

Influence of pretreatment variables on the bioavailability of sugars for the production of bioethanol from melon

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In recent years there have been increased efforts to make progress in the area of biofuels due to the need to replace fossil fuels, whose reserves are dwindling, and to reduce emissions of greenhouse gases. Bioethanol, along with biodiesel, represent the most promising biofuels and are considered the most viable alternative in the short and medium term (Restmac, 2013).

The complex structure of plants and the interaction of its constituent result in a material resistant to degradation, processing and transformation. Therefore, the biomass to be used to produce fuels must be pretreated to expose the cellulose of plant fibers. These processes objectives are to remove lignin and hemicellulose, reduce cellulose crystallinity and increase the porosity of the lignocellulosic materials. Thermal, chemical, mechanical and/or biological treatments are necessary to break the lignin-hemicellulose-cellulose interaction, increase accessibility to cellulose and the release of fermentable monomers by hydrolysis.

Melon is one of the major vegetable crops in the agricultural scheme of San Juan Province in Argentina. It has been estimated that about 20% of annual production is discarded due to problems in its marketing caused by low demand or low quality of the fruit which does not meet the requirements set by the market for fresh consumption. Besides, developments to industrialize the product or waste fruit are virtually nonexistent.

The melon has a composition that varies according to the variety of this fruit. On average, the pulp is about 88% water, 8% sugar and less than 1% cellulose and hemicellulose. Shells have proportionally higher content of sugars, close to 60% by weight, and a cellulose and hemicellulose content that is around 10% by weight, due to its markedly lower water content (National Agricultural Library, 2013).

The application of suitable biomass pretreatments to this fruit would allow its use for bioethanol production, releasing fermentable sugars from the pulp and shell, thus achieving higher yields in the production of this biofuel.

This work presents the results of the statistical study performed to determine the significant variables in melon biomass acid pretreatment using sulfuric acid. The variables studied were temperature, time, acid concentration and liquid to solid rate. A middle fraction design was applied with three duplicated center points and analyzed using statistical software.

References

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