CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Imran Ahmed; Elma Frias; Shanta Hareesh

Project Number

S0401

Project Title

Analysis between ADC Green and Wood Waste Using the Processes of Post-Hydrolysis vs. Enzymatic Hydrolysis and K-ligni

Abstract

Objectives/Goals

Because of the various environmental concerns, cellulosic ethanol was tested as a possible renewable fuel source. Both ADC green and wood waste were tested in order to produce ethanol and possibly even resolve many human and environmental concerns. Unfortunately, the high cost and time in producing the ethanol conflict with the benefits such as decreased foreign dependency and carbon emissions. If the project could be repeated, more samples would be used and other forms of biomass would have been tested.

Methods/Materials

The first process was milling the biomass to a compost texture using the miller. After the biomass was altered pretreatment was done by using the sand-bath to break down the cellulose so the enzymes could have access to the hemicellulose and lignin. After the lignin fibers were broken down, the pretreated biomass was separated into a liquid and solid form. To determine the amount of sugar in the solid form, the processes of enzymatic hydrolysis and K-lignin were conducted. Enzymatic hydrolysis involved the usage of novazyme and spezyme on a neutralized sample of the solid biomass. K-lignin involved adding sulfuric acid to the solid sample, followed by placing it in the water bath; the sample was then placed in the autoclave. Then, the sample went through filtration; the collected solid was placed into the oven to dry out and then it was ashed.For the liquid sample, the process of post-hydrolysis was done, which involved testing the pH, followed by adding additional acid, and placing the samples into the autoclave to be later neutralized using calcium carbonate. The sugar levels of all the samples collected were analysis using the High Performance Liquid Chromatography machine.

Results

In the post-hydrolysis using ADC green, the glucan and xylan percentage yields were 11.9% and 83.6%. In the post-hydrolysis using wood waste, the glucan and xylan percentage were 8.2% and 93.3%. In the K-lignin process using ADC green, the glucan and xylan percentage yields were 86.72% and 7.42%. In the K-lignin process using wood waste, the glucan and xylan percentage were 83.11% and 6.44%. In the combined solid and liquid after pretreatment analysis using ADC green, the glucan and xylan percentage yields were 98.57% and 91.03%. In the combined solid and liquid after pretreatment analysis using wood waste, the glucan and xylan percentage yields were 91.29% and 99.76% respectively.

Summary Statement

This experiment focused on the production of cellulosic ethanol from ADC green and wood waste using the processes of K-lignin, enzymatic hydrolysis, and post-hydrolysis; geared to research any possibility of replacing gasoline with ethanol.

Help Received

Mirvat Ebrik, Vu Nguyen, and Jian Shi overlooked our project [UCR: CE-CERT]