

Diseases of Bitter Melon in South Florida¹

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Bitter melon (*Momordica charantia* L.), also known as bitter gourd or bitter squash, is a tropical and subtropical vegetable crop in the family Cucurbitaceae. It originated in South Asia and is widely grown in Asia, Africa, and the Caribbean for its edible fruit. As one of the most nutritious cucurbits, bitter melon is reported to have medicinal properties. A compound known as “charantin” present in the bitter melon fruit has been used to lower blood sugar levels to treat diabetes. The plant is also rich in vitamins A and C, iron, phosphorus, and carbohydrates.

Two major types of bitter melon are grown in South Florida year-round: Chinese and Indian bitter melons. The Chinese type is 20–30 cm long, oblong with bluntly tapering ends, and pale green in color with a gently undulating, warty surface. The bitter melon more typical of the Indian type has a shorter and narrower shape with tapered, pointed ends and a rough skin covered with triangular “teeth” and 8–10 vertical ridges. When ripe, the fruit turns from deep green to yellowish orange in color. The Indian type of bitter melon tastes more bitter than the Chinese type.

The most common diseases of bitter melon in South Florida include downy mildew, powdery mildew, Fusarium wilt, target leaf spot, and root-knot caused by nematodes. This publication describes these diseases and provides recommendations for their control. In terms of chemical applications, it is mandatory to read and follow the labels prior to application.

Downy Mildew (*Pseudoperonospora cubensis*)

Downy mildew is a common foliar disease of cucurbits, including bitter melon in South Florida, where high humidity and mild temperatures exist year-round. The disease first appears as small, water-soaked, yellow, angular lesions on the upper surface of the leaves that are restricted by the leaf veins. In later stages of infection, infected tissues become bright yellow and the center of the lesions turns brown. Under high humidity, whitish to gray powdery growth may appear on the lower leaf surface. The disease spreads rapidly, resulting in defoliation and death if not controlled.

Control

Major control measures include cultural practices and fungicide applications. Maximum control can be achieved with an integrated disease management approach. Maximizing the distance from potential sources of inoculum, using plant spacing to reduce canopy density, and avoiding overhead irrigation can reduce downy mildew incidence and severity. With small plantings, growers may be able to remove affected leaves from the field. Many protectant and systemic fungicides are labeled for use to control downy mildew on cucurbits. Mefenoxam is a fungicide that provides effective downy mildew control when applied as a foliar spray in a preventive program. When weather conditions are favorable for downy mildew, applications should begin prior to the appearance of symptoms and

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continue until the threat is over. However, the efficacy of chemical control measures may be reduced if *P. cubensis* populations develop resistance to the fungicides applied. To reduce the resistance, rotation of fungicides with different modes of action is highly recommended. *P. cubensis* was the first oomycete with documented resistance to metalaxyl and reduced sensitivity to mancozeb. It is also reported that populations of *P. cubensis* developed resistance to strobilurins, another group of chemical compounds widely used in agriculture as fungicides. In such a case, a protectant fungicide such as mancozeb must be alternatively applied with mefenoxam in order to prevent the development of resistant strains. Other approved fungicides that have provided good downy mildew control include cymoxinil, cyazofamid, fluopicolide, mandipropamid, and propamocarb.

Powdery Mildew (*Sphaerotheca fuliginea*)

Powdery mildew favors high humidity and high temperatures and tends to first occur on older leaves. Typical symptoms appear as white powdery residue primarily on the upper leaf surface. On the lower leaf surface, symptoms occur as circular patches or spots. Powdery mildew symptoms on foliage at early stages are very similar to downy mildew, which often makes it difficult to identify the disease accurately. It is always wise to seek a certified laboratory diagnosis in order to identify the pathogen correctly. In severe cases, these spots spread, coalesce, and cover both surfaces of the leaves, then spread to other parts of the plant. Severely affected foliage becomes brown and shriveled, and defoliation may occur subsequently. Fruits of the affected plants do not develop fully and remain small.

