Volatile oils Containing Acyclic Monoterpenes as Major Constituents

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BALM MALISSAE FOLIUM (Melisa, oğul otu)

MELISSAE AETHEROLEUM

MELISSA OFFICINALIS

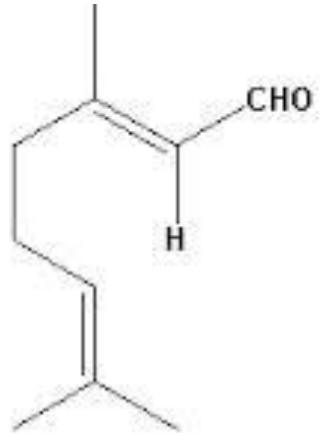
Lamiaceae

Grows also in Cyprus

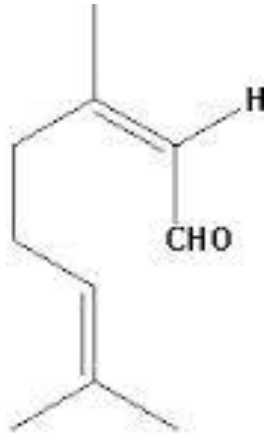
Chemical Composition : Despite its low concentration (0.5 ml/kg), the essential oil has received most of the attention; nevertheless, other constituents have been isolated from balm, including triterpenes and phenolic acids derived from caffeic acid, dimers such as rosmarinic acid, and trimers such as malitric acids A and B; flavonoids (quercitrin, 7-glucosides of apigenin and luteolin), and glycosides and monoterpenes and of aromatic alcohols.

The dried leaves of balm must contain not less than 5% total hydroxycinnamic acid derivatives expressed as rosmarinic acid.

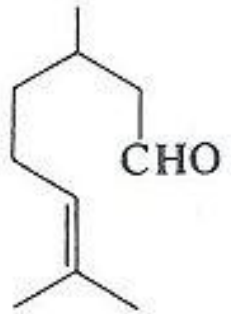
Balm oil (Melissae aetheroleum) is characterized by acyclic monoterpenoid aldehydes : citrals (geranial + neral) in very variabel quantities,but in a constant ratio (4/3), (R)-(+)-citronellal (found in substantial amounts in some batches of German origin), alongside methylheptanone (a degradation product of citral), geranyl acetate, β-caryophyllene, β-caryophyllene oxide, germacrene D and several dozen other compounds, mainly terpenoids.



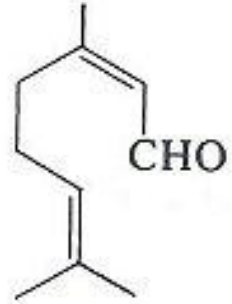
Citral-a(Geranial)
(*trans* form)



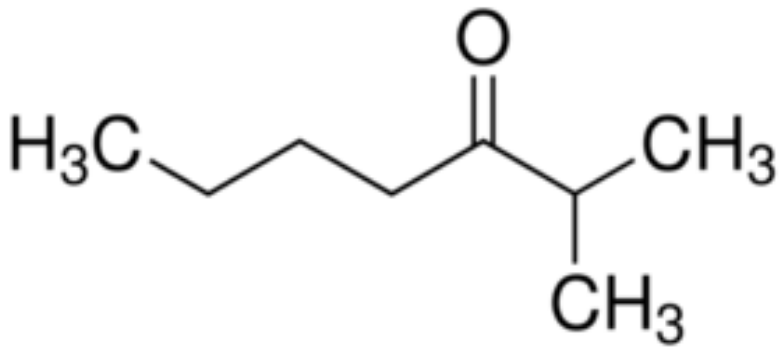
Citral-b(Neral)
(*cis* form)



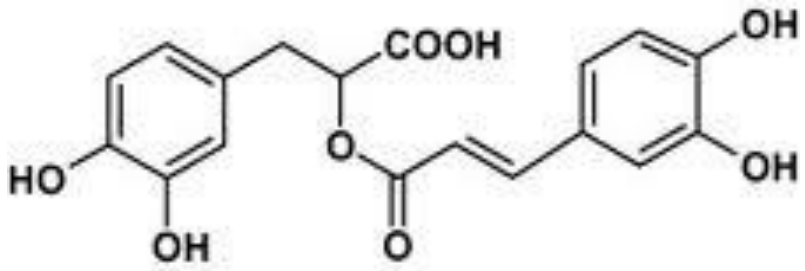
Citronellal



Citral



methylheptanone



Rosmarinic acid (RA)

Pharmacological properties : Balm oil is an antibacterial and antifungal agent, and is also responsible for the spasmolytic properties that are recognized for the drug. The hydroalkoholic extract is a CNS sedative. The same extract potentiates the sleep-inducing effect of pentobarbital.

Several activities have been shown for the aqueous extract, most of all, antiviral activity. This activity, shown on various viruses (herpes, vaccinia), could be due to the phenolic acids, or their derivaties, or both, and to their interaction with viral proteins.

In humans, interesting results have been observed in the local treatment of herpes using a balm extract-based ointment shortened the duration on the disorder and delayed recurrent episodes

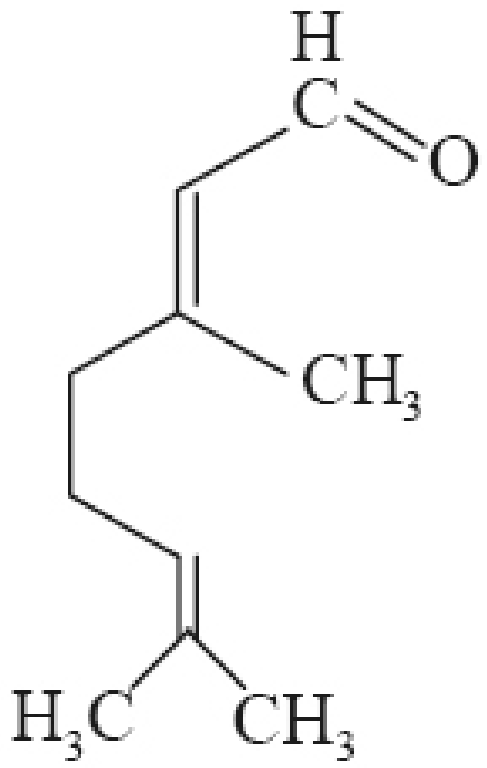
Uses : Currently, balm-based phytomedicines for oral use may claim three indications : 1. for the symptomatic treatment of gastrointestinal disturbances (epigastric bloating, impaired digestion, eructations, flatulence), 2. as an adjunctive therapy for the painful component of functional dispepsia, 3. for the symptomatic treatment of neurotoxic disorders in the adult and in the child, for example in case of minor sleeplessness.

