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Free and immobilized fungal oxidoreductases for the selective oxidation of 5-hydroxymethylfurfural

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PURPOSE OF THE ABSTRACT

Basidiomycetous fungi have attracted a great deal of interest due to their ability to produce vast amounts of lignocellulolytic enzymes that are involved in the degradation and transformation of lignocellulosic materials [1]. A large group of Carbohydrate active enzymes (Cazymes) that are naturally secreted into the extracellular environment during fungal growth on lignocellulosic substrate, are annotated in the AA3 and AA5 families [2,3].
In this study, three novel hydrogen peroxide-producing glyoxal oxidases from Pycnoporus cinnabarinus (PcGLOX) belonging to the AA5_1 subfamily, were cloned and heterologously expressed in Aspergillus niger or in Pichia pastoris either in the flask or in the bioreactor. The PcGLOX have been characterized for their substrate specificity on wide variety of substrates. The results showed that the three PcGLOX displayed a significant difference in substrate preference and catalytic efficiency. For instance, PcGLOX2 and PcGLOX3 exhibited an important activity towards the oxidation of 5-hydroxymethylfurfural (5-HMF). Its conversion has been optimized using an enzymatic cascade with aryl-alcohol oxidase from Ustilago maydis. The enzymes have been immobilized by cross-linked enzyme aggregate (CLEA) immobilization technology and assessed for their activity, substrate specificity, pH and thermal stability and recyclability in order to ensure their cost-effective use and to increase their potential to be applied in the packing, textiles, coatings and other industries.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

glyoxal oxidases | aryl-alcohol oxidase | 5-hydroxymethylfurfural | cross-linked enzyme aggregate immobilization

BIBLIOGRAPHY

[1] Dashtban, M., Schraft, H., Syed, T.A et al. Int. J. Biochem. Mol. Biol. 2010;1(1), 36-50.

[2] Sützl, L., Laurent, C.V.F.P., Abrera, A.T. et al. Appl. Microbiol. Biotechnol. 2018, 102: 2477.

[3] Daou, M., Faulds, C.B. World J. Microbiol. Biotechnol. 2017, 33:87