

**“Optimization of pH, sorbent dose, and contact time in the biosorption of Cu, Cd  
and Pb in sugarcane bagasse in a tri-metal aqueous system.”**

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## ABSTRACT

**“Optimization of pH, sorbent dose, and contact time in the biosorption of Cu, Cd, and Pb in sugarcane bagasse in a tri-metal aqueous system.”**

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Adsorption is one of the physicochemical treatment processes found to be effective in removing heavy metals from aqueous solutions. The biosorption of Cu, Cd, and Pb in sugarcane bagasse in a tri-metal aqueous system was optimized for pH, sorbent dose, and contact time using Doehlert design and it was found that the optimal values are pH 5, a sorbent dose of 1.33g sorbent/mg metal, a contact time of 4 hours, and the available sites on the sorbent for metal binding were influenced by pH. Furthermore, the effect of initial metal concentration on the metal uptake of the sorbent was also studied and it was found that at increasing metal concentrations the metal uptake also increased at a fixed (optimum) sorbent dose. The sorbent affinity was observed to be increasing in favor of increasing ionic radius,  $\text{Cu} < \text{Cd} < \text{Pb}$ , at relatively low metal concentrations and  $\text{Cd} < \text{Cu} < \text{Pb}$  at relatively high metal concentrations. Each metal behaved differently on the sorbent. Copper obeyed the Langmuir isotherm whereas cadmium and lead both obeyed the Freundlich isotherm. Finally, the IR spectrum of the sorbent was elucidated and  $-\text{OH}$  and  $-\text{COOH}$  groups were present but complexation was absent. Hence, in a tri-metal aqueous system containing Cu, Cd and Pb, the biosorption process in bagasse is proposed to be by physical adsorption.