

Whitefly Pests of Florida Citrus ¹

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Introduction

During the 1920s whiteflies were considered the most serious citrus pest in Florida. The University of Florida imported several fungi parasitic to whiteflies in the early 1930s. Since then, whiteflies have declined in importance and today groves are seldom sprayed just to control them.

Physical Description

Whitefly adults resemble tiny moths with two pairs of wings. The wings are mealy-white (except for the citrus blackfly) and cover the body in a sloping roof-like manner.

Early instars of young whiteflies (nymphs) resemble the immature stages of soft scale insects. They are usually flat, oval, transparent, 1 to 3 mm long and lack legs or antennae. Nymphs are active only during the first instar (crawlers), becoming sessile for the rest of the nymphal instars.

Whitefly eggs are oval- to sausage-shaped and can be either light or dark brown.

Life History

Peak whitefly populations occur during March-April, June-July, and September-October with as many as four generations per year in Florida.

Injury to Crops

Whitefly nymphs injure crops by attaching themselves to the underside of leaves where they feed on plant juices, thus removing nutrients from the plant. The feeding also results in excretions of honeydew which fall on the leaves below. A black-colored sooty mold fungi soon cover those leaves, resulting in decreased photosynthesis. Whiteflies become a problem when they continually sap the plant of energy needed for growth. Whitefly populations increase when there is constant flushing and availability of new growth, such as after severe hedging and topping.

Management Recommendations

A regularly maintained program of hedging and topping can help avoid whitefly problems. However, if whiteflies become a problem several control methods are available.

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Chemical Control

If spraying is necessary, the best time to do so is after the eggs have hatched since the first instar nymphs (the "crawlers") are the most vulnerable. Spray oil has some insecticidal properties, but is primarily used to remove sooty mold which grows on honeydew that whiteflies excrete on fruit and leaves. It is important to note that spraying with copper for control of harmful fungal diseases will also inhibit growth of "friendly fungi" resulting in an increase in whitefly populations. Also, more than one application of sulfur per year can have an adverse effect on parasite populations.



Figure 1. Citrus leaves with sooty mold growing on honeydew excreted by the citrus whitefly, *Dialeurodes citri* (Ashmead) Credits: University of Florida

Growers should consult the Florida Citrus Pest Management Guide for recommended insecticides. It is available at the local Cooperative Extension Service office or on the Website at <http://edis.ifas.ufl.edu/cg004>.

Biological Control

Biological control of whiteflies is based on several entomophagous fungi and four parasitic wasps. Each does an excellent job of controlling its host. The wasps are parasites of citrus whitefly, woolly whitefly and blackfly. The fungi which attack whitefly nymphs are collectively known as "friendly

fungi." Of these, the best known and most effective are two species of *Aschersonia* which are commonly known as red *Aschersonia*, *Aschersonia aleyrodis*, and yellow *Aschersonia*, *Aschersonia goldiana*.



Figure 2. Red, *Aschersonia aleyrodis*, and yellow, *A. goldiana*, *Aschersonia* fungi attacking immature whiteflies Credits: University of Florida

Red *Aschersonia* is actually pink with red spots and is about 3 mm in diameter. It attacks citrus and cloudywinged whiteflies. Yellow *Aschersonia* is cream to white in color with yellow spores and is the same size as red *Aschersonia*. It is only effective against cloudywinged whitefly. These fungi are common during the wet summer and fall seasons. Brown whitefly fungus, *Aegerita webberi*, attacks both citrus and cloudywinged whiteflies. It has brown pustules and is about 3 mm in diameter. It becomes common during dry weather. White fringe fungus, *Fusarium aleyrodis*, named for the delicate white fringe which appears on the whitefly nymphs, is common on both citrus and cloudywinged whitefly. It is difficult to recognize since the characteristic white fringe damages easily or blows away. Cinnamon fungus, *Verticillium cinnamoneum*, forms brown pustules with a powdery cinnamon colored surface. It attacks whitefly nymphs, but is not as important in controlling whiteflies as are other fungi. Several lady beetles also act as minor controls of whitefly.

