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PHYTOCHEMICAL ANALYSIS AND ANTIMICROBIAL ACTIVITY OF *POLYALTHIA LONGIFOLIA*

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ABSTRACT

Polyalthia longifolia is a lofty evergreen plant, native to India, commonly planted due to its effectiveness in alleviating noise pollution. The has been used in the traditional system of medicine for the treatment of fever, skin diseases, diabetics and hypertension. A number of biologically active compounds have been isolated from the plant. However, its antimicrobial activity has not been investigated still now. Hence it was considered to evaluate the premilinary phytochemical analysis and antimicrobial activity. The premillinary phytochemical analysis and antimicrobial activity of different extarcts (petroleum ether, chloroform, ethyl acetate, ethanol and aqueous) of leaves of *Polyalthia longifolia* was studied against six different bacteria by disc diffusion method. The various metabolites present in all the extracts. Among various solvent extracts studied, chloroform extract showed higher degree of inhibition followed by ethylacetate, ethanol, petroleum ether and aqueous.

KEYWORDS

Polyalthia longifolia, phytochemical analysis, antimicrobial activity, disc diffusion method

INTRODUCTION

Plants are the main source of food. They are rich in nutrients. They are also rich in compounds which have pain relieving and healing abilities. From earliest times itself, plants were used for treatment of disease without knowledge about the compounds present and their mode of action. Over the centuries societies around the world have developed their own tradition to make sense of medicinal plants and their uses. The wide spread use of herbal remedies and health care preparations obtained from commonly used traditional herbs and medicinal plants have been raised due to the occurrence of natural products with medicinal properties.

Even though pharmacological industries have produced a number of new antibiotics in the last three decades, resistance to these drugs by microorganisms has also increased. In general, bacteria have the genetic ability to transmit and acquire resistance to drugs, which

are utilized as therapeutic agents. Such a fact is cause for concern, because of the number of patients in hospitals who have suppressed immunity, and due to new bacterial strains, which are multi-resistant. Consequently, new infections occur in hospitals resulting in high mortality[1].

The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efficiency. Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant. These products are known by their active substances, for example, the phenolic compounds which are part of the essential oils, as well as in tannin[2].

Polyalthia longifolia is a lofty evergreen tree, native to India, commonly planted due to its effectiveness in alleviating noise pollution. It exhibits symmetrical pyramidal growth with willowy weeping pendulous branches and long narrow lanceolate leaves with undulate margins. The tree is known to grow over 30 ft in height. In traditional medicines various herbal preparations are being used for treating dueodenal ulcers. The plant has been used in traditional system of medicine for the treatment of fever, skin diseases, diabetics, hypertension and helmiinthiasis. A number of biologically active compounds have been isolated from the plant [3].

The relatively lower incidence of adverse reactions to plant preparation compared to modern conventional pharmaceuticals, coupled with their reduced cost is encouraging both the consuming public and national health care institutions to consider plant medicines as alternatives to synthesis drugs[4], Infectious diseases account for high proportions of health problems in the developing countries like India. Micro organisms have developed resistance to many antibiotics and this has created immense clinical problem in the treatment of infectious diseases[5].

Bacterial resistance to antimicrobial drugs is a worldwide problem that has emerged even among the common poultry pathogens. Nowadays, the use of antibiotics to control diseases is producing adverse toxicity to the host organs, tissues and cells. The toxicity produced by the antimicrobial agents can be cured or prevented or antagonized using herbs. Herbal medicines are in great demand in both developed and developing countries as a source of primary healthcare owing to their attributes having wide biological and medicinal activities, high safety margins and lesser costs. Herbal molecules are safe and will overcome the resistance produced by the pathogens as they exist in a combined form or in a pooled form of more than one molecule in the protoplasm of the plant cell. Some herbs were known to prevent cancer. Some herbs have antibacterial and antifungal properties that are useful for clinical use. Some of the *in vitro* studies have been conducted, in which herbal extracts were given to clinical drug resistant strains and different serotype strains of infection[6]. Hence the present study reports on the preliminary phytochemical analysis and antibacterial activity of *Polyalthia longifolia*.

