013); Sivrice, (Caklıcioglu and Turkoglu, 2010); (Yeşil and Inal, 2019).	Irano-Turanian
109	<i>Salvia officinalis</i> L.	Tıbbi adaçayı	Adaçayı	Leaves	Inf	Int. (colds and flu, kidney diseases)	West and East Anatolia, Black Sea	Düzce (Gürbüz et al., 2019); Kazdağ, (Uysal, 2010); Maden, (Caklıcioglu et al., 2011).	Unknown	
110	<i>Salvia palaestina</i> Benth	sümelşalba	Ada çayı	Aerial parts	Inf	Int. (colds and flu, diabetes, expectorant)	East Anatolia	Batman, (Bulut et al., 2019).	Irano-Turanian	
111	<i>Salvia pinnata</i> L.	çanakşalbası	Ellik otu	Aerial parts	Inf	Int. (colds and flu)	Marmara	Osmani, (Koyuncu et al., 2010).	Mediterranean	
112	<i>Salvia pocolata</i> Náb.	küllüşalba	Bareş	Aerial parts	Inf	Int. (diabetes)	East Anatolia	Van, (Dalar, 2018).	Irano-Turanian	
113	<i>Salvia rosfolia</i> Sm.*	gülmeryemiye	Adaçayı	Aerial parts	Inf	Int. (carminative, constipation, kidney stone, stomachache)	Black Sea	Eastern Black Sea, (Toksoy et al., 2010); Kelkit, (Korkmaz and Karakurt, 2015).	Irano-Turanian	
114	<i>Salvia russellii</i> Benth.	kurdeş	Şaplamaotu	Aerial parts	Dec	Int. (abdominal pain, common cold)	Central Anatolia	Central Anatolia, (Sezik et al., 2001).	Irano-Turanian	
115	<i>Salvia sclarea</i> L.	pasculak	Dağ çayı, misk adaçayı, yağlı kara	Aerial parts, flowers	Inf	Int. (colds and flu, digestive, respiratory system diseases, throat ache)	East Anatolia, Central Anatolia, Marmara, Mediterranean	Aladağlar, (Özdemir and Alpınar, 2015); Antalya, (Fakir et al., 2016); East Anatolia, (Altundag and Ozturk, 2011);	Unknown	

Table 3. (Continued).

116	<i>Salvia staminea</i> Montbret & Aucher ex Benth.	erkekşalba	No name	Aerial parts	Pol	Ext. (wound healing)	Osmaneli, (Koyuncu et al., 2010); Ovacık, (Tuzlacı and Doğan, 2010).	East Anatolia	Irano-Turanian
117	<i>Salvia syriaca</i> L.	çevlikotu	Kılkürk, polaç, sıvısvok	Aerial parts	Fresh (raw)	Int. (abscess, antacid)	Korkut, (Behçet and Arık, 2013); Malatya, (Tetik et al., 2013).	East Anatolia	Irano-Turanian
118	<i>Salvia tomentosa</i> Mill.	şalba	Adaçayı, salba, hoşafıama, moşafıa, moşapıa	Leaves	Inf	Int. (abdominal pain, colds and flu, kidney stone, pharyngitis)	Antalya, (Fakir et al., 2016); Bayramıç, (Bulut and Tuzlacı, 2009); Edremit, (Polat and Satıl, 2012); Torul, (Karaköse et al., 2019).	Aegean, Black Sea, Marmara, Mediterranean	Mediterranean
119	<i>Salvia trichoclada</i> Benth.	meşşalbası	Bareş	Aerial parts	Inf	Int. (diabetes)	Van, (Dalar, 2018).	East Anatolia	Irano-Turanian
120	<i>Salvia verticillata</i> L. subsp. <i>amasiaca</i> (Frey & Bornm.) Bornm.	hartşalbası	Karabaş otu, yağlıkara		Dec, Inf	Int. (abdominal pain, colds, laxative, nausea)	East Anatolia, (Altundag and Oztürk, 2011); Central Anatolia (Sezik et al., 2001).	East Anatolia, Central Anatolia	Irano-Turanian
121	<i>Salvia verticillata</i> L. subsp. <i>verticillata</i>	dadırak	Bareş, karabaş otu, yağlıkara	Aerial parts	Dec, Inf	Int. (catarrh, colds and flu, diabetes, gastric pain, laxative)	East Anatolia, (Altundag and Oztürk, 2011); Osmaneli, (Koyuncu et al., 2010); Van, (Dalar, 2018).	East Anatolia, Marmara	Euro-Siberian
122	<i>Salvia virgata</i> Jacq.	fatmanaotu	Adaçayı, ellik otu, pengi		Inf	Int. (colds and flu, muscle pain)	Karlıova, (Nadıroğlu et al., 2019); Osmaneli, (Koyuncu et al., 2010).	East Anatolia, Marmara	Irano-Turanian

Table 3. (Continued).

123	<i>Salvia viridis</i> L.	zarıfşalba	Adaçayı, yeşilbaş	Aerial parts, flowers	Dec, Fresh (raw), Inf	Int. (colds and flu, gastric pain, stomachache)	Bircik, (Akan et al., 2008); Karaisali, (Güneş et al., 2017); Osmanieli, (Koyuncu et al., 2010).	Marmara, Mediterranean, Southeastern	Mediterranean
124	<i>Salvia wiedenmannii</i> Boiss.*	sultantacı	Adaçayı	Aerial parts	Inf	Int. (colds and flu)	Osmanieli, (Koyuncu et al., 2010).	Marmara	Irano-Turanian
125	<i>Salvia verbenaca</i> L.	elmakekiği	Dağ çayı	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Buldun, (Ertuğ et al., 2004).	Aegean, Mediterranean, Marmara, Blacksea	Mediterranean
126	<i>Satureja aintabensis</i> P.H.Davis*	antepekayakekiği	Antep kekiği	Flowers, leaves	Inf	Int. (antiseptic, diuretic, stomachache)	Öz Aydın et al. 2005	Southeast Anatolia	Irano-Turanian
127	<i>Satureja boissieri</i> Hausskn. ex Boiss.	cantiri	Kekik	Flowers, leaves	Inf	Int. (antiseptic, diuretic, stomachache)	Madra (Satıl et al. 2008b)	East Anatolia	Irano-Turanian
128	<i>Satureja cilicica</i> P.H.Davis*	knalkekik	Dağ kekiği	Flowers, leaves	Inf	Int. (abdominal pain, menstruation pain)	Andirni, (Demirci and Özhatay, 2012).	Mediterranean	East Mediterranean
129	<i>Satureja cuneifolia</i> Ten.	kayakekiği	Kekik	Flowers, leaves	Inf	Int. (abdominal pain, common cold)	Central Anatolia, (Sezik et al., 2001).	Central Anatolia	Mediterranean
130	<i>Satureja hortensis</i> L.	çibriska	Anık, kekik, pungi	Flowers, leaves	Inf	Int. (antihypertensive, antispasmodic, colds and flu, urinary inflammations)	Maden, (Cakılcıoğlu et al., 2011); Malatya, (Tetik et al., 2013), Solhan, (Polat et al., 2013).	East Anatolia	Unknown
131	<i>Satureja taurica</i> P.H.Davis	adakekiği	Kekik	Flowers, leaves	Inf	Int. (antiseptic, diuretic, stomachache)	Satıl and Kaya 2007	Marmara	East Mediterranean
132	<i>Satureja macrantha</i> C.A.Mey.	sülünkekiği	Kekik	Flowers, leaves	Inf	Int. (antiseptic, diuretic, stomachache)	Satıl and Kaya 2007	East Anatolia	Irano-Turanian
133	<i>Satureja pilosa</i> Velen.	eybekkekiği	Kayakekiği, taş kekiği	Aerial parts	Inf	Int. (abdominal pain)	Madra (Satıl et al. 2008b)	Aegean	Euro-Siberian
134	<i>Satureja spicigera</i> (K.Koch) Boiss.	çorbakekiği	Kekik, zımpara	Flowers, leaves	Inf	Int. (antihypertensive, cardiac disorder)	Espıye, (Polat et al., 2015a).	Black Sea	Blacksea
135	<i>Satureja thymbra</i> L.	halilibrahimzahteri	Kekik	Aerial parts	Inf	Int. (shortness of breath)	Antakya, (Altay and Çelik, 2011).	Mediterranean	East Mediterranean

Table 3. (Continued).

136	<i>Scutellaria orientalis</i> L. subsp. <i>orientalis</i>	sarıkasıde	Kasıde, keşel mahmut, şimşekotu	Aerial parts	Inf	Int. (abdominal pain, analgesic, astringent, cancer, stomachache), Ext. (hemorrhoid, wound healing)	East Anatolia, (Altundag and Ozturk, 2011); Çatak, (Mükemre et al., 2015); Sivrice, (Cakırcioğlu and Turkoglu, 2010).	East Anatolia	Irano-Turanian
137	<i>Scutellaria orientalis</i> L. subsp. <i>sosnowskyi</i> (Takht.) Fed.	erkekkaşide	Sancı otu	Aerial parts	Inf	Int. (abdominal pain, carminative, nephralgia)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
138	<i>Scutellaria orientalis</i> L. subsp. <i>pinnatifida</i> J.R.Edm.	kurbaçsırımı	Qesel mehmut	Aerial parts	Inf	Int. (diabetes)	Van, (Dalar, 2018).	East Anatolia	Unknown
139	<i>Scutellaria tomentosa</i> Bertol.	bozkaşide	Korku otu	Aerial parts	Dec	Int. (depression)	Birecik, (Akan et al., 2008).	Southeastern	Irano-Turanian
140	<i>Sideritis althoa</i> Papan. & Kokkini	kedikuyruğuçayı	Kandıllı çayı, Dağ çayı, Tülküyruğu çayı, Yüzüklü çayı, Adacıyı	Aerial parts, flowers	Inf	Int. (colds and flu)	Edremit, (Polat and Satlı, 2012).	Aegean, Marmara	East Mediterranean
141	<i>Sideritis bilgerana</i> P.H.Davis*	altınbaşçayı	Boz şabla, dağ çayı	Aerial parts, flowers	Inf	Int. (stomachache)	Aladağlar, (Ozdemir and Alpınar, 2015); Karaisalı, (Güneş et al., 2017).	Central Anatolia, Mediterranean	East Mediterranean
142	<i>Sideritis caesarea</i> H.Duman, Aytaç & Başer*	topalçay	Dağ çayı	Aerial parts, flowers	Dec	Int. (sedative, stomach ache)	Pınarbaşı, (Gençler Özkan and Koyuncu, 2005).	Central Anatolia	Irano-Turanian
143	<i>Sideritis condensata</i> Boiss. & Heldr.*	kozalıkeklik	Dağ adacıyı	Aerial parts, flowers	Inf	Int. (analgesic, stomachache)	Antalya, (Fakir et al., 2016).	Mediterranean	East Mediterranean
144	<i>Sideritis congesta</i> P.H.Davis & Hub.-Mor.*	başakçayı	Adacıyı, dağ çayı	Aerial parts, flowers	Dec, Inf	Int. (antitussive, carminative, emmenagogue, orexigenic, sedative)	Adana, (Everest and Ozturk, 2005).	Mediterranean	East Mediterranean
145	<i>Sideritis erythrantha</i> Boiss. & Heldr. subsp. <i>erythrantha</i> *	morçay	Adacıyı	Aerial parts, flowers	Inf	Int. (bronchitis, colds and flu, pharyngitis)	Aydınçık, (Sargın et al., 2015b).	Mediterranean	East Mediterranean

Table 3. (Continued).