Whitefly Identification Key

The identification key in this fact sheet is designed to identify the four major species of whiteflies that commonly infest citrus in Florida. Another key that covers 16 species of whiteflies that may infest Florida citrus is available on the World Wide Web. The WWW key, developed by the Florida Department of Agriculture and Consumer Services'

Division of Plant Industry, uses color photographs of nymphs to assist in identification. It is available at <http://www.doacs.state.fl.us/pi/enpp/ento/aleyrodi.html>.

1a The whitefly adult is white or white with dark spots on the wings. Nymphs are difficult to see or identify..... go to 2

1b The whitefly adult is slate blue in color, eggs are present and laid in spirals. Nymphs are black with prominent spines..... citrus blackfly

2a The whitefly adult is all white without any dark spots on wings..... citrus whitefly

2b The whitefly adult is white with a darkened area at the end of each wing. Occasionally a yellow fungus is present..... cloudywinged whitefly

2c The whitefly female adult is all white and is surrounded by waxy filaments. Eggs are laid in a circle with the female at rest in the center..... woolly whitefly

Citrus Whitefly

The citrus whitefly, *Dialeurodes citri* (Ashmead), is a native of India and was once the most important citrus pest in Florida. Its preferred hosts are citrus, chinaberry and umbrella trees.

Description and Life History

Citrus whitefly adults live an average of 14 days and the female lays an average of 150 eggs. The adult is a pure mealy-white without any dark spots on the wings.

Citrus whitefly nymphs are oval, thin and translucent, which makes them difficult to see on green leaves. Larvae require 23 to 30 days before pupating. Within another 13 to 30 days the adults emerge.

The citrus whitefly lays smooth, shiny, sausage-shaped, pale yellow eggs which hatch in eight to 24 days depending on the season. The crawlers move about for several hours before settling.

Detailed information on this species, along with many color photographs, is available on the UF/IFAS



Figure 3. Adults of the citrus whitefly, *Dialeurodes citri* (Ashmead) Credits: University of Florida

Featured Creatures WWW site which is available at <http://entomology.ifas.ufl.edu/creatures>.

Biological Control

An introduced wasp parasite, *Encarsia lahorensis*, was established in Florida's citrus regions and is reducing citrus whitefly populations. Yellow *Aschersonia* fungus does not attack this species, but red *Aschersonia* and the brown whitefly fungus do.

Cloudywinged Whitefly

The cloudywinged whitefly, *Singhiella citrifolii* (Morgan), is the most common whitefly in the central and southern portions of the Florida citrus area.

Description and Life History

The adult cloudywinged whitefly is white with a cloudy-gray area at the end of each wing.



Figure 4. Adult cloudywinged whiteflies, *Singhiella citrifolii* (Morgan) Credits: R. Nguyen, Division of Plant Industry

Cloudywinged whitefly nymphs and pupae are thin, translucent and oval, resembling those of the citrus whitefly.

Cloudywinged whitefly eggs are yellow when laid, but soon turn black and are sculptured with a network of ridges. The eggs are sausage-shaped.

Detailed information on this species, along with many color photographs, is available on the UF/IFAS Featured Creatures WWW site which is available at <http://entomology.ifas.ufl.edu/creatures>.

Biological Control

Both *Aschersonia* fungi attack this pest. The presence of yellow *Aschersonia* guarantees the cloudywinged whitefly is present. The brown and white fringe whitefly fungi also help control this pest.

Woolly Whitefly

The woolly whitefly, *Aleurothrixus floccus* (Maskell), first appeared as a citrus pest about 1909 in Tampa. It had every indication of becoming a serious pest before it was subdued by a parasitic wasp.

Description and Life History

Emerging adults are yellowish white and seldom fly. Adult females are surrounded by waxy filaments. The first instar nymphs of the woolly whitefly are light green, and the rest are brown. Parasitized nymphs are black. Woolly whiteflies derive their name from the waxy filaments which develop during the pupal stage.

