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Fiber Characteristics and Spinning Performance of Mechanically-stripped Cotton on the High Plains

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Preface

This bulletin gives information on the fiber properties and spinning performance of machine-stripped cottons of the High Plains. All samples of the 1949 and 1951 crops were on seed cotton machine-stripped after frost. The samples of the 1950 crop also included cotton hand-pulled before frost. All the samples of the 1949 crop and 60 percent of those of the 1951 crop were from field-stored machine-stripped seed cotton. The samples were obtained at or near the time of ginning from storage stocks.

Hand pulling of cotton before frost is more selective and includes only the more mature bolls. Stripping after frost is the kind of mechanical harvesting done on the High Plains. The mechanical stripper gathers 90 to 98 percent of the cotton. Mechanical stripping results in a mixture of bolls of various stages of maturity. Hence, the lint from machine-stripped bolls has finer fibers than lint from bolls harvested by hand earlier in the season. According to spinning tests of the 1949 crop, $\frac{7}{8}$-inch cotton of finer and weaker fiber made yarn as strong as $\frac{7}{8}$-inch cotton of coarser and stronger fiber. The strength of the yarns made from the weaker, finer cotton was increased by packing more fibers into a bundle and thereby obtaining greater cohesiveness when twisted. The behavior of cottons of 1950 and 1951 was similar to that of the cottons of 1949.

A high percentage of the cottons of the High Plains has fine fibers and relatively low tensile strength. This study indicates the importance of fiber and spinning tests in merchandising High Plains cotton as such tests disclose the best utilization.

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Fiber Characteristics and Spinning Performance of Mechanically-stripped Cotton on the High Plains

J. M. Ward, L. E. Hessler and W. E. Paulson[1]

THIS PROJECT was initiated to determine the effects of mechanical harvesting on the ginning business. Ginning capacity even with hand harvesting has frequently been inadequate to keep up with the rate of harvesting. It was anticipated that ginning capacity would be strained during periods when machine picking and stripping were done at full capacity.

This study was confined to the High Plains because mechanical stripping is done extensively in this area. Samples were collected in Dawson, Lynn, Terry, Crosby, Lubbock, Hockley, Cochran, Bailey, Lamb, Hale, Floyd, Swisher and Castro counties. The mechanical stripper gathers 90 to 98 percent of the cotton. The amount of waste varies with the efficiency of the machine and the variety of cotton. Harvesting by this method results in a mixture of bolls of various stages of maturity. Mechanically-stripped cotton usually contains more immature (therefore finer) fibers than hand-harvested cotton. High Plains cottons vary widely in fineness because of variations in growing conditions due largely to differences in altitude which range from 2,900 to 4,000 feet.

Cotton grown on the High Plains is practically all one inch or less in length and the best utilization of this cotton requires a knowledge of the physical properties of the fiber. If the classer's grade and staple length are supplemented by fineness and maturity data, it is possible to select the cotton best fitted for a specific purpose.

Length of Growing Season as Related to Stripping

The High Plains area growing season is 217 days in the southern section, 206 days in the central and 197 days in the northern part. Average date of first frost is November 4 at Lubbock in the central part of the area. There are more cloudy days and cool nights in the northern section which

[1]Respectively, assistant professor, Department of Agricultural Economics and Sociology, College Station, Texas; research associate, Cotton Research, Texas Technological College, Lubbock, Texas; and professor, Department of Agricultural Economics and Sociology.

produces conditions less favorable than is indicated by the small difference in growing season. According to the Census Bureau, ginnings by November 1 account for 40 percent of the crop in the southern section, 35 percent in the central section and 28 percent in the northern section. After the coming of cold weather, defoliation occurs and the opening of the bolls is hastened. Acceleration of boll opening also may be obtained by chemical defoliation before frost. Defoliation by natural or artificial means leaves the plants in suitable condition for stripping.

Seasonal Operation of Strippers

Experience indicates that stripper harvesting can be started 5 to 10 days after a first killing frost. The desirable interval between the dropping of the leaves and the beginning of stripper harvesting varies according to the moisture content of the plants and bolls. If the plants have been chemically defoliated 2 to 3 weeks prior to frost, machine stripping can be started sooner than if the plants are allowed to stand until the leaves are removed solely by frost. Strippers are more efficient and less wasty when the stems of the plants are pliable. As the cotton plants reach the proper condition for stripping, the period during which the machine may be operated to the best advantage is strictly limited. The plants become brittle soon after a heavy frost. Under such circumstance, the machine-stripped bolls are mixed with much foreign matter in the form of stem and stalk fragments.