146	<i>Sideritis galatica</i> Bormm.*	kırçayı	Dağ çayı	Aerial parts, flowers	Inf	Int. (colds and flu)	Osmaneli, (Koyuncu et al., 2010).	Marmara	Irano-Turanian
147	<i>Sideritis germanicopolitana</i> Bormm. subsp. <i>germanicopolitana</i> *	karakurbuğaçayı	Dağ çayı	Aerial parts, flowers	Inf	Int. (colds and flu)	Osmaneli, (Koyuncu et al., 2010).	Marmara	Euro-Siberian
148	<i>Sideritis hispidula</i> P. H. Davis*	serçay	Dağ çayı	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Duman et al. 2005	West Mediterranean	Irano-Turanian
149	<i>Sideritis hololeuca</i> Boiss. & Heldr.*	çalçayı	DağDçayı	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Duman et al. 2005	Central Mediterranean	East Mediterranean
150	<i>Sideritis lanata</i> L.	ipekçayı	Dağ çayı	Aerial parts	Inf	Int. (colds and flu, kidney diseases)	Osmaneli, (Koyuncu et al., 2010); Mersin (Sargın et al., 2015).	Marmara, Mediterranean	East Mediterranean
151	<i>Sideritis leptoclada</i> O. Schwarz & P. H. Davis*	kızılçayı	Adaçayı	Aerial parts, flowers	Inf	Int. (high cholesterol, vasodilator)	Burdur, (Özçelik and Balabanlı, 2005).	Mediterranean	East Mediterranean
152	<i>Sideritis libanotica</i> Labill. subsp. <i>kurdica</i> (Bormm.) Hub.-Mor.	inceçay	Adaçayı	Aerial parts	Dec. Inf. pol.	Int. (astringent, colds and flu, sedative); Ext. (wound healing, skin diseases)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
153	<i>Sideritis libanotica</i> Labill. subsp. <i>libanotica</i> Labill.	gevregen	Dağçayı, torosçayı, yaylaçayı	Aerial parts	Dec. Inf	Int. (colds and flu, diarrhea, digestive)	Aladağlar, (Özdemir and Alpmar, 2015); Malatya, (Tetik et al., 2013).	Central Anatolia, East Anatolia, Mediterranean	East Mediterranean
154	<i>Sideritis libanotica</i> Labill. subsp. <i>linearis</i> (Benth.) Bormm.	torosçayı	Çaye çe, tüylü dag adaçayı	Aerial parts	Dec. Inf	Int. (colds and flu, stomachache)	Antalya, (Fakir et al., 2016); Kirecik, (Yeşil and Akalın, 2009).	East Anatolia, Mediterranean	Mediterranean
155	<i>Sideritis montana</i> L. subsp. <i>montana</i>	karacay	Dağ çayı, tülküyruğu, yaraotu	Aerial parts	Inf	Int. (cough, colds and flu)	Aladağlar, (Özdemir and Alpmar, 2015); East Anatolia, (Altundag and Ozturk, 2011); Osmaneli, (Koyuncu et al., 2010).	Central Anatolia, East Anatolia, Mediterranean, Marmara	East Mediterranean



Table 3. (Continued).

156	<i>Sideritis perfoliata</i> L.	fincaçayı	Cavea, dağ çayı	Aerial parts, flowers	Dec, Inf	Int. (colds and flu, cough, stomachache); Ext. (sore throat)	Acıpayam, (Bulut et al., 2017); Ayyacık, (Uysal et al., 2012).	Agean, Marmara	East Mediterranean
157	<i>Sideritis phrygia</i> Bormm.*	taşlıkçayı	Dağ çayı	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Duman et al. 2005	Central Anatolia	Irano-Turanian
158	<i>Sideritis pisiatica</i> Boiss. & Heldr.*	eldivençayı	Dallıadaçayı, havaotu	Aerial parts	Dec	Int. (abdominal pain)	Torosdağları, (Yeşilada et al., 1995).	Mediterranean,	East Mediterranean
159	<i>Sideritis scardica</i> Griseb. subsp. <i>scardica</i>	pazlakçayı	Adaçayı, bazlak çayı, kuyruklu adaçayı, tilkikuyruğu	Aerial parts	Dec	Int. (bronchitis, cough, colds and flu)	Kırklareli, (Kültür, 2007).	Marmara	Euro-Siberian
160	<i>Sideritis sipyrea</i> Boiss.*	sipliçayı	Adaçayı, çalba, dağ çayı, şalba	Aerial parts, flowers	Inf	Int. (colds and flu)	Sarıgöl, (Sargın et al., 2015a).	Agean	East Mediterranean
161	<i>Sideritis stricta</i> Boiss. & Heldr.*	tilkikuyruğuçayı	Dağ çayı	Aerial parts, flowers	Inf	Int. (colds and flu)	Aladağlar, (Özdemir and Alpınar, 2015).	Central Anatolia	East Mediterranean
162	<i>Sideritis tmolea</i> P.H.Davis*	sivriçay	Yakıotu, yaku şalbası	Aerial parts, flowers	Ca, Inf, Mashed	Int. (carminative, cold and flu, diarrhea, dyspepsia, intestinal spasm)	Sarıgöl, (Sargın et al., 2015).	Agean	East Mediterranean
163	<i>Sideritis trojana</i> Bormm.*	sarıközçayı	Cilbak çay, kazdağı çayı, tüylü çay, sarıköz çayı, dağ çayı	Aerial parts, flowers	Inf	Int. (abdominal pain, kidney ailments, laxative, stomachache, sore throat)	Bayramic, (Bulut and Tuzlacı, 2009); Burhaniye, Havran, (Polat and Satlı, 2010).	Marmara	East Mediterranean
164	<i>Sideritis vuralii</i> H.Duman & Başer*	babaçayı	Dağ çayı	Aerial parts	Inf	Int. (antiseptic, diuretic, stomachache)	Duman et al. 2005	East Mediterranean	East Mediterranean
165	<i>Stachys aleurites</i> Boiss. & Heldr.*	köprülüçay	Tokali	Aerial parts	Inf	Int. (anodyne, colds and flu, stomachache)	Antalya, (Fakir et al., 2016); west mediterranean (Fakir et al., 2009; Satlı and Açar, 2020)	East Mediterranean	East Mediterranean
166	<i>Stachys annua</i> (L.) J. subsp. <i>annua</i> var. <i>annua</i>	hactosmanotu	Dağ çayı	Aerial parts, flowers	Dec, Inf	Int. (antipyretic, colds and flu, insomnia, menstrual irregularity)	East Anatolia, (Altundag and Ozturk, 2011), Osmaneli	East Anatolia, Marmara	Unknown

Table 3. (Continued).

167	<i>Stachys annua</i> (L.) L. subsp. <i>lycaonica</i> R. Bhattacherjee	hacrosmanotu	Dağ çayı	Aerial parts	Inf, Dec	Int. (antipyretic, cholesterol, colds, diabetes, expectorant, insomnia, menstrual disorders, rheumatism)	(Koyuncu et al., 2010). Bilecik (Koyuncu et al., 2010); East Anatolia (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
168	<i>Stachys arvensis</i> (L.) L.	tarlakarabaşı	Mayasıl otu	Aerial parts	Dec	Int. (hemorrhoid)	Rize, (Sıraç et al., 2013).	Black Sea	Unknown
169	<i>Stachys byzantina</i> K. Koch	bozkarabaş	Eşek otu	Aerial parts	Inf	Int. (colds and flu)	Osmani, (Koyuncu et al., 2010).	Marmara	Euro-Siberian
170	<i>Stachys cretica</i> L. subsp. <i>lesbiaca</i> Rech.f.	şabla	Deli ada çayı	Aerial parts	Inf	Int. (stomachache)	Bayramiç, (Bulut and Tuzlacı, 2009).	Marmara	East Mediterranean
171	<i>Stachys cretica</i> L. subsp. <i>anatolica</i> Rech.f.*	yağlıkara	Aslankuynuğu, beyaz şabla, boz şabla, dağ çayı	Aerial parts, flowers	Dec, Inf	Int. (colds and flu, diarrhea, stomachache, insomnia, menstrual irregularity)	Aladağlar, (Özdemir and Alpınar, 2015); East Anatolia, (Altundag and Ozturk, 2011); Osmani, (Koyuncu et al., 2010).	Central Anatolia, East Anatolia, Mediterranean, Marmara	Unknown
172	<i>Stachys cretica</i> subsp. <i>mersinaea</i> (Boiss.) Rech.f.*	boncuksalba	Boncuk şabla, dağ çayı, deli çayı, rizeçayı	Aerial parts	Dec, Inf	Int. (colds and flu, hypertension, stomachache)	Aladağlar, (Özdemir and Alpınar, 2015); East Anatolia, (Altundag and Ozturk, 2011).	Central Anatolia, East Anatolia, Mediterranean	East Mediterranean
173	<i>Stachys gaziantepensis</i> Dinç & Doğu	unknown	Unknown	Aerial parts	Inf	Int. (colds)	East Anatolia (Kaya et al., 2017; Satlı and Açar, 2020)	Unknown	Unknown
174	<i>Stachys iberica</i> M. Bieb. subsp. <i>georgica</i> Rech.f.	üçdeliçay	Dağ çayı	Aerial parts	Dec	Int. (antipyretic, colds and flu)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
175	<i>Stachys iberica</i> M. Bieb. subsp. <i>stenostachya</i> (Boiss.) Rech.f.	benlidiçay	Dağ çayı	Aerial parts	Dec	Int. (antipyretic, colds and flu, stomachache)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian

Table 3. (Continued).

