RESEARCH PROBLEM

The University of Arkansas Cotton Breeding Program attempts to develop cotton genotypes that are improved with respect to yield, host-plant resistance, fiber quality, and adaptation to Arkansas environments. Such genotypes would be expected to provide higher, more consistent yields with fewer inputs. To maintain a strong breeding program, continued research is needed to develop techniques that will identify genotypes with favorable genes, combine those genes into adapted lines, then select and test derived lines.

BACKGROUND INFORMATION

Cotton breeding programs have existed at the University of Arkansas since the 1920s (Bourland and Waddle, 1988). Throughout this time, the primary emphases of the programs have been to identify and develop lines that are highly adapted to Arkansas environments and possess good host-plant resistance traits. Bourland (2009) provided the most recent update of the current program.

RESEARCH DESCRIPTION

Breeding lines and strains are annually evaluated at multiple locations in the University of Arkansas Cotton Breeding Program. Breeding lines are developed and evaluated in non-replicated tests, which include initial crossing of parents, individual plant selections from segregating populations, and evaluation of the progeny grown from seed of individual plants. Once segregating populations are established, each sequential test provides screening of genotypes to identify ones with specific host-plant resistance and agronomic performance capabilities. Selected progeny are carried forward and evaluated in replicated strain tests at multiple Arkansas locations to determine yield, quality, host-plant resistance and adaptation properties. Superior strains are subsequently evaluated over multiple

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years and in regional tests. Improved strains are used as parents in the breeding program and/or released as germplasm or cultivars. Bourland (2004) described the selection criteria presently being used.

RESULTS AND DISCUSSION

Breeding Lines
A primary focus of conventional crosses in 2009 was to combine lines having specific morphological traits, enhanced yield components and improved fiber characteristics. In the conventional breeding effort, 24 new crosses, 24 \( F_2 \) populations, 12 \( F_3 \) populations, 18 \( F_4 \) populations, 598 1st year progeny, and 168 advanced progeny were evaluated. Bolls were harvested from superior plants in \( F_2 \) and \( F_3 \) populations and bulked by population. Individual plants (910) were selected from the \( F_4 \) populations. After discarding individual plants for fiber traits, 578 progeny from the individual plant selections will be evaluated in 2010. Also, 168 superior \( F_5 \) progeny were advanced, and 72 \( F_6 \) advanced progeny were promoted to strain status.

Additionally, transgenic forms of Arkot lines crossed with lines possessing nectariless, frego-bract, high-gland, or red-leaf traits were advanced in 2009. The transgenic effort included evaluation of 12 \( F_3 \) populations, 30 advanced progeny, and 8 strains. After discarding for field performance and fiber traits, 18 of the advanced progeny and strains will be evaluated in replicated strain tests in 2010. The strains include eight Round-up Ready Flex frego-bract lines. The frego-bract lines are being developed as part of an effort to evaluate them for use as a trap and/or monitoring of tarnished plant bugs.

Strain Evaluation
In 2009, 108 conventional lines were evaluated in replicated strain tests at multiple locations. Within each test, strains were compared to standard cultivars (DP 393 and SG 105). Based on their performance, 36 of the strains were selected and entered into 2010 New and Advanced Strain Tests. Superior strains exhibited a wide range of lint percentages, leaf pubescence, maturity, and fiber quality. The 2009 New and Advanced Strains were tested for host-plant resistance (tarnished plant bug, bacterial blight, fusarium wilt, and resistance to seed deterioration). Selected lines were evaluated in regional strain tests.

Germplasm Releases
Germplasm releases are a major function of most public breeding programs. In 2009, the Arkansas Agricultural Experiment Station released two cotton germplasm lines, Arkot 9811 and Arkot 9815, which were developed by this breeding program. Both lines have been best adapted to central and south Arkansas test environments. Over all test sites, lint yield, yield components and fiber quality of the two lines were equal to two check cultivars. Additionally, two advanced conventional lines performed very well in replicated strip tests. Both are being considered for variety release in 2010.
PRACTICAL APPLICATION

Genotypes that possess enhanced host-plant resistance, improved yield and yield stability, and good fiber quality are being developed. Improved host-plant resistance should decrease production costs and risks. Selection based on yield components may help to identify and develop lines having improved and more stable yield. Released germplasm lines should be valuable as breeding material to commercial breeders or released as cultivars. In either case, Arkansas cotton producers should benefit from having cultivars that are specifically adapted to their growing conditions.

LITERATURE CITED