The 1949 cotton crop of the High Plains exceeded one and one-half million bales. The first freeze occurred October 31. With the beginning of mechanical stripping on a large scale, the daily rate of stripping greatly exceeded the capacity of the gins. During such times the gins usually operate on a 24-hour basis. Beyond the point of stripping up to full gin capacity, growers are faced with the alternative of storing the surplus seed cotton on the farm or at the gin, or of leaving the cotton unharvested in the field for later stripping as ginning service becomes available. Most of the cotton growers of the High Plains in 1949 chose full scale stripping and farm storage of the supply in excess of ginning capacity. Perhaps as much as 90 percent of the storage was on the ground in the cotton fields.

Collection of Seed Cotton Samples, 1949

Three hundred and two samples were collected from farm-stored cotton of the 1949 crop. Stormproof and open-

boll varieties were represented. The samples were representative of the counties in which machine-stripped cotton was farm-stored prior to ginning. The samples were ginned on a small, one-stand gin after the close of the ginning season.

Collection of Seed Cotton Samples, 1950

During the 1950 cotton harvest on the High Plains, the bulk of the cotton stripped by machines was of the stormproof varieties. Sufficient labor was available to "hand pull" the open-boll varieties the first time over. Of 147 seed cotton samples collected, 105 were of the stormproof varieties, mechanically stripped. Less than 10 percent of the 1950 crop was held in storage between the time of stripping and ginning. All the seed cotton samples were collected at or near the time of custom ginning. All were ginned on a small, one-stand gin in late January 1951.

Collection of Seed Cotton Samples, 1951

One hundred seventy-seven seed cotton samples were collected from the 1951 crop. They were stored in a shed as collected and were ginned later in the same manner as the samples from the two previous crops. The expansion of cotton growing now in progress on the High Plains made possible the collection of several samples from a section having a shorter growing season than sections of the area previously sampled. These samples were obtained in Castro county. Sixty-five seed cotton samples were taken directly from trailers at the time of harvest, and 104 were from field storage at or near the time of ginning from storage stocks. The remaining samples were obtained from seed cotton stored in barns or gin seed cotton houses prior to ginning.

Quality and Fiber Characteristics, 1949

Stormproof varieties have finer fiber than open-boll varieties grown in the area. Stormproof varieties are better adapted to mechanical stripping. This increases the proportion of cottons with fine fibers. In stormproof cottons, the locks are held closely in special type bolls which open partially and remain intact before and during the stripping operation. The structure of the stormproof boll is such that the penetration of dust and moisture into the seed cotton is held to a minimum. These desirable properties of stormproof cottons are not characteristic of the more common or open-boll cottons. The locks of the open-boll cottons tend to string out and result in considerable wastage during stripping.

Table 1. Fineness, maturity and tensile strength of machine-stripped High Plains cotton, 1949-51

Micrograms per inch[1]	Percent of total			Fiber maturity[2]	Percent of total			Tensile strength (1,000 lbs. per sq. in.)[3]	Percent of total		
	1949	1950	1951		1949	1950	1951		1949	1950	1951
3.9 & lower—fine	61.3	78.2	55.4	Above 84—very mature	28.1	5.4		Below 72—weak	29.1	19.7	8.5
4.0-4.9—average	35.1	20.4	44.6	77-84—mature	57.7	25.8		72-77—fair	52.7	69.4	62.7
5.0-6.0—coarse	3.6	1.4		68-76—average	14.2	46.3	23.7	78-82—average	18.2	10.9	28.8
				60-67—immature		18.4	40.1				
	100.0	100.0	100.0	Below 60—very immature		4.1	36.2		100.0	100.0	100.0
					100.0	100.0	100.0				

[1]Micronaire, linear scale 1949; curvilinear scale 1950 and 1951.
[2]Percent of thick walled or mature fibers, 1949 and 1950 NaOH method, 1951 polarized light method.
[3]The equation for conversion of the Pressley index to tensile strength in 1,000 lbs. per square inch is 10.8116 Pressley index—0.12.

