



The Extraction of Mint Oil from Mint Leaves: A Study

A. Shanmugasundaram ^{*}, A. Lakshmanan ^{*}, D. Tamilmani ^{*}

^{*} Department of Agriculture Engineering, Sri Shakthi Institute of Engineering and Technology, Coimbatore- 641062, Tamil Nadu, India.

* Corresponding Author: ashanmugasundaramam@siet.ac.in

Received : 29th March 2020, Accepted : 22th May 2020

Abstract: Essential oils are a diverse group of natural products. Oils are the important source of aromatic and flavoring chemicals in food, industrial, and pharmaceutical products. Essential oil is a concentrated hydrophobic liquid containing volatile aroma compounds derived from the different parts of the plants. Various extraction methods are used in the manufacture and extraction of essential oils from the plant materials. Essential oils are produced using several techniques like water distillation, steam distillation, hydro diffusion, maceration, solvent-free microwave extraction, solar distillation and CO₂ supercritical fluid extraction, etc. These extraction and expression methods are used to remove the oils from the dried/fresh plants (or) machines to squeeze the oil out of the plants. Out of all the extraction methods, supercritical carbon dioxide method is more efficient. The present report is an attempt to list out the various methods of extraction of essential oil from the different parts of the mint leaves and their merits and demerits. The world production and consumption of essential oils and perfumes are increasing very fast. Production technology is an essential element to improve the overall yield and quality of essential oil. The traditional technologies pertaining to essential oil processing are of great significance and are still being used in many parts of the globe. Water distillation, water and steam distillation, steam distillation, are the most traditional and commonly used methods.

Keywords: Hydrophobic, Volatile, Mint oil, Water distillation, Supercritical carbon dioxide

1. Introduction

Mint oil is obtained from leaves of peppermint plant which is a hybrid of spearmint and water-mint. Peppermint plant is mainly found in tropical regions having wet climate. It is cultivated in the states of Kerala and Karnataka in southern India and in the states of Assam, Mizoram, Nagaland and Sikkim in north-eastern India. Peppermint is also cultivated in Bhutan, Nepal, China, Sri-Lanka, Vietnam, Thailand, Malaysia, and Mexico and in Indonesia. India is the largest exporter of the mint oil followed by Thailand and Vietnam. Mint oil is

stored in the glands present at the bottom of the leaves. The harvested leaves are then crushed and then steam or hydro distilled to obtain oil which is used as a flavouring agent in toothpastes, mouth-fresheners, chewing gums, etc.

Mint oil has a lowering effect on the heart rate and the systolic pressure. Relaxation of bronchial smooth muscles, increase in the ventilation are also other cardiovascular effects of peppermint oil. Inhalation of peppermint oil increases the nasal air force and thus supplies more air into the lungs. In a few studies it was also claimed that it makes the lung surfactant more efficient enabling better pulmonary function. Pepper mint is used in making oral dentifrices as it can provide over all freshness in breath and also keep away bad breath. It improves the gastric emptying rate. There is a significant antiemetic effect of peppermint in reducing postoperative nausea for patients with very sensitive gag reflexes. Peppermint is said to be a good analgesic to be applied topically and also a coolant for the skin. Peppermint oil stimulates cold receptors on the skin and dilates blood vessels, causing a sensation of coldness and an analgesic effect.

2. Mint Leaves Plant

Mint is mostly found in the tropical regions which have hot and humid climate and receive plenty of rainfall. Mint is easy to cultivate with minimum care and attention. Mint plant also requires very less or no fertilizers and pesticides as it can grow in any type of soil and is resistant to most diseases and pests. Mint oil is present in the bottom part of mint leaves in very small quantities. It is extracted by first crushing the leaves to maximize the surface area for extraction and to expose the stored oil in the leaves. By passing steam or methanol through the leaves, the cell walls get softened and oil gets extracted.



Figure 1. Mint Leaves

Table1. Properties of Mint oil

Sr No.	Properties	Values
1	Molecular weight	965.51672 g/mol
2	Density	0.896-0.908 g/cm ³ (25 deg)
3	Molecular Formula	C ₆ H ₁₀ O ₇
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

3. Experimental Methodology

Oil was extracted from mint leaves by solvent extraction process. The extraction of oil basically divided in to two parts; extraction of oil from leaves (wet and dry) in to the solvent and separation of oil and solvent.

Raw materials i.e mint leaves were cleaned to remove dirt, and spoiled leaves. This can be done by washing. The leaves were hand crushed so that plant matter can be exposed for better results. The extraction was carried for both Wet and Dry basis. The liquid phase was distilled to separate the oil and solvent. The entire liquid phase was distilled at 700 C which is the boiling point of the solvent used. The pure solvent was recovered as a distillate and the oil was obtained as a bottom product. The bottom product obtain was heated in an open pan at 800 C for 30 minutes to remove the moisture or solvent present in the oil if any.

Soxhlet extraction apparatus

The solvent used for this method are generally hexane, ether or methanol. Solvent is poured into round bottom flask and crushed custard apple seeds are placed in the thimble and inserted in the centre of the extractor. This soxhlet is heated at 60 degree Celsius. When the solvent is boiling the vapour rises through the vertical tube in to the condenser at the top. The liquid condensate drips in to the filter paper thimble in the centre which contains the oil to be extracted. The extract seeps through the pores of the thimble and fills the siphon tube where it flows back down in to the round bottom flask. This is allowed to continue for 30 mins. The weight of oil extracted was determined at 30 mins interval. At the end of the extraction, the result mixture containing the oil was distilled off using simple distillation to recover solvent for the oil. Temperature was maintained near about 65- 70 degree Celsius by regulating the magnetic cum heater and stirrer.



