DECOLORIZATION OF RBBR DYE USING FUNGAL ENZYME IMMOBILIZED ON CHITOSAN BEADS

[1]NG SHI QI, [2]NURUL NADIAH ABD RAZAK, [3]MOHAMAD SUFFIAN MOHAMAD ANNUAR

[1]School of Bioscience, Faculty of Pharmacy and Biomedical Sciences, MAHSA University, Bandar Saujana Putra, 42610, Jenjarom, Selangor, Malaysia.
[2]Centre for Foundation Studies in Science, University of Malaya, 50603 Kuala Lumpur, Malaysia.
[3]Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia
E-mail: [1]shiqi0203@gmail.com

Abstract - The growing environmental damage caused by industrial effluents especially synthetic colours, requires the creation of effective biodegradation techniques. Due to its wide substrate selectivity and capacity to generate harmless by-products, laccase enzyme, has shown significant promise in breaking down these contaminants. The poor stability and reusability of the free enzyme make its practical use difficult. In this study, the laccase was immobilized on chitosan beads to improve its stability and reusability. Employing Box Behnken Design (BBD), the effectiveness of immobilized laccase in decolorizing RBBR dye was evaluated based on selected parameters. Through optimization study, the optimal combination to obtain around 91%. The residual and ANOVA analyses validated the experimental model's excellent reliability (R^2= 95.73%), confirming the efficacy of the chosen parameters in optimising dye degradation efficiency. The thermal and pH stability of laccase has rose through immobilization technique. Reusability tests revealed that laccase can be recycled for additional 6 cycles after being immobilized with chitosan beads. Immobilized laccase is effectively break down complicated colour molecules such as RBBR dye in wastewater, therefore offering a sustainable and reasonably priced alternative for treating industrial effluent.

Keywords - RBBR Dye; Laccase; Bioremediation; BBD; Optimization; Wastewater