

Abstract

This research work is all about production of *Ganoderma lucidum* laccase through lignolytic waste fermentation and its biotechnological applications. Surface culture fermentation technique was done to produce the laccase enzyme from *Ganoderma lucidum*. The optimization of the laccase enzyme was done by numerous parameters like influence of pH, incubation temperature and incubation time, various sources of laccase inducer wastes, carbon and nitrogen, various concentration levels of sawdust, glucose, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, KH_2PO_4 , CaCl_2 , yeast extract, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, ZnSO_4 and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ in order to enhance the laccase production. The results indicated that 10g glucose, 3g yeast extract, 2g KH_2PO_4 , 0.5g ZnSO_4 , 0.1 grams CaCl_2 , 1g $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 0.1g $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 0.5g $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ provided the high yield of laccase enzyme. The maximum production of laccase was observed as $0.415 \pm 0.015\text{U/ml}$ whilst pH 6.0 of fermentation medium at 25°C was incubated for 10 days with all the optimized culture medium elements. Characterization of laccase enzyme was performed using OFAT technique following a few parameters like effect of pH, temperature, substrate concentrations, inhibitors, thermal stability and pH stability. Laccase enzyme extracted from *Ganoderma lucidum* was purified using ammonium sulfate followed by dialysis. The purified laccase enzyme was assayed by the use of spectrophotometer. The yield of $0.415 \pm 0.015\text{U/ml}$ laccase from *Ganoderma lucidum* proved to be the potential source for cost effective and sustainable method to produce and use laccase enzyme. Laccase was applied in delignification of waste water from paper industry, discoloration of waste water from textile industry and inhibition of browning of apple slices and apple juice.