

# Detection of Cell-bound Microcystin-LR in Hambanthota Reservoirs, Sri Lanka

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**Abstract:** Cyanobacteria or blue-green algae grow intensively in nutrient-rich waters; have been detected in irrigation reservoirs in Sri Lanka used for human consumption. Dense surface scums (bloom) are largely associated with cyanobacteria that release hazardous toxins (hepato-, neuro-, dermato-, cytotoxins) into the water from cells upon the bloom collapse. The genera *Microcystis*, *Anabaena*, *Cylindrospermopsis*, *Oscillatoria* have been identified dominant in above irrigation reservoirs that produce hepatotoxic microcystins (MCs) and neurotoxic cylindrospermopsin. Recent research indicates that irrigation reservoirs have become eutrophic or hypereutrophic due to massive anthropogenic practices occurred in their watersheds. Considering the adverse health impacts on human by cyanotoxins the WHO set a guideline maximum of  $1 \mu\text{g l}^{-1}$  of MC-LR in drinking water (1998), the most hazardous of MCs. The current study recorded the cell-bound MC-LR in relation to cyanobacterial cell densities in ten irrigation reservoirs in Hambanthota District, Sri Lanka. The study reservoirs supply water for drinking and rice paddy cultivation, the main agricultural activity. Raw water and plankton samples were collected for a six-month period from June, 2013. The nitrate-N, total phosphate and chlorophyll-a related to cyanobacteria growth were analysed by standard spectrophotometric methods. Microscopic observations of cyanobacteria, determination of cell densities were done. Raw water samples were filtered through  $0.22 \mu\text{m}$  GF/C filters, freeze-thawed, extracted to 80 % methanol, rotary evaporated at  $40^{\circ}\text{C}$ , the residue redissolved in 100% methanol and MC-LR quantified through HPLC-PDA. Chandrikawewa reservoir recorded the highest nitrate-N ( $0.08 \text{ mg/l}$ ), Weerawila reservoir the highest total phosphate ( $0.052 \pm 3.36 \text{ mg/l}$ ) and Mau Ara reservoir the highest Chlorophyll-a ( $0.08 \pm 0.001 \text{ mg/l}$ ) respectively. *Microcystis* sp. was identified in nine reservoirs (the highest recorded in Detagamuwa 92%) and *Nodularia* sp. in Mau Ara reservoir (16%) only. Further, HPLC-PDA resulted in cell-bound MC-LR ( $> \text{WHO guideline } 1 \mu\text{g l}^{-1}$ ) in eight reservoirs; Detagamuwa  $34.12 \mu\text{g/ml}$ , Nelumwewa  $32.74 \mu\text{g/ml}$ , Ridiyagama  $28.84 \mu\text{g/ml}$ , Tissawewa  $22.92 \mu\text{g/ml}$ , Mau Ara  $12.23 \mu\text{g/ml}$ , Weerawila  $19.73 \mu\text{g/ml}$ , Kiriibbanwewa  $8.12 \mu\text{g/ml}$  and Chandrikawewa  $4.54 \mu\text{g/ml}$ .

**Keywords:** Hepatotoxic Microcystins, cell-bound MC-LR, HPLC-PDA