Table 2. Fineness and maturity of High Plains cottons, 1950 crop, harvested before and after frost

Fineness			Maturity		
	Percent of total			Percent of total	
Micrograms per inch	Hand-harvested before frost	Machine-stripped after frost	Fiber maturity[1]	Hand-harvested before frost	Machine-stripped after frost
3.0-3.9—fine	31.0	78.2	84 & above—very mature	21.9	5.4
4.0-4.9—average	54.2	20.4	77-84—mature	58.7	25.8
5.0-5.9—coarse	14.8	1.4	68-76—average	15.7	46.3
			60-67—immature	2.3	18.4
	100.0	100.0	Below 60—very immature	1.4	4.1
				100.0	100.0

[1]NaOH method. The fibers are swollen with an 18 percent solution of sodium hydroxide and then measured at high magnification.

In classing the lint cotton samples of the 1949 crop according to official standards, it was found that 75 percent of the stormproof, but only 47 percent of the non-stormproof cottons, was graded middling light spot, strict low middling and strict low middling plus. These were high grades for the time and method of harvesting. All these samples were from cotton stripped mechanically.

Fineness, maturity and tensile strength of the cottons sampled in 1949 are summarized in Table 1. It is evident that a high percentage of these cottons had fine fibers with average or better maturity, and tensile strength below average. These cottons were mixed for spinning on the basis of similarity in fiber properties.

Quality and Fiber Characteristics, 1950

Forty-six percent of the stormproof cottons mechanically stripped in 1950 were in the highest grade group, middling light spot, strict low middling and strict low middling plus. This compares with 75 percent in the same group in 1949. Weather conditions in 1950 were less favorable for the production of desirable grades.

A total of 498 samples were collected to compare the fiber properties and spinning performance of pre-frost hand pulled cottons with after-frost machine-stripped cottons. Of these, 351 samples were pre-frost hand-pulled and fiber tests were run on 331 and spinning tests on 20 of them. The after-frost machine-stripped samples contained 122 fiber tests and 25 spinning tests.

Fineness, maturity and tensile strength of cottons harvested before and after frost are shown in Tables 2 and 3. The pre-frost hand-harvested cottons were much coarser and more mature, but the difference in tensile strength was not so pronounced.

In the two southern counties, Lynn and Dawson, 90 percent of the samples from the pre-frost harvested cottons were in the average and coarser class with respect to fineness. The longer, warmer growing season of the central and southern parts of the area produce coarser, stronger cotton fibers than the cooler, shorter growing season of the northern section. A large part of the cotton acreage in the northern section is irrigated. This produces finer, less mature fibers. A larger acreage of stormproof varieties also is a factor. In the northern section of the area, 61 percent of the cottons were in the average and coarse group. This is confirmation

of generally accepted facts regarding High Plains cottons. The tensile strength of 47 percent of the cottons from the two southern counties were in the average or above group but only 15 percent from the northern counties were in this group.

Quality and Fiber Characteristics, 1951

Seventy-six percent of all cottons from field storage of the 1951 crop were low middling equivalent or better in grade; 69 percent of the cottons from trailers were in the same group. Major differences in grade can be attributed largely to variations in growing conditions, variety and season. Samples from field-stored seed cotton which received one inch of moisture composed of rain and snow when in storage during the first week in January 1952, were of satisfactory grade.

As indicated in Table 1, the 1951 cottons were coarser and stronger with a greater percentage of immature fibers than those of the two previous crops.

Spinning Performance of 1949 Samples

Twenty-five spinning tests were run on the 1949 machine-stripped cottons. Twist multipliers of 3.75, 4.25, 4.75 and 5.25 were used over a range of yarn numbers of 7's to 28's (see definition of terms). Neps varied closely with fineness; it is believed that on the coarser yarns the effect of neps on yarn appearance grade was not significant. Twist per inch is more important in the coarser cottons than in the finer. The finer cottons take more twist before reaching a shearing point than the coarser cottons.

