MISSISSIPPI SOYBEAN PROMOTION BOARD
PROJECT NO. 02-2017 (YEAR 1)
2017 ANNUAL REPORT

Title: Refinement/Validation of Soybean Looper Thresholds in Mississippi Soybeans

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BACKGROUND AND OBJECTIVES

Soybean looper is an annual pest of soybeans in Mississippi. During 2006 to 2015 the percentage of soybeans in Mississippi treated for soybean looper ranged 2.8% to 47.3%, with greater than 25% of the soybeans treated in seven of the ten years. Also, the control cost has increased from $9.00/acre during 2006 to $16.00/acre during 2015.

Recently the defoliation threshold (20% defoliation) for reproductive stage soybeans has been validated. The current action threshold for soybean looper infesting reproductive stage soybeans in Mississippi is ≥8 larvae one half inch or larger per row foot using drop cloth sampling, or ≥19 larvae one half inch or larger using sweep net sampling. Annually these thresholds are used to make pest management decisions for soybean looper infestations which can be a substantial cost to growers.

A search of the literature failed to find any published reference on how the current soybean looper threshold (based on insect counts) was developed or how this threshold relates to the defoliation threshold. With soybean looper management being a significant investment for growers and the defoliation threshold having been recently validated, the soybean looper (insect count) threshold should also be refined/validated.

The Diamide insecticides have been the cornerstone of caterpillar pest management, including soybean looper and corn earworm, since their introduction. Reports of inconsistent control of soybean looper with Diamide insecticides occurred during 2016 in Mississippi and in other Southern states. Efficacy of these products in replicated trials conducted during 2016 in Mississippi was observed to be lower than that observed in previous years. These results are consistent with results from both field and laboratory studies conducted in other areas of the Midsouth and the Southeastern U.S. Efficacy trials evaluate alternative products for soybean looper management and laboratory assays to monitor Diamide insecticide performance will be conducted.

OBJECTIVE(S)

The first objective of this project will be to refine/validate the treatment threshold for soybean looper infesting soybeans in Mississippi. This will allow producers and consultants to make more informed treatment decisions for soybean looper. As a component of this objective, comparisons between drop cloth and sweep net sampling methods will be conducted. This will allow for the development of a conversion factor between the two methods and to estimate the sampling efficiency of the methods.

The second objective will be to evaluate alternative insecticides (non-Diamide products) for soybean looper management. Representative Diamide insecticides will also be included in trials for comparison. Results of these studies will serve as field-based performance and susceptibility monitoring efforts and

will be used to make recommendations to growers and consultants.

The third objective will be to monitor the response of soybean looper populations from Mississippi soybeans to Diamide insecticides in laboratory assays. Laboratory assays are often able to detect changes in insect response/susceptibility to insecticides before field control issues are observed or become widespread. The Baseline responses of soybean looper to several insecticides including representative Diamide insecticides have been established. Results from these assays will be compared to baseline responses. Since there is potential for numerous collections during the same time period, collections will be shared with other researchers investigating soybean looper response/susceptibility to insecticides.

REPORT OF PROGRESS/ACTIVITY

Objective 1.

Experiments were conducted to investigate the relationship between soybean looper density and percent defoliation. Plots were sampled with a sweep net to determine the number of soybean looper larvae per 25 sweeps (numbers <1/2inch and ≥1/2 inch in length). On the same day as the sweep net sampling, 5 plants per plot were randomly collected and the area of all leaves on each plant was determined using a Li-Cor leaf area meter and the mean leaf area per plant was determined. The control plots were sprayed multiple times with Prevathon to minimize soybean looper feeding. Percent defoliation was determined by comparing the leaf area of the control plots and the infested plots.

A significant relationship between the total number of soybean looper and percent defoliation was observed (Figure 1). For every increase of 1 larvae per 25 sweeps, defoliation increased 0.64%. A significant relationship between the number of soybean looper larvae ≥1/2 inch in length and percent defoliation was also observed (Figure 2). For every increase of 1 larvae ≥1/2 inch in length per 25 sweeps, defoliation increased 0.8%.

