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DILUTE-ACID HYDROLYSIS OF *JATROPHA CURCAS* HUSK AND SHELL FOR ETHANOL PRODUCTION.

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Introduction

Jatropha curcas L. is a tropical plant with considerable potential for producing many products of high economic and social interest (1). During oil extraction process for biodiesel production some lignocellulosic residues, such as husk and shell are generated (2). Finding applications for those residues is a problem that deserves investigation. In this work the potential of those materials for ethanol production is explored, and their behavior under dilute-acid prehydrolysis is evaluated.

Methodology

The materials were characterised using the National Renewable Energy Laboratory (NREL) standard protocols. The content of moisture, ash, ethanol extractives, cellulose, xylan and lignin were determined. A 2^3 experimental design was performed for evaluating the effect of dilute-sulphuric acid hydrolysis on xylan and cellulose solubilisation. The independent variables were temperature, acid concentration and time.

Result and Discussions

In this work, a characterization of *J. curcas* L. shell and husks was performed. Since relatively high content of glucans (30.0% (w/w)) and xylans (16.5% (w/w)) were found, the material resulted of interest for ethanol production. The highest xylose formation was achieved at 180°C after a dilute acid pretreatment. At that temperature, a decrease of the acid concentration from 4 to 1% led to a decrease of xylose formation from 9-10 to 4-5 g/L. Xylose formation was maximal at the lowest severity (Log Ro = 3.40). The increase of the severity factor from 3.4 to 4.17 led to xylose degradation to furfural. Further increases led to xylose depletion and to furfural degradation (Fig. 1). Another series of tests was performed with the reaction time set at 10 min for evaluating the effect of acid concentration. The new experiment revealed that at the highest temperature (220°C) the acid concentration required for reaching the highest concentration of xylose was 2% (Fig. 2). When the temperature was decreased to 180°C the maximum zone moved to high acid concentrations (3,5-4 %), where xylose formation was the highest (11.6 g/L) and furfural concentration was the lowest (0.8 g/L). A zone where optimal conditions are located was found at acid concentration 3.5-4%, 180°C, and 10-min reaction+ time. Around that zone a maximal xylan hydrolysis was achieved, and the reactivity of cellulose upon enzymatic hydrolysis was high. However, further optimization studies are required.

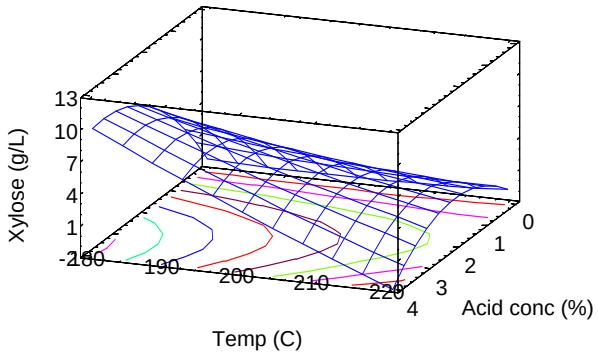

Fig. 1. Effect of temperature and acid concentration on xylose formation during hydrolysis. Reaction time: 10min.

Conclusions

The chemical composition of *Jatropha curcas* L. husk and shell justifies their possible utilisation as raw material for ethanol production.
The maximal yield of xylose upon dilute-acid hydrolysis was found in the experiment performed with 4% sulfuric acid, at 180°C and during 10 min.
Further studies are required for determination of optimal conditions for xylan and cellulose hydrolysis.

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