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ANTIBACTERIAL ACTIVITY OF DIFFERENT PLANT EXTRACTS ON *PSEUDOMONAS AERUGINOSA*

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Key words : *Medicinal plants, Antibacterial activity, Well diffusion method, Pseudomonas aeruginosa.*

Abstract - A preliminary screening of ten different medicinal plants for antibacterial activity was carried out. Most of these plants are mentioned in the traditional systems of medicine as sources of aseptic agents. Crude, ethanol and acetone extracts of all the plants were tested for their antibacterial activity against *Pseudomonas aeruginosa* by well diffusion method. Maximum antibacterial activity was found in ethanolic extracts, followed by acetone and crude extracts of all the plants tested.

INTRODUCTION

In recent years, there is a growing tendency all over the world to shift from synthetic to natural based products including medicinal plants. Numerous reports have appeared on the microbicidal activity of plants and their secondary metabolites. Scientific experiments have documented that antimicrobial properties of spices and herbs have been realized the medicinal properties of plants. The antimicrobial activity varies widely depending on the herbs, test medium and microorganisms. For these reasons spice antimicrobials should not be considered as primary preservatives (Giese, 1994). Garlic (*Allium sativum*) have a wide variety of application including respiratory tract infection, skin disorders, parasitic infections and act as an antibiotic and antimicrobial agents (Alexander, 1998). Epidemiological studies have found that garlic have decreased the incidence of gastrointestinal cancer (Mei, 1982). Ginger exerts a great influence on gastrointestinal tract and stimulates gastric acid secretion (Tyler, 1994), and ginger possess bactericidal action against many pathogens including *Salmonella typhi* and *Vibrio cholera* (Stewart and Wood, 1991). Crude and acetone extracts of various parts of *Punica granatum, Tamarindus indica, Garcinia gummygutta, Avverhoea carambola* and *Spondias pinnata* were active against both gram positive and gram negative organisms (Babu *et al.* 2002).

Studies have shown that the antibacterial activity of Azadirachta indica were tested under *in vitro* condition against *Escherichia coli, Shigella, Salmonella, Klebsiella* and *Vibrio cholerae* with ether and aqueous extract (Vijaya *et al.* 1995). Observations have showed that natural substances controlled the spectacular symptoms of certain diseases. *Curcuma longa* rhizome extracts were evaluated for antibacterial activity against pathogenic strains of gram positive bacteria *Staphylococcus aureus* and *Staphylococcus epidermidis*) and gram negative bacteria (*Escherichia coli, Pseudomonas aeruginosa* and *Salmonella typhi*) (Singh *et al.* 2002). Curcuminoids isolated from the rhizome of *Curcuma longa* attributed a wide array of biological activities such as antioxidant, anti-inflammatory, wound healing, anticancer, anti-proliferation, antifungal and antibacterial activity (Luthra *et al.* 2001; Oshiro *et al.* 1990; Shalini *et al.* 1992; Surh, 1999). *Carica papaya* fruits and latex parts are useful to treat skin disease, leprosy, inflammations, bronchitis, urinary tract infections and many other diseases. The present study was undertaken to determine the antibacterial activity

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of different plant extracts on *Pseudomonas aeruginosa.*

MATERIALS AND METHODS

Collection of plant materials

The plant materials were collected from in and around Coimbatore, Tamil Nadu, India, and for evaluation of its antimicrobial effects. The plant parts (leaves, rhizomes and fruits) were washed thoroughly in tap water followed by sterile distilled water and shade dried at room temperature for 10-15 days.

Preparation of extracts

Dry plant material 5 g was ground by using mortar and pestle and made into a suspension with 10 mL of sterile distilled water, 2.5 mL of acetone and 50 mL of 70% ethanol separately. The suspension was allowed overnight at room temperature to settle down and the extract was collected and stored in a sterile container at 4°C (Bibitha *et al.* 2002).