176	<i>Stachys iberica</i> M.Bieb.subsp. <i>iberica</i>	tokdeliçay	Gihaye zerike	Aerial parts	Inf	Int. (jaundice)	Karlıova, (Nadiroğlu et al., 2019).	East Anatolia	Unknown
177	<i>Stachys kurdica</i> Boiss. & Hohen. var. <i>kurdica</i>	karadeliçay	Bareşa kulikzer çaya, beci, Çaya çaye, dağ çayı, kasei mahmud, tüylü çay	Aerial parts	Dec	Int. (cold, stomachache)	Catak, (Mükemre et al., 2015).	East Anatolia	Irano-Turanian
178	<i>Stachys lavandulifolia</i> Vahl	tüylüçay	Bareş, çaye qwe, çaya, beci, Çaya çaye, dağ çayı, kasei mahmud, tüylü çay	Aerial parts, flowers, leaves	Inf	Int. (antipyretic, anypnia, cough, cancer, colds and flu, diabetes, digestive, diuretic, headache, insomnia, throat ache sedative)	Aladağlar, (Özdemir and Alpinar, 2015); Antalya, (Fakir et al., 2016); East Anatolia, (Altundag and Ozturk, 2011); Karlıova, (Nadiroğlu et al., 2019); Solhan, (Polat et al., 2013); Van, (Dalar, 2018); Yüksekova, (Bulut et al., 2016).	Central Anatolia, East Anatolia, Mediterranean	Unknown
179	<i>Stachys macrantha</i> (K.Koch) Stearn	kocasogulcan	Unknown	Aerial parts	Inf	Int. (digestive)	Rize, (Saraç et al., 2013).	Black Sea	Blacksea
180	<i>Stachys mardinensis</i> (Post.) R.R.Mill	kayapungu	Kaya pungu, punge, tehta, rnhana tehtan, dağ çayı, ot çayı	Aerial parts	Inf	Int. (bronchitis, cough, diabetes, headache)	Birecik (Akan et al., 2008)	Southeast Anatolia	Irano-Turanian
181	<i>Stachys obliqua</i> Waldst. & Kit.	sarıçayçe	Dağ çayı	Aerial parts, leaves	Inf	Int. (colds and flu)	Edremit, (Polat and Satlı, 2012).	Aegean, Marmara	East Mediterranean
182	<i>Stachys recta</i> L.	karakurbağautu	Dağ çayı	Leaves, Flowers	Inf	Int. (appetizer, carminative, stomachache)	Özhatay et al., 1997; Baytop, 1999; Satlı and Açar, 2020	Mediterranean, Marmara	Unknown
183	<i>Stachys sericantha</i> P.H.Davis	dikenliçay	Dikenliçay	Aerial parts	Inf, Dec	Int. (colds, cough, stomachache)	Antalya (Kaya et al. 2017)	Mediterranean	Unknown
184	<i>Stachys sylvatica</i> L.	hamsırgan	Ham sorgan		Inf	Int. (cardiac disorder)	Espiye, (Polat et al., 2015a).	Black Sea	Euro-Siberian

Table 3. (Continued).

185	<i>Stachys thirkei</i> K.Koch	kestere	Minareotu, tavşanakotu	Aerial parts	Inf	Int. (camminative, colds, digestive, sedative)	Kepsut (Özdemir Nath and Kultur, 2016)	West Anatolia	Unknown
186	<b><i>Stachys molea</i> Boiss.*</b>	sürmeliçayçe	Kestire	Aerial parts	Inf	Int. (colds and flu)	Osmaneli, (Koyuncu et al., 2010).	Marmara	East Mediterranean
187	<i>Teucrium chamaedrys</i> L. subsp. <i>chamaedrys</i>	kasamahmut	Cipkesen, kasakımahmut, kasamahmut otu	Aerial parts, flowers	Inf	Int. (abdominal pain, analgesic, kidney stones)	Antalya, (Fakir et al., 2016); Central Anatolia, (Sezik et al., 2001); Edremit, (Polat and Satl, 2012); Gümüşhacıköy, (Cansaran et al., 2007).	Aegean, Black Sea, Marmara, Central Anatolia, Mediterranean	Unknown
188	<i>Teucrium chamaedrys</i> L. subsp. <i>lydium</i> O. Schwarz	bodurmahmut	Mayasıl otu	Aerial parts, flowers	Dec	Int. (hemorrhoid)	Ayvacık, (Uysal et al., 2012).	Marmara	Mediterranean
189	<i>Teucrium chamaedrys</i> L. subsp. <i>sinuatum</i> (Celak.) Rech.f.	sancıotu	Çay qwe, çaye çiya, mayasıl otu	Aerial parts	Dec, Inf	Int. (anypnia, antispasmodic, colds and flu, gastric pain, poisoning,sedative); Ext. (hemorrhoid, rheumatism)	Geçitli, (Kaval et al., 2014); Sivrice, (Caklıoğlu and Turkoglu, 2010); Solhan, (Polat et al., 2013).	East Anatolia	Irano-Turanian
190	<i>Teucrium chamaedrys</i> L. subsp. <i>sypressise</i> (K.Koch) Rech.f.	sıcakotu	Neman	Aerial parts,	Inf	Int. (diabetes)	Van, (Dalar, 2018).	East Anatolia	Irano-Turanian
191	<i>Teucrium chamaedrys</i> L. subsp. <i>tauricola</i> Rech.f.	çobansargısı	Hüseyinbetre	Aerial parts	Mashed, Inf	Int. (stomachache); Ext. (hemorrhoid)	Karaisalı, (Güneş Andırın, (Demirci and Özhatay, 2012).	Mediterranean	Mediterranean
192	<i>Teucrium divaricatum</i> Sieber subsp. <i>gracuum</i> (Celak.) Bornm.	böceotu	Mürçüotu, bulhurcuoğlu otu, böceotu	Aerial parts	Inf	Int. (cough, tonic for eyes, sickness, stomachache, urinary diseases)	Marmaris, (Gürdal and Kültür, 2013).	Aegean	Mediterranean
193	<i>Teucrium flavum</i> L. subsp. <i>hellenicum</i> Rech.f.	sarıyaşan	Mayasıl otu	Aerial parts	Dec	Ext. (Hemorrhoid)	Gönen, (Tuzlacı and Aymaz, 2001).	Marmara	Unknown
194	<i>Teucrium orientale</i> L. var. <i>puberulens</i> Ekm	kirveotu	Neman	Aerial parts	Inf	Int. (diabetes)	Van, (Dalar, 2018).	East Anatolia	Irano-Turanian

Table 3. (Continued).

195	<i>Teucrium parviflorum</i> Schreb.	koyunotu										
196	<i>Teucrium polium</i> L. subsp. <i>polium</i>	acıyavşan	Dağ kekliği	Aerial parts, flowers	Dec, Inf, fresh (raw)	Ext. (antihemorrhoidal)	East Anatolia, (Altundag and Ozturk, 2011). Ayvacik, (Uysal et al., 2012); Birecik, (Akan et al., 2008); Cankiri (Ezer and Avci, 2004); Çatak, (Mükemre et al., 2015); Edremit, (Polat and Satil, 2012); Geçitli, (Karaisali, Güneş et al., 2017); Malatya, (Teik et al., 2013); Sivrice, (Cakicioglu and Turkoglu, 2010); Solhan, (Polat et al., 2013); Izmit, (Kizilaskan and Özhatay, 2012).	East Anatolia, (Altundag and Ozturk, 2011). Ayvacik, (Uysal et al., 2012); Birecik, (Akan et al., 2008); Cankiri (Ezer and Avci, 2004); Çatak, (Mükemre et al., 2015); Edremit, (Polat and Satil, 2012); Geçitli, (Karaisali, Güneş et al., 2017); Malatya, (Teik et al., 2013); Sivrice, (Cakicioglu and Turkoglu, 2010); Solhan, (Polat et al., 2013); Izmit, (Kizilaskan and Özhatay, 2012).	East Anatolia	Irano-Turanian		
197	<i>Thymbra capitata</i> (L.) Cav.	acıkekik	Kara kekik	Aerial parts, flowers	Dec	Int. (tonic)	Dalaman, (Sagiroglu et al., 2013a).	Agean	Mediterranean			
198	<i>Thymbra spicata</i> L. subsp. <i>spicata</i>	zahter	Eşek zahteri, kekik, kr çayı, kr kekliği, kayakekliği, sevil kekliği, zahter, cahter	Aerial parts, flowers	Dec, Inf	Int. (antiseptic, colds and flu, cough, chest pain, diabetes, gastric pain, headache, stomachache); Ext. (toothache)	Bayramiç, (Bulut and Tuzlacı, 2009); Birecik, (Akan et al., 2008); East Anatolia, (Altundag and Ozturk, 2011); Edremit, (Polat and Satil, 2012); Karaisali, (Güneş et al., 2017); Yalova, (Kocyiğit and Özhatay,	Agean, East Anatolia, Marmara, Mediterranean, Southeastern	Mediterranean			

Table 3. (Continued).

