

Strawberry Anthracnose

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Introduction - The term anthracnose is a general term used to describe plant diseases. Strawberry anthracnose refers to several diseases of strawberry caused by members of the same group of fungi (*Colletotrichum*), all producing similar symptoms (Table 1). These pathogens are capable of infecting fruit, buds, blossoms, petioles, runners, crowns, and foliage. Though generally thought of as southern diseases (optimal development temperature is approx. 80 degrees F), anthracnose is not limited to the south. Anthracnose crown rot (caused mainly by *C. fragariae*) is the most destructive disease of strawberry in the southeastern United States and on a global scale, anthracnose fruit rot (caused by all 3 species, but most often associated with *C. acutatum*) is a significant problem. Anthracnose fruit rot is especially severe in annual cropping systems where berries are grown on plastic-mulched raised beds. Fully open flowers and ripening fruit are very susceptible to infection. Under rainy, warm harvest season conditions the disease is able to spread very quickly and may destroy the entire crop. *C. acutatum* is considered to be most prevalent species in the Northeast.

Table 1: Symptoms associated with the various *Colletotrichum* species

<i>Symptom</i>	<i>C. acutatum</i>	<i>C. dematium</i>	<i>C. fragariae</i>	<i>C. gloeosporioides</i>
Crown rot			X	
Fruit rot	X	X	X	X
Black leaf spot			X	X
Irregular leaf spot	X			

Symptoms - Lesions first appear as small, dark spots on stolons and petioles (Fig. 1). These enlarge to become dark, elongated, dry, sunken lesions which often girdle the stem. When petioles or runners become girdled, individual leaves or entire daughter plants may wilt and die. Petiole infections occur at the base of the petiole, causing the leaf to bend sharply at the point of attachment and hang down.



Lesion symptoms of *C. fragariae* on strawberry stems (Fig. 1). Anthracnose leaf spot on strawberry leaf (Fig. 2).

Leaves: Anthracnose or black leaf spot is caused by *C. fragariae* or *C. gloeosporioides*. Lesions on leaves are small (<1/4"), round, and black (sometimes light gray) often resembling ink spots (Fig. 2). Spots may become numerous on leaflets without causing leaf death and often appear first on expanding leaves of runner plants. While the fungi are not reported to sporulate in these leaf lesions, the presence of leaf spot may be a warning signal that abundant inoculum is present on other plant parts and fungicide applications are needed. Irregular leaf spot, caused by *C. acutatum*, has dark brown to black lesions forming on leaf margins and tips and extending along the margin and inward to the mid-rib. These lesions do not continue to develop in fully expanded leaves but infected leaves may persist on plants for 2-3 months. The fungus sporulates in these lesions and may serve as an inoculum source for flower blight and fruit rot.

Flower Parts: Flower blight may occur any time after the bud emerges from the crown (Fig. 3). Fully open flowers are most susceptible to infection. Flower buds, sepals, pedicels, and peduncles may also become infected. Infected flowers dry quickly; dark lesions spread down the pedicel from the flower. Pedicels may be infected first; flower bud stems are girdled and buds die. Sepal infections occur as the bud is emerging from the crown. Sepals dry and turn brown; the resulting tip burn resembles that caused by excessive fertilizer. When warm, humid conditions prevail during bloom, all parts of the flower truss may die, giving plants a blighted appearance.



Blight symptoms of strawberry anthracnose on flowers (Fig. 3). Infected fruit displaying darkening sunken lesions (Fig. 4).

Fruit: Symptoms appear as whitish, water soaked lesions up to 3 mm in diameter. As lesions develop, they turn a light tan to dark brown and eventually become sunken and black with in 2 to 3 days (Fig. 4). After several days, lesions may be covered with pink to orange to light salmon-colored spore masses. Infected fruit eventually dry down to form hard, black, shriveled mummies. Fruit can be infected at any stage of development. Both ripe and unripe fruit can be affected. Infected seeds (achenes) turn black and are slightly sunken. These single seed infections often occur on green fruit; a typical lesion develops as the fruit ripens.

