AROMA PROFILE OF *EUCALYPTUS GLOBULUS*: COLLECTED FROM NORTH WEST KARNATAKA, INDIA

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Abstract: The chemical composition of the essential oil of the leaves of *Eucalyptus globulus* (Myrtaceae) grown in North West Karnataka, has been analyzed by GC and GC/MS. Forty-eight constituents were identified, accounting 97.93% of the total oil. The major compounds were á-phellandrene (40.31%), á-pinene (13.71%), â-pinene (13.31%), ã-terpinene (9.61%) and 1,8-cineol (4.96%). The oil was rich in monoterpene hydrocarbons (81.14%).

Keywords: *Eucalyptus globulus*; Myrtaceae; Essential oil; á-phellandrene; GC/MS.

INTRODUCTION

The Myrtaceae family comprises approximately 130 genera and 3000 species of trees and shrubs[1]. *Eucalyptus globulus* is an ever green tree growing up to 40 to 70 m and widely planted in the sub tropical and Mediterranean regions[2]. The fresh leaves are sometimes eating as vegetables, while the dry leaves were often smoked as cigarettes for treatment of asthma[3]. It is also to be useful in the various treatments of lung ailment, malaria, bladder and liver infection[4]. Diverse pharmacological activities like antihyperglycemic[5], hypoglycemic[6], antioxidant[7], antibacterial[8] and antifungal[9] have been reported. Essential oil derived from *Eucalyptus globulus* exhibited antimicrobial[10,11], analgesic, anti-inflammatory[12] and insecticidal[13,14] activities. Various compounds such as 1,8-cineole, á-pinene and d-limonene[13] from India, á-pinene, á-terpineol, globulol and aromadendrene from Argentina[14], á-pinene and 1,8-cineole[16] from Ethiopia, aromadendrene, á-phellandrene, 1,8-cineole, ledene and globulol[17] from Portugal, 1,8-cineol and á-pinene[18] from Tunisia, terpinen-4-ol, ã-terpinene, spathulenol, ñ-cymene, ñ-cymen-7-ol, globulol and á-phellandrene[19] from Nigeria, 1,8-cineole, limonene, á-pinene and o-Cymene[14] from Brazil have been reported. In this communication presents the chemical composition of the essential oil of *Eucalyptus globulus* collected from Western Ghats region of North West Karnataka, India and to demarcate the terpenoid profile.

EXPERIMENTAL

Plant material

The leaves of *Eucalyptus globulus* were collected from district Belgaum (N 15.88668; E 74.52353), Karnataka, India, in the month of October, 2011. The plant was identified by Dr. H. V. Hegde, Scientist, Regional Medical Research Centre (ICMR), Belgaum, Karnataka, India, where voucher specimen (No. RMRC-586) has been deposited.

Isolation of essential oil

The fresh plant materials (200 g) were hydro-distilled for 3 h using a Clevenger type apparatus. The oil was dried over anhydrous sodium sulfate and stored at -4 °C until analysis. The yield of oils was 0.3%.

Analysis of oil

The gas chromatography (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 x 0.25 mm i.d., 0.25 ìm film thickness) fused silica capillary column. Nitrogen was a carrier gas at 1.0 mL/min flow rate. Temperature programming was 60 °C - 220 °C at 3 °C/min, for injector and detector temperatures were 230 °C and 250 °C, respectively. The injection volume was 1.0 ìL diluted in *n*-hexane, split ratio was 1: 50. The gas chromatography-mass spectrometry (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 fused silica capillary column (30 m x 0.25 mm i.d., 0.25 ìm film thickness). The column temperature was programmed from 60 °C - 220 °C at 3 °C/min, using He as a carrier gas at 1.0 mL/min. The injector temperature was 230 °C, injection size 0.1 ìL 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_{28}, under identical experimental condition), MS library search (NIST and WILEY), and by comparison with MS literature data[20]. 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 of essential oil of the leaves of *Eucalyptus globulus* is presented in Table 1. The constituents of leaves oil of *Eucalyptus globulus* are listed in order of their elution order on the TG-5 column. In total of forty-eight compounds were identified from the oil representing 97.93%

