Journal of Medicinal Plants Studies
www.PlantsJournal.com

ISSN (E): 2320-3862
ISSN (P): 2394-0530
NAAS Rating 2017: 3.53
JMPS 2017; 5(3): 47-49

Received: 20-03-2017
Accepted: 22-04-2017

M Ananthavalli
Research Scholar, Department of Botany, Queen Mary's College (A), Chennai, India

S Karpagam
Associate Professor, Department of Botany, Queen Mary's College (A), Chennai, India

Correspondence
M Ananthavalli
Research Scholar, Department of Botany, Queen Mary's College (A), Chennai, India

Antibacterial activity and phytochemical content of Avicennia Marina collected from polluted and unpolluted site

M Ananthavalli and S Karpagam

Abstract
The aim of the present study is to evaluate the phytochemical content and antibacterial activity of *Avicennia marina* collected from polluted and unpolluted site from the back-waters of Attipatuputhunagar. The plants were collected separately and tested for phytochemical analysis and antibacterial activity against various bacteria such as *Salmonella typhi*, *Staphylococcus aureus*, *Escherichia coli* and *Klebsiella pneumonia*. Preliminary phytochemical analysis was performed with ethanol and aqueous extract of *Avicennia marina* plant leaf collected from polluted and unpolluted sites that showed the presence of alkaloids, phenols, tannin, flavonoids, aminoacids, diterpenes, oxalate, cardiac glycosides, quinone, anthocyanin, leucoanthocyanin and Xanthoprotein. The ethanol extract showed the presence of higher phytochemical content when compared to the aqueous extract. The plant collected from polluted site showed the presence of only less amount of phytochemical content when compared to unpolluted site. The ethanol extract of the leaf exhibited significant antibacterial property against tested bacterial organisms. The activity of the extract was comparable with the standards amoxicillin. In conclusion, the result of the present study showed the presence of wide spectrum of antibacterial activities against all the above bacterial pathogens studied. The maximum zone of inhibition was observed in ethanol extract when compared to aqueous extract of unpolluted site plant leaf.

Keywords: *Avicennia marina,* antibacterial activity, phytochemical content

Introduction
As mangroves need warm conditions for development and survival, they are found only in tropical climates. Medicinal plants are known to produce certain bioactive molecules which react with other organisms in the environment; inhibiting bacterial or fungal growth [1]**.** Antimicrobial properties of medicinal plants are being increasingly reported from different parts of the world [2]. *Avicennia marina,* commonly known as grey mangrove or white mangrove, is a species of mangrove tree classified in the plant family Acanthaceae (formerly in the Verbenaceae or Avicenniaceae). It grows as a shrub or tree to a height of three to ten meters, or up to 14 meters in tropical regions, growing in the saline intertidal zones of sheltered coast lines. It has been reported to tolerate extreme weather conditions and high winds [3]. Mangrove plant extracts have been used for centuries as a popular method for treating several health disorders. Medicinal compounds in the mangroves have long been used in folk medicine to treat diseases [4]. The present study was carried out to screen the antibacterial activities and phytochemical analysis of *Avicennia marina* collected from polluted and unpolluted sites.

Material and Methods
Collection of plant materials
The plants were collected from different location; polluted and unpolluted sites Attipatuputhunagar. Ennore, Thiruavallur District. The collected plants were identified in the Department of Botany, Queen Mary`s college, Chennai.

Plant Material
Fresh plants were washed thoroughly three times with running tap water then finally with sterile water followed by shade drying at room temperature for 15-20 days and powered by using an electric blender and stored in airtight container.

Preparation of Extract

Each sample of 10g were taken and soaked for 24 hours in 30 ml of aqueous and ethanol separately. The extracts were filtered using Whatman filter paper No 1 evaporated to dryness and re-dissolved in DMSO (Dimethyl Sulphoxide). The extracts were preserved in airtight container and kept at 45˚C for further use.

