Fixed bed column study for the removal of Acid Blue 25 dye using NaOH-treated fallen leaves of *Ficus racemosa*

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ABSTRACT

The present study aims at evaluating the potential of adsorbent obtained from fallen leaves of *Ficus racemosa* with NaOH activation for Acid Blue 25 (AB 25) dye removal from aqueous solution in a continuous mode. The effect of various operating parameters such as bed height (2–6 cm), initial dye concentration (50–200 mg/L) and flow rate (6–10 mL/min) on the extent of dye removal has been investigated. The obtained results for the variation of operating parameters confirmed better column performance at higher bed height and lower flow rate. Different kinetic models such as Thomas, Adams–Bohart, Yoon–Nelson and bed depth service time (BDST) were applied to the obtained experimental data using column studies to predict the breakthrough curves and average mean square error has been employed to check the best suitability of the model. Thomas and BDST model predictions were established to be in better agreement with the experimental results. Maximum biosorption capacity for 100 mg/L of dye concentration present initially was obtained as 44.14 mg/g at optimum condition of 6 mL/min as the flow rate. The experimental observed capacity matched with the predicted biosorption capacity of 45.71 mg/g using the Thomas model. Elution studies conducted for seven cycles confirmed the reusability of synthesized biosorbent to treat industrial dye effluent in a column. Overall, the study clearly established the utility of synthesized biosorbent for the removal of AB 25 from wastewater in a continuous fixed bed adsorption process.

Keywords: Acid Blue 25; Sustainable biosorbent; Column study; Desorption; Kinetic models; *Ficus racemosa*

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