

Preliminary tests of production of cellulosic bioethanol for testing simultaneous hydrolysis and fermentation

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It is necessary to find valid renewable sources that do not compete with food production at affordable costs and alternatives, to help alleviate the exhaustion of fossil fuels. Cellulosic biomass can be chemically or enzymatically hydrolyzed and then the sugars obtained fermented with yeasts to produce ethanol. The possibility of hydrolysis and fermentation simultaneous presents the advantage like, prevents inhibition of enzymes, reduces the risk of pollution and decreases production costs. The drawback is that the optimum temperature for the enzyme treatment is about 50°C, while the corresponding fermentation is close to 32°C

Rice husks, lignocellulosic waste of rice production, are abundant in the Argentina NEA region and an excellent raw material for the bioethanol production because it has a high cellulose content. In order to realize in the future enzymatic hydrolysis and fermentation in one step with rice husks, it have been performed preliminary tests of enzymatic hydrolysis on Whatman filter paper N°1 at temperatures below the optimum (32°C), and subsequent fermentation with four different yeast, *Saccharomyces cerevisiae*, *Candida tropicalis*, *Candida guilliermondii* and *Candida kefir*, at the same temperature. The selection of yeast was performed according to specific criteria. *Candida kefir* can bear temperatures up to 37°C, which was taken like feasible alternative for realizing of simultaneous process in the future at high temperatures. The *Candida* and *Saccharomyces* work at 32°C, but also have affinity for 5-carbon sugars such as xylose, which are present in small amounts if the material has been pretreated with acid to remove hemicellulose. The filter paper characterization was determinated through amount of moisture, and ash and then was realized the hydrolysis during 72 hours at 32°C on a rotary shaker, using enzymes, like celullases of *Trichoderma reseei* and celobiasses of *Aspergillus niger*.

The subsequent fermentation was performed in the supernatant of the hydrolysis, supplemented with nutrients and the four yeasts listed above for 24 hours at 32 °C, with the same stirring used. The amount of glucose obtained in the hydrolysis was determinate by High Performance Liquid Chromatography (HPLC) with refractive index (IR) detector. In the hydrolysis at 32°C the cellulose conversion to glucose was 81%. The results of ethanol generated by the fermentation were determinated by HPLC and the porcentaje of ethanol obtained of each fermentation with each yeast were of

66.22% for *Saccharomyces cerevisiae*, *Candida kefyr* 50.15%, *Candida guilliermondii* 45% and *Candida tropicalis* 61.47%.

The results show that all yeasts generated ethanol, even when the fermentation time was only 24 hours. In the hydrolysis at 32°C were obtained encouraging results, as in fermentation for 24 hours at the same temperature. Based on these results was realized the simultaneous processing with rice hulks to 48 hours with temperatures between 35 and 37°C.