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**Developmental regulation of processes, pathways, and genes that affect stem growth and composition in sorghum**

Identifying useful information for engineering sorghum stem composition for improved conversion to biofuels and bio-products.

**The Science**

We collected sorghum stem RNA-seq transcriptome profiles and composition data for approximately 100 days of development beginning at floral initiation. Our analysis identified more than 200 differentially expressed genes involved in stem growth, cell wall biology, and sucrose accumulation.

**The Impact**

An important next step in energy sorghum hybrid development is to improve biomass composition in order to reduce the cost and improve the efficiency of converting biomass to biofuels and bio-products. The stem transcription profile resource and the genes and regulatory dynamics identified in this study will be useful for engineering sorghum stem composition for improved conversion to biofuels and bio-products.

**Summary**

Optimization of energy sorghum biomass composition for low-cost high-efficiency conversion to biofuels and bio-products will contribute to the economic sustainability of bioenergy production. Some energy sorghum genotypes, generally referred to as sweet sorghums, can accumulate up to approximately 50% of their stem biomass in the form of sugars, principally as sucrose. In this study, we collected sweet sorghum Della stem RNA-seq transcriptome profiles and composition data for approximately 100 days of development beginning at floral initiation. The analysis identified more than 200 differentially expressed genes involved in stem growth, cell wall biology, and sucrose accumulation. Following floral initiation, the level of sucrose and other non-structural carbohydrates increased to approximately 50% of the stem’s dry weight. Accumulation of stem sucrose was correlated with developmental events and differences in gene expression. Overall, the stem transcription profile resource and the genes and regulatory dynamics identified in this study will be useful for engineering sorghum stem composition for improved conversion to biofuels and bio-products.

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**Publications**

McKinley, B. *et al.* “Dynamics of biomass partitioning, stem gene expression, cell wall biosynthesis, and sucrose accumulation during development of *Sorghum bicolor***.”** *The Plant Journal* **88**, 662-680 (2016) [DOI: 10.1111/tpj.13269].

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<http://onlinelibrary.wiley.com/doi/10.1111/tpj.13269/abstract>

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