Modelling of the removal of crystal violet dye from textile effluent using Murraya koenigii stem biochar

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\textbf{A B S T R A C T}

Dye-based industries, particularly small and medium scale industries, release their effluents into waterways without treatment due to cost considerations. Murraya koenigii stem is an agricultural waste that is present in various vegetable markets. To produce a value-added product from this agricultural waste, it is proposed to convert this waste into activated carbon for the removal of crystal violet dye from the aqueous medium. Therefore, the biochar was prepared from the curry tree bark. Batch adsorption experiments were conducted as a function of variables such as adsorbent dosage, time, temperature and dye concentration and subsequently, the optimum conditions were determined. The optimum operational parameters such as adsorbent dosage were found to be 100 mg L\textsuperscript{-1}, time (60 min), temperature (35°C) and dye concentration (50 mg L\textsuperscript{-1}). The equilibrium adsorption of dye on the adsorbent ($q_e$) was found to be 50 mg g\textsuperscript{-1} and the removal efficiency was about 70%. The structure and morphology of curry tree carbon (CTC) before and after adsorption were characterized by Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy. FTIR analysis indicated a change in peak. The results were analyzed using Langmuir and Freundlich isotherm model and it best fitted with the Langmuir model. Kinetic studies were assessed and were found to follow the pseudo-second-order model. We investigated the use of biochar produced from agricultural waste and our results provide novel perception into the potential of biochar to remove crystal violet from textile effluents.

\textbf{Keywords:} Curry tree carbon; Crystal violet; Textile effluent; Decolourization

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