

Field Productivities of Napier Grass for Production of Sugars and Ethanol

Background/objective

Napier grass (*Pennisetum purpureum* (L) Schum) is being developed as a perennial bioenergy crop for production in the southeastern United States. This study addresses gaps at the nexus of feedstock production and processing, examining the interdependence of crop production management and conversion to bioethanol.

Approach

- ❖ Napier grass was grown in field plots (Shellman, Ga.) with three different harvest and fertilizer application regimes for four growing seasons.
- ❖ Biomass production was measured for each season.
- ❖ Harvest samples from two years were analyzed for chemical composition and bioprocessed for production of sugars and ethanol.

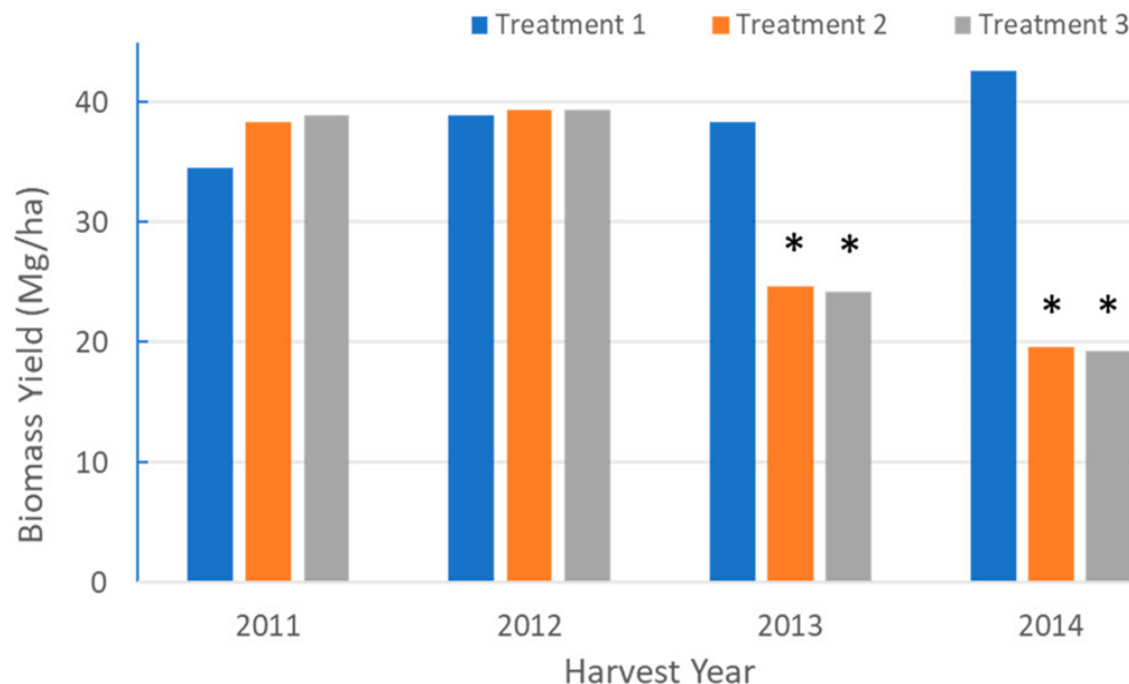
Results

- ❖ Biomass harvesting once per year was optimal for bioenergy production. Twice-per-year harvest led to a drastic yield losses beginning in Year 3 (see figure).
- ❖ Under optimal production conditions, Napier grass was able to yield 9,040 – 12,800 L of ethanol per ha using a moist ammonia pretreatment coupled with fermentation by a xylose-fermenting yeast.
- ❖ Ethanol yield per unit biomass did not differ significantly between the three harvest and fertilization regimes, indicating that managing Napier grass to maximize biomass production is more important for maximizing ethanol yield.

Significance

This work demonstrates that optimization of harvesting regime is critical for maximizing ethanol yield from Napier grass. This factor should be considered in the development of other perennial grasses as bioenergy feedstocks.

Dien, et al., 2020. "Field Productivities of Napier Grass for Production of Sugars and Ethanol." *ACS Sustainable Chemistry & Engineering* 8(4):2052-60. doi.org/10.1021/acssuschemeng.9b06637



Biomass yield of Napier grass over four years for three treatments: 1 — May fertilize, December harvest; 2 — May fertilize, harvest in June and December; and 3 — half-fertilize in May, harvest in June, half fertilize in June, harvest in December.