

ANALYSIS OF COTTON QUALITY ON THE HIGH PLAINS OF TEXAS,
1958 CROP YEAR

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SUMMARY

The 23 High Plains cotton counties in 1958 produced 2,025,000 bales of cotton, which are more than 45 percent of the cotton grown in Texas, and approximately 17 percent of the United States total. To improve marketing of the crop produced in this concentrated area, information as to quality was published for seven census periods of approximately 2 weeks each. Therefore, reports on quality of cotton are available to local growers as well as to the domestic and foreign processors.

A sample of slightly more than 3 percent of this cotton was surveyed for grade, staple length and micronaire fineness. Strength measurements were made on 9 percent of the samples.

The percentage distribution of quality measurements during prescribed census periods was tabulated. All measurements of cotton quality averaged higher during the early part of the season. There was a significant decrease in staple length, strength and micronaire fineness as the harvesting progressed in late season.

Major findings for the entire season indicate that 71.3 percent of the cotton samples analyzed graded white and 25.6 percent graded light spotted. Eighty-three percent of the white cotton and 96.9 percent of the light spotted cotton graded strict low middling or better. The average staple length was 31/32 inch. One-fourth of the cotton measured 1 inch or longer. Fineness, as measured by micronaire, averaged 4.0. Eighty-one and one-half percent was above the tenderable limit of 3.5. Strength averaged 74,600 pounds per square inch with almost half above 75,000.

Approximately 13 percent of the white and light spotted cotton for the entire season graded below strict low middling. Thirty-six and one-half percent fell below a 3.5 micronaire fineness, and 52.9 percent was below 75,000 pounds per square inch strength. Less than 1 percent of the cotton sampled prior to October 1 graded lower than strict low middling. Nine and one-half percent had a staple length of less than 31/32 inch. Only 3 percent was below 3.5 micronaire fineness, and 27.9 percent under 75,000 pounds per square inch strength. At least 20 percent of the cotton classified between December 13 and January 15, graded under strict low middling. Seventy-three and one-half percent fell below 31/32 inch, 57.7 percent fell below a 3.5 micronaire fineness, and 65.2 percent fell below 75,000 pounds per square inch strength.

This study will enable the cotton producer and the spinner to evaluate better the fiber properties of High Plains cotton. The producer can use these data to compare his individual results with those of the area as a whole. The spinner can ascertain readily whether the area is producing the type of cotton which meets his specifications.

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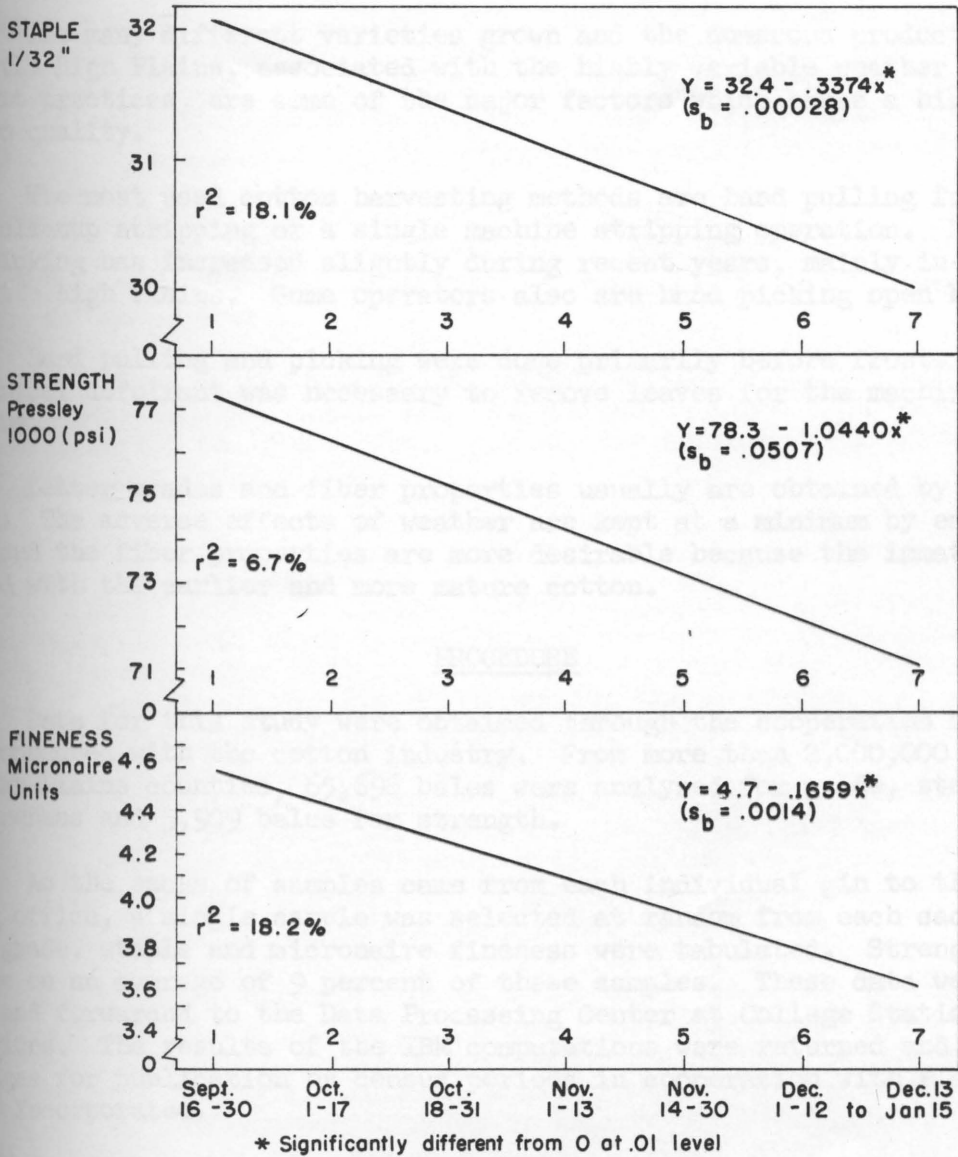


