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 to 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 (2013b) provided the most recent update of the current program. The breeding program has primarily focused on conventional genotypes. Conventional genotypes continue to be important to the cotton industry. Transgenic cultivars are usually developed by backcrossing transgenes into advanced conventional genotypes. In addition, the recent advent of glyphosate-resistant pigweed has renewed some interest in conventional cotton cultivars.

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 years and in regional tests. Improved strains are used as parents in the breeding program and/or released as germplasm lines or cultivars. Bourland (2004, 2013a) described the selection criteria presently being used.

RESULTS AND DISCUSSION

Breeding Lines

The primary objectives of crosses made in 2007 through 2013 (F₁ through F₆ generations evaluated in 2013) have included development of enhanced nectariless lines (with the goal of improving resistance to tarnished plant bug), improvement of yield components (how lines achieve yield), and improvement of fiber quality (with specific use of Q-score). Breeding line development is entirely focused on conventional cotton lines.

Each of the 24 sets of crosses made in 2013 was between conventional cotton lines. The primary focus of these crosses was to combine lines having specific morphological traits, enhanced yield components and improved fiber characteristics. The 2013 breeding line effort also included evaluation of 24 F₂ populations, 24 F₃ populations, 24 F₄ populations, 678 1st year progeny, and 240 advanced progeny. Bolls were harvested from superior plants in F₂ and F₃ populations and bulked by population. Individual plants (1170) were selected from the F₄ populations. After discarding individual plants for fiber traits, 720 progeny from the individual plant selections will be evaluated in 2013. Also, 216 superior F₄ progeny were advanced, and 72 F₆ advanced progeny were promoted to strain status. These 72 F₆ advanced progeny included 42 progeny derived from crosses with UA48 (Bourland and Jones, 2012). Hopefully, these are lines that combine fiber quality of UA48 with the enhanced yielding ability of their other parent.

Strain Evaluation

In 2013, 108 conventional and 4 transgenic strains (preliminary, new and advanced) were evaluated at multiple locations. Screening for host-plant resistance included evaluation for resistance to seed deterioration, bacterial blight, Verticillium wilt, tarnished plant bug, and root knot nematode (in greenhouse). Work to improve yield stability by focusing on yield components and to improve fiber quality by reducing bract trichomes continued.

Germplasm Releases

Germplasm releases are a major function of public breeding programs. Since 2004, a total of 48 cotton germplasm lines and three cotton cultivars have been released by the Arkansas Agricultural Experiment Station. Five of these germplasm lines were released in 2013 (Bourland and Jones, 2014a,b) Variation with respect to yield, adaptation, yield components, fiber properties, and specific morphologi-
cal and host-plant resistance traits are represented in these lines. The lines provide new genetic material to public and private cotton breeders with documented adaptation to the mid-South cotton region. Additional lines are now being considered for release.

**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 and other public cotton 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**


