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Mangrove plant *Sonneratia apetala* antimicrobial activity on selected pathogenic microorganisms

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ABSTRACT

The antimicrobial activity of the mangrove plant extract of *Sonneratia apetala* on the various test microorganisms, including clinical multiple antibiotic resistant bacteria and phytopathogens were investigated. Antimicrobial activities of the extracts were determined by the well diffusion method. *In vitro* screening of *S. apetala* mangrove plant extracts of showed species specific activity in inhibiting the growth of bacteria and fungi. Hexane, chloroform and methanol extracts showed good activity against all the pathogens, where as methanolic extracts were active against most of the pathogens.

Key words: Mangrove plant, *Sonneratia apetala,* antimicrobial activity, well diffusion method.

INTRODUCTION

Plants have been formed the basis of natural pesticides, that make excellent leads for new pesticide development (Newman *et al.,* 2000). The potential of higher plants as a source of new drugs is still largely unexplored. The plant world is a rich storehouse of natural chemicals that could be exploited for use as pesticides. The total number of plant chemicals may exceed 400,000 and of these 10,000 are secondary metabolites whose major role in the plants is reportedly defensive (Grayer and Harborne, 1994). Many species of higher plants have not been described, much less surveyed for chemical or biologically active constituent and new sources of commercially valuable pesticides (Gottlieb *et al.,* 2002). Higher plants are much more important in the production of economically important organic compounds, pharmaceuticals and pesticides (Hostettman and Wolfender, 1997). Hence, last decade witnessed an increase in the investigation on plants as a source of new biomolecules for human disease management (Grierson and Afolayan, 1999). Mangroves have long been a source of astonishment for the layman and of interest for scientist. Mangroves have been reported to contain compounds like tannins, alkaloids and polyphenols (Combs *et al*, 1949), which have antimicrobial activity (Jamale *et al*, 1998; Nishiyama *et al*, 1978 and Ross *et al*, 1980). *Sonneratia apetala* (mangrove) is belongs to Sonneratiaceae family and it is growing as tree/shrub along seaward fringe and intertidal areas like coringa, Kakinada. This study is an attempt to determine the antimicrobial activity of mangrove plant *S. apetala* hexane, chloroform and methanolic extracts on certain pathogenic microbes.

MATERIAL AND METHODS

Plant material

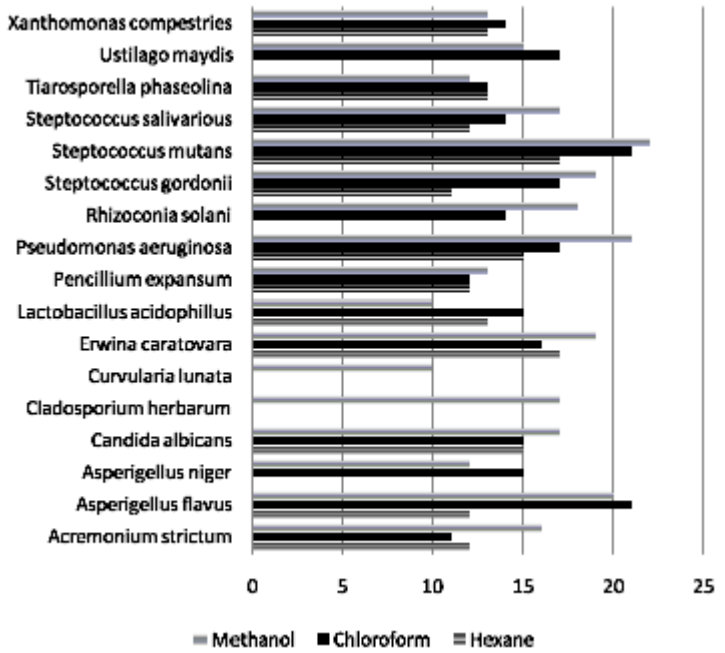
Plant parts were collected randomly from mangrove forest, coringa near to Kakinada Godavari district, Andhrapradesh, India. The samples mangrove plant parts were shade dried, cut into small pieces and powdered in a mixer grinder the residues (crude extracts) obtained were finally dried under vacuum.

Extraction of plant material

The extraction method employed here is a known amount of coarsely powdered plant materials of different plant species were successively extracted with organic solvents like chloroform, methanol and water basing on order of their polarity using soxhlet apparatus. The different extracts obtained were subsequently concentrated under reduced pressure to get their corresponding residues. The extracts were screened for antimicrobial activity using the method described under the section.

Organisms used in this study

The antimicrobial activity of *Sonneratia apetala* extracts was tested against *Asperigellus flavus* (MTCC 1884), *Asperigellus niger* (MTCC 2723), *Acremonium strictum* (MTCC 3072), *Candida albicans* (MTCC 3017), *Cladosporium herbarum* (MTCC 2143), *Curvularia lunata* (MTCC 2030), *Erwina caratovara* (MTCC 3609), *Lactobacillus acidophilus* (MTCC 447), *Pseudomonas aeruginosa* (MTCC 424), *Pencillium expansum* (MTCC 2006), *Rhizoconia solani* (MTCC 4633), *Streptococcus gordonii* (MTCC 2695), *Streptococcus mutans* (MTCC 890), *Streptococcus salivarious* (MTCC 1938), *Tiarosporella phaseolina* (MTCC 2165), *Ustilago maydis* (MTCC 1474) and *Xanthomonas compestris* (MTCC 2286). These microorganisms were procured from The Microbial Type Culture Collection & Gene Bank (MTCC), Institute of Microbial Technology Sector39-A, Chandigarh, India. The strains are maintained and tested on Nutrient Agar (NA) for bacteria and Potato Dextrose Agar (PDA) for fungi.



Zone of inhibition in mm, 100mg/ml concentration, 50µl/well

Graph 1: Antimicrobial activity of Hexane, chloroform and methanol extracts *Sonneratia apetala* of Areal parts

Determination of antibacterial activity

The crude extracts of the different plant parts of different species were subjected to antimicrobial assay using the agar well diffusion method of Murray *et al* (1995) modified by Olurinola (1996).

20 ml of nutrient agar was dispensed into sterile universal bottles these were then inoculated with 0.2 ml of cultures mixed gently and poured into sterile petri dishes. After setting a number 3-cup borer (6mm) diameter was properly sterilized by flaming and used to make three to five uniform cups/ wells in each Petri dish. A drop of molten nutrient agar was used to seal the base of each cup.

The cups/wells were filled with 50µl of the extract concentration of 100mg/ml and allow diffusing for 45 minutes. The solvents used for reconstituting the extracts were similarly analyzed. The plates were incubated at 37°C for 24h for bacteria. The above procedure is allowed for fungal assays but except the media potato dextrose agar instead of nutrient agar and incubates at 25°C for 48 hours. The zones of inhibition were measured with antibiotic zone scale in mm and the experiment was carried out in duplicates.

RESULTS AND DISCUSSION

The antifungal and antibacterial activity of areal parts of *Sonneratia apetala* extracts of hexane, chloroform and methanol are presented here. The chloroform and methanolic extracts showed considerably more activity than the hexane extract. Maximum antimicrobial activity was shown against *Asperigellus flavus, Streptococcus mutans* with chloroform. The greatest activity of the methanolic extract was against *Asperigellus flavus* followed by *Candida albicans* and *Cladosporium herbarum.* The hexane extract appears to have less antibacterial and antifungal activity than the chloroform and methanolic extracts from the above results it can be concluded that plant extracts have greater potential as antimicrobial compounds against microorganisms and that they can be used in the treatment of infectious diseases caused by resistant pathogenic microorganisms.

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