



Formulation and evaluation of peppermint oil from mentha leaves and its insecticidal effects on plant and therapeutic effects on human

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Abstract:

Peppermint oil is gained from the leaves of the herb, *Mentha piperita* L. and *M. arvensis* var. *piperascens* member of the Labiatae family. This family has many betterly known essential oil plants such as spearmint, basil, lavender, rosemary, sage, marjoram and thyme. This is a well known and important medicinal plant commonly used in several indigenous systems of medicine for various health benefits viz. analgesic, antiseptic, astringent, carminative, decongestant, expectorant, nervine, stimulant, stomachic, inflammatory diseases, ulcer and stomach problems. The followed article is an up-to-date and accurate analysis of the chemistry, pharmacology, analysis, and uses of Peppermint oil.

Introduction:

We get peppermint oil from the leaves of the perennial herb, *Mentha piperita* L. and *M. arvensis* var. *piperascens* a member of the labiate family. It has no color, pale yellow or pale greenish-yellow liquid having characteristic odor and taste feels sensation of cold, it is soluble in ethanol (70%). The solution may be unclear. The oil is found on beneath of the leaves, is extracted by steam distillation and then undergo rectification and fractionation prior to use. India is world's largest manufacturer and exporter of mint oil. Mint oil and its constituents and derivatives are used in daily food, pharmaceutical and perfumery and flavoring industry. Its main constituent which is menthol, is used in the production of lozenges, toothpastes, pain balms, cold balms, Dabur Pudina Hara, etc. The basic raw material for peppermint oil is leaves of a plant *Mentha arvensis*. The oil is used for deal with certain stomach disorders like indigestion, gas problem, acidity, etc. It is the main constituent of ayurvedic medicines like Dabur's 'Pudina Hara'. The oil is a real source of menthol, which is the main constituent of cough drops and ointments like Vicks Vaporub, etc

Morphology of mint:

Mints show fragrance, almost exclusively perennial herbs. They show wide-spreading underground and overground stolons and erect, square, branched stems. The leaves are appeared in opposite pairs, from oblong to lanceolate, often downy, and with a serrated margin.

Leaf color has a range from dark green and gray-green to purple, blue, and may be pale yellow. The flowers are white to purple and produced in false whorls called verticillasters. The corolla is two-lipped with four subequal lobes, the upper lobe usually the biggest. The fruit is an achene, containing one to four seeds.



Taxonomy:

Mentha belongs to the tribe Mentheae in the subfamily Nepetoideae. The tribe contains about 65 genera, and relationships within it remain unclear. Authors have different opinion on the circumscription of Mentha. For example, *M. cervina* has put in Pulegium and Preslia, and *M. cunninghamii* has been placed in Micromeria. In 2004, a molecular phylogenetic study shows that both *M. cervina* and *M. cunninghamii* should be included in Mentha. However, *M. cunninghamii* was declined in a 2007 treatment of the genus.

More than 3,000 names have been published in the genus Mentha, a trank from species to forms, the majority of which are regarded as synonyms or illegitimate names. The taxonomy of the genus is made difficult because many species hybridize readily, or are themselves derived from possibly ancient hybridization events. Seeds from hybrids give rise to variable offspring, which can spread through vegetative propagation. The change has led to what has been described as "paroxysms of species and subspecific taxa"; for example, one taxonomist published 434 new mint taxa for central Europe alone during 1911 and 1916. Recent sources recognize between and species.

Cultivation:

All mints grow near pools of water, lakes, rivers, and cool moist spots in partial shade. In general, mints permit a wide range of conditions, and can also be grown in full sun. Mint develops all year round.

They are fast-growing, increasing their reach along surfaces through a network of runners. Due to their expeditious growth, one plant of each desired mint, along with a bit care, will provide more than sufficient mint for daily use. Some mint species spread harmfully than others. Even with the less invasive mints, proper concern should be taken when mixing any mint with any other plants, lest the mint take over. To control mints in an open environment, they should be planted in deep, bottomless containers sunk in the ground, or planted above ground in tubs and barrels.

Some mints can be propagated by seed, but growth from seed can be an unreliable method for raising mint for two reasons: mint seeds are highly variable one might not end up with what one supposed was planted and some mint varieties are sterile. It is more effective to take and plant cuttings from the runners of healthy mints.



