

Antibacterial Activity of Some Marine Macro Algae From The Coastal Environments of Southern Odisha

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Abstract:- The Present Communication Deals With The Antibacterial Activity Of Five Seaweeds *Gracilaria Verrucosa*, , *Enteromorpha Compressa*, *Polysiphonia Sertularioides*, *Chaetomorpha Linum* And *Ceramium Elegans* Of Chilika Lake Against The Test Bacteria *Escherichia Coli* And *Pseudomonas Aeruginosa*. For Experimental Study Different Seaweed Extracts (Aqueous, Ethanol And Methanol) Was Determined By The Disk Diffusion Method. From The Experiment It Was Found That In Aqueous Extracts Of Marine Algae There Was No Effect Of Antibacterial Activity Where As In Ethanol And Methanol Extracts, Antibacterial Activities Were Observed. Methanol Extracts Exhibited More Antibacterial Activity Than Ethanol Extracts Of Marine Algae.

Key Words: Antibacterial Activity, Disk Diffusion Method, Seaweeds, Test Organisms, Zone Of Inhibition

I. INTRODUCTION:

Antibiotic Research Is One Of The Most Exciting Fields Not Only In Chemotherapy, But Also In Relation To Action On Microscopic Forms Of Plant Life. An Antibiotic Can Be Defined As A Substance Produced By A Living Organism, Which Inhibits The Growth Or Activity Of Another Living Organism, Studies On The Utilization Of Antibiotics Is Not New, Rather It Was Started In 1929, When Dr. Alexander Flemming , Found That A Mould Had Contaminated His Cultures Of A Pathogenic Bacterium , *Staphylococcus Aureus* And Had Killed Bacteria In Its Immediate Vicinity Leaving A Clear Ring Of Lysed Bacteria. The Mould Was A *Penicillium Notatum*. Since Then, Investigations Have Been Made To Ascertain The Effects Of Antibiotics On Various Organisms. Provasoli *Et Al.* (1948) Were Among The First Investigation To Show Interest In The Use Of Antibiotics To Obtain Pure Culture Of Algae. In 1951, Provasoli *Et Al* Reported The Effect Of Penicilin, Streptomycin, Chlorotetracycline, Oxytetracyclins, Chloromphenicol, Bacitracin And Polymixin Tolerated By Representative Species Of Algae And Protozoa.

Arulsenthil *Et Al* (2008) Found Out The Antimicrobial Activity Of Methanol, Diethyl Ether, Acetone And Dichloromethane Extracts Of *Padina* Collected From Tuticorin Coast Against 10 Human Pathogenic Bacteria. A Number Of Reports Regarding The Medicinal Important Of Seaweeds Belonging To Chlorophyceae, Phaeophyceae And Rhodophyceae From The Corners Of The World. Several Scientists From India And Abroad (Bukholder *Et Al.*, 1960; Martinez Nadal *Et Al.*, 1963; Bhakuni And Silva, 1974; Glombitza, 1970;Hornsey And Hide, 1974; Sreenivasa Rao And Parekh, 1982; Naqvi *Et Al.*, 1980; Sreenivas Rao *Et Al.*, 1982) Have Made Consistent Efforts To Detect The Antimicrobial Activity From Marine Algae. Antibacterial Activity Was Evaluated By Agar Diffusion Method (Suay *Et Al.*, 2000).

Chilika Lake Is The Largest Brackish Water, Tropical Semi-arid, Partly Closed Coastal Lagoon Along The East Coast Of India Situated Between Latitude Of 19⁰28' And 19⁰54' N And Longitudes 85⁰06' And 85⁰38' E. Chilika Lagoon Lies Adjoining The Districts Of Puri, Khurda And Ganjam Of Orissa State. It Is Home To A Large Variety Of Microalgae, Marine Seaweeds, Sea-Grasses, Fishes, Crabs That Thrive In Brackish Water. In The Lake, Submerged Rock And Rocky Shores Offer A Very Good Substrate For The Luxuriant Growth Of Various Forms Of Marine Algae Of Different Classes.

