THE EFFECT OF LEVEL OF DEFOLIATION ON STORAGE AND QUALITY OF SEED COTTON

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Abstract

Cotton was defoliated to achieve three levels of defoliation, 1) Natural leaf drop, 2) Intermediate leaf drop and 3) 95% leaf drop, at four locations in the Mississippi Delta during the fall of 1997. The leaf levels at three locations consisted of mature leaves with very little honey dew and little or no regrowth in any of the levels of defoliation. One location included parts of a field that was replanted very late in the season due to flooding and consequently had immature leaves and high levels of green bolls present at harvest. Six replications of approximately 60 pounds of spindle harvested seed cotton from each defoliation level was placed into open mesh bags (three replications of each of the three treatments into each of two modules) and implanted into the grower's modules constructed with cotton harvested from the 95% level of defoliation. Moisture samples were collected and analyzed from the field and samples before harvesting, after harvesting with a spindle harvester and storage periods ranging from 3 to 6 weeks. Thermocouples were placed into each sample implant and into the grower module above and below each sample implant. Temperature data was recorded throughout the storage period of the module.

All samples from three of the four locations showed only a slight temperature rise of less than 15 degrees Fahrenheit above the ambient temperature at the time of harvest with an initial rise after one to two days and then a steady decrease in temperature. The fourth location had significant heating occur in most of the samples from all levels of defoliation. The grower's modules heated simultaneously with the bagged samples probably as a result of the extremely green seed cotton placed into the module as much as a result of the bagged sample influence. The grower's module lint samples for this location all showed light spot or full spot color grades. No correlation of leaf level to sample heating could be established for any of the four locations. Similarly, no correlation of sample moisture and maximum temperature or temperature differential between harvest temperature and maximum sample temperature reached could be established.

Both lint and seed samples were collected for quality and trash level analysis that are yet to be completed.

Introduction

Previous work with seed cotton storage has shown that temperature is an after-the-fact indicator of quality deterioration of both seed and lint. Seed cotton stored in modules increased in temperature with increasing amounts of green trash and moisture in the seed cotton (Sorensen,J.W. and Lambert Wilkes, 1973 and Curley, R, et. al., 1987). Lint quality, primarily color grade, decreased with higher temperatures and longer storage periods. Willcutt (1995) found that some modules of seed cotton heated even though moisture content of the module was at or below 9.5% and defoliation was near 100% leaf drop. Brahears et. al. (1997) found similar results with modules divided into thirds but attributed the differences to specific defoliation materials.

Cotton producers in the rain belt portion of the cotton belt are making use of the new defoliation materials available for crop termination, defoliation and boll opening. They report they spend approximately $25 per acre for these materials and their application. The goal is to achieve a well defoliated crop that in many instances is spindle picked once over. The Defoliation Task Force, an industry group of scientist studying the advantages and disadvantages of defoliation, the materials currently available and their effect on fiber quality, have been unable to show an economic benefit to the producers for defoliation prior to harvesting. They indicate that quality loss is minimal as a result of the extra green leaf and trash harvested from non defoliated fields. These test have not included the impact of the green plants and trash on the harvesters or the ability to store this greener seed cotton in modules.

The guidelines established for safe storage of seed cotton in modules (Willcutt, M. H., et. al., 1992) suggests that modules should be below 12 percent moisture (mass moisture) and free of green trash in order to store safely without heating and quality losses. Many instances in the literature indicate that these trends are generally correct but that exceptions are also fairly common (Curley, et. al., 1987 and Sorenson and Wilkes, 1973). Willcutt (1995) found that cotton modules heated and fiber color deteriorated even when cotton fields were seemingly excellently defoliated and the modules were below 9 percent mass moisture when constructed. Similarly, seed cotton with mass moisture as high as 17 percent has been stored in modules without quality loss.