LEMON VERBENA (hakiki oğul otu,limon otu)
LIPPIAE FOLIUM

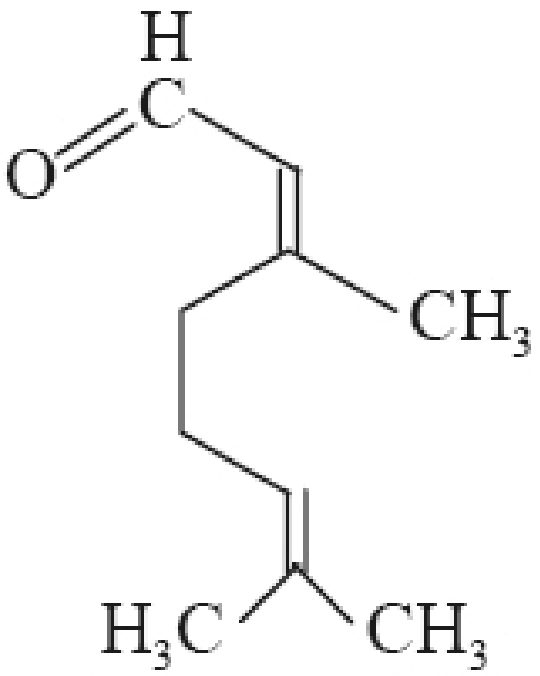
Lippia citriodora = Aloysia triphylla **(Verbenaceae)**

The dried leaf has long been sold, like mint leaves and flowering tops, or linden inflorescens. Like these, it is widely used to prepare infusions, which some refer to as comforting health beverages. Upon brusing, the drug gives off a pleasant odor, remiscent, of that of lemon. In Turkey the drug has been sold under the name “hakiki oğul otu” (oğul otu = *Melissa officinalis*). The drug assay includes quantitation of the essential oil (>0.4% v/w) and TLC analysis (to show the presence of citral).

The drug also contains flavonoids, chiefly 6-hydroxylated flavones and their methyl ethers (salvigenin, eupafolin, hispidulin and more).



Geranial (Citral-a)



Neral (Citral-b)

Lemon verbena is traditionally used orally to treat the symptoms of various digestive ailments such as epigastric bloating, impaired digestion, eructations and flatulence, and of neurotoxic disorders in adults and children, especially in case of minor sleeplessness.

There are also another lemon-scented essential oils in trade. “**Citronella**” is an essential oil obtained by steam distillation from the leaves of ***Cymbopogon nardus*** **(Graminae**, 1% essential oil). It contains 50% **citronellal**. “**Lemon-grass** “ oil is another essential oil obtained by steam distillation from the leaves of ***Cymbopogon citratus*** (Graminae, 1-2% essential oil). It contains 70-80% **citral**.

Rutaceae Containing Essential Oils

Most Rutaceae elaborate essential oils in schizolysogenous pockets characteristic of the family. Some genera in Rutaceae are among the leaders in the world market for essential oils like *Citrus* ssp.

Expression of *Citrus* Pericarps

The principle of this method is quite simple : the rind is lacerated, and the contents of the ruptured secretory cavities are recovered by a physical process. The classic process consists in applying an abrasive action on the surface of the fruit in a flow of water. After eliminating the solid waste, the essential oil is separated from the aqueous phase by centrifugation. Other machines break the cavities by depression, and collect the essential oil directly.

ESSENTIAL OILS OF *CITRUS*

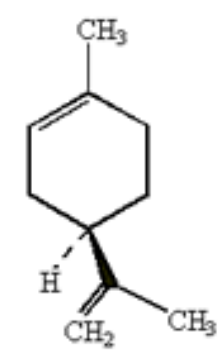
The various species in this genus elaborate and store essential oils in schzolysogenous pockets located in the external part of the mesocarp of the fruit (flavido). It is the florable location that allows direct recovery of the oils by “expression”. These oils may be used as flavors for medications and to formulate the parapharmaceutical products. They are used primarily in food technology and perfumery.

Some of these essential oils are listed in the pharmacopoeias (bergamot oil, mandarin oil, lemon oil). A characteristic element of the *Citrus* oils obtained by expression is the presence of non-volatile compounds : their concentration is generally lower than 5%, but can exceed 10% (lime). The assay for *Citrus* oils includes the customary determinations (optical rotation, refractive index, acid value, and more), as well as a measurement of the carbonyl value, and a determination of the “CD” value by spectrometric analysis in the UV. This CD value provides information on the level of carbonyl compounds

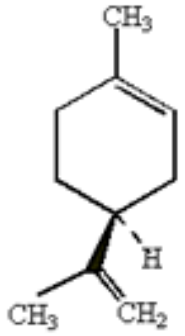
LEMON OIL CITRUS LIMONI AETHEROLEUM

Citrus limonum

The essential oil prepared from the pericarps of *Citrus limon,* is a little less rich in monoterpenoid hydrocarbons (85-92%) than bitter orange oil, and the limonene level fluctuates between 60 and 75%, this monocyclic hydrocarbon occurs alongside 8-12% β-pinene and 8-10% γ-terpinene. Note the presence of aliphatic aldehydes (0.2-05%), including nonanal and octanal) and monoterpenoid aldehydes (2-3% including geranial, neral, and citronellal)



