

Microcystin-LR equivalent concentrations in fish tissue during a postbloom *Microcystis* exposure in Loskop Dam, South Africa

T Nchabelenga, P Cheng^b, PJ Oberholster^{bc}, A-M Bothad, WJ Smita & WJ Luus-Powell^a

^a Department of Biodiversity, School of Molecular and Life Sciences, University of Limpopo, Sovenga, South Africa

^b CSIR Natural Resources and the Environment, Stellenbosch, South Africa

^c Department of Paraclinical Sciences, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa

^d Department of Genetics, University of Stellenbosch, Stellenbosch, South Africa

Abstract

The effects of a decomposing cyanobacteria bloom on water quality and the accumulation of microcystin-LR equivalent toxin in fish at Loskop Dam were studied in May 2012. Enzyme-linked immunosorbent assay [ELISA] was used to confirm the presence of microcystin-LR equivalent in the water and to determine the microcystin (MCYST) concentration in the liver and muscle of fish. The lowest concentration of extracellular MCYST-LR equivalent was recorded in the lacustrine zone, where no cyanobacterial cells were observed, while the highest concentration ($3.25 \mu\text{g l}^{-1}$), 3.25 times higher than World Health Organization standard, was observed in the riverine zone. Extremely high MCYST-LR equivalent concentrations of $1.72 \mu\text{g MCYST-LReq kg}^{-1}$ in the liver and $0.19 \mu\text{g kg}^{-1}$ in muscles of *Labeo rosae*, and $2.14 \mu\text{g MCYST-LReq kg}^{-1}$ in the liver and $0.17 \mu\text{g kg}^{-1}$ in muscles of *Oreochromis mossambicus*, indicate that the consumption of sufficient fish biomass might cause severe adverse effects in humans. Microscopic analyses of the stomach content of both fish species revealed low numbers of cyanobacterial *Microcystis aeruginosa* cells in comparison to other phytoplankton. The extracellular MCYST-LR equivalent of the decomposing bloom may have played a major role in the high levels observed in the livers of the two fish species. These findings are important for all downstream water users.