Willcutt (1997) used small samples of seed cotton implanted into a "parent" module constructed with seed cotton harvested from a well defoliated field of cotton in a limited test conducted in 1996. The parent module was harvested when the mass moisture was below 10 percent. This test indicated that the samples representing the

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intermediate level of defoliation and mass moisture of approximately 12 to 14 percent heated and thus fiber quality deteriorated the most of all the treatments. Moisture contents ranged from 10 percent for the well defoliated to 17 percent for the natural leaf drop defoliation treatments.

Recent work with defoliation materials in tests across the cotton belt has shown little quality difference from defoliation if seed cotton was ginned soon after harvest (Valco, T.D., and K. Bragg, 1996). The question then becomes "Why defoliate or under what circumstances is it profitable to defoliate ?".

Objectives

The objectives of this year's test were to refine the small sample implant process and to test levels of defoliation in modules storage and the resulting fiber quality. The levels of defoliation resulted in a range of seed cotton trash, moisture and ambient temperature levels at harvest at four locations in the Mississippi Delta.

Test Design

Four cotton producers were selected as cooperators by county agricultural agents in Leflore, Coahoma, Washington and Tallahatchie Counties in Mississippi in the fall of 1997. A check strip in each growers' field was left without a defoliation treatment to allow natural leaf drop to occur. The remainder of the field was then treated with a combination of defoliants to achieve an intermediate level of defoliation (approximately 80 to 85 % leaf drop). A second application was made in approximately 7 days to all of the field except for strips of the un-defoliated and intermediate defoliation treatments. This resulted in a 95% leaf drop area for sampling and constructing two "parent" storage modules. Therefore the treatments are:

Treatment 1: Natural Defoliation
Treatment 2: Intermediate Defoliation
Treatment 3: 95% Defoliation
Treatment 4: Natural Defoliation with Calcium Propionate (Clarksdale only).

Leflore County "Greenwood" Location

The first location was defoliated with ground equipment on September 27 and harvested on October 8, 1997. Cotton was approximately 60% open boll with mostly mature leaves and a uniform field appearance at the time of defoliation with some natural leaf drop already occurring. Yield was approximately 900 lb per acre. Immediately before harvesting began, six seed cotton samples were hand-picked from each defoliation level, placed into jars and sealed for gravimetric moisture determination. This grower utilized up to six, older two-row harvesters and two module builders for his cotton harvest. One harvester was selected to harvest a minimum of 500 lb of seed cotton for small samples from each of the defoliation level strips. The harvester basket was dumped into a trailer after each strip had been harvested. Six open mesh bags were filled with approximately 60 lb of seed cotton each from each treatment. Three additional bags from each treatment were filled with approximately 30 lb of seed cotton and transported to the USDA Cotton Ginning Lab at Stoneville, Ms. These bags were placed into a cotton trailer under a shed roof and kept for later ginning as a quality check. A seed cotton sample representative of each sample was collected, placed into a jar and sealed for gravimetric moisture determination.

A module builder was filled, leveled and compacted to about the three foot level from the grower's 95% level of defoliation portion of the field with the other harvesters. A thermocouple was inserted into the center of each of the seed cotton sample bags. The samples were then placed crosswise into the module with approximately 1.5 ft between samples, with the thermocouple plug positioned next to the side of the module (Figure 1). Three replications of each of the three treatments were placed in each of two modules for a randomized complete block design. The modules were then filled with additional seed cotton, compacted and covers placed on them. Additional thermocouples were inserted into the finished modules approximately 1.5 ft above and below the sample bags approximately three ft into the module. Ambient temperature during harvesting and module construction reached 90 degrees Fahrenheit.

Sample and module temperature data were recorded on daily intervals for the first 7 days after the modules were constructed, then less frequently throughout the storage period. The samples that were implanted into the modules were retrieved during the week of November 25 when the modules were ginned. All samples were ginned on December 8 and 9, 1997 at the USDA Cotton Ginning Lab at Stoneville, Ms.

