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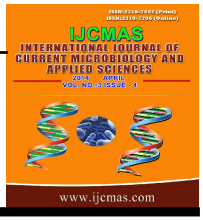

Original Research Article

Phycochemical and antimicrobial study of vigorous fresh water alga *Mougeotia*

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A B S T R A C T

Keywords

Mougeotia, phyco-chemical, antimicrobial tests, dominance

Mougeotia (C.A.Agardh) is fast growing fresh water green algae found generously in the water bodies of Durg region. This alga is particularly interesting due to its vigorous and luxuriant growth in its habitat throughout the year. The present study was undertaken to investigate the preliminary phycochemical studies and antimicrobial tests to ascertain the presence of such compounds that help in widespread distribution of the alga throughout the year and its dominance over other fresh water algal organisms. The alga was found to be rich in carbohydrates, proteins, lipids, alkaloids, sterols and terpenoids but phenols and tannins were not reported. Antimicrobial tests revealed that the algal extract were more potent against bacteria as compared to fungi.

Introduction

Fresh water green algae are a group of fast growing autotrophic diversified organism which transform radiant energy into chemical energy by capturing solar energy which maintain the homoeostasis of ecosystem and biomes. Besides having higher photosynthetic efficiency as compared to terrestrial plants, algae also have high growth rates and biomass production. Tropical conditions such as those in India provide favourable environment for the luxuriant growth of these organisms in the nature (Subbaramaiah, 1972; Srivastava and Odhwani, 1992; Thajuddin & Subramanian, 1992; Thajuddin *et al.* 2002; Rajakumar, 2004; Chellappa *et al.* 2004; Goyal S.K, 1962,1964; Bhatnagar and Bhatnagar 2005; and Bhatnagar *et al.* 2008; Makandar and Bhatnagar 2010).

Mougeotia is free floating filamentous green algae. Being a member of Family Zygnemataceae it shares a taxonomic position with *Spirogyra* and *Zygnema. Mougeotia* is abundantly found in the fresh water bodies of Durg region throughout the year. It richly flourishes in

the fresh water ponds to an extent that during maximum part of the year it does not allow any other type of algae to dominate.

Durg district is situated in the southwest part of Chhattisgarh plain. It lies towards the east of Shivnath river. The district generally experiences a dry tropical weather which is moderate but on a warmer side in summer season. The summer temperatures are quite extreme in the region reaching as much as 48^{o}C in the season. During summer season, which lasts from March to June experiencing maximum temperatures from mid April to Mid June the water bodies experience a sharp volumetric decline in the water content posing water stress to the aquatic organisms. But the organism under study was seen to flourish during the extreme summer temperatures as well. The present study aimed at identifying the characteristics responsible for the vigorous growth and dominance of *Mougeotia* species.

Materials and Methods

Collection and identification of algae

Mougeotia was collected from three ponds of Durg region in Chhattisgarh state. The identification of alga was done by standard books Prescott (1951), Fristch (1937).

Culture of alga

For developing monoculture the strain were isolated and kept in culture media. The Chu 10 medium with pH 7.6 maintained was found to be most suitable for growth of the algae by providing appropriate light and aeration in tissue culture rack.

Preparation of algal extract

The fresh algae obtained by culturing in synthetic media were isolated, washed thoroughly and shade dried at room temperature and then milled into coarse powder in mortar and pestle.

Preliminary phytochemical studies

Detection of Carbohydrates

Small quantity of aqueous extract was tested qualitatively by Fehling's test and quantitatively by Anthrone test for carbohydrate-

Detection of proteins

Small quantities of the extract was dissolved in a few ml of water and were subjected to qualitative estimation by Millon's and Biuret test and quantitative estimation by Lowry's test.

Preparation of extract

The algal powder was dissolved in methanol in an cotton plugged ehrelenmeyer flask and kept for 15 days. The flask was periodically subjected to shaking on an electronic shaker. After 15 days the extract was filtered using Whatmann filter paper No. 40.

Detection of Secondary metabolites

A small quantity of the extract was treated with few drops of dilute Hydrochloric acid and filtered. The filtrate was used for the following tests.

Alkaloids by Hager's reagent and Mayer's reagent.
Phytosterols by Salkowski test and Libermann Buchard tests.
Oils and fats by filter paper test and saponification test. Phenolic compounds and tannins by ferric chloride test.

Antimicrobial activity

The methanolic extracts of algae were tested for their antibacterial activity by

agar well diffusion method. For antibacterial tests the media used was Nutrient agar and for fungal cultures to be tested Potato Dextrose Agar media was used. Amoxicillin was used as standard drug for the antibacterial tests and col-trimazole was used as standard for the antifungal tests.

Results and Discussion

Phycochemical analysis of fresh water green algae *Mougeotia* extract, showed the presence of carbohydtrates, proteins, lipids and fats, alkaloids, sterols and terpenoids, and absence of phenolic compounds (Table -1).

Antibacterial tests were conducted against gram +ve bacteria *Staphylococcus aureus* and gram –ve bacteria *Escherichia coli.* Antifungal tests were conducted against two human pathogenic fungi *Candida albicans* and *Asprgillus niger*(Table-2).

The phycochemical analysis of the extract of *Mougeotia* showed presence of primary metabolites as carbohydrates, proteins and lipids and also of secondary metabolites as alkaloids, sterols and terpenoids. Quantitative estimation of carbohydrates and proteins revealed a high concentration of both carbohydrates and proteins.

