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THE EFFECT OF GINNING ON THE SPINNING QUALITY OF ARIZONA COTTON

By

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THE EFFECT OF GINNING ON THE SPINNING QUALITY OF ARIZONA COTTON

BY W. I. THOMAS AND R. S. HAWKINS[1]

INTRODUCTION

Before World War II most of the cotton produced in the southwestern irrigated areas was sold for export to Japan. That market was, of course, lost when the war began, but the demand for cotton was so great at that time that the loss of the Japanese market was not felt. The continuation of U.S. Government loans on cotton has been another influencing factor in providing a market outlet for southwestern cotton. It is not good economy for such an extensive industry as the cotton business of the irrigated areas to be dependent for market outlets on foreign sources which have been generally declining at alarming rates in recent years or upon such artificial media as government controls which may be only temporary expedients.

In the meantime much of the cotton from Arizona and other southwestern states has sold at a discount in relation to other cottons of the same grade and staple. Over the years discounts of one hundred points or more have not been uncommon, and the total loss to farmers probably has exceeded one hundred million dollars. This loss has been due to the poor spinning quality of the cotton whether real or imaginary. The main complaints have been neppiness, rough appearance of the final yarn produced, excessive waste, and lack of strength.

The lack of fiber strength has largely been eliminated in certain irrigated areas following the discovery and establishment as a commercial variety of New Mexico 1517, and of California 4-42, and more recently Arizona Acala strains give promise of additional improvements in this direction. The Pressley fiber strength tester has been a most useful tool for the cotton breeder in evaluating the strength properties of his selections.

Considerable progress has been made in improving southwestern cotton through varietal selections and some also with fertilizers, dates of planting, and artificial processing as aids to better spinning. The problems of excessive waste and neps, however, are still common, although some spinning tests indicate that these factors are by no means universally excessive.

It has been noted that spinning test reports from laboratory samples almost always show a lower nep count than those from commercially-ginned samples. This led to the suspicion that ginning manipulations might be responsible in large measure for excessive neppiness in southwestern cotton. The development of the southwestern cotton industry was accompanied by the es-

[1]The authors gratefully acknowledge the careful and accurate work of Mrs. Edna Lewis in connection with the laboratory determinations.

tablishment of the modern gin equipped with rather extensive cleaning devices. If excessive handling in a gin creates neps and and thus lowers the intrinsic value of the crop it puts the southwestern producer in the awkward position of accepting penalties for poor preparation which offset or exceed the premiums for improved grades. Grades have been well above the national average and should have brought substantial premiums (see Figure 1).

EXPERIMENTAL PROCEDURE

CROP OF 1946

During the 1946 harvest season fifteen paired lots of seed cotton of two samples each were collected for spinning tests. One sample of each pair was ginned on a laboratory saw gin with the use of no cleaning equipment. The other paired sample of each lot was ginned on a commercial gin which was well equipped with cleaning machinery.

The ginned samples of lint were submitted to the U.S.D.A. Cotton Spinning Laboratory at College Station, Texas, for spinning tests. The results of these tests show an average nep count of 16.6 neps per 100 inches of card webbing for the laboratory-ginned samples and 34.2 neps for the commercially-ginned samples (see Table 1).

TABLE 1.—NUMBER OF NEPS IN THE CARD WEB AND APPEARANCE OF 22's YARNS OF COTTON SAMPLES LABORATORY-GINNED AS COMPARED WITH COMMERCIALLY-GINNED COTTON, 1946.

Sample pair	Laboratory-ginned		Commercially-ginned	
	Neps (100 sq. in. card web)	Yarn appearance (22's)	Neps (100 sq. in. card web)	Yarn appearance (22's)
1	23	C+	32	B
2	17	B	21	C+
3	17	C+	30	C
4	11	B+	29	C
5	12	C+	32	C
6	19	B	33	C+
7	22	C	33	C
8	19	C	36	C
9	16	C+	41	C+
10	16	C+	27	C
11	14	C+	46	C+
12	18	C+	34	C
13	11	C+	41	C
14	13	C+	28	C
15	21	C	50	D
Mean neps	16.6		34.2	

The range in nep count for the fifteen laboratory-ginned samples was from 11 to a high of 23 and for the fifteen commercially-ginned samples from 27 to 50 neps. In no instance was the nep

