Biosorption of cadmium from aqueous solutions by *Trichoderma* fungus: kinetic, thermodynamic, and equilibrium study

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**ABSTRACT**

Among toxic heavy metals, cadmium is one of the most dangerous for human health. Since cadmium is a well-known toxic metal, industrial effluents and wastewaters rich in cadmium must be treated prior to their disposal. Present study deals with the evaluation of biosorptive removal of cadmium by *Trichoderma* fungus. The effect of different important parameters such as initial pH, cadmium concentration, contact time, stirring rate, and temperature on cadmium sorption was investigated. Cadmium biosorption capacity and its removal efficiency increased along with the increase of pH of the solution, and maximum biosorption of cadmium(II) ions were observed at pH 6. Biosorption kinetics data were fitted using pseudo-first-order and pseudo-second-order models. It was found that the kinetics data fitted well the pseudo-first-order during the initial 120 min of biosorption, and when the biosorption time was 120 min, the experimental data fitted very well with the pseudo-second-order kinetics reaction. Thermodynamic parameters such as standard Gibbs free energy (ΔG˚), standard enthalpy (ΔH˚), and standard entropy (ΔS˚) were evaluated. The results confirmed that biosorption of cadmium(II) ions by *Trichoderma* fungus was spontaneous and endothermic nature.

**Keywords:** Biosorption; Cadmium; *Trichoderma* fungus; Isotherm; Kinetics

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