

Citrus Whitefly, *Dialeurodes citri* (Ashmead) (Insecta: Hemiptera: Aleyrodidae)¹

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Introduction

The citrus whitefly, *Dialeurodes citri* (Ashmead), was once the most important citrus pest in Florida, but today it ranks below the snow scale, citrus rust mite, and several others. Nevertheless, it is still a serious pest in Florida. A native of India, it appears to have been introduced into Florida some time between 1858 and 1885 (Morrill and Back 1911). It is now found out-of-doors throughout Florida and parts of other gulf states and California and in greenhouses in many parts of the United States.

Distribution

Florida, Georgia, South Carolina, North Carolina, eastern Virginia, Alabama, Mississippi, Louisiana (New Orleans), Texas (Rio Grande Valley), and California; Mexico (Veracruz area); Guatemala; Bermuda; Chile; Peru; Argentina; Brazil; France (Alpes-Maritimes); Sri Lanka; China; Taiwan; India; Vietnam; Japan; Macao; Pakistan; Sikkim. Some records of *D. citri* apply to *D. citrifolii* (Morgan), cloudycing whitefly.

Description

Adult

The adult (Figure 1) is a tiny, mealy-white insect with four mealy-white wings that expand less than 1/8 of an inch. The adults of both sexes have two pairs of wings covered with a white, powdery wax which gives the insects their common name. In the middle of each wing, cloudywinged whitefly adults have a darkened area which is lacking in the wings of the citrus whitefly, and the wings fold to a flatter position than those of the citrus whitefly.

Nymph

The nymph is a flat, elliptical, scale-like object, closely fastened to the underside of a leaf. It becomes fixed after the first molt. The nymphs, after the first instar, are flattened, oval, and are similar in appearance to the early instars of the unarmored scale insects. Like the scale insects, whiteflies lose their normal legs and antennae after the first molt (they are kept, but are abbreviated), but unlike the scale insects, the females gain them back in the adult stage.

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Figure 1. Adults of the citrus whitefly, *Dialeurodes citri* (Ashmead). Credits: University of Florida

The nymphs of the citrus whitefly lack a fringe of conspicuous, white, waxy plates or rods extending out from the margin of the body, which characterizes some species of whiteflies. Nymphs and pupae of the citrus and cloudywinged whiteflies are almost indistinguishable. Nymphs of both species are translucent, oval in outline, and very thin. Because the green color of the leaf shows through the body, nymphs are difficult to see. Pupae are similar but are thickened and are somewhat opaque, and eye spots of the developing adult may show through the pupal skin.

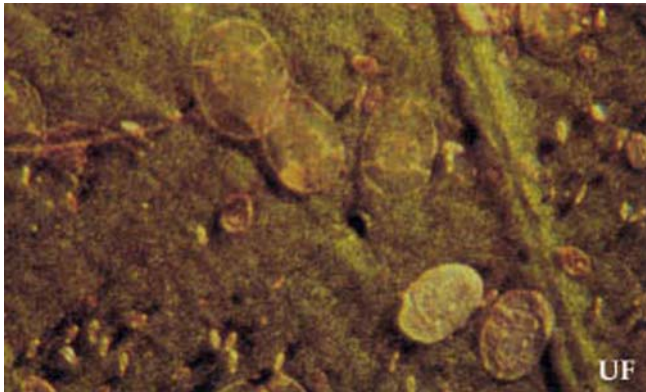


Figure 2. Eggs and larvae of the citrus whitefly, *Dialeurodes citri* (Ashmead). Credits: University of Florida

Eggs

The citrus whitefly lays yellow eggs with a surface which is nearly smooth, distinguishing them from eggs of the cloudywinged whitefly which are

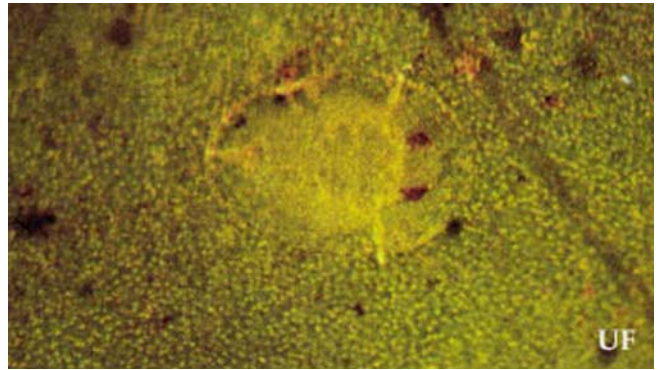


Figure 3. Pupa of the citrus whitefly, *Dialeurodes citri* (Ashmead). Credits: University of Florida

yellow when freshly laid, but soon turn black and have a surface that is netted with a system of ridges.

