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MACHINE-STRIPPED COTTON

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COMPARATIVE PERFORMANCES OF A STICK MACHINE AND A BUR MACHINE ON MACHINE-STRIPPED COTTON

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PURPOSE AND SCOPE

Cotton gins processing stripper-harvested cotton are faced with the difficult task of removing large quantities of sticks, stems, and burs from the incoming seed cotton. Inadequate removal of foreign matter before ginning can reduce ginning capacity, increase downtime, and contribute to the trashiness and bark content of the ginned lint. To obtain satisfactory grades and efficient gin stand operation, most gins use seed cotton cleaning equipment specifically designed for removing sticks and burs. The two machines most commonly used for extracting large trash from stripper-harvested cotton are the stick machine and the bur machine.

The modern commercial stick machine derives its origin from the U.S. Department of Agriculture's stick remover[2] developed in the early 1950's.

The bur machine is older, dating back to the early days of hand-snapped and machine-stripped cotton. During the last 10 years, the stick machine has virtually replaced the bur machine in all cotton-producing areas except in areas where the predominant method of harvest is stripping. One reason for the continued usage of the bur machine is that it was designed originally for stripper-harvested cotton. Consequently, it was widely distributed in the stripper areas and has been used extensively ever since. Also, many ginners have not replaced their bur machines because they have felt they were essential for the efficient cleaning of stripper cotton.

One disadvantage of the bur machine is its low capacity compared with its relatively large size. This disadvantage is especially apparent since the trend is increasing toward high-capacity ginning. Ginners erecting new plants and those remodeling their existing plants must decide whether to use more bur machines or replace their existing

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ones with the higher capacity stick machines. Ginners need current information on the effectiveness of both machines to make these decisions.

The purpose of this investigation was to determine comparative cleaning efficiencies of the stick machine and the bur machine for machine-stripped cotton under a wide range of ginning conditions.

EXPERIMENTAL PROCEDURE

The typical seed cotton cleaning system for machine-stripped cotton consists of airline cleaner, inclined cleaner, bur machine, inclined cleaner, and stick machine. Normally these machines are used in this sequence. Occasionally, however, the machines are arranged in a different sequence. Also, some cleaning systems do not contain all these machines. Some of the newer gins are likely to have two stick machines and no bur machine, and the older gins only bur machines. Since the stick machine and the bur machine can be used in a cotton gin in various ways, it was felt that any valid evaluation of the merits of these two machines should be based on comparisons at all possible locations within the seed cotton cleaning sequence. In this experiment the comparisons were made at four locations by using the six cleaning arrangements for seed cotton shown in figure 1.

At each of the test locations samples of seed cotton were taken both before and after cleaning with the stick and the bur machines. These samples were used to determine moisture and foreign matter contents of the seed cotton. The weight of trash removed by both machines was also obtained for each comparison along with a trash sample that was used to determine losses of seed cotton. Appropriate lint samples were taken after ginning for standard fiber tests.

The test cotton was processed through an 8-foot-wide stick machine and a 14-foot-long bur machine at rates of 5½ to 7 bales per hour. All the cotton was ginned on one gin stand at a rate of 3.7 bales per hour. The lint was further cleaned with two stages of saw-type lint cleaning.

Cleaning arrangements for seed cotton were tested in a randomized order for each of six replications. The test cottons consisted of nine bales each of Dunn 56-C and Paymaster 111 varieties. All nine bales of each variety were tested three times for a total of six test replications. The size of all 36 test lots was approximately one-half bale.

Statistically significant differences between the effects of the stick machine and the bur ma-

NORMAL SEQUENCE	TEST LOCATION	OTHER SEQUENCES					
		1	2	3	4	5	6
AIRLINE CLEANER		AIRLINE CLEANER	AIRLINE CLEANER	AIRLINE CLEANER	AIRLINE CLEANER	AIRLINE CLEANER	AIRLINE CLEANER
TOWER DRIER		TOWER DRIER	TOWER DRIER	TOWER DRIER	TOWER DRIER	TOWER DRIER	TOWER DRIER
INCLINED CLEANER	1	BUR MACHINE	STICK MACHINE	STICK MACHINE	INCLINED CLEANER	INCLINED CLEANER	INCLINED CLEANER
BUR MACHINE	2	INCLINED CLEANER	INCLINED CLEANER	INCLINED CLEANER	STICK MACHINE	BUR MACHINE	BUR MACHINE
TOWER DRIER		TOWER DRIER	TOWER DRIER	TOWER DRIER	TOWER DRIER	TOWER DRIER	TOWER DRIER
INCLINED CLEANER	3	STICK MACHINE	STICK MACHINE	BUR MACHINE	INCLINED CLEANER	INCLINED CLEANER	INCLINED CLEANER
STICK MACHINE	4	– – –	– – –	– – –	STICK MACHINE	STICK MACHINE	BUR MACHINE

