



Extraction Of Mint Oil From Mentha Piperita Leaves

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Abstract: Among natural items, essential oils constitute a broad category. Chemicals used to add taste and perfume to culinary, industrial, and medicinal items are mostly derived from oils. Essential oil is a concentrated hydrophobic liquid made from various plant components that contains volatile fragrance molecules. Essential oils are manufactured and extracted from plant sources using a variety of extraction techniques. A variety of processes, including solvent-free microwave extraction, solar distillation, CO₂ supercritical fluid extraction, hydro diffusion, and steam distillation, are used to create essential oils. These techniques for extraction and expression are employed to remove the oils from dried or fresh plants, respectively. There are several ways to extract mint oil, including solvent extraction, supercritical fluid extraction, and steam distillation. The most popular and traditional method for extracting mint oil among these methods is steam distillation. The mint plant material is heated with steam, which causes the essential oil to vaporize. Following the vapor's condensation and collection, the oil and condensed water are separated. Solvent extraction is the process of dissolving the essential oil from the mint plant material using organic solvents like ethanol or hexane. The oil's constituents are selectively extracted by the solvent, which is then evaporated or refined to produce concentrated mint oil.

Index Terms - *Mint oil extraction, Mentha species, Extraction techniques, Steam distillation, Solvent extraction, Supercritical fluid extraction*

I. INTRODUCTION

The technique of extracting essential oil from mint plants, particularly those of the Mentha species, is known as mint oil extraction. Mint oil is valued in a variety of sectors, including food, medicines, and cosmetics, due to its well-known unique and energizing scent. An overview of the process for extracting mint oil from mint plants is given in this introduction. Different methods are used to separate the essential oil from mint plant components during the extraction process. The main objective is to extract the volatile aromatic chemicals from the mint leaves or other plant components. These elements give the oil its distinctive minty smell and help it to have the intended effects. Steam distillation is the most often used technique among them any extraction techniques. The mint plant material is heated using steam, which causes the essential oil to vaporize. The oil is then separated from the condensed water because of the vapour being condensed. Another method is solvent extraction, which involves dissolving the essential oil from the mint plant material using organic solvents like ethanol or hexane. The oil's constituents are selectively extracted by the solvent, which is then evaporated or refined to produce concentrated mint oil. The mint oil goes through additional processing after extraction, such as filtering, purification, and quality testing, to guarantee its potency, purity, and compliance with industry requirements. The resultant mint oil has a unique minty scent and is used to flavour foods, make medicinal items, and create personal care products, among other things.

II. LITERATURE REVIEW

[1] Sharma, N., Joshi, R., & Gaur, R. In order to extract mint oil from *Mentha arvensis*, this study examined many extraction techniques, including steam distillation, solvent extraction, and supercritical fluid extraction. The yield, chemical make-up, and quality of the extracted oils were assessed by the researchers, who also offered insights into the effectiveness and efficiency of each extraction method.

[2] Chawla, P., et al. This study employed response surface approach to refine the steam distillation procedure for extracting mint oil. The yield and content of the extracted oil were investigated in relation to several process parameters, including extraction time, temperature, and plant-to-water ratio. The results gave important information for improving mint oil quality and extraction effectiveness.

[3] Li, T., et al. In this work, carbon dioxide was used as a solvent to extract peppermint oil utilising supercritical fluids from *Mentha piperita*. The yield and composition of the extracted oil were examined in relation to the effects of pressure, temperature, and extraction time. The results demonstrated the possibility of supercritical fluid extraction as a productive technique for extracting mint oil.

[4] Vérias, H. N., et al. This study looked at the solvent extraction of *Mentha piperita* essential oil utilising ethanol, methanol, and hexane as the various solvents. The yield, chemical make-up, and antioxidant activity of the extracted oils were all assessed in the study. The findings revealed information on the appropriateness of several solvents for producing high-quality mint oil.

[5] Tavarini, S., et al. In order to ascertain the essential oil content and antioxidant activity of *Mentha spicata*, this study investigated a number of extraction techniques, including steam distillation, solvent extraction, and microwave assisted extraction. The researchers provided a thorough examination of several mint oil extraction methods by assessing the yield, chemical profile, and antioxidant capacity of the derived oils instead.

