



EARLY BLIGHT OF POTATO

Early blight of potato, caused by the fungus *Alternaria solani*, is prevalent worldwide wherever potatoes, tomatoes, peppers, and eggplant are grown. The name early blight is misleading, as the disease normally appears first on plants where the tuber crop is setting or where tubers have already formed. Actively growing young tissue and plants heavily fertilized with nitrogen do **not** exhibit symptoms, and most secondary spread occurs as plants age, especially after blossoming. Yield reductions of 50 or more bushels per acre are not uncommon in Illinois where unprotected foliage is destroyed prematurely.



Figure 1. Early blight lesions, caused by *Alternaria solani* (courtesy D.P. Weingartner).

Most rapid spread of the disease occurs during periods of alternating wet and dry weather. The disease is often most severe when potato plants are predisposed by injury, poor nutrition, or other type of stress.

Besides attacking tomatoes (see [Report on Plant Diseases No. 908](#)), peppers, and eggplant, the causal fungus also infects garden petunia, black and beaked nightshades, jimsonweed, henbane, apple-of-Peru or shoo-fly-plant, horsenettle, groundcherries, false Jerusalem-cherry Jerusalem cherry, spiny amaranth or pigweed, Chinese amaranth, quickweed or small flowered galinsoga as well as other ornamental and weed species of *Solanum*.

SYMPTOMS

Chocolate brown to nearly black spots (lesions) appear first on the oldest, lower leaves. The lesions at first are small, dry, papery, and usually oval or angular, measuring up to 1/8 inch in diameter. The lesions gradually enlarge to about 1/2 inch in diameter. They are often bounded by the larger veins in the leaf (Figure 1). Many lesions are targetlike, having a series of slightly raised and depressed, concentric rings within the diseased area (Figure 2). If abundant, the lesions may merge, forming irregular blotches that kill a large portion of the leaf. Toxic



Figure 2. Potato Early Blight lesion (Stevenson, UW).

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Figure 3. Leaves affected by early blight remain attached to the plant (courtesy W.R. Stevenson).

substances, believed to be produced by the fungus, cause a narrow yellowish zone at the margin of a lesion and the leaves to turn yellow between the lesions (Figure 3). In warm, moist weather, infected leaves commonly wither, droop, and may fall prematurely. If blight is severe, plants may be entirely defoliated. Stem and petiole lesions are generally elongated, shallow, brownish black, and cause little damage. Advanced vine symptoms can be confused with *Verticillium* wilt (see [Report on Plant Diseases](#) No. 1010) and leaf scald associated with moisture stress in irrigated potatoes.

Tuber lesions are usually small, circular to irregular, and slate black to brownish black. The lesions later become somewhat sunken and are often surrounded by a slightly raised, purplish to gunmetal border. Affected tuber tissue is firm, hard, somewhat corky or leathery, and usually brown (Figure 4). Occasionally these shallow lesions may be invaded by secondary, soil-inhabiting fungi and bacteria to produce a rot in storage. Tuber lesions increase in size rather slowly and may not become severe until the middle or end of the storage period. Tissue in advanced decay is often water-soaked and yellow to greenish yellow. Later, the tubers become shriveled.



Figure 4. Peeled tuber showing the depth of early blight lesions (courtesy G.D. franc).

DISEASE CYCLE

The *Alternari* fungus is carried over from year to year on tomato seed and potato tubers, as well as on dead infected leaves and stems of potato, tomato, pepper, eggplant, petunia, and weed hosts. The survival structures are thick-walled chlamyospores which form within mycelial cells and spores called conidia (Figure 5). The chlamyospores can survive in debris left on the soil surface or buried in the soil. the fungus overwinters at least one season and probably can survive several years.

In the spring the fungus resumes growth during favorable conditions and produces large numbers of microscopic conidia (Figure 5) that are blown by air currents, splashed by rain, carried by insects, and probably by tools and farm equipment from plant to plant and from field to field. The conidia are produced on the foliage of potato, tomato, and other hosts even after it has died. The spores germinate within two hours between 44° and 93°F (6° and 34°C) and penetrate the leaves, stems, and tubers of potatoes directly through the epidermis. Infection may occur—within a period of 12 hours at 50°F (10°C), 8 hours at 59°F (15°C) and only 3 hours at warmer temperatures—if moisture is present in the form of dew, fog, or rain. Leaf spots may become visible two or three days after infection has occurred. Some infections remain latent until the host tissues mature. Lesion expansion is favored by temperatures near 61°F (16°C), free moisture, and by slow drying conditions. Leaf and stem lesions reach maximum size in about a week. New conidiophores and conidia usually form on lesions at least 3/8 inch in diameter. Conidiophore and spore production are favored by gentle rains and heavy dews. Maximum spore production occurs during moist periods when temperatures are 66° to 73°F (19° to 23°C). Temperatures

above 80°F (27°C) stop conidia formation. Maximum spore production in the field occurs between 3:00 a.m. and 9:00 p.m. About 100 *Alternaria* spores can form on a single leaf lesion 0.4 inch in diameter. The same lesion can produce up to four crops of new conidia. The minimum time from penetration and infection to the production of a new crop of spores is about 5 to 7 days.