▨ TEST AND COMPARISON MADE

FIGURE 1.—Amount and sequence of machinery used for the six cleaning arrangements for seed cotton tested.

chine were determined by an analysis of variance for each location in the experiment. All six replications were combined for these analyses. Since two cotton varieties were used in this experiment, ascertaining the homogeneity of variances between the varieties was necessary to justify combining them in the analysis. This was done using Bartlett's test for homogeneity of variance.[3] This test was applied to all foreign matter and moisture data from samples taken before and after cleaning. No significant differences in variance between varieties were noted for any of the data.

EXPERIMENTAL RESULTS

Seed Cotton Moisture Content

The average seed cotton moisture contents for all replications were within the range of 8.0 to 9.3 percent (table 1). No significant differences were noted in the average seed cotton moisture contents between the stick machine and the bur machine for any of the four test locations.

[3] STEEL, R. G. D., and TORRIE, J. H. PRINCIPLES AND PROCEDURES OF STATISTICS. P. 349. New York, London. 1960.

TABLE 1.—*Seed cotton moisture contents before extraction at 4 test locations*

Replication number and type of extractor	Test location			
	1	2	3	4
	Pct.	Pct.	Pct.	Pct.
1:				
Stick machine	10.7	9.6	7.8	10.7
Bur machine	10.9	9.9	8.8	9.0
2:				
Stick machine	9.9	12.0	9.0	10.4
Bur machine	12.4	11.2	9.4	9.8
3:				
Stick machine	10.4	10.5	9.1	9.9
Bur machine	10.8	11.4	9.3	9.5
4:				
Stick machine	7.7	6.9	7.3	7.2
Bur machine	7.3	7.1	7.1	6.8
5:				
Stick machine	7.1	8.0	7.2	7.6
Bur machine	6.9	7.7	7.4	7.9
6:				
Stick machine	7.4	7.7	7.3	7.3
Bur machine	7.6	7.1	7.5	7.5
Average: [1]				
Stick machine	8.9	9.1	8.0	8.9
Bur machine	9.3	9.1	8.3	8.4

[1] No significant difference between the types of extractors at the 5-percent level for any of the 4 locations.

Foreign Matter Content

Foreign matter contents of seed cotton were determined by the fractionation method. The amounts of burs, sticks, and fine trash in the seed cotton were determined for each sample and expressed as percentages of the original sample weight. The total trash percentage was the sum of the percentages of these individual trash components.

The foreign matter contents of the seed cotton before entering the stick and the bur machines are given in table 2. The total foreign matter contents were approximately 32, 29, 15, and 18 percent for test locations 1, 2, 3, and 4, respectively. Differences between foreign matter contents of seed cotton entering the stick machine and that entering the bur machine were generally

TABLE 2.— *Foreign matter contents of seed cotton before and after extraction with stick and bur machines, 4 test locations* [1]

Location and type of extractor	Burs		Sticks		Fine		Total	
	Before	After	Before	After	Before	After	Before	After
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
No. 1:								
Stick machine	21.3	7.2*	5.2	3.2	6.3	5.3	32.8	15.7*
Bur machine	20.6	9.4*	4.8	3.8	5.8	6.6	31.2	19.8*
No. 2:								
Stick machine	18.6*	7.0*	4.9	3.1	4.6	4.5	28.1*	14.6*
Bur machine	22.1*	9.0*	4.1	2.9	4.0	5.5	30.2*	17.4*
No. 3:								
Stick machine	9.0	3.4	2.7	1.7	3.8	3.8	15.5	8.9
Bur machine	7.8	4.2	2.5	1.6	3.9	4.3	14.2	10.1
No. 4:								
Stick machine	9.9	4.5*	4.2*	2.3	4.1	4.3	18.2	11.1*
Bur machine	10.5	7.2*	3.6*	2.6	3.4	4.2	17.5	14.0*

[1] From appendix tables 7 and 8.

*=Significant difference between the 2 machines at the 5-percent level.

small and not significant. However, at location No. 2 the seed cotton entering the bur machine had a significantly larger amount of burs than the seed cotton cleaned by the stick machine. Also, at location No. 4 the stick content of seed cotton entering the stick machine was slightly higher than that entering the bur machine.

