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AGRONOMY

Impact of Environmental Conditions and Variety on Seed Coat Fragment Issues in Georgia in 2020

Lavesta C. Hand*, Ed Barnes, Phillip Roberts, John Snider, and Wesley Porter

ABSTRACT

In 2020, there were an abnormal number of seed coat fragment (SCF) reports from cotton produced in Alabama, Georgia, and Florida resulting in price deductions of more than $23 million in the region and $18 million in Georgia alone based on loan value. To understand what led to the historic number of SCF calls, variety trial samples from Georgia were evaluated for SCF issues. Trials were conducted across 24 locations in Georgia and included 12 varieties. A total of 286 seedcotton samples were ginned at the UGA Microgin in Tifton, GA, and two fiber samples were collected, one for High Volume Instrument and one for Advanced Fiber Information System (AFIS) analysis, and a seed sample was collected for free fatty acid (FFA) analysis. None of the samples sent to the Memphis, TN classing office received an extraneous matter call; however, there were differences in AFIS seed coat nep (SCN) counts, trash, and FFA when evaluated by site and variety. Variety was not as impactful as location, indicating that environmental differences between sites were responsible for the differences. As more rainfall occurred from first open boll to harvest, SCN count increased. Additionally, as average daily solar radiation increased, SCN count decreased. Therefore, it was determined that significant and prolonged weathering is what likely led to the outbreak of SCF issues in the Southeast. Future research should continue to evaluate environmental impacts on the occurrence of extraneous matter as well as an objective method to determine extraneous matter occurrences in cotton lint.

L.C. Hand*, J. Snider, and W. Porter, Department of Crop and Soil Sciences, University of Georgia, 2360 Rainwater Rd., Tifton, GA 31794; P. Roberts, Department of Entomology, University of Georgia, 2360 Rainwater Rd., Tifton, GA 31794; and E. Barnes, Cotton Incorporated, 6399 Weston Pkwy., Cary, NC 27513.
*Corresponding author: camphand@uga.edu

INTRODUCTION

Cotton quality, particularly as it pertains to extraneous matter, has become a major focus of the cotton industry. Although some instances of extraneous matter in cotton fiber can be prevented, such as plastic contamination (Wanjura et al., 2020), many instances of extraneous matter occur as a result of environmental conditions during the season (Brown and Sandlin, 2020).

One type of extraneous matter evaluated in the USDA classing process is seed coat fragments (SCF). SCFs occur when the outer coat of the seed tears off or is shattered and is often not removed from ginned lint if it still has fibers attached (Boykin, 2008a, 2010). SCFs cause problems with yarn spinning, strength, and dying (Bel and Xu, 2010; Krifa et al., 2001). Previous research determined that multiple factors contribute to SCFs in ginned lint, including a relationship between SCFs and cotton varieties (Boykin, 2008a). Research on variety, harvest timing, and lint cleaning found that weathering had a large impact on SCF number in ginned lint, and although additional lint cleaning could remove more SCFs, it resulted in more damaged fibers (Anthony et al., 1988). SCF number in the same study was influenced more by year than any other factor evaluated. Other research evaluated the impact of ginning practices on SCFs. Boykin (2008b) reported a slight increase, from 5 to 12%, in SCFs as cotton passed through a gin stand, suggesting that ginning might not have a large impact on the issue. Regardless of these impacts on SCFs, practically all ginned lint can contain SCFs due to the chazal end of the seed not being fully developed, thus making it weak and more likely to break off (Pearson, 1939).

Due to the issues associated with SCFs in ginned cotton fiber, the USDA classing system assigns a quality deduction for SCFs. According to the USDA loan value, the deduction for level 1 SCFs is -445 points pound^{-1}, and level 2 SCFs result in a -705 points pound^{-1} deduction based on a $0.52 loan value (NCC, n.d.).

Generally, SCF issues occur in hotspots every few years in a region of the U.S. (Barnes, 2020). In 2020, the southeastern U.S. had an historic number of SCF calls by the Macon, GA classing office. Of the 2.6 million bales classed out of the southeastern U.S., 40.7% of the bales had SCFs (USDA, 2021). Based on the deductions stated, this cost cotton growers in the Southeast more than $23 million. The majority of bales classed in the Southeast were produced in Georgia, with more than 2.1 million bales classed and 40.3% of those bales having SCFs (USDA, 2021). This resulted in grower losses of more than $18 million in Georgia alone.

