

Pima Cotton Improvement

Carl V. Feaster, Research Agronomist and E. L. Turcotte, Research Geneticist
 USDA, Agricultural Research Service

Summary

Pima S-6 is released for commercial production. It has been tested as P34 in Regional Tests since 1975. The major advantages of Pima S-6 over Pima S-5 are earlier maturity and higher yield.

The Pima Regional Test was grown at six locations in Arizona in 1982. Strains P34, P45, P51, P52, P53, P58, and P59 were developed at Phoenix under low-elevation conditions. P57, P60, and P61 were developed at Safford and E15 at El Paso under high-elevation conditions. Table 1 includes yield data from the six locations--Phoenix, Wenden, Salome, and Marana below 2,500 feet elevation, and Safford (2) above 2,500 feet elevation. P59, a strain included in the Regional Test for the first time in 1982, averaged highest in yield. P34, a strain that has been included in Regional Tests since 1975, was second highest in yield. At the four lower-elevation locations, P34 averaged 18% higher in yield than Pima S-5, and at the two higher-elevation locations it averaged 22% higher.

Data, comparing experimental strain P34 and Pima S-5, were summarized for the release and naming of P34 as Pima S-6 for commercial production. The major advantages of P34 over Pima S-5 are earlier maturity and higher yield. The yield increase for P34 over Pima S-5 at various elevations from 1975 to 1981 ranged from 4 to 18%. The greatest yield increase from P34 was obtained at high elevation, particularly in New Mexico and Texas. P34, compared with Pima S-5, is a more open plant, less leafy, equal or shorter in height at low elevation and equal or taller at high elevation, has a higher percent lint, smaller boll, slightly shorter 2.5% span fiber length, slightly longer 50% span fiber length, stronger fiber, coarser fiber, and the fiber has less reflectance and greater yellowness. In processing, P34 gives slightly stronger yarn and better yarn appearance than Pima S-5.

Advanced and Preliminary Tests of strains developed at low (Phoenix) and high (Safford) elevation were continued at Phoenix and Safford. At Phoenix, five of the fifty-five strains developed at low elevation yielded at least 10% higher than P34. The more productive strains were similar to slightly earlier than P34. The earliest strains tended to cut-out prior to the end of the season and were less productive than the medium-early strains. At Safford, strains developed at high elevation were later maturing than P34 or Pima S-5 and, with few exceptions, were not as productive as P34.

Two Pima cultivars, two upland cultivars, and four interspecific hybrids involving the four cultivars were evaluated under two irrigation levels at low and high elevations. An interspecific hybrid from a short Pima X a short upland gave an acceptable plant height response over a range of environments.

Table 1. Yields from Pima Regional Tests, 1982.

	Phoenix		Wenden		Salome		Marana (Clark)		Mean below 2500' elevation	
	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank
P59	1198	5	1330	1	1202	2	1214	1	1236	1
P34	1295	2	1183	7	1116	7	1082	2	1169	3
P53	1340	1	1290	2	1139	4	1032	3	1200	2
E15	1216	3	1257	3	1199	3	928	8	1150	4
P45	1139	8	1215	5	1132	5	1010	4	1124	6
P61	1187	6	1255	4	1121	6	946	6	1127	5
P60	1172	7	1157	8	1078	8	990	5	1099	7
P57	905	12	1207	6	1208	1	809	11	1032	8
P52	1043	9	1025	10	960	9	901	9	982	10
Pima S-5	1199	4	1002	11	873	10	884	10	990	9
P51	908	11	1029	9	838	11	938	7	928	11
P58	919	10	965	12	707	12	795	12	847	12

	Safford (Curtis)		Safford (Layton)		Mean above 2500' elevation		Mean all elevations
	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A	Rank	Pounds lint/A
P59	1388	1	1207	5	1298	2	1257
P34	1311	2	1296	1	1304	1	1214
P53	1206	10	1126	6	1166	7	1189
E15	1234	7	1226	4	1230	5	1177
P45	1271	4	1235	2	1253	3	1167
P61	1235	6	1235	2	1235	4	1163
P60	1234	7	1063	10	1149	10	1116
P57	1307	3	1117	7	1212	6	1092
P52	1234	7	1095	8	1165	8	1043
Pima S-5	1053	12	1083	9	1068	12	1016
P51	1254	5	1055	11	1155	9	1004
P58	1155	11	991	12	1073	11	922

Pima Cotton Genetics

E. L. Turcotte, Research Geneticist and Carl V. Feaster, Research Agronomist
USDA, Agricultural Research Service

Summary

Genetic analyses showed that factors modifying the expression of nectariless in Pima cotton have been stabilized, and that flowering and fruiting in primitive *G. barbadense* cottons from Central and South America is inherited as a simple recessive trait. An aberrant leaf trait found in Pima S-2 was named Golden veins with the gene symbol *Gv*. Hybrid cotton studies showed that Pima restorer lines have acceptable pollen shed, but are deficient in fertility restoration when crossed with a Pima A line.

The inheritance of Pima mutant traits was studied to provide genetic information on how these traits may be used to develop improved genetic populations. Genetic analyses of an aberrant leaf trait in Pima S-2 showed that it was conditioned by one dominant gene. The trait was named Golden veins with the gene symbol *Gv*. Flowering response in two short-day primitive germplasm stocks was conditioned by one recessive gene pair. Linkage tests among eight gene pairs were negative. Four morphologically aberrant Pima plants were identified for genetic analyses. F_1 plants from crossing Pima stocks with a high frequency (28 percent) and a normal frequency (2 percent) of 4-lock bolls had 12 percent 4-lock bolls.

The transfer to Pima of potentially useful traits, including glandless for improved food and feed, and nectariless, frego bract, and rugose boll for insect tolerance, was continued. Three doubled haploids with the nectariless trait were derived via semigamy. Pooled data from seven BC_2F_2 - populations indicated that factors modifying nectariless in *G. barbadense* have been stabilized. Backcrosses three and four were made in the transfer of genetic-cytoplasmic male sterility into six Pima experimental strains. Two doubled haploids with *G. harknessii* cytoplasm and 79-106 genomes were obtained via semigamy. Ten Pima restorer lines were evaluated in the field. Three had adequate pollen shed during the growing season, showed relatively good production potential, and had acceptable ginning and fiber properties. Testcrosses involving a Pima A line and these three R lines showed lack of pollen shed early in the season, indicating incomplete fertility restoration by the respective R lines.

Semigamy continued to be used to produce haploids and doubled haploids for pure lines in one generation. The chromosome number of four haploids was doubled with colchicine. Five of 25 doubled haploids from F_1 plants showed good production potential with acceptable fiber quality. Seed of 46 doubled haploids were renewed.

The conversion of certain short-day, primitive *G. barbadense* germplasm stocks to a day-neutral habit was continued to broaden the *barbadense* germplasm base. Ten short-day primitive stocks were crossed with Pima S-5 to initiate their conversion to a day-neutral flowering habit. The conversion of 50 other primitive stocks was continued. Ten germplasm stocks from Peru and one stock from St. Croix, V.I. were added to the collection. Requests for seed of 27 stocks were filled. Seed of 45 stocks were renewed.