Journal of Essential Oil Research

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tjeo20

Leaf Essential Oils of Cinnamomum glanduliferum (Wall) Meissn and Cinnamomum glaucescens (Nees) Meissn

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Published online: 28 Nov 2011.

J. Essent. Oil Res., **18**, 200-202 (March/April 2006)

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Abstract

The leaf essential oils of *Cinnamomum glanduliferum* (Wall) Meissn and *C. glaucescens* (Nees) Meissn growing wild in northeast India were studied by GC and GC/MS. Thirty-six and 15 components representing 67.8% and 98.7% of the total oils of *C. glanduliferum* and *C. glaucescens*, respectively, were identified. (E)-Nerolidol (52.2%) was the major component in *C. glanduliferum*, while elemicin (92.9%) was the predominant component in *C. glaucescens.* The occurrence of (E)-nerolidol (52.2%) and elemicin (92.9%) as a major component in the leaf oils of *C. glanduliferum* and *C. glaucescens*, respectively, are reported here for the first time in this genus. These results of comparisons with those previously reported for the same plant parts revealed that *C. glanduliferum* leaf oil is a chemotype source for (E)-nerolidol, while *C. glaucescens* leaf oil is a new source of elemicin.

Key Word Index

Cinnamomum glanduliferum, *Cinnamomum glaucescens*, Lauraceae, essential oil composition, (E)-nerolidol, elemicin, chemotype.

Introduction

Cinnamomum glanduliferum and C. glaucescens (Lauraceae) are large-sized evergreen tree species native to the tropical Himalayan regions of India and Nepal. In northeast India, *C. glanduliferum* and *C. glaucescens* occur naturally in both the hills and plains up to an altitude of 1200 m and are known locally by the common name 'Gondsoroi tree.' Almost all parts of the plants are aromatic. The wood of *C. glaucescens* imparts an oil rich in safrole, myristicin and elemicin (1). Berries of this plant also yield Sugandha kokila oil of commercial value (2,3). However, there appears to be no report on the leaf oil of this species. The wood and leaf of *C. glanduliferum* also yield essential oils. The plant's wood contains d-camphor and is reported to be a good substitute for Sassafras (4), while the leaf oil, possessing a camphoraceous odor, is rich in cineole (1,5). The present communication was aimed at furthering knowledge of the chemical composition of the leaf oils of these two taxa of *Cinnamomum* growing wild in northeast India.

Experimental

Plant material: The leaves of *C. glanduliferum* and *C. glaucescens* were collected from mature trees growing wild in the Chessa area (100 m) of Arunachal Pradesh, and Jorhat (87 m) of Assam, India, respectively. Voucher specimens of the taxa (RRLJ 1613 and RRLJ 1869) were deposited at the Herbarium of Regional Research Laboratory (CSIR), Jorhat, Assam, India.

Oil isolation: Three hundred grams of fresh leaves of each taxon were cut into small pieces and hydrodistilled separately in a Clevenger-type apparatus for 3 h. The oils obtained were dried over anhydrous Na_2SO_4 and stored in sealed glass vials under refrigeration prior to analysis.

Analysis: Physico-chemical properties like refractive index and oil density were determined using a Carl Zeiss 3300 g ABBE Refractometer and classical weighing method with the help of pycnometer, respectively.

GC: A Perkin-Elmer Autosystem XL gas chromatograph equipped with a FID detector and an HP-1 fused silica column

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Received: July 2004
Revised: December 2004
Accepted: January 2005

1041-2905/06/0002-0200$14.00/3—

(25 m x 0.20 mm, 0.25 µm film thickness) was employed. The oil samples, dissolved in hexane, were injected in the split mode, using pressure-controlled He as carrier gas at a linear velocity of 30 cm/s (at 60°C). The injector and detector temperatures were maintained at 250°C. The column oven temperature was programmed from 60°C (after 2 min) to 250°C at 4°C/min. The final temperature was held for 20 min. Peak areas and retention times were measured by electronic integration. The relative amounts of individual components were based on the peak areas obtained, without FID response factor correction.