Since 2010, the University of Georgia has had a consistent on-farm variety evaluation program (Collins et al., 2011). This allows multiple varieties to be evaluated over a wide range of environments to determine yield stability, and samples are also collected for fiber quality. This program was continued in 2020, and fiber samples were collected from each trial and ginned at the University of Georgia Microgin, which is a scaled down version of a commercial gin (Li et al., 2011). The objective of this research was to use these samples to determine what influenced the SCF event in Georgia.

MATERIALS AND METHODS

On-farm variety trials were conducted in 24 locations across the cotton producing region of Georgia in 2020. Table 1 provides a generalized description of on-farm variety trials for the 2020 season and indicates location (county), planting date, first open boll date, and harvest date. Varieties evaluated are listed in Table 2. Varieties were evaluated in large plots, ranging from 5 to 11 m wide, and 91 to 365 m long. Treatments were arranged in a randomized complete block design with three replications. Cotton was planted, managed throughout the season, and harvested with grower cooperator practices and equipment, with assistance provided from the local county extension agent.

Upon harvest of the trial, a single seed cotton sample was collected from each variety, weighing approximately 7 kg. All seed cotton samples were processed at the UGA Microgin (Li et al., 2011). The UGA Microgin contains all machines of a typical gin including dryers, cylinder cleaners, stick machine, extractor feeder, gin stand, and saw-type lint cleaners. Two fiber samples were collected from the ginned lint per variety per location. One sample was

Table 1. Planting date, first open boll date, and harvest date for each location in Georgia

County	Planting Date	First Open Boll Date	Harvest Date
Appling	6/1/2020	9/13/2020	10/28/2020
Ben Hill	6/4/2020	9/14/2020	11/16/2020
Berrien	5/14/2020	8/31/2020	10/20/2020
Brooks	5/5/2020	8/24/2020	11/9/2020
Bulloch	6/1/2020	9/11/2020	1/19/2021
Burke Dryland	5/15/2020	9/1/2020	10/22/2020
Burke Irrigated	5/21/2020	9/4/2020	10/27/2020
Coffee	5/28/2020	9/8/2020	11/18/2020
Colquitt Dryland	5/12/2020	8/28/2020	12/3/2020
Colquitt Irrigated	5/16/2020	8/31/2020	11/6/2020
Cook Dryland	5/12/2020	8/30/2020	11/24/2020
Cook Irrigated	4/29/2020	8/25/2020	10/19/2020
Early	6/2/2020	9/4/2020	12/22/2020
Grady	5/22/2020	9/1/2020	12/5/2020
Jeff Davis	5/22/2020	9/4/2020	10/28/2020
Macon	5/6/2020	9/4/2020	11/4/2020
Oconee	5/26/2020	9/29/2020	11/19/2020
Pulaski	5/19/2020	9/4/2020	11/4/2020
Screven	5/11/2020	8/28/2020	9/24/2020
Sumter	5/13/2020	9/2/2020	11/4/2020
Tattnall	6/2/2020	9/12/2020	11/20/2020
Tift	5/11/2020	8/29/2020	10/27/2020
Toombs	6/2/2020	9/12/2020	11/14/2020
Turner	6/2/2020	9/15/2020	12/4/2020
Worth	5/26/2020	9/4/2020	12/7/2020

Table 2. Varieties evaluated in the 2020 UGA On-Farm Variety Evaluation Program

Variety	Manufacturer
DP 1646 B2XF DP 2038 B3XF DP 2055 B3XF	Bayer Crop Science, 800 N. Lindbergh Blvd, St. Louis, MO
NG 5711 B3XF NG 4936 B3XF	Americot Inc., 5013 122nd St., Lubbock, TX
PHY 400 W3FE PHY 545 W3FE	Corteva Agriscience, 9330 Zionsville Rd., Indianapolis, IN
ST 4990 B3XF ST 5471 GLTP	BASF Corp., 26 Davis Dr., Research Triangle Park, NC
DG 3615 B3XF DG 3799 B3XF	Nutrien Ag Solutions, 3005 Rocky Mountain Ave., Loveland, CO
AR 9608 B3XF	Land O' Lakes Inc., 4001 Lexington Ave. N, Arden Hills, MN

