PHYSIOLOGICAL BASIS OF PALMER AMARANTH COMPETITIVENESS IN COTTON

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Abstract

Palmer amaranth continues to be a troublesome weed in the southeast, especially in cotton production systems. While yield loss due to Palmer amaranth competition has been widely documented, the basis for this has not been explored. The authors hypothesize that on the sandy soils of the southeast, the main factor driving competition is water rather than light. To test this hypothesis, experiments were carried out in Citra, FL and Tifton, GA in 2013. Cotton was planted in standard fashion and Palmer amaranth seed were sown the day of planting and thinned to 1 plant per plot. Each location had four replications and two treatments 1) 1 Palmer amaranth per plot and 2) a weed free control. Soil relative water content was recorded weekly at 1m depth. Soil moisture data were collected at 0.6 m increments starting at 0 m (adjacent to the Palmer amaranth) and extending 3 m away. Cotton photosynthesis and stomatal conductance was recorded weekly up to 3 m away from each Palmer amaranth plant with a Licor 6400. A sap flow system was installed at each location to determine cotton water movement in the stem, again in relation to a Palmer amaranth plant. Due to excessive rainfall at each location, differences were only found in soil relative water content at 0 to 20cm in depth. Cotton photosynthesis increases linearly ($p=0.0003$) as distance from each Palmer amaranth plant increased. Seed cotton yield also followed this trend ($p=0.0006$) with a 1.5g increase in yield for each foot that the cotton plant was located away from the Palmer amaranth plant. Although dramatic soil moisture depletions were not found during this growing season, another factor, such as light, likely drove cotton photosynthesis reduction and yield loss trends.