

Colletotrichum crown rot (anthracnose crown rot) of strawberries¹

Steven MacKenzie and Natalia Peres²

Colletotrichum crown rot is caused by the fungi *Colletotrichum gloeosporioides* and *Colletotrichum fragariae*. Both pathogens kill strawberry plants by aggressively invading crown tissue. Crown rot is a serious disease in warm production regions such as those in the southeastern United States since both *C. fragariae* and *C. gloeosporioides* grow and reproduce best at temperatures greater than 25°C. Although crown rot is observed in fields during the winter production season, it is most severe in nurseries in the southeastern United States and is one of the primary reasons that production of transplants moved to cooler regions. A third species of *Colletotrichum*, *Colletotrichum acutatum*, also causes plants to decline in vigor and wilt. Although it is sometimes isolated from crown tissue, decline and wilt symptoms caused by this species are generally due to infection of buds and roots.

Causal agent and symptoms

The symptoms caused by *C. gloeosporioides* and *C. fragariae* are virtually indistinguishable from one another in the field. Plants infected with virulent

strains initially show signs of water stress and subsequently collapse (Fig.1). This process may be relatively rapid, taking only 2 or 3 days at high temperatures. Under low temperatures, plants may show signs of stress and subsequently recover for weeks before collapsing. Cutting through crown tissue of infected plants lengthwise reveals a reddish-brown, firm rot (Fig.2). Infected plants from nurseries may grow normally for some time before symptoms occur. There are typically no lesions on foliage or stolons in production fields, although under greenhouse conditions or in summer nurseries necrosis on stolons, lesions on fruit, or black leaf spots may be visible. Symptoms of *Colletotrichum* crown rot may be confused with those of *Phytophthora* crown rot. To confirm a diagnosis, the pathogen must be isolated from the diseased crowns and identified.

Disease development and spread

Propagation of plants in Canada and northern states for the production season has greatly reduced the incidence of crown rot. Currently, during the

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2. Steven MacKenzie, research coordinator, and Natalia Peres, assistant professor, Gulf Coast Research and Education Center, Cooperative Extension Service, IFAS, University of Florida, Gainesville, FL 32611.

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warm months at the beginning and end of the production season crown rot incidences up to 5% still occur on plants in Florida fields. Plants can become infected after transplanting since *C. gloeosporioides* strains pathogenic to strawberry are abundant on noncultivated hosts in Florida and genetic data indicates that they are from the same population as those from strawberry crowns. *C. fragariae* has also been isolated from at least one native host in Florida and may be a pathogen on some ornamental species. Although inoculum from plants showing symptoms at the beginning of a production season can spread to other plants by the end of the season, the disease does not appear to be multi-cyclic and usually does not spread from symptomatic to healthy plants. In southern nurseries, higher temperatures and frequent rains favor spread of the inoculum among strawberry plants. *Colletotrichum* spp. responsible for crown rot do not appear to survive between seasons on plant debris since plants are typically killed immediately after the production season ends in the spring and the fungus disappears from crowns during the hot summer months.

Control

Using disease-free transplants is the most effective method for controlling crown rot in production fields. Currently, there is no certification program to guarantee that transplants are free of crown rot and infected plants may not show symptoms until they have been established in the field. Transplants from northern latitudes or high-altitude nurseries should be used to grow crown rot free plants in Florida fields. Weekly foliar sprays of protectant fungicides such as Captan® are very effective in controlling the spread of crown rot from infected to uninfected plants and may reduce infections from native vegetation. However, protectant fungicides do not hinder the progress of symptoms in plants that are already infected. Cultural practices that reduce the occurrence and movement of water on foliage such as the use of drip irrigation will limit the dispersal of the pathogen. Plants are also more sensitive to infection under high fertility conditions. Reduced nitrogen rates in nurseries or the use of nitrate as rather than ammonium nitrogen sources may also reduce risk.

There are no known cultivars that are immune to crown rot, although cultivars do differ in susceptibility. The use of resistant cultivars will delay the onset of disease until later in the season or reduce the incidence of crown rot. Cultivars such as Festival, Camarosa and Gaviota are highly susceptible, whereas cultivars such as Earlibrite, Sweet Charlie, Carmine and Camino Real show moderate levels of resistance. Treasure displays the highest level of resistance to crown rot of the cultivars that we have tested. Resistance to crown rot caused by *C. gloeosporioides* and by *C. fragariae* appears to be highly correlated. Although there may be some correlation between resistance to crown rot and to anthracnose fruit rot caused by *C. acutatum*, the correlation is not high as illustrated by the fact that Treasure is highly resistant to crown rot but highly susceptible to anthracnose fruit rot.



Figure 1. Initial symptoms of *Colletotrichum* crown rot.



Figure 2. *Colletotrichum* crown rot (internal crown symptoms).

Table 1. Products labeled in Florida for control of Colletotrichum crown rot.

Trade Name	Active Ingredient	Type	PHI or REI (hours) ¹	Comments
Abound	azoxystrobin	strobilurin	0	Do not make more than 2 sequential applications and no more than 4 applications per crop year.
Cabrio	pyraclostrobin	strobilurin	0	Do not make more than 2 sequential applications and no more than 4 applications per crop year.
Captan	captan	multi-site protectant	24	Also suppresses Botrytis and anthracnose fruit rots. Do not mix with bicarbonate or sulfur fungicides.
Topsin M	thiophanate methyl	benzimidazole	24	Fungicides from different chemical groups should be used in spray program for disease resistance management.
¹ PHI - Post harvest interval; REI = Restricted entry interval.				