Identification

The identification key provided here 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. . . . 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

Life History and Habits

Winter is passed in the mature larval or nymphal stage, usually on the undersides of leaves. Early in the spring pupae appear, and in March and April adults emerge. Eggs are deposited on foliage and hatch in eight to 24 days, depending on the season. Unfertilized eggs develop into males only. The larvae soon settle to feed and do not move about until the adult stage is reached. There are several overlapping broods each year. Nymphal life averages 23 to 30 days. Pupal development requires 13 to 30 days. The adult lives an average of about 10 days, but has been known to live for as long as 27 days. The adult female lays about 150 eggs under outdoor conditions. The entire life cycle from egg to adult requires from 41 to 333 days, but a great variation has been noted even among eggs laid on the same leaf on the same day.

Hosts

Citrus is the most important host, but the following are also food plants --- allamanda, banana shrub, Boston ivy, cape jasmine, chinaberry, laurel cherry, crape myrtle, coffee, English ivy, *Ficus macrophylla*, gardenia, green ash, jasmine, lilac, myrtle, mock olive, pear, privet, osage orange, Portugal cherry, pomegranate, prickly ash, smilax, tree of heaven, trumpet vine, umbrella tree, water oak, persimmon, and devilwood or wild olive.

Damage

The whitefly injures the plant by consuming large quantities of sap, which it obtains with its sucking mouth parts. Further injury is caused by sooty mold fungus which grows over fruit and foliage in the copious amount of honeydew excreted by the whitefly. This black fungus may cover the leaves and fruit so completely that it interferes with the proper physiological activities of the trees. Heavily-infested trees become weak and produce small crops of insipid fruit. Also, fruit covered with sooty mold will be retarded in ripening and late in coloring, especially the upper part, which may remain green after the lower portion has assumed the color of ripe fruit. The fruit often must be washed before it is put on the market. A secondary injury to the trees may result from an excessive increase of the common scales of

citrus which find protection under the sooty mold that covers leaves and branches.



Figure 4. Citrus leaves with sooty mold growing on honeydew excreted by the citrus whitefly, *Dialeurodes citri* (Ashmead). Credits: University of Florida

Whiteflies become a problem when they continually sap the plant of energy needed for growth. This occurs when there is constant flushing and availability of new growth, such as after severe hedging and topping.

Cultural Control

A regularly maintained program of hedging and topping can help avoid whitefly problems.

Biological Control

Insect Parasites and Predators

Several parasites and predators attack the citrus whitefly. An introduced wasp parasite (*Encarsia lahorensis* Howard) is established in Florida's citrus regions and is reducing citrus whitefly populations.

Delphastus pusillus (Lec.), a small dark brown ladybird beetle, feeds on the eggs but is never abundant. *Delphastus catalinae* (Horn), a California species, was introduced into Florida by University of Florida entomologists, and it also feeds on whitefly eggs. *Cryptognatha flavescens* Motsch., a coccinellid about 1/10 inch long and reddish brown, and another ladybird beetle, *Verania cardoni* Weise, were found by Woglum to feed on the citrus whitefly in India. Morrill and Back (1911) recorded two other ladybird beetles, *Cycloneda sanguinea* L. and *Scymnus punctatus* Melsh., that feed on the citrus whitefly in Florida, a mirid bug, lacewings, mites, ants, and a species of thrips, *Aleurodothrips fasciapennis* Franklin.



Figure 5. Citrus whitefly parasite, *Encarsia lahorensis* Howard, ovipositing in an immature citrus whitefly. Credits: University of Florida

Parasitic Fungi

In large commercial plantings of citrus, citrus whitefly and cloudywinged whitefly are largely controlled in rainy weather by whitefly fungi. Some important species are the red fungus (*Aschersonia aleyrodinis* Webber) and the brown fungus (*Aegerita webberi* Fawcett). A yellow fungus, *Aschersonia goldiana*, does not attack the citrus whitefly, but is very effective against the cloudywinged whitefly. The presence of the yellow fungus guarantees that cloudywinged whitefly is present. These fungi are generally present in all citrus groves in Florida and increase in numbers when the proper environmental conditions prevail. These fungi are commonly referred to as "friendly fungi," and the two major species are often referred to as red *Aschersonia* and yellow *Aschersonia*.

