Bangladesh J. Sci. Ind. Res. **41**(1-2), 97-100, 2006

Growth, Yield, Oil Content and Composition of *Cymbopogon Jwarencusa* in Bangladesh

Jasim Uddin Chowdhury, Nemai Chandra Nandi, Minhaj Uddin, Majibur Rahman and Mir Ezharul Hosain

BCSIR Laboratories, P. O. Chittagong Cantonment, Chittagong-4220, Bangladesh

Abstract

Cymbopogon jwarencusa, an aromatic grass recently introduced in Bangladesh was studied for its growth, yield, oil content and composition of the oil. The herbage yield and oil content were highest in 2nd and 1st cutting respectively. Among the thirty three compounds identified by GC- MS, piperitone (85 %) was the single major compound in the oil. Among others, eucalyptol (2.2 %), camphene (2 %) and β-elemene (1.4 %) are mentionable.

Introduction

Cymbopogon jwarencusa (Jones) Schultz. is an aromatic grass with densely tufted roots, growing wild in Kashmir, Uttar Pradesh, Rajasthan, Madhay Pradesh and Assam of India.[1,2] It is also found in Sind pradesh of Pakistan. The grass yields about 1 % essential oil containing 90 % piperitone. Oil from Sind contains 44 % ketone.[1,3] Thappa *et al*[4] reported 22 % piperitone in its oil as major constituents of the oil. Piperitone on conversion yields menthol/thymol with great pharmaceutical utility. In China piperitone has been used as an asthomlytic.[5] It is also reported to as carminative, stimulant and emmenagogue, diaphoretic in chronic rheumatism, in coughs, cholera etc.[1,3] Singh *et al*[6] reported it as fungicidal. Guenther[7] reported two types of oil containing ketone, 77 % and 44 %.

Sobti *et al*[8] reported presence of 50-60 % piperitone from the plants grown in Srinagar. Detection of car-4-ene (20 %), pipertione (44 %), car-3-ene (2 %), β-caryophyllene (1.5 %), p-cymene (1 %), piperitol (18 %), perillyl alcohol (10 %), farnesol (1 %) and palmitic acid (2 %) reported in Compendium of Indian Medicinal Plants.[9] Dhar *et al*[10] reported the presence of up to 63 % piperitone from the plants grown in India. This plant is not available in Bangladesh and introduced in 2001. Its growth and yield

performances along with the chemical constituents of the essential oil were studied.

Materials and Methods

The herbs were collected from the experimental field of BCSIR Laboratories, Chittagong. Data on plant height and herb yield were recorded and the essential oils were isolated by hydro-distillation using Clevenger apparatus for four hrs. The oil obtained was dried over anhydrous sodium sulphate.

GC-MS analysis : The oil of *Cymbopogon jawarencusa* was analyzed by GC-MS Electron Impact Ionization (El) method on GC-17A gas chromatograph (Shimadzu) coupled to a GC/MS QP 5050A Mass Spectrometer (Shimadzu); fused silica capillary column (30m x 2.5mm; 0.25 μm film thickness), coated with DB-1 (J&W); column temperature 40^{O} C (2 min) to 170^{O} C at the rate of 3^{O} C/min; carrier gas, helium at constant pressure of 90 Kpa. Acquisition parameters full scan; scan range 40-350 amu. The compounds were identified from the NIST library data.

Results and Discussion

Table I shows the growth and yield performances of *C. jwarencusa* plant. The highest plant height, herb weight per plant, and essential oil content were found to be 48.5 cm, 351.2gm and 1.86 % (volume by fresh weight basis) respectively. Table II shows the chemical constituents of the essential oil. Thirty-three compounds were identified by GC-MS of which piperitone (85.04 %) was found to be the single major compound in the oil. Other major compounds were eucalyptol (2.24 %), camphene (2.11 %) and β-elemene (1.44 %). Results revealed that *C. jwarencusa* thrives well in Bangladesh conditions than India[8,10] in respect of oil (upto 1.2 %) and piperitone (45-70 %) contents in the oil. It was found that *C. jwarencusa* grows comparatively well in upper lands and can not tolerate water logging. It can be cultivated commercially as a source of piperitone in Bangladesh.

