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Contamination Status of Algae Toxins Microcystins in Some Selected Water Bodies in Sri Lanka

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Abstract

Harmful cyanobacterial (blue-green algae) blooms, are common in eutrophic waters. Certain bloom forming species such as *Microcystis*, *Anabaena*, *Nostoc* and *Planktothrix/Oscillatoria* are a serious threat to water quality due to the potent toxins production. Microcystins, the cyclic heptapeptides produced by cyanobacteria, are hepatotoxic and tumor-promoting; inhibit protein phosphatases types 1 and 2A. WHO established a recommended level of 1 µg/l for the most hazardous Microcystin-LR (MC-LR) for drinking water. Therefore, at water treatment procedures both intra- and extracellular toxin levels are equally important. More recent studies done in Sri Lanka indicated that most inland freshwater bodies carry high toxigenic cyanobacteria populations of twenty four genera, of which *Microcystis* and *Cylindrospermopsis* are the dominant. The present study was carried out to identify and quantify nuisance algae/ cyanobacteria and potential contamination level of MC-LR in ten selected water bodies used for irrigation, drinking and recreational purposes. Water and phytoplankton sampling was done from February 2011 to February 2012. Some water quality parameters crucial in algae growth were determined using standard chemical and spectrophotometric methods. Presence of MC-LR was screened by the Immuno Strip kit at the site and ELISA method in the laboratory. Total phosphates in all ten water bodies were ranged between 0.034-0.315 mg/l and nitrates were <0.1 mg/l respectively. *Microcystis* sp. which mainly produces microcystin variants was the dominant cyanobacteria in a majority of water bodies (Kanthale 98.51%, Girithale 92.68 %, Kondawattuwana 91.05 %, Nuwara wewa 66.83%, Jayanthi wewa 65.05%). *Cylindrospermopsis* sp. which produces cylindrospermopsin was recorded in Nuwara wewa (1.89%) and Kondawattuwana (0.06%). *Anabaena* sp. which produces microcystin variants was detected in Girithale (0.76%) and Jayanthi wewa (1.33%). Both *Cylindrospermopsis* sp. and *Anabaena* sp. were recorded in low abundance compared to *Microcystis* sp. All ten water bodies were screened for MC-LR by the Immuno Strip kit resulted in low to moderate risk (0-15 µg/l) condition. It was further confirmed that some water bodies (used for drinking and other domestic consumption) in South East and North East area were contaminated with MC-LR. Microcystins were detected in Weeragoda tank as 0.146 µg/l, Jayanthi wewa 0.712 µg/l, Kondawattuwana tank 0.441 µg/l, Kanthale tank 0.2 µg/l and Unnichchai tank 1.3 µg/l during the non bloom situation. Though the recorded MC-LR contamination was below the permitted values given by the WHO, there is a risk in the near future making water unsuitable for drinking purposes as there is an increasing tendency of growing toxic cyanobacteria species in all water sources which are used for drinking.

Keywords: Phytoplankton, Cyanobacteria, Cyanotoxin, ImmunoStrips, ELISA