II. MATERIAL AND METHODS:

The Seaweeds Or Marine Macro Algae *Gracilaria Verrucosa*, , *Enteromorpha Compressa*, *Polysiphonia Sertularioides*, *Chaetomorpha Linum* And *Ceramium Elegans* Were Collected From Various Sites Of The Chilika Lake Of Odisha. The Freshly Collected Algal Samples Were Thoroughly Cleaned And Washed In Chilika Water. They Were Then Placed In Plastic Bags. Samples For Water Chemistry Analysis Were Taken In Acid Washed One Liter Capacity Plastic Bottles From A Depth Of 15 To 30 Cm. The Plastic Bags Containing Plant Samples And The Plastic Bottle Containing Water Samples Were Brought To The Laboratory In A Thermo Cool Box Filled With Ice. Some Thalli Are Fixed In The Site In 4% Formalin / Chilika Water.

2.1 Test Organisms:

Clinical Isolates Of *Escherichia Coli* And *Pseudomonas Aeruginosa* From Department Of Microbiology Ouat, Bhubaneswar, Odisha Were Used As Test Organisms. The Test Organisms Were Sub-Cultured And Routinely Maintained On Nutrient Agar.

2.2 Disk Diffusion Method:

Bauer *Et Al*, 1996) Was Used For the Determination Of Anti-Bacterial Activity Of The Extract Residues. Whatman Paper No.1 Filter Paper Was Used To Make Sterile Discs In Order To Screen For The Antibacterial Activity. From The Stock Culture Of Various Test Organisms Inoculums Was Prepared By Sub Culturing Each Of The Organisms On Muller- Hinton Agar At 37⁰c. The Filter Paper Was Punctured To The Shape Of Commercial Antibiotic Disc And The Discs Were Autoclaved At 121⁰c For 15 Minutes. The Suspension Of Bacteria Culture Was Prepared According To The Macfareland 0.5. The Discs Loaded With Extract Residues Were Aseptically Placed On Top Of The Seeded Medium And Gently Pressed To Ensure Contact. The Plates Were Then Incubated At 37⁰c. After Overnight Incubation, The Plates Were Observed For Zones Of Inhibition After 24-48 Hours.

III. RESULT AND DISCUSSION

Antibacterial Activity Of Aqueous, Methanol And Ethanol Extracts Of Marine Algae:

- Solvent Extract Residues Were Used At Concentration Of 1000µg.
- Results Were Calculated From The Average Of Triplicates

Antibacterial Activity of Crude Extracts Of The Seaweeds:

Organisms	Test Bacteria	Zone Of Inhibition (Mm)		
		Aqueous Extracts	Ethanol Extracts	Methanol Extracts
<i>Ceramium Elegans</i>	<i>Pseudomonas Aeruginosa</i>	–	9.25 ±0.22	11.28± 0.26
	<i>E.Coli</i>	–	10.12 ± 0.24	15.16 ±0.29
<i>Polysiphonia Sertularioides</i>	<i>Pseudomonas Aeruginosa</i>	–	8.01±0.19	12± 0.27
	<i>E.Coli</i>	2	10.04 + 0.22	14+0.28
<i>Gracilaria Verrucosa</i>	<i>Pseudomonas Aeruginosa</i>	–	10.01±0.21	16.3±0.30
	<i>E.Coli</i>	– –	8±0.19	18±0.32
<i>Enteromorpha compressa</i>	<i>Pseudomonas Aeruginosa</i>	– –	8±0.19	20±0.35
	<i>E.Coli</i>		12+0.28	24+0.38
<i>Chaetomorpha Linum</i>	<i>Pseudomonas Aeruginosa</i>	– –	6.07 ±0.13	18.1±0.32
	<i>E.Coli</i>		9.01+0.20	23.5+0.37

