IDENTIFICATION OF THE LAST EFFECTIVE BOLL POPULATION FOR BASING END OF SEASON MANAGEMENT DECISIONS

Dan D. Fromme
Texas AgriLife Extension Service
Corpus Christi, TX
J. Tom Cothren
Texas AgriLife Research
College Station, TX
Carlos J. Fernandez
Texas AgriLife Research
Corpus Christi, TX

Abstract

Determining the proper timing for harvest aid application is an important decision in cotton production. COTMAN™, a decision-aid tool developed in Arkansas is one of several methods being utilized for making this decision. Through monitoring nodes above white flower (NAWF), COTMAN can more accurately identify the last effective boll (LEB) population. It has been proposed that the LEB population occurs when there are five nodes above the uppermost first position white flower (NAWF=5), which is also known as cutout. This assumption is derived from previous research in Arkansas showing that the boll population which contributes 95% of yield is set when the crop stage is at NAWF=5 (Bourland et al., 1992). The objective of this study was to determine if LEB population occurs at NAWF=5 in other parts of the Cotton Belt.

Results of this study were similar to what has been found in Arkansas, 97% of total lint yield was set when NAWF=5. Only 3.0% or 44 pounds of lint was found above NAWF=5 in a high yielding environment (1400 lbs/acre). No differences in total lint yield per acre were found between the three NAWF positions. Therefore, there was no reason to delay defoliation once NAWF=5 + 850 heat units was reached.

Introduction

COTMAN™ is a decision-aid tool developed in Arkansas for managing cotton production. Nodes above white flower (NAWF) is an informative measure of crop growth status, and allows for better precision in making harvest aid decisions at the end of the season. Through monitoring NAWF, COTMAN can more accurately identify the last effective boll (LEB) population. The LEB population occurs when there are five nodes above the uppermost first position white flower (NAWF=5), which is purportedly known as cutout. This assumption is derived from previous research in Arkansas showing that the boll population which contributes 95% of yield is set when the crop stage is at NAWF=5 (Bourland et al., 1992). The objective of this study was to determine if LEB population occurs at NAWF=5 in other parts of the Cotton Belt.

Methods

A field study was conducted at the Texas Agrilife Research and Extension Center at Corpus Christi, Texas. Date of planting was on March 19, 2008. Row spacing was on 38-inch centers. Soil type was Victoria clay. Supplemental water requirements during the growing season were through a drip irrigation system. The experimental design was a split plot consisting of four replications in a randomized complete block consisting of two cotton varieties and three nodal positions (NAWF= 5, 4, and 3). Plot sizes were four rows by fifty feet. Varieties utilized were DP 143B2F and DP 117B2F. Varieties were main plots and sub plots were the three nodal positions. Bi-weekly NAWF counts were taken until NAWF=5, 4, or 3 were reached. Once each nodal position was reached, 20 plants per plot were tagged at the respective nodal position. All treatments were defoliated at 850 heat units beyond either NAWF=5, 4, or 3. For all treatments, harvest was initiated 10 days after defoliation application. At harvest, each of tagged plant was hand-harvested in two distinct sub-samples to determine the percentage of yield above NAWF=5, 4, and 3. The first sub-sample included all seed cotton above NAWF=5, 4, or 3; while the second sub-sample included all of the seed cotton at and below the corresponding tagged nodal position. Lint yield per acre was determined by hand-harvesting one-thousandth of an acre from each of the plots. Seed cotton samples were ginned on a 10-saw research laboratory gin. Fiber quality data was determined by sending a 30 gram sample of lint from each of the plots to the

International Textile Center at Lubbock, Texas. Statistical analysis was conducted using PROC GLM. Means separation was determined by fishers protected LSD at the ≤ .05 levels.

Results

Tables 1 and 2 include the number of days to cutout and accumulated heat units at defoliation, respectively. For this study, no variety by NAWF interactions was observed. There were no significant differences in percent of lint or pounds of lint above NAWF between the two varieties (Tables 3, 4). Also, there were no differences in total pounds of lint per acre between the two varieties (Table 5). However, there was a significantly higher percent and pounds of lint contribution above NAWF=5 when comparing to NAWF=4 and 3 (Table 3, 4).

