Science Societies

Robotic System Reveals Genetics of Sorghum Canopy Architecture

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A forage chopper harvesting photoperiod-sensitive sorghum in Boone, IA at the end of the seas

A forage chopper harvesting photoperiod-sensitive sorghum in Boone, IA at the end of the season. Photo by Joshua Kemp, Iowa State University.

The complexity of certain plant features makes their characterization and improvement challenging. Canopy architecture, the arrangement of plant organs in space, contributes to important morphophysiological traits, impacting crop production and yields. Technologies like high-throughput phenotyping systems (HTPS) facilitate data collection, especially for dynamic traits evaluated multiple times during a growing season.

Canopy architecture is remarkably diverse in sorghum with grain-type and photoperiod-sensitive cultivars presenting distinct characteristics. Untangling the genetic mechanisms behind these dynamics is essential for improving performance and developing high-yielding cultivars.

An interdisciplinary team from Iowa State University studied canopy architecture dynamics in more than 600 sorghum varieties using a ground-based robotic HTPS called Phenobot 1.0. They used it to generate 3D representations of the canopy, estimate growth rates, and investigate genomic regions contributing to canopy growth. Whereas grain types showed larger variability, photoperiod-sensitive sorghums displayed higher growth rates. The researchers identified genes related to lignin biosynthesis and growth regulators for validation and manipulation of canopy architecture dynamics in sorghum.

This study demonstrates the value of in-field HTPS. It also provides information for use in sorghum breeding pipelines to obtain superior cultivars that contribute to profitability and sustainability in farmers' fields.

Adapted from

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