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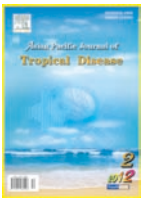

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Chemical compositions of *Cinnamomum tamala* oil from two different regions of India

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ABSTRACT

Objective: This study was made to investigate the chemical composition of *Cinnamomum tamala*, (Buch.-Ham.) Nees & Eberm (Tejpat) oil (CTO) which was taken from two different regions. The plant leaves were collected from two different regions of India (Southern India and Northern India). **Methods:** The chemical composition of the hydro distilled essential oil of *Cinnamomum tamala* were analyzed by Gas chromatography-mass spectrometry (GC-MS). **Results:** The GC-MS analysis of the oil collected from northern region (Chandigarh Botanical garden, Chandigarh) showed 20 constituents of which methyl eugenol (46.65%), eugenol (26.70%), trans-cinnamyl acetate (12.48%) and Beta-Caryophyllene (6.26%) were found the major components. The GC-MS analysis of the oil collected from southern area showed 31 constituents of which cinnamaldehyde (44.898%), Tans-cinnamyl acetate (25.327%) and Ascabin (15.249%) were found the major components. **Conclusions:** The oil is used in various preparations in pharmaceutical industries so it should be used after the verifications of quality of the oil. The difference observed in the amount and type of constituents may be due to the geographical origin of the plant.

1. Introduction

Cinnamomum tamala, (Buch.-Ham.) Nees & Eberm (Tejpat) (Lauraceae) is a tree commercially known as Indian cassia. The plant is widely distributed throughout tropical and sub-tropical Asia, Australia, the Pacific region and South America[1]. In India it is found along the north-western Himalayas, in Sikkim, Assam, Mizoram and Meghalaya[2]. It has been used in traditional medicines as an astringent, stimulant, diuretic, carminative and in cardiac disorders[3]. Tejpat is generally harvested in dry and mild weather from October to December and in some places, the collection is continued till the month of March[4]. On an average, a tree produces 10-25 kg of dry leaves and its 0.2-0.4% oil can be extracted from leaves. Timely collection of leaf is important since early and late collection may result in poor quality of the leaves or essential oil[5]. The leaves of C. tamala have been used for flavouring food and as medicinal ingredient like in diabetes, hyperlipidemia, inflammation, hepatotoxicity, diarrhea etc. The leaves are used as a spice and also as fodder. The essential oil from the leaves is also used as a flavouring agent[6].

The leaves of *Cinnamomum tamala* have been reported to possess antidiabetic, antioxidant[7-8], antidiarrhoeal [9], antihyperlipidemic[10], antioxygenic[11], anti-inflammatory [12], acaricidal[13], hepatoprotective[14], gastroprotective[15], antibacterial and immunomodulatory activities[16].

In the present investigation we determined the composition of the essential oil using *Cinnamomum tamala* from two different regions of India. The variation in the content of the major constituents was studied.

2. Materials and methods

2.1 Plant Material

The plant leaves were collected from two different regions of India (Southern India and Northern India). The dried leaves of *Cinnamomum tamala* procured were identified and authenticated by Dr. H. B. Singh, Head, Raw Materials Herbarium and Museum, National Institute of Science

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Communication and Information Resources (Ref. NISCAIR/RHMD/Consult/-2011-12/1858/158), Delhi (India).

2.2 Isolation of oil

The plant leaves from two different regions of India (Northern and Southern India) were cut in to small pieces and oil was extracted with the help of Clevenger apparatus by hydro distillation method. The percentage yield of the oil was found to be 0.35% and 0.45% respectively of light yellow colour in both cases. The solubility was checked and both the oils were found soluble in acetone.

2.3 Gas chromatography-mass spectrometry (GC-MS) analysis

The GC/MS analysis of the essential oil was performed using Agilent 7890A GC system equipped with MS detector 5975C inert XL EI/CI MSD having automatic sampler CTC analysis CombiPAL robotic arm. For GC/MS detection, an electron ionization system with ionization energy of 70 eV was used. Helium gas was used as the carrier gas at a constant flow rate of 1 ml/min. The inlet temperature was set at 270 ℃. The specification of the capillary column used was Agilent 19091S-433: 1548, 52849 HP-5MS 5% Phenyl Methyl Silox 30 m x 250 μm x 0.25 μm HP-5MS. The oven temperature was programmed from 80 ℃ to 300 ℃. The diluted samples (1/100, v/v, in Hexane) of 2 μL were injected.