(R) - Limonene

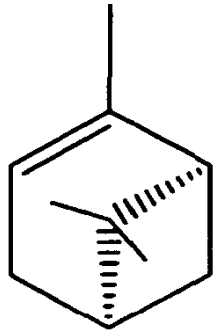


(S) - Limonene

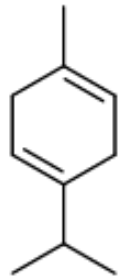
mirror plane

oranges and lemons

β-Pinene

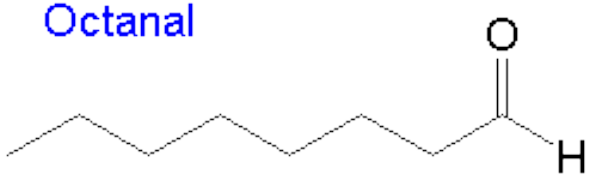


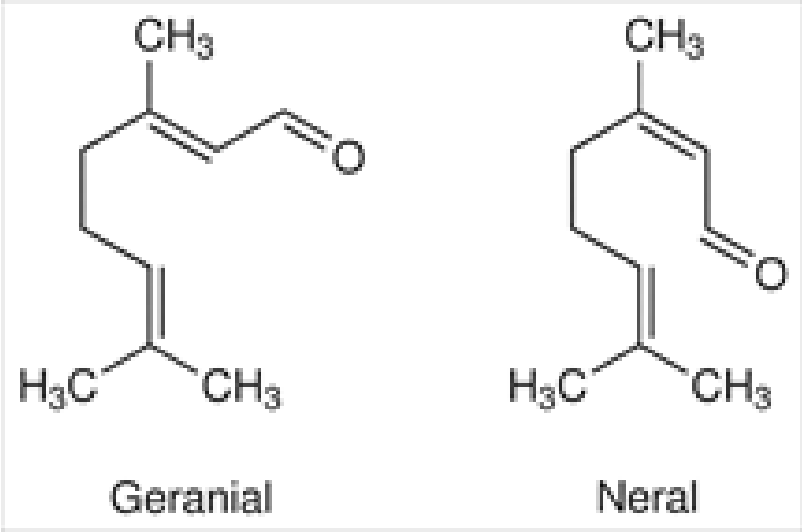
(alpha-pinene).



γ-Terpinene

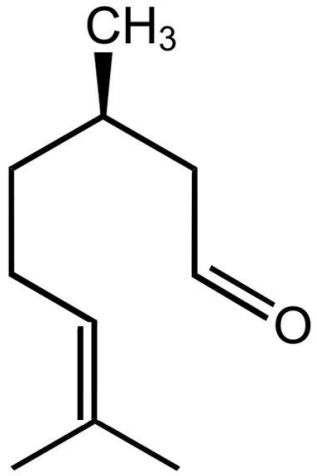
Octanal



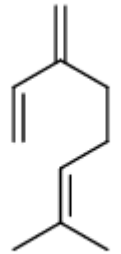


Geranial

Neral



Citronellal



Myrcene

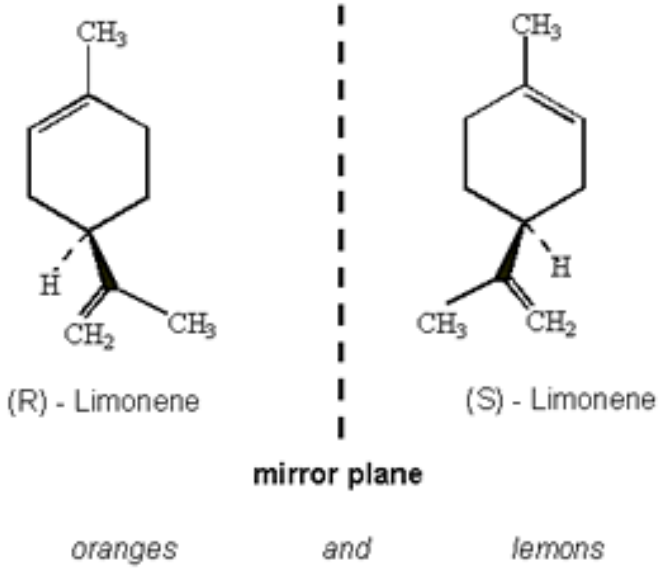
Geranial=Citral A Neral=Citral B

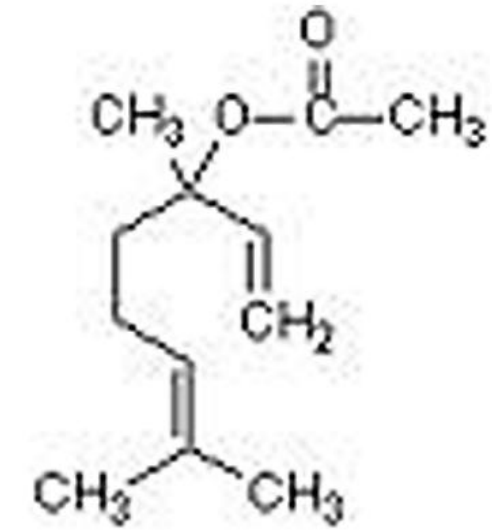
BERGAMOT OIL BERGAMIAE AETHEROLEUM

Citrus aurantium* ssp. *bergamia

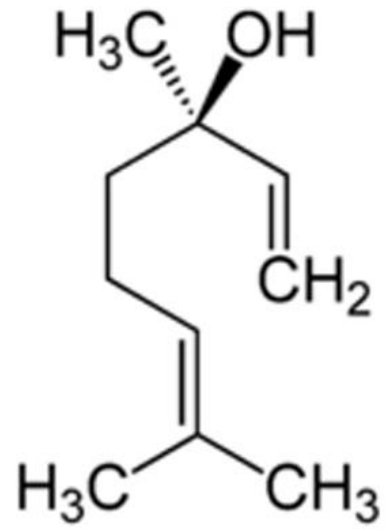
The essential oil extracted without heating, by mechanical processes, from the fresh pericarp of the fruit. Its composition is clearly different from that of other *Citrus* oils.

