

MULTIDISCIPLINARY APPROACH TO INVESTIGATE THE EFFECTS OF DROUGHT STRESS ON COTTON FIBER QUALITY

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Abstract

Drought is a major environmental stress that reduces cotton yield and fiber quality in the State of Texas. Due to the inherent difficulties of studying fiber tissue and the lack of markers to monitor the fiber development, little is known about the regulation of processes (traits) that are critical to the formation of high quality fiber and the association of these traits with drought tolerance in cotton (their performance under drought stress). Four cotton transgenic lines were planted in the field under three different irrigation levels, with three replicates per condition. On the day of flowering (0 dpa) individual flowers were tagged and developing bolls from at least 8-10 per plants per replicate per irrigation level were harvested at critical stages from 10 to 56 dpa. Mature fibers were hand-harvested at the end of growing season. Multidisciplinary approach was used to investigate the effects of drought stress on fiber development. To detect the effect of drought stress on the structural changes of fibers and to identify the timing of the transition from primary cell wall synthesis to the secondary cell wall deposition, Fourier Transform Infrared spectroscopy (FTIR) and Thermogravimetric Analysis (TGA) were used. The effects on fiber quality traits of mature fibers were determined by High Volume Instrument (HVI), Advanced Fiber Information System (AFIS), and image analysis of fiber cross-sections.