Research Article

Evaluation of Antimicrobial Activity of *Polyalthia longifolia* Seed Extracts

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ABSTRACT

The aim of the present study was to assess the antimicrobial potential of extracts prepared from *Polyalthia longifolia* seeds, against bacterial strains as, *Escherichia coli*, *Salmonella abony*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus cereus* and yeast strains as *Saccharomyces cereviseae & Aspergillus niger.* The cold solvent extracts were used to evaluate antimicrobial activities by well diffusion method; the inhibitory zones were recorded in millimeters. The results of this evaluation showed that zone of inhibition against the tested micro-organisms were found in the range of 2.00 to 15.00 mm at a concentration of 40 µL. The highest antibacterial activity was found to acetone extract (15mm) against *Bacillus cereus and* chloroform extract (10mm) is even more active than *Staphylococcus aureus*; compared with the standard drug (streptomycin). Comparable antifungal activity was found to ethanol extract with fluconazole as standard drug. The inhibitory effect is very similar and even more with that of standard drug. The results indicate that the possibility of using these extracts against bacterial and fungal infections. This study revealed the importance of plant extracts and its effectiveness for clinical studies involving antimicrobial preparations. Extensive investigation is needed to isolate the secondary metabolites from the extracts in order to test specific compounds for antimicrobial activity and the mechanisms involved.

Keywords: Antimicrobial activity, *Polyalthia longifolia*, seed extracts.

INTRODUCTION

Ayurveda, Siddha and Unani, the traditional systems of medicine, make use of herbal preparations to cure various disorders. Ayurveda, the home-grown system of medicine has been a part of Indian culture. The demand of plant based therapeutics is increasing in developing and developed countries as they are easily biodegradable with minimum environmental hazards. Different extracts and isolated compounds from plant parts have provided a foundation for modern pharmaceutical compounds. A worldwide trend towards the use of naturally occurring phytochemicals has been increased. *Polyalthia longifolia* is one of the important medicinal plants.

Use of herbal products as antimicrobial agents provides the best alternative to the use of toxic synthetic antibiotics. This insists to isolate, identify and purify the naturally occurring chemical moieties, which are mainly responsible for pharmacological and therapeutic action[1] All parts of the plant are reported to have medicinal value in Ayurvedic system of medicine in the treatment of disorders.[2] Secondary metabolites like flavonoids, alkaloids and tannins show the medicinal property for stress removal which causes various diseases as tumors, fever, skin diseases, hypertension and helmenthiasis etc.[3-8]

Literature survey revealed that a number of biologically active compounds have been isolated from this plant. The plant extract and isolated compounds have been studied for various biological activities such as, antibacterial[9-11], antifungal[12], anticancer[13], anti-inflammatory & cytotoxic[14], hypotensive[15], fungicides[16] and analgesic.[17] Literature reports indicated the use of Ashoka bark as a natural mordant[18] and as a biomonitor of automobile pollution.[19] Antitumor and antioxidant activity of *P. longifolia* stem bark has been reported.[20] The fresh stem bark juice is used to treat indigestion. Diterpenoids and alkaloids isolated from the seeds demonstrated significant antibacterial and antifungal activities.[21] Reports revealed the antibacterial activity of *P. longifolia* flowers[22-24], stem bark[25] and leaf extracts.[26]

Our previous study related to phytochemical analysis of the *Polyalthia longifolia* seed extracts revealed the presence of steroids, alkaloids, tannins, carbohydrates, phenolics, flavonoids, amino acids and biological important elements as major chemical constituents.[27-29] Quantitative estimation of phenols and flavonoids from seed extracts have been carried out.[30] A survey of literature revealed that no reports were available on antimicrobial activity of seed extracts. Therefore it was thought worthwhile to investigate and explore the antimicrobial potential of *Polyalthia longifolia* seed extracts against different microorganisms. Further screening of this medicinal plant may results in obtaining the new biologically active compound.

MATERIALS AND METHODS

P. longifolia seeds were collected from the local garden, Pune, Maharashtra India. It was authenticated at

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Botanical Survey of India, Pune, India having voucher specimen number POLMK1;BSI /WRC/ TEC/ 2009.