The essential oil contains β-pinene (5-9.5%), limonene (33-42%), γ-terpinene (6-10.5%), linalool (7-15%), linalyl acetate (22-33%), and geranial (<0.5). The bergapten concentration must fall between 0.15-0.45%).

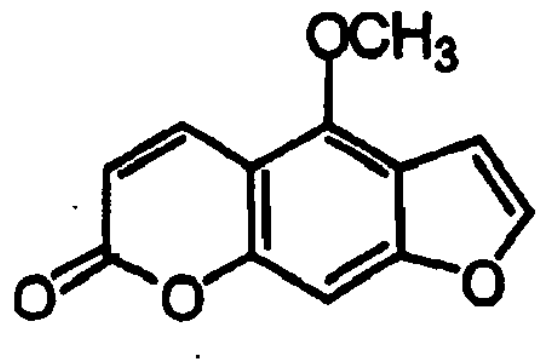




Linalyl Acetate



Linalool



Bergapten (5-methoxypsoralen)

The chief consumers of bergamot oil (whole or for some uses, freed from bergapten) are the perfumery industry (colognes) and the cosmetology industry. The phototoxicity of bergamot oil has led the relevant international organisations to recommend a maximum concentration of 2% (75ppm of bergapten) in perfumery products, whereever their use might be followed by exposure to sunlight.

ORANGE TREE PERICARPIUM AURANTII AMARAE

***Citrus aurantium* ssp. *aurantium* (*Citrus aurantium* ssp. *amara*)**

The bitter orange tree is a small tree cultivated mainly in the Mediterranean area. There are three monographs in the pharmacopoeias to the orange species :

-The dried flower, collected before it blooms
-The bitter orange peel, in other words the pericarp of the ripe or nearly ripe fruit
- The dried leaf

The Drugs : The bitter orange drugs, especially the pericarp, contain apart the essential oil in highly amounts flavonoids :
(citroflavonoids=bioflavonoids like naringin, hesperetin)

Pharmacological Properties and Uses : The bitter orange peel is used orally to stimulate the appetite and facilitate weight gain. In Germany, where the indications are similar, gastric ulcer is a contraindication.

Also based on tradition the leaf and flower of bitter orange **and of sweet orange** is used, generally in infusion, to treat the symptoms of neurotonic disorders in adults and children, especially in case of minor sleeplessness.

ORANGE OIL
CITRUS AURANTII DULCI AETHEROLEUM

Citrus aurantium* var. *dulcis

The pericarps of the differnt cultivars of the sweet orange tree produce an essential oil comprising monoterpenoid hydrocarbons almost exclusively (limonene (93.5-96.5%), β-myrcene (1.5-2%). Alongside small quantities of decanal, citrals and linalool.

Bitter orange oil : The fresh pericarp of the bitter orange produces by expression, an essential oil fairly similar to that of the sweet orange, although less rich in carbonyl compounds.

Bitter orange flower oil : Bitter orange flower oil is rich in linalool (28-44%), linalyl acetate (3-15%), limonene (9-18%), and β-pinene (7-17%).

MANDARINE ORANGE OIL
CITRUS RETICULATAE AETHEROLEUM

Citrus reticulata

Like lemon oil and lime oil (*Citrus aurantiifolia*) the mandarin orange oil is characterized by a fairy low level of limonene (65-75%), and a high level of γ-terpinene (10-20%). The β-pinene level is low (1-3%).

GRAPEFRUIT OIL **CITRUS PARADISI AETHEROLEUM**

Citrus paradisi

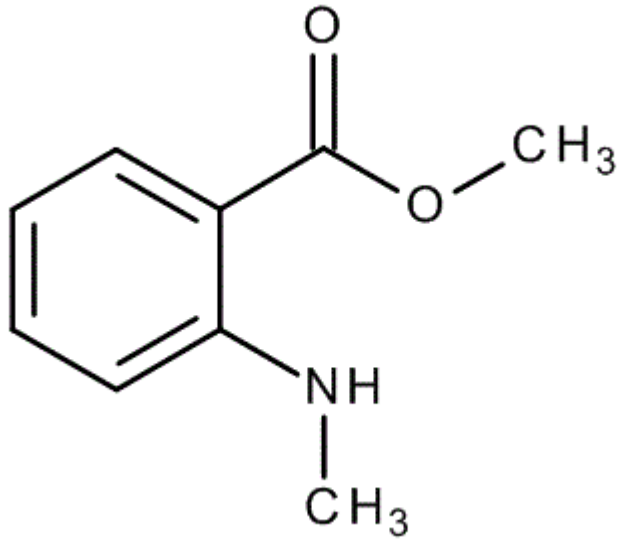
The essential oil contains 96-97% monoterpenoid hydrocarbons (limonene, myrcene). The level of aliphatic aldehydes is low (0.6% including octanal and decanal).

PETITGRAIN OILS (lemon, bitter orange, mandarin)

The term petitgrain oil designates the essential oils obtained by distillation of the leaves, small twigs, and small unripe fruits of the species considered. The composition of these essential oils is very different from that of the oils produced by the expression of the pericarps.

