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OPTIMIZATION OF PHOSPHATE REMOVAL FROM SYNTHETIC WASTEWATER BY BACTERIAL CONSORTIUM USING BOX-BEHNKEN DESIGN

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Abstract

In this work, a four factor three-level Box–Behnken factorial design based on response surface methodology (RSM) was employed to optimize the removal of phosphate from synthetic wastewater (mineral salts medium-MSM) by the bacterial consortium (*Bacillus* sp. RS-1, *Pseudomonas* sp. YLW-7, *Enterobacter* sp. KLW-2). A mathematical model was then developed to show the effect of each medium composition and their interactions on phosphate removal. The effect of the lactose concentration (X_1), pH (X_2), time (X_3), and agitation (X_4) and their interactions on the removal of phosphate by the bacterial consortium was investigated for an initial phosphate concentration of 100 mg l^{-1} as a fixed input parameter for the batch studies. Quadratic models obtained for the response variable predicted optimum phosphate removal (Y_1) of 92.2 % in MSM with lactose corresponding to a bacterial consortium growth of 1.1 in terms of optical density (OD) (Y_2) and 0.34 g l^{-1} as dry biomass (Y_3), after 72 h. The ANOVA results showed that the coefficient determination value (R^2) for Y_1, Y_2 and Y_3 were found to be 0.9 and the experimental values are in good agreement with the predicted ones. The response indicated significant fit of the model to the experimental data, which confirms that RSM could be effectively used to predict the phosphate removal from wastewater by the bacterial consortium used in this work.

Key words: bacterial consortium, Box- Behnken design, optimization, phosphate removal, response surface methodology

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