

# Identification, Monitoring and Management of Serious Pest Insects of Peppers in Florida and Transfer of Technology to Small Scale Growers

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## Abstract

In Florida, various pepper cultivars are widely cultivated by small scale growers and are economically important specialty crops. Pepper production in the sunshine state faces serious challenges from various pest insects. Among them, pepper weevil, *Anthonomus eugenii* (Coleoptera: Curculionidae); western flower thrips, *Frankliniella occidentalis* (Thysanoptera: Thripidae) and Silverleaf whitefly, *Bemisia argentifolii* (Hemiptera: Aleyrodidae) are serious pest insects to control in both conventional and organic production systems. Indeed, these pests are generalist herbivore and therefore benefit from a wide variety of alternative hosts. Western flower thrips and silverleaf whitefly are vectors of plant viruses that can completely destroy an entire field in the spring and summer. Since 2015, we have cultivated various popular cultivars of peppers in our integrated pest management (IPM) demonstration site. A number of field days and workshops were conducted for small scale growers with a view to provide hands on training on pest identification, monitoring and management of serious pest insects to increase their crop productivity and profitability. Also, commodity-wise pest information spreadsheets on pest identification, proper monitoring tools, and pest management strategies were developed and distributed among pepper growers. These tools help growers in decision making toward effective peppers IPM program.

## Introduction

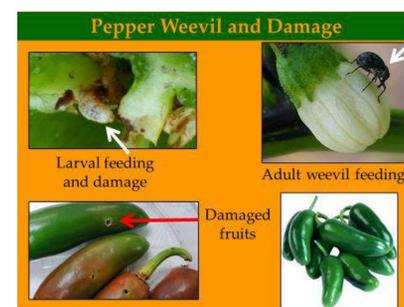
Peppers are one of the most economically important food crops in Florida. In 2017, bell peppers were cultivated on 13,500 acres with a value of about \$207 million dollars in Florida (USDA-NASS, 2018). Pepper weevil, *Anthonomus eugenii* Cano (Coleoptera: Curculionidae) is one of the key pest insects of peppers that has caused significant losses to pepper growers in Florida. In north Florida alone, pepper weevil caused a reduction of marketable yields of at least 50% between 2014 to 2017 (Freeman et al. 2018). Adult pepper weevils feed on fruits and leaf buds. The weevil lays eggs on flowers, buds and fruits. Fruit drop is the most common sign of pepper weevil infestation in open fields (Toapanta, 2005). Limited pesticidal options are available to control this serious pest (Stansly and Kostyk, 2017). Silverleaf whitefly, *Bemisia argentifolii* (Bellows & Perring) (Hemiptera: Aleyrodidae) damage young pepper plants and can prevent them from maturing. When the species feed on the plants, it excretes honey dew, a sticky excretory waste which encourages mold growth and subsequently reducing the quality of fruits produced. The pest also acquires and harbor viruses in their nymphal and adult stages causing little to no fruit yield in infected plants (McAuslane, 2009). Western flower thrips, *Frankliniella occidentalis* (Pergande), which became a key pest of tomatoes and peppers in north Florida in 1986 vectors the 'tomato spotted wilted virus'. Adult thrips feed on pollen and flower tissues. Larval and adult feeding causes damage to flowers, leaves and fruits which can reduce the market value of the crop. Small scale growers in Florida therefore need cost effective solutions to these serious pests on peppers with a view to increase their crop productivity and profitability.

## Objectives

To provide necessary knowledge and hands-on skills to small scale pepper growers to properly identify, monitor and manage serious pest insects on peppers.

## Materials and methods

Bell, Habanero and Jalapeno peppers were cultivated in the IPM Demonstration site at the Center for Viticulture and Small Fruit Research, Florida A&M University (FAMU) from 2015 to 2018. Several extension and outreach events were organized during the pepper cropping seasons. Pests and beneficial insects monitoring were done using sticky and pheromone traps. Insects were identified using 3x magnified lenses (field) and stereo microscopes (lab.). Samples were collected from the FAMU Research and Education Center in Quincy, Florida. Infested peppers were brought to the CBC laboratory for partial rearing. For thrips, flower samples were collected throughout the season. Adults whiteflies were collected by the aspirators.



