

Labiatae Family in folk Medicine in Iran: from Ethnobotany to Pharmacology

Farzaneh Naghibi*, Mahmoud Mosaddegh, Saeed Mohammadi Motamed
and Abdolbaset Ghorbani

*Traditional Medicine & Materia Medica Research Center, Shaheed Beheshti University of
Medical Sciences, Tehran, Iran.*

Abstract

Labiatae family is well represented in Iran by 46 genera and 410 species and subspecies. Many members of this family are used in traditional and folk medicine. Also they are used as culinary and ornamental plants. There are no distinct references on the ethnobotany and ethnopharmacology of the family in Iran and most of the publications and documents related to the uses of these species are both in Persian and not comprehensive. In this article we reviewed all the available publication on this family. Also documentation from unpublished resources and ethnobotanical surveys has been included. Based on our literature search, out of the total number of the Labiatae family in Iran, 18% of the species are used for medicinal purposes. Leaves are the most used plant parts. Medicinal applications are classified into 13 main categories. A number of pharmacological and experimental studies have been reviewed, which confirm some of the traditional applications and also show the headline for future works on this family.

Keywords: Labiatae; Ethnobotany; Ethnopharmacology; Folk medicine.

Introduction

The Labiatae family (Lamiaceae) is one of the largest and most distinctive families of flowering plants, with about 220 genera and almost 4000 species worldwide. This family has an almost cosmopolitan distribution. Some genera like *Nepeta*, *Phlomis*, *Eremostachys*, *Salvia* and *Lagochilus* have a great diversity in the Mediterranean and C/SW Asia (1-3).

Labiatae are best known for the essential oils common to many members of the family. Many biologically active essential oils have been isolated from various members of this family. The family is also famous for the presence of

diterpenoids in its members. These plants have been surely used by humans since prehistoric times. Evidence from archeological excavations shows that some species of this family, which are now known only as wild plants, had been cultivated at local scales in the past (4). This family is one of the major sources of culinary, vegetable and medicinal plants all over the world. Species of *Mentha*, *Thymus*, *Salvia*, *Origanum*, *Coleus* and *Ocimum* are used as food flavorings, vegetables and in industry. Also several species of family are used in traditional and modern medicine.

Iran has a very honorable past in traditional medicine, which goes back to the time of Babylonian-Assyrian civilization. One of the most significant ancient heritages is sophisticated experience of people who have tried over

* Corresponding author:

E-mail: fnaghibi@itmrc.org

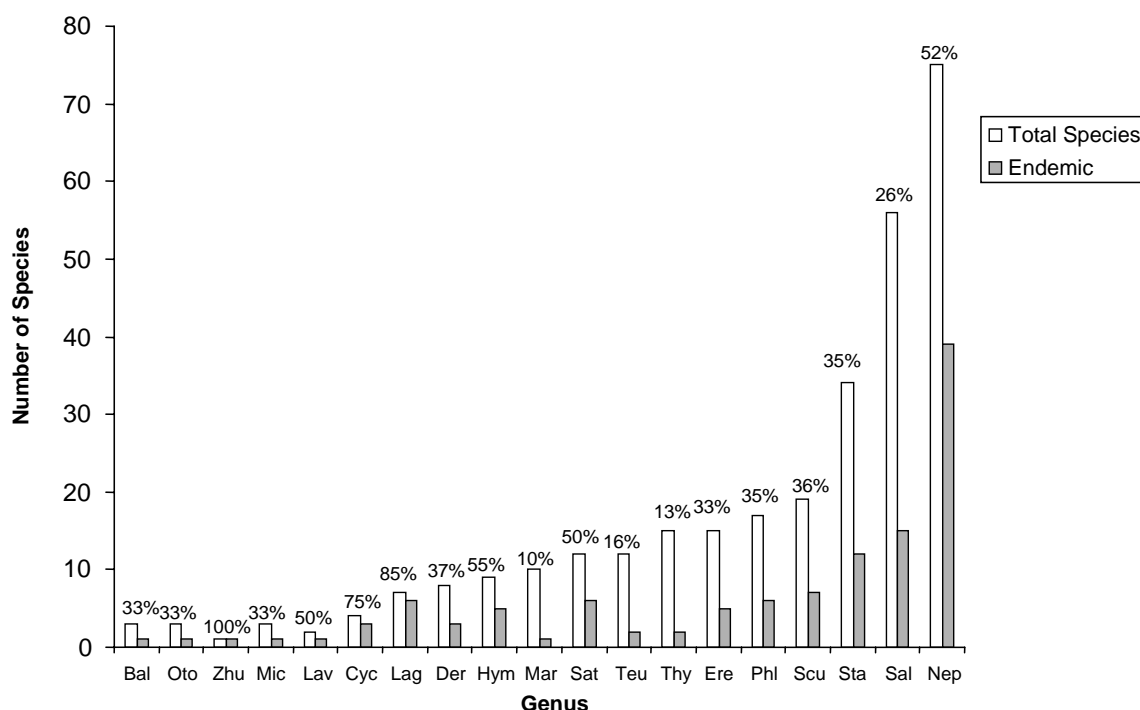


Figure 1. Percentage of endemism in the Labiatae in Iran
Teu= Teucrium; Scu= Scutellaria; Lav= Lavandula; Mar= Marrubium; Nep= Nepeta; Der=Deracocephalum; Hym= Hymenocrater; Ere= Eremostachys ; Phl= Phlomis; Bal= Ballota; Sta=Stachys; Sal= Salvia; Thy= Thymus; Oto= Otostegia; Lag= Lagochilus; Mic= Micromeria; Cyc= Cyclostegia; Sat= Satureja; Zhu= Zhumeria

millennia to find useful plants for health improvement, with each generation adding its own experience to this tradition. Because of the high rate of species diversity and endemism in Labiatae, many species are used in traditional and folk medicine in Iran. Unfortunately, there are no distinct references on the ethnobotany and ethnopharmacology of the family in Iran and most of the publications and documents related to the uses of these species are both in Persian and not comprehensive. In this article we tried to bring some of these scattered publications together. We have also attempted to identify the scientific names of some of these species in order to make them accessible for the scientific community. In addition, some pharmacognosy

student's these are reviewed and documentation from unpublished resources and ethnobotanical surveys have been included.

Chemistry of Labiatae:

This family contains a wide variety of chemicals, but discussion in this regard is beyond the scope of this article and these compounds would only briefly discussed. A wide range of compounds such as terpenoids, iridoids, phenolic compounds and flavonoides have been reported from the members of the family (5-7). Some of the short chain terpenoids in essential oils are responsible for odor and taste in these plants. *Lavandula* species contain several pleasant-smelling terpenoid compounds

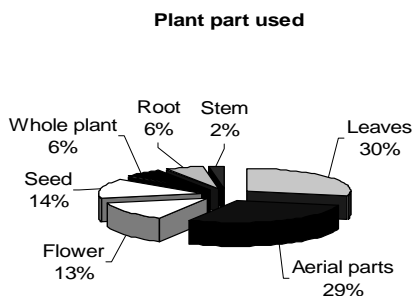


Figure 2. Distribution of plant parts used in the Labiatae family

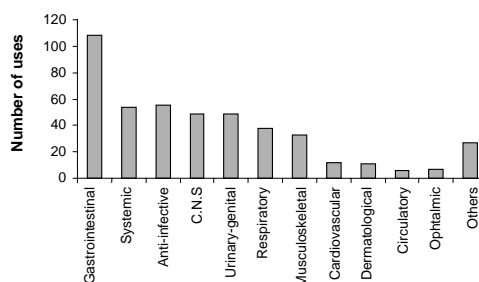


Figure 3. Frequency distribution of uses by type of illnesses in each category.

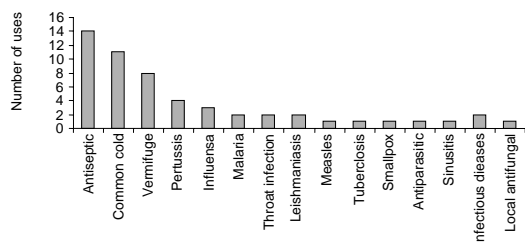


Figure 4. Frequency distribution of uses by type of illnesses in anti-infective category.

and are used in perfumes and for deterring moth damage in stored clothing (5). Lebdan diterpenoids are found in 20 genera of the family including *Ballota*, *Coleus*, *Lagichilus*, *Leonotice*, *Marrubium* and *Sideritis*. Coleon compounds (tri-cyclic diterpenoids), found in leaves and inflorescence of *Plectoranthus* and other genera, have some antioxidant properties (8). Iridoides are also found in the family and have taxonomic importance. The family is also a rich source of plant species containing large amounts of phenolic acids. For example, rosmarinic acid occurs in species of the subfamily *Nepetoideae* and it is absent in the *Lamioideae* subfamily (sensu Erdetman). This compound has anti-bacterial, anti-viral, antioxidant and anti-inflammatory properties. More and more studies carried out in numerous research centers show that the complex pharmacological activity of some medicinal plants of the family is strictly connected with the presence of phenolics (7). Flavonoides also occur in the *Labiatae* in a variety of structural forms including flavones, flavonols, flavanones, dihydroflavonols and chalcones (9).

Labiatae in Iran:

With 46 genera and 410 species and subspecies, Labiatae have great diversity and distribution in Iran. From these species, 124 species and subspecies (30%) are endemic to

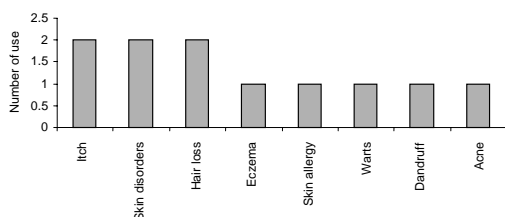


Figure 6. Frequency distribution of uses by type of illnesses in dermatological category.

