Master data ingredient / monograph

Ingredient/plant: Peppermint (Mentha piperita)

Scientific name:	Mentha piperita
Order:	Lamiales (Lippenblütlerartige)
Family:	Lamiaceae (Lippenblütengewächse)
Subfamily:	-
Genus:	Mentha
Species:	Mentha piperita

Description:

Peppermint (*Mentha × piperita*) is a (usually) sterile hybrid mint, a cross between watermint (*Mentha aquatica*) and spearmint (*Mentha spicata*). It is occasionally found wild with its parent species in central and southern Europe, but the first intentional crossbreed of watermint and spearmint was done in England. Being sterile, it spreads by rooting. Native to Great Britain and found in Europe and the United States. It prefers a moist soil and is generally found in damp places and marshes.

The hairy stems are from 30-70 cm tall, rarely up to 100 cm, smooth, and square in cross section. The leaves are from 4-9 cm long and 1.5-4 cm broad, dark green with reddish veins, and with an acute apex and coarsely toothed margins. The flowers are purple, 6-8 mm long, with a four-lobed corolla about 5 mm diameter; they are produced in whorls around the stem, forming thick, blunt spikes. Flowering is from July to September.

Peppermint is generally regarded as 'the world's oldest medicine', with archeological evidence placing its use at least as far back as ten thousand years ago.

Cultivation
Peppermint generally thrives in shade and expands quickly by underground rhizomes. If you choose to grow peppermint, it is advisable to plant it in a container; otherwise it can rapidly take over a whole garden. It needs a good water supply, and is ideal for planting in part-sun to shade areas.
The leaves and flowering tops, collected as soon as the flowers begin to open and carefully dried, are the usable portion of the plant. The wild form of the plant is less suitable for this purpose, with cultivated plants having been selected for more and better oil content. Seeds sold at stores labeled peppermint are not the true plant. The true peppermint cannot produce seeds, as it is sterile.

Medicinal used parts of peppermint: leaves, dried, collected just before flowering.

Properties:

Peppermint, and to a lesser extent spearmint and cornmint, are among the most popular herbs; their many uses as flavoring ingredients are well known.

Medicinally, peppermint is used to aid the various processes of digestion: to combat gas, increase bile flow, heal the stomach and liver, etc. Its active constituents are found in its essential oil, mainly menthol, menthone and menthyl acetate. Menthyl acetate is responsible for peppermint's minty aroma and flavor. Menthol, peppermint's main active ingredient, is found in the leaves and flowering tops of the plants. The menthol content of peppermint oil determines the quality of its essential oil. This varies depending upon climate, habitat and where the peppermint is grown. The oil's spasmolytic, anti-ulcer, anti-inflammatory, and antibacterial properties have been experimentally verified.

Peppermint is nontoxic, though some people may be allergic to the leaves. Peppermint leaf and oil, as well as mint oil, are approved by the German Commisssion E for internal and external uses:

Mint and peppermint oil are used internally for flatulence, GI and gallbladder disorders and catarrh and externally for myalgia and neuralgia.

Peppermint leaf is used for spastic complaints of the GI tract and gallbladder.

Pharmacological properties:

Peppermint is a common flavoring, which makes it seem familiar and therefore "simple". Actually, its chemistry is highly complex, with over 100 components, primarily menthol.

Peppermint is a digestive aid
Experiments conducted in Russia on four dogs with chronically implanted fistula of the gallbladder, indicated a preparation of peppermint leaves, containing mostly mixed flavanoids, had a pronounced choleretic effect on the liver, markedly increasing bile output. Its effect was superior to the choleretic drug chologon (ketocholamic acid). Bile composition was changed, resulting in decreased cholates, bilirubin, and cholesterol, although the total output of cholates increased.

Peppermint stimulates gallbladder contraction, resulting in increased digestion. A peppermint infusion or tea raises bile secretion to a level about 9 times greater than normal. In addition, the antiseptic property of peppermint helps disinfect the bile duct as it is secreted in the bile. A mode of action has been proposed for peppermint and a few other essential oils: they stimulate the vagus nerve, which then leads the secretion of bile.

a) spasmolytic properties

The spasmolytic property of peppermint has been established against many convulsant drugs, including acetylcholine, histamine, serotonin, and anaphylaxotocin. Preparations used include isolated cuts of rabbit and guinea-pig intestine, isolated guinea pig lungs, cat lungs "in situ," and whole animals under conditions of anaphylactic shock. The smooth muscle spasmolytic effect is myotropic, resembling that of papaverine. Peppermint extract has been found to decrease the tone of the lower esophagus sphincters to aid the escape of air.

b) antibacterial properties

Peppermint oils are consistently among the strongest antibiotic natural oils tested. In one study, for example, peppermint ranked among the top 3 of 17 essential oils tested for inhibition of swine erysipelas, and a sporeless culture of Bacillus anthracis. Of 22 essential oils tested in another study, peppermint was on of the top 5 inhibitors of 11 species of bacteria. In a semi-solid agar held at 45 degrees, peppermint and a select few other essential oils inhibited Streptococcus faecalis, Bacillus cereus, Salmonella enteritidis, and other gram positive and gram negative bacteria.