Pests of Vegetables and Action Thresholds			
Species Common Name	Species Scientific Name	Crops	Thresholds
Melon thrips	<i>Thrips palmi</i>	Pepper	2-3 larvae/plant or adults/flower or fruit Ratio of 1 pirate bug/180 thrips is adequate to suppress thrips density 1 thrips/plant
Western flower thrips	<i>Frankliniella occidentalis</i>	Tomato	
Pepper weevil	<i>Anthonomus eugenii</i>	Pepper	5% fruit damage
Southern green stinkbug	<i>Nezara viridula</i>	Tomato	1 nymph or adult/plant
Silverleaf whitefly	<i>Bemisia argentifolii</i>	Tomato, pepper	0.50 nymph on terminal leaflet or 1 adult/leaf 2-4/plant
Green peach aphid	<i>Myzus persicae</i>	Tomato, pepper	
Two-spotted spider mite	<i>Tetranychus urticae</i>	Tomato, Bean, Pepper	10 nymph or adult/plant



## Results and discussion

Adult pepper weevil and their immature stages were captured and identified. They are oval in shape, 2.0-3.5mm long, 1.5 to 1.8mm wide, mahogany-brown with a long, stout beak and scaly thorax/elytra. Adult feeding appeared as specks on fruit. Larval feeding within the mature fruit causes the core to become brown and moldy. Infested fruit stems turn yellow and the fruit turns yellow or red prematurely. In north Florida, pepper weevil's were active from middle of May to end of September. Their population density was high in Habanero and Jalapeno peppers than Bell peppers. Adult white flies are soft and whitish yellow when they first emerge and after a few hours, the front wings turn iridescent white due to the deposition of a powdery wax, and the body remains light yellow. Adult thrips have fully developed wings with long fringes of cilia. The thrips adult is less than 2 mm in length. It has three color morphs. The color morphs are termed dark-brown, light, and intermediate (yellow with a dark longitudinal band along the dorsum of the thorax and the abdomen).

### Transfer of technology to small scale growers

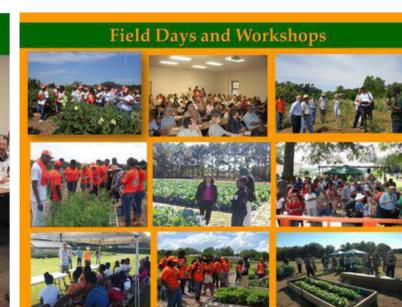
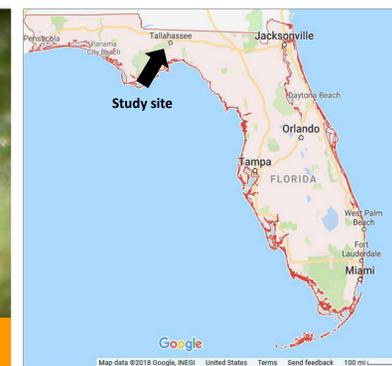
- Provide identification tools and commodity-wise spread sheets on serious pest insects and their biological control agents,
- Provide knowledge of new and effective traps to growers,
- Provide cost effective pest management solutions to growers including the use of trap and refuge crops,
- Assist growers in diversifying their pepper crops and conservation of biological control agents, and
- Assist growers in making proper decision in controlling pepper pests.



Silverleaf whitefly and its immature stages



Minute pirate bug feeding on a western flower thrips



## Conclusion

Managing pepper weevil, Silverleaf whitefly, and western flower thrips in pepper crops in north Florida is becoming challenging for small scale growers. This might be partially due to unviability of effective pesticides, development of pesticides resistance, and low densities of specific biocontrol agents. Our efforts to provide necessary knowledge and hands-on skills to small scale growers by organizing extension and outreach events during the cropping season has proven successful for numerous growers. Indeed, pest and beneficial species identification, monitoring, and effective management have benefits for pepper growers. Also, action thresholds developed earlier on these major pests are benefiting the growers to control these pests on time. However, viral diseases vectored by the Silverleaf whitefly and western flower thrips need urgent attention to develop effective solution. Currently, very few pesticides are available to control pepper weevil. Monitoring and detection in adult stage is being conducted effectively by growers using pheromone traps. The pest is of great significance to quarantine and can pose serious challenge to peppers trade and food security.

## Acknowledgments

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## References

- Freeman JG., Dittmar, PJ, Vallad GE. 2018. Chapter 1. Commercial Vegetable Production in Florida. In: GE. Vallad, HA. Smith, PJ. Dittmar, and JH. Freeman. (eds), Vegetable production handbook of Florida (2017-2018). UF-IFAS Extension. 378 pp.
- McAuslane HJ. 2009. Silverleaf whitefly in featured creatures (rev). Accessed online on 29th October 2018. (<https://entnemdept.ufl.edu/creatures/veg/leaf/silverleafwhitefly.htm>).
- Stansly, PA, Kostyk B. 2017. Insecticidal control of pepper weevil on jalapeno pepper. Arthropod Management Tests, 1-2 doi: 10.1093/amt/tsx018.
- Toapanta MA, Schuster DJ, Stansly PA. 2005. Development and life history of *Anthonomus eugenii* (Coleoptera: Curculionidae) at constant temperatures. Environmental Entomology 34: 999-1008.
- USDA-NASS. 2017. State agricultural overview of Florida. Accessed online on 29 October 2018. (<https://www.nass.usda.gov/quickstats/Ag/stateoverview.php>).