231. Genetic Architecture Of Sorghum Biomass Yield Component Traits Identified Using High-Throughput, Field-Based Phenotyping Technologies

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Project Goals: A systems approach (Genome---wide Association Studies; GWAS) will be used to identify the genetic control of rates of photosynthesis, photo- protection, and biomass growth, as well as a series of biomass yield---related plant architecture traits (e.g., plant height, stalk diameter, leaf number, leaf width, leaf length, leaf angle, leaf area index) in the C4 grass sorghum [Sorghum bicolor (L.) Moench], a promising and productive biomass crop.

These experiments will identify SNP markers within or closely linked to the genes that control these traits. Using these identified SNPs it will be possible to predict the phenotypes of sorghum lines based on their underlying genotypes and conduct genomic selection experiments designed to improve biomass yields of sorghum hybrids.

The C4 grass sorghum is one of the most promising and productive plant species for biomass production in the US. One of the key breeding objectives for biomass crops is increased yield, which is affected by growth rate. Genome-wide Association Studies (GWAS) are being used to identify the genetic control of rates of photosynthesis, photo-protection, and biomass growth, as well as a series of biomass- related plant architecture traits (e.g., plant height, stalk diameter, leaf number, leaf width, leaf length, leaf angle, leaf area index). Identifying the genetic control of biomass growth rates will allow breeders to genetically stack genes that control maximal growth rates, thereby paving a path to producing higher yielding hybrids.

To date, most automated phenotyping systems have been laboratory-or greenhouse-based. These systems suffer from the limitation that plant performance in laboratories or greenhouses is often only poorly correlated with field performance. To overcome these challenges, in this study, biomass volumes of a large genetically diverse collection of sorghum lines was assayed at multiple time points during the growing season with a unique high-throughput, field-based phenotyping robot. This robotic system is expected to contribute widely to the genetic improvement of biomass crops of importance to the US economy.

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