

ETHNOPHARMACOLOGICAL AND PHYTOCHEMICAL STUDY OF MAJOR SPECIES FROM LABIATAE FAMILY IN SAUDI ARABIA: A SYSTEMATIC REVIEW

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ABSTRACT

A review on a medicinal plant belong to family *Labiatae* has been made in the Kingdom of Saudi Arabia. Among the reported flora in the Kingdom of Saudi Arabia, *Labiatae* family has the highest species. A total of 23 species of *Labiatae* family has been reported with high medicinal value. A detail review on 12 species of *Labiatae* family had done to know their phytochemical constituents, medicinal uses and pharmacological properties. In this review we also explore the total chemical constituents present in each plant with a unique list of 3D chemical structures. (E)-2-Hexenal, 1,8-Cineole, Bicyclogermacrene, Borneol, Bornyl acetate, Bulnesol, Caffeic acid, Camphene, Camphor, Eugenol, Gallic acid, Quercetin, Terpinene, Thymol, etc are the important constituent in these 12 species of *Labiatae* family. This study also shows that *Marrubium vulgare* L, *Ocimum basilicum* L, *Origanum majorana* and *Otostegia fruticosa* plants had reported with many medicinal uses and pharmacological properties. Medicinal constituents include the highest phenolic, flavonoid content and strong aromatic essential oil. Further scientific investigations on these 12 species are needed to explore toxicity and clinical efficacy and as well as to explore the therapeutic effects of major secondary metabolites. The summarized information from the current review may be a useful tool for researchers to carry out further study and explore other scientific aspects of the herbs.

Keywords: *Labiatae*, Traditional system, Essential oil, Saudi Arabia, and Antioxidant activity

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INTRODUCTION

Herbal medicines are currently in high demand, and their popularity is growing by the day. According to the WHO, herbal medicines are used by 70-80 percent of the world's population for medicinal purposes [1]. For primary health care, the traditional medical system relies heavily on plants and animals. Herbal medicines are valuable in developing countries because of their medical value, as well as their sociocultural and spiritual uses in rural and tribal communities [2]. In terms of ethnomedicine, the Lamiaceae is the most diverse plant family. Lamiaceae, formerly called Labiatae. Due to high volatile content, it has great medicinal value [3]. There are approximately 236 genera and 6900-7200 species in it. Because of the presence of an external glandular structure, many species in this family are highly aromatic and contain volatile oil [4]. The Lamiaceae family of flowering plants is also known as the mint family. Many of the plants are aromatic

throughout and include common culinary herbs [5]. In the current review had been done to know the medical uses, pharmacological properties, and various phytochemical compounds of 12 species of *Labiatae* family in the kingdom of Saudi Arabia.

MATERIALS AND METHODS

Ethnobotanical data was collected by relevant literature from scientific databases such as; Web of science, PubMed, Google Scholar, Scopus, and other web sources such as flora of the kingdom of Saudi Arabia. A concise information of common names, medicinal uses and pharmacological properties were gathered and summarized in table 1. Individual total phytochemical constituent is shown in table 3-6 and fig. 1. We had created a unique list of important compound present in these 12 species (table 2). Also, the 3-D structures of unique compounds of 12 species are shown in fig. 2.

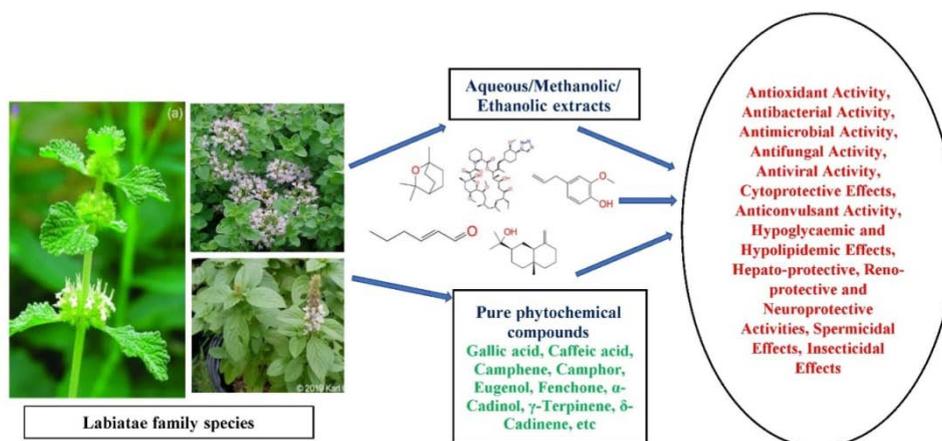


Fig. 1: Graphical abstract of Labiatae family

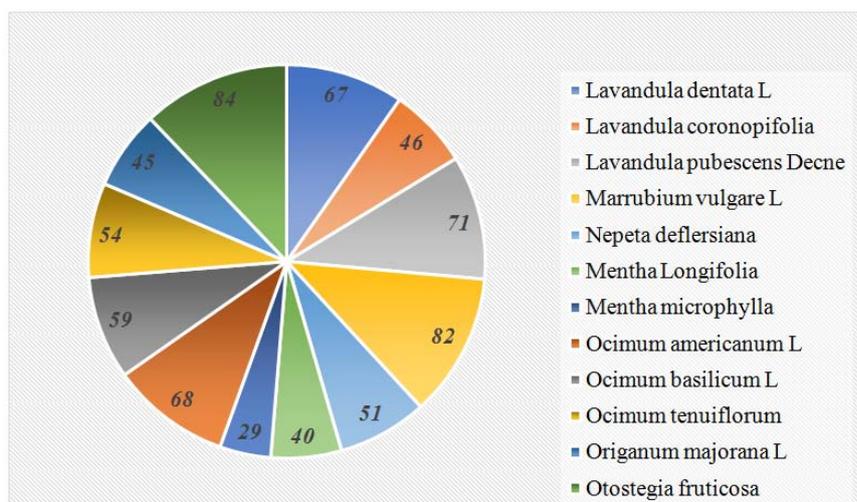


Fig. 2: Total number of compounds reported

RESULTS AND DISCUSSION

Lavandula dentata

Lavandula dentata is also known as fringed lavender. It is a flowering plants species of family Lamiaceae, native to the Mediterranean, Arabian Peninsula, and Atlantic islands. It grows to 60 cm tall, with grey-green leaves, which are lance or linear-shaped with lightly woolly texture and toothed edges [6]. It blooms in late spring and has purple flowers with pale violet bracts on top. The whole plant has a strong aromatic scent which is like lavender [7]. It's a popular ornamental plant, and the essential oil produce is often used in perfumes. In Murcia, the plant is used as an herbal treatment for stomach-ache [8]. A total of 67 compounds are isolated in *Lavandula dentata* (table 3).

