WITHIN CANOPY DISTRIBUTION OF COTTON YIELD AND QUALITY

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Abstract

Cotton is sold by weight, but a bale's lint price per pound is determined by its fiber quality profile. Cotton quality is defined by a set of standardized properties (length, strength, elongation, uniformity, color, trash, and micronaire) collected on every U.S. bale. Each cotton fiber is the remnant of a single cell which upon harvest exists as a dry, hollow tube of crystalline cellulose. The length, perimeter, and thickness are a fiber's physical dimensions. These dimensions influence both the mechanics involved in yarn spinning and the quality of the yarn produced. Genetic and environmental factors affect the development and consequently, the final properties of cotton crops. However, information is lacking about the degree of influence they impart, especially on fiber perimeter (fineness) and cell wall thickness (maturity), both components of micronaire. Small differences between sample's micronaire may be indistinguishable even when dramatic differences in their fineness and maturity are present. The complex interaction between these traits has made breeding efforts difficult. Competing with the uniformity offered by synthetic fibers requires attention to the within-plant variation of cotton fiber quality. Plant mapping was conducted on several upland cotton genotypes across years and locations. Distribution differences were noted for yield and fiber quality parameters. Distribution patterns varied between genotypes both vertically (by node) and horizontally (by position) and have implications regarding genotypic stability and for selection. A uniform fiber quality profile improves cotton's ability to compete with synthetic fibers. The results show that plot sampling techniques can greatly influence fiber quality testing results and as a result the effectiveness of genetic selection. Substantial bias when selecting for yield components and fiber quality can be introduced if boll sampling does not remain consistent within and across populations by considering the fruiting position's harvested. The Cottonscope is a very accurate and precise tool for measuring fiber fineness and maturity ratio. The instrument provided valuable insight into the interpretation of micronaire. The findings of this study demonstrated micronaire had strong correlation with fiber fineness. Thus, breeding for lower micronaire by direct selection can be a useful strategy to improve fiber fineness where fiber maturity is not a problem.