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Table 1: Chemical composition of the essential oil of *Eucalyptus globulus.*

Compound	%	RI Lit	Identification
á-Thujene	1.15	938	RI,MS
á-Pinene	13.71	943	RI,MS
á-Fenchene	0.03	956	RI,MS
Camphene	0.09	958	RI,MS
â-Pinene	13.31	986	RI,MS
Myrcene	0.01	995	RI,MS
á-Phellandrene	40.31	1011	RI,MS
á-Terpinene	0.05	1023	RI,MS
p-Cymene	1.20	1032	RI,MS
Limonene	0.49	1038	RI,MS
1,8-Cineol	4.96	1040	RI,MS
(*E*)-â-Ocimene	0.02	1057	RI,MS
ã-Terpinene	9.61	1068	RI,MS
cis-Linalool oxide	0.11	1081	RI,MS
p-Mentha-2,4(8)-diene	1.16	1092	RI,MS
endo-Fenchol	0.14	1117	RI,MS
cis-p-Menth-2-en-1-ol	0.27	1126	RI,MS
trans-Pinene hydrate	0.18	1147	RI,MS
Borneol	0.21	1171	RI,MS
Terpin-4-ol	2.29	1185	RI,MS
á-Terpineol	2.25	1196	RI,MS
cis-Piperitol	0.05	1198	RI,MS
trans-Piperitol	0.09	1211	RI,MS
Carvotanacetone	0.18	1251	RI,MS
Thymol	t	1298	RI,MS
Carvacrol	t	1304	RI,MS
Eugenol	t	1362	RI,MS
Cyclosativene	0.03	1375	RI,MS
á-Ylangene	t	1378	RI,MS
Methyl eugenol	0.03	1407	RI,MS
á-Gurjunene	0.04	1413	RI,MS
â-Caryophyllene	0.21	1425	RI,MS
â-Gurjunene	0.11	1437	RI,MS
Aromadendrene	0.04	1445	RI,MS
á-Humulene	0.02	1459	RI,MS
Seychellene	t	1467	RI,MS
â-Selinene	0.05	1493	RI,MS
á-Selinene	t	1501	RI,MS
ã-Cadinene	0.02	1520	RI,MS
ä-Cadinene	t	1532	RI,MS
Elemol	t	1556	RI,MS
Caryophyllene oxide	0.02	1589	RI,MS
Khusimone	t	1599	RI,MS
Guaiol	t	1601	RI,MS
10-*epi*-ã-Eudesmol	1.72	1627	RI,MS
ã-Eudesmol	0.14	1639	RI,MS
Cubenol	2.04	1651	RI,MS
á-Muurolol	1.59	1655	RI,MS
Monoterpene hydrocarbons	81.14		
Oxygenated monoterpenes	10.73		
Sesquiterpene hydrocarbons	0.55		
Oxygenated sesquiterpenes	5.51		
Phenyl derivatives	t		
Total	**97.93%**		

't'=trace(<0.01%)

of the total oil. The major compounds were á-phellandrene (40.31%), á-pinene (13.71%), â-pinene (13.31%), ã-terpinene (9.61%) and 1,8-cineol (4.96%). The oil was rich in monoterpene hydrocarbons (81.14%) followed by oxygenated monoterpenes (10.73%), oxygenated sesquiterpenes (5.51%), sesquiterpene hydrocarbons (0.55%) and phenyl derivatives (<0.01%). The quantitative and qualitative divergence from other regions may be due to the geographical, climatic and soil conditions in the southern part of India, which in turn may affect the composition and other secondary metabolites of the plant. The present finding is intended as a contribution to the better knowledge of the chemical composition of the essential oil of the leaves of *Eucalyptus globulus.*

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