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Florida Plant Disease Management Guide: Beans[1]

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Specific Common Diseases

Alternaria Leaf and Pod Spot (*Alternaria* spp.)

Symptoms: Symptoms are generally confined to older leaves. Lesions tend to become circular, dark-brown and zonate with advanced age and size. Centers of older spots may appear gray and often fall out, leaving a dark-brown lesion border and a shot-hole appearance on the leaf. Petioles and stalks may also become infected, developing dark-brown elongated spots. The pathogen causes lesions on the pods that appear as small, raised black pimples. Moderate to severe pod damage often throws produce out of grade, thus reducing growers' profits.

Alternaria infections of bean plants occur throughout the season in the winter vegetable areas of southern Florida. This disease is often found on plants that have been injured by spider mites or weakened by nutrient stress, especially nitrogen and/or potassium.

Cultural Controls: Avoid nutrient stress that can weaken bean plants. Control insect problems.

Chemical Controls: See fungicides listed for anthracnose control in PPP-6.

Anthracnose (*Colletotrichum lindemuthianum*)

Symptoms: Anthracnose affects all above-ground portions of the bean plant. The most noticeable symptoms are on the pods, especially on lima or butter beans, where the fungus causes yellowish-brown or purple-colored, irregular, sunken spots with dark reddish-brown borders. These spots vary in size and often coalesce. Infections may occur on the underside of the leaf veins, showing a dark, brick-red to purplish color which later turns to dark brown. Elongated dark-red or blackened lesions also may be found on the stems.

Under moist conditions, masses of flesh-colored spores are produced on the surface of the lesions. These small spores are easily spread to other plants by splashing rain or mechanical means. Fields of anthracnose-affected beans should not be cultivated or worked while plants are wet. The spores of the anthracnose fungus bear a sticky substance, causing them to adhere to hands and clothing of farm workers and to the bodies of insects and other animals. Anthracnose disease development is favored by cool, wet weather.

Cultural Controls: Purchase anthracnose-free seed or seed grown in arid regions as the causal fungus can be

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seedborne. Plant resistant varieties when available. Plow under bean debris immediately after harvesting infected fields. Rotate fields out of beans for at least three years where disease has been a problem. The pathogen can survive in soil for two years.

Chemical Controls: See PPP-6.

Ashy Stem Blight (*Macrophomina phaseolina*)

Symptoms: Seedling infection may occur before or after emergence and appears as small, dark sunken lesions at the base of the cotyledon. The disease progresses quickly into the petioles of primary leaves and then into the shoot tip. Strong winds or cultivation result in the breakage of many infected plants at the soil line. Older plants develop a root and stem rot with sunken lesions and may become stunted. Plants exhibit a one-sided wilt and leaf yellowing prior to plant death. A diagnostic sign is the presence of small, black sclerotia in or on stem and root tissue.

This disease is most severe under very hot growing conditions or when adverse soil moisture or fertility shortens the normal maturity of the crop. The fungus survives as sclerotia and/or mycelium on debris and in the soil. It is important to avoid depositing soil on stems during cultivation.

Cultural Controls: Plant only certified, disease-free bean seed. Maintain effective nematode control programs so plants are not prematurely stressed. Balanced soil fertility and avoiding moisture stress will lessen disease incidence. Rotation is not a satisfactory control measure due to the wide host range of this fungus. Do not deposit soil on stems during cultivation.

Bacterial Blights (*Xanthomonas campestris* pv. *phaseoli*, *Pseudomonas syringae* pv. *phaseolicola*)

Symptoms: There are two bacterial blights occurring in Florida, halo blight caused by *Pseudomonas syringae* pv. *phaseolicola* and common blight caused by *Xanthomonas campestris* pv. *phaseoli*. The symptoms and controls for each are similar.

These diseases may attack the seed, seedlings, leaves and pods. Many seedlings from infected seed may die before or soon after they emerge, but some may continue to live. In either case, they serve as a source of inoculum for nearby plants. During wet weather, lesions on these infected plants produce slimy masses of bacteria that are spread by wind-blown rain or mechanical means. On older plants, the first evidence of infection of the leaves appears in the form of water-soaked angular lesions that enlarge and coalesce over time. In the case of halo blight, these are often surrounded by a yellow halo. Later, the spotted leaf tissue turns brown and dies. The spots on the pods start as water-soaked (greasy) areas and later become surrounded by a brick-red border.

