

# Lee County Agriculture

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## THE MEDITERRANEAN FRUIT FLY IN FLORIDA

(*Ceratitis Capitata*)

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**INTRODUCTION:** The Mediterranean fruit fly, *Ceratitis capitata*, is one of the world's most destructive fruit pests because of its worldwide distribution and a wide host range. It has the ability to tolerate colder climates than most other fruit flies and is ranked first among the economically destructive fruit fly species.

Its larvae (grubs) develop and feed on most tropical, subtropical and deciduous fruit and some vegetables. Although it may be a major pest of citrus, it is often a more serious pest of some deciduous fruits, such as the peach, pear and apple. The larvae feed upon the pulp of host fruits, sometimes tunneling through it and eventually reducing the fruit to a mushy, inedible mass.

In some Mediterranean countries, only the earlier varieties of citrus are grown, because the flies develop so rapidly that late season fruits are too heavily infested to be marketable. Some areas have had almost 100 percent infestation in stone fruits. Harvesting susceptible fruits

before maturity is practiced in Mediterranean areas infested with the "medfly."

In this age of jet transportation, the "medfly" can be transported from one part of the world to another in a matter of hours. This generally complicates efforts to contain it within present locations. Once it is established, eradication efforts may be extremely difficult and expensive. In addition to reduction in crop yields, infested areas have the additional expense of control measures and costly sorting processes for both fresh and processed fruits and vegetables.

**DISTRIBUTION:** Mediterranean fruit fly infestation in the United States has occurred in Hawaii since 1910 and in California since September 1975. In Florida infestations occurred from April 1929 to July 1930, April 1956 to November 1957, June 1962 to February 1963, June to August, 1963, and in August of 1981.

Around the world, the medfly is now established in almost all Mediterranean countries, Africa, the Middle East, Central and South America, the Caribbean and occasionally in Northern European countries.

**HOSTS:** The Mediterranean fruit fly attacks more than 260 different fruits, flowers, vegetables, and nuts (partial list, Tables 1-4). Thin-skinned, succulent fruits are preferred. Host preferences vary in different regions. Although several species of cucurbits (cucumber, cantaloupe, watermelon, pumpkin, squash, etc.) have been recorded as hosts of the medfly, cucurbits are considered to be very poor hosts. Knowledge of the hosts in one country often aids in correctly predicting those fruits which are most likely to be infested in a newly infested country, but what may be a preferred host in one part of the world may be a poor host in another.

**IDENTIFICATION:** Adults are slightly smaller (3.5 - 5 mm) than a house fly and have brightly colored wings typical of fruit flies.

The body is yellowish with a brown tinge, especially on the abdomen and legs. The medfly has a wide brownish yellow band across the middle of its wings. The eyes are reddish purple. The thorax is creamy white to yellow with a characteristic pattern of black blotches.

**LIFE HISTORY AND HABITS:** The length of time required for the medfly to complete its life cycle during Florida's summer, and upon which eradication schedules are based, is 21-30 days. A female medfly will lay 1-10 eggs in an egg cavity 1 mm deep and may lay as many as 22 eggs per day or as many as 800 during her lifetime (usually about 300). Females will not lay eggs when temperatures drop below 61EF. During warm weather eggs hatch in 1.5-3 days. The duration of the egg stage is considerably increased by lower temperatures. Females usually die soon after egg laying.

Eggs are deposited under the skin of fruit which is just beginning to ripen, often in an area where some break in the skin has already occurred. Several females may use the same deposition hole with 75 or more eggs clustered in one spot. When the eggs hatch, the larvae promptly begin eating. Fruit in a hard or semi-ripe condition is better for laying egg than fully ripened fruit. Ripe fruit is

likely to be more juicy and such fruits often are associated with a high mortality of eggs and young larvae.

Larval life may be as short as 6-10 days. In citrus fruits, especially limes and lemons, it appears to be longer. Thus larvae require 14-26 days to reach maturity in a ripe lemon, as compared with 10-15 days in a green peach.

Adults emerge in largest numbers early in the morning during warm weather. They can fly short distances, but winds may carry them a mile or more away. Copulation may occur at any time throughout the day. Males and female medflies are sexually active four days and six to eight days after emergence from the fruit, respectively.

