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Antimicrobial Potential of Whole Plant and Callus Extract of *Aristolochia bracteolata* Lam

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ABSTRACT

The present study was subjected to evaluate the antimicrobial potential of whole (i.e., root, stem, leaf) plant and callus extract of medicinal plant *Aristolochia bracteolata* Lam using agar well diffusion method against bacterial pathogens *Pseudomonas aeruginosa, Bacillus subtilis, Escherichia coli, Klebsiella pneumoniae.* The fungal pathogens were *Aspergillus flavus, Aspergillus niger* and *Fusarium solani*. The antimicrobial activity revealed that the whole plant extract has more effective antimicrobial activity than callus extract. The study recommends that the extract of plant parts possesses novel broad spectrum of antimicrobial properties. Thus the study open up the scope for further analysis of medicinal plant extracts to develop antimicrobial drugs.

INTRODUCTION

Medicinal plants have provided the basic building blocks for a number of highly effective drugs. India has more than 3000 years of medicinal plants. Medicinal plants are widely used by all sections of the population either directly as folk remedies or indirectly in the preparation of modern pharmaceuticals. The limited lifespan of antibiotics has rendered and necessities to search for have antimicrobial substances from various sources such as medicinal plant. Plants produce a diverse range of bioactive molecules, making them rich source of different types of medicines. Plant and plant-derived agents have long history to clinical relevance source of potential chemotherapeutic agents. (Cushine et al., 2005) The screening of plant extracts and plant products for antimicrobial activity has shown that higher plants represent a potential source of anti-infective agents with possibly novel mechanism of action (Amani et al., 1998, Barbour et al., 2004).

Aristolochia bracteolata is a perennial medicinal plant with cordate leaves and dark – purple color tubular flowers, belonging to the family Aristolochiaceae. The whole plant was used as anthelminthic, antipyretic and anti-inflammatory agents. The plant contains Aristolochic acid has many medicinal properties in various disease condition (Kritikar and Basu 1975). The present study was conducted to investigate the antimicrobial activity of various extracts.

MATERIALS AND METHODS

Collection of plant material:

Fresh plant material was collected from Herbal garden, A.V.V.M. Sri Pushpam College (Autonomous), Poondi. The plant was identified and authenticated by Botanist of Rapinat Herbarium. The *in vitro* propagated plant and callus were taken for further antimicrobial activity.

Test Microbes:

Human pathogenic bacteria such as *Staphylococcus aureus, E. coli, Bacillus subtilis, Klebsiella pneumoniae* and fungal pathogens were *Aspergillus flavus, Aspergillus niger, Fusarium solani* were collected from Centre For Bioscience and Nanoscience Research (CBNR) center Coimbatore. All the test bacterial samples were maintained on Nutrient Agar media and fungal samples on Potato Dextrose Agar media.

Preparation of Extract:

The whole plant washed individually under running tap water. The whole plant was shade dried and powdered using pulverizer. The powder of *A. bracteolata* was stored in airtight container at room temperature and used for extraction. The in vitro propagated callus was shade dried and used for extraction. The method of Alade and Irobi (1993) was adopted for preparation of plant extracts. A fixed weight of 25 g of powdered plant material was soaked separately in 150 ml of each of methanol, chloroform, aqueous for 72 hours. Then the extracts were used for antimicrobial assay.

Antimicrobial activity:

The plant extract and callus extract were tested for antimicrobial activity in the agar well diffusion method (Perez et al., 1990) against *S. aureus, B. subtilis, E. coli, K. pneumoniae* and fungal pathogens were *A. niger, A. flavus* and *F. solani*.

Antibacterial activity:

The antibacterial activity against various clinical pathogens was performed using petri plates were prepared with 20 ml of Nutrient Agar media.
The test culture (100 µl of a suspension containing 10^8 CFU / ml bacteria) were swabbed and allowed to dry for 10 minutes. Wells of 5mm in diameter and about 2cm apart were puncture in the culture medium using sterile cork borers. The plant extracts were added to the wells. For bacterial culture plates were incubated for 24 hrs at 37ºC (Esimone et al., 1998). At the end of incubation, the plates were observed for and zone of inhibition were measured. The zones of inhibition were recorded. Ampicillin was served as standard.

Antifungal activity:

For fungal culture, the plates were incubated at 48hrs at 37ºC. The zone of inhibition was measured. Fluconazole was used as control

Table 1 Antibacterial activity of whole plant and callus extracts of *Aristolochia bracteolata*

	Zone of inhibition in mm				
Plant extracts	**Organisms**	**Methanol**	**Chloroform**	**Aqueous**	**Standard**
Whole plant	*Staphylococcus aureus*	7mm	8mm	8mm	7mm
	Bacillus subtilis	13mm	11mm	10mm	8mm
	E. coli	9mm	7mm	9mm	4mm
	Klebsiella pneumoniae	10mm	10mm	13mm	8mm
Callus extract	*Staphylococcus aureus*	11mm	12mm	10mm	6mm
	Bacillus subtilis	12mm	11mm	13mm	9mm
	E. coli	8mm	10mm	8mm	3mm
	Klebsiella penumoniae	10mm	2mm	12mm	8mm

Table: 2 Antifungal activity of whole plant and callus extracts of *Aristolochia bracteolata*

