Investigation of Ligninolytic Enzyme Productions by Submerged and Solid State Fermentations

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Objectives: Lignin degradation by fungi or their specific enzymes has been focus of a large number of biotechnological studies. The most efficient lignin degraders are fungi of the white rot group. Of these, *Pleurotus* species are commercially important edible mushroom species. These fungi can be cultivated on a wide variety of substrates, including plant residues. Therefore, there has been an increasing trend to use of solid state fermentation (SSF) process which is prevalent for enzyme production in recent years. In this study; the aim is to investigate production conditions of lignin peroxidase (LiP), manganese peroxidase (MnP), aryl alcohol oxidase (AAO) and laccase (Lac) enzymes from *Pleurotus eryngii* in submerged (SF) and solid state fermentations by using peach waste during 20 days on stationary conditions at 28˚C. In addition, protein, reducing sugar and nitrogen amounts were also researched.

Materials and Methods: Ligninolytic enzymes by *P. eryngii* were performed with submerged and solid state fermentation during 20 days on stationary conditions at 28˚C. The enzyme activities of LiP, MnP, AAO and Lac and also levels of protein, reducing sugar and nitrogen were determined spectrophotometrically. Chemical analyses of peach waste were performed in terms of lignin, total carbohydrate and cellulose.

Results: The reducing sugar and nitrogen levels were sharply decreased up to 5th day on SF and SSF cultivations, then nearly stable, so that the cultivation was reached to critical reducing sugar and nitrogen concentration. The maximal Lac activity in SSF cultivation was obtained as 1383.395 U/L, and this value was 2.32-fold higher than that of SF. The maximal MnP activity in SSF was determined as 326.755 U/L on 7th day. And, there were LiP and AAO activites on both SSF and SF conditions.

Conclusion: According to these results, ligninolytic enzyme productions were higher in SSF compared to SF. This situation showed that the investigated ligninolytic enzymes can be produced economically in the process of biotransformation of this waste.

Keywords: ligninolytic enzymes, solid state fermentation, submerged fermentation, *Pleurotus eryngii*