

Phenotyping for water use efficiency and related traits in C₄ grasses *Setaria* and *Sorghum*

Jennifer Barrett¹, Darshi Banan³, Allen Hubbard¹, Shrikaar Kambhampati¹, Hui Jiang¹, Xiaoping Li¹, Rachel Paul³, Charles Pignon³, Parthiban Prakash³, Erica Agnew¹, Jennifer Brophy⁴, José Dinneny⁴, Todd Mockler¹, Patick Ellsworth², Asaph B. Cousins², Andrew D.B. Leakey³ and Ivan Baxter¹

¹Donald Danforth Plant Science Center, St. Louis, MO

²Washington State University, Pullman, WA 99163

³University of Illinois at Urbana-Champaign, Urbana, IL 61801

⁴Stanford University, Palo Alto, CA

Project Goals:

This project aims to leverage *Setaria viridis* as a model system to develop novel technologies and methodologies to redesign the bioenergy feedstock *Sorghum bicolor* to enhance water use and photosynthetic efficiencies.

url: www.foxmillet.org

Abstract: Plant growth and water use are interrelated processes influenced by the genetic control of both plant morphological and biochemical characteristics. Improving plant water use efficiency (WUE) to sustain growth in different environments is an important breeding objective that can improve crop yields and enhance agricultural sustainability. However, genetic improvements of WUE using traditional methods have proven difficult due to low throughput and environmental heterogeneity encountered in field settings. To overcome these limitations we have utilized a combination of high throughput approaches that measure physiological and biochemical properties of plants applied to populations of the C₄ species *Setaria viridis* and *Sorghum Bicolor*. Across multiple experiments, we have combined greenhouse and field based methods to control water availability, and leveraged image based phenotyping of plant growth along with methods to visualize root crown initiation, stomatal patterning, leaf physiology, and biochemical measurements of metabolites, transcripts, carbon isotopes and elemental accumulation. By combining these approaches with quantitative genetics populations, we are able to get a more comprehensive understanding of the factors contributing to water use efficiency in these important species.

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