ABSTRACT

The present investigation deals with the production of a thermophilic peroxidase by *Aspergillus versicolour* IMPP-1175 and enzyme immobilization by entrapment in calcium alginate to degrade aromatic compounds in textile waste water. The batch culture experiments were carried out using pre-treated cotton seed meal (CSM) as a raw substrate under solid-state-fermentation (SSF) in Erlenmeyer flasks (250 ml). Cultural conditions including 30 ml of saline water (pH 7.57) at 1:3 substrate to moisture ratio, time of incubation (48 h) and size of inoculum (8%, v/v) were optimized for the improved production (67.1 U/g) of manganese peroxidase (MnP). Metallurgical microscopy of unfermented and fermented CSM exhibited quite different surface properties of the particles. The crude MnP extract was then partially characterized to determine the thermophilic behaviour of the enzyme. The activity increased by 1.5 fold at 50°C when incubated for 45 min. Hydrogen peroxide (1 M) was selected as an enzyme inducer in the assay mixture. Associative enzymes particularly catalase, laccase and lignin peroxidase were also observed, but their highest activities were 19.72, 4.28 and 31.45 U/g, respectively. The enzyme was partially purified by $(NH_4)_2SO_4$ precipitation and maximum specific activity (2.028 U/mg) was detected at 60% salt concentration. The fold purification was found to be 2.088. During sample dialysis, the pellet was found to be superior compared to the supernatant. The enzyme MnP was lyophilized by a freeze dryer at –40°C under vacuum. Notably over 2.1 fold highly active enzyme concentration was accomplished in only 15 min. A higher stability and activity of MnP was observed when 1.5 ml enzyme extract was immobilized by entrapment in 3% (w/v) calcium alginate for 25 min. The potential residual enzyme activity by the immobilized MnP was found to be 226.18 U/g which supported maximum degradation of 10% phenol solution. At 50% diluted sample of textile wastewater, 179.6 U/g of the immobilized MnP were consumed while the remaining activity declined sharply to 46.58 U/g showing optimal enzyme application. During the course of enzymatic reaction, the initial and final pH values were recorded 8.11 and 8.02, respectively.