199	<i>Thymbra sintenisii</i> Bormm. & Azn. subsp. <i>sintenisii</i>	akzahter	Catire	Aerial parts, flowers	Inf	Int. (colds and flu)	2006; (Yeşil and Inal, 2019). Batman, (Bulut et al., 2019).	East Anatolia	Irano-Turanian
200	<i>Thymus ciliatus</i> Boiss. & Balansa	kuçukkekliği	Keklik limonkekliği, kuçukkekliği, peynir kekliği	Aerial parts, flowers	Inf	Int. (stomachache)	Antalya, (Fakir et al., 2016); Marmaris, (Gürdal and Kültür, 2013).	Aegean, Mediterranean	East Mediterranean
201	<i>Thymus comptus</i> Friv.	boğumlukeklik	Keklik	Aerial parts, flowers	Inf	Int. (antibacterial, antifungal)	Celen 2006	Thracian	Unknown
202	<i>Thymus fallax</i> Fisch. & C.A.Mey.	catiri	Keklik	Aerial parts, flowers	Dec, Inf	Int. (antiinflammatory, backache, cancer, hypertension, enteralgia, vermifuge)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
203	<i>Thymus haussknacii</i> Velen.*	firatkekliği	Çatır keklik, dağ kekliği, kekik	Aerial parts, flowers	Dec	Int. (respiratory tract problem, colds and flu, high cholesterol)	Sivrice, (Cakilcioglu and Turkoglu, 2010); Maden, (Cakilcioglu et al., 2011); Malatya, (Tetik et al., 2013).	East Anatolia	Irano-Turanian
204	<i>Thymus kotschyanus</i> Boiss. & Hohen. subsp. <i>kotschyanus</i>	keklik	Anıx, çatır, çatıra kuvi, kekik, onıx, çatır	Aerial parts, flowers	Dec	Int. (colds and flu, gastritis, high cholesterol, sedative, shortness of breath, tonsillitis)	Çatak, (Mükemre et al., 2015); Gecitli, (Kaval et al., 2014); Maden, (Cakilcioglu et al., 2011); Solhan, (Polat et al., 2013).	East Anatolia Southeastern	Irano-Turanian
205	<i>Thymus leucostomus</i> Hausskn. & Velen.*	anakekik	Keklik	Aerial parts, flowers	Inf	Int. (anorexia, bronchitis, expectorant, cancer, diabetes, halitosis, hemorrhoid, renal inflammations)	Haymana, (Sarper et al., 2009); Osmanieli, (Koyuncu et al., 2010); (Yeşil and Inal, 2019).	Central Anatolia, Marmara	Irano-Turanian
206	<i>Thymus leucotrichus</i> Hal.	dağkekliği	Deli keklik, kekik	Aerial parts, flowers	Dec, Inf	Int. (abdominal pain, bronchitis, common cold, breathing problems, high cholesterol)	Aladağlar, (Özdemir and Alpınar, 2015);	Black Sea, Central Anatolia	Unknown

Table 3. (Continued).

207	<i>Thymus longicaulis</i> C. Presl. subsp. <i>chaubardii</i> (Rech.f.) Jalas	dağkekiği	Keklik, keklik otu, yer kekliği	Aerial parts, flowers	Dec, Inf	Int. (bronchitis, common colds, diabetes, enteralgia, hemorrhoid, kidney stone, stomachache)	Espiye, (Polat et al., 2015b). Ayvaci, (Uysal et al., 2012); Inner-West Anatolia, (Kargıoğlu et al., 2008); Izmit, (Kızılsarıan and Özhatay 2012); Osmani, (Koyuncu et al., 2010).	Inner Anatolia, Marmara	Mediterranean
208	<i>Thymus longicaulis</i> C.Presl. subsp. <i>longicaulis</i>	aşkekiği	Dağ çayı, kekik, tımira, yayla kekliği, orman kekliği	Aerial parts, flowers	Inf	Int. (abdominal pain, colds and flu, cough, edema, respiratory disorder)	Edremit, (Polat and Satıl, 2012); Gidiü, (Elçi and Erik, 2006); Torul, (Karaköse et al., 2019).	Aegean, Black Sea, Central Anatolia, Marmara	Euro-Siberian
209	<i>Thymus nigricus</i> Klokov & Des.-Shost.	peynirkekliği	Keklik	Aerial parts, flowers	Inf	Int. (antiinflammatory, backache, hypertension, enteralgia, cancer, common cold, kidney stones, vermifuge)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Irano-Turanian
210	<i>Thymus nummularius</i> M.Bieb.	limonkekliği	Anzer çayı, keklik	Aerial parts, flowers	Inf	Int. (antitussive, bronchial, colds and flu, digestive, stomachache)	Rize, (Saraç et al., 2013); Trabzon, (Akbulut and Bayramoğlu, 2014).	Black Sea	Blacksea
211	<i>Thymus praecox</i> Opiz. subsp. <i>grossheimii</i> (Ronniger) Jalas	yaylakekiği	Keklik	Aerial parts, flowers	Inf	Int. (antiinflammatory, common colds, hypertension, enteralgia, cancer, vermifuge)	East Anatolia, (Altundag and Ozturk, 2011).	East Anatolia	Blacksea
212	<i>Thymus sibthorpii</i> Benth.	topkeklik	Keklik, keklikotu	Aerial parts, flowers	Dec, Inf	Int. (hypertrophy, kidney stones, prostatic, stomachache); Ext. (antidandruff)	Çatalca, (Genç and Özhatay, 2006).	Marmara	Euro-Siberian
213	<i>Thymus siphyleus</i> Boiss.	sipilkekliği	Anx, kekik, gara kekik, yayla kekliği, erkek kekik, catri, feklik otu, kekik	Aerial parts, flowers	Inf, dec. (gar)	Int. (asthma, colds and flu, diabetes, hemorrhoid, kidney diseases, prostrate, sedative, stomachache, uterine cancer); Ext. (toothache)	Andirın, (Demirci and Özhatay, 2012); Merzifon, (Ezer and Mumcu Arslan, 2006); East Anatolia, (Altundag and	Black Sea, Central Anatolia, East Anatolia, Marmara, Mediterranean	Unknown

Table 3. (Continued).

214	<i>Thymus transcaucasicus</i> Romniger	karkekiği	Kekik, çatıra	Aerial parts, flowers	Inf	Int. (antimflammatory, backache, cancer, common cold, eczema, enteralgia, hypertension, kidney disease, rheumatism, stomachache, vermifuge) Int. (diabetes, digestive, throat ache and stomachache)	East Anatolia (Altundag and Ozturk, 2011), Kars, (Güneş and Özhatay, 2011). Antalya, (Fakir et al., 2016); Bayramiç, (Bulut and Tuzlacı, 2009); Manisa, (Uğurlu and Secmen, 2008).	East Anatolia	Unknown
215	<i>Thymus zygoides</i> Griseb.	bodurkekiği	Kabekekiği, Kekik, kır çayı, taş kekiği	Aerial parts, flowers	Inf		Aggean, Marmara, Mediterranean	Mediterranean	
216	<i>Vitex agnus-castus</i> L.	hayt	Ayrt, hayt	Fruit, Flowers	Dec, Inf, Comp	Int. (abdominal pain, antipyretic, headache, kidney sand); Ext. (eczema)	Aggean, Marmara	Mediterranean	
217	<i>Ziziphora capitata</i> L.	anuk	Dağ reyhanı, mor kekik, nane ruhu, reyhan	Whole plant	Inf, dec. (gar)	Int. (colds and flu, cough, diuretic, hypertension, intestinal worms, sore throat, stomachache); Ext. (toothache)	Aladağlar, (Özdemir and Alpınar, 2015); Ayvacık, (Uysal et al., 2012); Kütahya, (Satl and Selvi, 2020); Tarsus and Yahyalı (Sığiroğlu et al., 2013b).	Central Anatolia, Marmara, Mediterranean	Unknown



Table 3. (Continued).

218	<i>Ziziphora clinopodioides</i> Lam.		Reyhan	Aerial parts	Dec, Inf	Int. (carminative, colds and flu, orexigenic, stomachache)	East Anatolia, (Altundag and Ozturk, 2011); Erzurum, Kütahya	East Anatolia	Irano-Turanian
219	<i>Ziziphora taurica</i> M.Bieb. subsp. <b>cleonioides</b> (Boiss.) P.H.Davis*	naneruhu	Kekik	Whole plant	Inf	Int. (colds and flu)	Manisa, (Satl and Selvi, 2020).	Mediterranean	Mediterranean
220	<i>Ziziphora taurica</i> M.Bieb. subsp. <i>taurica</i>	çölreyhanı	Merze: name, nane çayı	Whole plant	Inf	Int. (carminative, colds and flu, hypertension, orexigenic, stomachache)	Balkesir, (Satl and Selvi, 2020); East Anatolia, (Altundag and Ozturk, 2011); Edremit, (Polat and Satl, 2012).	Aegean, Marmara, East Anatolia	Unknown
221	<i>Ziziphora tenuior</i> L.	fareotu	Catıra kuvü	Whole plant	Inf	Int. (common colds, cough, diabetes)	Konya, Şanlıurfa, Van, (Dalar, 2018).	Central Anatolia, East Anatolia	Irano-Turanian
		*Endemic taxon (These taxa is shown as bold). <b>Abbreviations:</b> Int: internally; Ex: externally; ca: cataplasma, comp: compress; crs: crushed, dec: decoction, oil: essential oil of drug; gar: gargle; Inf: infusion, Inh: inhalation, pol:poultice; l; leaves chewing, ess. oil: essential oil, oint: ointment.							

**Table 4.** Lamiaceae taxa included in monographs and pharmacopoeias (the ones found in Turkey are highlighted in bold).

