Short Communication

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Seasonal Variation in the Composition of Essential Oil of *Eucalyptus camaldulensis* from Pakistan

Muhammad Rafique and F M Chaudhary

PCSIR Laboratories Complex, Shahrah-e-Jalaluddin Roomi, Lahore 54600, Pakistan

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Wide variations in composition of the essential oils have been reported earlier (Kuleman 1959; Fundero *et al* 1970; Gunay and Guniz 1974; Chawdhury *et al* 1987; Chaudhry and Rafique 1996). The essential oil of *Eucalyptus camaldulensis* Dehn Blakely (*Euc rostrata*, Baker and Smith) grown in Pakistan has been studied for its chemical composition and commercial exploitation. The oil contains 57 components, out of which 25 have been identified. The major ones being 1, 8-cineol (47.7-52.6%), terpineol (4.2-5.4%), terpinyl acetate (0.9-3.7%), linalyl acetate (3.8-5.5%), neryl acetate (5.6-6.5%), citronellyl acetate (3.7-4.7%), citronellal (1.9-2.7%) α-pinene (2.8-3.4%) β-pinene (1.7-2.5%) phellandrene (0.9-1.7%), p-cymene (1.2-1.8%) and phellandral (0.6-1.1%).

The leaves of *Eucalyptus camaldulensis* were collected in the middle of each month at regular intervals to study the variation in the yeild of the oil and chemical composition. Leaves and terminal branches (3 kg) of *E. camaldulensis* were taken in 20 l round bottomed flask. The essential oil (32.1) gm was obtained by steam distillation using Deans Stark apparatus. The light yellow coloured oil was dried over anhydrous sodium sulphate.

Table 1

Physico-chemical properties of the essential oils of *E. camaldulensis*

Month	% Yield of the essential oil	Refractive index at 24°C	Colour
Jan.	1.07	1.472	Amber
Feb	1.01	1.472	Amber
Mar.	0.99	1.472	Light pale
April	0.97	1.472	"
May	1.08	1.474	"
June	1.01	1.476	"
July	1.05	1.472	"
Aug.	1.23	1.465	"
Sept.	1.24	1.462	"
Oct.	1.25	1.468	"
Nov.	1.18	1.472	"
Dec.	1.15	1.472	"

The oil was examined on a Pye-Unicam 104 gas chramatograph with FID detector and WCOT-SE-30 column. Various components were identified by their retension time and co-injection of standard samples (Singh and Sinha 1981). Percentage composition of individual components was calculated on the basis of peak area using SP-4100 (Spectra-Physics) computing integrator.

The comparative studies indicated that the yield of the oil was minimum in April (0.97%) and then started increasing

Table 2

The percentage composition of *Eucalyptus camaldulensis* essential oils

Essential Oils	Jan.	Feb.	Mar.	Apr.	May	June.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
α-pinene	3.3	3.4	3.35	3.3	3.1	2.9	2.8	2.9	3.0	2.9	3.1	3.4
β-pinene	2.5	2.5	2.4	2.5	2.3	2.1	2.2	1.7	2.1	2.0	2.1	2.2
Δ^3-carene	0.9	0.7	1.2	1.0	0.9	1.2	1.3	1.4	1.0	1.1	0.9	1.0
unidentified	0.3	0.4	0.2	0.7	0.0	0.4	0.2	0.5	0.3	0.0	0.1	0.4
1, 8-cineol	51.7	51.8	50.8	52.1	51.5	50.8	47.7	49.8	51.6	50.7	50.6	52.6
unidentified	1.2	1.7	0.9	0.7	1.9	1.0	1.2	1.8	0.7	1.2	0.9	1.6
α-phellandrene	1.4	1.0	1.3	1.4	0.9	1.7	1.0	1.2	1.5	1.2	1.5	0.9
α-terpinene	0.3	0.2	0.4	0.3	0.1	0.4	0.4	0.3	0.2	0.3	0.2	0.4
p-cymene	1.7	1.6	1.8	1.5	1.6	1.8	1.7	1.2	1.6	1.7	1.6	1.3
y-terpinene	0.1	0.4	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1
phellandral	0.8	0.7	1.1	0.7	0.8	0.6	1.0	0.9	0.9	0.7	0.9	0.9
citronellal	2.7	2.3	2.6	2.4	1.9	2.1	2.3	2.0	2.1	2.0	1.9	2.4
cuminal	1.0	1.1	1.3	1.0	0.9	1.3	1.2	1.3	0.9	0.8	1.2	0.9
unidentified	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.2	0.2	0.1	0.0	0.0
citronellol	0.4	0.4	0.3	0.5	0.3	0.6	0.7	0.5	0.4	0.4	0.3	0.1

(Cont'd ...)

(Table 2 cont'd)

eugenol	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.3	0.4	0.6	-
geraniol	0.7	0.7	0.6	0.8	0.8	0.6	0.8	0.5	0.5	0.8	0.6	0.7
nerol	0.5	0.4	0.6	0.8	0.5	0.7	0.7	0.4	0.6	0.3	0.7	0.5
carvacrol	0.2	0.2	0.1	0.2	0.4	0.3	0.2	0.3	0.1	0.1	0.3	0.2
thymol	0.3	0.5	0.2	0.5	0.4	0.2	0.2	0.2	0.4	0.4	0.2	0.1
α-terpineol	4.7	4.6	5.4	4.7	4.2	5.1	4.7	4.6	4.2	4.4	4.6	4.5
unidentified	0.1	0.1	0.1	0.2	0.1	0.2	0.0	0.1	0.0	0.0	0.1	0.2
cuminol	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2
terpinyl acetate	3.2	3.2	3.7	2.8	3.1	3.0	2.7	2.9	3.2	0.9	1.7	3.1
linalool	0.2	0.2	0.3	0.1	0.2	0.2	0.2	0.4	0.2	0.2	0.2	0.4
aromadendrene	0.5	0.3	0.6	0.5	0.2	0.0	0.5	0.4	0.3	0.2	0.1	0.4
linalyl acetate	5.4	3.8	4.6	5.2	5.0	4.8	4.5	5.2	4.9	5.0	4.9	5.1
neryl acetate	6.2	6.3	6.5	5.8	6.0	5.6	5.9	5.7	6.3	6.1	6.4	6.2
citronellyl acetate	4.6	4.5	3.6	4.2	4.7	4.1	3.7	4.0	4.0	4.4	4.2	4.5

till it reached a maximum in October (1.25%) and constantly decreased thereafter (Table 1).

The results of essential oil composition (Table 2) indicate that the essential oil of *Eucalyptus camaldulensis* is rich in 1,8-cineol (47.7-52.6%) and can be exploited commercially.

Key words: *Eucalyptus camaldulensis,* Seasonal variation, Oil composition.

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