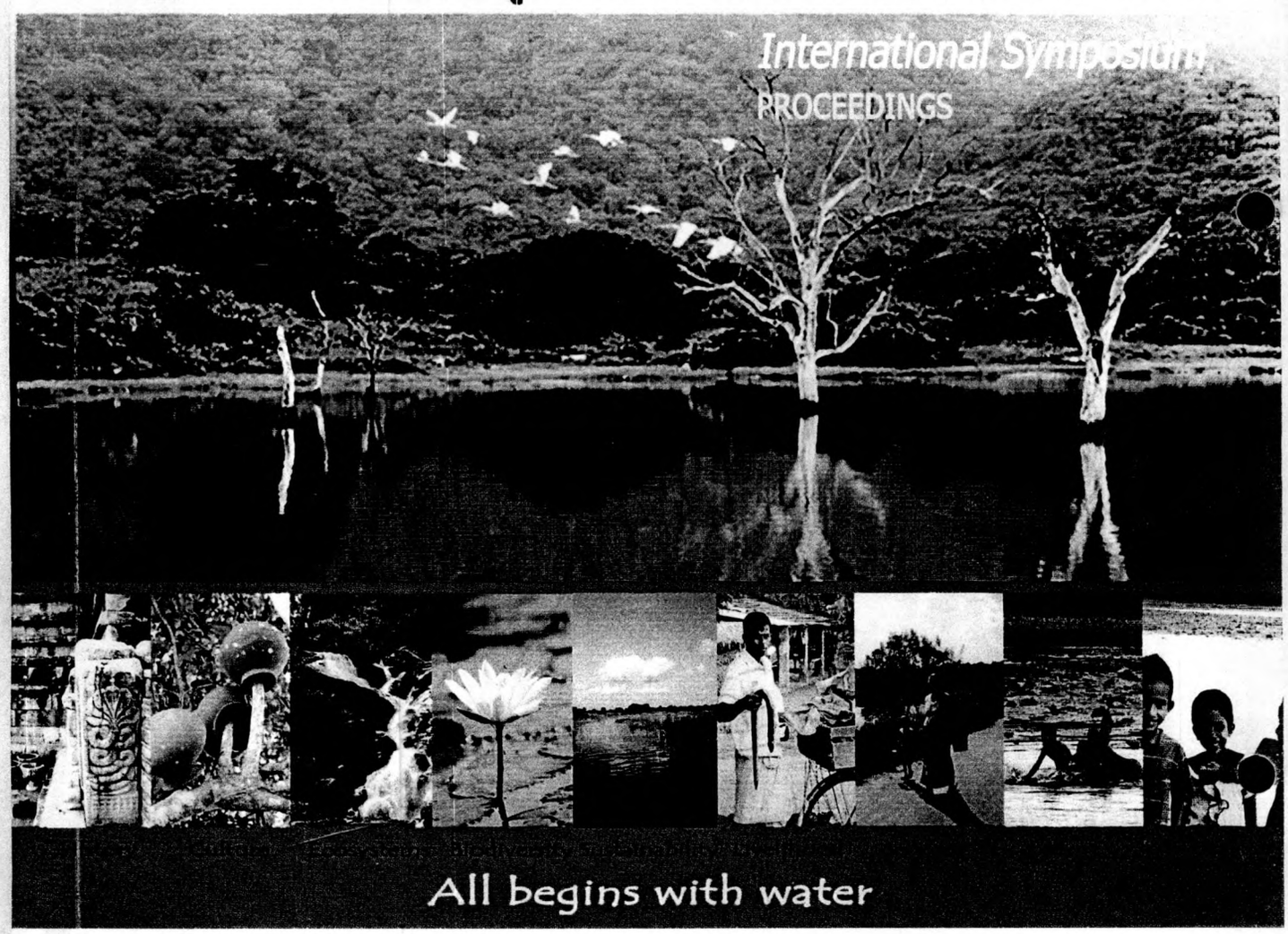
CHALLENGES AHEAD 2016

WATER QUALITY AND HUMAN HEALTH

International Symposium

PROCEEDINGS



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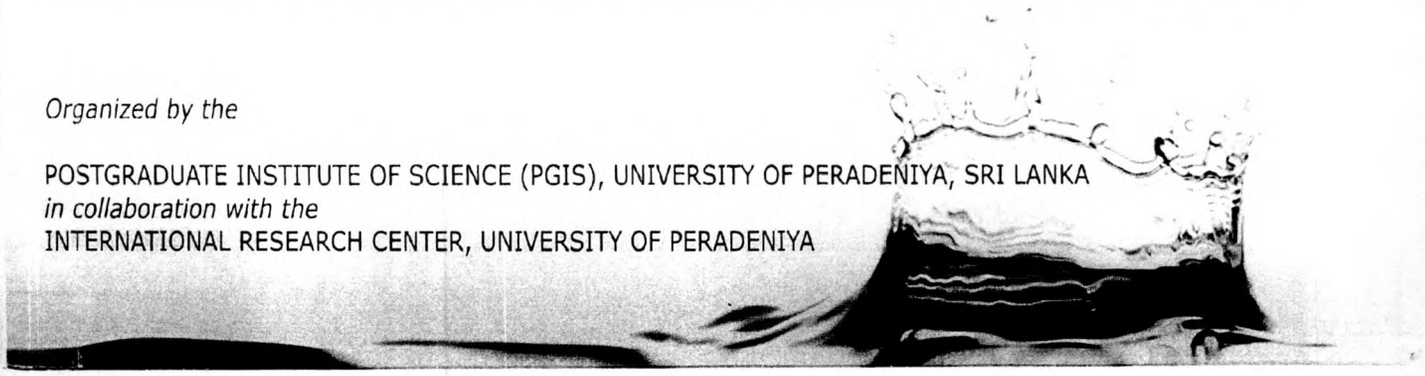

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EFFECT OF PHYSICOCHEMICAL AND BIOLOGICAL PARAMETERS ON THE OCCURRENCE OF MICROCYSTIN-LR AND THEIR DESTRUCTION BY MICROBES

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Microcystin-LR (MC-LR) is one of the most toxic cyanobacterial secondary metabolites present in Sri Lankan water bodies. MC-LR intoxication can cause serious health issues to humans and other organisms through the use of MC-LR contaminated water. MC-LR is produced within the cells of different genera of freshwater cyanobacteria: *Microcystis*, *Anabaena*, *Oscillatoria* (*Planktothrix*), *Nostoc*, and *Anabaenopsis*. However, heterotrophic bacteria in freshwater can degrade MC-LR into non-harmful products under optimal environmental conditions. The present study focuses on the effect of physicochemical and biological parameters of water on occurrence of MC-LR and their removal by bacteria.

The present study was carried out from 1st September 2011 to 31st August 2014 in some selected water bodies of Sri Lanka. Water samples were collected from five locations of each water body. Water temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), total phosphate (TP), nitrate nitrogen (NO_3^--N), chlorophyll-a, cyanobacterial cell density and total MC-LR were analyzed. Enrichment studies were carried out to isolate MC-LR degrading bacteria and BIOLOG MT2 plate method was employed in screening of the efficiency of MC-LR degraders. Pearson Correlation Coefficient (PCC) analysis and Principle Component Analysis (PCA) were used to analyze data.

