Efficiency of Immobilized Cyanobacteria in Heavy Metals Removal from Industrial Effluents

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Abstract

Two cyanobacterial species (*Anabaena variabilis* and *Tolypthrix ceytonica*) were selected for bioremediation of heavy metals-contaminated industrial effluents based on their high efficiency as metals accumulators. Sodium alginate immobilized cells were examined in continuous mode (at 50 and 100 ml/h flow rates) using as individual or mixed cultures for 6 h. Contaminated effluents were collected from Plastic and Electrical Industries Company.

Results revealed that removal efficiency (RE%) is a function of heavy metal type and microbial species and proportionally increased with exposure time achieving their highest removal percentage at the end of the experiment (6 h) regardless metal type, microbial species or metal concentration. The maximum achieved RE(s) recorded 94.45% for Fe^{2+} (*A. variabilis* at 50 ml/h), Zn^{2+} (98.98% by *A. variabilis*; 98.63% by *A. variabilis* & *T. ceytonica* mixture and 98.61% by *T. ceytonica* at 100 ml/h), 94.22% for Pb^{2+} (*A. variabilis & T. ceytonica* mixture at 100 ml/h) and finally *A. variabilis & T. ceytonica* mixture showed the highest Cu^{2+} RE of 93.33 and 91.33% at 50 and 100 ml/h flow rates respectively.

So it is concluded that the selected cyanobacterial species either characterized by excellent bioremoval abilities towards metals contaminating wastewater with selective preferences between them. This advantage could be efficiently used for remediation of industrial effluents as well as natural aquatic ecosystems. This biotechnology provides an economic and excellent tool not only for the protection of the received environments but also to recover and reuse the treated wastewater in any purpose such as aqua-culturing or irrigation of agricultural edible and non edible crops.

Key Words: Bioaccumulation, Cyanobacteria, Heavy Metals, Immobilization, Industrial Effluents