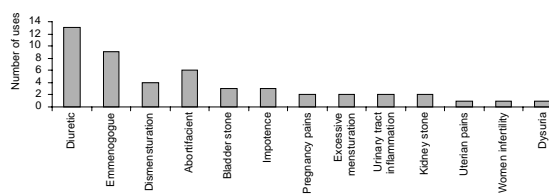


Figure 5. Frequency distribution of uses by type of illnesses in urinary-genital category.

Iran (1-3, 10). *Nepeta* (76 sp.), *Salvia* (56 sp.), *Stachys* (34sp.), *Scutellaria* (19 sp.), *Phlomis* (17 sp.), *Eremostachys* (16 sp.), *Thymus* (16 sp.) and *Teucrium* (12 sp.) are the largest genera in Iran. In addition there is a monotypic genus, *Zhumeria majdae*, occurring in the southern parts of Iran. A comparison of endemic species with the total number of species of some genera and the percentage of endemism is presented in figure 1.

The importance of Labiatae family

Members of the family are used for different purposes, but we can group their uses into three main categories; 1) medicinal; 2) ornamental and 3) aromatic plants which are used as culinary herbs, vegetables and in the perfume industry.

a) Medicinal uses:

Many species are used in traditional and modern medicine and recent investigations have proven the basis of the medicinal uses. There are diverse uses of the family members in traditional ways in different parts of the world. Based on our literature search, more than 81 species have been documented for medicinal uses in Iran, of which 16 species are not naturally grown in Iran. These species are listed in table 1, including their vernacular names, plant part used, uses and mode of preparation and administration. Out of

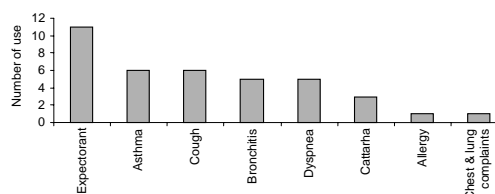


Figure 7. Frequency distribution of uses by type of illnesses in respiratory category.

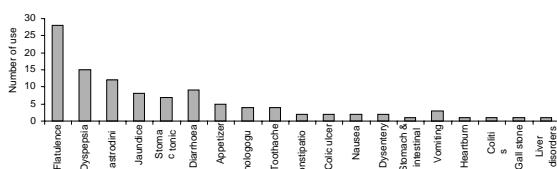


Figure 8. Frequency distribution of uses by type of illnesses in Gastrointestinal category.

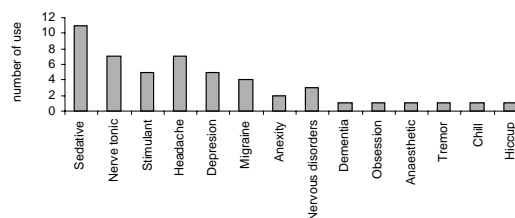


Figure 9. Frequency distribution of uses by type of illnesses in C.N.S category.

the total number of the Labiatae family in Iran, 18% of species are used for medicinal purposes. Leaves are the most widely used plant parts (figure 2). Medicinal applications are classified into 13 main categories. Statistical description of the total number of their uses related to the type of illness treated and details of their uses within each organ system are presented in figure 3 to 10.

As could be concluded from figure 3, Labiatae species are mainly used for the ailments related to the digestive system, especially flatulence and dyspepsia. The second and third most common applications are for the treatment of body problems such as reconstituent and infection, respectively.

b) Aromatic and culinary uses:

Species of *Mentha*, *Thymus*, *Lavandula*, *Ocimum*, *Origanum*, *Melissa* and *Satureja* are also used as culinary and flavoring plants. These uses are mostly due to the presence of essential oils common to the family. The Mediterranean region has been the main center for domestication and cultivation of Labiatae and many cultivated species are derived from wild ancestors of this region.

Lallemantia iberica Fisch. & C.A. Mey. was cultivated in Iran and southern parts of the former USSR as an oil-seed plant (11). *Mentha spicata* L. is used as a culinary herb and

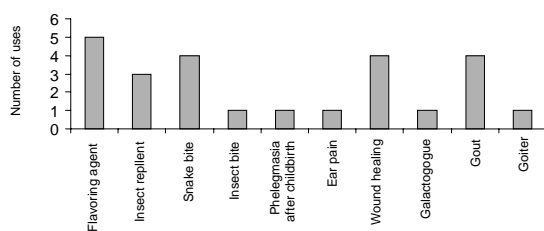


Figure 10. Frequency distribution of uses by type of illnesses without any special category.

also in toothpaste and chewing gum industry. Other species of *Mentha* such as *M. aquatica* L. and *M. longifolia* (L.) Hudson are used as wild vegetables and culinary herbs. *Satureja hortensis* L. and *S. mutica* Fisch & C. A. Mey. are used as flavoring plants. *Ocimum*, *Origanum* and *Melissa* species are cultivated as vegetables. Species of *Thymus* (Avishan) are used as culinary herbs and as tea in many parts of Iran. *Ziziphora tenuior* L. is a common teapot herb. In addition other species of the genus like *Z. clinopodioides* Lam. are very popular as teapot herbs. These species are available in local markets or in Attaris (traditional medicinal plant stores). Species of *Lavandula*, which contain aromatic terpenoid compounds, are also used in culinary and perfumery.

c) Ornamental uses:

Several genera of the family grow as ornamentals, including *Lavandula*, *Mentha*, *Molucella*, *Nepeta*, *Perovscia*, *Stachys*, *Teucrium*, *Salvia* and *Thymus*. Many species of *Stachys*, *Thymus* and *Satureja* are used as rock garden plants. Many of the decorative new world species of *Salvia* are cultivated throughout the world. *Nepeta cataria* L., *N. grandiflora*, and

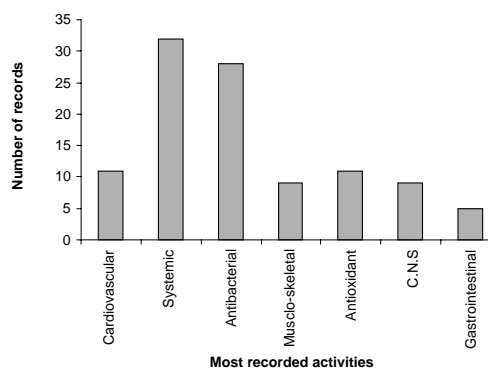


Figure 11. Assessed pharmacological activities in the main categories of health problems.

N. sibirica, with big blue flowers are among common ornamentals. Also *N. speciosa* Boiss. & Noe., *N. menthoides* Boiss. & Buhse., *N. haussknechtii* Bornm. and *N. betonicifolia* C. A. Mey. have potential to be used as rock plants (8). Species of *Lavandula* are also used in parks as ornamental plants. *Rosmarinus officinalis* L., a medicinal shrubby plant from the Mediterranean region, is cultivated in Iran for medicinal and ornamental purposes.

B- Experimental pharmacology:

Many species of the family have been experimentally studied and the efficiency of some traditional applications was confirmed by these works (figure11). For example, the anti-bacterial characteristic of *Thymus* spp. (thyme) is due to the occurrence of thymol in this genus. This substance can be used as a disinfectant. Many other mints have also been shown to be anti-bacterials. These properties are due to the mono- and sesquiterpene in the essential oils of these plants, but, it is becoming increasingly apparent that other compounds (eg. diterpenoids) may be responsible (5). Lavender oil, which contains terpenoid compounds, is used for dandruff and scalp hair re-growth and also possesses antimicrobial, antiviral and antifungal properties. Extract of *Stachys lavandulifolia* Vahl. from aerial parts, has proven to be effective in the improvement of patients suffering from anxiety disorders. This could be attributed to the presence of anti-anxiety compounds Apigenin and Luteolin in the plant (12). *Dracocephalum moldavica* L., which contains linalool, linalyl acetate, neural, geranial, geraniol and geranyl acetate, has been used for liver and stomach diseases in Mongolian medicine. In Zabaikalie medicine it is used for nephritis, gastro-enteritis and as gargle for stomatitis. In clinical tests it has been found that a decoction shows good results in curing children's pyelonephritis (13). *Dracocephalum kotschy* Boiss. is traditionally consumed as analgesic and for the treatment of fever and rheumatism. Experimental works have implicated that an alcoholic extract of aerial parts of the plant has analgesic, anti-inflammatory and antipyretic activities (14). Also, the essential oils induce a significant

reduction in pain responses in comparison with the controls. Presence of limonene and alpha-terpineol can be responsible for anti-nociceptive properties of these essential oils (15). There is no literature on some species used traditionally in Iran such as *Lallemantia royleana* (Benth. in Wall.) Benth., *L. iberica* (Stev.) Fisch & C. A. Mey. and *Hymnocrater elegans* Bunge. *Lavandula angustifolia* Mill. is taken for the treatment of inflammation, coughing, and digestive problems and as a sedative. Experimental assays show anti-inflammatory (Carragenin test) and analgesic (formalin and acetic acid induced writhing test) properties (16). *Marrubium vulgare* L. is traditionally used for digestive and respiratory problems (Table-1). Experimental works have also shown hypotensive, anti-nociceptive and anti-inflammatory properties (17, 18). *Nepeta cataria* is used as a sedative, blood depurative and anti-obsession drug. Experimental works have shown an anti-microbial activity against gram- positive bacteria (19). Medicinal properties of *Nepeta* species are related to terpenoids and flavonoides. Compounds such as 1-8-cineole, are very common in *Nepeta* and have expectorant, antiseptic and anthelmintic activities (8). Acetone fractions of *Satureja mutica* C.A. Mey. and *S. macrantha* were active against the epimastigotes of *Trypanosoma cruzi*, the ethological agent of Chagas disease (20). *Thymus kotschyanus* Boiss. & Hohen has extensive traditional applications, mostly for digestive problems. Pharmacological studies demonstrated anti-bacterial, hypotensive and cardiotoxic effects for this plant. A high aromatic compound content of the phenol-rich oils (carvacrol & thymol), which are found in aerial parts of the plant, seems to be accounting for the strong antibacterial activity (21, 22). An interesting result, which comes from comparison of recorded traditional uses and experimental works, is that despite the high rate of recorded traditional application, for gastrointestinal uses, few experimental works have been performed on this aspect (figure 16). This could be due to the known properties of essential oils on gastrointestinal problems. Most of the works had been carried out on systemic and antibacterial properties.

