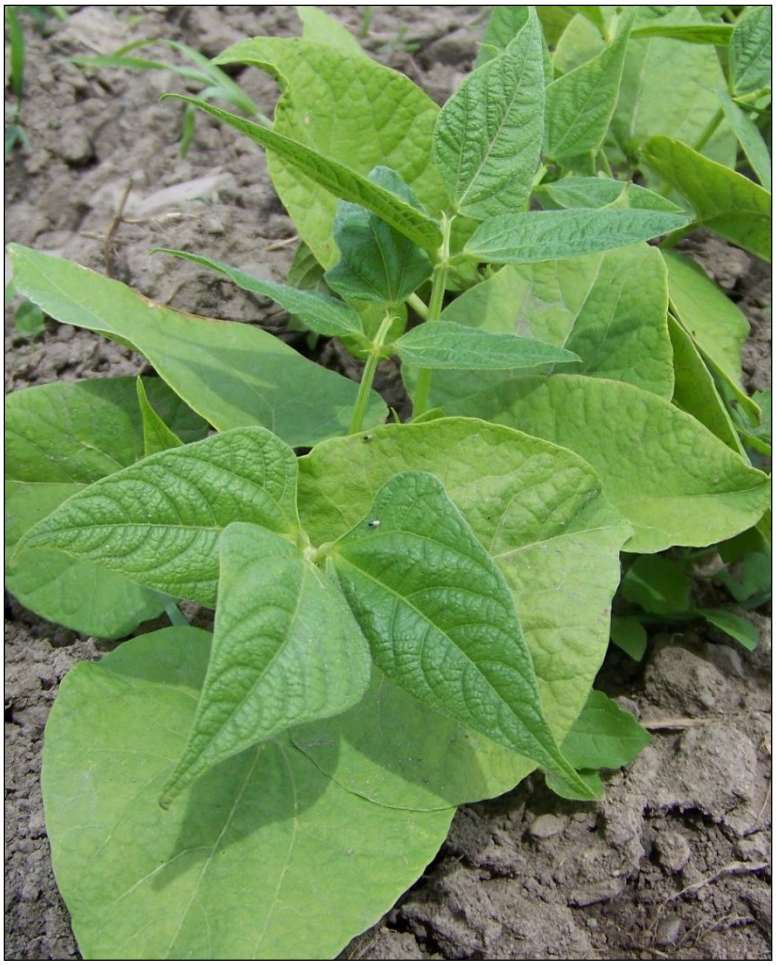
NORTHWEST CROPS & SOILS PROGRAM

Northeast Dry Bean Pest Guide



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USDA United States Department of Agriculture National Institute of Food and Agriculture

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Introduction

Dry beans (*Phaseolus* spp.) come in a wide variety of shapes, colors, and sizes (Figure 1). Varieties like Jacob's cattle, European soldier, Black turtle, and Yellow-eyed beans are commonly grown in the Northeast. The edible field bean is considered a grain legume crop that is well-suited for our climate but requires good soil quality and diverse crop rotations. Beans are a staple food for much of the world due to their high protein content (generally 22% to 24%). They can serve as a great addition to a grain rotation and are a highly marketable crop.

Figure 1. Raquel (top) and Vermont Cranberry (bottom) dry bean varieties.

Sourcing Quality Seed

Growers should carefully choose their dry bean varieties based on maturity, growth habit, and water requirements and buy certified, disease-resistant seed. To ensure desirable yield and quality, it is important to purchase high quality seed with good germination (> 90%) that is free of weed seeds and seed-borne diseases. Buying 'Certified Seed' is your best bet for purchasing high quality seed. However, sourcing certified heirloom dry bean seed in quantities greater than a pound has proven to be a challenge. Much of the heirloom bean seed we have found thus far has not been 'Certified Seed'—rather it has been saved seed from growers or from businesses selling beans for food. Anthracnose is the primary seed-borne disease identified in Vermont. Unfortunately, there isn't a 'do-it-yourself' test you can do to test for infected seed. However, the University of Vermont Plant Diagnostic Clinic can screen seeds for Anthracnose and other diseases. For instructions on submitting a sample to the Clinic, visit their website at: https://www.uvm.edu/extension/pdc

Dry Bean Pest Management

Weed Control

Weeds may develop quickly in beans because the beans are slow to establish a canopy and do not compete well. Pre-emergent weed control can be accomplished with either a tine-weeder or a rotary hoe, depending on the weather and soil conditions and amount of plant residue in the field. Do not cultivate when the beans are starting to emerge as bean seedlings are very fragile and can easily snap. Cultivation can be undertaken when plants are between 2 and 3 inches tall until canopy closure.