The most common and popular mints for commercial cultivation are peppermint (*Mentha x piperita*), native spearmint (*Mentha spicata*), Scotch spearmint (*Mentha gracilis*), and cornmint (*Mentha arvensis*); also (more recently) apple mint (*Mentha suaveolens*).

Mints are supposed to make good companion plants, repelling pesty insects and attracting beneficial ones. They are susceptible to whitefly and aphids.

Harvesting of mint leaves can be done at any time. Fresh leaves should be used immediately or stored up to a few days in plastic bags in a refrigerator. Optionally, leaves can be frozen in ice cube trays. Dried mint leaves should be stored in an airtight container placed in a cool, dark, dry area.

Etymology of mint:

The word "mint" descends from the Latin word *mentha*, which is rooted in the Greek word *minthe*, personified in Greek mythology as *Minthe*, a nymph who was transformed into a mint plant. This, in turn, ultimately derived from a proto-Indo-European root that is also the origin of the Sanskrit *mantha*, *mathana* (*premnaserratifolia*).

References to "mint leaves", without a qualifier like "peppermint" or "apple mint", generally refer to spearmint leaves.

In Spain and Central and South America, mint is known as *menta*. In Lusophone countries, especially in Portugal, mint species are popularly known as *hortelã*. In many Indo-Aryan languages, it is called *pudīna*:
Sindhi: پودرو, Bengali: পুদিনা.

The taxonomic family *Lamiaceae* is known as the mint family. It includes many other aromatic herbs, including most of the more common cooking herbs, such as basil, rosemary, sage, oregano, and catnip.

As an English colloquial term, any small mint-flavored confectionery item can be called a mint.

In common usage, other plants with fragrant leaves may be called

“mint”, although they are not in the mint family:

Vietnamese mint, commonly used in Southeast Asian cuisine is *Persicaria odorata* in the family Polygonaceae, collectively known as smartweeds or pinkweeds.

Mexican mint marigold is *Tagetes lucida* in the sunflower family (Asteraceae).

Uses:

Using fresh mint and other herbs and spices in cooking can help a person add flavor while reducing their sodium and sugar intake.

Throughout history, people have used different species of mint plants in medicine. Different types of mint plants offer a range of antioxidant qualities and potential health benefits, especially for people who have irritable bowel syndrome (IBS).

In this article, we provide a nutritional breakdown of mint and explain its possible health benefits. We also give tips on including more mint in the diet.

Possible benefits:

Mint may have several potential health benefits.

❑ **Managing gastrointestinal problems:**

- ❑ Mint is a calming herb that people have used for thousands of years to help soothe an upset stomach or indigestion.
- ❑ A 2019 review Trusted Source found that placebo-controlled studies support the use of peppermint oil as a remedy for a range of gastrointestinal conditions, including indigestion, IBS, stomach pain in children, and feelings of sickness after surgery.
- ❑ The authors of the review found that mint works against harmful microbes, regulates muscle relaxation, and helps control inflammation.
- ❑ A different review Trusted Source from the same year assessed 12 randomized controlled trials and found that peppermint oil was a safe and effective intervention for pain symptoms in adults with IBS.
- ❑ However, a 2019 randomized, double-blind trial Trusted Source of 190 people with IBS found that peppermint oil did not significantly reduce symptoms.
- ❑ More research is necessary to confirm the benefits of mint products in managing IBS.

❑ **Allergies**

- ❑ Mint plants contain an antioxidant and anti-inflammatory agent called rosmarinic acid.
- ❑ A 2019 study on rats Trusted Source found that rosmarinic acid reduced symptoms of asthma when compared to a control group that did not receive a supplement.
- ❑ The mint plant family provides a range of plant compounds that have anti-allergenic effects, according to a 2019 review Trusted Source published in *Frontiers in Pharmacology*.
- ❑ However, the content of mint extract in oils and ointments may be far stronger than dietary mint. There is very little research into the effect of dietary mint on the symptoms of allergies.