Figure 1. Regression of three quality measures on period of classification for High Plains cotton, 1958.

INTRODUCTION

Obtaining high quality cotton is one of the most important problems facing cotton producers on the High Plains of Texas. Information about quality characteristics and its economic significance will enable producers and handlers to promote higher quality cotton and thus increase the economic return for the area.

The many different varieties grown and the numerous production practices used on the High Plains, associated with the highly variable weather conditions and management practices, are some of the major factors which cause a high variability in cotton quality.

The most used cotton harvesting methods are hand pulling followed by machine cleanup stripping or a single machine stripping operation. Mechanical cotton picking has increased slightly during recent years, mainly in the southern part of the High Plains. Some operators also are hand picking open boll cotton.

Hand pulling and picking were done primarily before frost. A hard freeze or a chemical defoliant was necessary to remove leaves for the machine harvesting operations.

Better grades and fiber properties usually are obtained by early hand snapping. The adverse effects of weather are kept at a minimum by early hand harvesting and the fiber properties are more desirable because the immature bolls are not mixed with the earlier and more mature cotton.

PROCEDURE

Data for this study were obtained through the cooperation of numerous people connected with the cotton industry. From more than 2,000,000 bales ginned in 23 High Plains counties, 65,696 bales were analyzed for grade, staple and micronaire fineness and 5,909 bales for strength.

As the sacks of samples came from each individual gin to the cotton classing office, a single sample was selected at random from each sack of samples and its grade, staple and micronaire fineness were tabulated. Strength measurements were made on an average of 9 percent of these samples. These data were then key punched and forwarded to the Data Processing Center at College Station for IBM computations. The results of the IBM computations were returned and compiled by percentages for publication by census periods in cooperation with Plains Cotton Growers, Incorporated.

The census periods were: first period, September 16-30; second period, October 1-17; third period, October 18-31; fourth period, November 1-13; fifth period, November 14-30; sixth period, December 1-12; and seventh period, December 13-January 15.

The percentage of the cotton that was above and below the desirable quality characteristics was calculated. A regression analysis was made for staple length, strength and micronaire fineness measurements with census periods.

RESULTS

Quality Comparisons

Before October 1, more than 28.5 percent of the cotton graded strict middling and almost half (47.3 percent) was middling. For the season, the percentages for these two grades were 2.2 and 15.7, respectively. Whereas, only 1.6 percent of the cotton harvested before October 1 graded strict low middling 31/32 inch, this quality category of 18 percent was the largest for the entire season. Although more than 10 percent of the season's cotton graded strict low middling 15/16 inch, less than 1 percent of the early crop was of that grade and staple.

Staple length of cotton harvested before October 1 was approximately 1 inch, the average for the season was 31/32 inch. Micronaire fineness for the early season was 4.3 as compared with the average of 4.0. Strength was 79,000 pounds per square inch, as compared with 74,600.

At the first of the season, 88 percent of the cotton was white. The seasonal percentage of white cotton was 71.3 percent. Light spot accounted for only 12 percent during the first census period, the seasonal average was more than doubled (25.6 percent), Table 1.