2.4 Identification of constituents

The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. The oils components were identified by matching their recorded mass spectra with the data bank mass spectra (Search library Database/W9N08.L) and by comparing their retention indices relative to a series of n-hydrocarbons (C7-C23) with literature values[17].

3. Results

3.1 Chemical composition of essential oil

The chromatogram of CTO from northern region (Chandigarh Botanical garden, Chandigarh) by GC-MS is shown in figure 1. The GC-MS analysis of CTO led to the identification and quantification of 20 components (Table 1) which accounted for 100% of the total oil of which methyl eugenol (46.65%), eugenol (26.70%), trans-cinnamyl acetate (12.48%) and Beta-Caryophyllene (6.26%) were found the major components.

The chromatogram of CTO from southern region by GC-MS is shown in figure 2. The GC-MS analysis of CTO led to the identification and quantification of 31 components (Table 2) which accounted for 99.99% of the total oil. The main volatile components of CTO were found as cinnamaldehyde (44.898%), Trans cinnamyl acetate (25.327%), Ascabin (15.249%), Hydro cinnamyl acetate (3.384%), Beta-caryophyllene (2.669%) which comprised of 91.527% of the oil.

Table 1
Chemical composition of *Cinnamomum tamala* essential oil (Northern India)

Compound	Retention Time	% of Total
Alpha-pinene	3.613	0.03%
Benzaldehyde	4.054	0.13%
Beta Phellandrene	5.267	0.05%
Linalool	6.840	0.06%
Benzene propanal	8.631	0.08%
2H-1-benzopyran	8.998	0.07%
Estragole	9.616	0.06%
Cinnamaldehyde	11.790	2.16%
Eugenol	14.502	26.70%
3-Phenyl-1-propene	14.817	0.85%
Alpha-copaene	14.966	0.25%
Methyl eugenol	15.967	46.65%
Beta-Caryophyllene	16.322	6.26%
Trans-Cinnamyl acetate	17.128	12.48%
Alpha-Humulene	17.346	0.45%
Bicyclo germacrene	18.639	0.18%
Phenol	19.600	0.07%
Spathulenol	21.054	0.07%
Caryophyllene oxide	21.191	0.24%
Ascabin	25.443	3.16%
Total components of oil		100 %

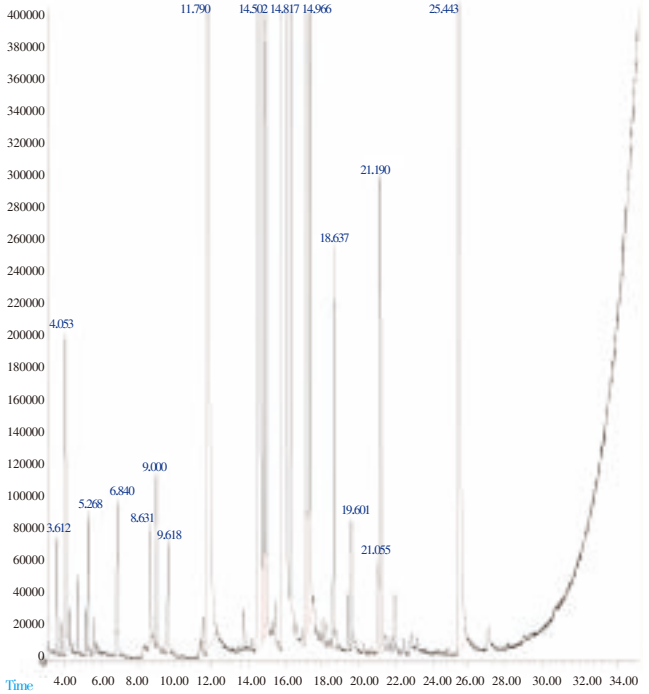

Figure 1. Chromatogram of *Cinnamomum tamala* oil from northern region

Table2

Chemical composition of *Cinnamomum tamala* essential oil (Southern India)