III. RAW MATERIAL (Mint Leaves)

The tropical regions with their hot, muggy environment and abundant rains are where you can find mint most frequently. Mint requires little care and attention and is simple to grow. Because it can thrive in any type of soil and is immune to most illnesses and pests, the mint plant also needs very little to no fertilizers and pesticides. Very little amounts of mint oil can be found at the bottom of mint leaves. It is removed by first crushing the leaves to expose the stored oil and increase the surface area for oil extraction. The cell walls of the leaves are relaxed, and oil is extracted by running steam or methanol through them.



Fig1: Mint Leaves

IV. PROPERTIES OF MINT OIL

Sr. No	Properties	Values
1	Molecular Formula	C62H108O7
2	Molecular weight	965.51672 g/mol
3	Density	0.896-0.908 g/cm ³ at 25 ^o C
4	Boiling point	82-93°C.
5	Solubility	Slightly soluble in water and alcohol
6	Specific Gravity	0.90 g/mL at 20°C
7	Refractive Index	1.421

V. APPARATUS

Soxhlet extraction apparatus was used for the extraction of oil from mint leaves. The extraction of organic molecules from solid materials is done using the flexible Soxhlet device. It is made up of a condenser, a Soxhlet extractor, and an extraction flask. In the Soxhlet extractor, the solid sample is placed in a thimble, and a suitable solvent is added to the extraction flask. As a result of the heating of the apparatus, the solvent rises into the condenser, evaporates, condenses, and drops back into the flask. The solvent can flow through the solid sample during this continuous operation, extracting the desired components. The extraction process is cyclical, with the solvent being syphoned back into the flask, which boosts its effectiveness. In order to achieve a thorough extraction, the extraction continues for a predetermined amount of time, usually several hours. After cooling the Soxhlet apparatus, the Soxhlet extractor is then taken out. Usually, the extracted substances from the thimble are collected for usage or additional investigation. The Soxhlet apparatus is frequently used in several disciplines, including medicines, food science, and environmental studies, to produce accurate and efficient extractions.



Fig 2: Soxhlet Apparatus

VI. METHODOLOGY

A. Sample collection Choose fresh and healthy mint plant material from the required mint species (e.g., *Mentha arvensis*, *Mentha piperita*), such as leaves or aerial parts. Make sure there are no impurities or pollutants in the plant material. Fresh peppermint samples were collected during early morning hours from market of Pune, India.

B. Cleaning Thoroughly clean the mint plant material to remove dirt, debris, and any residual pesticides or chemicals.

C. Steam Distillation Set up a distillation flask, condenser, and collecting vessel steam distillation system. Put the dried and cleaned plant material from the mint in the distillation flask. Water should be added to the flask such that it covers the plant matter. The essential oil vapour will be carried by the steam created when the flask is heated. Condense the vapour in the condenser, then gather the essential oil and water mixture that results in the collecting jar. The mixture should be divided into two layers. The mint essential oil will be in the top layer. Using a separating funnel or another appropriate method, carefully separate the oil layer from the water layer.

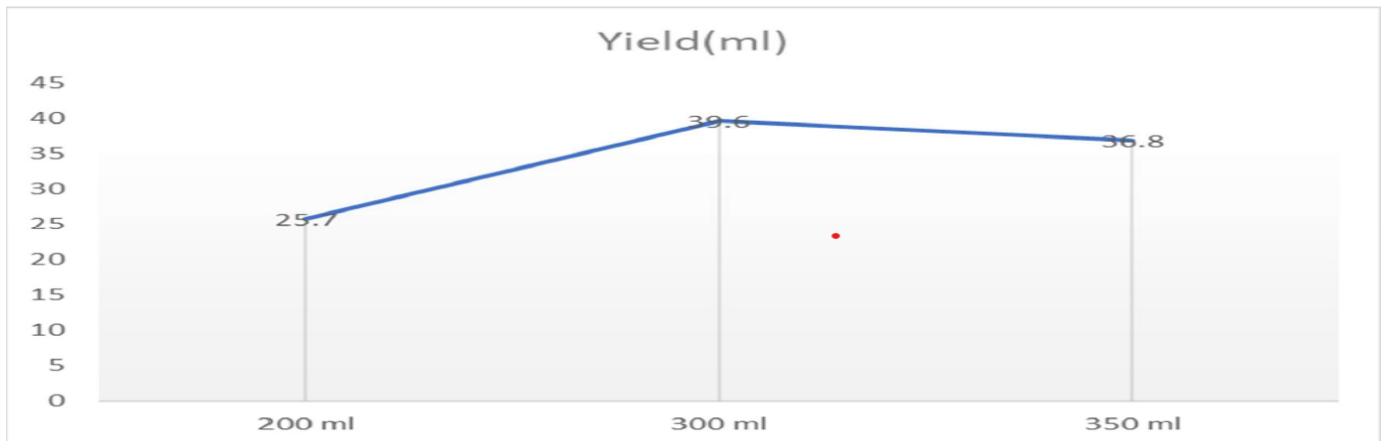
D. Solvent Extraction To expand the surface area and facilitate effective extraction, grind, or chop the mint plant material. Put the plant material in an extraction jar that is appropriate. Add your preferred solvent (such as ethanol or hexane) until the plant material is thoroughly submerged. To ensure adequate contact between the plant material and solvent, give the mixture time to macerate. To separate the liquid extract from the solid plant material, filter the mixture. Utilising techniques like rotary evaporation or low temperature distillation, concentrate the liquid extract by evaporating the solvent. Gather and place the concentrated mint oil in an appropriate container for storage.

