

Abstract of Presenting Work

Metabolism and phytoremediation potential of macrophytes exposed to microcystins

Case Study: Lake Amatitlán, Guatemala

Phytoremediation potential of *Ceratophyllum demersum*, *Egeria densa* and *Hydrilla verticillata* from Lake Amatitlán, Guatemala were evaluated when exposed to *Microcystis aeruginosa* cyanobacterial cell free crude extracts (CE) with 104.4 ± 7.6 µg/L total microcystins (MCs) as candidates for the phytoremediation "Green Liver System®". Uptake, bioaccumulation, theoretical biotransformation of MCs, biochemical and physiological responses were monitored in laboratory experiments after 1, 4, 8 hours and 1, 3, 7 and 14 days. Results showed no presence of MCs after 14 days of exposure in media from *H. verticillata* and only 0.7 ± 0.3 and 3.1 ± 1.0 µg/L total MC in *E. densa* and *C. demersum*, were quantified respectively. Low bioaccumulation of MCs displayed 2, 11 and 32 % from initial MCs with theoretical MC biotransformation of 72, 53 and 45%, in CE exposed *H. verticillata*, *C. demersum* and *E. densa*, respectively. In all macrophytes immediate antioxidative defense and biotransformation activities measurable at biochemical (glutathione-S transferase-GST, glutathione reductase-GR, guajacol peroxidase-POD, catalase-CAT, carotenoid, glutathione-GSH and glutathione disulfide-GSSG concentrations) and physiological (photosynthetic pigment concentrations) levels were detected. During field studies, lake water (90 µg/L total MCs), cyanobacterial biomass (1931 µg/L total MCs: MC-LR, -RR and -YR), macrophytes (*Typha* sp., *Polygonum portoricensis*, *H. verticillata* and *Eichhornia crassipes*) and agricultural products (*Solanum lycopersicum* and *Capsicum annuum*) irrigated with lake water showed high MC bioaccumulation (16915 µg/Kg dry weight total MC). It is concluded that cyanobacterial blooms from Lake Amatitlán, pose a threat to human health, yet the three macrophytes evaluated in laboratory experiments can take MC up, bioaccumulate and biotransform them aided by the activation of biotransformation phase II pathway via enzymatic and antioxidant activation of GST, GSH and GSSG, thus serving as good phytoremediators of MC for Lake Amatitlán, Guatemala.