Bacterial strain

The study was carried out by collecting clinical specimens from various Hospitals in and around Coimbatore, Tamil Nadu, India. The collected samples such as blood, sputum, urine were processed by subjecting to microscopy, biochemical tests, and cultural characterization for the confirmation of *Pseudomonas* sp. (Cappuccino and Sherman, 1996).

Inoculum preparation

The test bacteria was inoculated into nutrient broth (Himedia, Mumbai, India) and incubated at 37°C for overnight. Lawn culture was prepared in nutrient agar plates using overnight cultures.

Antibacterial assay

The plant extracts were tested for their antibacterial activity by well diffusion method (Chung *et al.* 1990) against two bacterial strains of the genus *Pseudomonas*. The broth culture of *Pseudomonas* sp. were swabbed over nutrient agar by using sterile cotton buds, and wells were made by using sterile well cutter (6 mm). Extracts were transferred to the wells and incubated at 37°C for 24 hrs. After incubation the zone of inhibition was recorded. Control wells were maintained with sterile distilled water.

RESULT AND DISCUSSION

The strains isolated from various specimens were characterized based on their morphological, biochemical and cultural characteristics. They are Gram negative ß haemolytic colonies and on *Pseudomonas* isolation agar medium they produced large translucent irregular pigmented colonies. Biochemically, in IMVIC test they showed positive result for citrate only. Oxidase, catalase and nitrate reduction tests are positive, hydrogen sulphide was not produced and in TSI test they produced alkaline in both slant and butt area.

The medicinal plants selected for the present study are mentioned in traditional medicines for the treatment of inflammation, diarrhoea, skin and liver diseases and edema. The antibacterial effect was observed by measuring the zone of inhibition (mm) produced by the plant extracts. The two bacterial strains p1 and p2 subjected to the study

Table 1. Antimicrobial Activity of medicinal plants on *Pseudomonas* isolates.

S. No.	Types of plants	Isolate (P1)			Isolate (P2)		
		C	E	A	C	E	A
1.	*Azadirachta indica*	R	R	R	R	S	R
2.	*Moringa indica*	R	R	R	R	S	S
3.	*Allium sativum*	R	R	S	R	S	S
4.	*Tamarindus indica*	R	R	S	R	S	R
5.	*Punica granatum*	S	S	S	S	S	S
6.	*Zingiber officinale*	R	R	R	R	S	R
7.	*Curcuma longa*	R	R	R	R	S	R
8.	*Tridax procumbens*	R	R	R	R	S	S
9.	*Momordica charantia*	R	R	R	R	S	R
10.	*Carica papaya*	S	R	R	R	R	R

C – crude; E – ethanol; A – acetone extracts; R- resistant; S- sensitive

and showed variations in the susceptibility patterns. The results were shown in Table 1.

The isolate p2 was sensitive to ethanolic extract of nine plants except *Carica papaya* whereas p1 showed resistance to all ethanolic extract except *Punica granatum*. Next to ethanolic extract acetone extract exerted greater activity against both isolates. Among the plants, used crude, ethanol, acetone extracts of *Punica granatum* showed maximum against both the test organisms.

Hence, the present study suggests that *Punica granatum* shows high antibacterial activity which could be considered to be of great importance and its better for the isolation of antibacterial compounds. Similar findings were reported by Babu *et al.* (2002) the antimicrobial activity varies based on the type of herbs or spices, test media and test pathogens. For these reasons, spice antimicrobials should not be consider as a primary preservative method (Giese, 1994).

Antimicrobial effectiveness of spices and herbs show difference in resistance pattern. They may act as germicidal or inhibitory agents in effect. The active component of spices/herbs at low concentrations may interact synergistically with other factors (NaCl, acids and preservatives) to increase preservative effects (Zaika, 1998). The effectiveness of plants was may be combined with action of other chemical compounds (Bai, 1990). The results of this study are very encouraging and indicate that these medicinal plants should be studied more extensively to explore its potential in the treatment of many infectious diseases.

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