analyzed by High Volume Instrument (HVI) (Uster Technologies, Knoxville, TN) at the USDA Classing Office in Memphis, TN. The other fiber sample was analyzed by the Advanced Fiber Information System (AFIS) (AFIS PRO, version 2, Uster Technologies, Knoxville, TN) at the Cotton Incorporated Production Evaluation Laboratory in Cary, NC. In addition to fiber samples, seed samples were also collected to measure free fatty acid (FFA) content in the cottonseed oil, as this could provide a further indication of seed cotton weathering and potential for SCF issues (Hoffpauir et al., 1947). A 0.5-kg subsample was tested at a private laboratory (Hahn Laboratories, Columbia, SC) using standard analytical methods for FFA analysis (Mahesar et al., 2014).

All data were subjected to ANOVA using PROC GLIMMIX in SAS version 9.4 (SAS Institute, Cary, NC) to determine the impacts of location and variety on fiber quality data. All fiber quality data were analyzed, but only seed coat nep (SCN), trash, and FFA data are discussed, as those are the major indicators for SCF issues. Although an interaction between location and variety was evaluated, it was not significant. Therefore, all data was pooled across the main effects. When presenting location data, all data were averaged across variety, and vice versa when variety is presented. To determine if environmental factors (based on location) influenced SCF issues, yearly weather data were obtained for the weather station nearest to each variety trial location from the UGA Weather Monitoring Network (www.georgiaweather.net). Environmental factors investigated include relative humidity, solar radiation, and rainfall. To correlate response variables to environmental factors, PROC CORR was utilized in SAS, and correlation coefficients and *p* values are presented in Table 3. To illustrate relationships between variables, data were graphed, and regression analysis was done in Sigmaplot 14 (Systat Software, San Jose, CA).

Table 3. Pearson correlation coefficients for seed coat neps in response to environmental factors, fiber quality, and seed analysis[z]

	Seed Coat Neps	*p* value
Free Fatty Acids	0.132	0.0258
Trash	0.408	< 0.0001
Rainfall	0.22	< 0.0001
Solar Radiation	-0.119	0.0436
Relative Humidity	0.0743	0.2100

[z] Correlation coefficients were generated using PROC CORR in SAS v. 9.4.

RESULTS AND DISCUSSION

Significant Weather Events in 2020. The 2020 Atlantic hurricane season was extremely active (NOAA, 2021). There were 30 named storms, of which 11 made landfall on the U.S. Of those 11, three passed over Georgia during critical periods of cotton production. Hurricane Sally made landfall on 16 September 2020 and moved across the major cotton producing region of Georgia, Hurricane Zeta made landfall on 28 October 2020 and moved across the northern portion of Georgia, and finally Hurricane Eta made landfall on 8 November 2020 and moved across the southeastern portion of the state (Barnes, 2020). Hurricanes Sally, Zeta, and Eta brought 2 to 38, 2 to 18, and 2 to 18 cm of rainfall across trial locations, respectively (Berg and Reinhart, 2021; Blake et al., 2021; Pasch et al. 2021). In the crop progress report the week of and the week after Hurricane Sally, USDA reported that 52 and 64% of cotton in Georgia had bolls opening (USDA, 2020a, b). Generally, the first bolls to open in cotton are first position bolls located lower on the plant and these bolls make up the majority of total cotton yield (Ritchie et al., 2007). With the majority of the Georgia cotton crop having open bolls, and the vast majority likely being first position bolls low on the plant, this significant amount of weathering from multiple storms could lead to fiber quality issues.

HVI Data. Fiber samples from each location were sent to Memphis, TN, for classing purposes. Samples from the variety trial locations were consistent with statewide fiber quality measurements relative to strength, uniformity, micronaire, reflectance, and yellowness (USDA, 2021). However, in contrast to statewide quality data from the Macon, GA classing office, UGA variety trial samples received no SCF extraneous matter calls from the Memphis, TN classing office (data not shown). Although there were SCFs present in the fiber (L.C. Hand, personal observation), it was not at a sufficient level to result in an extraneous matter call by the classing office. Although much of the classing process is now done using HVI machinery, extraneous matter calls are made on a subjective basis using visual and tactile assessments by the human classer. To further investigate this issue, objective data from AFIS on SCN and trash counts were used to predict the presence of SCFs.

