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Antibacterial activity of essential oils of *Cymbopogon flexuosus, Memecylon umbellatum and Ocimum tenuiflorum*

M. Maridass

Fissd's Research Institute of Conservation Ecology, Tirunelveli-627011,Tamilnadu

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Abstract

The objective of this study was to evaluate the antibacterial activity of essential oils of *Memecylon umbellatum* barks; *Cymbopogon flexuosus* leaves and *Ocimum tenuiflorum* leaves against human pathogens. Methods: An antibacterial activity essential oils were carried out by using the disc diffusion method. Results: Distillate essential oils of *Memecylon umbellatum* barks; *Cymbopogon flexuosus* leaves and *Ocimum tenuiflorum* leaves were showing a zone of inhibition. The conclusion of the present study indicates that essentials oil of these plants have good antibacterial activity against tested human pathogenic bacteria.

Keywords: Medicinal plants, essential oil, antibacterial activity

1. INTRODUCTION

World Health Organization reported that 75% of the world's populations are using plant products for basic healthcare needs. The use of plant parts has offered an effective medicine for the treatment of various diseases. The plant parts used in herbal therapy include seeds, berries, roots, leaves, fruits, bark, flowers, or even the whole plants. The human being was mainly dependent on crude botanical material for medical needs to retain vitality and cure diseases [1]. About 1,200 new drugs have been approved by the US Food and Drug Administration (FDA) since 1950 [2]. Till now, an approximately 250,000 higher plant species on earth, and more than 80,000 are of medicinal values. 122 active constituents were identified from the plant sources and they were used in the modern medicine. Some of these compounds include tubocurarine, morphine, codeine, aspirin, atropine, pilocarpine, ephedrine, vinblastine, vincristine, taxol, podophyllotoxin, camptothecin, digitoxigenin, gitoxigenin, digoxigenin, capsaicin, allicin, curcumin, and artemisinin. Several microorganisms, which cause damage to human health, exhibit drug resistance due to inadequate use of antibiotics. Thus, there is a need for the discovery of new substances from natural sources, including plants [3]. An antibacterial activity of essential oils has gained an increased interest and are considered as safe and eco-friendly alternative to control pathogenic microorganisms[4-5]. Therefore, in the present study was to evaluation of antibacterial activity of essential oils of selected medicinal plant parts of *Memecylon umbellatum* barks, *Cymbopogon flexuosus* leaves and *Ocimum tenuiflorum* leaves against human pathogenic bacteria.

2. MATERIALS AND METHODS

2.1 Collection of Plant Samples

Three medicinal plants of *Memecylon umbellatum* barks, *Cymbopogon flexuosus* leaves and *Ocimum tenuiflorum* leaves were collected from the Southern Western Ghat during the periods of summer season (June 2018 the plant's flowering stage).

2.1.1 Extraction of Essential oils

Extraction of essential oils from *M. umbellatum* barks, *C. flexuosus* leaves and *Ocimum tenuiflorum* leaves was carried out by using solvent extraction. Approximately, 50g each fresh plant materials was extracted with 500 ml of petroleum ether for 1h in at room temperature. The following formula was used to determine the essential oil yield: Essential oils yield (%) =W_1 / W_2 X 100.

W_1 = weight of oils (grm); W_2 total weight of fresh leaves (grams)

2.2 Antimicrobial Activity of essential oils

The essential oils were individually tested against bacteria viz. *Bacillus subtilis*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli.* Each essential oils were dissolved in dimethyl sulfoxide (DMSO), sterilized by filtration using a sintered glass filter, and stored at 4°C. The antibacterial activity of the essential oil was tested using the agar disc diffusion method. Bacterial strains were grown on overnight at 27°C in broth culture and 100µl of suspension containing

10^6 CFU ml^{-1} of bacteria was spread on the surface of Mueller-Hinton Agar (MHA) plates. Each disc 6mm diameters were filled with 50µL of each essential oils (10 µl). DMSO was used as a control. Each antibacterial assay was performed in triplicate. The plates were incubated at an appropriate growth temperature for 12h for bacterial strains (37°C). The resulting an assessment of antibacterial activity was based on the measurement of inhibition zones on the agar surface around the disc.

3. RESULTS AND DISCUSSION

The results of the essential oils of *M. umbellatum* barks, *C. flexuosus* leaves and *O. tenuiflorum* leaves were collected for the distillation method and quantity of essential oils were represented in the table-1. The maximum yield of essential oil of *C. flexuosus* leaf is 3.5% and minimum yield of essential oils of *Memecylon umbellatum* bark is 1.83%. Previous studies on the lowest yield of essential oils of both plants of *O. gratissimum* L. and *O. basilicum* L. respectively [3].

Table -1: Quantity of essential oils of selected three medicinal plants

Sl.No.	Plant Name and Parts	Quantity of oils (%)	Nature of color
1	*Memecylon umbellatum* barks	1.83	Brownish yellow
2	*Cymbopogon flexuosus* leaves	3.45	Dark yellow
3	*Ocimum tenuiflorum* leaves	2.81	Greenish yellow

Table -1: Quantity of essential oils of selected three medicinal plants

Sl. No	Plant Name and Parts	Tested Bacteria					
		Zone of Inhibition (mm)					
		Bacillus subtilis	*Escherichia coli*	*K. pneumoniae*	*Pseudomonas aeruginosa*	*Staphylococcus aureus*	*Salmonella typhi*
1	*Memecylon umbellatum* barks	10	14	13	15	**21**	12
2	*Cymbopogon flexuosus* leaves	**15**	13	**15**	12	13	14
3	*Ocimum tenuiflorum* Leaves	14	15	18	**19**	18	18

The results of the present study observed that disk diffusion method using the antibacterial activity of the three essential oils of *M. umbellatum* barks, *C. flexuosus* leaves and *O. tenuiflorum* leaves were represented in the table-2. The essential oils of three medicinal plants of *M. umbellatum* barks, *C. flexuosus* leaves and *O. tenuiflorum* leaves shown the good antibacterial activity observed. The essential oils of *M. umbellatum* bark was observed that maximum zone of inhibition active against *S. aureus* and minimum zone of inhibition active against *Bacillus subtilis*. The essential oils of *C. flexuosus* leaves was active against maximum inhibition zone of both strains of *B. subtilis* and *S. aureus* and minimum zone of inhibition active against *B. subtilis* and *K. pneumoniae*. The essential oils of *O. tenuiflorum* leaves was maximum zone of inhibition active against *P. aeruginosa* and minimum zone of inhibition active against *B. subtilis*. An essential oils are a potentially useful source of antimicrobial compounds [6]. Previous report, among the aromatic plants were studied the major active constituents found to be monoterpenes viz. linalool, eugenol and thymol [3]. The essential oils of cinnamon, clove, pimento, thyme, oregano, and rosemary were shown to possess strong antibacterial activity against *S. typhi*, *S. aureus*, and *P. aeruginosa* [7]. The conclusion of the present report is a good antibacterial activity observed in the three medicinal plants of *Memecylon umbellatum* barks, *Cymbopogon flexuosus* leaves and *Ocimum tenuiflorum* leaves are alternative source of antimicrobial agents and may play an important role in the discovery of new drugs for the treatment of harmful bacteria.

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