SIMULTANEOUS SACCHARIFICATION AND FERMENTATION FOR ETHANOL PRODUCTION FROM PRETREATED CORNCOB

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Introduction. Ethanol production, beyond its current role as additive for oxygenated fuel fuel, will require the use of lignocellulosic biomass as feedstock due to its abundance and low cost [1]. Simultaneous saccharification and fermentation (SSF) is thought to be the best process for enzymatic conversion of cellulose to ethanol due to hydrolytic enzymes and the fermenting microorganisms are in the same reactor.

This work focused in the use of agricultural residues as feedstock for ethanol production. Different pretreatments were assessed by means of cellulose availability, fermentable sugars production and ethanol production by SSF.

Methods. Corncob (vd. jaguaan) was used in the present work. Cellulose content was determined by Van Soest Method [2]. Corncob was subjected to alkaline pretreatment with NaOH at different concentrations (1, 2 and 3%). Enzymatic hydrolysis (pH 5.5, 38°C at 130 rpm, enzymatic load of 15 FPU of Celluclast® 1.5 L) and fermentation using *Zymomonas mobilis* was carried out only for the case of corncob pretreated with 1% alkaline solution due for best results compared to the other cases studied (2 and 3 % NaOH).

Results. Alkaline pretreatment (NaOH) at 1% showed the best efficiency with respect to 2 and 3 %.

Table 1 Corncob characterization after pretreatment.

Cellulose		Hemicellulose		Lignine		Ash	
x̄	σ	x̄	σ	x̄	σ	x̄	σ
			NaOH				
43.14	0.445	18.78	1.080	0.82	0.265	4.45	0.370
40.45	0.600	13.99	0.670	0.79	0.015	2.55	0.010
37.52	0.850	14.76	0.780	0.65	0.040	1.86	0.050
			H2SO4				
37.47	1.200	8.57	0.275	5.81	0.210	12.46	0.510
36.49	0.290	5.44	0.080	6.49	0.040	11.12	1.190
36.95	0.910	5.58	0.030	6.53	0.090	9.25	0.115

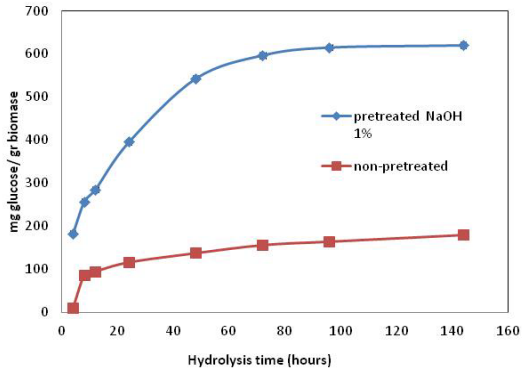

Fig.1 Kinetics of enzymatic hydrolysis of pretreated and non – pretreated corncob

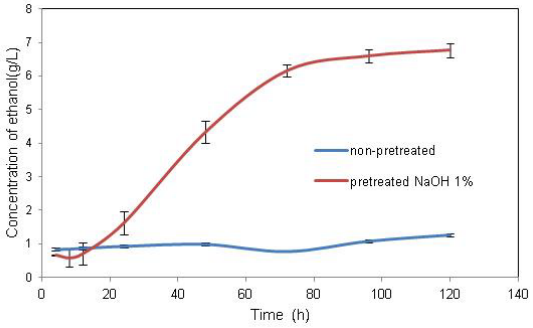

Fig 2 Results of ethanol production by *Zymomonas mobilis* (pH 5.5, 38°C at 130 rpm).

Figure 1 shows the efficiency of enzymatic hydrolysis, achieving 90.5% of theoretical yield. Figure 2 shows the ethanol production by *Zymomonas mobilis* in the SSF process achieving 7 g/L of ethanol.

Conclusions. Results show that corncob residue has the potential to be used as feedstock for ethanol production due to its availability and high fermentable sugars production.

References.

1. Farrell AE, Plevin RJ, Turner BT, Jones AD, O'Hare M, Kammen.(2006) *Science,* 311(1):506-508.
2. Van Soest PJ. (1967) *Journal of the Association of Official Analytical Chemists*, v.50, p.50-55.