AFIS and FFA Data. Previous research has demonstrated a significant relationship between actual SCF count and SCN and trash data generated from AFIS (Boykin, 2008a). This dataset confirms significant positive correlations between SCN and trash counts (Table 3; Fig. 1), as well as SCN count and FFA content (Table 3; Fig. 2). Therefore, SCN count, trash count, and FFA content were evaluated and are presented to determine potential for SCF issues.

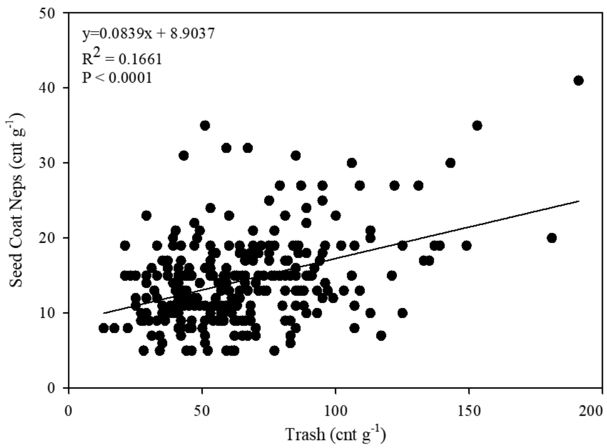

Figure 1. Relationship between seed coat neps and trash measured using AFIS.

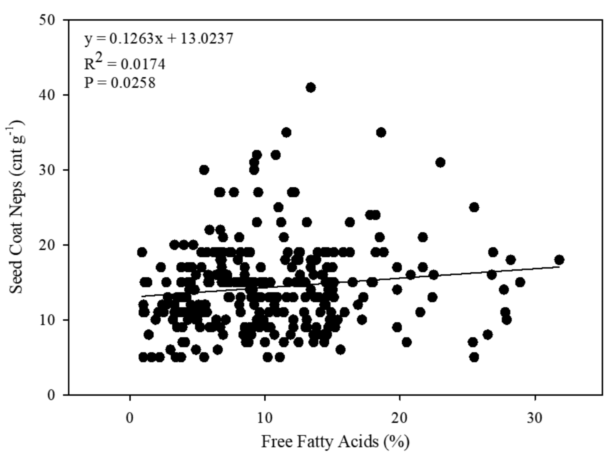

Figure 2. Relationship between seed coat neps and free fatty acid content in ginned cotton seeds.

To determine the impact of variety on potential for SCF issues, variety data were averaged across all 24 locations (Table 4). SCN count ($p = 0.0003$), trash count ($p < 0.0001$), and FFA content ($p < 0.0001$) were all significant for variety when averaged across location. With respect to SCN count, NG 4936 B3XF, ST 4990 B3XF, and DP 2055 B3XF all had higher SCN numbers than DP 2038 B3XF (Table 4). Outside of those differences, all varieties had similar SCN. Relative to trash count, AR 9608 B3XF, PHY 400 W3FE, PHY 545 W3FE, and DG 3615 B3XF had higher trash counts than DP 2038 B3XF (Table 4). Similar to SCN data, outside of the differences mentioned, all other varieties had similar trash counts. For FFA content, DG 3615 B3XF and DG 3799 B3XF had the lowest FFA percentage, whereas all other varieties were significantly higher (Table 4). Although there were differences in the data, there were no trends suggesting that a certain variety resulted in greater SCF issues than another. According to USDA, these varieties comprised nearly 75% of the planted acreage in Georgia in 2020 (USDA-AMS, 2020). Two varieties, DP 1646 B2XF and NG 5711 B3XF, comprised more than 50% of the acreage in Georgia in the same year. With those two varieties making up the majority of planted acreage, and more than 40% of the bales produced in the state having SCFs detected, it stands to reason that if variety was a factor impacting SCF issues in 2020, that this data would indicate so. However, data presented herein does not indicate that the most commonly planted varieties in Georgia in 2020 played a significant role in the SCF issues throughout the state, thus indicating that variety had minimal impact. It is also important to remember that even though some data showed differences with respect to SCN, trash, and FFA, the classing office indicated SCF levels were not high enough to result in an extraneous matter call.