Major Quality Changes

The effect of weather damage, mainly tinged fiber from frost, in changing the proportion of white to light spotted cotton was especially apparent after the fifth period. In comparison with the first census period, the percentage of spotted cotton was more than doubled by the fifth period, almost tripled by the sixth period and quadrupled by the seventh period. The cotton meeting 31/32 inch or better staple length had dropped approximately 5 percent per census period during the first part of the season. However, less than half and only one-fourth of the cotton had this staple length by the sixth and seventh periods, respectively. Micronaire fineness measurements for most of the cotton was 3.5 or above until the sixth and seventh periods. Strength of 75,000 pounds per square inch was reached by less than half of the cotton after the second census period.

The regression analysis plotted in Figure 1 shows the decrease for three quality measurements as the season progressed. The values associated with the regression by staple length, strength and micronaire fineness measurements at the time of harvest were highly significant. Staple length was approximately .0150 inch shorter for each census period delay in harvesting. Strength dropped by 1.044 thousand pounds per square inch and micronaire fineness .1659 unit each subsequent census period.

The staple length, strength and micronaire fineness declined more than 1/16 inch, 7,050 pounds per square inch and .91 unit, respectively, between the first and last period.

A regression of the means of the staple length, strength and micronaire fineness computed by the r^2 method show values of 90, 19 and 28 percent, respectively. The variability of individual observations is eliminated, thus the variability of the varieties tends to be compensated.

Table 1. Percentage of various quality categories of the cotton crop by census periods on the Texas High Plains, 1958 crop year^{1/}

Sampling periods	Color and grade					Staple ^{3/}		Pressley ^{3/} (Strength)		Micronaire ^{3/} (Fineness)	
	White & plus		Light spot		Other ^{2/}	31/32 and better	Below 31/32 in.	75,000 PSI & better	Below 75,000 PSI	3.5 and above	Below 3.5
	SIM and better	Below SIM	SIM and better	Below SIM							
-----Percent-----											
9/16-30	87.1 xxxxx ^{4/}	0.9	12.0			90.5	9.5	72.1	27.9	97.0	3.0
10/1-17	77.3	7.6	14.3	0.1	1.7	85.1	14.9	64.5 xxxxx	35.5 xxxxx	96.9	3.1
10/18-31	74.2	10.4	15.0	0.1	0.3	79.8	20.2	42.5	57.5	93.4	6.6
11/1-13	70.7 xxxxx	12.3	16.2	0.6	0.2	75.4	24.6	46.6	53.4	95.4	4.6
11/14-30	57.0	13.0	27.3 xxxxx	0.3	2.4 xxxxx	63.0	37.0	49.1	50.9	82.8	17.2
12/1-12	43.4	13.8	33.4	1.5 xxxxx	7.9	46.3 xxxxx	53.7 xxxxx	41.0	59.0	68.1 xxxxx	31.9 xxxxx
12/13-1/15	30.1	16.6	43.8	3.0	6.5	26.5	73.5	34.8	65.2	42.3	57.7
Total	59.2	12.1	24.8	0.8	3.1	63.5	36.5	47.1	52.9	81.5	18.5

1/ The following 23 counties were included: Yoakum, Floyd, Swisher, Garza, Terry, Dawson, Hockley, Bailey, Lamb, Motley, Lubbock, Crosby, Gaines, Castro, Parmer, Borden, Lynn, Briscoe, Hale, Cochran, Martin (part), Dickens (part) and Deaf Smith.

2/ The following percentages are other than white, plus or light spotted grades.

3/ Small discrepancies in the totals are due to rounding off to the nearest tenth.

4/ xxxxx Greatest change percentagewise.

DISCUSSION

Many cotton producers have indicated that the 1958 High Plains cotton crop was more uniform in color, grade and staple length than usual because of the favorable weather conditions. Nevertheless, the results of the survey indicated a wide range in quality characteristics. This variability in quality occurs because the study covers the entire area in which there was a tremendous variation in factors that affect quality. These factors include type of soil, amount and distribution of water for irrigation, weather factors (temperature) and length of growing season.

The frequency distributions for staple, strength and micronaire fineness be census periods show that as the season progressed the quality deteriorated, Table 2. Cotton harvested late in the season is suitable for coarse fabric. However, there often is an over-supply of this type of cotton which decreases its market value. This situation becomes apparent in West Texas during years of short growing season or adverse weather.

Because the cost of producing cotton under similar cultural practices is approximately equal, the net income realized depends largely on the harvesting method used and the lint price received for the cotton. The lint price is, to a large extent, determined by the grade and staple length. A bale of single machine-stripped cotton usually is harvested for \$20 to \$30 cheaper than hand snapping. Thus the quality of the hand-snapped cotton must more than compensate for the additional labor cost.