Studies were also conducted to compare sweep net sampling to drop cloth sampling. These were conducted on four producer fields with natural infestations of soybean looper. A minimum of 8 samples with each method was collected at each site. When multiple samplers were used, each sampler collected samples using each method. The data collected using both sampling method were paired for each sampler.

A significant relationship between the total numbers of soybean looper larvae collected using the sweep net and drop cloth methods was found (Figure 3). For every soybean looper larvae collected using the drop cloth method, 0.3 larvae were collected with the sweep net method. There was also a significant relationship between the numbers of soybean looper larvae ≥1/2 inch in length collected using each method (Figure 4). For every soybean looper larvae ≥1/2 inch in length collected using the drop cloth method, 0.43 larvae were collected with the sweep net method.

Objective 2.

Studies were conducted to evaluate selected insecticides for management of soybean looper infestations, including non-Diamide class insecticides. In the first study, all of the insecticide treatments, except Besiege (Diamide) and Prevathon (14 oz/acre, Diamide), significantly reduced soybean looper densities

compared to the non-treated control at 3 days after treatment (DAT) (Table 1). Also, plots treated with Intrepid Edge (both rates, IGR and Spinosyn), Radiant (both rates, Spinosyn), or Steward (Oxydiazine) had significantly fewer soybean looper larvae compared to plots treated with Besiege (Diamide), Prevathon (14 oz/acre, Diamide), or Intrepid (both rates, IGR).

At 6 DAT all of the insecticide treatments resulted in significantly lower densities of soybean looper larvae than the non-treated control. Plots treated with Intrepid Edge (both rates, IGR and Spinosyn), Radiant (both rates, Spinosyn), or Steward (Oxydiazine) had significantly fewer soybean looper larvae compared to plots treated with Besiege (Diamide), Prevathon (both rates, Diamide), or Intrepid (both rates, IGR).

At 10DAT all of the insecticide treatments, except Besiege (Diamide), resulted in significantly lower densities of soybean looper larvae than the non-treated control. Intrepid Edge (both rates, IGR and Spinosyn) and Steward (Oxydiazine) significantly reduced soybean looper densities compared to Besiege (Diamide), Prevathon (both rates, Diamide), also.

All of the insecticide treatments resulted in significantly higher soybean yield compared to the non-treated control. Plots treated with Prevathon (20 oz/acre, Diamide) had significantly higher yields than plots treated with Radiant (2 oz/acre, Spinosyn) or Prevathon (14 oz/acre, Diamide).

In the second trial, all of the insecticide treatments resulted in significantly lower densities of soybean looper compared to the non-treated control at 3, 6, and 10 DAT (Table 2). Also, Intrepid Edge (IGR and Spinosyn) resulted in significantly fewer soybean loopers per 25 sweeps compared to Diamond (IGR) at 3 DAT. All of the insecticide treatments resulted in significantly higher yields compared to the non-treated control.

In the third study, all of the insecticide treatments resulted in significantly lower densities of soybean looper compared to the non-treated control at 3, 6, and 10 DAT, except Cavalier (IGR) at 3 and 10 DAT (Table 3). At 10 DAT, Intrepid Edge (IGR and Spinosyn) resulted in significantly fewer larvae than any of the other insecticide treatments. Only Intrepid Edge (IGR and Spinosyn) and Prevathon (Diamide) resulted in significantly higher yields compared to the non-treated control.

Objective 3.

Soybean looper infestations did not persist in the field for an extended period of time. The unusually high rainfall and a tropical storm during August, followed by a cold front that lowered temperatures considerably, triggered outbreaks of multiple diseases in soybean looper populations. These diseases caused soybean looper densities to decline rapidly to almost non-existent levels.