Table 4. Seed coat neps, trash, and free fatty acid content as influenced by variety in 2020

Variety	Seed Coat Neps[z,y]	Trash[z,y]	Free Fatty Acid Content[z,y]
	count g^{-1}	count g^{-1}	%
DP 1646 B2XF	11.1 bc	63 bcde	10.4 ab
DP 2038 B3XF	10.6 c	52 e	11.6 a
DP 2055 B3XF	13 ab	54 de	9.2 abc
NG 5711 B3XF	13.6 abc	59 cde	11 a
NG 4936 B3XF	15.9 a	55 de	14.4 a
PHY 400 W3FE	13.2 abc	83 a	11.5 a
PHY 545 W3FE	14.0 abc	73 ab	8.4 bcd
ST 4990 B3XF	15.2 ab	62 bcde	12.6 a
ST 5471 GLTP	14.7 abc	61 cde	10.1 ab
DG 3615 B3XF	13.2 abc	70 abc	7.3 d
DG 3799 B3XF	12.3 abc	66 bcd	6.4 d
AR 9608 B3XF	14.0 abc	85 a	9.7 ab
	$p = 0.0003$	$p < 0.0001$	$p < 0.0001$

[z] **Means followed by the same letter within a column do not differ according to the Tukey-Kramer method (α = 0.05)**

[y] **All response variables are averaged across location.**

To evaluate the impact of location on potential for SCF issues, data were averaged across all varieties (Table 5). SCN count ($p < 0.0001$), trash count ($p < 0.0001$), and FFA content ($p < 0.0001$) were all significant with respect to location. Counties with the highest SCN count were Cook (dryland), Tattnall, Grady, and Early (Table 5). Counties with the lowest SCN count included Appling, Ben Hill, Berrien, Burke (dryland), Colquitt (dryland), Oconee, and Screven (Table 5). Similar trends were noted with trash counts, with Cook (dryland) and Tattnall counties having the two highest trash counts, and Burke (dryland) County having the lowest (Table 5). Relative to FFA content, Brooks County had the highest FFA percentage, whereas Screven County had the lowest (Table 5). Trends from this data indicate that generally, counties in the southwestern part of Georgia (Cook, Grady, Early, Brooks) might have been more problematic than counties on the eastern part of the state (Burke, Oconee, Screven), although there were exceptions. Generally, management of each trial was similar, which indicates management of these trials did not lead to location differences. Therefore, differing environmental conditions at different locations could be what led to the differences in potential for SCF issues.

Impact of Environmental Factors on SCN Count. To determine the impact of environmental factors on potential SCF issues, weather data was obtained from the UGA Weather Monitoring Network from the nearest weather station to each trial. With this data and knowledge of planting date for each trial, DD-60s were calculated for the entire season. Based on cumulative DD-60s, the date of first open boll (2,150 DD-60s) for each location was determined. Weather data from first open boll to harvest was evaluated, with weather components evaluated being relative humidity, solar radiation, and rainfall. Relative humidity and solar radiation were calculated as daily averages, and rainfall totals were calculated from 2,150 DD-60s until harvest. Based on the previously established relationships between SCN count and trash count or FFA content, only correlations between weather data and SCN counts are discussed.

Based on Pearson Correlation Coefficients (Table 3), SCN data was negatively correlated with solar radiation (n = 284, r = -0.119, $p = 0.0436$), positively correlated with rainfall (n = 284, r = 0.22, $p < 0.0001$), and not correlated to relative humidity (n = 284, r = 0.0743, $p = 0.21$). Therefore, it is believed that the contributors to SCF issues in 2020 were rainfall and solar radiation. Average daily solar radiation and cumulative rainfall from first open boll to harvest for each location can be found in Table 6. Generally, averaged across varieties, as average daily solar radiation between first open boll and harvest increased, SCN counts decreased (Fig. 3). Additionally, as cumulative rainfall at each location increased, SCN counts also increased (Fig. 4).

Table 5. Seed coat neps, trash, and free fatty acid content as influenced by location in 2020

