



## Evaluation of *In-vitro* antimicrobial activity of leaf extracts of *Maerua oblongifolia* (Forssk.) A. Rich

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### Abstract

Extracts of *Maerua oblongifolia* (Forssk.) A. Rich. Leaves were investigated for their antimicrobial activity against four bacterial strains, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* as well as two fungal strains *Sclerotium rolfsii* and *Aspergillus Niger* by agar disk diffusion method. *In-vitro* antimicrobial activity was documented for petroleum ether, chloroform, ethyl acetate, acetone, and methanol. Methanolic extract had a higher degree of antimicrobial activity in comparison to petroleum ether, chloroform, ethyl acetate, and acetone. The present investigation suggests that the leaf extracts contain bioactive molecules with antimicrobial activity against the tested bacterial and fungal Strains, indicating a major potential for developing a novel comprehensive antimicrobial drug formulation from leaves of *M. oblongifolia*.

**Keywords:** *In-vitro* antimicrobial activity, *maerua oblongifolia*, leaves, agar disk diffusion method

### Introduction

Herbal drugs have been used in conventional medical systems all across the world for thousands of years [1]. Medicinal plants are essential sources of bioactive compounds to treat human diseases. India has been known for its traditional knowledge of herbal medicine as mentioned in Ayurveda. Herbs play an important role in ayurvedic treatments [2]. Therapeutic properties of herbal drugs are chiefly due to the presence of some natural bioactive compounds generally known as phytochemicals [3, 4]. Since, ancient times plant products are derived from plant parts such as root or tuber, stem, bark, leaves, flowers, fruits, seeds have been part of phytomedicine [5]. Natural products of plant origin are safer than synthetic drugs. According to World Health Organization (WHO) about 80% of people in the world were using traditional medicine as part of their primary health care needs. Due to an increase in antibiotic resistant microorganisms, there has been an increasing need in recent years for the production of a new antimicrobial agents [6, 7]. The current investigation was aimed to carry out the *in-vitro* antimicrobial activities of different solvent leaf extracts of *M. oblongifolia* used in Ayurveda and other traditional system of medicines to treat infectious diseases caused by microorganisms. *Maerua oblongifolia* (Forssk.) A. Rich. Popularly known as buchakra gadda in Telugu, is a climbing shrub belonging to the family Capparaceae. It is distributed in West Africa, Arabia, and Srilanka. In India, it is found growing in the Deccan peninsula, Gujarat and Telangana [8]. The plant is used in many ayurvedic preparations. It is used in the treatment of fever, diabetes mellitus, typhoid, stomach ache, urinary calculi, anemia, and cough [9, 10].

### Materials and Methods

#### Collection of plant material

The leaves of *M. oblongifolia* have been collected from Adilabad (District), Telangana State, India. Plant material was authenticated by the Department of Botany, Osmania

University, Hyderabad. The voucher specimen (Herbarium HY-42) has been deposited in the herbarium collections of Department of Botany, Osmania University for future references. Leaves were totally washed under running tap water for removal of soil, dust and any other particles and shade dried at room temperature 22°C for 15-20 days.

#### Preparation of extracts

The leaves have been grounded into a coarse powder using mortar and pestle. 20gm coarse powder was dissolved in 200 ml of various solvents systems to make the extracts. After 48 hours of incubation the contents were analyzed. Hot continuous solvent extraction was performed using a Soxhlet apparatus. Petroleum ether, chloroform, ethyl acetate, acetone, and methanol were used for extraction, in the order of their increasing polarity. The extraction process was continued for 7 hours or until a drop of solvent from the siphon tube was evaporated. The solvent was distilled in a rotary evaporator (Heidolf LABAROTA Efficient Evaporators 4000) to concentrate all extracts and refrigerated for further use [11].

#### Test organisms

The bacterial and fungal strains were used to evaluate the antimicrobial properties of various solvent leaf extracts of *M. oblongifolia* included two Gram-positive bacteria *Staphylococcus aureus* (MTCC -96) & *Bacillus subtilis* (MTCC-121), two Gram-negative bacteria *Escherichia coli* (MTCC-443) & *Pseudomonas aeruginosa* (MTCC-424) and two fungal strains *Aspergillus niger* (MTCC-227) and *Sclerotium rolfsii* (MTCC-289). The tested bacterial strains and fungal strains were acquired from the Microbial Type Culture Collection (MTCC) Chandigarh, India. These microbial strains were preserved at 4°C on nutrient agar medium and Potato Dextrose Agar (PDA) medium respectively.