Mougeotia is an actively photosynthesizing green alga, it forms an important part of the aquatic ecosystem. As the phycochemical analysis of the extract of *Mougeotia* showed the presence of primary metabolites such as carbohydrates, proteins and lipids, thus confirming its role as a producer in aquatic ecosystem. Quantitative estimation of carbohydrates and proteins revealed a high concentration of both. The high concentration of protein makes it an interesting organism as it not only provides strength for a vigorous growth but also serve as a substrate for synthesis of secondary metabolites by alternative pathway. Secondary metabolites as alkaloids, sterols, terpenoids are also found in *Mougeotia.* Absence of phenol and tannin in them significantly shows absence of genes lacking for their metabolism which its present in higher forms of plants, but high amount of protein simultaneously opens the rich amino acids required for proteins and body building in their food chain.

Antimicrobial tests conducted by methanolic extracts of *Mougeotia* indicated that although it shows antibacterial as well as antifungal properties, but by comparing the zone of inhibition formed in the bacterial and fungal infections, they prove to be more potent antibacterial agents. And among bacteria they are more effective on Gram (-)ve bacteria as *Escherichia coli* than Gram (+)ve bacteria as *Staphylococcus aureus*.

Thus from the present study it can be concluded that this vigorous alga dominates over the water body due to its high potentials and antimicrobial properties. Although we are still far from deriving the conclusion of using it as potent food additive for human beings but it can well be assumed that this will prove to be a nutritious diet for fishes and can be recommended as fish food, so may interfere the food chain of carnivores.

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Table.1 Preliminary Phycochemical studies of extract of *Mougeotia* sp.

S.No.	Phycochemical	Tests	Algal extract
1.	Carbohydrate	Fehling's test	+
2.	Proteins	Millon's test Biuret test	+ +
3.	Lipids and fats	Filter paper test Saponification test	+ +
4.	Alkaloids	Hager's test Mayer's test	+ +
5.	Phenolic compounds and tannins	Ferric chloride test	-
6.	Phytosterols	Salkowski test Liebermann Burchard's test	- +
7.	Terpenoids	Terpenoid test	+

Quantitative estimation of carbohydrates and proteins

S.No.	Primary metabolite	Quantity
1.	Carbohydrate	32 mg/ml
2.	Proteins	25.4 mg/ml

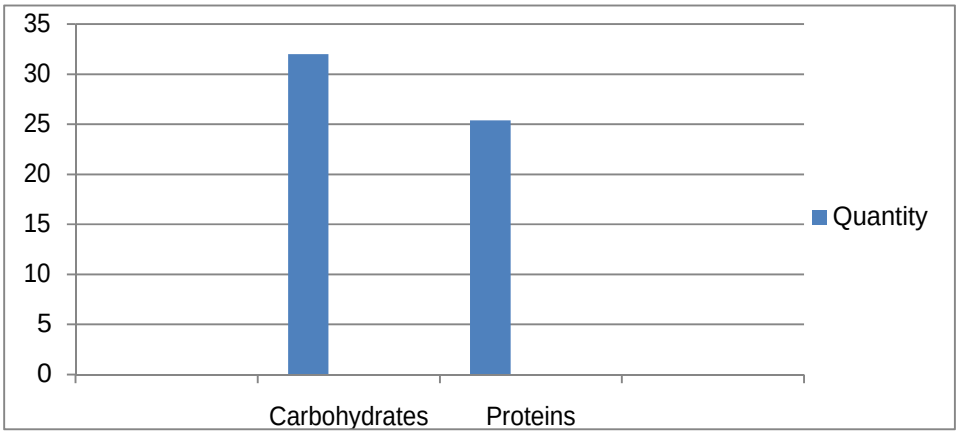
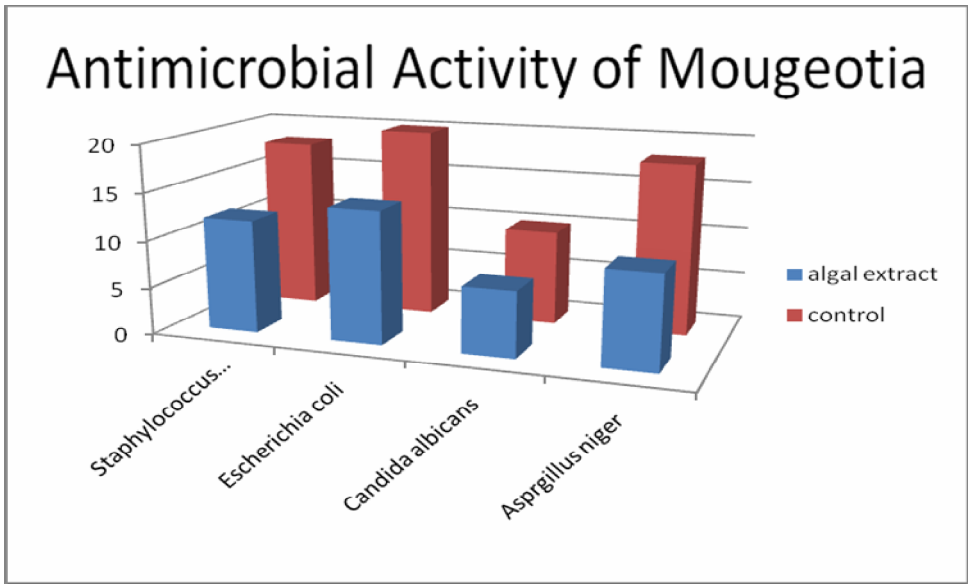


Table-2 Antimicrobial test against bacteria and fungi showed the following results

S. No.	Test Microorganisms	Diameter of Zone of inhibition (mm)	Standard Drug (mm)
1.	*Staphylococcus aureus*	12	18
2.	*Escherichia coli*	14	20
3.	*Candida albicans*	7	10
4.	*Asprgillus niger*	10	18

Standard : Amoxicillin for Bacteria
: Col-trimazole for Fungi



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