No	Taxa	English name	Monographs						Pharmacopies		
			AHP	COM. E	EMA	ESCOP	PDR	WHO	EU	BHP	TURK
1	<b><i>Ajuga chamaepitys</i> (L.) Schreb.</b>	<b>Ground Pine</b>	-				+				
2	<i>Ajuga reptans</i> L.	Bugle	-				+				
3	<b><i>Ballota nigra</i> L.</b>	<b>Black Horehound</b>	+			+	+	-	+	+	+
4	<b><i>Calamintha nepeta</i> Willk. (syn.)</b>	<b>Calamint</b>	-				+				
5	<i>Galeopsis segetum</i> Neck.	Hempnettle	-				+				
6	<i>Glechoma hederacea</i> L.	Ground Ivy	-				+			+	
7	<b><i>Hyssopus officinalis</i> L.</b>	<b>Hyssop</b>					+				
8	<b><i>Lamium album</i> L.</b>	<b>White Nettle</b>	+				+			+	
9	<b><i>Lavandula angustifolia</i> Mill.</b>	<b>English Lavender</b>	+	+	+	+	+	+	+		+
10	<i>Lavandula × intermedia</i> Emeric ex Loisel.	Lavender						+			
11	<b><i>Leonurus cardiaca</i> L.</b>	<b>Motherwort</b>	+	+	+	+	+	+	+	+	+
12	<i>Leonurus japonicus</i> Houtt.	Chinese Motherwort	-				+				
13	<i>Lycopus virginicus</i> L.	Bugleweed	+	-	-		+	-	-		
14	<b><i>Marrubium vulgare</i> L.</b>	<b>Horehound</b>	+	+	+	+	+	-	+	+	+
15	<b><i>Melissa officinalis</i> L.</b>	<b>Lemon Balm</b>	+	+	+	+	+	+	+	+	+
16	<b><i>Mentha aquatica</i> L.</b>	<b>Wild Mint</b>	-				+				
17	<b><i>Mentha arvensis</i> L.</b>	<b>Japanese Mint</b>	+				+			+	+
18	<b><i>Mentha longifolia</i> (L.) L.</b>	<b>English Horsemint</b>	-				+				
19	<b><i>Mentha × piperita</i> L.</b>	<b>Peppermint</b>	-	+	+	+	+	+	+	+	+
20	<b><i>Mentha pulegium</i> L.</b>	<b>Pennyroyal</b>	-				+				
21	<b><i>Mentha spicata</i> L.</b>	<b>Spearmint</b>	-				+				
22	<i>Monarda punctata</i> L.	Horsemint	-				+				
23	<b><i>Nepeta cataria</i> L.</b>	<b>Catnip</b>	-				+				
24	<b><i>Ocimum basilicum</i> L.</b>	<b>Basil</b>	+				+				
25	<i>Ocimum sanctum</i> L.	Badrooj	-				-	+			
26	<i>Origanum dictamnus</i> L.	Dittany of Crete herb	-	+	-		-	-	-	-	-
27	<b><i>Origanum onites</i> L.</b>	<b>Oregano</b>	-	-	-		-	-	+		+
28	<b><i>Origanum majorana</i> L.</b>	<b>Sweet Marjoram</b>	-	+	-		+	-	-	-	-
29	<b><i>Origanum vulgare</i> L.</b>	<b>Oregano</b>					+		+		
30	<i>Orthosiphon stamineus</i> Benth. (syn.)	Java tea	-	+	+		-	-		+	+
31	<i>Perilla frutescens</i> (L.) Britton	Perilla	-				+				
32	<b><i>Prunella vulgaris</i> L.</b>	<b>Self-Heal</b>	-				+				
33	<b><i>Rosmarinus officinalis</i> L.</b>	<b>Rosemary</b>	+	+	+	+	+	+	+	+	+
34	<b><i>Salvia fruticosa</i> Mill.</b>	<b>Greek Sage</b>	-	+	+	+	+	-	+		+
35	<i>Salvia multiorrhiza</i> Bunge	Red-Rooted Sage	-	+	-		+	-	-	+	-
36	<b><i>Salvia officinalis</i> L.</b>	<b>Sage</b>	+	+	+	+	+	+	+	+	+
37	<b><i>Salvia sclarea</i> L.</b>	<b>Clary Sage</b>	-		-		-	-	+	+	+
38	<b><i>Satureja hortensis</i> L.</b>	<b>Summer Savory</b>	-	-	-		+	-	-	-	-
39	<i>Scutellaria baicalensis</i> Georgi	Baical skullcap	-	-	-		-	+	-	-	-
40	<i>Scutellaria lateriflora</i> L.	Scullcap	+	-	-		+	-	-	-	-
41	<i>Sideritis scardica</i> Griseb.	Ironwort	-	+	-		-	-	-	-	-

Table 4. (Continued).

42	<i>Sideritis clandestina</i> (Bory & Chaub.) Hayek	Ironwort		-	+	-	-	-	-	-	-
43	<i>Sideritis raeseri</i> Boiss.	Ironwort		-	+	-	-	-	-	-	-
44	<i>Stachys palustris</i> L.	Woundwort		-	-	-	+	-	-	-	-
45	<i>Teucrium chamaedrys</i> L.	Germander		-	-	-	+	-	-	-	-
46	<i>Teucrium polium</i> L.	Poley		-	-	-	+	-	-	-	-
47	<i>Teucrium scorodonia</i> L.	Wood Sage		-	-	-	+	-	-	-	-
48	<i>Thymus serpyllum</i> L.	Wild Thyme		+	-	+	+	-	-	+	-
49	<i>Thymus vulgaris</i> L.	Thyme		+	+	+	+	+	+	+	+
50	<i>Thymus zygis</i> L.	Thyme		+	+	-	-	+	+	+	+
51	<i>Vitex agnus-castus</i> L.	Chaste Tree	+	+	+	+	+	+	+	+	+

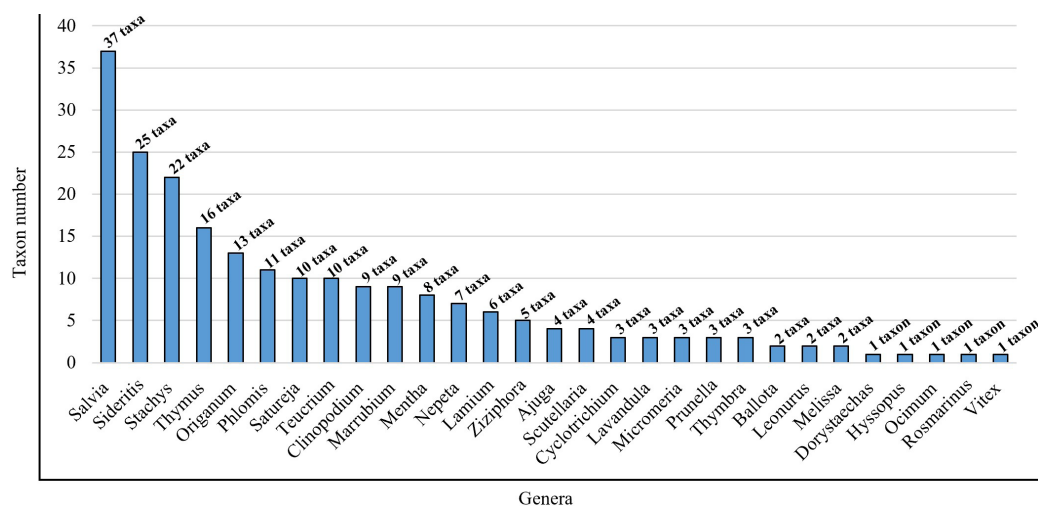


Figure 1. The genera and taxa numbers determined to be used for medicinal purposes.

and flavonols. Luteolin, apigenin, quercetin, scutellarin and diosmetin are the most common flavonoids in the Lamiaceae taxa (Atasü and Konuklugil, 1988).

### 3.2.3. Lignans

Lignans are dimeric compounds in which phenylpropane (C6C3) units are linked between their side chains at the C-8 positions to form three-dimensional networks. Several compounds of lignans have been isolated from Lamiaceae species. In particular, aryltetralin- and resinol-like lignans represent the most common compounds in this family (Frezza et al., 2019). However, aryltetralin- and resinol-like lignans have not been observed Lamiaceae taxa in Turkey. Only podophyllotoxin compounds were found. This compound has been detected in some taxa of *Phlomis*, *Nepeta*, *Salvia*, *Teucrium* and *Thymus*. Lignans, especially podophyllotoxin, are of interest to scientists because of their antimitotic and antitumour activity (Konuklugil, 1996).

### 3.2.4 Coumarins

Coumarins are lactones of hydroxycinnamic acids, with cyclic C6C3 skeletons. Coumarins in general have

antimicrobial and fungicidal activity. There are coumarins as perfumes, cosmetics, and industrial additives. Some of its derivatives have been used as aroma enhancers in tobaccos and certain alcoholic drinks (Pengelly, 2004; Stiefel et al., 2017). Nevertheless, their most relevant role is described in natural products, organic chemistry, and medicinal chemistry. Coumarins have been made mainly in developing coumarin-based anticoagulant, antioxidant, antimicrobial, anticancer, antidiabetic, analgesic, antineurodegenerative, and antiinflammatory agents. Coumarins found in some taxa of the genus *Lavandula* (hernairin, santonin), *Ocimum* (ausculetin, aesculin) and *Salvia* (esculetin) have been identified (Pengelly, 2004; Maggi et al., 2011; Matos et al., 2015).

### 3.3. Iridoid glycosides

Glycosides are a group of compounds characterised by the fact that chemically they consist of a sugar portion attached by a special bond to one or more nonsugar portions. Chemically they are hydroxyls of a sugar that are capable of forming ethers with other alcohols, or esters with acids.

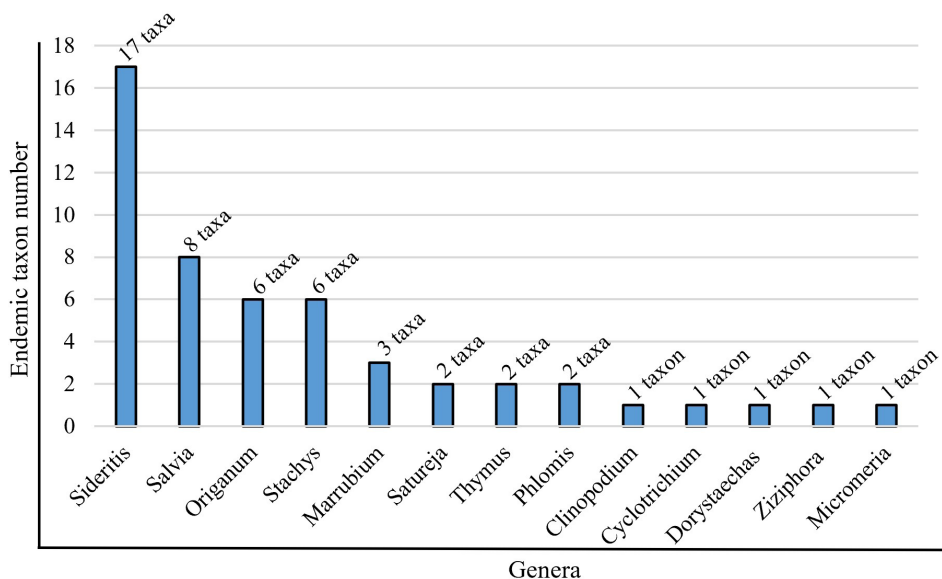


Figure 2. Endemic genera and their taxa numbers.

iridoid glycosides, phenylethanoid glycoside. There are iridoid glycosides in the Lamiaceae family. Iridoids are monoterpene lactones which can occur as glycosides, with one or more sugar molecules attached such as loganin or as aglycones, with no sugar attached e.g., nepetalactone (Kooiman, 1972; Richardson, 1992; Pengelly, 2004).