Figure 2. Soxhlet Apparatus

After extraction, sample is filtered out to remove solid material as residue and filtrate is contained with oil extracted. This filtered sample is lead to the simple distillation for first sample and steam distillation for second sample. Again, for the dried basis sample it is done by simple distillation followed by simple distillation. Then after distillation solvents distilled out while the oil extracted was remain in distillation chamber. Then lastly the oil separated is analyzed for density, percent of oil, viscosity, pH value and acid value, pour point, flash point.

4. Results and Discussion

Extraction of mint leaves oil by using solvent extraction as Methanol. Above Table II shows the oil extracted for both dry and wet basis and after soxhlet extraction it was followed by simple and steam distillation for separation of oil and solvent. Futher it was exposed to direct heating for removal of excess solvent.

Table 2. Extraction Data for Mint Oil

Parameter	Sohxlet 1(direct Heating)	Sohxlate 2(simple distillation)	Steam distillation	Sohxlet 3(dry basis)
Weight of mint leaves	40 g	40g	40g	40g
Temperature of heating mantle	50°C	50°C	100°C	50°C
Time	3 hrs	3.5hrs	1.5hrs	4hrs
Oil obtained	4ml	7ml	1ml	2ml

The mint leaf and oil are the composition of the different fatty acid namely omega 3 fatty acids, vitamin A and vitamin C. Mint oil consists of menthol, menthone and menthyl

acetate, menthofuran and 1, 8-cineol. It also contains small limonene, pulegone, caryophyllene and pinenel.

We have found high losses in dry basis near 100ml which is a lot more than for fresh mint leaves. Also, volatile content of dry mint leaves is less than 0.1% and that for fresh leaves 0.5% - 1%. This is because mint oil evaporates when the leaves are exposed to sunlight along with water. Hence, fresh leaves should be used for extraction of mint oil. After the extraction and separation of oil by soxhlet exaction followed by steam and simple distillation we analyzed oil samples for determination of percentage oil, density, acid value and color appearance. The calculations and result interpreted in Table II.

Table 3. Physical Properties of Mint Oil

Properties	Methanol
Density(g/cc)	0.9
Acid Value	1.98
Boiling Point	70-80°C
Flash Point	63°C
Odour	Pleasant
Colour	Deep green
% Extraction	20%

Mint oil and its constituents and derivatives are used in food, pharmaceutical and perfumery and flavoring industry. Its main constituent, menthol, is used in the manufacture of lozenges, toothpastes, pain balms and cold balms. The oil is used for treating certain stomach disorders like indigestion, gas problem, acidity; etc. It is often used in pediatric patients for treating abdominal pain, irritable bowel syndrome, nausea and symptomatic relief of coughs and colds. Inhalation of peppermint oil increases the nasal air force and thus supplies more air into the lungs. In a few studies it was also claimed that it makes the lung surfactant more efficient enabling better pulmonary function. Until now, many researchers have been done on the effectiveness of various kinds of natural products in the improvement of sport performances. Mint is an herb which is well known for its antispasmodic, painkilling, anti-inflammatory effects.

5. Conclusions

Also, water and oil are easy to separate and in case of methanol, it can be separated by heating or simple distillation as methanol is more volatile than mint oil. In method of direct heating after soxhlet extraction, the losses are higher as menthol decomposes due to higher temperatures and therefore, simple distillation after soxhlet extraction. In steam distillation, the

extraction temperature is around 800C. So, the quality of mint oil is affected as mint oil is heat-sensitive. Also, fresh leaves should be preferred against dry leaves as oil content in fresh leaves is higher because some amount of mint oil also evaporates when exposed sunlight. Thus, fresh leaves should be used and oil is extracted using sohxlet extraction followed by simple distillation for better yield and minimum losses

References

- [1] J. Ranjitha and S.Vijaylakshmi, Facile Methods for Extraction of essential oils from the species, International Journal of Pharmaceutical Sciences and Research, Vol. 5, Issue 4, April 2014
- [2] Motonobu Goto, Makasi Sato and Tsutomu Hirose, Extraction of peppermint oil by superficial carbon-dioxide method, Journal of Chemical Engineering of Japan, Vol. 26 No.4, 1993.
- [3] K. Satish kumar, Extraction of essential oil using steam distillation, National Institute of technology, Rourkela, 2010.
- [4] Aishwarya Balakrishnan, Therapeutic uses of pepper mint, Journal of Pharmaceutical sciences and Research Vol 7, Issue 7, 2015.
- [5] Shrivastava Alankar Review on Pepper Mint oil, Asian Journal of Pharmaceutical and Clinical Research Vol 2, Issue 2, April 2009.
- [6] Karanvir Gill, Rahul Gupta, Suresh Bhise, Manoj Bansal, Gurmaz Gill, Effect of hydrodistillation process on Extraction time and Oil recovery at various moisture contents from mentha leaves, International Journal of Engineering and Science, Vol.4, Issue 6, June 2014.
- [7] Nethravathi Mahadevappa, Divya Kittayanapallya Hanumantharaju Pooja Vishwanath Suvama, Vinutha Moses*, Soumya Chandrashekar and Shobha Gowda, study on advanced application of mint oil, journal of advanced scientific research, 2014.
- [8] Alankar Shrivastava, a review on peppermint oil, Asian journal of pharmaceutical and clinical research, May 2009.

Acknowledgements: NIL

Conflict of interest: NIL

About The License: © 2021 The Authors. This work is licensed under a Creative Commons Attribution 4.0 International License which permits unrestricted use, provided the original author and source are credited.