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Differential Effect of Planting Date On the Performance of Cotton Varieties On the High Plains of Texas, 1960-65

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Contents

Summary

Each year during the period 1960-1965, Paymaster 101-A (medium-early), Lankart 57 (medium) and Blightmaster (medium-late) were planted at Lubbock on six dates ranging from April 20 through June 30. However, four of the six 1963 plantings were destroyed by disease; data from that year are omitted. The plantings were fertilized and irrigated adequately, and the yields, lint percentages and fiber properties of each variety were determined. The more significant findings follow.

There was a definite differential effect of planting date on lint yields. That is, the yields for the three varieties were very similar for the April 20 planting date; but for May 15 and later plantings, the earliest maturing variety, Paymaster 101-A, generally outyielded the other two varieties. Thus, probable planting date should be a major consideration in selection of varietal types.

In general, each successive planting made after April 20, gave successively lower yields, lint percentages and micronaire values; and plantings made by June 1 produced longer fibers than plantings made after this date.

Fiber elongation values increased initially as the planting date become later. Then after peaking out on certain dates, which varied according to the maturity characteristics of the varieties, they decreased. Generally, the earlier the variety, the later the peak value of elongation was reached.

Classer's grades were generally Strict Low Middling or Middling for plantings made by June 10. The June 20 plantings produced mostly light spotted grades; and most of the June 30 plantings produced spotted, wasty grades.

Averaged overall planting dates, Paymaster 101-A produced the highest yields, lint percentages, fiber strength values and micronaire values. Lankart 57 produced the longest, weakest and most elastic fiber.

Since two-thirds of the test plantings were made in June, a post-optimum period, the better overall performance of the earlier maturing variety, Paymaster 101-A, was expected.

Differential Effect of Planting Date on the Performance of Cotton Varieties on the High Plains of Texas, 1960-65

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RESEARCH (7) HAS SHOWN THAT COTTON PLANTING on the High Plains should be delayed until the 10-day average minimum soil temperature at the 8 inch depth has reached 60°F. However, planting cannot always be accomplished at this time because of unfavorable soil moisture conditions or other factors. Each year on the High Plains thousands of acres of cotton are destroyed or badly damaged by hail, blowing soil, flooding and disease organisms. In situations such as these, if the cotton producer chooses not to leave the land idle, he must decide whether to plant (or replant) cotton or an alternate crop. As a basis for a sound decision he must have reliable estimates of the net returns he can expect from the various alternatives.

After 4 years of testing the effects of plant spacing and planting date on cotton grown under raingrown (dryland) conditions in Arkansas, Hughes (8) concluded that planting date did not significantly affect boll size, fiber strength or fiber fineness (micronaire). However, planting date significantly affected fiber length. Plantings made in early June produced the longest fibers, mid-to-late April plantings produced the shortest fibers, and plantings made about the second week of May produced intermediate fiber lengths. All tests were planted to the Rex variety.

Research results from 3 years of tests at Weslaco (1, 4, 6) showed that mid-March plantings outyielded mid-February plantings. Higher soil and air temperatures were cited as being major factors in the better performance of the mid-March plantings.

Tests at Lubbock during the 7-year period of 1953-1959 (3) showed similar yields from plantings made between April 20 and May 20. Every additional 10-day delay in planting after May 20 resulted in significant yield reductions. With the exception of the 1959 plantings, a single variety (usually of the medium-late maturity type) was planted.

Since data from other locations are not directly applicable to the High Plains area, and since the available data from this area were limited in scope, additional information on the interrelations of planting dates and various varietal types under less restricted growing conditions is needed. Therefore, the major objective of the experiments reported in this bulletin was to obtain information that will help the producer estimate the expected net returns from various varietal types planted on certain dates.

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MATERIALS AND METHODS

The field performance tests were conducted on Olton loam soil at the Texas A&M University Agricultural Research and Extension Center at Lubbock during 1960-65.

All the test designs were randomized complete blocks with planting dates as main plots and varieties as subplots.

During the testing period, the number of entries varied from 3 to 6, the plot lengths varied from 39 to 52 feet and the number of replications varied from 3 to 6. There were four rows per plot in each case.

Data are limited to the three varieties common to every test. They were Blightmaster (medium-late maturity), Lankart 57 (medium maturity) and Paymaster 101-A (medium-early maturity).

