THE EFFECT OF POPULATION AND IRRIGATION TERMINATION DATE ON NARROW-ROW COTTON

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Experiments were conducted at both Yuma and Phoenix to investigate the effect of date of irrigation termination and plant population on cotton production and growth.

Yuma Test[1/]

The experimental site received a uniform application of 100 pounds nitrogen per acre. Beds were formed with a lister and the top of the beds were flattened prior to the preplant irrigation. Deltapine 16 was planted both two rows per 40-inch bed with approximately 12 inches between rows and with single rows per bed on April 2, 1970. The experiment was thinned to the desired populations of 30,000, 60,000, and 90,000 plants/acre. Two irrigation termination dates were used. The first date had four replications and the last date had eight replications. The entire test received postplant irrigations on June 11, 29, and July 24 which was the termination date for four replications. The remaining eight replications received an additional irrigation on August 12. Approximately 1/2 inch of precipitation was received on August 26.

The experiment was heavily infested with pink bollworms and subsequent boll rot damage reduced yields. The plots were hand picked twice, the first time between September 30 and October 6, and the final time in late October. Table 1 shows the total seed cotton yields obtained. Yields were similar from the two irrigation termination dates and little effect of population can be seen. A consistent advantage of two rows per bed over one row per bed is shown, and surprisingly the difference is greatest at the lowest population. The soil in which this experiment was conducted showed some variability which was manifested in variable plant height. In many areas of the experiment the plants grew lush and were much more vegetative than desirable for high population plantings. As a result, many of the plants of the higher population were barren or had very few bolls. This likely can be given as a partial explanation for lowest yields being obtained at highest populations.

Table 1. Seed cotton yields (pounds/acre) with indicated rows per bed on 40-inch centers and last date of irrigation, Yuma 1970.

	July 24			August 12		
Plants/A	1 row	2 rows	Mean	1 row	2 rows	Mean
30,000	2148	2618	2384	2144	2768	2456
60,000	2298	2390	2344	2189	2473	2332
90,000	2207	2403	2306	2121	2313	2218
Mean	2218	2470	2345	2151	2518	2335

1/ We are grateful to Fred Carasso for his assistance in conducting this experiment.

Phoenix Tests

Two experiments were planted at Phoenix on April 7, 1970. The experimental sites received uniform applications of approximately 60 pounds of nitrogen per acre prior to planting. Beds were formed with a lister and the tops flattened after a preplant irrigation. The first experiment was planted two rows per bed and thinned to populations of 30,000, 60,000, and 80,000 plants/acre. This experiment received three irrigation termination dates which were July 22, August 1, and August 18. In the second experiment, either one or two rows per bed were planted on 30- and 40-inch beds and thinned to populations of 30,000, 60,000, and 80,000 plants/acre. When two rows were planted on 40-inch beds, the spacing between rows was approximately 12 inches and on 30-inch beds the spacing between the two rows was approximately 6 inches. Postplant irrigations were applied on June 3, June 27, July 9, July 22, August 1, and August 18. Irrigations were lighter than the conventional practice of the Research Center, and slightly greater than normal stress was allowed between irrigations. Generally about 4 inches were applied per irrigation. Both experiments had four replications and received over an inch of precipitation during the first week of September.

As was the case at Yuma, both of these experiments were heavily infested with pink bollworms and subsequent boll rot damage reduced yields. The plots were hand picked twice, the first time during the latter part of September and again during late October and early November.

Table 2 summarizes plant observations that were taken during mid-August in the first experiment. These data were taken from plots that had last been irrigated on August 1. As would be expected, increasing plant population reduced the number of bolls per plant. However, when this is expressed on a per acre basis, a marked increase is shown. Because the bolls from the higher populations were smaller, the dry weight of the bolls plus squares, shown here as fruit per acre, increased to the middle population but decreased at the highest population. As would be expected, the dry weight of the leaves per acre increased with population. This may have important implications in the amount of insect and boll rot damage that may occur at higher populations. Increasing plant population reduced the percentage of the total dry weight of the plant that was fruit. About an 8% reduction is shown. The percentage of dry weight as leaves decreased almost 2%, the petioles were essentially unaffected, while the percentage of dry weight as stems showed an increase of about 10%. Plant height and number of nodes per plant decreased with population. The high population had fewer vegetative branches and those present were smaller.

Table 2. Plant observations taken in mid-August 1970 on cotton planted two rows per bed on 40-inch centers.

Characteristics	Plants/acre		
	30,000	60,000	80,000
Bolls/plant (No.)	13.0	7.7	5.9
Bolls/acre (No.)	390,000	462,000	472,000
Fruit/acre (lb.)	2808	2988	2904
Leaves/acre (lb.)	1719	2010	2112
Percent fruit	44.6	41.7	36.4
Percent leaves	28.2	28.0	26.5
Percent petioles	5.5	5.5	5.3
Percent stems	21.7	24.7	31.8
Plant height (in.)	31.9	31.0	29.1
Nodes/plant (No.)	28.3	27.2	25.2
Vegetative branches/plant (No.)	1.8	.9	1.0
Nodes/vegetative branch (No.)	10.1	7.0	5.8

Table 3 shows the seed cotton yields that were obtained from the first experiment. These results are somewhat similar to those from Yuma. Plant population had relatively little effect. At the earliest termination date, however, 60,000 plants/acre show a slight increase over 30,000 plants/acre. If there is an advantage to planting cotton at a higher population, it is more likely to be expressed with an early irrigation termination. The low yield obtained from 80,000 plants/acre at the final irrigation termination date is unexplainable.

The observations taken in mid-August indicate a small potential for yield increase with 60,000 over 30,000 plants/acre. The fact that this trend was not observed in seed cotton yields at the later irrigation termination dates may have resulted from greater insect and boll rot damage in the higher populations. Observations and comparisons were not made in the various plots, but our plots had higher insect counts during the summer than adjacent conventionally planted plots.

Table 4 shows seed cotton yields obtained from the second experiment. As was the case at Yuma, two rows per bed shows a consistent advantage over one row per bed with both 30- and 40-inch beds. However, it is difficult to explain why cotton planted on 30-inch beds yielded less than 40-inch beds. As was shown with the previous experiment, higher populations did not result in higher yields.

The variety used in these experiments was bred and adapted for full season growth in 40-inch beds. Therefore, it may not be surprising that attempting to manipulate this variety to set an early fruit load and terminate early did not consistently result in increased yields at higher populations. However, we believe that with a properly adapted variety, a system of high population cotton planted in narrow rows with an early irrigation termination date can result in yields as high as those obtained from conventional methods and that economic savings can be realized.

Table 3. Seed cotton yields (pounds/acre) from cotton planted two rows per bed on 40-inch centers with indicated last date of irrigation, Phoenix 1970.

Plants/A	July 22	August 1	August 18	Mean
30,000	2351	2977	2938	2755
60,000	2560	2847	3004	2804
80,000	2272	2938	2494	2568
Mean	2390	2925	2808	

Table 4. Seed cotton yields (pounds/acre) with indicated bed spacing and rows per bed, Phoenix 1970. Last irrigation on August 18.

	30-inch beds			40-inch beds		
Plants/A	1 row	2 rows	Mean	1 row	2 rows	Mean
30,000	2625	2925	2775	2729	3030	2880
60,000	2573	2769	2671	2638	2886	2762
80,000	2599	2795	2716	2716	2847	2782
Mean	2599	2834	2721	2690	2925	2808