EFFECT OF DATE OF PLANTINGS ON THE YIELD AND OTHER AGRONOMIC CHARACTERS OF COTTON

by

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CHAPTER I

INTRODUCTION

The study of interrelationship between plants and climate has attracted the interest of botanists ever since the idea of evolution has prevailed. The earlier investigations were primarily observations and resulted in the development of such concepts as the plant association, plant succession, climaxes, life zones, climatic life forms, and so forth. These contributions merely aided in our understanding of plant distribution. In recent years, however, other lines of research have been developed, and these are beginning to contribute materially toward filling this gap in our knowledge. These newer studies, which are experimental rather than descriptive, are aimed directly at clarifying two sets of relationships. The first is the relation of plants to each other, and the second is their relationship to environments.

A farmer who is engaged in the production of any field crop has to wrestle with a number of factors some of which, thanks to the ceaseless efforts of our investigators, can be at least partially controlled by him. Others are beyond the orbits of present scientific research, and the

farmer is entirely dependent upon the mercy of nature. The factors of production may be tentatively considered under the following two general headings:

1. Physical factors of production--climate, soil, and so forth.
2. Biological factors of production--varieties, pests, diseases, and so forth.

The former are more or less beyond the control of the cultivator, while the latter are capable of at least partial control and adjustment. Though the act of production is primarily the responsibility of the man behind the plow, the net resultant of many years hard scientific research and investigation forms stepping stones for him. Whether an agronomist busy with the maintenance and raising of better seeds and crops, a breeder sweating hard year after year to produce an economically better variety, an entomologist or plant pathologist busy with the control of insects and diseases, or an agricultural chemist wrestling day in and day out in the diagnosis of his soils--they all aim at laying the foundation and stepping stones for the man on the land. Their individual efforts, after years and years hard labor, result in the evolution of a new strain that is superior in yield and quality, better suited to cope with adverse environments including insect and disease attacks. But the mere evolution of a variety is no

assurance of its success. It needs a specific set of environmental conditions to show up its potentialities. Thus, before a new variety could be advocated to the farmer, it must necessarily be accompanied with the recommendation of proper environment under which the crop has to complete its life cycle. This can be done only by sowing the crop at the proper or optimum planting time. Thus, although the optimum sowing date has always been determined for every new variety or strain, only a limited amount of effort has been made to determine the effect of different environments on these new varieties.

It has been thought generally that the large fluctuations in the annual yields of cotton and other field crops are to a considerable extent attributed to variations in the weather conditions prevailing in different seasons. Apart from the certain broad generalization, however, little can be said to be known definitely at present concerning the actual quantitative relations involved and the extent to which these may be modified by soil conditions, cultural practices, and environmental factors. For example, although the fiber length, fiber strength, boll maturity, lint percentage, and so forth have been studied quite in detail for different varieties, little if any evidence is available about the effect of environmental factors upon these characters within a single variety.

Sowings at different dates also provide a different set of environments. Cotton sown on the first of March meets day to day weather in altogether different stages of development than when sown on the first of April or May. Under these different sowing dates, the seed germinates and the plant passes through critical growth stages and the period of boll maturity under different temperatures, moisture and light conditions. Camp and Walker, working under controlled soil temperature conditions, found that cotton seed placed in soil with a temperature of 59 degrees F. required twice the time to reach 90 per cent germination as seed placed in the soil with a temperature of 66 degrees F., and three times as long as seed placed in soil with a temperature of 77 degrees F. These workers also found that the rate of growth of seedling cotton plants was greatly depressed with a soil temperature of 59 degrees F.; that at 66 degrees F. the rate was three times as great as at 59 degrees; and that maximum growth was obtained at a soil temperature of 93 degrees F. All this definitely stresses the need of having better knowledge of the effects of different environments as furnished by different dates of planting on the various agronomic characters of the cotton plant.

