

Anthracnose Fruit Rot of Strawberry¹

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Anthracnose fruit rot, caused by the fungus *Colletotrichum acutatum*, is an important disease for strawberry production worldwide. Other species of *Colletotrichum*, such as *C. fragariae* and *C. gloeosporioides*, are less frequently involved in fruit rot. Although fruit rot is the most important symptom caused by *C. acutatum*, the fungus can also attack other parts of the plant including the crown, leaves, petioles, and roots.

Pathogens and Symptoms

Symptoms of anthracnose fruit rot appear as dark and sunken lesions on infected fruit (Figure 1). On green fruit, anthracnose lesions are small (1/16 to 1/8 inch across), hard, sunken, dark brown or black. Lesions on ripening fruit are larger (1/8 to 1/2 inch), hard, sunken, and tan to dark brown. During wet weather, the lesions become covered by sticky, light orange ooze composed of millions of spores (conidia) in a mucilaginous matrix (Figure 2). When conditions are favorable for infection, multiple lesions nearly cover the fruit and lesions may appear on petioles (Figure 3). Strawberry flowers are highly susceptible and blighted flowers turn brown and remain attached to the plant (Figure 4), also a

symptom of Botrytis fruit rot or gray mold (caused by *Botrytis cinerea*). Small black spots on young button-sized fruit may also develop from flower infections (Figure 5).

Disease Development and Spread

C. acutatum is a strong colonizer of runner plants in the nursery, and infected transplants are a common source of inoculum for the production field. Weeds and other plants around production fields may also be colonized by *C. acutatum* from a diseased strawberry crop. In theory, these non-strawberry hosts could provide disease inoculum for the next crop, although this has not been demonstrated. *C. acutatum* appears to spread first on the foliage, often without causing visible symptoms. Some conidia are formed on green leaves and petioles, and more are produced as the tissue ages and dies. Molecular analysis of *C. acutatum* revealed that the population on strawberry reproduces asexually and has limited diversity. Conidia (asexual spores) are moved from the foliage to flowers and fruit by splashing water and harvesting operations. There, they germinate and infect. As anthracnose lesions develop, abundant spores are formed which may be moved to other plants and new

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fields on equipment and harvesters. Warm wet weather favors infection and disease spread. When conditions are favorable, anthracnose fruit rot is the most important disease of strawberry in Florida. Crop losses occur mostly in the field, since forced air pre-cooling and refrigeration suppress disease development after harvest.

Control

Anthracnose fruit rot is best controlled by exclusion, i.e., by not introducing the pathogen into the field. Wherever possible, transplants should be obtained from pathogen-free nurseries. In addition, moving personnel and equipment from diseased fields into healthy fields should be avoided without proper cleaning and disinfection. Planting resistant cultivars such as Sweet Charlie and the newly released Florida Radiance and Florida Elyana has consistently controlled anthracnose, possibly because *C. acutatum* lacks the genetic diversity to overcome this resistance. When moderately susceptible cultivars (e.g., Strawberry Festival) or highly susceptible cultivars (e.g., Camarosa and Treasure) are grown, regular applications of fungicides are often needed to suppress the disease.

In central Florida, management of anthracnose is based on the use of weekly applications of the broad-spectrum protectant fungicide captan. Because weather conditions are less favorable early in the season, those applications can be made at lower label rates. Often, a few anthracnose-infected flowers and fruit in late January or early February lead to epidemics during warm, rainy weather in February and March. During the critical January to March period, protectant fungicides should be applied at higher label rates and additional fungicides may be needed for anthracnose control. Additional fungicides can be applied when the disease appears, or proactively throughout the critical period. If the decision made is to wait, fields should be scouted regularly to detect anthracnose early. Plants should be examined for blighted flowers (Figure 4) or black spots on small green fruit (Figure 5) approximately one week after rain events. When the disease is found, a strobilurin fungicide such as Abound or Cabrio should be tank mixed with the standard protectant. Switch is a good alternative to the

strobilurins when double cropping is not planned. Captevate, Pristine, and Switch are particularly useful during the main bloom period in late January and early February since these products contain two active ingredients that either suppress anthracnose and/or protect flowers from *Botrytis cinerea*. One active ingredient of Captevate is captan. Tank mixes or higher rates of protectant fungicides should be continued until the end of the season, or until dry weather completely suppresses the disease. Fungicides such as Abound, Cabrio, and Pristine should not be applied more than four or five times per season and no more than two consecutive times to avoid the development of resistance. More information about these products is given in the Table 1.