Medicinal uses

The essential oil obtain from *Lavandula dentata* are vulnerary. The plants parts are burnt as incense sticks and also used in the treatment of catarrh. In Saudi Arabia it is rare, available only in Asir region. It is also used in removal of kidney stones [9].

Pharmacological properties

The essential oil obtain from *Lavandula* is used traditionally as herbal medicine to relieve anxiety and stress, which was approved by the European medicines Agency [10].

Lavandula coronopifolia Poir

It is also known as *Lavandula stricta* Delile. It has a wide distribution, from the northeast of tropical Africa, Cape Verde across North Africa, Arabia to eastern Iran [11]. Common in Southwest regions of Saudi Arabia. *Lavandula coronopifolia* exhibits the highest phenolic and flavonoid content. A total of 46 compounds (29 compounds constitute about 95.1% of oil) were identified (table 3).

Medicinal uses

Essential oil is used in the treatment of bacterial infection cause by Klebsiella, pneumonia, Escherichia coli, Enterobacter, Salmonella specious. It is reported that Gram-positive bacteria are more susceptible to essential oils than Gram-negative bacteria [12]. Essential oil collected from *Lavandula coronopifolia* Poir in Saudi Arabia showed 46 volatile components with 1, 1-dimethyl ethyl and carvacrol are the main components [13]. The plant has disinfectant properties and known well to decrease the muscular tension, slacken the nerves, and relieve colic's and flatulence [14].

Pharmacological properties

Literature review had reported that *Lavandula coronopifolia* Poir possess antioxidant, antibacterial activity and hepatoprotective activity [15].

Lavandula pubescens Decne

It is also known as Dutch lavender. It is a perennial herb with erect branches, hairy stem with broad leaves. The presence of essential oils accounts for a large part of the taste and fragrance of this *Lavandula* genus; however, certain constituents of *Lavandula* have been shown to have biological activity, which might be responsible for the plant to be used as folk medicine. This plant is rarely available only in Asir region of Saudi Arabia. A total of 71 compounds were reported in table 3.

Medicinal uses

Some *Lavandula* species have been used in Yemeni folk medicine as antiseptic, diuretic and as a remedy for broncho-pulmonary infections [16, 17]. It yields aromatic and essential oil. Decoction of leaf of *Lavandula* is used to cure headache and cold. It's also used to treat anxiety and anxiety-related conditions, including insomnia, restlessness, and gastrointestinal distress [18].

Pharmacological properties

Literature review on *Lavandula* plant has showed that it possesses antibacterial and antioxidant activities [19].

Marrubium vulgare

It is also known as common horehound or white horehound. It is a flowering plant belonging to the Lamiaceae family of mints. It has nearly plant 30 species native to northern Africa, Europe, south-western and central Asia. It has grey colour leaved, which is a perennial herbaceous plant that grows to a height of 25–45 centimetres [10–18 inch]. *Marrubium vulgare* leaves are 2–5 cm [0.8–2.0 inch] long and have a densely crinkled surface covered in downy hairs. The flowers are white and arranged in clusters on the main stem's upper half [20]. It is rare available in Asir and western heights regions of Saudi Arabia [21]. A total of 82 compounds were isolated in this plant (table 4).

Medicinal uses

Jaundice, amenorrhoea, coughs, chronic bronchitis, dyspepsia, hepatitis, and rheumatism are all treated with this herb [21, 22].

Pharmacological properties

The various parts of the plant had reported with expectorant and anthelmintic activity [21, 22]. Other reported pharmacological properties include analgesic, antinociceptive, anti-edematogenic, antispasmodic, antidiabetic, gastroprotective, antioxidant, and hepatoprotective effects [23].

Nepeta deflersiana

It is a flowering plant belong to the family Lamiaceae. It is also known as Nepete. This genus is native to Asia, Europe, and Africa. In Saudi Arabia endemic it is rare, seen only southern region. The

leaves are heart-shaped and range in colour from green to grey green. Plants of the *Nepeta deflersiana* genus are usually aromatic [24, 25]. A total of 51 compounds are isolated (table 4).

Medicinal uses

It is used as mosquito's repellent, and insecticide, also used as larvicide against *Anopheles stephensi*.

Pharmacological properties

The literature shows that it contains antimicrobial, anticancer, antioxidant, anticonvulsant, analgesic, anti-inflammatory, and antidepressant properties [26].

Mentha longifolia

It is also known as horse mint. *Mentha* species native to Europe, excluding the western and central Asia, Britain, Ireland, and northern and southern Africa [27]. It's a multi-stemmed annual herbaceous plant with a peppermint-like fragrance. It has erected to creeping stems 40–120 cm tall with a creeping rhizome, like many mints [28]. In Saudi Arabia it is available in western mountain region. A total of 40 phytochemical compounds were reported (table 4).

Medical uses

It helps to remove dandruff of the head when used with vinegar [29]. The leaf extract is also used to treat coughs and respiratory problems [9]. It is also used as carminative, tonsillitis, diarrhoea [30], Reduce fever [31], Headache, and Kidney stones [32].

Pharmacological properties

It had reported with antibacterial activity [33], anthelmintic [34], spasmolytic [35], anti-haemolytic [36], and antioxidant activities [37].

Mentha microphylla C. Koch

Mentha microphylla is a species of mint, also known as Spearmint, Garden mint, Common mint and Lamb mint [38]. *Mentha microphylla* is a plant native to Europe and southern Asia, with a range that stretches from west Ireland to southern China in the east. Aromatic oil obtains from *Mentha microphylla* also called as spearmint oil. In oil, the most abundant compound is spearmint oil is carvone, which has a distinctive smell. Its availability is rare in northern and southern regions of Saudi Arabia. A total of 40 phytochemical compounds were isolated (table 5).

Medicinal uses

The parts of the plants are traditionally used in fever, analeptic, appetizer, and carminative [39].

Pharmacological properties

The various part of the plant had reported with antitumor [40], antimicrobial [41], antioxidant [42], antispasmodic activity [43].

