UTILIZING COTMAN FOR DEFOLIATION TIMING AND THE MANAGEMENT OF MICRONAIRE VALUES

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Abstract

COTMAN a cotton-management expert system based on in-season plant monitoring was evaluated by defoliating at various levels of heat unit accumulations from date of cutout (NAWF=5.0) on yield and fiber quality. Bollman, which is one of the two components of COTMAN, was utilized to monitor the crop on a weekly basis from first flower until cutout. Once physiological cutout was determined, Bollman calculated the heat units to aid in timing of defoliation. Defoliation was initiated at five different heat unit accumulations (650, 750, 850, 950, and 1050) from date of cutout. No significant differences in yields were observed once defoliation was initiated at 750 heat units or higher. Micronaire values were reduced or lowered significantly at the 750-heat unit level. No significant differences in length or strength were observed. Results of the replicated trials suggest that COTMAN was a very effective and practical method to determine when to implement defoliation when comparing to the percent open boll or nodes above cracked boll methods.

Introduction

A limited amount of field research has been implemented in Texas utilizing COTMAN as a management tool for defoliation. Conventional or traditional practices have relied on using percent open boll or nodes above cracked boll methods for initiating defoliation. A comparison of these methods under Texas Upper Gulf Coast growing conditions was needed to determine if accumulated heat units from date of cutout is an effective and practical method for defoliating.

Objective

To investigate the use of nodes above white flower (NAWF) to schedule cotton fields for defoliation by evaluating the effect of defoliating at various levels of heat unit accumulations after NAWF = 5.0 on yield and fiber quality.

Materials/Methods

Defoliation treatments were initiated at 650, 750, 850, 950, 1050 heat unit accumulations following NAWF = 5.0 in three different fields or locations. All three locations utilized a randomized complete block design, four replications for each treatment, and plot sizes were four rows by fifty feet long. A dropp/def/prep mixture was applied using a CO_2 backpack sprayer.

Measurements recorded included monitoring NAWF on a weekly basis beginning at first bloom through cutout, recording daily high and low temperatures from cutout until date of defoliation, percent open boll and nodes above cracked boll at defoliation. Each defoliation treatment was hand- harvested for yield one time (10 – 12 days) after defoliation. Fiber quality data was also recorded.

The bollman component of COTMAN was utilized to record NAWF and the daily high and low temperatures as well. Calling one of three different Crop Weather Stations located in the Texas Upper Coast Area collected source of temperature data.

Results/Discussion

The first field or the Beard location (Table 1.) was defoliated at 643, 741, 845, 923, and 1026 heat unit accumulations from date of cutout. No significant differences in yield were observed between the five different heat unit accumulations, however there were some differences numerically. A significant higher number of bolls were needed to produce a pound of lint at 643 heat units when comparing it to the four higher heat unit accumulations. No significant differences in number of bolls to produce a pound of lint was found between 741, 845, and 923 heat units, however it took more bolls to produce a pound of lint at 741 heat units when comparing it to 1026. No significant differences in number of bolls to produce a pound of lint were found between 845, 923, and 1026 heat unit accumulations. Micronaire values were significantly lower at the 643 and 741 heat unit accumulations. No differences in micronaire values were found between the 845, 923, and 1026 heat unit accumulations, however they tended to increase numerically as heat unit accumulations increased. Percent open boll and nodes above cracked boll information were also recorded for each of the heat unit accumulations and are available in table 1.

The second field or the Sappington location (Table 2.) was defoliated at 675, 748, 848, 926, and 1028 heat unit accumulations from date of cutout. No significant differences in yield were found between the five different heat unit accumulations, however there was strong trend upward in yield numerically until 1028 heat unit accumulations were reached. Number of bolls to produce a pound of lint at the five different heat unit accumulations was not significantly different but numerically it took fewer bolls as heat unit accumulations increased. No significant differences in micronaire values were found between 675 and 748 heat unit accumulations. However, micronaire value was significantly lower at 675 heat units when comparing it to 848, 926, and 1028 heat unit

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accumulations. No significant differences were found in micronaire values between 748, 848, 926, and 1028 heat unit accumulations, however they tended to trend upward numerically. Percent open boll and nodes above cracked boll information were also recorded for each of the heat unit accumulations and are available in table 2.