The foreign matter contents after extraction (table 2) showed significantly lower total trash contents for cotton extracted by the stick machine than by the bur machine at locations 1, 2, and 4. The total trash content at location 3 was slightly lower, but not significantly so, for the cotton extracted by the stick machine. At locations 1, 2, and 4 the bur contents for cotton extracted by the stick machine were significantly lower than for the cotton extracted by the bur machine. At location 3 the difference in bur content was only slightly lower for the cotton cleaned by the stick machine. Differences in stick content were small and insignificant. The fine trash contents tended to be higher for the cotton cleaned by the bur machine. However, these differences were not statistically significant.

Cleaning Efficiency

The cleaning efficiency, based on total trash removal, of the stick and the bur machines was calculated from the foreign matter contents of seed cotton before and after extracting for each test location (table 3). At each location the stick machine obtained the highest cleaning efficiency. The average cleaning efficiency of the stick machine varied from a low of 44.3 percent at location 4 to a high of 61.8 percent at location 1. Under similar conditions, the average cleaning efficiency of the bur machine varied from 22.9 percent at location 4 to 50.8 percent at location 2. Differences between the cleaning efficiencies of the two machines were statistically significant at locations 1 and 4. Even though the differences in cleaning efficiencies at locations 2 and 3 were not statistically significant, they were thought to be real differences because (a) at location 2 the higher level of burs in the seed cotton entering the bur machine tended to inflate its cleaning efficiency at that point, and (b) the fractionation data from which the efficiencies were calculated was variable and consequently only large differences in cleaning efficiencies were significant.

The cleaning efficiency of each machine was found to be a function of the foreign matter content of the seed cotton before extracting (fig. 2). Within the limits of this experiment the following linear regression equations adequately describe this relationship: Stick machine, $Y = 29.4 + 0.97 X$; bur machine, $Y = 4.2 + 1.41 X$.

TABLE 3.—*Cleaning efficiencies of the stick machine and the bur machine, 4 test locations* [1]

Replication number	Location 1		Location 2		Location 3		Location 4	
	Stick machine	Bur machine	Stick machine	Bur machine	Stick machine	Bur machine	Stick machine	Bur machine
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
1	61.7	45.0	52.2	46.4	32.8	42.3	35.6	25.3
2	49.0	39.0	52.0	43.0	46.0	19.7	41.3	14.1
3	54.0	36.0	49.4	32.2	39.8	11.7	40.5	30.6
4	67.7	58.7	61.0	58.5	45.5	33.9	50.5	31.7
5	69.5	46.8	60.9	58.7	47.0	43.3	50.7	9.8
6	68.8	49.3	63.1	66.2	69.9	22.6	47.2	25.6
Average, all replications.	61.8 *	45.8	56.4 NS	50.8	46.8 NS	28.9	44.3 *	22.9

[1] Cleaning efficiencies calculated from percentage of total trash contents before and after cleaning as determined by fractionation:

Cleaning efficiency $= 100 \left(1 - \dfrac{N_2 - N_1N_2}{N_1 - N_1N_2}\right)$.

