Phenotypic Evaluation of Saccharum spp. Genotypes During the Plant-Cane Crop for Biomass Production in Northcentral Mississippi

CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

Background/Objective

- Sugarcane (*Saccharum* spp.) has potential as a bioenergy crop, but its tropical origin and lack of cold tolerance limits production from cooler latitudes. *S. spontaneum* readily hybridizes with commercial sugarcane and lends cold tolerance and greater yield to the hybrid progeny, called energycane. There have been numerous new hybrid and backcross energycane genotypes developed at USDA Sugarcane Research Unit, but there is a paucity of information about how they perform in more northerly latitudes.
- In this study we asked the questions: Do new genotypes meet or exceed the same survival and yield as the control? Do they vary meaningfully in other traits used for bioenergy? To answer these questions, we tested 20 new genotypes at the same extreme north location used in 2018.

Approach

Twenty energycane genotypes were tested in the first season of growth from cane propagules (plant cane) against Ho 02-113 (the control) for two site-years in northcentral Mississippi. The objective of this study was to determine if any of these 20 genotypes exceed the abilities of Ho 02-113 at 33° N latitude to produce fermented and cellulosic ethanol by measuring yield, °Brix, and percentage cellulose.

Results

Except for percentage cellulose, all factors tested (dry matter yield (DMY), extractable juice volume, °Brix, theoretical ethanol from fermentation, theoretical ethanol from cellulose, and total theoretical ethanol (TTEY)) were greater from the second site-location compared to the first. DMY and TTEY were moderately correlated. Over the two years of this test, only Ho 14-9213 exceeded in mean DMY of Ho 02-113. Sixteen of the 19 test genotypes in this test equaled or exceeded the mean TTEY of Ho 02-113.

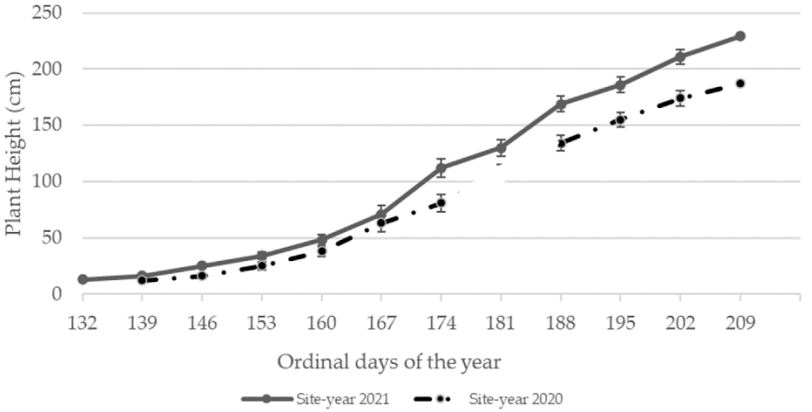

Fig. 1. Mean plant height (cm) of 20 energycane genotypes during the 2020 (dash) and 2021 (solid) growing season during the plant cane year.

Significance/Impacts

Genotypes with consistently poor yield and ethanol output are not a benefit to the energycane breeding program, and testing such as this gives justification for dropping these genotypes (or their parents) from the program. Additional, actual on-site testing is necessary to identify genotypes that are suited for biomass production (as well as bioenergy production) in areas north of the traditional *Saccharum* cultivation locations.

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