FOCUS ON QUALITY - BREEDING THROUGH SPINNING: WHAT HAPPENED IN 1999?
THE MID-SOUTH

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Abstract

The question has often been raised about which was the main culprit, environmental stress or genotypic problems, for the disappointingly low yields experienced in the Mid-south in 1999. Last year was not a good year for cotton in the Mid-south, and Arkansas, whose long term yield trends are very similar to those of the Mid-south, was no exception. The average state yield in Arkansas in 1999 was 715 lb. lint/acre compared to the average of 756 lb. lint/acre for the last five years. Boll numbers per acre were high, boll weight was low, and seed number per boll was normal. Fiber quality was generally good with an average staple length of 34.8, a strength of 28.7 g/tex, and a rather high micronaire of 4.7. In general, tobacco budworms were light, plant bugs were moderate, thrips and aphids were localized problems, and bollworms and boll weevils were the main pests, but extremely light. For the most part, insects did not have a major influence on yields.

The crop development pattern in Arkansas showed good, acceptable early-season growth with adequate root growth, good seedling and canopy development, and excellent square set and retention. The weather patterns in 1999 showed near normal maximum and minimum temperatures and adequate rainfall early in the season comparable to the long-term average. However, during the first five weeks of flowering and boll development, temperatures were excessively high and rainfall varied from none to extremely low. The mid-season high temperatures and drought resulted in low boll weight, boll problems, e.g. knotty bolls, and lower than expected yields given the good early-season growth and high square retention.

Although cotton originates from hot climates, it does not necessarily grow best at excessively high temperatures. The ideal temperature range for cotton is 68-86°F. From a physiological point of view, the ideal temperature range for optimal metabolic activity is 74-90°F. Average daily temperatures in July/August in the Mid-south are usually well above 90°F, which is above the optimum for photosynthesis. There is a strong correlation between yield and temperature in Arkansas during the first five weeks of flowering, with *high* temperatures being associated with low yields and *low* temperatures being associated with high yields. High temperatures decrease available carbohydrates because of decreased net photosynthesis (from high day temperatures) and increased respiration (high night temperature), both of which contributed to low boll weight. High temperatures can also cause pollen sterility and decreased fertility resulting in boll shed, lower seed number, malformed bolls, lower boll numbers and lower boll weight. Furthermore, the literature indicates that, in general, high temperatures favor high micronaire.

Drought further exacerbates the effects of high temperature on cotton. This is because the cotton plant needs large amounts of water for evaporative cooling as the water in the transpiration stream evaporates through the stomates in the leaf. The overall result of high temperatures, day or night, and the dry conditions is that there are insufficient sugars to satisfy all the plants needs resulting in increased small boll shedding, smaller boll size, malformed bolls, fewer seeds per boll, and lower yields.

Genotypic differences in response to the hot, dry conditions during boll development were small and localized. There were some reports of differences in cultivar response to the stressful conditions, but in general these cases did not appear to be attributable specifically to cultivar differences. However, there does appear to be a lack of drought and temperature tolerance in the currently available commercial cultivars.

In conclusion, 1999 insect pressures were light, but yields were disappointingly low. This was associated with the excessively hot, dry period during boll development, which resulted in insufficient carbohydrates to satisfy all the plants needs. This resulted in lower yields due to smaller boll size and shorter staple length. Lower yields may have been partially off-set by the extended season and higher micronaire.

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