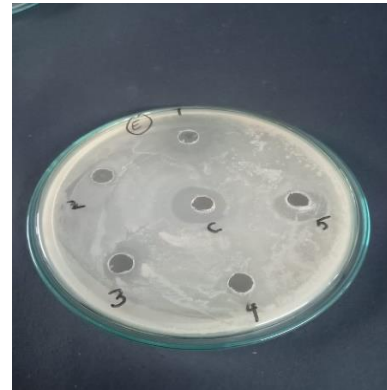
### Antimicrobial activity

Antimicrobial activity of various solvent leaf extracts of *M. Oblongifolia* was determined by using the agar disc diffusion method [12]. The diameter of zone of inhibition around the compound on the agar plate was calculated to assess the ability of a substance to inhibit the growth of microorganisms. In this method, Mueller-Hinton nutrient agar samples were inoculated with a standardized inoculum of the test microbial strains. Then, at the desired concentration, the filter paper discs (around 2 mm) containing the solvent leaf extracts were placed on the agar plate. The petri samples have been incubated under controlled conditions. The antimicrobial agent diffuses into the agar plates and prevents the growth of the microorganism. The inhibition zones of growth around the discs were calculated after 24 hours of incubation at 37° C for bacteria, 5-6 days at 30° C for fungi. Antimicrobial activity was observed by the existence of a clear zone of inhibition around the disc. The diameter of the zone of inhibition was measured and the tests were carried out in triplicate and results were tabulated.

### Results and Discussion

The results of the tested antibacterial and antifungal activity were tabulated in Table-1 & 2. The leaf extracts of *M. oblongifolia* had strong antimicrobial activity against the bacterial and fungal strains studied. The methanolic solvent leaf extract exhibited a high inhibitory effect against *Pseudomonas aeruginosa* (13 mm) followed by *Escherichia coli* (7 mm), *Bacillus subtilis* (7 mm) and *Aspergillus niger* (5 mm) but there is no inhibitory activity against *Sclerotium rolfsii*. Whereas the chloroform solvent extract has shown maximum inhibitory activity against *Bacillus subtilis* (10 mm) followed by *Pseudomonas aeruginosa* (9 mm) *Staphylococcus aureus* (9 mm) & *Escherichia coli* (7 mm). The ethyl acetate extract showed considerable activity against *Staphylococcus aureus* (6 mm), *Escherichia coli* (5 mm) & *Bacillus subtilis* (5 mm). While petroleum ether Solvent extract has shown the least inhibitory activity against *Staphylococcus aureus* (4 mm). The acetone solvent leaf extract of *M. oblongifolia* was not showing any inhibitory positive activity against the tested bacterial strains but showing moderate inhibitory activity against fungus *Aspergillus Niger* (4 mm) (Plate 1 and 2). The different solvent leaf extracts of *M. oblongifolia* showing the various levels of antimicrobial activity against selected microorganisms. Methanol leaf extract of *M. oblongifolia* showed a strong zone of inhibition against the bacteria *Pseudomonas aeruginosa* and *Aspergillus niger*, our study agrees with the findings of Mohamed Ietidal El Tahir *et al.* and Moglad EH *et al.*, who reported that the methanol and chloroform solvent leaf and stem extracts showing highest zone of inhibition against their microbial strains [13, 14]. The present investigation revealed that only methanol extract of *M. oblongifolia* showed the highest antifungal activity against *Aspergillus Niger*, which is agreeable and reconfirmed as reported by Arulanandraj *et al* [15].

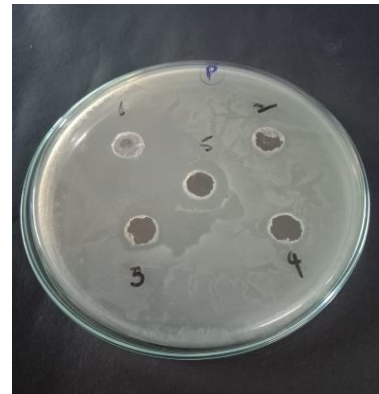
**Plate-1:** Zone of Inhibition observed in leaf extracts against selected bacterial strains