Compound	Retention Time	% of Total
Alpha-pinene	3.621	0.095%
Camphene	3.864	0.037%
Benzaldehyde	4.050	1.222%
Beta-pinene	4.312	0.034%
p-cymene	5.166	0.065%
Beta-Phellandrene	5.270	0.106%
Acetophenone	6.153	0.044%
Linalool	6.850	0.442%
Beta-phenylpropionaldehyde	8.608	1.856%
Phenetol	8.775	0.109%
Benzofuran	9.006	0.185%
Acrolein	10.285	0.286%
Cinnamaldehyde	11.886	44.898%
2-propenal, 3-phenyl cinnamaldehyde	12.249	0.087%
Eugenol	14.473	0.078%
Hydro cinnamyl acetate	14.836	3.384%
Alpha-copaene	14.980	0.414%
Pivalic acid	15.340	0.129%
Cinnamyl acetate	15.450	0.091%
Methyl eugenol	15.909	0.107%
Beta-caryophyllene	16.329	2.669%
Valecene	16.910	0.089%
Tans-cinnamyl acetate	17.172	25.327%
Alpha-humulene	17.365	0.636%
Bicyclogermacrene-lepdozene	18.658	0.191%
Naphthalene	19.455	0.067%
Spathulenol	21.108	0.780%
Caryophyllene oxide	21.230	1.135%
Alpha-patchoulene	21.547	0.090%
Humulene oxide	21.993	0.097%
Ascabin	25.584	15.249%
Total components of oil		99.99%

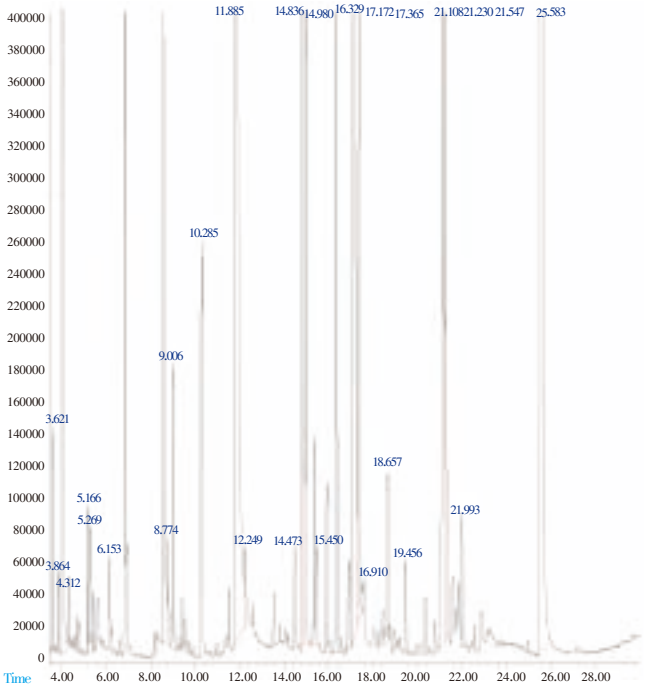

Figure 2. Chromatogram of *Cinnamomum tamala* oil from northern region

4. Discussion

The major component in oil of *Cinnamomum tamala* leaves from northern region was found methyl eugenol (46.65%) whereas in oil of *Cinnamomum tamala* leaves from southern region, the content of methyl eugenol was found 0.107% only. The other component in oil of *Cinnamomum tamala* leaves from northern region was found eugenol (26.70%) whereas in oil of *Cinnamomum tamala* leaves from southern region, the content of eugenol was found negligible (0.078%).

The major component in oil of *Cinnamomum tamala* leaves from southern region was found cinnamaldehyde (44.898%) whereas in oil of *Cinnamomum tamala* leaves from northern region the content of cinnamaldehyde was found 2.16% only. The other component in oil of *Cinnamomum tamala* leaves from southern region was found trans-cinnamyl acetate (25.327%) whereas in oil of *Cinnamomum tamala* leaves from northern region, the content of cinnamaldehyde was found half of the previous one i.e 12.48%. The third major component was found ascabin (15.249%) which was very less in the second one that was only 3.16%. A difference in the percentage of Beta-Caryophyllene was also observed. The variation in the content of the oil is due to the environmental conditions. The hot and humid condition favors the formation and composition of the oil.[18]

5. Conclusion

The result of this work established noticeable quantitative differences in the quantity of biologically active compounds in *Cinnamomum tamala* oil from different origins. This may consequently differ the plants in the organoleptic and pharmacological activity. The variability in the concentrations of the majority of compounds alerts us for the use of plant in medicines after verifications.

Conflict of interest statement

We declare that we have no conflict of interest.

