

Field performance of modified switchgrass demonstrates a “Goldilocks Effect”

Background

- Study assessed the field performance of transformed switchgrass plants that demonstrated low recalcitrance in a greenhouse setting. These transgenic plants overexpress the switchgrass MYB4 (PvMYB4) transcription factor gene, which regulates the expression of several lignin biosynthesis genes.

Approach

- Data were compared from the field and the greenhouse experiments to assess the degree of congruency for cell wall traits, sugar release efficiency and ethanol yield. Agronomic performance and rust susceptibility were also evaluated.

Outcome

- Over two growing seasons results showed that one transgenic event (out of eight) had important yield gains in both biofuel (32% increase) and biomass (63% increase) at the end of the second growing season, while some lines did not survive the winter.

Significance

- This study showed that too high PvMYB4 transgene expression is fatal to plants in the field, whereas too low expression shows no difference from controls; but when optimal expression is achieved the altered switchgrass produces higher biomass and biofuel yields.
- These gains represent the potential for a doubling of biofuel production per hectare over conventional feedstocks. This is the highest potential gain reported to date from any field-grown modified feedstock.



Photos of the field experiments in the first (2012) and second (2013) growing seasons. (a) July 3 2012: day of transplantation; (b) August 1 2012; (c) August 1 2013; (d) December 11 2013