The present study, carried out in the Salt River Valley

at the Mesa Farm, is an attempt to find out the effect of different planting dates on the yield and other agronomic characters of Acala and SXP cottons, and also to find out the best date of planting.

CHAPTER II

REVIEW OF LITERATURE

Anderson and Randolph, while studying the effects of time of planting and hill spacing, observed that the time of planting had much the greater effect on yield of both varieties under trial.

Hale studied the effect of variety, planting date, spacing, and seed treatment on cotton yields and stand. He conducted a five-year multiple factor field experiment in cecil sandy clay soil at Experiment Station, Georgia. Results from five varieties planted early (late March), medium (late April), and late (late May) showed that the planting date might affect the relative yields of varieties. The varieties showed some significant differences in their ability to produce satisfactory stands from early and medium early plantings.

Fulton, in his study of weather in relation to yield of American Egyptian cotton in Arizona, remarked that the final yield of cotton is undoubtedly affected by complex interactions of many factors. Thus indirect effects of weather on cotton yields may be almost as important as the direct effects of favoring or retarding the reproduction of harmful insects and the progress of diseases. He

further suggests that the length of growing season is distinctly one of the limiting factors in the production of high yields of Pima cotton in Arizona.

Trough and Trevor made a study of causes contributing to the large variations in yields from year to year in 4F cotton in Punjab (India). These failures were frequently referred to as the "blight." The chief symptoms are shedding of flowers and young bolls in September; the first pickings are poor and late; the bolls fail to open properly; the lint is extremely poor; the seed is improperly developed; and the leaves are often mottled, sometimes covered with brown angular spots, or turn yellow and red and eventually shed. The general fluctuation in yield can not be ascribed to soil, cultivation, seasonal variation in water supply, or to fungus or bacterial diseases, or insect pests, except as unfavorable environments modify internal conditions of the plant in such a manner as to favor insect attack. They concluded that in years of failure the overlapping effects of a series of adverse factors operating at comparatively short intervals of time do not permit recovery of a plant before it matures its crop, thus resulting in failure to produce properly developed lint and seed. The plant is most susceptible in its early stages, at which time the adverse factors are at a maximum.

Olson et al. studied the responses of varieties to date of seeding with respect to yield in barley. They had sown three varieties at three dates beginning in early May and separated by intervals of two weeks. The outstanding features of their results were that the varieties responded differently to dates of seeding. O.A.C. and Mensury showed a marked progressive reduction in yield from the first to the last sowing date. At the same time Garton showed much less reduction or none at all. The results indicated that it is not possible to define a high or low yielding variety unless the comparison is made within seeding date range. The definition must further be limited by reference to region or locality.

Adair, while studying the effect of time of seeding on yield and milling quality and other characters in rice, remarked that sensitive varieties showed a marked gradual decrease ranging from 18 to 20 per cent in the number of days required to reach maturity when sown on successively later dates; the different varieties showed a small but consistent shortening of the growth period ranging from 9 to 15 per cent as the sowing was delayed. The sensitive varieties showed a gradual reduction in height from the first to the last date of sowing; the indifferent varieties were variable, and with exception showed no consistent reduction in height due to delayed seeding. Most varieties

produced more straw in proportion to grain when sown in April than when sown in May or June. Further, the temperature during the ripening period seemed to affect the milling quality.

Florell (1929), while working on wheat, observed a tendency for the time of maturity to converge when varieties are sown at different dates. In none of the varieties, under his trial, was there more than 18 days difference in the date of maturity of the first and the last sowing. He reported that the reduction in yield associated with late seedings came about mainly through reduction in the number of culms per plant and kernels per spike. This was further confirmed by Harrington and Horner, who found a significant interaction indicating that the varieties responded differently to the various environments as furnished by the different sowing dates. Significant interactions between varieties and dates of sowing were found for both grain yield and plant height in nearly every year of the experiment.

