Planting Seed

SEEDLING EMERGENCE STUDIES ON UPLAND COTTON IN ARIZONA IN 1983

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These tests are a continuation of studies on cotton seed quality that have been conducted in Arizona for several years. Conditions for germination and emergence were poor in 1983 because of low spring temperatures. Therefore, field evaluations of seed quality should be good.

Commercial seed of 16 upland cotton varieties were planted early in the season for emergence studies at Maricopa, Marana, and Safford. Standard germination and cold test evaluations indicated that seed of all varieties was high quality (Table 1). DPL 70 and DPL NSL had significantly lower emergence than the highest emerging variety at all three locations (Table 2). Cold test germinations were among the lowest for those varieties. DPL 41, DPL 61, DPL 120, and Stonevillle 213 had significantly lower emergence than the best variety at one location each. DPL 41 and Stoneville 213 also had low cold test germination, while DPL 61 and DPL 120 had fairly high cold test germination. Though reduced emergence was obtained for some varieties, these tests alone cannot identify genetic based reduced seedling vigor. Further, days required for 50% emergence did not differ significantly among varieties in any test (Table 3).

Seed of DPL 61 having low quality (1980 crop with 1983 standard germ of 65% and cold test of 25%) and high quality (1982 crop, standard germ 94%, cold test germ 66%) was planted at three planting rates for yield comparison at Marana, and Safford, Arizona. Emergence was better for the high quality seed at both locations (Table 4). The test at Marana was not harvested for yield data, because of flood damage. Seed cotton yield was about 50% higher from the high quality seed than from the low quality seed at Safford. This was approximately proportional to the differences in stand. However, analysis of covariance showed significant differences in yield for the two seed qualities after correction for differences in stand. The difference must be due to individual plant productivity.

Six lots of DPL 90 cotton with different seed density was planted at three planting rates at Marana and Safford. Different seed densities were obtained from one lot of seed by taking four seed densities from different cuts from the gravity table, a sample prior to separation on the gravity table, and the commercial cut (the three highest densities) from the gravity table. Seedling stand was closely related to cold test results (Table 5 and Figure 1). The highest density seed had the highest stand at both locations and the highest yield at Safford. The Marana test was abandoned for harvest because of flooding. The

Table 1. Standard germination and cold test (18°C germination in 7 days) for 18 lots of cotton seed used in 1983 field testing in Arizona.

Variety	Standard	Cold Test
DPL 41	79.0 b*	82.5*
DPL 55	91.3 a*	93.0
DPL 61	80.0 b	86.0
DPL 62	87.8 b	80.5
DPL 70	79.3 b	79.5
DPL 90	92.3 a	89.5
DPL 120	87.8 ab	90.5
DPL 733	87.8 ab	87.0
DPL NSL	87.3 ab	80.5
DPL NSL 150	86.3 ab	90.0
Stoneville 825	86.0 ab	89.5
Stonevile 506	86.0 ab	87.0
Stoneville 213	81.5 b	77.5
Stoneville 302	86.5 ab	80.0
McNair 220	87.8 ab	81.5
McNair 235	86.8 ab	88.0
Pima S-5	-------	80.0
Pima S-6	84.5 a	82.0
Mean	85.7	84.7
CV	4 %	7 %

*Variety means were not significantly different at the 0.05 confidence level if followed by the same letter according to the Student-Newman-Kuel test. Cold test means did not differ significantly at the 0.05 confidence level.

Table 2. Seedling emergence percentage for 16 upland cotton varieties planted in 1983 at three locations in Arizona at planting dates indicated.

