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Short Communication

Antibacterial activity of *Eucalpytus citriodora* Hk. oil on few clinically important bacteria

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The antibacterial activity of *Eucalyptus citriodora* oil was evaluated. The volatile oil was extracted by steam distillation method. The tested bacterial strains were *Escherichia coli* ATCC 25922, *Staphylococcus aureus, Proteus mirabilis* NCIM2241, *Pseudomonas aeruginosa* ATCC27853, *Proteus vulgaris* NCTC8313, *Salmonella typhimurium, Enterobacter aerogenes* ATCC13048, *Pseudomonas testosteroni* NCIM 5098, *Alcaligenes fecalis, Bacillus cereus* ATCC11778 *and Citrobacter freundii* ATCC10787. Piperacillin and Amikacin were used as the positive controls. The activity of the oil increased with increase in concentration but decreased after a certain level. The study suggests that isolation of the active compound from oil would give more satisfactory and promising results.

Keywords: *Eucalyptus citriodora*, Antibacterial activity, medicinal plant, volatile oil.

INTRODUCTION

Eucalyptus is a tall, evergreen tree, native to Australia and Tasmania, successfully introduced worldwide, now extensively cultivated in many other countries including India (Nadkarni, 1976; Grieve, 1979; Bruneton, 1995). The genus name Eucalyptus comes from the Greek word eucalyptus, meaning "well-covered," and refers to its flowers that, in bud, are covered with a cup-like membrane (Grieve, 1979). Though native to Australia, its therapeutic uses have been introduced and integrated into traditional medicine systems, including Chinese, Indian Ayurvedic and Greco-European. It is focused towards local use as an antiseptic. Topical application of eucalyptus oil is effective against methicillin resistant *S. aureus* infection (Sherry et al., 2001). Moreover, the antiacterial action of oil of eucalyptus on local application is also reported (Kumar, 1988; Ahmad and Beg, 2001). Eucalyptol (1,8-cineole) is the active ingredient of the eucalyptus oil (Bruneton, 1995). This paper reports on the antibacterial activity of eucalyptus oil.

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MATERIAL AND METHODS

Plant material and extraction

The leaf material was collected in the month of September, 2003. It was identified by Dr. P. S. Nagar, Department of Biosciences, Saurashtra University, Rajkot. The volatile oil was obtained by steam distillation and rectification from the fresh leaves (Indian Pharmacopoeia, 1996). Different concentrations of oil were taken (10, 20, 30, 40, 50, 60 and 70 µl) and were dissolved in DMSO. The oil is highly soluble in DMSO. This was used for the antibacterial assay.

Antibacterial activity

Antibacterial assay was done by agar well diffusion method (Perez et al., 1990). Isolates of the following organisms: *Escherichia coli* ATCC25922, *Staphylococcus aureus, Proteus mirabilis* NCIM2241, *Pseudomonas aeruginosa* ATCC27853, *Proteus vulgaris* NCTC8313, *Salmonella typhimurium, Enterobacter aerogenes* ATCC13048, *Pseudomonas testosteroni* NCIM5098, *Alcaligenes fecalis, Bacillus cereus* ATCC11778 *and Citrobacter freundii* ATCC10787 were obtained from National Chemical Laboratory (NCL) Pune, India. They were maintained on N-agar slants at 4°C.

RESULTS AND DISCUSSION

Since multidrug resistance of these microorganisms is a

Table 1. Antibacterial activity of *Eucalyptus citriodora* against few clinically important bacterial strains.

Bacterial strain	Zone of Inhibition (mm) produced by different concentrations of oil dissolved in DMSO								Antibiotic	
	10 µl	20 µl	30 µl	40 µl	50 µl	60 µl	70 µl	DMSO	Piperacillin	Amikacin
E. coli	4	4	4	3	2.5	2.5	1.5	-	14	24
S. aureus	9	12.5	6.5	0.5	3.5	5	4	-	32	27
P. mirabils	3	6	12.5	18	14.5	5	4.5	-	0	23
P. aeruginosa	0	0	0	0	0	0	0	-	0	22
P. vulgaris	1.5	2	2	3	3	2.5	1	-	0	20
S. typhimurium	1	1.5	2.5	2.5	1.5	0.5	0.5	-	20	17
E.. aerogenes	5	6	5.5	5.5	1	0.5	0	-	22	20
P. testosteroni	2.5	3.5	4	3.5	1	1	1	-	0	30
A. fecalis	5	5	5.5	16	11	11	4	-	0	19
B. cereus	3	5	5	5	3	3	3	-	13	22
C. freundii	12.5	12.5	11.5	9.5	9.5	12.5	6	-	28	18

*Diameter of the disc is 7 mm (Himedia), DMSO was taken as control, and the results shown are the mean of three replicates. Piperacillin – 100 µg/disc, Amikacin – 30 µg/disc.

major medical problem, screening of natural products in a search for new antimicrobial agents that would be active against these organisms (Zgoda and Porter, 2001) is the need of the hour. Here in the present study, antibacterial activity of *E. citriodora* oil was checked against a battery of clinically important bacterial strains. The oil was generally active against all the bacterial strains studied except *P. aeruginosa* which was the most resistant bacterial strain studied. *P. aeruginosa* is problematic as it has intrinsic resistance to several antibiotics and a capability to acquire resistance during antibiotic therapy (Beck et al., 1988). The pattern of antibacterial activity varied with the increase in the concentration of oil and decrease in the concentration of solvent. The oil showed maximum activity at the concentration of 20 - 40 µl against all the bacterial strains studied as shown in Table 1. Amongst the gram negative strains studied, the oil was highly active against *P. mirabilis* and *A. fecalis*. The oil was active against *S. aureus* amongst the gram positive strains studied. DMSO was taken as the negative control.

The activity of oil has been compared with standard antibiotics Piperacillin and Amikacin. From the present study, it has been revealed that with the decrease in the concentration of DMSO, the activity of the oil decreased which shows the role of solute and solvent interaction. The study suggests that isolation of the active compound from oil would give more satisfactory and promising results. Isolation and identification of compounds present in the oil could be useful in understanding the relations between traditional cures and current medicines.

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