Journal of Essential Oil Research

ISSN: 1041-2905 (Print) 2163-8152 (Online) Journal homepage: https://www.tandfonline.com/loi/tjeo20

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To cite this article: Jubilee Purkayastha & Subhan C. Nath (2006) Composition of the Camphor-rich Essential Oil of *Ocimum basilicum* L. Native to Northeast India, Journal of Essential Oil Research, 18:3, 332-334, DOI: 10.1080/10412905.2006.9699104

To link to this article: https://doi.org/10.1080/10412905.2006.9699104

Published online: 28 Nov 2011.

J. Essent. Oil Res., **18**, 332-334 (May/June 2006)

Composition of the Camphor-rich Essential Oil of *Ocimum basilicum* L. Native to Northeast India

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Abstract

The essential oil of the aerial parts of *Ocimum basilicum* (native to northeast India) obtained by hydrodistillation was analyzed by GC and GC/MS. Forty-four components, representing about 92% of the total oil, were identified. Camphor (42.1%), followed by limonene (7.6%) and β-selinene (5.6%), was the major component of the oil.

Key Word Index

Ocimum basilicum, Lamiaceae, essential oil composition, camphor, limonene.

Introduction

Ocimum basilicum L. (Lamiaceae), known in trade as "basil" or "sweet basil," is an aromatic herb native to tropical Asia and the Pacific Islands that is distributed mainly in the tropics and sub-tropics of both hemispheres. This species has the most economic importance of the *Ocimum* genus and is cultivated and utilized throughout the world. The aromatic leaves are used fresh or dried as a flavoring agent for food, confectionary products and beverages (1). The plant is considered to be a stomachic, anthelmintic, alexipharmic, antipyretic, diaphoretic and expectorant, as well as a stimulant and carminative (1,2). The leaves are also used in folk medicine for bronchitis, chest and lung complaints, rheumatism and inflammation, hypertension and as a contraceptive (3,4,5,6). The essential oil obtained from the herb is mainly used in food industries and high-grade perfumery; it has also been found to possess antimicrobial properties (7).

Ocimum basilicum is highly polymorphic. The case of cross-pollination leads to a large number of forms (8). Likewise, the species is characterized by great variability in chemical composition. Based on their chemical composition and geographical source, basil oils have been conventionally classified into four types (1). European basil oil—from Italy, France, Bulgaria, Egypt and South Africa—is considered to have finest flavor and has methyl chavicol and linalool as major components. Reunion basil—from Comoro Island, Thailand, Madagascar and Vietnam—is characterized by a high concentration of methyl chavicol. Tropical basil oil—from India, Guatamala and Pakistan—is rich in methyl cinnamate, and basil oil from North Africa and the former USSR is rich in eugenol. In addition to these, other basil oils have also been reported which contained various quantities of linalool, camphor, methyl chavicol, methyl cinnamate and eugenol (9).

Ocimum basilicum is also growing wild in northeast India. While conducting an ethnofloristic survey of Lamiaceae members growing in Assam, in northeast India, we have come across a wild population of *O. basilicum* possessing a camphoraceous odor. Thus, as a part of an exploration of medicinal and aromatic plants in Assam, India, we investigated the oil of the species and the result obtained is communicated in this paper.

Experimental

The plant materials were collected during summer season from plants growing wild in the upper Brahmaputra valley region of upper Assam. Voucher specimens (RRLJ-1758) were deposited in the Herbarium of Regional Research Laboratory, Jorhat, Assam. Freshly collected aerial parts were cut into small pieces and hydrodistilled for 3 h using a Clevenger-type apparatus (10).The oil was dried over anhydrous sodium sulfate and stored in a sealed container under refrigeration prior to analysis.

GC analysis was done using a Hewlett-Packard 5890 Series II gas chromatograph equipped with a FID detector and a HP-1 fused silica column (24 m x 0.32 mm, 0.25 μm film thickness). The sample was injected in the split mode, using pressure-controlled He as carrier gas at a linear velocity of 30 cm/sec (at 60°C). Injector and detector temperatures were maintained at 250°C. The column oven temperature was

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

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 are based on the peak areas obtained, without FID response factor correction. Linear retention indices of the compounds were determined relative to n-alkanes.

GC/MS analysis was carried out with a Hewlett-Packard 5970A mass selective detector (MSD), directly coupled to a 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)-300°C at 5°C/min. The injector and GC/MS interfaces temperatures were maintained at 280° and 300°C, respectively. Sample was injected by splitter into He carrier gas, which was pressure-controlled to give a linear velocity of 44 cm/s (at 60°C). Electron ionization mass spectra were acquired over the mass range 10-400 Daltons at a rate of 2 spectra(s).

The constituents of the oil were identified by matching their 70 eV mass spectra and retention indices with reference libraries (11-17).

Results and Discussion

The oil, obtained by hydrodistillation in 0.55% (w/w) yield, was an almost colorless, mobile liquid with a camphoraceous odor. The chemical composition of the oil is presented in Table I. Among the 44 components identified, camphor was the major component (42.1%). Other components occurring in appreciable quantities in the oil are limonene (7.6%), β-selinene (5.6%), α-pinene (5.4%), camphene (4.7%), α-selinene (4.3%), myrtenol (3.3%), β-caryophyllene (3.3%). Quite a number of chemotype oils from *O. basilicum* have been reported thus far (1,9). The occurrence of camphor (9) in various quantities in oils of *O. basilicum* have been reported, but there appears to be no report of its occurrence as the major component. Thus the *O. basilicum* oil presently investigated can be considered as yet another chemotype. The oil may also be evaluated for its commercial feasibility.

Table. I. Percentage composition of the oil of *Ocimum basilicum* native to northeast India

Compound	Percentage
tricyclene	0.1
α-thujene	0.1
α-pinene	5.4
camphene	4.7
1-octen-3-ol	1.4
β-pinene	0.2
myrcene	1.6
(Z)-3-hexenyl acetate	0.1
α-phellandrene	0.4
α-terpinene	0.2
p-cymene	0.1
1,8-cineole	0.2
β-phellandrene	0.6
limonene	7.6
(Z)-β-ocimene	tr
(E)-β-ocimene	tr
γ-terpinene	1.2
trans-sabinene hydrate	0.2
terpenolene	1.1
cis-sabinene hydrate	0.3
linalool	tr
camphor	42.1
isoborneol	0.3
borneol	1.3
terpinen-4-ol	0.6
myrtenal	0.1
α-terpineol	0.3
myrtenol	3.3
myrtenyl acetate	0.2
α-copaene	0.2
β-elemene	1.0
β-caryophyllene	3.3
γ-maaliene	0.2
β-gurjunene (calarene)	1.4
trans-α-bergamotene	0.6
α-humulene	0.3
germacrene D	0.2
β-selinene	5.6
α-selinene	4.3
γ-cadinene	0.2
δ-cadinene	0.5
globulol	0.2
α-muurolol	0.1
α-cadinol	0.2

t = trace (< 0.1%)

Acknowledgments

The authors are grateful to P.G. Rao, director, Regional Research Laboratory, Jorhat, Assam, India for his keen interest in the work. The authors also gratefully acknowledge the technical help provided by the late Piet A. Leclercq, Laboratory of Instrumental Analysis, Department of Chemical Engineering, Eindhoven University of Technology, Netherlands, in GC/MS analysis of the oil.

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