

## Research Article



## ANTIMICROBIAL ACTIVITY OF MEMECYLON EDULE ROXB. AND MEMECYLON UMBELLATUM BURM.F.

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## ABSTRACT

Methanol extract of *Memecylon edule* and *Memecylon umbellatum* obtained by maceration and both extracts were investigated for *in vitro* antimicrobial activity against Gram-positive (*Staphylococcus aureus*, *Staphylococcus epidermidis*, *Micrococcus luteus* and *Bacillus cereus*) and Gram-negative bacteria (*Escherichia coli*, *Pseudomonas aeruginosa*, *Kelebsiella pneumonia*) and fungus such as *Aspergillus niger*, *Aspergillus fumigatus* and *Candida albicans* by disc diffusion method. Antimicrobial studies revealed that both the extracts have significant activity against gram-positive, gram-negative bacteria and fungus.

**Keywords:** Antibacterial, Antifungal, *Memecylon edule*, *Memecylon umbellatum*, Disc diffusion method.

## INTRODUCTION

The incidence of infection in human population is increasing at an alarming rate and literatures show that the prevalence of infection was 51%. Antibiotics provide the main basis for the therapy of microbial infections. Since the discovery of these antibiotics and their uses as chemotherapeutic agents there was a belief in the medical fraternity that this would lead to the eventual eradication of infectious diseases. However, over use of antibiotics has become the major factor for the emergence and dissemination of multi-drug resistant strains of several groups of microorganisms<sup>1-3</sup> and it has become a major therapeutic problem<sup>4</sup>. The relentless emergence of antibiotic resistant strains of pathogens, often with controversy regarding the use of antimicrobials together with the retarded discovery of novel antimicrobials forced researchers to consider careful treatment options for treating infections<sup>5,6</sup>. In this context, efforts are being made all over the world to discover agents from plants that can be used as antibiotics. A major part of the total population in developing countries still uses traditional folk medicine obtained from plants that can be used as antibiotics<sup>7</sup>. Biologically active compounds present in the medicinal plants have always been of great interest to scientist working in this field. In recent years the interest to evaluate plants possessing antimicrobial activity for diseases is growing<sup>8</sup>.

Country like India has been using crude plants as medicine since vedic period. In India the literature on diverse native floras and medicinal utilities of plant is voluminous<sup>9,10</sup>. Moreover, Indian folk medicine comprises numerous prescriptions for the treatment of infections. Some of anti-infective plants have been screened scientifically for the evaluation of the antimicrobial activity<sup>11,12</sup>, but most of the plants remain unexplored for their antimicrobial activity.

The genus *Memecylon* L., (Family: Melastomataceae) comprises of about 300 species in the world, of which 30 species have been reported from India and 16 species from Tamilnadu state<sup>13,14</sup>. The species *Memecylon edule* Roxb. and *Memecylon umbellatum* Burm.F. are used in the treatment of wounds, conjunctivitis, menorrhagia etc in the traditional medicine<sup>15-17</sup>. Literature survey on *Memecylon edule* revealed that it could inhibit human immunodeficiency virus type 1 (HIV-1) reverse transcriptase and posses anti-inflammatory, analgesic and wound healing activity. *Memecylon umbellatum* showed antispasmodic, antitumour, antidiabetic, wound healing, antihelmentic, antigenotoxic activities<sup>18-24</sup>. Phytochemical study of *Memecylon umbellatum* evidenced the presence of umbelactone, amyirin, sitosterol, ursolic acid and tannins<sup>25-27</sup>. However there is a paucity of information regarding the antimicrobial activity of these plants. Hence, it was interested to investigate antimicrobial activity of *Memecylon edule* and *Memecylon umbellatum*.

## MATERIALS AND METHODS

## Plant Materials

The plant *Memecylon edule* was collected from moist shola forests of Courtallum hills in Tamil Nadu and *Memecylon umbellatum* was collected from semiarid scrub forests in Urakaddam near Chennai, Tamilnadu. The plants were identified by Dr. P. Jayaraman, Director, Plant Anatomy Research Centre, Chennai - 600 045, India. Leaves of *Memecylon edule* and *Memecylon umbellatum* were washed with tap water to remove the dust and adhering materials and then dried in the shade. The dried materials were powdered by means of mechanical grinder and coarsely powdered leaves were used for extraction. Powdered leaves were macerated with methanol at room temperature for seven days. The extracts were concentrated *in vacuo* to get the methanol extract of *Memecylon edule* (MME) and methanol extract of *Memecylon umbellatum* (MMU).



## Antibacterial activity

### Test organisms

MME and MMU were screened against seven bacterial strains. Gram-positive organisms such as *Staphylococcus aureus* (ATCC 9144), *Staphylococcus epidermidis* (ATCC 155), *Micrococcus luteus* (ATCC 4698) and *Bacillus cereus* (ATCC 11778) were used. Further Gram-negative organisms *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 1688) and *Klebsiella pneumonia* (ATCC 25922) also used.

### Procedure

Antibacterial activity of MME and MMU was determined by disc diffusion method<sup>28</sup>. Sterilized nutrient agar medium<sup>29</sup> was inoculated with the suspension of the various microorganism at 40-50°C and poured in to petridishes to give a depth of 3-4 mm. Various concentration (250, 500, 750 µg/ml) of both MME and MMU were prepared. Sterile discs (made from Whatman filter paper, sterilized in UV lamp) dipped in specific concentration of the extracts and standard (Ciprofloxacin, 100µg/ml). The impregnated discs were allowed to dry.