Approximate planting dates for all tests were April 20, May 15, June 1, June 10, June 20 and June 30. The actual planting date did not deviate from the approximate date by more than 2 days. April 10 and May 1 plantings were made in 1964 and 1965, but the data are not included because 2 years were considered an inadequate sampling of a planting date.

Planting rates were determined on the basis of seed size and laboratory germination tests; and the rates varied from 25 to 40 pounds of seed per acre. A planter with W-type lister bottoms was used for seeding the plots in rows 40 inches apart.

A preplant irrigation of 4 to 6 acre inches was applied each year except 1961. Summer irrigations of approximately 3 to 4 acre inches were applied as needed to maintain adequate soil moisture. Hence the April 20 through June 1 planting generally received two or three summer irrigations; and the June 10 and June 20 plantings generally received one or two summer irrigations. The June 30 plots were summer irrigated in 1965 only; and they received only one irrigation.

The test area was fertilized each year with sufficient nitrogen, or nitrogen and phosphorus, to prevent soil fertility from limiting yields.

The two center rows of the plots were harvested with a mechanical stripper during late November or December of each year. A 1000-gram sample of the bur cotton from each plot was ginned to obtain lint percentage data and fiber samples. Grade and staple values were determined by personnel of the Agricultural Marketing Service, U.S. Department of Agriculture. Other fiber properties were determined by the Cotton Fiber Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Knoxville, Tennessee.

After harvest, plant counts were made and the total row-length of skips was determined for each plot. However, adjustments of the yield values for skips were made only in 1960, and these were small.

The May 15, 1961, planting was destroyed by flooding. Therefore, data reported for this planting were calculated by a missing test technique devised by Patterson (9).

Analyses of the data were made according to the procedures set forth by Snedecor (10); and differences among averages were tested for significance by Duncan's multiple range test (5).

GROWING CONDITIONS

Because seedling diseases destroyed the first four plantings of the 1963 test, this test was excluded from this report. In the other tests years, damage from seedling diseases was generally not severe; and although there was some stand reduction of the early planting in certain years, the stands generally were adequate. Verticillium wilt caused slight to moderate damage in 1962 and 1965 and caused moderate to severe damage in 1964.

Insect infestations were never severe enough to warrant control measures. However, there was some early thrip damage to the 1964 test.

The minimum 10-day average soil temperature at the 8-inch depth reached 60° on April 14, 20, 21, 24 and 13, in 1960, 1961, 1962, 1964 and 1965, respectively. The 13-year average date for this occurrence is April 24.

Rainfall during April through October was 18.94, 12.75, 15.57, 10.30 and 11.60 inches for 1960, 1961, 1962, 1964 and 1965, respectively. The 52-year average rainfall for this period is 15.11.

The occurrence of the first 32° or lower, temperatures in the fall ranged from October 31, 1960, to November 22, 1965. The 46-year average date for the first occurrence of a 32° temperature in the fall is October 31 at Lubbock (2).

RESULTS AND DISCUSSION

Yields

The yields of the varieties in each year and their 5-year average yields over the test period are given in Table 1.

Due primarily to differences in growing conditions, the 3-variety yearly averages were quite variable for the 5 years studied. They ranged from a low of 568 pounds of lint per acre in 1964 to a high of 708 pounds in 1961.

Paymaster 101-A had the highest overall average yield in every year except 1965; and Lankart 57 ranked second in all years except 1964. Poor stands of Lankart

TABLE 1. POUNDS OF LINT PER ACRE PRODUCED BY THREE VARIETIES WHEN PLANTED ON VARIOUS DATES AT LUBBOCK, TEXAS

Planting date	1960				1961				1962			
	B[1]	L	P	Av.	B	L	P	Av.	B	L	P	Av.
April 20	1031 a[2]	1067 a	933 b	1010	988 a	1039 a	1022 a	1016	862 b	964 a	959 a	928
May 15	830 b	892 ab	963 a	895	890 b	883 b	974 a	916	839 b	871 ab	922 a	877
June 1	897 a	841 b	946 a	895	821 a	771 a	821 a	804	871 a	890 a	848 a	870
June 10	662 a	693 a	732 a	696	687 b	687 b	804 a	726	751 b	816 ab	867 a	811
June 20	416 a	405 a	501 a	441	469 b	486 b	620 a	525	412 b	468 b	626 a	502
June 30	188 b	260 ab	295 a	248	235 a	251 a	302 a	263	171 a	181 a	232 a	195
Av.	671	693	728	697	682	686	757	708	651	698	742	697

