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STUDIES ON VOLATILE OIL OF EUCALYPTUS CAMALDULENSIS

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Introduction

Eucalyptus camaldulensis is an introduced plant to Sri Lanka. It is grown under the reforestation scheme in the dry zone. At present about 12,000 hectares are under *E. camaldulensis* plantation. These trees have a larger amount of foliage than *E. globulus.* The trees eventually will be felled for fuelwood. The leaves contain about 2% steam distillable volatile oil.The odour of this oil is somewhat different from the normal *E. globulus* leaf oil. Therefore it was felt that a detailed study of its chemical constitutents should be carried out.

Experimental

The leaves were obtained from the dry zone area in Sri Lanka and also from the experimental plants grown in the institute premises in Colombo. The leaves were allowed to whither for two days in the shade before steam distillation was carried out in an all glass apparatus (2L capacity). Total of 5kg of leaves were distilled and the oil yield was in the range1.5 — 2.0%.

Apparatus and Methods

The apparatus and techniques used for analytieal studies were column chromatography (CC), thin layer chromatography (TLC), gas liquid chromatography (GLC) and infra red spectroscopy.

The GLC analysis was carried on a Varian 2440 chromatograph equipped with a flame ionization detector (FID). 2 m × 3 mm stainless steel columns packed with Gas chrom Q 80-100 mesh coated with (1) 10% carbowax 20 M (ii) 10% SE-30 were used. Column oven temperature was programmed from 60° -200° at 4°/min. Peak areas were integrated using a PYE-UNICAM DP 88 integrator.

The fractionation of oil into hydrocarbon and oxygenated fractions was carried out on glass columns packed with silica gel 80-200 mesh. It was found that these fractions were helpful for detailed GLC and TLC analysis.

Thin layer chromatography was carried out on glass plates coated with silica gel G (from Merk) using a range of solvent systems.

Infrared spectra were recorded on a Perkin-Elmer 700 spectro-photometer.

The oil of *E. globulus* has been studied in great detail, [1-4] but not the oil of *E. camaldulensis*. The GLC patterns of *E. globulus* and *E. camaldulensis* obtained on Carbowax 20 M column are given in Fig I and II. The compounds were identified using retention data and peak enhancement methods and where possible IR spectra of trapped compounds were recorded and compared with authentic compounds or with those given in the literature.

Subfractionations of the oil on columns or by TLC techniques were used where GLC separation was unsatisfactory. For column chromatography n-hexane, diethyl ether and methanol were used in varying combinations and for thin layer chromatography, chloroform, carbon tetrachloride and methanol were used in suitable combination.

Results and Discussion

The analytical results are given in the Table I and II. A number of signigicant differences were seen between the chemical composition of the two varieties of oil.