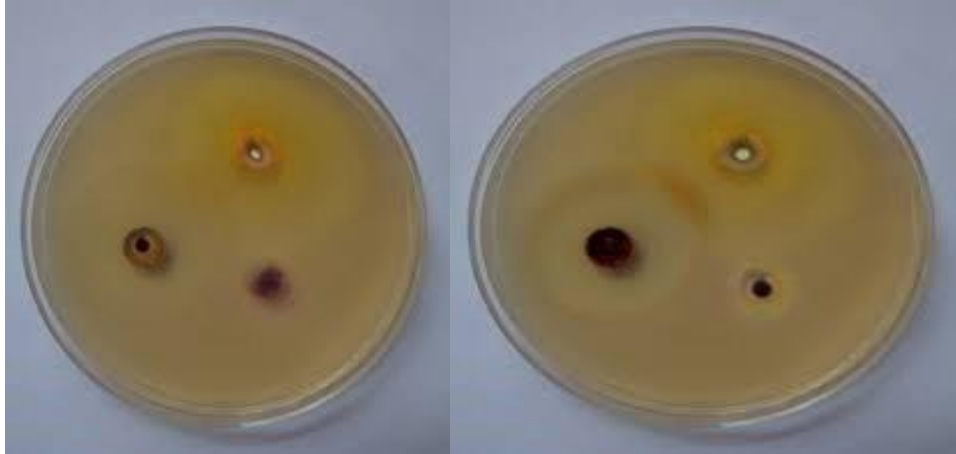


Fig 1.1 Antibacterial Activity Of Methanol Extract Of *Ceramium Elegans* Against *Pseudomonas Aeruginosa* & *E.Coli*

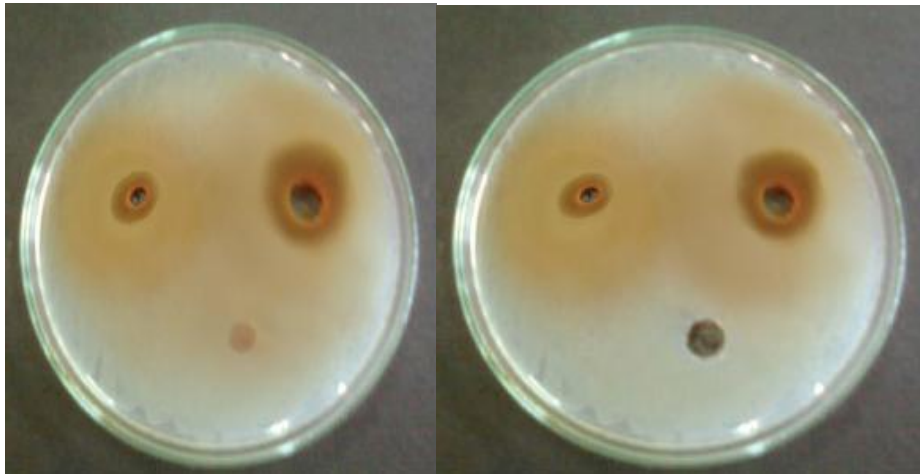


Fig 1.2 Antibacterial Activity Of Methanol Extract Of *Polysiphonia Sertularioides* Against *Pseudomonas Aeruginosa* & *E.Coli*

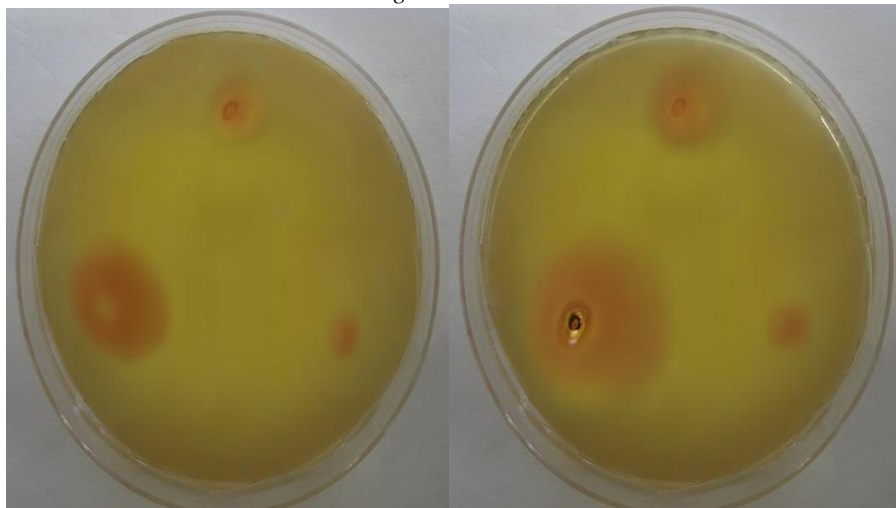


Fig1.3 Antibacterial Activity Of Methanol Extract Of *Gracilaria Verrucosa* Against *Pseudomonas Aeruginosa* & *E.Coli*

