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Antimicrobial Screening of *Asparagus racemosus* on Aquatic, Plant and Human Pathogens

Varaprasad Bobbarala, D. Bindu Maduri, G. Srinivasa Rao and D. Aryamithra

For U Biosciences, A/4A, Park lane Residency, East Point Colony, Visakhapatnam - 530 017, India.

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Three different organic solvents which include hexane, chloroform and methanol were used to extract the bioactive compounds from the root of *Asparagus racemosus* to screen the antimicrobial activity against selected plant, aqua and human clinical pathogens by agar diffusion method. The methonolic extract of *A. racemosus was* more active against 90% of the organisms tested. It was followed by chloroform extract (75%) and hexane extract (20%) in inhibiting the growth of the organisms tested. The crude extracts of *A. racemosus* had broad spectrum of activity because they inhibit the growth of both gram positive, gram negative bacteria and fungal pathogens as well.

Key words: *Asparagus racemosus*, Crude extracts, Bacterial and fungal pathogens, antimicrobial activity.

So many antibiotic resistant bacterial strains were developed due to the improper use of a number of broad spectrum antibacterial drugs (Kandhasamy *et al*. (2008). Moreover Natural and synthetic antibiotics produce side effects to the Consumers (Tomin and Tomasz, 1986). To overcome this problem, scientists are more interested to develop new antibiotics from unicellular organisms, fungi, algae and higher plants. Among them, higher plants play an important role by producing large number of organic compounds as secondary metabolites, which can be used as self defense. They act as bioactive compounds, chemotherapeutic, bactericidal, and bacteriostatic agents (Evans *et al*., 1986: Purohit and Bohra 1998). As a result, antimicrobial substances derived from plants have received considerable attention in recent years. Several plants are used in folk medicine and other tradisional medicine as aseptic agents throughout the world.

Asparagus is the Greek word for "stalk" or "shoot". About 300 species of Asparagus are known to occur in the world. *Asparagus racemosus* or "Satavar" is a creeper of the plant genus *asperagus* it contains adventitious root system with tuberous roots. For each plant, many tuberous roots are present. These tuberous roots after proper

* To whom all correspondence should be addressed.
E-mail: varaprasadphd@rediffmail.com

processing and drying are used as medicine in Ayurveda, with the name of Shatavari. The Asparagus genus is considered to be of medicinal importance because of the presence of steroidal saponins and sapogenins in various parts of the plant (oketch-Rabah HA 1998; Rao SB 1952; Shao YU *et al*., 1997). Out of several species of 'Asparagus' grown in India, *A. racemosus, A. gonaclades* and *A. adsendens* are most commonly used in indigenous medicine. *A. racemosus* is commonly mentioned as a rasayana in the Ayurveda (Nadkarni AK 1954). Rasayanas are those plant drugs which promote general well being of an individual by increasing cellular vitality or resistance. Beneficial effects of the root of *A. racemosus* are suggested in nervous disorders, dyspepsia, diarrhoea, dysentry, tumors, inflammations, hyperdipsia, neuropathy, hepatopathy, cough, bronchitis, hyperacidity and certain infectious diseases (Chopra RN *et al*., 1994; Dalvi SS *et al*., 1990). A study of ancient classical Ayurvedic literature claimed several therapeutic attributes for the root of *A. racemosus* (Hindi as Shatavari) and has been specially recommended in cases of threatened abortion and as a galactogogue (Narendranath KA *et al*., 1986; Sholapurkar ML *et al*., 1986). Based on information the root of *Asparagus racemosus* was selected to evaluate its antimicrobial activity.

MATERIAL AND METHODS

Plant description

The plant *A. racemosus*, used in this study belongs to the family asparagaceae. A thorny, climbing undershrub with woody stems. Young stems are very delicate, brittle and smooth; leaves are reduced to minute scales and spines. Curved cladodes replace the leaves. Flowers are white fragrant, in simple or branched recemes. Fruits are globular, or vaguely 3 lobbed, pulpy berries, purplish black when ripe, seeds with hard and brittle testa. Roots are succulent and tuberous, from 30 cm to 1 m in length, smooth and tapering at both ends.

Plant processing

The plant material used in the present study is the root of *Asparagus racemosus.* The roots were removed using sterile scalpel and washed with sterile distilled water. They were chopped into small pieces and dried in shade and made into fine powder using blender. The powder was used for soxhlet extraction of biologically active compounds.

Solvents used

Organic solvents such as Hexane, Chloroform and Methonol were used for the extraction of the biologically active compounds.

