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Comparison of the properties of essential oils from commercial sources and edible dry mint

Hasniye Yaşa*

Abstract

Peppermint oil is isolated from the plant *Mentha piperita L.*, which is an aromatic perennial herbs belonging to the family of Lamiaceae found all over the world. Peppermint oils of several mentha species can be used for pharmaceutical and nutritional aspects, as natural additives in medicine, drugs, foods, mouthwash, toothwash, chewing gum and confectionary because of their antiviral, antibacterial, antifungal, pesticidal, anti-inflammatory and antimicrobial properties and pain decreasing and immunity increasing activities.

In this study is to research the difference of the chemical constituents of essential oil from some commercial mint oils and edible dry mint with Clevenger method. We have investigated the chemical composition of the mint oil samples with GC/MS and optical rotations were determined to see which chemicals might cause this difference.

We have found that the best essential oil with regard to menthol content is the purchased Turkish mint oil sample. Chinese mint oil was the second. Edible mint oil is rich in carvone.

The mint essential oil of dry mint leaves obtained with Clevenger method has a high carvone content, so it could be used in aromatherapy and alternative medicine

Keywords: Commercial mint oil, Essential oil, GC-MS

1. INTRODUCTION

Since essential oils are economically important in drugs, chemistry, and cosmetics, many countries harvest aromatic and medicinal plants containing them. In our country, mint has a very broad area of use in drug, food, and cosmetics for long years [1].

Mint essential oil is isolated from *Mentha piperita L.*, which is an aromatic and long-lived plant in the Lamiaceae family [2]. Mint oil is one of the most important essential oils in the world, owing to its oral and topical use and its antimicrobial effect [3]. When used in topical setting, mint oil relieves aching muscles and gives a cooling sensation and calming feel [4]. It also has antimicrobial

properties, and might help smoothen foul breath and digestive problems [5-7].

Medical use of mint is based on ancient Greek plant pharmacopoeia, where the plant was used traditionally in digestive and gall bladder problems [8-10]. It was used in upper respiratory tract problems and cough in the inhalative form [8].

Mint essential oil [11], obtained from the root, leaf, and flowers, was used to treat illnesses like irritable bowel syndrome, headache and dyspepsia without ulcer [12-14]. Mint extract is also used as a flavoring agent in many products, including toothpastes and mouthwashes [15]. Menthol is extracted from mint and it is used in topical

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products to treat respiratory distress syndrome, headache and stomachache [16].

The aim of this study is to research the difference of the chemical constituents of essential oil from some commercial mint oils and edible dry mint with Clevenger method. Because these oils have differences in pharmacologic efficiencies like muscles, nerves, rheumatism, and antispasmodic properties. According to the literature survey, the medical activity of essential oils change with their sources. We have investigated the chemical composition of the mint oil samples with GC/MS and IR and optical rotations were determined to see which chemicals might cause this difference.

2. EXPERIMENTAL METHOD

Japanese and Chinese commercial mint oils were acquired in the German market and Turkish commercial mint oil at the Turkish market. The purchased commercial mint oils and the essential oil of edible dry mint obtained with the Clevenger apparatus were processed with a Shimadzu QP2010 Plus using a GC-MS column Teknokroma TRB-5MS (30 m x 0.25 mm x 0.25 μ m I.D.). IR spectra were obtained with a Mattson 1000 IR spectrometer. Rotation angles were measured with an Optical Activity AA-55 instrument.

2.1. General procedure for essential oil of edible dry mint

For this purpose, the purchased Chinese, Japanese, and Turkish commercial oil samples were investigated and edible dry mint leaves were processed with Clevenger method to yield the oil. In this procedure, 100 g of dry mint leaves were taken in a flask with 500 mL capacity. It was boiled in the Clevenger apparatus with distilled water as seen in Figure 1. Mint oil was obtained with 1% yield and it was kept under nitrogen atmosphere in a refrigerator.