Seven soybean populations were collected from different locations. Insects from these collections were infected with multiple diseases and the number of insects from these collections declined rapidly and failed to reproduce in the laboratory. Therefore, no assays could be conducted. Additional attempts to collect populations were made during late Aug. and Sep. after weather conditions had stabilized; however, soybean looper densities were not sufficient to make collections.

IMPACTS AND BENEFITS TO MISSISSIPPI SOYBEAN PRODUCERS

Results from these studies will be used to validate/refine treatment thresholds for soybean looper based on sweep net sampling and relate count-based scouting with the defoliation threshold. Results will also help refine treatment recommendations for soybean looper management.

END PRODUCTS–COMPLETED OR FORTHCOMING

2017 Mississippi Entomological Association Meeting. October 16-17, 2017 Starkville, MS.

2018 Entomological Society of America Southeastern Branch Annual Meeting. March 4-7, 2018. Orlando, FL.

Results were also presented at >20 grower meetings throughout the state of Mississippi during the winter/spring of 2017-2018.

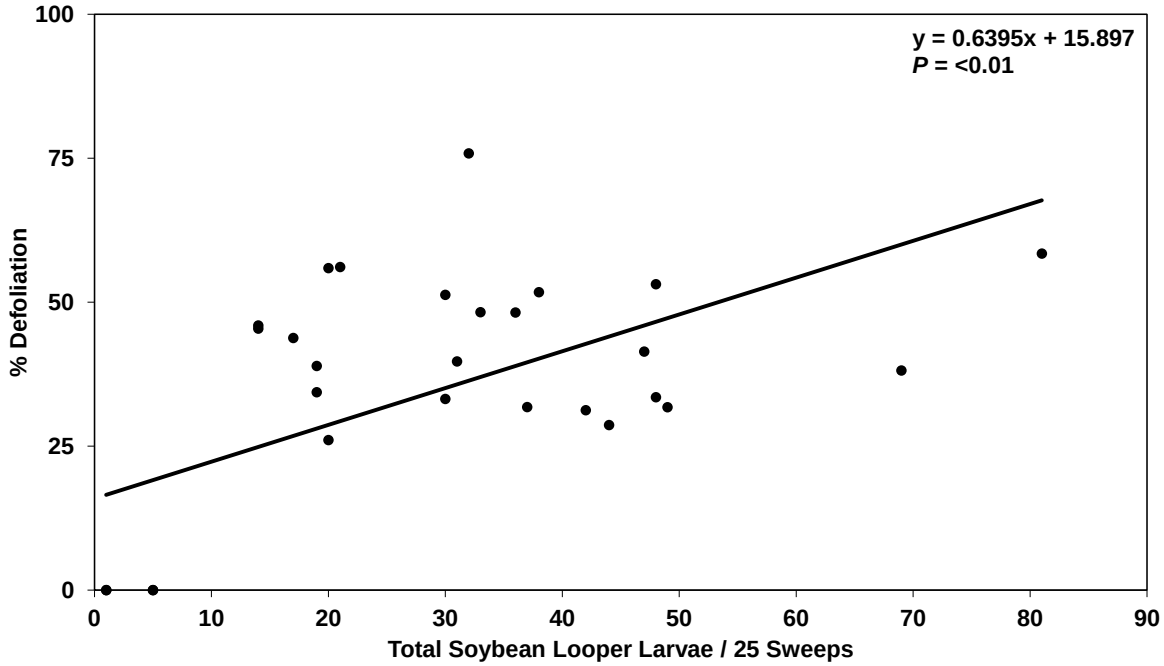

Figure 1. Relationship between total numbers of soybean looper larvae per 25 sweeps and percent defoliation of soybean.

