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ENGINEERING AND GINNING

The Effects of Seed Cotton Cleaning on Seed Coat Fragments

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ABSTRACT

Processing problems in textile mills have been linked to seed coat fragments (SCF), and prevention of SCF during ginning is one important goal of cotton ginning research. The primary objective of this experiment was to determine if seed-cotton cleaners used prior to the extractor-feeder/gin stand change SCF levels in ginned lint. Several cottons were processed at different moisture contents with different seed cotton cleaners, and lint samples collected at the battery condenser were analyzed manually for SCF and motes. Samples were also analyzed with the Advanced Fiber Information System (AFIS) for seed coat neps (SCN) and neps. Analysis of lint samples revealed that SCF content for cotton processed with either a cylinder cleaner (14.4 SCF/g lint) or stick machine (13.7 SCF/g lint) before the extractor-feeder/gin stand was not found to differ statistically ($p<0.05$) from cotton processed with only the extractor-feeder/gin stand (14.0 SCF/g lint). In most cases the same was true for the number of AFIS SCN, but AFIS neps were increased with the cylinder cleaner or stick machine. Also, the SCF content of 15.4 SCF/g lint for cotton processed with a standard machine sequence (cylinder cleaner, stick machine, cylinder cleaner, extractor-feeder/gin stand, and two lint cleaners) was not found to be statistically higher than lint processed with only an extractor-feeder/gin stand and two lint cleaners (15.2 SCF/g lint). Again, this was generally true for the number of AFIS SCN, but AFIS neps were increased with the additional seed cotton cleaners. In conclusion, seed cotton cleaners were not found to increase SCF levels in comparison to the extractor-feeder/gin stand. Since the baseline treatment for comparison (the extractor-feeder/gin stand) included some seed cotton cleaning, the conclusion could not be made that seed cotton cleaners do not produce SCF, but the finding that additional seed cotton cleaners produced no additional SCF was important due to the importance of these machines in removing other unwanted material from seed cotton.

After harvest, cotton is dried, cleaned, and ginned to remove lint from the seed. These processes require pneumatic and mechanical handling which may contribute to seed coat fragments (SCF) dislodged from the cottonseed. Though ginned lint is typically cleaned, many SCF remain attached to lint which makes them difficult to remove with lint cleaners. The presence of SCF and other material such as neps (fiber entanglements) lead to problems in textile mills during spinning and dyeing (Bargeron and Garner, 1991; Pearson, 1955; Pilsbury, 1992; and Krifa and Gourlot, 2001). Jacobsen et al. (2001) confirmed earlier findings that the majority of impurities in lint are neps, followed by SCF and non-seed impurities, and Boykin et al. (2009) showed that SCF accounted for 34% of foreign material in lint after lint cleaning.

The major point of origin for SCF is the gin stand where saws are used to remove lint from seed, but there has been some evidence of damage to seed before reaching the gin stand. Moore and Shaw (1967) sampled seven commercial gins in Mississippi and Louisiana. For 210 bales ginned, they found that seed damage increased from 4.2% at the wagon (before entering the gin plant) to 5.0% at the gin stand feeder to 9.7% in the ginned seed. Conveying, drying, and cleaning cotton before the gin stand can potentially either create SCF or cause damage to the cottonseed making them more prone to SCF formation in the gin stand.

Figure 1 shows a schematic of a typical cotton gin used to process spindle-picked upland cotton. Seed cotton cleaners such as cylinder cleaners and stick machines play an important role in removing soil and unwanted plant parts from cotton before reaching the gin stand. Initial trash content,

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moisture content, and differences associated with cotton cultivars have been shown to influence the cleaning performance of these machines (Anthony, 1996; Anthony, 2002, and Anthony and Rayburn, 1989). It is important to remove as much trash as reasonably possible from cotton before reaching the gin stand since trash entering the gin stand is reduced in size by the gin saws making it increasingly difficult to remove with lint cleaners. Therefore, seed cotton cleaners play a crucial role in the process of ginning cotton.