Ocimum americanum

It was formerly known as *Ocimum canum*, also known as American basil. It's an annual herb with lavender or white flowers. Despite its misleading name, it is native to Africa, China, Saudi Arabia [rare, south-western region], the India subcontinent and Southeast Asia. It is an aromatic plant that usually grows to 20-30 cm tall while some other specimens grow up to 100 cm tall, which comprises of >150 species [44]. Young leaves of *Ocimum americanum* are cooked or consumed raw, as a side dish with rice. The leaves are also used as condiment [45], a flavouring in soups, salads, sauces etc [46]. A total of 68 compounds are isolated (table 5).

Medicinal uses

Leaf's paste used in the treatment of skin diseases. The paste prepared from leaves are also applied for healing of wounds and burns [47]. Fever, indigestion, and diarrhoea were treated with an infusion made from the leaves [48].

Pharmacological properties

It has been reported with antibacterial and antifungal activity [49]. Antioxidant, anti-inflammation and antiproliferative effects of flowers and leaves in the colon had also been reported [50].

Ocimum basilicum L

Ocimum basilicum L. is also called as Great basil. It's an annual plant that grows in subtropical, tropical, and temperate climates around the world. It is the member of family Labiatae [Lamiaceae]. It is distributed worldwide in Saudi Arabia, Tropical Africa, Pakistan, Kashmir, Himalayas to Nepal, Malaysia, and Sri Lanka [51]. In south Hijaz and eastern region of Saudi Arabia it is commonly cultivated. It contains wide varieties of medicinal constituents. Basil is one of the most common herbs in the cooking and food network, with a wide range of applications, particularly in food flavouring and preservation, in addition to cultural and traditional rituals [52, 53]. A total of 59 compounds are reported (table 5).

Medicinal uses

The plant's different parts, especially roots, leaves and seeds, are commonly used as daily household remedies. Its leaves are aromatic [antiseptic], often fragrant, and used as an expectorant. In hepatic and gastric disorders, the decoration of leaves is given. It is also used in bronchitis, in cough, acts as a diuretic and as well as tonic for the stomach. The paste of leaves is applied over the inflammations [54].

Pharmacological properties

The various plant parts had been reported with many pharmacological properties such as antioxidant [55], antibacterial [56], antimicrobial [57], antifungal [58], antiviral [59], cytoprotective [60], anticonvulsant [61], hypoglycaemic and hypolipidemic [62, 63], hepato-protective, reno-protective and neuroprotective activities [64-66], with spermicidal and insecticidal effects [67, 68].

Ocimum tenuiflorum L

The Lamiaceae family includes *Ocimum tenuiflorum* L, also known as *Ocimum Sanctum* [tulsi] or Holi basil. Owing to its renowned medicinal properties, it has been termed the "mother medicine of nature" and the "Queen of plants". It is believed to have originated in north India and is now found in the eastern world as a native species. In Saudi Arabia is available in the southwestern region [69]. A total of 54 compounds are isolated in *Ocimum tenuiflorum* L (table 6).

Medicinal uses

The plant has a wide range of health-beneficial properties. It is suggested as a cure for a variety of ailments, including fever, diarrhoea, anxiety, dysentery, cough, vomiting, gastric, arthritis, cardiac, asthma, eye diseases, otalgia, hiccups, indigestion, and genitourinary disorders, back pain, ringworm, insect, scorpion, and snake bites. Skin diseases, as well as malaria, are treated with plant parts [70-73].

Pharmacological properties

Scientific findings of *O. sanctum*, shows that has antioxidant, anticancer, anti-inflammatory, antidiabetic, γ -irradiation protection, antistress, and anti-leishmanicidal properties. *O. sanctum* has been found to contain over 54 phytochemical compounds, including phenyl propanoids, terpenoids, phenolics, flavonoids, fatty acid derivatives, steroids essential oil, and fixed oil [74].

Origanum majorana

Origanum majorana is a mint-like aromatic herb that originated in Egypt and Arabia. It is a member of the Lamiaceae family. It is commonly known as sweet marjoram and is cultivated all over the world in different parts of France, Hungary, India, and the United States, mainly for its flavour and fragrance. In Saudi Arabia it is rare and available in south regions. The plants reach a height of 60 cm and have ovate leaves that are whitish or greyish in colour, one-lipped calyces, and white corollas. A paniculate inflorescence is formed by the flowers being arranged in spikes [75]. A total of 45 compounds were isolated (table 6).

Medicinal uses

It's a common home remedy for sore throats, rheumatoid arthritis, nervous disorders, chest infections, coughs, cardiovascular diseases, skincare, flatulence, epilepsy, insomnia, and stomach disorders [76].

Pharmacological properties

The phytochemical extracts obtain from various parts of plant including leaves, stem and roots had reported with antioxidant [77], anti-anxiety [78], anticonvulsant [79], antidiabetic [80], anti-gout [81], anti-mutagenic [82], antiulcer [83], antibacterial [84], antifungal [85], anti-protozoal, insecticidal [86], and antiovioidal activities [87].

Otostegia fruticosa

Otostegia fruticosa [Forssk.] is a shrub widely distributed in Djibouti, Sudan, Ethiopia, Eritrea, Cameroon, Saudi Arabia [rare and southern regions], Sinai, Yemen, Israel, and Palestine. It is commonly called by its vernacular name "sasa or geram tungut". The leaves are oval to rounded and are about 5-12 cm long. The flowers are cream in colour with more or less hairy branches [88]. So far, this plant had reported with 84 compounds (table 6).

Medicinal uses

In Ethiopia it has been used in the treatment of asthma, arthritis, febrile illness, tonsillitis, stomachache, sunstroke, and gynaecological problems [89, 90]. It is widely used for minimizing palpitation, controlling blood pressure, cardiac pain, cough, headache, gastric discomfort, parasite repellent, as well as an antipyretic, laxative, and carminative effects in the Hormozgan province of southern Iran [91].

Pharmacological properties

Many studies have been carried out using various animal models and *in vitro* assays. These studies show that *Otostegia* species have the potential for developing remedial agents. Some major pharmacological properties reported are antimicrobial [92], anti-oxidant [93], anti-diabetic [94], anti-glycation activity [95], hepatoprotective [96], antimalarial [97], anti-inflammatory activities, as well as healing of burn wound and anti-arthritis effect [98, 99].