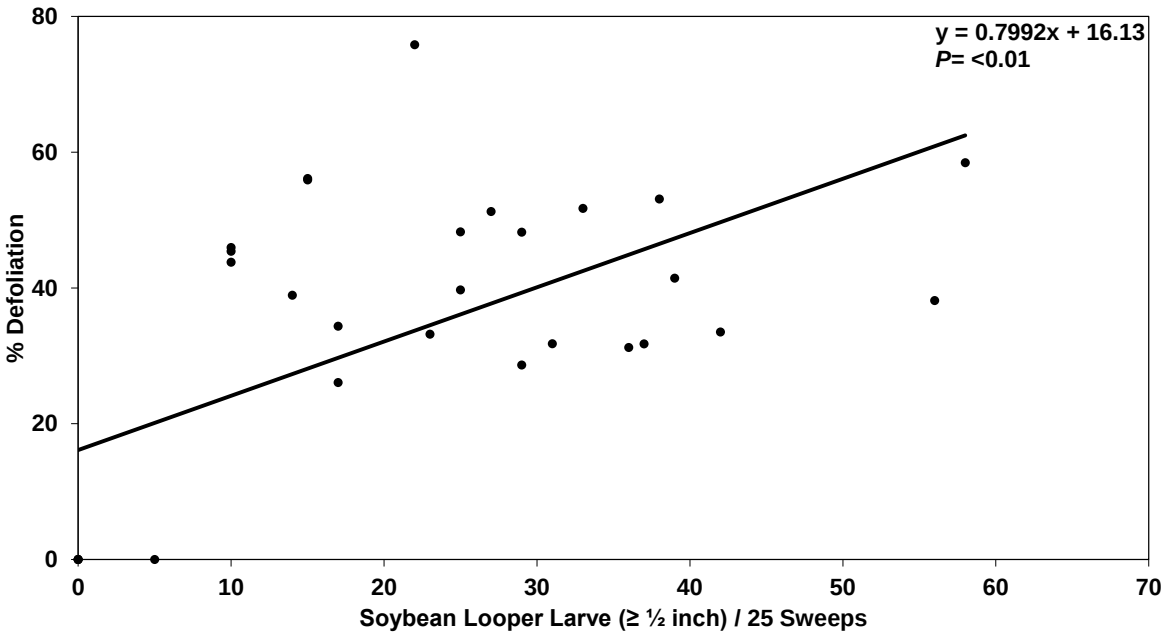

Figure 2. Relationship between numbers of soybean looper larvae ≥1/2 inch in length per 25 sweeps and percent defoliation of soybean.

