Abstract

Algae are ubiquitous and constitute a large and diverse group of typically autotrophic organisms that have only a limited history of characterization and exploration. Exploring and screening of the indigenous algae offers a rich base for global biotechnological application and can allow communities to prospect for algae suited to regional needs. Native phycological flora is *a priori* adapted to the regional biotic and abiotic factors, and thus are evolutionarily primed for local waste management. Selecting this biota with intrinsic characteristics offers a diverse base of organisms naturally engineered to regions that have needs for waste mitigation and also provide an ideal platform for additional strain development and optimization. Indeed, many algae with favorable characteristics may already inhabit local wastewater, but lack proper domestication for wastewater remediation. Natural selective pressure from anthropogenic industry on native algae yield organisms primed for waste remediation within the local context. Harnessing algae for wastewater remediation is still in its nascent stages, giving logical heeds to explore this realm for potential application. In Panchgram area of Hailakandi district (Southern Assam), North-East India, the river barak serves as principal source of water for the domestic purposes and industrial uses. The deleterious impact of pollution from the nearby paper mill of this lifeline river is a causing concern. Thus, in the present study with an aim to investigate the distribution of algal communities around Panchgram papermill area and screening of novel species for bioremeadiation, a systematic survey of the algal flora followed by establishment of pure culture and molecular characterization of cyanobacteria and finally their application for waste remedial purpose was carried out.

Chapter 1 deals with an introductory background, the objectives of the study and the significance of the present research work.

Chapter 2 highlights the extensive literature review exploring the motive of undertaking the research work *vis-à-vis* the current status.

Chapter 3 includes details of the study area, different techniques, equipments, methods adopted for sampling, analysis, statistics.

Chapter 4 deals with the data on water quality, soil quality for habitat characterization and distribution of algal communities of different strategically selected sites. An attempt had been made to correlate the environmental variables with algal parameters using different statistical methods.

Chapter 5 describes the isolation, purification and taxonomic assignment based on morphological characterization and cultural developmental history of some cyanobacterial strains.

Chapter 6 furnish an account of growth kinetics, biochemical evaluation including soluble protein, total carbohydrate, chlorophyll a, total carotenoid, phycocyanin, phycoerythrin and allophycocyanin of the isolated cyanobacterial strains.

Chapter 7 gives an account of heavy metal tolerance, wastewater detoxification, physico-biochemical alteration, and LC50 value of the novel species selected for bioremediation.

Chapter 8 includes molecular characterization of the selected isolated cyanobacteria strains. A total of 8 pure cyanobacterial isolates were sequenced for the 16S rRNA gene and submitted to

the NCBI GenBank under the respective accession numbers. A Neighbor Joining tree was constructed on the basis of 16SrRNA partial gene sequences of the strains.

Chapter 9 deals with the general discussion pertaining to the present research work encompassing the entire work. Herein, a comparative assessment of the results obtained in individual work chapter has been assembled with some conclusive remarks.

The relevant literatures pertaining to **Chapter 1-9** are enlisted at the end of the thesis followed by the research publications and papers presented at the Symposium and Conferences.