

Chapter – 16

EARLY BLIGHT OF POTATOES

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Pathogen: *Alternaria solani*

Hosts: Potato (*Solanum tuberosum*)

Early blight (target spot) of tomato and potato is caused by the fungus *Alternaria solani*. This common disease may also occur on other solanaceous plants, such as pepper and eggplant, as well as certain Brassica spp. Although this disease usually affects older, senescing plants, it can cause complete defoliation when environmental conditions are optimal for disease development.

Symptoms

Foliar

Symptoms of early blight usually appear near the end of the season, though symptoms may appear earlier. Brown lesions first appear on older, lower leaves, and spread up toward new growth. Initial symptoms on leaves appear as small 1-2 mm black or brown lesions and under conducive environmental conditions the lesions will enlarge and are often surrounded by a yellow halo .



Lesions greater than 10 mm in diameter often have dark pigmented concentric rings. Leaves, however, usually do not fall off. Lesions may also develop on the stems. These lesions begin as small, dark, slightly sunken areas that enlarge and may develop the target-appearance as on the leaves.

Fruit

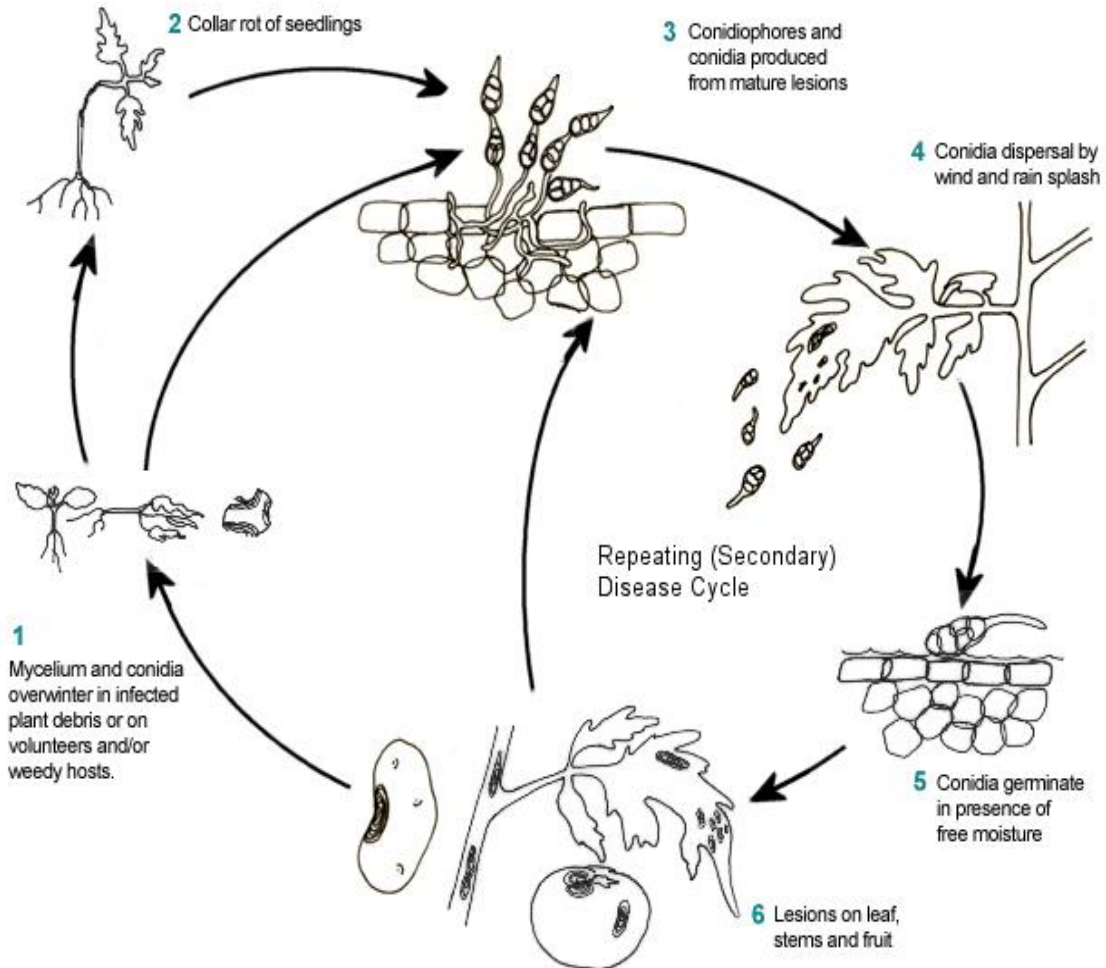
Symptoms may also appear on the potato tubers. Infected potato tubers develop dark, sunken lesions that are often surrounded by a purplish raised border. Under these lesions, the tissue is dry, leathery and brown. Lesions will increase in size in storage, though they will remain superficial.



