2003 FLORIDA CITRUS INVASIVE PEST AND DISEASE IDENTIFICATION HANDBOOK

Presented by:

Florida Department of Agriculture and Consumer Services

Division of PLANT INDUSTRY

Protecting Growers’ Futures
Disease: Citrus Canker

Brief description of disease:

Citrus canker, which is caused by a bacterial pathogen, is a serious disease of most commercial citrus varieties and some citrus relatives. Canker is transmitted by wind-driven rain, birds and animals, and contaminated equipment and personnel. There is no cure for citrus canker. Infected or exposed trees must be uprooted and burned.

Considerable regulatory effort is directed at preventing the spread of citrus canker because it is not present in all citrus-growing regions of the world where the climate is conducive to citrus canker development. Whether state officials are involved in an active eradication program or not, it's prudent to take appropriate precautions to protect your investment. Use non-porous harvesting equipment, such as plastic, smooth fiberglass or aluminum tubs, crates and ladders. Because canker is easily spread by humans, movement of people and equipment in and out of groves should be limited; each should be sprayed with an approved decontamination agent upon entry and exit. Schedule irrigation at times when workers do not need to be in groves.
Disease: Citrus Canker

**Symptoms:**

Citrus canker is a bacteria which disfigures and weakens citrus trees. However, canker can be present in a grove for months before symptoms appear. The pathogen causes necrotic lesions on leaves, stems and fruit (Fig. 1 and Fig. 2). Look for raised, corky, tan lesions with water-soaked margins and yellow halos on the citrus leaves (Fig. 3). Severe infections can cause defoliation, badly blemished fruit, premature fruit drop, twig dieback and general tree decline.

**How will this disease impact a grove?**

Citrus canker is a bacteria which disfigures and eventually kills citrus trees. **There is no cure for citrus canker. Infected or exposed trees must be uprooted and burned** (Fig. 4).

Because canker has the potential to destroy all citrus in Florida, growers and caretakers need to scrupulously follow decontamination and sanitation procedures to prevent canker spread, regardless of their distance from canker finds (Fig. 5).

**What do I do if I find this disease in a grove?**

Do **NOT** collect samples of citrus for canker diagnosis. Note the location of the suspect trees, map the location, and immediately notify the Division of Plant Industry (DPI) at (352) 372-3505 ext. 143 or call the FDACS/DPI Help Line at (800) 282-5153.

Fig. 1. Citrus canker found on stems, twigs, leaves and fruit. Fig. 2. Citrus canker on grapefruit. Fig. 3. Citrus canker on leaves. Fig. 4. Burning canker contaminated citrus trees. Fig. 5. Canker decontamination station. (Photographs courtesy of Florida Citrus Mutual and FDACS Division of Plant Industry).
Disease: Citrus Leprosis (CiLV)

Brief description of disease:

Citrus Leprosis (CiLV) is a serious non-systemic virus disease of citrus leading to crop loss and tree death. It is vectored by one or more species of false spider mites (*Brevipalpus* sp.). The disease has been present in South American citrus-growing areas for a number of years. Recently, it has been found in Panama and there are fears of it spreading throughout Central America and eventually into North American citrus growing areas. Although CiLV was reported to occur in Florida more than 50 years ago, the virus is not currently found in Florida.

Leprosis is mainly found on sweet oranges. The most susceptible are the early and mid-season sweet oranges. The disease produces localized symptoms on leaves, stems, and fruit of sweet oranges. Other citrus cultivars are susceptible (sour oranges, tangerines and tangor), but they do not show conspicuous symptoms.

Unlike most other viral infections, CiLV never becomes systemic in the plant. The disease only spreads around the feeding sites of infected mites. The virus is believed to multiply in its mite vectors and therefore is considered to be a propagative virus in its insect hosts. The only means of diagnosis at this time is the presence of the virus particles in the plant tissue.
**Disease: Citrus Leprosis (CiLV)**

**Symptoms:**

Chlorotic lesions on the leaves and fruit are the primary symptom. Concentric flat or depressed lesions are found on the fruit often surrounded with a chlorotic zone or halo (Fig. 2). On the leaves and twigs, the lesion may become brown, with or without a necrotic center. Later the lesions develop into flat or somewhat raised necrotic areas. Lesions may coalesce on larger limbs to resemble psorosis-induced bark scaling (Fig. 3). The lesions on leaves and fruit can be confused with citrus canker lesions, but when coupled with chlorotic lesions on twigs, abscission of leaves/fruits, twig dieback and bark scaling that may resemble psorosis, you can get a good idea of how the disease appears (Fig. 4).

**How will this disease impact a grove?**

Citrus Leprosis (CiLV) is a serious non-systemic virus disease of citrus. Heavily infected leaves and fruit will eventually drop off and extensive lesion development on twigs will cause dieback. This can lead to substantial yield losses. In areas of South America where CiLV occurs and the mite vector is not controlled, the tree dies.

