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Full Length Research Paper

Chemical component studies on the leaf and inflorescence essential oil of *Hyptis brevipes* (Poit.)

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***Hyptis brevipes* Poit. leaf and inflorescence essential oils obtained by hydrodistillation, were analyzed by gas chromatography mass spectroscopy (GC-MS). Fifty seven components were identified in the leaf oil. The major components were germacrene D (13.54%), caryophyllene (12.31%), phthalamide doxime (9.47%) and caryophyllene oxide (8.57%). Thirty seven components were identified in inflorescence oil with the main components being in caryophyllene oxide (45.09%), 1,5,5,8-tetramethyl-12-Oxabicyclo [9.1.0] dodeca-3,7-diene (4.95%), caryophyllene (4.79%) and α-bourbonene (4.20%). The compositions of both oils varied qualitatively and quantitatively.**

Key words: *Hyptis brevipes*, essential oil, GC-MS analysis, germacrene D, caryophyllene oxide.

INTRODUCTION

Hyptis brevipes Poit. (Syns. *Hyptis lanceolata* Poir, *Leucas poggeana* Briq., *Hyptis lanceifolia* Thonn., *Lasiocorys poggeana* (Briq.), *Hyptis acuta* Benth.) belongs to the family *Lamiaceae*. It is a weed of waste places, plantation crops, forest margins and becoming abundant in fallow ground. It prefers a wet tropical climate, less common in regions with a seasonal wet/dry regime (Waterhouse and Mitchell, 1998). The genus *Hyptis* comprising more than 300 species, exhibits a major morphological diversity found in various tropical and subtropical regions of the world including Bangladesh.

Most of them originate from tropical America. This specie is quite aromatic and is frequently used in treatments of gastrointestinal infections, cramps, and pain, as well as skin infections (Correa, 1931). The plant is used in the southern Sahara to treat asthma and malaria, cereals conservation (Adjanohoun et al., 1986) and to repel mosquitoes (Seyoum et al., 2002). The plant showed antibacterial and antifungal activities (Goun et al., 2003; Zollo et al., 1998). But the species *H. lanceolata* (Zollo et al., 1998) was less described. Koba et al. (2007) reported that *H. lanceolata* leaf essential oil rich in germacrene D (27.8 %), β-caryophyllene (12.6 %) and β-elemene (9.5 %).

The most abundant constituents identified in the oil of *H lanceolata* were β-pinene (40.7%) and germacrene D (19.9%) (Tchoumbougnang et al., 2005). Despite those intensive works done to investigate the chemical composition of *Hyptis* species essential oil all over the world. But there is no published report in the literature about the chemical composition of *H. brevipes* essential oil from Bangladesh. So, an attempt has been taken to investigate the chemical components of essential oil obtained from the leaves and inflorescences of *H. brevipes* grown in Bangladesh.

MATERIALS AND METHODS

Plant material

Fresh leaves and inflorescences of *H. brevipes* were collected from the plants grown in the campus of BCSIR Laboratory, Chittagong during June 2007. One-voucher specimen (Y-26) was deposited in the herbarium of BCSIR Laboratory, Chittagong.

Extraction of essential oil

Leaves and inflorescences of *H. brevipes* were cut into small pieces and subjected to hydrodistillation method using Clevenger's apparatus for 4 h (Clevenger, 1928). The oil were extracted with diethyl ether and dried over anhydrous sodium sulfate.