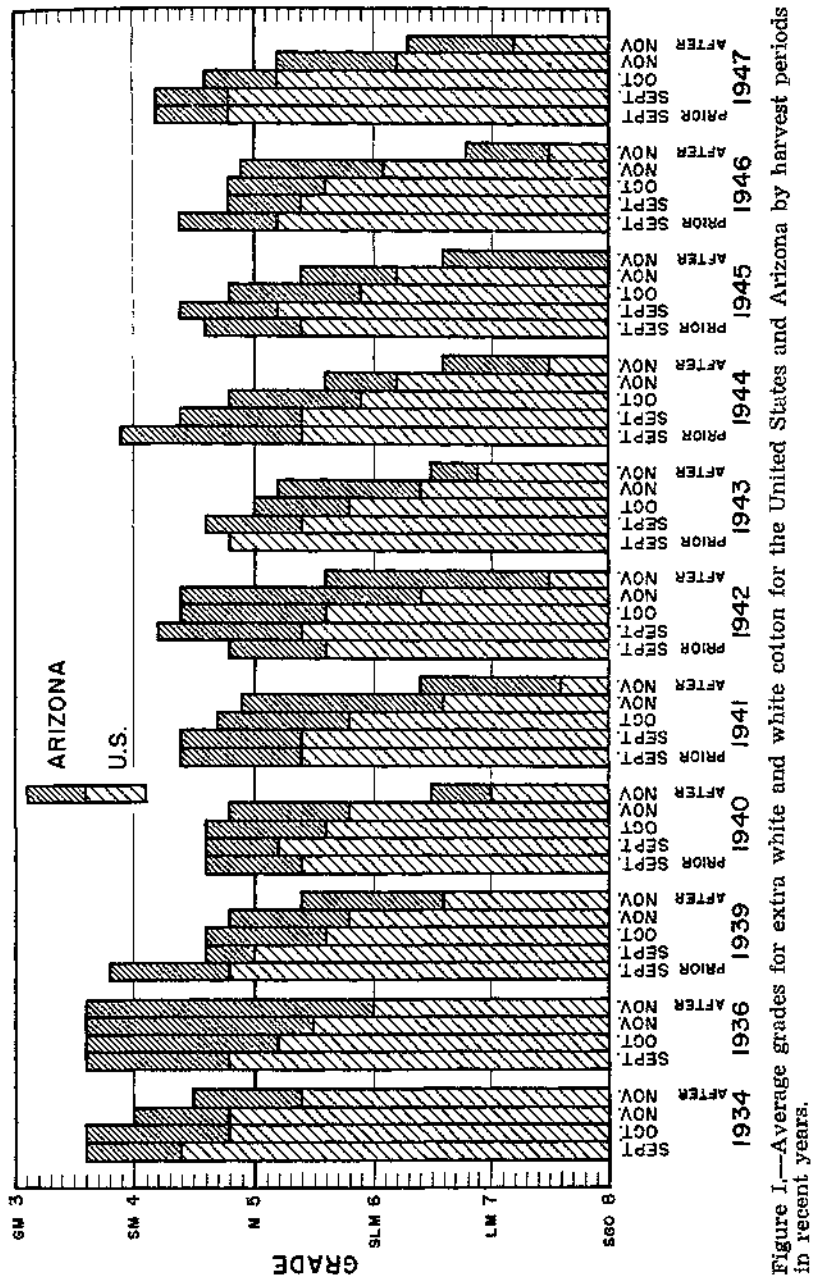

Figure 1.—Average grades for extra white and white cotton for the United States and Arizona by harvest periods in recent years.

count as high in the laboratory-ginned sample. Such clear-cut differences demonstrate that in this instance, at least, excessive nep formation was caused by ginning machinery.

Despite the lack of use of any cleaning machinery in connection with the laboratory-ginned samples, the resultant yarn graded almost a half grade better than did the yarn made from the commercially-ginned cotton as indicated in Table 2.

TABLE 2.—FREQUENCY DISTRIBUTION OF YARN APPEARANCE OF FIFTEEN PAIRED SAMPLES — ONE LABORATORY-GINNED, THE OTHER COMMERCIALLY-GINNED

Yarn appearance grade	Number of samples	
	Laboratory-ginned	Commercially-ginned
B+	1	0
B	2	1
C+	9	4
C	3	9
D	0	1

CROP OF 1947

Eight paired lots of two samples each were collected in 1947 at a local gin, one (lint) being taken at the press box and one (seed cotton) from the wagon. The seed cotton samples were ginned on a laboratory gin similar to the procedure used the previous (1946) season.

