



EARLY BLIGHT, SEPTORIA LEAF SPOT, AND ANTHRACNOSE OF TOMATO

All three of these common and important diseases are caused by fungi: early blight by *Alternaria solani*; Septoria leaf spot by *Septoria lycopersici*; and anthracnose by *Colletotrichum coccodes*. These diseases are considered collectively here because: 1) early blight (Figure 1) and Septoria leaf spot (Figure 2) cause defoliation, exposing the fruit to sunscald, which contributes to the development of anthracnose; and 2) the same management practices and fungicide program are used for all three diseases. The losses from these diseases may approach 100 percent in warm, wet seasons where control measures are not practiced. Harvestable fruit numbers, size, and quality are all reduced by these diseases.

SYMPTOMS

Early blight. Early blight can affect plants at any stage of development. Symptoms of early blight occur on fruit, stem, and foliage. 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 (Figures 1). Lesions greater than 10 mm in diameter often have dark pigmented concentric rings. This so-called “bullseye” type lesion is highly characteristic of early blight. As lesions expand and new lesions develop entire leaves may turn chlorotic and dehisce, leading to significant defoliation. Lesions occurring on stems are often sunken and lens-shaped with a light center, and have the typical concentric rings. On young tomato seedlings lesions may completely girdle the stem, a phase of the disease known as “collar rot,” which may lead to reduced plant vigor or death. Infection of both green and ripe tomato fruit normally occurs through the calyx with lesions sometimes reaching a considerable size. The lesions appear leathery and may have the characteristic concentric rings. Infected fruit will frequently drop prematurely.

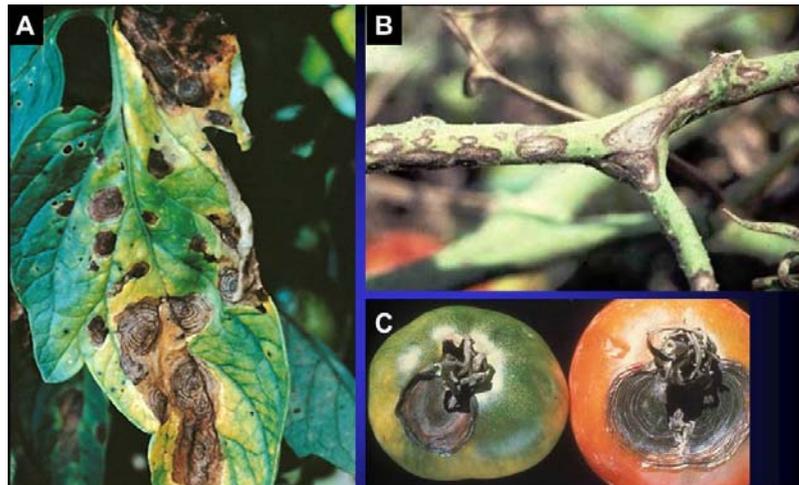


Figure 1. Early blight of tomato, caused by *Alternaria solani*. A, Concentric rings of leaf lesions; B, Concentric rings on a stem (Photo courtesy OMAFRA); C, spots on fruit.

Septoria leaf spot. *Septoria lycopersici* can infect plants at any stage of development. Symptoms usually appear on the lower leaves after the first fruit sets. They appear as small, water-soaked spots

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that soon become circular about 3 mm in diameter, with dark brown margins and tan to gray centers (Figure 2). The light-colored centers of the spots are dotted with black pycnidia (Figure 2), which are the most distinctive symptom of Septoria leaf spot. A yellow halo is often associated with leaf lesions. If the leaf lesions are numerous, infected leaves may wither. Lesions also develop on stems, petioles, and the calyx. These lesions are generally smaller and darker brown than those on leaves. The disease spreads upward, from oldest to youngest growth. If the leaf lesions are numerous, some infected leaves turn slightly yellow and then brown, and they wither. Fruit infection is rare.

