VARIATION IN FIBER MICRONAIRE, STRENGTH AND LENGTH

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Abstract

The intrinsic properties of cotton fibers are determined by modulation of genetic potential by growth environment. This fundamental hypothesis is strongly supported by the significant and well-documented variations among and within individual cotton fibers and the significant ranges of fiber properties found at the seed, boll, plant, row, field, and bale levels.

Examinations of 12 cotton genotypes grown in different years and locations indicate that genotype and environment and interactions between genotype and environment are significant factors in determining fiber maturity, micronaire, and the micronaire components, fiber wall thickening [maturity] and cross-sectional area. Further, the modulating actions of growth environment on genetic potential are obvious in spatial-distribution of micronaire in field maps obtained in precision agriculture studies conducted in South Carolina and Louisiana. Significant environmentally linked variations in micronaire are also seen among the maximum-minimum ranges within bales from the Louisiana study and between two HVI analyses of those same bales when those analyses were performed by two different testing organizations. Significant variations in micronaire were also found in 186 bales of differing genotypes grown in Louisiana and between the HVI micronaire results obtained for those bales from two different testing offices in Texas and Louisiana. There was little agreement between the two testing offices on how many bales had micronaire levels in the high penalty range.

Fiber strength is more closely linked to genotype than to environment, but genotype-environment interactions are also evident in yarn and fiber strength determinations. No spatially correlated variations were found in fiber strength in the South Carolina Study, but there were zones of high and low fiber elongation percent. Zones of higher fiber strength were visible in the Louisiana field study. Significant variations in strength were found among the sixteen spatially correlated bales that were harvested in the Louisiana study and also among the 186 mixed-genotype bales, also from Louisiana. Marked differences were also found among the HVI strength analyses obtained from the two testing offices.

Genotype alone was more important in determining fiber length, but there were interactions between environment and genotype in the length and short fiber content data. Spatial variation in fiber length was found in the South Carolina precision agriculture study and among the sixteen bales from the Louisiana zoned-management study and the 186 randomly selected Louisiana bales. Unexpectedly, there were also significant differences between the length determinations obtained from the two HVI testing locations.

The data and statistics comparing to the HVI tests indicate that bulk averages currently reported are very poor indicators of the fiber properties present in the total population [bale]. Averages without the corresponding ranges can be very misleading and do not accurately or precisely describe the fiber population within a bale. Also, comparisons of the HVI test results of the same samples from the two testing locations indicate that testing accuracy may be sacrificed for precision and/or speed. At present, management strategies for reducing fiber variability during production are emerging, but both producers and processors are thwarted by the lack of accurate and precise measures of 'target' fiber properties. Cooperation on multiple levels and resolution of the current 'moving target' problems in fiber quality are needed if U.S. cotton growers are to produce good yields of cotton fiber having the properties modern textile mills require.

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