Ethanol Production from Sugar Beet Pulp

Objective

To determine the technical feasibility of sequential enzyme treatments to produce separate fermentable sugar streams to increase cellulose loading rates and ethanol titers from sugar fermentation. Separate sugar streams also may be fermented into other higher-value fuels or chemicals.

- Minimal additional costs for harvest, storage or transportation of sugar beet pulp
- Elimination of drying and pressing processes for pulp; energy for drying is estimated at $80/ton
- Low lignin content (<2%) leads to elimination of costly thermochemical pretreatment required for most other biomass feedstocks
- Sugar beet pulp has a high carbohydrate content consisting mainly of cellulose, hemicellulose and pectin
- Cellulose, hemicellulose and pectin components are readily hydrolyzed by commercial enzymes

Impact

- North Dakota and Minnesota produce 15.8 million tons of sugar beets per year, which is more than 50% of total U.S. production
- 750,000 dry tons of low-value pulp remain after sucrose extraction in North Dakota and Minnesota
- North Dakota and Minnesota could produce 75 million to 90 million gallons of ethanol per year if all carbohydrates in beet pulp (70-75%) can be used

Benefits

- Relatively small production scale on a processing plant basis
- Relatively low level of cellulose content
- Large pectin levels not typical of most lignocellulosic biomass
- Hemicellulose component has different composition than most biomass feedstocks

Challenges

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- 750,000 dry tons of low-value pulp remain after sucrose extraction in North Dakota and Minnesota
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