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References

[1] Gupta R, Bajpai KG, Johri S, Saxena AM. An overview of 253

Indian novel traditional medicinal plants with anti-diabetic potentials, *Afr J Trad CAM* 2008; **5**: 1-17.

[2] Dighe VV, Gursale AA, Sane RT, Menon S, Patel PH. Quantitative Determination of Eugenol from *Cinnamomum tamala* Nees and Eberm, Leaf Powder and Polyherbal Formulation Using Reverse Phase Liquid Chromatography. *Chromatographia* 2005; **61**:443-446.

[3] Kar A, Choudhary BK, Bandyopadhyay NG. Comparative evaluation of hypoglycaemic activity of some Indian medicinal plants in alloxan diabetic rats, *J Ethnopharmacol* 2003; **84**:105-108.

[4] Krishnamurthy T. Minor Forest Products of India. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi; 1996, p. 38.

[5] Lamichhane D and Karna NK. Harvesting methods of *Cinnamomum tamala* leaves in private land, a case study from Udayapur district, Nepal, Banko Janakari, 19(2), 20-24.

[6] Chauhan NK, Haider SZ, Lohani H, Sah S, Yadav RK. Quality evaluation of *Cinnamomum tamala* Nees. from different locations of Uttarakhand. *J Non-Tim Forest Prod* 2009; **16**: 191-194.

[7] Kar A, Choudhary BK, Bandyopadhyay NG. Comparative evaluation of hypoglycaemic activity of some Indian medicinal plants in alloxan diabetic rats. *J Ethnopharmacol* 2003; **84**:105-108.

[8] Chakraborty U, and Das H. Antidiabetic and Antioxidant Activities of *Cinnamomum tamala* Leaf Extracts in STZ-treated Diabetic Rats, Global Journal of *Biotechnology & Biochemistry* 2010; **5** (1): 12-18.

[9] Rao CV, Vijayakumar M, Sairam K, Kumar V. Antidiarrhoeal activity of the standardised extract of *Cinnamomum tamala* in experimental rats, *Journal of natural medicines* 2008; **62**(4): 396-402.

[10] Dhulasavant V, Shinde S, Pawar M, Naikwade NS. Antihyperlipidemic Activity of *Cinnamomum tamala* Nees, on High Cholesterol Diet Induced Hyperlipidemia, *International Journal of PharmTech Research* 2010; **2**(4): 2517-2521.

[11] Semwal AD, Sharma GK, Arya SS. Pro-or antioxygenic activity of tejpat (*Cinnamomum tamala*) and red chilli (Capsicum annum) in sunflower oil, *Journal of the Science of Food and Agriculture* 1999; **79**(12): 1733-1736.

[12] Gambhire MN, Juvekar AR, Wankhede SS. Anti-inflammatory activity of aqueous extract of *Cinnamomum tamala* leaves by in vivo and in vitro methods, *Journal of Pharmacy Research* 2009; **2**(9): 1521-1524.

[13] Reddy GVM et al. Acaricidal activity of aqueous extracts from leaves and bark of cinnamomum and jatropha against two spotted spider mite, Tetranychus urticae Koch, *Karnataka J Agric Sci* 2009; **22**(3): 693-695.

[14] Selvam NT et al. Hepatoprotective Activity Of Methanolic Extract Of *Cinnamomum Tamala* (Nees) Against Paracetamol Intoxicated Swiss Albino Mice, *International J Pharm World Res* 2010; **1**(2):1-13.

[15] Eswaran MB, Surendran S, Vijayakumar M, Ojha SK, Rawat AKS, Rao CV. Gastroprotective activity of *Cinnamomum tamala* leaves on experimental gastric ulcers in rats. *J Ethnopharmaco* 2010; **128**: 537-540.

[16] Chaurasia JK, Pandey N and Tripathi YB. Effect of hexane fraction of leaves of *Cinnamomum tamala* Linn on macrophage functions. I*nflammopharmacology* 2010; **18**(3):147-154.

[17] Adams RP. Identification of essential oils components by gas chromatography/quadrupole mass spectroscopy. Illinois, USA: Allured Publishing Corporation; 2001, p.56

[18] Thappa RK, Bakshi SK, Dhar PL, Agarwal SG, Kitchlu S, Kaul MK, Suri KA. Significance of changed climatic factors on essential oil composition of Echinacea purpurea under subtropical conditions. *Flavour and Fragrance Journal* 2004; **19**(5): 452-454.