

Diseases in Florida Vegetable Garden Beans: Bush, Lima, Pole, Wax, Southern Peas, English Peas, and Snow Peas¹

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Many Floridians delight in maintaining a vegetable garden in their backyard. Others keep several pots of popular vegetables on patios or similar residential sites. Our long growing season and generally mild climate are ideal for the gardening enthusiast. What's more, the health benefits of moderate gardening activity are well documented, and the supply of wholesome garden-fresh vegetables adds to our quality of life in the Sunshine State.

Sometimes pest problems interfere with our gardening pursuits. Some problems, such as weeds and certain insects, are relatively easy to identify as causing damage. However, another group of maladies, plant diseases, can cause serious damage and are underappreciated and poorly understood by many homeowners.

The majority of plant health problems categorized as plant diseases are caused by microorganisms. As the name implies, these are extremely tiny disease-causing agents that ordinarily require a microscope to be seen. The very minute size of these disease pathogens accounts for the

mystery that often surrounds their presence and impact in the garden.

The pathogenic microorganisms that attack garden vegetables, including Bush beans, Lima beans, Pole beans, Wax beans, Southern peas, English peas, and Chinese or Snow peas can be classified into four major groups: fungi, bacteria, nematodes, and viruses.

Fungi are seen (at 100-400x magnification) as threads (hyphae) that absorb food and water from their host (Figure 1). Many of these fungi reproduce by forming thousands of spores that are readily blown about by even light winds. These spores can alight on your bean plants and eventually cause disease. Other fungi have the capacity to survive very long periods of time (10 or more years) in soil in absence of a host. Once beans are planted in infested soil, these resistant fungal structures can become viable again and attack plant roots, causing disease. Fungi cause the majority of bean diseases you are likely to find in the home garden.

1. This document is PP-209, one of a series of the Plant Pathology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date June 2005. Reviewed: June 2008. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

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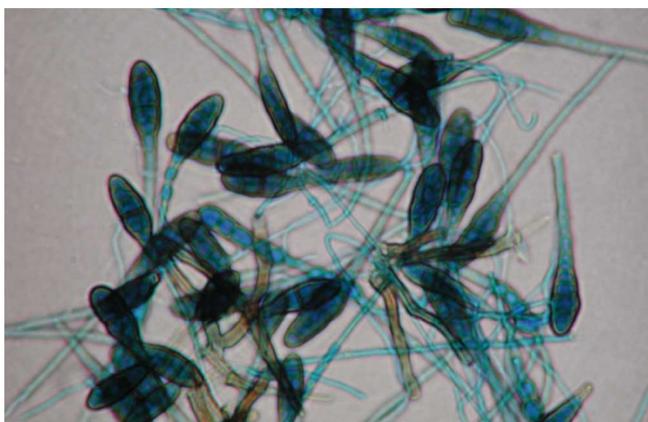


Figure 1. Microscopic threads (hyphae) and spores of a typical plant-pathogenic fungus.

Bacteria are even smaller than fungi (you need a 1000x magnification with a special light microscope to see them) (Figure 2). They consist of only one cell and do not form the airborne spores that fungi do. Rather than being blown by the wind, bacteria are usually spread by splashing water, as in rainstorms or overhead sprinkler irrigation. They can also be spread by gardeners who touch diseased plants and healthy plants in succession without thoroughly washing their hands in between.

