Drought Tolerance

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Drought stress is a major limiting factor to crop yields, even in sub-humid regions like the Missouri Bootheel. Due to common factors such as soils with low available water holding capacities, even short-term drought can impact yield leading producers of rainfed crops to convert to irrigated production. Irrigated farmers are affected by drought as well. Delays in irrigation are common due to equipment maintenance, other demands on labor, the need to allow time for pesticide and/or fertilizer applications, and water supplies shared among multiple fields and/or crops.

Seed companies have devoted much effort to improving drought tolerance in crops. Pioneer[1] introduced non-transgenic "AQUAmax™" corn hybrids in 2011 and Monsanto plans to release biotech drought-tolerant corn in 2013. Similar efforts are ongoing with other crops, including cotton. In some cases, conventional plant breeding strategies are used to enhance desirable traits such as improved nitrogen fixation in soybean or a longer silking window for corn. In other cases, transgenic breeding programs identify plants with greater tolerance to drought stress and transfer selected genes from those plants into agronomic crops.

While the focus for improved drought tolerance has been on production in more arid climates, it can benefit Mid-South producers as well. It could allow a longer time between irrigations, increasing the chances of rain occurring before irrigation is necessary. Improvement in drought tolerance should lead to reduced irrigation requirements for Mid-South crops, which would reduce the water pumped from the region's aquifers as well as the energy required to pump and apply the water. However, research is needed to determine the similarities and differences in optimal irrigation management between currently grown crops and those with improved drought tolerance. Managing irrigation on drought-tolerant crops using the present recommendations based on current cultivars and hybrids will not result in water savings.

USDA-ARS scientists began research at the Fisher Delta Research Center to study the similarities and differences between a Pioneer AQUAmax hybrid and another hybrid recommended for southeast Missouri. The spatially-referenced properties of temperature, reflectance, and height of the crop canopy along with the temperature and relative humidity of the air above the canopy are monitored during the growing season in both irrigated and nonirrigated plots. The large-scale plots will be harvested with a yield monitor so that in addition to total yield, the spatial variability of the yield can be related to spatial differences in soil properties and the crop properties observed during the growing season. Future research will include additional hybrids and other drought-tolerant crops. The results of this research will provide a better understanding of drought-tolerant crops produced in a sub-humid climate and how recommendations for their management will need to differ from current recommendations. Δ

[1] Mention of trade names or commercial products is solely for purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture.

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