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CHARACTERIZATION OF THE EUCALYPTUS (E. GLOBULUS) LEAVES OIL

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Abstract

Studies were carried out on the characterization of *Eucalyptus globulus* leaves oil. It is found that *Eucalyptus globulus* tree bears a lot of leaves which are grown under the soil texture and climatic condition of Bangladesh contain a fair amount of pale yellow coloured volatile oil. The oil of the leaves were extracted by hydro distillation method during the month of July to December. The highest yield (3.5%) of the oil was obtained from the maturity leaves of the tree in the month of July and the lowest yield (0.08) in the month of December. Physico-chemical characteristics of the extracted oil like saponification value, acid value, iodine value, specific gravity, refractive index, optical rotation and separation of lipid classes were studied by the conventional methods and the results suggested that the oil can be used suitably for the preparation of pharmaceutical and industrial products.

Introduction

Eucalyptus globulus is an evergreen tallest tree in the world with straight clear boles. Generally, the tree is in the height of 250 to 300 ft or more. Some places the tree is called as "Blue Gum Tree". The tree likes to grow in a cool moist, equitable climate and deep soil. About 300 species of Eucalyptus are grown in the world. But in our country only *Eucalyptus globulus* species are found to be grown, because the soil texture and climatic condition of Bangladesh are only suitable for this species for plantation. The tree is planted in houses, garden and roads for increasing the beauty[1]. The tree bears a lot of leaves which are simple, entire, gland-dotted, and pendulousite. The leaves contain about 1-3% volatile oil and it is the primary source of globules eucalyptus oil production[2,3]. The main constituent of the oil is Cineole[4]. The oil is largely used as a mosquito and vermin repellent and as an ingredient of germicidal and disinfecting preparations[5]. The oil is chiefly used in the treatment of nose and throat disorders, malaria and other fevers[6]. It is also used in antiseptic and flavouring agent[7,8]. The oil is used for embrocation, as a vermifuge, cloth clearer, spot stain remover etc. and used in medicine[9,10]. The oil has antimicrobial, biopesticide properties and also has antibacterial effects on pathogenic bacteria in the respiratory tract and stimulates immune system of human[11,12,13]. Hence the objective of the work was to characterize the oil of Eucalyptus leaves.

Experimental

The young mature leaves were collected from locally grown 16-17 years old *Eucalyptus globulus* tree month wise from July-December, 2008. The leaves were then cut into small pieces for subjecting them to hydro distillation. 250 g. leaves were taken in a 3 liter round bottomed flask and 1.5 liter distilled water was added to it and then it was distilled. The oil was collected in another round-bottomed flask with water. The distillation was continued for about three hours. The crude oil thus obtained was transferred into a

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separating funnel and separated the oil from the upper layer. The oil was then dried over anhydrous sodium sulphate. The product was filtered and kept in a bottle and the percentage of oil was calculated.

The specific gravity of the volatile oil was calculated at 15°C with the help of Pycnometer, Refractive index, moisture and volatile matter of the oil were determined by the standard IUPAC method[14]. The acid value and saponification value of the oil were determined by the standard AOCS[15] method. Hanus method was followed to determine the iodine value of the oil[16]. Cineole was estimated by the Ortho-Cresol method[17.] Separation of lipid classes of the oil into three major lipid classes, neutral lipid, glycolipid and phospholipid by silicic acid column chromatography on about 150 g. oil followed by Rouser et. al[18].

Table 1. Extraction of *Eucalyptus globulus* leaves oil during the month of July to December.

Months	Wt of leaves in (g)	Date	% of oil
July	250	01.07.08	3.5
		10.07.08	3.3
		20.07.08	3.2
		30.07.08	3.0
August	250	01.08.08	2.7
		10.08.08	2.5
		20.08.08	2.3
		30.08.08	2.1
September	250	01.09.08	2.2
		10.09.08	2.0
		20.09.08	1.92
		30.09.08	1.8
October	250	01.10.08	1.5
		10.10.08	1.4
		20.10.08	1.2
		30.10.08	1.1
November	250	01.11.08	1.0
		10.11.08	0.8
		20.11.08	0.7
		30.11.08	0.5
December	250	01.12.08	0.3
		10.12.08	0.2
		20.12.08	0.1
		30.12.08	0.08

Table 2. Physico-Chemical Characteristics of Eucalyptus oil

Sl No.	Physico-Chemical Characteristics	Value
1.	Percentage of oil	3.5 ± SE (SE = 0.058)
2.	Moisture and Volatile matter (%)	0.115 ± SE (SE= 0.0006)
3.	Specific gravity at 15°C	0.920 ± SE (SE=0.0029)
4.	Refractive index at 20°C	1.4625 ± SE (SE=0.00005)
5.	Optical rotation at 20°C	1°45´ to 8° ± SE (SE=0.00005)
6.	Acid value	1.23 ± SE (SE=0.0058)
7.	Saponification value	45 ± SE (SE=0.577)
8.	Iodine value	25.5 ± SE (SE=0.0577)
9.	Solubility	Soluble in alcohol
10.	Odour	Aromatic
11.	Cineole (%)	67 ± SE (SE=0.5773)
12.	Neutral lipid	93.6 ± SE (SE=0.5573)
13.	Glycolipid	3.5 ± SE (SE=0.055)
14.	Phospholipid	2.7 ± SE (SE=0.052)

Results and Discussion

The oil was extracted from the Eucalyptus leaves by hydro distillation method and the result was shown in Table 1. From the result it was observed that the highest yield of oil was 3.5% achieved in the month of July on 01.07.08 among 1-30 days after 10 days interval. But the yield of the oil was decreased gradually during the months of August, September, October, November and the lowest yield of oil was 0.08% found in the month of December on 30.12.08. The yield of oil depends on season[9].

The Physico-chemical characteristics of the oil were determined by the conventional methods and the results were presented in Table 2. From the result it was found that among the characteristic properties, the specific gravity and refractive index of the oil were more or less good agreement with the reported result given by Gildemeister and Hoffmann of peppermint oil[19] and the acid and saponification values of the oil were almost similar to that of the reported result of *Eucalyptus globulus* oil[20]. The percentage of cineole main constituent of the oil was estimated by ortho-cresole method was more or less similar with the reported result of Garratte[21] . Total lipids were separated into three lipid classes and the results were given in Table 1. From the results it was found that neutral lipid was found to be 93% of the total weight of the lipid.

Conclusion

Eucalyptus globulus leaves are an important source of volatile oil. The extraction of the oil depends on season, climate, age of the trees and maturity of the leaves. The highest

amount of yield of oil was achieved in the month of July. The chief constituent of the oil is Cineole (65-70%) which is aromatic in nature and may be used as an important raw material for the preparation of Pharmaceutical and Industrial products and also used in perfumery industries.

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