Variety	Maricopa April 4	Marana April 8	Safford April 12
DPL 30	28.4 ab*	45.5 ab	27.4 abc
DPL 41	25.8 ab	33.4 abc	14.7 d
DPL 55	32.9 ab	43.8 ab	27.9 abc
DPL 61	29.1 ab	41.8 ab	18.1 cd
DPL 62	27.9 ab	46.4 ab	27.0 abc
DPL 70	19.0 b	26.3 bc	17.4 cd
DPL 90	40.4 ab	48.5 a	25.9 abcd
DPL 120	27.6 ab	32.5 abc	15.7 cd
DPL 733	48.5 a	50.4 a	37.7 a
DPL NSL	24.3 b	30.0 bc	24.6 bcd
DPL NSL 150	38.6 ab	47.3 ab	34.6 ab
Stv. 825	27.9 ab	46.8 ab	36.6 ab
Stv. 506	35.1 ab	42.8 ab	27.6 abc
Stv. 213	22.9 b	39.9 abc	25.6 abcd
McNair 220	40.5 ab	44.1 ab	26.3 abcd
McNair 235	39.6 ab	49.0 a	35.6 ab
Mean	31.8	41.8	26.4
CV	44 %	25 %	27 %

*Means within a column are not significantly different at the 0.05 confidence level from other means followed by the same letter according to the Student-Newman-Kuel test.

Table 3. Estimated days for 50% of seedlings to emerge for 16 upland cotton varieties planted in 1983 at three locations in Arizona at the planting dates indicated.

Variety	Test location and planting dates: Maricopa April 4	Marana April 8	Safford April 12	Combined
DPL 30	12.0*	19.8*	22.1*	17.8*
DPL 41	17.3	20.4	21.6	19.7
DPL 55	13.7	21.2	20.5	18.4
DPL 61	14.9	20.3	22.5	19.1
DPL 62	19.5	20.4	21.8	20.5
DPL 70	16.1	20.7	21.5	19.4
DPL 90	17.6	20.3	21.4	19.7
DPL 120	18.1	20.7	22.4	20.3
DPL 733	14.1	20.5	21.1	18.5
DPL NSL	17.7	20.7	21.7	19.9
DPL NSL 150	16.2	20.0	20.9	18.9
Stv. 825	15.8	20.8	21.5	19.3
Stv. 506	15.5	20.5	21.7	19.1
Stv. 213	13.5	20.4	21.4	18.3
McNair 220	13.0	20.2	21.9	18.2
McNair 235	19.1	20.7	22.2	20.6
Mean	15.9	20.5	21.6	19.2
CV	34 %	5 %	6 %	22 %

*Differences among varieties within a test and combined were not significant at the 0.05 confidence level.

Table 4. Seedling emergence for high quality and low quality DPL 61 seed planted at two locations in Arizona at planting dates indicated. Seed cotton yield at Safford.

Seed Quality	Seeds/ row*	Marana - April 8 Emerge	Marana - April 8 % emerge	Safford - April 12 Emerge	Safford - April 12 % emerge	lbs lint acre
Low	100	15.5 d	15.5	19.2 d	12.8	401c
Low	200	32.0 c	16.0	39.4 c	13.1	485b
Low	300	55.8 a	18.6	58.8 b	13.1	508b
High	100	24.0 cd	24.0	36.0 c	24.0	685a
High	200	43.3 b	21.7	63.4 b	21.1	691a
High	300	64.8 a	21.6	87.6 a	19.5	703a
Mean low qual.		34.4b	16.7b	39.1b	13.0b	461b
Mean high qual.		44.0a	22.4a	62.3a	21.5a	691a

*150, 300, and 450 at Safford.

**Estimated 32% Gin Turnout	22 %	17 %	19 %	18 %	14 %

**Means within a column are not significantly different at the 0.05 confidence level, from other means followed by the same letter, according to the Student-Newman-Keul test.

Table 5. Stand and seed cotton yield of 6 DPL 90 upland cotton cuts of a seed lot from a gravity table separation planted at two locations in Arizona in 1983.