Spinning tests again showed consistently lower nep count for the laboratory-ginned samples as compared with the commercially-ginned samples, although these differences were not as great as they had been with the 1947 material (see Table 3).

TABLE 3.—NUMBER OF NEPS IN THE CARD WEB AND APPEARANCE OF 22's YARNS OF COTTON SAMPLES, CROP OF 1947

Sample pair	Laboratory-ginned		Commercially-ginned	
	Neps (100 sq. in. card web)	Yarn appearance (22's)	Neps (100 sq. in. card web)	Yarn appearance (22's)
1	11	B+	15	B
2	8	B	13	C+
3	15	B	17	C+
4	24	C+	24	C+
5	19	C+	21	C
6	15	C+	26	C+
7	12	C+	29	C+
8	14	B	21	C+
Mean neps	14.75		20.75	

Likewise yarn appearance was materially better with the laboratory-ginned samples as shown in Tables 3 and 4.

TABLE 4.—FREQUENCY DISTRIBUTION OF YARN APPEARANCE OF EIGHT PAIRED SAMPLES OF LABORATORY AND COMMERCIALLY-GINNED COTTON, 1947

Yarn appearance grade	Number of samples	
	Laboratory-ginned	Commercially-ginned
B+	1	0
B	3	1
C+	4	6
C	0	1

CROP OF 1949

During the crop season of 1949, a fairly uniform lot of Acala Santan seed cotton was divided into 15-pound lots and ginned in the following manner:

1. Lint removed from the seed by hand
2. Ginned by a 25-saw laboratory gin
3. Ginned on a Pima roller gin
4. Put through an extractor and ginned by hand

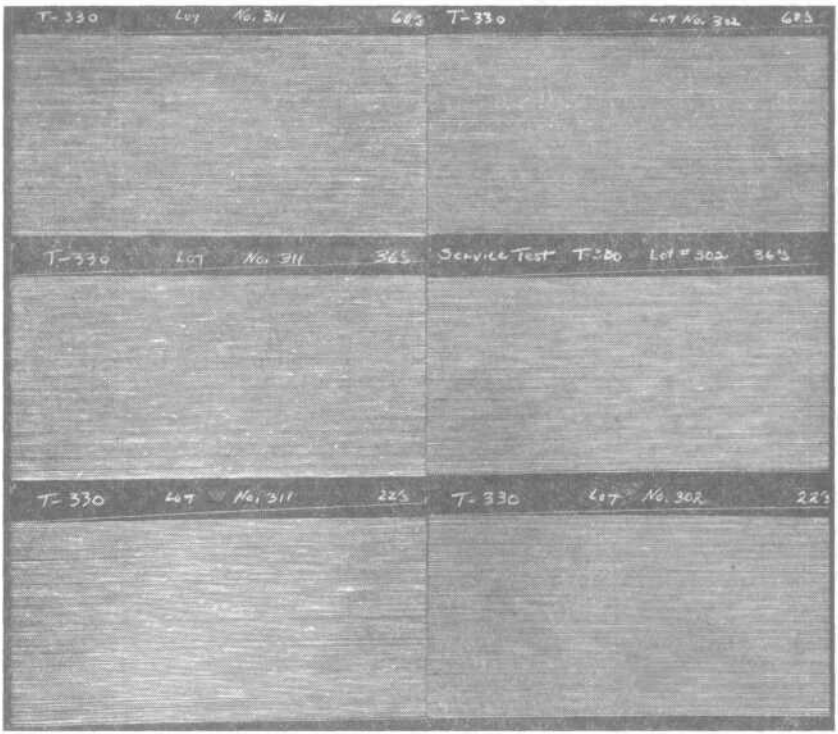

Plate I.—Left, yarn (sizes 60, 36, and 22) from commercially-ginned cotton (Sample No. 7—Crop of 1949);
Right, yarn (sizes 60, 36, and 22) from lint removed from seed by hand (Sample No. 1—Crop of 1949).

5. Put through an extractor and saw ginned as in 2
6. Put through a laboratory type of impact cleaner and roller ginned on a Pima gin
7. Commercially ginned

These lint samples were then submitted to the U.S.D.A. Cotton Spinning Laboratory at Texas A. and M. and spinning data obtained as indicated in Table 5.