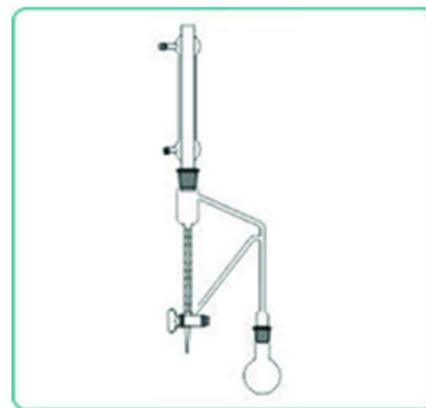


Fig. 1. System of obtained essential oil by Clevenger apparatus

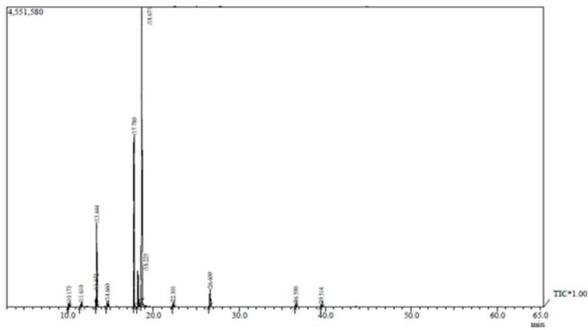
2.2 GC/MS Analysis of the Essential Oils

Gas chromatography–mass spectrometry (GC-MS) data were recorded on a Shimadzu QP2010 Plus using a GC-MS column Teknokroma TRB-5MS (30 m x 0.25 mm x 0.25 μ m I.D.). The operating conditions were as follows: injection temperature 250°C, Helium carrier gas flow: 20 psi. Split ratio: 1/100. E.I.:70 eV. Temperature programming: 80°C (5 min) - 250°C at 5°C/min, hold 30 min. The results were determined by looking at the retention indices in the literature [8, 9] and comparing with their MS spectra.

3. RESULTS AND DISCUSSION

The chief compound of biological activity of mint essential oil is menthol. Figures 2-9 show the gas chromatogram and IR spectrum of essential oil. The functional groups present in the essential oil were determined by comparing the vibration frequencies in wavenumbers of the sample spectrograph obtained from an FT-IR spectrophotometer with those of an IR correlation chart. In the FT-IR spectrums of mint essential oils the absorption band or frequency from 3500 cm^{-1} –3200 cm^{-1} broad, showed the presence of O-H stretch, H- bonded for alcohol and phenol and 3000 cm^{-1} -2850 cm^{-1} medium indicate C-H stretch for an alkane. The absorbance band at 1666.90 cm^{-1} revealed the presence of C=O bond for carbonyl. A strong absorption band between 900–675 cm^{-1} indicated the presence of aromatic C=C (Figure 3, 5, 7, and 9). A medium-weak band between 1680-1600 cm^{-1} showed the presence of alkenes C=C stretch. Table 1 demonstrates the list of compounds whose GC/MS concentration is not

less than 0.1% of total peak concentration. We have found that the best essential oil with regard to menthol content is the purchased Turkish mint oil sample. Chinese mint oil was the second. Edible mint oil is rich in carvone (Table 1). Carvone is used in pesticides, aromatic constituents in foods and pellet feeds, personal care products aromatherapy, and alternative medicine [15]. The essential oil we obtained with extraction might be considered as an example.