Seed Lot	Planting* Rate	Cold Test % Germ	Marana - April 8 Stand	Marana - April 8 % stand	Safford - April 12 Stand	Safford - April 12 % stand	lbs seed cotton/ Acre
1. Before gravity table	1X		49.0 fg**	49.0	48.4 gh	32.3	621 ghi
	2X		109.7	54.8	90.0 ef	30.0	767 gh
	3X		159.8 bcd	53.3	142.0 bc	31.6	924 abc
2. Lowest density	1X		28.8 g	28.8	21.6 h	14.4	424 k
	2X		51.7 fg	25.8	42.0 gh	14.0	581 j
	3X		75.2 f	25.1	52.0 g	11.6	720 i
3. Second lowest density	1X		68.0 fg	68.0	63.8 fg	42.5	732 hi
	2X		120.2 e	60.1	107.4 de	35.8	871 de
	3X		159.7 bcd	53.2	163.4 ab	36.3	848 ef
4. Second highest density	1X		63.8 fg	63.8	56.8 g	37.9	732 hi
	2X		135.7 de	67.8	91.2 ef	30.4	848 ef
	3X		156.8 bcd	52.3	126.8 cd	28.2	912 bc
5. Highest density	1X		68.7 fg	68.7	74.8 fg	49.9	772 g
	2X		145.5 cde	72.8	139.0 bc	46.3	984 cd
	3X		214.2 a	71.4	185.2 a	41.2	941 ab
6. Commercial cut table	1X		64.3 fg	64.3	65.4 fg	43.6	743 ghi
	2X		137.0 de	68.5	111.4 de	37.1	830 f
	3X		192.8 ab	64.3	143.6 bc	31.9	953 a
Summary							
1.		42.0 b	106.2 d	52.4 d	93.5 c	31.3 c	772 c
2.		28.7 c	51.9 e	26.6 e	38.5 d	13.3 d	575 d
3.		61.3 a	116.0 c	60.4 c	111.5 b	38.2 b	819 b
4.		57.0 a	118.8 c	61.3 c	91.6 c	32.2 c	830 b
5.		67.3 a	142.8 a	70.9 a	133.0 a	45.8 a	871 a
6.		65.7 a	131.4 b	65.7 b	106.8 b	37.5 b	842 ab
Mean		53.7	111.2	57.0	95.8	33.1	784
CV		13 %	23 %	21 %	19 %	17 %	15 %

* 1X = 100 seed at Marana and 150 seed at Safford.

** Means within a column are not significantly different at the 0.05 confidence level from other means followed by the same letter according to the Student-Newman-Keul test.

