



Managing Whiteflies in the Greenhouse

Introduction

Whiteflies are sucking insects that feed on plant sap. Adults are small, white insects with four white wings. Both the adults and immature stages are found on the underside of the leaves. If heavy populations develop, plants become weakened with less vigor. The presence of low numbers of whiteflies can reduce the marketability of many greenhouse ornamental crops. On greenhouse tomatoes, the presence of honeydew and sooty mold reduces fruit quality.

Identification

The primary whitefly species in greenhouses include the greenhouse whitefly (*Trialeurodes vaporariorum*) and sweet potato whitefly B-biotype (MEAM1) (*Bemisia tabaci*), which was formally called the silverleaf whitefly (*Bemisia argentifolii*). A new biotype of *B. tabaci*, the Q-biotype, (now known as MED) was reported in the U.S. in 2006, which is known to be resistant to many commonly used insecticides. Samples need to be submitted to specialized laboratories for genetic testing, as you cannot tell the biotypes apart (B compared to Q) visually.

Occasionally, the bandedwinged whitefly (*Trialeurodes abutilonia*) may enter greenhouses from outdoors in the fall, but it not a serious pest and control is rarely needed. Adults may occasionally be seen on yellow sticky cards.

The powdery white (1/16th inch long) greenhouse whitefly adults have wings that tend to lie flat over their body.

Figure 1: Greenhouse whitefly adults. Photo by L. Pundt



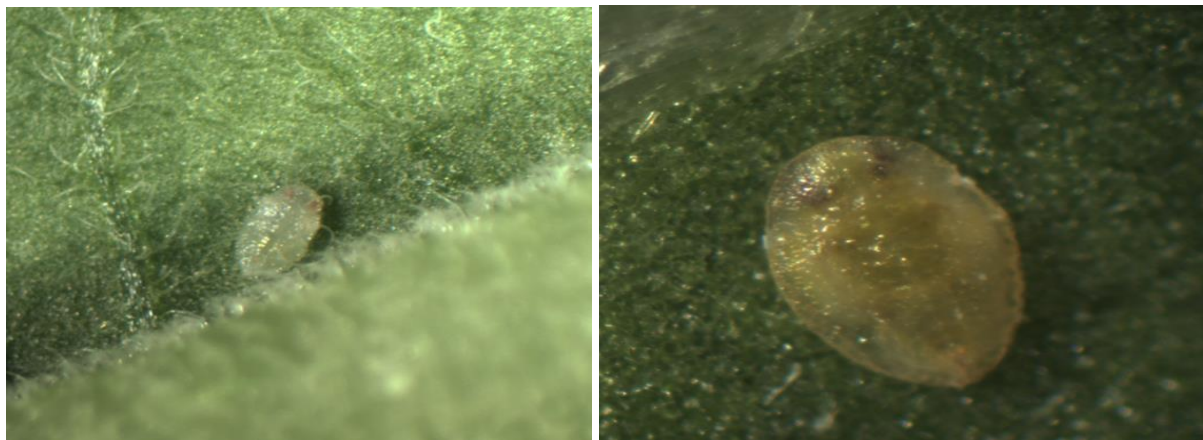
The yellowish, sweet potato whitefly adults are slightly smaller than the greenhouse whitefly adults are. Sweet potato whitefly adults also tend to hold their wings at a 45-degree angle close to their body.

Figure 2 & 3: Sweet potato whiteflies immatures (left) and immatures and adults (right). Photos by L. Pundt



A more reliable method to identify the different species is to examine the immature pupal stage. The greenhouse whitefly pupae are white with straight, elevated sides. You can also see a fringe of wax filaments around the edge of the pupal case. Sweet potato whitefly pupae are yellowish with a more rounded edge. In general, sweet potato pupae have fewer waxy filaments than the greenhouse whitefly pupae. Red eyes indicate adults are ready to emerge.

Figure 4 & 5: Greenhouse whitefly pupae (left) and sweet potato whitefly pupae (right). Photos by L. Pundt



Feeding Damage

Whitefly nymphs and adults have piercing sucking mouthparts that are used to feed on plant fluids. While low populations may not cause serious plant injury, the presence of only one or two whiteflies at the time of sale may be objectionable to customers. At higher population levels, whiteflies can cause the plant's foliage to become yellowed and mottled. Nymphs may secrete large amounts of honeydew, a sweet sugary sap, onto the plant's foliage. Honeydew serves as a growing media for the black sooty mold fungus that is unsightly and can interfere with photosynthesis.

Figure 3: Shiny honeydew (left) and black sooty mold fungus (right). Photos by L. Pundt



Biology and Life Cycle

Whiteflies life cycle progresses from the first, second, third and fourth nymphal stages to the pupal stage (end of the 4th instar) to adults. Adult whiteflies may live for one to two months. Development takes from 14 to 40 days depending upon temperature, host plant and whitefly species. Females lay their eggs on the underside of upper leaves. The eggs hatch into first instar nymphs that move a short distance and then settle down to feed. The nymphal stages (2nd, 3rd and 4th) are stationary and do not move. During the late fourth instar, you may see the red eyes of the developing adult. After the adults emerge from the pupal case, you can see a T-shaped emergence hole. (Do not confuse this with the round emergence hole as parasitic wasps emerge).

