CURRENT BOTANY
Curr. Bot. 2(1):29-31, 2011

REGULAR ARTICLE

Bio-activity of Algae Belonging to Bhusawal region, Maharashtra

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KEYWORDS

Algae, antibacterial activity, growth promoting activity

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EDITOR

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CB Volume 2, Year 2011, Pages 29-31

ABSTRACT

Three algal species; *Spirogyra* (A), *Chara* (B) and *Cladophora* (*C)* were isolated from Tapi river near Bhusawal (M.S.). These algae were tested in compliance with the agar well diffusion method for their antibacterial and antifungal agent production on various organisms that incite diseases to human and plants *(Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Proteus vulgaris, Asperigillus niger and Candida albicans)*. The bioactive metabolites are extracted by using diethyl ether, butanol, acetone and methanol. It was found that; sample A had the highest bioactivity towards the tested bacteria. Algae are found to be rich source nutrients like carbohydrates, lipids and proteins. Thus they act as growth promoting substance for fungi like *Candia albicans* and *Asperigillus niger*. From tested algae B has highest growth promoting ability for fungi *Candia albicans* and *Asperigillus niger*.

Introduction

Algal organisms are rich source of novel and biologically active primary and secondary metabolites. These metabolites may be potential bioactive compounds of interest in the pharmaceutical industry (Rania and Hala, 2008). The existence of bioactive compounds in algae is to be expected due to co-occurrence of these organisms in aquatic natural communities, where an inhibitory interaction occurred between producers and competitors within the same habitat. These metabolites may be synthesized under stress conditions and low growth rate (Keating, 1978).It is generally accepted that algae which lack physical defenses produce toxic chemicals to protect themselves in hostile environments. From review articles it was found that more than 750 species of algae are reported by various workers in Jalgaon district, but none of the algae had been used for any commercial purpose. During last few decades there has been an increase in research activities performed on the fresh water algae especially related to their taxonomy studies of higher algae and on Cynobacteria. Various strains of Cyanobacteria are known to produce intracellular and extracellular metabolites with diverse biological activities such as antialgal, antibacterial and antifungal and antiviral activity (Kalireioglu et al., 2006). Algae are found to be rich source nutrients like carbohydrates, lipids and proteins. Thus they act as growth promoting substance for fungi like *Candia albicans* and *Asperigillus niger*. The aim of the present work was to study the biological activity of cell extracts of various fresh water algae against both bacteria and fungi.

Materials and Methods

Algal flora

Algal samples were obtained from Tapi river (21°02′50.56″N 75°47′15.99″E21.0473778°N 75.787775°E) Bhusawal, Jalgaon and Maharashtra state. Algae were washed in sterile distilled water and identified by using taxonomic key.

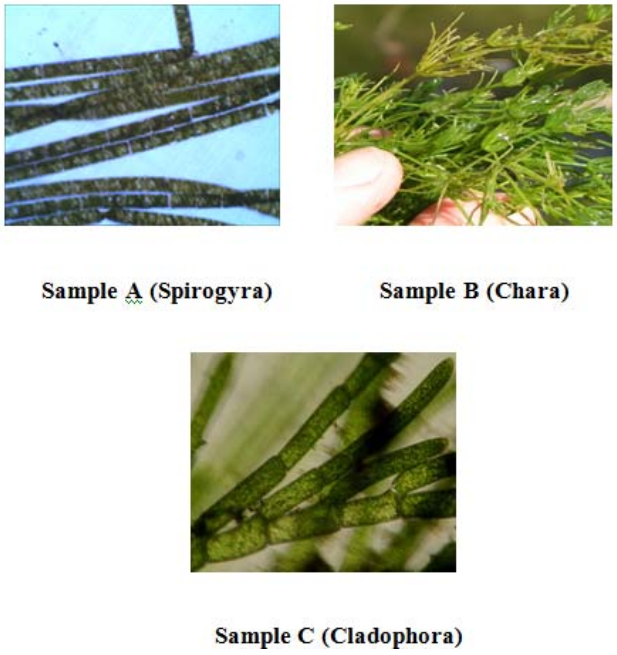

Fig. 1 Algae tested for bioactivity

Test organisms

The test organisms used in this work were *Escherichia coli, Bacillus subtilis, Staphylococcus aureus, and Proteus vulgaris, fungi Aspergillus niger and Candida albicans* were isolated in laboratory of Bhusawal Arts, Science and P. O. Nahata Commerce College, Bhusawal. The bacterial strains were inoculated into nutrient broth and incubated for 24 hours; the fungal strains were inoculated into glucose peptone broth for 5 days.

Extraction of bioactive compounds

The algae are dried and powder was prepared. 0.5g of each of the four algal powders was extracted in 10ml of various organic solvents acetone, butanol, diethyl ether and methanol in homogenizer. After homogenization extract are centrifuged and supernatant was collected and kept for solvent evaporation then they remaining extract was mixed in 0.5% respective solvent and phosphate buffer having pH 6.8.