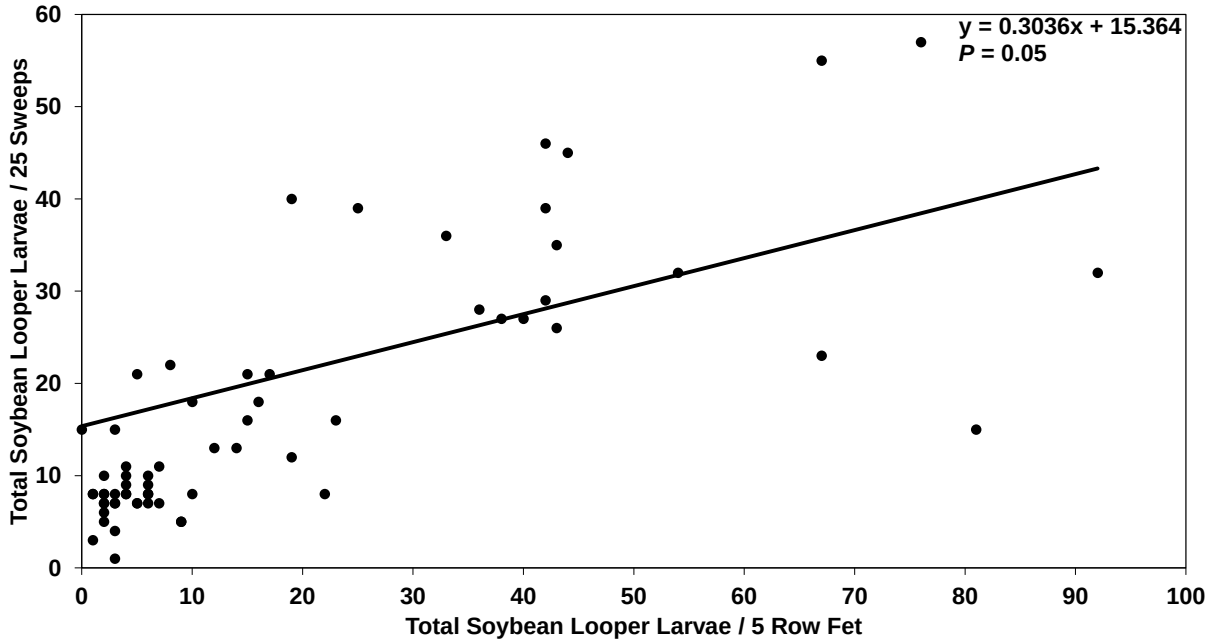

Figure 3. Relationship between total numbers of soybean looper larvae per 5 row ft using drop cloth sampling method and total numbers of soybean looper larvae per 25 sweeps using sweep net sampling method.

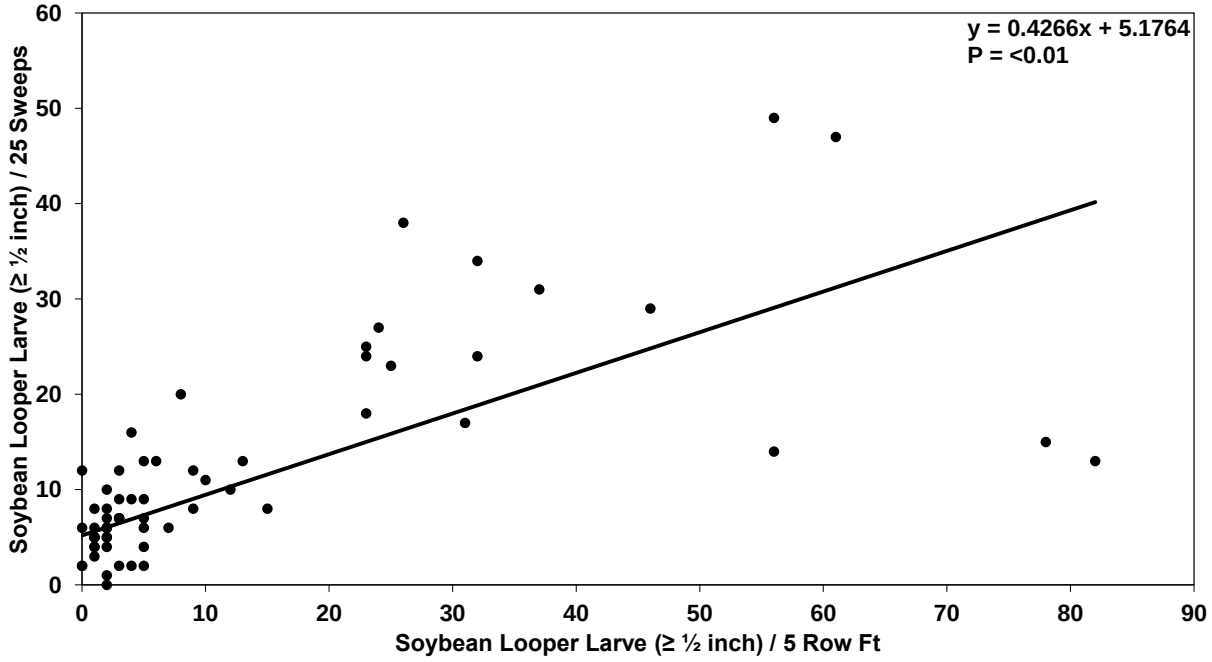

Figure 4. Relationship between numbers of soybean looper larvae 1/2 inch in length per 5 row ft using drop cloth sampling method and numbers of soybean looper larvae ≥1/2 inch in length per 25 sweeps using sweep net sampling method.

