ABSTRACT

Colored substances must be removed from the textile wastewater effluents before discharging them into the water ecosystem. The degradation of azo dyes has been a major environmental concern because of the hazards these dyes pose to human health and the ecological environment. At present, Response Surface Methodology (RSM) acts as a powerful tool for optimizing multivariate factors through step-wise experimentation that influences dye color removal. One of the experimental designs of RSM is the BoxBehnken Design which identifies potential interactions between different factors and optimizes each factor into 3 levels. In contrast to other designs, BBD is time-saving, requires lesser runs, and gives maximum dye decolorization values of up to 80%. In this study, the degradation efficiency of Levafix Fast CA Red Reactive by bacterial strain *B. thuringienesis* was studied. The parameters like dye concentration, time of incubation and yeast extract were optimized using RSM. A proposed model of RSM including total of 20 experiments was conducted which indicated that a dye concentration of 100ppm, 0.34% of yeast extract gives a maximum decolorization rate of 85% after 72 h of incubation. The value of R_2 = 0.914 showed an outstanding assessment of experimental data through the polynomial regression model. The possible combinations of three parameters designed by RSM were confirmed through experiments and indicated that the bacterial strain has the decolorizing ability for the bioremediation of textile effluents. The metabolic products generated during the degradation of dye were analyzed through UV-Vis spectrophotometry, FTIR, and GCMS analysis. Different peaks in UV-Vis spectra of control dye disappeared in treated sample. Similarly, azo bond and primary amines appearing in FTIR of control spectra also disappeared in experimental sample indicating the complete degradation of Levafix Fast CA Red Reactive.

Key words

BDD, Decolorization, Response Surface Methodology, Levafix Fast CA Red Reactive