

Tannins in sorghum and benefits focus of genetic research

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They might be called a blessing or a curse -- tannins, which are present in certain sorghums, contain health-promoting antioxidant properties, but also provide a bitter taste and decreased protein digestibility. To better understand tannins, their role in sorghum and how they can be altered to improve sorghum's use as food and feed, a team of scientists led by Kansas State University and U.S. Department of Agriculture researchers, has cloned the tannin gene in sorghum.

[Tannins'](#) high antioxidant, anti-inflammatory and UV-protective functions promote human health, plus recent studies show they can be a tool in fighting obesity because they reduce digestibility, said Jianming Yu, associate professor of agronomy at Kansas State University. Tannins in [sorghum](#) also provide a natural chemical defense against bird predation and bacterial and fungal attack in the field.

On the other hand, tannins provide a [bitter taste](#) to some foods and decrease protein digestibility and feed efficiency in humans and livestock.

The team was led by Yu, along with Tesfaye Tesso, Kansas State University sorghum breeder and associate professor of agronomy and Scott Bean, scientist with the U.S. [Department of Agriculture](#) -Agricultural Research Service (USDA-ARS) and adjunct faculty in the university's Department of Agronomy.

The researchers' study, "Presence of tannins in sorghum grains is

conditioned by different natural alleles of Tannin1" was published in the June 26 issue of the [Proceedings of the National Academy of Sciences \(PNAS\)](#).

Sorghum is an old-world cereal grass that serves as a dietary staple for more than 500 million people in more than 30 countries, Yu said. In 2011, the United States was the No. 1 exporter of sorghum on the world market and the No. 2 producer (behind Nigeria), according to the U.S. Department of Agriculture. In 2011, Kansas produced 110.0 million bushels – 51 percent of the total U.S. crop. Sorghum production in the U.S., primarily for the feed industry, uses non-tannin sorghum hybrids.

Unlike many plants which employ C3 photosynthesis that uses water, carbon dioxide and solar energy to synthesize sugars, sorghum, which performs a modified form called C4 photosynthesis, has adapted to hot environments.

"One key reason to study tannins is to untangle their relationship with cold tolerance, a key agronomic trait to improve sorghum. The work is ongoing," said sorghum breeder Tesso. An earlier screening work found that a high proportion of cold tolerant sorghum lines contain tannins.

"Several other factors make tannins an important research subject," said Bean, noting their antioxidant capacity and relevant health benefits, their natural occurrence in some cereal crops, and their role in sorghum production. "Knowledge of tannins in biosynthesis pathways can be used to generate lines that produce high-content tannins in sorghum and other cereals to promote health through their unique nutritional properties."

This study, like many studies in recent years, benefits from work done several years ago on Arabidopsis, which are small flowering plants related to cabbage and mustard, said Yuye Wu, the first author and Kansas State University research associate of agronomy. "Many genes

have been identified in Arabidopsis, through the mutational approach, but there is still much to be learned about the genetic control of tannins in cereal crops."

"This kind of genetic research in crops, coupled with nutritional and medical research, could open the possibility of producing different levels and combinations of phenolic compounds to promote human health," Yu said. What the researchers learn about tannins in sorghum will be beneficial to the future study of tannins in other plants, including some fruits, vegetables and a few other grains such as finger millets and barley.

More information: www.pnas.org/content/109/26/10281.abstract

Provided by Kansas State University

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