Table I. Growth and yield parameters of *Cymbopogon jwarencusa*

Parameters	Cuttings		
	1st	2nd	3rd
Plant Height (cm)	38.80	40.00	33.90
Herb yield/Plant (gm)	249.3	351.2	201.6
Moisture content (%)	67.50	72.00	73.80
Oil content (%)	1.86	1.79	1.59

Table II. Composition of the essential oil in *Cymbopogon jwarencusa*

Sl. No.	Chemical compounds	Molecular weight	Molecular formula	%
1.	Benzene methanol, α, α, 4-trimethyl	150	$C_{10}H_{14}O$	0.60
2.	2(3H)-Benzofuranone, hexahydro 3-3methyle	152	$C_9H_{12}O_2$	0.09
3.	Biisobutenyl	110	C_8H_{14}	0.33
4.	Tert-Butylbenzoquinone	164	$C_{10}H_{12}O_2$	0.21
5.	1-Butyne-3-one, 1-(6,6-dimethyl-1,2 epoxycyclohexyl)	192	$C_{12}H_{16}O_2$	0.15
6.	Camphene	136	$C_{10}H_{16}$	2.11
7.	2-Caren, 10-al	150	$C_{10}H_{14}O$	0.15
8.	Trans-2-Caren-4-ol	152	$C_9H_{16}O$	0.21
9.	Caryophyllene	166	$C_{10}H_{14}O_2$	0.47
10.	Caryophyllene oxide	220	$C_{15}H_{24}O$	0.71
11.	2-Cyclohexen-l-one,4-hydroxy-3-methyl-6 (l-methylethyl), trans	168	$C_{10}H_{16}O_2$	0.58
12.	Cyclopentane acetaldehyde, 2-formyl-3-methyl, a-methylene	210	$C_{13}H_{22}O_2$	0.18
13.	Dicyclobutylidene oxide	124	$C_8H_{12}O$	0.33
14.	Dimethylhepta-2,4-diene	124	C_9H_{16}	0.24
15.	β-Elemene	204	$C_{15}H_{24}$	1.44
16.	Eucalyptol	154	$C_{10}H_{18}O$	2.24
17.	Eucarvone	150	$C_{10}H_{14}O$	0.27
18.	γ-Eudesmol	222	$C_{15}H_{26}O$	0.16
19.	1H-Indene, 1-ethylidene octahydro-7a-methyl-	164	$C_{12}H_{20}$	0.14
20.	Ledol	222	$C_{15}H_{26}O$	0.41
21.	Limonene-1, 2-epoxide	152	$C_9H_{12}O_2$	0.20
22.	Cis-p-Mentha-2, 8-dien-1-ol	152	$C_{10}H_{16}O$	0.22
23.	Trans-p-2, 8-Menthadien-1-ol	152	$C_{10}H_{16}O$	0.15
24.	6-Methyl-3-Cyclohexen-1-canboxaldelyde	124	$C_8H_{12}O$	0.15
25.	Neryl acetate	196	$C_{12}H_{20}O_2$	0.21
26.	Neryl propionate	210	$C_{13}H_{22}O_2$	0.15
27.	Octahydroindole	125	$C_8H_{15}N$	0.40
28.	Trans-Piperitol	154	$C_{10}H_{18}O$	0.66
29.	Piperitone	136	$C_{10}H_{16}O$	85.04
30.	6-Propenylbicyclo [3.1.0] hexan-2-one	136	$C_9H_{12}O$	0.32
31.	Umbellulone	150	$C_{10}H_{14}O$	0.20
32.	Verbenol	152	$C_{10}H_{16}O$	0.45
33.	Verbenone	150	$C_{10}H_{14}O$	0.85

References

1. Anonymous. The Wealth of India, Raw materials, CSIR, New Delhi, India, **2** (1950) 424-425.

2. A. K. Dhar, R. K. Thappa and C. K. Atal. *Plant Med*., (1981) 13-18.

3. R. N. Chopra, S. L. Nayar and I. C. Chopra, Glossary of Indian Medicinal Plants, CSIR, New Delhi, Indian. (1956) 87.

4. R. K. Thappa, S. G. Agarwal, K. L. Dhar and C. K. Atal. *Indian Perfum* **23** (1979) 14-15.

5. X. Peigen. *J. Ethnopharma*., **1** (1983) 95-109.

6. A. K. Singh, A. Dikshit, M. L. Sarma and S. S. Dixit. *Econ. Bot*., **34** (1980) 184-190.

7. E. Guenther. The Essential Oils, R E K Publishing Co., Huntington, New York. **III** (1949) 683-685.

8. S. N. Sobti, V. Verma and B. L. Rao. In Cultivation and Utilization of Aromatic Plants (ed. Atal C.K and Kapur B. M.), RRL, Jammu-Tawi, India (1982) 302-307.

9. R. P. Rastogi (Ed.). Compendium of Indian Medicinal Plants, CDRI, Lucknow & PID, New Delhi, India, **2** (1991) 240.

10. A. K. Dhar, R. S. Dhar, K. Rekha and S, Latto. *Indian Perfum*., **41(2)** (1997) 51-52.