Effects of Microcystis aeruginosa on life history of water flea Daphnia magna

Author(s): LIU Liping**, LI Kang¹, CHEN Taoying¹, DAI Xilin¹, JIANG Min¹, and James S. DIANA²

¹ Key Laboratory of Exploration and Utilization of Aquatic Genetic Resources of the Shanghai Ocean University and Ministry of Education, Shanghai Ocean University, Shanghai 201306, China
² School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI, USA

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Cyanobacterial blooms in eutrophic freshwater systems are a worldwide problem, creating adverse effects for many aquatic organisms by producing toxic microcystins and deteriorating water quality. In this study, microcystins (MCs) in Microcystis aeruginosa, and Daphnia magna exposed to M. aeruginosa, were analyzed by HPLC-MS, and the effects of M. aeruginosa on D. magna were investigated. When D. magna was exposed to M. aeruginosa for more than 2 h, Microcystin-LR (MC-LR) was detected. When exposed to 1.5 x 10⁶, 3 x 10⁶, 0.75 x 10⁷, and 1.5 x 10⁷ cell/mL of M. aeruginosa for 96 h, average survival of D. magna for treatments were 23.33%, 33.33%, 13.33%, 16.67%, respectively, which were significantly lower than the average 100% survival in the control group (P < 0.05). The adverse effects of M. aeruginosa on body length, time for the first brood, brood numbers, gross fecundity, lifespan, and population growth of D. magna were density-dependent. These results suggest that the occurrence of M. aeruginosa blooms could strongly inhibit the population growth of D. magna through depression of survival, individual growth and gross fecundity. In the most serious situations, M. aeruginosa blooms could undermine the food web by eliminating filter-feeding zooplankton, which would destroy the ecological balance of aquaculture water bodies.

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