Effect Of *Orius insidiosus* (Hemiptera: Anthocoridae) And Spinosad (Conserve®) On Western Flower Thrips, *Frankliniella occidentalis* (Thysanoptera: Thripidae), Populations In Transvaal Daisy Flowers

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Abstract

Western flower thrips (WFT), *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae), is a major insect pest of greenhouse-grown horticultural crops. Greenhouse producers typically apply insecticides to suppress WFT populations. However, continual reliance on insecticides can lead to the development of resistant in WFT populations. The insidious flower bug, *Orius insidiosus* (Say) (Hemiptera: Anthocoridae), is a commercially available predatory bug of WFT that offers an alternative to using insecticides for WFT suppression. Therefore, we investigated the efficacy of one or two *O. insidiosus* adults compared to spray applications of the standard insecticide, spinosad (Conserve®) in suppressing WFT adult populations in transvaal daisy (*Gerbera jamesonii*), cut-flowers under greenhouse conditions. Percent adult WFT mortality was significantly lower when one or two *O. insidiosus* adults were released into the flowers (mean range: 32 to 34%; n=747), compared to the untreated and water control (8 to 9%; n=431). The highest percent mortality of WFT adults was associated with the spinosad (Conserve®) treatment (100%; n= 203).

Purpose

Compare applications of the insecticide, spinosad (Conserve®) to releases of insidious flower bug, *Orius insidiosus*, adults to better understand how each plant protection strategy functions within a greenhouse production system in suppressing WFT populations.

Question, Hypotheses, and Prediction

Question: Will *Orius insidiosus* adults induce equal percent mortality of WFT adults compared to the insecticide, spinosad (Conserve®)?

Hypotheses:

H_o: Percent mortality induced by *Orius insidiosus* adults on WFT adults will be similar to the insecticide, spinosad (Conserve®).

H_a: Percent mortality induced by *Orius insidiosus* adults on WFT adults will be different than the insecticide, spinosad (Conserve®).

Prediction: Percent WFT adult mortality will be significantly greater for the spinosad (Conserve®) treatment.

Study System

Western flower thrips is a major insect pest of cut flowers grown under greenhouse conditions (1). Western flower thrips have piercing-sucking mouthparts that are used to ingest plant fluids. Direct feeding damage results in leaf and/or flower deformation and indirect feeding damage is associated with the transmission of *Impatiens necrotic spot* or *Tomato spotted wilt* virus (2). Direct and indirect feeding damage reduces plant aesthetic quality and marketability. Western flower thrips populations are most commonly dealt with by using insecticides (3). Spinosad (Conserve®) is an insecticide often used by greenhouse producers to suppress WFT populations. However, repeated use of insecticides can result in the development of resistant WFT populations (4). The insidious flower bug, *Orius insidiosus,* is a commercially available predatory bug that may be an alternative to using insecticides for WFT suppression. *Orius insidiosus* adults are generalist predators feeding on a number of insect pests in greenhouse production systems including: thrips, mites, aphids, and whiteflies (5). In greenhouse production systems, *O. insidiosus* is primarily used against western flower thrips.

Methods and Experimental Design

- 250 mL plastic cups were filled with sand, which held 22 mL glass vials containing tap water (Figure 1).
- Stems of yellow transvaal daisy, *Gerbera jamesonii*, flowers (Figure 2), were excised to a length of 3.8 to 5.0 cm (Figure 3) and placed into the glass vials (Figure 4).
- Glass vials with transvaal daisy cut flowers were then placed individually into 11.5 x 17.0 x 9.0 cm plexi-glass cages (Figure 5) that had holes covered with No-Thrips insect screening (mesh size: 0.15 x 0.15 mm) that allowed for ventilation and prevented *O. insidiosus* or WFT adults from escaping.

Figures: (1) 250 mL plastic cup with sand and 22 mL glass vial filled with water; (2) transvaal daisy flower; (3) transvaal daisy flower with excised stem; (4) transvaal daisy flower in glass vial with water; and (5) transvaal daisy flower in glass vial placed into 11.5 x 17.0 x 9.0 cm plexi-glass cage.

- After 24 hours, each transvaal daisy flower was infested with no less than 30 WFT adults (Figure 6).
- After an additional 24 hours, treatments were applied to the transvaal daisy flowers.
- The experiment was set-up as a completely randomized design, with 5 treatments, and 7 replicates per treatment. The treatments were as follows:
  1) Untreated.
  2) Water control (spray application).
  3) One insidious flower bug, *Orius insidiosus*, adult (Figure 7).
  4) Two insidious flower bug, *Orius insidiosus*, adults.
  5) Spinosad (Conserve®) at 0.81 mL/946 mL (spray application) (Figure 8).

