

Some Common Diseases of Papaya in Florida¹

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Papaya is a large herbaceous tropical plant grown for its melon-like fruit. The papaya is frost-sensitive, and is grown only in southern Florida, with commercial production centered in Dade County where frost damage is least likely.

Diseases are the most important limiting production problems of papaya. Although the plant is classified botanically as perennial, virus diseases have reduced the effective crop life to 1-2 years.

This fact sheet describes the symptoms of several important Florida papaya diseases and recommendations for control. Since few pesticides are registered by the Environmental Protection Agency for use on papaya, and the plant is prone to damage by some chemical sprays, consult the University of Florida extension service or the *Plant Disease Control Guide* for current fungicide recommendations.

PAPAYA RINGSPOT

Papaya ringspot, caused by papaya ringspot virus, is the most important disease of the crop in Florida, severely limiting the potential for commercial production. Earliest symptoms appear as

yellowing and vein-clearing of younger leaves. A prominent yellow mottling of the leaves follows. One or more lobes of infected leaves may become severely distorted and narrow (Plate 1). Dark green streaks may develop on the petioles and stems.



Plate 1.

The disease has been named because of the striking symptoms that appear on fruit. These consist of circles and C-shaped markings that are darker green than the background fruit color (Plate 2). Later, these markings may become gray and crusty in texture.



Plate 2.

Infected plants exhibit growth reduction. There is reduced fruit set, and quality, especially flavor, is adversely affected.

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The term "plates," where used in this document, refers to color photographs that can be displayed on screen from CD-ROM. These photographs are not included in the printed document.

Papaya ringspot virus can be transmitted mechanically and by grafting. However, it is thought that aphid transmission is the most important mechanism for disease spread in the field.

Until recently, little could be done to effectively control this disease. Attempts to reduce disease levels by applying aphicides (insecticides) have not been successful. Cultural controls, such as roguing infected plants and physically isolating papaya orchards, have also been ineffective. However, good sources of field resistance have been identified by scientists at the Homestead Tropical Research and Education Center, with potential for improved varieties for producers.

PAPAYA APICAL NECROSIS

Papaya apical necrosis is a relatively new virus problem in Florida. It is caused by a newly discovered virus (papaya apical necrosis virus or droopy necrosis virus) that is quite different from papaya ringspot virus.

The first symptoms are drooping and downward cupping of leaves in the upper part of the plant. Blades of the youngest leaves are pale yellow, sharply cupped downward, and do not expand properly (Plate 3). Petioles are short and stiff, and stem internodes become very short.



Plate 3.

The disease usually increases in severity in the winter. Leaves often develop marginal necrosis, and those near the stem tip begin to drop. The tip of the stem usually dies. The disease progresses down the stem until the entire plant is dead.

Neither the vector nor an alternative host for this virus has been identified. Since field incidence is low at present, the only practical means of control are to rogue diseased plants and isolate papaya plantings.

ANTHRACNOSE

Anthracnose, caused by *Colletotrichum gloeosporioides*, is an important fungus disease that

primarily affects papaya fruit. The disease symptoms begin as small water-soaked spots on ripening fruit. As the spots develop, they become sunken, turn brown or black, and may enlarge to 2 in. (5 cm) in diameter (Plate 4). The fungus may produce a pink mass of spores in the middle of these older spots. The pathogen can grow into the fruit, resulting in softening of the tissue and an off flavor of the pulp.



Plate 4.

Infection of older petioles may occur, but this is thought to be important only as a source of the fungus for further fruit infection.

Because anthracnose is such a potentially damaging disease, it is important to **begin an effective fungicide spray program at the beginning of fruit set** and to continue at appropriate intervals while the plants are producing fruit.

POWDERY MILDEW

Powdery mildew is caused by the fungus *Oidium caricae*. The disease is easily recognized by the presence of a white, superficial growth on leaf surfaces. The disease begins as tiny, light yellow spots on the lower surface of leaves. As the spots enlarge, a white, powdery growth, the actual body and spores of the fungus, appears on lower leaf surfaces. At this time pale yellow areas appear on the upper leaf surface at the infection sites. In advanced stages, white fungal growth will develop on the upper leaf surface of leaf lesions (Plate 5).



Plate 5.

The great masses of spores produced on infected leaves are readily spread by wind currents to healthy plants. Year-round production of papaya permits uninterrupted reproduction of the fungus and continuous presence of the disease in an active state.

Fruit infection has not been observed in Florida, but has been reported in other papaya-growing areas. No chemical control has been approved by the Environmental Protection Agency.

PHYTOPHTHORA BLIGHT

Phytophthora blight can be one of the most devastating diseases of papaya. Complete loss has been seen in some Dade County orchards. *Phytophthora parasitica* is thought to be the causal agent, but more research is needed on the identification of the fungal species. The fungus causes a wide range of damage, including damping-off, root rot, stem rot and girdling, and fruit rot.