**MALATHION:** Malathion is the accepted chemical used to control the medfly. All vertebrates, both warm-blooded animals (mammals and birds) and cold-blooded (reptiles and amphibians) have a much higher tolerance to Malathion than do insects. Fish have an average of 10 fold more tolerance than insects.

Malathion has been around since 1950 and has been part of fruit fly control programs since 1956. The bait spray programs have been continuously improved to minimize the amount of bait spray needed for effective control of the pest fruit fly.

Acceptable exposure: According to the US-EPA: the acceptable daily intake for humans is 0.02 milligrams per kilogram of body weight per day. A 22-pound child can receive a 0.2 milligram dose of Malathion every day without an effect.

Expected dose from bait spray applications: A child eating a small amount of soil from a treated area would ingest about 0.0000043 milligrams per kilogram per day of Malathion in a single exposure. This is less than 1/46,000th of the acceptable daily intake for a 22-pound child. The greatest exposure would be for an adult contacting sprayed vegetation before the treatment had dried. The dose there is about 0.093 milligrams per kilogram per day in a single exposure. This represents less than 1 percent of the acceptable daily intake for a 110-pound person.

Surface water: The Medfly Control Program requires that surface water (rivers, lakes and ponds) not be sprayed. USDA does monitor Malathion in surface water during medfly control programs.

Soil: Malathion's breakdown in soil was found to be a combination of biological and nonbiological factors. Breakdown is faster in alkaline soils than in acid soils. In acidic soil the half-life of Malathion is about seven days.

**THREAT TO FLORIDA AGRICULTURE:** Florida agriculture generates farm cash of \$6 billion annually, of which citrus and vegetable crops contribute more than 40 percent. Agriculture has an estimated overall economic impact in Florida of more than \$54 billion.

If there is a long-term or widespread medfly infestation, Florida growers would not be permitted to ship numerous fruit and vegetable crops to many foreign and domestic markets, which would have an adverse impact on numerous sectors in the state's economy, including employment and transportation. The movement of fruits and vegetables, even within the state, would be disrupted, which could lead to higher prices in the supermarket. The price of orange juice could also increase if the medfly damages fruit in commercial groves.

Perhaps the greatest threat posed by the medfly is the potential loss of domestic and export markets for host fruits and vegetables. Other states and foreign countries impose quarantines to prevent the spread of exotic pests in their territories. This means citrus and vegetable crops, as well as backyard produce, grown in an infested Florida area could not be shipped out of the area to markets or even friends in most other states and countries.

Recent marketing efforts have led to expanded export for citrus and tomatoes to Japan and Mexico, which could now be threatened. Currently, Florida exports about \$300 million per year of fresh citrus to Canada and other countries.

If the medfly is not eradicated in Florida, it would require ongoing pesticide treatments by homeowners and commercial growers to many fruits and vegetables, and costly post-harvest treatments of fruits and vegetables to meet quarantine restrictions of domestic and foreign markets.

### Mediterranean Fruit Fly Host List

Table 1. Generally or Heavily Infested Fruits

Common Name(s)	Scientific Name
Ackee	<i>Blighia sapida</i>
White sapote	<i>Casimiroa edulis</i>
Star apple	<i>Chrysophyllum cainito</i>
Chrysophyllum	<i>Chrysophyllum polynesianum</i>
Calamondin, Panama orange	<i>X Citrofortunella mitis</i>
Lime	<i>Citrus aurantifolia</i>
Seville orange	<i>Citrus aurantium</i>
Lemon except `Eureka` `Lisbon` and Sour lemon	<i>Citrus limon and Citrus x limonia</i>
Pummelo	<i>Citrus maxima</i>
Orange	<i>Citrus x nobilis</i>
Pomelo	<i>Citrus x paradisi</i>
Tangerine	<i>Citrus reticulata</i>

