Pima Cotton Genetics

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Summary

A male-sterile trait found in Pima cotton was named Male sterile-12 with the gene symbol Ms_{12}. Analyses of a kidney seed trait revealed that it is conditioned by one pair of recessive genes and that it is relatively common in primitive cottons from tropical America. Genetic variability associated with stocks having kidney seed indicates the need to continue collecting primitive kidney cottons from as many areas as possible.

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The transfer to Pima of several potentially useful traits was continued. Included in the transfer are nectariless, okra, and lacinate leaf shapes, frego bract, and rugose boll. These traits confer tolerance to certain insect pests. Fertile plants from six BC_4F_3 populations were selected to isolate homozygous fertility restorer lines in the transfer of genetic-cytoplasmic male sterility into six Pima experimental strains. Backcross six was made in the development of six Pima experimental strain A lines. F_1 plants from crosses of two double haploids with G. harknessii cytoplasm and 79-106 nuclear genomes and a 79-106 fertility restorer showed good production potential. This indicates that combining G. harknessii cytoplasm and unrelated nuclear genomes in one generation via semigamy is a feasable method of deriving A lines for possible use in hybrid cotton. Eight dominant and 12 recessive genetic markers continued to be transferred to Pima.

The use of semigamy to produce haploid and double haploid for pure lines was continued. One hundred and ninety-seven chimeral seedlings were derived to obtain haploid sectors for chromosome doubling with colchicine to combine G. hirsutum or G. barbadense cytoplasm with three G. hirsutum and three G. barbadense nuclear genomes. Nine haploids were doubled, two with G. hirsutum cytoplasm and seven with G. barbadense cytoplasm. These stocks will be used to study cytoplasm and nuclear genome interactions. Seed of 39 doubled haploids were renewed. Eight of these were rated above average for performance.

Seed of 273 G. barbadense L. germplasm stocks were renewed for future use as sources of genetic variability. Requests for seed of 46 stocks were filled. Three hundred and ninety-nine germplasm stocks were received for addition to the G. barbadense collection. Fifty-five short-day stocks were crossed with Pima S-6 to begin their conversion to a day-neutral, flowering habit. These stocks will be useful in broadening the germplasm base of Pima cotton. Ten F_2 and 16 backcross one F_2 populations from crosses of primitive short-day cottons and Pima S-5 were grown at Maricopa for selection of flowering plants which will be crossed with their respective short-day parents for backcross one and two. When completed, the conversion of primitive cottons to a day-neutral flowering habit will allow these stocks to be evaluated by cotton researchers in temperate zones in the summer.

Table 1. Yields from Pima Regional Tests, 1984.

	Maricopa		Salome		Marana		Mean below 2500	
	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank
Pima S-6	1175 ab[1/]	3	1182 a	1	1041 a	1	1133	1
P51	1231 a	2	1024 b	3	1023 ab	2	1093	3
P53	1245 a	1	1100 b	2	984 bc	4	1110	2
P62	1095 ab	5	931 c	4	999 abc	3	1008	5
P58	1024 b	6	896 c	6	958 c	6	959	6
P63	1162 ab	4	906 c	5	968 c	5	1012	4
C.V.(%)	8.5		5.4		2.4			

	Safford (Curtis)		Safford Station		Anthony		El Paso		Mean Above 2500'		Mean all locations
	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A
Pima S-6	843 a	1	1081 abc	4	979 b	2	1254 a	1	1039	1	1079
P51	712 b	4	1207 a	1	860 c	4	1105 b	2	971	2	1023
P53	575 c	6	987 bc	5	1080 a	1	1070 bc	3	928	4	1006
P62	777 ab	2	1154 ab	2	869 c	3	1056 cd	4	964	3	983
P58	720 b	3	1101 ab	3	850 c	5	1021 d	5	923	5	939
P63	597 c	5	899 c	6	748 d	6	942 e	6	797	6	889
C.V. (%)	7.4		9.2		4.5		1.9				

[1/] Yields in a given column followed by the same letter are not significantly different at the 5% level of probability.