ASSESSING POTENTIAL EFFECTS OF A LACCASE EXTRACT OVER THE ENZYMATIC HYDROLYSIS OF EUCALYPTUS BARK RESIDUES

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Body

Lignocellulosic materials are rising as an alternative to petroleum, from which biofuels and numerous compounds may be produced. Eucalyptus barks, abundantly generated by pulp & paper mills, are a good example of such materials, being typically used for energy production. Holocellulose conversion of these materials is usually made by enzyme preparations, mainly acting on the hydrolysis of complex cellulose into monomer sugars. These materials, however, can still present a substantial amount of lignin, a well-documented enzymes barrier. This work aimed to assess how a laccases extract can influence the hydrolysis of eucalyptus bark and the best conditions for their action. Eucalyptus bark residues (EBR) were initially subjected to autohydrolysis with a severity (S_0) of 3.84 [1]. The pre-treated solid was then hydrolyzed using Cellic CTec2, combined with a laccases-mediated treatment employing an extract prepared by the group of Maria de Lourdes Polizelli [2]. Potential effects of laccases were estimated through the quantification of the glucose produced over time and differences in the profile of enzymes adsorption onto the solid. The effects of laccases over the hydrolysis of EBR seemed to be dependent of numerous factors. For a solids load of 2 %, laccases addition simultaneously with cellulases had no positive effects but when added 24 h before cellulases, glucose production increased 11 %, possibly from an inferior electron donors competition with LPMOs on Cellic Ctec. Increasing laccases dosage from 2 to 10 IU/g solid led to a visible reduction of hydrolysis efficiency, suggesting possible toxicity/inhibition effects above a given level. Applying a washing step showed to be efficient in removing some of the formed phenolics, while its overall benefit seemed to depend on the extension of laccases action before being "washed". When an efficient laccases treatment was conducted before the washing step, involving reduced mass transfer limitations and an adequate period of time, subsequent enzymatic hydrolysis produced nearly 30 % more glucose for a 8 % solids load. In accordance, there was also a significant increase on the levels of free Cel7A after hydrolysis of this new solid, suggesting important modifications on the levels and structure of its lignin. The utilization of laccases on the hydrolysis of lignocellulosic biomass may represent an interesting element for more efficient and economic processes.

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Palavras-chave : Laccase, lignocellulosic biomass, enzymatic hydrolysis