

IMPROVING COTTON (*GOSSYPIMUM HIRSUTUM* L.) FOR FIBER AND YARN QUALITY

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Abstract

For the last two decades, cotton breeders have used HVI (High Volume Instrument) as their primary and often sole source of fiber quality data when making plant selections. Fiber data generated by AFIS (Advanced Fiber Information System) technology is also now available to plant breeders, and provides additional information on length characteristics and fiber maturity. Two methods of evaluating fiber quality of upland cotton (*Gossypium hirsutum* L.) in a breeding program were compared. Spinning performance of cottons selected using data from each of these methods was evaluated. One method used only HVI data for plant selections while the other method used only data from AFIS. One critical difference between the selection methods was the use of fiber length distributions as the only selection criteria in the AFIS method. Line development began with fifteen intraspecific F_2 populations in 2005. Selections were made in the F_2 and F_3 generations using fiber data generated from either HVI or AFIS instruments. Evaluation continued until F_5 lines were selected in 2007. In 2008, 10 lines from each selection method and 4 commercial varieties were planted at three locations in a RCBD with 4-row plots in 4 replications. Whole plots were harvested and 2 replications were bulked to generate enough lint for a spinning study with 2 replications from each location. Carded and combed 30Ne count ring spun yarns were produced from each of the F_5 breeding lines and 4 commercial varieties. Yarn properties evaluated include skein breaking tenacity, elongation, single-end tenacity, work of rupture, coefficient of variation, thin places, thick places, neps, and hairiness. Combing noils percentage was also evaluated.

Early generation selections were effective as indicated by average fiber properties of selected lines versus average fiber properties of the population. Overall improvement of fiber quality in selected lines was apparent as early as the F_2 generation. F_2 selections from the AFIS method had better overall average fiber quality than F_2 selections from the HVI method, but intense selection pressure in the F_3 generation resulted in similar average fiber quality between the methods. Both selection methods resulted in F_5 lines with better fiber quality and spinning performance than commercial varieties. F_5 lines from both methods had lower short fiber content by number, (SFCn), and a lower percentage of combing noils than the commercial varieties. Results from different locations indicate fiber maturity has a significant impact on length characteristics. Fiber and yarn data indicate it is possible to improve fiber length distribution using either selection method. Principle component analysis (PCA) revealed differences between length distribution of HVI only lines and AFIS lines, even though average fiber properties from each selection method were similar. Yarn properties varied less among the HVI-selected lines, but the best spinning quality came from 2 lines within the group selected using AFIS.

It is important for breeders to understand the relationships that exist between overall fiber quality, specific fiber properties, yarn quality and spinning performance. All of these factors interact and are critical to the development of cottons that can compete in a global market. Understanding these interactions will allow breeders to more effectively use fiber data, from HVI or AFIS, for selection purposes to improve fiber quality.

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