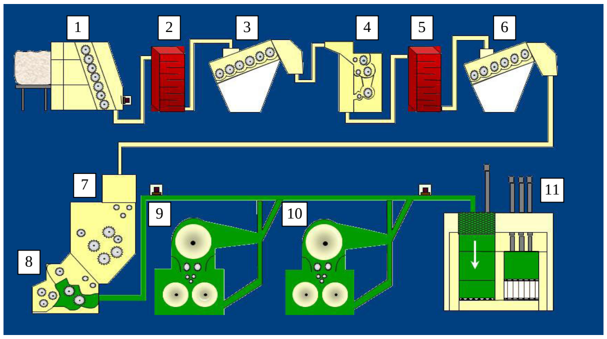

Figure 1. Typical ginning machinery for spindle-picked upland cotton includes a module feeder (1) followed by first stage dryer (2), first cylinder cleaner (3), stick machine (4), second stage dryer (5), second cylinder cleaner (6), extractor-feeder (7), gin stand (8), one or two lint cleaners (9,10), and bale press (11).

Seed coats in ginned lint can be measured by manual and automated methods. In Method D 2496 (ASTM, 1985), SCF are manually counted and weighed in lint. The Advanced Fiber Information System (AFIS) is an automated method to detect fiber properties including the number of seed coats neps (SCN) and neps in lint. Baldwin et al. (1995) describes how the instrument counts SCN and neps and why some SCF are counted as trash or dust instead of SCN. The primary objective of the current study was to determine if SCF levels increase with the use of seed cotton cleaners, but AFIS SCN and neps were also studied.

METHODS

Cotton was ginned in a small-scale cotton saw gin (microgin) equipped with standard gin machinery (two dryers, two cylinder cleaners, stick machine, extractor-feeder/gin stand, and two saw-type lint cleaners) in Stoneville, MS (Anthony and McCaskill, 1974). The setup of the microgin allowed machine sequence to vary. The test evaluated five machine sequences:

- Extractor-Feeder/Gin Stand (EFGS)
- Cylinder Cleaner (CC) + EFGS
- Stick Machine (SM) + EFGS
- EFGS + 2 Lint Cleaners (2LC)
- CC + SM + CC + EFGS + 2LC

Two successive experiments were conducted to evaluate the machine treatments under differing moisture levels. In the first experiment, cotton was passed through two tower driers set at 65 ºC (150 ºF) for the “low” moisture treatment and no drying for the “high” moisture treatment. In that experiment, initial seed cotton moisture (7.6%) was reduced to 6.3% for the “low” moisture treatment and 7.3% for the “high” moisture treatment, as measured at the gin stand feeder. Final lint moisture content was 3.3% for the “low” moisture treatment and 4.5% for the “high” moisture treatment.

Since moisture levels achieved in the first experiment were low relative to the 6% to 7% lint moisture range recommended for optimal ginning (Byler, 2006; Hughs et al. 1994), a second experiment was conducted to achieve higher moisture levels. In the second experiment, cotton was pre-conditioned for two months in an environmental chamber set at 21° C (70° F) and 85% relative humidity to achieve a 13% initial seed cotton moisture content. Cotton was passed through one tower drier set at 65 ºC (150 ºF) for the “low” moisture treatment and no drying for the “high” moisture treatment. The initial seed cotton moisture content (13%) was reduced to 11.1% for the “low” moisture treatment and 12.3% for the “high” moisture treatment, as measured at the gin stand feeder; final lint moisture content was 5.6% for the “low” moisture treatment and 6.4% for the “high” moisture treatment. The moisture levels achieved in the second experiment were closer to those recommended for optimal ginning.

Six cottons were tested in the first experiment. These included four cottons from Delta and Pine Land Company (SG215BR, DP434RR, and two DP444BR cottons from different fields) and two cottons from Stoneville Pedigreed Seed Company (ST4892BR and ST5599BR). All cottons were grown in different fields, so the purpose of using multiple cultivars was not to evaluate cultivars but to broaden the inference base of the experiment. The two DP444BR cottons were designated DP444BR-a and DP444BR-b. Two cottons were tested in the second experiment including SG215BR and ST4892BR from the same fields as the first experiment. All treatment combinations (five machine sequences and two moisture levels) were included for each cultivar in each test for a total of 80 treatments. In each experiment, the design was split plot with the main unit moisture level set up as a randomized complete block and the sub-unit as a full factorial of machine sequence and cultivar. Each combination of moisture level, machine sequence, and cultivar was replicated three times for a total of 180 test lots in the first experiment and 60 test lots in the second experiment. Test lots ranged from 13.6 to 18.1 kg (30 to 40 lb) seed cotton.