Location	Seed Coat Neps[z,y]		Trash[z,y]		Free Fatty Acid Content[z,y]	
	count g^{-1}		count g^{-1}		%	
Appling	8.8	d	56	e-i	4.7	klm
Ben Hill	9.7	d	58	efgh	3.7	lm
Berrien	10.2	d	74	cde	10.7	efgh
Brooks	12.8	bcd	79	cd	26.7	a
Bulloch	12.8	bcd	50	f-j	13.8	cde
Burke Dryland	10.6	d	31	j	10.2	efgh
Burke Irrigated	14.9	bcd	61	d-h	5.2	jkl
Coffee	14.1	bcd	67	c-g	6.3	ijkl
Colquitt Dryland	9.0	d	47	fhij	15.1	bcd
Colquitt Irrigated	14.3	bcd	89	bc	11	efg
Cook Dryland	23.6	a	127	a	9.8	fghi
Cook Irrigated	15.3	bcd	88	bc	17.5	b
Early	17.7	abc	69	cdef	7.5	hijk
Grady	17.8	abc	56	e-i	15.2	bc
Jeff Davis	13.2	bcd	76	cde	8.2	ghij
Macon	12.8	bcd	74	cde	13.6	cde
Oconee	9.5	d	43	hij	4.4	klm
Pulaski	15.6	bcd	69	cdef	6	jkl
Screven	10.6	d	36	ij	1.2	m
Sumter	11.5	bcd	45	hij	6.1	jkl
Tattnall	18.1	ab	101	b	11.7	c-g
Tift	11.3	cd	78	cde	11.6	defg
Toombs	13.8	bcd	48	ghij	11.8	cdef
Turner	12.3	bcd	45	hij	12.8	cdef
Worth	12.8	bcd	63	d-h	10	fgh
	$p < 0.0001$		$p < 0.0001$		$p < 0.0001$	

[z] Means followed by the same letter within a column do not differ according to the Tukey-Kramer method ($\alpha = 0.05$)

[y] All response variables are averaged across variety.

Table 6. Average daily solar radiation and total rainfall from 2,150 DD-60s to harvest in 2020

Location	Average Solar Radiation	Total Rainfall
	MJ m^{-2}	cm
Appling	13.65	11.35
Ben Hill	12.19	21.64
Berrien	13.77	11.93
Brooks	14.30	27.38
Bulloch	10.80	32.82
Burke Dryland	16.21	6.17
Burke Irrigated	15.12	6.32
Coffee	13.23	17.02
Colquitt Dryland	12.69	18.47
Colquitt Irrigated	14.68	24.99
Cook Dryland	13.04	21.03
Cook Irrigated	14.19	12.70
Early	12.54	33.85
Grady	13.26	38.23
Jeff Davis	12.64	8.64
Macon	13.88	25.55
Oconee	12.92	9.52
Pulaski	14.51	21.01
Screven	24.14	6.40
Sumter	14.31	26.34
Tattnall	11.05	25.78
Tift	15.15	16.89
Toombs	12.15	13.82
Turner	11.65	20.5
Worth	12.70	31.40

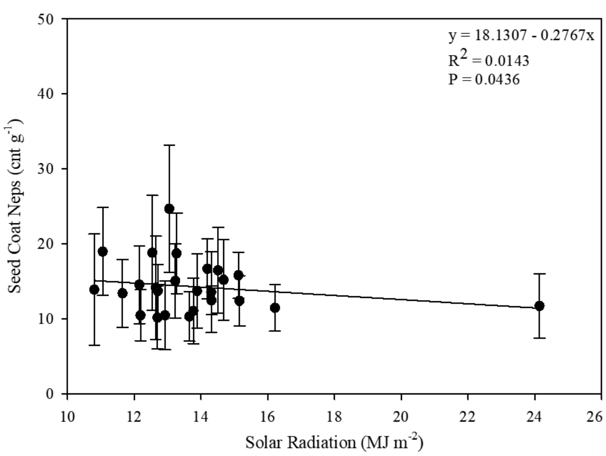

Figure 3. Seed coat neps (averaged across varieties) as influenced by average daily solar radiation intensity from 2,150 DD-60s to harvest in 2020.

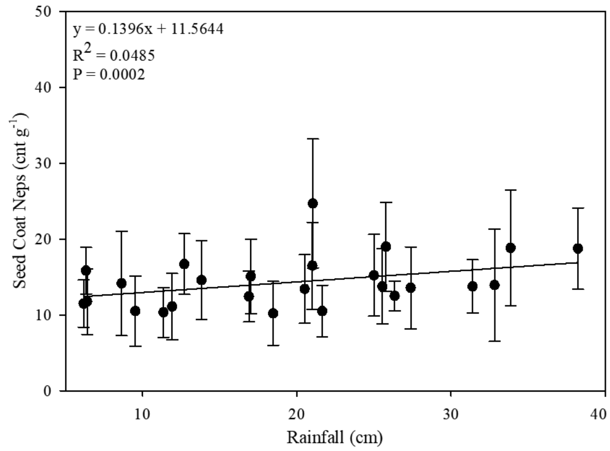

Figure 4. Seed coat neps (averaged across varieties) as influenced by cumulative rainfall amount from 2,150 DD-60s to harvest in 2020.