Examples are :

. Lemon petitgrain oil, with carbonyl compounds (14-33%), 2. Bergamot petitgrain oil, which contains linalyl acetate, linalool and limonene, 3. Mandarin orange petitgrain oil, which contains as the major component, methyl-N-methylanthranilate (45-63%).



methyl-N-methylanthranilate

LAVENDER LAVANDULAE FLOS (Lavanta
***Lavandula* spp., *Lavandula angustifolia* and**
***L. spica* Lamiaceae**

***Lavandula angustifolia* (true lavender)**

Lavandula spica (lavande aspic)

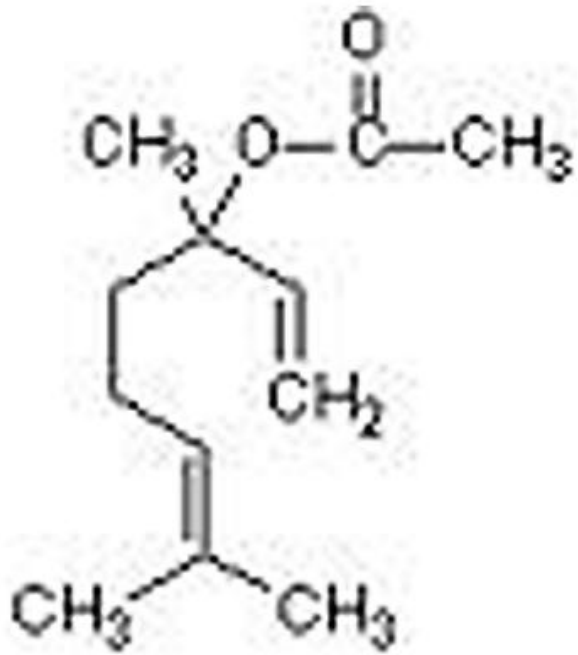
Lavandula angustifolia cultivation

Both species grow wildly in the low mountains of the Mediterranean basin, and they are cultivated in many countries in Europe (France, Spain, Bulgaria).

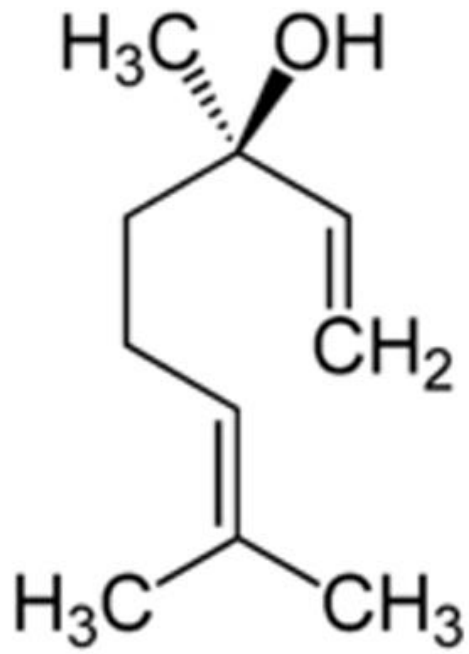
Both species are used medically and also in perfumery and cosmetology.

True lavender : The drug consists of the dried flowers, and must contain not less than 8ml/kg essential oil.

Essential oil (Lavandulae aetheroleum) : The concentration of the essential oil varies depending on many factors, particularly the mode of cultivation and the enviromental conditions. According to the pharmacopoeias, lavender oil must contain 25-38% linalool, 25-45% linalyl acetate, and limonene, cineole, camphor and α-terpineol.



Linalyl Acetate



Linalool

Pharmacological Properties and Uses : The drug may be used with the following indications :

Topically : traditionally used to treat minor wounds after thorough cleansing; for sunburns, superficial burns of limited area, and diaper rush; to relieve nasal congestion in the common cold; as a mouth wash for oral hygiene.

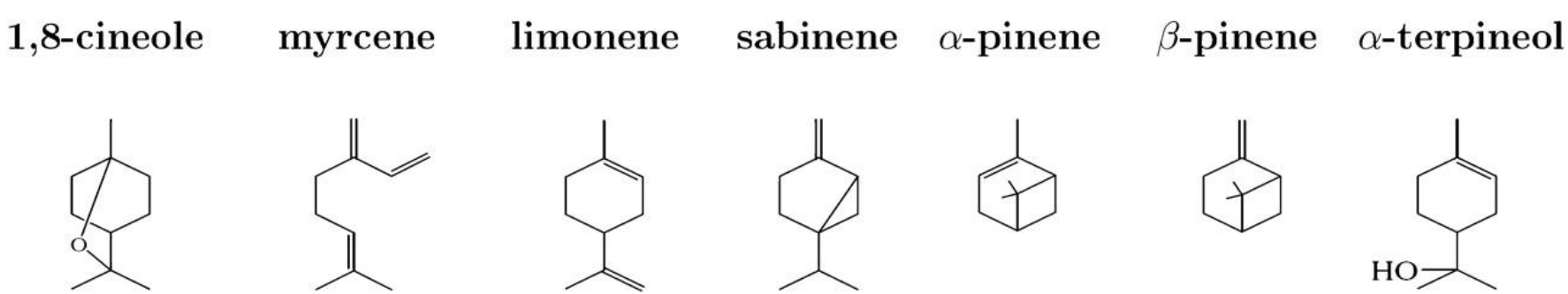
Orally : it is traditionally used to treat the symptoms of neurotonic disorders in adults and children, in case of minor sleeplessness.

The same type of indications – for the oral route- are allowed in Germany where lavender is also used in baths to improve functional circulatory problems

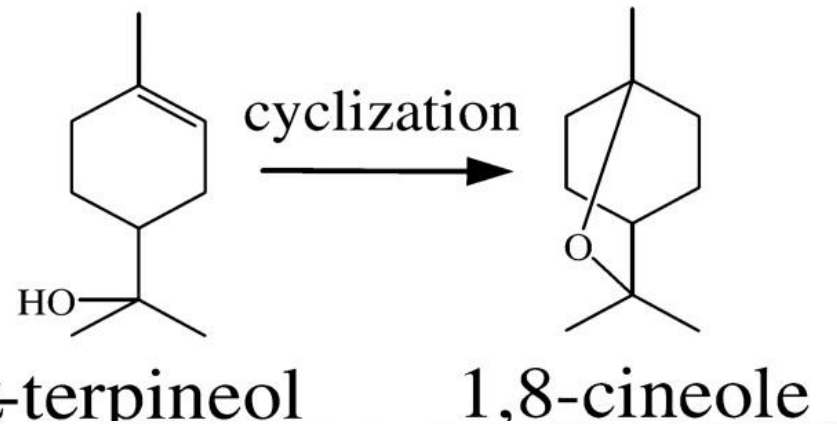
Lavande aspic : It produces an essential oil that is particularly rich in cineole (30-40%) and in camphor (15%), and therefore less prized.

