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VOLATILES OF *OCIMUM BASILICUM* (LOCAL) AT DIFFERENT PHASES OF PLANT GROWTH

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The essential oil of *Ocimum basilicum* (Local) (0.27-0.29%) obtained by hydrodistillation of the plant at various phases was characterised by GC/MS. Among the 22 compounds identified Linalool (83.0-87.1%), 1:8 Cineole (3.2-4.7%) and Camphor (0.4-0.5%) predominated, while other constituents were either in small quantities or in traces.

Key words: *Ocimum basilicum*, Linalool, Monoterpenes.

Introduction

Ocimum basilicum (Local) N.O. Labiatae (Dymock 1992) commonly known as Niazboo is a scented herb, endemic to tropical and subtropical regions of the world. The plant is also cultivated locally, because of its numerous uses in local system of medicine (Kirtikar and Basu 1984).

Though various species of the genus *Ocimum* have been studied (Brophy and Jogia 1986; Gulati and Sinha 1989; Fleisher and Fleisher 1992; Riaz *et al* 1994) this local variety was not studied earlier.

In continuation of our screening programme of Pakistani aromatic flora, the physico-chemical characteristics and chemical composition of the essential oil of *O. basilicum* have been investigated revealing the presence of several useful aroma constituents.

Materials and Methods

Ocimum basilicum (Local variety) plants, grown in the experimental field at the premises of PCSIR Laboratories Complex, Lahore, were collected at two phases i.e. in October 1994 and November 1994. Four kg and three kg of the whole plant were separately subjected to simultaneous distillation/solvent extraction using Likens and Nickerson apparatus (1964) for 4-5h until there was no further increase in the volume of the oil collected. Oils were dried over anhydrous sodium sulphate, filtered and weighed. The oil yields were 0.29% at the pre-flowering stage and 0.27% at the flowering stage of the fresh plant.

Physico-chemical characteristics such as specific gravity, refractive index (Abbe"s), acid and ester numbers were measured according to the standard procedures (Table 1).

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Identification by GC/MS. Gas chromatographic analysis was conducted on a Shimadzu GC-14 Chromatograph equipped with a flame ionization detector, using a 25 m x 0.22 mm (i.d.) SE-30 WCOT fused silica column.

Nitrogen was used as carrier gas with a flow velocity of 1-2 ml min^{-1}, split ratio of 1:100 and sample size 0.1 µl. The column temperature was programmed at 70°C for 5 min with 5°C min^{-1} rise to 200°C, while detector and injector temperatures of 300 and 250°C respectively were used. Percentage composition of individual components was calculated on the basis of peak area using a Shimadzu C-R4A Chromatopac electronoc integrator.

Jeol Model JMS-AX 505 H Mass spectrometer combined with Hewlett Packard 5890 series gas chromatograph was used for GC/MS analysis. Oil samples were injected into a 25 m x 0.22, WCOT Bps (5% phenyl, 95% dimethyl siloxane), fused silica column, using helium as carrier gas, split ratio 1:100, EI + (Electron impact), electron energy 70 ev, ionization source temperature 250°C, interface temperature 230°C. Column temperature was programmed at 80°C for zero min. with 5°C min^{-1} rise to 230°C. Data acquisition and processing were performed by Jeol JMA-DA 5000 system with library search. Various components were identified by their retention time and M. S. library search.

Results and Discussion

The essential oil obtained by hydrodistillation of the indigenous plant at different phases was analysed by GC/MS. Its composition (Table 2) is quite similar with the one reported from the volatiles of *Ocimum basilicum* traditionally growtn in Israel having linalool as the main constituent (Fleisher and Fleisher 1992). This variety differs completely from the variety commercially cultivated in

Pakistan, *Ocimum basilicum* (Riaz *et al* 1994) having methyl chavicol as the main constituent.

A review of Table 2 indicates that the percentage of linalool, camphor and cineole decreases from pre-flowering stage to flowering stage, (Fig 1 & 2) while on the other hand the percentage of terpinolene, myrcenol and geranyl acetate increases.

Table 1

Physico-chemical characteristics of oils at different phases

Parameters	A	B
Percentage of essential oil on fresh basis	0.29	0.27
Wt. per ml. of the oil at 20°C	0.8545	0.8747
Refractive Index at 20°C	1.4658	1.4676
Acid value	1.03	2.15
Ester value	5.00	3.7

A, Preflowering stage; B, Flowering stage.

TLC and GC/MS analysis of the oil afforded 32 well resolved components out of which 21 were identified. TLC has been shown in Fig 3.

The identified chemical constituents consist of 4 monoterpene hydrocarbons, 5 oxygenated monoterpenes, 3 esters, 8 sesquiterpene hydrocarbons and one oxygenated sesquiterpene.

The compound at peak 6 was tentatively identified as linalool. Its MS showed important peaks at m/z (%) (rel.int.): 154[M]$^+$ (0.0), 71(100), 93(86.5), 41(50.0), 55(48.0) and 80(37.5). The constituent at 7 was tentatively identified as camphor. Its MS showed characteristics fragments at m/z (%), (rel.int): 152 [M]$^+$ (36.5), 95(100), 8(72.1), 41(50.0), 108(44.7) and 69(31.9). The constituent at peak 11 was tentatively identified as geranyl acetate. Its MS showed peaks m/z (%): (rel.int.) 196 [M]$^+$ (0.0) 41(100), 69(82.7), 93(70.2), 121(27.9) and 136(24.0).