Controlling this disease requires the pruning of affected trees and the increased use of acaricides. It is important for growers to use only certified disease-free budwood to avoid bringing this disease into Florida.

**What do I do if I find this disease in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153.
Disease: Citrus Chlorotic Dwarf (CCD)

Brief description of disease:

Citrus chlorotic dwarf (CCD) is a viral disease of citrus that was first found in Eastern Turkey in 1986 (Fig. 1). The disease was found not long after the accidental introduction of the bayberry whitefly into Eastern Turkey. Recent research has confirmed that the causal agent of the disease is transmitted by the bayberry whitefly.

The disease is known to affect lemon, mandarin, grapefruit and sweet oranges although sweet oranges are less affected than the others. The disease is considered to be the most serious citrus disease in the Eastern Mediterranean and has spread rapidly throughout the citrus growing regions of Turkey wherever the vector was present.

The virus that causes this disease can be graft-transmitted, but it is not mechanically transmissible. Graft inoculation to rough lemon is the only detection method available at this time. It can take several months for the symptoms to manifest on the inoculated host plant. The virus can be eliminated from infected budwood by shoot tip grafting.
**Disease: Citrus Chlorotic Dwarf (CCD)**

**Symptoms:**

Symptoms of CCD in young leaves consist of various chlorotic patterns and crinkling or other types of leaf distortion (Fig. 2). Field symptoms consist of chlorotic flecking, warping, crinkling, inverted cupping and variegation (Fig. 3). Leaves of infected plants are small and often have a V-shaped notch near the leaf apex (Fig. 4).

**How will this disease impact a grove?**

Young trees are generally stunted and yield is substantially reduced in sensitive cultivars.

The vector of CCD (the bayberry whitefly) is present in Florida. Therefore, there is a high risk of establishment and spread of this disease in Florida if it were introduced. It is important for growers to only use certified disease-free budwood.

**What do I do if I find this disease in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153.

---

Disease: Citrus Greening

Brief description of disease:

Citrus greening, also called huanglongbing or yellow dragon disease, is one of the most serious diseases of citrus in the world. In some areas of the world where the disease is endemic, citrus trees decline within 5-8 years after planting, and most never bear usable fruit. In countries where citrus greening occurs, it is a primary limiting factor for citrus production (Fig. 1).

Citrus greening is caused by phloem-limited bacteria. The African form of the disease is heat sensitive, and the Asian one is not. The bacteria are transmitted by insect vectors and by grafting.

The host range of citrus greening is poorly known because of difficulties in detection of the pathogen. Most citrus species probably are susceptible. Oranges and mandarins are severely damaged. Grapefruit also becomes unproductive if it is infected with citrus greening bacteria.

The bacteria that cause citrus greening disease are transmitted by citrus psyllids. African citrus psyllid and citrus greening are found in Africa, the Saudi Arabian Peninsula, and several islands in the Indian Ocean. Asian citrus psyllid and citrus greening are found throughout Asia, in the Saudi Arabian Peninsula, and in some islands in the Indian Ocean. Both vector psyllids will transmit both pathogens.

Asian citrus psyllid also occurs in several South American and Caribbean countries, as well as in Florida and Texas in the U.S. So far, however, there is no evidence that any form of citrus greening occurs anywhere in the Western Hemisphere. The biggest risk for establishment of citrus greening in the U.S. is illegal importation of infected plant material. Since symptoms of citrus greening may take some time to develop, the disease can be graft transmitted from an apparently healthy budwood source. Thus, it is vitally important to avoid importing any citrus trees or propagation material from foreign sources.
Disease: Citrus Greening

Symptoms:

Citrus greening disease is characterized by leaf symptoms reminiscent of severe nutritional deficiencies, yellow shoots (Fig. 1), twig dieback, tree decline, and reduced fruit size and quality. Symptoms resembling zinc deficiency occur on younger leaves, and older leaves develop a characteristic mottle (Fig. 2). The mottle differs from nutrition-related mottling in that greening induced mottling usually crosses leaf veins, whereas nutrition related mottles usually occur between or along leaf veins. Leaves may also be small and upright.

Fruit yield is severely reduced, and what little fruit is produced is greatly reduced in quality. Seed abortion is also common (Fig. 3). Fruit are small, lopsided, poorly colored (hence the name greening), and have a bitter, sour flavor.

How will this disease impact a grove?

Citrus greening disease would eventually destroy groves. Yields would be reduced almost completely, and remaining fruit would not be usable due to small size, poor color, and bad taste.

If citrus greening disease were to become established in Florida, the first choice would be to eradicate it. However, if infected plants were not found soon enough to eliminate the disease permanently, disease management would be required. To date, there is nowhere in the world where citrus greening disease occurs that it is under completely successful management. In every place where the disease occurs, life expectancy of citrus trees is vastly reduced and production losses are significant. The most successful management efforts combine production of clean stock with psyllid control and inoculum suppression once groves are established. Psyllids must be controlled both within groves and on any alternative host plants. Inoculum suppression involves removal or severe pruning of any affected grove trees several times each year. Non-commercial citrus and any alternative hosts of the pathogens may also need to be removed.

