# 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 sweetpotato 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 (1/16$^{th}$ inch long) greenhouse whitefly adults have wings that tend to lie flat over their body.

*Figure 1: Greenhouse whitefly adults on underside of leaves. Photos by L. Pundt*

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

*Figure 2: Sweetpotato whiteflies immatures (on left); immatures and adults (on 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 and a fringe of wax filaments around the edge of the pupal case. Sweetpotato whitefly pupae are yellowish with a more rounded edge. In general, sweetpotato pupae have fewer waxy filaments than the greenhouse whitefly pupae. Red eyes indicate adults are ready to emerge.

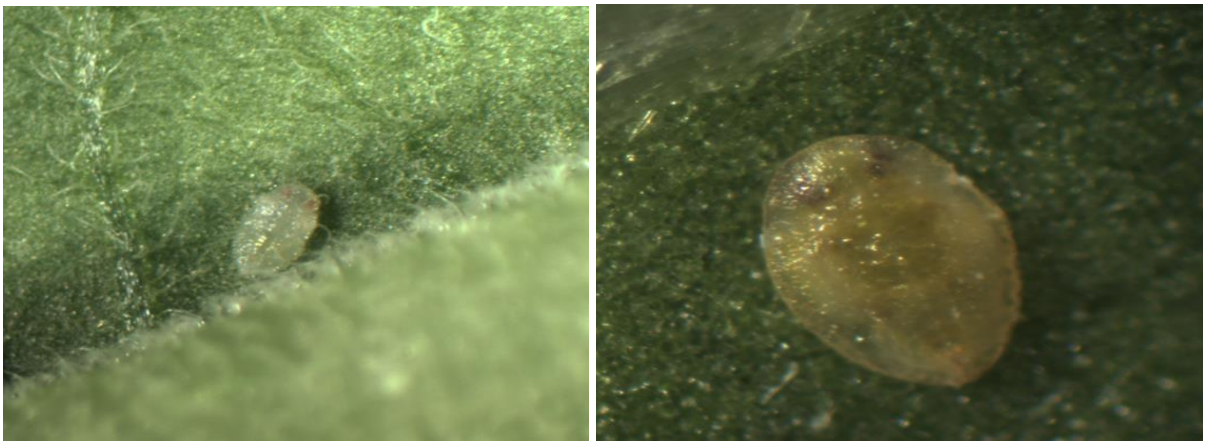

*Figure 3: Greenhouse whitefly pupae (on left) and sweetpotato whitefly pupae (on right). Photos by L. Pundt*

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

**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 |

**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).

**Prevention**

- Start the season 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 whitefly problems
- Avoid over fertilizing crops as this increase their attractiveness to adult whiteflies
- Inspect incoming plants and cuttings for both adult and immature whiteflies

**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

**Biological Controls Whitefly Parasitoids**

Several different host specific parasitic wasps, as well as predatory mites and beetles are commercially available. See *Biological Control of Whiteflies factsheet* on the UConn Greenhouse IPM webpage under publications and then biological controls for more information.

**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 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.

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**References**

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