VARIETAL RESPONSE TO HEAT STRESS DURING REPRODUCTIVE DEVELOPMENT

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Abstract

Cotton grown in the Desert Southwest is commonly characterized as having high yields and high quality lint. However, in the last several years severe and prolonged monsoon weather has adversely affected cotton yield in this region. During the summer monsoon, cotton typically experiences a heat stress as a result of increased atmospheric moisture and high air temperatures. Early optimum planting dates and short season varieties - the main cultural practices employed to minimize monsoon-induced heat stress - are only partially successful since initiation and duration of the monsoon can vary. Therefore, it is imperative that more heat tolerant germplasm be identified. The overall objective of this project is to develop efficient techniques for screening cotton germplasm for heat tolerance. As an initial approach, we examined varietal response to heat stress during reproductive development to identify stages in reproductive development and plant processes that distinguish heat tolerant from heat sensitive varieties. Exposure of greenhouse grown varieties to a moderate heat stress (34 / 29 ºC day/night temperature) relative to control (34 / 23 ºC) had no effect on boll retention with the exception of GC 510 and ST Georgia King, both considered to be heat sensitive. The weight per boll, however, was significantly reduced and the extent of this reduction was variety dependent (variety-temperature interaction significant at P=0.0034). Exposure of varieties to a more severe heat stress (39 / 29 ºC) had a negative impact on boll retention. Daily flower tagging suggested differences in heat tolerant and heat sensitive varieties. GC510, a variety with minimal heat tolerance, exhibited a very quick response to imposition of heat stress. Nearly all flowers tagged in the five days following imposition of heat stress aborted. In contrast, DPL 5415, considered relatively heat tolerant, did not produce a marked decrease in boll retention until six days after imposition of heat stress. Flower abnormalities (extended stigma, anther indehiscence) were observed for all varieties exposed to the severe heat stress starting 14 days after treatment initiation. However, our data shows a significant boll drop prior to the appearance of these abnormalities suggesting that the early boll drop is not a result of these aberrations. Work is continuing to better define distinguishing traits between heat sensitive and tolerant varieties during reproductive development.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1451-1452 (1998)
National Cotton Council, Memphis TN