Damping-off is the rapid wilting and death of very young plants. This occurs in production houses and in the field shortly after transplanting.

Spots on the stems of established plants begin as water-soaked lesions, especially at fruit and branch scars. These areas can enlarge and even girdle the tree, resulting in wilt and death of the top of the plant.

Root infection can be very severe. Unfortunately, the first indication of major root infection often is rapid browning and wilting of the trees, followed by total collapse of the plants within days.

Fruit infection is the most obvious aspect of the disease and potentially very important economically, because of the possibility of carry-over to the market. Water-soaked spots are again the first evidence of infection. Diseased fruit then become covered with a characteristic mass of whitish fungal growth (Plate 6). Fruits eventually shrivel and fall to the ground, where they serve as an important source of *Phytophthora* inoculum for root infection.



Plate 6.

Phytophthora blight is a wet weather disease. The spores of the fungus are spread by wind and splashing rain. The spores must have free water to

germinate, producing large numbers of smaller swimming spores that invade healthy tissue.

Fungicide sprays, as discussed for anthracnose, can be used for *Phytophthora* blight control.

CORYNESPORA LEAF SPOT

Corynespora leaf spot is a recently described disease of Florida papaya, caused by the fungus *Corynespora cassiicola*. It is a disease primarily of the leaf blade but will occasionally occur on petioles and male flower stalks. It has not been observed on fruit or stems.

Older leaves are most likely to be affected. Symptoms are first evident as small, yellow areas. Fully developed spots have a small 0.1 in. (2 mm) brown center, with a prominent, yellow halo 0.2-0.4 in. (4-8 mm) (Plate 7). When leaf spots are examined closely, one may observe faint, concentric rings (Plate 8). *C. cassiicola* forms spores on both upper and lower leaf surfaces, but masses of spores are most evident on the latter. Examination of lower leaf surfaces with a hand lens for a dark growth of the fungus body and spores is important for diagnosis of this disease.



Plate 7.



Plate 8.

Heavy infection results in premature defoliation with losses in yield and possibly fruit quality.

Corynespora leaf spot is controlled very well by periodic applications of fungicide. No specific registrations exist for the disease. However, applications of fungicide as recommended for anthracnose control have also provided excellent control of *Corynespora* leaf spot.

YELLOW STRAP LEAF

Yellow strap leaf is a recently reported and unusual disease of Florida papayas. It is caused by an organism that does not actually parasitize the host. The fungus *Aspergillus wentii*, a common soil-inhabitant, produces a toxin, which is absorbed through the papaya roots. Within the plant, the toxin interferes with normal protein metabolism, resulting in severe plant damage.

The first symptom of yellow strap leaf is a yellowing of new leaves, especially along the leaf margins. Leaf blades become narrow and, in severe cases, appear strap-like. Tips of leaf lobes are hooked downward or laterally toward the midrib, and are thicker than normal. Petioles and internodes become very short, often giving the trees a bushy appearance (Plate 9). Female flowers do not develop normally and do not set fruit. Male flowers are stunted toward the stem tip and produce no pollen.



Plate 9.

Plants with yellow strap leaf are usually in more or less circular "hot spots" in the field, with the most severely affected plants in the center of the affected areas.

Yellow strap leaf is a serious problem in hot, rainy weather. Papayas may show dramatic recovery during the dry season, but symptoms can recur when conditions become favorable.

At present there is no practical control for yellow strap leaf. Pasteurization of soil has controlled the problem in small-pot, greenhouse studies, but, of course, this is not practical in the field. One might expect fumigation to work, but the disease occurs in plantings on fumigated beds as well as in plantings on level, unfumigated land.

ROOT KNOT

Root knot is caused by *Meloidogyne* nematodes (tiny soil-inhabiting worms). The larvae of these nematodes can travel short distances in soil, finding

and attacking papaya roots, usually near the tips. When female larvae feed near the water-conducting core of the roots, the plant cells increase in number and size until readily visible swellings, called galls or "knots" are formed (Plate 10). To confirm a diagnosis, one can cut into the galls and observe pearly looking, pear-shaped female nematodes embedded in the tissue.



Plate 10.

Leaves of papayas that are affected by root knot nematodes appear pale green or slightly yellow and are generally unthrifty. They may be more sensitive than normal to water stress. Fruits are smaller than normal and more likely to have an off-flavor.

Although papayas, especially young plants, can be severely damaged by root knot nematodes, recent experiments at Homestead Agricultural Research and Education Center suggest that the crop may not be a preferred host for reproduction of the worms.

To control root knot nematode problems, avoid heavily infested land if possible. It is recommended that papayas grown in land likely to be infested, for example, "old" vegetable land, should be set in raised, mulched beds that have been fumigated (consult county agent or the Florida Cooperative Extension Service *Nematode Control Guide* for specific fumigant recommendations). The effects of root knot can be partially alleviated by maintaining plants at optimum water and nutrition levels.