IGRs on Fungus Gnats and Western Flower Thrips

A close-up of a yellow sticky card used to monitor thrips and fungus gnats. (All Photos courtesy of Scott Ludwig)

Evaluation of medium-applied IGRs against fungus gnat and western flower thrips populations on African violets.

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The impact of fungus gnat larvae on greenhouse crops has been difficult to assess since feeding damage occurs on the root system within the potting medium. The larvae feed on fungi and organic matter in the media, in addition to feeding on healthy and diseased plant tissue. Feeding damage to the roots of healthy plants has been shown to predispose the plant to infection by plant pathogens. The ability of adult fungus gnats to transmit pathogens is also of concern. Fungus gnats have been recorded to vector the pathogen responsible for verticillium wilt, root and stem rots, damping off, black root rot and fusarium wilt.

Western flower thrips are also difficult to manage in greenhouse production systems. This pest not only causes significant damage to foliage and flowers of susceptible plants but also is capable of vectoring tospoviruses. Western flower thrips management has become extremely difficult because thrips have developed resistance to many of the major classes of insecticides commonly used in conventional management programs. Another challenge to the management of western flower thrips is that late second instar nymphs migrate off the plant into the potting medium where the insect remains for two additional stages until adult emergence. This aspect of the lifecycle makes management difficult since these immature stages are not exposed to foliar insecticide applications. Adults emerging from the medium are capable of dispersing throughout the greenhouse. In addition, first instar nymphs that fed previously on virally infected foliage are capable of transmitting the virus to new susceptible plants as adults.

An earlier study by Scott Ludwig and Ronald Oetting at the University of Georgia, Athens, Ga., found that three insect growth regulators, Precision (fenoxycarb), Adept (diflubenzuron) and Distance (pyriproxyfen), applied at label rates to the potting medium, reduced western flower thrips emergence from the potting medium. If adult thrips emergence could be reduced by the use of medium treatments, fewer applications of foliar insecticides would be needed.

The ability to use only one insecticide to manage both pests could decrease labor and insecticide costs for growers. In addition, the use of medium drenches for thrips control should reduce the number of foliar insecticide applications required. A reduction in foliar insecticide use would also decrease the likelihood that thrips would develop resistance to insecticides. The objective of this research was to evaluate, under commercial growing conditions, the impact of Precision, Adept and Distance on western flower thrips and fungus gnat populations when insecticides were applied to the potting medium of African violets at the rates used for fungus gnat management.

MATERIALS AND METHODS

The following trials were conducted at a research greenhouse on The Pennsylvania State University campus, University Park, Pa., and at Herman Lederer & Sons Greenhouse, Parker Ford, Pa. In all of the trials, rooted cuttings of African violets were planted in 4-inch pots and fertigated using drip tubes. The trials were conducted for 28-35 days to represent a typical African violet production cycle.

The Pennsylvania State University greenhouse has a truss-frame greenhouse covered with corrugated polycarbonate, a concrete floor and an insect screen between the cooling pads and the plants. The trials were replicated four times with 50 plants (trial one) or 33 plants (trial two) per block. Blocks were separated by 3 feet.

The greenhouse at Herman Lederer & Sons Greenhouse is a quonset with a soil floor and no insect screen. There were 144 plants per block, and the trial was replicated six times. In this trial, potato wedges were randomly placed in the potting medium 28 days after treatment application and checked for the presence of fungus gnat larvae two days later.

The treatments evaluated at label rates were 0.08 g.L-1 (0.01 oz./gal.) active ingredient (AI) Precision, 0.02 g.L-1 (0.003 oz./gal.) AI Adept, 0.09 g.L-1 (0.01 oz./gal.) AI Distance and an untreated control. For each treatment, a 60-mL (2 fl oz.) drench was applied to each pot at the initiation of the experiment, and a second drench was made in the Precision and Adept treatments 14 days after the first drench.

The trials were set up as a randomized complete block design. Sampling for thrips and fungus gnats was conducted by the use of one yellow and one blue 3- x 5-inch sticky card placed in each block. The number of thrips and fungus gnats on each card was recorded at seven-day intervals.