Measurements and samples taken during the ginning process included weights for gin turnout, seed cotton fractionation, moisture by gravimetric and moisture meter, three lint sub samples per sample for HVI and APHIS measurements and seed samples for oil mill quality and germination.

Tallahatchie County "Charleston" Location

This experiment was conducted identically to the Leflore County experiment with a few exceptions. The field of cotton chosen had suffered from early season spring rains which resulted in replanting in areas of the field. This delay in planting resulted in immature green cotton interspersed with more mature cotton in the strips treated for defoliation level. Defoliation was also initiated earlier than it should have been, probably when no more than 40% of the bolls were open. Harvesting was scheduled on November 10 for the benefit of those conducting the test and thus was probably 3 or more days earlier than it should have been following the application of the defoliants. Thus the field was very green for harvesting, even to the point that white

flowers were observed in un-defoliated areas of the natural leaf drop treatment. All treatments had significantly higher levels of green bolls than any other test location. Yield was approximately 550 lb per acre. Only one four-row harvester and one module builder were used to harvest the defoliation level samples and module seed cotton. Harvest began approximately 11:00 A.M. and lasted until dusky dark. Temperature during the harvesting activities reached 88 degrees Fahrenheit. Hand picked seed cotton moisture samples were harvested as much as 2 hours before the picker arrived at the field, making comparison of the pre and post harvest moisture data unusable at this location.

Coahoma County "Clarksdale" Location

The field chosen for this location had a uniformly mature crop that had reached approximately 60 % open bolls before the defoliation treatments were applied. Harvesting was conducted on 17 October with ambient temperature reaching 66 degrees Fahrenheit. All sampling was conducted as described for the Leflore County Location with the exception that a fourth treatment was added by subdividing the natural leaf drop treatment. This treatment consisted of mixing a preservative, calcium propionate at a dilution of 1 gallon of material in 50 gallons of water, and applying at 16 gallons of finished solution per acre with a high boy sprayer over the top of the plants just prior to harvesting. This resulted in 24 samples instead of 18. Thus three modules were used as "parents" containing two replications of four treatments for a total of 8 samples in each module. Harvest for the test was initiated about 10:00 A.M. and concluded about 3:00 P.M.

Washington County "Refuge" Location

This field used in this location was treated later than the other fields and consequently had defoliation treatments applied during cooler weather conditions. The field had a yield of about 750 lbs per acre and was fairly uniform in maturity when the treatments were applied. The defoliation results obtained were about the same as the other locations except that the intermediate and the 95% defoliation treatments were similar in result. An alternative "intermediate" level was chosen from an adjacent area that had Starfire^{Tm} and sodium chlorate applied only three days prior to harvesting the test. This area had most of the desiccated leaves still loosely attached to the plants. Therefore, the trash levels appeared to be about equal between the natural leaf drop and intermediate levels of defoliation with the intermediate level having the more desiccated trash of the two treatments. Ambient temperature during harvest reached 75 degrees Fahrenheit with a 10 to 15 mph wind during the day. A 2 inch rain fell 3-4 hours after completing harvesting of the test on 23 October at 3:30 P.M.

Results and Discussion

The temperatures of the samples were averaged by treatment and location and are shown for Greenwood, Charleston, Clarksdale and Refuge in Figures 2 through 5 respectively. An average module temperature for each location was computed and included in the figures. Average moisture for treatments and locations are provided in Table 1.

All locations had individual samples that heated to some extent. The temperatures of the natural leaf drop samples tended to peak about 4 degrees Fahrenheit above the intermediate and 95% defoliation treatments for the Greenwood location (Figure 2). This location did not increase in temperature after the second day and remained at less than a 15 degree increase over the ambient conditions when the modules were constructed. All temperatures exhibited a steady decline over the storage period. Parent module temperatures were about the same as the sample temperatures. Sample moisture conditions were all in the ideal range or below 12% level. It was observed that the second module had individual thermocouples exhibiting temperatures of 107 degrees F less than 2 hours after completion of the module. This was presumed to be a result of internal friction of fibers upon one another during the compacting process.