N_1 = Total trash content before cleaning, percent ÷ 100, original weight base.
N_2 = Total trash content after cleaning, percent ÷ 100, original weight base.
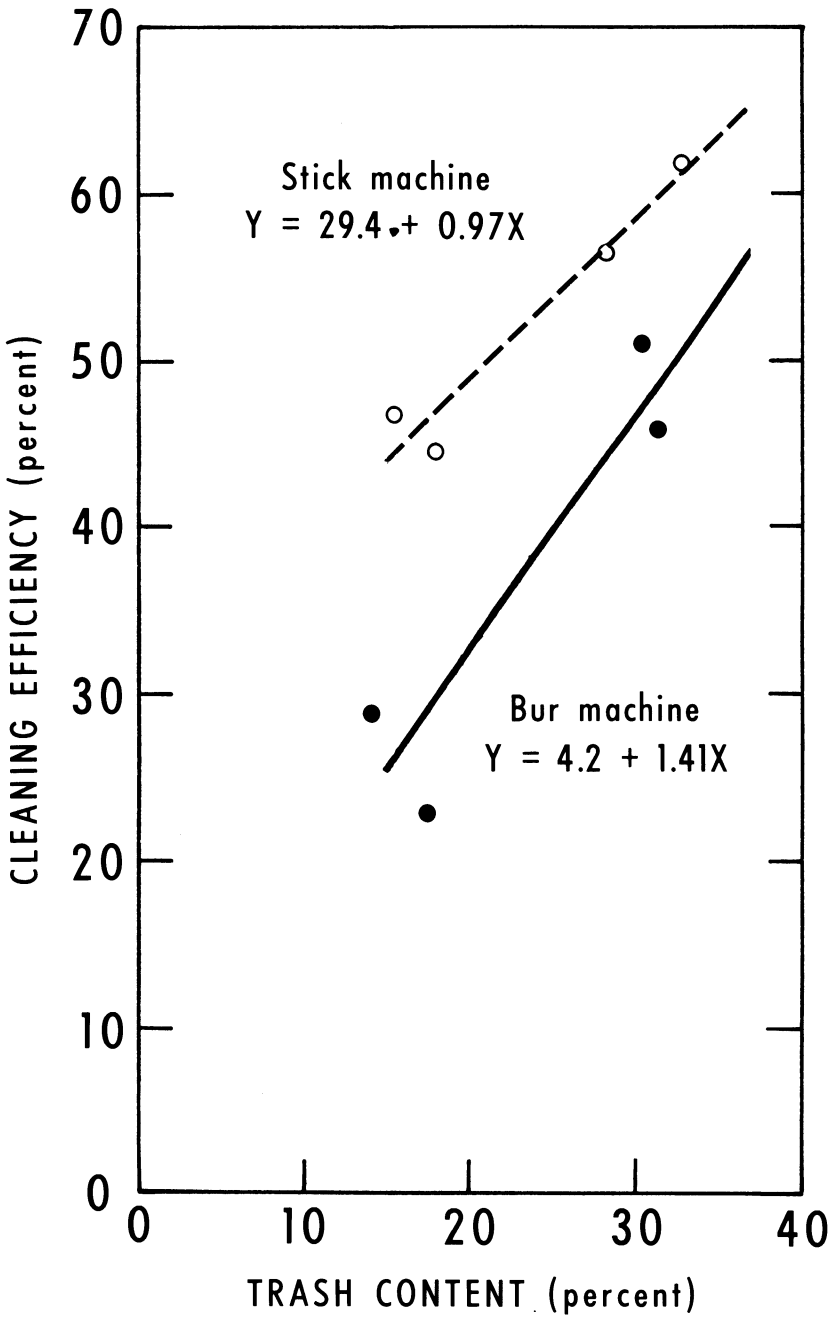* = Significant differences at the 5-percent level; NS = not significant at the 5-percent level.

FIGURE 2.—The effect of foreign matter content of seed cotton upon the cleaning efficiency of a stick machine and a bur machine.

$Y =$ Cleaning efficiency, percent.

$X =$ Foreign matter content, percent.

These two equations indicate that (1) the stick machine operated at higher cleaning efficiencies than the bur machine for the range of foreign matter contents tested, and (2) the bur machine was more sensitive than the stick machine to changes in foreign matter contents of the incoming seed cotton.

Amount of Trash Extracted

The amount of trash removed by each machine was determined by weighing all the trash extracted from each $\frac{1}{2}$-bale test lot (appendix table 9). The stick machine extracted 207.8, 202.7, 54.7, and 73.3 pounds of trash per $\frac{1}{2}$-bale test lot at locations 1, 2, 3, and 4, while at these same locations the bur machine extracted 147.2, 144.5, 37.2, and 36.0 pounds (fig. 3). The stick machine extracted significantly larger amounts of trash than the bur machine at all four test locations.

Changes in bur, stick, and fine trash contents due to extraction with a stick machine and a bur machine are shown in figure 4. These graphs were constructed by using the foreign matter determinations before and after extraction and the weights of trash removed by each machine at the four test locations. Again, these graphs are averages of all six test replications and are expressed in pounds of trash per bale of seed cotton. A few of the weights were adjusted to compensate for slight differences in trash content of the seed cotton before extraction.

These graphs show that less burs, sticks, and fine trash remained in the seed cotton after extraction with the stick than with the bur machine at all four locations. The greatest reduction in both burs and sticks occurred at the first location using the stick machine. The bur machine did its most efficient cleaning at location 2. The stick machine reduced fine trash content slightly at each location while the bur machine increased the amount of fine trash at all four locations. This was apparently due to pulverization of the larger trash particles within the bur machine.

Less trash remained in the seed cotton after cleaning at the third location than at the fourth location. This occurred even though more equipment was used before the fourth location. Ten cylinders of cleaning and a stick machine were used on seed cotton before the third location while 16 cylinders of cleaning and a bur machine were used before the fourth location.