Figures: (6) Western flower thrips (WFT), *Frankliniella occidentalis*, adult; (7) insidious flower bug, *Orius insidiosus*, adult feeding on an adult WFT; and (8) container of spinosad (Conserve®).

- Forty-eight hours after releasing *O. insidiosus* adults and spraying spinosad (Conserve®), transvaal daisy flowers were harvested and transported back to a laboratory where the number of live and dead adult WFT were counted for each flower (replicate).
- Percent adult WFT mortality was calculated by dividing the number of dead WFT adults by the total number of WFT adults recovered per flower (replicate); then multiplying by 100.
- Data were analyzed using an analysis of variance (ANOVA) and Fisher's protected least significance difference test when the ANOVA indicated a significant treatment effect ($P \leq 0.05$)
- Data were normalized using a square-root transformation procedure. Data reported are non-transformed.

Results

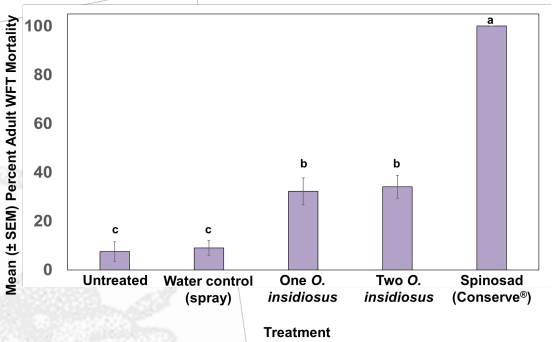

Figure 9. Mean (± SEM) percent western flower thrips (WFT) adult mortality after exposure to the following treatments: 1) untreated (n=151), 2) water control (spray application; n=280), 3) one insidious flower bug, *Orius insidiosus*, adult (n=368), 4) two insidious flower bug, *Orius insidiosus*, adults (n=379), and 5) spinosad (Conserve®) at 0.81 mL/946 mL (spray application; n=203). Means followed by the same letter are not significantly different ($P>0.05$) as determined by Fisher's protected least significant difference test. Vertical bars represent the standard error of the mean (SEM).

Conclusions

- Overall, there was a significant treatment effect on percent adult WFT mortality ($F=27.99$; df=4, 10; $P<0.0001$) as indicated by the ANOVA ($H_o \neq H_a$).
- Natural percent mortality of adult WFT was low (<9%) in the untreated and was not significantly different than the water control (spray application); thus, the water control (spray application) treatment did not affect percent mortality of adult WFT.
- There was no significant difference in percent adult WFT mortality between one or two *O. insidiosus*, adults (Figure 9). This suggests that mating time may disrupt biological control of adult WFT under the parameters of the experiment.
- The spinosad (Conserve®) at 0.81 mL/946 mL treatment resulted in the highest percent adult WFT mortality, which was significantly greater than both of the *O. insidiosus* adult treatments (Figure 9).

Future Directions

- Determine if mating time disrupts suppression of adult WFT when using *O. insidiosus* adults by comparing releases of males alone, females alone, and the combination.
- Investigate predator-prey ratios to determine if *O. insidiosus* adults are equally effective at lower densities of WFT adults.

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References Cited

(1) Cloyd, R. A. 2009. Western flower thrips (*Frankliniella occidentalis*) management on ornamental crops grown in greenhouses: Have we reached an impasse? Pest Technol. 3: 1-9. (2) Pappu, H., R. A. C. Jones, and R. K. Jain. 2009. Global status of tospovirus epidemics in diverse cropping systems: successes achieved and challenges ahead. Virus Res. 141: 219-236. (3) Kontsedalov, S., P. G. Weintraub, A. R. Horowitz, and I. Ishaaya. 1998. Effects of insecticides on immature and adult western flower thrips (Thysanoptera: Thripidae) in Israel. J. Econ. Entomol. 91: 1067-1071. (4) Loughner, R. L., D. F. Warnock, and R. A. Cloyd. 2005. Resistance of greenhouse, laboratory, and native populations of western flower thrips to spinosad. HortScience 40: 146-149. (5) Kiman, Z. B., and K. V. Yeargan. 1985. Development and reproduction of the predator *Orius insidiosus* (Hemiptera: Anthocoridae) reared on diets of selected plant material and arthropod prey. Ann. Entomol. Soc. Am. 78: 464-467.