PCC calculated between physicochemical parameters, cyanobacterial cell density and MC – LR levels of water bodies found that *p*-values for water temperature (0.009), pH (0.002), TP (0.001), NO_3^--N (0.01) and cyanobacterial cell density (0.001) were positively correlated with MC-LR concentration in water. However, cholorophyll-a concentration did not show a correlation with MC-LR concentration as chlorophyll-a is a pigment from green algae as well. Moreover, the PCA analysis found that the water bodies studied were clustered in three different ways: A,B and C. Cluster A included water bodies with low values for all measured parameters including MC-LR, whereas clusters B and C included water bodies with high values for all measured parameters and MC-LR. Cluster C was a sub set of cluster B. However, water bodies in cluster A did not show the presence of efficient MC-LR degraders, while water bodies belonging to cluster B and C had MC-LR degrading bacteria in their environment. The most efficient MC-LR degrader was detected in cluster C. Thus, unlike water bodies in cluster A, conditions prevailing in water bodies in cluster B and C favours MC-LR production by cyanoabcteria and heterotrophic bacterial metabolism of MC-LR. Therefore, it is clear that the analysis of physicochemical and biological parameters in water will be a useful monitoring tool to predict the presence of MC-LR in water and their destruction by microbes.

Keywords: Physicochemical parameters, biological parameters, microcystin-LR, principle component analysis (PCA), Pearson correlation coefficient (PCC)

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