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BIOSORPTION OF AMARANTH DYE FROM AQUEOUS SOLUTION BY ROOTS, LEAVES, STEMS AND THE WHOLE PLANT OF *E. crassipes*

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Abstract

In the present work, the kinetics of amaranth dye biosorption onto the roots, stems, leaves and the whole plant of water hyacinth (*Eichhornia crassipes*) were studied for differential evaluation of the plant's biosorptive potential to remove the toxic dye from aqueous solutions. *E. crassipes´* leaves showed the highest level of amaranth dye biosorption (43.1 mg/g), followed by the entire plant (31.18 mg/g), the roots (28.51 mg/g), and finally by the stems (23.97 mg/g). The same differential trend was observed for the initial volumetric rate of amaranth dye biosorption. The kinetics modeling of amaranth dye biosorption by the roots, stems, leaves and entire *E. crassipes* plant showed good agreement of experimental data with the pseudo-second-order model, which indicates that the rate-limiting step of the biosorption process is the most probably chemisorption. FTIR analysis results suggest that amaranth dye molecules interact with the amide I and amide II functional groups, which are present in the proteins of the vegetative organs and entire aquatic plant. Proximate chemical analysis revealed higher content of total protein in *E. crassipes´* leaves than in other vegetative organs. A linear relationship was found between total protein content and amaranth biosorption capacity at equilibrium, which indicates that the proteins play a crucial role in amaranth dye biosorption from aqueous solution by *E. crassipes*. *E. crassipes'* leaves may be used as a low-cost, effective and environmentally friendly biosorbent to detoxify amaranth dye-polluted wastewaters.

Key words: Amaranth dye, biosorption, *Eichhornia crassipes*, FTIR

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