What do I do if I find this disease in a grove?

Call the FDACS/DPI Help Line at (800) 282-5153.

Fig. 1. Pomkan tree showing yellow shoot characteristic of citrus greening. Fig. 2. Mottled appearance to citrus leaves caused by citrus greening. Fig. 3. Seed abortion caused by citrus greening.
Disease: Citrus Variegated Chlorosis (CVC)

Brief description of disease:

Citrus Variegated Chlorosis (CVC) is caused by a strain of *Xylella fastidiosa*, *(Xf)* a fastidious, xylem-limited bacterium. CVC was first noticed and described in 1987 in Brazil and has since spread from Sao Paulo and Minas Gerais to northeastern Brazil becoming a serious problem in sweet orange production in that area. Recently, the disease has been reported in Argentina and Paraguay.

CVC spreads from tree to tree within citrus groves mainly through vectors. At least 11 sucking insects (*Homoptera, Cidcadellidae*) are able to transmit the bacterium. The vector insects acquire the pathogen while feeding on xylem sap of the infected trees and transmit it while feeding on a healthy tree. There is a 9-12 month long latent period before symptoms appear after the inoculation. This long latency allows the spread of infected but symptomless nursery trees and probably explains how the disease spanned Brazil within a decade.

Symptoms:

The pathogen affects citrus at various ages. Young infected trees develop more severe symptoms than mature trees. Affected trees show foliar interveinal chlorosis resembling zinc deficiency. Bright yellow leaf mottle (Fig. 1) appears on young leaves with distinct lesions on the upper leaf surface. Sectoring of symptoms in canopy can be observed on newly affected trees, but the CVC syndrome usually appears generally throughout the canopy on trees infected for a while. As leaves mature, small, light brown to dark brown, slightly raised gummy lesions appear on the underside of affected leaves. Affected trees are stunted. The infected tree canopy has a thin appearance because of defoliation and the dieback of twigs and branches. Affected branches show abnormal flowering and fruit setting. Fruit from infected trees are small and subject to early ripening and sunburn because of the thin canopy (Fig. 2).
Disease: Citrus Variegated Chlorosis (CVC)

Symptoms alone are not reliable for CVC diagnosis because similar syndromes can be induced by other pathogens and/or environmental stresses. Accurate diagnosis should rely on laboratory isolation along with serological and DNA-based tests. A sample of symptomatic twigs and leaves should be submitted to the Division of Plant Industry - Plant Pathology Section. The suspect tree should be kept under surveillance since repeated visits may be needed to observe symptom development.

How will this disease impact a grove?

CVC has the potential to ruin all sweet oranges in an infested grove if it is not detected early. In addition, Xf cause serious diseases in many economically important plants, including Pierce’s disease of grape, plum leaf scald, phony disease of peach, and leaf scorch in oak, almond sycamore and coffee. Therefore, it may become a threat to other crops in the vicinity.

Citrus growers should never plant citrus trees from an uncertified nursery. The introduction of new citrus propagative material and production of citrus nursery stock are strictly regulated in Florida. All legally sold citrus nursery stock in Florida has been indexed for CVC and many other serious diseases. Citrus growers and their employees should be familiar with disease symptoms in the interest of early detection. Grove managers should look for unusual signs of CVC syndrome, especially for the early symptoms of chlorosis appearing on one or several branches of a sweet orange tree, later becoming more severe throughout the canopy.

What do I do if I find this disease in a grove?

Call the FDACS/DPI Help Line at (800) 282-5153.

Fig. 1. Bright yellow leaf mottle from infection by citrus variegated chlorosis (Photography credit: R. F. Lee, UF/IFAS).
Fig. 2. Fruit damaged to thinning canopies of tree infected by citrus variegated chlorosis.
Disease: Sweet Orange Scab

**Brief description of disease:**

Sweet Orange Scab (SOS) is caused by the fungal pathogen *Elsinoe australis*. It is genetically distinguishable from the common citrus scab (*E. fawcettii*, formerly known as sour orange scab) and Tyrone’s scab, a scab disease in Australia now considered a form of common scab.

SOS looks much like the common citrus scab disease already present in Florida; however, it does not cause lesions on foliage of its host, only on the fruit. Also, the lesions of SOS tend to be a little flatter in profile and less spongy than common scab. In practice, if both scab pathogens are present in an area, it is difficult to distinguish SOS from the cosmopolitan common scab and its variants by symptoms alone or even by morphological comparisons of the pathogens in pure culture. To further complicate the scab picture, common scab is made up of four pathotypes differentiated by host range.