Candy made from peppermint and other such materials has a low content of microorganisms, due to the germicidal properties of its flavoring. Peppermint oil is effective against other organisms as well, including: Staphylococcus pyogenes, Streptococcus pyogenes, Penicillium glaucum, Aspergillus albus, Neisseria perflava, Sarcina lutea, Bacillus mensentericus, Bacillus subtilis, and Micrococcus aureus. Cornmint and spearmint also have effective antibacterial properties, as would be expected. Spearmint has some antitubercular and anthelmintic action.

c) antiviral activity

Peppermint contains many of the same components as lemon balm, which had been shown to have considerable antiviral activity. On that basis, peppermint was investigated and found also to inhibit several viruses, including Newcastle Disease, Herpes simplex, vaccinia, Semliki Forest, and West Nile viruses in egg and cell-culture systems. The herb contains a tannin with an affinity for Newcastle virus and mumps virus, and a nontannin fraction with antiviral effects agains herpes simplex virus.

d) antipyretic and antiulcer properties of Azulene (residue of peppermint oil)

Azulene, an isolate from the residue of peppermint oil distillation has a marked antipyretic action. A 0.1 gm/kg dose, injected intramuscularly, was effective against hot water burns on the ear of a rabbit. Administered in a dose of 0.05 gm/kg, the preparation is effective in reducing pathological changes of the mucosa in experiments on rats with butadione-induced gastric ulcer. With intraperitoneal administration, the LD50 of azulen is 1.5 gm/kg for mice and 1.165 gm/kg for rats.

e) cytotoxic properties

Cornmint and peppermint oils have some cytotoxic properties, but it is unlikely the whole plant would exhibit these effects.

Cosmetic properties:

Many over-the-counter balms and liniments contain peppermint essential oil. These are applied externally to relieve muscle pain, arthritis, itching and fungal infections.

Possible interactions:

If peppermint is used on a daily basis, the following drugs may be imperfectly absorbed: tetracycline derivatives, oral anticholinergics, phenothiazines, digoxin, isoniazid, phenytoin, and warfarin.
The urinary excretion of alkaline drugs, such as amphetamines or quinidine, may be inhibited by the antacid nature of peppermint.
Peppermint's analgesic effects may be additive with other analgesics and anesthetics. These effects may be inhibited by barbiturates, despite any CNS-depressant effects which may occur. The analgesic property of this herb may be reversed or even eliminated by P-chlorophenylalanine, cyproheptadine HCl, and phenobarbital. Conversely, the CNS-depressant tendency of this analgesic may be potentiated by chlorprothixene HCl, haloperidol, and tranquilizers.

Comments
Since peppermint's action depends on the presence of cholinergic substances, it will be affected by the decrease in cholinergic-receptor stimulation produced by anticholinergics.
The presence of azulenes in peppermint may interfere with the actions of bradykinin, histamine, acetylcholine, and serotonin.
In the absence of other hard data, it may be assumed observable interactions occur between the many central nervous system drugs and the psychoactive principles in this herb.
There is evidence to show combined use of bactericidal and bacteriostatic agents will lower the effectiveness of the bacteriostatic agent. However, how this finding applies to herbal anti-infectives is still unknown.

Use:

Peppermint has a high menthol content, and is often used as a flavouring in tea, ice cream, confectionery, chewing gum, and toothpaste. The oil also contains menthone and menthyl esters. It is the oldest and most popular flavour of mint-flavored confectionery. Peppermint can also be found in some shampoos and soaps, which give the hair a minty scent and produce a cooling sensation on the skin.
Peppermint, like many spices and herbs, is believed to have medicinal properties when consumed. It is said that it helps against upset stomachs, inhibits the growth of certain bacteria, and can help smooth and relax muscles when inhaled or applied to the skin. Other health benefits are attributed to the high manganese, vitamin C and vitamin A content; as well as trace amounts of various other nutrients such as fibre, iron, calcium, folate, potassium, tryptophan, magnesium, omega-3 fatty acids, riboflavin, and copper.

Peppermint oil has been demonstrated to reduce colicky abdominal pain due to irritable bowel syndrome (IBS) with an NNT (number needed to treat) around 3.1, but the oil is irritant to the stomach in the quantity required and therefore needs wrapping for delayed release in the intestine. Peppermint relaxes the gastro-oesophageal sphincter, thus promoting belching.