Phytochemical Analysis

The plants have primary and secondary metabolites which can be used for medicinal and other uses. There is a need to analyze the plants for such phytochemical screening. Phytochemical screening was carried out by using the standard protocols as described by Harborne [5]. The alkaloids are determined by Wagner's Test [6], carbohydrates by Benedict's Test; saponin by Foam Test; phenol by Ferric Chloride Test; flavonoids by Lead Acetate Test; diterpenes by Copper Acetate Test, terpenoids by Salkowski's Test [7], aminoacids by Ninhydrin Test; proteins by Biuret Test, Tannins by Ferric Chloride Test; and oxalate by Ethanoic acid glacial [8]. Further detection of steroids was carried out by Harborne; detection of coumarin was done by Mace method [9] and quinone by conc. H_2SO4. Xanthoproteins by conc. HNO_3 and NH_3 Test [10], cardiac glycosides by Kellerkillani synthesis [11], anthocyanin by HCl and NH_3 [12], leucoanthocyanin by isoamyl alcohol; carboxylic acid by effervescence test and glycosides by Modified Borntrager's Test [13].

Antibacterial Assay

Test Organisms

The bacterial cultures used in the study were *Staphylococcus aureus, salmonella typhi, Klebsiella pneumoniae* and *Escherichia coli.*

Culture medium

Mueller Hinton Agar (MHA) medium was used to study the antibacterial activity.

Antibacterial activity assay

Antibacterial activity of solvent extracts was determined by well diffusion method on MHA medium. The bacterial culture to be tested was inoculated as lawn culture using sterile swab. Wells were made on to the agar plate using sterile cork borer (6 mm diameter). The extracts were applied to different wells in serially increasing volumes 25µl, 50µL 75µL and 100µL. Amoxicillin (10µg) was used as the reference. The plates were labelled, covered and incubated at 37°C for 24 h.

Result

Table 1: Phytochemical content of leaf of *Avicennia marina* collected from polluted and unpolluted sites

Name of the Test	Polluted Ethanol	Polluted Aqueous	Unpolluted Ethanol	Unpolluted Aqueous
Steroid	-	-	-	-
Oxalate	-	-	+	-
Cardiac Glycosides	+	-	-	-
Anthocyanin	-	-	+	-
Leucoanthocyanin	-	+	+	+
Carboxylic Acid	-	-	+	-
Xanthoprotein	-	+	-	+
Coumarin	-	+	+	+
Quinones	+	+	+	+
Glycosides	+	-	+	-
Alkaloids	+	+	+	+
Carbohydrates	-	-	-	-
Saponins	-	+	-	+
Phenols	-	+	-	+
Flavonoids	-	+	-	+
Aminoacids	-	+	-	+
Diterpenes	-	+	+	+
Tannins	+	+	+	+
Terpenoids	+	-	+	-
Protein	-	-	-	-

Note: + present; - absent; UP-Unpolluted site plant, P-Polluted site plant.

Table 2: Antibacterial activity of leaf of *Avicennia marina* collected from polluted and unpolluted site

Extract	Name of organisms	Concentration/zone of inhibition (mm)				
		Amoxicillin	25µL	50µL	75µL	100µL
Polluted Ethanol	*Salmonella Typhi*	21	8	10	13	14
Unpolluted Ethanol		20	9	12	14	17
Polluted Aqueous		15	7	10	11	11
Unpolluted Aqueous		17	-	9	11	13
Polluted Ethanol	*Klebsiella Pneumoniae*	22	10	12	13	15
Unpolluted Ethanol		21	9	11	15	17
Polluted Aqueous		17	8	9	10	11
Unpolluted Aqueous		15	-	8	9	12
Polluted Ethanol	*Escherichia coli*	21	-	9	10	11
Unpolluted Ethanol		21	9	10	12	13
Polluted Aqueous		*18*	-	-	10	11
Unpolluted Aqueous		*19*	-	11	13	14

Polluted Ethanol	*Staphylococcus aureus*	*22*	7	9	11	12
Unpolluted Ethanol		*21*	11	13	15	17
Polluted Aqueous		*20*	-	-	10	11
Unpolluted Aqueous		*18*	-	-	11	12

Result and Discussion

The phytochemical components and antibacterial activity of *Avicennia marina* leaf collected from polluted and unpolluted sites was examined in the present study. Twenty different phytochemical tests were carried out for two different extracts. Ethanol extract showed the presence of eleven phytoconstituents in unpolluted and six phytoconstituents in polluted site. The preliminary phytochemical analysis showed the presence of primary and secondary metabolites such as alkaloids, diterpenes, tannin, terpenoids, oxalate, anthocyanin, leucoanthocyanin, cardiac glycosides, coumarin, quinone, and glycosides in the ethanol extract of unpolluted site in Table 1. The presence of alkaloids, flavonoids, aminoacids, carbohydrates, alcohol, sugar, lipid contents were reported in *Avicennia marina* [14]. The ethanol extract of the plant leaf was found to be more active than the aqueous extract. The results of antibacterial activity showed highest activity against *Salmonella typhi, Klebsiella pneumonia*, and *Staphylococcus aureus* in unpolluted site plant. The zone of inhibition was compared to that of the standard. Ethanolic leaf extract of *Avicennia marina* showed both antifungal and antibacterial activity as reported [15]. The unpolluted site plant showed highest activity when compared to the polluted site.