Air shade dried and pulverized seed material (1g) was kept in contact with non polar to polar solvents at room temperature for 24 hours. Solvents were recovered under reduced pressure to achieve extractive values. Extractive values have been noted for non polar hexane (7.45%), semi polar ethyl acetate & acetone (7.64% &9.0%) and for polar ethanol, methanol and aqueous extracts (10%, 10.5% & 12.0%).

Antimicrobial studies for the test samples were carried out against bacterial strains as, *Escherichia coli* (ATCC - 11246), *Salmonella abony* (ATCC - 23564), *Pseudomonas aeruginosa* (ATCC - 27853), *Staphylococcus aureus* (ATCC - 6538P), *Bacillus cereus* (ATCC – 11778) and yeast strains as *Saccharomyces cereviseae* (ATCC - 9763) & *Aspergillus niger* (ATCC - 16404).

The well diffusion method was employed. Test samples of each extracts (10 mg) were dissolved in respective solvents (1 ml). Sterile 8.00 mm diameter wells were impregnated with extract (40 µL). The plates were incubated for 24 hours at 37 ± 0.1 °C, while yeast strain was inoculated on nutrient broth and incubated for 48 hours at 25 ± 0.1 °C. Adequate amount of Muller Hinton Agar and Chloramphenicol Yeast Glucose Agar were dispensed into sterile plates and allowed to solidify under aseptic conditions. The count of the bacterial strains and yeast strain was adjusted to yield 1 X 10^7 to 1 X 10^8 mL^{-1} and 1 X 10^5 to 1 X 10^6 mL^{-1} respectively. The test organisms (0.1 ml) were inoculated with a sterile spreader on the surface of solid medium in plates. The agar plates inoculated with test organism were incubated for one hour before placing the extract impregnated paper discs on the plates. The bacterial plates were incubated at 37 ± 0.1 °C for 24 hours while the yeast plates were incubated at 25 ± 0.1 °C for 48 hours and zones of growth of inhibition and the diameters of these zones were measured in millimeters. Streptomycin discs (10 µg/disc) and fluconazole discs (50 µg/disc) were used as positive controls.

RESULTS AND DISCUSSION

In the present study, the antimicrobial activity of seed extracts against bacterial and fungal strains were assessed by the presence or absence of inhibition zones. Results obtained using well diffusion method is summarized in Table 1. Diameters of the inhibition zone for studied organisms are recorded excluding zone of inhibition of the well diameter (8mm). It was observed that all the tested extracts showed activity towards bacterial strains *Staphylococcus aureus* and Bacillus *cereus*. Activity observed was even more compared with standard (Streptomycin). For E. coli strain activity was observed for acetone, methanol and ethanol extracts. Ethanol extract was equally active against fungal strain *S. cereviseae* which is compared with standard (Fluconazole).

The antimicrobial activities of medicinal plants are due to presence of flavonoids, tannins and alkaloids. The antimicrobial activity found may be due to secondary metabolites in the plant material either individual or in combination. It is observed that seed extracts are even more active compard to standard because plant active substances are soluble in organic solvents. Our results indicates the potential usefulness of *P. longifolia* seed extracts in the treatment of bacterial and fungal strain. These observed reports and presence of various phytochemicals in different extracts confirms its potential against tested pathogens. There is need to develop new antimicrobial agents which can satisfy the present demand. Hence *Polyalthia longifolia* seed extracts can be used as an alternative to the cost effective and more toxic pathogens available in the market.

Conclusion: The *Polyalthia longifolia* seed extracts can be used in the treatment of bacterial and fungal infectious diseases. The activities observed could be attributed to the presence of Phytochemicals detected which have been associated with antibacterial activity. Further investigation is needed to isolate the secondary metabolites from the extracts in order to test specific compounds for antimicrobial activity and to study the mechanism involved.

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Table 1: Antimicrobial Activity of Seed Extracts

Micro-organism	Diameter of zone of inhibition (mm)[a]					
	Std.	Chloroform	Ethyl Acetate	Acetone	Ethanol	Methanol
Salmonella abony	4	-	-	-	1	-
E. coli	10	-	-	3	2	5
P. aeruginosa	10	-	-	-	-	-
S. aureus	7	10	3	7	8	9
Bacillus *cereus*	15	12	10	15	10	10
Aspergillus niger	-	-	-	-	-	-
S. cereviseae	4	1	-	-	4	1

A - zone of inhibition excluding the well diameter (8mm) and - = No activity.

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