Insect Management Strategies Using Insect Growth Regulators in Mississippi Soybeans, 28-2022 Annual Report

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Objectives:

To examine the impact of selected insect growth regulators applied at the R3 to R4 growth stages on insect pest infestations and soybean yield.

Annual

During 2022 experiments were conducted to evaluate selected insect growth regulators applied at the R3 growth stage against lepidopteran pests infesting soybeans. These experiments were conducted at the Delta Research and Extension Center and on commercial farms.

Two leaf bioassay experiments were conducted to evaluate the impact of selected insect growth regulators on soybean looper mortality. While one experiment was conducted using corn earworm. Each experiment also included Prevathon (chlorantraniliprole) as a comparison. Treatments were applied in the first experiment on 8 Jun and on 28 Jul in the second trial. Treated soybean leaves were removed from the plot. Discs were cut from leaves (10 per plot) and leaf disc were placed in insect rearing cups. One second instar larvae were placed into each cup with the leave disc. There were four replicates in each experiment resulting in a total of 40 discs and larvae per treatment. Mortality was determined at 3 days after infestation. Bioassays with soybean looper larvae were conducted at 1, 7, 14, 21, and 28 days after treatment (DAT). Data from these two trials were combined. Corn earworm larvae were also used in the 28 Jul experiment with infestations at 2 hrs after treatment, and at 7, 14, and 21 DAT. At 1 DAT Prevathon, Intrepid, and Diamond resulted in higher mortality of soybean looper than the untreated control (Table 1). At 7 DAT Prevathon resulted in higher mortality compared to all other treatments. At 14 DAT Prevathon, Intrepid, and Diamond resulted in higher mortality than the untreated control. Only Prevathon and Intrepid resulted in higher mortality than the untreated control at 21 and 28 DAT. When corn earworm larvae were infested at 2 hrs after treatment, Prevathon, Intrepid, and Dimilin resulted in greater mortality than that observed in the untreated control (Table 2). At 7 DAT Prevathon, Intrepid, and Diamond resulted in greater mortality than that observed in the untreated control, with only Prevathon resulting in >50% mortality. Only Prevathon and Diamond at 14 DAT and Prevathon at 21 DAT resulted in greater mortality than that observed in the untreated control.

Three large plot experiments were conducted on early planted soybeans on commercial farms near Leland and Hollandale. In these trials plots were 8 to 16 rows wide and the length of the field (plots 1.5-3 acres), and treatments were replicated three times.

Applications were made at the R3-R4 growth stages on 29 Jun (two trials) and 7 Jul (one trial). Trials were sampled weekly out to 30 DAT. No infestations of lepidopteran insect pests were observed during this period (data not shown). Two experiments were conducted on later planted soybeans on commercial farms. Treatments were applied at the R3 growth stage on 29 Jul (Drew trial) and 4 Aug (Greenwood) trial. In these trials plots were 8 to 16 rows wide and the length of the field (plots 1.5-3 acres). Treatments were replicated two times at Drew and three times Greenwood. At the Drew location, no lepidopteran insect pest infestations were observed at 7 and 13 DAT. Low numbers of soybean loopers were observed at 20 DAT, and looper densities exceeded threshold at 28 DAT (Table 3). No differences among treatments were observed on either date. At the Greenwood location, densities of corn earworm and soybean looper were low out to 27 DAT (Table 4). Another trial was conducted on a late planted soybean field following wheat at the Delta Research and Extension Center. Plots were 16 rows wide (ca. 1.5 acres). Treatments were applied at the R3 growth stage on 3 Aug. Soybean looper infestations occurred at 18 DAT. All of the insecticides, except Dimilin, reduced defoliation from soybean loopers at 28 DAT (Table 5). Only Prevathon and Diamond resulted in higher yields than the untreated control.

