BT COTTON PERFORMANCE UNDER DIFFERENT MANAGEMENT PRACTICES

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Abstract

Four adaptive program approaches for Bt cotton were compared in small plot trials. Insecticides were applied in response to bollworm, *Helicoverpa zea* (Cresson), boll weevils, *Anthonomus grandis* (Boddie) or to boll weevils and tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois). Programs were adjusted according to infestation threats and were reflective of local concerns about 1) failures to control bollworms with Bt cottons, 2) square shedding induced by newly hatched larvae of both bollworms and tobacco budworms, *Heliothis virescens* (F.), and 3) failure to control boll weevils and plant bugs in Bt cotton with synthetic pyrethroid insecticides.

Materials and Methods

'Deltapine 32B' was planted 11 May in eight-row plots that were 100 feet long and separated from each other by a 2-row fallow border. All plots were treated with a boll weevil "pinhead" spray (Baythroid 2EC, 0.034 lb (AI)/acre) on 15 June. Cursory surveys for insect pests were made prior to activation of the experiment.

First invasions of bollworm moths were noted mid July. Counts of eggs and newly hatched larvae 15 July were made in each plot of the four programs (Table 1). These counts triggered sprays in two programs: egg numbers triggered number 1, and number 2 by egg hatch. Program 3 was initiated 10 August when boll weevil punctured squares became apparent in one of the four replications. This infestation steadily increased throughout all replications by 14 August. Program 3 plots were sprayed with Regent which was directed only at boll weevil and plant bug. In programs 1 and 2 the synthetic pyrethroid applications were aimed at bollworm, boll weevil and plant bug. Application schedules (Tables 2 & 3) show a crude separation among programs. Theoretically, full protection from all three pests was provided by program 1. Program 4 was not protected (untreated control). Program 2 initiated for bollworm egg hatch also served as a comparison of three applications of Baythroid and Regent for control of boll weevil and plant bugs.

No attempts were made to influence these adaptive programs with plant monitoring data. A few measurements were taken with COTMAN for descriptive purposes. In those cases, 10 plants per plot were monitored to obtain a plant status report 19 August, two days after termination of insecticide applications in program 2. Nodes Above White Flower (NAWF) counts were taken weekly to judge cutout and boll tolerance to bollworms, boll weevils and plant bugs.

Results

Yield of the programs 1, 2 and 3 were significantly different from the untreated control (program 4), but were not different from each other (Table 4). The numerical differences among programs, however, tend to raise questions about the adequacy of adaptive programs 2 and 3.

The local fear that boll weevil and plant bugs would not be controlled following prior pyrethroid applications was not warranted in this case. Excellent control was obtained following three applications (Table 5). Good, but not excellent control of boll weevil and plant bug was obtained from dose 0.038 lb (AI)/ac of Regent. Yield trends, however, may not be explained by these control data. Square or boll shedding that occurred prior to August 14 may have played a role (Table 6). More investigation will be required to determine if small square and /or bolls accounted for this difference. Early shed did cause some delay in maturity (Table 7).

Discussion

Crop protection programs for Bt cotton are emerging in Midsouth production areas. There are preventative as well as threshold-based approaches to control bollworms, boll weevil and tarnished plant bug. Some risk adverse decision-makers, concerned about higher tolerance level of bollworm to Bt toxins compared to tobacco budworm, automatically apply synthetic pyrethroid insecticides when faced with high egg numbers. When pest pressure also includes threats from boll weevil, action to control both pests may be warranted. Complications with this approach arise with selection of resistant populations of tarnished plant bug or Heliothines following exposure to synthetic pyrethroids. The approach also can get expensive.

As we gain crop protection experience with Bt cotton, it is apparent that there is potential to overreact to pests in Bt systems just as in conventional cotton. To move to a production system that is economically and biologically sustainable we must move away from crop protection programs that rely solely on pest numbers and thresholds. These thresholds contribute to a production system driven

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by fear and vulnerable to insecticide resistance. Decision-makers must consider crop status in addition to pest population densities. Our future research focus with Bt systems will include an integrated approach to crop management that includes plant monitoring in addition to pest monitoring.

Table 1. Mean number of bollworm eggs and larvae observed per 10 terminals in DP 32B plots 15 July 1998, Marianna, AR.

	Program 1	2	3	4
Bollworm eggs & larvae/10 Terminals	7.5	7.25	5.5	7.5

Table 2. Listing of insecticides, rates and timing for Bt program test

Date	Program	Insecticide(s)	Rate, lb(AI)/acre
June 15	1- 4	Baythroid 2EC	0.034
July 16	1	Baythroid 2EC	0.05
		Larvin 3.2F	0.48
July 20	1, 2	Karate 1EC	0.038
July 27	1, 2	Karate 1EC	0.041
Aug 4	1, 2	Baythroid 2EC	0.036
		Methyl Parathion 4EC	0.266
Aug 10	1, 2	Baythroid 2EC	0.034
		Larvin 3.2F	0.9
	3	Regent 2.5 EC	0.038
Aug 13	1, 2	Karate 1EC	0.035
	3	Regent 2.5EC	0.038
Aug 17	1, 2	Karate 1EC	0.038
	3	Regent 2.5EC	0.038
Aug 21	1	Baythroid 2EC	0.034
	3	Regent 2.5 EC	0.038
Aug 24	1	Baythroid 2EC	0.034
	3	Regent 2.5 EC	0.038
Aug. 28	1	Baythroid 2EC	0.036
	3	Regent 2.5 EC	0.038

Table 3. Insecticide application timing for each treatment in Bt program plots, 1998, Marianna, AR.

Date	Program 1	2	3	4
July 16	1			
July 20	2	1		
July 27	3	2		
Aug 4	4	3		
Aug10	5	4	1	
Aug 13	6	5	2	
Aug 17	7	6	3	
Aug 21	8		4	
Aug 24	9		5	
Aug 28	10		6	

Table 4. Mean yield of Bt Program Plots, 1998, Marianna, AR.

Program	Seedcotton Yield (lb/acre)
1	2969.8
2	2811.8
3	2665.8
4	2020.3
LSD.05	429.6

Table 5. Damaged squares observed on 19 August 1998, Marianna, AR.

Program	Mean no. Damaged squares/25 squares	Squares Damaged (%)	Proportion of Damage caused by each pest: % by weevil	% by bug
1	3.2	12.8	54	46
2	2.0	8.0	75	25
3	10.5	42.0	95	5
4	21.7	86.8	87	13
LSD.05	4.2			

Table 6. First position sheds (%) of fruiting forms recorded 14 August 1998 in Bt Program plots, Marianna, AR.

Program	1st Position Shed (%)
1	35.8
2	36.1
3	56.3
4	60.2

Table 7. Number of days to and date of NAWF=5 (nodes above white flower) in Bt Program plots, 1998, Marianna, AR.

	Program 1	2	3	4
Days to NAWF=5	88	85	91	95
Date of NAWF = 5	Aug 7	Aug 4	Aug 10	Aug 11