Fiber Properties

One cleaning arrangement tested for seed cotton contained 16 cylinders of cleaning and two
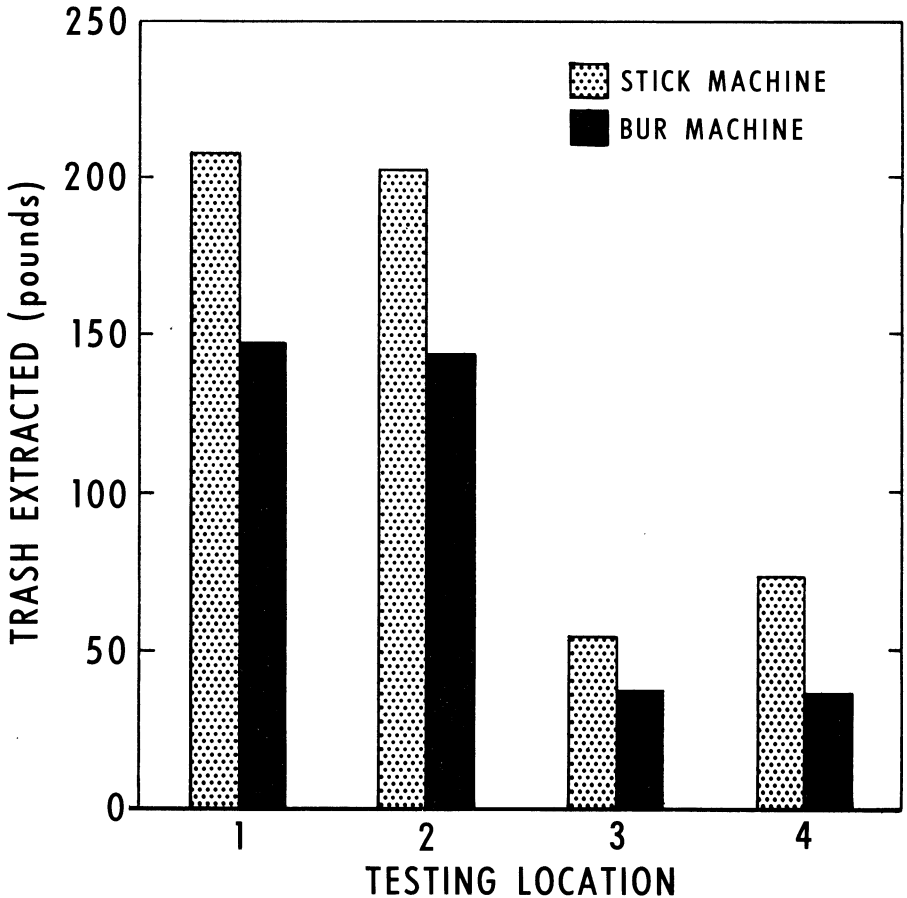
FIGURE 3.—Amounts of trash extracted from one-half bale of cotton by the stick machine and the bur machine.

stick machines and another, 16 cylinders of cleaning and two bur machines. Selected fiber properties of lint from these two cleaning treatments are compared in table 4. Differences in seed cotton cleaning machinery were not reflected in any of the following measurements: (1) 2.5-percent span length, (2) 50-percent span length, (3) lint-moisture content, (4) grade index, or (5) classer's staple. The percentage of nonlint before lint cleaning was highest for the cleaning arrangement using bur machines. However, two stages of lint cleaning eliminated these differences in percentage of nonlint.

Seed Cotton Losses

Samples of trash extracted by the stick machine and bur machine were taken at locations 1 and 3 and analyzed for seed cot-

