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Oil Content variation and Antimicrobial activity of Eucalyptus leaves oils of three different Species of Dehradun, Uttarakhand, India

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Abstract: Eucalyptus is a tall, evergreen tree, native to Australia and Tasmania, successfully introduced worldwide, now extensively cultivated in many other countries including India. Aim of this study is to determine the oil content variation and antimicrobial activity of three different eucalyptus species of Dehradun region. The leaves of three different species of *Eucalyptus* - *Eucalyptus globulus, Eucalyptus tereticornis* and *Eucalyptus robusta* were collected from nearby area of Dehradun After drying the plant materials in shade, their essential oils were obtained by hydrodistillation.The oil yield (%w/w) of *Eucalyptus globulus* was (1.05%) , *Eucalyptus tereticornis* was (0.51%) while of *Eucalyptus robusta* was (0.79%). The essential oils extracted *was* tested for antimicrobial activity against *Escherichia coli*, *Salmonella typhi, Pseudomonas aeruginosa , Streptococcus Lactobacillus* and *Staphylococcus aureus.* The *Eucalyptus globulus* essential oil shows an max zone of inhibition of 14mm diameter against *E.coli, Eucalyptus tereticornis* essential oil shows an maximum zone of inhibition 7mm diameter against *Pseudomonas*, while *Eucalyptus robusta* essential oil shows an maximum zone of inhibition of 11mm against *Lactobacillus*.

Key words: Eucalyptus leaves oils, Eucalyptus Species of Dehradun Uttarakhand India, Oil Content variation Antimicrobial activity.

Introduction:

Development of microbial resistance to antibiotics is a global concern. Isolation of microbial agents less susceptible to regular antibiotics and recovery of increasing resistant isolates during antibacterial therapy is rising throughout the world which highlights the need for new principles. The use of essential oils as functional ingredients in foods, drinks, toiletries, cosmetics is bringing momentum. The growing interest of consumers in ingredients from natural sources and also because of increasing concern about potentially harmful synthetic additives (1). Within the wide range of the above-mentioned products, a common need is availability of nature aimed at avoiding lipid deterioration, oxidation and spoilage by microorganisms. Until recently, essential oils have been studied mostly from their flavor and fragrance viewpoints only for flavoring foods, drinks and other goods. Actually, however, essential oils and components are gaining increasing interest because of their relatively safe status, their wide acceptance by consumers and their exploitation for potential multi-purpose functional use (2). The genus *Eucalyptus* (family Myrtaceae) comprises well-known plants of over 600 species of trees [3]. Although most of the plants are native to Australia, numerous species have been introduced to other parts of the world, including Iran, as economic and ornamental trees in forest trial provenances [4], where the plants have become source of important fast-growing hardwood trees [5] and essential oils [6]. The *Eucalyptus* essential oils could be grouped into three types on the basis of their chemical constituents (medicinal, industrial and perfumery) [7, 8, 9]

Consequently, *Eucalyptus* essential oils composition from various countries have been extensively investigated due to their numerous uses in the Pharmaceutical and Cosmetics industries. The

eucalyptus essential oils are valued because of the their main component, 1,8-cineole, which is an antiseptic used in the treatment of respiratory tract infection. However, the yield and chemical composition of the leaf oil vary widely between species, individual trees as well as with the growing environment [8, 9, 10]. Previous studies of the leaf oil compositions of *Eucalyptus* species used commercially as a natural source of 1,8- cineole have been reported (12). Much research has been done on the oil composition of different *Eucalyptus* species. This paper now reports for the determination of oil content variation and antimicrobial activity of essential oil of *Eucalyptus robusta, Eucalyptus tertecornis, and Eucalyptus globulus* grown in *Dehradun.*

Materials and Methods

Plant Material :
Leaves from three different *Eucalyptus* species were Dehradun and its nearby areas in January, 2010. The species were identified by Dr Sumer Chand Scientist systematic Botany Division, Forest Research Institute, Dehradun, Uttarakhand, India.

Extraction of essential oil: Freshly collected 300 g leaves were weighed and hydrodistilled for three hours for complete extraction of essential oil, using a commercial Clevenger-type apparatus. The oil samples obtained from hydrodistillation were freed from moisture by adding anhydrous sodium sulfate and absolute oil samples were obtained.

Percentage Yield of Oil: **T**he amount of extracted oil was determined and % age yield of the extracted oil from each sample on the basis of various eucalyptus leaves samples by using following formula:

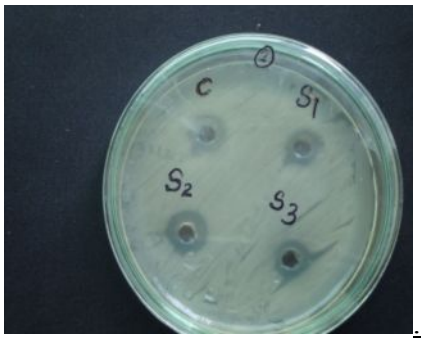
$$\textit{\% age yield of oil} = \frac{\text{Weight of oil}}{\textit{Weight of Eucalyptus leaves}} x100$$

