A crucial gene controls stem juiciness in sorghum and beyond

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Tall and short sorghum varieties growing in the field. Credit: Dr. Nadia Shakoor, Donald Danforth Plant Science

Perhaps you've never tasted sorghum (*Sorghum bicolor*), the fifth most popular crop in the world, but you probably will soon. This ancient grain is a common source of food in developing countries and is also used to make Baijiu, one of the world's most popular spirits.

Grain sorghum, a tough, drought-tolerant plant with dry, brittle stems, is also used to make products ranging from animal feed to industrial chemicals to gluten-free flour, and it represents a promising source of biofuel. The less common juicy-stemmed sweet sorghum varieties are used to produce a maple syrup-like product. Stem juiciness can make a plant more tolerant to drought, but it can also make it less disease

resistant, and the height of these plants can cause them to topple over in the wind. Understanding how the stem juiciness trait evolved and identifying the underlying gene could help breeders fine-tune this trait in sorghum and other important crops while shedding light on stem water transport in plants.

Over 100 years ago, scientists discovered that stem juiciness is governed by a single genetic locus called Dry. While this genetic region has since been narrowed down to a small area on a single chromosome, moisture levels in sorghum stems can be quite variable, making it difficult to study this trait and pin down the underlying gene.

Through careful genetic analysis of a large, diverse panel of sorghum varieties, scientists at the Chinese Academy of Sciences discovered the gene controlling the stem juiciness trait in sorghum, as described in this month's issue of *The Plant Cell*.

The Dry gene product appears to function as a master switch that controls the expression of many genes that help determine the shape and composition of the plant cell wall. Mutations in the Dry gene in juicy-stemmed sorghum varieties lead to abnormal cell walls and even cell collapse, but the high sugar content in these plants enhances their growth and could lead to increased grain production. It appears that breeders have long been selecting plants with mutations in the Dry gene to increase the efficiency of sorghum syrup production. The authors identified similar genes in other crop species, providing the opportunity to shape the level of stem juiciness in other plants as well.

According to Dr. Thomas Juenger of the University of Texas, "This is an important discovery of an iconic sorghum gene and a great example of an integrative approach using genetic mapping, natural variation, and transgenic manipulations to understand a key factor underlying an important domestication event".

More information: Li-Min Zhang, L.M. et al. (2018). Sweet Sorghum Originated through Selection of the Dry Gene, Encoding a Plant-specific NAC Transcription Factor. *Plant Cell* DOI: 10.1105/tpc.18.00313 , www.plantcell.org/content/earl … 8/09/25/tpc.18.00313