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Table 1. Chemical constituents of leaf essential oil of *H. brevipes.*

S/No.	Name of constituents	%
1.	℘-Cadinene	0.29
2.	(E) Ocimene	0.36
3.	℘-Elemene	7.18
4.	℘-Eudesmol	2.50
5.	℘-Muurolene	0.86
6.	12-Oxabicyclo (9.1.0)dodec-4) dienes 1,5,8-tetramethyl	0.75
7.	1H-Cycloprople azulene, 1a, 2, 3,4,7-tetransethyl, [1aR(1aL, 4L, 4aL)]	2.29
8.	1H-Cycloproly azulene, decahydro 1,1,7-trimethyl-4-methylene [1aR(1aL, 1CB, 7L, 7aB, 7bL)]	0.32
9.	1-Octen-3-ol	0.58
10.	2,3,4-Triflurobenzoie acid-4-tetrancyl ester	0.18
11.	2,6,10-Cycloundecatriene-1-one, 2,6,7,7-tetramethyl	0.17
12.	2-Pentadecanone, 6,10,14-trimethyl	0.17
13.	3-Carene	0.03
14.	5-Nonanol,2,8-Dimethyl	0.11
15.	Aromadendrene oxide	0.18
16.	β-Bisabolene	0.47
17.	β-Elemene	6.46
18.	β-Linalool	0.51
19.	β-Methyl erotoric acid	0.15
20.	β-Pinene	0.06
21.	Camphone	0.25
22.	Camphor	0.16
23.	Carotol	3.83
24.	Caryophyllene	12.31
25.	Caryophyllene oxide	8.57
26.	Cedrene	0.84
27.	Copaene	1.69
28.	Cubenol	0.55
29.	Cycloisolongi folene, 8,9-dehydro	0.09
30.	Eucalyptol	0.21
31.	Farnesol isomer a	0.17
32.	Flavan	0.45
33.	Germacrene D	13.54
34.	Germacrene D-4-ol	2.35
35.	Hexyl valerate	0.12
36.	Hotrienol	0.23
37.	Isomerlegol	1.67
38.	Isopropyl cyclohexene	0.13
39.	Juniper camphor	3.70
40.	α-Bergamotene	0.77
41.	α-Bourbonene	1.08
42.	α-Caryophyllene	4.83
43.	α-Cubebene	0.17
44.	Ledol	3.08
45.	Limonene	0.34
46.	α-Muurolene	0.15
47.	Longipinocarveol	0.49
48.	α-Pinene	0.12
49.	α-Selinene	0.67
50.	α-Thujene	0.10
51.	Neryl acetate	0.07

Table 2. Chemical constituents of inflorescence essential oil of *H. brevipes*.

S/No.	Name of constituents	%
1	℘ -Gvrjunenep oxide (2)	0.72
2	℘-Elemene	1.08
3	℘-Muurolene	0.67
4	[+] 1-Cyano-d-Camphidine	2.84
5	1,5,5,8-Tetramethyl-12-Oxabicyclo [9.1.0] dodeca-3,7-diene	4.95
6	1-Octen-3-ol	2.41
7	3-Isopnpytricyc[4,3,1(2.5)] oxide-3-en-10-0l	0.66
8	Abieta-8(140,9(11).1.2-triene	1.64
9	Aexyl-2-methylbatyrath	0.58
10	Aromadendrene oxide	2.70
11	β-Bisabolene	0.61
12	Caryophyllene	4.79
13	Caryophyllene oxide	45.09
14	Copaene	1.69
15	Curcumene	0.87
16	Germacrene D	1.05
17	Kamran 18-al, 17-(acetylony)-, [4B]	0.78
18	Lanceol-cis	1.12
19	α-Bnyphyllene	1.45
20	α-Bourbonene	4.20
21	α-Cadinol	3.72
22	α-Crbenene	0.46
23	Ledene alcohol	0.71
24	Linalool	1.58
25	Longipinocerleol, trcns	0.55
26	Neoclovene-(1), dihydro	1.53
27	Nerolidyl propionate	0.69
28	Nonanal	0.28
29	O-Cymene	0.78
30	Oleyl alcohol	0.42
31	Patchoulane	0.91
32	Phytol	3.46
33	Retinal	1.16
35	Solavetivone	1.24
36	Spathulenol	0.91
37	trans -Undec-4-enal	1.46
38	Trans-Nerolidol	0.83

GC-MS analysis

The essential oils from leaves and inflorescences of *H. brevipes* were analyzed by GC-MS electron impact ionization (EI) method on GC-17A gas chromatograph (Shimadzu) coupled to a GC-MS QP 5050A Mass Spectrometer (Shimadzu); fused silica capillary column (30 m x 0.25 mm; 0.25 µm film thickness), coated with DB-5 ms (J and W); column temperature 100˚C (2 min) to 250˚C at the rate of 3˚C/min; carrier gas, helium at constant pressure of 90 Kpa. Acquisition parameters full scan; scan range 40 to 350 amu. Samples were injected by splitting and the split ratio 1:20.

