

# Some Common Diseases of Mango in Florida

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The mango (*Mangifera indica*), produces a tree fruit well-known and widely consumed throughout the tropical world. Demand for mangoes is increasing in Florida as more people become aware of its unique flavor and as the Latin American population grows.

The number of diseases affecting mango in Florida is relatively small but can seriously limit production if not adequately controlled. This fact sheet concentrates on the symptoms of the important mango diseases, the weather conditions conducive to disease development, and methods for control. Due to frequent changes in the availability and use restrictions for agricultural chemicals, consult the University of Florida Extension Service for specific, current fungicide recommendations.

## Anthracnose

Anthracnose, the most important mango disease, is caused by the fungus *Colletotrichum gleosporioides*. Flower blight, fruit rot, and leaf spots are among the symptoms of this disease. Symptoms on the panicles (flower clusters) start as small black or dark-brown spots. These can enlarge, coalesce and kill the flowers (Fig. 1), greatly reducing yield.

On leaves anthracnose lesions start as small, angular, brown to black spots (Fig. 2). If

tissue is young when originally infected, spots can enlarge to form extensive dead areas (Fig. 2). Lesions that begin in older leaves are usually smaller with a maximum diameter of 1/2 inch (6 mm); they appear as glossy dark brown to black angular spots.

Fruit infection commonly occurs and can result in serious decay problems in the orchard, in transit, at the market, and after sale. The fungus invades the skin of fruit and remains in a "latent" (a living but nonsymptom-producing) state until fruit ripening begins. Ripe fruit, either before or after picking, can then develop prominent dark-brown to black decay spots (Fig. 3). These may coalesce and can eventually penetrate deep into fruit, resulting in extensive fruit rotting. An interesting manifestation of anthracnose fruit damage is the symptom called "tear staining" (Fig. 4) that develops when spore-laden water droplets from infected twigs and panicles wash over and infect the fruit.

Anthracnose is usually more serious in years when rain and heavy dews are frequent, from the onset of flowering until fruit are about half size.

Control of anthracnose, especially on very susceptible cultivars, such as 'Haden' and 'Irwin', centers on a diligent fungicide program. Effective control of even the postharvest phase of this disease is best accomplished by a good spray program in the orchard. Begin fungicide

applications at the first appearance of panicles and continue spraying at recommended intervals until the pre-harvest waiting period is reached.

Homeowners may want to consider planting moderately resistant cultivars, such as Carrie, Edward, or Glenn to minimize the need for extensive spraying.

**Table 1. Susceptibility of fruit of different mango cultivars to anthracnose and bacterial spot.**

Cultivar	Disease reaction <sup>z</sup>	
	Anthracnose	Bacterial black spot
Carrie	MR	R
Earlygold	MR	R
Edward	MR	HS
Fascell	S	S
Florigon	MR	HS
Glenn	MR	S
Haden	S	HS
Irwin	HS	S
Julie	MR	-
Keitt	MR	HS
Kent	HS	HS
Man dok Mai	-	R
Palmer	S	-
Sensation	S	HR
Tommy Atkins	MR	S
Van Dyke	MR	R
Zill	S	S

<sup>z</sup>Disease reaction: HR= highly resistant; R=resistant; MR=moderately resistant; S= susceptible; and HS= highly susceptible

## **Powdery Mildew**

Powdery mildew is caused by the fungus *Oidium mangiferae*. Although a somewhat sporadic disease, it can cause severe crop loss due to flower and panicle infection and subsequent failure of fruit set.

The diagnostic key in the identification of this disease is the appearance of a whitish, powdery growth of the fungus on panicles and young fruit. Young infected fruit turn brown and fall. The white growth can also be seen on the undersurface of young infected leaves. Severe infection of young leaves results in premature leaf drop. On mature leaves, the spots turn purplish brown, as the white fungal mass eventually disappears (Fig. 5).

Powdery mildew occurs in the spring and is particularly destructive in years when the weather is cool and dry. Control is fungicide treatment.

## **Alga Spot**

(Red Rust, Green Scurf)

A parasitic alga, *Cephaleuros virescens*, incites this relatively minor disease of mango. Leaf spots start as circular green-gray areas that eventually turn rust red as the alga produces a profusion of rust-colored microscopic "spores" on the leaf surface (Fig. 6). Infection of stem tissue can also occur and is much more serious than leaf infection. Cankers develop in the bark and stem-thickening can take place at infection sites. Rust-red "spore" masses will also develop on infected stems. Severely diseased branches may have to be pruned from the tree. Alga spot only becomes a serious problem when growers are overly dependent on organic fungicides for general foliar disease control. It normally is not a problem where copper fungicides are used periodically.

## **Verticillium Wilt**

Verticillium wilt, caused by the soil-borne fungus *Verticillium albo-atrum* or *V. dahliae* is a disease of increasing importance to mango production, especially on the Rockdale soils of Dade County. The problem is usually observed in young trees planted on land previously cropped to vegetables that are also susceptible to this disease. The Verticillium fungus can survive in soil in a dormant state for at least 15 years. When trees are set in infested soil, the fungus returns to an active stage and invades the mango roots. As *Verticillium* colonizes and blocks the vascular (water-conducting) system, trees begin to exhibit symptoms of water stress.

Trees decline and die back slowly in a more or less random fashion in the grove. Leaves wilt and die, often in a characteristic "one-sided" fashion, a key diagnostic feature (Fig. 7). The dead leaves often remain attached to infected branches, giving the tree a "fired" appearance (Fig. 7). If longitudinal cuts are made in infected branches, brown vascular discoloration is often evident.

