Global Journal of Medicinal Plant Research, 1(2): 207-209, 2013
ISSN 2074-0883

Chemical Composition of the Essential Oil of Camphor Basil (*Ocimum kilimandscharicum* Guerke)

R.K. Joshi

Department of Phytochemistry, Regional Medical Research Centre (ICMR), Nehru Nagar, Belgaum, Karnataka, India

ABSTRACT

The essential oil obtained by hydro-distillation of the leaves of *Ocimum kilimandscharicum* Guerke, was analyzed by gas chromatography equipped with a flame ionization detector (GC-FID) and gas chromatography coupled with mass spectrometry (GC/MS). Forty-one constituents were identified, which comprised 97.1% of the total constituents. The most abundant compound was camphor (45.9%), followed 1,8-cineol (14.6%) and limonene (8.1%).

***Key words*:** *Ocimum kilimandscharicum* Guerke, Lamiaceae, essential oil composition, camphor, 1,8-cineol.

Introduction

The genus *Ocimum*, of the family Lamiaceae, has tropical distribution with nearly two-third of the 160 species reported from West Africa and the remaining one-third from Asia and America. India is represented by nine species of *Ocimum*, mainly confined to tropical and peninsular regions (Anonymous, 1966). *O. kilimandscharicum* Guerke commonly known as 'Camphor Basil' and 'Kapur Tulsi' in Hindi, is a perennial, under shrub with simple ovate-oblong leaves. Flowers are light purplish or white. Seeds are ovoid-oblong, black to brown and mucilaginous. *O. kilimandscharicum* is an exotic West African species (Bhasin, M., 2012). The plant has carminative, stimulant, antipyretic, anti-fungal and anti-bacterial properties (Bhasin, M., 2012). Chemical composition of the essential oil of *O. kilimandscharicum* have been reported from Indiana where the major constituents were linalool (41.94-58.85%), camphor (17.0-15.82%) and 1,8-cineole (10.18-6.38%) (Charles, D.J. and J.E. Simon, 1992). Camphor (57.87%) (Vinutha, T. and L.N. Srikar, 2007) and 1,8-cineol (62.0%) (Ntezurubanza, L., et al., 1984), have been accounted from South India and Rwanda, respectively. In another report from North India camphor (53.89%), limonene (10.5%) and camphene (4.5%) (Garg, S.N., et al., 2004), were reported as the major constituents of the essential oil of *O. kilimandscharicum*.

Literature review revealed that no report is available on the chemical composition of the essential oil of the economically important plant *O. kilimandscharicum* from this region. In light of this communication this article presents essential oil composition from the leaves of *O. kilimandscharicum* collected from the Western Ghats region, one of the 34 global biodiversity hotspots (Myers, N., et al., 2000).

Materials and Methods

Plant material:

Leaves of *O. kilimandscharicum* were collected in May 2010, at a height of 800 m from medicinal garden of Regional Medical Research Centre (ICMR) Belgaum (N 15.88668; E 74.52353), Karnataka, India. The plant (voucher specimen No. RMRC-533) was identified by Dr. H. V. Hegde, Research Scientist, Regional Medical Research Centre, Belgaum.

Isolation of essential oil:

The fresh plant material (500 g) was subjected to hydro-distillation using Clevenger type apparatus for 3 h. The oil was collected and dried over anhydrous sodium sulfate and stored in sealed vials at -4°C until analysis. The oil yield was 0.18% v/w.

Gas chromatography:

The GC analysis of the oil was carried out on Varian 450 gas chromatograph equipped with FID, using stationary phase CP Sil-8-CB (30 m × 0.25 mm i.d., 0.25 µm film thickness) column. Nitrogen was a carrier gas at 1.0 mL/min flow rate. Temperature programming was 60-220°C at 3°C/min, for injector and detector

Corresponding Author: R.K. Joshi, Department of Phytochemistry, Regional Medical Research Centre (ICMR), Nehru Nagar, Belgaum, Karnataka, India
E-mail: joshirk_natprod@yahoo.com

temperatures were 230 and 250°C, respectively. The injection volume was 1.0 µL diluted in *n*-hexane; split ratio was 1: 50.

Gas chromatography-mass spectrometry:

The GC-MS analysis of the oil was carried out on Thermo Scientific Trace Ultra GC interfaced with a Thermo Scientific ITQ 1100 Mass Spectrometer fitted with TG-5 (30 m × 0.25 mm i.d., 0.25 µm film thickness) column. The oven temperature was programmed from 60-220°C at 3°C/min using helium as a carrier gas at 1.0 mL/min. The injector temperature was 230°C, injection size 0.1 µL prepared in *n*-hexane; split ratio 1:50. MS were taken at 70 eV with mass scan range of 40-450 amu.