➤ **Soothing common cold symptoms**

- ❑ Mint contains menthol. This is an aromatic decongestant that might help to break up phlegm and mucus, making it easier to expel.
- ❑ Applying menthol ointments or vapor rubs may be a safe and effective Trusted Source treatment for children who have a common cold.
- ❑ However, the American Lung Association (ALA) advises that scientific studies do not support the use of menthol for managing cold symptoms.
- ❑ Despite this, some people may find that cold symptoms reduce after applying a menthol vapor rub.
- ❑ The Office of Dietary Supplements (ODS) advise that peppermint oil may cause skin irritation and redness Trusted Source. They recommend that parents or carers do not apply the ointment directly to the chest or face of a child due to serious possible side effects after direct inhalation.

□ Diet

- Mint leaves are a tender herb with gentle stems. It is best to add them raw or at the end of the cooking process. This helps them maintain their delicate flavor and texture.
- When buying mint, look for bright, unblemished leaves. Store them in a reusable plastic bag in the refrigerator for up to 1 week.
- Mint is relatively easy to grow, and people can cultivate it at home, making it a sustainable way to add flavor to meals.
- When preparing mint, use a sharp knife and cut gently. Using a dull knife or over-chopping will bruise the herb and lead to a loss of flavor on the cutting board surface.
- Middle Eastern cuisines, such as lamb, soups, and vegetable salads often contain mint for flavor.

□ Other ideas include:

- Making a mint limeade by mixing lime juice with sugar or stevia and muddled mint leaves. Top it off with filtered water and ice cubes.
- Incorporating mint into a fresh fruit salsa with chopped apples, pear, lemon or lime juice, jalapeno, and honey. Serve with cinnamon pita chips or on top of baked chicken.
- Jazzing up your water by adding mint leaves and cucumber for a refreshing treat.
- Adding a few chopped mint leaves to your next chocolate chip cookie dough.
- Pouring hot water over mint leaves and steeping for 5-6 minutes for homemade mint tea. Try using chocolate mint leaves for a twist.
- Chopping mint and tossing with fresh pineapple for a quick snack.
- Alternatively, you can try these healthful and delicious recipes from registered dietitians:

□ Risks:

- Like many herbs, mint can adversely affect some people.
- People with gastroesophageal reflux disease (GERD) should not use mint in an attempt to soothe digestive issues. According to a 2019 review Trusted Source, mint commonly acts as a trigger for GERD symptoms.
- Taking peppermint oil in large doses can be toxic Trusted Source. It is essential to stick to the recommended doses of peppermint oil.
- Pure menthol is poisonous and not for internal consumption. People should only ever apply it to the skin or a nearby surface, such as a pillow, to disperse fumes.
- Do not apply mint oil to the face of an infant or small child, as it may cause spasms that inhibit breathing.
- Speak with your healthcare provider to determine whether any of your medications could interact with mint or mint oil.

□ Nutrition

A 2-tablespoon serving, or 3.2 grams (g) of fresh peppermint provides:

- 2.24 calories
- 0.12 g of protein
- 0.48 g of carbohydrates
- 0.03 g of fat
- 0.26 g of fiber

Mint also contains trace amounts of:

- Potassium
 - Magnesium
 - Calcium
 - Phosphorus
 - Vitamin C
 - Iron
 - Vitamin A
- While mint contains several nutrients, the amount that a person would typically use in a meal is not sufficient to provide a significant amount of a person's daily requirement.
 - Mint in the diet is most beneficial as a replacement for salty, sugary, or caloric flavorings. Mint ointments or supplements provide most of their benefits.

Formulation:

- Take fresh mint and neem leaves.
- Fill all the leaves in a dry jar.
- Add any kind of 15 ml vegetable oil.
- Mix both the oil and leaves well.
- Keep it under sunrise for 10 days.
- After 10 days heat the mixture well.
- Select a low flame burner to heat.
- After extracting all contents filter it well.
- Peppermint oil is now ready.



Evaluation:

International Pharmacopoeia monograph:

- Relative density: 0.900 to 0.916.
- Refractive index: 1.457 to 1.467.
- Optical rotation: -10° to -30° .
- Acid value: maximum 1.4 determined on 5.0 g diluted in 50 ml of the prescribed mixture of solvents.

Fatty oils and resinified essential oils :

- Complies with the Test for fatty oils and resinified essential oils.
- Chromatographic profiling of peppermint oil can be done With Gas chromatography with flame ionization detector.

