Field study of COMT transgenic switchgrass

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Background

Lignin in the secondary walls of switchgrass limits accessibility to sugars; genetic modification to the lignin biosynthetic pathway could improve cost-competitiveness of biofuel production from lignocellulosic feedstocks. Earlier work with greenhouse-grown COMT RNAi switchgrass was promising in sugar release and biofuel production.

Approach

- A two-year field study using two independent transgenic events (COMT2 and COMT3) were conducted to:
  - verify that RNAi-mediated silencing of COMT was stable in transgenic tissues and that the expected modification to lignin content and composition were retained in field- grown plants,
  - characterize the chemical composition of the cell wall and to assess whether the improved sugar release efficiency and ethanol yield were maintained in field-grown plants, and
  - investigate potential impacts of COMT-downregulation on agronomic performance and susceptibility to disease.

Outcomes

- The lignin-modified transgenic switchgrass had similar gains in sugar release (up to 34% higher) and biofuel production (up to 28% higher) as observed when comparing transgenic and control plants grown in the greenhouse.
- The greenhouse-grown experimental plant tissue was live and green, compared with the senesced, brown tissue harvested at the end of the growing season from the field experiments.
- The COMT2 transgenic event yielded over 50% more liters of ethanol per hectare compared with the control, which demonstrates that transgenic feedstocks could make important improvements in lignocellulosic biofuels.

Significance

- This is the first reported field study evaluating biofuel potential of transgenic switchgrass with reduced cell wall recalcitrance.
- This report shows that conversion phenotypes can be maintained in the field.

Baxter, *et al.*, "Two-year field analysis of reduced recalcitrance transgenic switchgrass," *Plant Biotech J,* 12:7 (914-927) 2014. doi: 10.1111/pbi.12195

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