

Toxicon

A laboratory based exposure of *Microcystis* and *Oscillatoria* cyanobacterial isolates to heterotrophic bacteria

L.L. Ndelela, P.J. Oberholster, J.H. Van Wyk, P.H. Cheng

ABSTRACT:

Biological control of cyanobacteria is a viable means of controlling nuisance bloom occurrences; however the majority of studies done are against *Microcystis* sp., with a commonly lytic effect caused. Filamentous cyanobacteria such as *Oscillatoria* are not as extensively studied in this area of biological control and are often part of *Microcystis* dominated blooms. This study employed heterotrophic bacterial isolates selected from bloom waters that indicated potential predatory behaviour against both filamentous and colonial cyanobacterial isolates. In comparison to a known *Bacillus* isolate, which is often reported among bacterial control agents, three other bacteria isolates were tested as control agents against non-axenic *Oscillatoria* and *Microcystis* cyanobacterial cultures. Assessments of cyanobacterial cell responses to the bacteria were conducted through water chemistry, chlorophyll a, alkaline phosphatase activity, microscopy and cyanotoxin measurements. The changes in these parameters were compared to untreated cyanobacterial cultures where no bacteria were added. The study found that at ratios of bacteria half that of *Microcystis*, minimal changes in chlorophyll a were observed, whilst *Oscillatoria* showed a decreased chlorophyll a more in the presence of isolates 1 and 3w. The assessment of alkaline phosphatase activity showed decreased activity in both cyanobacterial isolates exposed to the bacteria, relative to the untreated control sample. Microscopy analysis through fluorescence indicated that the attachment of the bacteria to the surface of the cyanobacteria hampered with the fluorescence and scanning electron microscopy indicated that the cells were damaged by the addition of the bacterial isolates. Cyanotoxin detection through the ELISA kit testing indicated that there was toxin reduction in samples treated with the bacterial isolates, with the highest reduction being close to 60% in the case of *Microcystis* sp. treated with isolate 3w. Similar reductions were noted in the filamentous cyanobacterium *Oscillatoria*, in the presence of isolate 1.