The Charleston experiment resulted in the greatest increase in seed cotton temperatures (Figure 3), probably because of the "green" nature of the crop put into samples and the modules. Average treatment maximum temperatures of 107 degrees F or 19 degrees F above ambient conditions were reached on the 4th day for the samples and the 7th day (110 degrees F) for the parent modules. This location also showed a steady decline in temperatures after the maximum temperatures were reached. One of the modules increased in temperature significantly more than the other and may have been the cause of samples heating. Seed cotton moisture ranged from 10.3% for the 95% defoliation level to 17.4% for the natural leaf drop treatments for this location. The growers module color grades were all light spot or spotted.

The samples from the Clarksdale location exhibited an increase in temperature from the 66 degrees F ambient conditions to 86 degrees F by the third day with most of the increase in temperature occurring by the end of the 2nd day (Figure 4). No differences in temperatures of any of the treatments were observed. All treatment temperatures declined steadily over the storage period. Moisture determinations indicated that all samples were in the previously determined "danger zone" for storage without quality deterioration with levels ranging between 12.7% and 15.7% moisture for the 95% defoliation and the natural leaf drop with preservative treatments. All of the grower's bale grades were either 21 (Strict Middling) or 31 (Middling) color for this location.

The samples from the Refuge location exhibited similar temperature increases to the Greenwood location or a rise of about 15 degrees F above ambient conditions when the

cotton was picked (Figure 5). Only 2.2 degrees F differential in average temperatures was noted for any of the treatments with the intermediate treatment reaching the highest temperature. Moisture contents ranged from 11.2% for the 95% defoliation to 14.8% for the intermediate and natural leaf drop treatments.

A graph of the average sample moisture content versus the average maximum temperature level reached by the samples for all locations and treatments is provided in Figure 6. This plot exhibits no correlation of maximum temperature and sample moisture. A similar plot was developed using moisture and temperature differential between the ambient conditions and maximum temperature and similarly exhibited no correlation between the two measurements.

Fiber and seed quality data have not yet been analyzed statistically for differences and trends. The data provided in Tables 2-4 are the averages for each treatment and location for both the module storage and the non-storage samples.

Averages of AFIS data is provided as a summary for all locations and treatments in Table 2. Visually there appears to be no consistent trend in treatment effects for any of the AFIS data over all locations; however, there are noticeable differences in Neps, Short Fiber Content, Trash Count, and Visible Foreign Matter between locations.

Averages of HVI data are provided in summary form for locations and treatments in Table 3. Most noticeable is the relatively low micronaire values for the Charleston location which would suggest that the defoliation was applied too early for full fiber maturity. Yellowing did occur at the Charleston and Clarksdale locations as evidenced by the elevated "plus b" values. The Refuge location exhibited extraordinary strength characteristics probably associated more with variety than any other variable.

Averages of Oil Mill Seed Quality data are provided for locations and treatments in Table 4. Free fatty acid contents were elevated for the natural and intermediate levels of defoliation at Charleston and the intermediate level at Refuge. Lower oil content for these same treatments, especially at the Charleston location resulted in lower composite seed grades. The higher oil contents and composite grades at Clarksdale are probably attributable to irrigation and fertility at this location as compared to the other locations being produced with rainfall only.

The addition of a preservative, calcium propionate, by spraying over the top of the natural defoliation treatment immediately prior to harvesting did not appear to influence the fiber or seed quality when comparing treatments 1 and 2 for the Clarksdale location.

Sample lint and seed quality data will be analyzed with the data presented in this report to establish any relationships that may exist between module moisture, temperatures reached and quality obtained from the samples. Gin turnout is yet to be supplied by the ginning lab.

