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Enhanced Biodecolorization of Azo Dye Reactive Orange 16 by Immobilized Phanerochaete Chrysosporium; Optimization of Immobilization Factors

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ABSTRACT

Processes using immobilized growing cells seem to be more promising than those with free cells, since the immobilization allows using the microbial cells repeatedly and continuously. Furthermore, the lignolytic system of Phanerochaete Chrysosporium fungi which is responsible for degradation of industrial dyes can be preserved from shear stress by cell immobilization. In this study, P. Chrysosporium was used for decolorization of azo dye Reactive Orange 16. Calcium alginate biogel was selected as a carrier and Na-alginate concentration (1% and 3% w/v), $CaCl_2$ concentration (10% and 30% w/v), bead diameter (2 and 4 mm) and inoculum size (10^5 and 10^7 spores/l) were considered as the immobilization parameters to be optimized. Full factorial design of experiments was used to estimate each possible independent and interactive effect of mentioned parameters on three responses of biodecolorization percent, lignin peroxidase and manganese peroxidase activities. Under optimum immobilization conditions, lignin and manganese peroxidase activities and decolorization of 324 U/L, 175 U/L and 87% after 2 h were respectively obtained that were at least 8 fold higher than those achieved at center point. The results indicated that decolorization was strongly in accordance with the production of lignolytic enzymes.

Keywords: Biodecolorization, Immobilization, Design of experiments (DOE), Phanerochaete Chrysosporium, Azo dye.