Table 1: Medicinal uses and pharmacological properties of labiatae family

Name of the plant	Common names	Medical uses	Pharmacological properties
<i>Lavandula dentata</i>	Fringed lavender	Treatment of catarrh, Removal of kidney stones	Antianxiety [10]
<i>Lavandula coronopifolia</i> Poir	<i>Lavandula stricta</i> Delile	Infections, Relieve flatulence and Colic's	Antioxidant, Antibacterial and Hepatoprotective activity [15]
<i>Lavandula pubescens</i> Decne	Dutch lavender	Headache, Cold, Insomnia, Gastro-Intestinal distress	Antibacterial and Antioxidant Activities [19]
<i>Marrubium vulgare</i>	White horehound	Jaundice, Amenorrhoea, Coughs, Chronic bronchitis, Dyspepsia, Hepatitis and Rheumatism	Anthelmintic, Expectorant, [21, 22] Analgesic, Antinociceptive, Antispasmodic effects, Antidiabetic, Gastroprotective, Antioxidant, and Hepatoprotective activities [23]
<i>Nepeta deflersiana</i>	<i>Nepete</i>	Mosquito's repellent, Insecticide, Larvicide against <i>Anopheles stephensi</i> .	Analgesic, Cytotoxic, Anti-inflammatory Agent, Antimicrobial, Anticarcinogen, Antioxidant, Anticonvulsant, and Antidepressant [26]
<i>Mentha longifolia</i>	Horse mint	Breathing problem, Cough, Carminative, Tonsillitis, Diarrhoea, reduces fever, Headache, Remove kidney stones	Antibacterial Activity [33], Anthelmintic [34], Spasmolytic activity [35], Anti-haemolytic activity [36], and Antioxidant activity [37]
<i>Mentha microphylla</i> C. Koch	Garden mint	Fever, Analeptic, Appetizer and Carminative	Antitumor [40], Antimicrobial [41], Antioxidant [42], Antispasmodic activities [43]
<i>Ocimum Americanum</i>	American basil	Fever, <i>Healing of wounds</i> , Indigestion, and Diarrhoea.	Antibacterial and antifungal activity [49]. Antioxidant, Anti-inflammation and antiproliferative effects [50].
<i>Ocimum basilicum</i> L	Great basil	Expectorant, Bronchitis, Diuretic, Stomach pain. Treat inflammations.	Antioxidant activity [55], Antibacterial activity [56], Antimicrobial activity [57], Antifungal activity [58], Antiviral activity [59], Cytoprotective effects [60], Anticonvulsant activity [61], Hypoglycaemic and Hypolipidemic effects [62, 63], Hepato-protective, Renoprotective and Neuroprotective Activities [64-66], Spermicidal effects [67], Insecticidal effects [68]
<i>Ocimum tenuiflorum</i> L	Holi basil	Fever, Diarrhoea, Anxiety, Dysentery, Cough, Vomiting, Gastric, Arthritis, Cardiac, Asthma, Eye Diseases, Hiccups, Indigestion, Back Pain, Genitourinary Disorders, Ringworm, Insect, Scorpion, Snake Bites, Skin diseases, and to treat Malaria	Antioxidant, Anticancer, Anti-inflammatory, Antidiabetic, Antistress, and anti-leishmanicidal activities [74]
<i>Origanum majorana</i>	Sweet marjoram	Remedy for Sore Throat, Nervous Disorders, Rheumatic Pain, Chest Infection, Cough, Skincare, Cardiovascular Diseases, Flatulence, Epilepsy, Insomnia, and Stomach disorders	Antioxidant [77], Anti-anxiety [78], Anticonvulsant [79], Antidiabetic [80], Anti-gout [81], Anti-mutagenic activity [82], Antiulcer [83], Antibacterial [84], Antifungal [85], Anti-protozoal, insecticidal [86] and Antiovioidal activity [87].
<i>Otostegia fruticosa</i>	Sasa or Geram tungut	Asthma, Arthritis, Febrile Illness, Tonsillitis, Stomachache, Sunstroke, Gynaecological Problems, Regulating Blood Pressure Reducing Palpitation, Cardiac Distress, Cough, Gastric Discomfort, Headache, Parasite Repellent as well as Antipyretic, Laxative and Carminative	Antimicrobial activity [92], Anti-oxidant activity [93], Anti-diabetic activity [94], Anti-glycation activity [95], Hepatoprotective activity [96], Antimalarial activity [97], Anti-inflammatory and healing of burn wound [98] and Anti-arthritis [99].

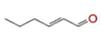
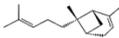
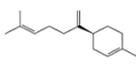
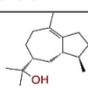
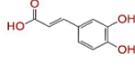
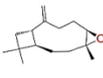
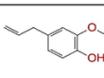
 (E)-2-Hexenal	 1,8-Cineole	 ABT-281	 Alpha-Bergamotene	 Alpha-Cadinol
 Alpha-Calacorene	 Alpha-Copaene	 Alpha-Cubebene	 Alpha-Gurjunene	 Alpha-Humulene
 Alpha-Murolene	 Alpha-Phellandrene	 Alpha-pinene	 Alpha-Terpinene	 Alpha-Terpineol
 Alpha-Thujene	 Alpha-Ylangene	 Beta-Bisabolene	 Beta-Caryophyllene	 Beta-Copaene 2D
 Beta-Eudesmol	 Beta-Pinene	 Beta-Selinene	 Beta-Terpinene	 Bicyclgermacrene
 Borneol	 Bornyl acetate	 Bulnesol	 Caffeic acid	 Camphene
 Camphor	 Caryophyllene oxide	 Caryophyllene	 Cis-Carveol	 Cis-Ocimene
 Cis-Sabinene hydrate	 Delta-Cadinene	 Eugenol	 Fenchone	 Gallic acid
 Gamma-Bourbonene	 Gamma-Cadinene	 Gamma-Eudesmol	 Gamma-Terpinene	 Geraniol

Table 2: Unique list of important compounds

(E)-2	
Hexenal	Spathulenol
1,8-Cineole	Terpinen-4-ol
ABT-281	Terpinene
Bicyclgermacrene	Terpinolene
Borneol	Thymol
Bornyl acetate	trans-Carveol
Bulnesol	trans-Ocimene
Caffeic acid	trans-Sabinene hydrate
Camphene	Tricyclene
Camphor	Verbenone
Caryophyllene	α -Bergamotene
Caryophyllene oxide	α -Cadinol
cis-Carveol	α -Calacorene
cis-Ocimene	α -Copaene
cis-Sabinene hydrate	α -Cubebene
Eugenol	α -Gurjunene
Fenchone	α -Humulene
Gallic acid	α -Murolene
Geraniol	α -Phellandrene
Geranyl acetate	α -pinene
germacrene D	α -Terpinene
Hexadecanoic acid, ethyl ester	α -Terpineol
Humulene epoxide II	α -Thujene
Isoborneol	α -Ylangene
Limonene	β -Bisabolene
Linalool	β -Bourbonene