Scab lesions are initially dry, raised pinkish-tan pustules on the host surface. The pustules continue to grow to become tan to brown to gray, cracked warty outgrowths. The size of the scab lesion will vary according to cultivar and tissue age (scabs grow larger when younger tissue gets infected). Spores of the pathogen are released in rainy weather from fruiting structures embedded in the scabby tissue. Only about 1-2 hours of wetness at temperatures from 20 to 21 (range 14 to 25) degrees C are required for spore production to begin, and another 2-3 hours of wetness is enough for successful infection. Symptoms appear after about 5 days at the quickest (on young leaves). Prolonged wet periods favor heavy infection. Spores do not survive drying, but more spores are produced from fruiting bodies embedded in
Disease: Sweet Orange Scab

the scabby tissues when wet conditions prevail. Fruit infections are possible during the first 2 months after petal fall. A sexual reproductive stage is known for the SOS pathogen in Brazil, but the role of the spores produced sexually is not well understood. How the SOS pathogen survives in the absence of fruit has not been resolved. The pathogen gets dispersed by rain splash, wind-blown rain droplets, and by movement of infected plant parts (in this case only fruits).

Symptoms:

SOS symptoms occur only on fruit. The lesions are tan to gray, raised and somewhat pustular, but not to the degree that common citrus scab lesions are (Figs. 1,2 and 3). The lesions of SOS tend to become confluent more readily than those of common scab. Sweet oranges and tangerines would be the likely hosts, but lemon can also become infected. Though the fact that SOS occurs only on fruit might seem to be a useful distinctive trait, remember that common scab is cosmopolitan in Florida on some of the same hosts. The two diseases could easily be confused (Fig. 4). If sweet oranges alone are infected and the lesions are relatively flat for scab, this should be a clue that perhaps SOS is present.

How will this disease impact a grove?

SOS could create one more impediment to fresh fruit shipments from Florida, since the disease is only known from commercial citrus production areas in South America, and other citrus producing countries would reject Florida fresh fruit on the basis that they don’t have the disease. SOS can be managed with well-timed fungicide applications during the formative stages of fruit development, much the same way common scab is managed.

What do I do if I find this disease in a grove?

Call the FDACS/DPI Help Line at (800) 282-5153.

Fig 1. Sweet orange scab on Valencia sweet orange. Fig 2. Sweet orange scab scabs (here on mandarin) are flatter than those of common scab. Fig. 3. Early sweet orange scab lesions on fruitlet of Valencia sweet orange. Fig. 4. Sweet orange scab (left) and common scab (right) on lemon for comparison.
Disease Name: Witches’ Broom of Lime

Brief description of disease:

Witches’ Broom Disease of Lime (WBDL) is a new citrus disease limited in distribution to the northern coast of Oman in the 1970s (where it is widespread); United Arab Emirates in 1989, southeast Iran in 1995, and in India in 1999—hence occurring only in the Asian Continent (Fig. 1). Although the disease has threatened lime production in lime orchards in Oman, United Arab Emirates and India, it has not been reported anywhere else in the eastern or the western hemisphere. WBDL was observed in host tissues, but never cultured. A unicellular causal organism Candidatus Phytoplasma aurantifolia occurs in phloem sieve tubes, but it has also never been cultured.
Disease Name: Witches’ Broom of Lime

The disease is commonly referred to as lime witches’ broom since it was first found on acid lime in Oman. It is also reported on citron and sweet limes. However, under artificial inoculation conditions almost all citrus types have been demonstrated to be infected by graft transmission.

Symptoms:

Appearance of one or more witches’ broom at any place in the tree canopy are characteristic of WBDL (Fig. 2). The affected brooms have very small pale leaves with thin proliferating twigs. Leaves on old brooms dry up and fall off leaving dead naked branches (Figs. 3, 4). Graft transmissibility from shoots of infected brooms onto healthy citrus has been proven. Symptom expression is unique at warm (30°C) temperatures. However, there is no evidence of seed transmission. Transmission by leaf hoppers and psyllids is rapid. The leafhopper, *Hishimonus phycitis*, caught on infected lime brooms in Oman confirmed this vector as an active agent for transmission of *P. aurantifolia* pathogen to healthy limes and lemons.

How will this disease impact a grove?

If the disease affects a citrus grove, the plants would show characteristic symptoms mentioned as above, with premature leaf dropping, general decline of the plant vigor and no fruit production. At early stages of the disease, WBDL can be checked by timely regulatory movement of propagating citrus material followed by eradication efforts.

What to do if I find this disease in a grove?

Call the FDACS/DPI Help Line at (800) 282-5153.

