

PIMA COTTON IMPROVEMENT

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Temperatures during July and August, 1969 were the highest on record. This resulted in lower than average Pima cotton yields at the lower elevations but higher than average at the higher elevations. At the lower elevations, boll shedding was generally severe beginning about July 10 and continuing for several weeks. Strains possessing varying degrees of heat tolerance showed widely different responses to shedding. This allowed us to apply intensive selection pressure for heat tolerance within our breeding material at Phoenix. At high elevations, temperatures were not high enough to cause widespread shedding in Pima.

The Regional Pima Test was harvested at five locations in Arizona in 1969. The test included Pima S-2, Pima S-3, Pima S-4, and three experimental strains. Strains P19 and P21 were derived from our program at Phoenix, and 126-1 was developed by Drs. Bryan and Muramoto at Tucson. The locations where these tests were grown vary in elevation from approximately 1200 to 3000 feet. Yields from these tests are reported in Tables 1 and 2.

Table 1 includes yield data from low-elevation locations--Phoenix (1200'), Tempe (1200'), and Coolidge (1500'). At these locations, P21 and Pima S-4 gave average yields considerably above the other varieties and strains. P21, compared with Pima S-4, is taller and has slightly longer fiber that gives stronger yarn. At Phoenix where shed was very severe, P21 yielded significantly higher than Pima S-4. It appeared to have about as much heat tolerance as any Pima strain evaluated at Phoenix in 1969. Pima S-3 was extremely rank and unproductive at the low elevations in 1969.

Table 2 includes yield data from the two high-elevation locations. P21 also yielded well at these locations. Its taller plant and higher fruiting, as compared with Pima S-4, could be an advantage under conditions where Pima S-4 sets fruit so low on the plant that efficient machine harvesting is difficult.

Various strains tests were continued at Phoenix and Safford. At Phoenix only a very few strains in yield tests were more productive than Pima S-4. These few strains had less shed than Pima S-4 during July and August, and were considered to possess greater heat tolerance than Pima S-4. Likewise, a few progeny rows and early generation segregates indicated a relatively high degree of heat tolerance.

At Safford many strains yielded significantly higher than Pima S-3. These strains were generally intermediate between Pima S-3 and Pima S-4 in plant height and earliness. Heat tolerance apparently was not a factor in the yield performance of these strains. For example, one test at Safford included Pima S-3 and 11 strains selected from P18 material. All 11 strains yielded significantly higher than Pima S-3; however, these

strains grown in the maintenance nursery at Phoenix last season shed practically all their fruiting forms and produced extremely low yields. Thus, at Safford, we had highly productive strains, some of which have heat tolerance (for example P21) and others that have little heat tolerance (for example P18 strains). Additional testing will indicate the relative merits of these two groups of strains under high-elevation conditions.

The continued use of semigamy has allowed the recovery of virescent-marked and glandless-marked stocks. Semigamy is an abnormal form of reproduction we found in a stock of Pima cotton. It results in a few haploid plants sectored for maternal and paternal tissue. Doubling the chromosome number of the paternal-tissue sectors provides pure lines without the need of further inbreeding. The development of semigametic-marked stocks has allowed us to use normal materials as male parents in the production of pure lines from paternal-tissue haploids. We can now sample combinations of characters as early as the F_2 generation. Thus we have widened the scope of material from which pure lines of Pima cotton can be effectively produced via semigamy.

Further progress was made in the development of glandless breeding stocks of Pima cotton. Several plants were selected in 1969 that are heterozygous for the glandless genes gl_2 and gl_3 . Progeny from these plants will contain glandless segregates from which glandless stocks will be produced. This material will allow comparisons of the glanded and glandless characters in Pima cotton.

The nectariless, frego bract, and okra-leaf shape characteristics have possible economic value, and we are transferring them to Pima breeding stocks also.

Cooperators in the Pima Improvement Program include Arizona State University, Howard Wuertz, Carl and Phil Curtis, and Scott Pace.

Table 1

Pounds of Lint Per Acre from Regional Pima Tests
Grown at 1200' to 1500' Elevations in Arizona, 1969

| | Phoenix (CRC) | | Tempe (ASU) | | Coolidge (Wuertz) | | Mean Total pick |
|----------------------------------|---------------|---------------|---------------|---------------|-------------------|---------------|-----------------------|
| | First pick | Total pick | First pick | Total pick | First pick | Total pick | |
| P21 | 588 a | 685 a | 439 a | 512 a | 690 ab | 736 b | 644 |
| Pima S-4 | 518 b | 632 b | 420 a | 497 a | 723 a | 790 a | 640 |
| P19 | 382 d | 514 c | 358 b | 421 b | 659 b | 712 b | 549 |
| 126-1 | 442 c | 531 c | 372 b | 437 b | 575 c | 622 c | 530 |
| Pima S-2 | 388 d | 496 c | 382 b | 441 b | 586 c | 642 c | 526 |
| Pima S-3 | 192 e | 273 d | 268 c | 357 c | 413 d | 471 d | 367 |
| Coefficient of Variability | 8.6% | 8.1% | 5.6% | 5.5% | 6.2% | 6.0% | |

In a given column, yields followed by the same letter are not significantly different at the 5% level.

Table 2
Pounds of Lint Per Acre from Regional Pima Tests
Grown at 2900' Elevation in Arizona, 1969

| | Safford (Curtis) | | Safford (Pace) | | Mean Total pick |
|-------------------------------|---------------------|---------------|-------------------|---------------|-----------------------|
| | First pick | Total pick | First pick | Total pick | |
| P21 | 1241 a | 1298 a | 791 a | 904 a | 1101 |
| Pima S-4 | 1145 a | 1202 ab | 721 abc | 826 ab | 1014 |
| P19 | 998 b | 1077 bc | 765 ab | 933 a | 1005 |
| Pima S-3 | 913 b | 1031 cd | 714 abc | 835 ab | 933 |
| Pima S-2 | 995 b | 1073 bc | 623 c | 736 b | 905 |
| 126-1 | 886 b | 933 d | 676 bc | 764 b | 849 |
| Coefficient of Variability | 11.3% | 11.0% | 11.8% | 11.5% | |

In a given column, yields followed by the same letter are not significantly different at the 5% level.