Plant Spacing of Pima Cotton

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The proper within-row spacing of cotton plants for optimum performance of the crop is of vital importance to the cotton grower. Plant spacing greatly influences the type of growth of the cotton plant.

If plants are closely spaced in the row, the stalks are small and spindly, fruiting branches are short, and the crop consists largely of bolls located near the main stalk, with the lowest bolls set relatively high on the plant. Wide spacing results in a branching type growth with long fruiting branches that begin to form relatively low on the plant.

Peebles, Den Hartog, and Pressley[1] and Leding and Cotton[2] conducted within-row spacing experiments with Pima cotton (*Gossypium barbadense* L.) in Arizona and New Mexico, respectively, between 1950 and 1952. They included Pima 32 and several similar experimental strains in their tests. Peebles *et al* found that close plant spacing of 2 to 6 inches, compared to a wide spacing of 12 to 16 inches, increased lint yield by an average of 12.9 per cent, and that earliness (percentage of first pick) was nearly 15 per cent greater at the 6-inch than at 12- to 16-inch spacings.

At a 4-inch spacing, earliness was less than 5 per cent above the mean for the 12- to 16-inch spacings. Leding and Cotton reported that in New Mexico appreciable yield differences occurred in favor of spaced plants, with a 12-inch spacing appearing to give the best all-round results. They compared spacings of 18, 12 and 6 inches and unthinned (approximately 3.3 plants per foot). Between-row spacing in the Arizona tests was 36 inches and in New Mexico 40 inches.

Different at Different Places

The apparent lack of agreement in the results of these two groups of workers in regard to recommended within-row spacings could be due to environmental conditions. Differences in altitude (approximately 1200 to 1400 feet for the Arizona tests and 3800 feet for the tests in New Mexico) contributed much to the varied growing conditions.

The present study was undertaken to determine the response of the current commercial varieties of Pima (Pima S-1 and Pima S-2) to different within-row plant spacings under varying environmental conditions.

In 1960, Pima S-1 and Pima S-2 were grown at Tempe and Safford with the following within-row spacings: unthinned (planting rate approximately 20 pounds per acre resulting in a 3-inch average spacing), 6, 12, 18, 24 and 30 inches. The spacing between rows was 40 inches at Tempe and 38 inches at Safford. The altitude at Tempe is approximately 1,200 feet and approximately 3,000 feet at Safford.

In 1961 a similar test was grown only at Tempe. The 1962 tests with only Pima S-2 included the following spacings: unthinned (average spacing 3 inches), 6, 9, 12, 15 and 18 inches. The 1962 tests were grown at Tempe and Safford.

Check Several Items

The effect of plant spacing was determined for each of the following characteristics: lint yield per acre, per cent first pick, plant height, boll size, lint per cent, fiber length, fiber strength and fiber fineness.

YIELD OF LINT PER ACRE.—In 1960 at Tempe, the 6-inch spacing for both varieties resulted in highest yields and the loss in yield from no thinning as compared to 6-inch spacing was highly significant (Table I). Also there was an increasing loss in yield as spacing was increased from 12 to 30 inches. At Safford the 6-inch spacing gave the highest yield for Pima S-2 and the 12-inch spacing for Pima S-1, and there was no significant yield reduction from no thinning when compared to the 6-inch spacing for either variety. Spacing in excess of 6 inches for Pima S-2 and 12 inches for Pima S-1 resulted in a loss in yield when compared to the spacing giving the maximum yield

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Table I. Effect of spacing on yield and earliness of Pima S-1 and Pima S-2 at Tempe, 1960-61, and Safford, 1960.

Spacing	*Variety*	*Tempe, 1960*		*Safford, 1960*		*Tempe, 1961*	
		Pounds lint/acre	*Per cent 1st pick*	*Pounds lint/acre*	*Per cent 1st pick*	*Pounds lint/acre*	*Per cent 1st pick*
No thin	S-1	517	51	1164	74	795	46
	S-2	743	68	1251	81	935	56
6-inch	S-1	714	59	1195	79	821	54
	S-2	891	73	1304	82	1044	61
12-inch	S-1	647	61	1258	75	873	56
	S-2	811	71	1280	78	1068	65
18-inch	S-1	620	55	1215	75	818	48
	S-2	764	69	1255	76	1037	56
24-inch	S-1	512	54	1150	70	765	47
	S-2	704	66	1120	69	1014	51
30-inch	S-1	472	54	1084	69	714	44
	S-2	618	60	1099	67	906	48

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[1]R. H. Peebles, G. T. Den Hartog and E. H. Pressley; Effect of Spacing on Some Agronomic and Fiber Characteristics of Irrigated Cotton. U.S.D.A. Technical Bulletin No. 1140, June 1956.

[2]A. R. Leding and John R. Cotton; Spacing Experiments with American-Egyptian Cotton in New Mexico. New Mexico Agricultural Experiment Station Press Bulletin 1083. April 1953.

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for each variety — the wider spacings giving the greater losses.