ton content to obtain a measure of the seed cotton losses by each machine (table 5). These data along with that of trash weight were used to calculate the pounds of seed cotton lost from a bale of cotton by each machine. Equivalent lint losses were determined by multiplying the seed cotton weights by the constant 0.33. At location 1 the stick machine lost approximately 12 pounds of lint per bale while the bur machine lost only 1½ pounds. At location 3 these losses were less than ¾ pound for each machine.
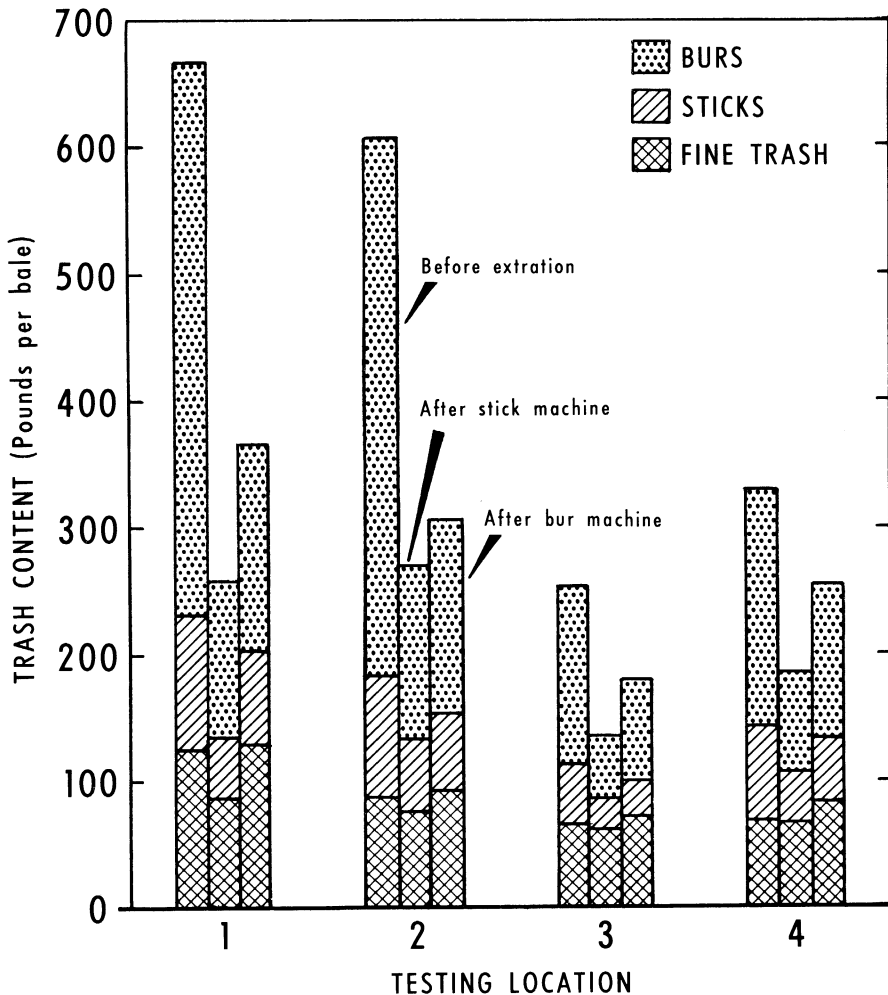

FIGURE 4.—Trash contents of seed cotton before and after extraction with a stick machine and a bur machine for four test locations.

TABLE 4.—*Fiber properties of Dunn 56-C and Paymaster 111 cotton, before and after cleaning by 2 cleaning machinery arrangements*

Fiber property	Unit	16 cylinders and 2 stick machines		16 cylinders and 2 bur machines	
		Dunn 56-C	Paymaster 111	Dunn 56-C	Paymaster 111
Before lint cleaning:					
Nonlint _____	Percent	12.3	6.0	13.2	7.2
2.5-percent span length ____	Inch	1.15	1.05	1.15	1.06
50-percent span length ____	Do.	.51	.47	.52	.47
After 2 stages of lint cleaning:					
Nonlint _____	Percent	5.0	2.5	4.8	2.9
2.5-percent span length ____	Inch	1.11	1.01	1.10	1.03
50-percent span length _____	Do.	.45	.45	.45	.45
Moisture content _____	Percent	5.3	7.6	5.4	7.8
Grade _____	Index	79.0	89.0	76.0	89.3
Classer's staple _____	32d inch	34.0	31.7	33.7	31.3

TABLE 5.—*Seed cotton losses by the stick machine and the bur machine at 2 test locations* [1]

Location and type of extractor	Amount of seed cotton in trash	Losses per bale	
		Seed cotton	Lint
	Pct.	*Lb.*	*Lb.*
No. 1:			
Stick machine _____	9.6	35.8	11.9
Bur machine _____	1.3	4.6	1.5
No. 3:			
Stick machine _____	1.6	2.2	.7
Bur machine _____	.7	.4	.2

[1] Average of 6 replications.

SUMMARY AND CONCLUSIONS

Experiments were conducted during the 1969 harvest season to determine which conventional extractor, the stick machine or the bur machine, was most effective for cleaning stripper-harvested cotton. Eighteen bales of test cotton, nine from each of two common stripper varieties, were divided into 36 test lots. Half the lots were processed through an 8-foot stick machine and half through a 14-foot bur machine at rates of approximately six bales

per hour. In these tests the cleaning efficiency and weight of trash removed were determined for each machine at four locations within the seed cotton cleaning sequence of a typical stripper cotton ginning system.

