



RESEARCH ARTICLE

ANTIMICROBIAL ACTIVITY OF *ALTERNANTHERA TENELLA* COLLA

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ABSTRACT

The antimicrobial activity of *Alternanthera tenella* Colla leaf extracts were tested against human pathogenic bacteria (two Gram-positive and two Gram-negative) and against three pathogenic fungi (*Candida* sp) by agar well diffusion method. The solvents were used for extraction are chloroform, ethyl acetate and methanol. All the extracts manifested significant bactericidal and fungal activity against all microorganisms tested. The inhibition zone diameters ranged between 6 mm to 24 mm diameter. The maximum antibacterial activity recorded in highest concentration of methanol extract and minimum activity was found in lowest concentration of chloroform extract against *Staphylococcus aureus*. The maximum antifungal activity recorded in highest concentration of chloroform extract against *Candida tropicalis* and minimum activity was found in lowest concentration of ethyl acetate extract against *Candida parasilosis*.

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INTRODUCTION

Plants have been classified based on an essential source of medicinal agents for centuries. Medicinal plants are distributed worldwide, most abundant in tropical countries. According to World Health Organization (Santos *et al.*, 1995) medicinal plants would be the best source to obtain a variety of drugs used to treat infectious diseases. Folk medicine is safe, cheaper and more effective than modern medicine. Medicinal plant extracts have active phytochemical contents with known antimicrobial efficiency can be pronounced implication in therapeutic cures. Plants are rich in a wide variety of secondary metabolites tannins, saponins, quinone, anthraquinone, steroids, glycosides, terpenoids, triterpenoids, flavonoids, alkaloids, coumarins, phenolic compounds and essential oils with antimicrobial properties (Cowan, 1999; Lewis and Elvin Lewis, 1999). *Alternanthera tenella* Colla belongs to Amaranthaceae family. A terrestrial weed along canals, fallow fields, also on barren land locally abundant. (Mayurnathan *et al.*, 1994). The current study aim is to evaluate the antimicrobial activity of *Alternanthera tenella* leaves.

MATERIALS AND METHODS

Plant collection and authentication

The *Alternanthera tenella*, plants were collected from several areas around Chennai. Taxonomic identification of the plant was confirmed by the botanist Mr. Jayaraman, Institute of Herbal Botany, Plant Anatomy Research Centre, West Tambaram, Chennai.

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Extraction of Plant material

Fresh healthy plants were collected. Leaves were separated. Washed in tap water and rinsed in distilled water to remove all impurities. Cleaned leaves were shade dried under room temperature for two weeks. Then ground into fine powder using electric blender. The dried powdered leaves were separately extracted with methanol, ethyl acetate and chloroform in the ratio 1:10, then kept in rotary shaker for 24 hours. After 24 hours, the solvents were filtered. The process was repeated three times. The combined extracts obtained were condensed in condenser and stored at 24<sup>o</sup> C until use. All the extracts were dissolved in sterile Dimethyl sulphoxide (DMSO) for antibacterial as well as antifungal activity.

Test Microorganisms

The seven species of test microorganism were selected for study. Gram - positive bacterial species which involve in the study were *Micrococcus luteus* and *Staphylococcus aureus* and Gram - negative bacterial species were *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. Fungal species used in this study include *Candida albicans*, *Candida parasilosis* and *Candida tropicalis*. Cultures maintained in agar slants. The twenty four hours broth cultures were used for antimicrobial assay

Antibacterial assay

Antibacterial activity of leaf extracts was evaluated by agar well diffusion method (Russel and Furr, 1997; Perez *et al.*, 1990; Priya and Ganjewala 2007). Sterilization was done by autoclaving at 121<sup>o</sup>C for 15 minutes. Twenty four hours broth cultures of the bacteria were used for the antibacterial assay. A

**Table 1. Antibacterial activity of *Alternanthera tenella* leaf extracts by well diffusion method**

Type of Bacteria	Mean Diameter Inhibition Zone (mm)											
	Methanol				Ethyl acetate				Chloroform			
	Concentration ( $\mu\text{g/ml}$ )				Concentration ( $\mu\text{g/ml}$ )				Concentration ( $\mu\text{g/ml}$ )			
	250	500	750	1000	250	500	750	1000	250	500	750	1000
<i>Micrococcus luteus</i>	11	12	13	16	12	14	15	17	11	13	15	16
<i>Staphylococcus aureus</i>	19	21	23	24	12	15	16	19	6	12	16	15
<i>Pseudomonas aeruginosa</i> ,	11	13	16	19	11	13	14	17	11	13	15	16
<i>Klebsiella pneumoniae</i>	13	16	17	19	13	16	16	19	11	13	15	18