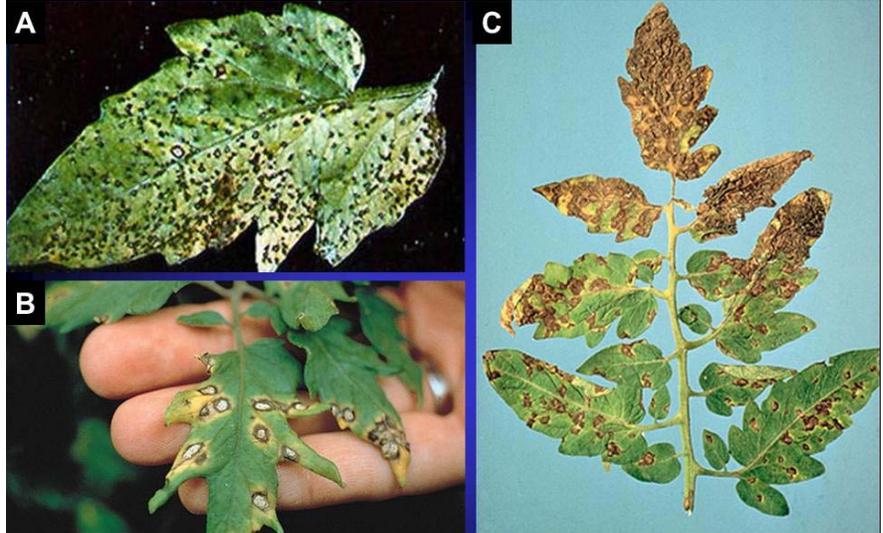


Figure 2. *Septoria* blight lesions on tomato leaves, caused by *Septoria lycopersici*. A, leaf lesions; B, pycnidia in leaf lesions; C, leaf blight. Photo courtesy APS.

Anthracnose. The most characteristic symptom develops on ripe fruit. The fruit may be infected when green and small, but symptoms do not appear until it begins to ripen. Symptoms first become

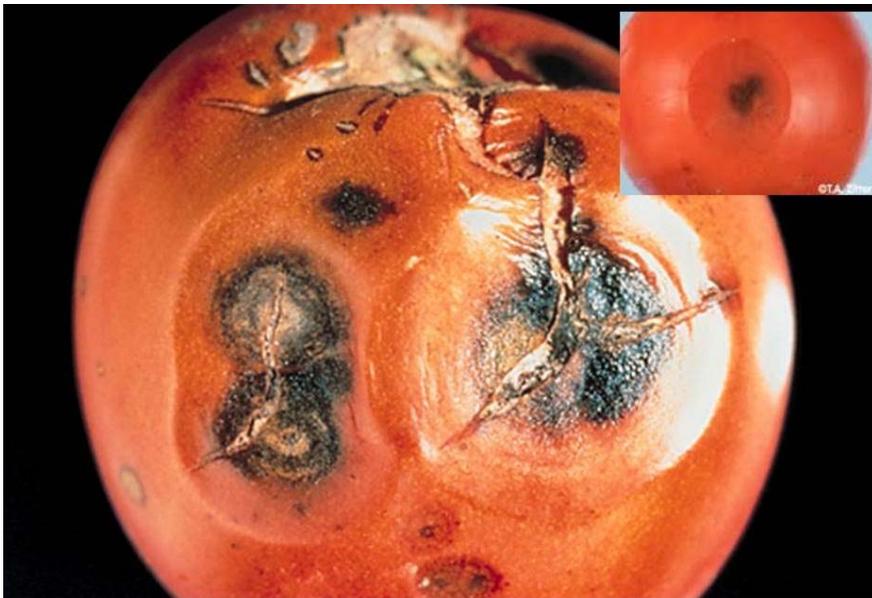


Figure 3. Anthracnose lesions with fungal fruiting bodies, caused by *Colletotrichum coccodes*. Photo courtesy APS.

visible on ripe fruit as small, circular, indented spots in the skin. A lesion may enlarge to ½ inch in diameter and become more sunken (Figure 3). As the spots expand, they develop dark centers or concentric rings of dark specks, which are the spore-producing bodies (acervuli) of the fungus. The flesh beneath a lesion may have a lighter color than the surrounding tissue and granular in texture. The center of a lesion is usually tan, and as the lesion matures it becomes dotted with small black specks (microsclerotia). The surface of a mature lesion generally remains smooth and intact.

DISEASE CYCLES

Early blight. *Alternaria solani* overwinters on infected plant debris and on seed. In mild locations, the pathogen can survive from season to season on volunteer tomato, potato, eggplant, orsenettle, and black nightshade. Primary infection is generally caused by the fungus in the soil and occurs during

rainy weather with temperatures of 75-84°F (24-29°C). Conidia germinate within 2 hr in water at temperatures from 43 to 93°F (6-34°C) and within 35-45 min at the optimum of 82-86°F (28-30°C). Lesions become visible under favorable conditions in 2 or 3 days. Conidia form when the leaf spot is about 3 mm in diameter. Heavy dews or frequent rains are necessary for abundant sporulation. The conidia are wind-disseminated. Older leaves are usually affected first, with younger leaves becoming affected later, as they attain a certain physiological maturity.