Peppermint flowers are heavy nectar producers and honeybees as well as other nectar harvesting organisms forage them heavily. A mild, pleasant varietal honey can be produced if there is sufficient acreage of plants.

Areas of North America where peppermint was formerly grown for oil (now produced synthetically) often have an abundance of feral plants, and it is considered somewhat invasive.

Preparation and administration:

Three times a day
Dried herb : 2-4 grams
Tea: made from 1 tsp of dried herb
Oil: 0.05-0.2 ml (use enteric coated capsules if for Irritable Bowel Syndrome)
This herb has approval status by the German Commission E.

Recommended daily dosages in Germany are as follows:
Internal use:
6 - 12 drops oil
3 - 4 drops in hot water for inhalation.
3 - 6 g leaf
5 - 15 g leaf tincture

external use:
1 - 5% essential oil for nasal ointment
5 - 20% solution.

Limits of administration:

Extreme caution should be used when administering to children under five years of age as the menthol can cause a choking reaction in young children.
Peppermint oil should not be applied to the faces of infants or small children.
The essential oil of peppermint should not be ingested unless under professional supervision.
Pure menthol or pure peppermint should not be ingested. Pure peppermint may cause an irregular heartbeat. Pure menthol is poisonous and fatal in doses as small as 1 tsp.
Pregnant women with a history of miscarriage should use peppermint with caution. Large amounts of peppermint may trigger a miscarriage. Additional caution should be practiced by women who are breast-feeding their infants.
Peppermint should not be used in conjunction with homeopathic treatment.

Assessment / safety factors and toxicity:

Some individuals may experience allergic contact dermatitis from the plant, and some hay fever has been associated with fields of peppermint.

Menthol and menthol-containing drugs can be lethal to infants if applied to the nose, as when the infant has a cold. This use should be avoided.

If the essential oil is not used properly it can cause dermatitis and other allergic reactions.

Rare reactions to enteric-coated capsules may occur. These reactions include skin rash, heartburn, slow heart rate, and muscle tremors.
Large internal doses of peppermint essential oil may result in kidney damage.

Mint oil has approval status by the German Commission E.
Peppermint leaf has approval status by the German Commission E.

Further remarks and characteristics:

Peppermint oil in the view of FDA / USA:

Oleum Menthae Piperita. U. S., Br. Oil of Peppermint. Ol. Menth. Pip. [Peppermint Oil]

"A volatile oil distilled from the flowering plant of Mentha piperita Linné (Fam. Labiatae), rectified by steam distillation, and yielding not less than 5 per cent. of esters, calculated as menthyl acetate [C10H19C2H3O2 = 198.18], and not less than 50 per cent. of total menthol [C10H19OH = 156.16], free and as esters. Preserve it in well-stoppered, amber-colored bottles, in a cool place, protected from light." U. S. "Oil of Peppermint is the oil distilled from fresh flowering peppermint, Mentha piperita, Sm., and rectified, if necessary." Br.

Huile volatile de Menthe poivree, Fr. Cod.; Essence de Menthe poivree, Fr.; Oleum Menthae piperitae, P. G.; Pfefferminzöl, G.; Essenza di menta, It.; Esencia de menta piperita, Sp.

Peppermint varies exceedingly in the quantity of oil which it affords. Four pounds of the fresh herb yield, according to Baume, from a drachm and a half to three drachms of the oil. Zeiler gives as the product of the fresh herb, from 0.37 to 0.68 per cent., of the dried 1.14 per cent. The yield is generally less than 1 per cent. This oil is largely distilled in the States of Michigan, Indiana, and New York. For a valuable account of its method of production in Michigan, by A. M. Todd, see A. J. P., 1888, 328. The oil is also largely produced in Japan. (See illustrated paper, C. D., 1896, 601.) Gildemeister and Hoffmann (Aetherische Oele, p. 836) estimate the world's production of peppermint oil at 175,000 kilos, of which the United States furnishes 90,000 kilos, and Japan 70,000 kilos. It is officially described as "a colorless liquid,

having a strong odor of peppermint, and a pungent taste, followed by a sensation of cold when air is drawn into the mouth. It is soluble in 4 volumes of 70 per cent. alcohol, showing not more than slight opalescence and no separation of oil globules. Specific gravity: 0.896 to 0.908 at 25° C. (77° F.). The optical rotation varies between -23° and -33° in a 100 mm. tube at 25° C. (77° F.). Distil about 1 mil from 25 mils of the Oil and pour the distillate on 5 mils of mercuric chloride T.S.; a white film does not form at the zone of contact within one minute (dimethyl sulphide found in non-rectified oils)." U. S.