Summary

Data collected in the 1997 crop year is again inconclusive in that some samples with high moisture contents did not heat while some samples with "safe moisture contents did heat. There was no correlation of maximum temperature reached and moisture content. All four locations produced natural defoliation treatments with high leaf contents that would have been expected to heat in storage. The addition of a preservative, calcium propionate to the natural defoliation treatment immediately prior to harvest at one location did not influence fiber or seed qualities.

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Table 1: Seed Cotton Sample Average Moisture Content (%) After Picking

Treatment	Grnwood	Chrlston	Clksdale	Refuge
Natural	11.8	17.4	15.6	14.8
Intermed.	8.5	13.8	13.0	14.8
95%	7.5	10.3	12.7	11.2
Preserv. + Natural			15.7	

Table 2: Averages of AFIS Dat

Location: Greenwood

Treatment		Nep size(um)	Neps per Gram	UQL	SFC	Trash cnt/g	Size(um)	Trash(cnt/g)	VFM(%)
1	Module	747	202	1.29	3.9	345	390	76	1.56
2	Module	748	183	1.29	3.6	224	407	54	1.08
3	Module	748	183	1.28	3.6	228	418	57	1.26
1	NS	744	187	1.29	3.4	325	401	80	1.45
2	NS	745	178	1.29	3.3	246	404	57	1.15
3	NS	741	188	1.29	3.6	254	452	77	1.54

Location: Charleston

Treatment		Nep size(um)	Neps per Gram	UQL	SFC	Trash cnt/g	Size(um)	Trash(cnt/g)	VFM(%)
1	Module	760	281	1.26	4.7	761	409	197	3.43
2	Module	759	277	1.23	5.2	635	425	178	3.16
3	Module	754	317	1.22	5.3	639	397	160	2.71
1	NS	760	282	1.25	4.6	811	403	209	3.49
2	NS	759	277	1.23	4.9	544	418	142	2.65
3	NS	749	331	1.22	5.6	601	421	162	2.78

Location: Clarksdale

Treatment		Nep size(um)	Neps per Gram	UQL	SFC	Trash cnt/g	Size(um)	Trash(cnt/g)	VFM(%)
1	Module	771	181	1.24	3.7	283	415	71	1.43
2	Module	785	215	1.24	3.9	339	424	85	1.84
3	Module	768	222	1.23	3.9	305	446	82	1.80
4	Module	780	196	1.24	3.8	335	430	88	1.90
1	NS	779	197	1.25	3.3	308	421	75	1.67
2	NS	777	220	1.22	4.0	302	424	75	1.61
3	NS	777	241	1.23	4.0	281	480	92	1.84
4	NS	782	213	1.24	3.6	273	403	69	1.34

Location: Refuge

Treatment		Nep size(um)	Neps per Gram	UQL	SFC	Trash cnt/g	Size(um)	Trash(cnt/g)	VFM(%)
1	Module	772	158	1.30	2.8	247	428	64	1.38
2	Module	758	167	1.28	3.0	325	424	84	1.73
3	Module	749	169	1.29	2.7	228	445	64	1.36
1	NS	757	153	1.29	2.8	252	435	68	1.48
2	NS	753	175	1.27	3.0	308	423	79	1.66
3	NS	747	170	1.29	2.7	216	490	65	1.67

Table 3: HVI Data for the Mississippi Cotton Defoliation Study

Location: Greenwood

Treatment		hv_mic	hv_len	hv_unifndx	hv_str	hv_elo	hv_rd	hv_plusb	hv_clrgrd	hv_leaf	hv_sfibcon
1	Module	4.3	1.2	83.7	29.3	11.8	72.6	9.4	0	1.2	5.7
2	Module	4.4	1.2	83.6	29.3	11.8	74.8	9.1	0	1.1	5.9
3	Module	4.5	1.2	83.7	29.2	11.6	74.8	8.8	0	1.1	5.8
1	ns	4.3	1.2	83.7	29.8	11.9	71.9	9.2	0.0	1.7	5.5
2	ns	4.3	1.2	84.0	29.8	11.9	75.3	8.8	0.0	1.0	5.7
3	ns	4.5	1.2	83.6	29.0	11.8	75.8	8.6	0.0	1.1	5.6