In 1961 at Tempe, maximum yield for each variety was obtained at the 12-inch spacing. Although yields from the different spacings were not significantly different, there was a gradual increase in yield from the unthinned to the 12-inch spacing and then a gradual decrease through the 30-inch spacing. The results deviate slightly from those in 1960, when the maximum yield at Tempe was obtained from the 6-inch spacing and the loss of yield from unthinned as compared to 6 inches was highly significant.

Table II. Effect of spacing on yield and earliness of Pima S-2 at Tempe and Safford, 1962.

	Tempe		*Safford*	
Spacing	*Pounds lint/acre*	*Per cent 1st pick*	*Pounds lint/acre*	*Per cent 1st pick*
No thin	969	84	942	67
6-inch	905	89	929	73
9-inch	816	87	921	75
12-inch	738	88	837	74
15-inch	690	82	762	70
18-inch	664	82	779	64

Tests With S-2 Only

In 1962, 9- and 15-inch spacings were substituted for the wider, relatively unproductive spacings of 24 and 30 inches (Table II). Pima S-2 was the only variety grown, since the relative reactions of Pima S-1 and Pima S-2 to different spacings were similar in 1960 and 1961. The 1962 season, as contrasted to 1960 and 1961, was conducive to earlier boll set and this in turn resulted in a more favorable yield response from the unthinned cotton. In closely spaced cotton, low fruiting branches usually do not develop, and the first boll generally appears so high on the plant that yield is reduced.

The 3-inch spacing did not produce this effect at either location in 1962. At Tempe the unthinned plants yielded significantly above those at the 6-inch spacing, while at Safford the unthinned plants yielded slightly but not significantly above those at the 6-inch spacing. There was a general trend for lower yields with wider spacings at both locations.

In these tests over a 3-year period, cotton was grown under diverse conditions due to altitude influence and years. It may be expected that the results were not entirely consistent. It does appear, however, that a within-row spacing of approximately 6 inches will be satisfactory under most conditions.

3 Inches Close Enough

In these tests the unthinned plots were planted at approximately 20 pounds per acre, which gave a stand with approximately a 3-inch spacing. The only real yield reduction from not thinning was experienced at Tempe in 1960. Thinning, however, seems extremely desirable if planting rates result in plants appreciably closer than 3 inches. Plants too closely spaced have a poor bottom set and may become tall, top-heavy and lodged. This condition often results in yield reduction which is more pronounced in some seasons than in others.

EARLINESS.—Maximum earliness (per cent first pick) was obtained from the 6- to 12-inch spacings, with lateness associated with either closer or wider spacings. Close spacing exerts two opposing effects on crop maturity. The closely spaced plants have short fruiting branches so that the crop consists primarily of bolls located near the main stalk. Plants of this type tend to mature earlier, because the time interval of flower formation is much shorter between first nodes of the successive fruiting branches than between successive nodes on a given fruiting branch. On the other hand, low flowers in closely spaced cotton generally do not develop, and the first boll appears higher on the plant, thus delaying development and maturity of the crop.

Extremely wide spacing also has a delaying effect on crop maturity, because bolls are set on long fruiting branches. The time interval between flower appearances on a given fruiting branch is about twice as long as the interval between flower development at the first nodes of successive fruiting branches. Spacing of approximately 6 inches seems to give the optimum combination of flower formation for maximum earliness.

PLANT HEIGHT. — Shorter plants are generally obtained with wider spacings; however, within the range of spacings conducive to maximum yields, height differences are minor. Height responses are closely associated with bottom set as poor bottom set tends to result in taller plants.

Lint Per Cent Not Affected

BOLL SIZE.—Boll size differences were observed in only one of the five tests. In this test, smaller bolls were obtained with closer spacing.

LINT PER CENT.—Lint per cent was not significantly influenced by spacing.

FIBER LENGTH.—Three of the five tests showed significant effects of spacing on fiber length. Generally the longest fiber was obtained from the spacings which gave optimum yield performance.

FIBER STRENGTH. — Two of the tests showed significant effects of spacing on fiber strength. In these tests weaker fiber was associated with the close spacing. However, there generally was no appreciable difference in strength within the range of spacings giving maximum yields.

FIBER FINENESS.—Spacing had a significant influence on fineness in two of the five tests. In these the closer spacings gave the finest fiber.

Affects Yield, Earliness

Yield, earliness, and type of growth of cotton are appreciably affected by plant spacing. There are minor effects on boll and fiber properties. However, these differences are not appreciable within the range of spacings for maximum yield. Spacings between 3 and 6 inches seem most desirable, as these spacings tended to give optimum performance of the cotton plant in terms of yield, earliness, desirable plant type and fiber properties.

Unthinned plants (approximately 3-inch spacing) gave excellent results in the 1962 season when environmental conditions were conducive to a good bottom set. In 1960, particularly at Tempe, when the season was less favorable to a good bottom set, the 6-inch spacing was more desirable.

Probably you were well aware of National Farm-City Week in November. But did you know it had its origin right here in Arizona? Yes, it was in 1952 that the late Kenneth McMichen of Goodyear Farms, then serving as district chairman of the Kiwanis agricultural committee, proposed such a week to "foster better relationships between farm and city people." It was in 1955 when, as the idea kept spreading, Kiwanis International formally made this a national event.