A word of caution: bean taproots are easily torn from the ground during imprecise mechanical cultivation. To minimize damage to plants, beans should not be cultivated when they are wet or just after they have flowered.

Diseases

Root Rot

Dry beans are susceptible to various root rots including *Rhizoctonia*, *Fusarium*, and *Pythium*—all can cause seedling death and reduce yields.

Bacterial Leaf Diseases

In addition, several bacterial leaf diseases including Bacterial Bean Blight, Bacterial Brown Spot, and Halo Blight are common. Bacterial diseases are challenging to identify, but samples of diseased plant tissue can be sent to the UVM Plant Diagnostic Clinic for positive identification; see https://www.uvm.edu/extension/pdc for submission instructions.

Bacterial Bean Blight (*Xanthomonas campestris pv. Phaseoli*) begins with water-soaked spots the undersides of the leaves, which then grow into larger necrotic areas with a bright yellow border (Figure 2). Eventually the damaged parts of the leaf appeared burnt, but remain attached to the plant. Common bacterial blight favors wet, moist conditions. Bacteria that cause common bean blight can survive in or on the seeds, making contaminated seed the main source of the pathogen. The bacteria also survives better on crop residue left on the soil surface compared to reside that is worked into the soil. Secondary infection can occur after wind-blown rain or overhead irrigation.

Bacterial Brown Spot (*Pseudomonas syringae*) symptoms on plants include small circular, brown, necrotic lesions that are sometimes surrounded by yellow. Lesions may join to form linear streaks between veins on the leaf. The centers of old lesions fall out leaving strips or holes in the plants leaves (Figure 3). Bacterial brown spot thrives in warm, humid conditions. The bacteria can live on the plant surface without signs of disease. Once the bacterial population is large enough, that is when bacterial brown spot occurs. Inoculum can persist in the crop residue and is spread after a rain event or the use of overhead irrigation.

Halo Blight (*Pseudomonas syringae pv. Phaseolicola*) favors cool and moist conditions. Symptoms include yellow-green halos around necrotic spots on the leaves, and can develop into systematic chlorosis, a condition where leaves do not produce enough chlorophyll (Figure 4). Symptoms can also be seen on the pods and stems, as water-soaked, red or brown lesions. Contaminated seed is the main source of this pathogen, and the bacteria can survive for more than four years in the bean seed. Halo blight can also be spread by rain or irrigation.

Figure 2. Bean leaf infected with Bacterial Bean Blight.

Figure 3. Dry bean plant infected with Bacterial Brown Spot.

Figure 4. Dry bean leaf infected with Halo Blight. Photo credit: UMASS Extension Vegetable Program

Fungal Pathogens

***Sclerotinia* white mold** affects a number of crops including dry beans and favors cool, moist conditions, such as the end of the growing season. Infection starts with water spots or lesions on leaves, stems, and pods. The legions enlarge into a rotten mass of tissue that is covered with a cotton-like white mold (Figure 5). The infected area wilts and dies, and displays the characteristic bleached and dried appearance. The pathogen survives as sclerotia in the soil for several years. Sclerotia reproduces either by the production and release of airborne spores that come into contact with the plant or by direct contact by the plant with the fungal growth in soil or neighboring plant.

Ascochyta pod blight (*Ascochyta* spp.) is caused by a number of species of *Ascochyta* and thrives is cool, moist conditions. It can be identified by small circular brown spots on leaves in early growth stages and larger, dark grey lesions in later growth stages (Figure 6). Leaf tissue around the lesions may turn black. The pathogen survives in plant debris or in the seeds, and can be spread to from plant to plant by wind-blown rain or by overhead irrigation.