Location: Charleston

Treatment		hv_mic	hv_len	hv_unifndx	hv_str	hv_elo	hv_rd	hv_plusb	hv_clrgrd	hv_leaf	hv_sfibcon
1	Module	3.9	1.1	82.9	29.7	10.6	69.0	10.9	0	2.7	6.3
2	Module	3.7	1.1	82.5	29.3	10.8	70.2	10.2	0	2.0	6.6
3	Module	3.4	1.1	81.6	28.9	10.6	74.5	10.3	0	2.1	7.2
1	ns	3.7	1.1	83.6	29.8	10.9	71.4	9.9	0.0	2.6	6.4
2	ns	3.8	1.1	83.0	29.4	10.9	73.2	9.5	0.0	2.1	6.8
3	ns	3.3	1.1	82.1	29.7	10.9	76.3	9.1	0.0	1.9	7.3

Location: Clarksdale

Treatment		hv_mic	hv_len	hv_unifndx	hv_str	hv_elo	hv_rd	hv_plusb	hv_clrgrd	hv_leaf	hv_sfibcon
1	Module	4.8	1.1	82.9	28.7	10.4	73.4	10.0	0	1.3	6.4
2	Module	4.7	1.1	83.5	28.8	10.6	74.5	9.5	0	1.2	6.4
3	Module	4.5	1.1	83.7	28.7	10.5	76.0	9.4	0	1.2	6.6
4	Module	4.8	1.1	83.7	29.0	10.5	73.8	9.9	0	1.4	6.2
1	ns	4.8	1.1	83.5	29.4	10.5	73.8	9.8	0.0	1.6	6.3
2	ns	4.7	1.1	83.4	28.8	10.5	75.1	9.7	0.0	1.2	6.4
3	ns	4.5	1.1	83.3	28.6	10.7	76.6	9.2	0.0	1.1	6.8
4	ns	4.7	1.1	83.3	28.8	10.4	74.6	9.8	0.0	1.6	6.3

Location: Refuge

Treatment		hv_mic	hv_len	hv_unifndx	hv_str	hv_elo	hv_rd	hv_plusb	hv_clrgrd	hv_leaf	hv_sfibcon
1	Module	4.6	1.2	84.3	33.4	10.9	75.8	9.0	0	1.1	5.1
2	Module	4.5	1.2	84.2	32.4	11.0	74.9	9.1	0	1.7	5.5
3	Module	4.6	1.2	84.2	32.7	11.2	77.2	8.5	0	1.1	5.4
1	ns	4.7	1.2	84.4	32.9	11.2	76.2	8.8	0.0	1.2	5.3
2	ns	4.4	1.2	84.0	32.3	11.1	75.3	8.9	0.0	1.8	5.6
3	ns	4.6	1.2	84.4	32.6	11.3	77.5	8.3	0.0	1.2	5.3

Table 4: Oil Mill Seed Quality Averages

LOCATION: GREENWOOD

Treatment		FM	FFA	Oil	Ammonia	Net Qual	Quantity	Grade
1	Module	0.5	0.4	17.3	4.04	100.0	98.3	98.3
2	Module	0.2	0.3	17.6	3.96	100.0	98.9	98.8
3	Module	0.2	0.3	18.8	3.76	100.0	102.8	102.8
1	NS	0.2	0.3	17.5	3.98	100.0	98.8	98.8
2	NS	0.2	0.3	17.7	3.90	100.0	99.1	99.2
3	NS	0.2	0.2	18.5	3.70	100.0	101.4	101.3

