

Analysis of Physicochemical Properties and Structure of Laccase

P. Rajabi^{a*}, M. Najafi^a, M. Narjespoor^a, M.A. Memari^a

a Biocamp Research Institute, Tehran, 1568639313, Iran

*pegah8032@gmail.com

Abstract: Laccase is a polyphenol oxidase containing several copper atoms (multicopper oxidase) and has a glycoprotein structure called benzodiazepine[1-3]. This enzyme takes part in the oxidation of a wide range of compounds including mono, di and polyphenols aromatic amines, carboxylic acids and non-phenolic and inorganic substrates. Laccases are used in textile industry, pulp and paper industry, bioremediation and degradation of aromatic compounds including petroleum derivatives[4]. Laccase is produced by various microorganisms such as fungi, bacteria, organic plants and some insects. Laccases are found abundantly in fungal sources, particularly Ascomycetes, Deuteromycetes and Basidiomycota; which are known as white rot fungus[5]. In this study, we selected 20 enzymes from fungal sources to assess physicochemical properties of them. Physicochemical characteristics of the selected enzymes were analyzed using the **EXPASY'S ProtParam** server. In order to analyze the secondary structure and tertiary structure of the enzymes, **PSIPRED**, **Predict Protein** and **SWISS – Model** were used. Furthermore, Phylogenetic tree was constructed for the purpose of analysis the evolutionary relationship using **MEGA 7.0** software and the presence of signal peptides was investigated using **SignalP** server. All investigated laccases except *Talaromyces islandicus* and *Serpula puteana* were stable as a value >40 indicated a stable enzyme. Aliphatic index for laccases produced by *Schizophyllum commune* and *Trametes versicolor* were 87.54 and 87.43, respectively, which were among the highest aliphatic indexes. The results of the SignalP server suggested that all laccases possessed signal peptides except *Talaromyces islandicum*.

Keywords: Laccase; ProtParam; Phylogenetic tree; Signal peptide

References

- [1] M. Aghaie_Khouzani, H. Forootanfar, M. Moshfegh, M. Khoshayand, M. Faramarzi."Decolorization of some systhetic dyes using optimized culture broth of Laccase producing ascomyceted Paraconithyrium variabile."Biochem Eng J 2011;60: 9_15.
- [2] H. Forootanfar, M M. Movahednia, S. Yaghmaei, M. Tabatabaei_Samani, H. Rastegar, A. Sadighi, "et al Removal of Chbrophenolic derivatives by oil isolated ascomycete of Paraconiothyrium variabile and study in the role of its extracullar Laccase ."J Hazard Mater 2012; 209_203:199_203.
- [3] A. Rekus, B. Jastrzemska, J. Liesiene, J. Bryjak . Comarative studies on immobilized Laccase behavior in packed_bed and batch reactors. J Mol Catal B_ Enzym 2009;57(1_4): 216_223.
- [4] Ch. Ko, C. Fan." Enhance chemical oxygen demand removal and using Laccase _ polymerized membrane filtration ."J Hazard Master 2010; 181(1_3): 763_770.
- [5] PJ. Strong, JE. Burgess."Bioremediation of a wine distillery wastewater using white rot fungi and the subsequent production of Laccase." Water Sci Technol 2007; 56(2):179_186.