EVALUATION OF INSECTICIDE USE TERMINATION RULES IN LOUISIANA: A PRELIMINARY REPORT

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Abstract

Field tests (1993-95) were conducted in North Louisiana to evaluate the effects of terminating insect control strategies for bollworm/tobacco budworm (BW/TBW) and boll weevil at selected intervals on seedcotton yields. The termination intervals were based on cotton plant development measured as plant mainstem nodes above white flower (NAWF) and heat unit (HU) accumulation. Treatment termination intervals included NAWF = 5, NAWF = 5 + 200 HU, NAWF = 5 + 350-400 HU, NAWF = 5 + 500-600 HU and NAWF = 5 + 600-800 HU. In 1993, there were no significant differences in yields among termination intervals. In 1994, yields increased as insecticides were applied up to NAWF = 5 + 400 HU. Plots with insecticides terminated at this interval produced yields that were statistically higher than that for plots when treatments were terminated earlier. In 1995, there were no significant differences among in yields among various termination intervals.

Introduction

Insecticide treatment termination at the end of the production season is one of the most important decisions that cotton growers have to consider. Protection of the harvestable crop is a goal that must be balanced with high insect control costs and possible insecticide resistance problems. Managing for early maturity has been recommended as a means of avoiding losses caused by late-season insect injury (Isely 1957). An early maturing cotton crop increases net profits by eliminating the need for costly late-season insecticide treatments. However, there currently is no recommended procedure for determining when the harvestable crop has become mature and is safe from insect injury.

Crop growth status during mid-late season can be measured by using the node above white flower (NAWF) method (Bourland et al. 1992). The nodal position of the highest white flower on the main axis relative to the plant apex has been a reliable description of the relationship between fruit set and rate of plant terminal growth. By using the NAWF + accumulated heat units (HU) method, decisions can be made to terminate insecticide treatments when the last effective boll population accumulates sufficient HU to become tolerant to specific insect pests. Arkansas researchers have reported that the harvestable portion of the cotton crop is generally safe from bollworm, *Helicoverpa zea* (Boddie), and boll weevil, *Anthonomus grandis grandis* Boheman, at NAWF = 5 + 350 HU (Bernhardt el al. 1986, Bagwell and Tugwell 1992). After this date, additional insecticide treatments may prove to be uneconomical. Therefore, these end-of-season management practices can be used to reduce costs and improve the environment.

The objective of these studies is to evaluate a cotton plant development monitoring method that indicates the appropriate time to terminate late-season insecticide applications under Louisiana conditions.

Materials and Methods

In 1993 (MRS93), 1994 (MRS94) and 1995 (MRS95), cotton seed (DP20, Stoneville LA887 and Stoneville LA887, respectively) was planted on 11, 13 and 25 May, respectively, at the Macon Ridge location of the Northeast Research Station near Winnsboro, LA. In 1995, one test (NRS95) was planted with DP20 on 19 May at the St. Joseph location of the Northeast Research Station. For each test, the treatments were arranged in a randomized complete block design and replicated 5, times except for the MRS95 test which had 10 replications. The plots consisted of 4 rows (40-inch centers) x 50 ft. Insecticide treatments were applied with a high clearance sprayer calibrated to deliver 6 gal total spray/acre through Teejet TX-8 hollow cone nozzles (2/row) at 46 psi. Insecticide treatments and application dates are presented in Table 1. All tests conducted at the Macon Ridge location (MRS) received sprinkler irrigation "as needed" to maintain adequate moisture during the season. The test conducted at the Northeast Research Station (NRS) was non-irrigated.

Ten plants/plot (100/replication) were sampled 1-2 times weekly to determine the flowering pattern based on the NAWF. NAWF was recorded from first bloom until NAWF = 5. The HU were recorded daily from NAWF = 5 until defoliation.

Insect pest injury was determined by examining 25 terminals and 25 squares per plot for evidence of BW/TBW and boll weevil damage. The two center rows were mechanically harvested to determine seedcotton yields. Cumulative HU, termination dates, harvest intervals, and treatment application timing are presented in Table 2.
Data were analyzed with ANOVA, and means were separated according to DMRT.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:730-732 (1996)
National Cotton Council, Memphis TN

Results and Discussion

Populations of BW/TBW and boll weevil varied considerably in the tests during 1993-1995 and were generally low compared to adjacent tests in the same fields (unpublished). Insect infestations were highest in the MRS94 and NRS95 tests and significantly affected yield in the MRS94 test. Applications were applied in all tests regardless of insect pest density and probably reduced injury levels in some plots not designated to receive treatments due to the small plot size.

In the MRS94 test, seedcotton yields were significantly higher in plots that had termination intervals equal to or greater than NAWF = 5 + 400 HU (Table 3). There were no significant differences in seedcotton yields among termination intervals beyond NAWF = 5 + 400 HU. Although there were no statistical differences among termination intervals in the other tests, seedcotton yields consistently increased as treatment termination was delayed until NAWF = 5 + 350-400 HU (Tables 3 and 4). After that interval, the data became more variable, probably as a result of environmental conditions, higher BW/TBW and boll weevil infestations and crop injury by other insect pests. These studies will be continued for several years to refine the proper interval for terminating late-season insecticide applications.

Acknowledgments

The authors wish to express their appreciation to Mr. Ralph Sheppard and student employees for their assistance in conducting these tests. We also wish to thank Miss Becky Thomas for her help in developing the poster presentation, for the 1996 Beltwide Cotton Conferences in Nashville, TN.

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Table 1. Insecticide treatments and dates of application.

