

**WATER DEFICIT AND IRRIGATION RESPONSE IN UPLAND COTTON**

**Matthew S. Wiggins**  
**Christopher L. Main**  
**University of Tennessee**  
**Jackson, TN**  
**H. Adam Duncan**  
**Brian G. Leib**  
**University of Tennessee**  
**Knoxville, TN**

**Abstract**

Upland cotton varieties are cultivated widely across the United States in various climatic regimes, ranging from the arid Southwest to the humid Southeast. Regardless of production location, water availability proves to be one of the most limiting factors to production systems. Each year in the Mid-South cotton production area there is an increase in the amount of artificial irrigation, thus adding input cost to producers in the area. Therefore this study was conducted to provide insight on deficit and irrigation response in cotton and to provide a better understanding of physiological changes and yield impact on the crop. This study was conducted in 2010 and 2011 at the West Tennessee Research and Education Center in Jackson, TN. Across both years the same variety was used, PHY 375 WRF, and each year had adequate rainfall, receiving 22.7 inches and 14.1 inches, respectively. A No-Till production system was used and plot area measured 19 feet by 30 feet with a seed population ranging from 3.8 to 4 seed per foot. Weed control, plant growth regulator, plant nutrient requirements were met each year by following University of Tennessee recommendations. The objective of this study was to evaluate plant response to four different irrigation regimes by using main-stem node counts and quantifying canopy light interception, while making comparisons across two soils that vary in depth to a sandy layer. Irrigation treatments were applied from drip tape lying in the row furrow at rates of 0, 0.5, 1.0, and 1.5 inches per week. Comparisons were made across two depths to a sand layer of soil, where a deep soil is defined by a depth of 35 inches or greater to a sandy layer and a shallow soil is that of 24 inches or less. Physiological growth indicators such as plant height, number of nodes, nodes above white flower (NAWF), and canopy light interception were monitored during the blooming period of the crop each year to determine differences. Also, yield and fiber quality analysis (micronaire, fiber strength, staple length, uniformity) was conducted post-harvest of the crop. The deep soil in this study yielded more vegetative mass when in comparison with the shallower soil. This is also true when applying higher rates of irrigation where plants gained two more nodes and six inches of plant height. Maturity was significantly delayed in the deep soil and with the application of irrigation. Canopy light interception was increased in plots grown in the shallow soil profile from 48% to 53% when irrigation was applied. Yield and fiber quality were increased significantly with the application of irrigation and with plants located in a deeper soil profile. In summary, these results indicate that significant differences in physiological growth patterns, canopy light interception, yield, and fiber quality are evident when comparing across irrigation amounts and soil depths.