Generally, a reduction in solar radiation and an increase in rainfall accompanied each of the storms described earlier, with the major storm being Hurricane Sally. However, each location was impacted by each storm differently. Figure 5 illustrates solar radiation and rainfall from first open boll to harvest in Grady County, whereas Fig. 6 shows the same data in Appling County. Grady County is one of the locations higher in SCN count and FFA content along with being one of the farthest southwest locations evaluated. In contrast, Appling County is one of the lower ranking locations with respect to SCN count and FFA content, and it is one of the farthest east locations evaluated. With respect to Hurricane Sally, Grady County received more than 3 times as much rainfall and solar radiation was reduced more than the same time frame in Appling County. Similar observations were observed with Hurricane Zeta, and the Appling County trial was harvested at the time Hurricane Eta made landfall. This weather data could further explain location differences noted in previously discussed AFIS and FFA data.

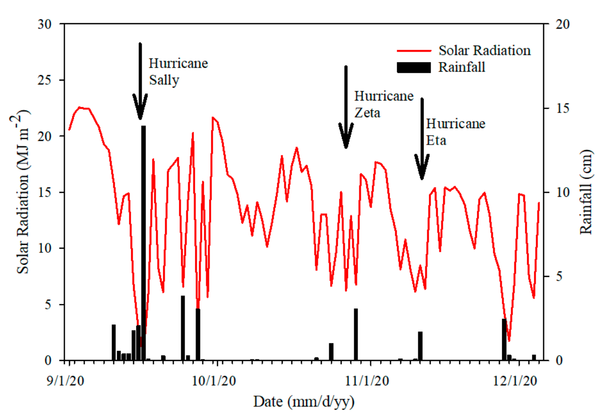

Figure 5. Grady County, GA solar radiation and rainfall data from 2,150 DD-60s (first open boll) to harvest.

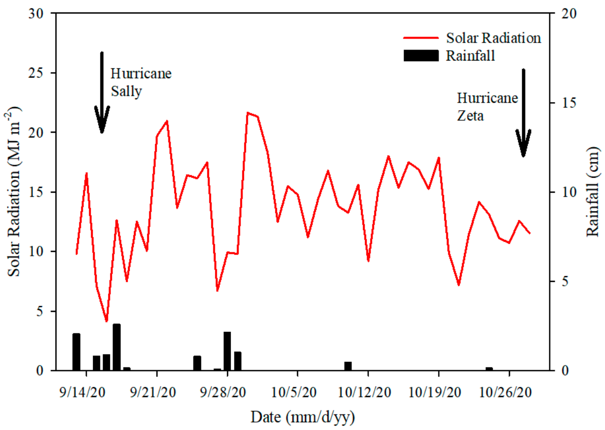

Figure 6. Appling County, GA solar radiation and rainfall data from 2,150 DD-60s (first open boll) to harvest.

Although much of these data explain how these weather phenomena could be associated with SCF issues observed in Georgia and the southeastern U.S., hurricanes have affected cotton production previously in the Southeast, with much fewer SCF issues noted (Sills, 2018; USDA, 2019). To compare 2020 to other years, yearly weather data was provided by the UGA Weather Monitoring Network for 2018 and 2019 for the station utilized for the Grady County data. Figures 7a, 7b, and 7c illustrate solar radiation and rainfall data for 1 September to 5 December 2018, 2019, and 2020, respectively. The harvest season of 2019 was relatively normal in that there was minimal disturbance from storms during crop maturity and harvest. However, both 2018 and 2020 had storms that impacted the cotton crop late in the season.