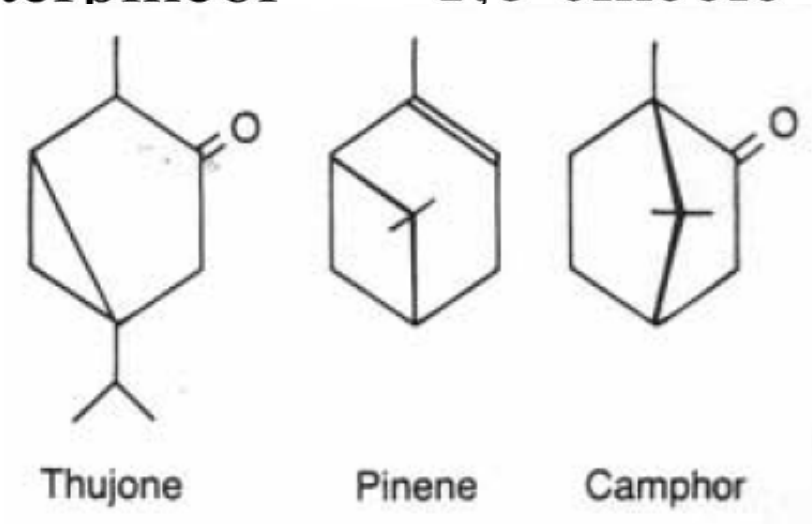
Lavandin : The composition of lavandin oils is intermediate between those of lavande aspic and true lavender. This essential oil contains limonene (0.5-1%), cineole (4-7%), camphor (6-8%), linalool (25-35%), linalyl acetate (28-38%), and α-terpineol (0.5-1%).

A


1,8-cineole
myrcene
limonene
sabinene
α-pinene
β-pinene
α-terpineol
O
HO

B


cyclization
HO
O
α-terpineol
1,8-cineole


O
O
Thujone
Pinene
Camphor

Lavandula angustifolia and *L. spica* do not grow in Turkey There are another two *Lavandula* species growing in the south-western part of Turkey (*Lavandula cariensis* and *L. stoechas*). Both species contain in the essential oils especially camphor and fenchon as the major components, they are not rich in linalool.

Lavandula cariensis

Growing also in Cyprus

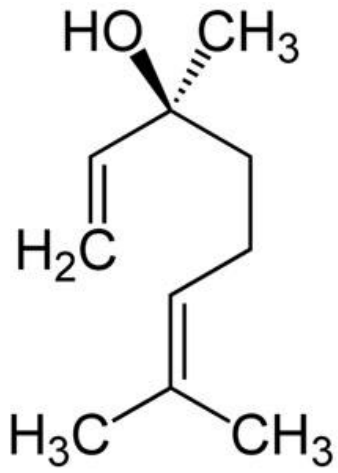
There are some *Lavandula stoechas* preparations especially in Germany used for cold and flu.

CORIANDER (kişniş)

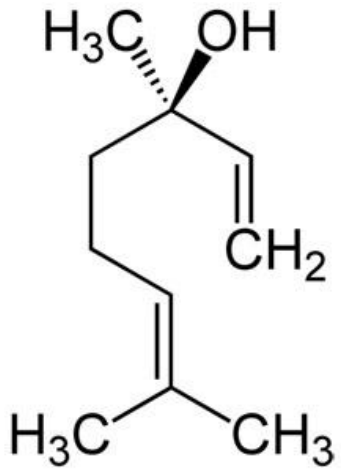
CORIANDRI FRUCTUS CORIANDRI AETHEROLEUM

Coriandrum sativum **Apiaceae**

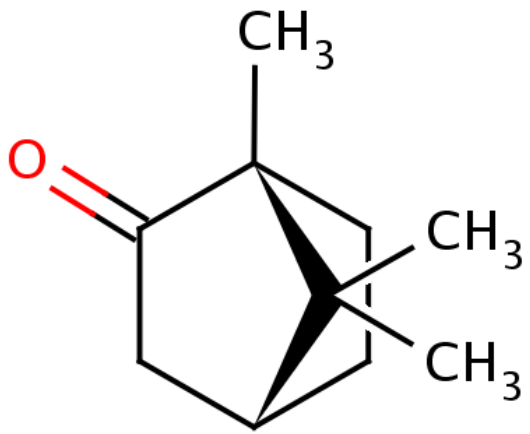
The dried fruit must contain not less than 3 ml/kg essential oil, but in can contain up to 14 ml/kg essential oil with (+)-linalool as the major constituent (65-78%, ripe fruit), alongside camphor(4-6%), geranyl acetate (1-3%) and γ-terpinene. Reputed to be an antispasmodic, the fruit is mostly a highly prized spice (curries, bakery products, liquors).



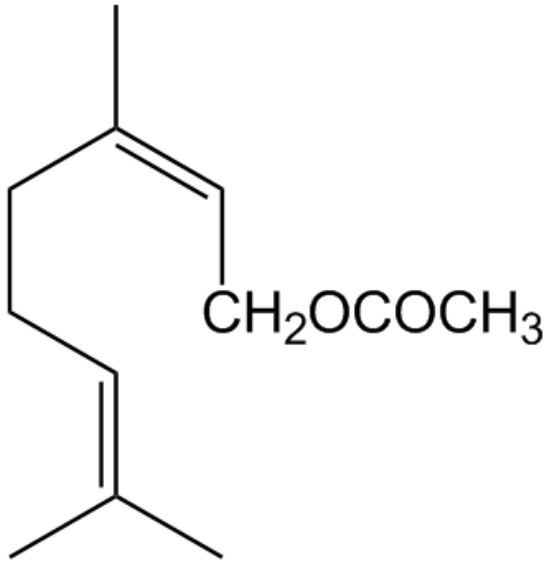
(S)-(+)-Linalool



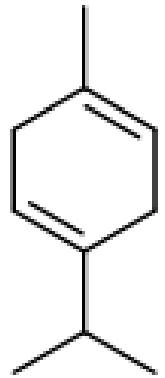
(R)-(−)-Linalool



camphor



geranyl acetate



γ-Terpinene

ROSE (gül) **ROSAE FLOS**

ROSAE AETHEROLEUM

Rosa damascena, R. centifolia **Rosaceae**

Rosa species

Rosa damascena is cultivated in Isparta province and the essential oil of rose is obtained in factories there.

