COTTON MATURITY AND YIELD RESPONSE TO VARIOUS IRRIGATION SCHEDULES IN THE OKLAHOMA PANHANDLE

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Abstract

Cotton producers in short season environments must capitalize on a short window of heat units to ensure a profitable crop. In arid environments such as the Oklahoma panhandle, avoiding water stress is key to mitigate factors of this region that may result in delayed maturity and yield loss. Previous research has identified growth stage specific water requirements and the benefits and repercussions of water deficit or excess during reproductive growth (Hsiao, 1976; Kramer, 1995). Meeting water demands during the squaring stage is critical to meeting yield goals (Ritchie, 2007), while during flowering, avoiding water stress ensures fiber quality (Burke, 2019). Advancing irrigation efficiency in the Oklahoma panhandle will enable more stable production and eventually provide a reference for irrigation scheduling in this environment (OWRB, 2012). The objective of this study was to evaluate subsurface drip irrigation strategies for cotton in a short season environment to increase yield, fiber quality, and crop value. The hypothesis of this study was that a moderate evapotranspiration (ET) replacement may best fit the short season but low rainfall environment in the Oklahoma panhandle to avoid both maturity issues and water deficit during reproductive growth.

The location of this experiment took place at the Oklahoma Panhandle Research and Extension Center in Goodwell, Oklahoma. The treatments included irrigation zones of four rows, with twenty-four rows total. Each irrigation zone had four rows of border on each side. There were four irrigation treatments, all receiving 10.7 cm of pre-plant irrigation: 90% of evapotranspiration (ET) replacement (90% ET), 36% of ET replacement (36% ET). 90% during squaring, 63% during bloom ET replacement (90/63% ET), and 63% of ET replacement (63% ET). The four varieties planted are: NexGen® 3930 B3XF (NG 3930), Stoneville ® 4480 B3XF (ST 4480), Dyna-Grow ® 3385 B2XF (DG 3385), and Deltapine 2012 B3XF (DP 2012). The plot dimensions where 101 m by 3.04 m, with three replications. The data collected consisted of plant height at 8 leaf, first bloom (FB), 2-, and 4-weeks after FB and nodes Above White Flower (NAWF) at FB, 2-, and 4-weeks FB. Then whole plots were harvested, lint yield was determined after ginning. A 100 g lint sample was taken for grading and HVI quality testing at the Texas Tech University Fiber and Biopolymer Research Institute. Experimental design was in a randomized complete block design. Our data was analyzed by SAS subjected to analysis of variance (ANOVA) using Proc Mixed in SAS V.9.4. Means separated using Fisher's Protected LSD at $\alpha = 0.05$.

The results of this experiment are as listed. Excess rainfall during squaring and bloom minimized the influence of irrigation treatments. Variety characteristics resulted in differences in plant growth, yield, and fiber quality. This provides insight into varieties that may be successful for irrigated production in this region. The irrigation effect on micronaire suggests that deficit irrigation strategies may prove successful in this short season environment, specifically in seasons with adequate precipitation.

References

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