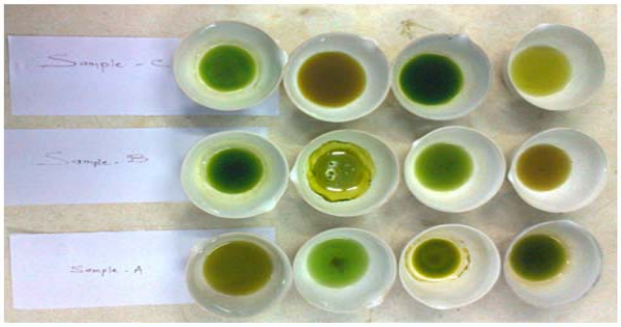

Fig. 2 Algal extract in various solvents

Inhibitory effect by the agar well diffusion method

The bioactivities of algae were tested by agar well diffusion method. For antibacterial activity 20 ml sterile nutrient agar was poured in petridishes, inoculated with 0.1ml of a 24 hr broth culture of test bacteria. For antifungal activity 20 ml of Potato dextrose agar were poured in petridishes and inoculated with 0.1 ml of 5 days glucose peptone broth culture of test fungi and yeast. Indicator microorganisms were spread on agar plates with. Four wells of 6 mm each were made and filled with 0.1 ml extract. The inoculated plates were incubated for 2 days at 300C for fungi and for 1 day at 370C for bacteria. After incubation the diameter of the inhibition zone was measured with mm scale and the results were recorded in mm.

Result and Discussion

The result obtained from the present study concerning the bioactivity of fresh water algae against different species of bacteria and fungi were recorded in table 1. The antibacterial activity of algae depends on type of algal species, solvent used for extraction, bacterial and fungal strains. The methanol extracts of *Spirogyra sp.* and acetone extracts of *Cladophora* gave the highest biological activity against tested organisms specifically *E.coli*. The result cleared that acetone and butanol extracts had moderate activites towards test organisms.

The result obtained from same studies conclude that algal extracts are found to be a best source for fungi, since there is no antifungal activity against *Candida albicans* and *Asperigillus niger*, in fact they acted as growth stimulating factor. In present investigation every extract of *Chara Species* and *Cladophora species* showed growth stimulatory effect near the well in which sample were poured.

Table 1. Antibacterial and antifungal activities of different extracts obtained from algae

Algal species	Organic solvents	Diameter of inhibition in mm					
		Bacterial species				Fungal species	
		Bacillus subtilis	*Escherichia coli*	*Proteus vulgaris*	*Staphyllococcus aureus*	*Aspergillus niger*	*Candida albicans*
Spirogyra	Acetone	13	12	11	10	--	--
	Butanol	10	12	12	12	--	--
	Diethyl ether	--	--	--	--	--	--
	Methanol	13	17	13	10	--	--
Chara	Acetone	--	--	--	--	--	--
	Butanol	--	--	--	--	--	--
	Diethyl ether	--	--	--	--	--	--
	Methanol	--	--	--	--	--	--
Cladrphora	Acetone	10	13	12	10	--	--
	Butanol	--	--	--	--	--	--
	Diethyl ether	--	--	--	--	--	--
	Methanol	9	10	11	--	--	--

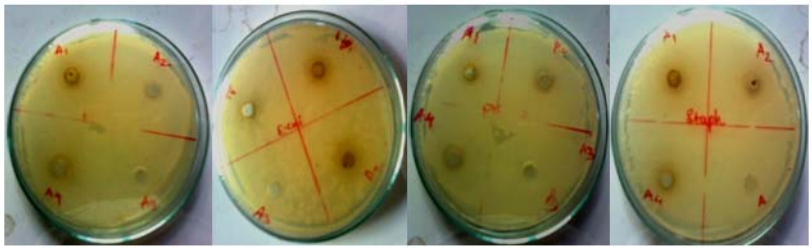

Fig. 3 Antibacterial activity of *Spirogyra* on Tested organisms

ISSN: 2220-4822

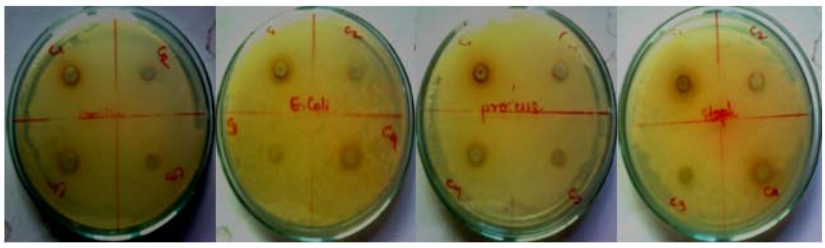

Fig.4 Antibacterial activity of *Cladophora* on Tested organisms

Fig. 5 Growth promoting activity of Sample B and C *Candida* spp.

Acknowledgement

The Authors are grateful to Dr. A.G.Rao the Principal, Moolji Jaitha College, Jalgaon, India and Dr. M.V. Woykole the Principal, Bhusawal Arts, Science and P. O. Nahata Commerce College, Bhusawal, India for providing library and laboratory facilities to carry out this work.

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