

## LABORATORY-SCALE EVALUATION OF ALGAECIDE EFFECTIVENESS FOR CONTROL OF MICROCYSTIN-PRODUCING CYANOBACTERIA FROM LAKE OKEECHOBEE, FLORIDA (USA)

Growth of microcystin-producing cyanobacteria in Lake Okeechobee (Florida, USA) and surrounding waters has resulted in adverse health impacts for humans and endangered species, as well as significant economic losses. As these issues worsen, there is growing pressure for efficacious solutions to rapidly mitigate harmful algal blooms (HABs) and protect critical freshwater resources. Applications of USEPA-registered algaecides as management tactics meet many decision-making criteria often required by water resource managers (e.g., effective, scalable, selective), but have not yet been evaluated on a large scale within the Lake Okeechobee waterway. This study was conducted to bolster the peer-reviewed database for available management tactics against microcystin-producing cyanobacteria in waters of this region. Laboratory-scale experiments can be conducted first to minimize uncertainty at larger scales and improve confidence in decision-making. In this study, samples containing microcystin-producing cyanobacteria collected from Lake Okeechobee were exposed to several USEPA-registered algaecides in laboratory toxicity experiments. Viability of target cyanobacteria was measured 3 days after treatment (DAT) in terms of cell density, chlorophyll-a concentrations, and phycocyanin concentrations. Based on responses of the cyanobacteria, minimum effective exposure concentrations were identified for each algaecide. Microcystin release (i.e. proportion of total microcystins in aqueous phase) was measured and compared 1 DAT among effective exposures. Total microcystin concentrations were measured in effective treatments at 1, 4, and 9 DAT to discern potential for microcystin persistence following exposures to the effective formulations and exposure concentrations. Overall, several formulations including GreenClean Liquid® 5.0, GreenClean Liquid® 5.0 combined with Hydrothol® 191, and the copper-based algaecides evaluated (Algimycin® PWF, Argos, Captain® XTR, Cutrine® Ultra, and SeClear®) achieved significant and similar effects on target cyanobacteria. The chelated copper-based formulations (Algimycin® PWF, Argos, Captain® XTR, and Cutrine® Ultra) resulted in relatively less microcystin release 1 DAT and lesser total microcystin concentrations 4 DAT. At 9 DAT, total microcystin concentrations were significantly lower than in untreated controls in all treatments evaluated. These results provide the necessary comparative performance data for preliminary decision-making and designing additional studies at larger scales. Importantly, the comparative toxicity data and approach provided in this study demonstrate the initial steps for development of site-specific management strategies for Lake Okeechobee and other areas impacted by harmful algal blooms with large spatial and temporal scales.