Remediation of Cr(VI) Contaminated Soil and Water Using an Optimized Strain (Anabaena cylindrica) Immobilized in a Polymer Matrix

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Chromite mining has contributed intensely to pollution of soil and ground water by hexavalent chromium, a potential carcinogen and mutagen for plants and bacteria. In the present study, I report the use of an indigenous cyanobacteria Anabaena cylindrica, immobilised in a novel polymer matrix for Cr(VI) bioremediation in simulated model effluent for chromite mine run off and in soil remediation in a paddy field. Anabaena cylindrica are Cr(VI) resistant: we demonstrate that they grew well under illumination in shaking conditions in BG11 medium containing 0.5 to 2 ppm Cr(VI). The effect of Cr(VI) on filament length, heterocyst frequency, protein profile and enzymes was observed. Superoxide dismutase, Ascorbate peroxide assay showed two star significance at P=0.05. Removal of Cr(VI) was also conducted in mine effluents using pre-grown cells. Anabaena cells were immobilized in a natural polymer, guar gum, grafted with poly acrylic acid and this was used for checking growth of Oryza sativa (Rice,Khandagiri variety) using simulated mine effluents.It was observed that in comparison to free cells, growth of plants(inter-nodal distance(38.1%), plant height(27%), quantum yield(4.1%)), grain yield (number of tillers per plant(57%), number of panicles(59%), panicle length(56.6%), grain yield per hectare(56.6%), 1000 seed weight(13%), total number of seeds(52.9%), number of seeds per panicle(31.2%), total seed weight(57%), harvesting index(66%) etc) were higher when immobilized biomass was used and the results showed two-star significance at F=0.05. Bioaccumulation of Cr(VI) by immobilised Anabaena cylindrica could be potentially applicable use of mine effluents as well as reclamation of mine overburden.