The third field or the Hansen location (Table 3.) was defoliated at 660, 778, 849, 947, and 1024 heat unit accumulations from date of cutout. No significant difference in yield was found between 660 and 778 heat unit accumulations, however yield was significantly lower at 660 heat units versus the 849, 947, and 1024 heat unit accumulations. There was no significant difference in yield between 778, 849, 947, and 1024 heat unit accumulations but there was a definite numerical increase as heat unit accumulations increased. It took a significant higher number of bolls to produce a pound of lint at 660 heat units when comparing it to the four higher heat unit accumulations. No significant differences in number of bolls to produce a pound of lint were found between 778, 849, 947, and 1024 heat unit accumulations. However, numerically there was a trend of fewer bolls needed as heat unit accumulations increased. Micronaire value for the 660-heat unit accumulation was significantly lower versus the four higher heat unit accumulations. Micronaire values for 778, 849and 947-heat unit accumulations were not different significantly but increased numerically as heat units increased. Micronaire values for 778 and 849 heat units were significantly lower when comparing them to 1024 heat unit accumulations. Micronaire values for 947 and 1024 heat unit accumulations were not different significantly. Percent open boll and nodes above cracked boll information were also recorded for each of the heat unit accumulations and are available in table 3.

There were no length or strength value differences between the five different heat unit accumulations in all three of the test.

The following information is the average of all three locations or fields (Table 4). Yield was reduced significantly at 650 heat unit accumulations versus the four higher heat unit accumulations. There was no significant difference in yield between the 750, 850, 950, and 1024 heat unit accumulations. However, yields numerically increased until 1050 heat unit accumulations were reached. It took more bolls to produce a pound of lint at 650 heat units versus 750, 850, 950, and 1050 heat unit accumulations. No significant difference in number of bolls to produce a pound of lint was noticed between the 750, 850, 950, and 1050 heat unit accumulations. However, a trend of fewer bolls to produce a pound of lint was observed numerically as heat unit accumulations increased. Micronaire values were not significantly different at 650 and 750 heat unit accumulations. However, they were significantly lower in value when comparing them to 850, 950, and 1050 heat unit accumulations. No significant difference was found in micronaire values when comparing the heat unit accumulations at 850, 950, and 1050. However, a numerical increase in micronaire values was observed as heat unit accumulations increased.

Summary

Initiation of defoliation can begin at the 750-850 accumulated heat unit level. This was approximately 4-8 days earlier versus current or conventional practices. Twelve to thirty-six percent open at 750-850 heat unit accumulations versus the more conventional sixty to seventy percent open at the 950 heat unit accumulations. This translates into an earlier harvest or fewer days exposed to inclement weather and earlier stalk destruction date and land preparation for next year's crop as well.

Mirconaire values were lowered or reduced significantly at 750 heat units. Differences in length and strength values were not observed. No length and strength values differences were found between the five different heat unit accumulations.

The method of initiating defoliation by utilizing accumulated heat units from date of cutout appears to be an easier and more accurate method versus percent open boll or nodes above cracked boll.

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Table 1. Beard Location-Defoliation Timing at Five Different Heat Unit Accumulations. DPL 20

Heat Units	% Open Boll	NACB	Yield[1]	Bolls/lb. Lint[2]	Micro-naire[3]
643	0	---	474 a	378 a	3.05 b
741	3	4	497 a	342 b	3.60 b
845	36	2.2	578 a	332 bc	3.90 a
923	64	.8	531 a	330 bc	3.95 a
1026	75	.4	541 a	318 c	3.98 a

[1] P=.1721
[2] P=.0004, LSD=20.366
[3] P=.0000, LSD=.267

Table 2. Sappington Location-Defoliation Timing at Five Different Heat Unit Accumulations. PM 1220 bg/rr

Heat Units	% Open Bolls	NACB	Yield[1]	Bolls/lb. Lint[2]	Micro-naire[3]
675	0	---	801 a	266 a	4.15 b
748	12	4	865 a	260 a	4.50 ab
848	36	2	887 a	241 a	4.75 a
926	68	.7	924 a	240 a	4.80 a
1028	92	.15	807 a	246 a	4.85 a

[1]P=.1998
[2]P=.1166
[3]P=.0089, LSD=.378

Table 3. Hansen Location-Defoliation Timing at Five Different Heat Unit Accumulations. DPL 50

Heat Units	% Open Bolls	NACB	Yield[1]	Bolls/lb. Lint[2]	Micro-naire[3]
660	0	---	570 b	329 a	3.43 c
778	3	4.5	677 ab	283 b	4.13 b
849	13	2.7	707 a	281 b	4.23 b
947	35	1	747 a	272 b	4.38 ab
1024	63	.3	749 a	268 b	4.60 a

[1]P=.0291, LSD=114.2
[2]P=.0000, LSD=17.41
[3]P=.0000, LSD=.318

Table 4. Average of All Three Locations-Defoliation Timing at Five Different Heat Unit Accumulations.

Heat Units	Yield[1]	Bolls/lb./Lint[2]	Micronaire[3]
650	616 b	329 a	3.54 b
750	680 a	283 b	4.08 b
850	725 a	281 b	4.29 a
950	734 a	272 b	4.38 a
1050	699 a	268 b	4.47 a

[1]P=.0088, LSD=61.2
[2]P=.0000, LSD=12.608
[3]P=.0000, LSD=.208