



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 6, pp. 17673-17675, June, 2017

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

GREEN SYNTHESIS OF ANTIMICROBIAL COMPOUNDS FROM MARINE MACRO ALGAE AGAINST MULTIDRUG RESISTANT HUMAN PATHOGENS

Thamizharasan S*

Department of Zoology, Periyar E.V.R College (Affiliated with Bharathidasan University),
Thiruchirappalli-620023, Tamilnadu, India

DOI: <http://dx.doi.org/10.24327/ijrsr.2017.0806.0402>

ARTICLE INFO

Article History:

Received 10th March, 2017
Received in revised form 14th
April, 2017
Accepted 08th May, 2017
Published online 28th June, 2017

Key Words:

P.gymnosphora, Disc diffusion E.coli,
S.aureus Macro algae and Chloroform

ABSTRACT

The ethno pharmacological efficacy of marine medicinal macro algae *Padina gymnosphora* was examined using agar disc diffusion assay against human pathogenic bacterial species, *Escherichia coli* and *Staphylococcus aureus*. Antimicrobial compounds of *P.gymnosphora* were extracted using chloroform as a solvent. Disc diffusion assay of chloroform extract of the algae with inhibition zone of *E.coli*(12mm), *S.aureus* (9mm) and Standard antibiotics Gentamycin (10mm) was observed. A high level inhibition of *E. coli* was found in chloroform solvent extracts of *P.gymnosphora*. In case of *S. aureus*, moderate inhibition of 9 mm was obtained. The results were found to be effective on tested two human pathogens.

Copyright © Thamizharasan S, 2017, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Most of the drugs today are obtained from natural sources or semi synthetic derivatives of natural products and used in the traditional systems of medicine. Several workers throughout the world have carried out antimicrobial studies on some medicinal plants.^[1,2] According to World Health Organization, medicinal plants would be the best source to obtain a variety of antimicrobial drugs.^[3,4] There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases.^[5,6] Therefore, researchers are increasingly turning their attention to plant based medicine, looking for new leads to develop better drugs against microbial infections.^[7,8,9] In marine ecosystems macro algae are plants, ecologically and biologically important and provide nutrition and an accommodating environment for other living organisms. Marine macro algae represent a reservoir of effective chemotherapeutic agents and can provide valuable sources of natural antimicrobial drugs.^[10] Bioactive metabolic compounds of the marine macro algae *Padina gymnosphora* showed species-specific antibacterial activity. These marine Plants produce a diverse range of bioactive molecules, making them rich source of different types of medicines.^[11,12] They have some of the valuable medicinal components. In the present

study an attempt was made to evaluate the antimicrobial activities and phyto chemical properties of *Padina gymnosphora* extracts against the human pathogenic bacterial strains.

MATERIALS AND METHODS

Sample Collection

The macroalgae *Padina gymnosphora* were collected by hand at low tide area of Mandapam sea shores near Rameshwaram, Southeast Coast of India. The seaweed sample were picked by hand and immediately washed with seawater to remove the foreign particles, sand particles and epiphytes. Then it was kept in an ice box containing slush ice and immediately transported to the laboratory and washed thoroughly using pure fresh water to remove the salt on the surface of the sample. Then the seaweeds spread on blotting paper to remove excess water and shade dried at room temperature.

Sample Identification

The collected sample of *Padina gymnosphora* was identified by Dr.C.Stella, Department of Marine Science, Alagappa University, Karaikudi, Dr.T.Ramanathan, Assistant Professor (Sr.Grade), Center for Advanced Study in Marine Biology, Annamalai University, Portonovo, Tamilnadu, India.

*Corresponding author: **Thamizharasan S**

Department of Zoology, Periyar E.V.R College (Affiliated with Bharathidasan University), Thiruchirappalli-620023, Tamilnadu, India

Preparation of Extract

The extract of *Padina gymnosphora* were taken from whole plant. Fresh *Padina gymnosphora* sample were collected (1kg) and shade dried at room temperature at 37°C and ground well in a manual Mill Blender. The powder (200g) was soaked with 800ml (1:3W/V) of chloroform in an aspirator bottle for 48h at room temperature with mechanical shaking.

The extract was filtered through a Buchner Funnel with Whatman number 1 Filter paper. The filtrate was evaporated to dryness under reduced pressure using rotary evaporator or hot air oven at 40°C. Finally crude extract was obtained in powder form. The crude extracts powder was stored at 4°C until further use.

Bacterial Strains and Culture Conditions

The bacterial strains used in the study were collected from K.A.V.P. Govt Medical College, Tiruchirappalli, Tamilnadu, India. The strains included Gram-negative bacteria (*Escherichia coli*) and Gram-positive bacteria (*Staphylococcus aureus*). The strains were supplemented with broth Cultures and incubated at 35°C for 24 h.

