



DILUTED-ACID PRETREATMENT AND ENZYMATIC HYDROLYSIS OF CORNCOBBS FOR ETHANOL PRODUCTION

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Introduction. In Mexico, corncobs are considered as potential raw materials in biorefinery process. Mexican diet is based on corn and National production is 2.7% of world corn production, 23 million tons, 2010 [1]. Mexico is the 4th producer worldwide but the consumption represents the 11% of the world; therefore, an important amount of corncobs are generated as residues. In most of the cases this residues are wastes but they are also used as animal feed. However, their use in biorefinery process could represent a higher valorization of this residue.

The objective of this work was to quantify the fermentable sugars obtained for corncobs using an diluted-acid hydrothermal pretreatment and an enzymatic hydrolysis process using the enzymatic cocktail Cellic®CTec2.

Methods. The corncobs were obtained from a local market and they were dried under UV light to avoid microbial attack, grinded to the particle size of >0.64 mm and frozen until use. Operation conditions of the diluted acid-pretreatment were H₂SO₄ 1.5% (v/v), 5 Psig, 120°C and 20 min, using a solid-liquid ratio of 15% wt. Pretreated biomasses were hydrolyzed with 1.3 mL/g_{biomass} Novozymes Cellic®CTec2 cocktail at 50°C during 24 h, 80 rpm and pH of 5.5. Initial characterization was performed according to standard methods of NREL. Reducing Sugars were estimated by the Dinitro Salicylic Acid (DNS) method and glucose and xylose concentrations were quantified with a biochemical analyzer (YSI, 2700).

Results. The initial biomass moisture was 5.22 ± 0.92%. The composition of corncobs in % (dry basis) was: ashes, 1.61 ± 0.24; Extractives, 14.24 ± 0.48; Total lignin, 18.03 ± 0.51; Hemicellulose, 33.44 ± 0.12; Cellulose, 42.12 ± 1.53. These values are comparable to those reported in the literature [2].

After the diluted-acid pretreatment the initial reducing sugars concentration was around 4 g/L this value increased up to 7 g/L after enzymatic hydrolysis (Fig 1). At this point the concentrations in g/L of xylose and glucose were 5.69 ± 0.75 and 8.03 ± 0.18, respectively.

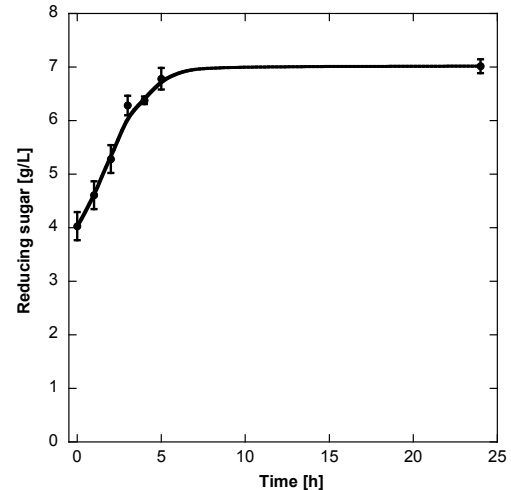


Fig.1 Reducing sugar during enzymatic hydrolysis.

The process of ethanol production by the biochemical pathway requires higher sugar concentrations to be competitive with first generation biofuels. In order to achieve those values of sugar concentration different solid-liquid ratios are being currently testing.

Conclusions. The diluted-acid pretreatment and enzymatic hydrolysis of corncobs under the evaluated conditions must be optimized in order to obtain higher sugar concentration.

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