2005 Beltwide Cotton Conferences, New Orleans, Louisiana - January 4 - 7, 2005

THE EFFECTS OF RANDOM MATING ON INTROGRESSION OF ALLELES FROM GOSSYPIUM TOMENTOSUM AND G. MUSTELINUM INTO G. HIRSUTUM

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Abstract

As part of an effort to expand the genetic base of Upland cotton, we are introgressing germplasm from two wild species, *Gossypium tomentosum* and *G. mustelinum*, into Upland cotton (*G. hirsutum* L.). As part of this effort, we are testing the efficacy of random-mating populations for interspecific breeding. Here we report on the results of the performance of multiple generations of interspecific populations in a randomized complete block with four replications in College Station during 2003 and the effects of random-mating on means and variances as well as individuals that show promise for selection. Generations available included: TM-1, the *Ms4* line, the wild species, F_1, BC_1F_1 to TM-1 and *Ms4*, BC_1rm_1, BC_1rm_2, BC_1F_2 and two commercial checks: FM832 and PSC355. *G. tomentosum* seedlings did not survive transplanting and were replaced with two large plants from our greenhouse in each replication. There was a mix-up with seed from the *Ms4* line and so it was not included in the *G. mustelinum* experiment, but was replaced with BC_3F_1 plants. Each entry consisted of 25 plants in a forty row plot. More than one entry was included of segregating generations to increase their population sizes. Measures were taken on individual plants within an entry. We measured plant height, total number of bolls, individual plant yield, lint percent, HVI (High Volume Instrument) and AFIS (Advanced Fiber Information System) fiber properties. Fiber testing was performed by Cotton Incorporated at their headquarters in Cary, NC. Means were estimated using univariate general linear model with genotypes and replications as fixed effects using SPSS 12.0 (Apache Software, Chicago, IL). Tests for equal variances were performed with the modified Levene's test. Equality of means for backcross generations was tested with an F-test for custom hypotheses.

For *G. tomentosum*, individual plant yield in hybrid and backcross populations was affected by maturity and premature boll abscission. These effects were profound in inbred populations like F_2 and BC_1F_2. The mean HVI bundle strength for the F_2 and backcross populations was higher than the recurrent parent, TM-1. Individuals in these populations had higher strength than the commercial checks. The mean fiber length in these populations was below that of TM-1, but there were individuals that segregated above the mean level for TM-1 and PSC355. Random-mating populations more closely resembled the BC_1F_2 generation than the BC_1F_1 in means and variances. Variances were not as high as we hoped. The effect of *Ms4* male-sterility was not partitioned due to difficulty distinguishing fertile and sterile plants late in the season.

For *G. mustelinum*, flowering appears to be day-length sensitive and may as well require a juvenile period or an additional abiotic cue. Greenhouse plants of *G. mustelinum* did not flower summer of 2002, even with strictly controlled light regimes. This makes these materials very late maturing, which may explain the very low yields in many of the generations. The small sample of many generations prevented us from being able to statistically distinguish these effects, except in the BC_3F_1 generation. This generation had comparable yield and plant characteristics, while maintaining many improved fiber quality traits. The biggest complication for using this species is its very late maturing phenotype. This may be due to day-length sensitivity, juvenility, or dependence on an abiotic cue not found in College Station summers or to a combination of these traits.