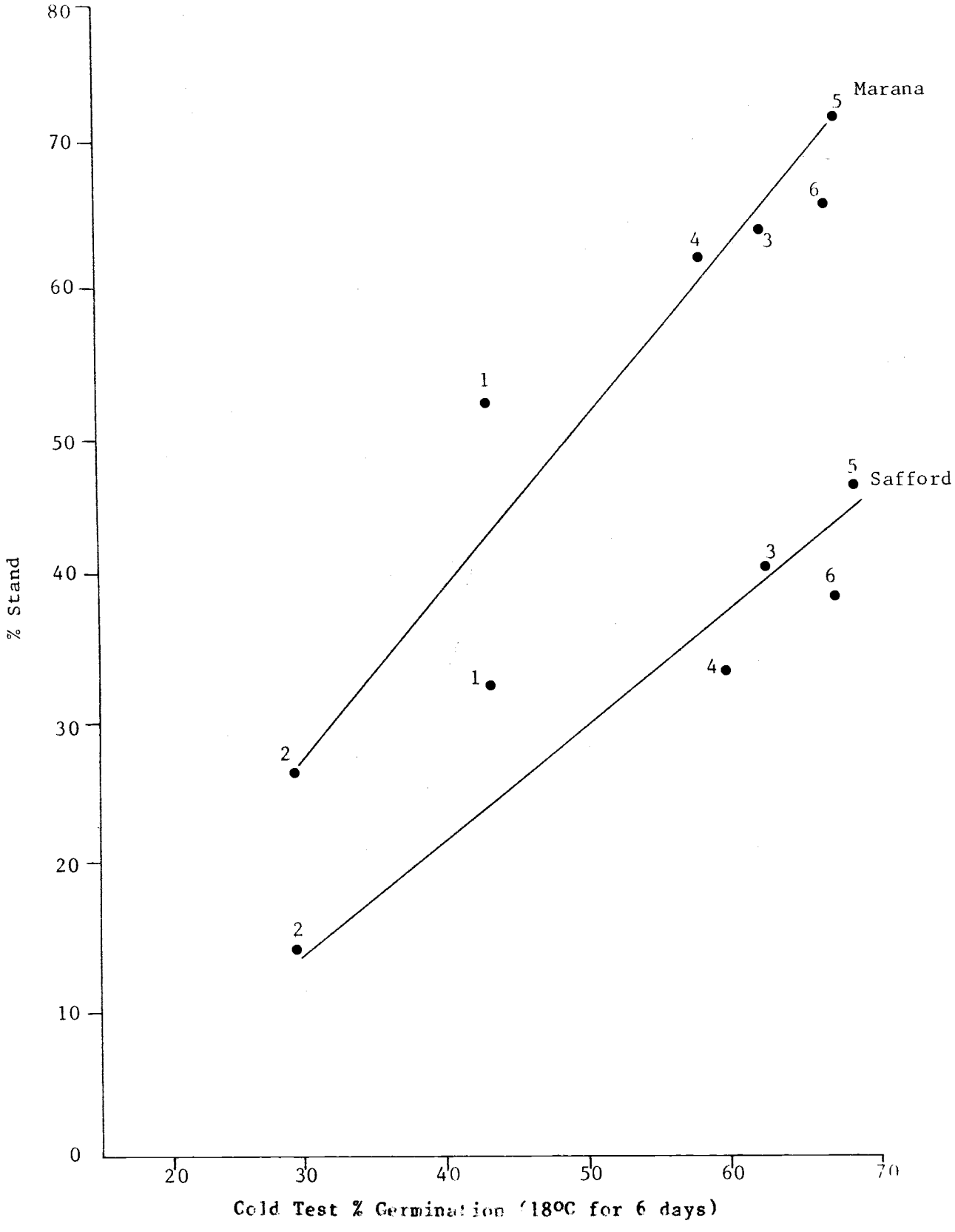

Figure 1. Relationship between cold test and stand for 6 lots of DPL 90 cotton of different seed densities planted at two locations in Arizona in 1983.

lowest density seed had significantly lower stand and yield than other treatments. The before gravity table seed was significantly lower in stand and seed cotton yield than highest density seed, in all cases. The unseparated seed difference was great enough to justify seed separation on the gravity table. Unlike the seed quality test, covariance correction for stand eliminated significance of treatment differences in yield.

Reevaluation of two tests grown in 1982 using immature (light colored) seed as compared to mature seed from the same DPL 61 lot showed unexplained yield reduction. Lint yield reduction from immature seed was about 75 pounds of lint/acre or $55.00/acre at $0.70/lb. that could not be accounted for by stand (Figure 2).

The differential effect of low quality seed from the two 1983 tests is illustrated in Figures 3 and 4. The DPL 61 seed qualities had an average difference in yield of 230 pounds of lint/acre (Table 4). In Figure 3 we find that about 40 pounds (17%) of the yield reduction can be explained by difference in stand. The remaining difference of 190 pounds of lint/acre ($133.00/acre at $0.70/lb.) must be caused by some other unknown factors. In contrast, the 267 pounds of lint/acre difference in yield for the two lots of DPL 90 of different seed densities shown in Figure 4 appears to be due entirely to differences in stand. The remaining four seed density lots had regression lines that were close to the two shown in Figure 4.

Removing the low density lot of DPL 90 seed from commercial seed because of expected reduced emergence appears justified, even though full yield could be expected if enough seed were planted. The 1983 DPL 61 seed of low quality was so low that it would not be marketed. However, the response obtained suggests that a similar, but smaller, difference in potential productivity might be found in commercial seed lots of different qualities.

Thus, these preliminary evaluations suggest that some low quality cotton seed (immature and old seed) will result in reduced lint yield regardless of stand. In other cases low quality cotton seed (low seed density) will not affect yield if an adequate stand is obtained.

The findings to date on seed quality need to be verified. Other causes of low seed quality such as cracked seed, field weathered seed and seed from different irrigation managements also need to be evaluated. Additionally, low quality seed needs to be compared under favorable emergence conditions such as late planting.

