PREHYDROLYSIS OF OLIVE-PRUNING DEBRIS FOR D-XYLOSE PRODUCTION

Sebastián Sánchez[1], Juan Francisco García[1], Manuel Cuevas[1], Nicolás Cruz[1], Vicente Bravo[2], Luc Rigal[3], Cathy Doumeng[3].
[1]Dept. Chemical, Environmental & Materials Engineering, Jaén University, 23071 Jaén, Spain.
[2] Dept. Chemical Engineering, Granada University, 18071 Granada, Spain.
[3] LCA-CATAR, ENSIACET, 31077 Toulouse, France.
Tel : 34953212219, Fax : 34953212041, E-mail : ssanchez@ujaen.es

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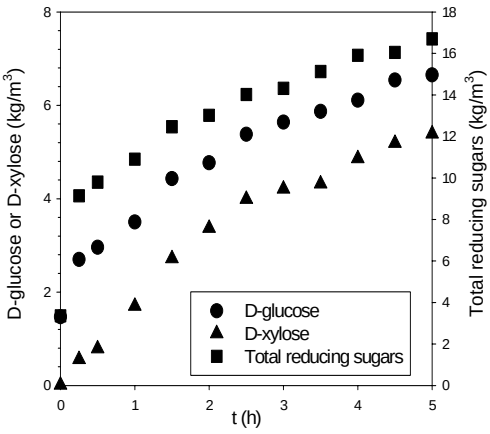
One way to make use of the pruning debris from olive trees is fractionation by hydrolysis of the principle components: cellulose, hemicellulose and lignin. An acid hydrolysis of lignocellulose materials conducted under mild conditions of temperature (100-150ºC) and acid concentration (1-8%) provides hydrolysis of hemicelluloses that is fast (10-120 min) and selective, rendering as reaction products a mixture of sugars and of certain degradation products. However, cellulose is attacked little, remaining in the solid phase due to the difficulty that its crystalline structure poses for the hydrolysing agent to gain access to the polymer chains[1]. If the objective is D-xylose production, the conditions should be milder to avoid degradation. This stage constitutes prehydrolysis, since its aim is to separate the hemicellulose fraction before cellulose hydrolysis[2].

Three types of prehydrolysis were conducted with the olive-pruning debris. The first was a hydrothermal treatment (200ºC and 2800 kPa), the second an acid hydrolysis at low temperatures (70-90ºC) and low sulphuric acid concentrations (2.5-5.0%), and finally a hydrolysis in a BI-VIS extruder[3] within the temperature range 70-100ºC with a concentration acid in the interval 5.0-13.5%.

The results reveal that the hydrothermal treatment and the extrusion were insufficient for complete hydrolysis of the hemicellulose fraction, rendering 1.7% in D-glucose and 0.4% in D-xylose on a base of the dry debris treated in the case of hydrothermal treatment, the resulting hydrolysate containing great quantities of partially hydrolysed oligosaccharides (xylanes). The extrusion did not succeed in solubilizing all the hemicelluloses, presenting results similar to hydrothermal treatment, although yields in D-glucose reached 2.5%. On the contrary, acid hydrolysis presented better results, providing a maximum of 13.3% in D-glucose and 10.8% in D-xylose, with the disadvantage of the generation of certain inhibitors in considerable quantities, such as acetic acid (3.3%).



Hydrolysis with sulphuric acid 5% at 90ºC

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