Hancock made a study of length, fineness, and strength of cotton lint as related to heredity and environment. He stated that when all the tests were combined for a given season, it was seen that location exerted a greater effect than variety on these properties. This was due to extreme seasonal conditions. Location affected strength more than

did either varieties or seasons. Seasons affected fineness and length more than did varieties or locations. He further added that the lint properties are definitely genetic characters of the cotton plant. Environmental conditions of the area where a variety is grown have an important influence upon the expression of the three lint properties he studied. These lint properties may be considered independent genetically, but under variable environments fineness follows length in a positive manner, while strength follows length in a negative manner.

Simpson and Hertel made a study of environmental modifications of fiber properties as a source of error in cotton experiments. They remark that environmental conditions during the period of fiber development influence the physical properties of cotton fiber. In certain areas of the Cotton Belt, soil and climatic conditions may be favorable for producing cotton of superior quality, whereas in other areas less favorable conditions may limit production to short-stapled types of lower commercial value.

Hutchinson made observations on the effect of environment on lint character and spinning value in Sea Island cotton. He found that since very good fields gave the lowest maturity and good fields the highest, there was no simple relation between fertility and maturity. He suggested that environmental factors have considerable

influence on lint diameter, and that factors tending to increase diameter tend to decrease maturity. He found maturity to be the quality most affected by environment, and it influences the value of the final product through characters other than spinning value.

CHAPTER III

METHODS AND MATERIAL

The cotton on which this study was made was obtained from a test run in 1946-1947 at the Mesa Farm in the Salt River Valley, Arizona. The main object was to determine the best date of planting, together with the effects of different environments as provided by the different dates of planting on the yield and other agronomic characters of cotton.

One-half of the border, about .091 acre in area, was planted to SXP, the other half to Acala, each replicated four times. Half of the replications were planted on raised beds, while the others were planted on "flat." Plantings were at about weekly intervals, with the exception of the last which was at a fortnight interval after the third planting. The dates of plantings were: 1, March 15; 2, March 22; 3, April 1; 4, April 15. During its growth the experiment received normal cultural practices of hoeing, weeding, thinning, and irrigation.

The yield figure obtained from each replication was computed on an acre basis.

A ten-boll sample was picked at random from each plot

for laboratory determinations which included a determination of staple length, ginning percentage, bolls per pound of seed cotton, moisture regain, strength index, lint index, and seed index. In addition, two large lots of twenty pounds of seed cotton each were procured from the first and last plantings of Acala for spinning tests.

Staple length was determined by measuring the halo length of combed samples of lint on the seed. The mean distance between the raphe and the end of the dense fibers was used.

Ginning percentage was determined on the basis of lint produced from a given weight of seed cotton.

Moisture regain was determined from the loss in weight of a lint sample dried at 100 degrees C. for one hour, divided by the dry oven weight of the lint.

Strength index was determined by the Pressley Index method.

Bolls per pound of seed cotton were calculated from the known weight of the ten-boll sample taken from each plot.

Seed index is a measure of the size of seeds and is expressed as the weight of 100 seeds.

Lint index is the weight in grams of lint from 100 seeds.

The spinning test lots are reported in the manner as used by the Production and Marketing Branch of the United States Department of Agriculture. These tests were conducted at their laboratory at College Station, Texas.

Data in each case were analyzed statistically by the method of Analysis of Variance.

CHAPTER IV

EXPERIMENTAL RESULTS AND DISCUSSIONS

Yield

Among the various economic attributes of the cotton plant, high yield, high ginning percentage, and good quality of lint are evidently the most important. Of these, yield to the grower usually takes preference over others. The importance of this character has been fully brought out by Panse (1941) who finds that to compensate for a reduction in yield of 1 per cent, the variety must show an increase of 10 per cent in quality. Therefore, yield data are the first criterion considered in discussing the performance of the two varieties planted at the four different dates.

