

Sub-aerial algal diversity in the biofilms of terracotta temples of Bishnupur, West Bengal, India and their Biotechnological potential

Author(s) Jnanendra Rath, Sikha Mandal, Samit Ray

Institution(s) 1. VBCCA, Visva-Bharati Culture Collection of Algae, Visva-Bharati University, Santiniketan, West Bengal, India

Abstract:

The blackish brown crust on the fine carvings of seven famous terracotta temples of Bishnupur was studied with regards to the presence of microalgae. Forty five taxa of micro algae belonging to 36 species of cyanobacteria, 5 species of chlorophyta and 4 species of Bacillariophyceae has been found from crusts of these monuments and . The isolated strains of algae were preserved in the Visva-Bharati Culture collection of algae (VBCCA) WDCM931 . The temples of Bishnupur were built in 17th century, crafted from the local lateritic soil and brick and are covered with terracotta tiles. However, due to colonisation by cyanobacteria and micro algae the fine sculptures are being damaged in course of time. Cyanobacterial taxa Aphanothece, Chroococcus, Gloeotheca, Lyngbya and Scytonema occurs in almost all the temples and are the dominant species forming biofilm over the fine sculptures deteriorating its fine carvings. Though the temperature on the surface of these temples increased up to 50 0 C during summer months, the cyanobacterial species survive forming black-brown crust. Aphanothece, Gloeocapsa, Gloeotheca, Cyanosarcina, Chroococcus, Lyngbya and Nostoc species are surrounded by thick external envelope layers formed due to extracellular polysaccharides and might be the cause of deterioration of the fine architecture of these beautiful temples. The blackish-brown crusts/ mats occurring on the rock surface of several temples exposed to intense solar radiation showed prominent absorption in the UV region of the spectrum. Absorption maxima at 258-260, 312, 317 or 325 nm in the crusts/mats was due to presence of mycosporine amino acid (MAAs) like compounds. An absorption peak at 384 nm, obtained in certain epilithic crusts was due to yellowish brown scytonemin pigment. Methanolic extract of these epilithic cyanobacterial species revealed that 12 species contained one or more MAAs absorbing in the UV-B and UV-C region. The Lyngbya sp. Isolated from the crust of these monuments leached a red pigment within one month of culture and having copious exopolysaccharides, which can be use as a bio-colorant and of immense biotechnological importance. These organisms also having high SOD scavenging activity. The survival strategies of these crust cyanobacteria like having UV-sunscreen pigments, high SOD scavenging activity, and high polysaccharide content can be exploit for biotechnological application. The diversity of microalgae of this important habitat along with its biotechnological importance will be discussed during the presentation.

Key words: Sub-aerial algae, terracotta temples, VBCCA, exopolysaccharides, MAAs