BRC Science Highlight
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Economic Analysis of Cellulosic Ethanol Production from Sugarcane Bagasse Using a Sequential Deacetylation, Hot Water and Disk-Refining Pretreatment

Background/objective

Many factors can influence the economics of the cellulosic ethanol production process. Here researchers evaluated the economic feasibility of a new cellulosic ethanol process implementing deacetylation followed by combined liquid hot water (LHW) and disk refining of sugarcane bagasse.

Approach

- Modeled solids loadings of 10% and 16% by mass with plant capacity constant at 200 tonnes/day bagasse.
- Used SuperPro Designer software to estimate economics of three-stage deacetylation, hot water pretreatment, and disk milling pretreatment.
- Analyzed sensitivity of overall process economics to variation in disk milling energy use, hydrolysis efficiency, solids loading, and feedstock cost.

Results

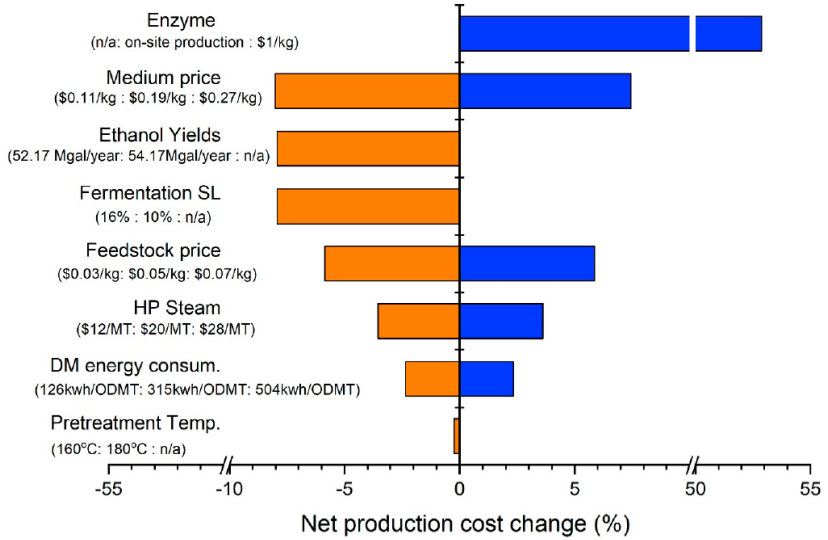
- 10% solids loading achieved slightly greater conversion efficiency (94%) than 16% solids loading (91%).
- Improved steam recovery and decreased enzyme costs are key for reducing ethanol production cost and MESP.

Significance

These results provide valuable insights into the factors influencing the economic feasibility of ethanol production from sugarcane bagasse, an abundant lignocellulosic biomass feedstock. This analysis will be used to inform future pilot-scale studies.

Production cost and MESP of ethanol from sugarcane bagasse

Solids loading	Ethanol yields	Production cost	Net production cost	MESP	Payback time
Scenario	Mgal/yr	$/gal	$/gal	$/gal	year
10%	54.17	4.48	4.16	4.90	8.91
16%	52.22	4.23	3.83	4.52	8.91



10% solids loading yielded slightly higher ethanol yields than 16%, but at a slightly higher cost (top). Production cost was especially sensitive to enzyme production cost and solids loading (bottom).

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