Control

An integrated approach using a combination of several practices is most effective in managing powdery mildew disease. Routine scouting for powdery mildew symptoms is necessary to detect the start of an infection at early stages so that preventative control measures can be initiated. Maintaining healthy plants through proper nutrition is important for reducing powdery mildew because healthy and vigorous plants are more resistant to powdery mildew infection than plants under nutritional stress. Strategies for powdery mildew management should include selecting powdery mildew-tolerant/resistant cultivars and using relatively non-toxic biorational compounds including botanicals, microbials, minerals, and synthetic materials (fungicides, biological agents, and systemic acquired resistance-inducing compounds). Sulfur fungicides

are cheaper to use for powdery mildew control. Other fungicides, including myclobutanil, tebuconazole, and chlorothalonil, are also registered for use on bitter melon for powdery mildew disease.

Fusarium Wilt (*Fusarium oxysporum*)

Initially, runners show symptoms of temporary wilting that become permanent over time. The problem often develops progressively and affects more vines. The leaves of the infected plants become yellow and wilt. Eventually, the plant dies. In older plants, leaves wilt suddenly, and vascular tissues in the xylem appear yellow or brown.

Control

Using resistant varieties is the most effective and practical means of controlling Fusarium wilt. Once the disease has been established, long crop rotations of 4–5 years or more with non-host crops may reduce disease incidence. When the disease is observed, remove infected plants from the field and destroy them. Because the pathogen's spores can be spread by water, avoiding furrow irrigation can reduce the spread of the disease. Maintaining good sanitation is important to prevent disease establishment. Disinfecting tools and machinery with disinfectants such as chlorine or sodium hypochlorite is also helpful. For crops grown on acidic soil, liming the soil to pH 6.5–7.0 is recommended because the fungal pathogen survives in the soil and prefers low soil pH. Chemical control may be a choice when the disease is severe. Drenching the soil with biorational fungicides, such as SoilGard® or Actinovate®, or fumigants containing chloropicrin before transplanting may slow down the onset of this disease and reduce disease incidence. Results with biological control agents have been mixed, and fumigant use may not be cost-effective for bitter melon production.

Target Leaf Spot (*Corynespora cassiicola*)

Target leaf spot, also called Corynespora blight, is a disease of cucurbits, including bitter melon in tropical and subtropical regions. It is common and occurs in Florida year-round, where temperatures and humidity favor its development. Initial symptoms appear on older leaves as angular yellow lesions. The spots enlarge and become circular with light brown centers and dark brown borders. As the disease progresses, the center of the lesions turns gray and falls out, leaving the leaf with a “shot-hole” appearance. Severe cases can result in defoliation.

Control

In tropical and subtropical areas where this disease occurs, maintaining good sanitation is important for control.

A weekly spray program with protectant fungicides such as mancozeb may be necessary to prevent disease development.

Root-Knot Nematode (*Meloidogyne* spp.)

Root-knot nematodes, *Meloidogyne* spp., are common and destructive to all cultivated cucurbit vegetables.

Meloidogyne spp. are present worldwide and are especially problematic in tropical and subtropical regions. Root-knot nematode damage is most severe in sandy soils. Symptoms of infected plants include yellowing of foliage, reduced size and number of leaves, wilting of vines in warm weather, and poor fruit quality and yield loss. The nematodes also disrupt the vascular system by inducing the transformation of vascular cells into giant cells, where the nematodes feed. Typical symptoms of plant damage are galls or swellings on the roots when plants are pulled up from the soil. Root systems of heavily infected plants may become necrotic and have fewer feeder roots. Severely infected plants may die before producing fruits.

Control

Nematode control measures can be divided into two major categories: cultural and chemical control. Nematode management includes crop rotation of non-host crops or resistant varieties, cultural and tillage practices, use of transplants, and pre-plant nematicide treatments. Unlike other chemical methods, these methods tend to reduce nematode populations gradually over time. Farm-specific conditions, such as soil type, temperature, and moisture, can be very important in determining whether different cultural practices can be used effectively for nematode management. In most cases, these management practices substantially reduce nematode populations but rarely bring the levels below economically damaging levels. This is especially true for lands continuously planted with susceptible crop varieties. In these cases, nematicide application is necessary to improve crop production.