LOCATION: CHARLESTON

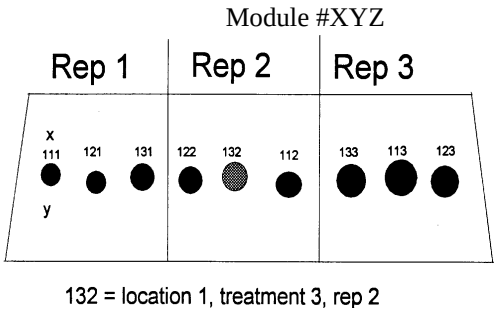
Treatment	Rep	FM	FFA	Oil	Ammonia	Net Qual	Quantity	Grade
1	Module	1.5	2.3	16.6	4.03	97.6	95.6	93.4
2	Module	1.1	1.7	15.8	3.97	99.1	92.0	91.1
3	Module	1.7	0.8	15.3	3.96	99.3	90.0	89.3
1	NS	0.7	0.8	16.0	3.96	100.0	92.9	92.8
2	NS	0.8	0.5	15.4	3.94	99.7	90.2	89.8
3	NS	1.0	0.7	15.9	3.74	99.7	91.2	90.8

LOCATION: CLARKSDALE

Treatment		FM	FFA	Oil	Ammonia	Net Qual	Quantity	Grade
1	Module	0.3	0.5	18.2	4.47	100.0	104.5	104.7
2	Module	0.3	0.4	18.2	4.45	100.0	104.4	104.4
3	Module	0.6	0.3	18.3	4.29	100.0	104.0	103.9
4	Module	0.4	0.4	18.6	4.40	100.0	105.9	105.8
1	NS	0.3	0.4	18.7	4.40	100.0	106.2	106.2
2	NS	0.3	0.4	18.2	4.34	100.0	103.7	103.8
3	NS	1.1	0.3	18.2	4.25	99.9	103.3	103.2
4	NS	0.5	0.3	18.3	4.32	100.0	104.1	104.2

LOCATION: REFUGE

Treatment	Rep	FM	FFA	Oil	Ammonia	Net Qual	Quantity	Grade
1	Module	0.1	0.4	17.9	3.54	100.0	98.0	98.1
2	Module	0.6	1.1	17.4	3.68	100.0	96.8	96.8
3	Module	0.2	0.4	18.0	3.44	100.0	97.4	97.3
1	NS	0.3	0.3	17.9	3.46	100.0	97.4	97.5
2	NS	0.8	0.8	17.4	3.64	99.8	96.4	96.3
3	NS	0.4	0.3	18.0	3.50	100.0	97.9	97.8



location 1 = Greenwood, Treatment 1 = natural leaf drop.
Treatment 2 = 65% Defoliation, Treatment 3 = 95% Defoliation

Figure 1. Seed Cotton Sample Diagram.

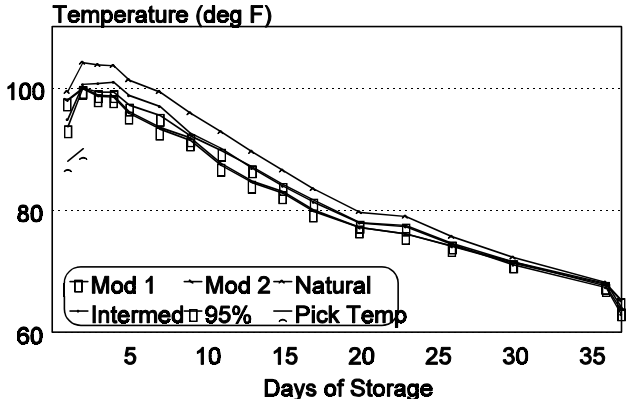


Figure 2. Mobile and Seed Cotton Sample Temperatures Versus Days of Storage for Greenwoood, MS.