Antimicrobial assay

Each bacterial strain were inoculated into Mueller Hinton broth. Antibacterial screening was carried out by agar well diffusion method. A 1.0 ml volume of the standard suspension (1×10^6 cfu/ml) was spread evenly on Mueller Hinton agar plates using sterile glass rod. Subsequently, 4 mm diameter wells were bored in the agar and a 100µl volume of extract reconstituted in 50% Dimethyl sulfoxide (DMSO) to a concentration of 100 mg/ml was placed into triplicate wells. The plates were incubated at 37°C for 24 h and the inhibition of bacterial growth was measured to the nearest mm. Gentamycin was used as positive control while DMSO (0.1ml) served as negative control.

RESULTS AND DISCUSSION

Antibacterial activity of chloroform extract of *Padina gymnosphora* on *Escherichia coli* and *Pseudomonas aeruginosa* were carried out by Kirby bauer well diffusion assay method. Similar findings were made by few researchers.^[13] Some reported that the anti-bacterial activity of *Padina gymnosphora* against the microbes of gastro intestinal tract.^[14]

In the present study, chloroform extract exhibited different degree of growth inhibition against tested bacterial strains *Escherichia coli*, *Pseudomonas aeruginosa* (Table 1).

Chloroform extracts of *Padina gymnosphora* exhibited considerable antimicrobial activity against tested microbial strains and showed more inhibition than standard antibiotics (Table 1). The results of the present study clearly showed that the marine macro algae *Padina gymnosphora* extracts showed potent antimicrobial activity against tested human pathogenic strains.

Negative control: It implies that the well contains DMSO only. It devoid of Bioactive compounds and authentic antibiotics.

Positive control: It indicates that the well contains authentic antibiotic Gentamycin, in aqueous medium.

Table 1

Human pathogens	Negative control (DMSO only)	Zone of inhibition in (mm)	
		Positive control	Experimental
		Gentamycin	<i>P. gymnosphora</i> extract
<i>E. coli</i>	Nil	10mm	12mm
<i>S. aureus</i>	Nil	7mm	9mm

Experimentalx It implies that the well contains only the Bioactive compounds of the extract obtained from *Padina gymnosphora*

Average: Mean value of 3 different assays.

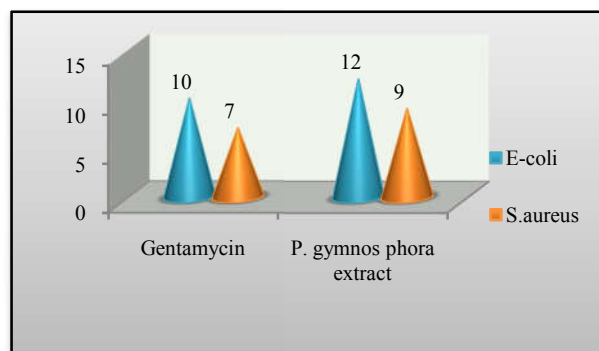


Fig 1

Inhibitory activity of *P. gymnosphora* extract

Some studies concerning the effectiveness of extraction methods light that chloroform extraction yields higher antimicrobial activity than aqueous extract.^[15] It is clear that extraction by organic solvents always provide a higher efficiency for antimicrobial activities as compared to water extracts.^[16] The experimental study revealed that chloroform extracts caused bigger clear zones than antibiotics. Higher plants, as sources of medicinal compounds continue to play dominant role in maintenance of human health since antiquities. Over 50% of all modern clinical drugs are of natural product origin.^[17,18,19] The natural products play an important role in drug development programs of the pharmaceutical industry. Similar findings were made by some researchers. Some authors also reported the anti-bacterial activity of *Padina gymnosphora* against the microbes of intestine and urinary tract.^[20]

CONCLUSION

In the present study the chloroform extract containing bioactive compounds such as glycosides, tannin, terpenoids, anthroquinone, amino acid, sterol, and proteins are present in seaweed *Padina gymnosphora* inhibited the growth of the pathogenic bacterial strains. The antibacterial activity of the chloroform extract of *Padina gymnosphora* indicates the greater efficiency than Gentamycin. Further detailed study on *Padina gymnosphora* is required for isolating and establishing the antibacterial substances.

