ENZYMATIC HYDROLYSIS OF TROPICAL GRASSES TO OBTAIN FERMENTABLE SUGARS

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Introduction. Bioethanol as one of liquid biofuels of second-generation derived from lignocellulosic biomass, is a sustainable alternative compared with obtained from food crops. It is due to its wide availability and low cost, besides to its contribution on mitigation of the climate change and energy security (1). Raw materials for its processing include grasses, woody crops, straw and fast-growing trees (2). Recently, the interest on grasses is growing because of their rapid growth and high productivity.

The objective of this study was to evaluate the composition of three tropical grasses and the feasibility of its conversion to fermentable sugars for later use in the production of bioethanol.

Methods. Samples of *Vetiveria zizanioides* (Vetiver), *Brachiaria humidicula* (Chetumal) and *Cynodon plectostachyus* (Estrella de África) were provided by INIFAP. The plant material was dehydrated and pulverized. The evaluation of cellulose, hemicellulose and lignin were performed according to previously reported methods (3). Grasses were pretreated with H_2SO_4 7% at 121 lb for 1 h in autoclave. The enzymatic hydrolysis was performed with enzymatic complex Celluclast (Sigma) at 50 ° C, pH 5, 240 rpm for 12 h. Reducing sugars were determined by the Somogyi-Nelson method (4).

Results. Table 1 shows the ratio of the lignocellulosic components, which varies depending on the species of grass. The cellulose content on tropical grasses is comparable with that reported for grass Switchgrass (31%), used in USA as energy crops (5).

Table 1. Content of lignocellulosic components (%/M.S) in tropical grasses.

Species	Cellulose	Hemicellulose	Lignin
Vetiveria zizanioides	32.02	40.32	24.93
Brachiaria humidicula	33.66	47.77	16.13
Cynodon plectostachyus	34.29	46.02	17.45

The higher levels of fermentable sugars were obtained at 12 h of enzymatic reaction for grass Chetumal (319.83 mg glucose/ g sample), followed by Vetiver with 248.33 mg/ g, and Estrella de África with 179.03 mg of glucose/g of sample (Fig. 1). This suggests that the type of species is an important factor to be considered for the production of fermentable sugars, being Chetumal grass which presented the highest conversion of cellulose.

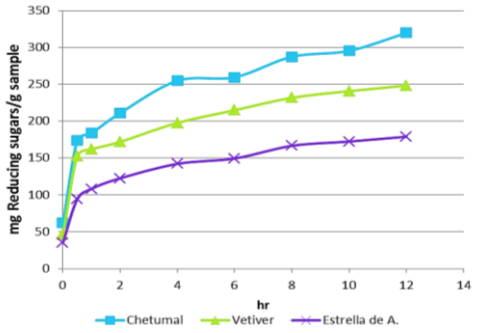

Fig.1 Kinetic study of the cellulose degradation from tropical grasses pretreated.

Conclusions. It was demonstrated feasibility of producing fermentable sugars from biomass of tropical grasses, which moreover were characterized by high cellulose content. Therefore, their use offers a promising alternative for the lignocellulosic bioethanol production.

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