**Table 2. Antifungal activity of *Alternanthera tenella* leaf extracts by well diffusion method**

Type of fungi	Mean Diameter Inhibition Zone (mm)											
	Methanol				Ethyl acetate				Chloroform			
	Concentration ( $\mu\text{g/ml}$ )				Concentration ( $\mu\text{g/ml}$ )				Concentration ( $\mu\text{g/ml}$ )			
	250	500	750	1000	250	500	750	1000	250	500	750	1000
<i>Candida albicans</i>	12	13	14	18	13	14	14	19	12	13	17	18
<i>Candida parasilosis</i>	10	12	14	15	6	7	15	15	10	12	13	14
<i>Candida tropicalis</i>	12	13	15	15	14	15	16	17	12	13	15	20

sterile cotton swab was dipped into bacterial broth and evenly streaked over the entire surface of sterile nutrient agar plates to obtain uniform inoculums. The wells were made on the seeded plates using sterile cork borer. Dried extracts were dissolved in Dimethyl sulfoxide (DMSO) to obtain different concentration (250, 500, 750 and 1000  $\mu\text{g/ml}$ ). The extracts were added to respective well using sterile micropipette. The inoculated plates were incubated at 37°C for 24 hours. The centre well was a control. After 24 hours examination, the bacterial growth was determined by measuring the diameter of zone of inhibition around each well (Elgayyar *et al.*, 2001; Kokoska *et al.*, 2002 and Lehmann, 1985). These experiments were carried out in triplicate and the mean values were tabulated.

#### Antifungal assay

Antifungal assay is similar to antibacterial assay in all aspects except Potato Dextrose Agar medium and fungal organisms were added.

## RESULTS

The results showed the antimicrobial activity of three solvent extracts tested against human pathogenic bacterial and fungal organisms was performed under laboratory evaluation.

#### Antibacterial activity of leaf extracts

Antibacterial activity of leaf extracts showed the zone of inhibition is ranging from 6 to 24mm diameter. The highest concentration (1000  $\mu\text{g/ml}$ ) of methanol extract showed the highest activity and the lowest concentration (250 $\mu\text{g/ml}$ ) of chloroform extract showed the lowest activity against gram positive bacteria *Staphylococcus aureus* (Table 1).

#### Antifungal activity of leaf extracts

Antifungal activity of *Alternanthera tenella* leaf extracts showed the zone of inhibition is ranging from 6 to 20mm diameter. The highest activity showed in highest concentration (1000  $\mu\text{g/ml}$ ) of chloroform extract against *Candida tropicalis* and the lowest activity in lowest concentration (250  $\mu\text{g/ml}$ ) of ethyl acetate extract against *Candida parasilosis* (Table 2).

## DISCUSSION

The antimicrobial activity of leaf extracts could be attributed to the presence of pronounced antimicrobial phytoconstituents tannins, saponins, quinone, anthraquinone, steroids, glycosides, amino acids, phenols, terpenoids, triterpenoids, flavonoids, alkaloids, coumarins (Navarro *et al.*, 1996 and Theim and Grosslinka, 2003). The antibacterial activity of the plant extracts have been attributed to some of the secondary metabolites (Alam, 2009; Cowan, 1999). The presences of phenolic compounds are thought to be toxic to microorganisms, inhibiting the enzymes which are essential for the growth of microorganisms (Khanahmadi *et al.*, 2010). Methanol extract showed high activity against both Gram - positive and Gram - negative bacteria. Chloroform extract showed high activity against *candida tropicalis*. Antimicrobial activity is ranging from lowest (250  $\mu\text{g/ml}$ ) to highest concentration (1000  $\mu\text{g/ml}$ ) of the leaf extract. These findings are in line with the investigation which indicates that the lowest activity was 7mm and the highest was at 18mm in diameter (Bii *et al.*, 2010). The *Alternanthera tenella* leaf extracts possess potential antimicrobial effect against wide array of pathogenic microorganisms is highly active. The methanol extracts showed highest antibacterial activity against both gram positive and gram negative bacteria. The activity depends upon the concentration and polarity of the solvent.

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