RESULTS

In all three trials, yellow sticky cards trapped significantly more thrips and fungus gnats than the blue sticky cards (see Figure 1, right). Consequently, the results from the yellow sticky cards were used in evaluating thrips and fungus gnat populations.

University Trials. There were no significant differences among the trials in thrips populations among the four treatments (see Figure 2, right). In the first trial, fungus gnat populations declined in all treatments immediately following the initiation of the study (see Figure 3, page 44). Adept and Distance treatments resulted in lower fungus gnat populations on three of the five sample periods after treatments were initiated. In the second trial, each of the three treatments resulted in significantly lower fungus gnat populations on three of the four sample periods after the treatments were initiated (see Figure 3, page 44).

Because the medium was kept relatively dry during the first trial, fungus gnat populations decreased across all treatments due to unfavorable conditions for larval development. Keeping pots dry is a technique often used to reduce fungus gnat populations. In addition, because the greenhouse used in this study had a concrete floor, there were no alternative breeding sites ➧

A bench with a yellow and blue sticky card.

Figure 1. Mean number ± standard deviation of fungus gnats and western flower thrips per yellow and blue sticky cards in pesticide efficacy trials on African violets at a Pennsylvania State University research greenhouse and Herman Lederer and Sons Greenhouse.

	EXPERIMENT LOCATION		
	Parker Ford	**University Park** Trial 1	**University Park** Trial 2
Western Flower Thrips			
Yellow card	0.5 ± 1.1a[z]	3.7 ± 5.9a	13.0 ± 14.0a
Blue card	0.09 ± 0.3b	0.5 ± 0.8b	0.2 ± 0.6b
Fungus Gnats			
Yellow card	34.5 ± 23.1a	6.2 ± 10.6a	13.6 ± 13.4a
Blue card	4.9 ± 4.9b	1.4 ± 2.7b	0.1 ± 0.14b

[z]Means within columns with the same letter for each pest species are not significantly different (P >0.05, least significant difference test).

Figure 2. Mean number ± standard deviation of western flower thrips per yellow sticky card following applications of diflubenzuron, pyriproxyfen and fenoxycarb to the medium of African violets at The Pennsylvania State University.

	Days after first insecticide application					
Trial One	**0**	**7**	**14**	**21**	**28**	**35**
Adept	0.5 ± 0.6a[z]	4.0 ± 3.3a	1.8 ± 1.7a	3.0 ± 2.2a	5.0 ± 2.9a	6.8 ± 3.2a
Distance	0.5 ± 0.6a	2.8 ± 3.5a	1.8 ± 2.9a	0.5 ± 0.6a	2.0 ± 2.0a	5.5 ± 1.3a
Precision	0.3 ± 0.5a	3.5 ± 3.8a	0.8 ± 1.0a	3.0 ± 1.8a	4.3 ± 2.2a	8.3 ± 3.3a
Control	0.3 ± 0.5a	2.5 ± 1.9a	2.5 ± 3.7a	3.8 ± 6.2a	6.0 ± 8.8a	20.3 ± 18.2a
Trial Two	**0**	**7**	**14**	**20**	**28**	
Adept	23.3 ± 17.5a	19.0 ± 10.7a	19.3 ± 16.5a	10.5 ± 5.1a	4.5 ± 1.7a	
Distance	9.3 ± 4.6a	5.0 ± 5.1a	8.8 ± 3.3a	4.8 ± 4.3a	3.5 ± 1.3a	
Precision	28.0 ± 20.5a	22.0 ± 12.5a	25.3 ± 17.2a	10.5 ± 4.4a	3.0 ± 1.4a	
Control	33.8 ± 39.7a	15.3 ± 16.0a	16.0 ± 6.7a	6.0 ± 6.5a	2.8 ± 3.2a	

[z]Means within columns with the same letter are not significantly different (P >0.05, least significant difference test).

Figure 3. Mean number ± standard deviation of fungus gnats per yellow sticky card following medium applications of diflubenzuron, pyriproxyfen and fenoxycarb to the medium of African violets at The Pennsylvania State University.

