Correlation between Early Season Insecticide Control of Pink Bollworm and Other Pests and Subsequent Whitefly Applications near Gila Bend, AZ, 1997.

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Abstract

Cotton pesticide application histories in the Gila Basin were followed from 27 April through 20 September. The main interest was the effect of early season applications to control pink bollworm, Pectinophora gossypiella, *and other pests on subsequent whitefly applications. Categories explored include, transgenic and non transgenic cotton, planting dates, and location within the valley. Regression analysis shows a significant effect due to the early season control for either* P. gossypiella, *or other pests (P>0.009) but lower for them together (P>0.026). Early applications for either PBW or other pest resulted in increased application for whitefly.*

Introduction

Recently, two new tools have been introduced that are affecting cotton production in Arizona. One is transgenic cotton, which will potentially reduce the total number of applications of insecticides needed for control of the pink bollworm, *Pectinophora gossypiella* (Saunders). The other tool is insect growth regulators for control of the whitefly, *Bemisia sp.* The use of these in concert will take some experience to fully integrate tem into the cotton production cycle. As part of the Gila Basin Integrated Pest Management Project we can follow both whitefly populations and track the use of insecticides in the field. These data can be combined and queried to answer some basic questions of how these tools are being used.

Transgenic cotton (Bt.) varieties do no need protection from pink bollworm (PBW) early in the season. It has been assumed that this would leave a more robust insect population in place in the cotton field, including beneficial insects. These insects would then reduce or delay the need for subsequent applications of insecticides to control other pests including whiteflies. A consequence of our effort to provide whitefly population densities information to the producers near Gila Bend was the need to observe Environmental Protection Agency reentry requirements for treated fields. Information on pesticide use has been integrated with whitefly population data and can also be used to help understand areawide processes that affect whitefly population changes with special reference to prior insecticide treatment histories.

Materials and Methods

Whitefly surveys began on 1 June and continued until 20 September 1997. Fields were to be sampled once per week for the duration of the summer. Water and insecticide application schedules were imposed on our schedule and in practice the goal of visiting each field was seldom achieved in practice. However, population densities were followed in 281 fields and preliminary results presented elsewhere (Jech and Husman, 1998). Information on insecticide treatments was obtained from the Arizona Department of Agriculture for early season insecticide treatments. This data was examined carefully. Producers and Pest Control Advisors (PCAs) provided 1080s via FAX and telephone messages to ensure safe scouting and reentry into treated fields. They also provided an end of the season pesticide

summary to verify treatment records in the database. These sources were carefully cross checked to assure accuracy.

Data presented reduce insecticide applications into three categories. These include applications for whiteflies, PBW and 'other' for additional pests. Aldicarb was included. Whitefly applications included the following insecticides: pyriproxyfen and buprofezin along with lambdacyhalothrin, endosulfan, amitraz or fenpropathrin. Pink bollworm control occurred early in May and included combinations of pheromone and insectides at low doses. Remaining applications were for other insect pests. Tracking field treatments extended from late April to late September. The main focus was on applications for control of the whitefly.

Included for analysis are cotton field planting dates (water dates). Planting dates were grouped within intervals that reflect windows within the planting season. Fields were placed in one of the following intervals: very early (1-15 March), early (16-31 March), mid (1-15 April), late (16-30 April) or very late (May). Bt. and non Bt. cotton were also separated along with location in the area (A=steeper river valley, north or B=open fields, south). Management of the applications was under the control of the individual producer and PCA team. Regression analysis (SAS Institute Inc., 1989) was carried out on the sum of the applications for PBW and other pests during the first 11 weeks (27 April through 19 July) and comparing it with the sum of the applications for whitefly beginning 22 June through 6 September covering the first application cycle for the whitefly populations.

Results and Discussion

Table 1 presents the average and standard deviations for the cotton (Bt. vs. non Bt., two areas and five planting dates) planted near Gila Bend. Bt. cotton has about as many applications as non Bt. planted within the same planting window. The number of whitefly applications in the north was less than in the south (A & B in the Tables) near Gila Bend. However, whitefly populations on the north were higher than on the south. Also, the standard deviation around the fields with the highest number of applications is short. This is a good indication that many fields had multiple treatments. The first applications went out in the week of 22 June. This was followed by a few more fields the following week. The last first application was the week of 3 August for the latest planted cotton. Very early planted cotton neither was the first treated nor did it support the highest whitefly populations (Jech & Husman, 1998).