Septoria leaf spot. *Septoria lycopersici* overwinters on infected tomato debris or debris of solanaceous weed hosts. The fungus can also survive on plant stakes and cages, and spread by seed. Under wet conditions, numerous spores (conidia) are produced in the pycnidia and are exuded. The fungus can be spread from plant to plant by splashing water, workers, equipment, and insects. The temperatures between 68 and 77°F (20-25°C) are optimum for infection, symptom expression, and development of pycnidia. Leaf spots can appear within 5 days from infection, pycnidia form within 7-10 days, and spore production is repeated within 10-13 days.

Anthracnose. *Colletotrichum coccodes* survives from year to year as microsclerotia, often in association with plant debris. Under wet and warm conditions, the microsclerotia germinate and produce hyphae and conidia in acervuli. Microsclerotia can survive for long periods in the soil under adverse weather conditions. The fungus may infect fruit resting on the soil surface. Microsclerotia and conidia may also be splashed onto foliage and fruit. Once in contact with the fruit, conidia germinate and infect fruit. The fungus also causes latent infections in immature tomato fruit. Latent infections are activated after exposure of the fruit to low temperatures or after fruit maturation and plant senescence. Once latent infections are activated, symptoms develop rapidly. Ripe or overripe tomatoes are highly susceptible, and symptoms progress rapidly on them. Conditions that favor plant infection are temperatures from 50 to 86°F (10 to 30°C) [with an optimum of 68-75°F (20-24°C)], together with free moisture. Spread of microsclerotia and conidia is favored by splashing rain and overhead irrigation.

DISEASE MANAGEMENT

Early blight, Septoria leaf spot, and anthracnose can be managed by the following practices.

A. For Transplant Growers

1. Purchase only pathogen-free seed (certified if possible) from a reputable firm.
2. Grow the seedlings in pathogen-free beds.
3. Provide ample ventilation for plants in the seedbed. Do not overhead water, or water in the evening, and avoid overcrowding the seedlings. Fertilize based on a soil test.
4. Do not hold plants in the seedbed or in storage any longer than is absolutely necessary after they have reached the proper stage for transplanting.

A. For Transplant Growers

1. Purchase only disease-free transplants, certified if possible. When transplanting, discard all seedlings with cankers or lesions on the stem and leaves. Space the plants so the tops will not

be crowded at maturity.

2. Eradicate all weeds preferably before planting and during the season, particularly those in the family Solanaceae. Examples include groundcherries, horsenettle, nightshades, and Jimsonweed. It is also important to keep down all weeds as far around the field or garden as is practical.
3. Do not cultivate or work with plants when the foliage is wet with rain or dew.
4. Some losses from these diseases can be avoided if a high, balanced soil fertility is maintained and tomatoes are planted in well-drained soil. Staking, caging, or mulching plants to keep fruit off the soil will reduce losses from all three diseases as well as other fruit rots.
5. Routine applications of fungicides is essential in controlling all three diseases. Applications should start a week or two after transplanting and continue close to harvest. Thorough coverage of the foliage, stems, and fruit is essential with each application. For the up-to-date recommendation on fungicide use for control of tomato diseases, refer to the current edition of publication number C1373, "Midwest Vegetable Production Guide for Commercial Growers" (www.btny.purdue.edu/pubs/id/id-56/). This publication is available from ITCS, University of Illinois, 1917 S. Wright St., Champaign, IL 61820; or call 1-800-345-6087.
6. TOM-CAST, a weather-timed fungicide spray program, is available to commercial tomato growers to help determine when applications are warranted. Daily disease severity values (DSV) are calculated from surface wetness and temperature data. Fungicide sprays are recommended only when specified accumulated DSVs have been reached.
7. Harvest all ripe fruit at each picking. If left in the field, such fruit will soon decay and serve as a major source of infection for the remaining fruit.
8. After harvest is completed, spade or cleanly plow down, compost, or burn all tomato vines and unharvestable fruit.
9. Rotate 3 or 4 years before planting tomatoes, eggplant, peppers, or potatoes in the same area. This helps prevent buildup of the causal fungi in the soil.
10. Plants with resistance to one or more of these fungi have been identified and may be commercially available. Consult current seed catalogs and trade publications