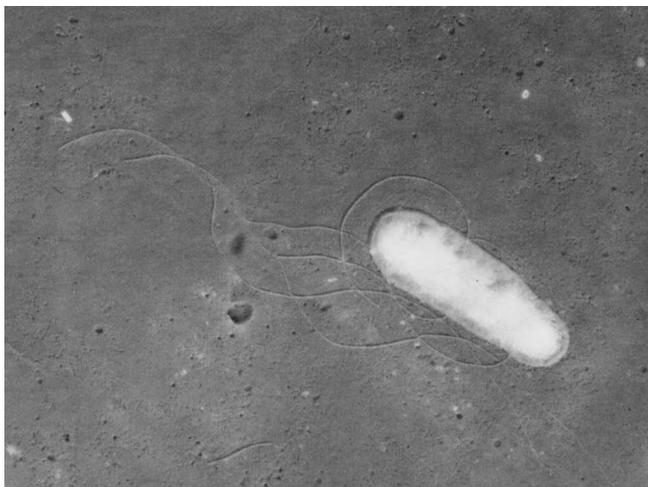


Figure 2. A bacterial cell (photo courtesy of J.B. Jones).

Nematodes are microscopic worms that live in the soil and feed on plant roots for survival (Figure 3). As they feed on the roots, beans grow slower and may not yield their full potential. Plants may be stunted and produce fewer beans that are smaller than normal when there is a high population of nematodes in the soil. Nematodes are spread from one location to another by the movement of soil. Remember anything that moves soil can move nematodes.



Figure 3. A plant-parasitic nematode (courtesy of J.D. Eisenback & Ulrich Zunke, Virginia Tech University).

Viruses are most strange indeed (Figure 4). They are not “organisms” in the sense of the fungi and bacteria. They are very large molecular structures consisting of a nucleic acid (DNA or RNA) wrapped in a protective coating of protein. Once inside bean cells, they take over the host cellular machinery and use it to produce more viruses. Most of the important bean viruses are transmitted to garden plants by aphids, whiteflies, or thrips.

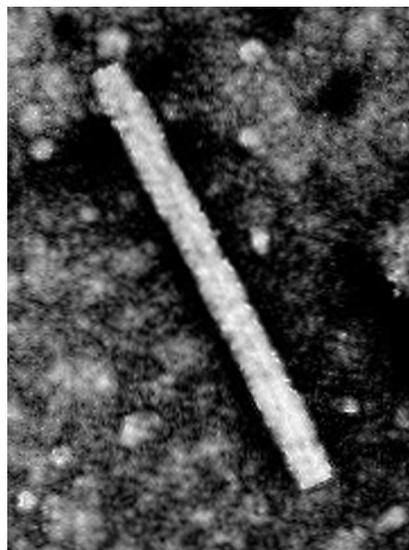


Figure 4. Typical rod-shaped virus as seen through a powerful electron microscope. (Courtesy of Scott Adkins, USDA).

The following diseases are a few of the ones that are most likely to appear on garden beans. This is not by any means an exhaustive list of bean diseases, but the ones we feel occur most often in Florida home

gardens. If you have a problem that you think might be a disease not covered in this publication, search the EDIS database of IFAS University of Florida (<http://edis.ifas.ufl.edu>) for information on additional bean diseases. Legal uses and effectiveness of plant disease control chemicals change with time. You are strongly advised to consult your local UF/IFAS Cooperative Extension office for current fungicide recommendations.

Seedling Diseases

One of the most common diseases of bean is called *damping-off*, which results in the death of young seedlings. Several fungi, including *Rhizoctonia solani* and *Pythium* spp. are often involved in the disease. When soil and temperature are not favorable for germination, such as cool and wet conditions, the seeds struggle to germinate, and the fungi overcome the developing seedling. This process can happen before the seedling emerges from the soil (pre-emergence damping-off) or after the seedling has emerged from the soil (post-emergence damping-off). It is a good idea to use seed that has been pre-treated with a fungicide. Also, be sure soil temperatures have reached at least 65° F before planting beans in your garden.