Provided a mature cotton is ready for harvest, the major advantage of hand pulling is the possibility that weather conditions may be less desirable for later machine stripping. Therefore, the major objective of a cotton producer should be to produce a high quality fiber and base his harvesting methods on the current economic situation. The difference between a profit or loss may depend on whether he can market a high quality crop and can use identical harvesting methods.

This survey was designed primarily to measure the quality throughout the season of cotton grown on the High Plains. Although results of this study show exact measurements of quality changes, the factors that cause these changes are not clearly denoted. Indications are that the average staple length of High Plains cotton may decrease as the season progresses because longer-staple varieties which are grown principally in the southern part of the High Plains usually are harvested early in the season, and the longer the open boll is left in the field the greater is the loss in staple length from weathering and gin damage.

Strength and micronaire fineness tend to be lower with underdeveloped cotton. This decrease in quality is especially apparent toward the end of the season when the major harvesting of the cotton consists of machine cleanup of immature bolls.

Further scientific research is needed to ascertain accurately the causes of quality deterioration during the season. Consequently, detailed analysis to determine ways of improving the average quality would be beneficial to the cotton industry to increase the price at which High Plains cotton can be marketed.

Table 2. Frequency distribution and means by census periods for staple length, Pressley strength and micronaire fineness measurements

Measurements	Census periods							Total
	1	2	3	4	5	6	7	
	: 9/16-30:10/1-17:10/18-31:11/1-13:11/14-30:12/1-12:12/13-1/15:							
Staple length 1/32 inch	36	106	125	99	80	20	3	469
	36	63	82	91	98	69	13	456
	150	171	179	136	106	87	34	863
	684	901	705	477	290	152	41	3,250
	979	1,975	2,469	2,733	2,105	956	165	11,382
	558	1,702	2,784	5,274	8,029	5,773	1,114	25,234
	210	704	1,288	2,468	5,242	6,159	2,346	18,417
	30	133	233	413	963	1,437	1,113	4,312
	11	45	56	84	173	342	487	1,198
	0	1	7	8	5	26	68	115
Total freq.	2,698	5,801	7,918	11,783	17,091	15,021	5,384	65,696 ^{1/}
Means	32.05	31.68	31.43	31.12	30.77	30.44	29.89	30.99 ^{2/}
Strength(1,000 psi)	95+	13	7	4	2	14	3	44
	90 - 94	53	19	10	14	14	10	120
	85 - 89	128	98	49	44	31	24	380
	80 - 84	194	186	123	111	62	87	783
	75 - 79	233	353	275	239	146	147	1,459
	70 - 74	170	272	417	299	186	238	1,704
	65 - 69	60	110	268	210	110	192	1,040
	Below 65	12	19	113	90	26	96	379
Total freq.	863	1,064	1,259	1,009	589	797	328	5,909 ^{1/}
Means	78.94	76.61	72.93	73.33	74.76	72.40	71.89	74.60 ^{2/}
Micronaire units	6.0 & up		2		2		2	6
	5.5 - 5.9	9	7	18	13	58	26	136
	5.0 - 5.4	171	552	551	542	505	241	2,620
	4.5 - 4.9	781	1,958	2,471	2,827	2,304	1,443	12,068
	4.0 - 4.4	1,205	2,260	3,094	4,647	5,509	3,904	17,294
	3.5 - 3.9	449	845	1,388	3,055	5,760	4,575	17,294
	3.0 - 3.4	76	160	355	656	2,630	3,496	8,863
	2.5 - 2.9	7	19	37	39	314	1,221	2,839
	Below 2.5			2	4	9	113	451
Total freq.	2,698	5,801	7,918	11,783	17,091	15,021	5,384	65,696 ^{1/}
Means	4.30	4.36	4.29	4.18	3.95	3.74	3.39	4.00 ^{2/}

^{1/} Grand total samples.

^{2/} Mean for entire season.

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DEFINITION OF TERMS

The quality measures in this study consist of grade, staple length, strength and micronaire fineness. Grade is established by visual observation and is based on an overall quality evaluation by cotton classers. Staple length is measured to the nearest 1/32 inch. Strength is a measure of tensile strength by the Pressley tester in 1,000 pounds per square inch. Micronaire is a measure of fiber fineness which is another measure of maturity. Cotton usually is more in demand if it has at least a grade of strict low middling, staple length of 31/32 inch, strength of 75,000 pounds per square inch and micronaire fineness of 3.5. Ranges of these quality values are summarized in the two tables.

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