Woolly whitefly eggs are laid on the underside of mature leaves. This differs from other whitefly species that lay their eggs on young leaves. Woolly whitefly eggs are laid in a circle with the female at rest in the center. The eggs are brown and sausage-shaped.

Biological Control

Some species of entomophagous fungi attack the woolly whitefly, but they are not as effective in controlling populations as they are on the citrus and cloudywinged whiteflies. The wasp parasites

Encarsia variegata, *Encarsia brasiliensis* and *Eretmocerus portoricensis* control woolly whitefly to such an extent it is seldom seen, although it is present throughout Florida's citrus growing area.

Citrus Blackfly

First discovered in Florida in 1934, the citrus blackfly, *Aleurocanthus woglumi* Ashby, was successfully eradicated. However, in early 1976 it was again discovered in the Ft. Lauderdale area. This time the infestation was so widespread that eradication was judged more difficult, if not impossible. Several parasitic wasps were released and two of them have done an outstanding job controlling infestations. Citrus, mango, kumquat and pink trumpet are the preferred hosts of citrus blackfly. Of these, citrus and mango appear to be the most preferred hosts, and grapefruit is the least desirable of the citrus varieties. Heavy infestations for more than one year can cause rapid tree deterioration and crop failure. Citrus blackfly infestations are more common on the lower half of citrus trees.



Figure 5. Heavy infestation of citrus blackfly, *Aleurocanthus woglumi* Ashby, on citrus leaves. Credits: Division of Plant Industry

Description and Life History

When the adults emerge they are bright brick red with the front of the head a pale yellow. Within 24 hours, however, they turn slate blue. What appears as a white band across their wings is caused by colorless spots.

Citrus blackfly nymphs differ from other whitefly nymphs in color, they are a black-blue, and by the presence of prominent spines and a white fringe of wax.

Citrus blackfly females lay their eggs in spiral patterns on the underside of leaves. The female lays two to three spirals of 28 to 34 eggs each within four days of emerging as an adult. The oval eggs that began as a creamy white color gradually change to brown, and then to black. Eggs hatch within nine to 50 days, depending on the temperature.

Detailed information on this species, along with many color photographs, is available on the UF/IFAS Featured Creatures WWW site which is available at <http://entomology.ifas.ufl.edu/creatures>.

Biological Control

There is a large natural mortality among citrus blackfly populations, but the female lays enough eggs to compensate for this. Ladybird beetles, spiders, and lacewing larvae, including the well-known "trash bugs," all destroy portions of the citrus blackfly population. However, none of these predators is capable of controlling this pest. Citrus blackfly is not attacked by the entomophagous fungi which help to control other whitefly species on Florida citrus. Fortunately, the citrus blackfly is under complete biological control due to the introduction of two parasitic wasps, *Encarsia perplexa* and *Amitus hesperidum*.

Human assistance is sometimes required in placing these parasites among host populations. Prior to the introduction of these parasites, the number of citrus blackfly nymphs averaged 40 to 60 per infested leaf. Now they average only three to 13 nymphs per leaf.

Nymphs killed by these tiny wasps are easily identified by the round exit hole left by the emerging adult parasites.

Whitefly Knowledgebase

The USDA **Whitefly** knowledgebase was developed at the University of Florida with the cooperation of thirteen whitefly entomologists from California, Florida, Georgia, North Carolina and Texas. **Whitefly** covers four vegetable and ornamental whiteflies: sweetpotato, silverleaf, greenhouse and bandedwinged. However, it provides detailed information on whitefly life cycle and

biology, as well as numerous color and scanning electron microscope photographs of each of the whitefly stages and plant infestations. As such, it is an excellent resource for those seeking a better understanding of whitefly citrus pests. **Whitefly** is available on the World Wide Web through: <http://entomology.ifas.ufl.edu/fasulo/whiteflies/>.