Since the cottons of the High Plains vary in fineness, spinning tests were made over the range of fineness to ascer-

Table 3. Tensile strength of High Plains cottons, 1950 crop, harvested before and after frost

Tensile strength	Samples			
	Number		Percent of total	
	Hand-harvested before frost	Machine-stripped after frost	Machine-stripped after frost	Hand-harvested before frost
72 & below.....weak	118	29	33.6	19.7
73-77.....fair	132	102	37.6	69.4
78-82.....average	83	15	23.7	10.2
83-89.....very good	18	1	5.1	.7
	351	147	100.0	100.0

tain the spinnability, yarn grade and strength of these cottons. The spinning tests revealed that 7/8-inch cotton in the very fine category behaved differently during processing into 11's yarn than did the 7/8-inch cotton that was coarser and stronger. Maximum strength was obtained in nearly every instance with 14.2 turns per inch. Although the very fine 7/8-inch cotton had somewhat lower tensile strength than the other 7/8-inch cotton, the yarn made from the weaker, finer cotton was as strong as that made from the coarser, stronger cotton. The strength of the yarns made from the weaker and finer cotton was increased by packing more fibers into a bundle and thereby obtaining greater cohesiveness when twisted. Maximum strength in 14's yarns was usually reached for both the fine and the coarse fibers with a twist of 15.8 turns per inch.

Table 4. Yarn appearance grades of yarns processed from stormproof cottons, 1950 crop, harvested before and after frost

	Hand-harvested before frost				Machine-stripped after frost			
	Yarn count							
Yarn appearance	No. of tests		Percent of total		No. of tests		Percent of total	
	11's	22's	11's	22's	11's	22's	11's	22's
A—	2	5	28.6	71.4	3	3	20.0	20.0
B+	3	1	42.8	14.3	11	11	73.3	73.3
B	2	1	28.6	14.3	1	1	6.7	6.7
Total	7	7	100.0	100.0	15	15	100.0	100.0

Yarn appearance

Grade	Designation	Index[1]
A and above	Excellent	130
B+	Very good	120
B	Good	110
C+	Average	100
C	Fair	90
D+	Poor	80
D and below	Very poor	70

[1]The yarn appearance index provides a means of averaging the appearance grade of two or more yarn numbers, and for comparing yarn appearance values obtained in the testing of a specific sample with those of the general average of cotton. A yarn appearance index greater than 100 indicates higher than average yarn appearance, whereas a yarn appearance smaller than 100 indicates lower than average yarn appearance. Cotton Branch, PMA, U. S. Department of Agriculture.

The final test of the cotton is its performance in a fabric. Several samples of machine-stripped cotton of one variety were grouped according to fiber properties for spinning and then made into fabrics. The main purpose of fabrication was to determine the effect of fineness on fabric strength and use value. Coarse fabrics, such as ducks, drills and sheetings, were made from these cottons. The breaking strength tests indicated that fineness of fiber is not detrimental to the strength of the finished fabrics. The fabrics were acceptable in appearance and were of B grade, or better. The breaking strength data of the fabrics and previous experience in correlating such data with wearing qualities indicate that strong and durable fabrics can be made from High Plains cotton.

Spinning Performance of 1950 Samples

The pre-frost, hand-harvested, stormproof cottons of the 1950 crop are contrasted with the after frost machine stripped stormproof cottons in Tables 4 and 5. The after-frost, machine-stripped stormproof cottons compare favorably with the before-frost, hand-harvested cottons in yarn appearance grade and skein strength.

Table 5. Skein strength of yarns processed from stormproof cottons, 1950 crop, harvested before and after frost

Hand-harvested before frost			Machine-stripped after frost		
Average of 7 samples			Average of 15 samples		
	Skein strength			Skein strength	
Twist multiple	11's	22's	Twist multiple	11's	22's
4.25	190.0 lbs.	83.7 lbs.	4.25	193.0 lbs.	83.2 lbs.
4.75	188.1 lbs.	84.5 lbs.	4.75	193.0 lbs.	83.0 lbs.

Spinning Performance of 1951 Samples

Nine varieties of the 1951 crop were tested for spinning performance. Sixty-two spinning tests were run; 54 of these are included in the four summary tables covering the four principal varieties, Tables 6, 7, 8 and 9.

The nep count of the 1951 cottons was much lower than either of the other two machine-stripped crops. The lower nep count produced a superior yarn grade. These tests indicate that the properties of the various varieties remain as stable as climatic conditions permit.