Anthracnose (*Colletotrichum lindemuthianum*) is one of the most destructive diseases, and it begins with discoloration as red spots on leaves that develops into lesions (Figure 7). As lesions develop, leaf veins turned reddish-dark brown and spread through the leaf. The fungus then spreads to the pods, causing black lesions. Mature circular lesions on pods are surrounded by reddish-brown to black borders with a grayish black interior that exuded pink masses of spores. Anthracnose can wipe out entire fields of beans, and is spread primarily by planting infected seed.

Figure 5. White mold on dry bean plant.

Figure 6. Signs of Ascochyta pod blight. Cultivars 'tiger's eye' (right) and 'black turtle' (left). Sunken lesions with dark center visible. Detail of concentric rings of small pycnidia (dots) developing in the center of lesions were the most diagnostic characteristic (right).

Figure 7. A. Typical symptoms of bean Anthracnose collected from an infected field. B. Leaf underside with dark lesions along veins. C. Circular pod lesions with gray-black centers. D. Distinctive interior of the lesion exuding tan to pink/salmon masses of spores.

Disease Management Strategies

In our cool, moist climate, practices that are critical to managing the multitude of diseases that impact dry beans include:

- planting clean seed
- improving air flow
- rotating crops

Buying "Certified Seed' is highly recommended whenever possible. Certified seed guarantees that the seed meets or exceeds a strict set of quality control standards. In the case of beans, this includes rigid standards of seed diseases.

Weed management is especially important to improve air flow and assist with keeping the bean plant canopy as dry as possible. A dry canopy can help minimize the infection of disease. Spores

from many of the fungal diseases can survive in the soil for 3 to 5 years, waiting for their host plant and/or ideal conditions.

Crop rotation is also crucial in minimizing disease presence during bean production. Dry beans should not be grown in the same field for more than 3 to 4 years. Small grains are well-suited to rotations with beans because they are not susceptible to the same diseases as beans. Conversely, crops like sunflower, canola, and soybeans should be spaced properly between dry bean plantings.

Insect Pests

The primary insect pest of dry beans in the Northeast is the Potato Leafhopper, *Empoasca fabae*. Potato leafhoppers have an appetite for more than 200 broad leaf plants. Adult females overwinter in southern states and are carried northward on spring wind currents. The migratory nature of this native pest makes its arrival time and population size unpredictable.

Adults land in alfalfa and bean fields upon arrival where they feed and lay eggs. Potato leafhoppers are light green, wedge shaped insects that can be found scuttling on the underside of leaves. Adults are 1/8th of an inch long. Wings do not develop until the adult stage (Figure 8). Depending on spring arrival time and temperature, growers have witnessed 2 to 4 generations per season in the Northeast.

Figure 8. Potato Leafhopper nymph and adult.

Potato leafhoppers feed with piercing-sucking mouthparts on host plant's vascular tissue. This restricts phloem and eventual xylem flow to the rest of the leaf resulting in leaf edge yellowing and curling. At high infestation levels, stunted internodes can be observed. Visual damage caused by potato leafhopper is called "hopper burn" (Figure 9). Hopper burn is not present until 5 to 7 days after leafhopper feeding has occurred. The first sign is yellowing of the leaf at the tip followed by necrosis and leaf curling. These symptoms are the result of the plant shutting down photosynthesis in the leaf in response to leafhopper feeding. As this pest weakens the plant, it becomes more vulnerable to disease.

Figure 9. Potato Leafhopper damage "hopper burn".

Integrated Pest Management Tactics

As with Integrated Pest Management (IPM) programs in other crops, weekly monitoring for pests is recommended. Scouting the undersides of three leaves per plant in each variety is recommended weekly. Potato leafhoppers have feeding preference for particular varieties. Leafhoppers tend to steer clear of varieties that have leaves with more leaf hairs that exude chemical compounds. Preliminarily, Tiger's Eye appears to be a dry bean variety more susceptible to potato leafhopper. Insecticide options are limited for organic growers but products with azadirachtin or pyrethrin as active ingredients are effective against potato leafhopper. For conventional management, products with active ingredients beta-cyfluthrin or imidicloprid may be used for potato leafhopper control. As always, pesticides used must be registered for use on dry beans in your state. Read and follow pesticide labels carefully. Certified organic producers should ensure products are allowed by checking with their certifier before they apply any product.

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