Use of food industry waste in the production of a thermostable cellulase

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Introduction

β-glucosidases is an important hydrolase and is a member of the cellulase system, playing significant roles in lignocellulosic biomass degradation. They are among the fungal enzymes produced by solid state fermentation and with biotechnological applications. The activity of the agricultural sector is one of the most important of the Brazilian economy and its agroindustry generates a large amount of by-product lignocellulosics potentially available for conversion into second generation ethanol. The use of agroindustrial wastes as culture medium in bioprocesses is an interesting alternative to reduce costs and minimize its accumulation (Da Silva *et al.*, 1995; Leite *et al.*, 2008, Pereira et al., *2015*). In order to achieve commercial viability, enzyme production must be by an efficient fermentation process and via the use of an inexpensive substrate. The solid state fermentation process (SSF) has been very efficient in the use of agroindustryl residues. Thus, the aim of this study is the production of this important cellulase using some food industry residues.

Material and methods

Enzyme production: β-glucosidase was produced by solid state fermentation, at 50°C for 96 h. The thermophilic fungus *Thermoascus aurantiacus* was cultivated in erlenmeyer flasks containing Sabouraud dextrose agar slope for 48 h at 50°C. The inoculation was carried out by transferring the suspension of microorganisms to polypropylene packages containing the substrate (corn cob, sugarcane bagasse or wheat bran) mixed with mineral solution to achieve an initial humidity of 60%. After the cultivation time, the enzyme was extracted by the addition of deionized water to the packages, followed stirring in a rotatory shaker, filtration in Musseline fabric filter and centrifugation at 4°C at 10000 × g for 20 min. Then, the enzymatic activity according to the fermentation time was assessed using the substrate that led to higher enzymatic activity.

Enzymatic activity: The activity (U) of the β-glucosidase according to Leite *et al.* (2008) using nitrophenyl-β-D-glucopyranoside as substrate.

Results and discussion

β-glucosidase was produced by solid state fermentation using three agroindustrial wastes and the results are shown in Figure 1. The values of enzymatic activity are within the similar range observed by Leite et al. (2008). According test t for independent samples, it was observed that the production was significantly affected by the carbon source, at 5% of significance level.

Table 1. Production of fungal β-glucosidase from different substrate sources.

Substrate	Activity (U/mL)
Corn cob	1,69
Sugarcane bagasse	5,42
Wheat bran	2,52

From the previous result, sugarcane bagasse was used to evaluate the enzymatic production through the cultivation time. The fungus showed maximum production of β-glucosidase after 96 h of fermentation (Figure 1).

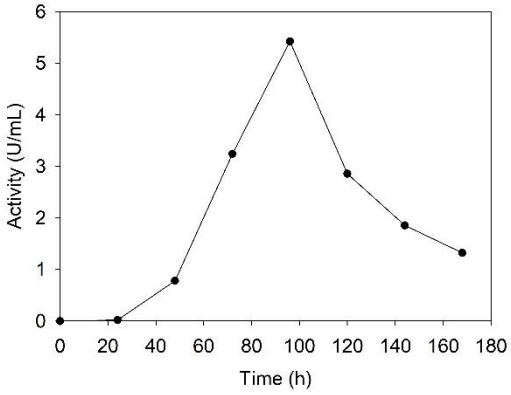

Figure 1. Time course of the β-glucosidase production using sugarcane bagasse as substrate.

Conclusion

The thermophilic fungus efficiently grew on the agroindustrial waste tested, although higher production has been observed in the use of sugarcane bagasse.

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