Antimicrobial activity

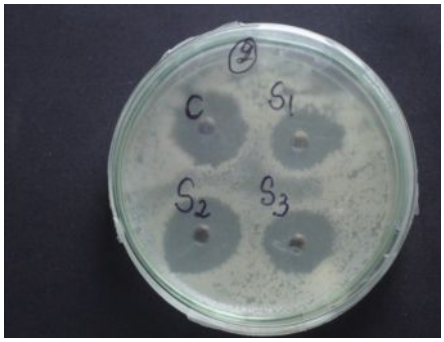
The essential oils extracted from *Eucalyptus robusta*, *Eucalyptus tereticornis* and *Eucalyptus globulus* were tested against *Escherichia coli*., *Pseudomonas aeruginosa, Streptococcus, Lactobacillus* and *staphylococcus* using agar diffusion method. About 20-25 ml of molten nutrient agar medium for each Petriplate cooled to 45^0 C and was added to pre-sterilized plates (150 mm in size). After this 0.1 ml of 12-16 hrs old cultures of bacterial species were spreader over the agar plates. Petriplates were allowed to dry. About 4-5 wells in each plates of 6mm diameter were punched in agar surface with the help of sterilized cork borer for sphere for placing the extracted oil samples of different eucalyptus species. About 20 µl of oil samples extracted from leaves of eucalyptus species were added in separate wells, after incubation at 37^0 c for 24-30 hrs the zones of inhibition were measured.

Table No. 1

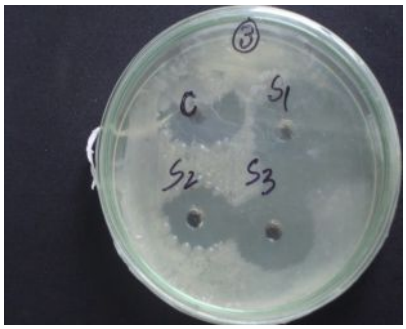
S.no	***Organism***	***Eucalyptus species***	***Inhibition zone(mm)***
1	*Pseudomonas aeruginosa*	*(a) robusta* *(b) tereticornis* *(c) globulus*	(a) 6mm (b) 7mm (c) 3mm
2	*Escherichia coli*	*(a) robusta* *(b) tereticornis* *(c) globulus*	(a) 9mm (b) 12mm (c) 14mm
3	*Lactobacillus*	*(a) robusta* *(b) tereticornis* *(c) globulus*	(a) 13mm (b) 10mm (c) 12mm
4	*Streptococcus*	*(a) robusta* *(b) tereticornis* *(c) globulus*	(a) 7mm (b) 9mm (c) 11mm
5	*Staphylococcus aureus*	*(a) robusta* *(b) tereticornis* *(c) globulus*	Maximum inhibition



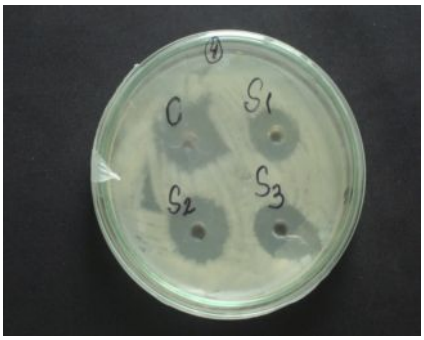
a) pseudomonas



b) E.coli



c) Lactobacillus



d) Streptococcus

e) Staphyllococcus.

Figure No.1 Essential oils extracted from three different eucalyptus species showing antimicrobial activity.

- $S_{1=}$ *Eucalyptus robusta*.
- S_2= *Eucalyptus tereticornis*.
- S_3= *Eucalyptus globulus*.
- C= control.

Results and Discussion:

The relative yield (% w/w) of essential oils of three different Eucalyptus species namely *Eucalyptus globulus* has the highest oil content(1.05%) and *Eucalyptus tereticornis* has lowest oil content(0.51%) while *Eucalyptus robusta* has oil content (0.79%).

The essential oils extracted from three different Eucalyptus species shows a maximum zone of inhibition against *Staphyllococcus aureus*. The *Eucalyptus tereticornis* shows an maximum zone of inhibition 7mm diameter against *Pseudomonas.* The *Eucalyptus globulus* shows an max zone of inhibition of 14mm and 11mm diameter against *E.coli* and *Streptococcus.*The *Eucalyptus robusta* shows an max zone of inhibition of11mm against *Lactobacillus* as shown in the table No. 1 and in fig-1.

Conclusion:

In-vitro analysis of the essential oil extracted from three different species of Eucalyptus taken for study showed an significant growth of inhibition against *Staphyllococcus aureus, Streptococcus, Lactobacillus, E.coli* and *Pseudomonas*. The maximum inhibition was shown by all three species essential oil against *Staphyllococcus*. These encouraging results indicates these species might be exploited as natural antibiotics for the treatment of several infectious diseases caused by these bacterial strains and could be useful in understanding the relationship between traditional cures and current medicines.

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