

The Responses of *Anabaena cylindrical* to Single and Combines Toxicity of Nickel, Aluminum and Lithium

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ABSTRACT

Rapid development of human activities leads to serious metal pollution. In the real polluted environment, the metals usually do not present in single pure form, but occur in mixtures in the environment. Thus, there is a need to study the response of whole cell towards combination of metals in order to develop a whole cell biosensor to detect metal pollutants in environmental samples. The objective of this study was to determine the response of immobilized *Anabaena cylindrical* toward single and combination toxicity of nickel (Ni), aluminum (Al) and lithium (Li). Three cell concentrations ($OD_{700nm} = 0.5$, 1.0 and 1.5) of *A. cylindrical* from Day 5, 6 and 7 cultures were made and then immobilized with 1% agarose. The immobilized cell were exposed to 0.100 mg/L Ni and OD_{400nm} was measured after 1 hour, 2 hours, 6 hours and 24 hours exposure. Immobilized *A. cylindrical* taken from Day 5 with $OD_{700nm} = 0.5$ gave the highest response after 2 hour exposure and thus used as the optimized condition for the experiment. The immobilized cells showed the increment in change in absorbance at low concentration of single Ni ions. Decrement in change in absorbance was observed at high concentration of single Ni ions. The exposure to single Al and Li ions showed a decrease trend in change in absorbance with increased concentration. The exposure to the combination of metals indicated that synergistic effect was found in the combination of Ni + Al and Ni + Li. The antagonistic effect was found in the combination Al + Li and Ni + Al + Li. High R^2 value for 0.001 mg/L to 0.100 mg/L for single and combined metal exposure indicated that *A. cylindrical* has the potential for biosensor application to detect single and combined metals. High slope values indicated that *A. cylindrical* was sensitive to single and combined metals.