(E)-2

Hexenal	Spathulenol
Linalyl acetate	β -Caryophyllene
Myrcene	β -Copaene
Myrtenal	β -Eudesmol
Myrtenol	β -Pinene
Neryl acetate	β -Selinene
p-Cymene	γ -Cadinene
Phytol	γ -Eudesmol
Pulegone	γ -Terpinene
Quercetin	δ -Cadinene
Sabinene	τ -Cadinol

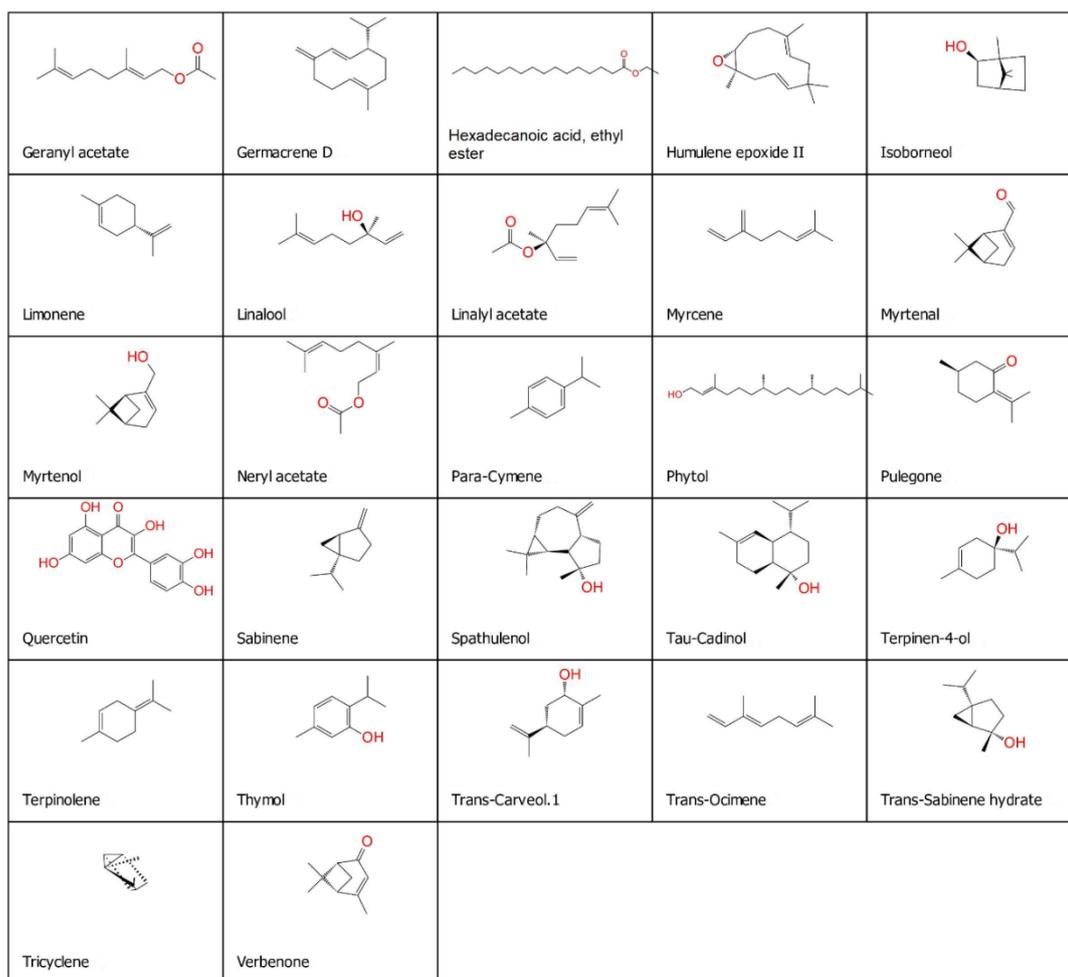


Fig. 2: 3D structures of a unique list of compounds

Table 3: Individual total phytochemical constituent

Lavandula dentata L	Lavandula coronopifolia	Lavandula pubescens decne
1,8-Cineole	Hexadecanoic acid, ethyl ester	Caryophyllene
Camphor	Hexadecanoic acid, ethyl ester	Caryophyllene oxide
cis-Carveol	1,2-Benzenedicarboxylic acid, diisooctyl ester	Terpinolene
cis-Sabinene hydrate	17-Pentatriacontene	α -Bergamotene
Fenchone	1-Cyclohexene-1-carboxaldehyde, 5,5-dimethyl-3-oxo	α -Calacorene
Geranyl acetate	1-Heptatriacotanol	α -Copaene
Humulene epoxide II	1-Hexacosanol	α -Cubebene
Isoborneol	1-Hexadecanol, 2-methyl	α -Gurjunene
Linalool	2,5-Cyclohexadiene-1,4-dione, 2,6-bis(1,1-dimethylethyl)-	α -Muuroolene
Myrcene	2,5-Octadecadiynoic acid, methyl ester	α -Terpinene
Myrtenal	2-Dodecanone	α -Terpinene
Myrtenol	3,5-Heptadienal, 2-ethylidene-6-methyl	α -Ylangene
Sabinene	4-(3,3-Dimethyl-but-1-ynyl)-4-hydroxy-2,6,6-trimethylcyclohex-2-enone	β -Bisabolene
Spathulenol	4,7,10,13,16,19-Docosahexaenoic acid, methyl ester,	β -Copaene