Hurricane Michael made landfall in the U.S. on 10 October 2018 (Beven II et al., 2019). At the time this storm made landfall, 88% of the cotton crop in Georgia had bolls opening and 12% had been harvested (USDA, 2018). This indicated that of the crop that had bolls open, much of it was at or nearing maturity. This, along with the strength of Hurricane Michael upon landfall resulted in significant yield losses ranging from 25% to a total loss (Sills, 2018). This cotton was exposed to a significant weathering event; however, it was not prolonged throughout the maturation process, as was seen in 2020. Of note is the last classing office report from the 2018 ginning season, which showed a significant spike in SCF reports. Of the 1,147 bales classed from Georgia for the week ending on 21 March 2019, nearly 35% had SCFs (USDA, 2019). At this point, these were presumably the last bales harvested of the season, and they had endured a significant amount of weathering. This is another indication that a single event does not lead to the production of SCFs in lint, but it takes significant weathering over time. Previous research also indicated that weathering over time, primarily due to delayed harvest, can reduce cotton quality and increases the potential of extraneous matter issues (Anthony et al., 1988).

The main differences between the weather events in 2018 and 2020 are that they occurred roughly one month apart from each other (within their respective growing seasons), which can greatly affect stage of crop maturity. The weathering events of 2020 began closer to the point of first open boll, which indicates that lower, first position fruit were exposed to weathering throughout the maturing process. However, in 2018, a single weathering event resulted in yield loss across the state but minimal extraneous matter issues immediately after Hurricane Michael. However, with cotton that was exposed to Hurricane Michael and subsequent weathering after that storm, there was an increase in extraneous matter issues.

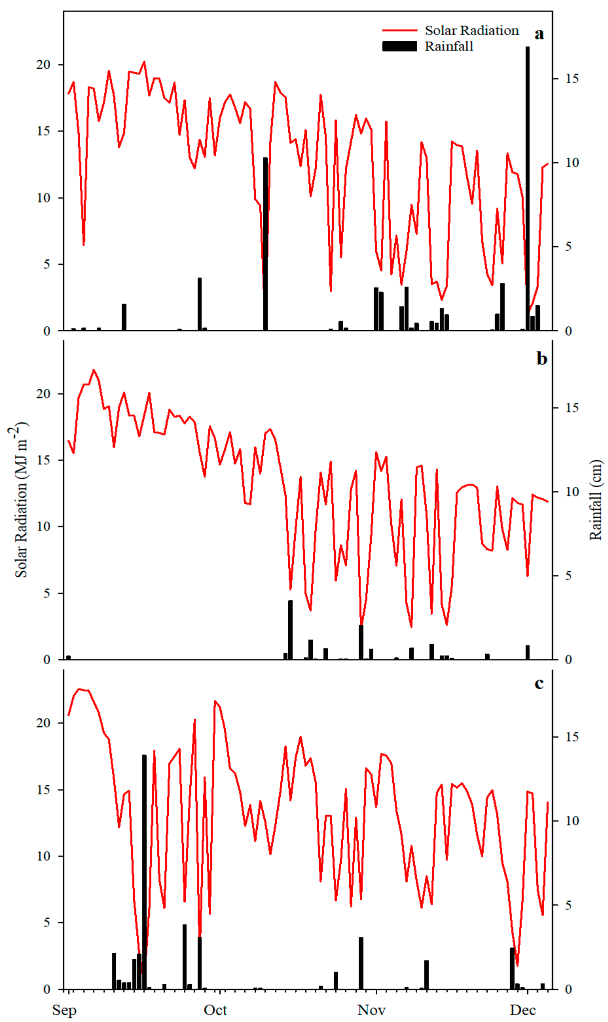

Figure 7. Grady County, GA solar radiation and rainfall data from 1 September to 5 December in 2018 (a), 2019 (b), and 2020 (c).

CONCLUSIONS

The SCF outbreak in 2020 was, hopefully, a once-in-a-lifetime event. With an economic impact of more than $23 million in the Southeast and more than $18 million in Georgia alone, many interested parties across all aspects of the cotton industry were searching for answers. Although the samples discussed herein that were sent to the Memphis, TN classing office did not receive any extraneous matter calls, indications of SCF issues from AFIS and FFA data were found. Variety had a minimal impact, whereas location and accompanying environmental conditions played a larger role. Generally, higher rainfall totals and lower average daily solar radiation from first open boll to harvest resulted in higher SCN counts. Additionally, in comparing weather data by location, some locations had higher affects by weathering than others, leading to location differences. When comparing yearly weather data, it was also determined that a single weathering event might not result in SCF issues, but continued weathering over time seems to be what causes SCF issues. Future research should continue to evaluate the impacts of variety and weathering on extraneous matter issues, as well as an objective method for evaluating extraneous matter at the classing office.

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