Cultural Controls: The most effective control is to plant certified blight-free bean seed. If the disease appears, pickers and cultivators should be kept out of the field while the plants are wet to reduce spread of the disease in the field. To minimize field-to-field disease spread, sanitize equipment by spraying with a disinfectant after working in an infected field. Common blight has been found to survive in the soil from one growing season until the next. Beans should not be planted in infested fields for at least three years.

Chemical Controls: See PPP-6.

Cercospora Leaf Blights (*Cercospora canescens*, *C. cruenta*)

Symptoms: These diseases occur on *Phaseolus, Dolichus*, and *Vigna* species of beans, with the fungus surviving in crop debris and on or in seed. The disease is fairly uncommon in beans in Florida, but they often occur on southern peas. *Cercospora canescens* produces a circular to slightly angular leaf spot with a gray center and a reddish border. Lesions are smaller on lima beans than other bean species with more intense red borders.

Cercospora cruenta infects stems, leaves, and pods of mature and senescent plants. Brown to rust-colored lesions (irregular in size and shape) develop on the leaves. These lesions are patch-like in appearance, angular, and form a checkerboard pattern. The undersurface of the leaves characteristically exhibits the dark, fuzzy growth of the causal fungus. The lesion centers often drop from the dried, necrotic tissue giving a shot-hole appearance.

Cultural Controls: Plant only disease-free, certified seed. Plow up and bury all infested crop debris to reduce the survival of the causal fungi in the field.

Chemical Controls: See PPP-6.

Cladosporium Pod Spot (*Cladosporium vigna*)

Symptoms: Pod lesions start as small, narrow, brown-black spots with a slightly yellow halo. Spots enlarge irregularly, turning purplish-black in color. Young pod infection results in pod distortion and in some cases pod drop. Older pod lesions develop a dark border and a light brown center of dead tissue. Leaf infection is less common and is characterized by a brownish-purple mold growth on the undersides of leaves. This is primarily a disease of southern pea.

Cultural Controls: Plant only disease-free seed since this disease is commonly seedborne. Black-eye varieties of southern peas are more susceptible than purple-hull varieties.

Damping-Off and Root Rots (*Pythium* spp., *Rhizoctonia solani*)

Symptoms: Several soilborne pathogens will rot bean seed and seedlings from planting time through emergence. infection at late stages by these fungi often cause root rots. Infected seeds become soft and discolored. Diseased roots are characterized by colorless to dark brown water-soaked lesions. Infected tissue is soft and watery and easily separated from the central cylinder of the stem by pulling the root. Sometimes, the stem is girdled. Further, when beans are grown under irrigation or exposed to heavy rainfall, pods touching the soil are infected. They become water-soaked and covered with a fluffy white fungal growth. Symptoms of *Pythium* root rot and *Rhizoctonia* root rot may resemble one another, so laboratory examination of the causal organisms may be necessary to differentiate between the two diseases. This condition is aggravated by deep planting, excess moisture and by the presence of newly incorporated green plant material such as weeds or cover crops.

Cultural Controls: Control of root rots and damping-off can be aided by preventing saturation of the soil and by chopping all cover crops and allowing them to dry thoroughly before disking or plowing under. Green cover crops should be turned under 6 to 8 weeks before planting time, and the land should be kept disked in order to prevent a new grass/weed cover from developing.

Chemical Controls: Seeds should be treated with a fungicide. See PPP-6.

Fusarium Root Rot (*Fusarium solani* f. sp. *phaseoli*)

Symptoms: Symptoms of infection appear as a reddish discoloration on the taproot as early as 1–2 weeks after plant emergence. Root lesions enlarge and turn dark brown in color. Clusters of roots develop above the lesion and below the soil line as the main taproot becomes riddled with longitudinal cracks, then hollows and dries. In dry seasons, plants will be stunted with poor pod and seed set. Disease symptoms in wet years may be limited to some leaf yellowing due to compensatory surface root development. This common soil fungus, *Fusarium solani*, produces a dry root rot in green beans, lima beans, southern peas, and English peas. This disease is most prevalent in hot weather, in acidic and low nutrient soils.

Cultural Controls: Practice crop rotation and maintain adequate nematode control. Insure the complete decomposition of crop debris or the cover crop by land preparation at least 4-6 weeks prior to planting.

