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 (2006) 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

Breeding Lines

A primary focus of breeding-line crosses in 2006 was to combine lines having enhanced yield components and fiber characteristics. Additionally, transgenic forms of Arkot lines were crossed with lines possessing nectariless, frego bract, or high-glanding traits. In 2006, 28 new crosses, 26 F₂ populations 16 F₃ populations, 16 F₄ populations, 1051 first year progeny, and 192 advanced progeny were evaluated. Bolls were harvested from superior plants in F₂ and F₃ populations and bulked by population. A total of 55 F₃ transgenic plants (after discarding for fiber quality and absence of transgenes) and 649 plants (after discarding for fiber quality) from F₄ populations was selected and will be evaluated as progeny in 2007. Also, 228 superior F₅ progeny were advanced, and 72 F₆ advanced progeny were promoted to strain status.

Strain Evaluation

In 2006, 108 strains were evaluated in replicated strain tests at multiple locations. Within each test, strains were compared to standard cultivars (DP 393 or PSC 355 and SG 105). Based on their performance, 36 of the strains were selected and entered into 2007 New and Advanced Strain Tests. Superior strains exhibited a wide range of lint percentages, leaf pubescence, maturity, and fiber quality. The 2006 New and Advanced Strains were tested for host plant resistance (i.e., to tarnished plant bug, bacterial blight, fusarium wilt, root knot nematode) and resistance to seed deterioration. Selected lines were evaluated in regional strain tests and the 2006 Arkansas Cotton Variety Test.

Germplasm Releases

Germplasm releases are a major function of most public breeding programs. In 2006, the Arkansas Agricultural Experiment Station released seven cotton germplasm lines that were developed by this breeding program. These included Arkot 9304a, Arkot 9304b, Arkot 9308, Arkot 9314, Arkot 9506, Arkot 9513, and Arkot RM24. The first four are lines that possess the high-glanding trait (gossypol glands in all parts of the calyx), which provides some insect resistance. 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.

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**LITERATURE CITED**