Figure 1. Anthracnose lesions on a ripening fruit. Credits: UF, GCREC



Figure 2. Spore mass of *C. acutatum* on anthracnose lesion. Credits: UF, GCREC



Figure 3. Anthracnose lesions on petioles. Credits: UF, GCREC



Figure 4. Anthracnose lesions on flowers. Credits: UF, GCREC

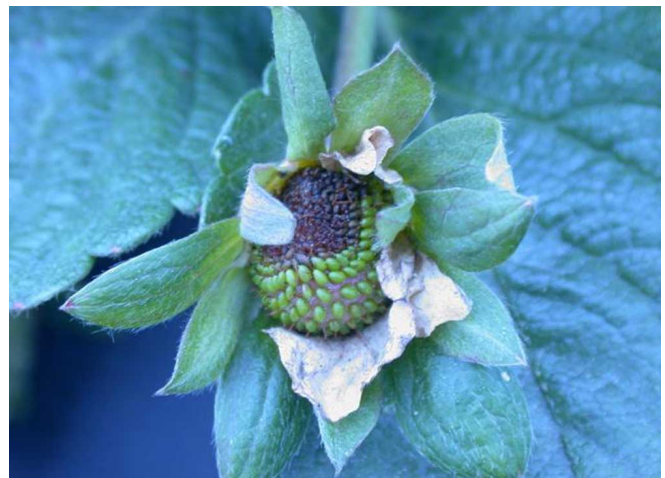


Figure 5. Anthracnose lesion on young fruit. Credits: UF, GCREC

Table 1. Fungicides registered for control of anthracnose fruit rot of strawberries in Florida*.

| Product name (active ingredient) | Fungicide Group ^a | Maximum rate per acre per Application Season | | Min. days to Harvest | Remarks |
|--|---------------------------------|---|------------|----------------------------|---|
| | | | | | |
| Abound (azoxystrobin) | 11 | 15.4 fl. oz. | 1.92 qt. | 0 | Do not make more than 2 consecutive applications and no more than 4 applications/crop/year. |
| Bumper 41.8 EC (propiconazole) | 3 | 4 fl. oz. | 16 fl. oz. | 0 | Do not make more than 2 consecutive applications. |
| Cabrio EG (pyraclostrobin) | 11 | 14 fl. oz. | 70 fl. oz. | 0 | Do not make more than 2 consecutive applications and no more than 5 applications/crop/year. |
| Captan 80 WDG (captan) | M4 | 3.75 lb. | 30 lb. | 1 | Rate per treated acre. Special label for FL allows up to 24 applications/season. |
| Captec 4L (captan) | M4 | 3 qt. | 24 qt. | 1 | Rate per treated acre. Special label for FL allows up to 24 applications/season. |
| Captevate 68 WDG (captan + fenhexamid) | M4 + 17 | 5.25 lb. | 21 lb. | 0 | Do not make more than 2 consecutive applications. |
| Orbit (propiconazole) | 3 | 4 fl. oz. | 16 fl. oz. | 0 | Do not make more than 2 consecutive applications. |
| Pristine (pyraclostrobin + boscalid) | 11 + 7 | 23 oz. | 115 oz. | 0 | Do not make more than 2 consecutive applications and no more than 5 applications/crop/year. |
| Switch 62.5 WG (cyprodinil + fludioxonil) | 9 + 12 | 14 oz. | 56 oz. | 0 | Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last application. |
| Tilt (propiconazole) | 3 | 4 fl. oz. | 16 fl. oz. | 0 | Do not make more than 2 consecutive applications. |

^a Fungicide group (FRAC Code): Numbers (1-37) and letters (M) are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered for fungicide resistance management decisions. M = Multi-site inhibitors, fungicide resistance risk is low; NC = not classified. Source: <http://www.frac.info/>
(FRAC = Fungicide Resistance Action Committee).

*Recommendations given in this fact sheet are based on experimentation and statements from the manufacturer. Consult the product label for specific use requirements and restrictions.