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, and 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 which are highly adapted to Arkansas environments and possess good host-plant resistance traits. Bourland (2007) provided the most recent update of the current program.

RESEARCH DESCRIPTION

Each year, breeding lines and strains are tested 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 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 2007 was to combine lines having specific morphological traits, enhanced yield components, and improved fiber characteristics. In the conventional breeding effort, 12 new crosses, 18 F₂ populations, 18 F₃ populations, 16 F₄ populations, 704 first year progeny, and 228 advanced progeny were evaluated. Bolls were harvested from superior plants in F₂ and F₃ populations and bulked by population. Individual plants (651) were selected from the F₄ populations. After discarding individual plants for fiber traits, 442 progeny from the individual plant selections will be evaluated in 2008. Also, 216 superior F₃ progeny were advanced, and 72 F₄ advanced progeny were promoted to strain status.

Additionally, transgenic forms of Arkot lines were crossed with lines possessing nectariless, frego-bract, high-glanding, or red-leaf traits. The transgenic effort included 10 new crosses, 10 F₂ populations, and 51 first-year progeny. A total of 300 plants was selected from F₂ transgenic populations, and 0 of these will be evaluated as progeny in 2008. After discarding for fiber traits, 34 of the 51 first-year progeny will be evaluated as advanced progeny in 2008.

Strain Evaluation

In 2008, 108 strains 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 2008 New and Advanced Strain Tests. Superior strains exhibited a wide range of lint percentages, leaf pubescence, maturity, and fiber quality. The 2007 New and Advanced Strains were tested for host-plant resistance (tarnished plant bug, bacterial blight, fusarium wilt, root knot nematode, 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 2007, the Arkansas Agricultural Experiment Station released six cotton germplasm lines that were developed by this breeding program. These included Arkot 9608ne, Arkot JJ46, Arkot 9610, Arkot 9620, Arkot 9623, and Arkot 9625. Arkot 9608ne possesses the nectariless trait, which provides some resistance to tarnished plant bugs. All of the lines are worthy or near-worthy of cultivar status relative to yield, fiber quality, and host-plant resistance.
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

