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MASSACHUSETTS CLEAN TECHNOLOGY AWARDS

A Program from The Foresight Project Inc; www.theforesightproject.org



Region II: Central Massachusetts

Jessica DiFazio: Hopkinton High School, Hopkinton

CleanTech Award: *"Grassahol: An analysis of Grasses and Pre-Treatment Methods"*

About Me:

My name is Jessica DiFazio and I am from Hopkinton, Massachusetts. I am interested in pursuing engineering. My family and I enjoy the summer and being outside. We have a place in New Hampshire where we like to spend much of our time swimming and I especially like driving the boat.

I am a goalie and play soccer nine months out of the year as well as throw discus in track. Performing in music groups is another of my hobbies; I play the saxophone in jazz band and a bassoon in more classical ensembles. My favorite new hobby is driving my car. I just received my license and it is awesome. However, my favorite pass-time is just playing outside with my friends.

My Project:

Ethanol is a good bio-fuel, but using corn has raised concerns that it will increase food prices humans and livestock. Corn also is a very high intensity use of the land, depleting the soil, and requiring in most cases a heavy use of fertilizers and pesticides. As an alternative ethanol source, I investigated stalky grasses; these have an advantage in that they grow in poor soil unlike corn. However, they have a very high cellulose content that needs to be broken down before any fermentation to produce ethanol. For my project, I looked at various grasses as well as various pretreatment processes to improve hydrolysis.

I tried five different coastal grasses: Calamagrostis, American Beach, Agrostis, Silverfeder and Switch grass (the current accepted grass for production of ethanol). I tested three pre-treatments: chopping, freezing, and liquid nitrogen immersion. My results showed that by treating the grasses with a cryogenic liquid which rapidly expands to a gas, ruptures the lignin casings and cellulosic membranes and enables the cellulose enzymes to more easily digest the cellulose resulting in an overall increase in total ethanol yield.

The post-hydrolysis glucose results determined by spectrophotometry established that Calamagrostis had the highest yield and greatest response to the pre-treatments. The results indicate that coastal stalky grasses can be used as alternative sources of ethanol and expansion pre-treatments can increase the ethanol yield.