E. Post-Extraction Steps Conduct quality control checks, such as calculating the yield, examining the mint oil's chemical make-up, and assessing its scent and other sensory qualities. Remove contaminants and improve the oil's quality by further processing the extracted oil, if necessary, using techniques like filtering, decantation, or purification. To preserve its quality and shelf life, store the mint oil in sealed containers far from light, heat, and moisture.

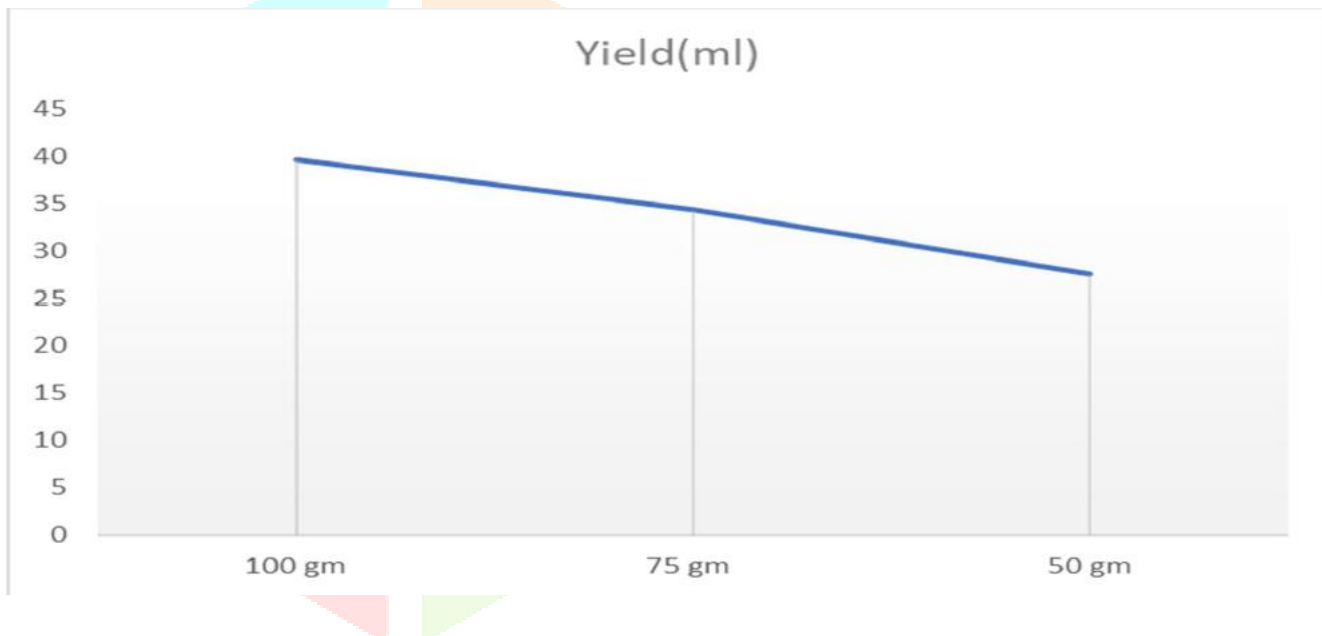
F. Gas Chromatography The components of a mixture can be separated and examined using the analytical technique known as gas chromatography (GC). Utilising the various physical and chemical characteristics of the many substances, it operates. In GC, the sample is injected into a packed or coated column that contains a stationary phase. The individual chemicals' interactions with the stationary phase as the sample moves through the column are variable. Because of this interaction, they move differently, eventually separating based on characteristics like boiling point, polarity, and molecular size. A detector that produces a signal based on the concentration of the separated substances then finds them. The resulting information is documented and examined, frequently in the form of a chromatogram.