Table 2

Composition of essential oils (in %)[C] in *Ocimum basilicum* (Local) at different phases of plant growth

Peak[D]	Rt. Sec.	% rel.int.	Compounds	A	B	M/z[E]
1.	169	3.25	α-pinene	0.4	0.4	93, 77, 79, 41, 121, 105
3.	200	6.90	β-pinene	0.3	T	93, 41, 69, 77, 121, 136
4.	251	60.01	1:8 cineole	4.7	3.2	43, 108, 154, 81, 71, 84
5.	256	3.96	Terpineolene	0.4	0.6	93, 79, 80, 41, 121, 126
6.	253	100.00	Linalool	87.1	86.4	71, 93, 41, 108, 152, 69
7.	389	10.85	Camphor	0.5	0.4	95, 81, 41, 108, 152, 69
7(a)	409	2.89	Myrcenol	0.8	1.43	59, 81, 93, 43, 136, 68
8.	421	2.78	4-terpineol	T	T	71, 111, 93, 154, 86, 43
9.	442	10.40	α-terpineol	T	T	59, 93, 136, 121, 81, 43
10.	473	2.15	Fenchyl acetate	T	T	81, 43, 136, 93, 121, 107
11.	482	1.05	Geranyl acetate	0.6	2.4	41, 69, 93, 121, 79, 136
13.	565	2.77	1-α-bornyl acetate	1.0	1.1	95, 136, 43, 121, 108, 55
15.	721	2.95	β-elemene	T	T	81, 93, 68, 107, 41, 121
16.	766	1.62	Humulene	0.8	0.9	93, 133, 41, 79, 120, 103
17.	789	3.23	α-bergamotene	T	T	93, 119, 41, 69, 107, 79
20.	830	2.56	γ-cadinene	T	T	161, 105, 204, 119, 91, 81
21.	859	6.92	β-cubebene	T	T	161, 105, 41, 91, 69, 204
22.	880	1.85	δ-elemene	T	T	121, 161, 204, 93, 81, 105
24.	908	9.52	γ-muurolene	T	T	161, 204, 105, 119, 91, 133
25.	916	1.66	δ-cadinene	T	T	159, 204, 134, 119, 105, 91
28.	1111	2.85	Eudesm-7-en-4-ol (Juniper camphor)	T	T	161, 204, 95, 121, 43, 105

T, Traces; A, pre-flowering; B, after flowering; C, Percentages calculated from the peak area; D, Peak numbers are given in order of appearance and compounds are listed in order of increased Rt; E, The six most intense peaks are represented; m/z, Molecular weight of the fragment over-change on the ion.

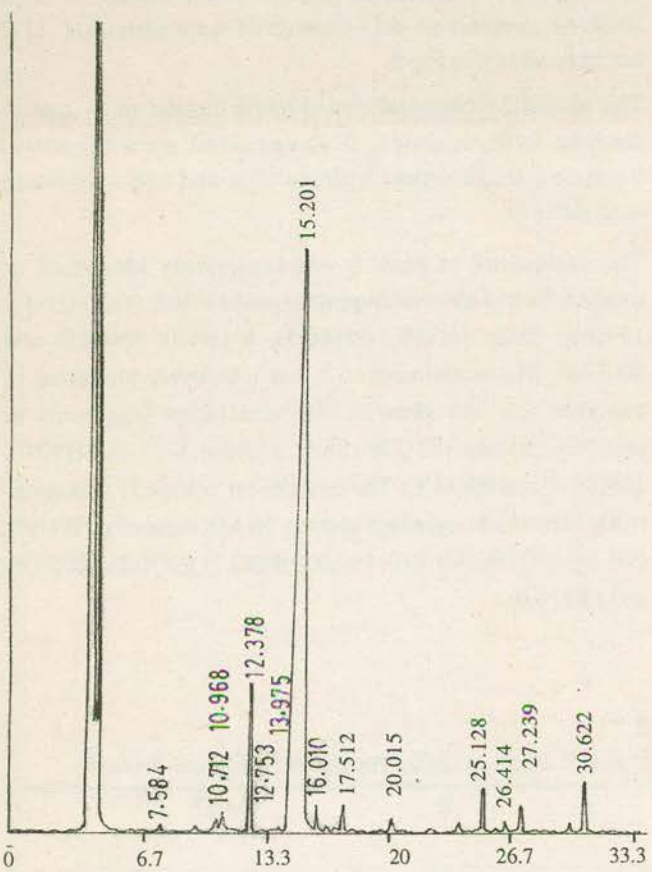

Fig 1. GC of the essential oil of *Ocimum basilicum* (local) at pre- flowering stage.