Planting date	1964				1965				5-year average			
	B	L	P	Av.	B	L	P	Av.	B	L	P	Av.
April 20	848 a	684 b	858 a	797	1007 a	1038 a	997 a	1014	947	958	954	953
May 15	787 a	711 a	803 a	767	844 a	898 a	878 a	873	838	851	908	866
June 1	601 a	707 a	734 a	681	656 b	835 a	763 ab	751	769	809	822	800
June 10	410 a	507 a	418 a	445	623 a	667 a	606 a	632	627	674	685	662
June 20	467 a	392 a	470 a	443	283 a	292 a	328 a	301	409	409	509	442
June 30	279 a	288 a	265 a	277	58 b	141 ab	235 a	145	186	224	266	225
Av.	565	548	591	568	578	645	634	619	629	654	691	658

[1] B = Blightmaster; L = Lankart 57; P = Paymaster 101-A.

[2] In the same row within a given year, any two averages followed by the same letter are not significantly different at odds of 19:1.

in the April 20 planting in 1964 caused a yield reduction for that date. And it was primarily this yield reduction that caused Lankart's 1964 average to fall below that of Blightmaster.

The differential effect of planting date on the performance of the varieties is also shown in Table 1. During the 5 years of testing, none of the three varieties was consistently high yielding in the April 20 plantings. However, for plantings after April 20, Paymaster generally produced more lint than the other two varieties and in nine cases Paymaster produced significantly more (at odds of 19:1) lint than Blightmaster. In five cases, Paymaster produced significantly more than Lankart. This was not unexpected since two-thirds of the plantings were made in June; and Paymaster is an earlier maturing variety than the other two. However, it does point out that whether the planting date is a free decision on the part of the producer or is fixed by uncontrollable natural causes, it should be a major consideration in selecting a variety to be planted.

The 5-year averages in Table 1 also show that the largest yield reductions from delayed planting resulted from plantings made after June 1. That is, the overall 5-year averages show that for each day's delay in planting from April 20 to May 15 a 3.5 pounds per day reduction in yield occurred (i.e., 953—866 divided by 25 days = 3.5). And for each day's delay in planting from May 15 to June 1, the average yield reduction was 3.9 pounds per day; from June 1 to June 10 it was 15.3 pounds; from June 10 to June 20 it was 22.0 pounds; and from June 20 to June 30 it was 21.7 pounds per day.

Lint Percentages

The 5-year average values for lint percentages (mechanical stripper harvested samples) are presented in Table 2.

The April 20 plantings had the highest lint percentages. With the exception of the May 15 planting, as the season progressed, the later the planting date the lower were the three variety average lint percentages.

Paymaster has the highest 5-year average lint percentage and was followed in ranking by Lankart and Blightmaster, respectively; and the later the planting the greater the differences became between Paymaster and the other two varieties.

Fiber Properties

The 5-year average values for staple length, upper half mean length, fiber strength, fiber elongation and micronaire are shown in Table 2.

Averaged over the 5 years, Lankart produced the longest fiber. During this period, Blightmaster and Paymaster maintained the same average staple length, but the upper half mean length of Blightmaster was slightly longer than that of Paymaster.

The fiber length averages of the first three planting dates were very similar; but the later the planting after June 1, the shorter was the fiber produced.

In every case, Paymaster had the highest fiber strength and Lankart had the lowest. The data also show that the fiber strength values of Blightmaster were

TABLE 2. FIVE-YEAR AVERAGE LINT PERCENTAGES AND FIBER PROPERTIES FOR THREE VARIETIES WHEN PLANTED ON VARIOUS DATES AT LUBBOCK, TEXAS

Planting date	Lint percentage				Staple length (32 nds. in.)				Upper half mean[1] fiber length (in.)			
	B[2]	L	P	Av.	B	L	P	Av.	B	L	P	Av.
April 20	23.4	24.8	24.7	24.3	30.1	30.7	30.1	30.3	.96	.98	.92	.95
May 15	21.8	21.2	23.0	22.0	30.3	30.5	29.8	30.2	.97	.98	.93	.96
June 1	22.0	22.7	22.6	22.4	30.3	30.5	30.3	30.4	.95	.98	.92	.95
June 10	20.8	21.8	22.9	21.8	29.7	30.1	29.8	29.9	.92	.96	.91	.93
June 20	16.9	17.5	20.6	18.3	29.2	29.3	29.1	29.2	.93	.93	.90	.92
June 30	12.7	13.9	16.5	14.4	28.7	29.4	29.0	29.0	.91	.90	.90	.90
Av.	19.6	20.3	21.7	20.5	29.7	30.1	29.7	29.8	.94	.96	.91	.94