Lavandula dentata L	Lavandula coronopifolia	Lavandula pubescens decne
Terpinen-4-ol	5-Amino-1-pentanol	γ -Cadinene
trans-Carveol	5-Methoxy-2,2,6-trimethyl-1-(3-methyl-buta-1,3-dienyl)-7-oxa-bicyclo[4.1.0]heptane	γ -Terpinene
trans-Sabinene hydrate	7,8-Epoxy-lanostan-11-ol, 3-acetoxy	δ -Cadinene
Tricyclene	7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione	4-yl)acetic acid
Verbenone	8,11,14-Eicosatrienoic acid, methyl ester,	5,6-Dimethylene-1-cyclooctene
cis-a-Bisabolene	a-Diamascenone	p-Xylene
cis-Calamenene tr	Alloaromadendrene oxide-(1)	(-)-Calamenene
(E,E)-Farnesol	Benzene acetaldehyde	(-)-4-Terpineol
1,8-Dehydrocineole	Benzoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, methyl ester	(-)- β -Elemene
6-dehydrocarvotanacetone	Carvacrol	(+)-Ledene
a-Calacorene	Caryophyllene oxide	(3E)-2,7-Dimethyl-3-octen-5-yne
a-Cedrene	Cedran-diol, 8S,13	(3Z)-2,7-Dimethyl-3-octen-5-yne
a-Fenchene	Cedrol	(6-tert-Butyl-1,1-dimethyl-2,3-dihydro-1H-inden-1-(3,5-Di-tert-butyl-4-hydroxyphenyl)propan-1-one
a-Fenchol	cis-Z-à-Bisabolene epoxide	1,2,3,4,5-Pentamethylcyclopentadiene
a-Muurolool	Ethyl iso-allocholate	1,3,5,5-Tetramethyl-1,3-cyclohexadiene
a-Phelladrene	Geranyl isovalerate	1,3,5,7-Cyclooctatetraene
a-Pinene	Hexadecan-1,1-bis (dodecyloxy)	1,3-Dimethyl-1,5-cyclooctadiene
a-Sinesal	n-Decanoic acid	1-Amino-2-(4-chlorobenzoyl)-6,7,8,9-tetrahydro-5-methylthieno[2,3-c]isoquinoline
a-Terpinen-7-al	n-Hexadecanoic acid	1-Methyl-6-isopropylidene-1-Nitrosopyrrolidine
a-Terpineol	n-Tridecan-1-ol	2-(3-Acetoxy-4,4,10,13,14-pentamethyl-2,3,4,5,6,7,10,11,12,13,14,15,16,17-tetradecahydro-1H-cyclopenta[a]phenanthren-17-yl)-propanoic acid
a-Thujene	Octadecanoic acid	2,4,6-Tri-tert-butylphenol
a-trans-Bergamotene	Octadecanoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis	2,5,5-Trimethyl-1,3,6-heptatriene
b-Bisabolenal	P-Anisic acid methyl ester	2,5-Dimethyl-3-methylene-5-heptadiene
b-Bourbonene	Pentanol	2,6-Di-tert-butylbenzoquinone
b-Cubebene	Phenol, 2-amino-4,6-bis(1,1-dimethylethyl)	3,3,3j,3j,5,5,5j,5j-Octamethyl-1,1j-bi(1-cyclohexen-1yl)
b-Eudesmol	Phenyl ethyl alcohol	3,5,7-Trimethoxy-2-(4-methoxyphenyl)-4H-chromen-4-one
b-Pinene	Retinol 26.90 0.27 286	3,5-Bis(tert-butyl)-4-hydroxy-propiophenon
b-Selinene	Tetradecanoic acid	3-Deoxyestradiol
Cadalene	Trans linalool oxide	3-Hydroxyspirost-8-en-11-one
Camphinelone	trans-2-Caren-4-ol	4-(1,5-Dihydro-2,4,3-benzodioxaborepin-3-yl) benzoic acid
Carvacrol tr 1306	Ttidecandial	4,4,5,6-Tetramethyl-1,3-oxazinane-2-thione
Carvotanacetone	Verrucarol	4-Terpinyol acetate
c-Cadinene		6-Isopropenyl-3-(methoxymethoxy)-3-methyl-1-cyclohexene
cis-14-Muurolool-5-en-4-one		6-Methyl-5-(1-methylethylidene)-6,8-nonadien-2-one
cis-Muurolool-4(14),5-diene		Acoradien
cis-p-Menth-2-en-1-ol		Alloaromadendrene
cis-Verbenol		Aromadendrene
c-Muurolole		Benzaldehyde
c-Terpinene		Benzothiazole
Cumin aldehyde		Carvacrol
Dehydro-Sabina ketone		Cyclosativene
dihydro-Eugenol		d-Limonene
E-Caryophyllene		Isothymol methyl ether
Lavender acetone		Jolkinol D
Linalool acetate		Longifolene
ortho-Cresol		m-Cymene
p-Cymen-7-ol		Naphthalene
p-Cymen-8-ol		Neo-allo-ocimene
Pinocarvone		p-Cymenene
Piperitone		trans-3-Caren-2-ol
trans-b-Ocimene		α -Cumene hydroperoxide
trans-Calamenene		β -Eudesmene
trans-Verbenol		β -Guaiene
		β -Ylangene
		δ -Valerolactone

Table 4: Individual total phytochemical constituent

Marrubium vulgare L.	Nepeta deflersiana	Mentha longifolia L.
Caffeic acid	(E)-2-Hexenal	Thymol
Gallic acid	Borneol	1,8-Cineole
Quercetin	Bulnesol	Borneol
Cyllenin A	Camphor	Caryophyllene
Deacetylforskolin	Caryophyllene oxide	cis-Ocimene
11-Oxomarrubiin	cis-Carveol	Eugenol
12(S)-hydroxymarrubiin	Eugenol	Limonene
3-Deoxy-15(S)-methoxyvelutine	Fenchone	Neryl acetate
3-hydroxyapigenin oumaroyl)-glucoside	Geraniol	Phytol
Acacetin	Humulene epoxide II	Pulegone
Acacetin 7-O-rhamnoside	Limonene	Sabinene
Acteoside	Linalool	Spathulenol
Aesculin	Myrtenol	α -Cadinol
Alyssonoside	Phytol	α -Humulene
Apigenin	Terpinen-4-ol	α -Terpineol
Apigenin 40-O-(600-O-p-coumaroyl)-glucoside	Thymol	β -Bourbonene
Apigenin 6,8-di-C-glucoside	trans-Carveol	β -Pinene
Apigenin 7-[2-glucosyllactate]	α -Calacorene	Trans- β -Farnesene
Apigenin 7-[2-glucuronosyllactate]	α -Humulene	3-Terpinolone
Apigenin 7-acetate	α -Terpineol	Camphane
Apigenin 7-O-(300, 600-di-p-coumaroyl)-glucoside	β -Bourbonene	Caryophyllene oxide
Apigenin 7-O-(400-p-coumaroyl)-glucoside (1) (Terniflorin)	β -Eudesmol	Cis-Pulegone Oxide
Apigenin 7-O-(600-p-coumaroyl)-glucoside	β -Selinene	delta-Cadinene
Apigenin 7-O-glucoside	γ -Eudesmol	Dihydrocarveole
Apigenin 7-O-glucuronide	τ -Cadinol	Dihydrocarvone
Apigenin 8-C-glucoside	n-Dodecanoic acid	Geraniol
Arenarioside	Nonanoic acid	Germacrene D
Ballotetroside	(E)- β -Farnesene	Germacrene D-4-ol
Caffeoylmalic acid	(E)- β -Caryophyllene	Isopulegone
Carnosol	(E)- β -Damascenone	Limonene oxide
Chlorogenic acid	1-(1-cyclohexene-1-yl)-ethanone	Menthol
Chrysoeriol	2-Methoxy-p-cresol	Menthone
Chrysoeriol 7-O-glucuronide	6,10,14-Trimethylpentadecane-2-one	Menthyl acetate
Deacetylvitexilactone	7-epi- α -Selinene	Neodihydrocarveol
Dihydroperegrinin	Carvone	Piperitone
Diosmetin	Cemberene A	p-menth-1,8-dien-3-one
Diosmetin-7-O-glucoside	Decanoic acid	α -Pinene
Ferulic acid	epi- α -Muuurolol	β -Elemene
Forsythoside B	Eudesm-11-en-4 α -ol	β -Myrcene
Galangin	exo-Fenchol	β -trans-Ocimene
Gentisic acid	Hexadecanoic acid	
Kaempferol 3-O-glucoside	Manool	
Ladanein	Methyleugenol	
Leucosceptoside A	n-Pentacosane	
Lupeol	n-Tetradecanoic acid	
Luteolin 7-[2-glucosyllactate]	trans-Linalool oxide	
Luteolin 7-[2-glucuronosyllactate]	α -Alaskene	
Luteolin 7-acetate	α -Fenchol	
Luteolin 7-O-glucoside	α -Guaiol	
Luteolin 7-O-glucuronide	β -Bisabolol	
Luteolin 7-O-rutinoside	β -Pinene	
Luteolin 7-rhamnoside		
Marrubenol		
Marrubic acid		
Marrubiin		
Marruboside		
Marruliba-acetal		
Naringenin		
Naringin		
Oleanolic acid		
p-Coumaric acid		
Peregrinin		
Peregrinol		
p-Hydroxybenzoic acid		
Polyodonine		
Preleosibirin		
Premarrubiin		
Protocatechuic acid		
Quercetin 3-O-galactoside		
Quercetin 3-O-glucoside		
Quercetin 3-O-rutinoside		

