

Insect Management in Papaya¹

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Insects may be a limiting factor in growing papayas, especially from fruit set until harvest. Among those likely to be a problem are the papaya fruit fly, webworm, whitefly, mites, aphids, scales, mealybugs, leafhoppers and hornworms. Of these pests, the papaya fruit fly is especially important because it is difficult to control and requires some preventive control measures. According to EPA data bank information sources several materials are approved for use on papayas (Table 1). The uses may extend and include application to fruit-bearing plants or they may be restricted to ornamental or nursery use only. It is the responsibility of the applicator to use only labeled materials to meet their specific needs. See Table 1.

Local authorities, agricultural supply dealers and the County Agricultural Extension office may be able to supply additional information. Under the FIFRA amendment of 1978 the grower may use a material (insecticide) that is legal and EPA approved for a pest on a crop for other non-listed pests as long as the user follows the label directions and rates for an approved pest.

Specific Pests

Mites , *Tetranychus* spp.

Spider mites are observed on the underside of older leaves causing leaf decoloration and leaf drop. When populations are high, the apical leaves show deformity, mottling and virus-like symptoms.

Papaya Fruit Flies , *Toxotrypana curvicauda* Gerstaecker

These are sometimes called wasps, because of the long ovipositor of the female fly as well as similarities in size and color. This long egg-laying organ, which is as long as the body proper, penetrates the flesh of the fruit and enters the seed cavity. Eggs are usually laid in small fruit, about two to three inches in diameter, but they may be deposited in smaller and larger fruit, especially during high populations of the fly.

The larvae, which are small legless maggots, feed on the seed and interior parts of the fruit. When the larvae become mature, they emerge from the fruit, drop to the ground beneath the plant and pupate just below the soil surface. After about two to four weeks

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Figure 1. *Tetranychus* spp. infesting papaya leaves.

the flies emerge to mate and seek fruit in which to lay eggs.



Figure 2. Papaya fruit fly female (left) and fruit damaged by papaya fruit fly (right).

Control. It is too late to attempt control measures after the female fruit fly has deposited eggs in the fruit. Consequently, control procedures should be directed at preventing egg-laying either by mechanical means or by applying insecticides to kill the adult female before she deposits her eggs. Permethrin (Pounce 3.2 EC applied at 8 oz per acre or Ambush applied at 12.8 oz per acre - in 100 gal of water) is recommended. They may be applied until 7 days before harvest. Do not apply more than 6 times per season.

Control of the fly may be achieved by mechanical protection such as the use of paper bags.

Each fruit may be enclosed in a 3-5 pound size bag tied around the fruit stem to hold the bag. Newspaper, one-half sheet (about 12-15 inches in size), may be rolled to enclose the fruit, then tied around the fruit stem, and also the free end. Bagging should begin when the fruit is small, shortly after the flower parts have fallen. This method of control is more adapted to small (1 to 25 plants) than to large (one-fourth acre or more) plantings. Although bagging the fruit is the most certain method of control, it is a laborious process and requires attention at regular intervals (10 to 14 days) to keep the young fruit covered. Also, this procedure will injure some of the fruit unless handled carefully.

Sanitation is important in the control of the papaya fruit fly. It consists of destroying all dropped and prematurely ripe fruit, as well as small fruit suspected of being infested to prevent the larvae from developing into adult fruit flies.

Papaya Webworms

These are sometimes referred to as the fruit cluster worm, but is commonly called papaya webworm. It develops under a web between and around fruits and along stems of plants. The webworm cause injury to fruit and stem, providing an entrance for the fungus disease, anthracnose.

Control. Permethrin (Pounce 3.2 EC used at 8 oz/acre) is recommended. Use of malathion and/or *Bacillus thuringiensis* for other insects may reduce or aid in the control of webworms.

Papaya Whiteflies

Adult is a small white insect which often can be detected by shaking the leaves of the plant -- especially young leaves. The eggs are yellow and oval shaped, and appear to have been dusted. The crawlers are flat and resemble scale crawlers, feeding and developing on the undersides of leaves.

Three growth stages are followed by a pupa, and then the winged adult. The whiteflies produce honeydew, on which sooty mold grows. The whitefly in papaya is parasitized by *Amitus fuscipennis* MacGown & Nebeker, *Amitus* sp. and *Encarsia tabacivora* Viggiani.

Scales

The papaya scale, *Philephedra tuberculosa* Nakahara and Gill, attacks papaya and Annona fruits.