Oil of rose (Rosae aetheroleum, Otto or Attar of Rose), is a volatile oil obtained by distillation from the fresh flowers of *Rosa damascena* or *Rosa centifolia.* The chief producing countries are Bulgaria, Turkey and Morocco. The oil is prepared in copper alembic stills by the peasants or in large factories under carefull scientific control. Some 3000 parts of flowers yield only one part of oil. The oil is very expensive and very liable to adulteration. The “peasant distilled oil” usually fetches a lower price than that produced in the larger works.

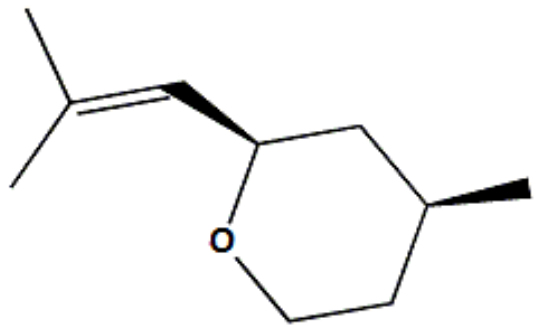
Origin : There has been great debate for many centuries on the origins of *Rosa damascena*. Fossils of rose were discovered in the US they are believed to be 30 million years old. Although it is generally believed that Rosa damascena is a hybrid between *R. gallica* and *R. canina*., its birthplace is thought to be Persia.Although there are studies that claim the firsy hybrid of rose was discovered in Anatolia or in Western Asia in the bronze ages.

History : Homer alludes to the rose by singing of the «perfume of roses» and «rosy fingered» in the Iliad and Odyssey. The great Greek poetess Sappho selected the rose as the queen of flowers around 600 B.C. The Word rose is derived from the Greek Word «rhedon» and the Persian Word «vareda», meaning «red». It is believed that the oldest species of *Rosa gallica* the precursor of Damask rose was indeed red.

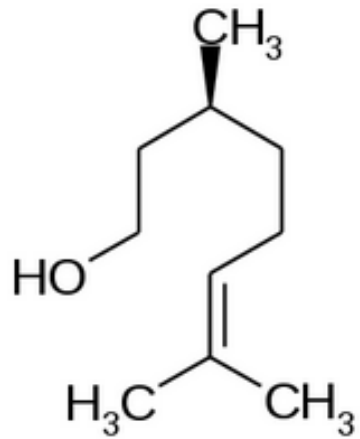
Rosa gallica *Rosa canina* dog rose, kuşburnu)

Rose oil contains mainly acyclic monoterpenes citronellol (40-50%), geraniol (20%), and also nerol. The chemical constituents of the absolute rose oil is quite different. It contains phenylethanol (65-75%), citronellol (20-25%), and geraniol (5-7%).

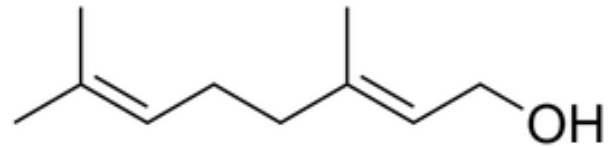
Rose oil has some activities like antimicrobial, antioxidant effects, but is of great importance in perfumery.