Rhizoctonia Root, Stem, and Pod Rot

Rhizoctonia root, stem, and pod rot, caused by *Rhizoctonia solani*, is common throughout the world. It is one of the most economically important root diseases of beans. It has a wide host range that includes most annual and many perennial plants. Symptoms of Rhizoctonia root rot include small, elongate, sunken, reddish-brown lesions on the roots and hypocotyls of young plants (Figure 5). Lesions often occur at the soil line and appear water-soaked and eventually turn reddish-brown to brick red with age. Lesions may girdle the seedling and cause stunting and death of plants. This disease is most severe on younger plants. In addition, leaves and pods can be affected. Reddish-brown spots occur on the leaves and sunken, brick red lesions can be observed on the pods. Sometimes the pods will develop these symptoms after harvest when in storage. It is wise to plant disease-free seed, maintain

good drainage and plant no deeper than 1-1.5 inches in order to reduce this disease in the garden.



Figure 5. Symptoms of Rhizoctonia root rot include small, elongate, sunken, reddish-brown lesions on the roots and hypocotyls of young plants.

Pythium Blight

Pythium blight occurs occasionally in the home garden. Damping-off (see above) is one of the common symptoms of Pythium blight. However, symptoms may develop on more mature plants. Since the *Pythium* fungus inhabits the soil, the damage is often at or near the soil line. The stem becomes soft and may be covered with a conspicuous white moldy growth (Figure 6). This disease is seen almost exclusively during hot, wet weather. Other than seed treatment, there is little that can be done to combat Pythium blight. If it is a major problem, one might consider planting in cooler times of the year.



Figure 6. Pythium blight on the stem of a mature bean plant.

Bean Rust

Rust, caused by the fungus *Uromyces appendiculatus*, attacks all aboveground plant parts, but is most commonly seen on the underside of leaves. Rust is a common problem on beans in the garden during late winter and early spring. Rust can be a serious problem when plants are attacked early in the season.

Rust is most common on older plants. It is usually observed on the leaves but may also occur on pods. The first symptoms of rust are small, white, slightly raised spots (pimple-like) on the lower leaf surface that may be surrounded by a yellow halo. Within 1 week these pustules erupt into rust-colored spots, which gradually get larger. The powdery mass of rust colored spores will easily spread to your fingers when rubbed across symptomatic tissues. These spots will appear on the lower and upper leaf surface (Figure 7). The entire leaf will eventually turn yellow. Heavily infected leaves will collapse, dry up, and drop prematurely. A severely infected planting looks scorched.



Figure 7. Bean rust symptoms on upper and lower leaf surfaces.

The rust fungus resides on dead infected bean plants from the previous planting. Spores can be spread long-distance by wind. Thousands of spores can be produced from each infected leaf and a new generation of spores is produced about every 10 days.

Disease development is favored by cloudy, humid weather and temperature around 75° F. Control consists of crop rotation, sanitation, weed control, the use of resistant varieties, and the use of fungicides when necessary. If rust is a problem, do not plant beans in the same location for at least two seasons.

Powdery Mildew

Powdery mildew, caused by an *Oidium* sp., can be a serious disease of beans. It can affect all aboveground plant parts. This disease is found primarily on older leaves of plants and forms small, round, whitish spots on the older leaves. On closer examination, a cottony fungal growth can be seen associated with the white spots (Figure 8). Eventually the entire leaf will be covered with this powdery substance. In severe cases, the leaves will turn yellow and become distorted and may die prematurely resulting in extensive defoliation. Stems and pods may become infected. Infected pods develop purplish spots and may become distorted (Figure 9).



Figure 8. Powdery mildew symptoms on bean leaves.

Powdery mildew resides on weeds year round. The spores of the fungus are easily dispersed by wind or splashing water. This disease is usually most severe during cool, humid weather or following



Figure 9. Powdery mildew symptoms on bean pods.

application of irrigation water during cool weather. In Florida these conditions normally occur during winter or early spring.

Control consists of resistant bean varieties, use of fungicides when necessary, and good plant nutrition. It is important to use a balanced soil fertility program in your garden, as plants grown under nutritional stress are more susceptible to powdery mildew. Fungicides containing sulfur can be used to control powdery mildew. Always follow the directions and restrictions on the manufacturer's label.