Whitefly applications peak at the end of July and the beginning of August, Table 2. Applications first began in late June. Nearly one third of the fields were treated on the week of the 20 July and continued at this level through the week of 10 August. A second peak of applications occurs the week of 7 September. The data is in good agreement with population trends presented elsewhere. In fact, about twenty fields in the basin received no treatment for whitefly in 1997. The number of whitefly applications does not appear to differ between the transgenic and non transgenic cotton at most planting intervals. A second peak of applications occurred near mid September. This peak corresponds with a late whitefly population peak.

How does the early application of a pesticide to control PBW affect subsequent applications for control of whiteflies? Using records from 1080s provided to the Arizona Department of Agriculture, we followed control applications for PBW and other pests from the early season (Tables 3 & 4) it was possible to follow the same field through subsequent treatments for whitefly and other pests over time from May through September. The application of which insecticide was applied against which pest was clear cut in the early season. As the season progressed to near the end of August, multiple applications against multiple pests occurred. The early season data offers the opportunity to decide which patterns of pesticide use affected the whitefly applications in late June. The PBW pressure was clearly heavy in the early season. Many producers and PCAs were uncomfortable with the PBW levels and applied very low rate insecticides (active ingredient/acre) to fields planted with both Bt. and non Bt. cotton.

Table 4 presents applications for pests other than PBW. By inspection there are apparently treatment patterns for PBW, other and for whiteflies. Late August and September applications for other pests replaced applications for whiteflies within the broad categories defined. There may be a pattern for large areas to be a treated unit. To learn if a pattern or relationship existed, a comparison between the categories was initiatied.

Regression analysis was performed using the sum of the PBW and other pest applications within a category and predicting the subsequent whitefly applications. The correlations ('other pest': r^2=0.378, F=9.12, df=1,15, P>0.009; PBW: r^2=0.398, F=9.91, df=1,15, P>0.009) are not high, but are convincing that a relationship between early season pesticide use and subsequent whitefly applications. When the factors are added, the correlation changes only slightly (PBW & other pest: r^2=0.406, F=9.12, df=2, 14, P>0.026). This suggested that both predict the same information and could be analyzed as one factor. Another factor should be mentioned that is not included in this analysis. The factor is management style of the producer-PCA team in control of a group of fields. The steeper riverine portion of area had fewer applications for whitefly control and higher populations of whiteflies. The open area had more applications and lower field populations of whiteflies. With the current information it would appear that careful attention to control of PBW and other pests may reduce or help in timing of control for whitefly.

Acknowledgements

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References Cited

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Table 1. Average number of treatements for whitefly and when the first treatment occurred for 281 fields planted with transgenic and non transgenic cotton, at different times in two geographic locations near Gila Bend, AZ, 1997.

Transgenic	Area	Planting Date	Number of Fields	Average Whitefly Applications	Standard Deviation of Whitefly Applications	Date of First Whitefly Application
Yes	A	1-15 Mar.	11	1.2	0.9	27 July 2 Aug.
No	A	1-15 Mar.	2	1	1.4	27 July 2 Aug.
Yes	B	1-15 Mar.	9	3.3	1.1	29 June 5 July
No	B	1-15 Mar.	21	3.6	1.1	29 June 5 July
Yes	A	16-31 Mar.	34	1.5	1.3	13-19 July
No	A	16-31 Mar.	14	1.4	0.9	29 June 5 July
Yes	B	16-31 Mar.	57	4.5	1.2	29 June 5 July
No	B	16-31 Mar.	28	4.2	1.4	22-28 July
Yes	A	1-15 Apr.	22	2	1.1	13-19 July
No	A	1-15 Apr.	23	1.1	1.4	29 June 5 July
Yes	B	1-15 Apr.	16	4.3	1.7	13-19 July
No	B	1-15 Apr.	5	2.8	1.3	13-19 July
Yes	A	16-30 Apr.	25	1.3	1.0	20-26 July
Yes	B	16-30 Apr.	5	4	1.2	20-26 July
No	B	16-30 Apr.	2	2	0.0	13-19 July
Yes	A	May	5	0.8	0.8	27 July 2 Aug.
No	A	May	2	1	0.0	3-9 Aug.

Table 2. The number of fields treated with insecticides to control whitefly near Gila Bend, AZ, 1997.