Scale infestation results in 3 types of damage to papaya plants. First, flower and leaf drop occur from severely infested young plants. Secondly, when the infestation on seedlings or on young plants is localized near the apex, distortion of apical leaves is induced. Thirdly, females attached to the fruit cause cosmetic damage that makes fruit unmarketable.



Figure 3. Papaya infested with *P. tuberculosa* females.

Life History. Female scales produce up to 900 eggs over 3 to 4 weeks. Eggs hatch after 12-17 days, and crawlers settle on leaves, stem and fruit. The papaya scale pass through two nymphal (immature) stages.

This scale has at least 9 different predators, among them the mealy bug ladybird (*Cryptolaemus montrouzieri*), and it is attacked by fungus *Verticillium lecanii*, which causes, during the summer, up to 90% mortality.

There are two small parasitic wasps, e.g., *Coccophagous lycimnia* and *Trichomastus portoricensis*, that periodically cause significant mortality.

Papaya Mealybug

Papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink feed on leaves, stems, fruits and even on seedlings. Mealybugs cause deformity, wrinkling and rolling of the leaf edges and

early leaf drop. Attack to unripe fruits causes sap running and blemishes, a source of fruit downgrading. Papaya fruit can be heavily infested with mealybugs, becoming white and essentially inedible. Under heavy infestations, the abaxial side of the lower leaves can be covered with insects that congregate near the main vein.



Figure 4. Papaya mealybug.



Figure 5. Papaya mealybugs infesting fruits.

The parasitoid, *Acerophagus nubilipennis* Dozier (Hymenoptera: Encyrtidae) is an effective parasitoid of the mealybug in Florida.

Leafhoppers (Homoptera: Cicadellidae)

Leafhoppers cause two types of damage: direct feeding and secondary damage as vectors. Symptoms of leafhopper feeding include tip burn, wrinkling and cupping of the leaves, burning of leaf margins in large trees, and stunting of smaller plants. Leafhoppers are more important for their vectoring



Figure 6. Papaya leaves infested with papaya mealybug.

ability than for the mechanical damage. In Florida, *Empoasca stevensi* Young is the only cicadellid species collected from papaya leaves.



Figure 7. Leaf curling is one of the symptoms of attack by the leafhopper, *Empoasca stevensi*, in Florida.

Aphids (Homoptera: Aphididae)

Aphids do not colonize papaya plants, but are a serious threat to papaya production due to their ability to transmit diseases, in particular papaya ringspot virus (PRSV) and the papaya mosaic virus. The aphids,

Myzus persicae (Sulzer) and *Lipaphis erysimi* (Katenbach) infest leaves of papaya plantings in south Florida. These species increase from November through May.

References

Crane, J. and Mossler, M. 2006. Pesticides Registered for Tropical Fruit Crops in Florida. University of Florida, IFAS Extension, EDIS, FS HS177 (<http://edis.ifas.ufl.edu/HS177>).

Table 1. Insecticides registered for guava in Florida.

Chemical Name	Brand Name(s)	Pest(s) Controlled
Azadirachtin	Align, Azatin	general insecticide
<i>Bacillus thuringiensis</i>	Dipel, others	lepidoptera larvae
<i>Beauveria bassiana</i>	Mycotrol	aphids, mealybugs, others
Bifenazate	Floramite ¹	mites
Bifenthrin	Talstar ¹	various insects, mites
Fenbutatin-oxide	Vendex	mites
Fenpropathrin	Tame ²	various insects, mites
Hexythiazox	Savey ²	various insects, mites
Hydramethylnon	Amdro ¹	ants
Kaolin (clay)	Surround	barrier and irritant to various insects
Imidacloprid	Provado	thrips
Malathion	Malathion	scales, thrips
Methoxyfenozide	Intrepid	lepidoptera larvae
Permethrin	Pounce, Ambush	mites
Potassium salts of fatty acids	Safer Soap	aphids, lace bugs, mealybugs, spidermites, others
Pymetrozine	Endeavor ²	aphids, whiteflies
Pyrethrin + rotenone	Pyrellin	aphids, lepidoptera, thrips
Pyrethrins	Pyrenone	aphids, lepidoptera, mites, thrips
Pyriproxyfen	Esteem Ant Bait	ants
Pyriproxyfen	Knack, Esteem	scales
S-methoprene	Extinguish	ants
Spinosad	SpinTor 2SC	lepidoptera larvae, mirids, thrips
Various refined horticultural oils	Sunspray, citrus spray oil, crop oil, FC 435-66, FC 455-88, others	aphids, mites, scales
¹ For use with non-bearing trees only. ² For nursery/nonbearing trees only.		