Research Article

GC-MS Profile of Volatile oils of *Cinnamomum Zeylanicum* Blume and *Ocimum kilimandscharicum* Baker ex Gurke

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ABSTRACT

The volatile oil of *Cinnamomum zeylanicum* Blume, commonly known as cinnamon oil and *Ocimum kilimandscharicum* Baker ex Gurke, commonly known as kapur tulsi oil were subjected to Gas chromatography- Mass spectroscopy (GC-MS) analysis to study their chemical composition. Total eight components of cinnamon oil and eight components of kapur tulsi oil were identified. The major component of cinnamon oil was found to be cinnamaldehyde (91.82%). Minor compounds were found to be 1-8 cineole, ∝-muurolene, selinene, geraniol, E-cinnamic acid, vinyl trans-cinnamate. The major component of kapur tulsi oil was found to be camphor (46.14%). Other components were found to be eugenol, 1-8 cineole, limonene, *α*- pinene, camphene, *β*- myrecene and *α*-terpineol.

Keywords: GC-MS, volatile oils, *Cinnamomum zeylanicum* Blume, *Ocimum kilimandscharicum*, cinnamon oil, kapur tulsi oil.

INTRODUCTION

Essential oils, volatile oils or aromatic oils, as their name implies are the volatile, odorous principles of plant and animal sources. Volatile oils are generally mixtures of hydrocarbons and oxygenated compounds derived from these hydrocarbons. In some oils, the hydrocarbons predominate and only limited amounts of oxygenated constituents are present, in others the bulk of the oil consists of oxygenated compounds. The odour and taste of volatile oils is mainly determined by these oxygenated constituents, which are to some extent soluble in water but more soluble in alcohol. Many oils are terpenoid in origin, a smaller number such as those of cinnamon and clove contain principally aromatic (benzene) derivatives mixed with the terpenes. A few compounds, although aromatic in structure, are terpenoid in origin[1].

Cinnamomum zeylanicum Blume (Lauraceae), the evergreen tree of tropical area, is considered to be the native of Sri Lanka and Malabar Coast of India, and up to a limited extent in eastern India[2]. It is a moderate sized tree, up to 16 m in height. The bark of the tree is the well-known Ceylon cinnamon of commerce. The bark of tree consists of volatile oil, commonly known as cinnamon oil, possesses many medicinal properties like antibacterial and antifungal properties[3]. The oil is styptic, emmenagogue, tonic to the liver, useful in inflammation, vomiting and abdominal pains[4]. The oil is a valuable flavouring ingredient used widely in all kinds of confectionary, baked foods, meat seasonings, candies, soft drinks, ketchups, pickles, sauces, beverages, pharmaceutical and dental preparations, mouth rinses etc[5].

Ocimum kilimandscharicum (Lamiaceae) is a native of Africa and was introduced and cultivated in India and some parts of Turkey. In India, it is cultivated in West Bengal, Assam, Tamil Nadu, Karnataka, Kerala, Dehradun and in North India[6]. It is a woody shrub that can reach 2 m high in warm temperature regions of the tropics but can be propagated by seeds and vegetatively. The plant has pubescent quadrangular branchlets with simple leaves that are opposite and oblong narrows at the base and deeply serrated. The leaves accommodate volatile oil, which represents the essence of plant[7,8]. In Indian System of Medicine (Ayurveda), oil of *O. kilimandscharicum*, commonly known as kapur tulsi oil, has been used as an anti-inflammatory, indigestion, insecticidal, mosquito repellent, aromatic and antimicrobial[9, 10].

Gas chromatography has been the method of choice for analysis of volatile oils for many years. The constituents of volatile oils are identified using a combination of different GC techniques, including GC in combination with mass spectrometry. GC-MS is the most powerful technique used to identify the components present in the oils. In the present study, the leaves of *O.kilimandscharicum* and bark of *C. zeylanicum* were collected, identified and authenticated, and subjected to hydrodistillation for extraction of their volatile oils. Both the oils were studied for their organoleptic and physical properties, and analysed by GC-MS method to know their chemical composition.

MATERIALS AND METHODS

Collection of plant material

The authenticated plant material for extraction of kapur tulsi oil was collected from Medicinal Plant Garden of University Institute of Pharmaceutical Sciences, Panjab

University, Chandigarh. The cinnamon bark was procured from local market of Ambala Cantt. The drug samples were authenticated by Dr. H.B Singh, Chief scientist and Head, RHMD, NISCAIR, New Delhi vide ref. no. NISCAIR/RHMD/Consult/2011-12/1807/107. The essential oils under study were isolated by hydrodistillation process using Clevenger's apparatus.

