

EFFICACY OF SOIL AND FOLIAR APPLIED INSECTICIDES AGAINST SILVERLEAF WHITEFLY IN SNAP BEANS

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Introduction

Silverleaf whitefly, *Bemisia tabaci*, is a severe pest of snap beans grown in the fall in some areas of south Georgia. It appears to be emerging as a more consistent pest in areas outside of historical problems. This test was conducted at the University of Georgia's Tifton Vegetable Park to evaluate the efficacy of insecticides against this pest.

Materials and Methods

Snap beans (variety: Nash) were direct seeded on 3 Sept. 2009 into single rows on 6 foot beds. Experimental plots were one row (treated as 3 feet) by 23 feet long and were arranged in a randomized complete block design with four replications. Treatments evaluated included soil applied insecticides and foliar applied insecticides. The soil applied insecticides were applied as a drench treatment on 5 Sept. Each plot was treated with the designated amount of insecticide applied in 3 liters of water poured in a four inch band along the row. After application of these insecticides, the entire test was watered with a roughly 12 inch band over the row with 50 gallons of water per 500 feet of row. Foliar applications were made on 19 and 26 Sept. and 2 and 10 Oct. (four weekly applications). Foliar applications were made with a CO₂ pressurized backpack sprayer (60 PSI) in 40 GPA with 3 hollow-cone nozzles per row (one over-the-top, two on drops). All foliar treatments included a tank mix with DyneAmic at 0.25% v/v.

Soil applied insecticides evaluated were: Venom 70SG at 6 oz/ac and Coragen 1.67SC at 5 oz/ac. Foliar applied insecticides were: Leverage at 3.5 oz/ac, Oberon 2 SC at 8.5 oz/ac, Movento at 5 oz/ac, Knack at 8 oz/ac, Assail 30SG at 4 oz/ac, Courier 40SC 13.6 oz/ac, Rimon at 12 oz/ac, and Bifenthrin 2EC at 6.4 oz/ac. A non-treated check was included for comparison.

Immature whitefly densities.

One leaf was selected from each of three randomly selected plants in each plot on each sample date. Leaves were selected based on age and potential for established immature whitefly populations (older leaves). Each leaf was examined under a stereo-microscope at 15x magnification and a single field of view was counted for whitefly immature stages. Eggs, small nymphs (1st and 2nd instars) and large nymphs (3rd and 4th instars) were counted (some stages were not counted on some dates as age of the population on the selected leaf minimized the numbers of that stage).

Adult whitefly emergence. Infested leaves or plants were collected on three dates and held in paper bags for emergence of adults. On 8 Oct., ten first-trifoliolate leaves were collected from each plot (unifoliolate leaves were targeted, but miscommunication resulted in selection of trifoliolate leaves). On 15 and 23 Oct., three plants were randomly selected from each plot and held for adult emergence. Leaves/plants were held long enough to allow for emergence and death of adults from the later instar nymphs present at the time of collection. The samples were then examined for adult whiteflies and the number of adults was counted or estimated for each sample. Where adult densities were low (less than 300), whiteflies were directly counted. Where densities were high, the adults were sucked into a pipette to determine volume and the numbers estimated based on 9445 adults per ml (based on published data).

Leaf damage from cucumber beetle adults was evident throughout the test. On 3 Oct., each plot was visually examined and the number of **Aspots** within the plot with obvious beetle feeding was counted.

All data were analyzed with the PROC ANOVA procedure of PC-SAS. Where significant differences were detected ($P < 0.05$), means were separated with LSD ($P = 0.05$). Adult emergence data was analyzed as raw numbers and after data transformation ($\text{Log of } X+1$) to account for extreme variability in some treatments (particularly among treatments that did not provide excellent control).

Results and Discussion

Whitefly eggs.

No significant effects were detected in egg densities until after the 3rd application, when Knack had significantly more eggs than all other treatments including the Check. This is normal with this product as it prevents eggs from hatching and results in accumulation of eggs.

Small nymphs.