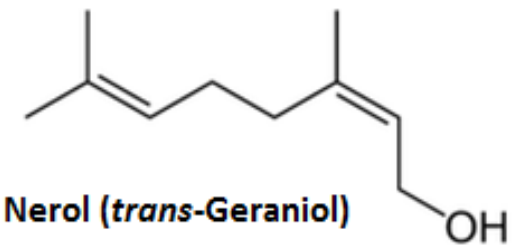
Rose Oxide



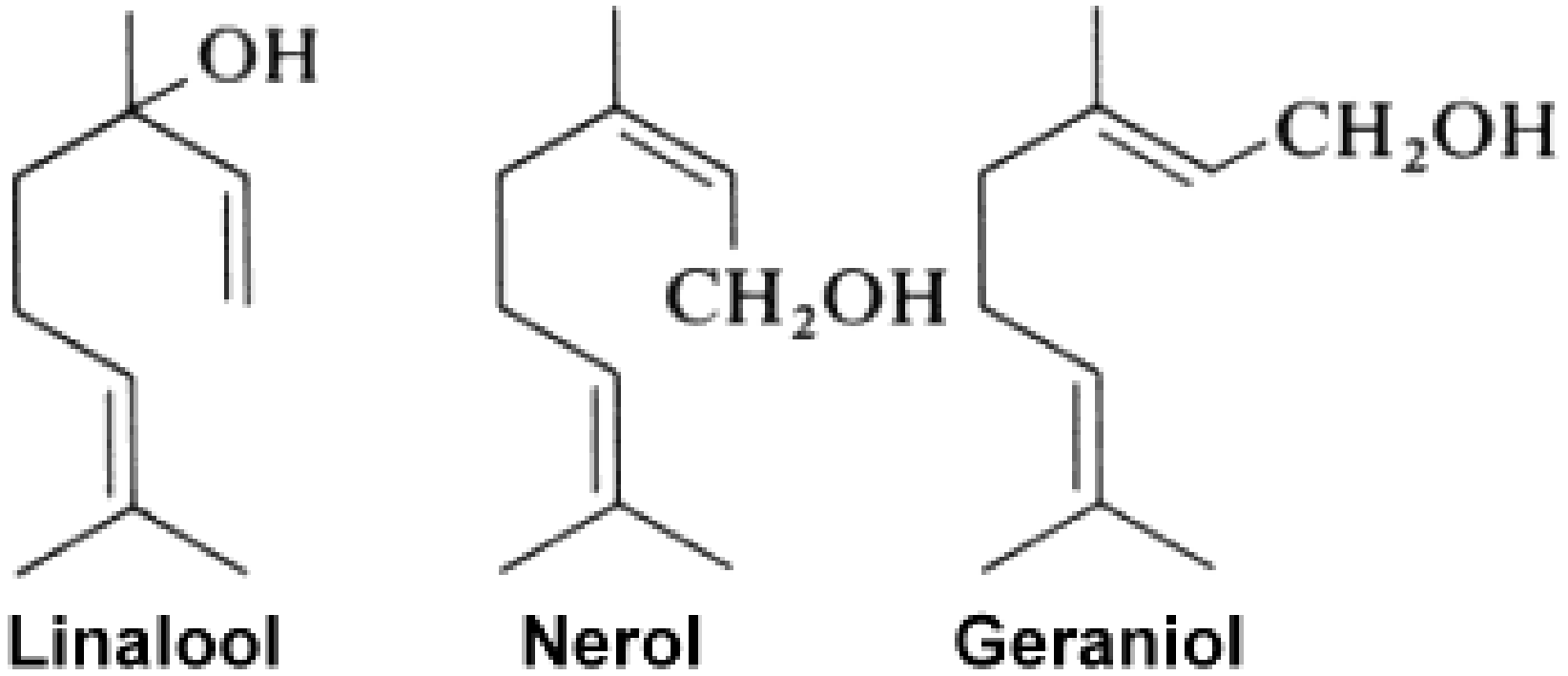
Citronellol



Geraniol



Nerol (*trans*-Geraniol)



Linalool Nerol Geraniol

Another rose-scented essential oil is “**Palma-rosa**” oil, which obtained by steam distillation from *Cymbopogon martini* (Graminae) leaves growing in India. This oil contains 75-95% geraniol.

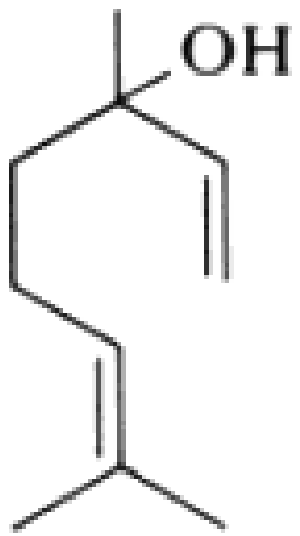
PELARGONIUM, GERANIUM (Itır)

Pelargonii folium

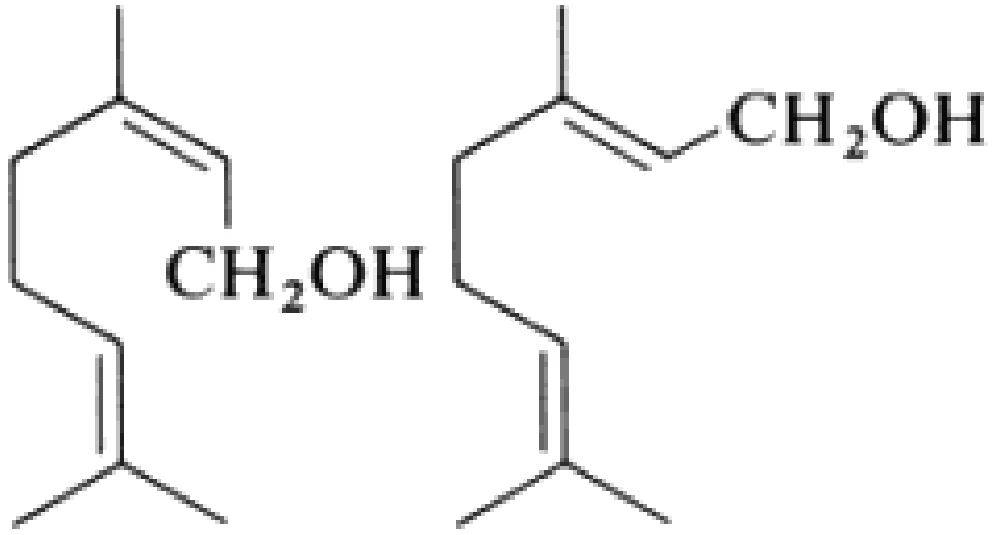
Pelargonium graveolens, P. roseum, P. odoratissimum

Geraniaceae

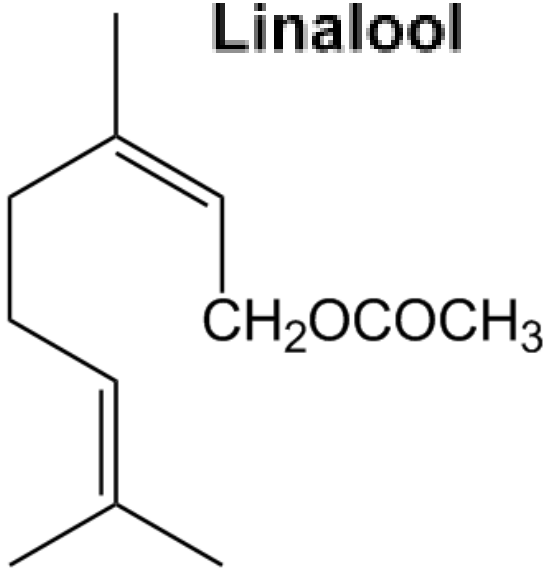
The main components of Geranium essential oils oil are α- pinen, myrcen, limonen, menthone and especially acyclic monoterpenes linalool, geranyl acetat, citronellol, geraniol and geranyl butyrat.



Linalool



Nerol Geraniol



geranyl acetate

The health benefits of Geranium Essential Oil can be attributed to its properties as an astringent, hemostatic, cicatrisant, cytophylactic, diuretic, deodorant, styptic, tonic, vermifuge and vulnerary agent. It is widely used as an element in aromatherapy for its many health benefits, including its ability to balance hormones, relieve stress and depression, reduce inflammation and irritation, improve the health of the skin, alleviate the effects of menopause, improve circulation, benefit dental health, boost kidney health, and reduce blood pressure.

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