Disease Cycle

The fungus overwinters in infected residue in the soil and on weedy solanaceous hosts. Spores infect leaves directly through the epidermis when the leaves contact the soil, or when spores are blown or splashed to susceptible leaves. Leaves that are the most susceptible are those that are older and under stress from other diseases or nitrogen deficiency. Under cool, moist conditions, the fungus can produce numerous spores that are wind-blown to adjacent leaves and plants, leading to new infections. Potato tubers usually become infected with the fungus when immature or wounded tubers are lifted from the ground through soil infested with fungal spores.

Disease Cycle and Epidemiology



Alternaria solani overwinters primarily on infected crop debris. The dark pigmentation of the mycelium increases resistance to lysis which extends the survival time in the soil to several years. Thick-walled chlamydospores have been reported, but they are found infrequently. In mild climates the pathogen can survive from season to season on volunteer tomato and potato plants as well as other weedy Solanaceous hosts such as horsenettle and nightshade. Warm, humid (24-29°C/ 75-84°F) environmental conditions are conducive to infection. In the presence of free moisture and at an optimum of 28-30°C (82-86°F), conidia will germinate in approximately 40 min.

Desiccated germ tubes are able to renew growth when re-wetted, and, hence, infection can occur under conditions of alternating wet and dry periods. Germ tubes penetrate the leaf epidermis directly or enter through stomata. Infection of potato tubers usually occurs through wounds in the tuber skin inflicted during harvest. Wet conditions at harvest provide a favorable environment for spore germination as well as causing swollen lenticels on the tubers which are easily invaded. Time from initial infection to appearance of foliar symptoms is dependent on environmental conditions, leaf age, and cultivar susceptibility. Early blight is principally a disease of aging plant tissue. Lesions generally appear quickly under warm, moist conditions on older foliage and are usually visible within 5-7 days after infection. A long wet period is required for sporulation but it can also occur under conditions of alternating wet and dry periods. Conidiophores are produced during wet nights and the following day light and dryness induce them to produce spores, which emerge on the second wet night. Secondary spread of the disease results from conidia being dispersed mainly by wind and occasionally by splashing rain or overhead irrigation. Early blight is considered polycyclic with repeating cycles of new infection. This is the period when the disease has the potential to spread rapidly and build up to damaging levels in the crop.

Pathogen Biology

The causal pathogen of early blight is the fungus *Alternaria solani*. There is no known sexual stage and hence it is classified as a Deuteromycete. The genus *Alternaria* is a large and important group of pathogenic fungi, which cause a significant number of important diseases. The fungus is readily cultured on artificial media such as V8 juice where it produces a deeply pigmented gray/black hairy colony. The mycelium is haploid and septate, becoming darkly pigmented with age. Sporulation in culture can be stimulated by exposure to fluorescent light. The asexual conidia are borne singly or in a chain of two on distinct conidiophores. The beaked conidia normally possess 9–11 transverse septae (Figure 8). Morphological and pathogenic variability among isolates of *A. solani* has given rise to claims of the existence of races, although this remains unproven.



Management

- As with many diseases, no single management strategy will cure the disease. Rather, a combination of methods should be used to decrease its effects.
- Plant disease-free seeds and plants; avoid bruising seed tubers before planting.
- Maintain plant health through proper water and fertilization regimes; nitrogen and phosphorus deficiencies increase susceptibility to early blight.
- Garden areas should be rotated out of potatoes, tomatoes, pepper and eggplant for 3-4 years so that hosts of the disease are not present.
- Minimize leaf wetness by watering plants in the morning or at the base of the plant.
- Harvest mature tubers when soil is not wet, and minimize injury to the tubers.
- Remove infested plant material after harvest, or incorporate material into the soil.
- Several foliar fungicides are registered for early blight. Mancozeb, chlorothalonil and copper are effective against early blight when applied at approximately 7-10 days intervals. Spraying should commence at the first sign of disease or immediately after bloom.
- Plant varieties that are resistant or have a lower susceptibility to early blight.

References

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