EFFECTS OF HEAT STRESS ON COTTON PRODUCTION IN THE LOW DESERTS OF ARIZONA

E.R. Norton
The University of Arizona
Safford, AZ
B. Evancho
The University of Arizona
Tucson, AZ

Abstract

High temperature trends in the low desert of Arizona can have a severe negative impact on cotton production. Heat stress indices have been developed for tracking effects on cotton fruiting patterns and ultimately yield. This protocol evaluates the effects of level two (L2 - crop canopy temperature above 86 degrees Fahrenheit) heat stress on flower formation, pollen shed, fruit retention and distribution, and ultimately yield. A set of 42 pre-commercial and commercial lines were planted at the Maricopa Agricultural Center in Maricopa, AZ. Two varieties included in this trial are known to have significant tolerance to heat stress and serve as controls for comparison. A series of plant measurements and flower viability measurements were collected over the course of the 2019 growing season to evaluate the effects of L2 heat stress on fruiting distribution patterns. These measurements included in season fruit retention, height to node ratios, nodes above white flower, flower morphology, and pollen dehiscence. End of season measurements included a complete plant map including incidence of malformed bolls. Boll samples were also collected to obtain seed index, boll size, and seeds per boll. Final lint yield was obtained by harvesting the plot with a mechanical harvester equipped with load cells. Samples were collected from each plot to determine gin turnout and fiber quality.

The overall objective of this trial is to develop a set of in-field measurements that can accurately describe the heat tolerance level of a given variety. The crop season 2019 was significantly cooler and thus resulted in much lower levels of heat stress than what has been experienced in recent years. Despite lower heat stress in 2019 a significant level of variability in flower morphology, pollen indehiscence and seed properties were still observed and measured. However, little of that data was well correlated with final yield. The measured parameter that was most closely correlated with yield in the 2019 dataset was flower morphology. As the incidence of malformed flowers increased, yield declined. The lack of correlation in yield to the measured parameters is believed to be due to the lack of intense heat stress experienced in 2019. The project will be continued in 2020 in an effort to capture the variability that exists from year to year in heat stress levels.