References

1. Manilal A, Sujith S, Selvin J, Shakir C, Kiran GS. Antibacterial activity of *Falkenbergia hillebrandii* (Born)

- from the Indian coast against human pathogens. *FYTON* 2009; 78: 161-166
- Salvador N, Gomez-Garreta A, Lavelli L, Ribera L. Antimicrobial activity of Iberian macroalgae. *Sci. Mar.* 2007; 71: 101-113.
 - Shanmughapriya S, Manilal A, Sujith S, Selvin J, Kiran GS, Natarajaseenivasan K. Antimicrobial activity of seaweeds extracts against multiresistant pathogens. *Annals of Microbiology* 2008; 58; 535-541.
 - Manilal A, Sujith S, Kiran GS, Selvin J, Shakir C, Gandhimathi R, Lipton AP. Antimicrobial potential and seasonality of red algae collected from the southwest coast of India tested against shrimp, human and phytopathogens, *Annals of Microbiology* 2009; 59 (2): 207-219.
 - Manivannan K, Karthikai devi G, Anantharaman P, Balasubramanian T. Antimicrobial potential of selected brown seaweeds from Vedalai coastal waters, Gulf of Mannar. *Asian*
 - Ngbede J, Yakubu RA, Njam DA. Phytochemical Screening for active compounds in *Cornarium schweinfurthii* leaves from Jos North, Plateau state. *Nigeria Res J Biol. Sci.* 2008; 3(9): 1076-1078.
 - Onwukeame DN, Ikuegbvweha TB, Asonye CC. Evaluation of phytochemical constituents antibacterial activities and effects of exudates of *Pycanthus angolensis* weld warb on corneal ulcers in rabbit. *Trop. J. Pharm. Res.* 2007; 6 (2): 725-730.
 - Aparna Saraf. Phytochemical and Antimicrobial Studies of Medicinal Plant *Costus speciosus* (Koen.) *E-Journal of Chemistry* 2010; 7(S1): S405-S413.
 - Sharanabasappa GK, Santosh MK, Shaila D, Seetharam YN, Sanjeevarao I. Phytochemical Studies on *Bauhinia racemosa* Lam. *Bauhinia purpurea* Linn. and *Hardwickia binata* Roxb. *E-Journal of Chemistry* 2007; 4(1):21-31.
 - Mallikharjuna PB, Rajanna LN, Seetharam YN, Sharanabasappa GK. Phytochemical Studies of *Strychnos potatorum* L. f.-A Medicinal Plant. *E-Journal of Chemistry* 2007; 4(4): 510-518.
 - Paul Raj K, Irudayaraj V, Johnson M, Patric Raja D. Phytochemical and anti-bacterial activity of epidermal glands extract of *Christella parasitica* (L.) H. Lev *J.Asian Pacific Journal of Tropical Biomedicine* (2012)
 - Krishnaveni Eahamban1, Johnson Marimuthu @Antonisamy1(2012)* Preliminary Phytochemical, UV-VIS, HPLC and Anti-bacterial Studies on *Gracilaria corticata*
 - Adhikary, S.P., 2000. Studies on the proteins, peptides and free amino acids contents in some species of brown algae from South-eastern Coast of India. *Review of Algology*, 6:209-216.
 - Mohamed, Fayaz, K.K.Namitha, K.N.Chidambara Murthy, M.Mahadevaswamy, R.Sarada, availability and antioxidant activity of *Kappasphycus alvarezii* (Doty) *J.Agric.Food Chemi.*, 53:792-797.
 - Kaliaperuma, N, J.R.Ramalingam, S.Kalimuth and R.Ezhilvalavan, 2002. Seasonal changes in growth, biochemical constituents and phycocolloid of some marine algae of Mandapam Coast Seaweed Research and utilization 24(1): 23
 - MubarakAli D, Praveenkumar R, Shenbagavalli T, Nivetha TM, Ahamed AP, Al-Dhabi NA, et al. New reports on anti-bacterial activities of fatty acid methyl esters (FAME) obtained from *Scenedesmus bijugatus* var. *bicellularis* biomass. *RSC Adv* 2012; 2: 11552-11556.
 - Priyadarshani I, Rath B. Bioactive compounds from microalgae and Cyanobacteria: utility and applications. *Int J Pharm Sci Res* 2012; 3(11): 4123-4130.
 - Sethubathi GVB, Prabu VA. Antibacterial activity of cyanobacterial species from Adirampattinam Coast, Southeast coast of Palk Bay. *Curr Res J Biol Sci* 2010; 2(1): 24-26.
 - Priyadarshini S, Bragadeeswaran S, Prabhu K, Ran SS. Antimicrobial and hemolytic activity of seaweed extracts *Ulva fasciata* (Delile 1813) from Mandapam, Southeast coast of India. *Asian Pac J Trop Biomed* 2011; 1(Suppl 1): S38-S39.
 - Mohammady NGE, Ricken CW, Lindell SR, Reddy CM, Taha HM, Lau CPL, et al. Age of nitrogen deficient microalgal cells is a key factor for maximizing lipid content. *Res J Phytochem* 2012; 6(2):

How to cite this article:

Thamizharasan S.2017, Green Synthesis of Antimicrobial Compounds From Marine Macro Algae Against Multidrug Resistant Human Pathogens. *Int J Recent Sci Res.* 8(6), pp. 17673-17675. DOI: <http://dx.doi.org/10.24327/ijrsr.2017.0806.0402>