Fig. 1. Characteristic witches’ broom caused by witches’ broom of lime. Fig. 2. Proliferation of witches’ brooms in tree canopy. Fig. 3. Closeup of witches’ broom with leaves fallen off. Fig. 4. Overall appearance of severe damage caused by witches’ broom of lime.
Pest: Caribbean Fruit Fly, *Anastrepha suspensa*

**Brief description of pest:**

Adult females are about 5-8 mm long (including ovipositor sheath) and males a little shorter. The wings of both sexes are about 5-6 mm long. The body is brown to honey-colored, with three yellow stripes on the thorax. The wings are boldly marked with sinuous, brown bands. The female’s ovipositor sheath is conspicuous and robust, cylindrical, and slightly shorter than the thorax; the needle-like ovipositor (normally retracted inside sheath) is 1.4-1.6 mm long, (Fig.1) with a finely serrate tip.

The larva is a legless maggot, creamy white to yellowish in color, and may grow to a length of 7-9 mm within the host fruit. It is cylindrical with a truncate rear end and a tapered head where a pair of fine, black, curved mouthhooks are present. Pupae are brown to red-brown and found in the soil.

**Symptoms:**

“Caribfly” is present year-round in Florida, and when populations swell, especially during April – July, adults are likely to be encountered on the foliage or fruit of citrus and other host trees.

The female punctures a hole through the skin of the fruit to deposit her eggs, usually only a few at a time in citrus. At the puncture site, decay will set in within a few days. Look for a discolored, soft spot on the fruit surface. When eggs hatch (about 3 days), tiny larvae begin to tunnel through the rind and into the fruit pulp, leaving behind a line of damaged and decayed tissue. Look for wriggling, whitish maggots (Fig. 2). As usual only one or a few larvae are present and feeding damage remains confined to part of the fruit.
ever, other insects, such as nitidullid beetles and *Drosophila* flies, also invade the fruit once the fruit exterior begins to decay at the oviposition site, and the entirety of the fruit will eventually be destroyed. When fruit fly larvae are mature, they exit the fruit leaving behind obvious exit holes of about 1 mm diameter.

**How will this pest impact a grove?**

Citrus is not the preferred host of Caribfly and flies inflict little damage early in the season. However, as fruits become overly ripe, they are much more likely to become infested. Uncontrolled Caribfly infestations may render many late-season fruits inedible. Adults and larvae will not damage trees or foliage. Caribfly is not a quarantine pest in Florida, although it is in other states and countries. Commercial growers who wish to export fresh fruit will face regulatory hurdles in doing so.

**What do I do if I find this pest in a grove?**

Your local extension agent and the Florida Department of Agriculture and Consumer Services can provide identification services and control recommendations (FDACS/DPI Help Line (800) 282-5153). Area-wide control is possible by removing preferred hosts, such as guava, from the vicinity of groves. “Bait sprays” comprising an attractant and a pesticide such as malathion, also are effective in killing adults. Sanitary practices, such as removing unharvested fruit from trees and the ground, will reduce breeding populations.

Fig. 1. Adult female Caribbean fruit fly, *A. suspensa* (Photography credit: Jeffrey Lotz, FDACS/DPI).

Fig. 2. *Caribbean fruit fly larvae on fruit* (Photography credit: Jeffrey Lotz, FDACS/DPI).
Pest: Guava fruit fly, *Bactrocera correcta*

Brief description of pest:

Adults are about 5-6 mm long. The wings are marked with a short, pale band along the leading edge of the wing, a small dark spot near the wing tip, and a diagonal, pale band from near the wing base to the posterior edge. The dorsal thorax has a dark base color and two bright, yellow stripes, yellow “shoulders” and yellow at the posterior tip. The thorax also has yellow spots and stripes laterally. The abdomen is yellowish with a black “T”-shaped mark medially (Fig. 1). The female has a hardened, tapered, wasp-like ovipositor sheath and a needle-like ovipositor.

The larva is a legless maggot, creamy white in color, and may grow to a length of 5-6 mm within the host fruit. It is cylindrical with a truncate rear end and a tapered head where a pair of fine, black, curved mouthhooks are present.

(Fig. 1)

Symptoms:

Adult flies will be found on the foliage or fruit of host trees. They are unlikely to be seen unless a large outbreak has occurred.

The female punctures a hole through the skin of the fruit to deposit her eggs in batches. At the puncture site, decay will set in within a few days. Look for a discolored, soft spot on the fruit surface. When eggs hatch (about 3 days), tiny larvae begin to tunnel through the rind and into the fruit pulp, leaving behind a line of damaged and decayed tissue. As feeding continues and larvae grow, the damage grows more severe, eventually encompassing much of the fruit interior. Look for wriggling, whitish maggots. Other insects, such as nitidulid beetles and *Drosophila* flies, also invade the fruit once the fruit exterior begins to decay at the oviposition site.
Pest: Guava fruit fly, *Bactrocera correcta*

**How will this pest impact a grove?**

As the name suggests, these flies typically attack guava, although other fruits are also subject to infestation. Guava fruit fly affects fruit only. Adults and larvae will not damage trees or foliage. Although citrus infestation by guava fruit fly is not well known, uncontrolled guava fruit fly infestations may result in severe fruit drop and rendering fruit inedible. Detection of guava fruit fly will result in quarantine of a large number of potential host plants, including citrus, in the surrounding area. Quarantine regulations will prevent the movement of fruit out of the regulated area until the infestation has been eradicated.

