

## PIMA COTTON IMPROVEMENT

Carl V. Feaster and E.L. Turcotte

Growers of American Pima cotton experienced a wide range of yields in 1971. Our tests in the various areas yielded average or above. The early frost resulted in a considerable loss of top crop for many growers, and only those situations where an early crop was obtained were yields above average.

The Pima Regional Test was harvested at five locations in Arizona in 1971. The test included Pima S-3, Pima S-4, and eight experimental strains. P19, P21, and P23 were selected at Phoenix under low-elevation conditions. P22, P24, and P25 were selected at Safford, and E2 and E3 at El Paso under high-elevation conditions. As a group, Pima S-4 and the strains selected under low altitude conditions were shorter in plant height and earlier than Pima S-3 and the strains selected under high-elevation conditions.

Table 1 includes data from the five Pima Regional Tests. Two locations (Phoenix and Tempe) are considered low-elevation conditions, one (Marana) intermediate, and the two Safford locations high. P23 yielded well at all locations. It was the tallest and earliest of the strains selected at low-elevations. Its height was not excessive at low elevation and appeared adequate for efficient machine harvesting at high elevations. P22 averaged highest in yield of the strains selected at high elevation. E2 and E3 yielded well at the two Safford locations, but were only slightly more productive than Pima S-3 at Phoenix. The average yields of the strains at the five locations were:

	<u>Pounds lint per acre</u>
P23	715
Pima S-4	659
P19	659
P21	654
P22	632
P25	593
P24	590
E3	554
E2	525
Pima S-3	449

Two replicated strip-plantings also were grown at Phoenix and Safford (Curtis Farm) in 1971. Yields were as follows:

Phoenix

	<u>Pounds lint per acre</u>
Pima S-4	640 c
P19	587 c
P21	741 b
P23	843 a

Safford (Curtis Farm)

	<u>Pounds lint per acre</u>
Pima S-3	648 c
Pima S-4	779 b
P19	640 c
P21	766 b
P22	839 ab
P23	891 a

P23 was the most productive in these two tests.

Advanced and Preliminary Strains Tests were continued at Phoenix and Safford. At Phoenix the Advanced Strains Test included Pima S-4 and 15 experimental strains. Thirteen of the experimental strains yielded significantly higher than Pima S-4. These strains varied in height from slightly taller to slightly shorter than Pima S-4 and were similar to Pima S-4 in maturity. Fiber properties of these strains were equal or superior to Pima S-4. The Preliminary Strains Test grown at Phoenix included Pima S-4 and nine experimental strains. Seven of the strains yielded significantly higher than Pima S-4. The most productive strain had outstanding fiber length -- a 2.5% span length of 1.56 compared with 1.44 for Pima S-4. The Advanced Strains Test at Safford included Pima S-3, Pima S-4 and eight experimental strains. None of the strains were more productive than Pima S-3 and Pima S-4.

Evaluation of numerous progeny rows was continued at both Phoenix and Safford. Several progeny rows were selected for yield testing at both high and low elevations in 1972. Numerous plant selections were taken from  $F_2$  through  $F_4$  generations at Phoenix and Safford.

Genetic studies included inheritance, allelism, and linkage tests. The results from crossing two genetic stocks with yellow foliage suggested that similar genes in the two genomes of commercial cotton express the same character differently. A linkage test showed male sterility to be associated with one of the gland determining genes. Three additional multiple-marked stocks were developed.

The transfer of 16 genetic characters including nectariless, a factor of possible economic value for insect control, was continued. Several glandless (gossypol free) progenies and plants were selected in the development of a Pima glandless stock.

A collection of Gossypium barbadense germplasm was evaluated, catalogued, and maintained as a breeding material source. Eight entries from four countries were added in 1971.

Studies with semigamy included (1) determining the origin of hybrid and paternal tissue in chimeral plants and (2) developing a pure line (doubled haploid) strain of Pima.