The soil applied drench treatments showed significant reductions in egg counts at 22 and 27 days after treatment (25 and 30 Sept.). Foliar treatments had relatively minor effects until after the 4th application (a few were significant after the second, but relatively minor reductions). On Oct. 14, only Movento, Knack, Courier and Oberon showed significantly lower small nymph densities than the Check.

Large nymphs.

Low populations and variability prevented detection of any differences after the first application. Coragen appeared to provide good suppression of populations through 33 days after application (6 Oct.). Among the foliar treatments, Leverage and Brigade actually resulted in increased densities after the 3rd application. Rimon, Oberon, Courier, Knack, and Movento reduced densities by the 4th application, with Courier and Movento showing significant reductions after the 2nd application.

Adult emergence.

Soil drench treatments did not show significant effects, but the first sample was collected 35 days after treatment. Mean separations of the transformed data (Log of X+1) indicate the best and longest suppression of adult emergence with Courier, Knack and Movento, followed by Rimon and Oberon. Assail separated from the Check on a single date, whereas, Leverage and Brigade were not significantly different from the Check.

Egg counts and small nymph counts appear to be poor indicators of efficacy for most of these products (possible exception of soil drench products). Whitefly populations were not evaluated soon enough to determine the efficacy and residual of the Venom soil drench, but Coragen did appear to provide significant reductions at least through 33 days after treatment. (Venom may have performed poorly, as did Assail - this effect on snap beans has been previously noted for neonicotinoid insecticides but can not be explained). The best control in this test was provided by Movento, Courier and Knack. Oberon and Rimon also showed significant reductions, but were not as consistent. Assail provided minimal control on snap beans (yet continues to work on squash). Leverage and Brigade provided no control (indicating probably pyrethroid resistance in the whitefly population).

Cucumber beetle adult feeding.

The greatest suppression of beetle feeding was seen with the pyrethroid insecticides (Brigade and Leverage [which contains baythroid]) and Assail, which were the only treatments significantly different from the Check.

Snap bean test, TVP, 2008.

Treatment	SLWF eggs per 3 fields of view			No. of beetle damaged spots per plot
	Unifoliolate leaves		First trifoliolate	
	25 Sept.	30 Sept.	6 Oct.	3 Oct.
	6 DAT-1	4 DAT-2	4 DAT-3	1 DAT-3
Check	118.00 a	68.50 a	102.50 b	13.50 ab
Knack	107.00 a	101.00 a	177.50 a	9.75 abc
Assail	135.33 a	90.25 a	92.50 bc	5.50 cde
Venom (soil)**	60.00 a	49.50 a	92.50 bc	15.00 a
Coragen (soil)**	45.33 a	67.00 a	77.50 bc	12.25 ab
Oberon	106.00 a	82.75 a	77.00 bc	10.50 abc
Courier	173.33 a	65.75 a	75.00 bc	8.75 bcd
Rimon	80.00 a	78.00 a	68.50 bc	11.50 ab
Brigade	117.33 a	89.50 a	67.50 bc	1.50 e
Movento	71.33 a	51.50 a	66.50 bc	11.25 ab
Leverage	116.67 a	60.00 a	53.00 c	4.00 de

Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05).

** Days after treatment for the soil applied treatments were:

25 Sept. = 22 days

30 Sept. = 27 days

6 Oct. = 33 days

Snap bean test, TVP, 2008.

Treatment	SLWF small nymphs per 3 fields of view			
	Unifoliolate leaves		First trifoliolate	
	25 Sept.	30 Sept.	6 Oct.	14 Oct.
	6 DAT-1	4 DAT-2	4 DAT-3	4 DAT-4
Check	218.75 a	302.50 ab	153.00 a	116.00 a
Venom (soil)	73.25 c	112.75 e	164.50 a	125.00 a
Coragen (soil)	97.75 bc	56.75 e	132.00 a	129.00 a
Leverage	233.25 a	280.00 abcd	87.75 a	80.50 abc
Brigade	198.50 a	272.50 abcd	156.50 a	110.00 a
Assail	247.00 a	297.50 abc	150.00 a	87.50 ab
Rimon	178.75 ab	210.00 d	141.50 a	70.00 abcd
Oberon	209.25 a	215.00 cd	135.00 a	21.00 bcd
Courier	168.25 ab	297.50 abc	195.00 a	18.50 bcd
Knack	204.50 a	317.50 a	52.50 a	5.00 cd
Movento	183.00 a	222.50 bcd	100.25 a	0.00 d

Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05).