*Nepeta*, *Salvia*, and *Satureja*, all in the Nepetoideae, were found to contain species with iridoid glycosides (Boros and Stermitz, 1990; Richardson, 1992). Iridoids often have a bitter taste and show a wide range of pharmacological activities, including analgesic, antihepatotoxic, antitumour, antiplasmodic, antiviral, antimutagenic, cardiovascular, antiinflammatory, choleric, hypoglycaemic, immunomodulatory and laxative effects (Bello et al., 2018). Iridoids are found in some taxa of *Ajuga*, *Lamium*, *Leonurus*, *Nepeta*, *Prasium*, *Phlomis*, *Salvia*, *Satureja*, *Scutellaria*, *Sideritis*, *Stachys*, *Teucrium* and *Vitex* (Rizk et al., 1985; Boros and Stermitz, 1990; Richardson, 1992; Háznagy-Radnai et al., 2006; Hammami et al., 2007; Bello et al., 2018; Güven et al., 2021). Triterpenes constitute a large structurally diverse group of natural compounds biogenetically derived from active isoprene. Two C<sub>15</sub> units build squalene or related acyclic 30-carbon precursors (Nazaruk et al., 2015). They are found in almost all genera in Turkey. These compounds present several biological activities including antiinflammatory, antioxidant, antiviral, antidiabetic, antitumour, hepato-protective and cardio-protective. In the Turkish Lamiaceae taxa, ursolic and oleanolic acids are common triterpenoid (Richardson, 1992).

### 3.4. Tannins

Tannins represent the largest group of polyphenols with bitter taste. They are widely distributed in the aerial

plants such as leaves and stems. They are the chief plant constituents responsible for astringency. Tannins are externally astringent and internally antidiarrheal. It has a vasoconstricting effect in thin vessels. For this reason, it is used in superficial wounds and hemorrhoids. They are found in almost all genera in Turkey (Sever Yılmaz and Saltan Çitoğlu, 2003; Pengelly, 2004; Jaisw et al., 2018; Zengin et al., 2021).

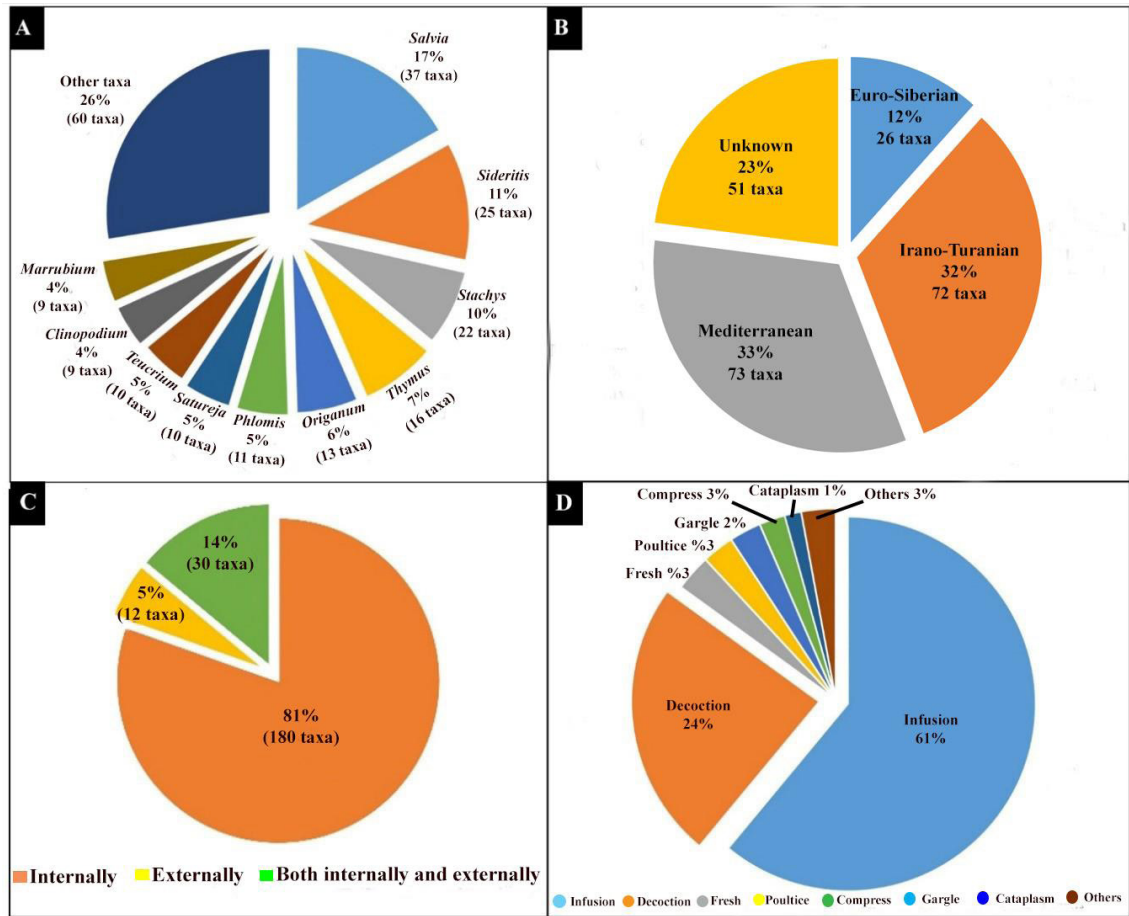
### 3.5. Fatty oils

The fatty acid components of the seed oils of Lamiaceae taxa mostly are palmitic, palmitoleic, stearic, oleic, linoleic, linolenic, and arachidic acids. These fatty acids are responsible for the antioxidant activity. It is seen more or less fatty acid in seeds of all taxa in Turkey (Marin et al., 1991; Ayas et al., 2004).

## 4. Results and discussion

A significant part of ethnobotanical studies in Turkey has been carried out in rural areas. The ethnobotanical analyses were presented statistically by Ertuğ (2014). According to Ertuğ (2014), a total of 1420 studies were carried out, and an additional 156 theses were completed. Regional distribution of the studies revealed that Central Anatolia Region ranks first with 192 studies whereas Southeastern Anatolia Region ranks the last with 59 studies. With 28 studies, the province hosting the majority of the studies is Muğla, located in the Aegean Region. These studies have played a significant role in bringing the ethnobotanical inventory of Anatolia to light.

The number of plants used as food in Turkey reaches 1200. This figure corresponds to approximately 10% of the plants grown in Turkey (Ertuğ, 2014). The number of endemic edible plants is 104 which corresponds to 8.6%.



**Figure 3.** Various graphical datas. A) The genera with the highest number of taxa; B) distribution of taxa by phytogeographic regions; C) means of uptake for drugs into the human body; D) patterns of use concerning herbal drugs.

Among 81 families covering edible plants, Lamiaceae family ranks first with 169 taxa (23.6%), while the patterns of use for these plants is generally as spices and tea (Ertuğ, 2000, 2014). Most commonly used plants in the Lamiaceae family are *Sideritis*-mountain tea (27), *Salvia*-sage (26), *Thymus*-thyme (23), and *Origanum*-marjoram (Ertuğ, 2000). Medicinal herbs and plants with therapeutical uses come to mind first, when considering medicinal plants in Turkey. Plants such as “mint, sage, thyme” from the Lamiaceae family, which are among the “heritage plants”, are widely used in everyone’s family (Ertuğ, 2014). *Vitex agnus-castus* is used to weave baskets (Ertuğ, 2004). While the rate of being endemic among edible plants is 9%, this rate is around 20% in the Lamiaceae family (Ertuğ, 2014).

As a result of the study, it was determined that a total of 221 taxa (192 species) of plants naturally distributed in Turkey belonging to 29 genera, 51 (23%) of which are endemic have medicinal/therapeutic uses in Turkey (Figure 1). The scientific and local names of these taxa, the geographical regions where they are used and their

phytogeographic elements, the usage they are used by the local people and the diseases they are used as treatment are shown in Table 3 in alphabetical order. The genera with the most endemic taxa are *Sideritis* (17 endemic taxa), *Salvia* (8 endemic taxa), and *Origanum* (6 endemic taxa) (Figure 2).

The genera with the most taxa are *Salvia* (37 taxa), *Sideritis* (25 taxa), *Stachys* (22 taxa), *Thymus* (16 taxa) and *Origanum* (13 taxa) (Figures 1 and 3a). When examining the distribution of taxa according to phytogeographic regions, it was determined that 33% have Mediterranean, 32% have Irano-Turanian and 12% have Euro-Siberian elements. The phytogeographic element of 23% is unknown (Figure 3b). Mostly aerial parts, flowers and leaves of plants are used as herbal drugs. While 81% of the herbs are taken internally and orally, 5% are applied externally on the skin or in the mouth (mouthwash). Fourteen percent of them are found to be used both internally and externally (Figure 3c). Ten different patterns of use for Lamiaceae taxa plants among the people were determined. Most preferred patterns of use are infusion (61%) and decoction (24%) (Figure 3d).