Conclusion

The unpolluted site plant of *Avicennia marina* showed the presence many bioactive compounds and significant bacterial activities when compared to the polluted site. It is an important period to know about the values of medicinal properties in mangroves to resist the pathogenic bacteria which cause the infectious diseases among the human beings, animals and plants. These medicinal properties can be of great significance for therapeutic treatments. In conclusion, leaves from the *Avicennia marina* plants possessed equally good inhibitory activity against the tested bacteria. The presence of phytochemicals is responsible for their therapeutic effects.

Reference

1. Bandaranayake WM. Bioactivities, bioactive compounds and chemical constituents of mangrove plants. Wetlands Ecology and Management. 2002; 10:421-452.
2. Rai PK, Mehta S, Gupta RK, Watal G. A Novel Antimicrobial Agents Trichosanthes Diocia. International Journal of Pharma and Bioscience. 2010; 1(3):1-9.
3. Bobbarala V, Vadlapudi VR, Naidu KC. Antimicrobial Potentialities of Mangrove Plant *Avicennia marina*. Journal of Pharmacy Research. 2009; 2(6):1019-1021.
4. Bandaranayake WM. Traditional and medicinal uses of mangroves. Mangroves and Salt Marshes. 1998; 2:133-148.
5. Harborne, JB. Phytochemical Methods. Chapman and Hall Ltd. London. 1973, 49-188.
6. Pranshant Tiwari, Bimlesh Kumar, Mandeep Kaur, Gurpreet Kaur, Harleen Kaur. Phytochemical screening and Extraction: A Review. International Pharmaceutica Sciencia. 2011; 1(1):99-106.
7. Zakia Khanam, Chew Shwu Wen, Irshad UI Haq Bhat. Phytochemical screening and antimicrobial activity of root and stem extracts of wild Eurycoma longifolia Jack (Tongkat Ali). Journal of King Saud University- Science. 2014, 1-8.
8. Solomon Charles Ugochukwu, Arukwe Uche I. and Onuoha Ifeanyi. Preliminary phytochemical screening of different solvent extracts of stem bark and roots of Dennetia tripetala G. Baker. Asian J. Plant Sci. Res. 2013; 3(3):10-13.
9. Mace ME. Phytochemistry. 1963; 16:915-925
10. Suman Kumar RC. Venkateshwar, Samuel G, Gangadhar S. Phytochemical Screening of some compounds from plant leaf extracts of Holoptelea integrifolia (Planch.) and Celestrus emarginata (Grah.) used by Gondu tribes at Adilabad District, Andhra Pradesh, India. International Journal of Engineering Science Invention. 2013; 2(2):65-70.
11. Chandra Shekar Misra, Kumar Pratyush, Lipin Dev MS, Joel James, Arun Kumar Thaliyil Veeettil, Thankamani V. A comparative study on phytochemical screening and antibacterial activity of roots of Alstonia scholaris with the roots, leaves and stem bark. Int. J. Res. Phytochem. Pharmacol. 2013; 1(2):77-82.
12. Ashvin Godghate, Rajaram Sawant, Ashok Sutar. Phytochemical analysis of ethanolic extract of roots of carrisa carandus linn. rasayan J. Chem. 2012; 5(4):456-459.
13. Kokate CK, Purohit AP, Gokhale SB. Chapter V-Experimental pharmacognostic evaluation in" The text book of Pharmacognosy Nirali prakashan, pune. 2006, 67.
14. Bandaranayake. Bioactivities, bioactive compounds and chemical constituents of mangrove plants. Wetlands Ecology and management. 2002; 10:421-452.
15. Behbahani BA. Antifungal effect of aqueous and ethanolic mangrove plant extract on pathogenic fungus in vitro. 2013; 4(7):1652-1658.