Two small plot trials were conducted at the Delta Research and Extension Center. Treatments included the insect growth regulators Dimilin, Diamond, and Intrepid along with an untreated control. A diamide insecticide (Prevathon) and a pyrethroid (Warrior II) were included as comparisons. The insecticides were applied with and without a fungicide (Miravis Top) at the R3 growth stage. Treatments were applied on 3 Aug in the first trial and on 18 Aug in the second trial. Treatments were replicated four times in each trial. In the first trial, no interaction between fungicide and insecticide treatments was observed for soybean looper densities on any sample date or for yield. Therefore data for each insecticide treatment with and without fungicide were combined. Differences in soybean looper densities were observed at 15 DAT (Table 6). Plots treated with Prevathon had fewer loopers than those treated with any of the other insecticides, except Intrepid. No differences among treatments for looper densities were observed at 8, 22, 28, or 35 DAT. No differences among treatments were observed for yield. In the second trial no interaction between fungicide and insecticide treatments was observed for soybean looper densities or percent defoliation on any sample date or for yield. At 7 and 13 DAT Prevathon, Intrepid, and Diamond resulted in fewer loopers than the untreated control (Table 7). At 20 DAT differences among treatments were observed, however looper densities had declined dramatically with mean densities <8 larvae / 25 sweeps. Looper densities continued to decline and only 6 larvae were collected from all plots at 27 DAT. Prevathon, Intrepid, and Diamond resulted in less defoliation than the untreated control at 11 and 20 DAT. These treatments also resulted in higher yields than the untreated control (Table 8).

Preliminary data indicate that inclusion of an insect growth regulator in a fungicide application at the R3-R4 growth stage may have utility in certain instances. These would be primarily late planted soybeans. However, the success of this strategy is still dependent on timing of insect infestations.

Results from these studies were presented by the student working on this project at the Mississippi Entomological Society Annual Meeting, the Entomological Society of America Annual Meeting, the Beltwide Cotton Conferences, and at the Southeastern Branch of the Entomological Society of America Annual Meeting. Findings were also presented at the Mississippi State Row Crop Short Course, and the Mississippi Agricultural Consultants Annual Meeting.

Table 1. Impact of selected insecticides on soybean looper mortality at 1, 7, 14, 21, and 28 days after treatment in leaf bioassays I and II.

Treatment/Form.	Rate / acre (oz product)	Percent Mortality (72 hrs after infestation)				
		1 DAT	7 DAT	14 DAT	21 DAT	28 DAT
Prevathon 0.43SC	14.0	95.6a	63.3a	41.4a	47.7a	47.7a
Intrepid 2F	6.0	89.9ab	28.3b	43.0a	24.5b	24.5b
Diamond 0.83EC	6.0	78.5b	33.3b	51.5a	11.1bc	11.1bc
Dimilin 2L	4.0	35.1c	23.6b	32.7ab	15.0bc	15.0bc
Untreated	-	10.7d	5.0c	16.5b	5.0c	5.0c
P>F		<0.01	<0.001	0.02	<0.01	<0.01

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

Table 2. Impact of selected insecticides on corn earworm mortality at 2 hrs, 7, 14, and 21 days after treatment in leaf bioassay.

	Rate / acre	Percent Mortality (72 hrs after infestation)			
Treatment/Form.	(oz product)	2 hrs	7 DAT	14 DAT	21 DAT
Prevathon 0.43SC	14.0	100.0a	90.0a	75.0a	64.4a
Intrepid 2F	6.0	53.9b	48.9b	20.0bc	27.5b
Diamond 0.83EC	6.0	35.0bc	46.4b	42.5b	21.2b
Dimilin 2L	4.0	50.0b	25.0c	22.5bc	19.4b
Untreated	-	17.5c	15.0c	12.5c	12.8b
P>F		<0.01	<0.01	<0.01	<0.01

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

Table 3. Evaluation of selected insecticides applied at the R3 growth stage against soybean looper in a large plot trial at Drew, MS.

Treatment/Form.	Rate / acre (oz product)	Soybean Looper / 25 Sweeps	
		20 DAT	28 DAT
Intrepid 2F	6.0	7.4	25.6
Diamond 0.83EC	6.0	10.6	34.3
Dimilin 2L	4.0	9.4	31.5
Untreated	-	4.4	23.1
P>F		0.39	0.27

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

Table 4. Evaluation of selected insecticides applied at the R3 growth stage against corn earworm and soybean looper in a large plot trial at Greenwood, MS.