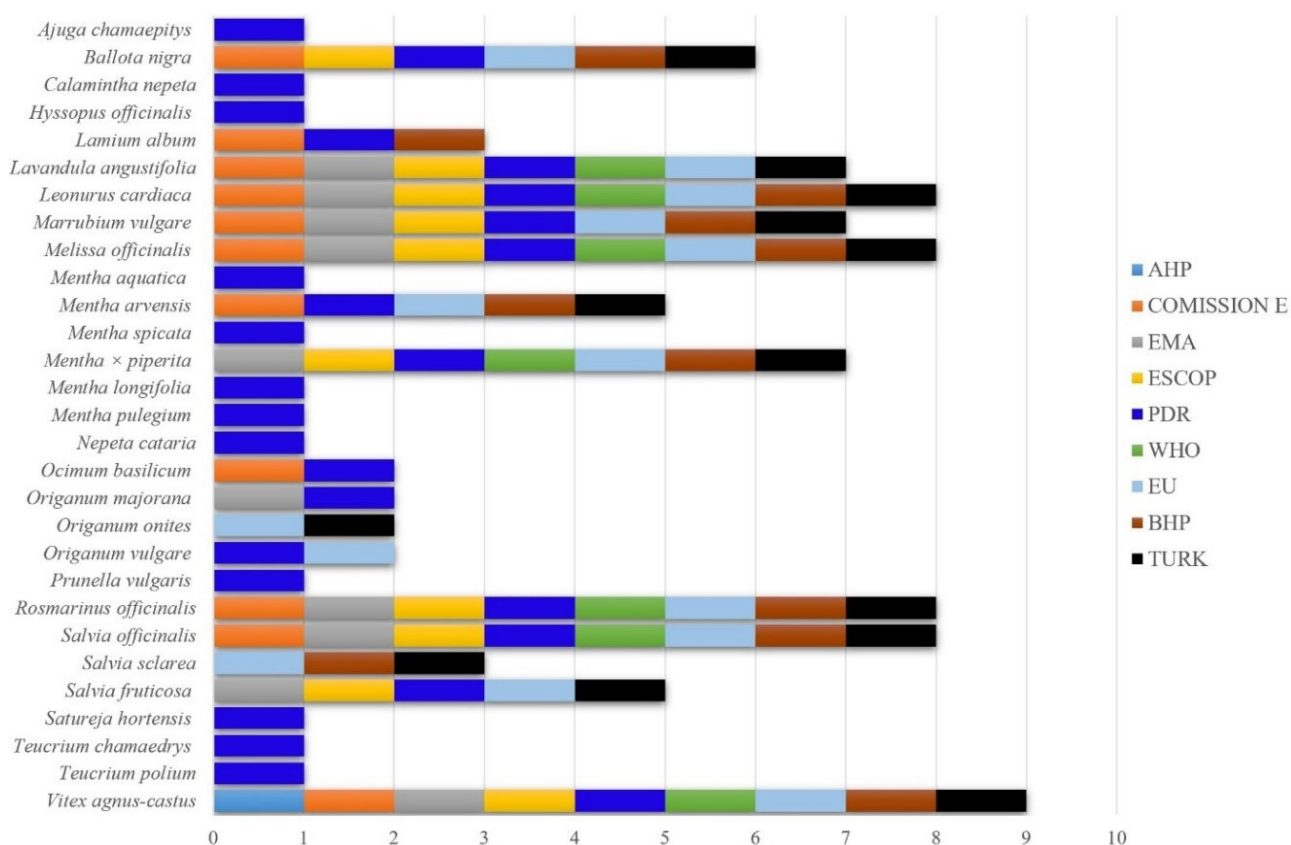


Figure 4. Lamiaceae taxa of Turkey included in pharmacopoeia and monographs.

Lamiaceae family is most frequently included in the first 5 families in the ethnobotanical studies conducted on the traditional use of medicinal plants in Turkey (Satil et al., 2008a; Çakılcioglu and Türkoğlu, 2009; Sarper et al., 2009; Toksoy et al., 2010; Çakılcioglu and Civelek, 2011; Polat and Satil, 2012; Polat et al., 2012; Gürdal and Kültür, 2013; Polat et al., 2013; Kaval et al., 2014; Güler et al., 2015; Güzel et al., 2015; Polat et al., 2015a,b; Sargın et al., 2015a,b; Mükemre et al., 2016; Yüce-Babacan et al., 2017; Bulut et al., 2017; Güneş et al., 2018; Karaköse et al., 2019; Güler et al., 2021; Yalçın et al., 2021a,b).

Within the framework of the research, a total of 97 articles were reviewed for investigating the traditional medicinal uses of Lamiaceae family taxa, generally published in field indexed journals. Considering the distribution of the reviewed articles by regions, 27 studies were found out to be conducted in the Eastern Anatolia region, 14 studies in the Aegean, Mediterranean and Marmara regions, 12 studies in the Black Sea and Central Anatolia regions and 4 studies in the Southeastern Anatolia region. It is observed that 82 plant taxa belonging to Lamiaceae family are used in the treatment of diseases in the Eastern Anatolia region whereas this number is 73 in the Marmara region, 55 in the Mediterranean region, 42

in the Aegean region, 41 in the Central Anatolia region, 27 in the Black Sea region and 14 in the Southeastern Anatolia region. Eastern Anatolia and Marmara regions come to the fore when considering the distribution of the number of plants by region. Major reason for the high number of plants used in the Eastern Anatolia region is the high number of studies conducted in the region. The number of taxa used for medicinal purposes is only 8 in the Southeastern Anatolia region, where the least research is conducted.

These researches concluded that *Salvia*, *Sideritis*, *Origanum*, *Thymus*, *Mentha*, *Lavandula*, *Satureja* and *Stachys* genera are more commonly used than other genera among local people.

*Salvia* belongs to the subfamily Nepetoideae in the Lamiaceae family. In traditional medicine, *Salvia* is one of the oldest medicinal plants used by humans, and it is considered as a universal panacea (Uritu et al., 2018). In the folk medicine of Anatolia, *Salvia* (mostly *S. fruticosa* Mill., *S. tomentosa* L., *S. multicaulis* Vahl.) was used to treat several diseases such as asthma, bronchitis, colds-flu, tonsillitis, stomach disorders, carminative and diabetes (Everest and Ozturk, 2005; Polat and Satil, 2010; Senol et al., 2010; Sargın et al., 2013; Özdemir and Alpınar, 2015;



Fakir et al., 2016; Güneş et al., 2017; Polat et al. 2017). Many biological activity studies conducted on *Salvia* taxa have revealed that the taxa have antiinflammatory, antibacterial, and antiviral effects in parallel with the traditional uses of the genus (Akkol et al., 2008; Karataş and Ertekin, 2010; Erdogan et al., 2011; Coisin et al., 2012; Firuzi et al., 2013). Essential oil combination obtained from some taxa, including *S. fruticosa* species, is demonstrated to be effective against influenza A/H1N1 and human rhinovirus 14 (HRV14) viruses that cause upperrespiratory tract diseases (Tseliou et al., 2019). In addition, *S. fruticosa* extract in ethanol is found out to be effective against many bacterial species such as gram (+) *Escherichia coli*, *Salmonella typhimurium*, and gram (-) *Staphylococcus aureus*, *Bacillus cereus* (Duletic-Lausevic et al., 2018). In another study investigating the biological activities of *Salvia fruticosa* and *S. tomentosa*, extract and essential oil obtained from taxa have been determined to have a strong antibacterial effect on *Mycobacterium tuberculosis* bacteria and in addition antifungal effects against *Microsporum gypseum*, *Trichophyton mentagrophytes* and some other *Candida* species (Tan et al., 2015). This case is very significant for the common traditional medicinal uses of the genus *Salvia* to come together with modern studies on a common ground.

*Sideritis* comprises over 150 species distributed in the Western Palearctic zone. The generic name *Sideritis* originates from the Greek, meaning iron. It is related to the use of the herb for curing wounds caused by metal arms (Castro and Nuñez, 1994). Ethnobotanical studies have revealed that *Sideritis* taxa in Turkey have traditionally been used in the treatment of diseases such as stomatoid diseases, upperrespiratory tract problems, wound treatment and diarrhea (Gençler Özkan and Koyuncu, 2005; Polat and Satıl, 2010; Altundag and Ozturk, 2011; Özdemir and Alpınar, 2015). Activity studies conducted on *Sideritis* species have revealed that many species belonging to this genus have antibacterial and antiviral effects (Aligiannis et al., 2001a; Aneva et al., 2019; Pihan et al., 2019). This finding supports the traditional use of *Sideritis* taxa against colds, flu and diarrhea. A study conducted in 2007 by Saraç and Uğur (2007) set forth the strong effect of ethanol extract of *Sideritis leptoclada* O. Schwarz & P.H. Davis against gram-positive bacteria (*Bacillus subtilis*, *Micrococcus luteus*, *Staphylococcus aureus*, *Staphylococcus epidermidis*). In another activity study on *Sideritis trojana* Bornm. the antihelicobacter activity of essential oils obtained from the taxon was identified (Kırmızıbekmez et al., 2017). In addition, activity studies conducted on *Sideritis perfoliata*, *Sideritis scardica* Griseb. revealed the antiinflammatory effects of the taxa (Tadić et al., 2007; Charami et al., 2008).

*Origanum* is a genus of herbaceous perennials and

subshrubs in the Lamiaceae family, native to Europe, North Africa, and much of temperate Asia and can be found in open or mountainous environments (Uritu et al., 2018). Hippocrates used *Origanum majorana* L. as an antiseptic agent. The ancient Greeks consider *Origanum* as a symbol of love, honour, and happiness. Aristotle declares that *Origanum* is an antipoison. The people from old Egypt used *Origanum* to disinfect and preserve food (Prerna and Vasudeva, 2015). In the folk medicine of Turkey, *Origanum* was used to treat several illnesses such as asthma, bronchitis, colds-flu, coughs, urinary inflammations, abdominal pains, headache and stomach disorders (Cakilcioglu et al., 2011; Polat et al., 2013; Saraç et al., 2013; Özdemir and Alpınar, 2015; Yeşil and İnal, 2019). There are many antimicrobial, antifungal, antioxidant activity studies conducted on *Origanum* species (Adam et al., 1998; Aligiannis et al., 2001b; Faleiro et al., 2005; Busatta et al., 2008). Biological activity studies reveal data supporting the traditional intensive use of *Origanum* taxa against upperrespiratory tract diseases, cough and stomach disorders.

*Thymus*, part of the Lamiaceae family, consists of over 200 species of aromatic plants with evergreen leaves. Geographically, these plants extend to Asia, North Africa, and Europe. Used for thousands of years in traditional medicine, the effects of *Thymus* species in medicine is wide (Uritu et al., 2018). Considering the traditional medicinal uses of *Thymus* taxa in our country, it is observed that they are commonly used as antiinflammatory against upperrespiratory tract diseases as well as against skin diseases, diabetes, hypertension and stomach disorders (Ezer and Mumcu Arslan, 2006; Koyuncu et al., 2010; Altundag and Ozturk, 2011; Kızılarıslan and Özhatay 2012; Gürdal and Kültür, 2013). There are many antimicrobial, antifungal, antioxidant activity studies conducted on *Thymus* species (Karaman et al., 2001; Lee et al., 2005; Rota et al., 2008; Zuzarte et al., 2013; Nabavi et al., 2015). Biological activity studies reveal data supporting the traditional intensive use of *Thymus* taxa against upperrespiratory tract diseases, cough and stomach disorders. However, no data was encountered confirming the use of *Thymus* species against diabetes and hypertension disorders.

*Mentha* species belong to the family Lamiaceae and are widely distributed in Europe, Asia, Africa, Australia, and North America (Lawrence, 2006). Extracts of this genus are traditionally used as foods and are highly valued due to the presence of significant amounts of antioxidant phenolic compounds (Salehi et al., 2018). *Mentha* taxa are traditionally used in Turkey as antispasmodic against stomach ailments and nausea as well as against respiratory diseases and hemorrhoids (Uğurlu and Secmen, 2008; Cakilcioglu et al., 2011; Tuzlacı and Şenkardeş, 2011;

Güneş et al., 2017). There are many antimicrobial, antifungal, antioxidant activity studies conducted on *Mentha* species (Işcan et al., 2002; Gulluce et al., 2007; Soković et al., 2009; Dorman et al., 2013). Biological activity studies reveal data supporting the traditional intensive use of *Mentha* taxa against upperrespiratory tract diseases, cough and stomach disorders. However; a single study has been reached revealing that only essential oils obtained from *Mentha × piperita* L. have an antispasmodic effect on rats, when trying to validate widespread use as an antispasmodic among the public (Sousa et al., 2010). No activity study has been found that confirms the widespread traditional use of *Mentha spicata* L. and *Mentha longifolia* L. in the treatment of hemorrhoids.