Table 6. Fiber properties and spinning data, 27 tests, Macha variety, 1951

Fiber properties

	Upper half mean length (inches)	Mean length (inches)	Length uniformity (percent)	Fiber strength (1000 lbs. per square inch)	Fineness (micrograms per inch)	Maturity (percent)
Average	.90	.64	71	75.8	3.7	60
Range	.83-.98	.58-.75	66-79	71.7-81.4	2.8-4.8	40-71

Processing results

Nep count (neps per 100 square inches card web—40 gr. sliver)

Average	21
Range	8-44

Picking and carding waste (percent)

Average	21.11
Range	12.38-32.52

Yarn strength—skein (pounds)

Twist multiple

Yarn No.	11's	14's	22's	28's
3.75 (Average)	187.7	138.3	84.3	57.3
(Range)	169.5-206.3	120.2-152.1	68.4-93.0	43.0-64.2
4.25 (Average)	186.8	141.4	84.1	60.3
(Range)	172.2-203.1	132.3-148.9	71.9-93.2	52.9-68.9
4.75 (Average)	180.2	135.8	81.1	59.9
(Range)	161.6-194.8	128.2-143.6	70.0-86.6	50.3-66.1
5.25 (Average)	173.5	131.6	79.9	59.6
(Range)	152.6-188.1	121.0-146.2	70.8-86.5	50.7-64.9

Yarn grade

Average	B+	B+	B+	B+

Table 7. Fiber properties and spinning data, 12 tests, Stormproof No. 1 variety, 1951

Fiber properties

	Upper half mean length (inches)	Mean length (inches)	Length uniformity (percent)	Fiber strength (1000 lbs. per square inch)	Fineness (micrograms per inch)	Maturity (percent)
Average	.87	.61	71	73.6	3.6	59
Range	.80-.93	.58-.66	67-74	69.3-79.3	2.9-4.4	44-73

Processing results

Nep count (neps per 100 square inches card web—40 gr. sliver)

Average	17
Range	7-33

Picking and carding waste (percent)

Average	22.03
Range	18.53-26.33

Yarn strength—skein (pounds)

Twist multiple Yarn No.	11's	14's	22's	28's
3.75 (Average)	188.8	137.6	81.7	59.2
(Range)	154.9-213.3	128.8-149.9	67.2-89.4	47.5-67.3
4.25 (Average)	181.5	140.9	84.4	59.3
(Range)	157.1-195.5	131.0-150.1	72.3-90.6	50.7-64.4
4.75 (Average)	172.1	132.7	78.7	58.9
(Range)	162.4-180.3	128.2-138.4	73.9-86.5	54.2-63.3
5.25 (Average)	167.0	128.6	76.5	57.3
(Range)	157.4-175.4	122.8-133.4	71.8-80.8	52.7-62.8
Yarn grade Average	B+	B+	B+	B+

Table 8. Fiber properties and spinning data, 9 tests, CA-122 Early variety, 1951

Fiber properties

	Upper half mean length (inches)	Mean length (inches)	Length uniformity (percent)	Fiber strength (1000 lbs. per square inch)	Fineness (micrograms per inch)	Maturity (percent)
Average	.87	.62	71	76.8	4.2	66
Range	.84-.90	.58-.66	68-77	70.8-80.8	3.4-4.9	57-72

Processing results

Nep count (neps per 100 square inches card web—40 gr. sliver)

Average	16
Range	7-26

Picking and carding waste (percent)

Average	19.50
Range	16.91-24.07

Yarn strength—skein (pounds)

Twist multiple

Yarn No.	11's	14's	22's	28's
3.75 (Average)	186.8	138.1	81.8	58.2
(Range)	173.4-204.2	129.6-153.0	71.6-93.4	52.9-67.3
4.25 (Average)	192.6	139.5	82.2	59.7
(Range)	177.3-212.4	133.3-150.0	76.1-86.9	55.4-68.0
4.75 (Average)	188.1	136.2	81.8	60.1
(Range)	172.7-207.2	132.5-144.0	78.6-87.6	56.1-67.9
5.25 (Average)	182.6	134.6	78.5	58.4
(Range)	164.2-199.2	129.2-143.0	75.0-84.2	55.0-64.3

Yarn grade

Average	B+	B+	B+	B+

Table 9. Fiber properties and spinning data, 6 tests, Northern Star variety, 1951

Fiber properties

	Upper half mean length (inches)	Mean length (inches)	Length uniformity (percent)	Fiber strength (1000 lbs. per square inch)	Fineness (micrograms per inch)	Maturity (percent)
Average	.90	.63	70	75.9	3.9	64
Range	.85-.96	.61-.65	66-72	70.9-80.3	3.6-4.3	57-68

Processing results

Nep count (neps per 100 square inches card web—40 gr. sliver)