Planting date	Fiber strength (gms./grex)[3]				Fiber elongation (%)[3]				Micronaire units[4]			
	B	L	P	Av.	B	L	P	Av.	B	L	P	Av.
April 20	1.62	1.50	1.64	1.59	9.2	10.7	9.2	9.7	3.7	3.7	3.7	3.7
May 15	1.63	1.52	1.69	1.61	9.3	10.7	9.4	9.8	3.5	3.6	3.4	3.5
June 1	1.60	1.53	1.68	1.60	10.2	10.9	9.6	10.2	3.2	3.4	3.3	3.3
June 10	1.64	1.54	1.74	1.64	9.4	11.2	9.6	10.1	3.3	3.3	3.4	3.3
June 20	1.62	1.54	1.79	1.65	9.4	10.8	9.9	10.0	2.9	2.9	3.3	3.0
June 30	1.64	1.63	1.76	1.68	9.0	10.9	9.2	9.7	2.4	2.5	2.6	2.5
Av.	1.62	1.54	1.72	1.63	9.4	10.9	9.5	9.9	3.2	3.2	3.3	3.2

[1]2.5% span lengths used in 1964 and 1965.

[2]B=Blightmaster; L=Lankart 57; P=Paymaster 101-A.

[3]Four-year average as the fiber in 1961 was too short for testing.

[4]"Below scale" readings in the yearly data were assigned a value of 2.0 so the data from all tests could be analyzed.

very consistent, whereas Paymaster had a much wider range in values. Lankart's values were also consistent for the first five planting dates.

The percentages of fiber elongation were very similar for Blightmaster and Paymaster; and their elongation values were considerably lower than those of Lankart.

The elongation values for each variety showed an initial increase as planting date advanced. However, a peak value was then reached and a decline in elongation followed. Each variety reached its peak in a different planting date; as a rule the earlier the variety in maturity, the later the peak of elongation.

The 5-year average micronaire values (units) of Blightmaster and Lankart were the same; and the average for Paymaster was only slightly higher than that of the other two varieties. However, with one minor exception, the micronaire values of both Blightmaster and Lankart decreased with each successively later planting. Paymaster, on the other hand, had almost the same micronaire values for all but the earliest and latest planting dates. Again, the earliness of Paymaster was probably the major factor in this differential response to planting date.

The 5-year average grades for the varieties are shown in Table 3.

For the most part, grades were quite acceptable for all varieties for plantings made on or before June 10. However, the effects of boll immaturity were very evident in the June 20 and June 30 plantings. The June 20 average grades were all light spotted, and the June 30 averages were all middling, spotted and wasty.

TABLE 3. FIVE-YEAR AVERAGE GRADES FOR THREE VARIETIES WHEN PLANTED ON VARIOUS DATES AT LUBBOCK, TEXAS

Planting date	Blightmaster	Lankart 57	Paymaster 101-A
April 20	SLM	SLM	SLM
May 15	SLM	SLM	SLM
June 1	M	SLM	SLM
June 10	M lt sp	M	M
June 20	SLM lt sp	SLM lt sp	M lt sp
June 30	M sp wasty	M sp wasty	M sp wasty

Applicability of the Data

There are certain limitations to the data that should be delineated. For example, as the data are all from a single location, extrapolation to other locations an appreciable distance from Lubbock should take elevation and latitude into account. Generally areas south and east of a line drawn approximately from the southwest corner of Yoakum County to the northeast corner of Floyd County can expect to have slightly higher temperatures and up to 15 days longer frost-free season than the Lubbock area. Areas to the north and west of this line can expect generally slightly lower temperatures and up to 15 days shorter frost-free season than Lubbock (2). Therefore, in situations where length of growing season, or temperatures, or both, are the only factors limiting cotton yields, areas to the north and west of the previously mentioned line generally can expect lower yields than those from the Lubbock area. Areas south and east of this line generally can expect higher yields than those of the Lubbock area.

It should also be pointed out that the years of these tests were, for the most part, characterized by above-average soil temperature conditions by April 20, and by the later-than-average occurrence of the first 32° temperature in the fall. Thus, the yields that were obtained probably should be considered as slightly "above average."

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