Discussion: From the table on page 16 it is evident that yield of seed cotton of the upland variety Acala was reduced by late plantings. The highest yield was obtained from the March 15 sowing, and the lowest from the April 15. There was a gradual reduction in the yields of the two intermediate sowings. Although the difference in the yields was small as compared with the yield obtained from the first sowing, it was statistically significant at the

Date of planting	Yield in lbs. of seed cotton per acre Y Acala	SXP
March 15, 1946	2,159.5	2,066.00
March 22	2,052.25	1,848.75
April 1	2,008.25	1,953.25
April 15	1,708.75	1,752.75
Critical difference required for significance at .01	378.79	302.14
.05	273.5	218.15

Analysis of Variance of Seed Cotton per Acre

Treatment	Acala D.F.	Acala S.S.	Acala M.S.	SXP D.F.	SXP S.S.	SXP M.S.
Total	15	1118662.44	74577.49	15	884120.44	58941.36
Replications	3	3746817.69	124895.89	3	476910.69	158970.23
Date of planting	3	447183.19	149061.06	3	218372.19	72790.73
Error	9	296791.56	32976.84	9	188837.56	20981.95

.05 level of significance. The reduction of yield from the April 15 planting was highly significant at the .01 level of significance. Yield of SXP was also reduced by late planting, although not in serial order as with Acala. However, the yield obtained from the last planting date, April 15, was significantly reduced at the .05 level. There was no appreciable difference between the yields obtained from the first three planting dates.

As shown by the analysis of the above data, early planted cotton is at a definite advantage from the yield standpoint. It is nevertheless recognized that farmers with a large acreage to cover can not do all their planting at the most opportune time; however, under Salt River Valley conditions, they can safely extend their sowing period to the first week of April, but any delay up to and beyond April 15 would seriously reduce their yields. It is recommended, therefore, that they should try to complete their sowings well ahead of that time.

Ginning Percentage Determinations

A high ginning percentage is another important economic attribute of the cotton plant. Panse (1941), pointing out the importance of this character, has shown that a loss of 1 per cent in ginning percentages eats up nearly 3 per cent profit of the crop, or 30 per cent in quality

profits. The analysis of variance of the ginning percentages from different planting dates is given on page 19.

Discussion: Acala. The analysis of variance shows that there is gradual reduction in the ginning percentage from the seed cotton obtained from the early sown to the later plantings. The highest ginning percentage is from the March 15 sowing, and the least from the April 15 sowing. The difference in the decrease of the last sowing is highly significant. Though there is an appreciable reduction in the ginning percentages of the March 15 and March 22 plantings, they are statistically not significant. The difference between the first and the third sowing date is again highly significant almost to the level of 1 per cent.

It is clear, therefor, that the earlier plantings gave a higher ginning return compared with those obtained from the late plantings. Taking into consideration this factor of ginning percentage only, it appears worth while to complete sowings by the third week of March to avoid any significant decrease.

SXP. The analysis of ginning percentage in this case does not indicate any clear-cut trend. The lowest average ginning return was from the first planting, and the highest from the second planting, the difference between the two being highly significant. The second highest was the last

Date of planting	Acala Av. ginning %	SXP Av. ginning %
March 15, 1946	40.00	30.15
March 22	39.83	31.15
April 1	39.75	30.70
April 15	39.08	30.825
Critical difference required for significance 1% level	.26	.55
5% level	.19	.40

Analysis of Variance

Treatment	Acala D.F.	Acala S.S.	Acala M.S.	SXP D.F.	SXP S.S.	SXP M.S.
Total	15	3.36	.224	15	11.05	.736
Replication	3	0.06	.02	3	2.95	.983
Date of planting	3	1.97	.656	3	2.08	.699
Error	9	1.33	.148	9	6.02	.689

sowing, followed by the third sowing. However, the difference between the March 22 planting and the mid-April planting was not significant, whereas the difference between the second and the third plantings was highly significant to the level of 1 per cent.