Mosaic (Bean Common Mosaic Virus, Bean Golden Mosaic Virus)

Symptoms: These diseases are caused by viruses. The leaves of diseased plants become mottled with light and dark green areas, the greener portion of the pattern often becomes distinctly puckered. Bean golden mosaic with a striking yellow mottling of leaves is now the most common and destructive virus of the snap bean in south Florida. Plants are severely stunted and little yield is obtained. The virus may cause a downward curling of the leaf margins, and in some varieties extreme malformation of the leaves occurs. The whole plant may become stunted and have a pale-yellow appearance. Flowers may shed freely, resulting in late and irregular setting of the pods. Usually, the earlier the plants become infected, the greater the reduction in yield will be. Bean common mosaic is spread via seed and aphids, whereas bean golden mosaic virus is spread by whiteflies.

Cultural Controls: Plant virus-free seed. The best seed is produced in the dry areas of the United States (Idaho, Oklahoma, Wyoming, Colorado, etc.). The use of resistant varieties offers the only other practical means of control. Seed treatment or eradication of the aphid or whitefly populations has not been successful on a commercial scale. However, control of the virus-bearing weeds in and around the fields and the vectors that spread the virus will help in reducing infection.

Powdery Mildew (*Erysiphe polygoni*)

Symptoms: The first evidence of the disease is the presence of small, dark-green areas in a mottled pattern over the leaf. These areas develop into white talcum-like spots that increase in size and run together to form a whitish, powdery growth, primarily over the upper surface of the leaves. If infection is severe, the diseased leaves curl downward and become distorted and pale yellow. The pods become mottled or blotched with purple in color and have little direct evidence of mildew growth.

This disease is usually most severe during cool, humid weather or following application of irrigation water during cool weather. In Florida, these conditions normally occur during late fall and early spring.

Cultural Controls: Growing resistant varieties of beans wherever available and following good cultural practices such as crop rotation and plowing infected debris under after harvesting can adequately control powdery mildew in most cases.

Chemical Controls: See PPP-6.

Red Node (Tobacco streak virus)

Symptoms: Red node is caused by a strain of the *tobacco streak virus* (TSV), spread by thrips. It is a sporadic problem but has occurred in several seasons in south Florida. The initial symptom is usually a characteristic reddening of the node of bean stems. Veins of leaves may also be reddish and turn necrotic. Sunken, reddish lesions may form on pods.

Cultural Controls: Plant virus-free seed. Control leguminous weeds that may be source of TSV.

Rhizoctonia Root, Stem, and Pod Rot (*Rhizoctonia solani*)

Symptoms: *Rhizoctonia* is a soilborne fungus that can rot bean seeds prior to emergence from the soil. Young seedlings develop brick-red to brown, sunken lesions on the tap root and basal stem. When the disease is severe, the tips of branch and tap roots may rot off leaving reddish-brown stubs. Such plants are weakened and may not survive. Above-ground symptoms appear as chlorosis of lower leaves with leaf marginal and tip burn and stunting. Older plants are affected similarly to seedlings.

In addition, leaves and pods can be affected. Leaves become irregularly blighted with reddish-brown spots. During moist, warm weather, the tan strands of the causal fungus can be seen matting leaves together or spanning the distance from the soil to the lowest leaves. Pods develop typical sunken, brick-red lesions both in the field and during shipment, especially near tips close to the ground.

This disease is so common on beans in Florida that 100% field infections are not rare in spring or fall. Stand losses up to 75% have been reported, which makes it one of the most economically important root diseases of beans. *Rhizoctonia solani* has a broad host range that includes most annual and many perennial plants.

Cultural Controls: Turn under summer vegetation 3–4 weeks before planting, use disease-free seed, plant in warm soil not deeper than 1–1.5 inches, and maintain good drainage. At harvest, cull out all pods showing the disease to prevent its spread in transit.

Chemical Controls: Use Chloroneb or Vitavax for seed treatment.

Rust (*Uromyces appendiculatus*)

Symptoms: Rust occurs on the leaves and rarely on the pods in Florida. The first evidence of the disease is the presence of small, pale-yellow spots on the upper side of the affected leaves. Usually, 2–3 days later, cinnamon-brown pustules about 1/16 inches in diameter appear in the yellow spots and break open, exposing the spores. Under severe conditions, the rust pustules may be so numerous that the whole leaf becomes yellow, withers, and dies. This loss of foliage can greatly reduce the yield. Conditions most favorable for severe rust infections in south Florida usually occur during the late winter-spring months, beginning in February or March. Crop losses are greater when rust pustules are numerous before blossoming, rather than when the disease appears after the blossoms have formed. Traditionally, this disease has been most severe on pole beans in south Florida.