For each test lot, three lint samples were taken at the battery condenser and analyzed for fiber properties including seed coat neps (SCN) and neps by the AFIS (Uster Technologies, Knoxville, Tenn.) and for seed coat fragments (SCF) and motes by ASTM Method D 2496 (ASTM, 1985). Moisture contents analysis was performed on three samples taken at the wagon, feeder, and battery condenser with the oven method as described by Shepherd (1972). Statistical analysis of treatments and treatment interactions was performed using the Mixed model procedure (Proc MIXED, SAS v8.2, SAS Institute, Inc., Cary, N.C., 2001). As described earlier, the dataset included two experiments both with a split plot design including moisture level as the main unit in randomized complete block and the sub-units machine sequence and cultivar. Machine sequences did not change between the two experiments, but moisture conditioning and cultivars did change. Therefore, analyzing the dataset required studying the effects of rep, cultivar, and moisture level within each experiment. To perform this statistical analysis, fixed effects included experiment, rep within experiment, cultivar within experiment, moisture within experiment, sequence, sequence x experiment, cultivar x moisture within experiment, cultivar x sequence within experiment, moisture x sequence within experiment, and cultivar x moisture x sequence within experiment; and the random effect was rep x moisture within experiment. All data were log transformed before statistical analysis, and results were converted to number values for this report. This was done to normalize differences in variance seen primarily among cultivars. Separate statistical models were used to analyze machine treatments without lint cleaning (3 treatments) and with lint cleaning (2 treatments). The LSMeans statement (Proc MIXED) was used to determine least square means for treatments as well as the significance of treatment differences. These results were illustrated in figures and tables where significant differences ($p<0.05$) were noted with a series of letters for each treatment. Significant differences were not observed among treatments with the same letter.

RESULTS

Lint samples collected at the battery condenser were analyzed manually to determine SCF content. The number of SCF was reported per gram of lint (SCF count/g lint) and the weight of SCF was reported per gram of lint (SCF mg/g lint). Samples were also analyzed manually for the number and weight of motes (mote count/g lint and mote mg/g lint); and AFIS was used to analyze the number of seed coat neps (SCN count/g lint) and neps (nep count/g lint). These measurements were used primarily to determine if seed cotton cleaners increased the incidence of these unwanted components of ginned lint, but moisture treatments, multiple cotton cultivars, and all treatment interactions were also analyzed. Lint cleaners were not the focus of this study, so results were presented separately for machine treatments without lint cleaners and machine treatments including lint cleaners.

Without Lint Cleaners. For the first statistical model (Table 1), results were used to compare cotton processed with an extractor-feeder/gin stand (EFGS) to cotton processed with an added cylinder cleaner (CC+EFGS) or an added stick machine (SM+EFGS). In this case, the EFGS was the baseline machine treatment, which included some seed cotton cleaning done by the extractor-feeder. The number of SCF varied significantly among cotton cultivars ($p<0.0001$) but not between moisture levels or machine treatments. Furthermore, interactions between treatments were not found to be significant for the number of SCF. For the weight of SCF, statistical differences were found among cultivars ($p<0.0001$) and moisture levels ($p<0.05$) but not machine treatments or treatment interactions. Mean values for machine treatments averaged over experiments, cultivars, and moisture treatments are given in Table 2. Though SCF count and weight were lower for SM+EFGS than EFGS, differences were not statistically significant. The results showed that adding either a cylinder cleaner or stick machine to an extractor-feeder/gin stand setup did not significantly change the SCF content of lint.

