Key traits leading to reduced recalcitrance remain stable following three years of field trials

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Background

- Down-regulation of the caffeic acid *O*-methyltransferase (*COMT*) gene in the lignin biosynthesis pathway of switchgrass has been previously shown by BESC to improve the thermochemical and biochemical conversion of biomass, i.e., to reduce biomass recalcitrance.
- Further study of the physicochemical changes and their consequences in field-grown plants is an essential step in evaluating and demonstrating the improved performance of lignin-altered plants.

Approach

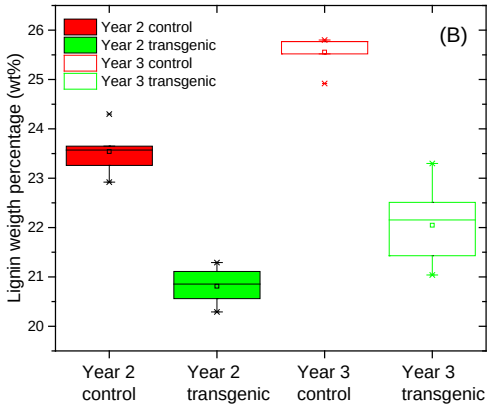
- Chemical composition, cellulose crystallinity and the degree of polymerization, molecular weight of hemicellulose, and cellulose accessibility were measured in down-regulated COMT switchgrass following growth in the field for 2 and 3 seasons.

Outcome

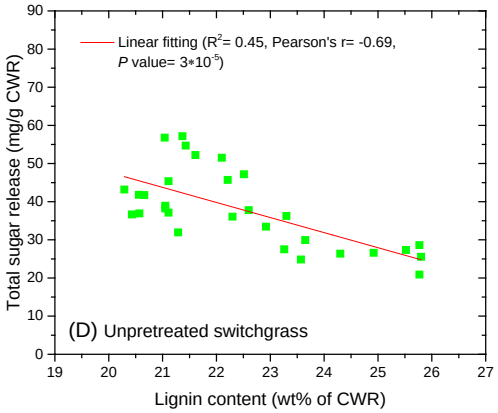
- Reduced lignin content and resultant reduced biomass recalcitrance remained stable in field-grown trials for at least three seasons.
- Decreased lignin content and increased biomass accessibility were shown to be stronger factors in reduction of recalcitrance than other factors measured.

Significance

- The originally reported improvements in biomass cellulose accessibility wrought by down-regulation of COMT in switchgrass have remained stable following three years of field trials.
- Demonstrating stability of introduced traits for improved biofuel production in bioenergy crops is an important proof-of-principle on the path toward long-term validation of such approaches.



Lignin (wt%) distribution



Correlation of sugar release with lignin content

Li, M. et.al., "Study of traits and recalcitrance reduction of field-grown COMT down-regulated switchgrass" *Biotechnol Biofuels* (2017). DOI: 10.1186/s13068-016-0695-7

BESC BioEnergy Science Center