The results of this experiment indicated that—

1. The stick machine removed more burs, sticks, and fine trash than the bur machine at all four test locations.

2. Increases in the cleaning efficiencies of both the stick machine and the bur machine were directly related to increases in the foreign matter content of seed cotton.

3. Excessive quantities of cotton were lost by the stick machine when it was used as the first machine in the cleaning sequence.

4. The bur machine pulverized some of the larger trash particles and produced more fine trash than it removed.

5. No differences were detected in the 2.5-percent span length, 50-percent span length, grade index, or classer's staple length when cotton from the stick machine and the bur machine was compared.

APPENDIX

TABLE 6.—*Results from analyses of variance for differences in the cleaning performances between a stick machine and a bur machine*

Item	F values and significance tests for the listed items at the 4 test locations [1]			
	No. 1	No. 2	No. 3	No. 4
Moisture content _____	1.11 NS	0.04 NS	3.46 NS	2.19 NS
Foreign matter content before extraction:				
Bur content _____	.38 NS	18.94 **	1.12 NS	1.88 NS
Stick content _____	.65 NS	1.88 NS	1.19 NS	28.81 **
Fine trash content _____	5.76 NS	1.98 NS	.04 NS	2.53 NS
Total trash content ____	2.22 NS	6.94 *	1.10 NS	2.67 NS
Foreign matter content after extraction:				
Bur content _____	7.38 *	16.09 *	2.06 NS	37.07 **
Stick content _____	2.04 NS	.69 NS	.31 NS	.99 NS
Fine trash content _____	4.09 NS	3.90 NS	4.52 NS	.07 NS
Total trash content ____	94.36 **	23.96 **	3.01 NS	23.06 **
Cleaning efficiency _____	52.27 **	3.87 NS	4.74 NS	20.41 **
Trash extracted _____	24.61 **	29.14 **	63.14 **	142.55 **

[1] Values of F required for significance at the 5- and 1-percent levels are 6.61 and 16.26, respectively. * = significance at the 5-percent level; ** = significance at the 1-percent level; NS = not significant at the 5-percent level.

TABLE 7.—*Foreign matter contents of seed cotton before extraction with a stick and a bur machine, 4 test locations*

Replication and type of foreign matter	Location 1		Location 2		Location 3		Location 4	
	Stick	Bur	Stick	Bur	Stick	Bur	Stick	Bur
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
1:								
Burs _____	23.0	20.7	20.6	22.1	9.6	9.3	11.3	12.6
Sticks _____	5.5	4.8	5.4	3.7	3.0	3.5	4.1	3.8
Fine _____	7.0	7.1	4.9	5.2	4.4	4.7	4.9	3.2
Total _____	35.5	32.6	30.9	31.0	17.0	17.5	20.3	19.6
2:								
Burs _____	20.8	20.9	21.2	22.9	9.6	7.5	13.6	12.6
Sticks _____	5.3	6.4	6.1	5.9	3.9	3.7	6.2	5.4
Fine _____	6.8	6.7	4.1	3.8	4.5	4.6	4.3	4.1
Total _____	32.9	34.0	31.4	32.6	18.0	15.8	24.1	22.1
3:								
Burs _____	22.3	22.0	19.4	21.8	10.1	9.1	12.2	12.3
Sticks _____	3.4	4.5	2.8	3.1	1.9	1.7	3.5	2.9
Fine _____	6.3	5.8	5.3	3.4	4.6	5.2	4.1	4.7
Total _____	32.0	32.3	27.5	28.3	16.6	16.0	19.8	19.9
4:								
Burs _____	19.3	23.2	16.6	22.4	6.2	8.3	7.6	9.1
Sticks _____	6.3	4.1	4.1	3.0	2.2	1.5	3.2	2.4
Fine _____	6.4	5.4	4.3	3.1	3.4	3.4	3.1	3.3
Total _____	32.0	32.7	25.0	28.5	11.8	13.2	13.9	14.8
5:								
Burs _____	21.3	19.3	16.2	19.8	6.6	6.8	8.2	9.1
Sticks _____	5.8	4.5	7.4	4.3	2.4	2.5	4.1	3.9
Fine _____	5.4	5.0	4.6	5.5	3.1	2.9	4.4	2.5
Total _____	32.5	28.8	28.2	29.6	12.1	12.2	16.7	15.5
6:								
Burs _____	20.9	17.6	17.5	23.3	11.6	5.6	6.7	7.0
Sticks _____	5.1	4.5	3.4	4.3	2.9	2.1	3.9	3.3
Fine _____	6.0	4.6	4.4	2.7	3.0	2.4	3.7	2.7
Total _____	32.0	26.7	25.3	30.3	17.5	10.1	14.3	13.0
Average, all replications:								
Burs _____	21.27	20.62	18.58	22.05	8.95	7.77	9.93	10.45
Sticks _____	5.23	4.80	4.87	4.05	2.72	2.50	4.17	3.62
Fine _____	6.32	5.77	4.60	3.95	3.83	3.87	4.08	3.42
Total _____	32.82	31.18	28.05	30.05	15.50	14.13	18.18	17.48

