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Study On Antibacterial Activity Of *Padina Gymnospora* And *Ulva Lactuca*

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ABSTRACT

New and therapeutic agents play a vital role to fight against various diseases prevailing in the present era. The bioactive compounds from the marine algae are known to possess antibacterial, antifungal, antiviral, anticancer properties. Seaweed originates from a natural marine environment had to be tested for their bacterial contamination before consuming it in the raw form. The avoidance and treatment of such pathogens had to be rectified by consuming natural products. One such naturally occurring marine renewable resource is the seaweeds which provide variety of primary and secondary metabolites such as polysaccharides, fatty acids, phlorotannins, phenolic compounds, carotenoids and bioactive compounds with antibacterial, antifungal, antimicrobial activity. Several species of alga have been investigated for their bioactive compounds. There are many studies pertaining to the antibacterial activity of marine seaweeds against various infectious microorganisms. The aim of the present study was to investigate the antibacterial activity of *Padina gymnospora* and *Ulva lactuca* collected from Gulf of Mannar Bioreserve. The selected seaweed extract exhibited significant antibacterial activity against the clinical pathogens, *Klebsiella pneumonia*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*. There was no detectable bacterial growth using the selected seaweeds. The methanolic extracts were found to inhibit the growth of all bacterial organisms tested. The antibacterial effects of the selected seaweed extracts were compared with standard amoxylin and Chlorampenicol against the clinical pathogens. The results showed that *Padina gymnospora* had maximum zone of inhibition of 13.0mm, 14.3mm and 13.3mm than *Ulva lactuca* with 12.7mm, 13.8mm and 12.9mm against clinical pathogens such as *Klebsiella pneumonia*, *Staphylococcus aureus* and *Pseudomonas aeruginosa.* This study proved that the selected seaweeds had a remarkable antibacterial potential due to their bioactive compounds present naturally than the commercially available medications.

Keywords: *Padina gymnospora* and *Ulva lactuca,* antibacterial activity, bioactive compounds, amoxylin and Chlorampenicol

INTRODUCTION

Next to plant, marine food source plays an important role in treating many ailments occurring due to the contact of microorganisms. Seaweeds or otherwise called as Sea Vegetables or Sea Herbs that can be consumed in raw form or cooked. Since ancient times seaweeds are consumed as salads, porridge. The gelling properties of seaweeds are used in the production of jelly, ice creams and chocolates.

Marine algae are excellent producers of biomass and showed its important application in many Pharma industries. Seaweeds possess antibacterial, antiviral, anti- inflammatory, anti-diabetic, anti-tumor activities. The clinical pathogens are killed by commercially available drugs which may side effects causing threats in near future. The seaweeds are presently used in the pharmaceutical industries to replace artificial and commercially available drugs. The marine living seaweed is the richest source of many useful macro and micronutrients, bioactive

compounds, phytonutrients and antioxidant properties that are proved to be used in the manufacturing of many important drugs which can cure non- communicable diseases.

Many new bio-molecules are isolated from the marine environment are used to developed new pharmaceuticals drugs [1-3]. Most of the marine macroalgae are effective against various pathogens. There are more than 2000 species of seaweeds of which more than 140- 150 species of marine macro algae are used in the manufacturing of pharmaceutical drugs due to the presence of secondary bioactive compounds [4,5].

Materials and Methods

The microorganisms used in this study were human pathogens namely *Pseudomonas aeruginosa* (Gram negative), *Klebsiella pneumoniae* (Gram negative), *Staphylococcus aureus* (Gram positive). Bacterial strains stock cultures were maintained at 4°C on Muller Hinton Agar medium. An active culture was prepared by inoculating fresh Muller Hinton broth medium with a loop of cells from the stock cultures at 37°C for overnight. In order to get desirable cell counts, overnight grown bacterial cells were sub cultured in a fresh Muller Hinton Broth at 37°C. According to Bacteriological analytical manual, 16th edition, 2005, Kirby- Bauer Disc Diffusion Method was carried out.

Whatmann filter paper (No:1) discs of 6mm diameter were impregnated with 10µl of the solution containing crude extracts obtained from the selected edible seaweed . Reference standard discs were prepared with Amoxylin Chlorophenical (50 µg /ml) to compare the antibacterial activity of seaweed extracts. After drying, the discs with seaweed extract and standard Amoxylin and Chlorophenical were placed on Muller Hinton Agar (MHA) already swabbed by bacterial stock cultures and incubated at 37°C for 24 hrs. After incubation, plates were examined for clear zone around the discs. A clear zone with diameter more than 2 mm was taken as an antibacterial activity.

Results and Discussion

The present study showed the antibacterial activity of *Padina gymnospora* and *Ulva lactuca* against common pathogens such as *Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonoas aeruginosa* was carried out. Natural marine products provide varied antibacterial compounds that defend against all kinds of living organisms.