Plant Date	Area	Transgenic	Number of Fields	22-28 June	29 June 5 July	6-12 July	13-19 July	20-26 July	27 July 2 Aug.	3-9 Aug.	10-16 Aug.	17-23 Aug.	24-30 Aug.	31 Aug. 6 Sep.	7- 13 Sep.	17-20 Sep.
1-15 Mar.	A	Yes	11						6		3	2			2	
		No	2						1							1
	B	Yes	9		1	1	1	9	3	3	3	1		1	3	1
		No	21		5	5	4	12	8	14	3	2			13	5
16-31 Mar.	A	Yes	34					4	8	13	11	5	1		8	
		No	14		2	2			8	1			5			3
	B	Yes	57		7	7	3	44	36	16	33	10	23	24	37	6
		No	28	3	2	2	3	10	25	14	4	4			21	15
1-15 Apr.	A	Yes	22			2		2	6	9	11	5		1	7	1
		No	23		2	2		1	4	5	3	1	2		2	4
	B	Yes	16						15	2	9	1	8	10	9	
		No	5				1	2	4	1	1	1			3	
16-30 Apr.	A	Yes	25					5		8	12	1	4			
	B	Yes	5			2		3	5	1	1	1	3	2	3	
		No	2						2		2					
May	A	Yes	5						1	2	1					
	B	No	2													
Percent of 281 fields treated				1.1	6.8	8.2	4.3	32.7	47.0	31.7	34.5	12.1	16.4	13.5	38.4	12.8

Table 3. The number of fields treated for pink bollworm control using broad spectrum insecticides during April and May, 1997 near Gila Bend, AZ.

Plant Date	Area	Transgenic	Number of Fields	27April-3May	4-10 May	11-17 May	18-24 May	25-31 May	1-7 May	8-14 May	15-21 June	22-28 June	29 June 5 July	6-12 July	13-19 July
1-15 Mar.	A	Yes	11			1							1	1	
		No	2			1	1		1			1			
	B	Yes	9			1	1	6	1	1		1			
		No	21			13	3	10	6	3	3	11			3
16-31 Mar.	A	Yes	34							8					
		No	14			4	4		4	2		4	1	1	
	B	Yes	57			5	1	15	8	3	8	2	3	3	
		No	28			16	6	21	6	1	1	13			1
1-15 Apr.	A	Yes	22				1								
		No	23		2		5		1	6	6	9			
	B	Yes	16					1	1	3	3				5
		No	5			3	1	3	1	1	1	4			1
16-30 Apr.	A	Yes	25				3								
	B	Yes	5						1	3	3				
		No	2			2		2	1	1	1		2	2	1
May	A	Yes	5												
	B	No	2												
Percent of 281 fields treated				0.0	0.7	16.4	9.3	20.6	11.0	11.4	9.3	16.0	2.5	2.5	3.9

Table 4. The number of fields treated for pest other than the whitefly or pink bollworm near Gila Bend, AZ, 1997.

Plant Date	Area	Transgenic	Number of Fields	27April-3May	4-10 May	11-17 May	18-24 May	25-31 May	1-7 May	8-14 May	15-21 June	22-28 June	30 June 5 July	6-12 July	13-19 July	20-26 July	27 July 2 Aug.	3-9 Aug.	10-16 Aug.	17-23 Aug.	24-30 Aug.	31 Aug. 6 Sep.	7- 13 Sep.	17-20 Sep.
1-15 Mar.	A	Yes	11												3					1	2		2	
		No	2												1	1				1	1	2	1	
	B	Yes	9		1										1			4	1	2	4			1
		No	21	3				1		10	10		8	8	6	1			17	19	18	19	6	14
16-31 Mar.	A	Yes	34		1			4		4					3	8	2	3		1	7	3	8	
		No	14							6					8			4		6	2	6	6	
	B	Yes	57				16	4	5		4	5	5	5	16		1	9	12	12	9	7		1
		No	28	6	2			2	4	23	23	7	8	8	6	4	1	7	9	20	26	26	6	11
1-15 Apr.	A	Yes	22												2	7	3	2	2	3	7	4	5	
		No	23	1				1							2	4		2	1	5	5	4	7	1
	B	Yes	16				1	1					2		4				7	3	2	3		1
		No	5							3	3							1	3	3	5	5	2	5
16-30 Apr.	A	Yes	25		1											6			5	8	2			8
	B	Yes	5										2		1				3	3	1	2	2	1
		No	2												1					2	2	2		2
May	A	Yes	5													1			1	2			1	
	B	No	2																					
Percent of 281 fields treated				3.6	1.8	0.0	6.0	4.6	3.2	16.4	14.2	4.3	8.9	7.5	19.2	11.4	2.5	11.4	21.7	32.4	33.1	29.5	16.4	16.0