TABLE 8.—*Foreign matter contents of seed cotton after extraction with a stick and a bur machine, 4 test locations*

Replication and type of foreign matter	Location 1		Location 2		Location 3		Location 4	
	Stick	Bur	Stick	Bur	Stick	Bur	Stick	Bur
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
1:								
Burs _____	9.4	8.8	8.3	9.5	4.8	3.5	6.0	7.9
Sticks _____	3.1	4.1	3.3	3.2	1.8	1.8	2.8	2.6
Fine _____	4.9	8.1	6.0	6.7	5.5	5.6	5.3	4.9
Total _____	17.4	21.0	17.6	19.4	12.1	10.9	14.1	15.4
2:								
Burs _____	9.4	12.9	8.7	11.1	4.1	5.7	6.7	9.7
Sticks _____	4.9	4.6	5.0	3.8	2.2	2.2	4.1	3.5
Fine _____	5.7	6.4	4.3	6.7	4.3	5.2	4.9	6.4
Total _____	20.0	23.9	18.0	21.6	10.6	13.1	15.7	19.6
3:								
Burs _____	9.7	11.1	9.1	12.6	5.0	7.9	5.9	8.0
Sticks _____	2.6	3.7	1.8	2.2	1.5	1.2	2.0	1.9
Fine _____	5.5	8.6	5.2	6.3	4.2	5.3	4.9	4.8
Total _____	17.8	23.4	16.1	21.1	10.7	14.4	12.8	14.7
4:								
Burs _____	4.7	7.6	6.0	6.0	2.1	2.0	2.8	5.5
Sticks _____	3.6	2.7	2.0	2.6	1.4	.7	1.3	1.8
Fine _____	4.9	6.4	3.5	5.7	3.3	4.2	3.3	3.3
Total _____	13.2	16.7	11.5	14.3	6.8	6.9	7.4	10.6
5:								
Burs _____	4.0	8.9	5.3	7.8	2.3	3.0	3.2	7.9
Sticks _____	3.3	4.4	3.1	2.8	1.6	1.8	2.2	3.0
Fine _____	5.5	4.4	4.9	4.2	2.9	2.5	3.6	3.3
Total _____	12.8	17.7	13.3	14.8	6.8	7.3	9.0	14.2
6:								
Burs _____	5.8	6.8	4.7	7.1	1.8	3.1	2.6	4.4
Sticks _____	1.9	3.0	3.3	2.5	1.4	1.7	1.6	3.0
Fine _____	5.1	5.8	3.1	3.2	2.8	3.2	3.9	2.6
Total _____	12.8	15.6	11.1	12.8	6.0	8.0	8.1	10.0
Average, all replications:								
Burs _____	7.17	9.35	7.02	9.02	3.35	4.20	4.53	7.23
Sticks _____	3.23	3.75	3.08	2.85	1.65	1.57	2.33	2.63
Fine _____	5.27	6.62	4.50	5.47	3.83	4.33	4.32	4.22
Total _____	15.67	19.72	14.60	17.33	8.83	10.10	11.18	14.08

TABLE 9.—*Weights of trash extracted by the stick machine and the bur machine from ½-bale test lots*

Replication number and type of extractor	Location number			
	1	2	3	4
	Lb.	*Lb.*	*Lb.*	*Lb.*
1:				
Stick machine _____	156	223	64	84
Bur machine _____	152	138	42	38
2:				
Stick machine _____	227	235	59	81
Bur machine _____	156	168	34	45
3:				
Stick machine _____	235	227	59	90
Bur machine _____	146	139	40	45
4:				
Stick machine _____	227	185	52	60
Bur machine _____	173	135	40	35
5:				
Stick machine _____	210	187	48	68
Bur machine _____	134	151	33	33
6:				
Stick machine _____	192	159	46	57
Bur machine _____	122	136	34	20
Averages:				
Stick machine _____	207.8	202.7	54.7	73.3
Bur machine _____	147.2**	144.5**	37.2**	36.0**

** = Significant difference at the 1-percent level.