Identification of the components:

Identification of constituents were done on the basis of Retention Index (RI, determined with reference to homologous series of *n*-alkanes C_8-C_{25}, under identical experimental condition), MS library search (NIST and WILEY), and by comparison with MS literature data (Adams, R.P., 2007). The relative amounts of individual components were calculated based on GC peak area (FID response) without using correction factor.

Results and Discussion

The chemical composition and retention index of the essential oil of leaves of *O. kilimandscharicum* are presented in Table 1. The constituents of *O. kilimandscharicum* are listed in order of their elution order on the TG-5 column. In total of forty-one constituents were identified from the leaves oil of *O. kilimandscharicum* representing 97.1% of the total oil. The most abundant compound was camphor (45.9%), followed cineol-1,8 (14.6%) and limonene (8.1%). The major compound camphor is the marker constituent of *O. kilimandscharicum*. The presence of cineol-1,8 and limonene in this study and quantitative and qualitative divergence from the northern and southern part of India, and other regions may be due to the geographical, climatic and soil conditions, which in turn may affect the composition and other secondary metabolites of the plant. However, marker compound camphor is present in remarkable amounts.

Table 1: Chemical composition of the essential oil of *O. kilimandscharicum*

Compounds	RI	Area %	Identification
Tricyclene	931	0.2	RI,MS
α-Thujene	935	0.2	RI,MS
α-Pinene	944	1.0	RI,MS
Camphene	960	5.5	RI,MS
Sabinene	981	0.1	RI,MS
β-Pinene	982	1.9	RI,MS
Myrcene	997	1.7	RI,MS
α-Phellandrene	1008	t	RI,MS
Isosylvestrene	1014	0.3	RI,MS
α-Terpinene	1022	t	RI,MS
p-Cymene	1030	0.2	RI,MS
Limonene	1035	8.1	RI,MS
Cineol-1,8	1037	14.6	RI,MS
(*Z*)-*β*-Ocimene	1043	0.1	RI,MS
(*E*)-*β*-Ocimene	1057	4.2	RI,MS
γ-Terpinene	1064	0.8	RI,MS
cis-Sabinene hydrate	1077	1.7	RI,MS
Terpinolene	1093	1.3	RI,MS
trans-Sabinene hydrate	1105	0.6	RI,MS
α-Campholenal	1132	0.2	RI,MS
Camphor	1157	45.9	RI,MS
Isoborneol	1166	0.2	RI,MS
Borneol	1173	t	RI,MS
Terpin-4-ol	1184	0.8	RI,MS
α-Terpineol	1195	2.4	RI,MS
Eugenol	1362	t	RI,MS
α-Copaene	1383	t	RI,MS
β-Cubenene	1395	t	RI,MS
β-Elemene	1398	0.1	RI,MS
α-Gurjunene	1416	t	RI,MS
β-Caryophyllene	1426	1.9	RI,MS
β-Copaene	1438	t	RI,MS
α-Humulene	1461	0.2	RI,MS
γ-Muurolene	1484	2.1	RI,MS
Cubebol	1522	0.1	RI,MS
δ-Cadinene	1529	0.1	RI,MS

Spathulenol	1586	0.1	RI,MS
Caryophyllene oxide	1591	t	RI,MS
Globulol	1599	t	RI,MS
Cubenol	1654	0.1	RI,MS
α-Cadinol	1661	0.4	RI,MS
Total Identified		97.1	

RI=Retention index relative to C_8-C_{25} *n*-alkanes on TG-5 column, MS=(GC/MS), t=trace (<0.01%)

References

Anonymous, 1966. *The Wealth of India – Raw Materials*, Vol. III, CSIR, New Delhi.

Bhasin, M., 2012. *Ocimum*- Taxonomy, medicinal potentialities and economic value of essential oil. *J. Biosphe*., 1: 48-50.

Charles, D.J. and J.E. Simon, 1992. Essential oil constituents of *Ocimum kilimandscharicum* Guerke. *J. Essent. Oil Res*., 4: 125-128.

Vinutha, T. and L.N. Srikar, 2007. Essential oil composition of *Ocimum sanctum* and *Ocimum kilimandscharicum* inoculated with biofertilizers. *Indian Perfum*., 51: 60-62.

Ntezurubanza, L., J.J. Scheffer, A. Looman and A.B. Svendsen, 1984. Composition of essential oil of *Ocimum kilimandscharicum* Grown in Rwanda1. *Planta Med*., 50: 385-388.

Garg, S.N., A.A. Naqvi, J.R. Bahl and S.P.S. Khanuja, 2004. Composition of the essential oil of *Ocimum kilimandscharicum* leaf. *Indian Perfum*., 48: 47-49.

Myers, N., R.A. Mittermeier, C.G. Mittermeier, A.B. Gustavo, D.A. Fonseca and J. Kent, 2000. Biodiversity hotspots for conservation priorities. *Nature*, 403: 853-858.

Adams, R.P., 2007. *Identification of essential oil components by gas chromatography/mass spectrometry*, 4th ed. Allured Publ. Corp., Carol Stream, IL.