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Phytochemical Screening and *In vitro* Antimicrobial Activity of Ornamental Plant *Anthurium andraeanum*

J.R. Abima shazhni[1], A. Renu[2] and M. Murugan[3*]

[1]*Research Scholar, Sathyabama University, Jeppiaar Nagar, Chennai- 600 119, Tamil Nadu, India*
[2]*Department of Biotechnology, Udhaya School of Engineering, Vellamodi- 629 104, Tamil Nadu, India*
[3]*Centre for Biological Science, Noorul Islam University, Kumaracoil- 629 180, Tamil Nadu, India*

Abstract

The present study was aimed to screen the phytochemical constituents and antimicrobial activity of different parts of *Anthurium andraeanum*. Powdered plant materials of flower, leaf, stem and root were extracted with different solvents such as aqueous, acetone, dimethyl sulfoxide, chloroform and ethanol. Phytochemical screening was performed with standard protocols and this study showed the presence of alkaloids, flavonoids, phenols, phlobatannins, steroids and tanninsn. Antimicrobial activity of the plant extracts were carried out by agar well diffusion method against four bacterial and two fungal pathogens. The plant extracts exhibited inhibition activity against entire tested pathogens. Gram negative bacterial strains of *E.coli* and *K.pneumoniae* and fungal pathogen *A.fumigatus* were highly inhibited. The flower extracts showed superior zone of inhibition against the fungal pathogen *A.fumigatus,* also the bacterial pathogen *E.coli*. These results indicate the ornamental plant *A.andraeanum* have antimicrobial values that could be useful in the treatment microbial diseases.

Keywords: *Anthurium,* Antimicrobial activity Phytochemicals and Plant metabolites.

INTRODUCTION

Plants contained a wide range of chemical substances called as phytochemicals, which can be used to treat chronic as well as infectious diseases [1]. Phytochemicals are chemical compounds that occur naturally in plant and serving a more specific function [2]. The plant secondary metabolites often play an important role in plant defence against herbivory and other interspecies defences. Humans use secondary metabolites as medicines, flavorings and recreational drugs [3]. Plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine and they have received considerable attention in recent years due to their diverse pharmacological properties [4].

Anthurium andraeanum is a flowering plant species belongs to the family Araceae. It is a perennial herbaceous plant cultivated for its continuing and attractive heart shaped inflorescence. Anthuriums a modified leaf, bearing numerous small botanical flowers on a pencillike protrusion and has a vase life of 14-28 days. The plants are produced for many purposes including cut flower, flowering potted plants and landscape plants [5], they are mostly grown in some small gardens and nurseries [6]. This present study aimed to isolate the phytochemical constituents present in the plant of *A.andraeanum* and study of its antimicrobial activity.

MATERIALS AND METHODS

Plant sample

The plant *A.andraeanum* was collected from Kanyakumari District, Tamil Nadu, India. The collected plant material was rinsed severally with clean tap water to make it dust and debris free and subjected to drying in a dark place at room temperature for a few days. After dried, different plant parts such as flower, leaf, stem and root were ground in electric chopper to get a fine powder for further use.

Preparation of extracts

The powered plant powder was individually subjected to soxhlet extraction using different solvents such as aqueous (distilled water), acetone, chloroform, dimethyl sulfoxide and ethanol. Each 5 g of dried, powder of plant material was filled separately in the thimble and extracted successively with 60 ml of solvents for 3 h. After solvent evaporation, each of these solvent extract was weighed and preserved at room temperature until further use.

Screening of phytochemicals

Screening of phytochemical components present in the plant samples were performed by standard phytochemical test protocols described by Sofowora [7] and Harborne [8]. The major components such as alkaloids, flavonoids, phenolic compounds, phlobatannin, steroids and tannin were screened in the entire plant extracts.

Antimicrobial activity assay

Antimicrobial activities of the plant extracts were determined by agar well diffusion method. Four bacterial pathogens such as *Bacillus cereus, Staphyloccocus aureus Escherichia coli,* and *Klebsiella pneumonia,* and two fungal pathogens such as *Aspergillus fumigatus* and *Penicillium chrysogenum* were tested. Pure cultures of above microorganisms were obtained from Kamini Biotech, Thuckalay, Kanyakumari District. The test bacterial strains were inoculated into Nutrient Broth medium and incubated at 37° C for 24 h. Fungal strains were inoculated into Potato Dextrose Broth medium and incubated at 28° C for 48 h. After incubation, the culture tubes were compared with the turbidity standard. Fresh bacterial cultures of 0.1 ml having 108 colony forming unit were spread onto

Nutrient Agar plate using sterile cotton swab, likewise the fungal cultures were spread onto Potato Dextrose Agar plates. The wells were punched off into agar medium with sterile well puncture. Each well filled with 50 µl of plant extract using micro pipette in aseptic condition. The plates were then kept in a refrigerator to allow pre-diffusion of the extract for 30 min and further incubated at 37 °C for 24 h and 28 °C for 48 h for bacterial and fungal plates respectively.

RESULTS

Phytochemical screening

Phytochemical constituents screening of the plant parts includes flower, leaf, stem and root were carried out in five different solvent extracts such as aqueous, acetone, chloroform, dimethyl sulfoxide and ethanol. The flower and stem extracts contained alkaloids, flavonoids, phlobatannins, steroids and tannin. Leaf and root extracts contained alkaloids, flavonoids, phenolic compounds, steroids and tannin (Table 1).

