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The Role of Brassinosteroids in the Development of Sorghum

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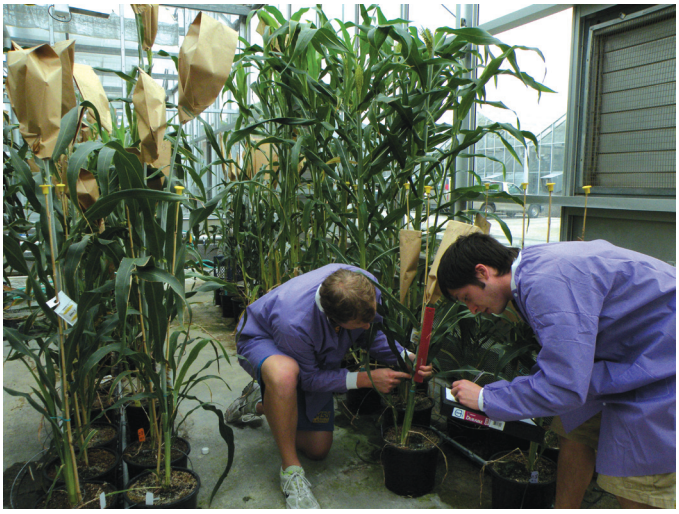
Current day seed sorghum stocks contain up to four dwarf genes that minimize the size of vegetative parts and increase harvest index. To date, only the *d3* dwarf gene has been characterized molecularly. The gene encodes a homolog of the *Arabidopsis* and maize ABC transporter ABCB1, which is associated with polar transport of the plant growth hormone auxin. The mechanism behind the other dwarf mutations is currently unknown. Brassinosteroids (BRs) have a profound effect on development of monocot species, as they are involved in cell division, cell elongation, and sex determination. Mutations in the biosynthesis or the reception of BRs result in shorter, stunted plants (dwarf). This project aims to determine the role of BRs in growth and development of sorghum.

We developed a strategy to phenocopy a BR mutant by treating sorghum plants (Tx623) with the potent brassinosteroid inhibitor propiconazole (PCZ). PCZ is a chemical inhibitor of the rate-limiting step of BR biosynthesis in plants. The compound is also used commercially as fungicide to treat turf grass diseases. After analyzing the growth retardation effect of PCZ, we performed a phenotypic screen in a mutagenized sorghum collection provided by Professors Clifford Weil and Mitchell Tuinstra (Department of Agronomy).

The results showed that the PCZ-treated plants had reduced height (61% and 33% of control for 100µM PCZ and 500µM PCZ, respectively) and tiller number (control = 4.6, 100µM PCZ = 3.3, 500µM PCZ = 1.4). Surprisingly, yield (8.5g = control, 19.3g = 100µM PCZ, 20.7g = 500µM PCZ) and harvest indices (seed yield/total biomass) (control = 0.09, 100µM PCZ = 0.31, 500µM PCZ = 0.38) were significantly greater in PCZ-treated plants.

Research advisor Burkhard Schulz explains, "Sorghum is one of the most important staple foods in Sub-Saharan Africa and Asia. There is growing interest in it as a biofuel plant and feed for livestock. The research performed by William and Neil provides novel possibilities to dramatically improve yield in this important crop."



Data collection on dwarf mutant lines of sorghum.

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