Days after first insecticide application						
Trial One	**0**	**7**	**14**	**21**	**28**	**35**
Adept	21.5 ± 12.5a[z]	1.5 ± 1.3b	1.5 ± 1.3b	0.3 ± 0.5a	1.0 ± 1.2a	1.0 ± 1.4b
Distance	5.25 ± 6.9a	0.5 ± 1.0ab	1.8 ± 1.0b	0.3 ± 0.5a	1.3 ± 1.5a	0.3 ± 0.5b
Precision	7.3 ± 8.7a	0.8 ± 2.1b	2.5 ± 1.3ab	1.0 ± 1.4a	1.3 ± 1.3a	0.3 ± 0.5b
Control	27.8 ± 6.9a	8.8 ± 6.9a	5.8 ± 4.1a	2.0 ± 2.7a	0.3 ± 0.5a	3.0 ± 1.8a
Trial Two	**0**	**7**	**14**	**20**	**28**	
Adept	11.5 ± 3.9a	3.25 ± 2.1b	18.0 ± 8.8b	18.5 ± 9.1ab	11.5 ± 1.8b	
Distance	9.25 ± 8.8a	4.0 ± 3.5ab	18.5 ± 6.7b	8.3 ± 5.6b	8.3 ± 6.6b	
Precision	5.0 ± 7.8a	4.5 ± 2.4ab	18.0 ± 2.2b	16.3 ± 6.7b	8.5 ± 5.1b	
Control	19.0 ± 12.2a	17.0 ± 16.6a	53.8 ± 18.3a	33.8 ± 15.2a	22.5 ± 9.1a	

[z]Means within columns with the same letter are not significantly different (P >0.05, least significant difference test).

Figure 4. Mean number ± standard deviation of fungus gnats per yellow sticky card following medium applications of diflubenzuron, pyriproxyfen and fenoxycarb to the medium of African violets at Herman Lederer and Sons Greenhouse.

Days after first insecticide application					
	7	**14**	**21**	**28**	**35**
Adept	22 ± 11.06a[z]	54.3 ± 17.6a	35.8 ± 25.9a	41.7 ± 31.9a	54.0 ± 28.8a
Distance	14.2 ± 10.2a	49.7 ± 31.2ab	32.0 ± 28.8a	39.7 ± 29.2a	44.5 ± 20.3a
Precision	18.7 ± 17.1a	28.5 ± 24.5a	28.0 ± 28.7a	24.5 ± 12.3a	41.8 ± 7.7a
Control	17.2 ± 6.5a	39.8 ± 15.6ab	19.5 ± 6.7a	31.2 ± 17.3a	49.2 ± 14.1a

[z]Means within columns with the same letter are not significantly different (P >0.05, least significant difference test).

for fungus gnats within the greenhouse. Results from the second trial indicated that the use of Adept, Distance and Precision resulted in effective management of fungus gnat populations.

Commercial Flower Grower Trial. In this trial, the mean thrips populations remained below one thrips per card for all treatments. In contrast to the thrips population, fungus gnats were high (see Figure 4, above). Fungus gnats did not appear to be affected by the medium-applied treatments. The potato wedges yielded low fungus gnat larval populations, indicating that the adult fungus gnats being caught on the sticky cards were not emerging from the pots. Sticky cards placed under the benches on day 28 and counted on day 35 indicated a high fungus gnat population under the benches. We speculate that the fungus gnats sampled on the sticky cards were migrating from the floor. Although the greenhouse was kept clean and the soil floor was kept dry, fungus gnats were apparently completing development under the benches.

CONCLUSION

Adept, Distance and Precision are effective tools for managing fungus gnats on greenhouse-produced ornamentals. While pesticide applications for fungus gnats are traditionally only made to the medium in which the plants are growing, there may be additional locations that need to be treated to provide adequate fungus gnat management. Results from the greenhouse trial at Herman Lederer & Sons Greenhouse indicated that a pesticide application to the soil under the benches was needed. While Adept, Distance and Precision have been shown to reduce thrips emergence from potting medium in other studies, no definitive results could be obtained from these trials. Additional studies are warranted to further investigate medium drenches as a tool for thrips management. GPN

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