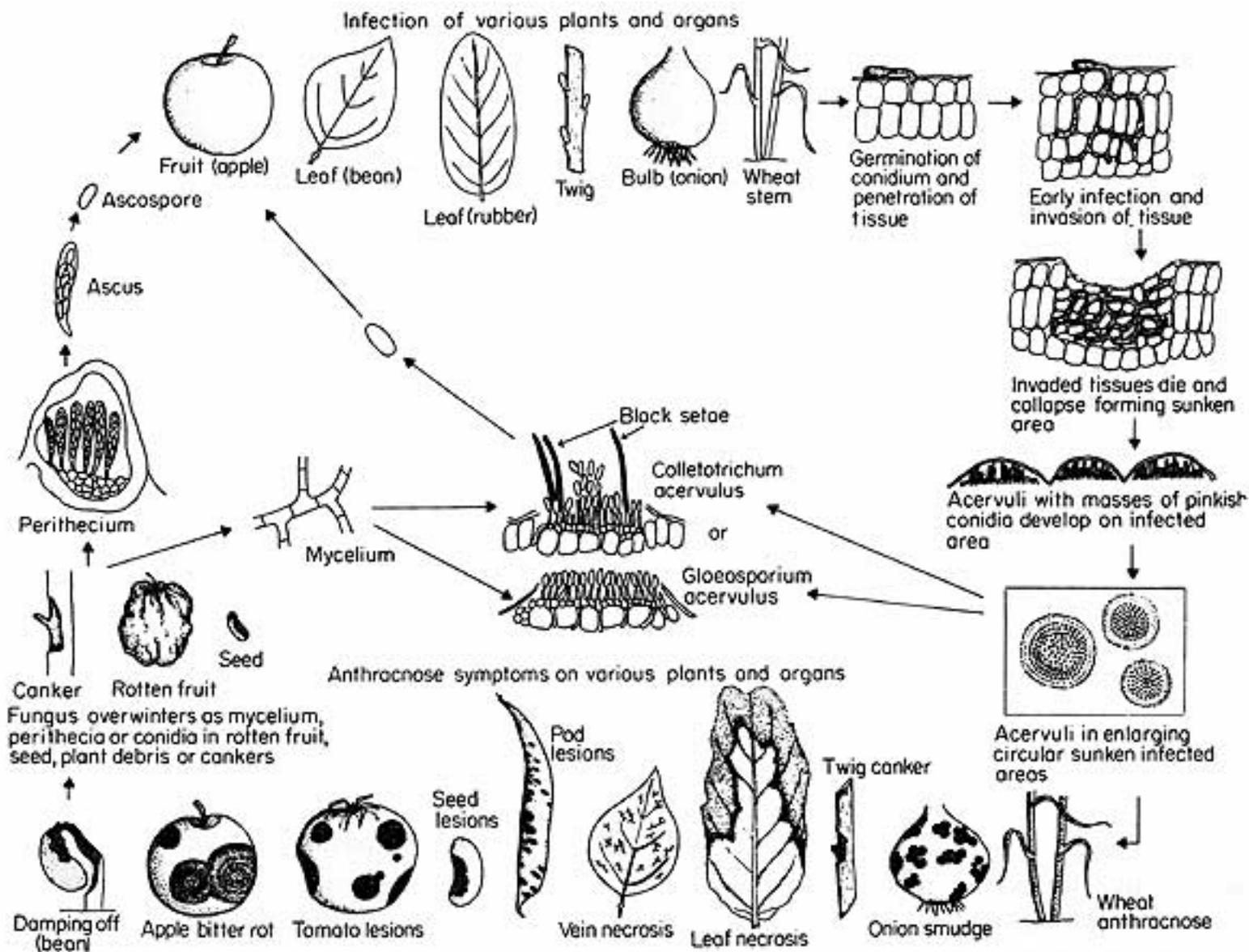
Crowns: The fungus moves into the crown from petiole or stolon cankers, or may start as an infection from spores washed by rain or irrigation into the center bud. When crown tissue becomes infected, the entire plant grows normally for a while, then wilts and dies. The internal tissue of infected crowns will develop a firm, reddish brown rot (seen by slicing through the crowns)(Fig. 5). Crown tissue may be uniformly discolored or streaked with brown, and lesions may produce salmon-colored masses of spores.



Infected crown displaying reddish brown rot (Fig. 5)

Signs (visible presence of the pathogen) - Pink to orange to light salmon-colored spore masses on the surfaces of lesions form on most if not all plants parts. *C. gloeosporioides* also readily produces perithecia.

Disease cycle - Infected transplants and soil from infected transplants appear to be the primary source of inoculum in most instances, especially in annual production systems. This may be especially true for *C. fragariae*, which has a limited host range and does not survive in soil over the summer. In perennial systems, the fungi may overseason in infected plants and debris, providing inoculum for the following fruiting season. Spores (conidia) may be dispersed in the field by wind-driven rain, splashing water, insects, movement of workers, equipment or animals. Disease development and spread is minimal in most cases under cool, dry conditions. Crown infections often occur in the nursery but do not appear until after planting. The fungus continues to develop in newly planted nursery infected plants, which may suddenly die during warm weather in the fall or early spring of the following year.



Anthracnose on various plants - disease cycle is similar for anthracnose of strawberry - reprinted from: Agrios G. N. (1997) Plant Pathology, 4th ed..Academic Press, San Diego, CA

Conditions favoring Infection - Anthracnose is considered to be a warm-weather disease with an optimum temperature for plant infection by *C. fragariae* between 80 and 90 °F. Therefore, the disease is generally not a problem in the Northeast unless warmer temperatures and rainfall prevail during fruit set and harvest. *C. acutatum* fruit infections occur at 68 °F. Both fungi need nearly 100% relative humidity for spore germination and infection to occur.

Disease management - Since control is extremely difficult when favorable environmental conditions exist, measures should start at planting to reduce inoculum levels. This begins with anthracnose-free plants ([Appendix of Strawberry Cultivar Disease Resistance](#)). Use of drip irrigation and between row straw mulch will also help lessen the spread of disease within fields. Early season fruit with infections

should be culled and removed from fields. Anthracnose fruit rot may be partly controlled with protective fungicide applications from flower bud emergence to harvest, however, fungicide programs have sometimes met with little to marginal success. For more information on fungicide programs see "Pest Management Guidelines for Commercial Small Fruit Production" . Check product labels for timing and rates of application for products.

Reference List

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