Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02959, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02959
EGU General Assembly 2008

Application of high resolution spectral fluorescence and ELISA to assess the removal of cyanobacteria and cyanobacterial toxins from water systems

D. Barrington, A. Ghadouani

School of Environmental Systems Engineering, University of Western Australia, Crawley, Australia (barrid01@student.uwa.edu.au / Fax: 6488 1015 / Phone: 6488 3701)

Toxic cyanobacterial blooms are a major threat to the sustainability and safety of waterways worldwide, and often contain toxins which are detrimental to human and animal health. In Western Australia, blooms are common in wastewater treatment plants, and the treated wastewater is currently released to the environment. Wastewater plant effluent is required to be free of toxins prior to release. Hydrogen peroxide, an environmentally benign algicide, has been proposed for use as a cyanobacterial removal technique. The expected response times for cyanobacteria and their toxins to hydrogen peroxide are of the order of minutes to hours, and hence assessment of the dynamics required data to be collected in realtime and at the highest resolution possible. This was achieved by use of the bbe-Moldaenke FluoroProbe to determine the photosynthetic activity of the sample. This relatively new technology has shown high correlation with the traditional fluorescence measurement method of solvent extraction followed by single wavelength fluorescence. Cyanobacterial toxins were measured using an Abraxis PN 520011, Microcystins/Nodularins (ADDA) ELISA Kit, Microtiter Plate (96T).

A statistically robust factorial design was devised to establish the response of cyanobacterial biomass and cyanobacterial toxins to the addition of various doses of hydrogen peroxide over time. Wastewater samples were collected and dosed accordingly, and fluorescence of the chlorophyll a concentration contributed by several algal groups was measured at various timesteps using the FluoroProbe. The multi-spectral

fluorescence study yielded results with high reproducibility, and suggested that hydrogen peroxide is effective at reducing the biomass of algal communities within wastewater treatment ponds. Effective doses displayed a statistically significant exponential decay curve for chlorophyll a fluorescence, a proxy measurement of algal biomass. At such concentrations cell lysis was induced in virtually all cyanobacterial cells within 48 hours of application. Analysis of the effects of hydrogen peroxide addition on intra- and extra-cellular cyanobacterial toxin concentrations is currently being performed using Enzyme Linked Immunosorbent Assay, with promising results.