Table 1. P-values for seed coat fragment (SCF), mote, AFIS seed coat nep (SCN), and AFIS nep contents for treatments excluding lint cleaning.

Treatment	SCF count	SCF weight	Mote count	Mote weight	SCN count	Nep count
Experiment	0.6719	0.4807	0.4477	0.0824	0.0008	0.0001
Rep(exp)	0.0008	0.0130	0.6378	0.5646	0.4425	0.9172
Cultivar(exp)	0.0000	0.0000	0.3668	0.0514	0.0000	0.0000
Moisture(exp)	0.5939	0.0496	0.9523	0.9646	0.0003	0.0095
Machine	0.6554	0.2299	0.2481	0.7891	0.3612	0.0226
Machine*exp	0.4129	0.4291	0.4427	0.5334	0.9340	0.0556
Cultivar*moist(exp)	0.1167	0.6947	0.2552	0.2944	0.2447	0.1709
Cultivar*machine(exp)	0.7395	0.4474	0.3854	0.2880	0.4311	0.0312
Moist*machine(exp)	0.7031	0.6571	0.7328	0.7007	0.6406	0.5936
Cultivar*moist*machine(exp)	0.1965	0.1370	0.5834	0.9303	0.0326	0.2746

Table 2. Seed coat fragment (SCF), mote, AFIS seed coat nep (SCN), and AFIS nep contents for machine treatments excluding lint cleaning averaged over experiments, cultivars, and moisture treatments.

Machine treatment	SCF count / g lint	SCF weight, mg/g lint	Mote count / g lint	Mote weight, mg/g lint	SCN count / g lint	Nep count / g lint
EFGS	14.0a	13.0a	2.34a	12.1a	12.6a	157b
CC+EFGS	14.4a	11.6a	2.08a	11.3a	12.7a	167a
SM+EFGS	13.7a	11.0a	1.92a	10.8a	12.0a	163ab

The number and weight of motes did not vary statistically among machine treatments or any other treatments (Table 1). The AFIS SCN count varied among cultivars and moisture treatments but not machine treatments (Table 1). Averaged over experiments, cultivars, and moisture treatments, the number of SCN was lower for SM+EFGS than for EFGS, but differences were not statistically significant (Table 2). There was a significant interaction between cultivar, moisture and machine treatments (Table 1) indicating that AFIS SCN differed between machine treatments for certain cultivars and moisture treatments. Therefore, a closer look at interactions between machine treatments and cultivar/moisture treatments was needed to determine how machine treatments affected AFIS SCN counts. Also to consider was that moisture contents were overall lower in experiment 1 with initial seed cotton moisture content of 7.6% than in experiment 2 with initial seed cotton moisture content of 13%, and only 2 of the 6 cultivars used in experiment 1 were used in experiment 2. For AFIS SCN count, Table 3 shows the significance of machine treatments for each cultivar/moisture treatment combination in each experiment. The number of SCN varied significantly among machine treatments in experiment 1 for SG215BR in the low moisture treatment. P-values were also low (though not significant) in experiment 1 for ST5599BR in the high moisture treatment and in experiment 2 for SG215BR in the high moisture treatment. Figure 2 shows that the number of SCN decreased for these cultivars/moisture treatments for the SM+EFGS in comparison to EFGS and CC+EFGS treatments. These results suggest that the addition of a cylinder cleaner to an extractor-feeder/gin stand setup did not significantly change the AFIS SCN content of lint. In most cases this was also true for the stick machine, though there were some instances where the stick machine increased AFIS SCN content.

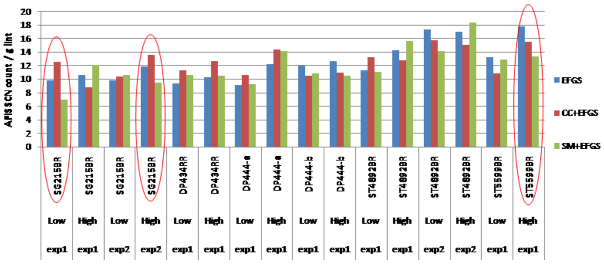

Figure 2. AFIS seed coat nep (SCN) counts for machine treatments for each experiment/moisture/ cultivar treatment combination. Treatments circled in red exhibited the largest treatment differences, though not all were statistically significant (refer to Table 3 for statistics).

