282. Application of a fungal extract with laccase activity to improve the enzymatic hydrolysis of eucalyptus bark residues

Daniel Gomes[1], Michele Michelin[1], Maria de Lourdes Polizeli[2], Lucília Domingues[1] and José Teixeira[1]

[1]Centre of Biological Engineering, Universidade do Minho, Braga, Portugal; [2]Faculdade de Filosofia Ciências e Letras de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, Brazil

Background & Objectives: Lignocellulosic materials are growingly being used as an alternative to petroleum, from which biofuels and several added-value compounds can be produced. An example of such residues refers to eucalyptus barks, which are abundantly generated by pulp & paper mills and typically used for internal energy production. The conversion of their holocellulose fraction is usually conducted by well-established commercial enzyme cocktails mainly acting towards the hydrolysis of complex cellulose into monomer fermentable sugars. Such materials, however, can still present a considerable fraction of lignin, which is a well documented enzymes barrier. This work aimed to assess the potential effects from a laccases extract on the efficiency of hydrolysis of eucalyptus bark residues resulting from possible modifications on lignin structure or content.

Methods: A laccases-containing extract was previously prepared by the group of Maria de Lourdes Polizelli through cultivation of *Pleurotus sajor-caju* on orange bagasse for 21 days. Eucalyptus bark residues (EBR) were subjected to a non-isothermal autohydrolysis pre-treatment with a severity (S_0) of 3.84. The pre-treated solid was hydrolyzed using Cellic CTec2 combined with the laccases extract under distinct operational conditions. Potential effects of laccases addition were estimated through the quantification of released glucose over the hydrolysis time.

Results: Laccases effects on the enzymatic hydrolysis of EBR were found to be dependent of different factors. Under a low solids loading (2 %), the addition of laccases simultaneously with cellulases resulted into no visible improvements. When laccases were added 24 h before cellulases a 11 % increase was observed in glucose production, possibly from a superior amount of electron donors, important for LPMOs on Cellic Ctec. Using a laccases mediator (2 mM ABTS) led to no improvements under these conditions. Similarly, when laccase dosage increased from 2 to 10 IU/gsolid there was a visible reduction of hydrolysis efficiency, suggesting possible inhibition effects above a given level. Applying a dosage as low as 2 IU/g 24 h before cellulases resulted on an improvement of glucose production of approximately 15-20 % when 7 % solids were used.

Conclusions: Laccases may represent a new valuable component for biomass degrading processes, which should enable more efficient hydrolysis and important savings over these processes.

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