Bacterial Blights

There are two bacterial blights: common bacterial blight, caused by *Xanthomonas campestris* pv. *phaseoli*; and halo blight, caused by *Pseudomonas syringae* pv. *phaseolicola*. Common bacterial blight is found more often in the state of Florida. The symptoms of these two diseases are somewhat similar. Development of common bacterial blight is favored by temperatures in the 85 to 95° F range, whereas halo blight is favored by cooler

temperatures. The initial symptoms of these two diseases appear as water-soaked spots on the lower leaf surface. These spots eventually turn brown and are often surrounded by a yellow halo (especially in the case of halo blight). As the spots get larger they often run together resulting in large dead areas. When infection is severe, the leaves may appear burned, but often symptoms consist of small (1/8 in or so) wet-to-greasy areas on both upper and lower leaf surfaces. In time, leaves may drop prematurely. Symptoms on pods appear as circular, sunken, reddish-brown areas that vary in size (Figure 10). These areas are often surrounded by a reddish-brown margin. Infected seeds are usually shriveled, discolored, and exhibit poor germination and vigor. Infected pods are unappealing, and many home gardeners choose not to bring such pods into the kitchen.



Figure 10. Symptoms of bacterial blight on pods appear as circular, sunken, reddish-brown areas that vary in size.

Bacterial blights, like most bacterial diseases, are difficult to control once introduced into a garden. Therefore, you are advised to do all you can to prevent the introduction of the pathogens when the garden is established. If you start your plants from seed, purchase the seed from a reputable seed company. This will increase the likelihood that you have seed free of bacteria. If you purchase transplants at a retail nursery outlet, be sure to inspect plants carefully for symptoms of bacterial blight and avoid purchase of diseased transplants. Avoid overhead sprinkle irrigation as much as possible. Consider planting later in the fall in southern Florida in order to minimize production in the warmer, rainy season. Copper-containing fungicides (bactericides)

that can be purchased at garden centers may provide some control for bacterial blights.

Root-Knot Nematodes

The most common nematode that attacks bean in the Florida garden is the southern root-knot nematode (*Meloidogyne incognita*). This nematode attacks young bean roots, where it enters inside the root and starts to feed from plant cells. As they feed, the nematodes produce compounds that cause the plant cells to increase in size and number. This results in large, swollen roots that plant pathologists call galls (Figure 11). Above ground these plants appear yellow and stunted. If nematodes are suspected in the garden, pull up a plant and check the root system for the presence of galls. Galls should not be confused with legume nodules caused by nitrogen-fixing bacteria on the roots. Nematode galls will not fall off easily, whereas nodules can be readily pulled off roots. If galls are seen, it is best not to plant beans in these locations the following season.



Figure 11. Galls on the roots caused by root-knot nematodes.

Mosaic Viruses

Bean Common Virus and *Bean Golden Mosaic Virus* could presumably be a problem anywhere a garden is grown in Florida, especially in areas with significant commercial bean production.

Severe symptoms caused by both viruses occur on bean, especially when young plants are infected. These young, diseased plants are severely stunted. Leaf edges curl upward and appear mottled (i.e., show

alternating areas of light and dark green) (Figure 12). The tops of plants appear bushy. Often, pod set is poor or non-existent. Bean Common Mosaic Virus is spread by infected seed and aphids. Bean golden mosaic virus is transmitted by whiteflies and is now considered to be the most common and destructive virus of snap beans.

Control of viral diseases can be very difficult. Again, it is important that virus-free transplants be purchased and set in gardens. An isolated, infected bean plant or two can be removed and destroyed in an effort to eliminate sources of virus that might infect other beans. A lengthy period of time between plantings in the garden will help break the cycle that can lead to repeated virus infection. For example, in southern Florida, it makes sense to have a bean-free period in the garden for 3-4 months in the summer.



Figure 12. Bright yellow mottling associated with severe bean golden mosaic virus infection of bean.