Identification of the compounds

Compound identification was done by comparing the NIST library data of the peaks with those reported in literature, mass spectra of the peaks with literature data. Percentage composition was computed from GC peak areas on BD-5 ms column without applying correction factors.

RESULTS

Essential oils from the leaves and inflorescences of *H. brevipes* were analyzed by GC-MS. The oil yields were 0.80 and 1.45%, respectively. Tables 1 and 2 reported the composition of the leaf and inflorescence oils of *H. brevipes*. The major constituents of the leaf essential oil were germacrene D (13.54%), caryophyllene (12.31%),

phthalamide doxime (9.47%), caryophyllene oxide (8.87%), ℘-elemene (7.18%), β-elemene (6.46%), α-caryophyllene (4.83%), carotol (3.83%), juniper camphor (3.70%), ledol (3.08%), ℘-eudesmol (2.50%), 1H-cycloprople azulene, 1a, 2, 3,4,7-tetransethyl, [1aR(1aL, 4L, 4aL)] (2.29%), copaene (1.69%), isomerlegol (1.67%), valencene (1.31%) and α-bourbonene (1.08%). On the other hand, the inflorescence essential oil contained caryophyllene oxide (45.09%), 1,5,5,8-tetramethyl-12-Oxabicyclo [9.1.0] dodeca-3,7-diene (4.95%), caryophyllene (4.79%), α-bourbonene (4.20%), α-cadinol (3.72%), phytol (3.46%), [+] 1-cyano-d-camphidine (2.84%), aromadendrene oxide (2.70%), 1-octen-3-ol (2.41%), copaene (1.69%), abieta-8(140,9(11).1.2-triene (1.64%), linalool (1.58%), neoclovene-(1), dihydro (1.53%), trans -undec-4-enal (1.46%), α-bnyphyllene (1.45%), solavetivone (1.24%), retinal (1.16%), lanceol-cis (1.12%), ℘-elemene (1.08%) and germacrene D (1.05%). These oils composition are close to the reported oil in Cameroon (Tchoumbougnang et al., 2005), Togo (Koba et al., 2007) with the exception that the oils have relatively high amount of germacrene D, caryophyllene and caryophyllene oxide.

DISCUSSION

The study reveals that composition of the oil differs from the earlier reports and may, therefore be treated as different chemotypes. On the basis of aforementioned fact, it may be concluded that *H. brevipes*, growing widely in Bangladesh, may be utilized as a source for the isolation of natural germacrene D and caryophyllene oxide, respectively. The high concentration of germacrene D and caryophyllene oxide in leaf and inflorescence oil make it potentially useful in the medicines because they exhibit antibacterial and antifungal activities (Goun et al., 2003; Zollo et al., 1998). Germacrene D is typically produced in a number plant species for their antimicrobial and insecticidal properties, though it also played a role asinsect pheromones (He and Cane, 2004). Caryophyllene oxide, an oxygenated terpenoid, well known as preservative in food, drugs and cosmetics, has been tested *in vitro* as an antifungal against dermatophytes and it permitted testing and comparing the efficiency of different antifungal drugs (Yang et al., 1999). *H. brevipes* oil was found to contain caryophyllene oxide and caryophyllene, which are responsible for its antimicrobial activities (Singha et al., 1993). However, further study has to be conducted for its confirmation. It is worth noting that the oil of *H. brevipes* has been reported to be used in folk medicine in the treatment of asthma and malaria, cereals conservation and to repel mosquitoes.

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