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**Dynamics of gene expression during development and expansion of vegetative stem internodes of bioenergy sorghum**

Information on stem anatomy and gene expression to improve sorghum biomass yield and composition.

**The Science**

Bioenergy sorghum accumulates 75% of shoot biomass in its stem internodes. To identify genes and molecular mechanisms that modulate the extent of internode growth, we conducted microscopic and transcriptomic analyses of four successive sub-apical vegetative internodes representing different stages of internode development of the bioenergy sorghum genotype R.07020.

**The Impact**

In bioenergy C4 grasses such as energy sorghum, where stem biomass is the major yield component, detailed information on vegetative stem growth, development, and gene expression may be useful for improving biomass yield and composition.

**Summary**

Grass stem internodes are formed during vegetative growth and elongate in response to developmental and environmental signals. To identify genes and molecular mechanisms that modulate the extent of internode growth, we conducted microscopic and transcriptomic analyses of four successive sub-apical vegetative internodes representing different stages of internode development of the bioenergy sorghum genotype R.07020. Microscopic analyses revealed that all internode tissue types including pith parenchyma and vascular bundles are present in the four successive internodes. Growth in the first two sub-apical internodes occurred primarily through an increase in cell number consistent with expression of genes involved in the cell cycle and DNA replication. Growth of the third internode was associated with an increase in cell length, and growth cessation in the fourth internode was associated with up-regulation of genes involved in secondary cell wall deposition. The expression of genes involved in hormone metabolism and signaling indicates that GA, BR, and CK activity decreased while ethylene, ABA, and JA increased in the third/fourth internodes; auxin signaling is also modified. The expression patterns of transcription factors are closely associated with their role during the development of the vegetative internodes. This study provides a baseline of information on changes in stem anatomy and gene expression that occur during development of internodes in vegetative sorghum plants that may be useful for improving biomass yield and composition.

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**Publications**

Kebrom, T.H., McKinley, B. & Mullet, J.E. Dynamics of gene expression during development and expansion of vegetative stem internodes of bioenergy sorghum**.** *Biotechnology for Biofuels* **10**,159 (2017) [DOI: 10.1186/s13068-017-0848-3].

**Related Links**

<https://biotechnologyforbiofuels.biomedcentral.com/articles/10.1186/s13068-017-0848-3>

**PM Recommendation for SC Web Publication**