Date	Treatment	Rate lb (AI)/acre
MRS93		
2 Aug	Karate 1 EC	0.033
6 Aug	Karate 1 EC + Guthion 2L	0.033 + 0.25
10 Aug	Karate 1 EC + Guthion 2L	0.033 + 0.25
30 Aug	Methyl Parathion 4E	0.25
MRS94		
9 Aug	Methyl Parathion 4E	0.25
15 Aug	Baythroid 2EC + Methyl Parathion 4E	0.033 + 0.25
9 Sep	Methyl Parathion 4E	0.25
14 Sep	Methyl Parathion 4E	0.25
MRS95		
12 Jul	Karate 1EC + Methyl Parathion 4E	0.03+0.25
21 Jul	Karate 1EC + Methyl Parathion 4E	0.03+0.25
8 Aug	Karate 1EC + Methyl Parathion 4E	0 .03+0.25
18 Aug	Baythroid 2EC + Larvin 3.2F + Methyl Parathion 4E	0.06+0.27+0.33
29 Aug	Curacron 8EC + Larvin 3.2F	1.0+0.27
5 Sep	Curacron 8EC + Larvin 3.2F	1.0+0.27
NRS95		
28 Jun	Bidrin 8EC + Ovasyn 1.5EC	0.4+0.25
10 Jul	Guthion 2L	0.25
24 Jul	Karate 1EC + Larvin 3.2F + Methyl Parathion 4E	0.03 +0.27+0.3
31 Jul	Larvin 3.2F + Fury 1.5EC + Methyl Parathion 4E	0.27+0.06+0.3
9 Aug	Karate 1EC + Pirate 3F + Ovasyn 1.5EC + Methyl Parathion 4E	0.03+0.2+0.25+0.3
17 Aug	Larvin 3.2F+ Baythroid 2EC + Curacron 8EC	0.27+0.04+1.0
24 Aug	Pirate 3F + Curacron 8EC + Methyl Parathion 4E	0.2+1.0+0.3
12 Sep	Guthion 2L	0.25

Table 2. Development of cotton plants and treatment application timing.

Application Timing	Date	Days From Planting	Actual HU	Insecticide Treatment Stopped	Number of Applications
MRS93					
Planting	11 May	-----	------	----------	-----
≤ 5 NAWF	2 Aug	82	------	2 Aug	0
+ 200[1]	10 Aug	90	202	10 Aug	+1
+ 400[1]	18 Aug	98	397	17 Aug	+2
+ 600[1]	26 Aug	106	595	26 Aug	+3
+ 800[1]	3 Sep	114	809	30 Aug	+4
Defoliation	17 Sep	128	1011	-----------	-----
Harvest 1	24 Sep	135	1168	-----------	-----
Harvest 2	12 Oct	153	1377	-----------	-----
MRS94					
Planting	13 May	-----	------	----------	-----
≤ 5 NAWF	4 Aug	83	------	4 Aug	0
+ 200[1]	13 Aug	92	199	13 Aug	+1
+ 400[1]	24 Aug	103	418	-----------	+2
+ 600[1]	2 Sep	112	610	9 Sep	+3
+ 800[1]	13 Sep	123	804	14 Sep	+4
Defoliation	21 Sep	131	912	-----------	-----
Harvest 1	27 Sep	137	961	-----------	-----
Harvest 2	25 Oct	165	1217	-----------	-----
MRS95					
Planting	25 Aug	-----	------	----------	-----
≤ 5 NAWF	8 Aug	75	------	8 Aug	0
+ 200[1]	16 Aug	83	214	16 Aug	+1
+ 350[1]	21 Aug	88	350	21 Aug	+2
+ 500[1]	28 Aug	95	523	28 Aug	+3
+ 650[1]	2 Sep	100	650	-----------	+4
Defoliation1	8 Sep	116	936	-----------	-----
Harvest 1	29 Sep	127	1060	-----------	-----
Harvest 2	6 Oct	134	1145	-----------	-----
NRS95					
Planting	16 May	-----	------	----------	-----
≤ 5 NAWF	31 Jul	75	------	31 Jul	0
+ 200[1]	7 Aug	83	214	9 Aug	+1
+ 350[1]	13 Aug	88	350	17 Aug	+2
+ 500[1]	19 Aug	95	523	20 Aug	+3
+ 650[1]	25 Aug	101	653	25 Aug	+4
Defoliation1	8 Sep	125	1159	-----------	-----
Harvest 1	10 Oct	147	1143	-----------	-----

[1]Heat units.

Table 3. Seedcotton yields in tests MRS93 and MRS94.

	Yield (Lb. seedcotton/acre)	
Treatment/Interval	MRS93	MRS94
≤ 5 NAWF	2389.3a	2493.5b
≤ 5 NAWF + 200 HU	2390.6a	2546.2b
≤ 5 NAWF + 400 HU	2541.8a	2742.2a
≤ 5 NAWF + 600 HU	2458.9a	2638.1ab
≤ 5 NAWF + 800 HU	2624.5a	2713.8a
(P>F)	0.07	<0.01

Means within columns followed by a common letter are not significantly different *(P = 0.05:DMRT)*.

Table 4. Seedcotton yields in tests MRS95 and NRS95.

	Yield (Lb. seedcotton/acre)	
Treatment/Interval	MRS95	NRS95
≤ 5 NAWF	1508.1a	1661.3a
≤ 5 NAWF + 200 HU	1582.6a	1726.6a
≤ 5 NAWF + 350 HU	1619.2a	1788.6a
≤ 5 NAWF + 500 HU	1591.0a	1860.6a
≤ 5 NAWF + 650 HU	1564.3a	1881.8a
(P>F)	0.16	0.72

Means within columns followed by a common letter are not significantly different *(P = 0.05;DMRT)*.