Sorption sites of microalgae possess metal binding ability towards Cr(VI) from tannery effluents—a kinetic and characterization study

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ABSTRACT

Prominent microalgal species, namely *Anabaena*, *Oscillatoria*, *Phormidium*, and *Spirogyra*, were isolated from estuaries polluted with tannery effluents and studied to determine their Cr(VI) bio-sorption potential. The bio-sorption potential was determined by studying the effect of growth, biomass, reduction of Cr(VI) levels, and Cr(VI) absorption by the microalgal species. The respective values for *Anabaena*, *Oscillatoria*, *Phormidium*, and *Spirogyra* compared with the control were as follows: growth in BG 11 medium containing tannery effluent was 53.99, 60.03, 55.76, and 55.85%; the biomass was 60.65, 77.61, 67.16, and 76.01%; the Cr(VI) reduction potential was 70.96, 80.64, 76.12, and 74.83%; and the bio-sorption potential was 75.48, 80.64, 79.35, and 77.41%. The removal of heavy metals by microalgal biomass involves bio-reduction and bio-sorption. Fourier-transform infrared spectroscopy and nuclear magnetic resonance results revealed the presence of microalgal sorption sites. All four species showed maximum removal through bio-sorption, which was achieved at the end of the stationary phase. Kinetic models such as pseudo-first-order and pseudo-second-order models were tested, and the experimental data were in agreement with the kinetic model. The results of this study suggest that the microalgal species employed could be used as effective bio-sorbents for Cr(VI) removal from tannery effluents.

Keywords: Bio-sorption; Microalgae; Cr(VI); Effluent; Kinetic models