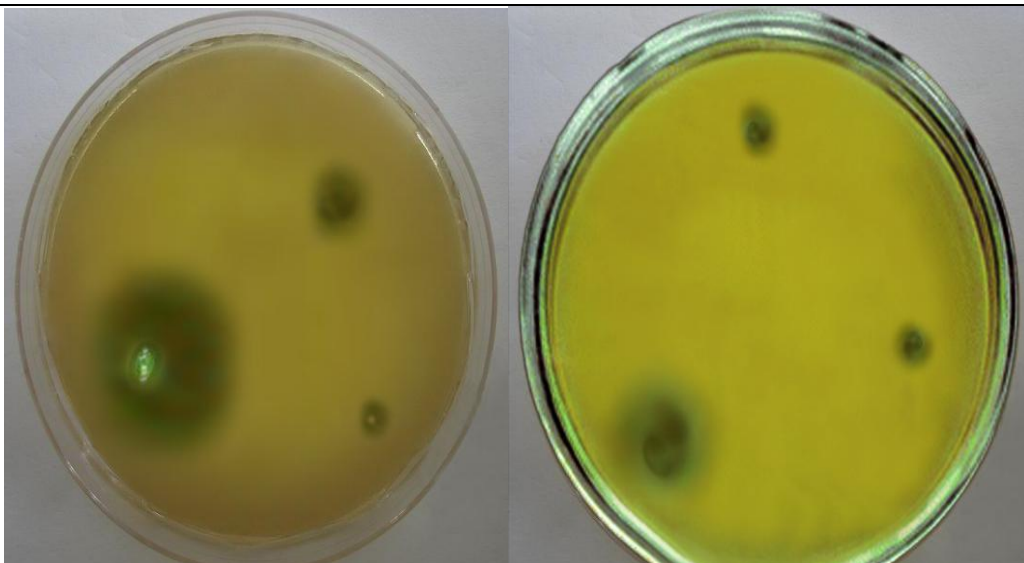
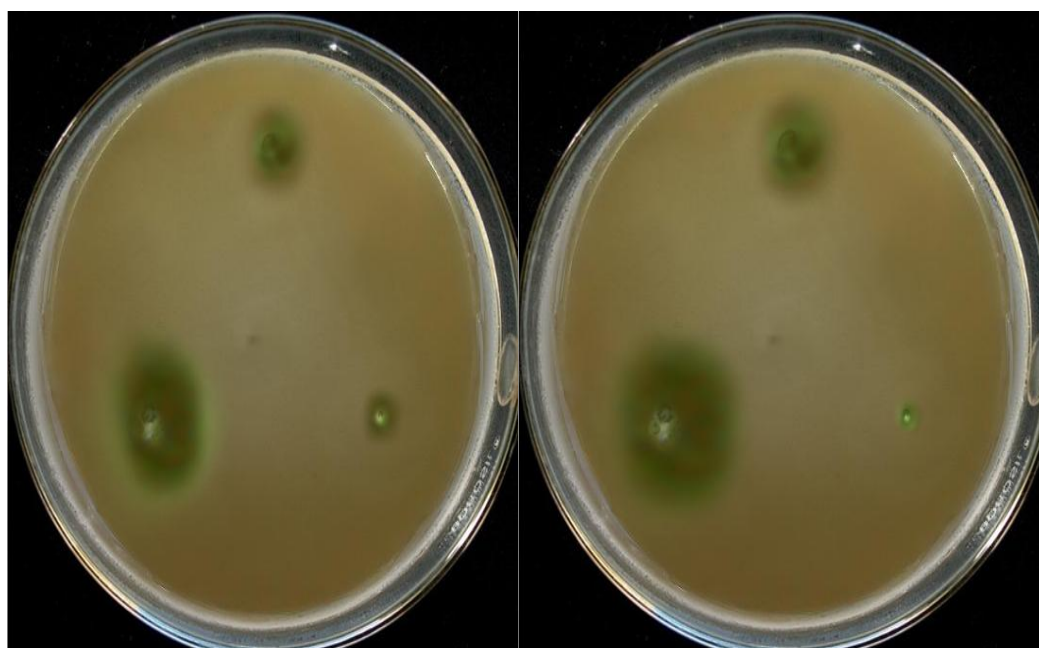