Cultural Controls: For bush and pole beans, plant resistant or tolerant varieties when available. Avoid late spring plantings.

Chemical Controls: See PPP-6.

White Mold (*Sclerotinia sclerotiorum*)

Symptoms: Most infections begin on flower petals that have fallen onto plants. Young plants diseased by this fungus have a watery soft rot of the stem beginning near the soil line and extending up to the primary leaves. In older plants, infection can occur on any growing part,

including the pods. A day or two after infection, a white fungal growth appears over the diseased parts. Later, black sclerotia (irregularly shaped, hard bodies) ranging from ¼ to ½ inch in length are produced by the fungus. The presence of sclerotia is an identifying characteristic that is unmistakable. Most of the infections occur when the plants are at or near blossoming time.

In addition to being called white mold, this disease is known as watery soft rot, sclerotinose, and sclerotinia rot of beans. During periods of cool weather accompanied by frequent rains, fogs or heavy dews, epidemics of white mold can be expected. The disease will develop after 20 or more days, with a mean temperature of 70°F or below, in an area in which the soil is infested with the sclerotia of the fungus. The lower temperatures stimulate the production of small mushroom-like, spore-bearing, fruiting bodies. The spores (ascospores) from these fruiting bodies are discharged into the air and are disseminated by wind and splashing rain. Virtually all inoculum in Florida is ascosporic.

Cultural Controls: Turn soil at least 6 inches deep where possible. Flooding fields for 5–6 weeks during summer months will effectively reduce the number of sclerotia in the soil. Before using flooding as a control measure, find out from local authorities if drainage into a given body of water after flooding agricultural fields is permissible. Plant seed farther apart (2–3 in) within bean rows to allow for adequate air circulation when plants mature.

Chemical Controls: See PPP-6.

Southern Blight (*Sclerotium rolfsii*)

Symptoms: Infection by the southern blight fungus usually produces a sudden wilting as the first symptom, followed by the appearance of a collar of fan-like, white fungal growth. This band of white fungus threads is attached to the stem at the soil line and may spread over and into the soil for a radius of one or more inches. Death of the plant follows soon thereafter. If an infected plant is pulled, soil can be seen adhering to the mycelium around the stem.

In the white mycelium, numerous sclerotia are produced both on the plant and on the mycelial threads on the soil. The sclerotia first appear as white nodules, but later turn tan and are about the size of cabbage seed. Under favorable conditions, the sclerotia germinate by producing mycelial threads, which can live for long periods on organic material in the soil. It occurs throughout Florida and is especially prevalent in soils that have been cultivated for many years. Southern blight is a warm weather disease and occurs on beans in early fall and late spring plantings. The fungus is preserved over periods of unfavorable environmental conditions in the form of sclerotia and is disseminated in water, in soil, and on farm machinery.

Cultural Controls: Long crop rotations with grass crops are best choices. Turn under cover crops and weeds at least 6 inches deep as far ahead of planting as possible to allow decomposition of the plant material before bean seeds are planted. A minimum of a week or 10 days for lower Florida east coast, to several weeks further north should elapse between turning under weeds (or cover crops) and planting. The ground should be maintained clean of subsequent grass/weed growth until planting.

Chemical Controls: See PPP-6.

Wet Rot (*Choanephora cucurbitarum*)

Symptoms: This disease has been reported throughout Florida on beans and southern peas. It is found on bean foliage, blossoms, and pods. On the leaves, symptoms begin as water-soaked areas without external white mycelium; these lesions then enlarge, darken and dry with age. Signs of the fungus become evident on both surfaces of the leaf as well as on blossoms and pods. These consist of whitish fungal growth tipped with numerous black spore-bearing structures, giving the appearance of "whiskers". It can be expected during periods of excessive rainfall and high temperatures.

Cultural Controls: Avoid excessively high plant populations that may favor disease incidence. Data exist indicating that disease severity is correlated with high populations of cowpea curculio on southern pea plants.

Chemical Controls: The fungicides such as Botran when used to control other diseases will provide control of this disease.