** Days after treatment for the soil applied treatments were:

25 Sept. = 22 days

30 Sept. = 27 days

6 Oct. = 33 days

14 Oct. = 41 days

Snap bean test, TVP, 2008.

Treatment	SLWF large nymphs per 3 fields of view				
	Unifoliolate leaves			First trifoliolate	
	25 Sept.	30 Sept.	6 Oct.	6 Oct.*	14 Oct.
	6 DAT-1	4 DAT-2	4 DAT-3	4 DAT-3	4 DAT-4
Check	7.00 abc	27.50 abc	150.25 cd	22.00 a	205.75 ab
Venom (soil)	2.00 abc	17.25 bcd	118.50 cde	23.25 a	232.50 a
Coragen (soil)	0.00 c	0.25 d	13.50 f	9.25 a	81.00 cde
Leverage	8.25 ab	32.75 abc	262.50 ab	21.00 a	125.00 abcd
Brigade	8.00 ab	37.00 ab	262.75 a	49.50 a	175.00 abc
Assail	9.50 a	38.25 a	164.00 cd	45.25 a	105.25 bcde
Rimon	1.50 bc	25.00 abc	53.50 ef	17.00 a	74.75 cde
Oberon	2.00 abc	15.75 cd	77.25 def	57.00 a	41.50 de
Courier	1.00 bc	1.75 d	9.25 f	27.50 a	4.00 e
Knack	9.25 a	28.75 abc	172.25 bc	53.75 a	14.00 e
Movento	0.25 c	0.50 d	0.00 f	0.00 a	0.00 e

Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05).

* Differences were detected at P=0.1

** Days after treatment for the soil applied treatments were:

25 Sept. = 22 days

30 Sept. = 27 days

6 Oct. = 33 days

14 Oct. = 41 days

Snap bean test, TVP, 2008.

Treatment	Number of SLWF adults emerged					
	Per 10 trifoliates		Per 3 plants			
	8 Oct. (6 DAT-3)		15 Oct. (5 DAT-4)		23 Oct. (13 DAT-4)	
	Adults	Log (X+1)	Adults	Log (X+1)	Adults	Log (X+1)
Check	289.75 ab	5.61 a	1794.5 abc	7.36 a	1652.8 abc	7.36 a
Venom (soil)	147.25 bcd	4.83 a	1959.8 ab	7.36 a	3329.3 a	7.71 a
Coragen (soil)	132.25 bcd	4.73 a	1265.0 abc	6.66 ab	1652.8 abc	7.32 a
Leverage	156.25 bcd	4.64 a	2550.3 a	7.32 a	1048.8 bc	6.62 a
Brigade	341.00 a	5.63 a	2314.0 a	7.55 a	2608.8 ab	7.22 a
Assail	77.75 cd	3.08 b	1818.3 abc	7.43 a	1251.8 bc	6.82 a
Rimon	122.50 bcd	4.69 a	354.3 bc	5.17 bc	79.8 c	4.38 b
Oberon	191.50 abc	4.91 a	308.5 bc	4.83 c	61.0 c	3.82 b
Courier	15.25 d	2.05 b	11.3 c	2.22 de	8.5 c	2.00 c
Knack	9.50 d	2.09 b	11.3 c	2.40 d	5.5 c	1.65 c
Movento	8.00 d	2.00 b	1.8 c	0.72 e	33.5 c	2.00 c

Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05).

* Differences were detected at P=0.1

** Days after treatment for the soil applied treatments were:

8 Oct. = 35 days

15 Oct. = 42 days

23 Oct. = 51 days