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## Standardization of quality parameters in isolated essential oils of *Mentha citrata* of Indian origin: under varied geographical location

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### ABSTRACT

In the present work, the effect of the geographical origin on essential oil content and composition was evaluated. The study was undertaken to the physico-chemical properties of mint oil of *Mentha citrata* produced in the northern part of the India particularly Moradabad, Badaun, Sambhal, Bareilly etc. There was observed some analyzed samples of *Mentha citrata* essential oil not obeyed Bureau of Indian Standards (BIS) specifications parameter e.g. the higher linalool and linalyl acetate contents, which are not mentioned in the BIS specification. The obtained results of this study demonstrate to developing the official standard of mint oil.

**Keywords:** *Mentha citrata*, standardization, quality, physico-chemical.

### 1. Introduction

The wide spread cultivation and processing of aromatic crops in India particularly mint crops. In recent years is an example in a short span of time India is being recognized as a major producer of mint crops. Their potentialities were discovered in ancient times due to their flavoring properties and medicinal value. Nowadays, several mint species and their essential oils are exploited at diversified sectors: food; agronomy; cosmetic; medicine and pharmacy<sup>[1]</sup>.

At agronomical level the essential oils from mint species revealed insecticidal properties being considered eco-friendly pesticides, assisting in the crop protection against pests<sup>[2]</sup>. Their exhaled fragrance, highly enjoyed, is employed in perfumes and cosmetic products<sup>[3]</sup>. At medicinal and pharmaceutical levels, extracts and/or essential oils from mint species revealed inhibition of acetylcholinesterase activity<sup>[4]</sup>, and vasodilatation<sup>[5]</sup>, among other health benefits<sup>[6]</sup>. Mint species are also exploited due to their bioactive potential, namely antioxidant and antimicrobial properties<sup>[7,8]</sup>.

As the quality parameters of the oil depends on the particularly soil and agro climatic conditions of the mint growing area. Geographical origin is one of the most important aspects that influence plants essential oils composition<sup>[9, 10]</sup>. A survey of the literature reveals that an oil known as Lemon mint, Lavender mint or Bergamot mint contains Linalool and Linalyl acetate. The main constituents of bergamot mint oil are linalool (50-56%) and linalyl acetate (34.3%)<sup>[11]</sup>. However, the relative proportions of the two constituents as well as the minor constituents differ considerably depending upon the strain, geographical location and other environmental factor<sup>[12]</sup>. Y. Fujita has reported the analysis result of chemical constituents of *Mentha citrata* oil produced in Japan<sup>[13]</sup>. Virmani *et al.* have analyzed the quality parameter of *Mentha citrata* grown in Lucknow (India)<sup>[14]</sup>. There were found in observations some more water soluble constituents in *Mentha citrata*<sup>[15]</sup>. However, the actual percentage of various constituents varies considerably according to the genetic geographical and ecological conditions etc.<sup>[16]</sup>.

In this sense, the present work describes the effect of different origin areas in essential oil quality, depending on two methodologies (i) study of three physical properties (e.g. optical rotation, refractive index, specific gravity) and (ii) determination of major constituents in the oil.

### 2. Experimental

#### 2.1 Materials and Methods

The present studies were carried out to standardize the quality parameter of mint oil grown in the northern part of the India particularly Moradabad, Badaun, Sambhal, Bareilly etc. The samples were subject to detailed analysis for their physico-chemical properties like *viz*: optical

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rotation, refractive index, specific gravity and determination of major constituents like linalool and linalyl acetate etc.

## 2.2 Instrumentation

The optical rotation (Perkin Elemer digital polarimeter model 243-B), refractive index (Abbe type Refractometer,) and chemical constituents were determined by gas chromatograph with flame ionization detector (FID) (Hawlett Packered make model 5890-II using fused silica capillary column 25 x 0.32 mm HP carbowax 20 m) Nitrogen as carrier gas and data were recorded in the computer.