Micro organisms used in the present study

Bacteria and Fungi causing diseases in plants, humans, and aquaculture were used in the present study. Among bacteria they were both gram positive and gram negative. Ten gram negative bacteria were *Aeromonas hydrophila, Erwinia caratovora, Escherichia coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Pseudomonas marginale, Pseudomonas syringae , Peudomonas spp., Vibrio spp.* and *Xanthomonas campestris. Nine gram positive bacteria* were *Enterococus fecalies, lactobacillus acidophilus, Lactobacillus fermentum, Micrococus leuteus, Staphylococus aureus, Staphylococus faciolences, Streptococus mitis, Streptococcus mutans streptococus thermophilus*. Eleven plant pathogenic fungi were *Acremonium strictum, Alternaria alternate, Aspergillusflavus, Bipolaris bicolor, Cladosporium herbarum, Curvularia lunata, Fusarium oxysporum, Pencillium expansum, Rhizoctonia solani, Ustigo maydis* and one human pathogenic fungi *Candida albicans.*

Extraction procedure

150g of powder of root of *Asparagus racemosus* was weighed and packed with filter paper as a roll and placed in a soxhalet apparatus. Through the soxhalet extraction process plant material was extracted into round bottom flak. Then it was condensed via condensation process and collected into a beaker, store in a refrigerator for further use.

Culture medium

Nutrient agar and Potato dextrose agar were used to study antibacterial and anti fungal activities respectively of root of *A. racemosus*.

Inoculum preparation

Pure cultures of bacterial and fungal pathogens removed and transferred to nutrient broth, potato dextrose broth respectively and incubated at 37p C /24h. The tubidity was adjusted to that of standard level by adding sterile Nutrient broth and Potato dextrose broth.

Assay of antimicrobial activity by pour plate technique

Antibacterial activity was carried out by agar diffusion method (Bauer *et al*., 1966). 0.1ml of 24 hours old culture of bacterial or fungal pathogen was mixed with sterilized, tap water cooled respective agar medium and poured into petridish. After solidification made appropriate wells by using cork metal borer with a diameter of 6mm. Then the crude extract was placed in respective wells at equal distance. The plates were kept at room temperature for 25min, which helps to diffuse the extract into the medium. Later plates were incubated at 37p c /24h to determine the antifungal or antibacterial activity of the respective solvent extract of *A .racemosus*

RESULTS AND DISCUSSION

The efficacy of different solvent extracts of *A. racemosus* on antifungal and antibacterial activity was shown in table 1. Frequent uses of antibiotics make the organisms resistant to such antibiotics (Sydney *et al*., 1980). Chloroform and methanolic extracts of root of *A.racemosus* exhibited broad spectrum of antibacterial as well as antifungal activity. In the present study it was observed that methanolic and chloroform extracts inhibited the growth of pathogenic bacteria and fungi 90% and 75% respectively. Whereas hexane extract exhibited 20% of activity against pathogenic bacteria and fungi.

The broad spectrum of antibacterial and anti fungal of these extracts was due to the presence of active principle present in the extracts. The bioactive compounds may be polar molecules like saponins (Singh and Gupta, 2008) responsible for broad spectrum of antibacterial and antifungal activity (Kafaru, 1994). Both gram positive and gram negative bacteria were sensitive to the Methanolic and chloroform extracts tested. Among gram positive bacteria tested *Streptococcus mutans* (Dental caries) was more sensitive to the Methanolic (25mm), Chloroform (22mm) extracts of *A. racemosus*. Among gram negative bacteria tested *Xanthomonas campestris, Pseudomonas aeriginosa and Aeromonas hydrophila* were more sensitive to the Methanolic all of them produced (22mm) Zone of inhibition. Whereas chloroform extracts produced 20mm, 19mm, and 22mm of inhibition zone respectively. Methanolic extracts of *A. racemosus* exhibited high antifungal against *Alternaria alternate* (24mm), *Cladosprium herbarum* (23mm), *Candida albicans* (22mm), *fusarium oxysporum* (20mm), *Tiarosporella phureolina* (20mm). Whereas chloroform extracts of *A. racemosus* shown maximum activity against *Alternaria alternate* (23mm), *fusarium oxysporum* (22mm), *Candida albicans* (20mm), *Cladosporium herbarum* (20mm) and *Tiarosporella phaseolina* (20mm). The study supported the claim of the usefulness of the *A. racemosus* in candiosis and dental caries infections and also suggests its use in plant diseases and diseases in aquaculture caused by pathogenic bacteria and fungi. Hence it can be used and administered in the medical practices while treating with above diseases.

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