Preliminary Study on Presence of Cyanotoxins in Relation to the Annual Variation of Water Quality Parameters in Natural Water Resources in Padaviya, Sri Lanka

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Microcystins (MCs) are toxins produced by freshwater cyanobacteria that cause liver and kidney damage. They are suspected causative agents of chronic kidney disease of unknown etiology (CKDu) which is highly prevalent in the North Central Province of Sri Lanka, including Padaviya. We studied the influence of water quality parameters on levels of (MCs). We measured levels of MCs using indirect competitive ELISA and water quality parameters (Ammonium (NH_4^+), pH, Chloride (Cl^-), Nitrate (NO_3^-), Conductivity, and Dissolved Oxygen (DO)) using ion selective electrodes in three reservoirs and 13 dug-wells across six Grama-niladhari divisions in Padaviya during the two main agricultural seasons: Yala (May–August) and Maha (September–March) in 2022-2023. Sampling was conducted in the months of December, March (Maha) and June, August, (Yala). All MCs levels were under the WHO limit of 1 ppb. Most water sources had MCs concentration below our detection limit of 0.35 ppb, except in certain location during March (Padaviya reservoir 0.64 ppb; six wells, 0.40 to 0.46 ppb). Mean NH_4^+ levels were higher during Maha (1.96 ± 2.13 mg/L) than Yala (0.82 ± 1.79 mg/L) only three wells showed NH_4^+ levels below the WHO limit of 0.2 mg/L during Maha. NH_4^+ levels showed a broad range in both Maha (0.08 to 6.8 mg/L) and Yala (0.15 to 7.25 mg/L). The pH values were well within the WHO standard (6.5 – 8.5 pH) except in Padaviya reservoir (9.04 ± 0.23 pH) during August. Cl^- (2 to 166 mg/L) and NO_3^- (0.9 to 32 mg/L) levels were below WHO limits of 250 mg/L and 50 mg/L, respectively. Conductivity was higher during Yala (88 to 605 µS/cm) than in Maha (179 to 894 µS/cm), exceeding the WHO limit of 750 µS/cm in some wells. DO levels ranged from 4.6 to 9.7 mg/L. High levels of NH_4^+ may promote growth of cyanobacteria resulting in the higher levels of MCs seen during March. Quantifying cyanobacteria and studying ecological factors will help in determining the factors that cause cyanobacteria blooms.

Key words: Microcystins, Water Quality Parameters, Padaviya, Yala and Maha
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