2000 SUMMARIES OF

COTTON RESEARCH IN PROGRESS

UNIVERSITY OF ARKANSAS COTTON BREEDING PROGRAM 1999 PROGRESS REPORT

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RESEARCH PROBLEM

A primary objective of the University of Arkansas Cotton Breeding Program is to develop genotypes that are improved with respect to 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 identify genotypes with favorable genes, combine them 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 which are highly adapted to Arkansas environments and possess good host plant resistance traits. Overviews and updates of the current program have been published (Bourland, 1988; 1995a; 1995b; 1996; 1997; 1998; 1999).

RESEARCH DESCRIPTION

With some modifications, the selection procedure outlined by Bourland (1998) continued to be employed in the University of Arkansas Cotton Breeding Program in 1999. These procedures include establishment and screening of breeding lines, followed by evaluation of preliminary, new, and advanced strains. The number of entries and locations of tests associated with progeny and strain testing in 1999 are summarized in Table 1. In addition, crosses were made in 1999 with a primary focus of combining genotypes selected on the bases of their basic yield components.

RESULTS

Breeding Lines

Breeding lines, which include generations from individual plant selections through Advanced Progeny, are evaluated in non-replicated observation tests. Typically, standard cultivars are planted intermittently throughout the test for comparison. Breeding

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lines are produced by screening for resistance to seed deterioration, resistance to bacterial blight, morphological traits, yield, and fiber quality. The number of breeding lines evaluated in the program are indicated in Table 1.

Strain Evaluation

Compared to two standard cultivars (Sure-Grow 125 and Stoneville 474), the 1999 field results indicated that improvement in agronomic performance is being achieved. Of the 60 new and advanced strains evaluated, 10 and 33 strains yielded significantly more than the highest and lowest yielding standard cultivar, respectively. These superior strains exhibited a wide range of lint percentages, leaf pubescence, maturity, and fiber quality.

These 60 strains were also evaluated for resistance to thrips in paired plots at Keiser in 1999. Four-row plots were split with two rows receiving in-furrow Temik (aldicarb) treatment and the other two rows receiving no chemical treatment for thrips. Thrips in this plot area in 1999 were very high and uniformly distributed across the field. Yield without Temik was regressed by yield with Temik. The standard cultivars were near the regression line and approximated the average yield of the strains.

In these tests, lines having the highest yield over all locations tended to have the best response in terms of yield and resistance in the thrips test. These included 9111-57-20 (first overall locations in Advanced Strain Test II), 9108-04 (first overall in Advanced Strain Test I), and 9108-04-17 and 9409-22 (first and second overall in the New Strain Test). However, strains with high-yielding ability did not always provide high yield with thrips present. Four strains which were selections from 8717-17 had similar yield without Temik but varied greatly with Temik applied. This suggests that these can tolerate thrips to establish a relative constant yield, although their agronomic yielding ability varies greatly. Also, a relatively low R-squared indicated that only 37 to 60% of variability in yield without Temik was explained by yield with Temik. The performance of some genetically similar lines suggests that progress in resistance to thrips has been made in this program. Lines in the 2000 New and Advanced Strain Test will again be evaluated for thrips resistance.

Data are being summarized for the following strains to be released in 2000:

A314-07-14	Evaluated for 3 years in strain tests; selected from line (A314-07) that was evaluated for 6 years. Good fiber quality (particularly fiber strength), hairy leaf, moderate host plant resistance, maturity, and yield. Expands genetic base of lines adapted to this area.
A306-16	Evaluated for 6 years in strain tests; selections from this line have not shown improved traits. Good fiber quality (particularly fiber strength), hairy leaf, moderate host plant resistance, maturity, and yield. Expands genetic base of lines adapted to this area.
8606-50	Evaluated for 6 years in strain tests; selections have not shown improvements. Very early maturing, good

	fiber strength, hairy leaf, bacterial blight resistant, moderate resistance to Fusarium and Verticillium wilt, and good yielding ability (particularly with respect to its early maturity).
8304 lines	Specific lines have shown rapid true leaf development, seedlings have enlarged epicotyls at emergence. This trait may be important for improvement of seedling vigor.
Tufted lines	Lines have tufted seed (no linters except on micropylar end of seed) which may be a valuable seed trait.
Ark 8712	Advanced line that has been evaluated for 7 years in strain and variety tests. Smooth leaf, early maturing, good fiber quality, and good yield (13th out of 37 in the 1999 Arkansas first year Cotton Variety Test). May be released as variety.

PRACTICAL APPLICATION

Genotypes with improved host plant resistance that are adaptable to Arkansas environments and possess good fiber quality are being developed. These genotypes 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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Table 1. Number of entries associated with different generations of the University of Arkansas Cotton Breeding Program in 1999.

Test	Entries tested	Test sites[z]	Entries selected	Selections in 2000 test
	no.		no.	
Segregating populations	30	K	960 (plants)	1st year Progeny
1st year Progeny	897	K, R	248	Advanced Progeny
Advanced Progeny	193	C, R	54	Preliminary Strain
Preliminary Strain	64	K, M	12	New Strain
New Strain	24	K, C, M, R	13	New & Advanced Strain
Advanced Strain	36	K, C, M, R	9	Advanced Strain

[z] Tests were conducted at Keiser (K), Clarkedale (C), Marianna (M) and Rohwer (R).