Average	12
Range	8-19

Picking and carding waste (percent)

Average	23.56
Range	17.56-27.22

Yarn strength—skein (pounds)

Twist multiple Yarn No.	11's	14's	22's	28's
3.75 (Average)	192.6	141.4	82.2	62.3
(Range)	178.4-205.4	123.7-148.9	75.8-89.0	56.0-66.5
4.25 (Average)	196.2	140.8	83.0	63.1
(Range)	181.3-207.0	131.7-145.8	75.8-87.5	58.5-66.9
4.75 (Average)	192.3	132.1	85.6	64.2
(Range)	174.3-200.6	122.3-137.0	76.9-91.9	57.7-69.4
5.25 (Average)	180.8	126.2	84.7	65.6
(Range)	169.6-188.1	116.8-132.2	76.4-89.7	54.4-80.1
Yarn grade Average	B+	B+	B+	B+

While the cotton grown on the High Plains is practically all one inch or less in length, utilization necessitates knowing the physical properties of the fiber. Cotton with a high percentage of immature fibers does not dye uniformly. One eastern mill operator refuses to buy any cotton from this area of less than a specified fineness as all his products are dyed. The savings in dyestuffs alone more than justifies the expense of buying on specification. It is because of the importance of fiber properties that the data presented in this report type the cotton by variety. Thus, the purchaser of cotton of the area can rely fully on the classer's length and grade and the laboratory fineness and maturity tests as the guide in obtaining cotton of the required specifications.

Many of the mills use these cottons for fabrics such as ducks, awning materials and belting. The essential requirements in such products are yarn and fabric strengths. For this reason, the yarn strengths and the ranges for each twist are given in this report. With the strength data at the various twists, the mill operator will be able to find the variety that best meets his specifications. At the same time, the mill can determine at what twist the maximum strength may be realized. This is also graphically shown for 85 percent of the varieties tested in Figure 1.

As quality and waste are competitive features which most mills must take into account, the nep count, processing waste and yarn grades are of vital concern to mill men. These factors may serve as guides in organizing their production methods for achieving results comparable with those of the pilot plant.

Summary

Year by year an increasing percentage of the cotton on the High Plains is being stripped mechanically. In 1949, a year of high production, 35 to 40 percent of the crop was stripped mechanically.

Stormproof varieties are best adapted to mechanical stripping. Grades from such varieties are higher and wastage during the stripping process is much lower than from open-boll varieties.

Spinning tests make data available on cotton of known fiber properties. These data can be used as an aid in selecting cotton varieties with fiber properties similar to those of the cotton spun in the tests. The results of the spinning tests can then be duplicated within a reasonable range.