The dried discs were placed on the surface of agar plates. The plates were left for 1h at room temperature and incubated at 37°C for 18h. The diameter of zone of inhibition of extracts and standard were measured.

## Antifungal activity

### Test organisms

MME and MMU were screened against three antifungal strains. They are *Aspergillus niger* (ATCC 9029), *Aspergillus fumigatus* (ATCC 46645), *Candida albicans* (ATCC 10231).

### Procedure

Suspension of microorganisms were added to sterile sabouraud dextrose agar medium at 45°C and the mixture was transferred to sterile petridishes and allowed to solidify. Sterile discs dipped in various concentrations (250, 500, 750 µg/ml) of MME and MMU and Ketaconazole (100 µg/ml) were placed on the surface of agar plates. The plates were left for 1h at room temperature and incubated at 37°C for 18 h. The diameter of zone of inhibition of extracts and standard was measured.

**Table 1:** Antibacterial activity of MME and MMU

S.No	Organisms	Zone of inhibition (mm)							
		MME (µg/ml)			Std (µg/ml)	MMU (µg/ml)			Std (µg/ml)
		250	500	750	100	250	500	750	100
	<b>Gram-positive</b>								
1.	<i>Staphylococcus aureus</i>	15	18	23	33	14	19	32	34
2.	<i>Staphylococcus epidermidis</i>	15	17	25	32	13	15	31	32
3.	<i>Micrococcus luteus</i>	13	17	26	32	15	16	27	31
4.	<i>Bacillus Cereus</i>	11	14	17	30	10	12	16	33
	<b>Gram-negative</b>								
1.	<i>Escherichia coli</i>	14	18	23	33	15	18	21	32
2.	<i>Pseudomonas aeruginosa</i>	12	18	22	33	12	14	16	32
3.	<i>Kelebsiella pneumonia</i>	13	15	17	30	15	18	23	32

Values are mean of three replicates recorded to the nearest whole millimeter. Std: Ciprofloxacin.

**Table 2:** Antifungal activity of MME and MMU

Organisms	Zone of inhibition (mm)							
	MME (µg/ml)			Std (µg/ml)	MMU (µg/ml)			Std (µg/ml)
	250	500	750	100	250	500	750	100
<i>Aspergillus niger</i>	10	14	16	19	12	14	19	20
<i>Aspergillus fumigatus</i>	12	14	17	20	14	15	18	20
<i>Candida albicans</i>	12	14	16	18	13	15	18	19

Values are means of three replicates recorded to the nearest whole millimeter. Std: Ketaconazole.



## RESULTS AND DISCUSSION

Antibacterial activity of MME and MMU at different concentrations (250, 500, 750 µg/ml) against both gram-positive and gram-negative bacterial strains on comparison with ciprofloxacin is shown in table 1. MME and MMU showed concentration dependent activity against all the tested bacteria with the zone of inhibition ranged from 11-32 mm at various concentrations. Most antibacterial medicinal plants are active against gram-positive bacteria. Interestingly the present investigation showed that MME and MMU exhibited a remarkable antibacterial activity on both gram-positive and gram-negative bacteria. MME exhibited maximum antibacterial activity against *Micrococcus luteus*, followed by *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus cereus* and *Klebsiella pneumonia* at the concentration of 750 µg/ml. On the other hand MMU exhibited maximum antibacterial activity at the concentration of 750 µg/ml against *Staphylococcus aureus* followed by *Staphylococcus epidermidis*, *Micrococcus luteus*, *Klebsiella pneumonia*, *Escherichia coli*, *Bacillus cereus* and *Pseudomonas aeruginosa*. The antibacterial activity of MMU at 750 µg/ml was found to be almost equal to that of standard drug Ciprofloxacin.

The antifungal activity of the various concentrations (250, 500, 750 µg/ml) of MME and MMU was compared with standard drug ketoconazole against various strains of fungi such as are *Aspergillus niger*, *Aspergillus fumigatus*, *Candida albicans* is shown in table 2. The results showed that both MME and MMU have the capacity to inhibit the growth of the above mentioned fungal organisms by disc diffusion method. The antifungal activity of MMU at 750 µg/ml was found to be almost equal to that of standard drug ketoconazole.

## CONCLUSION

Antimicrobial studies of the leaves of *Memecylon edule* and *Memecylon umbellatum* demonstrated that the plants have considerable efficacy against various pathogenic bacteria and fungi. The study provides a scientific basis for the use of the plant as wound healing agent in traditional medicine. Preliminary phytochemical analysis of MME and MMU were reported to contain secondary metabolites phenols, flavonoids, saponins, tannins, glycosides, triterpens and phytosterols<sup>30</sup>. Presence of these phytochemicals enabled speculation that presence of one or more compounds might have contributed to antibacterial and antifungal activity of the plants *Memecylon edule* and *Memecylon umbellatum*<sup>31-35</sup>. Hence, further studies are required to isolate and identify the active constituent (s) attributed to the antimicrobial activity of plant *Memecylon umbellatum*.

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