Switchgrass Produced with 34% D/H Substitution by Hydroponic Cultivation for Neutron Scattering Experiments

Objective:

- Produce switchgrass biomass with deuterium incorporation of 30-40% for contrast matching in neutron scattering experiments

Approach:

- Develop methods for long-term cultivation of switchgrass in D_2O/H_2O mixtures, produce biomass from control and deuterated plants, and analyze isotopic content and chemical composition

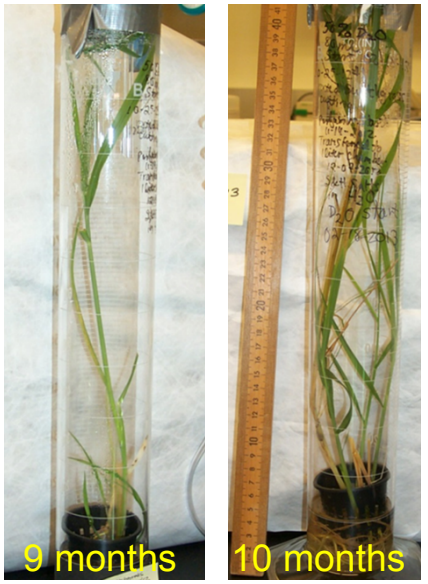
Results:

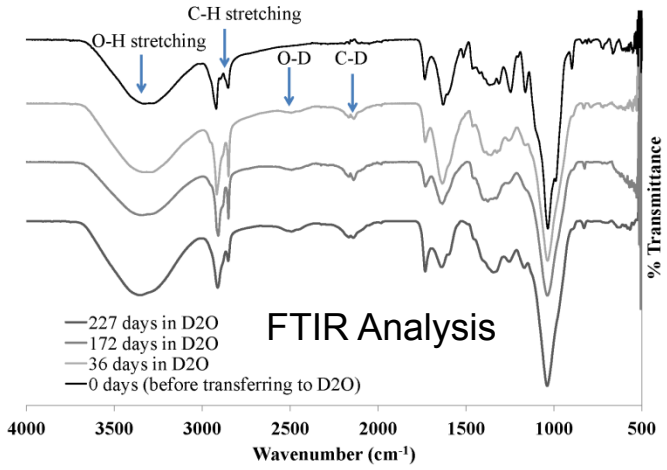
- We developed a method for vegetative propagation of hydroponic switchgrass plants from tiller cuttings
- We demonstrated a perfusion system with multiple individual growth chambers for simultaneous cultivation of control and experimental plants
- We produced 34% deuterated switchgrass (leaves and tillers) by cultivation in 50% D_2O
- We characterized of deuteration, chemical composition, and physical properties of deuterated switchgrass to be similar to protiated controls with slightly altered lignin.

Significance:

- First samples of sufficiently deuterated switchgrass will extend SANS and NMR capabilities for investigation of biomass structure and deconstruction.
- Methods employed for switchgrass will be applied for deuteration of other bioenergy crops

Switchgrass in 50% D_2O





Part of the BER Biofuels SFA at ORNL

Evans, BR, G Bali, M Foston, AJ Ragauskas, HM O'Neill, R Shah, J McGaughey, D Reeves, CS Rempe, BH Davison, "Production of deuterated switchgrass by hydroponic cultivation," *Planta*, in press, 2015 Contact: evansb@ornl.gov

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