

RESEARCH REPORT

Title: Breeding Cotton for Yield and Quality in Alabama

Project Number: 02-172-AL

Principle Investigator: David B. Weaver

A cotton breeding project was initiated at Auburn University in 2001 by making crosses among several well-adapted cultivars and germplasm. Our overall objectives were several: First to develop cotton germplasm with improved lint yield and fiber quality traits adapted to Alabama, second to study the genetic variability and heritability of various quantitative traits in cotton in early and late generations of inbreeding, and third to determine the effects of various inbreeding methods on the variance and heritability of those same traits. Traits of particular interest are lint yield, lint percentage, fiber weight per seed, earliness, and AFIS (Advance Fiber Information Systems) fiber quality traits, particularly those related to length, length uniformity, short fiber content, fiber maturity, and neps. During 2002, six F₂ populations, along with their parents and F₁ progeny were grown in the field and over 1500 individual plants were sampled and fiber analyzed by AFIS. During 2003, we grew approximately 1300 progeny rows from these individual F₂ plants (F_{2:3} lines) (pedigree method) and also grew single plant progenies from each F₂ plant (single-seed descent method). Three plants were sampled from each of the F_{2:3} lines (pedigree) lines for determination of fiber traits by AFIS. In 2004, we grew single-plant progenies from a random sample of the sampled F₃ plants (about 2000 F_{3:4} rows) primarily for the purpose of producing seed for yield-testing of lines in 2005. We also grew 200 F_{3:4} lines derived by single-seed descent, for the purpose of comparing the two inbreeding methods.

During 2005 and 2006, at the Plant Breeding Unit at Tallahassee, we evaluated 108 lines derived from pedigree and 92 lines derived by single-seed descent, for a total of 200 lines evaluated from the six populations. We also evaluated 48 pedigree-derived lines from one population at Prattville. Each population was evaluated in a different test. Plots were two rows, 6.1 m in length, with a spacing of 1 m between rows, replicated 3 times. Data were collected by sampling 50 bolls from each plot for determining lint percentage, boll size, lint weight per seed, and fiber quality. Fiber quality was analyzed by HVI at Cotton, Inc., Cary, NC. The entire plot was spindle-harvested to determine seed and lint yield.

Analysis of yield and fiber data from the 2005 season showed that selection method had no effect on mean population performance. Only one trait in one population (lint weight seed⁻¹ in Population 2, the population with the lowest mean lint weight seed⁻¹) was affected by selection. The growing season in 2005 was excellent. Yields were high, usually an average of more than 1200 lbs of lint per acre. Four experimental genotypes had higher lint yield than the best checks in Population 1, but differences were not significant. Populations 3 and 6 also had experimental lines equal or better than the checks for lint yield. For fiber traits, Population 2 in particular had high mean fiber length and fiber strength. Population 5 also had several experimental types with excellent fiber length and strength. Genetic correlation analysis indicated there remains in these populations a strong negative relationship between lint yield and fiber strength, a problem which has persisted in cotton since scientific efforts to improve the crop began. However, there were mostly positive genetic correlations between yield and other fiber traits, and no relationship between yield and fiber length. Crop year 2006 was not good for

collection of yield data. We had poor stands, and a dry, hot summer. Yields were very poor, and data collected were not meaningful. We were able to collect fiber data, however, and these are still being analyzed.