Fig 1.54 antibacterial Activity Of Methanol Extract Of *Enteromorpha Compressa* Against *Pseudomonas Aeruginosa* & *E.Coli*



Antibacterial Activity Of Methanol Extract Of *Chaetomorpha Linum* Against *Pseudomonas Aeruginosa* & *E.Coli*

Five Marine Macro Algae Were Selected For The Antimicrobial Activities Against Two Bacterial Test Organisms. The Selection Of These Macro Marine Algae Was Made On Account Of Their Common Occurrence In Chilika Lake Water. The Two Bacterial Strains Namely *Pseudomonas Aeruginosa* And *E.Coli* Were Selected For Antimicrobial Test. From The Above Experiments It Was Found That In Aqueous Extracts Of Marine Algae There Was No Effect Of Antimicrobial Activity On Marine Algae. But In Ethanol And Methanol Extracts, Antimicrobial Activities Were Observed. Methanol Extracts Exhibited More Antimicrobial Activity Than Ethanol Extracts Of Marine Algae. Methanolic Extracts Of *Ceramium Elegans*, *Chaetomorpha Linum*, *Polisiphonia Sertularioides*, *Gracilaria Verrucosa* And *Enteromorpha Compressa* Was More Effective Than Ethanolic Extracts Against The Test Bacteria *P.Aeruginosa* And *E.Coli* With Considerable Difference. In Ethanol Extract Zone Of Inhibition Was Highest In *Enteromorpha Compressa* (12 ± 0.28) Against *E.Coli* While Lowest In *Chaetomorpha Linum* (6.07 ± 0.13). In Methanol Extracts Highest Inhibition Effect Was Shown In *Enteromorpha Compressa*

(24±0.38) Against *E.Coli* Followed By *Chaetomorpha Linum* (23.5±0.37) While Lowest In *Ceramium Elegans* (11.28±0.26) Against *Pseudomonas Aeruginosa*.

IV. CONCLUSION:

From The Above Experiment It Was Concluded That Methanolic Extracts Of Five Marine Macro Algae *Ceramium Elegans*, *Chaetomorpha Linum*, *Polisiphonia Sertularioides*, *Gracilaria Verrucosa* And *Enteromorpha Compressa* Was More Effective Than Ethanolic Extracts Against The Test Bacteria *P.Aeruginosa* And *E.Coli* With Considerable Difference. However A Detail Study In This Field Is Required For Production Of Antibacterial Compounds From These Marine Macroalgae.

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VI. REFERENCES:

- [1] Arul Senthil Kr., Rajesh P., Murugan. Antibacterial Activity Of The Crude Extracts Of The Seaweed *Padina Boergesenii*. Seaweed Res. Utiln.2008; 30:177-182.
- [2] Bhakuni Ds., Silva M. Biodynamic Substances From Marine Flora. Bot. Mar. 1974 ; 17:40-51.
- [3] Burkholder Pr., Burkholder Lm., Almodovar Lr. Antibiotic Activity Of Some Marine Algae Of Puerto Rico. Bot. Mar.1960;2:149-156.
- [4] Glombitza Kw. Antimicrobial Constituents In Algae: Quantitative Determination Of Acrylic Acid In Sea-Algae. *Planta Medica*.1970; 18: 210-221
- [5] Hornsey Is, Hide D (1974). The Production Of Antimicrobial Compounds By British Marine Algae. I. Antibiotic Producing Marine Algae. Br. Phycol. J. 9: 337-342.
- [6] Naqvi, S. W., A. Solimabi, S. Y. Kamat, L. Fernandes, C. V. G. Reddy, D. S. Bhakuni And B. N. Dhawan. 1980. Screening Of Some Marine Plants From The Indian Coast For Biological Activity. **Bot. Mar.** 24: 51 - 55.
- [7] Rao P, Parekh Ks. Antibacterial Activity Of Indian Seaweeds. *Phykos* 1981; 23: 216-221.
- [8] Suay I, Arenal F, Asensio Fj, Basilio A, C Abello Ma, Diez Mt, Garcia Jb, Gonzalez Delnval A, Gorrochategui J, Hernandez P, Pelaez F, Vicente Mf (2000). Screening Of Basidiomycetes For Antimicrobial Activities. *Antonie Van Leeuwenhoek*. 78: 129-139