The only practical control for this disease is to avoid agricultural land with a previous history of intensive vegetable production. Unfortunately, management of Verticillium wilt through site selection is becoming more difficult in areas of increasing urbanization.

## **Mango Decline**

Several different diseases of mango, including blight, canker, gummosis, twig blight, tip die-back and stem bleeding, are listed here under the general term decline. Although these diseases are caused by several different fungi, notably *C. gleosporioides*, *Dothiorella* spp. and *Lasiidiplodia theobromae*, they are all capable of causing all or some of the following symptoms: marginal scorching of leaf lamina which may or may not progress to defoliation; foliar symp-

toms of nutritional deficiencies -particularly of iron and manganese; dieback of small branches basipetally from the terminal (Fig.8); oozing of a clear or cloudy exudate, either from terminal buds or from branches, scaffold limbs or trunks (Fig.9); and vascular discoloration. The causal fungi are endophytes in mango (infect, but do not necessarily cause symptoms), many of which also cause stem-end rots on fruit.

The internal location and the diversity of fungi that are involved in the decline syndrome reduce the opportunities for controlling these disorders with fungicides. These problems are usually observed after trees are affected by cold weather, drought, poor fertility and other stress factors. Thus, management of the controllable predisposing factors is beneficial.

### **Stem-end Rot**

Stem-end rot is usually a post-harvest disease of mango fruit. It can be important, especially when anthracnose, the most important post-harvest problem on fruit, is well controlled. In general, the stem-ends of affected fruit appear dark brown and watersoaked, and the affected areas may extend internally well into the fruit.

Stem-end rot is caused by many of the same fungi that cause mango decline, in particular *C. gleosporioides*, *Dothiorella* spp. and *L. theobromae*. "De-sapping" (placing the stem end of newly harvested fruit into the soil or turf beneath trees) should be avoided since infection by *L. theobromae* can be promoted by this practice. Post-harvest treatment of fruit with hot water or fungicides can reduce the development of this disease.

### **Malformation**

Malformation is a destructive disease that has been recognized in southern Florida since the early 1970s. Fortunately, malformation is more damaging in regions of the world, such as India and Pakistan, than in areas with appreciable rainfall, such as southern Florida.

Malformation affects vegetative and floral tissues of mango. Apical or axillary buds produce misshapen shoots with shortened internodes and dwarfed leaves which are brittle and recurve towards the supporting stem. Shoots may not expand fully, resulting in a bunched appearance on these portions of the plant. For these reasons, the disease can be quite important in nurseries. More important, however, is the affect of malformation on fruit set: fruit in affected panicles either do not set or abort. Primary and secondary axes on affected panicles are shortened, thickened and greatly branched. Malformed panicles may produce as many as three times the normal number of flowers, and these are usually enlarged. Inflorescences may also have an increased proportion of male vs. perfect flowers and may produce dwarfed and distorted leaves (exhibit phyllody) ( Fig.10).

The fungus *Fusarium subglutinans* causes malformation. It is believed that the mango bud mite, *Eriophyes mangiferae*, is a vector of this pathogen that enhances infection by wounding host tissues while feeding on mango. The pathogen is spread by grafting and in infected nursery stock. Unfortunately, no effective fungicides exist for the control of this disease. Primary emphases should be placed on using pathogen-free propagation materials when new orchards are established. If the disease is present in an orchard, all symptomatic tissues plus the subtending three nodes should be removed from the orchard and burned.



**Figure 1. Severe anthracnose infection of mango panicle (flower cluster, left) compared to near disease-free panicle (right).**



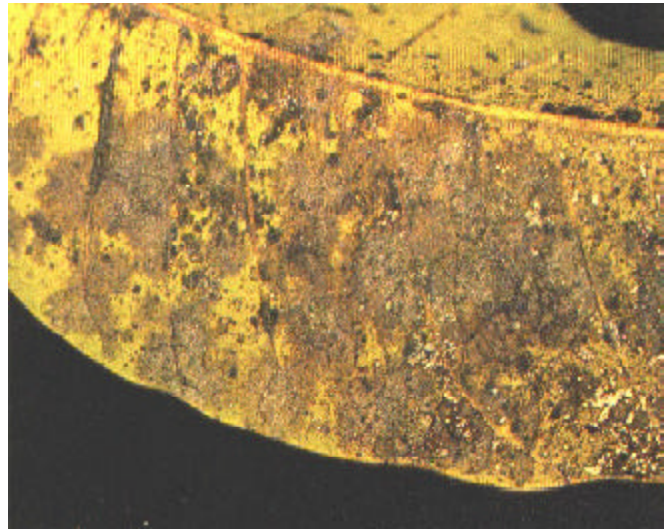
**Figure 2. Anthracnose infections in mango leaf. Note coalescence of lesions along mid-rib.**



**Figure 3. Numerous circular areas of anthracnose damage in mango fruit.**



**Figure 4.** The “tear-staining” symptom sometimes associated with anthracnose on mango fruit.



**Figure 5.** Late-state powdery mildew infection on underside of mango leaf.



**Figure 6.** Alga spot in mango leaf. The alga is at the stage where it is producing great masses of red “spores” on the leaf surface.



**Figure 7.** *Verticillium* wilt of young mango tree.



**Figure 8. Mango decline: tip dieback and branch death in a young tree.**



**Figure 9. Mango decline: gummosis symptom of decline in a young tree.**



**Figure 10. A malformed mango panicle in which leaves have developed, a typical symptom.**