	Rate / acre	Corn Earworm / 25 Sweeps			Soybean Looper / 25 Sweeps		
Treatment/Form.	(oz product)	8 DAT	14 DAT	27 DAT	8 DAT	14 DAT	27 DAT
Intrepid 2F	6.0	1.2	0.5	0.1	1.7	1.4c	1.7
Diamond 0.83EC	6.0	0.4	0.0	0.0	1.3	2.2bc	1.9
Dimilin 2L	4.0	1.4	0.6	0.0	4.2	3.7ab	1.5
Untreated	-	2.0	0.8	0.2	3.4	4.9a	1.7
P>F		0.19	0.15	0.19	0.07	0.02	0.95

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

Table 5. Evaluation of selected insecticides applied at the R3 growth stage against soybean looper in a large plot trial at Delta Research & Extension Center.

Treatment/Form.	Rate / acre (oz product)	Percent Defoliation 28 DAT	Yield (bu / acre)
Prevathon	14.0	15.7b	28.1a
Intrepid 2F	6.0	28.3b	19.3ab
Diamond 0.83EC	6.0	23.3b	21.9a
Dimilin 2L	4.0	64.0a	11.8b
Untreated	-	55.0a	11.7b
P>F		<0.0	0.01

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

Table 6. Impact of selected insecticides applied at the R3 growth stage on soybean looper densities at 8, 15, 22, 28, and 35 days after treatment and impacts on yield in Small Plot Trial I at Delta Research & Extension Center.

Treatment/Form.	Rate / acre (oz product)	Soybean Loopers / 25 Sweeps					Yield (bu/acre)
		8 DAT	15 DAT	22 DAT	28 DAT	35 DAT	
Prevathon 0.43SC	14.0	2.6	8.0c	37.9	16.9	8.4	33.7
Intrepid 2F	6.0	3.0	12.6bc	40.8	13.8	10.5	33.4
Diamond 0.83EC	6.0	3.9	14.3ab	37.9	16.4	11.4	29.7
Dimilin 2L	4.0	3.8	16.4ab	43.1	19.0	11.1	31.2
Warrior 2.08CS	1.92	4.9	18.9a	41.0	19.1	8.1	29.5
Untreated	-	2.9	15.2ab	47.7	22.5	7.4	31.5
P>F		0.25	0.02	0.92	0.32	0.30	0.25

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

Table 7. Impact of selected insecticides applied at the R3 growth stage on soybean looper densities at 7, 11, 13, and 20 days after treatment in Small Plot Trial II at Delta Research & Extension Center.

Treatment/Form .	Rate / acre (oz product)	Soybean loopers / 25 sweeps		
		7 DAT	13 DAT	20 DAT
Prevathon 0.43SC	14.0	41.4c	52.5ab	2.6d
Intrepid 2F	6.0	49.8c	32.6c	4.4cd
Diamond 0.83EC	6.0	47.3c	40.5bc	7.4a
Dimilin 2L	4.0	76.8a	46.8ab	7.1ab
Warrior 2.08CS	1.92	55.9bc	53.1a	5.1abc
Untreated	-	68.4ab	54.2a	5.0bc
P>F		<0.01	<0.01	<0.01

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

Table 8. Impact of selected insecticides applied at the R3 growth stage on defoliation at 11 and 20 days after treatment and impact on yield in Small Plot Trial II at Delta Research & Extension Center.

Treatment/Form.	Rate / acre (oz product)	Percent Defoliation 11 DAT	Percent Defoliation 20 DAT	Yield (bu/acre)
Prevathon 0.43SC	14.0	4.3c	6.3c	37.2a
Intrepid 2F	6.0	10.9c	13.1b	36.2a
Diamond 0.83EC	6.0	4.5c	6.5c	35.3a
Dimilin 2L	4.0	22.3a	24.5a	31.9b
Warrior 2.08CS	1.92	21.4a	25.0a	30.0b
Untreated	-	19.1a	22.5a	31.5b
P>F		<0.01	<0.01	<0.01

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