Field grown transgenic switchgrass has no negative affect on soil chemistry, microbiology or carbon storage potential

U.S. DEPARTMENT OF ENERGY | Office of Science

Background

BESC has demonstrated that when shoot S/G lignin ratio is decreased in switchgrass, greater yields of biofuel can be produced; understanding agronomic consequences of such changes is important to proving industrial value of engineered biofuel crops.

Approach

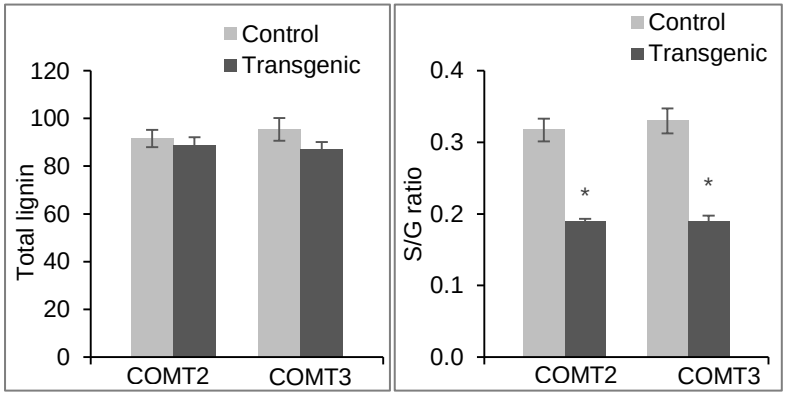
Two independent caffeic acid *O*-methyltransferase (COMT) downregulated transgenic lines and their non-transgenic controls were studied in the field for five years to determine whether engineered changes in lignin composition would affect soil chemistry, microbiology, and carbon cycling.

Outcomes

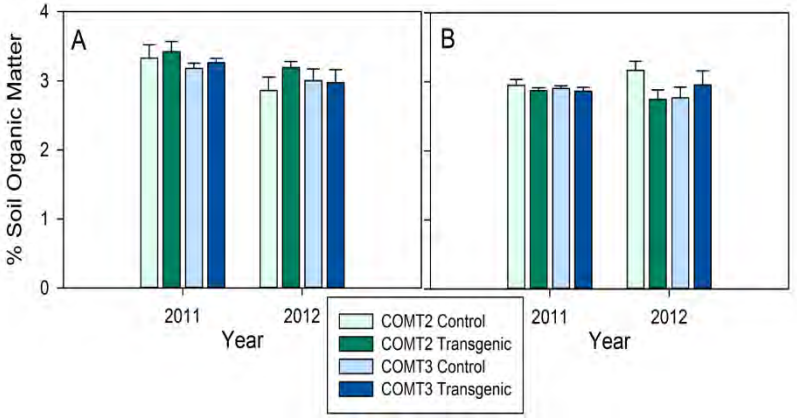
- No soil differences were observed between transgenic and control plants in terms of pH or the total concentrations of 19 elements.
- No effects were observed on microbiome (mainly bacterial) diversity, richness, or community composition.
- No changes in the capacity for soil carbon storage were observed.
- Switchgrass-contributed carbon was not significantly different between transgenic and control plants, but switchgrass did play a role in increasing carbon sequestration in the soil.

Significance

COMT-altered switchgrass appears to be substantially equivalent to non-engineered switchgrass with regards to soil and microbiome properties.



Total lignin content and syringyl-to-guaiacyl (S/G) lignin ratio in the roots of COMT-downregulated transgenic switchgrass lines and corresponding non-transgenic controls.



Mean soil organic matter in the upper 0-15 cm (A) and deeper 15-30 cm (B) during the first two growing seasons in soils below transgenic (dark colors) and control (light colors) switchgrass plants.

DeBruyn, JM., Bevard, DA., Essington, ME., McKnight, JY., Schaeffer, SM., Baxter, HL., Mazarei, M., Mann, DGJ., Dixon, RA., Chen, F., Zhou, C., Wang, Z-Y., Stewart, CN. Jr. (2016). Field grown transgenic switchgrass (*Panicum virgatum* L.) with altered lignin does not affect soil chemistry, microbiology and carbon storage potential. *Global Change Biology Bioenergy*, DOI: 10.1111/gcbb.12407.

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