Antimicrobial Activity of Blue-Green and Green Algae

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The methanolic extract of a blue-green alga and two green algae have been investigated for *in vitro* antimicrobial activity against *Proteus vulgaris, Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, Aspergillus niger, Aspergillus flavus* and *Rhizopus nigricans* using agar cup-plate method. Blue-green alga, namely, *Microchaete tenera*; and green algae, namely, *Nitella tenuissima* and *Sphaeroplea annulina*, showed significant antibacterial activity against *Pseudomonas aeruginosa*. *Microchaete tenera* showed good antimicrobial activity against *Proteus vulgaris* and *Aspergillus niger. Sphaeroplea annulina* showed feeble antifungal activity against *Aspergillus flavus*.

Man relied on natural products in general and plants in particular to promote and maintain good health and fight sickness, pain and disease since time immemorial. India is an important country in the world where ancient systems of medicine such as Ayurveda, Siddha and Unani have been in practice for many years. In common, all the above-mentioned systems of medicine are directly dependent upon natural resources such as plants. With the advances in experimental methods in phytochemistry and pharmacology, several medicinal plants were screened for active principles and biological activities[1]. However, there are meagre reports on the usage of primitive plants in biological activities. Therefore, an effort is made in the present investigation to screen a very common blue-green alga, namely, *Microchaete tenera* (Family: Microchaetaceae); and two green algae, namely, *Nitella tenuissima* (Family: Characeae) and *Sphaeroplea annulina* (Family: Sphaeropleaceae), for their antimicrobial activity.

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TABLE 1: *IN VITRO* ANTIMICROBIAL ACTIVITY OF *MICROCHAETE TENERA, NITELLA TENUISSIMA* AND *SPHAEROPLEA ANNULINA*

Organisms	Zone of inhibition (mm)*					
	1	2	3	4	5	6
Proteus vulgaris	14±0.0	13±0.0	12.5±0.01	17.5±0.01	ND	NI
Bacillus cereus	12±0.05	13±0.11	13±0.05	16±0.20	ND	NI
Escherichia coli	12.5±0.01	11.5±0.2	12±0.05	16.5±0.50	ND	NI
Pseudomonas aeruginosa	19.5±0.06	19±0.50	19.5±0.20	18±0.03	ND	NI
Aspergillus niger	17±0.02	13.5±0.1	14±0.40	ND	19±0.5	NI
Aspergillus flavus	12±0.01	10±0.03	11±0.05	ND	18.5±0.3	NI
Rhizopus nigricans	12.5±0.06	11±0.5	12.5±0.03	ND	16±0.05	NI

*All the values are mean ± standard deviation of three determinations. 1. *Microchaete tenera*, 2. *Nitella tenuissima*, 3. *Sphaeroplea annulina*, 4. Streptomycin sulphate (4 mg/ml of distilled water), 5. Bavistin (4 mg/ml of distilled water) and 6. Control (dimethylformamide). ND – Not done; NI – No Inhibition.

During the month of November 2001, *Microchaete tenera* was collected from the tank of Gulbarga University, Gulbarga; *Nitella tenuissima* from the Pala tank of Gulbarga and *Sphaeroplea annulina* collected from the Bheema River near Gulbarga. These were identified and authenticated at Algal Biotechnology Laboratory, Gulbarga University, Gulbarga.

These three algae were grown in De's medium[2] at pH 6.8, 7.2 and 7.5 respectively. The axenic cultures were obtained by repeated subculturing under aseptic conditions. The cultures were maintained under daylight fluorescent tubes with '14 h of light and 10 h of dark' cycle at a temperature of 25±2°.

The healthy cultures of selected algal material were filtered from the culture medium, washed 3-4 times in distilled water and its moisture was removed with the help of filter paper. The algal material was shade dried for 8 d, and the fully dried material was powdered using pestle and mortar. The powdered plant material was subjected to Soxhlet extraction using methanol. The extracts were concentrated to dryness in a flask evaporator under reduced pressure and controlled temperature. Four milligrams of each extract was dissolved in 1 ml of distilled dimethylformamide and assayed for its antimicrobial activity using agar cup-plate method[3–4]. *In vitro* screening was carried out using four species of bacteria, namely, *Proteus vulgaris, Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa;* and three species of fungi, namely, *Aspergillus niger, Aspergillus flavus and Rhizopus nigricans*.

Streptomycin sulphate (4 mg/ml of distilled water) and bavistin (4 mg/ml of distilled water) were used as standards for bacteria and fungi respectively. All the three algae showed marked activity against *Pseudomonas aeruginosa*. *Microchaete tenera* showed significant activity against *Proteus vulgaris* and *Aspergillus niger*. *Sphaeroplea annulina* showed good activity against *Aspergillus niger*. *Nitella tenuissima* showed feeble activity against *Aspergillus flavus* (Table 1). The data gathered was compared with the available literature[5–7], and it was found that there are no reports on these selected algae against microorganisms. Thus, it is evident from the results that these algae possess antimicrobial activity. Further studies are aimed at isolation and purification of phytoconstituents responsible for antimicrobial activity.

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