VII.RESULTS AND DISCUSSION

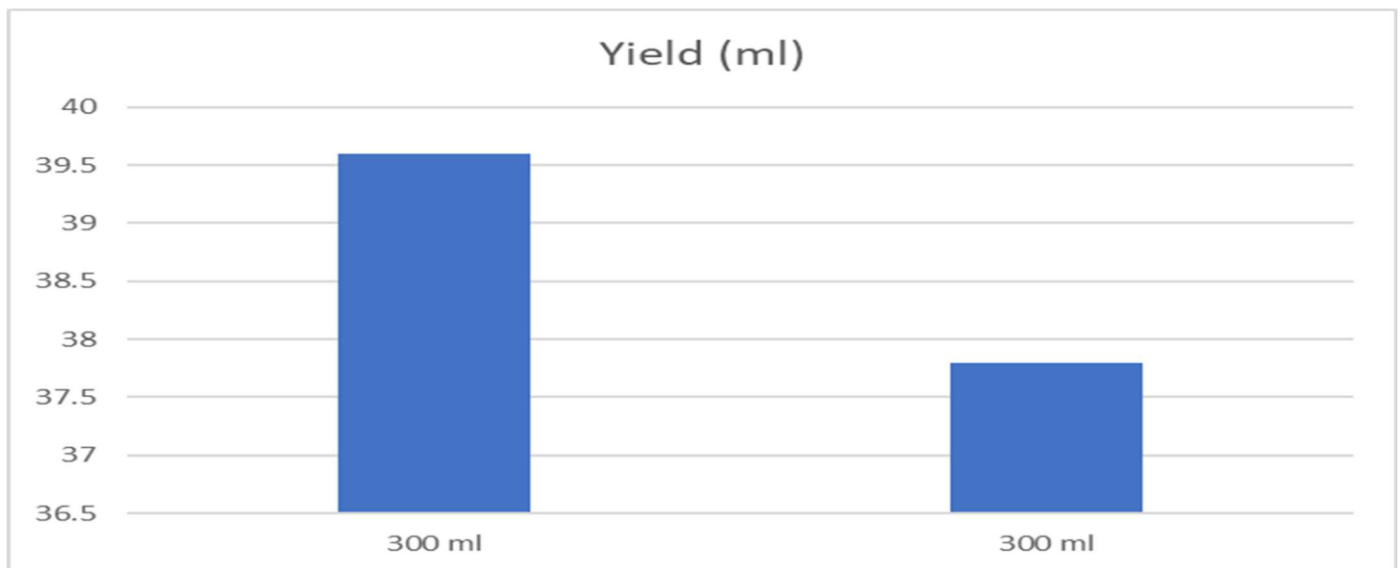
A. Effect of Solvent concentration on yield.