**What do I do if I find this pest in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153. Guava fruit fly is not amenable to local control by the grower. At the minimum, an area-wide program of intensive trapping in an 81 square mile zone around any guava fruit fly detection site will be implemented immediately. Further measures may include fruit-stripping and ground or aerial application of pesticides.

---

Fig. 1 Adult male guava fruit fly, *Bactocera correcta* (Photography credit: Jeffrey Lotz, FDACS/DPI).
Pest: Mediterranean fruit fly, *Ceratitis capitata*

**Brief description of pest:**

The adult Mediterranean fruit fly ("medfly") is slightly smaller than a housefly with an average length of 3.5-5 mm (Fig. 1). The wings are oval, with three converging colored bands and a webwork of black lines at the base. The thorax is mostly black with an intricate pattern of yellow or white spots and stripes. The abdomen is honey-colored with two silvery-white bands. The female has a short, truncate, hardened ovipositor sheath into which it retracts its needle-like ovipositor used to deposit eggs beneath the skin of the host fruit. The male has a pair of fine, black bristles on the head each with an expanded tip.

![Figure 1](image1.png)

The larva is a legless maggot, creamy white in color, and may grow to a length of 8 mm within the host fruit (Fig. 2). It is cylindrical with a truncate rear end and a tapered head where a pair of fine, black, curved mouthhooks are present.

![Figure 2](image2.png)

![Figure 3](image3.png)

![Figure 4](image4.png)
Pest: Mediterranean fruit fly, *Ceratitis capitata*

**Symptoms:**

Adult flies will be found on the foliage or fruit of host trees. They are unlikely to be seen unless a large outbreak has occurred. The female punctures a hole through the skin of the fruit to deposit her eggs, often 10 or more. At the puncture site, decay will set in within a few days. Look for a discolored, soft spot on the fruit surface (Fig. 3). When eggs hatch (about 3 days), tiny larvae begin to tunnel through the rind and into the fruit pulp, leaving behind a line of damaged and decayed tissue. As feeding continues and larvae grow, the damage grows more severe, eventually encompassing much of the fruit interior (Fig. 4). Look for wriggling, whitish maggots throughout – when mature, they can jump! When larvae are mature, they exit the fruit leaving behind obvious exit holes of about 1 mm diameter. Other insects, such as nitidulid beetles and *Drosophila* flies, also invade the fruit once the fruit exterior begins to decay at the oviposition site.

**How will this pest impact a grove?**

Mediterranean fruit fly affects fruit only. Adults and larvae will not damage trees or foliage. Uncontrolled medfly infestations result in severe fruit drop and fruit are rendered inedible. Quarantine regulations will prevent the movement of fruit out of the regulated area until the infestation has been eradicated.

**What do I do if I find this pest in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153. Mediterranean fruit fly is not amenable to local control by the grower. At the minimum, an area-wide program of intensive trapping in an 81 square mile zone around any medfly detection site will be implemented immediately. Further measures may include fruit-stripping, ground or aerial application of pesticides, or sterile insect technique (SIT).

Fig. 1. Adult Mediterranean fruit fly, *Ceratitis capitata*. Fig. 2. Larva of Mediterranean fruit fly (Photography credit: Jeffrey Lotz, FDACS/DPI). Fig. 3. Discoloration and decay caused by oviposition of female Mediterranean fruit flies. Fig. 4. Medfly damage on grapefruit (Photography credit: Gary Steck, FDACS/DPI).
Pest: Melon fly, *Bactrocera cucurbitae*

**Brief description of pest:**

The adult Melon fly is about 7-8 mm long. The wings of both sexes are about 6-7 mm long and marked with three dark bands: (1) a thin, brown band along the leading edge of the wing that is expanded to a semi-circular spot at the wing tip, (2) a thin, diagonal band from near the wing base to the posterior edge, and (3) an oblique stripe posteriorly beyond the middle of the wing (Fig. 1). The dorsal thorax is orange-brown with three bright, yellow stripes, yellow ‘shoulders’, and yellow at the posterior tip. The thorax also has yellow spots/stripes laterally. The abdomen is orange-brown with a black T-shaped mark medially. The female has a hardened, tapered, wasp-like ovipositor sheath and a needle-like ovipositor that is about 1.7 mm long.

The larva is a legless maggot, creamy white in color, and may grow to a length of 9-11 mm within the host fruit. It is cylindrical with a truncate rear end and a tapered head where a pair of fine, black, curved mouthhooks are present.

**Symptoms:**

As the name suggests, these flies typically attack melons, squashes, and related host plants. Adult flies will be on or in the vicinity of preferred hosts. They are unlikely to be seen on citrus unless primary host plants occur nearby and are infested with a significant population of flies.