Upon cooling or long standing it deposits a stearopten. Berzelius stated that at -13.3° C. (--8° F.) the oil deposits small capillary crystals. These are called peppermint camphor or menthol, C10H19OH. A complete summary of the composition of American peppermint oil, on the authority of Power and Kleber, given in Schimmel & Co.'s Report for April, 1897, shows the following constituents: acetaldehyde, isovaleraldehyde, dimethyl sulphide, amyl alcohol, isovaleric acid, pinene, phellandrene, cineol, limonene, menthone, C10H18O, menthol, the acetate and iso-valerate of menthyl, a-lactone, C10H16O2, and cadinene. Menthol, its oxidation product menthone, and the acetic and isovaleric esters of menthyl have been identified as present in English and French peppermint oils, which probably also contain most of the other constituents mentioned above. Menthol and its esters are regarded as the main constituents of oil of peppermint and an official assay for determining the percentage of menthol will be found above. The dimethyl sulphide and some of the other constituents are objectionable from the flavoring standpoint, and are largely removed by the steam distillation which is required for rectification. The polariscope has been shown to be an uncertain guide in determining the quality of oil of peppermint. (A. B. Stevens, Proc. A. Ph. A., 1888, p. 97.)

Flückiger discovered that from 50 to 70 drops of peppermint oil, shaken with one drop of nitric acid, sp. gr. 1.2, turn faintly yellowish brown, and after an hour or two a most beautiful blue-violet or greenish-blue by transmitted light, or copper color by reflected light. Either a greater amount of acid or heating hastens the reaction. The color is very persistent. The presence of 5 per cent. of turpentine does not interfere with the reaction. (P. J., Feb., 1871.)

Since menthol has been prepared largely from American peppermint oil, much of the latter has been put upon the market deprived of its menthol. To detect this fraud, Fritzsche Brothers recommend that a test tube partially filled with the oil and corked should be placed in a freezing mixture of ice and salt for ten or fifteen minutes. At the end of that time, if the oil has not been tampered with, it will have become cloudy, thick, or of a jelly-like consistence If then four or five small crystals of menthol be added, and the tube be replaced in the freezing mixture, the oil will in a very short time form a solid mass of crystals. For another method of testing dementholized oil, see a paper by E. C. Federer, Ph. Era, 1887, 36; also 1887, 97.

Power and Kleber first proposed (Ph. Rund., 1894, 157) to estimate the menthol in oil of peppermint by acetylizing a sample and saponifying an exactly weighed portion of the acetylized oil after washing, drying, and filtering the same. Kleber (A. J. P., 1897, 192) proposed to take instead a weighed quantity of the oil, acetylize it, and then saponify the product after washing and neutralizing it. In Schimmel & Co.'s

Report for October, 1897, Kleber criticizes Kebler's modification, and claims greater accuracy for the original method. Of course, this determination gives the total menthol; a determination of the combined menthol is had by titrating with alcoholic alkali.

Peppermint oil has been variously mixed and adulterated with the following substances: alcohol, oil of turpentine, oil of copaiba, oil of erigeron (from the erigeron plant growing with the peppermint plant, and being collected with it for distillation), oil of eucalyptus, oil of pennyroyal, and others. Most of these are detectable by the official tests, or when present lower the assay strength, or are readily recognized by the odor or taste, which they communicate to the oil. For further details concerning some of these adulterants and their detection, see U. S. D., 19th ed., p. 854, 855.

Chinese Oil of Peppermint has not found its way to any extent into commerce, yet it has at times attracted much attention. According to John Mackey, some of it has reached London in cylindrical tin canisters, and it is to be obtained in San Francisco. Some specimens resemble the ordinary oil, but become solid in cold weather; others remain liquid and show no tendency to deposit a camphor, while others are solid crystalline masses at all temperatures. It seems probable that the original Chinese oil contains a great excess of menthol, and constitutes the variety first spoken of, and that the solid and liquid oils are prepared by separating it into its two constituents. The solid oil Fluckiger states not to differ from American menthol. (See P. J., v, 366, 825.)

***Uses**.—Oil of peppermint possesses the physiological properties and therapeutic virtues of menthol, and may be used for practically all those conditions in which menthol is of service. It is generally preferred for internal use because of its more pleasant taste. It is an excellent carminative and gastric stimulant, and is widely employed in flatulence, nausea, and gastralgia. It adds to a stimulating effect upon the alimentary canal an antiseptic and local anesthetic influence. As a local application for coryza it may be used in strengths of from five to ten minims to an ounce of liquid petrolatum or olive oil. Incorporated into a lozenge it offers a pleasant and efficient antiseptic and anesthetic in pharyngitis. Internally it may be given either rubbed up with sugar and then dissolved in water, or more commonly in the form of the spirit. It is extremely popular as a flavoring agent.*

Dose, one to five minims (0.06-0.3 mil).

***Off. Prep**.—Aqua Menthae Piperitae, U. S.,* Br.*; Spiritus Menthae Piperitae, U. S., Br.*

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