*Lavandula* includes more than 39 known species, mostly distributed in Arabia, Mediterranean Coasts, Asia, Middle East, and Northern Africa (Uritu et al., 2018). Dioscorides stated that this plant is called “Stoechus” from its growing on the Stoechades, a group of islands on the south coast of Gaul (a region in Western Europe) near Massilia (modern Marseilles). Three species, *Lavandula stoechas*, *L. pedunculata* (Mill.) Cav., and *L. dentata* L. were known to Romans, and in Spain *L. stoechas* was known as ‘Romero Santo’ (sacred rosemary), and its oil was used as hemostatic and for cleansing wounds (Akbar, 2020). *Lavandula stoechas* and *L. angustifolia* Mill. are traditionally used in Turkey as a diuretic and sedative, as well as against high blood pressure, heart ailments, upperrespiratory tract problems and stomach ailments (Tuzlacı and Sadıkoğlu, 2007; Polat and Satıl, 2012; Güler et al., 2015; Güneş et al., 2017). Activity studies have revealed that the essential oil obtained from *L. angustifolia* is highly effective against many bacterial and fungal species (Hammer et al., 1999). It has also been suggested that essential oils, including lavender, may be useful in treating bacterial infections that are resistant to antibiotics. For example, *L. angustifolia* oil was demonstrated to have in vitro activity against both MRSA (methicillin-resistant *Staphylococcus aureus*) and VRE (vancomycin-resistant *Enterococcus faecalis*) at a concentration of less than 1% (Nelson, 1997). Essential oils derived from *L. stoechas*, with the main components such as fenchone (55.79%), camphor (18.18%), 1,8-cineole (8.03%), and myrtenyl acetate (6.25%) have been determined to have a strong effect on *Escherichia coli*, *Listeria monocytogenes*, *Salmonella typhimurium* and *Staphylococcus aureus* pathogens (Dadalioglu and Evrendilek, 2004). In addition, active substance studies on *Lavandula stoechas* confirm the sedative effect of the taxon (Gilani et al., 2000).

*Satureja* consists of aromatic plants of the Lamiaceae family that are related to rosemary and thyme (Uritu et al., 2018). It is known that *Satureja hortensis* L. is traditionally used in Turkey against high blood pressure, as an

antispasmodic, against upperrespiratory tract problems and reproductive system inflammations (Cakilcioglu et al., 2011; Polat et al., 2013). In some activity studies on *Satureja hortensis*, carvacrol and  $\gamma$ -terpinene were identified as the main components of the taxon. In the same study, *S. hortensis* was found to be an antibacterial agent against different gram-positive and gram-negative bacteria and powerful antioxidants in different in vitro methods (ABTS and DPPH). These effects were mainly due to the high amount of phenolics content in the oil. On the other hand, using *S. hortensis* essential oils (SEO) at inhibited concentrations for pathogenic bacteria can also affect the beneficial bacteria negatively. SEO showed toxicity on normal lung, liver and epithelial cells (Abou Baker et al., 2020). Activity studies conducted on *S. hortensis* revealed that the taxon has antioxidant, antimicrobial, antiparasitic and antiinflammatory effects (Momtaz and Abdollahi, 2010; Hajhashemi et al., 2012).

*Stachys* is one of the largest genera in the Lamiaceae. Estimates of the number of species in the genus are ranging between 300 and about 450 (Uritu et al., 2018). *Stachys* species (hedgenettle or woundwort) are important medicinal plants known for their flavor and fragrance. They are widely consumed in Europe and Asia as aromatic herbal teas (Bahadori et al., 2020). Ethnobotanical studies conducted in Turkey have revealed that *Stachys annua* (L.) L., *Stachys lavandulifolia* Vahl., *Stachys cretica* L. subsp. *anatolica* Rech.f. taxa are traditionally used as antipyretic, against menstrual cycle disorders, insomnia, stomach disorders and upperrespiratory tract disorders (Altundag and Ozturk, 2011; Polat et al., 2013; Özdemir and Alpınar, 2015; Fakir et al., 2016; Dalar, 2018). Activity studies have revealed that essential oil obtained particularly from *Stachys* (*S. inflata* Benth., *S. lavandulifolia*, and *S. byzantina* K.Koch) taxa has antioxidant, antidiabetic and antiobesity effects (Bahadori et al., 2020). In another study on the *Stachys lavandulifolia*, it was determined that the taxon has an antidepressant effect due to the flavonoids it contains (Jahani et al., 2019).

Lamiaceae taxa, which are used for medicinal purposes, were identified on National (TURK, BHP), Regional (EU) and International Pharmacopoeias (WHO) and various monographs (AHP, COMMISSION E, EMA, ESCOP, PDR) and it has been observed that 51 taxa in the world are included in these books. Twenty-nine (57%) of these taxa are widely used by local people in Turkey (Table 4; Figure 4).

The local names of the Lamiaceae family taxa clearly indicate the reflections of the cultural heritage and language diversity in Anatolia on the plant names (Table 3). We also see that many plant names are named according to the disease they are used to treat. Ex: Eczama herb/St. John's wort (*Ajuga* spp., *Teucrium chamaedrys*), diarrhea



**Table 5.** Disease categories and subcategories in which medicinal plants are used for therapeutic purposes.

Categories	Subcategories
Otolaryngology and respiratory system	Asthma, Antipyretic, Antitussive, Bronchitis, Breathing problems, Bronchitis, Catarrh, Chest pain, Colds and flu, Common cold, Cough, Diaphoretic, Dizziness, Dyspnea, Earache, Expectorant, Fever, Mucolytic, Pharyngitis, Refreshing, Respiratory disorder, Respiratory tract problem, Shortness of breath, Sore throat, Throat ache, Tonsillar inflammation, Tonsillitis
Gastric disorders	Abdominal ache, Abdominal pain, Antacid, Antispasmodic, Appetizing, Bellyache, Digestive, Digestive disorders, Dyspepsia, Gallbladder, Gastric disorders, Gastric pain, Gastritis indigestion, Nausea, Poisoning, Sickness, Stomachache, Ulcer
Urogenital system	Cystitis, Diaphoretic, Diuretic, Earache, Emmenagogue, Fever, Forgetfulness, Furuncle, Kidney stones, Nephralgia, Prostate, Renal Inflammations, Urethritis, Urinary diseases
Intestinal diseases	Antihemorrhoidal, Carminative, Colic, Colic Spasms, Constipation, Diarrhea, Enteralgia, Hemorrhoid, Intestinal spasm, Intestinal Worms, Laxative, Purgative, Vermifuge
Nervoussystem	Analgesic, Anorexia, Anypnia, Calmative, Depression, Dizziness, Epilepsy, Forgetfulness, Headache, Insomnia, Migraine, Sedative, Stimulant, Tranquillizer, Tremor
Cardiovascular	Anticoagulant, Antihypertensive, Astringent, Atherosclerosis, Bleeding, Blood pressure therapy, Cardiac diseases, Cardiac Disorder, Cardiotonic, Cardiovascular diseases, Cholesterol management, Embolism, Heart diseases, High cholesterol, Hypertension, Infarction, Vasodilator
Dermatology	Abscess, Antidandruff, Antiinflammatory, Antiseptic, Burns, Burns wound, Eczema, Edema, Fungal infection, Furuncle, Inflamed wounds, Rejuvenate, Skin diseases, Snakebites, To remove the umbilical cord, Tonic vulnerary, Wound healing, Wounds
Hormonal disorders	Diabetes Disease, Emmenagogue, Hemostatic, Hypertrophy, Jaundice, Menstrual irregularity, Menstruation, Menstruation pain, Menstruation regulator, Milk enhancer, Oreksijenik, Roborant
Mouth and dental health	Bad breath, Halitosis, Toothache
Eye diseases	Eye ailments, Tonic for eyes
Muscle and joint pain	Backache, Muscle pain, Rheumatism, Waist pain
Cancer	Lung, Prostate, Uterine

herb (*Marrubium globosum*), catarrh herb (*Nepeta italica*), hemorrhoid herb (*Ajuga chamaepitys*), pain herb (*Scutellaria sosnowskyi*) etc.

Considering the Lamiaceae taxa, which are used extensively among indigenous people for their therapeutic effects, taxa such as *Ajuga chamaepitys* (L.) Schreber subsp. *chia* (Schreber) Arcang. (St. John's wort), *Lavandula stoechas* L. (French lavender), *Melissa officinalis* L. (Lemon grass), *Mentha longifolia* (L.) L. subsp. *typhoides* (Briq.) Harley (peppermint), *Micromeria myrtifolia* Boiss. et Hohen. (Sage), *Ocimum basilicum* L. (Basil), *Origanum onites* (Oregano, Marjoram), *Origanum vulgare* L. (Mountain thyme, onyx), *Salvia fruticosa* (Sage), *Salvia multicaulis* (Mountain tea), *Sideritis montana* L. (Mountain tea), *Stachys lavandulifolia* (Mountain tea), *Teucrium polium* L. (Meyremhort), *Thymus sipyleus* Boiss. (Oregano), *Ziziphora capitata* L. (purple thyme) are widely used in Turkey (Table 3).

Considering different traditional medicinal uses of Lamiaceae taxa, colds and flu (100 uses), stomachache (74

uses) and antimicrobial (45 uses) symptoms are the most prominent (Table 3). Symptoms and diseases that people use plants for therapeutic purposes are grouped into 12 categories. Each category is also divided into subcategories (Table 5).

## 5. Conclusion

Turkey has a rich flora in terms of medicinal and aromatic plants. Majority of these medicinal and aromatic plants are members of the Lamiaceae family. These taxa are used reliably in the treatment of various diseases, particularly gastro-intestinal and upperrespiratory tract infections, for their aromatic odor due to the active ingredients in their essential oils and antimicrobial effects. These taxa, particularly 29 medicinal plants with scientifically proven effectiveness in pharmacopoeia and monographs, which do not cause toxic effects as long as there is no overdose are highly reliable and should be taken into account in the production of domestic drugs and brought into the country's economy.

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