

# EVALUATION OF SOIL DRENCH AND FOLIAR APPLIED INSECTICIDES FOR CONTROL OF WHITEFLY ON SQUASH

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## Introduction

The sweetpotato whitefly (a.k.a silverleaf whitefly) is a key pest of many vegetable crops grown in the fall in south Georgia. It is particularly damaging in squash, as even low densities of this pest can result in silverleaf symptoms. The neonicotinoid insecticides have been the cornerstone of whitefly management for more than a decade and results in 2006 trials suggested that resistance may be developing in south Georgia. Thus, it is imperative that we evaluate additional chemistries for control of whiteflies. This test was conducted to evaluate the efficacy of soil applied and foliar applied insecticides for control of sweetpotato whitefly.

## Materials and Methods

A small plot trail was conducted at the UGA Horticulture Farm in Tifton, Georgia. Squash (var. Destiny III) was direct seeded, with a single row on six foot beds. Once plants emerged, plots were established in a RCB design with three replications. Experimental plots were one row by 19 feet. Although the rows were on six foot beds, for application purposes they were treated as if they were on 3 foot beds.

Three insecticide drench treatments were included in the test. Admire Pro was applied at 10.5 oz/ac, Venom at 6 oz/ac and Coragen at 5 oz/ac. Drench treatments were applied shortly after stand establishment (only cotyledons were present). The insecticide required for application to a single plot was mixed in three liters of water. The treatment was poured over the row and the row was immediately drenched with water. The water drench consisted of a 6 to 8 inch band with about 1 gallon per 10 feet.

The foliar insecticide treatments evaluated were Venom at 3 oz./ac, Bifenthrin at 0.1 lb AI/ac + Orthene at 0.5 lb AI/ac, Knack at 8 oz/ac + Thiodan at 0.75 lb AI/ac, Oberon at 8.5 oz/ac, and Coragen at 5 oz/ac + DyneAmic 0.5%. A non-treated Check was included for comparison. Foliar insecticides were applied with a CO<sub>2</sub> pressurized backpack sprayer (60 PSI) in 40 GPA, with 3 hollow-cone nozzles per row (one over-the-top and two on drops).

The soil drench applications were applied 11 Sept. Foliar insecticide treatments were applied on 17, 24, and 30 Sept. In addition to the treatments being evaluated, the entire test was treated with bifenthrin at 0.1 lb AI/ac + Orthene at 0.5 lb AI/ac on 14, 20 and 27 Sept. These treatments were intended to aid in whitefly suppression and allow for better evaluation of the experimental treatments under extreme pest pressure.

Plots were evaluated for silverleaf symptoms and plant vigor. Silverleaf was rated as follows: 0 = no silverleaf, 1 = light silverleaf with a spotty distribution, 2 = light silverleaf but throughout the plot, 3 = moderate spots of silverleaf in the plot, 4 = moderate silverleaf throughout the plot, 5 = heavy spots of silverleaf, 6 = heavy silverleaf throughout the plot, 7 = heavy silverleaf and most plants severely stunted, and 8 = most plants in the plot dead. Plant vigor ratings consisted of the following: 1 = best plots in the test (most growth), 2 = intermediate plots, 3 = worst plots still alive, and 4 = most plants dead.

Data were analyzed with the PROC ANOVA procedure of PC-SAS. Where significant differences were detected ( $P < 0.05$ ), means were separated with LSD ( $P = 0.05$ )>

## Results and Discussion

It should first be noted that no silverleaf symptoms were noticeable in the test on 21 Sept. (4 days after the first foliar application. On 24 Sept. (7 days after the first foliar application and 13 days after the soil applications) several treatments showed severe silverleaf symptoms and some showed stunting. The Venom foliar treatment provided the most suppression of silverleaf on the first sample date, followed by the three soil treatments with moderate levels of silverleaf. The soil applications had lost their efficacy as silverleaf progressively worsened with subsequent sample dates. The Venom foliar treatment was the only treatment to maintain silverleaf ratings below a 4 for the entire test (4 = moderate symptoms throughout the plot). The Oberon and the Bifenthrin+Orthene treatments generally had no impact on silverleaf development and resembled the Check in development of silverleaf and eventual death of plants. The Coragen foliar treatment did not prevent development of silverleaf, but did maintain plant survival and moderate growth. The Knack+Thiodan treatment appeared to be providing some recovery of the plants as the silverleaf ratings declined on the final sample date.