	Zone of inhibition in mm				
Plant extracts	**Organisms**	**Methanol**	**Chloroform**	**Aqueous**	**Standard**
Whole plant	*Aspergillus flavus*	10mm	8mm	9mm	8mm
	Aspergillus niger	10mm	11mm	12mm	7mm
	Fusarium solani	12mm	9mm	10mm	9mm
Callus extract	*Aspergillus flavus*	8mm	9mm	7mm	6mm
	Aspergillus niger	7mm	10mm	9mm	8mm
	Fusarium solani	9mm	8mm	5mm	6mm

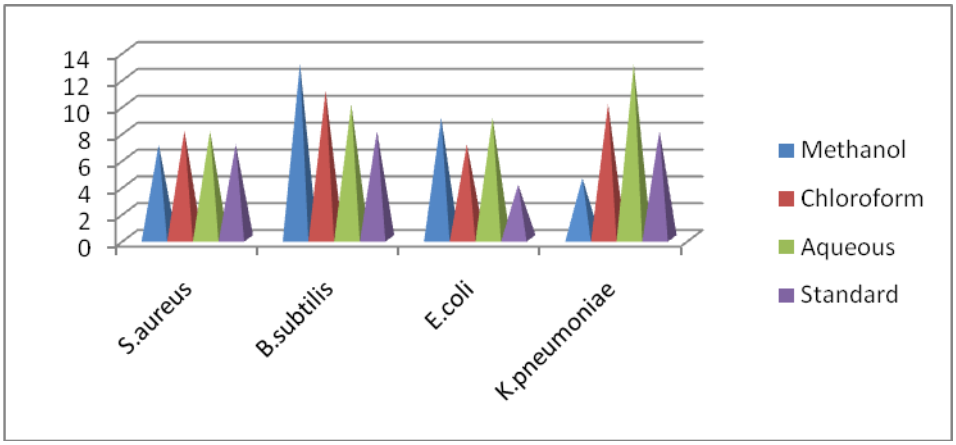

Fig.1: Showing antibacterial activity of Whole plant extract of *A. bracteolata*

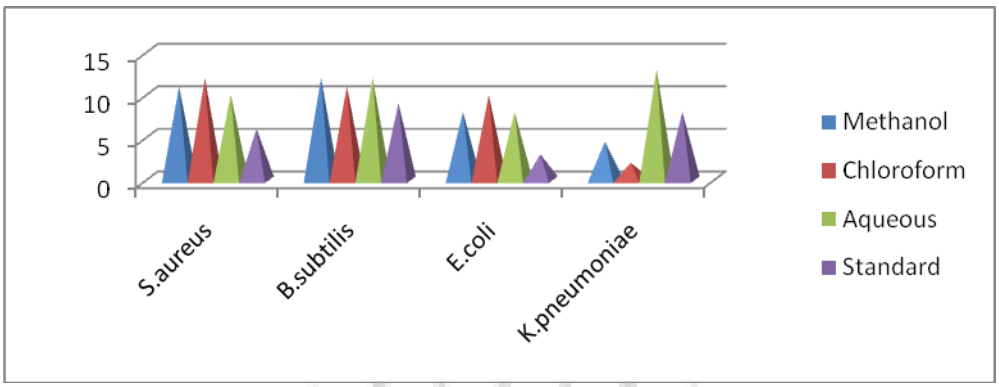

Fig 2: Showing antibacterial activity of Callus extract of *A.bracteolata*

RESULTS AND DISCUSSION

The antibacterial activity of the plant *Aristolochia bracteolata* aqueous leaf extract had significant inhibiting activity against *Klebsiella pneumoniae, B. subtilis, Staphylococcus aureus* and *E.coli* (Asraparveen *et al.*, 2012).

The present study showed the better antibacterial activity against *B. subtilis* in aqueous extract showing maximum zone 13mm and minimum activity against *S. aureus* of about 7mm zone in methanolic plant extract. For callus extract maximum zone of inhibition was found against *B. subtilis* in Aqueous extract of about 13mm and minimum zone of inhibition was found against *K. pneumoniae* in chloroform extract of about 2mm.

Plants containing tannins, alkaloids, saponin, flavonoid and glycosides showed a broad spectrum of antimicrobial activity (Khan et al., 2009; Tiwari *et al.*, 2011). The leaf extracts and Aristolochic acid from roots of *A. bracteolata* were found to be good antimicrobial agent (Cowan et al., 1999; Angalaparameshwari *et al.*, 2012).

Antifungal activity of present study showed that in whole plant extract the maximum zone of inhibition 12mm was observed both against *A. niger*, *F. solani* in aqueous extract and methanol extract respectively and minimum zone of inhibition 8mm was observed against *A. flavus* in chloroform extract. The Antifungal activity of callus extract the maximum zone of inhibition 10mm was observed both against *A. niger* in chloroform extract and minimum zone of inhibition 5mm was observed against *F. solani* in aqueous extract.

From the overall investigation, the whole plant extract of *A. bracteolata* showed better antibacterial and antifungal activity when compared to callus extract of *A. bracteolata*.

CONCLUSION

The results of this study have given useful information about the antimicrobial activity of medicinal plant *A. bracteolata* against various tested bacterial and fungal pathogens. The present study has focused on the *in vitro* propagated plant extract and callus extract, as there is no literature before in micro-propagated plant extract. The aqueous extract of the medicinal plant possesses excellent antimicrobial property when compared to other extracts. Thus the novel work will surely helpful for the detection of new antimicrobial drugs and drug designing. It is concluded that the present study would be helpful for scientists, research scholars and traditional people to design new antimicrobial drugs from plant based origin for the welfare of people.

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Conflict of Interest:

The authors have no conflict of interest.

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