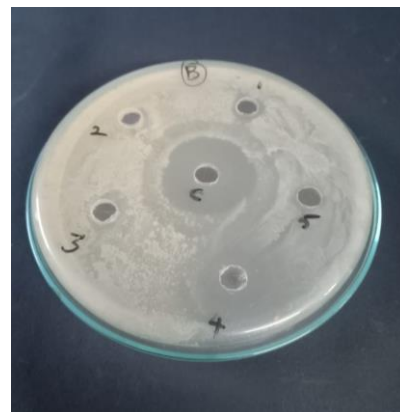
**Fig1:** *Staphylococcus aureus*



**Fig 2:** *Escherichia coli*

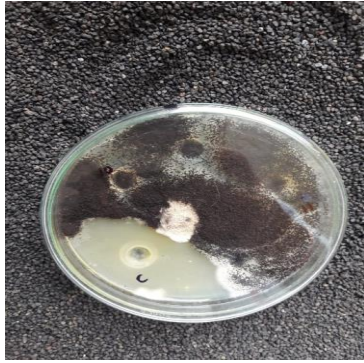


**Fig 3:** *Bacillus subtilis*



**Fig 4:** *Pseudomonas aeruginosa*

**Plate-2:** Zone of Inhibition observed in leaf extracts against selected fungal strains



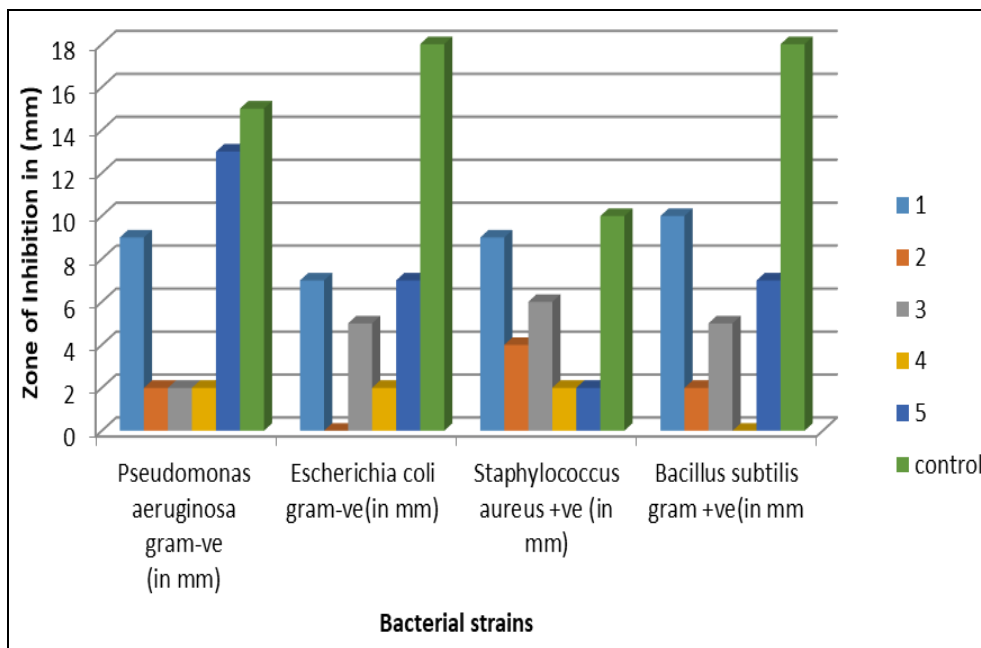
**Fig 5:** *Aspergillus Niger*



**Fig 6:** *Sclerotium rolfsii*

**Table 1:** Anti-bacterial activity of leaf extracts of *M. oblongifolia* in various solvent systems

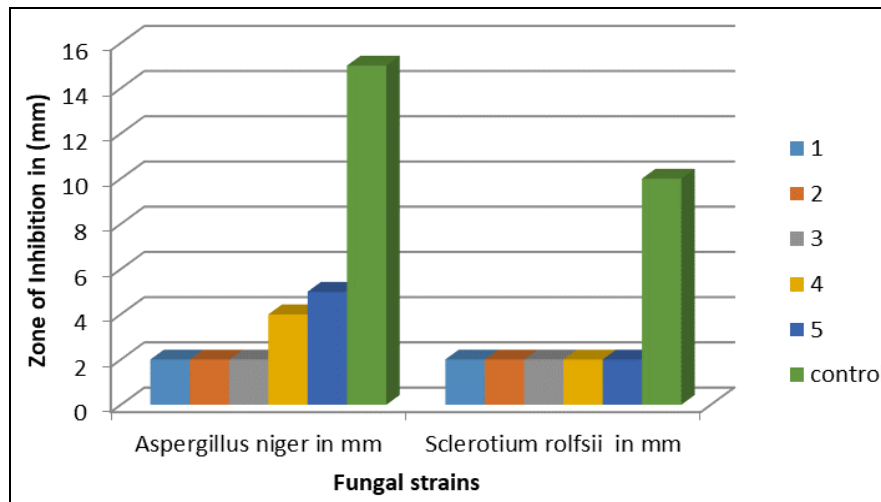
S. No	Leaf extract used	<i>Pseudomonas aeruginosa</i> -ve(mm)	<i>Escherichia coli</i> -ve (mm)	<i>Staphylococcus aureus</i> +ve (mm)	<i>Bacillus subtilis</i> +ve (mm)
1	chloroform	9	7	9	10
2	Petroleum ether	2	0	4	2
3	Ethyl acetate	2	5	6	5
4	acetone	2	2	2	0
5	methanol	13	7	2	7
6	control	15	18	10	18



**Fig 7:** Graphical representation of zone of inhibition of various solvent leaf extracts of *M. oblongifolia* against selected bacterial strains

**Table 2:** Anti-fungal activity of leaf extracts of *M. oblongifolia* in various solvent systems

S.NO	Leaf extract used	<i>Aspergillus niger</i> (mm)	<i>Sclerotium rolfsii</i> (mm)
1	chloroform	2	2
2	Petroleum ether	2	2
3	Ethyl acetate	2	2
4	acetone	4	2
5	methanol	5	2
6	control	15	10



**Fig 8:** Graphical representation of zone of inhibition of various solvent leaf extracts of *M. oblongifolia* against selected fungal strains

### Conclusion

The present investigation revealed the leaf extracts possess bioactive compounds responsible for antimicrobial activity against infectious diseases caused by bacteria and fungal strains. We also found that the methanol has been the most effective solvent for solubilizing antimicrobial compounds from the tested leaf material among five solvents. Further in this regard, isolation and purification are needed to evaluate the types of compounds responsible for the antimicrobial activity.

### Acknowledgments

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