Immature tuber surfaces are easily infected, whereas those of mature tubers are much more resistant. The optimum temperature for tuber infection is 54° to 61°F (12° to 16°C). If wet weather occurs at harvest, tubers may become infected through cuts, bruises, or unwounded surfaces.

CONTROL

1. Plant disease-free, certified, blue tag seed potatoes in **fertile**, well-drained soil. Fertilizer use should be based on a soil test. For more information refer to Illinois Extension Circular 1373, Midwest Vegetable Production Guide for Commercial Growers 2002.
2. Follow a **complete** spray or dust program. **Proper timing and thorough coverage** of foliage are essential. Start applications when early blight is **first** seen or just after flowering, and continue until the foliage dies normally or is killed artificially with “vine-killers.” If there is a threat of the potentially more serious late blight (see Report on Plant Disease No. 936), applications may need to start when plants are four to six inches tall. **Sprays are superior to dusts**. Apply dusts and sprays in the early morning or evening when the wind is usually at a minimum (less than 5 miles per hour for dusting and 10 mph for spraying) and leaf surfaces are damp with dew. Dusts should contain at least 5 to 10 percent fungicide. Be sure to follow all directions and precautions for mixing and applying as printed on the container label.
3. Irrigate on a **rising** temperature so that foliage will dry off completely before nightfall.
4. Eradicate weeds belonging to the potato-tomato family (Solanaceae) in and around the field or garden. Keep all weeds down as far around the field or garden as is practical.
5. Wait at least 3 or 4 days after vine killing before digging. This practice increases tuber resistance to the early blight fungus.
6. After harvest, where practical, plow under cleanly all plant debris and volunteer potatoes.
7. If feasible, follow at least a three-year rotation between susceptible crops (potato, tomato, eggplant).

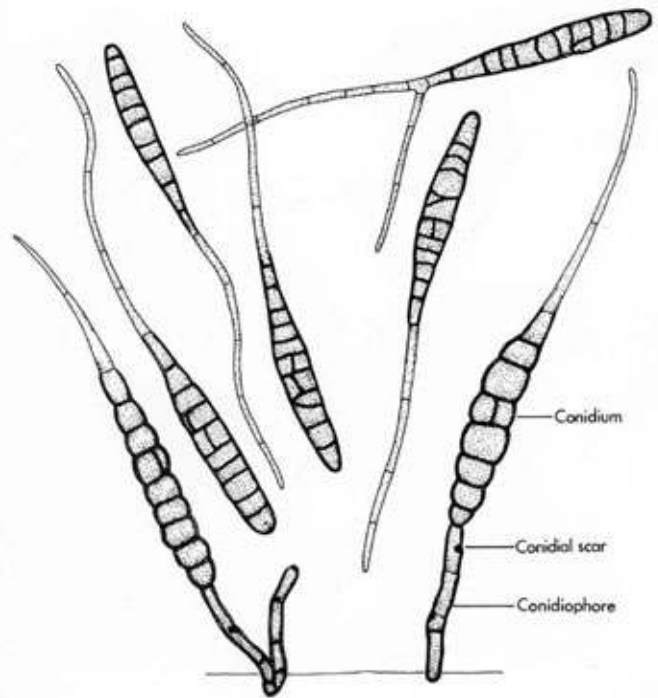


Figure 5. *Alternaria solani*, the early blight of potato fungus, as it appears under a high-power microscope (drawing by Lenore Gray).

8. Store blemish-free tubers in a clean, dry, dark, well-ventilated location at 40°F (4°C).
9. Handle tubers carefully to avoid bruises. Tuber infections may occur during grading and shipment.

For information on how and where to obtain publications mentioned above, contact your nearest Extension office or ITCS, University of Illinois P345, 1917 S. Wright St., Champaign, IL 61820.

Report of Plant Diseases (RPD) mentioned are available at
<http://www.ag.uiuc.edu/~vista/pubs.html>