The female punctures a hole through the skin of the fruit to deposit her eggs. At the puncture site, decay will set in within a few days. Look for a discolored, soft spot on the fruit surface. When eggs hatch (about 3 days), tiny larvae begin to tunnel through the fruit, leaving behind a line of damaged and decayed tissue. As
Pest: Melon fly, *Bactrocera cucurbitae*

feeding continues and larvae grow, the damage grows more severe, eventually encompassing much of the fruit interior. Look for wriggling, whitish maggots throughout. When larvae are mature, they exit the fruit leaving behind obvious exit holes. Other insects, such as nitidulid beetles and *Drosophila* flies, also invade the fruit once the fruit exterior begins to decay at the oviposition site.

**How will this pest impact a grove?**

Melon fly infests primarily vegetables, but citrus may also be attacked. Adults and larvae will not damage citrus trees or foliage. Detection of melon fly will result in quarantine of a large number of potential host plants, including citrus, in the surrounding area. Quarantine regulations will prevent the movement of fruit out of the regulated area until the infestation has been eradicated.

**What do I do if I find this pest in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153. Melon fly is not amenable to local control by the grower. At the minimum, an area-wide program of intensive trapping in an 81 square mile zone around any melon fly detection site will be implemented immediately. Further measures may include fruit-stripping, ground or aerial application of pesticides, or sterile insect technique (SIT).

Fig. 1. Adult male melon fruit fly, *Bactrocera curcubitae* (Photography credit: California Department of Food and Agriculture).
Pest: Mexican Fruit Fly, *Anastrepha ludens*

**Brief description of pest:**

Adult females are 10-12 mm long (including ovipositor sheath) and males are about 7.5 mm long. The wings of both sexes are about 7 mm long. The body color is pale brown, with three yellow stripes on the thorax. The wings are boldly marked with sinuous, yellow-brown bands. The female’s ovipositor sheath is conspicuous and robust, clearly longer than the thorax, and slightly constricted beyond the middle; the needle-like ovipositor (normally retracted inside sheath) is 3.3-4.7 mm long, with a finely serrate tip (Fig.1).

(Fig.1)

The larva is a legless maggot, creamy white to yellowish in color, and may grow to a length of 9-11 mm within the host fruit. It is cylindrical with a truncate rear end and a tapered head where a pair of fine, black, curved mouthhooks are present. Pupae are brown to red-brown and in the soil.

**Symptoms:**

Adult flies will be found on the foliage or fruit of host trees. They are unlikely to be seen unless a large outbreak has occurred.

The female punctures a hole through the skin of the fruit to deposit her eggs, usually in batches of 5-6. At the puncture site, decay will set in within a few days. Look for a discolored, soft spot on the fruit surface. When eggs hatch (6-10 days), tiny larvae begin to tunnel through the rind and into the fruit pulp, leaving behind a line of damaged and decayed tissue. As feeding continues and larvae
Pest: Mexican Fruit Fly, *Anastrepha ludens*

grow, the damage grows more severe, eventually encompassing much of the fruit interior. Look for wriggling, whitish maggots. Other insects, such as nitidulid beetles and *Drosophila* flies, also invade the fruit once the fruit exterior begins to decay at the oviposition site.

**How will this pest impact a grove?**

The preferred host of Mexican fruit fly (“Mexfly”) is grapefruit, although it will attack other citrus and other fruits as well. Mexfly affects fruit only. Adults and larvae will not damage trees or foliage. Uncontrolled Mexfly infestations may result in severe fruit drop and fruit are rendered inedible. Detection of Mexfly will result in quarantine of a large number of potential host plants in the surrounding area. Quarantine regulations will prevent the movement of fruit out of the regulated area until the infestation has been eradicated.

**What do I do if I find this pest in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153. Mexfly is not amenable to local control by the grower. At the minimum, an area-wide program of intensive trapping in an 81 square mile zone around any guava fruit fly detection site will be implemented immediately. Further measures may include fruit-stripping, ground or aerial application of pesticides, or sterile insect technique (SIT).

---

*Fig. 1. Adult female Mexican fruit fly, *Anastrepha ludens* (Photography credit: California Department of Food and Agriculture).*
Pest: Oriental fruit fly, *Bactrocera dorsalis*

**Brief description of pest:**

Adults are about 6-8 mm long. The wings of both sexes are about 6-7 mm long and marked with a thin, brown band along the leading edge of the wing, and a diagonal, brown band from near the wing base to the posterior edge. The dorsal thorax has a dark base color and two bright, yellow stripes, yellow ‘shoulders’ and yellow at the posterior tip. The thorax also has yellow spots and stripes laterally. The abdomen is yellowish with a black ‘T’-shaped mark medially (Fig. 1). The female has a hardened, tapered, wasp-like ovipositor sheath and a needle-like ovipositor that is between 1.4 and 1.6 mm long.