B. Effect of feed concentration on yield.



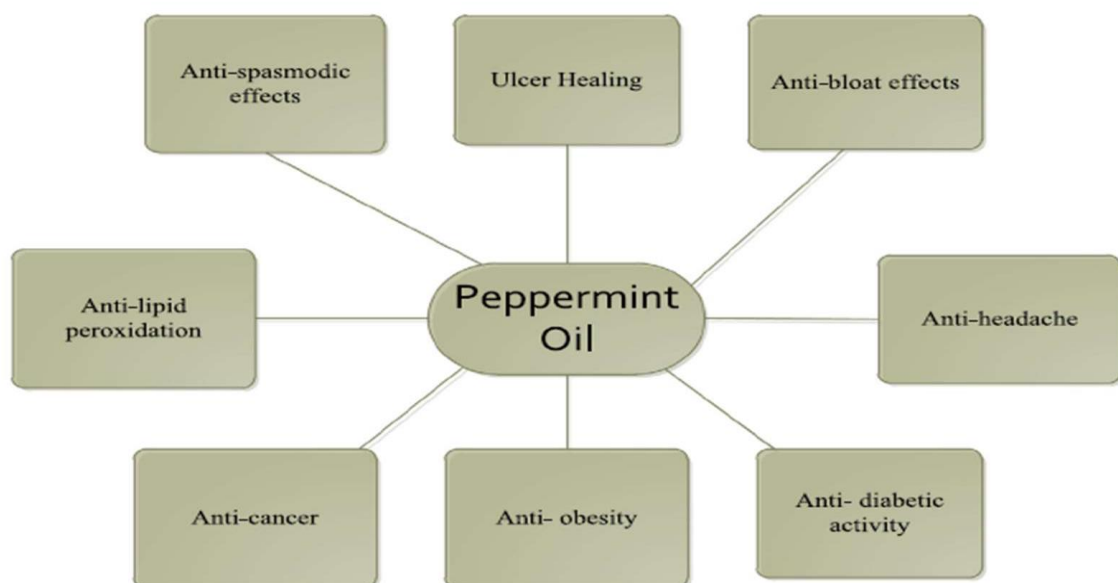
C. Effect of Solvents on the Yield



VIII. EXPERIMENTAL DATA

Run Order	Weight of Feed (in grams)	Solvent (in mL)	Time (in Hrs)	Oil Yield(mL)
1	100	300		39.6
2	75	300		34.3
3	100	200		25.7
4	100	350		36.8
5	50	300		27.5
6	100	300		36.8

IX. APLICATION



- A. Food and Beverage Industry Mint oil is widely used as a flavouring agent in the food and beverage industry. It is added to confectioneries, chewing gums, candies, chocolates, ice creams, beverages, and baked goods to provide a refreshing and cooling minty flavour. Mint oil can also be used to enhance the taste of sauces, dressings, and marinades.
- B. Pharmaceutical and Cosmetics Industry Mint oil is recognised for its possible therapeutic effects in the pharmaceutical and cosmetics industries. It has ingredients like menthol, menthone, and methyl acetate, which have analgesic, anti-inflammatory, antispasmodic, and antibacterial properties. Pharmaceutical items including cough syrups, creams for pain treatment, and throat lozenges are all made using mint oil. Because of its cooling and rejuvenating properties, it is also used in cosmetics including toothpaste, mouthwash, soap, shampoo, and skincare items
- C. Aromatherapy and Fragrance Industry Mint oil is a preferred option in the aromatherapy and fragrance industries because of its pleasing aroma. To provide a cool and energizing atmosphere, mint oil is used in the manufacturing of essential oil blends, perfumes, colognes, candles, and air fresheners. Its scent is great for stress reduction and relaxation because it is recognised to provide uplifting and relaxing effects.
- D. Personal Care and Oral Hygiene Products Because of its calming and cooling effects, mint oil is used for personal care items including body lotions, creams, and bath treatments. Due to its capacity to improve breath freshness and provide a feeling of cleanliness and refreshing, it is also frequently used in oral hygiene products including toothpaste, mouthwash, and breath fresheners.

X.CONCLUSION

In conclusion, the technique of extracting mint oil from mint plants is a useful one with a wide range of industrial uses. Mint oil, which is made from the leaves or aerial portions of mint plants, has potential medicinal benefits in addition to a reviving and cooling scent. Mint oil may be extracted from the plant material using techniques including steam distillation, solvent extraction. Prior to the extraction procedure, the mint plant material should be well cleaned and dried to improve the quality of the produced oil. Mint oil has a wide range of industrial uses. In the food and beverage sector, it is used as a flavouring additive to give baked products, drinks, and confections a minty flavour. Mint oil is appreciated for its therapeutic like toothpaste, throat lozenges, pain treatment lotions, and skincare products. It is also often used in fragrance and aromatherapy items, giving out a characteristics in the pharmaceutical and cosmetics industries and is used in things revitalizing perfume. Numerous industrial uses are made possible by the extraction of mint oil from mint plants, highlighting its value and promise in numerous industries. It is a valuable component in many goods thanks to its distinctive scent, flavour, and medicinal qualities

XI. ACKNOWLEDGMENT

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