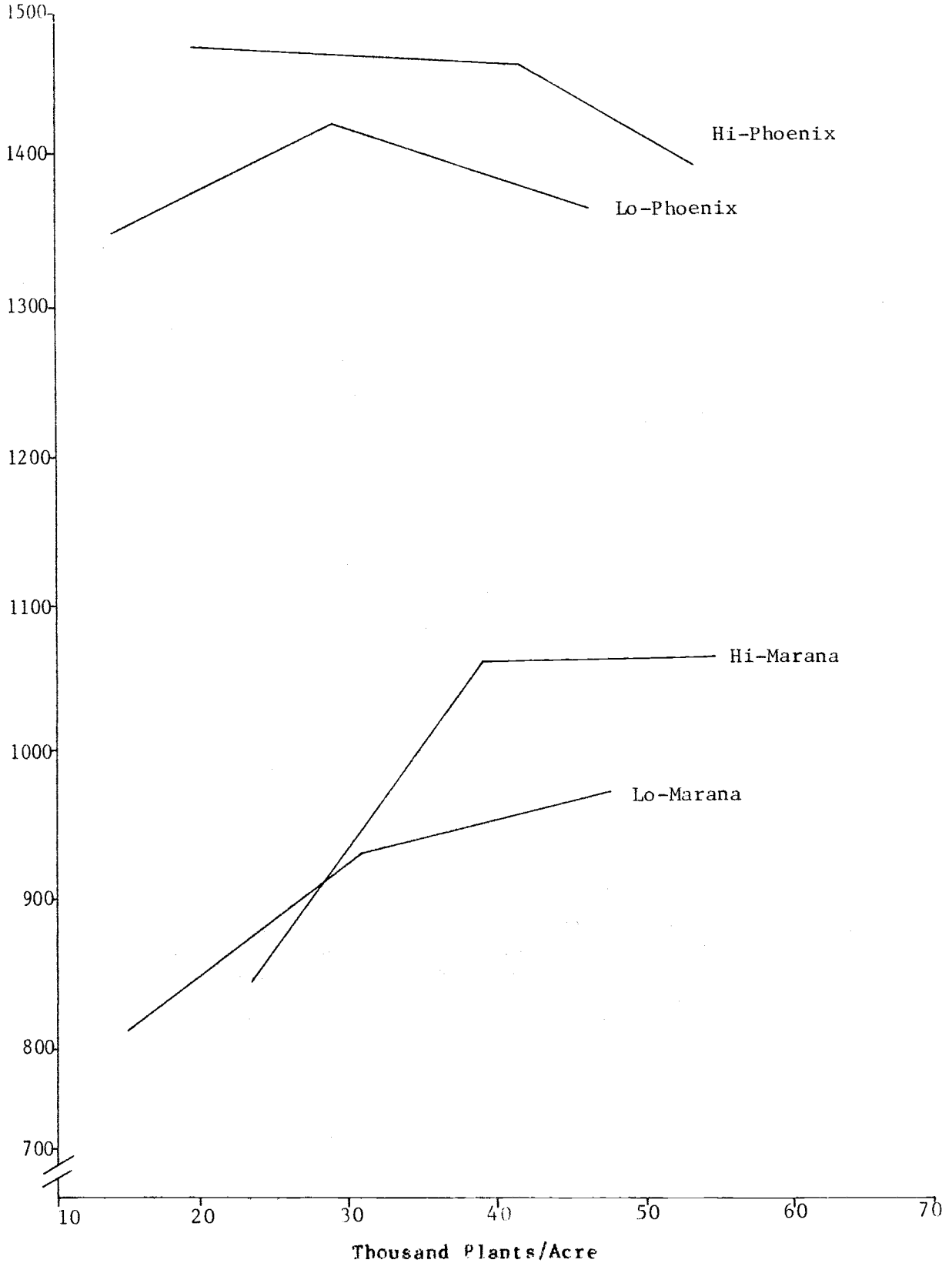

Figure 2. Lint yield of two portions of the same lot ofDPL 61 cotton grown at two locations in Arizona in 1982. Hi is mature black cotton seed while Lo is immature light colored seed from the same lot.