Table 1. continued

Common Name	Scientific Name
Malta orange	<i>Citrus sinensis</i>
Coffee	<i>Coffea canephora</i>
Quince	<i>Cydonia oblonga</i>
Persimmon	<i>Diospyros decandra</i> and <i>Diospyros kaki</i>
Kei apple	<i>Dovyalis caffra</i>
Loquat	<i>Eriobotrya japonica</i>
Surinam cherry	<i>Eugenia uniflora</i>
Common fig	<i>Ficus carica</i>
Kumquat	<i>Fortunella japonica</i>
Common apple	<i>Malus pumila</i>
Mango	<i>Mangifera indica</i>
Elengi tree, pogada	<i>Mimusops elengi</i>
Orange-jessamine, Mock orange	<i>Murraya paniculata</i>
American plum, Native plum	<i>Prunus americana</i>
Apricot	<i>Prunus armeniaca</i>
Garden plum	<i>Prunus domestica</i>
Peach	<i>Prunus persica</i>
Nectarine	<i>Prunus persica</i>
Strawberry guava, Cattley guava	<i>Psidium cattleianum</i>
Guava	<i>Psidium guajava</i>
Common pear	<i>Pyrus communis</i>
Leconte pear	<i>Pyrus X leconte</i>
Rose apple	<i>Syzygium jambos</i>

Table 2. Occasionally Infested Fruits

Common Name(s)	Scientific Name
Guanabana, soursop	<i>Annona muricata</i>
Carambola, star-fruit	<i>Averrhoa carambola</i>
Bell pepper	<i>Capsicum annuum</i>
Papaya, Papaw	<i>Carica papaya</i>
Hedge thorn	<i>Carissa bispinosa</i>
Strawberry	<i>Fragaria x ananassa</i>
Mangosteen	<i>Garcinia mangostana</i>
Garcinia, gourka	<i>Garcinia xanthochymus</i>
Cotton	<i>Gossypium sp.</i>
Walnut	<i>Juglans sp.</i>
Tomato	<i>Lycopersicon esculentum</i>
Ochrosia	<i>Ochrosia elliptica</i>
Avocado	<i>Persea americana</i>
Malay apple	<i>Syzygium malaccense</i>

Table 3. Rarely Infested Fruits

Common Name(s)	Scientific Name
Custard apple	<i>Annona reticulata</i>
Gomuti, sugar palm	<i>Arenga pinnata</i>
Breadfruit	<i>Artocarpus altilis</i>
Natal plum, Carissa	<i>Carissa grandiflora</i>
Cestrum, Jasmine	<i>Cestrum sp.</i>

Chinese wampee, Wampi	<i>Clausena lansium</i>
Blue palm	<i>Latania loddigesii</i>
Lychee	<i>Litchi chinensis</i>
European wolfberry	<i>Lycium europaeum</i>
Barbados cherry	<i>Malpighia glabra</i>
Sapodilla	<i>Manilkara zapota</i>
Banana	<i>Musa acuminata</i>
Plantain	<i>Musa x paradisiaca</i>

Common Name(s)	Scientific Name
Madagascar olive	<i>Noronhia emarginata</i>
Passion flower	<i>Passiflora sp.</i>
Date palm	<i>Phoenix dactylifera</i>
Pomegranate.	<i>Punica granatum</i>
Blackberry, Youngberry	<i>Rubus sp.</i>
Beach sandalwood	<i>Santalum freycinetianum</i>
Eggplant	<i>Solanum melongena</i>
Otaheite apple	<i>Spondias cytherea</i>
Fox grape	<i>Vitis lambrusca</i>

Table 4. Unknown Importance

Common Name(s)	Scientific Name
Pineapple	<i>Ananas comosus</i>
Cherimoya	<i>Annona cherimola</i>
Pondapple, Alligator apple	<i>Annona glabra</i>
Sugar apple, Sweetsop	<i>Annona squamosa</i>
Papaw, Pawpaw	<i>Asimina sp.</i>
Sprenger asparagus	<i>Asparagus densiflorus</i>
Belladonna	<i>Atropa belladonna</i>
Barberry	<i>Berberis holstii</i>
Bumelia	<i>Dumella lycoldos</i>
Tough bumelia, Buckthorn	<i>Bumelia tenax</i>
Butia palm, jelly palm, Pindo palm	<i>Butia sp.</i>
Ylang-ylang	<i>Canaga odorata</i>
Caper	<i>Capparis citrifolia</i>

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