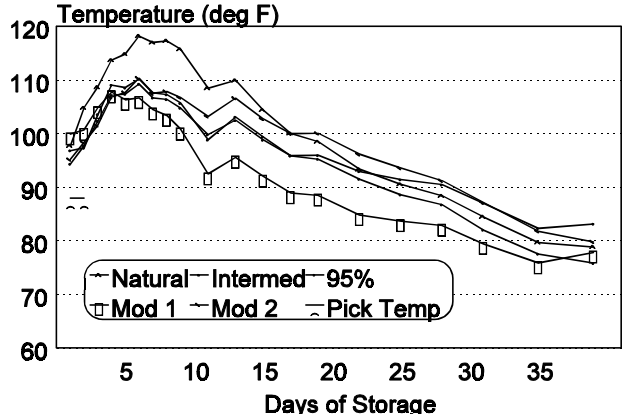


Figure 3. Module and Seed Cotton Sample Temperature Versus Days of Storage for Charleston, MS.

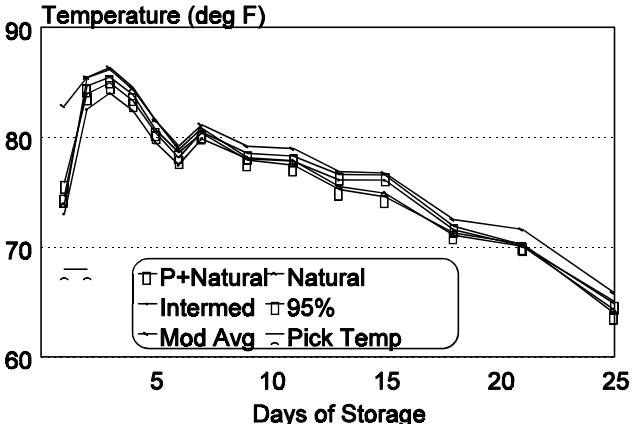


Figure 4. Module and Seed Cotton Sample Temperatures Versus Days of Storage for Clarksdale, MS.

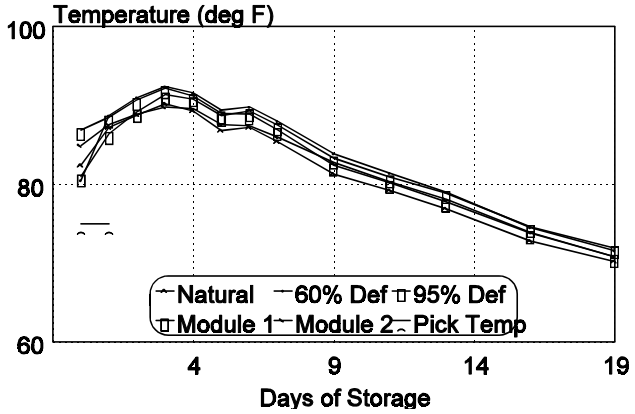


Figure 5. Module and Seed Cotton Sample Temperatures Versus Days of Storage for Greendale, MS.

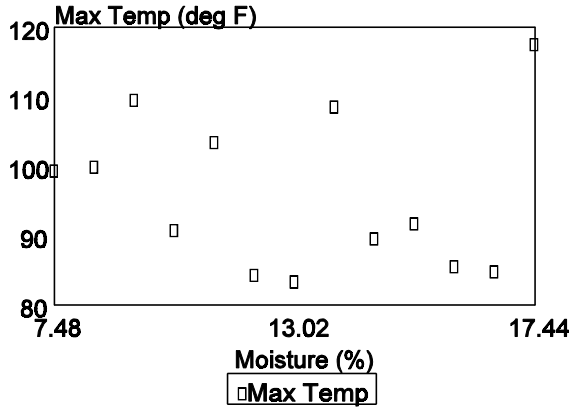


Figure 6. Seed Cotton and Moisture Content versus Maximum Temperature Reached for All Treatments and Locations.