Marrubium vulgare L	Nepeta deflersiana	Mentha longifolia L
Rosmarinic acid		
Sacranoside A		
Samioside		
Sinapic acid		
Syringic acid		
trans-Cinnamic acid		
Umbelliferone		
Vulgaroside A		
Vulgarin		
Vulgarol		
β -sitosterol		

Table 5: Individual total phytochemical constituent

Mentha microphylla	Ocimum americanum L	Ocimum basilicum L
(E)-2-hexenal	Caffeic acid	trans-Ocimene
germacrene D	Gallic acid	1,8-Cineole
limonene	Quercetin	Borneol
linalool	Isoquercitrin (Hirsutrin, Quercetin-3-O-glucoside)	Bornyl acetate
myrcene	Isovitexin (Apigenin-6-C-glucoside)	Camphene
Myrtenal	3-O-Methylrosmarinic acid	Camphor
Pulegone	4-Coumaric acid	Eugenol
sabinene	Apigenin (4',5,7-Trihydroxyflavone)	Fenchone
Terpinolene	Arachidic acid	Geranyl acetate
Verbenone	Caffeic acid phenethyl ester	Germacrene D
α -pinene	Caffeoylhexose	Linalyl acetate
β -pinene	Caftaric acid (2-O-Caffeoyltartaric acid)	Neryl acetate
(E)-ocimene	Chicoric acid (2,3-Di-O-caffeoyltartaric acid)	Sabinene
(Z)-jasmone	Chlorogenic acid (3-O-Caffeoylquinic acid)	trans-Sabinene hydrate
(Z)-ocimene	Cirsilineol (4',5-Dihydroxy-3',6,7-trimethoxyflavone)	α -Bergamotene
1-octen-3-ol	Cirsiliol (6,7-Dimethoxy-3',4',5-trihydroxyflavone)	α -Copaene
4-terpineol	Cirsimaritin (4',5-Dihydroxy-6,7-dimethoxyflavone)	α -Terpineol
ethyl 2-methylbutanoate	Cosmosiin (Apigenin, Apigenin-7-O-glucoside)	γ -Cadinene
ethyl 3-methylbutanoate	Coumaroylhexose isomer 1	transMethylCinmate
ethyl 3-methylbutanoate	Coumaroylhexose isomer 2	1 Octen3 ol
ethyl benzoate	Dihydroxy-tetramethoxy(iso)flavone	3-Octanol (CAS)
ethyl heptanoate	Di-O-methylellagic acid	4-Terpineol
ethyl hexanoate	Dodecanedioic acid	Carene
ethyl pentanoate	Ellagic acid	Cubenol
menthofuran	Eriodictyol	D-Fenchyl alcohol
nonanal	Eriodictyol-7-O-glucoside (Miscanthoside)	dl-Limonene
Piperitenone	Fertaric acid (2-O-Feruloyltartaric acid)	E-Citral
piperitenone oxide	Feruloylhexose	Ethyl Amyl Carbinol
trans-pinocarveol	Feruloylhexose isomer 1	Fenchyl acetate
	Feruloylhexose isomer 2	Methyl Cinmate
	Gardenin B (5-Hydroxy-4',6,7,8-tetramethoxyflavone)	Methyl Eugenol
	Genkwanin (4',5-Dihydroxy-7-methoxyflavone)	MythylChavicol
	Jasmonic acid	Nonyl acetate
	Linoleic acid	TAU-Cadinol
	Luteolin (3',4',5,7-Tetrahydroxyflavone)	trans-Caryophyllene
	Luteolin-7-O-glucoside (Cynaroside)	trans-Geraniol
	Luteolin-O-feruloylhexoside	Z-Citral
	Luteolin-O-malonylhexoside isomer 1	α -Pinene
	Luteolin-O-malonylhexoside isomer 2	α -Cadinene
	Methoxy-tetrahydroxy(iso)flavone-O-hexoside	α -Cubebene
	Methyl caffeate	α -Humulene
	Methyl rosmarinic acid	α -Terpinolene
	Nevadensin (5,7-Dihydroxy-4',6,8-trimethoxyflavone)	α -Eudesmol
	N-trans-Feruloyltyramine	α -Guaiene
	Oleic acid	α -Seline
	Palmitic acid	α -Terpinanlyl acetate
	Pilosin (4',6-Dimethoxy-5,7,8-trihydroxyflavone)	β -Myrcene
	Quercetin-di-O-hexoside	β -Pinene
	Quercetin-O-coumaroylhexose	β -Cubebene
	Quercetin-O-galloylhexoside	β -Elemene
	Quercetin-O-glucuronide	β -Linalool
	Quinic acid	β -Sesquiphellandren
	Riboflavin	β -CisOcimene
	Rosmarinic acid (Labiatic acid)	β -Citronellol
	Rosmarinic acid-O-hexoside	β -Farnesene
	Rutin (Quercetin-3-O-rutinoside)	γ -Muuroalone
	Salvigenin (5-Hydroxy-4',6,7-trimethoxyflavone)	γ -Terpinene