Whitefly Development at 70°F

Developmental Stage	Greenhouse Whitefly	Sweet potato Whitefly
Egg	9 days	12 days
1st instar	4 days	6 days
2nd/3rd instar	7 days	10 days
Pupal (4th instar)	11 days	10 days
Adult	5-40 days	5-30 days
Egg laying period of adult female	6 days	22 days
Egg to Adult	32 days	39 days

Prevention

- Start the cropping cycle with a clean, weed free greenhouse.
- A fallow period of 2 to 4 weeks, when all plants and weeds are eliminated, will help to minimize potential insect problems.
- Avoid over fertilizing crops as this increase their attractiveness to adult whiteflies.
- Inspect incoming plants and cuttings for both adult and immature whiteflies.
- Sweet potato whiteflies may be introduced into the greenhouse on poinsettia cuttings or incoming plugs.

Scouting

A weekly, regular monitoring program is needed for the early detection of whiteflies and to evaluate the effectiveness of your management program. Use yellow sticky cards, random foliar plant inspections and pest-infested indicator plants to monitor whitefly populations.

Yellow sticky cards can be placed in the greenhouse at the rate of approximately one per 1000 sq. ft. Place additional cards near doors and vents. Change cards weekly and keep track of population trends to determine if populations are increasing or decreasing.

Randomly inspect plants in production areas and near whitefly emigration areas. Weekly inspections will help you determine which life stage (egg, crawler, pupae or adult) is present. Often, only one to two life stages may be present. By knowing the predominant life stage you can better time pesticide applications to the most susceptible life stage. For example, you may want to target foliar sprays against the adult and immature whitefly nymphs. Eggs and pupae are tolerant to many insecticides. When a pest-infested plant is detected, it can be

tagged to be used as an indicator plant. You can then track the development of the whiteflies. See [Tips on Scouting Poinsettia Insect and Mite Pests](#) for more photos.

Biological Controls Whitefly Parasitoids

Encarsia formosa is a small, parasitic wasp that is especially effective against the greenhouse whitefly on greenhouse vegetables, which are long-term crops with higher tolerance levels for whiteflies than ornamental crops. *Encarsia* is primarily sold as parasitized greenhouse whitefly pupa that are glued onto small cards that need to be released as soon as the first whiteflies are detected. Hang the cards in the lower plant canopy as the adults emerge from the pupae and fly upward.

Female wasps lay eggs in the whitefly nymphs; larvae emerge from eggs and consume the internal contents of the whitefly. Larvae turn into pupa, and the emerging adults create a circular hole with their mouthparts that is used to exit the parasitized whitefly. Parasitized greenhouse whiteflies turn black and parasitized sweet potato whiteflies turn brown. *Encarsia* is most effective at temperatures between 70 to 80° F and 50 to 80 % relative humidities. Adults do not fly when temperatures are below 65° F. *Encarsia* is also very sensitive to pesticide residues on plants or dried residues on the greenhouse plastic.

Eretmocerus eremicus is a small, parasitic wasp that has been commercially available for use against the sweet potato whitefly since the 1990's. In addition to parasitizing whitefly nymphs, the adult females also kill whitefly nymphs by host feeding. *Eretmocerus* is available as pupae glued to cards, in blister packs or in bottles. *Eretmocerus* is most effective at temperatures between 77 and 84° F. It is also sold in mixed products with *Encarsia*. Regular, repeated releases are needed.

Parasitic wasps are attracted to the yellow sticky cards, so remove sticky cards before and after releasing the parasitic wasps. Replace the cards 3 or 4 days after releasing the parasitic wasps.

Whitefly Predators

The generalist predatory mite, *Amblyseius swirskii* feeds on whitefly eggs and nymphs as well as thrips. It is most effective at warmer temperatures (77-82° F) and a relative humidity of 70%. *Amblyseius swirskii* is commercially available in breeding sachets or in bulk to be applied to plant leaves. It is compatible with host specific parasitic wasps.

Delphastus pusillus is a predatory ladybird beetle that can feed on all stages of whiteflies. Both immature and adult beetles are predacious. *Delphastus* are most effective against high populations and may be used to in hot spots to supplement other whitefly biological controls.

Insect Pathogens

Beauveria bassiana is an insect killing fungus that works by contact. Begin applications early and repeated applications are needed.

Chemical Controls

Contact materials, translaminar materials and insect growth regulators may be used against whiteflies. Foliar insecticides can be applied against the whitefly adults and nymphs and systemic insecticides can be applied to the growing media.

For more information on specific materials to apply to greenhouse ornamentals, see the latest edition of the ***New England Greenhouse Floriculture Guide A Management Guide for Insects, Diseases, Weeds and Growth Regulators***. Available from [Northeast Greenhouse Conference and Expo](#).

For information on whitefly management on greenhouse tomatoes, consult the most recent edition of the New England Vegetable Management Guide, available online at <http://nevegetable.org>

An integrated program focusing on sanitation, cultural practices, biological controls and chemical controls is needed to manage whiteflies.

By Leanne Pundt, UConn Extension. 2014. Revised 2019

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