MATERIALS AND METHODS:

Plant collection

Healthy disease free, mature fresh plant leaf sample were collected in Namakkal Dt., Tamilnadu, India. The plants were identified in Botanical Survey of India (South Circle), Coimbatore. A voucher specimen of the plant has been deposited at the Department herbarium. Fresh leaves were washed thoroughly 2-3 times with running tap water and once with sterile water, shade-dried without any

contamination. The dried leaves were then powdered using an electric mill.

Preparation of Extracts [7]

For water extract: Leave powder (20g) was subjected to boil in 200 ml doubled distilled water in a 500 ml flask till the total volume becomes one fourth. The water extract was filtered through a 420 µm stainless steel filter, cooled and transferred to screw capped glass vials. For organic solvent extract: 10g of plant leave material was powdered and extracted with solvents of different polarities (petroleum ether, chloroform, ethyl acetate and ethanol) by cold maceration for 24 h. The extracts were filtered through Whatman No. 1 filter paper into screw capped vials. The entire extract was concentrated to dryness using rotary flash evaporator under reduced pressure.

Phytochemical Screening

Phytochemical screening was done for analyzing secondary metabolites that are responsible for curing ailments. The Phytochemical screening of the plant extract was carried out[8] in all the extracts.

Collection and maintenance of Microbial culture

The strains were collected from the Department of Microbiology, Karpagam University, Coimbatore and freeze preserved in nutrient agar slants. The bacterial strain such as (*Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Salmonella typhi Pseudomonas aeruginosa* and *Proteus vulgaris*) were inoculated in a nutrient broth at 37^0C for 24 hour in incubator.

The 36g of Muller Hinton agar (Himedia) was mixed with distilled water and then stabilized in autoclave at 15lbs pressure for 15 min. The sterilized media was poured into Petri dishes; the solidified plates were bored with 5mm diameter cork bearer. The plates with wells were used for the antimicrobial studies.

The various extracts were tested against the *Escherichia coli, Bacillus subtilis, Staphylococcus aureus, and Salmonella typhi* for antimicrobial activity. Wells of equal size were cut and the antibiotic was added into it for positive control; respective solvents acting as a negative control. The plates were incubated at 37^o C, overnight.

Antibacterial sensitivity [9]

The antibacterial activity of crude plant extracts of *Polyalthia longifolia* were determined by well diffusion method. Plates were prepared by pouring sterile Muller Hinton agar (Himedia) into sterile petri dishes that were previously autoclaved. Sterilized cotton swabs were dipped in the bacterial culture in nutrient broth and then swabbed on the agar plates. Wells of equal size were cut with proper gaps in the medium and the plant extracts were added into it. Then the plates were incubated at 37^oC and observed for zones of growth inhibition after 24 hours.

RESULTS AND DISCUSSION

Phytochemical analysis

Table 1 shows the result of the preliminary phytochemical analysis. The results showed the Carbohydrates, Oils and fats, Terpenoids, Steroids and sterols and amino acids showed the positive result in all the extracts. Saponins were absent in all the extracts. Cardio glycosides, tannins, phenolic compounds and flavanoids were absent in aqueous extract but other extracts exhibited positive result. Alkaloids were present only in chloroform, ethanol and aqueous extracts, petroleum and ethyl acetate extracts showed negative result.

