Approaches to the Development of Sustainable Energy Sorghum Biofuel Feedstocks in Drought Prone and Low Nitrogen Environments

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Website for project: https://sorghumsysbio.org/

Overall project goals:

- Establish a foundational, systems-level understanding of plant, microbial, and environmental interactions that will lead to translational strategies to enhance growth and sustainability of sorghum through improved genetic and microbial adaptations to water and nutrient limited environments.

Specific objectives addressed by this poster:

- Phenotypic characterizations of a diverse panel of sorghum genotypes across multiple years to define the most productive lines under drought and low nitrogen conditions.
- Associate genotypic and environmental effects with improved sorghum performance using robust statistical approaches.

The overall project involves both plant genetics and studies of the soil microbial communities associated with sorghum. In this poster we highlight the progress made towards identifying stress tolerance energy sorghum germplasm using:

- classical methods of measuring biomass
- more advanced approaches using:
    - metabolomic data to predict biomass
    - hyperspectral radiometry to measure nitrogen, chlorophyll and specific leaf area in the field on large populations
    - UAV to measure spectral qualities and temperature of the crop canopy
- chemical analyses such as wax composition and leaf sucrose content.

All of these traits were chosen because of their potentially importance in abiotic stress tolerance in sorghum. Results will be presented on how we are making these measurements, the prediction method and outcomes based on metabolite data, some preliminary wax composition results and canopy temperature data. Next steps being pursued to understand the genetic mechanisms of the variation in these observed traits will also be presented. Ultimately our goal is to understand the mechanisms that are important for abiotic stress tolerance and the underlying genetic factors that will contribute to enhancing the biomass production of energy sorghum for the biofuel feedstocks.

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