Evaluation of various storage treatments and storage times of sorghum biomass and the impact on the conversion to ethanol and fungal ecology

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Goals: Evaluate the impact of storage of biomass on the conversion to ethanol

1. To evaluate the changes (compositional, enzymatic activity) in sorghum biomass when stored under 1 of 4 storage treatments
2. To evaluate the impact storage treatment and storage length has on conversion of biomass to ethanol
3. To evaluate the changes in fungal ecology of sorghum biomass under different storage conditions and storage times

Statement of Problem:
In 2007 the Energy Independence and Security Act (EISA) was instated by the US Government. It set forth the Renewable Fuel Standard (RFS) program. The RFS set volumetric standards for cellulosic biofuel, biomass-based diesel, advanced biofuels and total renewable fuel that must be used in transportation fuel each year in the US, with requirements of 36 billion gallons of total renewable fuels by 2022, with 16 billion gallons produced using the cellulosic platform. Focusing on second generation biofuels (cellulosic) has created many challenges including harvest, storage, handling and transportation of biomass. Many cellulosic feedstocks are harvested annually or biannually requiring extended storage to supply a biorefinery throughout the course of a year. To date little research has been done to evaluate the impact biomass storage has on the production of second generation biofuels. To determine the impact of biomass storage, photoperiod-sensitive sorghum biomass was harvested, baled into small square bales and stored under 1 of 4 storage conditions: no plastic/no tarp, no plastic/tarp, plastic/no tarp or plastic/tarp. Bales were stored for six months with sampling every two months. Samples were evaluated for total compositional changes and enzymatic activity related to the degradation of cellulose and hemicellulose. The no plastic/no tarp treatment group was found to have the most dramatic dry-matter losses and highest enzymatic activity compared to bales from the other three storage conditions. The impact of storage condition on the conversion to ethanol and the changes in fungal ecology are yet to be evaluated.

Current Activities:
Currently evaluating enzymatic activity, compositional changes and conversion to ethanol efficiency of sorghum biomass stored as small square bales over a six month period. Evaluation of changes to fungal ecology during storage is also in progress.

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