Table1
Preliminary phytochemical analysis of *Polyalthia longifolia* in different plant extracts

S.NO	Compound	Extracts				
		PE	CH	EA	EH	AQ
1	Carbohydrates	+	+	+	+	+
2	Cardio glycosides	+	+	+	+	-
3	Saponins	-	-	-	-	-
4	Oils and Fats	+	+	+	+	+
5	Terpenoids	+	+	+	+	+
6	Alkaloids	-	+	-	+	+
7	Steroids and Sterols	+	+	+	+	+
8	Flavanoids	+	+	+	+	-
9	Tannins and Phenolic compounds	+	+	+	+	-
10	Amino acids	+	+	+	+	+

+	-	Positive
-	-	Negative
PE	-	Petroleum ether
CH	-	Chloroform
BE	-	Ethyl Acetate
EH	-	Ethanol
AQ	-	Aqueous

Table: 2

Antimicrobial activity of *Polyalthia longifolia* in different plant extracts

S.NO	Microorganism	Zone of Inhibition (mm)					
		Petroleum ether	Chloroform	Ethyl acetate	Ethanol	Aqueous	Control
1	*Salmonella typhi*	14±0.13	21±0.12	20±0.24	18±0.15	11±0.18	27±0.06
2	*Escherichia coli*	16±0.12	24±0.28	21±0.23	17±0.22	12±0.25	29±0.04
3	*Bacillus subtilis*	17±0.18	26±0.26	22±0.21	19±0.25	15±0.16	28±0.03
4	*Staphylococcus aureus*	15±0.21	25±0.22	21±0.18	18±0.09	14±0.19	25±0.05
5	*Pseudomonas aeruginosa*	14±0.25	24±0.21	20±0.17	15±0.19	11±0.15	24±0.04
6	*Proteus vulgaris*	15±0.19	23±0.13	21±0.25	18±0.23	13±0.13	27±0.05

Data given are mean of three replicates± standard error

Antibacterial sensitivity

The results of antibacterial sensitivity of various solvent extracts of *Polyalthia longifolia* leaves by disc diffusion method are in depicted table 2. The results reveal that all extracts are potent antimicrobials against all the pathogenic organisms studied. The antibacterial activity was screened from the zone of inhibition. Among various solvent extracts studied, chloroform extract showed higher degree of inhibition followed by ethylacetate, ethanol and petroleum ether. The aqueous extract show minimum inhibitory effect compare to the all the other extracts. The diameter of inhibition zones for each of the samples were compared with (positive control) standard antibiotic (chloramphenicol 30 mcg/disc). In negative control has not shown any inhibitory effect. Highest antibacterial activity was against *Bacillus subtilis* in chloroform extract, followed by *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Proteus vulgaris* and *Salmonella typhi*. Similar types of observation were also noticed in all the other extracts.

The antimicrobial activities of various plants have been reported by many Researchers[10]. The emergence of antibiotic resistance has its roots in the injudicious use of antibiotics and the subsequent transfer of resistance genes and bacteria among animals, animal products and environment. Extra chromosomal genes associated with plasmids were found to be responsible for these antibacterial resistant phenotypes that may impart resistance to an entire antibacterial class[11]. As the plant produce secondary metabolites in order to protect themselves from microorganism, herbivores and insects, thus antimicrobial effect is somehow expected from plants namely flavonoids, alkaloids and triterpenoid and are producing a better opportunity for testing wide range of microorganism. Preliminary phytochemical analysis during the present study also ascertains the presence of some potential group of bioactive substances[12].

CONCLUSION

Plants have an almost limitless ability to synthesize aromatic substances. Most of them are secondary metabolites, of which at least 12,000 have been isolated. In many cases, these substances serve as plant defense mechanisms against predation by microorganisms, insects and herbivores. The potential for developing antimicrobials from higher plants appears rewarding, as it will lead to the development of a phytomedicine to act against microbes. Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant. The property of active phyotoconstituents responsible for the antibacterial activity cannot be altered. (The nature of active phytochemical responsible for antibacterial activity can not be ascertained). Further studies of the active principles involved and their mode of action, formulated reparations for enhancing potency and stability are needed to recommend *Polyalthia longifolia* in control of several bacteria associated diseases.

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