Table 1. Performance of selected insecticides against soybean looper, 1.

Treatment/Form.	Rate (oz/acre)	3 DAT[1]	6 DAT	10 DAT	Yield (bu/acre)
Intrepid Edge 3F[2]	4.0	10.0fg	1.5c	1.1d	42.4ab
Intrepid Edge 3F[2]	5.0	6.6g	2.6c	0.7d	40.5ab
Besiege 1.252SC[3]	10.0	46.8abc	10.1b	10.9ab	44.0ab
Radiant 1SC[4]	2.0	10.1fg	1.9c	3.1cd	36.7b
Radiant 1SC[4]	4.0	5.9g	1.3c	1.7cde	39.3ab
Steward 1.25EC[5]	9.0	14.6ef	2.9c	0.9d	43.1ab
Prevathon 0.43SC[6]	14.0	48.6ab	10.1b	5.2bc	36.9b
Prevathon 0.43SC[6]	20.0	24.8de	14.4b	4.8bc	47.5a
Intrepid 2F[7]	4.0	28.9bcd	8.9b	1.7cd	40.5ab
Intrepid 2F[7]	6.0	27.6cd	12.7b	2.5cde	39.9ab
Non-Treated	-	52.9a	35.1a	19.1a	24.2c
P>F		<0.01	<0.01	<0.01	<0.01

Means within columns followed by a common letter are not significantly different (FPLD *P>F* 0.05).
[1]Days after emergence.
[2]Active ingredient – methoxyfenozide plus spinetoram, Class – IGR and Spinosyn.
[3]Active ingredient – chlorantraniliprole plus λ cyhalothrin, Class – Diamide and pyrethroid.
[4]Active ingredient – spinetoram, Class - Spinosyn.
[5]Active ingredient – indoxacarb, Class - Oxydiazine.
[6]Active ingredient – chlorantraniliprole, Class - Diamide.
[7]Active ingredient – methoxyfenozide, Class – IGR.

Table 2. Performance of selected insecticides against soybean looper, 2.

Treatment/Form.	Rate (oz/acre)	3 DAT[1]	6 DAT	10 DAT	Yield (bu/acre)
Intrepid Edge 3F[2]	5.0	2.3c	7.0b	2.3b	42.5a
Prevathon 0.43SC[3]	14.0	7.6bc	12.3b	5.3b	41.6a
Diamond 0.43EC[4]	6.0	9.5b	12.0b	4.3b	43.7a
Non-Treated	-	29.8a	36.0a	12.3a	28.9b
P>F		<0.01	<0.01	<0.01	0.02

Means within columns followed by a common letter are not significantly different (FPLD *P>F* 0.05).
[1]Days after emergence.
[2]Active ingredient – methoxyfenozide plus spinetoram, Class – IGR and Spinosyn.
[3]Active ingredient – chlorantraniliprole, Class - Diamide.
[4]Active ingredient – novaluron, Class – IGR.

Table 3. Performance of selected insecticides against soybean looper, 3.

Treatment/Form.	Rate (oz/acre)	3 DAT[1]	6 DAT	10 DAT	Yield (bu/acre)
Intrepid Edge 3F[2]	5.0	0.3b	1.8b	1.3c	39.7a
Prevathon 0.43SC[3]	14.0	15.5b	12.5b	5.0b	36.4a
Cavalier 2F[4]	8.0	21.4a	17.5b	8.5a	29.2b
Non-Treated	-	13.7a	28.0a	10.5a	22.9c
P>F		<0.01	<0.01	<0.01	<0.01

Means within columns followed by a common letter are not significantly different (FPLD *P>F* 0.05).
[1]Days after emergence.
[2]Active ingredient – methoxyfenozide plus spinetoram, Class – IGR and Spinosyn.
[3]Active ingredient – chlorantraniliprole, Class - Diamide.
[4]Active ingredient – diflubenzuron, Class – I