Table1. List of various plant species along with their species traditional uses.

Scientific name	Vernacular name	Part used	Traditional Uses in (as)	Pharmacological activity	Preparation Administration
<i>Ajuga chamaepitys</i> subsp. <i>tridactylites</i> (Ging. ex Benth.) P.H. Davis	Camaphytus		Jaundice, Joints pain, Gout (25)		
<i>Ajuga reptans</i> L.		L.	Reconstituent, Fever, Asthma, Gout (26)	Vasoconstrictor (27)	
<i>Calamintha graveolens</i> Benth.	Faranj-e mishk	Se.	Impotence, Stimulant (28) (29) Acne, Eczema, Depression, Nerves tonic (30)		Decoction Soaked in water
<i>Calamintha acinos</i>	Reyhan-e-vahshi		Bronchitis, Pertussis, Dyspnea, Measles, Smallpox Antiseptic for U.T. (30)		Decoction
<i>Dracocephalum kotschyi</i> Boiss.	Zarin giah	Wh.P.	Fever (31) Analgesic (15) Rheumatism (32)	Antihyperlipidemic (33) Antinociceptive (15) Analgesic, Antipyretic Anti-inflammatory (32)	Decoction Infusion
<i>Dracocephalum moldavica</i> L.	Badrashbi	A.p. Se. L.	Heart tonic (34);Reconstituent (29) (35); Sedative (34) (36) (37);Flatulence (29) (35);Vermifuge (31), Diaphoretic, Snakes bites and stings, Nausea (35)	Antifungal (14)	Distilled water Decoction
<i>Eremostachys glabra</i> Boiss		Rh.	Analgesic (local), Inflammation (38)	Antioxidative (39)	
<i>Hedeoma pulegioides</i>	Pudneh	A.p.	Headache, Flatulence, Stimulant, Emmenagogue Diaphoretic, Flavoring agent (28)		
<i>Hymnocrater elegans</i> Bunge.	Gol-e-serwaj	Fl.	Excessive menstruation (29)		Decoction
<i>Hyssopus officinalis</i> L. var. <i>angustifolia</i> (M. B.) Boiss.	Zofa Gol-e-puneh	A.p.	Cattarrh (28) (40), Fever, Rheumatism (28) Flatulence, Diaphoretic (28) (29) Stimulant (29), Spasm (40)	Muscle relaxing (41) Inhibitory on alpha-glucosidase, ostprandial Hyperglycemia (42)	Infusion Decoction
<i>Lallemantia royleana</i> (Benth. in Wall.) Benth. <i>L. iberica</i> (Stev.) Fisch & C.A. Mey	Balangu shirazi Balangu shahri	Se. R.	Fever (31); Common cold, Expectorant, Coughing (43) Reconstituent, Stimulant, Diuretic (14) Expectorant (14) (28) (29)		Soaked in water Sap as tea
<i>Lamium galeobdolon</i> L.	Gazaneh-e-zard	A.p.	Fever, Malaria, Warts, Constipation, Hair loss Rheumatism, Dandruff, Hemorrhage (9); Depreesion, Nerve tonic (92)		Decoction
<i>Lavandula dentate</i> L. <i>L. stoechas</i> L.	Ostokhodus Ossoghodus	Fl. L	Cattarrh (28) (29) (26),Malaria (28) (45); Diarrhea, Nervous disorders, Vomiting, Sedative, Antiseptic for wounds (28) (29) (26), Heart tonic, Nerves tonic, Dyspepsia, Anemia (46)	Anticonvulsant, Sedative Antispasmodic (47)	Infusion
<i>Lavandula angustifolia</i> Mill.	Ostokhodus	L.	Inflammation (16) Coughing, Flatulence, Diuretic, Spasm, Sedative (37)	Anti-inflammatory Analgesic (16) Cytotoxicity (48) Neuroprotective, Miticidal, Anaesthetic (28)	Extract

Table1. List of various plant species along with their species traditional uses. (Continued)

<i>Lavandula vera</i> D.C.	Ostokhodus (cultivated)	Fl. Se.	Depression, Migran (49)	(<i>Lavandula officinalis</i>) Diuretic (50) Antiallergic (51) Angioprotective(52)	
<i>Marrubium vulgare</i> L.	Gandna kouhi Ferasuon Yol-ghutli	Wh.P	Fever (31) (26), Nausea, Colitis, Bronchitis, Inflammation, Edema (30), Heart tonic (26); , Appetizer (30) (26) Diuretic (26), Cholagogue (30) (53) (26), Vermifuge, Expectorant (30), Dyspepsia (54), Ear pain (53); Abortifacient (36), Emmenagogue (53) (26)(36)	Hypoglycemic (119) Hypotensive, Vasorelaxant (45)(56), Antinociceptive (17), Anti-inflammatory (18)	Decoction
<i>Marrubium anisodon</i> K.Koch.	It-sieq, Narfiz Yol-ghutli	St. L	High blood pressure, Cardiac pains, Spasm, Flatulence, Dyspepsia, Women infertility (54)		Decoction Poultice
<i>Melissa officinalis</i> L.	Barangbo Badranjbuyeh	Fl. St. L. Se.	Gout, Palpitations, Tremor Blood depurative (30) Sedative (34) (37) (26) (57) (49), Diuretic (34) (46) Flatulence (37) (53) (57) (26), Flavoring agent (37) (53) Wound healing (37), Hair loss, Expectorant, Hiccup (53) Reconstituent, Dyspepsia, Emmenagogue, Joints pain Diaphoretic (57), Spasm, Headache (49), Impotence (46) Snake bites & stings (40)	Relaxant (58) Heart rate decreasing (59) Fungitoxic (60) Antimicrobial (61), Human CNS cholinergic receptor binding (62), Antioxidant (63), Anti- inflammatory (64), Cytotoxic (MTT) (65) Antiviral; HSV- 1(66) Neurotropic, peripheral analgesic– induce sleep (67), Anti-HIV-1 (68)	Decoction
<i>Mentha sylvestris</i> L.	Poneh Fudenj	L.	Rheumatism, Dysenthy, Dyspepsia (28) (29) Skin allergies, Stimulant (28), Chills (29)		Infusion
<i>Mentha piperata</i>	Naana felfeli khalvash	A.p.	Flatulence (30) (26), Inflammation, Dyspepsia, Jaundice, Throat infections Diaphoretic, Diuretic (30); Reconstituent, Stomach tonic (26)	Antimycobacterial (69) Antifungal (20,39) Antimicrobial (70) Antiallergic (71) Virucidal (72) Antioxidant (73) Radioprotective (74)	Decoction
<i>Mentha arvensis</i> L	Naana sahree		Flatulence, Constipation, Jaundice, Spasm, Diaphoretic Diuretic (30), Reconstituent, Stomach tonic (26)		Decoction
<i>Mentha longifolia</i> (L.) Hudson <i>M. longifolia</i> var. <i>chlorodictya</i> Rech. F. <i>M. spicata</i> L.	Poneh, Bideneh Yarpuz Naana vahshi	A.P. L	Bladder stone, Gall stone, Rheumatism, Jaundice, Diarrhoea (30); Toothache, Stomachache, Anti-infection (43) Dyspnea (30) (54), Flatulence , Gastrodynia (34) (29) Dyspepsia, Sedative (29), Stomach tonic, Reconstituent (26) Insect repellent (57)	(<i>M. longifolia</i>) Cyclooxygenase inhibitor (75) HIV 1 inhibitory (76) (<i>M. spicata</i>) Anti- inflammatory Haemostatic (77)	Decoction Distilled water Food additive Infusion
<i>Mentha aquatica</i> L.	Puneh, Bidanah	A.p.	Reconstituent, Stomach tonic (26)		
<i>Mentha sativa</i>	Naana sabz	L.	Jaundice, Dyspepsia, Diarrhoea, Cholagogue (30)		

Table1. List of various plant species along with their species traditional uses. (*Continued*)