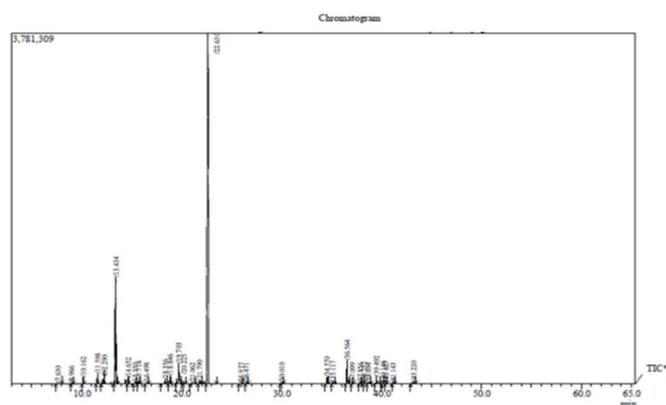


Fig. 8. Gas chromatogram of edible dry mint oil

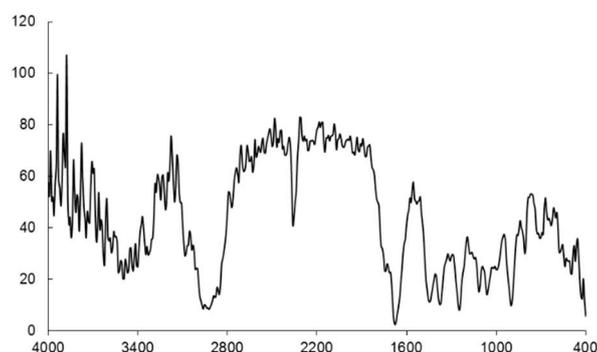


Fig. 9. IR spectrum of edible dry mint oil

Table 1: GC-MS results of essential oils of mint

Compounds	Chinese commercial mint oil (%)	Japanese commercial mint oil (%)	Turkish commercial mint oil (%)	Edible mint oil (%)
1,2- Propandiol	--	--	1.18	--
2-E-Hexenal	--	--	--	0.07
2,5-Diethyltetrahydrofuran	--	--	--	0.07
α -Pinene	0.33	0.91	0.29	0.50
Sabinene	0.61	--	--	--
β -Pinene	1.15	1.08	0.32	1,11
Ethylaminocarbinol	--	--	0.15	--
β - Myrcene	--	--	--	1.56
Limonene	--	5.85	--	--
1,8-Cineole	7.92	1.00	6.93	14,85
cis- Sabinene hydrate	0.62	--	--	0.45
α - Terpinolene	--	--	--	0.10
β -Phellandrene	--	--	--	--
Linalool	--	--	--	0.17
p-Menth-2-en-1-ol	--	--	--	0.12
Isopulegol	--	--	0,20	--

p-Menthone	34.47	24.28	4.33	--
Cyclohexanone	6.97	--	3,32	--
Menthol	--	13.53	--	--
α -Terpineol	--	--	--	0.57
L-menthol	51.81	40.71	70.76	1.09
cis-Dihydrocarveol	--	--	--	4.60
Dihydrocarvone	--	--	--	0.18
cis-carveol	--	--	--	0.17
cis-p-Mentha-1(7),8-dien-2-ol	--	--	--	0.66
Pulegone	0.78	--	0.37	--
Carvone	--	--	0.33	68.99
1-adamantanmethyl amine	--	--	--	0.09
Menthyl acetate	4.50	9.53	0.55	0.17
Dihydrocarvylacetate	--	--	--	0.31
β -Bourbonene	--	--	--	1.06
β -Elemene	--	--	--	0.35
Trans-caryophyllene	0.55	1.21	--	3.30
α - Amorphene	--	--	--	0.12
Ledene	--	--	--	0.11
α - Humulene	--	--	--	0.05
β - Farnesene	--	--	--	0.35
Germacrene	0.29	--	--	0.94
γ - Elemene	--	--	--	0.24
α - Elemene	--	--	--	0.23
cis-Calamenene	--	--	--	0.11
Diethylphthalate	--	1.11	10.26	0.42

Optical rotation is the property of defined substances, to turn the plane of polarized light. Mint oils contain chiral compounds. This is the reason why the mint oils rotate the oscillating plane of light and the resulting overall optical rotation. The highest rotation angle was obtained with the Clevenger-processed oil, as shown in Table 2.

Table 2: Rotation angles of essential oils of mint

Essential Oils	Optical Rotation
Chinese commercial mint oil	-18.5
Japanese commercial mint oil	-17.5
Turkish commercial mint oil	-11.5
Edible mint oil	-39.0

4. CONCLUSIONS

Mint oil [8, 9, 11] is a common pharmaceutical and nutritive element. The differences among these

essential oils are originated from the place where the plant was grown, conditions of growth, and extraction methods used. Turkish, Chinese, and Japanese commercial oils were obtained with supercritical fluid extraction (SFE) and the oils are rich in menthol. Edible mint oil was obtained with Clevenger method and is rich in carvone. Menthol is an effective constituent with antimicrobial and antiplasmid activities and it is used against inhalation problems, muscle pain, and headache [16]. It has a cooling effect and it diminishes fever. Edible mint oil with high carvone content could be used in personal care products and aromatherapy. Of the three mint oil samples purchased, Turkish oil was found to be the best effective one with high menthol content. Chinese mint oil was the second in terms of medical properties. The mint essential oil of dry mint leaves obtained with Clevenger method has a high carvone content, so it could be used in aromatherapy and alternative medicine.

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