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Biosorptive removal of basic dye methylene blue using raw and $CaCl_2$ treated biomass of green microalga *Scenedesmus obliquus*

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ABSTRACT

Dyes can cause significant problems to the aquatic environment and food chain, therefore, their removal is one of the main concerns. This study was performed to explore the potential of *Scenedesmus obliquus* to remove dyes from aquatic environment. A series of batch biosorption experiments were done to evaluate the effect of contact time, solution pH and biomass dosage on the sorption process. The pseudo-first-order and pseudo-second-order kinetic models were applied to study the biosorption kinetics. The equilibrium data were analyzed by Freundlich, Langmuir and Dubinin–Radushkevich. The Fourier transform infrared spectroscopic results highlighted the importance of the functional groups on the biomass cell wall in the sorption process. The sorption results revealed that more than 70% of the dye was removed in 10 min. Also, the biosorption process was strongly dependent on the biomass dosage with an optimum removal at 1.2 g/L. The pseudo-second-order model gives the best fit to the kinetic data and suggests that the adsorption rate of the raw biomass is six times that of the treated one. Freundlich model was found to be the best fit to the equilibrium data. It suggests higher uptake capability of raw biomass compared with the $CaCl_2$ treated one. The methylene blue (MB) uptake by the biomasses was a chemisorption process as indicated by the pseudo-second-order kinetic, Freundlich and Dubinin–Radushkevich models. This study proved that *S. obliquus* can efficiently remove MB from aqueous medium and the treatment of *S. obliquus* with $CaCl_2$ has detrimental effect on its sorption capacity.

Keywords: Biosorption; Isotherms modeling; Adsorption kinetics; Green algae; River Nile; Pre-treatment

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