## 2.3 Analysis of Chemical Constituents in Mint Oils

Major chemical constituents were determined by gas chromatograph with FID Injector and detector temperatures were set at 210 and 220 °C, respectively. The column oven temperature was programmed from 50 to 200 °C at a rate of 4.5 °C min<sup>-1</sup>; initial and final temperatures were held for 1 and 10 min, respectively. Nitrogen gas was used as a carrier gas

with a flow rate of 1.5 mL min<sup>-1</sup>. A sample of 0.2 µL was injected using the split mode (split ratio 60:1). All quantification was done using a built-in data-handling program provided by the manufacturer of the gas chromatograph. All experiments were performed in triplicate, and mean values were considered in data analysis.

## 3. Results and Discussion

### 3.1 Physical Properties

All samples were identical and possessed pale yellow colour. The odour test indicated characteristic minty and herbal note.

#### 3.1.1 Optical Rotation

Table 1 and 2 represents all observed values of optical rotation of the samples from from (-) 10.0 to (-) 17.0 with a mean value (-) 13.75. On comparison with BIS standard, the optical rotation values observed higher values then the standard values fixed by the BIS (-7 to -8).

**Table 1:** Physical properties of different samples at 27 °C of *Mentha citrata* oil.

Sample No.	Colour/odour	Optical rotation	Refractive index	Specific gravity
1	Pale Yellow with strong sweet fresh bergamot minty note followed by cooling sensation	-11.0	1.4610	0.8872
2	- do-	-12.5	1.4660	0.8829
3	- do-	-16.0	1.4690	0.9115
4	- do-	-17.0	1.4600	0.8921
5	- do-	-10.0	1.4600	0.8825
6	- do-	-16.0	14590	0.8902
MEAN	Pale Yellow with strong strong sweet fresh bergamot note followed by cooling sensation	-13.75	1.46187	0.8900

**Table 2:** Range of Different Characteristics of oil of *Mentha citrata* and requirements for oil of *Mentha citrata* as per IS 13261 : 1991.

S. No.	Name of characteristics	Range obtained	Requirements for oil of <i>Mentha citrata</i> as per IS 13261 : 1991
1.	Colour/odour	Pale Yellow with strong sweet fresh bergamot minty note followed by cooling sensation	Colourless to pale yellow Sweet-herbaceous with fruity/citrus notes (resemblig lavender/bergamot with clarly sage undertones)
2.	Optical rotation	(-) 10.0 to (-) 17.0	(-)7 to (-) 8
3.	Refractive index at 27 °C	1.4590 to 1.4824	1.4559 to 1.4609
4.	Specific gravity at 27 °C	0.88122 to 0.91022	0.8797 to 0.8897
5.	Linalool (by GLC method)	18.11% to 49.53%	-----
6.	Linalyl acetate	21.18 to 40.26	-----

**Table 3:** Chemical properties of different samples of *Mentha citrata* oil.

Sample No.	Linalool	Linalyl acetate
1	31.61	39.07
2	49.53	21.18
3	18.11	34.93
4	31.81	40.26
5	37.55	31.81
6	28.02	32068
Mean	32.77	33.32

### 3.1.2 Refractive Index

From table 1 and 2, the observed values mint oils not obeyed to the range of BIS specification. The refractive Index values of mint oil vary from 1.4590 to 1.4824 with mean value 1.4619. While, BIS specification reporting range of refractive index at 27 °C as 1.4559 to 1.4609.

### 3.1.3 Specific Gravity

We can compare by the table 1 and 2, for the variations in specific gravity at 27 °C. The specific gravity values are from the range 0.88122 to 0.91022 with mean value 0.8900 while it should be 0.8797 to 0.8897 as per BIS specification.

### 3.2 Chemical Properties

Table 3 define the important chemical constituents e.g. linalool and linalyl acetate. It is found that the percentage (%) of linalool in the oil from 18.11% to 49.53% with mean value 32.7 %. The other major constituent's linalyl acetate is from 21.18% to 40.26% with mean value 33.32%.

### 4. Conclusions

In view of the comparative study, mint oil collected from different areas of the northern part of India like Moradabad, Badaun, Sambhal, Bareilly etc., shows the range of different characteristics values were standards of mint oil as per IS 528: 1999 (table 1 and 2). The obtained results of this study demonstrate to developing the official standard of mint oil.

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