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Aldehyde PEGylation of Laccase from Trametes Versicolor in Route to Increase its Stability: Effect on Enzymatic Activity

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Laccase is a multicopper oxidase that catalyzes the oxidation of phenolic compounds. Laccase can be used in bioremediation, beverage (wine, fruit juice, and beer) processing, ascorbic acid determination, sugar beet pectin gelation baking, and as a biosensor. Recently, the antiproliferative activity of laccase toward tumor cells has been reported. Because of the potential applications of this enzyme, the efforts for enhancing and stabilizing its activity have increased. Thus, the PEGylation of laccase can be an alternative. PEGylation is the covalent attachment of one or more molecules of methoxy poly(ethylene glycol) (mPEG) to a protein. Normally, during the PEGylation reaction, the activity is reduced but the stability increases; thus, it is important to minimize the loss of activity. In thiswork, the effects of molar ratio (1:4, 1:8, and 1:12), concentration of laccase (6 and 12mg/ml), reaction time (4 and 17 h), molecular weight, and type of mPEG (20, 30, 40 kDa and 40 kDa-branched) were analyzed. The activity was measured using three substrates: ABTS, 2,6-dimethoxyphenol, and syringaldazine. The best conditions for laccase PEGylation were 12mg/ml of laccase,molar ratio 1:4, and 4 h reaction time. Under these conditions, the enzyme was able tomaintain nearly 100% of its enzymatic activity with ABTS. The PEGylation of laccase has not been extensively explored, so it is important to analyze the effects of this bioconjugation in route to produce a robust modified enzyme.

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