Table 3. P-values indicating the significance of machine treatment differences in AFIS seed coat nep (SCN) counts for each cultivar/moisture combination in each experiment for treatments excluding lint cleaning.

	Cultivar	Moisture	SCN count
Experiment 1			
	SG215BR	High	0.2518
	SG215BR	Low	0.0301
	DP434RR	High	0.4255
	DP434RR	Low	0.7127
	DP444BR-a	High	0.4799
	DP444BR-a	Low	0.7522
	DP444BR-b	High	0.4296
	DP444BR-b	Low	0.7729
	ST4892BR	High	0.4057
	ST4892BR	Low	0.5724
	ST5599BR	High	0.1149
	ST5599BR	Low	0.4057
Experiment 2			
	SG215BR	High	0.1013
	SG215BR	Low	0.9093
	ST4892BR	High	0.2740
	ST4892BR	Low	0.4321

AFIS neps varied among machine treatments, cultivars, and moisture treatments, and there was a significant interaction between machine treatments and cultivar (Table 1). Averaged over experiments, moisture treatments, and cultivars, neps were significantly higher for CC+EFGS than EFGS (Table 2). Table 4 illustrates the significance of machine treatment differences (across moisture treatments) for each cultivar in each experiment. The number of neps varied significantly among machine treatments in experiment 1 for ST5599BR, and P-values were also low (though not significant) for SG215BR and ST4892BR in experiment 1. For each of these cultivars, nep counts were higher for SM+EFGS than for EFGS (Figure 3). This differs from the overall results reported in Table 2. This was due to the interaction between experiment and machine treatment (p=0.0556) reported in Table 1. Table 5 shows nep counts for each experiment averaged across cultivars and moisture treatments. In experiment 1, neps were significantly higher for SM+EFGS than EFGS, and in experiment 2, neps were significantly higher for CC+EFGS than EFGS. This suggests the stick machine and cylinder cleaner increased neps under drier conditions (experiment 1) while only the cylinder cleaner increased neps under moister conditions (experiment 2), though results were not consistent for all cultivars tested.

Table 4. P-values indicating the significance of machine treatment differences in AFIS nep counts for each cultivar in each experiment for treatments excluding lint cleaning.

	Cultivar	Nep count
Experiment 1		
	SG215BR	0.0590
	DP434RR	0.5370
	DP444BR-a	0.2147
	DP444BR-b	0.6340
	ST4892BR	0.0516
	ST5599BR	0.0020
Experiment 2		
	SG215BR	0.1268
	ST4892BR	0.1725

Table 5. AFIS nep contents for machine treatments without lint cleaning in each experiment averaged over cultivar and moisture treatments.

	Machine treatment	Nep count / g lint
Experiment 1		
	EFGS	171b
	CC+EFGS	176ba
	SM+EFGS	182a
Experiment 2		
	EFGS	144d
	CC+EFGS	158c
	SM+EFGS	146d

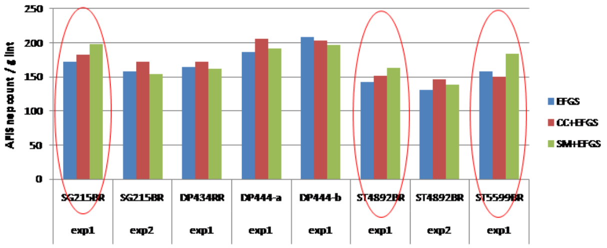

Figure 3. AFIS nep counts for machine treatments for each experiment/ cultivar treatment combination. Treatments circled in red exhibited the largest treatment differences, though not all were statistically significant (refer to Table 4 for statistics).