Table 1 Antibacterial activity of *Padina gymnospora* and *Ulva lactuca*

S.No.	Bacterial pathogens	Type of bacteria	Zone of inhibition (mm)			
			Padina gymnospora	***Ulva lactuca***	**Amoxylin (Positive control)**	**Chloramphenicol (Positive control)**
1.	*Staphylococcus aureus*	Gram Positive	**13.0**	**12.7**	**10**	**10.5**
2.	*Klebsiella pneumonia*	Gram Negative	**14.3**	**13.8**	**11.8**	**12.3**
3.	*Pseudomonoas aeruginosa*	Gram negative	**13.3**	**12.9**	**11.2**	**11.6**

The results of the present study results showed that *Padina gymnospora* has more antibacterial activity compared to *Ulva lactuca*. The brown seaweed had maximum zone of inhibition than the green seaweed. The zone of inhibition was compared with two antibiotics (Control) which is used against bacterial infections.

Similar to the present study, [6] investigated the antibacterial activity of *Padina tetrastromatica* against clinical pathogens *Vibrio cholerae, Shigella flexneri* and *Pseudomonas aeruginosa* and found that methanol extract of selected algae had a considerable inhibitory

activity on pathogens. [7] studied the antibacterial activity by disc diffusion technique of two brown seaweeds *Padina gymnospora* and *Turbinaria ornata* and reported that Phaeophyta had substantial activity against pathogenic bacteria as they contain secondary metabolites. [8] researched that seaweeds found in the natural marine resource can be used to treat Urinary tract infections and resistant against *E.coli, Klebsiella pneumoniae,* and *Proteus mirabilis* and concluded that seaweeds are the futuristic and most promising ingredient in the manufacturing of drugs to cure many diseases prevailing.

Likewise [9] determined the antimicrobial activity of methanol extract of *Ulva lactuca* by disc diffusion technique. The results showed strong antimicrobial activity against bacteria such as *Bacillus subtilis, Corynebacterium diphtheria, Staphylococcus aureus, E.coli, Pseudomonas aeruginosa* and *Salmonella paratyphi.* [10] investigated the *invitro* antifungal activity of *Ulva lactuca* Linn. against *Candida albicans, C.kruseri, C.guilliermondi, C.parapsilosis, C.tropicalis, C.glabarata* evaluated by disc diffusion method and resulted in maximum inhibition zone was observed in *Ulva lactuca,* revealed that the seaweeds can be used to cure fungal infections.

[11] studied the antibacterial activity of *Padina gymnospora* and *Turbinaria conoides* tested against gram positive and gram negative human pathogenic bacteria and showed that *Padina gymnospora* had the maximum zone of inhibition with methanol extract against *Staphylococcus aureus* and proved that the brown algae is a source of bioactive molecules screened for many biological activities.

[12]evaluated the antibacterial activity of various seaweeds and the results explained that *Padina gymnospora* showed maximum zone of inhibition against *K. pneumoniae* showed that Indian seaweed has immense potential in control of clinical pathogens and predicted that it can be used in developing antibacterial agents [13] showed that the seaweeds are used as therapeutic agents. *Padina species* was most effective against *S.saprophyticus* reveals that new products of antimicrobial agents can be obtained [14]. [15] studied the antimicrobial activity of different seaweeds against human and fish pathogens and result proved that *Padina gymnospora* exhibited good antibacterial activity. The methanolic extracts were found to inhibit the growth of all the bacterial and fungal micro organisms [16].

[17] carried out the research work in finding the antifungal activity of seaweeds which includes *Ulva lactuca, Padina gymnospora,* against fungal infections and documented that maximum zone of inhibition was observed in *Padina gymnospora* against *Candida albicans* reveals that the extracts of seaweed can also be used as a drug against fungal infections.

[18] investigated the antibacterial activity of selected ten seaweeds against pathogens such as *Eschericha coli, Salmonella typhi, Klebsiella pneumonia and Vibrio cholera* using agar disc diffusion method and resulted that brown and green seaweeds had maximum zone of inhibition.

The seaweeds are isolated and developed to newer antimicrobial agents. The study revealed that the extraction of antimicrobials from different species of seaweeds was solvent dependent, and found methanol as a good solvent for extraction of antimicrobials from brown seaweeds and acetone for red and green species [19,20]

[21] performed *invitro* antibacterial activity of *Ulva fasciata* on three extracts acetone, methanol and ethanol, observed that *Ulva fasciata* in a selective media produced good results against *E.coli* and proved that the green alga has the ability to inhibit the growth of gram positive and negative bacteria.

[22] studied the antibacterial activity of green algae *Ulva lactuca, Caulerpa taxifolia* and *Spongomorpha indica* extracted using three solvent against Gram-positive, Gram-negative bacterial and fungal organisms and reported that bacterial strains were more sensitive to the seaweed extracts when compared to the fungal organisms.

[23] reported the antibacterial activities of four seaweeds namely *Ulva lactuca*, *Padina gymnospora*, *Sargassum wightii* and *Gracilaria edulis* against human bacterial pathogens *Staphylococcus aureus*, *Vibrio cholerae*, *Shigella dysentriae*, *Shigella bodii*, *Salmonella paratyphi*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* and showed that brown alga exhibited higher antibacterial activity than other alga reveals that seaweeds can be used for the product preparation for the benefit of mankind.

Conclusion

Commercially available unrealistic antibiotics on term usage can create many dangerous side effects. So this present study of naturally available marine resource can be utilized the production of many medicated drugs which does not cause harm to the society. The utilization of seaweeds will be an eye opener to all the manufactures who design the drugs and the impact of this will benefit many consumers. Seaweeds are considered safe sources for many medicinal and pharmacological applications in the manufacturing of drugs.

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