Mentha microphylla	Ocimum americanum L	Ocimum basilicum L
	Stearic acid	γ -Gurjunene
	Stearidonic acid	δ -Guaiene
	Tuberonic acid	
	Tuberonic acid hexoside	
	Verbascoside	
	Verbascoside isomer	
	Vicenin-2 (Apigenin-6,8-di-C-glucoside)	
	Vitexin (Orientoside, Apigenin-8-C-glucoside)	
	Xanthomicrol (4',5-Dihydroxy-6,7,8-trimethoxyflavone)	
	α -Linolenic acid	
	α -Linolenic acid isomer	

Table 6: Individual total phytochemical constituent

Ocimum tenuiflorum	Origanum majorana L	Otostegia fruticosa
Bicyclogermacrene	trans-sabinene hydrate	Limonene
Camphene	Bicyclogermacrene	Bicyclogermacrene
Camphor	Bornyl acetate	Borneol
Caryophyllene oxide	Camphene	Bornyl acetate
Eugenol	Camphor	Bulnesol
Fenchone	cis-Ocimene	Camphene
Limonene	cis-Sabinene hydrate	Camphor
Linalool	Geraniol	Caryophyllene oxide
Myrcene	Geranyl acetate	Germacrene D
Sabinene	Isoborneol	Humulene epoxide II
Terpinene	Limonene	Linalool
Terpinene	Linalool	Myrcene
Terpinolene	Linalyl acetate	Myrtenol
Tricyclene	Myrcene	p-Cymene
Humulene	Neryl acetate	Sabinene
Isoboreno!	p-Cymene	Spathulenol
Alpha bisabolene	Sabinene	Terpinolene
Alpha pinene	Spathulenol	α -Cadinol
Amorphene	Terpinen-4-ol	α -Calacorene
Bergamoteno	Terpinolene	α -Copaene
Beta bisabolene	Thymol	α -Cubebene
Beta caryophyllene	trans-Ocimene	α -Gurjunene
Beta phone	unknown	α -Humulene
Bisabolere-z	Unknown	α -Muurolene
Bomel	α -Humulene	α -Phellandrene
Bourbonene	α -Phellandrene	α -Pinene
Cadinene	α -Pinene	α -Terpinene
Camphane hydrate	α -Terpinene	α -Terpineol
Carena	α -Terpineol	α -Thujene
Copaone	α -Thujene	α -Ylangene
Cubebene	β -Caryophyllene	β -Bisabolene
Cymene-ortho	β -Pinene	β -Bourbonene
Elemeno	γ -Terpinene	β -Caryophyllene
Estrago	trans-Piperitol	β -Copaene
Ethylisovalorato	5-Caranol *	β -Eudesmol
Eucalyptol	Acorenone	β -Pinene
Farnesene	Caryophyllene oxyde	β -Selinene
Germacrene	cis-dihydro- α -Terpinyl acetate *	γ -Cadinene
Guaiene	cis-para-Menth-2-en-1-ol	γ -Eudesmol
Longipinene	cis-Piperitol	γ -Terpinene
Methylisovalerate	Nerol	δ -Cadinene
Muurglene	trans-para-Menth-2en-1-ol	τ -Cadinol
Ocimene	trans-Sabinyl acetate	Ledol
Octen 3 ol	α -Pinene oxyde	(E)- β -Farnesene
Pholandrene	α -Terpinyl acetate	(Z)-Caryophyllene oxide
Sabinene hydrate		(Z)- β -Farnesene
Sabinene hydrate-trans		1,10-di- <i>epi</i> -Cubenol
Sesquichelanden		14-Hydroxy-(Z)-Caryophyllene
Sesquisabinene		1- <i>epi</i> -Cubenol
Terpinen-d-ol		5- <i>epi</i> -7- <i>epi</i> - α -Eudesmol
Terpineol		Abieta-7,13-diene
Terpineol-delta		Abietatriene
Thujene		Aromadendrene
Zingiberene		Bornyl formate
		Caryophylla-4(12),8(13)-dien-5 β -ol
		cis-7- <i>epi</i> -Sesquisabinene hydrate
		cis-Cadina-1(6),4-diene

Ocimum tenuiflorum	Origanum majorana L	Otostegia fruticosa
		cis- α -Bergamotene
		Dihydroedulan I
		endo-Fenchol
		endo-Fenchyl acetate
		Germacrene A
		Isopimara-9(11),15-diene
		Maaliol
		Myrtenyl acetate
		Myrtenyl formate
		Palustradiene
		Selin-11-en-4 α -ol
		Sesquithujene
		Thuja-2,4(10)-diene
		trans-Cadina-1(6),4-diene
		trans-Cadina-1,4-diene
		trans- α -Bergamotene
		Viridiflorol
		Xanthoxylin (= Brevifolin)
		α -Bisabolol+Germacrene-4(15),5,10(14)-trien-1 α -ol
		α -Cadinene
		α -Muurolol (= Torreyol)
		β -Cubebene
		β -Elemene
		β -Santalene
		γ -Muurolene
		δ -3-Carene
		δ -Selinene

CONCLUSION

Knowledge of medicinal plants for the curing many ailments are available among the tribal and local people of Saudi Arabia. In the reported flora in the Kingdom of Saudi Arabia, *Labiatae* family has highest species. A total of 23 species of *Labiatae* family has been reported with high medicinal value. The majority of the plants in this family are herbs or shrubs that are often aromatic. From the current review on 12 species it shows that *Marrubium vulgare* L, *Ocimum basilicum* L, *Origanum majorana* and *Otostegia fruticosa* had reported with many medicinal uses and pharmacological properties. Medicinal constituents include highest phenolic, flavonoid content and strong aromatic essential oil. Medicinal plants are a rich source of new drugs, and plants are used to make the majority of modern medicines. More deep research is needed to find out exact mechanism and phytochemical responsible for pharmacological activity.

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