<i>Nepeta bracteata</i> Benth.	Zofa	A.P.	Asthma, Flatulence (34), Bronchitis, Tuberculosis, Pertussis, Dyspnea, Goiter (30), Common cold (30) (8)		Decoction
<i>Nepeta cataria</i> L.	Alaf-e-gorbehdashti		Spasm, Anxiety, Sedative, Obsession, Nerves tonic Blood depurative (30)	Antimicrobial activity(19) Repellent activity(80)	
<i>Nepeta racemosa</i> Lam.	Gol-e-moro	Fl.	Gastrodynia, Flatulence, Antiseptic (34)		
<i>Nepeta micranta</i> Bunge. <i>N. ispahnica</i> Boiss.	Zofa	A.P.	Flatulence (29), Common cold (8)		Infusion
<i>Nepeta crispa</i> Wild.		L.	Culinary & medicinal agent (8)		
<i>Nepeta binaloudensis</i> Jamzad		A.p.	Common cold (8)		
<i>Nepeta pungens</i> (Bunge) Benth.		A.p.	Common cold (8)		
<i>Nepeta pogonosperma</i> Jamzad & Assadi		L.	Bacterial & fungal disease (8)		
<i>Nepeta menthoides</i> Boiss. & Buhse.	Ostokhodus	A.p.	Gastrodynia, Sedative (34), High blood pressure, Bone pain Nervous disorders, Rheumatism, Blood depurative (30)		Decoction
<i>Nepeta glomerulosa</i> Lam.			Itch, Skin disorders (26)		
<i>Ocimum basilicum</i> L.	Reyhan	Se. L.	Urinary tract inflammation (34), Chest & lung complaints (29) (10), Diuretic, Reconstituent, Flatulence (26)Nerves tonic, Colic ulcer, Dyspepsia (30), Inflammation, Diarrhoea, Appetizer (37), Expectorant (34)(79), Galactagogue (79) Influenza (28) (29) (10)	Antimicrobial (81) Antioxidant (82), Anti-inflammatory (83)	Decoction Infusion
<i>Ocimum minimum</i>	Reyhan-e-siyah		Insect repellent, Dysuria (30)		Decoction
<i>Ocimum canum</i> Sims.	Reyhan-e-kouhi	Se.	Heart tonic, Expectorant (29)	(<i>Ocimum sanctum</i>) Hypotensive (84) Antioxidant, Neuroprotective (85) Anti-ulcerogenic, ulcer-healing (66) Antithyroidic (86) Anti-inflammatory, Analgesic, Antipyretic (87)	Ice drink
<i>Ocimum majorana</i> L.	Marzangush	A.p	Rheumatism, Eye pain, Headache (79)	(<i>Ocimum gratissimum</i>) Cardiovascular (88), Wound-healing (89), Relaxant (90) Anthelmintic (91) Antidiarrhoeal (92) Analgesic, Spasmolytic (93)	infusion

Table1. List of various plant species along with their species traditional uses. (Continued)

<i>Origanum vulgare</i> L.	Marzanjush Kaklic-oti Oshomek-e-Kerek	A.P.	Toothache (28) (53); Kidney stone (54); Flatulence (28) (34) (54) (49); Rheumatism (28); Headache (28) (37); Sedative, Anxiety (30); Diaphoretic (28) (34); Emmenagogue (28) (37) (26); Reconstituent (28) (34) (26); Flavoring agent (54), Diuretic (34) (37) (26); Antiseptic (34); Nerves tonic (30) (26) (46) Vermifuge (53); Asthma, Jaundice (26); Spasm, Diarrhoea (49); Heart tonic (46), Gastrodynia (79)	Inhibition of thrombin Anticancer (94) Radical scavenging (95) Anti-hyperglycemic (96) Anti-H. pylori (97), Antifungal (98)	Decoction Mix with yoghurt Bath
<i>Origanum dictamnus</i>	Poneh kouhi		Dyspnea, Bronchitis, Allergy, Depression, Itch, Dementia (30) Abortifacient (49)		Decoction
<i>Otostegia persica</i> (Burmm.) Boiss.	Goldar, Gudar, Kas-e Goli	Ap.	Analgesic, Rheumatism, Toothache (99)	Antioxidant (100,101)	
<i>Perovskia abrotanoides</i> Kar.	Barazmbel	R.	Leishmaniasis (31,102)	Leishmanicidal (102)	Sap, applied directly Poultice made of crushed root
<i>Perovskia artemisioides</i> Boiss.	Barazmbel	R.	Leishmaniasis (31)		Sap/ applied directly Poultice made of crushed root
<i>Phlomis tuberosa</i> L.		L.	Culinary use (26)		Grilled
<i>Rosmarinus officinalis</i> L.	Aklil-e-kouhi	L. Fl.	Appetizer, Migrane, Gastrodynia, Rheumatism, Nervous disorders, Antiseptic for wounds (30) Diuretic (30) (37) (26), Flatulence, Inflammation, Analgesic (37), Cholagogue (30) (26)	Preventing liver damage(103) Insecticid (104), Antioxidant (105), Antinociceptive (106) Trypanocidal (107) Diuretic (108) Antiulcerogenic (109) Hyperglycemic, insulin release inhibitory (110) Relaxant (111)	Decoction
<i>Salvia aethiopis</i> L.		R. Wh.P.	Flatulence, Reconstituent (26)		
<i>Salvia aegyptica</i> L.	Maurlin	Se.	Eye disorders (29), Diarrhoea (26)		
<i>Salvia bracteata</i> Banks & Soland	Maryam goli-e- kouhi		Snake bites, Insect bites, Insect repellent, Flatulence Antiseptic for wounds (30)		Maceration in vinegar Decoction
<i>Salvia officinalis</i> L.	Maryam goli-e- kouhi	L. Fl.	Dyspepsia, Diuretic, Fever, Emmenagogue (26) Antiseptic for wounds (26) (37)	Antioxidant (112) lipid absorption inhibitor(113) treatment of patients with mild to moderate Alzheimer's disease(114)	
<i>Salvia hydrangea</i> D.C. ex Benth.	Gol-e-aruneh	Fl.	Fever, Flatulence, Rheumatism (34), Excessive menstruation (29), Common cold, Flavoring agent, Diuretic (37)	Antiplasmodial (115)	Decoction

Table1. List of various plant species along with their species traditional uses. (Continued)

<i>Salvia sclarea</i> L.		L. Fl.	Reconstituent, Emmenagogue, Antiseptic (26)	Antifungal (116) Antimicrobial (117)	Decoction
<i>Salvia macrosiphon</i> Boiss.	Tokhm-e-marv	Se.	Heart disturbances during pregnancy, Phelegmasia after childbirth (28) (29) (10), Reconstituent (28) (29), Coughing (34) (30), Pertussis, Angina, Sinusitis, Eye disorders (30) Expectorant (34)		Syrup Decoction
<i>Salvia viridis</i> L.	Bash-ashagh	Se.	Eye pain, Eye cleanser (54), Stomach tonic (26)	Antibacterial (118)	Moisted seeds used directly for cleansing eyes
<i>Satureja hortensis</i> L.	Marzeh	Se. A.P.	Stomach & intestinal disorders (119), Muscle pain (34) (120) Rheumatism (34), Colic ulcer, Stomach tonic, Impotence, Depression, Nerves tonic (30), Bone pain (30) (120), Dyspnea (30) (57), Anti-parasitic (31) (57), Vermifuge (30) (26)	Antispasmodic and anti-diarrhoeal (120) Antimicrobial (121) Anti-inflammation (122)	Decoction Sap as bathing for antiparasitic effect
<i>Satureja mutica</i> Fisch & C.A.Mey	Kemer-oti	A.p	Flavoring agent, Flatulence (54)		Additive
<i>Satureja khuzistanica</i> Jamzad	Marzeh khuzestani	A.p.	Inflammation , Toothache, Common cold (123), Antiseptic Analgesic (123) (124)	Antihyperlipidemic(in rat) Antidiabetic, Antioxidant (124)	
<i>Stachys byzantina</i> K. Koch.	Bezalagh	L.	Infected wounds, Cutting, (43)		Decoction, Demulcent
<i>Stachys turcamanica</i> Trautv.	Sim-kesh	Wh.p.	Foot inflammation, Toothache, Bronchitis, Influenza (54)		Infusion Demulcent Vapor
<i>Stachys lavandulaefolia</i> Vahl.	Marzanjush Tuklijeh, Chai alafi	L.	Fever (31) (57), Spasm (29), Gastrodynia (28) (29) Dyspepsia (34) (44); Sedative, Flatulence (57)	Anxiolytic (110)	Infusion Decoction
<i>Stachys germanica</i>	Tuklijeh	Fl.	Gastrodynia (28) (29), Painful menstruation (28)		Infusion
<i>Stachys schtschegleevii</i> Sosn. <i>S. inflata</i> Benth.			Asthma, Rheumatism, Infectious disease, Influenza (126)	Anti-inflammatory (126)	
<i>Teucrium chamaedrys</i>	Komaderios	A.p.	Jaundice, Bladder stone, Dyspepsia (25); Abortifacient (36)	Acute hepatitis due to ingestion of <i>T. chamaedrys</i> infusions (127)	
<i>Teucrium polium</i> L. <i>T. scordioides</i> Schreb.	Maryam-nokhodi Kalporeh Bakhsh-yeushan	A.p.	Pregnancy pains (28) (29), Flatulence (34) (54) (29), Analgesic (34), Liver disorders (54), Jaundice (53), Coughing, Abortifacient (37)	Analgesic, Antiinflammatory (128) Hypoglycemic (129) Antispasmodic (130) Antipyretic antibacterial (131) Hypolipidemic (132)	Infusion
<i>Teucrium stocksianum</i> Boiss	Kalporeh	A.p.	Fever (29)		

Table1. List of various plant species along with their species traditional uses. (Continued)

