Short Communication

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VARIABILITY IN YIELD AND VOLATILE CONSTITUENTS OF *CYMBOPOGON JAWARANCUSA* (JONES) SCHULT FROM PAKISTAN

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Cymbopogon jawarancusa (Gramineae) (Kirtikar and Basu 1993), locally known as Khavigrass is a perfumed grass widely distributed in the Himalayan region upto 2438 m from Kashmir to Assam. It also grows abundantly in the arid-zones of Pakistan (Sultan and Stewart 1958), especially in Mianwali, Jhang, Muzaffargarh and Campbellpur Districts. The genus *Cymbopogon* is known for the presence of economically important compounds such as citral, citronellol, geraniol, piperitone and methyl eugenol which are highly valued as flavoring agents and in the pharmaceutical industry. Although a lot of work has been carried out on the chemical composition of the essential oils (Saeed *et al* 1978; Thappa *et al* 1979; Mathela and Joshi 1981; Shahi and Sen 1989; Rao *et al* 1992; Beauchamp *et al* 1996) of this genus, yet this local variety of Punjab has not been studied earlier.

The present study deals with the physico-chemical characteristics and chemical composition of *Cymbopogon jawarancusa*.

Mature plants were collected from six different places, namely Multan, Bhakkar, Attock city, Talagang, Jhang and Kundian of the province of Punjab in the month of September. Shade dried samples (1500 g) of all were subjected to simultaneous distillation solvent/extraction for 12-15 h using Likens and Nickerson apparatus (Likens and Nickerson 1964). Oils were dried over anhydrous sodium sulphate. For complete recovery the aqueous layer was also extracted with diethyl ether, washed with water and dried over anhydrous sodium sulphate. The ether was distilled off and the last traces of the solvent were removed by flushing the oily material with nitrogen at 40°C. Both the extracts were combined to afford oils varying from 1.0 to 2.48 %. Physico-chemical parameters specific gravity, refractive index (Abbe's) acid and ester numbers were determined according to the standard procedure (Guenther 1948) and are given in Table 1.

Identification by GC. The oil was analysed on a Pye-Unicam 104 gas chromatograph equipped with a flame ionization detector, fitted with a 25 m x 0.22 mm (i.d.) WCoT SE-30 fused silica column. Hydrogen was used as the carrier gas with a flow rate of 26 cm^{-1} sec. a split ratio of 1:100 and a sample size 0.2 ul. The column temperature was programmed and was kept constant at 70°C for 4 min and elevated upto 220°C with a 4°C min^{-1} rise, while detector and injection temperature of 250°C and 300°C respectively were used . Components were identified by their retention times and peak enhancement with standard samples. Percentage of individual component was calculated on the basis of peak area using SP-4100 (Spectra Physics) computing integrator.

Volatile components of six cultivars identified by GC are presented in Table 2. A review of Table 1 and Table 2 indicates that practically there is no appreciable change in the composition and yield of essential oil. GC analysis of *C. jawarancusa* essential oil afforded fifty well resolved peaks of compounds of which fifteen were identified. Among these fifteen peaks the quantitative distribution indicated that piperitone was the most abundant compound (63.41 — 71.63 %). The composition of essential oils of the Pakistani *C. jawarancusa* resembles that of those from India (Singh and Pathak 1994) and China (Liu *et al* 1981) having 83 % and 60-70 % piperitone respectively. The chemical constituents consist of 5 monoterpene hydrocarbons and 7-oxygenated monoterpenoids and 2-sesquiterpenoids. The monoterpenoids

Table 1

Physico-chemical properties of the essential oil obtained from different areas

	A	B	C	D	E	F
	Percentage calculated from the peak area in GC.					
Yield (%)	1.5	1.02	2.00	2.48	1.28	1.37
Wt. (gm ml^{-1}) of the oil at 20°C	0.9428	0.9571	0.9598	0.9415	0.9458	0.9475
Refractive Index 20°C	1.4654	1.6460	1.4857	1.4859	1.6842	1.4864
Acid value (mg KOH g^{-1}oil)	4.85	4.92	5.6	5.02	4.34	4.00
Ester value (mg KOH g^{-1}oil)	35.10	33.40	31.1	30.5	29.20	33.5

A, Multan; B, Bhakkar; C, Jhang; D, Kundian; E, Attock City; F, Talagang.

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Table 2

Physico-chemical composition of the essential oil of *Cymbopogon jawarancusa* from six different cultivars

Compounds	A	B	C	D	E	F
	Percentage calculated from the peak area in GC.					
α-pinene	0.24	0.14	0.36	0.2	0.09	0.19
camphene	0.47	0.29	0.73	0.4	0.19	0.33
1,4-cineole	2.72	2.29	2.46	2.22	3.07	2.04
Δ^4-carene	7.67	6.36	6.94	6.89	6.09	6.60
p-cymene	0.12	0.17	0.16	0.17	0.16	0.20
1,8-cineole	3.52	3.23	3.24	3.07	3.11	2.89
Fenchone	0.14	0.16	0.19	0.20	0.07	0.10
Linalool	0.33	0.08	0.16	0.09	0.66	0.05
camphor	0.60	1.60	0.53	0.53	1.16	0.50
geranoil	0.78	0.81	0.43	0.49	0.56	0.48
terpin-4-ol	0.50	1.20	1.11	1.06	1.00	0.73
α-terpineol	1.32	0.73	0.35	0.32	0.58	0.44
piperitone	65.55	64.09	66.55	68.34	6341	71.63
β-caryophyllene	0.70	0.62	0.60	0.06	0.45	0.34
δ-cadinene	1.58	4.02	2.31	3.73	3.60	1.6

A, Multan; B, Bhakkar; C, Jhang; D, Kundian; E, Attock City; F, Talagang.

constitute 12.25 to 14.74 %, oxygenated monoterpenoids 67.44 to 73.93 % and sesquiterpenoids 1.94 to 4.64 % of the essential oils.

Key words: *Cymbopogon jawarancusa*, Gramineae, Piperitone, Monoterpenes.

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