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EVALUATION OF THE POTENTIAL OF POLY- β -HYDROXYBUTYRATE (PHB) PRODUCTION BY THE NATURAL CYANOBACTERIAL BLOOMS IN BEIRA LAKE

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Abstract

Petroleum based plastics impose a critical hazard to the environment. Hence, it is of utmost importance to enhance and optimize the production of biodegradable alternatives such as Polyhydroxyalkanoates (PHAs). Poly-β-hydroxybutyrate (PHB) is the most widespread and completely characterized PHA that is biosynthesized by many microorganisms. Cyanobacteria has been identified as the most feasible autotrophic prokaryote for the commercial biosynthesis of PHB. The present study aimed on direct utilization of naturally existing cyanobacterial blooms to extract biodegradable PHB, concurrently providing a considerable remedy to both hazardous cyanobacterial blooms and plastic pollution. The attempt was focused on minimizing the production cost by eliminating the growing of cyanobacterial monocultures. Fresh cyanobacterial bloom samples were collected in to sterilized plastic bottles from the hypereutrophic Beira Lake, Colombo. Microscopic identification confirmed that *Microcystis aeruginosa* was the dominant species followed by the cyanobacteria *Microcystis incerta* and *Spirulina platensis*. PHB production in collected bloom sample was enhanced by providing 12/12 hours light/dark cycle in the laboratory for a period of 4 days, without adding nutrient supplements. Sudan black B staining procedure was followed for the Microscopic visualization of PHB granules. Freeze dried bloom samples were pre-treated with 100% methanol followed by the extraction of PHB into 99.8% boiling chloroform. PHB derived Crotonic acid was quantified using the spectrophotometer at 235 nm. Fourier transform infrared spectroscopy (FTIR) results confirmed the presence of functional groups; C–H, –C-O-C-, C=O, OH and -CH3 group of PHB. The Raman spectrum of the crude extract showed an irrefutable similarity to that of the standard PHB. The yield which was calculated as the mean percentage weight of PHB extracted was found to be 7.129 ±0.12% w/w. Thus, the results of the present study suggest cyanobacterial blooms as a promising potential source for the production of biodegradable alternatives for PHB production.

Keywords: Biodegradable Plastics, Polyhydroxyalkanoates (PHAs), Beira lake Poly-β-hydroxybutyrate (PHB), Cyanobacteria