<i>Thymus serpyllum</i> L.	Kushan-e shirazi	L.	Flatulence (28) (29), Expectorant (49)	Antibacterial (21)	Infusion Additive
<i>Thymus pubescens</i> Boiss. & Kotschy ex Celak <i>T. carmanicus</i> Jalas.		L.	Rheumatism, Skin disorders (133)	Antibacterial (21)	Bath
<i>Thymus daenensis</i> (Subsp. <i>daenensis</i> Celak)	Avishan	Wh.p.	Fever (31), Diuretic, Vermifuge, Flatulence, Appetizer, Toothache (37)	(<i>Thymus vulgaris</i>) Anti-inflammatory (134) Antifungal (135) Human platelet aggregation inhibitors (136) Spasmolytic (137) inhibitory on H. pylori (138)	Decoction
<i>Thymus kotschyanus</i> Boiss.& Hohen	Avishan	A.p.	Gastrodynia, Joints pain (34), Common cold (34) (35), Flatulence (34) (57) (26) (133), Bone pain, Redness eyes, Blood depurative, Stomach tonic, Antiseptic (30), Coughing, Appetizer (30) (57), Kidney stones (43) (57), Reconstituen, Diuretic, Analgesic, High Blood pressure Uterine pains, Headache, Vomiting, Heartburn, Asthma, Catarrh, Inflammation & irritation of urinary organs (43), Expectorant, Emmenagogue, Spasm, Vermifuge, Sedative, Diaphoretic (133)	Antibacterial (139) Hypotensive, cardiotonic (22)	Decoction Infusion Vapor Powder (additive)
<i>Zataria multiflora</i> Boiss.	Avishan Ab-i-sham Avishan-e-shirazi Oshomek-e-peen	A.p.	Fever (31); Flatulence (29) (37); Pregnancy pains (29) (10) Rupture (29); Bone pain, Gastrodynia (34); Common cold (34) (37); Headache, Migran (30); Antiseptic (30) (140); Antiseptic, Haemostatic, Diarrhoea, Vomiting (79); Spasm, Anaesthetic (140); Joints pain, Diarrhoea, Vermifuge (37); Local antifungal (49)	Antinociceptive Anti-inflammatory(140) Antimicrobial (141)	Infusion Decoction Vapor
<i>Zhumeria majdae</i> Rech.& Wen.		D.S.L	Gastrodynia, Antiseptic, Painful menstruation (142)(143)(26)	Antinociceptive, Anti-inflammatory (143)	Preparation like tea
<i>Ziziphora tenuior</i> L.	Kakuti Pinah koei	A.p.	Fever, Dysentery (28) (29), Flatulence (144) (37) (26) Coughing (144) (37), Painful menstruation, Emmenagogue Bladder stone (144), Stomach tonic (28) (29) (10) Expectorant (37) (26), Diarrhea (37); Abortifacient (36)		Infusion Mix with doogh
<i>Ziziphora persica</i> Bunge.	Kaklic-oti	L.	Flatulence, Dyspepsia(54)		Infusion, Decoction
<i>Ziziphora clinopodioides</i> Lam.	Annakh Avishan-e-barik Moshk-e-toramashir	L. Fl.	Common cold, Inflammation, Antiseptic (34), Dyspepsia, Sedative (54), Expectorant (53), Migran, Depression (57) Stomach tonic, Gastrodynia, Fever, Heart disorders (26)		Infusion, Vapor Decoction Maceration

A.p. = Aerial parts, S= Seed, L= Leaf, Fl= Flower, R= Root, Rh. = Rhizome, Wh.p. = Whole plant, St. = Stem

C- Comments on some species:

Many species of the family, especially endemics, are used locally by indigenous people in different parts of Iran and there is little information or documented references about their uses. For example Maur (*Salvia aegyptica* L.) seeds are used locally in Baluchestan for eye diseases. The genus *Salvia* is well known for production of mucilage, when seeds are wetted. The mucilaginous layer around the seeds contains complex polysaccharides, which form a soft layer around the seeds. This layer may well have a cleansing effect, and polysaccharides are known to be useful in the treatment of inflammatory conditions and bacterial or viral infections (23). The same use for seeds of *Salvia viridis* L. is reported in the Turkmen Sahra area. *Nepeta pogonosperma* Jamzad & Assadi is used as an anti-fungal and anti-bacterial agent by Bedouins of Alborz Mountains (8) and *Leonorus cardiaca* L. and species of *Lamium* are used locally in Mazandaran (24).

Some species mentioned in table 1 do not occur naturally in Iran and could have been cultivated or imported from other countries such as India. For example, there are only two species of *Lavandula* growing naturally in Iran, *L. stricta* Del. and *L. sublepidata* Rech. K. These species are not mentioned as medicinal plants in references; however *L. soechas* L., *L. vera* DC., *L. angustifolia* Mill. and *L. dantata* L. have been referred to in table-1. From the genus *Ocimum*, only the *O. basilicum* L. occurs naturally in Iran. Other species may be cultivated or imported from other countries. Based on Flora Iranica, *Calamintha graveolens* and *C. acinos* do not occur in Iran and only *C. officinalis* Moench, *C. debilis* (Bunge.) Benth. and *C. grandiflora* (L.) Moench grow in Iran. Species of *Mentha* are also used as vegetables and as culinary herbs. *M. aquatica* and *M. longifolia* are used as vegetables in most parts of Iran, especially in the northern regions. *M. arvensis* L. and *M. sativa* do not exist naturally in Iran, based on Flora Iranica. *Origanum vulgare* L. is an extremely variable species. In Flora Iranica, it is represented by three subspecies which are not always clearly distinct. *Origanum dictamnus* L. does not occur in Iran.

Some genera have a great number of species and a wide range of distribution in Iran, but there are either no or few records of the use of the species of these genera. For example, *Hymnocrater* has 9 species in Iran, with a wide range of distribution, but we found no record on the use of this genus. These shrubby Labiate plants have a strong odor and it seems that they contain compounds with anti-feeding activity, because in areas with a high grazing pressure, these plants remain intact. Another example is the genus *Phlomis*, again with a relatively high number of species, but with only one record of use. This demonstrates the necessity of ethnobotanical studies in different parts of Iran to record all the knowledge of folk medicine practiced among indigenous people.

Citation of species which do not occur in Iran may also be a result of misidentification of these plants. The importance of a correct scientific identification of the plant can hardly be exaggerated, since it is the only key connecting the ethnobotanical information gained with already existing biological and chemical knowledge recorded in the literature. However, vernacular synonyms in a literature search pose a major problem. In some of the traditional texts, it is not possible to match these names with scientific names. Another problem is the uncertainty regarding scientific naming of plants, because of the different vernacular names or a local name which is given to two or more species. For example, the name Zuffa is matched with two species of *Nepeta bracteata* Benth. and *Hyssopus officinalis* L. in different references or Badi-ranj Buyeh has been variously referred to the species of *Nepeta*, *Calamintha* and *Melissa* or the name Avishan is a common name given to different species of *Thymus* in different parts of Iran. Local names are not a reliable source for identification of plants, because they differ significantly from one region to another.

Acknowledgments

The authors would like to thank Dr. Mohsin Raza, Dr. Rainer Bussman and Dr. Barbara Feri Haller for their reviews and helpful suggestions on this work.

References

- (1) Hedge, I.C., A global survey of the biogeography of the *Labiatae*. In Harley R.M. Reynolds T., *Advances in Labiatae Science*. Royal Botanical Gardens, Kew, London. (1992) 7-17
- (2) Hedge, I.C., *Labiatae* of South-west Asia: diversity, distribution and endemism, *Proceedings of the Royal Society of Edinburgh* (1986) 89: 23-35
- (3) Jamzad Z, Ingrouille M and Simmonds MSJ. Three new species of *Nepeta* (Lamiaceae) from Iran. *Taxon* (2003) 52: 93-98
- (4) Rivera Nunez, D., Obon de Gastro C., Palaeoethnobotany and archaeobotany of the *Labiatae* in Europe and Near East. In Harley, R.M. Reynolds, T., *Advances in Labiatae Science*. Royal Botanical Gardens, Kew, London. (1992b) 437-454
- (5) Richardson P. The chemistry of the *Labiatae*: An introduction and overview. In: Harley RM and Reynolds T. (Eds.) *Advances in Labiatae Science*. Botanical Garden Kew (1992) 291- 297
- (6) Lu Y and Yeap-foo L. Polyphenolics of *Salvia*- a review. *Phytochem.* (2002) 59: 117-140
- (7) Zegorka G and Glowniak K. Variation of free phenolic acids in medicinal plants belonging to the Lamiaceae family. *J. Pharm. Biomed. Anal.* (2001) 26: 179-187
- (8) Jamzad Z. *A Phylogenetic Study of Nepeta L.* (PhD thesis, Birkbeck college, university of London, (2001)
- (9) Tomas-Barberan, F.A., Gil, M.L.; Chemistry and natural distribution of Flavonoids in the *Labiatae*. In Harley, R.M. Reynolds, T., *Advances in Labiatae Science*. Royal Botanical Gardens, Kew, London. (1992) 200-305
- (10) Rechinger KH. *Labiatae* In: Flora Iranica, No. 150, Akademische Druch-u. Verlagsanstalt, Austria (1982)
- (11) Rivera Nunez, D., Obon de Gastro C., The ethnobotany of *Labiatae* of old world. In Harley, R.M. Reynolds, T., *Advances in Labiatae Science*. Royal Botanical Gardens, Kew, London. (1992a) 455-473
- (12) Safaei, A. Identification and Quantitative Determination of Luteolin and Apigenin in Aerial Parts of *Stachys lavandulifolia* by HPLC. *2nd International Congress on Traditional Medicine & Materia Medica*, Shaheed Beheshty University of Medical Sciences, Tehran (2004)
- (13) Budantsev AL, Shavarda AL and Medvedeva NA. The role of the *Labiatae* in the vegetable resources of the USSR. *Lamiales Newsletter* (1994) 3: 11-12
- (14) Amin GH, Mohammadi Z and Nakhjavanpour R. Phytochemical and Antifungal Study of Badarashbi. *4th Seminar on Medicinal Plants*, Tehran Medical Sciences University, Tehran (1990)
- (15) Golshani S, Karamkhani F, Monsef-Esfehani HR and Abdollahi M. Antinociceptive effects of the essential oil of *Dracocephalum kotschyi* in the mouse writhing test. *J. Pharm. Pharm. Sci.* (2004) 7: 76-79
- (16) Hajhashemi V, Ghannadi A and Sharif B. Anti-inflammatory and analgesic properties of the leaf extracts and essential oil of *Lavandula angustifolia* Mill. *J. Ethnopharmacol.* (2003) 89: 67-71
- (17) De Jesus RA, Cechinel-Filho V, Oliveira AE and Schlemper V. Analysis of the antinociceptive properties of marrubiin isolated from *Marrubium vulgare*. *Phytomedicine* (2000) 7: 111-5
- (18) Sahpaz S, Garbacki N, Tits M and Bailleul F. Isolation and pharmacological activity of phenylpropanoid esters from *Marrubium vulgare*. *J. Ethnopharmacol.* (2002) 79: 389-92
- (19) Nostro A, Cannatelli MA, Crisafi G and Alonzo V. The effect of *Nepeta cataria* extract on adherence and enzyme production of *Staphylococcus aureus*. *Int. J. Antimicrob. Agents* (2001) 18: 583-5
- (20) Gohari AR, Saeidania S, Kiuchi F and Honda G. Trypanocidal Activity of Some Endemic Species of *Satureja* in Iran. *2nd International Congress on Traditional Medicine & Materia Medica*, Shaheed Beheshty University of Medical Sciences, Tehran (2004)
- (21) Rasooli I and Mirmostafa SA. Antibacterial properties of *Thymus pubescens* and *Thymus serpyllum* essential oils. *Fitoterapia* (2002) 73: 183-279
- (22) Guseinov DIA, Kagramanov KM, Kasumov FIU and Akhundov RA. Research on the chemical composition and aspects of the pharmacological action of the essential oil of Kochi thyme (*Thymus kotschyanus* Boiss.). *Farmakol. Toksikol.* (1987) 50: 73-4
- (23) Heinrich M, Barnes J, Gibbons S and Williamson EM. *Fundamentals of Pharmacognosy and Phytotherapy*. Churchill Livingstone, (2004) 55
- (24) Shokri M and Safaian N. The Study of Medicinal Plants in Mazandaran (Northern Iran). *Acta Hort.* (1993) 333: 165-174
- (25) Brimani L. *Traditional Medicine and Traditional Drugs*. Gutenberg Publication, Tehran (1987)
- (26) Zargari A. *Medicinal Plants*. Tehran University Publication, Tehran (1989-1992)
- (27) Breschi MC, Martinotti E, Catalano S, Flamini G, Morelli I and Pagni AM. Vasoconstrictor activity of 8-O-acetylharpagide from *Ajuga reptans*. *J. Nat. Prod.* (1992) 55: 1145-8
- (28) Aynehchi Y. *Pharmacognosy and Medicinal Plants of Iran*. Tehran University Publication, Tehran (1986)
- (29) Hooper D and Field H. Useful plants and drugs of Iran and Iraq. *Field Museum of Natural History, Botanical Series* (1937) 9: 71-241
- (30) Amini A. *Illustrated Dictionary of Therapeutic Plants and their Traditional Usage in Kurdistan*. Taqobostan Publication, Khoramabad (1997)
- (31) Sairafianpuor M. *Iranian Medicinal Plants and Antiparasitic Compounds: from Ethnobotany to Contemporary Scientific Evidence*. Ph.D. Dissertation, Department of Medical chemistry, Royal Danish School of Pharmacy, Copenhagen (2002)
- (32) Ghafghazi T, Samsam Sheriat H, Movahhedian A and Purmoghaddas M. A Study on the Morphology, Phytochemistry, Pharmacology & Clinilical Activities of *Deracocephalum kotschyii* Boiss. *4th Seminar on Medicinal Plants*, Tehran Medical Sciences University,