No differences in micronaire values were observed between the two varieties or the three NAWF positions (Table 6). Fiber length was significantly higher for the DP 143B2F variety compared to DP 117B2F. Fiber length was significantly higher for NAWF=3 when compared to NAWF=4. However, no differences were found between NAWF=3 and NAWF=5 (Table 7). Uniformity value was significantly higher for DP 117B2F versus DP 143B2F. No differences in uniformity values were found between the three NAWF positions (Table 8). Fiber strength was significantly higher for DP 117B2F versus DP 143B2F. No differences in fiber strength were found between the three nodal positions (Table 9).

	NAWF		
Variety	5	4	3
DP 117B2F	84	87	93
DP 143B2F	88	91	98

Table 2. Accumulated heat units at defoliation, Corpus Christi, Texas, 2008.

	NAWF		
Variety	5	4	3
DP 117B2F	829	956	866
DP 143B2F	933	866	872

Table 3. Percent of lint contribution above NAWF 5, 4, and 3, Corpus Christi, Texas, 2008.

NAWF	DP 117B2F	DP 143B2F	Pr>F= .0004
5	2.64	3.48	3.06 a
4	.52	1.24	0.88 b
3	.18	.26	0.22 b
Pr>F= .1914	1.11 a	1.66 a	

Table 4. Pounds of lint above NAWF, Corpus Christi, Texas, 2008.

NAWF	DP 117B2F	DP 143B2F	Pr>F= .0016
5	39.63	48.44	44.04 a
4	5.95	16.29	11.12 b
3	7.41	4.74	6.07 b
Pr>F= .4734	17.66 a	23.15 a	

Table 5. Total pounds of lint/acre, Corpus Christi, Texas, 2008

NAWF	DP 117B2F	DP 143B2F	Pr>F= .5366
5	1449	1394	1422 a
4	1413	1306	1359 a
3	1388	1501	1445 a
Pr>F= .8985	1417 a	1400 a	

Table 6. Fiber micronaire values, Corpus Christi, Texas.

NAWF	DP 117B2F	DP 143B2F	Pr>F= .1695
5	4.23	4.08	4.15 a
4	4.35	4.20	4.28 a
3	4.38	4.13	4.25 a
Pr>F= .0991	4.32 a	4.13 a	

Table 7. Fiber length values, Corpus Christi, Texas, 2008.

NAWF	DP 117B2F	DP 143B2F	Pr>F= .0333
5	1.13	1.19	1.16 ab
4	1.11	1.20	1.15 b
3	1.13	1.21	1.17 a
Pr>F= .0011	1.12 b	1.20 a	

Table 8. Fiber uniformity values, Corpus Christi, Texas, 2008.

NAWF	DP 117B2F	DP 143B2F	Pr>F= .3736
5	83.90	81.95	83.20 a
4	84.23	82.50	83.36 a
3	84.45	83.75	83.83 a
Pr>F= .0338	84.19 a	82.73 b	

Table 9. Fiber strength values, Corpus Christi, Texas, 2008.

NAWF	DP 117B2F	DP 143B2F	Pr>F= .1198
5	32.68	31.20	31.94 a
4	32.33	31.10	31.71 a
3	33.40	31.58	32.49 a
Pr>F= .0186	32.80 a	31.29 b	

Summary

Ninety-seven percent of lint yield was set when NAWF=5 was reached. Only 3.06% of total lint yield contribution was found above NAWF=5. This is equivalent to 44 pounds of lint being found above NAWF=5 in a high yielding environment (1400 lbs/acre). No differences in total lint yield per acre were found between the three NAWF positions. Therefore, there was no reason to delay defoliation once NAWF=5 + 850 heat units was reached. Appreciation is expressed to Cotton Incorporated for providing the financial report for this study.

References

Bourland, F.M., D.M. Oosterhuis, and N.P. Tugwell. 1992. Concept for Monitoring the Growth and Development of Cotton Plants Using Main-Stem Node Counts. J. Prod. Agric., 5(4):532-538.