Evaluating Peppermint Oils by Chiral GC/MS 8:

Often, a product is adulterated to increase desirable Properties of the natural oil or to avoid costly Manufacturing of all-natural oil.

Adulteration usually is Accomplished by adding a similar but cheaper oil, such as Cornmint oil (*Mentha arvensis*), or by diluting the oil with Various solvent oils. Adulteration and quality consistency Of peppermint oil fuels concern over compromised quality, But also introduces health safety issues; for example, there is potential for an allergic reaction to an added unnatural Compound or excess of a natural component. Despite the Value of identifying and quantifying major components Like menthol, methone and methyl acetate, dependable Identification and quantification is difficult because each Of these is represented by several stereoisomers. Menthol, For example, has three chiral centers, for a total of eight Stereoisomers, making chromatographic separation Difficult. For this GC/MS method was published by Julie Kowalski optimized to following conditions claiming Detection of major components important to the quality Of peppermint oil product, thus providing manufacturers And buyers with consistent profiles with which to confirm And track product quality.

Inj.: temp.: 230°C

Carrier gas: helium, constant pressure

Flow rate: 35 cm/sec. at 100°C

Oven temp.: 40°C to 120°C @ 5°C/min. to 135°C @ 3°C/min. to 200°C @ 5°C/min.

Det: MS

□ Spectroscopic study of Mentha oils

- The visible fluorescence and excitation spectra of Mentha Oils (Japanese mint oil, peppermint oil and spearmint oil) have been recorded. Different physical constants which are characteristic of the fluorescent molecules have been calculated for all three oils. Results reveal that the same Group of organic compounds dominate in the oils of Peppermint and spearmint, whereas some different Compound is present in Japanese mint oil. Study also Demonstrated that the fluorescence intensity of these oils is comparable to that of Rhodamine 6G dye in methanol solution and suggests that Mentha oils may be a useful Lasing material in the 450-600 nm wavelength range. Estimation of Menthone, Menthofuran, Menthyl Acetate And Menthol in Peppermint Oil by Capillary Gas Chromatography 10 Support-coated open-tubular (SCOT) glass capillary Column (43 m x 0.5 mm I.D.) coated with SP-1000 was fitted into an aluminium support cage. A Packard-Becker 419 gas chromatograph equipped with dual flame ionization detectors and dual injectors was used. The Injection port temperature was 190°C and detector Temperature 190°C. The multilinear temperature Programmer was used as follows. Initial temperature of 64°C was held for 3 min, then the temperature was raised at 0.5°C/min to 80°C, then at 5°C/min to the final Temperature of 155°C, with an isothermal hold of 12 min at 155°C. The carrier gas was helium at a flow-rate of cu. 2 ml/min with nitrogen (18 ml/min) as make-up gas. Air Flow was 300 ml/min and hydrogen flow 30 ml/min. The Velocity of the carrier gas was about 21.5 cm/sec whilst The capacity ratio (k) of the column was 6.5 using docosane at 185°C.

□ Quantitative determination of Pulegone by Gas-Liquid Chromatography:

Various methods for the estimation of the pulegone was Found in the literature. It was due to one problem that Pulegone has a retention time, 11 According to the columns Employed, that is either very near to that of menthol (main Component), with consequent overlap or very similar to those of isomenthol and some sesquiterpene hydrocarbons

Uses: **Hot flushes in women:**

- A single-blind randomised control crossover study Was Performed to look at the effects of a peppermint and neroli Hydrolat spray on hot flushes in women being treated for Breast cancer. Only 18 of the 44 patients (41%) preferred The hydrolat spray to a plain water spray, which was less Than the 80% required to offer this spray as a standard Suggestion for hot flush management. However a small Number of those choosing it found it extremely helpful. Both sprays appeared to lessen hot flush annoyance. Previous chemotherapy appeared to be a factor influencing The choice of spray.