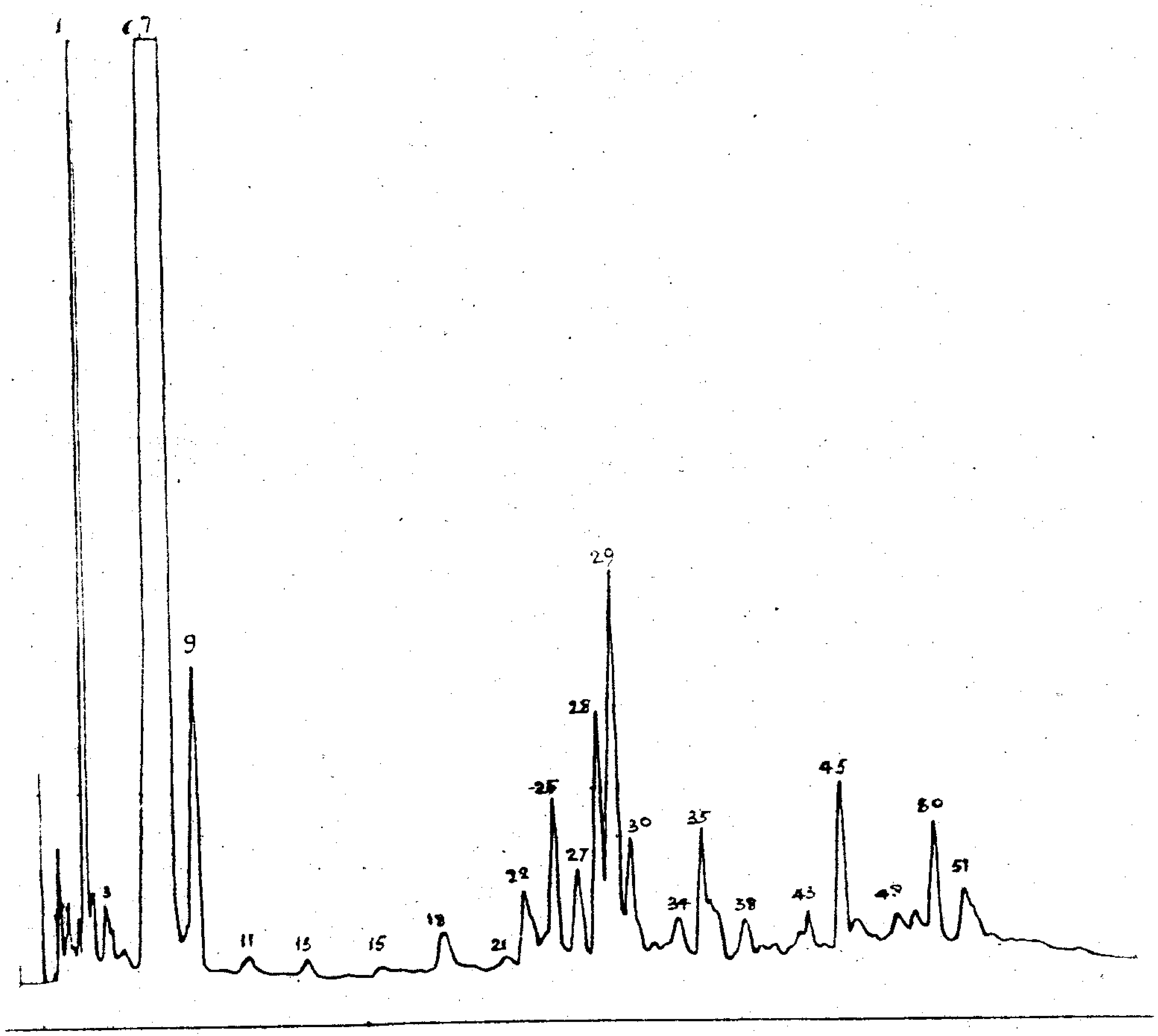

Figure 1 - GLC Pattern of *E.globulus* oil on Carbowax 20M Column

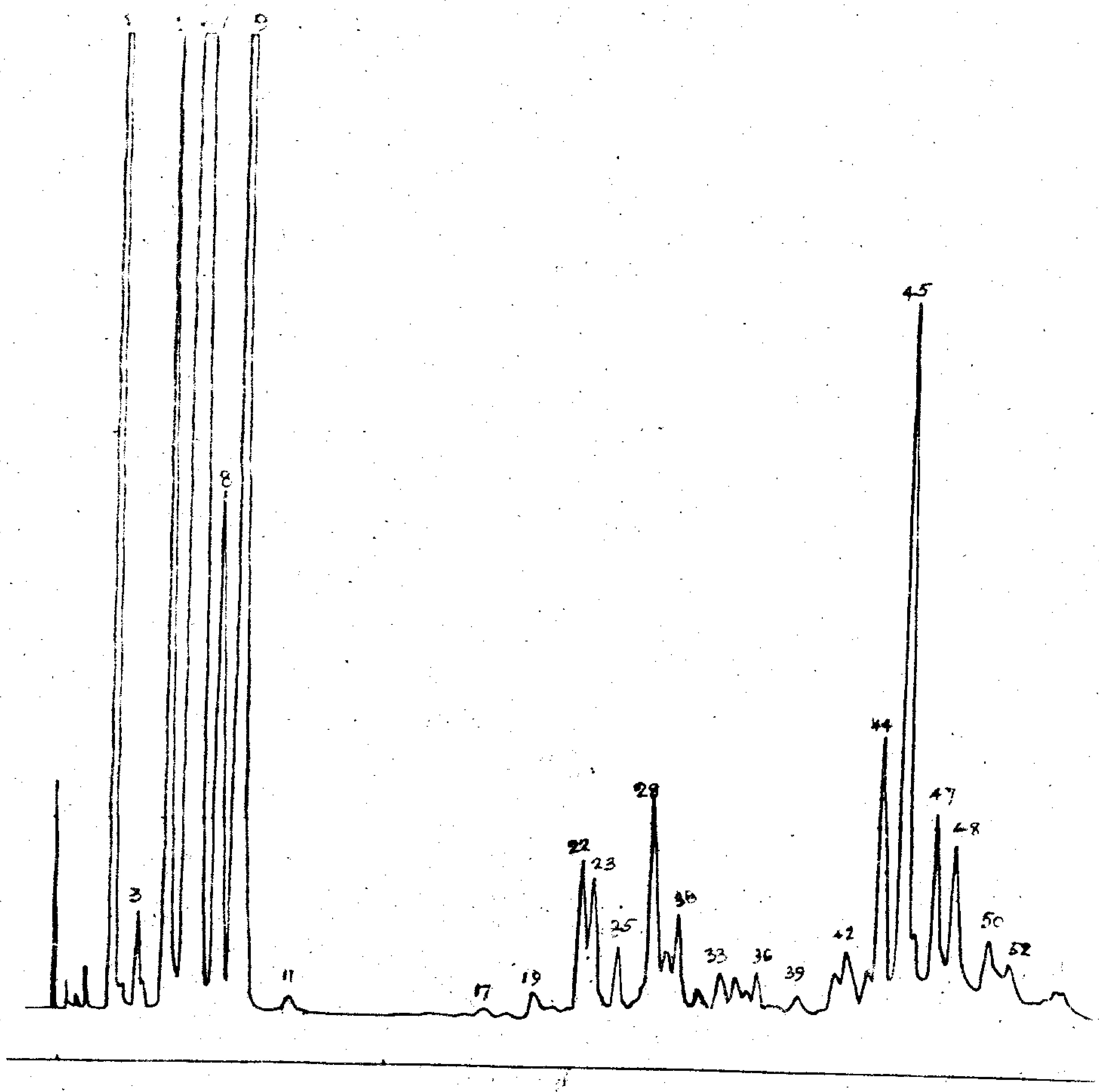

Figure 2 - GLC Pattern of *E.camaldulensis* oil on Carbowax 20M Column

Table 1

Analysis of Eucalyptus globulus oil

Peak No.	*Compound*	*Percentage in the oil*
1	α-Pinene	8.5
2	Camphene	0.3
3/4	β-Pinene/δ-3-Carene	0.5
5	α-Phellandrene	0.2
6/7	Limonene/1,8-Cineole	72.7
9	p-Cymene	1.6
11	—	0.2
13	α-Pinene epoxide	0.2
15	Fenchone	0.4
18	Pino carvone	0.2
21	Linalool	0.2
22	—	0.7
25	trans-Pinocarveol,	0.8
27	—	0.4
28	Myrtenol	1.3
29	Aromadendrene	2.7
30	α-Terpineol	0.6
32	α-Terpenyl acetate	0.1
34	—	0.3
35	cis-Carveol	0.6
38	—	0.3
40	—	0.1
43	—	0.2
45	Globulol	0.8
48	—	0.2
50	—	0.7
51	—	0.6

Table 2

Analysis of Eucalyptus camaldulensis Oil

Peak No.	*Compound*	*Method of Identification*	*Percentage in the oil*
1	α-Pinene	RD,PE	14.40
2	Camphene	RD,PE	0.12
3	β-Pinene	RD,PE	0.41
4	Unknown	—	Trace
5	α-Phellandrene	RD,PE	6.35
6	Limonene	RD,PE	6.15
7	1,8-Cineole	RD,PE	28.66
8	γ-Terpenene	RD,PE	3.47
9	p-Cymene	RD,PE	12.97
10-18	Unknown	—	(0.58)
19	Linalool	RD,PE	0.19
20	Unknown	—	0.01
21	iso-Pulegol	RD,PE	0.07
22	Terpene-4-ol	RD,PE	1.37
23	Aromadendrene	RD,PE	1.27
24-27	Unknown	—	(0.41)
28	α-Terpineol	RD,PE	2.34
29	α-Terpenyl acetate	RD,PE	Trace
30	Piperitone	RD,PE	0.39
31-32	Unknown	—	(0.05)
33	Nerol	RD,PE	0.19
34-35	Unknown	—	(0.45)
36	Phenyl ethyl alcohol	RD,PE	0.09