![Image of a fly](image1)

(Fig. 1)

The larva is a legless maggot, creamy white in color, and may grow to a length of 7.5-10 mm within the host fruit. It is cylindrical with a truncate rear end and a tapered head where a pair of fine, black, curved mouthhooks are present.

**Symptoms:**

Adult flies will be found on the foliage or fruit of host trees. They are unlikely to be seen unless a large outbreak has occurred.

The female punctures a hole through the skin of the fruit to deposit her eggs in batches of 3-15. At the puncture site, decay will set in within a few days. Look for a discolored, soft spot on the fruit surface. When eggs hatch (about 3 days), tiny larvae begin to tunnel through the rind and into the fruit pulp, leaving behind a line of damaged and decayed tissue. As feeding continues and larvae grow, the damage grows more severe, eventually encompassing much of the fruit interior.
Pest: Oriental fruit fly, *Bactrocera dorsalis*

Look for wriggling, whitish maggots throughout – when mature, they can jump! When larvae are mature, they exit the fruit leaving behind obvious exit holes of about 1 mm diameter. Other insects, such as nitidulid beetles and *Drosophila* flies, also invade the fruit once the fruit exterior begins to decay at the oviposition site.

**How will this pest impact a grove?**

Oriental fruit fly affects fruit only. Adults and larvae will not damage trees or foliage. Uncontrolled Oriental fruit fly infestations result in severe fruit drop and fruit are rendered inedible. Quarantine regulations will prevent the movement of fruit out of the regulated area until the infestation has been eradicated.

**What do I do if I find this pest in a grove?**

Call the FDACS/DPI Help Line (800) 282-5153. Oriental fruit fly is not amenable to local control by the grower. At the minimum, an area-wide program of intensive trapping in an 81 square mile zone around any Oriental fruit fly detection site will be implemented immediately. Further measures may include fruit-stripping, ground or aerial application of pesticides, or sterile insect technique (SIT).

Fig. 1. Adult male Oriental fruit fly, *Bactrocera dorsalis* (Photography credit: California Department of Food and Agriculture).
Pest Name: Yellow-headed Ravenous Weevil, *Myllocerus undatus*

**Brief description of pest:**

In September 2000, a homeowner in Broward County discovered pale grey weevils damaging the foliage of several ornamental plants (Fig. 1). The weevils were identified as *Myllocerus undatus* Marshall, a species native to Sri Lanka. An immediate survey of southern Florida revealed the weevil to be present at multiple localities from Boca Raton in Palm Beach County to northern Dade County. Since then it has spread north to West Palm Beach and south to the Homestead area, all in a fairly narrow band along the coast.

(Fig. 1)

There is little information on this species in the literature other than the original description. Data collected by Division of Plant Industry inspectors suggest this weevil has an extremely broad adult host range. Thus far, Florida records include 55 adult hosts ranging from palms to roadside weeds, but including citrus. The life history of *M. undatus* is not yet known in detail, but it appears to be similar to that of other root weevils such as *Pachnaeus* spp., *Artipus floridanus*, and *Diaprepes abbreviatus*. While adults damage the foliage, larvae feed underground on the roots of plants. It is expected that the larvae will be found to feed on fewer species of plants than the adults.

(Fig. 2)
Pest Name: Yellow-headed Ravenous Weevil, *Myllocerus undatus*

The weevil is superficially similar to a native leaf notcher weevil, *Artipus floridanus*, in size at 7-8 mm long, and in its general whitish-grey coloration (Fig. 2). However, it differs in many details, the most conspicuous of which is the dark mottling of the upper surface and the yellowish head. All the femora are spined in *M. undatus*, as opposed to *A. floridanus*, in which none of the femora are spined.

**Symptoms:**

Adults of most leaf-feeding weevils produce a characteristic “notching” along the edges of the leaves of the host plant. Adults of *M. undatus*, however, chew much more deeply into the leaf than do most weevils, often reaching the midrib, and thus destroying more of the leaf area. Foliage heavily attacked by *M. undatus* has a strikingly ragged appearance. The extent of larval damage, on the other hand, is not known at present, but should be similar to that produced by other root weevils in Florida.

**How will this pest impact a grove?**

It is not known yet if *M. undatus* will become a serious citrus pest in Florida, but so far it has given every indication that it will be a major pest of many plants in the southern part of the state. And it is known that adults, at least, will feed on citrus. Growers should be on the lookout for the characteristic damage produced by this weevil.

**What do I do if I find this pest in a grove?**

Call the FDACS/DPI Help Line at (800) 282-5153.

Fig. 1. *Myllocerus undatus* Marshall, an exotic weevil newly established in south Florida, on tropical almond. (Photography credit: Susan Halbert, FDACS/DPI)  Fig. 2. *Myllocerus undatus*, dorsal view of adult. (Photography credit: Paul Skelley, FDACS/DPI).