IDENTIFYING POTATO DISEASES IN PENNSYLVANIA

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Contents

3  Late Blight
5  Early Blight
6  Verticillium Wilt (Early Dying)
8  Rhizoctonia Canker (Black Scurf)
10  Fusarium Dry Rot and Seed Piece Decay
11  Silver Scurf
12  Pythium Leak
13  Pink Rot
14  Black Dot
15  Powdery Scab
16  Gray Mold
17  Sclerotinia Stalk Rot (White Mold)
18  Common Scab
19  Blackleg and Soft Rot
21  Ring Rot
22  Viruses
23  Physiological Disorders
Late Blight

**Causal Organism**

*Phytophthora infestans* (Mont.) De Bary (fungus)

**Affects**

foliage and tubers

**Symptoms**

**Foliage**

Symptoms of late blight appear as small light- to dark-green water-soaked spots, often with a chlorotic halo (Fig. 1). Lesions enlarge rapidly and turn brown or purplish black. The lesions are not limited by veins, and they coalesce as new infections occur, blighting and killing the entire leaf within a few days. If the lesions dry out, the leaf becomes very brittle (Fig. 2). Lesions may occur on petioles or stems, making detection difficult because leaves still appear green and healthy (Fig. 3). Infected stems turn black with rot but are not as spongy as stems infected with blackleg or soft rot bacteria (Fig. 4).

During periods of high relative humidity and leaf wetness, lesions may be bordered or totally covered by a cottonlike white moldy growth on the underside of the leaf or on the stems (Fig. 5). The white growth is the fungus sporulating, producing sporangia. Under continuously wet conditions, the fungus sporulates profusely and the disease progresses rapidly as the fungus rots the leaves and stems. High temperature and dry conditions will slow or temporarily stop disease development, but as conditions become moist and cool, the fungus resumes growth and disease development continues. Sporulation on stem lesions appears less affected by hot dry conditions because of the high relative humidity within the crop canopy.

1. Late blight lesions with chlorotic halo.
2. Late blight lesion that has dried and become brittle.
3. Late blight on stem.
4. Late blight on stem, leaves with sporulation.
5. Late blight lesions with sporulation.
**Tubers**
The exteriors of infected tubers show irregular and slightly depressed areas of brown to purplish skin (Fig. 6). A coppery brown granular rot usually extends less than one-half inch into the tuber. This rot may be deeper when the infection is caused by new genotypes of late blight (Fig. 7). The boundary between diseased and healthy tissue is not clearly defined. Tubers may appear shriveled as older lesions become firm and sunken due to water loss. Invasion by secondary decay organisms is common, resulting in the complete breakdown of tubers. The cottonlike white mold may be observed on the surface of tubers when they are stored under conditions of high moisture.

**Disease Cycle**
The fungus survives between potato crops primarily in infected tubers (as seed, culls, volunteers). When infected tubers sprout the following spring, the pathogen can grow from the tubers into the newly formed plants. Under cool, moist conditions, the fungus can sporulate on the foliage of these plants. If the spores become airborne, they can be carried to neighboring plants or nearby fields. As long as spores continue to form on diseased foliage, infections will occur throughout the growing season.

When spores are washed off the foliage by rainfall, tubers can become infected. Tubers also may become infected at harvest through contact with spores on infected vines. Tubers inadequately covered by soil are more likely to be infected than those that are properly hilled. If the fungus sporulates on tubers in storage, any movement of those tubers can cause the sporangia to be disseminated and allow infections to occur on other tubers.

**Conditions That Promote Disease**
Ideal conditions for late blight are cool nights (50 to 60°F) and warm days (60 to 70°F) accompanied by fog, rain, or long periods of leaf wetness. Conditions must remain moist for 7 to 10 hours for spore production to occur.

**Disease Look-alikes**

- **Foliage**
  - early blight, botrytis

- **Stem**
  - soft rot, blackleg

- **Tubers**
  - pink rot, early blight

**Management/Control**
- Use high-quality disease-free seed.
- Use resistant cultivars where possible; Kennebec, Sebago, and Elba are moderately resistant.
- Destroy cull piles and volunteers.
- Do not overfertilize with nitrogen.
- Make sure plants are adequately hilled.
- Apply fungicides.
- Scout suspect areas such as low-lying areas, areas near woods, and areas that tend to dry out more slowly.
- Vine kill and continue to apply protectant fungicides until plants are completely dead.
- Harvest only when vines are dead.
- Avoid harvesting under wet conditions.
- Maintain good air circulation in storage.
Early Blight

Causal Organism
*Alternaria solani* Sorauer (fungus)

Affects
foliage and tubers

Symptoms

Foliage
Foliar symptoms first appear as small circular dark spots on lower, older leaves (Fig. 8). Lesions are dark brown to black and have concentric rings, resulting in a targetlike appearance within the dead tissue. As lesions coalesce, they become restricted by large leaf veins and take on an angular shape (Fig. 9). Lesions may be surrounded by a chlorotic border. Infection also may occur on stems, resulting in small dark lesions that do not cause significant injury.

Tubers
Tuber lesions are dark, sunken, and often surrounded by a raised margin (Fig. 10). The underlying tissues are leathery to corky in texture, dry, and usually reddish to dark brown. Infected tubers become shrunken after prolonged storage.

Disease Cycle

The fungus overwinters in soil, plant debris, infected tubers, or other solanaceous hosts. The disease usually occurs along fields adjacent to potato fields from the previous season. Early blight usually occurs late in the season, with the first appearance in mid-July. Spores are produced on the older lesions and are dispersed to other plants by wind, rain, irrigation water, or mechanical means throughout the later part of the growing season. The disease therefore increases more rapidly after the plants flower. Tuber infection occurs during harvesting and is most severe when the tubers are bruised or wounded.

Conditions That Promote Disease

The temperature range for disease development is 68 to 86°F with an optimum range between 70 and 75°F. Alternating wet and dry conditions with long periods of high relative humidity and leaf wetness promote disease development. The disease is more severe on potatoes that are stressed from poor nutrition, insect damage, drought, or other stresses. Disease development increases as senescence begins.

Disease Look-alikes

Foliage
late blight, botrytis

Tubers
late blight, fusarium rot

Management/Control

- Rotate away from the previous year’s potato fields.
- Plant cultivars with some degree of resistance, since early-maturing cultivars are more susceptible than late-maturing cultivars. Katahdin, Kennebec, Sebago, Elba, and Atlantic are moderately resistant.
- Apply protectant fungicides beginning after bloom or at the first sight of early blight symptoms.
- Use cultural practices that promote tuber skin set.
- Use harvesting methods that minimize skinning and bruising.

8. Early blight lesions on leaves.
9. Early blight lesions on leaves and stem.
10. Early blight rot in tubers.