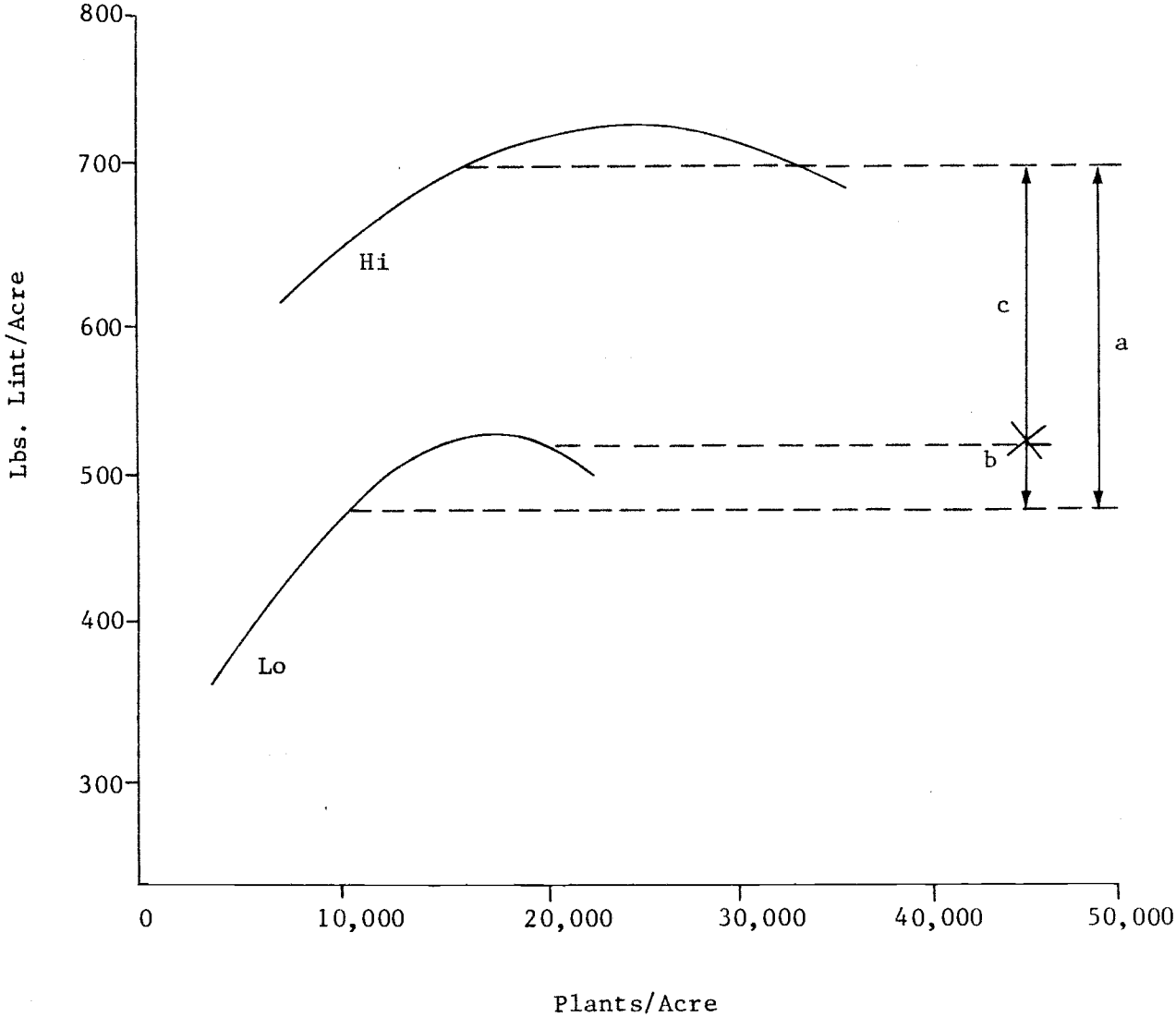

Figure 3. Pounds of line/acre from two lots of DPL 61 cotton at different plant populations and having high and low quality, with total yield difference between lots (a), difference due to stand (b), and difference due to other factors (c) at Safford, Arizona in 1983.

