Statistical modeling and optimization of the phosphorus biosorption by modified *Lemna minor* from aqueous solution using response surface methodology (RSM)

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**ABSTRACT**

Response surface methodology involving Box–Behnken design was used to evaluate the effects of three operating variables: pH, initial concentration of phosphorus, and adsorbent dosage on biosorption of phosphorus by modified *Lemna minor* by lab-scale batch study. Analysis of variance (ANOVA) showed pH, initial phosphorus concentration, interaction of phosphorus and adsorbent dose and the second-order effect of pH have values of “Prob. > F” less than 0.0500 indicating that model terms are significant for the biosorption of phosphorus. Optimum operational conditions for maximizing phosphorus biosorption were achieved at pH 4.8, initial phosphorus concentration of 19 mg/L and adsorbent dosage of 5.15 g/L. Under optimal value of parameters, high biosorption (89.2%) was obtained for phosphorus. Langmuir with 0.99 consistencies fitted better than Temkin, or Freundlich models. The maximum adsorption capacity of phosphorus was determined as 3.6 mg/g. Pseudo-second-order kinetic model exhibited the highest correlation with data. Results suggest that the modified *L. minor* has potential for biosorption as a low-cost and effective absorbent for phosphorus removal from aqueous solution.

**Keywords:** Response surface methodology; Phosphorus; *Lemna minor*; Biosorption

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