Determination of organoleptic and physical properties of extracted oils

The organoleptic properties like appearance/ colour, odour, taste, solubility and specific gravity of extracted oils were determined. Organoleptic properties served as a means of assessing the purity and quality of the oil as well as for identification.

Gas Chromatography - Mass Spectroscopy profile of cinnamon oil and kapur tulsi oil

Gas Chromatography has been the method of choice for analysis of essential oils for many years. The constituents of essential oils are identified using a combination of different GC techniques, including GC in combination with mass spectrometry. GC-MS is the most powerful technique used to identify the components present in the oils. The cinnamon oil and kapur tulsi oil were analysed by GC-MS technique for identification of their chemical constituents. Gas chromatograph- Mass Spectrometer (Model- Polaris Q, Thermoelectron Corporation, Germany) equipped with DB-5 column (30 m x 0.25 mm x 0.25 mm) was used for analysis. The oven temperature was programmed as isothermal at 40ºC for 1 min, then raised to 250ºC at 6ºC/min and held at this temperature for 4 min. Helium was used as carrier gas at the rate of 1.0 ml/min. Effluent of GC column was introduced directly into the source of the MS via a transfer line. Ionization voltage was 70ev and ion source temp was 230^{0} C. Scan range was 41- 450 amu[11].

The constituents were identified by comparison of their retention indices with literature values and their mass spectral data with those from the Wiley mass spectral library.

Table 1: It shows percentage (% age) yield of oils under study

Plants used for extraction of oils	Parts used	% Age (v/w)
Cinnamomum zeylanicum Blume	Bark	1 %
Ocimum kilimandscharicum Baker ex Gurke	Leaves	0.7 %

Table 2: Organoleptic and physical properties of extracted oils

Oils	Appearance/ Colour	Odour	Taste	Solubility	Specific Gravity
Cinnamon oil	Clear, light yellow liquid	Aromatic	Sweet & hot	Insoluble in water, soluble in alcohol, chloroform 70%	0.892
Kapur tulsi oil	Clear, colourless liquid	Aromatic, camphoraceous	Pungent and cooling	Insoluble in water, soluble in alcohol, chloroform	0.910

RESULTS AND DISCUSSION

The powdered bark of *Cinnamomum zeylanicum* and fresh leaves of *Ocimum kilimandscharicum* were subjected to hydrodistillation for extraction of volatile oils in clevengers apparatus individually for 5-6 hours. The % age yield of extracted oils was estimated, Table 1.

Organoleptic evaluation of extracted volatile oils was done and the characters were studied. The solubility of oils in different solvents such as water, alcohol, chloroform and petroleum ether was also determined, Table 2. The oils were clear and colourless to yellow when extracted freshly. They had strong aromatic and characteristic odour and greasy to touch. The oils were insoluble in water and soluble in organic solvents. The test oils showed specific gravity within the range of prescribed specific gravity of majority of the volatile oils. These physical constants served as a means of accessing the purity and quality of the volatile oils as well as their identification.

The cinnamon oil and kapur tulsi oil were subjected to GC-MS analysis to study their chemical composition. Figure 1 and 2 represent the GC-MS chromatogram of cinnamon oil and kapur tulsi oil respectively. The constituents of the oils were identified by comparison of their retention indices with literature values and their mass spectral data with those from the Wiley mass spectral library.

Table 3: Components of cinnamon oil identified by GC-MS analysis

Components identified	Retention time	Peak area (%)
Cinnamaldehyde	18.56	91.82
1-8 Cineole	22.41	1.5
Ylangene	19.62	1.49
E-Phellendrene	21.36	1.23
α- Murrolene	21.93	1.92
Selinene	21.64	1.84
Geraniol	15.78	1.31
E- Cinnamic acid	21.36	1.62

Table 4: Components of kapur tulsi oil identified by its GC-MS analysis

Components Identified	Retention time	Peak area (%)
Camphor	15.53	12.25
Eugenol	16.36	14.33
1-8 Cineole	30.69	7.20
Limonene	31.28	13.08
α- Pinene	32.86	46.14
Camphene	35.48	7.0
β- Myrcene	27.41	1.94
α - Terpineole	29.24	1.78