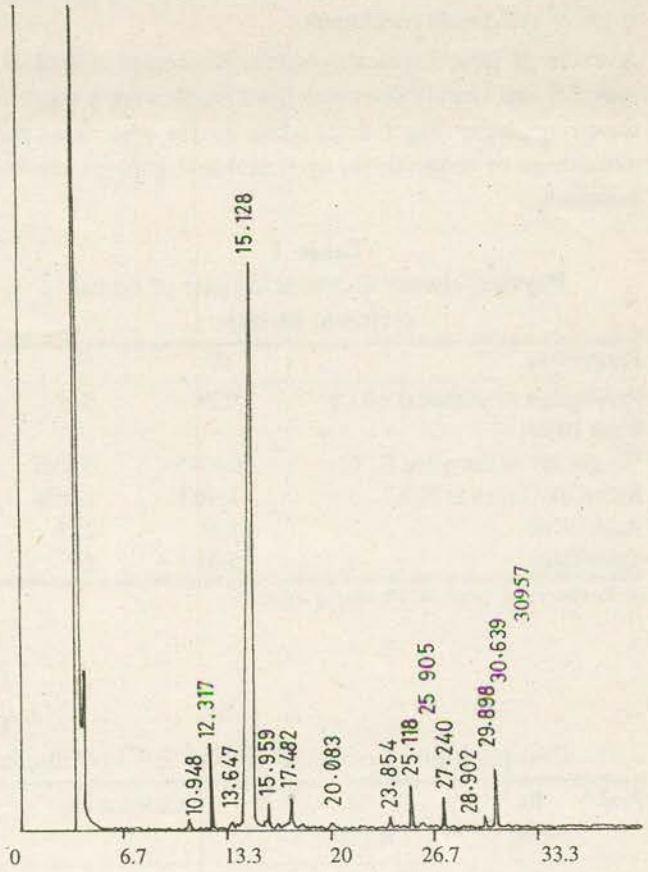

Fig 2. GC of the essential oil of *Ocimum basilicum* (local) at pre- flowering stage.

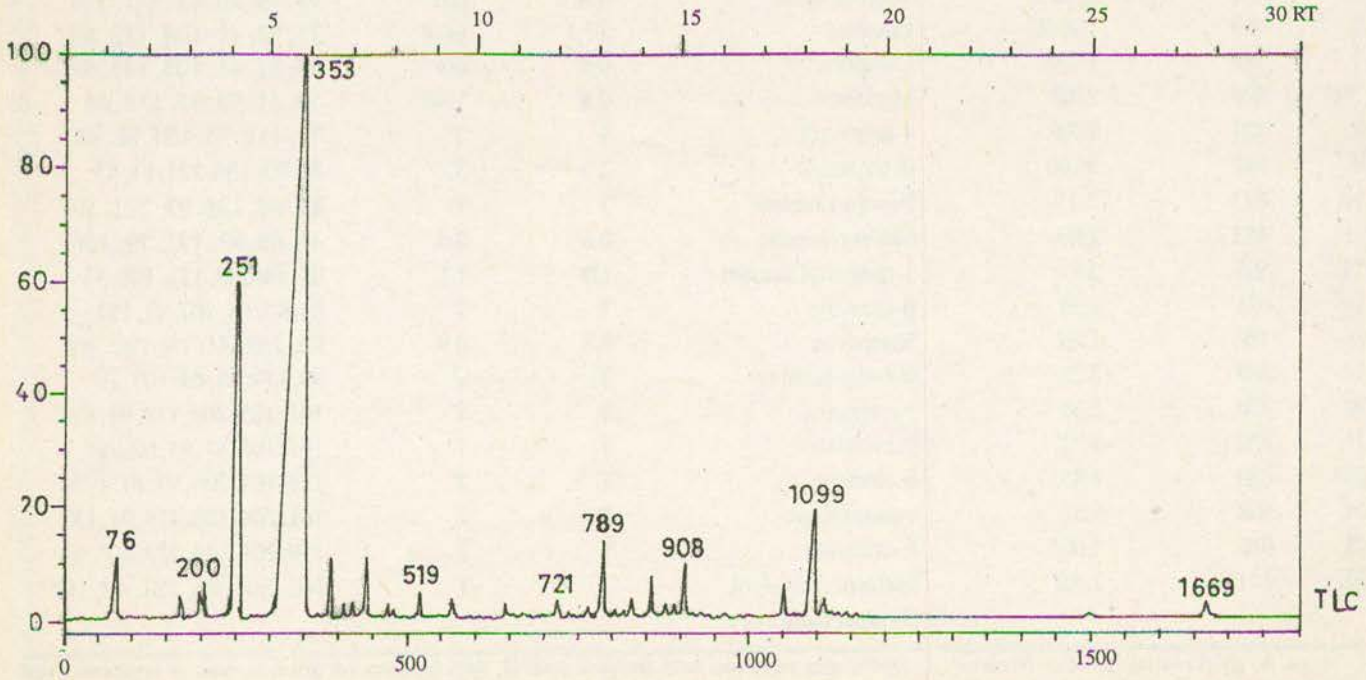

Fig 3. TLC of the essential oil of *Ocimum basilicum* (local) at pre- flowering stage.

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