With Lint Cleaners. For the second statistical model (Table 6), results were used to compare cotton processed with an extractor-feeder/gin stand with two lint cleaners (EFGS+2LC) to cotton processed with three added seed cotton cleaners (CC+SM+CC+EFGS+2LC). In this case including lint cleaning, the EFGS+2LC was the baseline machine treatment. The number and weight of SCF varied significantly among cultivars, but differences among moisture treatments, machine treatments, and all treatment combinations were not significant as indicated by p-values greater than 0.05 in Table 6. Table 7 shows that the number and weight of SCF increased for the CC+SM+CC+EFGS+2LC machine treatment, but the difference was small and statistically not significant. The number and weight of motes did not vary among machine treatments, cultivars, or moisture treatments, and most treatment interactions were not significant. The one exception was the interaction between cultivar and moisture treatments which was significant for the number of motes, indicating the number of motes differed between moisture treatments for some of the cultivars tested.

A closer look at this interaction revealed the number of motes was reduced for the SG215BR/low moisture treatment in experiment 1 and experiment 2, but the difference was not statistically significant for the other cottons tested. The number of SCN differed among cultivars and moisture treatments, but not machine treatments. Also, none of the treatment interactions were significant at $p<0.05$. The P-value for the interaction between cultivar, moisture, and machine treatments was nearly significant with $p=0.06$ for AFIS SCN (Table 6). Since this interaction was significant for treatments excluding lint cleaning (Table 1), the interaction of treatments including lint cleaning was explored further. Averaged over experiments, cultivars, and moisture treatments, the CC+SM+CC+EFGS+2LC machine treatment had fewer SCN, but the difference was small and not statistically significant (Table 7). For AFIS SCN count, Table 8 shows the significance of machine treatments for each cultivar/moisture treatment combination in each experiment. The number of SCN varied significantly among machine treatments in experiment 1 for the SG215BR/low moisture treatment. P-values were also low for the SG215BR/high moisture, ST5599BR/high moisture, and ST5599BR/low moisture treatments in experiment 1 and for the SG215BR/high moisture treatment in experiment 2. Figure 4 shows that the number SCN decreased for all but one of these five cultivar/moisture treatments for the CC+SM+CC+EFGS+2LC in comparison to EFGS+2LC, but the opposite was true for the SG215BR/high moisture treatment in experiment 1. In some cases, these results corresponded to results shown in Figure 2 where the stick machine was found to decrease AFIS SCN for three of these same cultivar/

Table 6. P-values for seed coat fragment (SCF), mote, AFIS seed coat nep (SCN), and AFIS nep contents for treatments including lint cleaning.

Treatment	SCF count	SCF weight	Mote count	Mote weight	SCN count	Nep count
Experiment	0.0000	0.1712	0.6927	0.5788	0.0211	0.0001
Rep(exp)	0.3923	0.0589	0.5564	0.7700	0.3453	0.2033
Cultivar(exp)	0.0000	0.0000	0.1589	0.0863	0.0000	0.0000
Moisture(exp)	0.8253	0.1910	0.7813	0.6983	0.0328	0.0036
Machine	0.7285	0.7685	0.5467	0.7990	0.1823	0.0012
Machine*exp	0.3974	0.2043	0.2623	0.2146	0.8086	0.0896
Cultivar*moist(exp)	0.9103	0.8617	0.0199	0.0954	0.5604	0.2088
Cultivar*machine(exp)	0.4285	0.8526	0.8280	0.9209	0.1817	0.8232
Moist*machine(exp)	0.0904	0.5843	0.9519	0.9379	0.5793	0.3364
Cultivar*moist*machine(exp)	0.5328	0.8174	0.9371	0.7136	0.0626	0.9521

Table 7. Seed coat fragment (SCF), mote, AFIS seed coat nep (SCN), and AFIS nep contents for machine treatments including lint cleaning averaged over experiments, cultivars, and moisture treatments.

Sequence	SCF count / g lint	SCF weight, mg/g lint	Mote count / g lint	Mote weight, mg/g lint	SCN count / g lint	Nep count / g lint
EFGS+2LC	15.2a	7.5a	0.89a	2.6a	11.2a	224b
CC+SM+CC+EFGS+2LC	15.4a	7.6a	0.78a	2.3a	10.5a	242a

moisture treatments. For AFIS neps, statistical differences were observed between cultivars, moisture treatments, and machine treatments (Table 6). Table 7 shows the CC+SM+CC+EFGS+2LC had more AFIS neps in comparison to EFGS+2LC. These results indicated that the addition of two cylinder cleaners and a stick machine to a setup including an extractor-feeder/gin stand and two lint cleaners consistently increased AFIS neps, but it also reduced AFIS SCN for some of the cottons tested, though differences were small and inconsistent across the experiment.

