"Performance of *Trichoderma harzianum* in fermentation with pretreated sugarcane bagasse for cellulolytic enzymes production and distinguishing expression of genes"

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Abstract

The industrial technologies for conversion of sugars and starch from sugarcane in ethanol are considered mature and available, except referring to enzymatic hydrolysis of sugarcane biomass. The efficient enzyme development to process the bagasse and the straw can increase ethanol yield per hectare of sugarcane: which presently is 6000 L/ha, could reach 10,000 L/ha, if 50% of the produced bagasse would be converted to ethanol. The filamentous fungi *Trichoderma harzianum* IOC 3844 has potential for cellulases production, however the mechanisms of enzyme production remain unknown. In this work we investigated the performance and profile of genic expression related to cellulolytic capacity of this fungi. Using different carbon sources (cellulose, lactose and pretreated bagasse-BED) in the phase of micelial growth and following to fermentation in conditions for hydrolytic enzyme production in medium with BED as carbon source, was possible to verify the influence of substrates. The sample that used lactose reached, with 96 hours of fermentation, similar levels of total proteins to the sample that used BED, however kept the enzymatic activities analyzed below that obtained by samples induced with BED and cellulose. In the case of the sample induced with cellulose, was observed an adaptation in first 48 hours of fermentation, when the sample reaches levels of enzymatic activities approximate of BED induced sample. These results indicate that the set of active genes for BED degradation is influenced by the carbon source in the phase of micelial growth and by the time of fermentation. Despite the tendency of fungi to adapt to the medium by expression and repression of certain genes the influences of inductor on enzymatic activities can be observed in long times of fermentation. Also allowed observe the positive performance of fungi in BED degradation, both in phase of induction of the micelial growth and fermentation. This substrate acts as surface for fungi setting, fermentable biomass and activator of the synthesis of hydrolytic complexes containing cellulases, xylanases and beta-glucosidases with industrial interest.

Supported by Fapesp

Keywords: Cellulases, sugarcane bagasse, Trichoderma, hydrolytic complexes, genic expression.