This, therefore suggests lack of any definite response of the SXP variety to different plantings with respect to this particular character in the ginning outturn. However, the results obtained with Acala agree with the findings of Afzal and Associates (1944) who worked on L.S.S., a Punjab-American variety, during 1942-1944. They found that sowing dates and the spacings affected the ginning percentage of varieties significantly, high values of this character having been obtained with early sowings and closer spacings.

Staple Length

Hancock (1944) in his study on cotton remarked that cotton lint is a composite of fibers, and as such is sampled and measured by the trade. Length is the primary measurement, the chief criterion of quality. It is an important factor in determining the market values of different cottons. In the United States, premiums are paid for the longer cottons, and a discount is made where the length of the staple is below 15/16". The staple length and analysis of variance data are given on page 21.

Date of planting	Staple length	
	Acala	SXP
March 15, 1946	33.75	40.0
March 22	33.75	39.25
April 1	34.00	40.25
April 15	33.25	40.75
Critical difference at .01	2.04	.98
.05	1.47	.63

Analysis of Variance

Treatment	Acala				SXP			
	D.F.	S.S.	M.S.	C.D.	D.F.	S.S.	M.S.	C.D.
Total	15	11.44	.763		15	7.00	.467	
Replications	3	1.69	.566		3	.25	.083	
Date of planting	3	1.19	.396		3	4.75	1.583	
Error	9	8.56	.951		9	2.00	.222	
Critical difference at .01				2.04				.98
.05				1.47				.63

Discussion: Acala. The upland variety Acala shows a reduction in the staple length in April 15 planting, although the difference is not statistically significant—not even at the 5 per cent level. There was, however, no difference between the performance of the first two plantings, while the third planting gave a slightly higher staple length though the difference is not appreciable.

These results show the same general trend as indicated by the yield data. Sowings may safely be extended to April 1 without any great difference in the staple length, but sowings made later than April 1 may result in a decreased staple length.

SXP. The results in this case do not give any clear-cut trend, and follow the same line as indicated by the yield performance. The shortest staple is from the second planting, while the longest is from the April 15 sowing. The differences, however, are quite significant with a trend for a longer staple in the later sowings, although as pointed out above the results do not show any definite trend.

The one outstanding feature is that staple length and ginning percentage do not go together. This is very clearly indicated by the performance of both Acala and SXP varieties. Acala, that had a range of 39 to 40 per cent in its gin outturn, had a staple length varying from 33.25 to

34.00 thirty-seconds of an inch, as contrasted with the ginning percentage of 30.15 to 31.15 of SXP with a staple length of 39.25 to 40.75 thirty-seconds of an inch. These results are in agreement with the findings of earlier investigators who observed that high gin outturn does not correlate with long staple.

Moisture Percentage

Hawkins (1945) has pointed out the importance of moisture content of cotton lint in Arizona. He indicated that probably much of the cotton is harvested and ginned in Arizona with not more than half as much water content as is contained in cotton from the more humid sections of the country, which cotton is said to spin more satisfactorily than that from the arid Southwest. If the cotton is not fully conditioned with sufficient moisture, there is a formation of "fly" (broken bits of fibers) and neps that the spinners complain about. On the other hand, damage due to excessive moisture is well known. It is, therefore, of utmost importance to study the possible effects of different dates of planting on the moisture content of the lint. The analysis of variance and the data of moisture content are presented on page 24.