- Tehran (1990)
- (33) Ebrahim Sajjadi S, Movahedian Atar AM and Yektaian A. Antihyperlipidemic effect of hydroalcoholic extract, and polyphenolic fraction from *Dracocephalum kotschyi* Boiss. *Pharm. Acta Helv.* (1998) 73: 167-70
- (34) Amin G. *Popular Medicinal Plants of Iran*. Iranian Research Institute of Medicinal Plants, Tehran (1991)
- (35) Miraldi E, Ferri S and Mostaghimi V. Botanical drugs and preparations in the traditional medicine of west Azarbaijan (Iran). *J. Ethnopharmacol.* (2001) 75: 77-87
- (36) Madari H and Jacobs RS. An analysis of cytotoxic botanical formulations used in the traditional medicine of ancient persia as abortifacients. *J. Nat. Prod.* (2004) 67: 1204-1210
- (37) *Iranian Herbal Pharmacopoeia*, Ministry of Health and Medical Education, Tehran (2002) Vol: 1-2
- (38) Delazar A, Shoeb M, Kumarasamy Y, Byres M, Nahar L, Modaresi M and Sarker SD. Two bioactive ferulic acid derivatives from *Eremostachys glabra*. *DARU* (2004) 12: 49-53
- (39) Edris AE and Farrag ES. Antifungal activity of peppermint and sweet basil essential oils and their major aroma constituents on some plant pathogenic fungi from the vapor phase. *Nahrung.* (2003) 47: 117-21
- (40) Puyan M. *Medicinal Plants of Southern Parts of Khorasan Province*. Danesh Publication, Mashhad (1982)
- (41) Lu M, Battinelli L, Daniele C, Melchioni C, Salvatore G and Mazzanti G. Muscle relaxing activity of *Hyssopus officinalis* essential oil on isolated intestinal preparations. *Planta Med.* (2002) 68: 213-216
- (42) Miyazaki H, Matsuura H, Yanagiya C, Mizutani J, Tsuji M and Ishihara C. Inhibitory effects of hyssop (*Hyssopus officinalis*) extracts on intestinal alpha-glucosidase activity and postprandial hyperglycemia. *J. Nutr. Sci. Vitaminol.* (2003) 49: 346-9
- (43) Mosaddegh M and Shajari E. Ethnobotanical study of Sabalan district in Ardabil Province of Iran. *2nd International Congress on Traditional Medicine & Materia Medica*, Shaheed Beheshty University of Medical Sciences, Tehran (2004)
- (44) Zekarya-e Razi M. *Alhavy* (Translated by Tabatabayii SM) *Alhavy Pharm. Comp* (1993)
- (45) El Bardai S, Lyoussi B, Wibo M and Morel N. Pharmacological evidence of hypotensive activity of *Marrubium vulgare* and *Foeniculum vulgare* in spontaneously hypertensive rat. *Clin. Exp. Hypertens.* (2001) 23: 329-43
- (46) Khosravi SM. *Sina Traditional Medicine: Treating Health Problems with Medicinal Plants and Natural Products*, Mohammad Publications, Tehran (1994)
- (47) Gilani AH, Aziz N, Khan MA, Shaheen F, Jabeen Q, Siddiqui BS and Herzig JW. Ethnopharmacological evaluation of the anticonvulsant, sedative and antispasmodic activities of *Lavandula stoechas* L. *J. Ethnopharmacol.* (2000) 71: 161-7
- (48) Prashar A, Locke IC and Evans CS. Cytotoxicity of lavender oil and its major components to human skin cells. *Cell Prolif.* (2004) 37: 221-9
- (49) Moattar F and Shams Ardakani M. *Phytotherapy Guide*. Academic of Medical sciences of Iran (1999)
- (50) Elhajili M, Baddouri K, Elkabbaj S, Meiouat F and Settaf A. Diuretic activity of the infusion of flowers from *Lavandula officinalis*. *Reprod Nutr. Dev.* (2001) 41: 393-9
- (51) Kim HM and Cho SH. Lavender oil inhibits immediate-type allergic reaction in mice and rats. *J. Pharm. Pharmacol.* (1999) 51: 221-6
- (52) Nikolaevskii VV, Kononova NS, Pertsovskii AI and Shinkarchuk IF. Effect of essential oils on the course of experimental atherosclerosis. *Patol. Fiziol. Eksp. Ter.* (1990) 5: 52-3
- (53) Abu Ali Sina (Avicenna). *Qanun in Medicine*, (Translated by Sharafkandy A) Soroush Publication, Tehran (1988)
- (54) Ghorbani AB. *Ethnobotanical Survey in Golestan Province and Adjacent Regions*. (M.Sc. Thesis), Faculty of Science, Tehran University, Tehran (2004)
- (55) Roman Ramos R, Alarcon-Aguilar F, Lara-Lemus A and Flores-Saenz JL. Hypoglycemic effect of plants used in Mexico as antidiabetics. *Arch. Med. Res.* (1992) 23: 59-64
- (56) El Bardai S, Morel N, Wibo M, Fabre N, Llabres G, Lyoussi B and Quetin-Leclercq J. The vasorelaxant activity of marrubenol and marrubiin from *Marrubium vulgare*. *Planta Med.* (2003) 69: 75-7
- (57) Shafizadeh F. *Popular Medicinal Plants of Lurestan*. Vol.1, Lurestan University of Medical Science, Khorramabad (2002)
- (58) Sadraei H, Ghannadi A and Malekshahi K. Relaxant effect of essential oil of *Melissa officinalis* and citral on rat ileum contractions. *Fitoterapia* (2003)74: 445-52
- (59) Zarabi M. *Pharmacognosical Evaluation of Ziziphora clinopodioides Lam.* (Pharm. D. Thesis), Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran (2000)
- (60) Araujo C, Sousa MJ, Ferreira MF and Leao C. Activity of essential oils from Mediterranean Lamiaceae species against food spoilage yeasts. *J. Food Prot.* (2003) 66: 625-32
- (61) Larrondo JV, Agut M and Calvo-Torras MA. Antimicrobial activity of essences from labiates. *Microbios* (1995) 82: 171-2
- (62) Wake G, Court J, Pickering A, Lewis R, Wilkins R and Perry E. CNS acetylcholine receptor activity in European medicinal plants traditionally used to improve failing memory. *J. Ethnopharmacol.* (2000) 69: 105-14
- (63) Mimica-Dukic N, Bozin B, Sokovic M and Simin N. Antimicrobial and antioxidant activities of *Melissa officinalis* L. (Lamiaceae) essential oil. *J. Agric. Food Chem.* (2004)52: 2485-9
- (64) Englberger W, Hadding U, Etschenberg E, Graf E, Leyck S, Winkelmann J and Parnham MJ. Rosmarinic acid: a new inhibitor of complement C3-convertase with