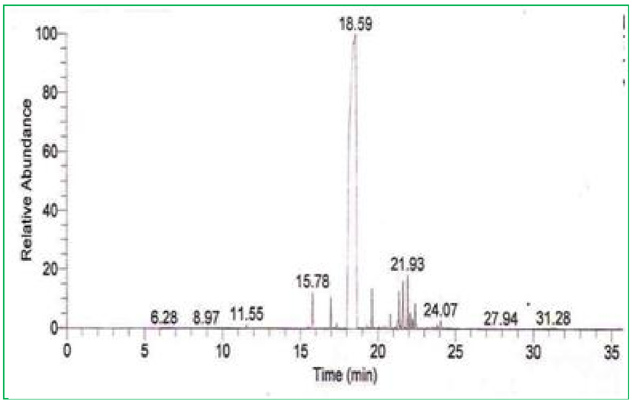

Figure 1: GC-MS chromatogram of cinnamon oil

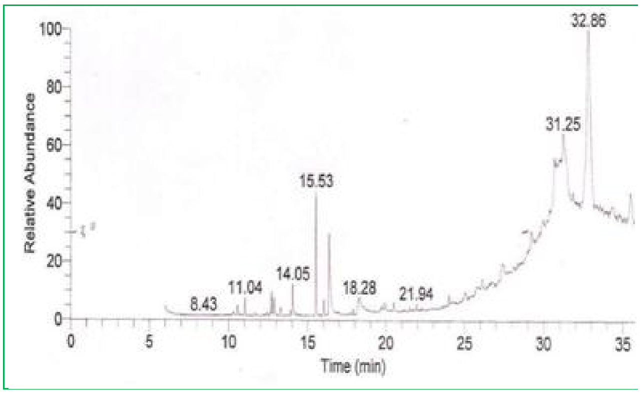

Figure 2: GC-MS chromatogram of kapur tulsi oil

Table 3 and 4 represent the components of cinnamon oil and kapur tulsi oil respectively, identified by GC-MS analysis. A total of 8 components of cinnamon oil and 8 components of kapur tulsi oil were identified. The major component of cinnamon oil was found to be cinnamaldehyde (91.82%). Minor compounds were found to be 1-8 cineole, ∝-murrolene, selinene, geraniol, E-cinnamic acid, vinyl trans-cinnamate. The major component of kapur tulsi oil was found to be camphor (46.14%). Other components identified were found to be eugenol, 1-8 cineole, limonene, α- pinene, camphene, β-myrecene and α- terpineol.

CONCLUSION

The volatile oils of *Cinnamomum zeylanicum* and *Ocimum kilimandscharicum* have passed all the physical parameters of the essential oils. This is the most searching examination that will confirm or reject the authenticity of oils and also reveal any adulteration with foreign substances. Qualitative and quantitative analysis of volatile compounds was also performed by GC-MS technique. The results obtained may help to find the active ingredients and provide a useful chemical basis for future research.

REFERENCES

1. Evans WC, Trease and Evans Pharmacognosy, 15th ed., WB Saunders, New York, 2002. 274
2. Kokate CK, Purohit AP and Gokhale SB, Volatile oils and terpenoidal drugs. In: Pharmacognosy. 43rd ed., Nirali Prakashan, Pune, 1993, 11.46-11.48
3. Bruneton J. Pharmacognosy, Phytochemistry, Medicinal plants, Lavoisier Publishing, Paris, 1998, 987 – 1000.
4. Kirtikar KR and Basu BD, Indian Medicinal Plants. 2nd ed, vol.3, Lalit Mohan Basu, Allahabad, 1984, 210-215
5. Heber WY, Textbook of Pharmacognosy, 6th ed., The Mc Graw- Hill Book Company, U.S.A, London., 1950, 368-371.
6. Khare CP, Indian Medicinal Plants, 1st ed. Springer, Heidlburg, 2007, p. 326.
7. Saha S, Dev T and Ghosh P, Micropropagation of *Ocimum Kilimandscharicum*. Acta Biologica Cracoviensia, 52, 2010, 50-58.
8. Darrah HH, Investigation of the cultivators of Basils, Economic Botany 1974, 28, 63-67.
9. Kashyap CP, Therapeutic potency of *Ocimum kilimandscharicum*: A Review. Global Journal of Pharmacology, 5(3), 2011, 191-200.
10. Githinji CW and Kokwaro JO, Ethnomedicinal study of major species in the family Labiatae from Kenya, Journal of Ethnopharmacology, 39, 1993, 197-203.
11. Diomande GD, Koffi AM, Tonzibo ZF, Bedi G, Figueredo G, GC and GC/MS analysis of essential oil of five cinnamomum species. Middle East Journal of Scientific Research, 11(6), 2012, 808-813.

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