Discussion: There is a slight variation in the moisture content of the lint obtained from different plantings,

Date of planting	Av. moisture % Acala	SXP
March 15, 1946	7.58	7.52
March 22	7.47	7.42
April 1	7.42	7.38
April 15	7.54	7.50
Critical difference at .01	.38	.30
.05	.27	.22

Analysis of Variance

Treatment	Acala D.F.	Acala S.S.	Acala M.S.	Acala C.D.	SXP D.F.	SXP S.S.	SXP M.S.	SXP C.D.
Total	15	.46	.03		15	.49	.32	
Replications	3	.06	.02		3	.05	.02	
Date of planting	3	.10	.03		3	.16	.03	
Error	9	.30	.03		9	.28	.03	
Critical difference at .01				.38				.30
.05				.27				.22

both in case of Acala and SXP; but the variation is of no appreciable extent and is certainly of no statistical significance. This shows that the date of planting had very insignificant effect, if any, on the moisture content of the lint. Acala had a slightly higher moisture content, ranging from .04 to .06, than the variety SXP. Both varieties responded similarly, the highest moisture content in both cases resulting from the first sowing and the lowest from the April 1 sowing.

It may, therefore, be concluded that the date of planting as such has no significant effect on the moisture content of the lint, with both varieties having given a similar response.

Strength of the Fiber

The fiber has three important properties: the length, the fineness, and the strength. Hancock (1944) remarked that lint properties are definitely genetic characters of the cotton plant. Environmental conditions of the area where a variety is grown have an important influence upon the expression of these three lint properties.

Research laboratories of the textile, tire, and belting industries and of the United States Department of Agriculture have recognized for several years the importance of strength of cotton lint in wearing apparel, sewing

thread, industrial fabrics, belt, ducks and cords, or cables of rubber tires. While tensile strength alone may not be as important as other lint properties contributing to the appearance of the wearing apparel and to fatigue resistance in industrial fabrics, this property must be present in all cotton textiles to the extent that manufacturing processes are not handicapped by undue yarn breakage and the slowing down of other operations depending on the strength in the lint. Special consideration, therefore, must be given to this property in those cottons that are to be used in the manufacture of most industrial goods and in all domestic goods requiring yarns of high strength.

It is, therefore, of utmost interest to observe the effect of planting date on the strength of the fiber. The data and analysis of variance are given on page 27.

Discussion: The upland variety Acala shows a very significant difference in its strength index of the fiber obtained from the different plantings. This shows that this variety, with especial reference to the strength of the fiber, is non-sensitive toward the differential environments as provided by different plantings. On the other hand, the SXP variety showed a greater response under different plantings. The strength index is least in the April 1 sowing, but shoots up in the mid-April planting. The difference just reaches the point of significance at

Date of planting	Av. strength index Acala	SXP
March 15, 1946	755.0	886.5
March 22	759.5	889.0
April 1	755.5	870.0
April 15	758.0	900.0
Critical difference at .01	40.79	39.61
.05	29.49	28.64

Analysis of Variance

Treatment	Acala D.F.	Acala S.S.	Acala M.S.	Acala C.D.	SXP D.F.	SXP S.S.	SXP M.S.	SXP C.D.
Total	15	7700	513.3		15	6245.75	416.38	
Replications	3	4197	1399.0		3	1195.25	398.42	
Date of planting	3	54	18.0		3	1842.75	614.25	
Error	9	3449	383.2		9	3207.75	356.41	
Critical difference at .01				40.79				39.61
.05				29.49				28.64

5 per cent level. There is a little tendency, with the exception of the third planting, for the increased strength to accompany the later sowings. However, it fails to indicate any definite trend.

Number of Bolls per Pound of Seed Cotton

The number of bolls per pound of seed cotton is important as it is a factor determining the cost of harvesting. A lower number of bolls per pound of seed cotton is desirable. The data and analysis of variance appear on page 29.

Discussion: The largest Acala bolls were obtained from the March 22 planting. The first planting of March 15 showed a statistically significant effect on boll size. Bolls obtained from the April plantings were intermediate in size.

The results with the SXP variety do not lead to any definite conclusion. Though there was an appreciable variation in the weight of bolls from the different plantings, the point of significance was not reached. No definite trend either way was shown with the SXP, and indications were that this variety does not show any definite response with respect to this character.

