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GENOTYPE-RELATED CHANGES IN FIBER PROPERTY UNIFORMITY ACROSS BOLL LOCATIONS

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Abstract

High length uniformity and reduced short-fiber content are desired by textile manufacturers. Those properties are associated with fewer fiber entanglements, less yarn breakage and fewer yarn irregularities. Lack of uniformity in micronaire values can lead to uneven dyeing. The objective of this study was to compare bulk fiber properties and within plant fiber properties across four genotypes. The cultivars (DP 388, FM 958, PSC 355 and ST 474) were compared. The three-year study was conducted on Gigger silt loam under rainfed and irrigated conditions. Fiber properties were analyzed from 50 boll randomly collected boll samples and boll samples from first position bolls at three canopy locations. The first bolls were tagged the second week of flowering and subsequent bolls were tagged at 7 to 10 day intervals. In two of the three years rainfed yields were below 600 kg ha^{-1} while in 2002 rainfed yields were above 1500 kg ha^{-1}. Irrigated yields were above 1100 kg ha^{-1} each year. The yields reflected the diverse growth environments during the three year period. Bulk fiber properties were averaged over years and rainfed and irrigated treatments were combined. FM 958 had the longest fiber, highest short fiber content (SFC) and the highest coefficient of variation for mean length [L(w) CV]. PSC 355 and ST 474 fibers had the same L(w) CV but different Uniformity Index (UI) values. Based on low SFC, low L(w) CV and high UI, PSC 355 fiber was more uniform than the other three genotypes. As L(w) CV decreased fiber strength increased for all cultivars. FM 958 fiber had a higher theta CV value than PSC 355 and ST 474 fibers. DP 388 and FM 958 fibers had similar micronaire and cross sectional area values but FM 958 had a smaller perimeter than DP 388. When L(w) CV was examined across tagging dates for irrigated cotton in two out of the 3 years L(w) CV was lower in fiber from late season bolls than fiber from early season bolls. The same trend seen in L(w) CV was found in theta CV. Theta CV decreased as cell wall thickness increased. When cross-sectional area was compared across early and late season bolls PSC 355 fiber was more uniform than fiber from the other cultivars. In all cultivars fiber perimeter decreased in late season bolls. Some genotypes manifest greater fiber property uniformity across diverse environments. Selection of cultivars with increased fiber property uniformity makes US cotton more attractive to both domestic and foreign markets.