

## WATER QUALITY, CYANOBACTERIA AND CYANOTOXIN CONTAMINATION IN SOME WATER BODIES IN ANURADHAPURA, POLONNARUWA, AMPARA AND BADULLA DISTRICTS, SRI LANKA

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Cylindrospermopsis (CYN) and Microcystin-LR (MC-LR) are the most potent cyanotoxins produced by cyanobacteria. The present study reports on the occurrence of cyanobacteria and cyanotoxins, CYN and MC-LR, in selected 16 water bodies: namely Nallachchiya Wewa, Kala Wewa, Nachchaduwa Wewa, Thuruwila Wewa, Nuwara Wewa, Mudaliyankulama Wewa, Wiharahalmillewa Wewa, Padaviya Wewa, Tissa Wewa, Muwapatigewela Wewa, Mawanella Wewa, Rathkinda Wewa, Ulhitiya Wewa, Parakrama Samudraya, Mirishena Wewa and Ambagas Wewa. Water and plankton samples were collected during dry and wet seasons. Water temperature, pH, dissolved oxygen (DO), and electric conductivity (EC) of water samples were measured on-site using standard meters. Nitrate-nitrogen (N-NO<sub>3</sub><sup>-</sup>), nitrite-nitrogen (N-NO<sub>2</sub><sup>-</sup>), total phosphate (TP) and total hardness (TH) were measured in the laboratory following the APHA methods. A portion from each water sample was subjected to quantify CYN and MC-LR using ELISA according to the manufacturer's instructions. Identification and enumeration of cyanobacteria were carried out under a light microscope (×400) following natural sedimentation method. Results were statistically analyzed using Principle Component Analysis (PCA) and Pearson correlation coefficient (PCC) to find the relationship among water quality parameters, MC-LR, CYN concentration and cyanobacteria. Water temperature during the dry season varied between 27.4 to 31.2 °C and from 28.0 to 31.9 °C during the wet season. During dry and wet seasons, DO, EC and TH were 2.1 - 4.6 and 2.4 - 8.5 mg L<sup>-1</sup>, 237 - 567 and 421 - 934 μS cm<sup>-1</sup> and 67<sup>-</sup> - 147 and 27 - 142 mg L<sup>-1</sup>, respectively, and the recorded values were within the range given for drinking water standards. The total nitrogen and total phosphorous ranges were 0.03 - 0.05 mg L<sup>-1</sup> and 0.2 - 0.5 mg L<sup>-1</sup> in both dry and wet seasons. *Cylindrospermopsis* spp. cell density was high (119 ± 1.13 to 34,538 ± 2.09 cells mL<sup>-1</sup>) in the dry season and fluctuated as low densities from 65 ± 0.08 to 10,678 ± 1.89 cells mL<sup>-1</sup> during the wet season. Mean concentration of CYN ranged between 0.47 and 3.99 μg L<sup>-1</sup> in the dry season and from 0.32 to 2.12 μg L<sup>-1</sup> in the wet season. The highest cell density of *Microcystis* spp. was recorded during the dry season (1652 ± 1.29 to 94,000 ± 3.14 cells mL<sup>-1</sup>) whereas, a low density (1200 ± 0.09 to 19,799 ± 2.39 cells mL<sup>-1</sup>) was found in wet season due to the dilution effect. Mean concentration of CYN ranged between 0.47 and 3.99 μg L<sup>-1</sup> in the dry season and from 0.32 to 2.12 μg L<sup>-1</sup> in the wet season. In addition to *Microcystis* spp. *Anabaena* sp. and *Oscillatoria* sp. were detected as potential toxin producing cyanobacteria in all water bodies tested. The PCA for water quality parameters, CYN and MC-LR concentrations revealed that water temperature, pH, N-NO<sub>3</sub><sup>-</sup>, TP as well as cell densities of *Cylindrospermopsis* spp. and *Microcystis* spp. clustered with CYN, MC-LR concentrations during the dry season. Furthermore, PCC confirmed that water temperature ( $p < 0.05$ ), pH ( $p = 0.012$ ), N-NO<sub>3</sub><sup>-</sup> ( $p = 0.004$ ), TP ( $p = 0.002$ ), *Microcystis* spp. cell density ( $p = 0.001$ ) and *Cylindrospermopsis* spp. cell density ( $p = 0.002$ ) had a strong positive correlation to the MC-LR and CYN concentrations. Therefore, in order to predict the outbreak of harmful levels of MC-LR, CYN in a particular water body, continuous monitoring of physico-chemical and biological parameters of the reservoirs could be advantageous.

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