37-44	Unknown	—	(4.70)
45	Globulol	RD,PE	6.57
46-51	Unknown	—	(6.92)
52	Eugenol (tentative)	RD,PE	0.31

Usually *E. globulus* oil contains about 75-85% of 1:8-cineole where as in *E. camaldulensis* it was around 45-50% and as low as 27%. α-pinene, limonene, p-cymene and globulol content is *E. camaldulensis* was higher than in *E. globulus* and aromadendrene was lower in *E. camaldulensis.* Analysis of oil stored over a long period of time revealed that there was a gradual reduction of α-phellandrene and a corresponding increase in p-cymene content.

E. camaldulensis oil has no potential use as a pharmaceutical due to its low cineole content and also high α-phellandrene content. However, higher content of α-pinene, limonene and p-cymene, makes it possible to convert this hydrocarbon fraction into deodorant and antiseptic type compounds. For instance reaction of the hydrocarbon fraction with 25% sulphuric acid converted the α-pinene into α-terpineol. This mixture containing α. terpineol, limonene 1,8-cineole and p-cymene had a pleasant pine oil fragrance. Spraying an emulsion of this mixture with water, served as a pleasant air freshner Calvin and others[3] had suggested that even oil of Eucalyptus could be a source of liquid fuel. *E. camaldulensis* may sometimes be a suitable plant for this purpose because of its low grade oil which cannot be otherwise utilised.

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