It may therefore be concluded that the response of varieties to the different plantings is a varietal character

Date of planting	Av. no. bolls per lb. seed cotton	
	Acala	SXP
March 15, 1946	67.25	135.75
March 22	61.25	132.50
April 1	63.75	141.50
April 15	64.50	134.75
Critical difference at .01	4.1	16.23
.05	2.95	11.72

Analysis of Variance

Treatment	Acala			SXP		
	D.F.	S.S.	M.S.	D.F.	S.S.	M.S.
Total	15	91.37	6.09	15	924	61.73
Replications	3	18.62	6.21	3	203	67.66
Date of planting	3	38.12	12.71	3	177	59.0
Error	9	34.63	3.85	9	546	60.66
Critical difference at .01			4.10			16.23
.05			2.95			11.72

so far as the weight of bolls per pound is concerned. Some varieties may show a definite response, while others may be quite non-sensitive.

Seed Index

Seed index is another very important factor, and has a great bearing on the lint and ginning percentage. Seed indices for the Acala and SXP varieties from the different plantings are given on page 31.

Discussion: With the upland variety Acala, there was hardly any difference in the seed weight obtained from different planting dates. The seed weight was higher in the second planting, but in no case is the difference of any significance. This suggests that the date of planting has no appreciable influence on the seed index of the Acala variety.

With the SXP, the highest weight was again obtained from the second planting, while there was a decrease in the weight of seed obtained from the subsequent sowings. The last--i.e., mid-April sowing--gave the lowest weight, thus indicating a trend that the later sowings have a decreasing effect on the seed weight. In this the decrease in weight is significant at the 5 per cent level as compared with the first three sowings, while compared with the second sowing the difference is significant even at 1 per cent level.

Date of planting	Seed index Acala	SXP
March 15, 1946	12.73	12.93
March 22	12.9	13.08
April 1	12.8	12.90
April 15	12.73	12.05
Critical difference at .01	.723	.89
.05	.522	.641

Analysis of Variance

Treatment	Acala D.F.	Acala S.S.	Acala M.S.	SXP D.F.	SXP S.S.	SXP M.S.
Total	15	1.3	0.867	15	1.76	.195
Replications	3	0.12	0.040	3	0.53	0.177
Date of planting	3	.09	0.030	3	0.095	0.032
Error	9	1.09	0.12	9	1.135	0.189
Critical difference at .01		.723				.89
.05		.522				.64

Thus the date of planting had an appreciable effect on the seed weight in the case of SXP, indicating that lighter weight seed may be expected from plantings made after April 1.

Lint Index

Lint index is another character which has been given much study in cotton-breeding work. An analysis of variance and table of lint index for both Acala and SXP varieties studied are given on page 33.

Discussion: Analysis of variance indicates that in the case of upland variety Acala there was an appreciable difference in the lint index obtained from the different plantings. The highest index was obtained from the March 22 planting, and the subsequent sowings showed a gradual decrease. The most marked decrease was noticeable in the mid-April sowing. The decrease was definitely significant at 5 per cent level when compared with all the previous plantings. The difference is still more significant even at 1 per cent level between the March 22 planting and the last mid-April planting.

So far as SXP is concerned, no definite trend was indicated. The response was very little and rather haphazard. The differences fell short of any degree of significance from all the four plantings. This variety therefore did

Date of planting	Lint index	
	Acala	SXP
March 15, 1946	8.50	5.65
March 22	8.75	5.89
April 1	8.59	5.71
April 15	8.18	5.83
Critical difference at .01	.52	.59
.05	.37	.43

Analysis of Variance

Treatment	Acala			SXP		
	D.F.	S.S.	M.S.	D.F.	S.S.	M.S.
Total	15	1.31	.087	15	1.08	.072
Replications	3	0.05	.017	3	0.19	0.063
Date of planting	3	0.70	.233	3	0.16	0.053
Error	9	0.56	.062	9	0.73	0.081
Critical difference at .01			.52			.59
.05			.37			.43

not indicate any definite response in lint index to the different environments provided by the different plantings.

