Timing of Episodic Drought on West Texas Cotton Cultivars

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Introduction
Recent prolonged periods of drought in West Texas have increased the necessity to lower the dependence on the Ogallala Aquifer for cotton production. In cotton production, extended periods of water deficit affect cotton plant growth rate, maturity, boll distribution, and fiber quality. However, extensive research on short term water paucity has not been heavily executed and studied.

Episodic drought is a water deficit that only occurs over part of the growing season. Short-term water stress may occur in many cases such as a period of atypical dry weather, irrigation system breakdowns or hindrances, or the necessity to divert water to another crop at a critical growth stage. Furthermore, many factors may affect a crop’s sensitivity to episodic drought including genotype and crop age.

Increased knowledge of deficit irrigation and episodic drought effects may help to increase the sustainability of the Ogallala aquifer and help improve irrigation management practices. Cotton producers may be able to decrease dependency on irrigation and have better water management strategies.

Objectives
1. Determine the effects of 10 different timings of episodic drought on in-season growth, yield, boll distribution, and fiber quality of six cotton cultivars.
2. Help with production-level decision making in cultivar selection and decision making following drought events.

Materials and Methods

- Six cotton cultivars representing a gamut of genotypes and drought tolerances were planted in West Texas during the 2013 growing season.
- Split plot design with four replicates was used, irrigation was main plot, cultivar was split plot.
- In-season measurements of total nodes, NAWF, and plant height were taken.

Environmental Conditions
The trial was originally planted on May 9, only to be hailed out a few weeks later. The trial was then replanted on June 15th. This replanting led to a shorter growing season for the cotton and only allowed for seven of the episodic drought treatments to be administered. The cotton thus did not have as much time as it might in a typical growing season to mature.

The 2013 growing season once again turned out to be a below average year for rainfall in West Texas. Even though there was not copious amounts of rainfall, there were some timely precipitation occurrences that may have caused there to be less separation between treatments. Still, separation was evident in both maturity and yield.

Results: Boll Distribution
Differences in boll distribution were distinct among episodic drought treatments in 2013.
- The earliest maturing treatment was the one that ended the episodic drought 3 weeks after first square.
- The control, which had no drought, was one of the latest maturing treatments.
- When cotton was stressed at FS, it still tended to mature later.
- Most treatments that experienced drought later in the season matured earlier.

Results: Yield
Differences in yield were distinct among episodic drought treatments and cultivars in 2013.
- The control, which had no drought treatment, surprisingly did not yield the most.
- It most likely did not have time to mature fully.
- When the cotton was stressed at 1 week after FS it yielded the best.
- When cotton was stressed at 5 weeks after FS it yielded the worst.
- Overall, DP 1212 had the greatest yields in the study.
- DP 1219 had the least amount of yield.
- Typically, if a cultivar was an earlier maturing variety, it had a greater yield because of the short growing season.

Conclusions
Cultivars in this study exhibited similar responses to episodic drought (no cultivar by irrigation interaction). It was evident that the maturity of a variety based on boll distribution and the occurrence of episodic drought at certain points in the growing season had a discernible relationship with final yield. More in depth analysis on cotton fiber quality, as well as boll distribution related to maturity and episodic drought is planned for the future.

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