



BIODEGRADATION OF THE CYANOTOXIN CYLINDROSPERMOPSIN USING *Bacillus cereus*

Peduruarachchi H.T.¹, Liyanage G.Y.^{1,2} and Manage P.M.^{1,2*}

¹Centre for Water Quality and Algae Research, Department of Zoology, Faculty of Applied Sciences,
University of Sri Jayewardenepura, Sri Lanka

²Faculty of Graduate Studies, University of Sri Jayewardenepura, Sri Lanka
pathmalal@sjp.ac.lk

Abstract

Cylindrospermopsin (CYN) is known to be one of the most common cyanotoxins, produced by cyanobacteria and found in various drinking water sources around the world. It is considered to be toxic to several human body organs including livers and kidneys, through the inhibition of protein synthesis. CYN is a heat stable alkaloid and could not be removed through conventional water treatment processes or even by heating at 100 °C. Moreover, available physico-chemical removal methods for CYN are not practically applicable for large scale in the water treatment systems, due to high initial and operating costs. However, recent studies have shown that there is a potential to remove cyanotoxins by microbial treatments, but such studies on degradation of CYN by microorganisms are limited. Thus, the present study has used four bacterial strains; *Bacillus cereus*-Y, *Bacillus cereus*-S, *Micrococcus luteus* and *Alcaligenes faecalis* which were previously isolated from water sources for the purpose of degradation of hydrocarbons and MC-LR. According to the HPLC analysis of the degradation kinetic study, *B. cereus*-S degrade three different initial concentrations of CYN; 1.0 ppm, 2.5 ppm and 5.0 ppm, with removal percentages of 39.06±2.43 %, 34.22±1.25 % and 26.35±0.40 % respectively, at 14 days of incubation where the other bacterial strains showed lower degradations. The highest rates of degradation for *B. cereus*-S were obtained at the 6th (0.0479±0.00174 ppm day⁻¹), 8th (0.0402±0.009 ppm day⁻¹) and 12th (0.0202±0.012 ppm day⁻¹) days of incubation for 1.0 ppm, 2.5 ppm and 5.0 ppm CYN concentrations respectively. Compared to the few existing literature regarding bacterial degradation of CYN, the present study highlights the efficient degradation capability of different concentrations of CYN by the bacterium *Bacillus cereus*-S.

Keywords: *Cylindrospermopsin, Biodegradation, Degradation kinetics, Bacillus cereus*-S