University of Arkansas Cotton Breeding Program - 2005 Progress Report

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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 (2005) 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 that 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

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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 breeding line crosses in 2005 was to combine nectarless and nectaried lines with lines having enhanced yield components and fiber characteristics. Additionally, forward crosses of transgenic forms of Arkot lines were initiated. In 2005, 28 new crosses, 16 F₂ populations, 16 F₁ populations, 36 F₄ populations, 738 first-year progeny, and 246 advanced progeny were evaluated. Bolls were harvested from superior plants in F₂ and F₃ populations and bulked by population. A total of 960 plants were selected from F₄ populations, 192 superior F₅ progeny were advanced, and 72 F₆ advanced progeny were promoted to strain status.

**Strain Evaluation**

In 2005, 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 2005 New and Advanced Strain Tests. Superior strains exhibited a wide range of lint percentages, leaf pubescence, maturity, and fiber quality. The 2005 New and Advanced Strains were tested for host-plant resistance [to thrips, tarnished plant bug, bacterial blight, fusarium wilt, seedling disease (*Rhizoctonia solani* Kuehn), root knot nematode, and seed deterioration]. Selected lines were evaluated in regional strain tests and the 2005 Arkansas Cotton Variety Test.

**Germplasm Releases**

Germplasm releases are a major function of most public breeding programs. Twelve germplasm lines were released by the University of Arkansas Cotton Breeding Program in 2005. These included Arkot 9202, Arkot 9203-03, Arkot 9203-17, Arkot 9208, Arkot S23-1, Arkot S23-2, Arkot S23-4, Arkot 9315, Arkot 9409, Arkot 9406ne, Arkot 9605ne, and Arkot 9631ne. The first four lines are worthy or near-worthy of cultivar status relative to yield, fiber quality, and host-plant resistance. The other eight provide potential breeding material for public and private breeders. Developed from exotic cotton germplasm, the Arkot S23 lines enhance the genetic diversity of adapted cotton, and thereby decreases genetic vulnerability of cotton. Arkot 9315 and Arkot 9409 share a common parent and combine good yield potential and early maturity. Arkot 9406ne, Arkot 9605ne, and Arkot 9631ne are improved nectarless lines. Nectarless lines do not secrete nectar, a food source and attractant for plant bugs.
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

