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Kinetics and equilibrium studies of copper, zinc, and nickel ions adsorptive removal on to *Archontophoenix alexandrae*: conditions optimization by RSM

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ABSTRACT

This study focuses on the investigation of adsorptive behavior of Cu, Ni, and Zn ions by *Archontophoenix alexandrae* in single metal system (SMS), bi-metal system (BMS), and tri-metal system (TMS). This was done through a novel strategy by combining factorial design (FD), response surface methodology (RSM), and mixture design (MD). The adsorption study was carried out as a function of pH, contact time, and biomass dosage and validated through screening design. To improve adsorption capacities of metallic ions, RSM and MD involving central composite design and simplex lattice design were used. The experimental designs demonstrated the maximum adsorption capacity for Cu. The existence of Cu ions suppressed the adsorption of Ni and Zn ions. Langmuir isotherm model and the pseudo-second-order kinetic model best explain the adsorption kinetics of Cu(II), Ni(II), and Zn(II) metal ions on to *A. alexandrae*. The *A. alexandrae* could possibly be used as an efficient biosorbent for the removal of toxic pollutants from industrial effluents.

Keywords: Biosorption; King palm; Factorial design; Response surface methodology; Equilibrium modeling

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