Table 1: Phytochemical Screening of *A.andraeanum*

Plant parts & solvents	Alkaloids	Flavonoids	Phenolic compounds	Phloba-tannins	Steroids	Tannin
Flower:						
Acetone	-	+	-	-	-	+
Aqueous	+	+	-	-	+	-
Chloroform	-	-	-	-	+	-
Dimethyl sulfoxide	-	-	-	+	+	-
Ethanol	+	+	-	-	+	-
Leaf:						
Acetone	+	+	-	-	-	+
Aqueous	-	-	+	-	-	+
Chloroform	-	-	-	-	+	+
Dimethyl sulfoxide	-	-	-	-	-	-
Ethanol	-	-	+	-	-	+
Stem:						
Acetone	-	+	-	-	+	-
Aqueous	-	-	-	-	-	-
Chloroform	-	-	-	+	-	-
Dimethyl sulfoxide	+	-	-	+	-	+
Ethanol	+	-	-	-	-	+
Root:						
Acetone	-	+	-	-	-	+
Aqueous	+	+	-	-	+	-
Chloroform	-	-	-	-	+	+
Dimethyl sulfoxide	-	+	-	-	+	-
Ethanol	-	-	+	-	-	+

'+' presence of compounds; '-' absence of compounds

Table 2: Antimicrobial activities of *A.andraeanum*

Plant parts & solvents	*B.cereus*	*S.aureus*	*E.coli*	*K.pneumoniae*	*A.fumigatus*	*P.chrysogenum*
Flower:						
Acetone	11	-	-	-	17	-
Aqueous	-	-	-	-	28	-
Chloroform	-	-	14	11	25	-
Dimethyl sulfoxide	-	-	11	10	17	-
Ethanol	12	10	12	11	20	10
Leaf:						
Acetone	11	11	13	11	-	-
Aqueous	-	-	-	-	-	-
Chloroform	12	11	11	10	-	-
Dimethyl sulfoxide	-	-	-	-	-	-
Ethanol	13	12	12	11	-	-
Stem:						
Acetone	-	-	10	-	-	-
Aqueous	-	-	-	-	-	-
Chloroform	11	-	13	11	-	16
Dimethyl sulfoxide	-	-	10	-	-	-
Ethanol	10	-	13	12	10	12
Root:						
Acetone	-	12	11	-	10	13
Aqueous	-	-	-	10	-	-
Chloroform	13	-	10	-	12	-
Dimethyl sulfoxide	11	-	-	-	13	10
Ethanol	12	20	10		15	10

Zone of inhibition in 'mm'

Antimicrobial activity

Antimicrobial activities of the samples were evaluated by a zone of inhibition. The flower extracts showed inhibition activity against *B.cereus, S.aureus, E.coli, K.pneumoniae, A.fumigatus* and *P.chrysogenum*. Leaf extracts showed inhibition activity against *B.cereus, S.aureus, E.coli* and *K.pneumoniae.* Stem extracts showed inhibition activity against *B.cereus, E.coli, K.pneumoniae, A.fumigatus* and *P.chrysogenum.* Root extracts showed inhibition activity against *B.cereus, S.aureus, E.coli, K.pneumoniae, A.fumigatus* and *P.chrysogenum* (Table 2).

DISCUSSION

The powdered material of plant parts were extracted with five different solvents such as aqueous, acetone, chloroform, dimethyl sulfoxide and ethanol. Phytochemical tests of the plant extracts were determined by followed standard protocols. In this investigation, the plant *Anthurium andraeanum* showed positive results for entire tested phytochemical components *viz*. alkaloids, flavonoids, phenolic compounds, phlobatannins, steroids and tannins. The phytochemical tests such as alkaloids, flavonoids, steroids and tannins were established positive results in many of the solvent extracts when compared to phenolic compounds and phlobatannins. Overall the plant contained alkaloids, flavonoids, to phenolic compounds, phlobatannins, steroids and tannins.

Antimicrobial activity of plant extracts were tested agar well diffusion method, against four bacterial and two fungal pathogens and the results were evaluated by measuring the zone of inhibition in 'mm'. In this study, the plant extracts exhibited inhibition activity against entire tested pathogens. Among the bacterial pathogens, Gram negative strains of *E.coli* and *K.pneumoniae* were highly affected than Gram positive bacteria of *B.cereus* and *S.aureus*. In fungal pathogens *A.fumigatus* was greatly inhibited by the plant extracts than *P.chrysogenum*. Among the plant parts used, flower, stem and root extracts were significantly affects the pathogenic organisms than leaf extracts. The flower extracts showed superior zone of inhibition against the fungal pathogen *A.fumigatus,* also the bacterial pathogen *E.coli*. The zone of inhibition was varied with different solvents used, among the five solvents used in this present study, ethanol extracts were showed fine activity against the pathogens followed by chloroform and acetone extracts.

The phytochemical constituents such as alkaloids, flavonoids, phenolic compounds, steroids, tannins, saponins and various other aromatic compounds are secondary metabolites of plants that serve a defence mechanism against prediction by many microorganisms, worms and other herbivores [4, 9]. It has been found to possess a broad range of activities, which may help in protection against persistent diseases [10]. Flavonoids are hydroxylated phenolic substance known to be synthesized by plants in response to microbial infection [11]. Phenols are largest group of plant metabolites, which have many biological properties such as antiapoptosis, antiageing, anticarcinogen, anti-inflammation and cell proliferating activities [12]. Steroids have been described to have antibacterial properties [13]. Tannins bind to proline rich proteins and interfere with the protein synthesis [14].

CONCLUSION

The present study reveals the existence of antimicrobial possessions of phytochemical components present in the ornamental plant *Anthurium andraeanum.* This investigation is limited and these results helpful for further investigation of *A.andraeanum* plants to assess their chemical prospective in future research.

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