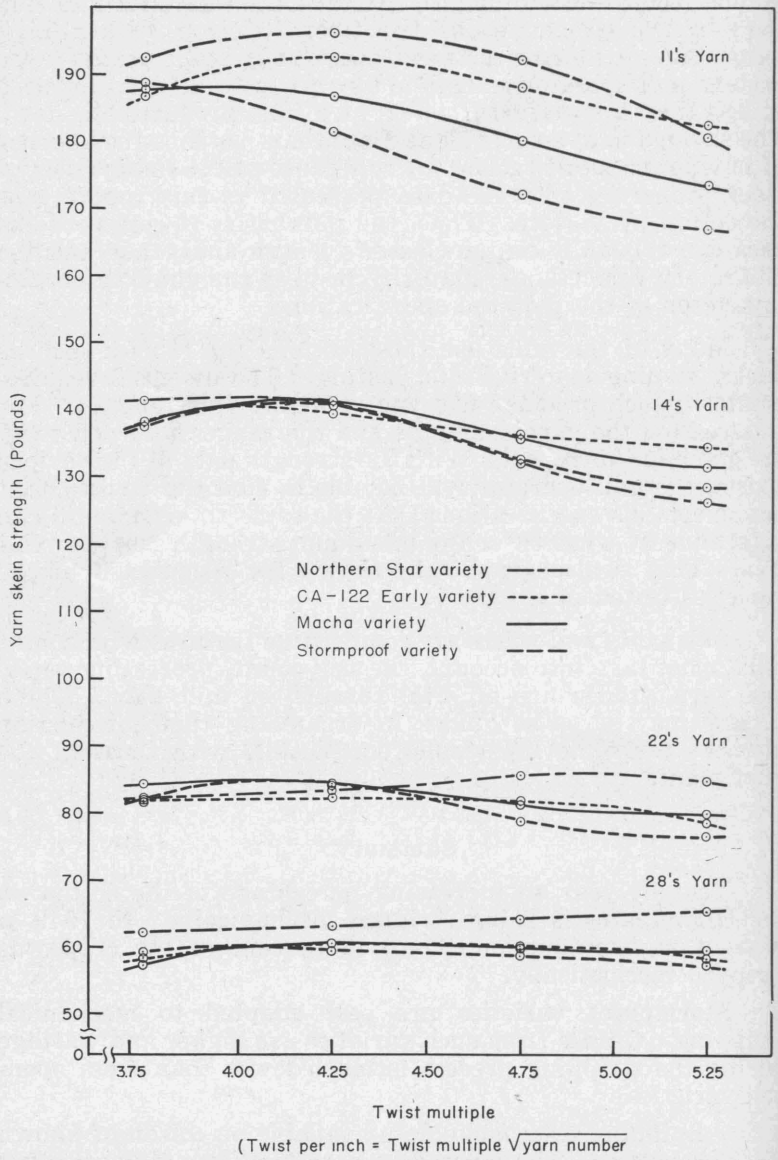

Figure 1. Average yarn skein strength by twist multiples, Macha, Stormproof No. 1, CA-122 Early and Northern Star varieties, 1951.

A high percentage of mechanically-stripped cottons of the High Plains have fine, immature fibers and relatively low tensile strength. Spinning tests of the 1949, 1950 and 1951 crops revealed that 7/8-inch cotton in the very fine category behaved differently during processing into 11's yarns than did the 7/8-inch cotton that was coarser and stronger. Although the very fine 7/8-inch cotton had fibers of somewhat lower tensile strength than the other 7/8-inch cotton, the yarn made from the weaker, finer cotton was as strong as that made from the coarser, stronger cotton. The strength of the yarns made from the weaker and finer cotton was increased by packing more fibers into a bundle and thereby obtaining greater cohesiveness when twisted. Spinning tests of stormproof cottons of the crop of 1950, harvested by hand in the 15-day period prior to frost and tests of similar cottons harvested by stripper after frost, show that the mechanically-stripped stormproof cottons compare favorably with the hand-pulled cottons in yarn strength and appearance grade.

The cottons of the 1951 crop were coarser, less mature and stronger than those of the two previous crops. The yarn was slightly stronger and the nep count much lower. The lower nep count produced a superior yarn grade.

Explanation of Terms

The upper-half-mean is the average length of the longest half of the fiber by weight and corresponds closely to staple length as determined by the classers.

The mean length is the average length of all fibers in the sample excluding those 1/4 inch or under.

Uniformity is a measure of fiber length distribution and is obtained by dividing the mean by the upper-half-mean and expressing the result in percent. Above 80 is considered uniform in fiber length, 80 to 76 average, 75 to 71 slightly irregular, and 70 or below, irregular.

Fiber tensile strength is the force in 1,000 pounds required to separate the equivalent of a surface area of one square inch. Ninety or above is considered excellent, 89 to 83 very good, 82 to 78 average, 77 to 72 fair, and below 72 is considered weak.

Fiber fineness is linear density expressed in terms of micrograms per inch. 1.8 to 2.9 micrograms per inch is considered extra fine, 3.0 to 3.9 fine, 4.0 to 4.9 average, 5.0 to 5.9 coarse, and above 6.0 is considered very coarse.

Fiber maturity represents the percentage of thick-walled fibers. 84 or above is considered very mature, 84 to 77 mature, 76 to 68 average, 67 to 61 immature, 60 or below very immature.

Twist multiplier indicates the twist per inch of yarn. The twist per inch applied to yarn is the product of the twist multiplier and the square root of the yarn number.

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The quality phases of this study were facilitated by the cooperation of the Cotton Research Committee of Texas through its staff of Cotton Research at Texas Technological College, Lubbock, Texas.

The helpful assistance of the farmers and ginners of the High Plains and the staff of Substation No. 8, Texas Agricultural Experiment Station, at Lubbock, was indispensable.

MORE DETAILS AVAILABLE

For information on machinery inventory and settings used in the spinning tests in this bulletin, contact:

Cotton Research
Box 4159
Texas Technological College
Lubbock, Texas