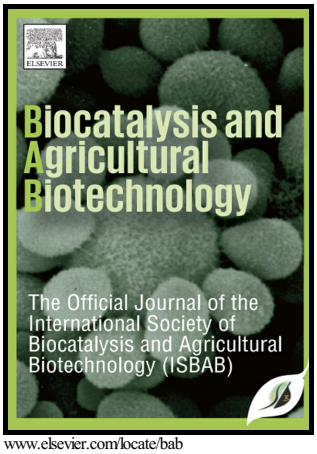

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Modelling and optimization of zeaxanthin production by Paracoccus zeaxanthinifaciens ATCC 21588 using hybrid genetic algorithm techniques

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Abstract

In the present study, overall zeaxanthin production by Paracoccus zeaxanthinifaciens ATCC 21588 in a complex medium was optimized using hybrid statistical and mathematical approaches. Initially, Taguchi design was used to identify the most significant input parameters viz., glucose, yeast extract, pyridoxine hydrochloride and methyl palmitate. These parameters were then studied using central composite design to develop response surface methodology (RSM) and artificial neural network (ANN) models. The ANN model was found to be superior to RSM model for its mapping abilities based on statistical evaluation using the coefficient of determination (R^2), root mean square error (RMSE) and standard error of prediction (SEP). The final optimization was performed by using genetic algorithm (GA), and the ANN-GA hybrid was found to be superior to RSM-GA hybrid with lower percent prediction error ($1.55_{ANN\text{-}GA} < 5.09_{RSM\text{-}GA}$). The optimum condition predicted by the ANN-GA hybrid was 24.3 g/L glucose, 30 g/L yeast extract, 0.18 mg/L pyridoxine hydrochloride and 8 g/L methyl palmitate which yielded an average overall zeaxanthin production of 11.63 mg/L after 72 h of incubation at 30 °C. Our study signifies that P.