



Removal of Indosol Turquoise FBL dye from aqueous solution by bagasse, a low cost agricultural waste: batch and column study

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ABSTRACT

This study involves the remediation of dye containing synthetic wastewater using bagasse, a low cost agricultural waste by batch and column methods. The simulated wastewater was prepared using Indosol Turquoise FBL, commonly used dye in the textile industry. Sugarcane bagasse was used in native, HCl-treated and Na-alginate-immobilized forms. The effect of different process parameters such as medium pH, biosorbent dose, contact time, initial dye concentration and temperature on the biosorption capacity of bagasse was investigated in batch study. Maximum dye removal (65.09 mg/g) was obtained with HCl-treated bagasse. Pseudo-second-order kinetic model was better fitted to the experimental data. The equilibrium data were best described by Langmuir adsorption isotherm model. The thermodynamic study indicated the thermodynamic nature of biosorption process. Effect of surfactants, heavy metal ions and salt concentration was also explored. Breakthrough capacities were also investigated in column mode study. Effect of bed height, flow rate and initial dye concentration were investigated in column study. Maximum dye removal in continuous mode study was 28.8 mg/g. The experimental data was subjected to Thomas Model and bed depth service time models. Surface analysis of sugarcane bagasse was carried out using Fourier transform infrared (FTIR) spectrometer and scanning electron microscopy (SEM). FTIR analysis of unloaded and Indosol Turquoise FBL loaded bagasse showed the involvement of hydroxyl and carboxylic groups in the biosorption process. The results indicated that bagasse could be used to treat dye containing effluents.

Keywords: Remediation; Kinetics; Thermodynamics; Breakthrough capacity; Adsorption

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