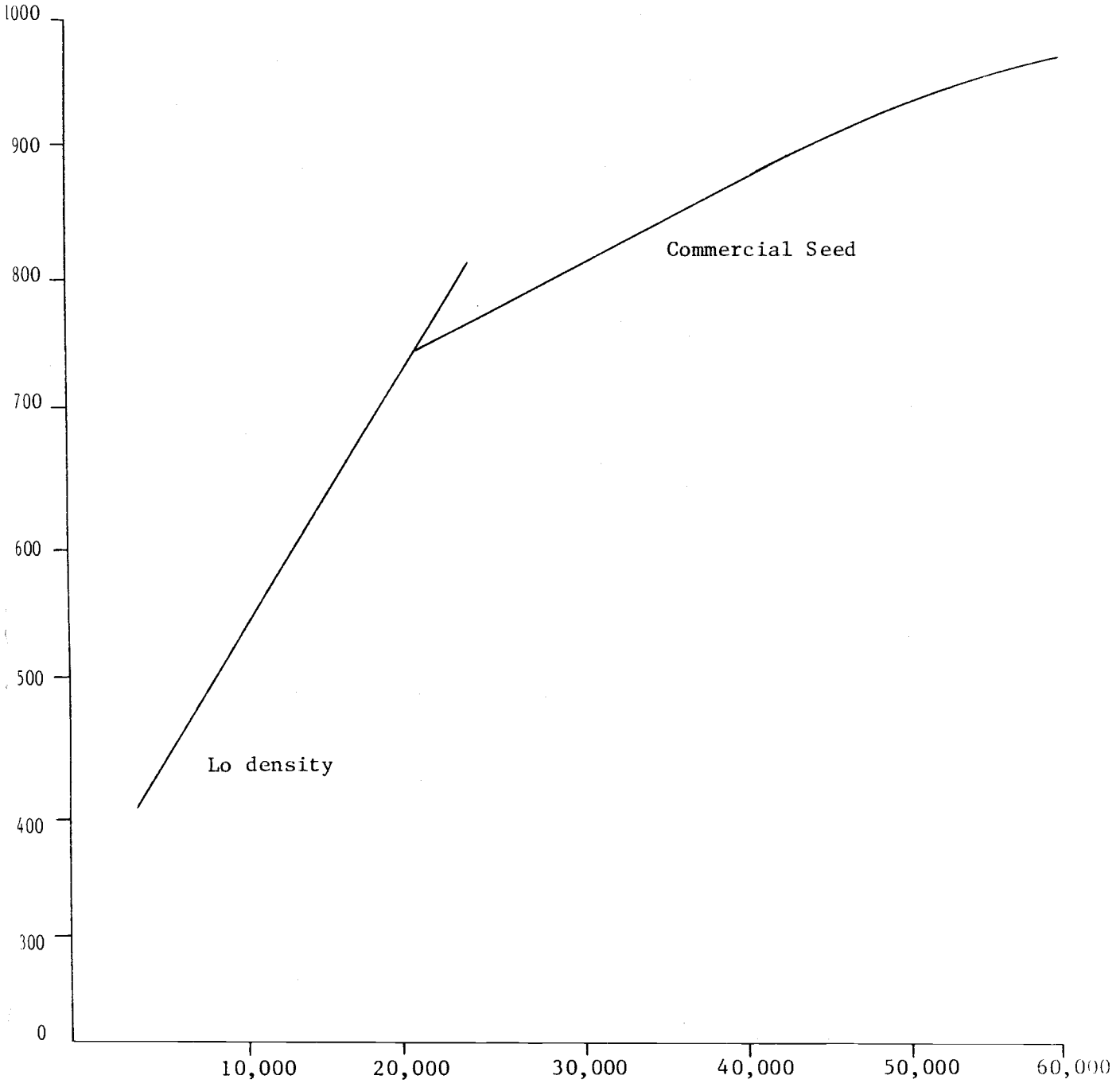

Figure 4. Pounds of lint/acre from two lots of DPL 90 cotton at different plant populatino with low density (reject) and commercial seed at Safford, Arizona in 1983.