



EVALUATION OF ACCUMULATION STATUS OF CYLINDROSPERMOPSIN (CYN) AND MICROCYSTIN-LR (MC-LR) IN RICE GRAINS IN CKDu HIGH PREVALENCE MEDIRIGIRIYA IN POLONNARUWA DISTRICT, SRI LANKA

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Abstract

Irrigation with Microcystin-LR (MC-LR) and Cylindrospermopsin (CYN) contaminated water poses a potential to accumulate MC-LR and CYN in plant tissues. *Oryza sativa* is the staple food source in Sri Lanka which contribute more than half of the caloric intake. However, the accumulation of CYN and MC-LR in rice grains were not understood in CKDu prevalence areas. CYN and MC-LR are the potent cyanotoxins that affect the function of kidney, liver and suspected as one of the possible causes for CKDu in Sri Lanka. The aim of the present study was to find the accumulation status of MC-LR and CYN in 117 *Oryza sativa* grains collected from CKDu high-prevalent Medirigiriya Mahathalakolawewa (36) and Ambagaswewa (31). CKDu non-prevalent Angunakolapallassa (50) in Hambanthota district was selected as the control area. MC-LR and CYN were quantified by the High Performance Liquid Chromatography (HPLC). Bioaccumulation of CYN and MC-LR in *O. sativa* was ranged from $0.1 \times 10^2 \pm 0.09 \mu\text{gkg}^{-1}$ – $2.30 \times 10^2 \pm 23 \mu\text{gkg}^{-1}$, $0.1 \times 10^2 \pm 0.09 \mu\text{gkg}^{-1}$ – $1.55 \times 10^2 \pm 13 \mu\text{gkg}^{-1}$ in rice samples which were collected from Medirigiriya – Mahathalakolawewa. In Medirigiriya - Ambagaswewa, the concentrations of MC-LR and CYN ranged between $0.1 \times 10^2 \pm 0.01 \mu\text{gkg}^{-1}$ – $2.70 \times 10^2 \pm 18 \mu\text{gkg}^{-1}$ and $5 \pm 0.02 \mu\text{g kg}^{-1}$ to $130 \pm 1.13 \mu\text{g kg}^{-1}$ respectively. The human health risk of CYN and MC-LR were ranged between $0.05 \times 10^{-2} \pm 0.001 \mu\text{gkg}^{-1}\text{day}^{-1}$ – $13.5 \times 10^{-2} \pm 0.001 \mu\text{gkg}^{-1}\text{day}^{-1}$ and $0.05 \times 10^{-2} \pm 0.001 \mu\text{gkg}^{-1}\text{day}^{-1}$ – $7 \times 10^{-2} \pm 0.01 \mu\text{gkg}^{-1}\text{day}^{-1}$ respectively. However, the-none of rice grains were positive for CYN and MC-LR collected from Angunakolapellassa. According to the TDI values given by WHO (MC-LR=0.04 $\mu\text{gkg}^{-1}\text{day}^{-1}$, CYN=0.02 $\mu\text{gkg}^{-1}\text{day}^{-1}$), 84% exceeded the TDI value for CYN where 55% exceeded the TDI value for MC-LR. Thus, the results of the study revealed that consumption of cyanotoxin contaminated *Oryza sativa* has a potential risk on accumulation of CYN and MC-LR in human body. Thus, public awareness should raise in order to minimise this risk of CYN and MC-LR in human body.

Keywords: Cylindrospermopsin (CYN), Microcystin-LR (MC-LR), *Oryza sativa*, CKDu, HPLC