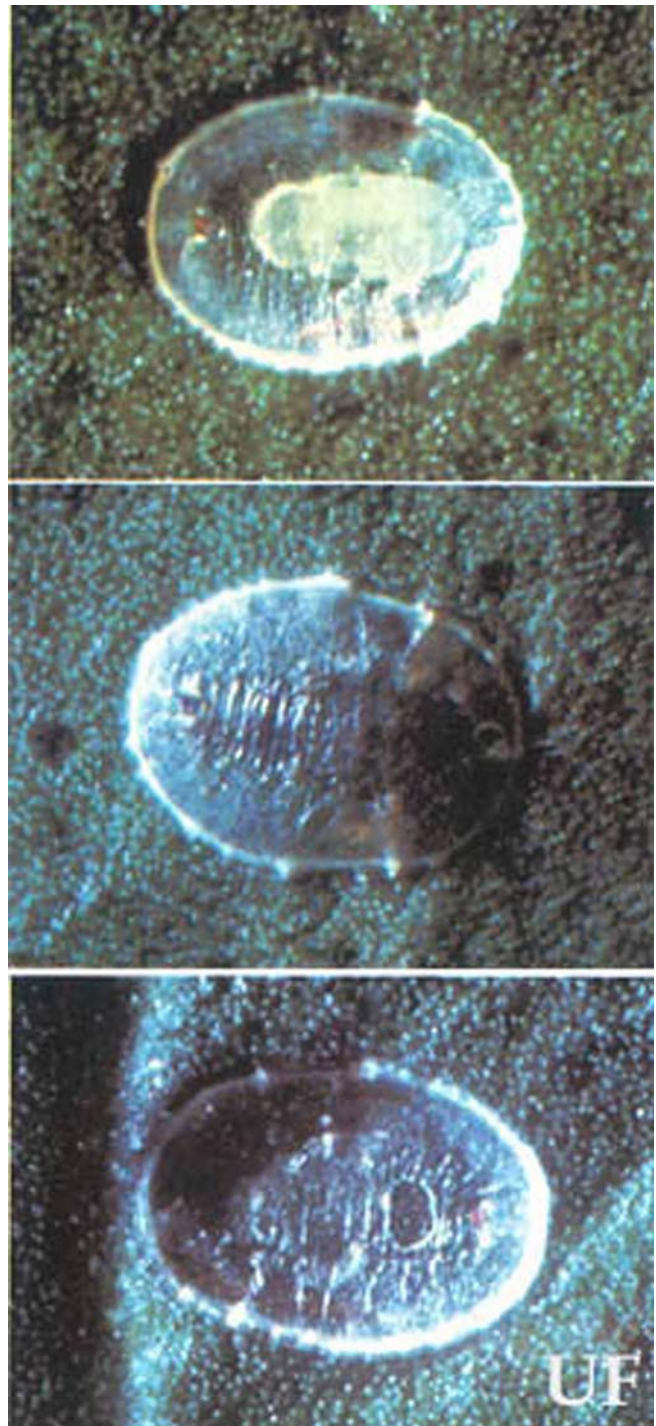


Figure 6. Top: immature larva of the parasite, *Encarsia lahorensis* Howard, in a larva of a citrus whitefly, *Dialeurodes citri* (Ashmead); middle: *E. lahorensis* pupa in citrus whitefly larva; bottom: emergence hole of an adult *E. lahorensis* in a dead citrus whitefly larva. Credits: University of Florida

Chemical Control

Whiteflies also are controlled by sprays applied primarily for control of scale insects. Spraying of



Figure 7. Adult coccinellid predator of whitefly nymphs, *Delphastus catalinae*. Credits: Kim Hoelmer, USDA



Figure 8. Lacewing larva (*Chrysoperla* sp.) feeding on whitefly nymphs. Credits: Jack Dykinga, USDA



Figure 9. Red, *Aschersonia aleyrodidis*, and yellow, *A. goldiana*, *Aschersonia* fungi attacking immature whiteflies. Credits: University of Florida

commercial citrus exclusively for whitefly control is seldom practiced in Florida. Recommended control measures for commercial or dooryard citrus are significantly different. Please consult the specific management guide for your situation.

Citrus Management Guide for Whiteflies in Commercial Groves (<http://edis.ifas.ufl.edu/CG004>)

Control of Whiteflies on Florida's Dooryard Citrus Trees (<http://edis.ifas.ufl.edu/XC002>)

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 parasites. Spray oil has some insecticidal properties, but is primarily used to remove sooty mold which grows on the fruit and leaves.

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