 Irritable Bowel Syndrome:

- Small intestine bacterial overgrowth and lactose intolerance Are associated with increased gas production, which may Sometimes trigger abdominal discomfort and bloating Which are also considered also the cardinal symptoms in IBS.16-17 Furthermore, a high prevalence of celiac disease Has been observed in patients with bloating and diarrhoea And positive H₂-lactose breath test. In these patients the Symptoms related to lactase deficiency seem to be the only Manifestation of celiac disease¹⁸. Basing themselves on These data, some authors suggest that these diseases should Be previously excluded in clinic therapeutic trials with Investigational drugs that affect IBS¹⁹. Peppermint oil has Been tested in children²⁰ and adults²¹ with IBS, with Conflicting results. A recent meta-analysis on this topic Concluded that the role of peppermint oil has not yet been Established beyond a reasonable doubt.²² In this regard one Double blind study by L. Marzio et al.²³ 57 patients with Irritable bowel syndrome were treated with peppermint Oil (two enteric-coated capsules twice per day or placebo) And 4 week treatment with peppermint oil improves Abdominal symptoms in patients with irritable bowel Syndrome.

 Antimicrobial and anti-plasmid activities

- The antimicrobial activities were determined on the Gram (+) Staphylococcus epidermidis and the Gram (?) Escherichia coli F'lacK12LE140, and on two yeast Saccharomyces cerevisiae 0425ä/1 and 042552C strains. The antiplasmid activities were investigated on E. coli F'lac Bacterial strain. Each of the oils exhibited antimicrobial Activity and three of them antiplasmid action. The Interaction of peppermint oil and menthol with the Antibiotics was studied on the same bacterial strain with The checkerboard method. Experiments proved the Antiplasmid activity of peppermint oil and its main Constituent, menthol, which means that menthol-Containing substances are potential agents that could Eliminate the resistance plasmids of bacteria. The main Point of this menthol-induced plasmid elimination is a Special mechanism of action. The compound preferentially Kills the plasmid-containing bacteria due to their increased Sensitivity to menthol. This essential oil is capable to exert a direct virucidal effect On HSV. Peppermint oil is also active against an acyclovir Resistant strain of HSV-1 (HSV-1-ACVres), plaque Formation was significantly reduced by 99%. Considering The lipophilic nature of the oil which enables it to penetrate The skin, peppermint oil might be suitable for topical

Indigestion :

- Adding few drops of peppermint essential oil in a glass of Water and drinking it after meal gives relief from indigestive. This oil acts as a carminative and helps effectively In removing the gas.
- It was also reported that peppermint oil is effective against type |allergic reaction

CONTRAINDICATIONS:

- Obstruction of bile ducts, gallbladder inflammation, severe Liver damage. In case of gallstones, to be used only after The consultant of physician.

PRECAUTIONS:

- Peppermint oil is non-toxic and non-irritant in low Dilutions, but sensitization may be a problem due to the Menthol content. It can cause irritation to the skin and Mucus membranes and should be kept well away from the Eyes. It should be avoided during pregnancy and should Not be used on children under seven. Peppermint oil in any form is not recommended for those With hiatal hernia, gallbladder disease or while pregnant Or nursing.
- Overdose symptoms of peppermint oil Are Slow Breathing, Rapid breathing, Abdominal pain, Diarrhea, Nausea, Vomiting, Blood in urine, Nourine production, Convulsions, Depression, Dizziness, Twitching, Unconsciousness, Uncoordinated movement and Flushing.

DOSAGE:**Internal:**

Average daily dose: 6-12 drops

For inhalation: 3-4 drops in hot water

For irritable colon: Average single dose 0.2 ml Average single dose 0.6 ml in enterically coated form.

External:

- Some drops rubbed in the affected face areas in semi-solid and oily preparations 5-20 %
- In aqueous-ethanol preparations 5-10 %
- In nasal ointments 1-5 % essential oil.

STORAGE:

- Store in well-filled, tightly-closed, light-resistant containers in cool place.

Conclusion and result:

- Regarding to health benefits of peppermint, it can be concluded That this plant has great potentials for treatment of human Diseases and also it has strong future in the world marketing. Further studies are needed to exploration of cellular and molecular Mechanisms of peppermint and its compounds on human body. Although peppermint plant has great beneficial and economical Role in human society, researches must be considered its minor Side effects and toxicity. The future in vivo human studies are Needed to determine the molecular mechanism of PO in human Health. Currently PO is most frequently traded essential oil in the Entire world and in many developed and developing countries it Considered as a valuable target for both food and pharmaceutical

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