Spinning Tests

Before cotton fibers can be woven into cloth, they must be spun into threads or yarns. Yarns differ considerably in size or fineness. The size of a yarn is indicated by the "counts." The counts are determined by the number (or count) of hanks of any particular yarn that are required to weigh a pound.

It is, therefore, of vital importance to study the effect of date of planting on the spinning quality of the fiber. In this case an 8-pound lint sample from the first picking of each March 15 and April 15 planting of the Acala plot series only was sent to the cotton-testing laboratory at College Station, Texas. The above two plantings were selected as they represented two extreme planting dates. The summary of the report of the cotton laboratory is given on page 35.

Discussion: The mid-April planting gave yarn of better appearance, greater strength, and higher equivalent staple than that produced from the mid-March planted cotton. The later-planted cotton also contained less neps in the card web. In short, the report indicated an advantage in late sowing, as far as spinning quality is concerned.

Date of planting	Neps at card	Yarn appearance			Yarn strength			Av. index	Equiv. staple
		22's	35's	60's	22's	36's	60's		
March 15, 1946	23	C+	D+	D	106.5	56.9	27.7	104.9	1 1/16
April 15, 1946	17	B	B	C	109.5	58.0	28.5	107.6	1 3/32

These results are a mere indication, and in order to obtain more definite results it is advisable to carry on further studies involving more representative samples and on a larger scale.

CHAPTER V

SUMMARY AND CONCLUSIONS

The present experiment was carried out on the Mesa Farm in the Salt River Valley of Arizona to study the effect of date of planting on the agronomic and lint properties of the cotton produced.

The varieties involved were Acala and SXP, with the following dates of plantings: 1, March 15; 2, March 22, 3, April 1; 4, April 15, 1946.

The effect of the date of planting was studied on the following agronomic and fiber properties: (1) yield, (2) staple length, (3) ginning percentage, (4) moisture percentage in the lint, (5) strength of the fiber, (6) number of bolls per pound of seed cotton, (7) seed index, (8) lint index, and (9) spinning quality.

The dates of planting had a marked effect on the yield. Earlier plantings resulted in better yields of both Acala and SXP. The yield from the mid-April planting was significantly low as compared with earlier sowings.

Varieties responded differently in ginning outturn. The upland variety Acala showed a definite reduction in the ginning outturn from the later sowings, with the difference being highly significant for the mid-April sowing.

The SXP variety, however, failed to show any definite response.

In the case of staple length, the upland variety Acala again showed a definite decrease in the later sowings, although the difference was not significant at all stages. SXP failed to show any definite trend, following the same pattern as for ginning outturn. However, the results confirmed the findings of earlier investigators, showing a negative correlation of ginning outturn with staple length.

There was no appreciable difference in the moisture content of the lint obtained from different plantings with either Acala or SXP.

The upland variety Acala did not show any response so far as strength of fiber was concerned. The response with SXP was significant, a reduced strength index resulting from April sowings.

Acala showed a definite reduction in boll size from April sowings. On the other hand, SXP bolls failed to show any definite response to planting date.

The varieties again responded differently so far as seed index was concerned. Acala failed to show any response, whereas SXP showed a definite reduction in the seed weight obtained from the late sowings. The lint index response was quite the reverse of seed index. In this case Acala showed a definite advantage for the March

sowings. SXP, however, showed no definite response.

A spinning test was run but only with the first picking of Acala from the mid-March and mid-April plantings. The yarn from the April-sown cotton showed a definite advantage so far as appearance and strength were concerned. There were also less neps in the cord web as compared with that from the mid-March planting.

In conclusion it may be stated that the varieties responded differently to the various planting dates. There is an indication that sowings of both varieties after April 1 are generally at an agronomic disadvantage. However, further investigation should be carried out before a definite recommendation could be made to farmers. This is true especially because of insufficient spinning tests.

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