Plant vigor ratings followed similar trends as the silverleaf ratings. The soil applied treatments initially were rated best to intermediate, but both Admire Pro and Coragen were rated progressively worse in subsequent ratings. The Venom soil treatment maintained good plant vigor ratings despite heavy silverleaf symptoms. The Venom foliar treatment was rated among the better plots throughout the test. As with the silverleaf symptoms, the Oberon and the Bifenthrin+Orthene treatments performed poorly, the Coragen foliar treatment was intermediate, and the Knack+Thiodan treatment showed some indication of recovery in the final rating.

The greatest concern in the results of this test is the relatively poor results with the neonicotinoid insecticides, relative to expected results. The relatively poor performance of the neonicotinoid insecticides, and all of the other insecticides in this test, can be explained in part by the extreme pest pressure. However, these products typically provide excellent control of whiteflies. The Admire and Venom drench treatments should prevent silverleaf symptoms for a minimum of three to four weeks, however, silverleaf was moderate to severe in both treatments within two weeks of the application. Similarly, the Venom foliar treatment typically prevents, or at least halts, development of silverleaf. Results with these products is indicative of resistance to the neonicotinoid group of insecticides (and has been supported by laboratory bioassays). Also of concern is the very poor results with bifenthrin+orthene. This treatment was applied twice each week (once as the evaluation treatment and once as a full test suppression treatment) and failed to provide any noticeable activity. Laboratory bioassays also indicated resistance to bifenthrin and these data indicate the resistance was severe enough to cause a complete field failure.

Coragen does represent a new chemistry for use against whiteflies. While Coragen did not provide the level of control experienced in some test, it did show good activity under extreme pest pressure. This product should add a valuable tool for both pest management and resistance management.

Table 1. Plot ratings for silverleaf and plant vigor, sweetpotato whitefly efficacy study in squash, UGA Horticulture Farm, Tifton, Georgia, 2007.

Treatment	App. type	Silverleaf Ratings				Vigor Ratings		
		24 Sept.	28 Sept.	4 Oct.	12 Oct.	28 Sept.	4 Oct.	12 Oct.
Check		6.8 ab	7.5 a	8.0 a	8.0 a	3.3 ab	4.0 a	4.0 a
Admire Pro	Soil	4.7 c	5.7 c	7.0 b	7.8 a	2.0 cd	3.2 bc	3.8 a
Coragen	Soil	4.7 c	5.8 c	6.0 c	7.0 b	2.0 cd	2.7 cd	3.2 b
Venom	Soil	4.0 c	5.8 c	6.0 c	6.0 c	1.0 e	1.0 f	1.2 e
Bifenthrin +Orthene	Foliar	6.5 ab	6.7 b	7.7 a	8.0 a	2.8 b	3.7 ab	4.0 a
Oberon	Foliar	7.0 a	7.3 a	8.0 a	8.0 a	3.7 a	4.0 a	4.0 a
Coragen	Foliar	6.0 b	5.7 c	5.8 c	6.0 c	2.0 cd	2.0 e	2.0 c
Knack +Thiodan	Foliar	6.2 ab	6.0 c	6.2 c	4.3 d	2.2 c	2.2 de	1.7 d
Venom	Foliar	3.0 d	3.7 d	3.7 d	3.7 e	1.5 de	1.3 f	1.0 e

Sept 21 - there was no silverleaf in the test.

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