Table I. Percentage composition of leaf oils of *Cinnamomum glanduliferum* and *C. glaucescens*

Components	*C. glanduliferum*	*C. glaucescens*
2-methyl-2-propenal	0.1	-
2-methyl-3-buten-2-ol	0.2	-
3-methyl-1-penten-3-ol	0.2	-
(E)-2-pentenal	0.2	-
hexanal	-	t
(E)-2-hexenal	-	t
(Z)-3-hexenol	-	t
heptanal	-	0.1
α-pinene	0.9	-
camphene	t	-
sabinene	0.7	-
β-pinene	1.0	t
myrcene	t	-
α-phellandrene	t	-
p-cymene	0.3	-
1,8-cineole	0.1	-
limonene	1.0	t
(E)-β-ocimene	-	t
γ-terpinene	0.2	-
trans-sabinenehydrate	0.3	-
cis-linalool oxide (furanoid)	0.1	-
trans-linalool oxide (furanoid)	t	-
cis-sabinenehydrate	0.1	-
linalool	1.0	t
trans-pinocarveol	0.3	-
terpinen-4-ol	0.3	-
myrtenal	0.1	-
α-terpineol	t	-
myrtenol	0.1	-
trans-carveol	t	-
carvone	0.2	-
piperitone	t	-
geranial	t	-
safrole	-	t
bornyl acetate	t	-
thymol	0.2	-
eugenol	0.5	-
neryl acetate	t	-
methyl eugenol	-	4.9
trans-α-bergamotene	-	0.2
epi-β-santalene	-	t
β-selinene	0.7	-
(E,E)-α-farnesene	-	0.1
elemicin	0.8	92.9
(E)-nerolidol	52.2	0.5
caryophyllene oxide	6.0	-

t = < 0.1

Temperature programmed (linear) retention indices of the compounds were determined relative to n-alkanes.

GC/MS: Analyses were carried out on a Hewlett-Packard 5970A mass selective detector (MSD), directly coupled to an HP 5790A gas chromatograph. A 25 m x 0.20 mm fused silica HP-1 column with a film thickness of 0.33 µm was employed. The column oven temperature was programmed from 60°C (after 3 min), then 5° C/min to 300°C (30 min). The injector and GC/MS interface temperatures were maintained at 280°C and 300°C, respectively. He carrier gas was pressure-controlled to give a linear gas velocity of 44 cm/s (at 60°C). Electron ionization mass spectra were acquired over the mass range 10-400 Da at a rate of 2 spectra/s.

Component identification: The components of the oils were identified by matching their 70 eV mass spectra and linear temperature programmed retention indices with standard references (6-15).

Results and Discussion

The oils, obtained in 0.4% yield (FWB), each from *C. glanduliferum* and *C. glaucescens,* were colorless to pale-yellow mobile liquids. Refractive indices (25°C) and densities (29°C) of the oils were as follows: *C. glanduliferum* = 1.4834 and 1.0221; *C. glaucescens* = 1.5230 and 1.0321.

The composition of oils of the taxa is presented in Table I. Thirty-six and 15 components of *C. glanduliferum* and *C. glaucescens* were identified, representing 67.8% and 98.7%, respectively, of the total oils. The oil obtained from *C. glanduliferum* could be characterized by the dominance of (E)-nerolidol (52.2%), followed by caryophyllene oxide (6.0%), while elemicin was the predominant component (92.9%), followed by methyl eugenol (4.9%), in the oil from *C. glaucescens* leaf.

The leaf oil of *C. glanduliferum,* which contains cineole as the major component, followed by linalool, camphor and α-terpineol, has been previously reported (1,5); in contrast, in the same species presently investigated, (E)-nerolidol was the major component, followed by 35 other components (Table I). This finding indicates the natural existence of two chemotype oils of *C. glanduliferum* leaf. However, no report on the leaf oil of *C. glaucescens* could be found. Thus, the present finding on leaf oil of *C. glaucescens* could be contemplated as a new report. Likewise, there appears to be no report so far on the occurrence of (E)-nerolidol and elemicin as major components in the oils of *Cinnamomum* members other than the plant species presently investigated. Thus, the present finding in context of major components is a novel report to the genus. The industrial importance of elemicin has recently been founded due to its use as a starting material for the synthesis of trimethoxyprem in the production of the antibacterial drug septran (16). The importance of (E)-nerolidol for industrial application has also been stressed recently (17). Thus, the possibility for commercial utilization of these oils may exist.

Acknowledgments

The authors are grateful to the director and head of the Division of Medicinal, Aromatic & Economic Plants of Regional Research Laboratory, Jorhat, Assam, India for their keen interest in the work. The authors are also thankful to late P.A. Leclercq, Department of

Chemical Engineering, Eindhoven university of Technology, the Netherlands for providing analytical data.

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