Table 1. Data from Pima Regional Tests, 1971

	Plant height (cm)	Lint per acre (pounds)	Percent lint	Fiber length		Fiber strength (T <sub>1</sub> )	Micron- aire
				50% span	2.5% span		
Phoenix (CRC)							
Pima S-3	189	224 e	30.4	.65	1.40	27.5	3.45
Pima S-4	140	586 b	32.7	.70	1.43	30.1	3.73
P19	145	594 b	32.7	.71	1.46	30.1	3.62
P21	153	699 a	32.1	.69	1.46	30.3	3.77
P22	184	498 c	32.2	.69	1.42	30.4	3.77
P23	164	640 ab	31.0	.70	1.43	29.3	3.70
P24	172	447 c	33.0	.69	1.42	32.4	3.63
P25	166	467 c	31.8	.68	1.41	29.4	3.47
E2	197	258 de	30.1	.71	1.40	29.5	4.13
E3	182	310 d	30.6	.70	1.41	30.3	4.07
Tempe (ASU)							
Pima S-3	180	358 h	32.3	.66	1.40	27.7	3.58
Pima S-4	135	795 bc	34.1	.67	1.40	28.5	3.77
P19	127	880 a	34.2	.70	1.44	29.0	3.68
P21	147	734 cd	33.8	.70	1.44	29.6	3.75
P22	158	733 cd	34.0	.69	1.41	28.3	3.88
P23	155	823 ab	32.3	.68	1.40	28.1	3.69
P24	173	627 ef	34.0	.70	1.42	29.9	3.83
P25	160	699 de	33.0	.70	1.42	28.7	3.55
E2	176	486 g	31.2	.70	1.41	28.2	4.24
E3	162	643 ef	32.3	.71	1.43	29.8	4.10

Table 1. (continued)

	Plant height (cm)	Lint per acre (pounds)	Percent lint	Fiber length		Fiber strength (T <sub>1</sub> )	Micron- aire
				50% span	2.5% span		
Marana							
Pima S-3	119	471 cd	35.6	.71	1.46	29.6	3.56
Pima S-4	90	486 bcd	37.1	.69	1.42	29.0	3.80
P19	96	496 bcd	36.8	.71	1.45	29.4	3.64
P21	99	561 ab	36.4	.69	1.45	30.1	3.79
P22	107	496 bcd	36.6	.68	1.43	28.8	3.75
P23	106	602 a	35.2	.69	1.42	29.1	3.67
P24	109	529 bc	36.6	.71	1.44	31.2	3.70
P25	109	542 abc	36.3	.70	1.45	29.1	3.50
E2	124	493 bcd	34.7	.70	1.43	29.2	3.97
E3	115	434 d	34.6	.70	1.43	30.0	3.82
Safford (Pace Farm)							
Pima S-3	88	646 d	35.3	.65	1.43	27.1	3.46
Pima S-4	67	757 abc	36.9	.63	1.40	27.6	3.52
P19	78	741 abc	37.5	.67	1.42	27.1	3.64
P21	78	700 bcd	36.6	.68	1.45	29.2	3.61
P22	87	742 abc	36.8	.65	1.41	27.6	3.63
P23	86	797 a	35.3	.66	1.41	28.1	3.55
P24	84	758 ab	36.8	.67	1.42	29.2	3.54
P25	86	688 cd	36.2	.68	1.44	28.3	3.40
E2	97	712 bc	35.1	.69	1.43	27.6	3.89
E3	88	719 bc	35.2	.71	1.42	28.6	3.82

Table 1. (continued)

	Plant height (cm)	Lint per acre (pounds)	Percent lint	Fiber length		Fiber strength (T <sub>1</sub> )	Micron- aire
				50% span	2.5% span		
Safford (Exp. Station)							
Pima S-3	106	547 b	34.2	.68	1.43	28.3	3.83
Pima S-4	73	672 a	35.6	.69	1.44	29.9	3.97
P19	95	583 b	35.5	.71	1.45	30.2	3.91
P21	91	577 b	35.3	.74	1.47	31.3	4.20
P22	96	691 a	35.6	.72	1.44	30.7	4.16
P23	90	711 a	34.8	.73	1.43	30.3	3.94
P24	98	591 b	35.3	.72	1.44	32.6	3.99
P25	91	569 b	34.4	.72	1.45	30.3	3.77
E2	95	676 a	34.8	.70	1.40	29.8	4.46
E3	96	664 a	34.0	.71	1.42	30.5	4.29

Yields followed by the same letter are not significantly different at the 5% level.

#### BREEDING RESEARCH WITH LONG STAPLE COTTON

W.E. Bryan and H. Muramoto

The objective of the long staple cotton breeding program has been to determine the best method of breeding a superior variety using selection criteria such as high yields, good agronomic traits and superior spinning qualities.

In 1971, 49 F<sub>4</sub> single plant selections were made from the F<sub>3</sub> progenies of 1970. These single plant selections were made in the field on the basis of yield and plant type. Lint quality will be determined in the cotton laboratory on the basis of length, strength and fineness. In the matter of plant type, height of plant is being investigated with respect to yield of seed cotton.

Back crossed seed was obtained by crossing the F<sub>1</sub> of a G. barbadense x G. hirsutum, Deltapine 16 with the G. barbadense parent in the hope of improving the yield of the G. barbadense cotton.