- anti-inflammatory activity. *Int. J. Immunopharmacol.* (1988) 10: 729-37
- (65) De Sousa AC, Alviano DS, Blank AF, Alves PB, Alviano CS and Gattass CR. *Melissa officinalis* L. essential oil: antitumoral and antioxidant activities. *J. Pharm. Pharmacol.* (2004) 56: 677-81
- (66) Dharmani P, Kuchibhotla VK, Maurya R, Srivastava S, Sharma S and Palit G. Evaluation of anti-ulcerogenic and ulcer-healing properties of *Ocimum sanctum* Linn. *J. Ethnopharmacol.* (2004) 93: 197-206
- (67) Soulimani R, Fleurentin J, Mortier F, Misslin R, Derrieu G and Pelt JM. Neurotropic action of the hydroalcoholic extract of *Melissa officinalis* in the mouse. *Planta Med.* (1991) 57: 105-9
- (68) Yamasaki K, Nakano M, Kawahata T, Mori H, Otake T, Ueba N, Oishi I, Inami R, Yamane M, Nakamura M, Murata H and Nakanishi T. Anti-HIV-1 activity of herbs in Labiatae. *Biol. Pharm. Bull.* (1998) 21: 829-33
- (69) Shkurupii VA, Kazarinova NV, Ogirenko AP, Nikonov SD, Tkachev AV and Tkachenko KG. Efficiency of the use of peppermint (*Mentha piperita* L.) essential oil inhalations in the combined multi-drug therapy for pulmonary tuberculosis. *Probl. Tuberk.* (2002) 4: 36-9
- (70) Iscan G, Kirimer N, Kurkuoglu M, Husnu Can Baser K and Demirci F. Antimicrobial screening of *Mentha piperita* essential oils. *J. Agric. Food Chem.* (2002) 50: 3943-6
- (71) Inoue T, Sugimoto Y, Masuda H and Kamei C. Antiallergic effect of flavonoid glycosides obtained from *Mentha piperita* L. *Biol. Pharm. Bull.* (2002) 25: 256-9
- (72) Schuhmacher A, Reichling J and Schnitzler P. Virucidal effect of peppermint oil on the enveloped virus herpes simplex virus type 1 and type 2 *in vitro*. *Phytomedicine* (2003) 10: 504-10
- (73) Mimica-Dukic N, Bozin B, Sokovic M, Mihajlovic B and Matavulj M. Antimicrobial and antioxidant activities of three *Mentha* species essential oils. *Planta Med.* (2003) 69: 413-9
- (74) Samarth RM, Goyal PK and Kumar A. Protection of swiss albino mice against whole-body gamma irradiation by *Mentha piperita* Linn. *Phytother. Res.* (2004) 18: 546-50
- (75) Harborn JB. *The Flavonoids*. Chapman and Hall, London (1994) 624
- (76) Amzazi S, Ghoulami S, Bakri Y, Il Idrissi A, Fkih-Tetouani S and Benjouad A. Human immunodeficiency virus type 1 inhibitory activity of *Mentha longifolia*. *Therapie* (2003) 58: 531-4
- (77) Zheng J, Wu LJ, Zheng L, Wu B and Song AH. Two new monoterpenoid glycosides from *Mentha spicata* L. *J. Asian Nat. Prod. Res.* (2003) 5: 69-73
- (78) Shahidi F. *Phytochemical and Antimicrobial Effects Survey of Mentha pulegium L.* (Pharm. D. Thesis), Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran (1985)
- (79) Salami A. *Anticent Iranian Medicine: The Traditional Medicine of Davan*. Didavar, Tehran (2002)
- (80) Peterson CJ, Nemetz LT, Jones LM and Coat JR. Behavioral activity of catnip (Lamiaceae) essential oil components to the German cockroach (*Blattodea: Blattellidae*). *J. Econ. Entomol.* (2002) 95: 377-80
- (81) Suppakul P, Miltz J, Sonneveld K and Bigger SW. Antimicrobial properties of basil and its possible application in food packaging. *J. Agric. Food Chem.* (2003) 51: 3197-207
- (82) Jayasinghe C, Gotoh N, Aoki T and Wada S. Phenolics composition and antioxidant activity of sweet basil (*Ocimum basilicum* L.). *J. Agric. Food Chem.* (2003) 51: 4442-9
- (83) Singh S. Mechanism of action of antiinflammatory effect of fixed oil of *Ocimum basilicum* Linn. *Indian J. Exp. Biol.* (1999) 37: 248-52
- (84) Singh S, Rehan HM and Majumdar DK. Effect of *Ocimum sanctum* fixed oil on blood pressure, blood clotting time and pentobarbitone-induced sleeping time. *J. Ethnopharmacol.* (2001) 78: 139-43
- (85) Yanpallewar SU, Rai S, Kumar M and Acharya SB. Evaluation of antioxidant and neuroprotective effect of *Ocimum sanctum* on transient cerebral ischemia and long-term cerebral hypoperfusion. *Pharmacol. Biochem. Behav.* (2004) 79: 155-64
- (86) Panda S and Kar A. *Ocimum sanctum* leaf extract in the regulation of thyroid function in the male mouse. *Pharmacol. Res.* (1998) 38: 107-10
- (87) Godhwani S, Godhwani JL and Vyas DS. *Ocimum sanctum*: an experimental study evaluating its anti-inflammatory, analgesic and antipyretic activity in animals. *J. Ethnopharmacol.* (1987) 21: 153-63
- (88) Lahlou S, Interaminense Lde F, Leal-Cardoso JH, Morais SM and Duarte GP. Cardiovascular effects of the essential oil of *Ocimum gratissimum* leaves in rats: role of the autonomic nervous system. *Clin. Exp. Pharmacol. Physiol.* (2004) 31: 219-25
- (89) Orafidiya LO, Agbani EO, Abereje OA, Awe T, Abudu A and Fakoya FA. An investigation into the wound-healing properties of essential oil of *Ocimum gratissimum* Linn. *J. Wound Care.* (2003) 12: 331-4
- (90) Madeira SV, Matos FJ, Leal-Cardoso JH, Criddle DN.; Relaxant effects of the essential oil of *Ocimum gratissimum* on isolated ileum of the guinea pig. *J. Ethnopharmacol.* (2002) 81: 1-4
- (91) Pessoa LM, Morais SM, Bevilaqua CM and Luciano JH. Anthelmintic activity of essential oil of *Ocimum gratissimum* Linn. and eugenol against *Haemonchus contortus*. *Vet. Parasitol.* (2002) 109: 59-63
- (92) Offiah VN and Chikwendu UA. Antidiarrhoeal effects of *Ocimum gratissimum* leaf extract in experimental animals. *J. Ethnopharmacol.* (1999) 68: 327-30
- (93) Aziba PI, Bass D and Elegbe Y. Pharmacological investigation of *Ocimum gratissimum* in rodents. *Phytother. Res.* (1999) 13: 427-9
- (94) Goun E, Cunningham G, Solodnikov S, Krasnykh O and Miles H. Antithrombin activity of some constituents from *Origanum vulgare*. *Fitoterapia* (2002) 73: 692-4

