

## Removal of methyl red from aqueous solution by activated carbon prepared from the *Annona squamosa* seed by adsorption

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### Abstract

The use of low-cost, locally available, highly efficient and eco-friendly adsorbents has been investigated as an ideal alternative to the current expensive methods of removing dyes from wastewater. This study investigates the potential use of activated carbon prepared from the *Annona squamosa* seed for the removal of methyl red (MR) dye from simulated wastewater. The effects of different system variables, adsorbent dosage, initial dye concentration, pH and contact time were investigated and optimal experimental conditions were ascertained. The results showed that as the amount of the adsorbent increased, the percentage of dye removal increased accordingly. Optimum pH value for dye adsorption was 7.0. Maximum dye was sequestered within 50 min of the start of every experiment. The adsorption of methylene blue followed the pseudo-second order rate equation and fits the Langmuir, Freundlich, Dubinin-Radushkevich (D-R) and Tempkin equations well. The maximum removal of MR was obtained at pH 7 as 82.81% for adsorbent dose of 0.2 g/ 50 mL and 25 mg L<sup>-1</sup> initial dye concentration at room temperature. Furthermore, adsorption kinetics of MR was studied and the rate of adsorption was found to conform to pseudo-second order kinetics with a good correlation ( $R^2 > 0.99$ ) with intraparticle diffusion as one of the rate determining steps. Activated carbon developed from the *Annona squamosa* seed can be an attractive option for dye removal from diluted industrial effluents since test reaction made on simulated dyeing wastewater showed better removal percentage of MR.

Keywords: *Annona squamosa*, Adsorption, Wastewater, Methyl red, Kinetics, Activated carbon

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