

Title: Population development, Selection, and Evaluation for Heat Stress and Study of Seed Coat Fragments.

P67 (Project 67 is located field 20 (P36)).

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The primary objective of this research is to identify/develop broadly adapted Acala and Upland improved cotton germplasm with potential heat stress tolerance, better fiber quality, and lint yield, broadening the genetic base of cotton. A second objective is to investigate cotton seed coat fragment production and its genetics under different environments.

Summary

Cotton is routinely grown in the hot, irrigated areas of the far Western U.S., and these extended periods of high temperature can reduce cotton (*Gossypium hirsutum* L. and *G. barbadense*) lint yield, even with adequate irrigation conditions. At least for Pima cotton, yield increases have been attributed to improved heat tolerance. Heat Stress is an abiotic stress associated to high temperatures in the desert far west where the daytime temperatures during the cotton production season can exceed 42 degree C. Extended periods of extremely high temperatures are common in these areas during the critical stage of peak flowering. When temperatures in the San Joaquin Valley reach temperatures above normal during the critical stage of peak flowering, California growers suffer the consequences of reduced yield by these cotton varieties weaknesses to heat. In 2003, potential lines were evaluated for heat tolerance in a replicated nursery; four genetically diverse populations for fiber quality and heat tolerance were created using double crosses; advanced generation progeny were evaluated for yield and fiber performance at Maricopa, AZ, Tifton, GA, and Shafter, CA. The lines selected for advancement had fiber lengths that were generally superior to two Acala check cultivars. Yield data is presented in Table 1 from the three locations. Fourteen lines were identified for advancement to replicated testing across locations (Maricopa, AZ, Tifton, GA, and Shafter CA) in 2004. At the UC Research and Extension Center in Shafter previously selected cotton entries are being grown in a replicated trail, and yield and fiber data will be collected for further assessment and possible germplasm releases.

In addition, one undesired product mixed with fibers is seed coat fragments (SCF) which are produced when they are torn off the seed during the ginning process. SCF are fiber impurities that cause problem during the high-spinning process, and start raising some concerns in the textile industry. SCF thus remain in the fiber up to the spinning phase and it is here where SCF cause breakages or result in the production of yarn with many imperfections. The different organizations involved in the spinning industry are now

convinced that productivity can only be improved if SCF are reduced or eliminated. California Acala Cotton is known to produce the best cotton in the US. Improved germplasm with reduced or no SCF production will help U.S. cotton exports, and eventually California growers by providing varieties with low or no level of SCF in their cotton production. As the first step to investigate SCF and in cooperation with the companion heat stress research the beginning SCF project will take place in 2004. Additional cotton entries were added to the heat stress replicated trail across locations (Maricopa, AZ, Tifton, GA, and Shafter CA). Harvested seed cotton from all entries will be subjected to SCF, ginning, and fiber tests. Data will be collected for further assessment.

Table 1. Yields of Fourteen Selected Progeny Lines at Maricopa, AZ, Tifton, GA, and Shafter CA in 2003^a.

Designation	Maricopa AZ		Shafter CA	Tifton GA
	fiber	adjusted fiber ^b	seedcotton	seedcotton
	lbs/acre	lbs/acre	lbs/plot	lbs/plot
FMAX958/SG248-8-5	1773	230	34.4	4.8
FMAX958/SG248-8-6	1769	226	32.1	4.5
FMAX958/SG248-20-4	1410	-56	26.1	5.7
FMAX958/SG248-20-6	1602	136	28.7	0.8
FMAX958/SG248-20-8	1753	182	-	7.1
FMAX958/SG248-35-3	1488	-26	28.6	5.6
FMAX958/SG248-37-1	1571	57	-	4.1
FMAX958/SG248-37-5	2008	395	30.0	5.2
FMAX958/SG248-37-13	1634	-62	-	4.1
FMAX958/SG248-46-4	1669	177	-	3.8
PD97006/SG248-5-2	1604	104	-	5.7
PD97006/SG248-11-3	1473	-63	23.9	2.4
PD97006/SG248-31-3	1357	-174	-	5.7
PD97006/SG248-42-3	1444	-463	33.9	5.5
Check average	1558	0	30.0	4.4

^aOnly 35 of the 70 lines tested at Maricopa AZ and Tifton GA were tested at Shafter CA in 2003, due to unavailability of seed.

^bYields of progeny were adjusted by taking the average yield of the three adjacent check plots and subtracting the resulting value from the progeny yield.