- (95) Matsuura H, Chiji H, Asakawa C, Amano M, Yoshihara T and Mizutani J. DPPH radical scavengers from dried leaves of oregano (*Origanum vulgare*). *Biosci. Biotechnol. Biochem.* (2003) 67: 2311-6
- (96) Lemhadri A, Zeggwagh NA, Maghrani M, Jouad H and Eddouks M. Anti-hyperglycaemic activity of the aqueous extract of *Origanum vulgare* growing wild in Tafilalet region. *J. Ethnopharmacol.* (2004) 92: 251-6
- (97) Stamatis G, Kyriazopoulos P, Golegou S, Basayiannis A, Skaltsas S and Skaltsa H. *In vitro* anti-Helicobacter pylori activity of Greek herbal medicines. *J. Ethnopharmacol.* (2003) 88: 175-9
- (98) Manohar V, Ingram C, Gray J, Talpur NA, Echard BW, Bagchi D and Preuss HG. Antifungal activities of origanum oil against *Candida albicans*. *Mol. Cell. Biochem* (2001) 228: 111-7
- (99) Sharififar F, Yassa N and Shafiee A. Antioxidant Activity of *Otostegia persica* (Labiatae) and its constituents. *Iran. J. Pharm. Res.* (2003) 235-239
- (100) Sharififar F. *Assessment of Anti-oxidant Activity of Some Iranian Plants and Determination of Effective Fractions.* (Pharm. D. Thesis), Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran (2003)
- (101) Shaiq Ali M, Saleem M, Ali Z and Ahmad V. Chemistry of *Zataria multiflora* (Lamiaceae). *Phytochem.* (2000) 55: 933-936
- (102) Sairafianpour M, Christensen J, Staerk D, Budnik BA, Kharazmi A, Bagherzadeh K and Jaroszewski JW. Leishmanicidal, antiplasmodial, and cytotoxic activity of novel diterpenoid 1, 2-quinones from *Perovskia abrotanoides*: new source of tanshinones. *J. Nat. Prod.* (2001) 64: 1398-403
- (103) Sotelo-Felix JL, Martinez-Fong D and Muriel De la Torre P. Protective effect of carnosol on CCl₄-induced acute liver damage in rats. *Eur. J. Gastroenterol. Hepatol.* (2002) 14: 1001-6
- (104) Papachristos DP, Karamanoli KI, Stamopoulos DC and Menkissoglu-Spiroudi U. The relationship between the chemical composition of three essential oils and their insecticidal activity against *Acanthoscelides obtectus* (Say). *Pest Manag. Sci.* (2004) 60: 514-20
- (105) Ibanez E, Kubatova A, Senorans FJ, Cavero S, Reglero G and Hawthorne SB. Subcritical water extraction of antioxidant compounds from rosemary plants. *J. Agric. Food Chem.* (2003) 51: 375-82
- (106) Hosseinzadeh H and Nourbakhsh M. Effect of *Rosmarinus officinalis* L. aerial parts extract on morphine withdrawal syndrome in mice. *Phytother. Res.* (2003) 17: 938-41
- (107) Abe F, Yamauchi T, Nagao T, Kinjo J, Okabe H, Higo H and Akahane H. Ursolic acid as a trypanocidal constituent in rosemary. *Biol. Pharm. Bull.* (2002) 25: 1485-7
- (108) Haloui M, Louedec L, Michel JB and Lyoussi B. Experimental diuretic effects of *Rosmarinus officinalis* and *Centaureum erythraea*. *J. Ethnopharmacol.* (2000) 71: 465-72
- (109) Dias PC, Foglio MA, Possenti A and de Carvalho JE. Antiulcerogenic activity of crude hydroalcoholic extract of *Rosmarinus officinalis* L. *J. Ethnopharmacol.* (2000) 69: 57-62
- (110) Al-Hader AA, Hasan ZA and Aqel MB. Hyperglycemic and insulin release inhibitory effects of *Rosmarinus officinalis*. *J. Ethnopharmacol.* (1994) 43: 217-21
- (111) Aqel MB. Relaxant effect of the volatile oil of *Rosmarinus officinalis* on tracheal smooth muscle. *J. Ethnopharmacol.* (1991) 33: 57-62.
- (112) Bors W, Michel C, Stettmaier K, Lu Y and Foo LY. Antioxidant mechanisms of polyphenolic caffeic acid oligomers, constituents of *Salvia officinalis*. *Biol Res.* (2004) 37: 301-11
- (113) Ninomiya K, Matsuda H, Shimoda H, Nishida N, Kasajima N, Yoshino T, Morikawa T and Yoshikawa M. Carnosic acid, a new class of lipid absorption inhibitor from sage. *Bioorg. Med. Chem. Lett.* (2004) 14: 1943-6
- (114) Akhondzadeh S, Noroozian M, Mohammadi M, Ohadinia S, Jamshidi AH and Khani M. *Salvia officinalis* extract in the treatment of patients with mild to moderate Alzheimer's disease: a double blind, randomized and placebo-controlled trial. *J. Clin. Pharm. Ther.* (2003) 28: 53-9
- (115) Sairafianpour M, Bahreininejad B, Witt M, Ziegler HL, Jaroszewski JW and Staerk D. Terpenoids of *Salvia hydrangea*: two new, rearranged 20-norabietanes and the effect of oleanolic acid on erythrocyte membranes. *Planta Med.* (2003) 69: 846-50
- (116) Pitarokili D, Couladis M, Petsikos-Panayotarou N and Tzakou O. Composition and antifungal activity on soil-borne pathogens of the essential oil of *Salvia sclarea* from Greece. *J. Agric. Food Chem.* (2002) 50: 6688-91
- (117) Ulubelen A, Topcu G, Eris C, Sonmez U, Kartal M, Kurucu S and Bozok-Johansson C. Terpenoids from *Salvia sclarea*. *Phytochem.* (1994) 36: 971-4
- (118) Ulubelen A, Oksuz S, Kolak U, Bozok-Johansson C, Celik C and Voelter W. Antibacterial diterpenes from the roots of *Salvia viridis*. *Planta Med.* (2000) 66: 458-62
- (119) Hajhashemi V, Sadraei H, Ghannadi AR, Mohseni MV. Antispasmodic and anti-diarrhoeal effect of *Satureja hortensis* L. essential oil. *J. Ethnopharmacol.* (2000) 71: 187-92
- (120) Hajhashemi V, Ghannadi A, Pezashkian SK. Antinociceptive and anti-inflammatory effects of *Satureja hortensis* L. extracts and essential oil. *J. Ethnopharmacol.* (2002) 82: 83-87
- (121) Sahin F, Karaman I, Gulluce M, Ogutcu H, Sengul M, Adiguzel A, Ozturk S, Kotan R.; Evaluation of antimicrobial activities of *Satureja hortensis* L. *J. Ethnopharmacol.* (200) 87: 61-5
- (122) Uslu C, Murat Karasen R, Sahin F, Taysi S and Akcay F. Effects of aqueous extracts of *Satureja hortensis* L. on rhinosinusitis treatment in rabbit. *J. Ethnopharmacol.* (2003) 88: 225-8
- (123) Dadkhah F. *Anti-inflammatory and Analgesic Effects*

- of *Satureja khuzestanica* Jamzad. (Pharm. D. Thesis), Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran (2003)
- (124) Abdollahi M, Salehni A, Mortazavi SHR, Ebrahimi M, Shafie A, Fouladian F, Keshavarz K, Sorouri S, Khorasani R and Kazemi A. Antioxidant, antidiabetic, antihyperlipidemic, reproduction stimulatory properties and safety of essential oil of *Satureja khuzestanica* in rat *in vivo*: a toxicopharmacological study. *Med. Sci. Monit.* (2003) 9: 331-335
- (125) Rabbani M, Sajjadi SE and Zarei HR. Anxiolytic effects of *Stachys lavandulifolia* Vahl. on the elevated plus-maze model of anxiety in mice. *J. Ethnopharmacol.* (2003) 89: 271-6
- (126) Maleki N, Garjani A, Nazmiyeh H, Nilouroushan N, Eftekhar AT, Allameh Z and Hassannian N. Potent Anti-inflammatory activities of hydroalcoholic extract from aerial parts of *Stachys inflata* on rats. *J. Ethnopharmacol.* (2001) 75: 213-218
- (127) Perez Alvarez J, Saez-Royuela F, Gento Pena E, Lopez Morante A, Velasco Osés A and Martin Lorente J. Acute hepatitis due to ingestion of *Teucrium chamaedrys* infusions. *Gastroenterol. Hepatol.* (2001) 24: 240-3
- (128) Abdollahi M. et al. Antinociceptive effects of *Teucrium polium* L. total extract and essential oil in mouse writhing test. *Pharmacol. Res.* (2003) 48: 31-35
- (129) Gharaibeh MN, Elayan HH and Salhab AS. Hypoglycemic effects of *Teucrium polium*. *J. Ethnopharmacol.* (1988) 24: 93-9
- (130) Hassan MM, Muhtadi FJ and Al-Badr AA. GLC-mass spectrometry of *Teucrium polium* oil. *J. Pharm. Sci.* (1979) 68: 800-1
- (131) Autore G, Capasso F, De Fusco R, Fasulo MP, Lembo M, Mascolo N and Menghini A. Antipyretic and antibacterial actions of *Teucrium polium* L. *Pharmacol. Res. Commun.* (1984) 16: 21-9
- (132) Rasekh HR, Khoshnood-Mansourkhani MJ and Kamalinejad M. Hypolipidemic effects of *Teucrium polium* in rats. *Fitoterapia* (2001) 72: 937-9
- (133) Rustaiyan A, Zare K and Habibi Z. Sesterterpenes from Iranian *Salvia* Species. *4th Seminar on Medicinal Plants*. Tehran Medical Sciences University, Tehran (1990)
- (134) Vigo E, Cepeda A, Gualillo O and Perez-Fernandez R. *In vitro* anti-inflammatory effect of *Eucalyptus globulus* and *Thymus vulgaris*: nitric oxide inhibition in J774A.1 murine macrophages. *J. Pharm. Pharmacol.* (2004) 56: 257-63
- (135) Pina-Vaz C, Goncalves Rodrigues A, Pinto E, Costade-Oliveira S, Tavares C, Salgueiro L, Cavaleiro C, Goncalves MJ and Martinez-de-Oliveira J. Antifungal activity of *Thymus* oils and their major compounds. *J. Eur. Acad. Dermatol. Venereol.* (2004) 18: 73-8
- (136) Okazaki K, Kawazoe K and Takaishi Y. Human platelet aggregation inhibitors from thyme (*Thymus vulgaris* L.). *Phytother. Res.* (2002) 16: 398-9
- (137) Van Den Broucke CO and Lemli JA. Spasmolytic activity of the flavonoids from *Thymus vulgaris*. *Pharm. Weekbl. Sci.* (1983) 5: 9-14
- (138) Tabak M, Armon R, Potasman I and Neeman I. *In vitro* inhibition of *Helicobacter pylori* by extracts of thyme. *J. Appl. Bacteriol.* (1996) 80: 667-72
- (139) Rasooli I and Mirmostafa SA. Bacterial susceptibility to and chemical composition of essential oils from *Thymus kotschyanus* and *Thymus persicus*. *J. Agric. Food Chem.* (2003) 51: 2200-5
- (140) Hosseinzadeh H, Ramezani M and Salmani G. Antinociceptive, anti-inflammatory and acute toxicity effects of *Zataria multiflora* Boiss extracts in mice and rats. *J. Ethnopharmacol.* (2000) 73: 379-385
- (141) Owlia PH, Pirveicy H, Saderi H, Rezvani MB and Mansouri S. Evaluation of the Antimicrobial Effects of Extract of *Zataria multiflora* Against Oral Streptococci. *2nd International Congress on Traditional Medicine & Materia Medica*, Shaheed Beheshti University of Medical Sciences, Tehran (2004)
- (142) Ghahreman A and Attar F. A floristic study report concerning Qeshm Island. *Iran. J. Bot.* (1996) 7: 57-62
- (143) Hosseinzadeh H, Ramezani M, Fadishei M and Mahmoudi M. Antinociceptive, anti-inflammatory and acute toxicity effects of *Zhumeria majdae* extracts in mice and rats. *Phytomedicine* (2002) 9: 135-41
- (144) Hariri KH. *Ziziphora*; *Distribution, Morphological Structure and Medicinal Properties*. (Pharm. D. Thesis), Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran (1972)