**Yeast biomass as biotechnological strategy for detoxification of hemicellulosic hydrolysate of sugarcane byproducts for xylitol production**

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**Highlights**

* Xylitol production using yeast biomass as detoxification agent.
* Use of sugarcane bagasse and straw for biotechnological production of xylitol.
* Yeast biomass is a promisor raw material for detoxification procedures.

**1. Introduction**

New technologies which use the exploitation of lignocellulosic materials have been contributed for the development of bioprocesses in the context of biorefineries for example the sugar and alcohol sector. The production of biomolecules from its constituent fraction in this material such as hemicellulose have been studied for example xylitol [1, 2, 3]. Xylitol is a sugar-alcohol important in industry of food, pharmaceutical, cosmetic and odontological), which industrial production occurs by chemical route. Investigations have been done for development of technology of its biotechnological production and it was also stablished parameters such as pH, temperature, aeration. The detoxification before fermentation is required in function of toxic compounds resultant from plant cellular wall deconstruction usually done by diluted acid hydrolysis [4]. Usually detoxification is made with vegetal activated charcoal which contributes for the reduction of toxic content of the hydrolysate such as phenolic compounds [5]. Alternative for charcoal can be proposed as exploitation of residual cellular biomass from the production process of xylitol. The use of non-viable microbial cells in detoxification has as objective its utilization as adsorbent, which can occur the interactions between toxic compounds (adsorbate) and functional groups of the cell and/or its cellular wall (adsorbent) [6]. This research proposes the use of yeast cellular biomass of *Candida guilliermondii* FTI 20037 as detoxification agent of hemicellulosic hydrolysate from the mixture of sugarcane bagasse and straw for xylitol biotechnological production.

**2. Methods**

The hemicellulosic hydrolyzate from the mixture of sugarcane bagasse and straw (HHSBS) was obtained by diluted acid hydrolysis (1% w/v of H2SO4) [5] followed by vacuum concentration to increase its sugars content. For detoxification it was used residual dry biomass of *Candida guilliermondii* FTI 20037 from a previous xylitol production in HHSBS. The detoxification process occurs in HHSBS (adjusted pH for 2), 5% (w/v) dry biomass of *Candida guilliermondii*, temperature 30°C, in Erlenmeyer flasks at 100 rpm to 24 hours. The control with activated charcoal 1% (w/v), pH 2.5, 60°C for 30 minutes was also realized [5]. The fermentation occurred in detoxified hydrolysates, with addition of nutrients (gL-1): solution of rice bran extract (20), (NH4)2SO4 (2), CaCl2·2H2O (0.1), for 46 hours. The determination of sugar concentration in hydrolysate was done by liquid chromatography, while phenolics by spectrophotometry [2].

**3. Results and discussion**

In the Table 1 are shown the results of fermentation of HHSBH with the use of dry biomass of *Candida guilliermondii* FTI 20037 as detoxifying agent as well the use of activated charcoal. The use of dry biomass of *Candida guilliermondii* residual of xylitol bioproduction indicates its potential as detoxification agent since removed 27% of phenolic compounds present in HHSBH compared with 40% when used activated charcoal. According the values shown in Table 1 the maximum value of yield and productivity was achieved in 46 hours, which were for yield (g.g-1) 0.83 and 0.66; and productivity (g.L-1.h-1) of 0.46 and 0.63, for HHSBS detoxified with dry biomass and activated charcoal, respectively.

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| HHSBS detoxified with yeast biomass | | | | | |
| Time (h) | Biomass (gL-1) | Xylose consumption (%) | Xylitol (gL-1) | Y p/s (gg-1) | Qp (gL-1h-1) |
| 22 | 7.15 | 14.85 | 6.97 | 0.19 | 0.42 |
| 46 | 9.95 | 48.69 | 21 | 0.83 | 0.46 |
| 70 | 13.37 | 81.74 | 29.45 | 0.69 | 0.42 |
| HHSBS detoxified with activated charcoal | | | | | |
| Time (h) | Biomass (gL-1) | Xylose consumption (%) | Xylitol (gL-1) | Y p/s (gg-1) | Qp (gL-1h-1) |
| 22 | 6.93 | 33.53 | 9.37 | 0.47 | 0.43 |
| 46 | 9.97 | 74.06 | 28.87 | 0.66 | 0.63 |
| 70 | 12.96 | 89.24 | 34.14 | 0.65 | 0.49 |

**Table 1.** Fermentative parameters from xylitol production by *Candida guilliermondii* FTI 20037 grown in HHSBS detoxified with dry cell biomass or activated charcoal.

**4. Conclusions**

The utilization of residual dry biomass from xylitol bioproduction in hemicellulosic hydrolysate of sugarcane bagasse and straw has potential to be used as detoxificant agent of this hydrolysate as economical strategy in relation to activated charcoal usually used in this bioprocess, besides the capacity of remove the toxics and promising fermentative parameters reached.

**References**

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