Table 8. P-values indicating the significance of machine sequence differences in AFIS seed coat nep (SCN) counts for each cultivar/moisture combination in each experiment for treatments including lint cleaning.

	Cultivar	Moisture	SCN count
Experiment 1			
	SG215BR	**High**	**0.0659**
	SG215BR	**Low**	**0.0299**
	DP434RR	**High**	**0.3320**
	DP434RR	**Low**	**0.3631**
	DP444BR-a	**High**	**0.2816**
	DP444BR-a	**Low**	**0.4724**
	DP444BR-b	**High**	**0.3419**
	DP444BR-b	**Low**	**0.4632**
	ST4892BR	**High**	**0.2246**
	ST4892BR	**Low**	**0.2135**
	ST5599BR	**High**	**0.0567**
	ST5599BR	**Low**	**0.1211**
Experiment 2			
	SG215BR	**High**	**0.1439**
	SG215BR	**Low**	**0.7557**
	ST4892BR	**High**	**0.9233**
	ST4892BR	**Low**	**0.9289**

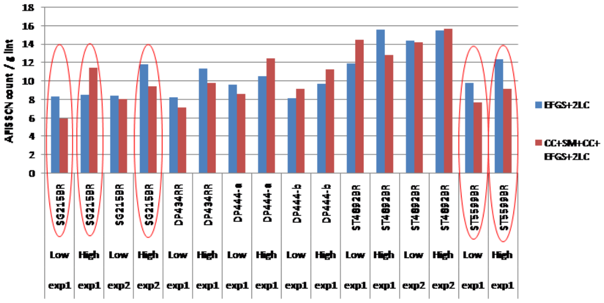

Figure 4. AFIS seed coat nep (SCN) counts for machine treatments for each experiment/moisture/ cultivar treatment combination. Treatments circled in red exhibited the largest treatment differences, though not all were statistically significant (refer to Table 8 for statistics).

CONCLUSION

Results of this study showed that the addition of a cylinder cleaner or stick machine to an extractor-feeder/gin stand setup without lint cleaners did not alter the seed coat fragment (SCF) or mote content of the ginned lint, and these results were consistent for multiple cottons tested at varying moisture conditions. Results were not as clear with AFIS seed coat neps (SCN) where the stick machine reduced SCN for certain cultivars under certain moisture conditions, though differences were relatively small and inconsistent across the experiment. For AFIS neps, the stick machine and cylinder cleaner were found to increase neps in experiment 1 which included dryer cotton while only the cylinder cleaner increased neps in experiment 2 which included cotton with a higher moisture content. The addition of two cylinder cleaners and a stick machine to an extractor-feeder/gin stand set up with two lint cleaners was also found to not change the SCF or mote content of ginned lint. But, results indicated that it increased AFIS neps and reduced AFIS SCN, though differences in AFIS SCN were only found for some of the cottons tested with differences small and inconsistent across the experiment. In conclusion, seed cotton cleaners were not found to increase SCF levels in comparison to the extractor-feeder/gin stand. Since the baseline treatment for comparison included some seed-cotton cleaning done by the extractor-feeder, the conclusion could not be made that seed cotton cleaners do not produce SCF, but the finding that additional seed cotton cleaners produced no additional SCF was important due to the widespread use and importance of these machines in removing other unwanted material from seed cotton. Future studies to prevent SCF from forming in the gin should focus on improvements to the gin stand. Other possible sources of SCF formation include cotton harvesters or pneumatic handling systems in cotton gins. Also, improved cotton cultivars and field production practices could lead to seed more resistant to SCF formation.

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DISCLAIMER

Mention of a trade names or commercial products in the publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U. S. Department of Agriculture.

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