TABLE 5.—INFLUENCE OF GINNING PROCEDURE ON SPINNING QUALITIES—1949

Lot no,	Ginning treatment	Grade	Staple	Neps*	% Waste	Yarn Appearance		
						22s	36s	60s
1.	Hand	MF (1)	1-1/32	5	4.12	Excellent	Good+	Good+
2.	Saw ginned	SM (4)	1"	21	7.32	Good+	Good	Good
3.	Roller	M. Lt. Spot (6)	1"	13	8.13	Average+	Average+	Average+
4.	Extractor cleaned hand ginned	GM (3)	1-1/32	8	6.49	Good+	Good	Good
5,	Extractor cleaned saw ginned	GM (3)	1"	24	7.43	Good	Average—	Average—
G.	Impact cleaned roller ginned	M (5)	1"	10	8.26	Good	Good	Average+
7.	Commercial ginned	SM (4)	1-1/32	94	9.64	Average	Poor+	Poor+

per 100 sq. in. of card web.

DISCUSSION

The Number one hand-ginned sample was classed middling fair (Number one) with a staple of 1-1/32 inches. It has been many years since any bales have been designated middling fair and certainly none in the Southwest. Good middling or grade 3 seems to be the top quality recognized at the present time. "A" grade yarns are also all that could be desired. The few neps that were found, 5, were probably caused by the mill machinery as the fast carding process was used. In a previous paper the authors reported some data on the effect of the carding process on the spinnability of cotton[2]. The low waste content, of course, is due to the extreme care in elimination of foreign material, and to leaving considerable substaple on the seeds.

Sample Number two was ginned on a small 25-saw Eagle gin. The saws were new, and slow speeds, 300 R.P.M., were used. The sample produced yarns of good appearance. The percentage of waste was about average, and the number of neps, 21, is considered average although four times that obtained by hand ginning. The grade was strict middling.

Sample Number three was ginned on a roller gin because of reports from a near-by area of this practice with upland cotton. It has been pointed out that the market desired this cotton because

[2]See Arizona Technical Bulletin 115.

of absence of neps. Our roller-ginned samples (see also Number six) were very low in nep content, but the yarn appearance grades were not improved as much as expected. Also the percentage of waste was higher with these samples. These samples graded one grade lower than expected, but this can be due to the unusual preparation of roller-ginned samples. Roller ginning is slow and expensive, and certainly is no solution to the problem, especially in view of the yarn appearance grades obtained. Its possible advantage with certain long staple uplands where they are being used as a substitute for extra long staple cottons is freely admitted.

Sample Number four was put through a Mitchell convertible extractor unit before hand ginning. The grade was raised to good middling but slightly more neps were obtained, 8 as compared to 5 from the Number one check, an excess of 3. Good yarn appearance grades were obtained.

Sample Number five was also extracted in the same manner as Number four, but saw ginned. The card webbing contained 24 neps as compared to 21 in the sample Number two check, again an excess of 3. The grade was also raised to good middling as in Number four. The yarn appearance grade was still average or better, but not as good as obtained with some of the other samples.

Sample Number six was put through a rather high speed impact cleaner type of machine and roller ginned. No difference in nep content and yarn appearance grade was obtained.

Sample Number seven is a commercially-ginned sample of the same lot. High neps and waste and poor yarn grades are quite apparent.

Previous tests reported in Technical Bulletin No. 115 from this station indicate that the nep content of 100 sq. in. of card web averages about 50 for commercially-ginned samples from this area with a range from 18 to 90, a waste content of 8½ per cent, and yarn appearance grades of average to poor.

SUMMARY AND CONCLUSIONS

1. From an agronomic standpoint Arizona produces excellent cotton.
2. Excessive neppiness and waste in yarn produced from Arizona cotton has been traced to the gin and more especially to the gin stands themselves.
3. The use of a new extractor for the removal of trash from seed cotton created but few neps, and practically none were created where a special impact cleaning device was used.
4. Yarn spun from lint removed from the seed by hand had remarkably low nep and waste content.
5. Roller ginning produces few neps as compared with saw ginning. However, roller-ginned upland cotton is likely to be graded lower because of preparation peculiar to roller ginning.

6. The data in this publication indicate that cleaning machinery does not contribute as greatly to excessive nep formation as does the operation of the saw stand itself.
7. Cotton carefully ginned on saw stands has given yarn of good appearance grades.
8. This preliminary work on nep formation, while consistent as far as it goes, merely opens the field for more complete and detailed research on the influence and improvement of machinery used in gin operations.