

Comparison of Normal and Short Pima Cotton Cultivars at Different Plant Populations

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Summary

Two tests on Pima cotton were conducted at Safford to verify our observations that shorter Pima cotton needs a higher plant population than tall Pima cotton for maximum yield. The tests verified the hypothesis. A table with approximate planting rates for different expected plant heights and expected percentage stand is included.

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In 1982 we reported that short Pima cotton plants produced the most lint at high plant populations, while taller plants produced the most lint at lower plant populations. In 1984 we conducted two tests on the Safford Agricultural Center in which Pima S-6 and Pima P-62 were planted at 100, 200, 300, 450, and 600 seeds/36 foot row. One hundred seeds/36 foot row is equal to 36,300 seeds/ acre. Plots were four rows wide with the center two rows harvested for lint yield. Test A had four replications and was planted on 10 April. Test B had three replications and was planted on 30 April. Because of cold weather, eleven percent of the seed emerged and survived to harvest in Test A. In Test B seedling survival was 52 percent.

The average plant height at harvest was 36 inches for Pima S-6 and 30 inches for P-62. The plant populations, lint yield, and plant height obtained at each planting rate are shown in Table 1. The highest lint yield for Pima S-6 was at 36,000 plants/acre, while for Pima P-62 it was at 61,000 plants/acre. Regression analysis (not shown) indicated that populations giving maximum lint yield for the two cultivars differed by only 6,000, plants/acre rather than the 25,000 plants/acre of the above results. The data did verify that short Pima cotton produced highest lint yield at a higher plant population than taller Pima cotton. We believe, but have not tested, that the same relationship among plant height, plant population, and lint yield holds true for upland cotton.

Therefore, a heavier rate of planting is needed for maximum lint yield for cotton destined to be short than for cotton destined to be tall. Based on our early Pima cotton studies, we have prepared a planting rate table with three prospective plant heights and three prospective stand percentages (Table 2). The pounds of planting seed per acre for Pima and upland cotton under each of these conditions is shown. This table is somewhat speculative for Pima cotton at this stage of the research, and very speculative for upland cotton. Despite this, it may help a grower decide how much planter adjustment is needed when moving his planter from a field that traditionally has short cotton to a field that usually has tall cotton, or vice versa. Our experience is that a 75% stand is seldom exceeded. We find a 50 to 60% stand most common, with lower percentages for very early plantings.

Table 1. Lint yield of a normal and short Pima cotton cultivar planted at five planting rates in two tests on the Safford Agricultural Center, Arizona in 1984.

| <u>Plants/Acre</u> | <u>Average Inches Between Plants</u> | <u>Lbs/Lint acre</u> | | <u>Height, inches</u> | |
|--------------------|--|----------------------|--------------|-----------------------|-------------|
| | | <u>S-6*</u> | <u>P-62*</u> | <u>S-6</u> | <u>P-62</u> |
| ----- Test A ----- | | | | | |
| 3,000 | 49 | 263 | 260 | 37 | 28 |
| 7,000 | 22 | 437 | 523 | 34 | 33 |
| 13,000 | 12 | 727 | 499 | 36 | 29 |
| 23,000 | 7 | 708 | 852 | 36 | 30 |
| 25,000 | 6 | 763 | 750 | 34 | 28 |
| C.V. | | 9% | | | |
| ----- Test B ----- | | | | | |
| 20,000 | 7 | 878 | 983 | 41 | 36 |
| 36,000 | 4 | <u>1006</u> | 1059 | 39 | 33 |
| 61,000 | 3 | 964 | <u>1136</u> | 38 | 32 |
| 86,000 | 2 | 927 | 1083 | 35 | 31 |
| 114,000 | 1 | 921 | 1057 | 35 | 29 |
| C.V. | | 12% | | | |

*Average plant height at harvest was 36 inches for Pima S-6 and 30 inches for P-62.

Table 2. Pounds of seed/acre needed for highest yield at three stand percentages (seedling emergence plus survival) and three plant heights for Pima and upland cotton planted in 40 inch rows. (Data based entirely on Pima cotton research)*.

| <u>Plant Height</u> | <u>Optimum Plants/Acre</u> | <u>Pima</u> | <u>Upland (DPL 90)</u> |
|-------------------------------|----------------------------|---------------------------|------------------------|
| | | - - - lbs seed/acre - - - | |
| - - - - - 75% stand - - - - - | | | |
| 2.5' | 62,000 | 22 | 16 |
| 3.5' | 48,000 | 17 | 13 |
| 4.5' | 34,000 | 12 | 9 |
| - - - - - 50% stand - - - - - | | | |
| 2.5' | 62,000 | 32 | 24 |
| 3.5' | 48,000 | 25 | 19 |
| 4.5' | 34,000 | 18 | 13 |
| - - - - - 25% stand - - - - - | | | |
| 2.5' | 62,000 | 65 | 49 |
| 3.5' | 48,000 | 50 | 38 |
| 4.5' | 34,000 | 36 | 27 |

*Planting rates based on number of seed/pound and the following regression formula for Pima cotton: lint yield in kg/ha = $0 + (\text{plants/ha})(.00538) - (\text{plants/ha})^2(.000,000,001,17) + (\text{plant height in cm})(9.475) - (\text{plant height in cm})^2(.035,42) - (\text{plants/ha} \times \text{plant height})(.000,025,55)$.