

Anthracnose fruit rot: Epidemic looming?

- Jim Mertely

The weather sure is unusual this year, so goes the old refrain. The unusually wet weather early this season has undoubtedly contributed to the spread of anthracnose fruit rot in our strawberry fields. Normally, growers have few problems with this disease until February or March, but this year, samples of infected fruit have been seen in the Strawberry Diagnostic Lab (and in our own field) since late December. While cool weather in January should slow down the disease, a serious epidemic could develop this spring if mild weather is accompanied by showers.



Black spots are produced on green fruit, and sunken brown lesions develop on ripening fruit.

Anthracnose fruit rot (or black spot) is caused by the fungus *Colletotrichum acutatum*. This fungus infects most plant tissues and all stages of the fruit. Flowers infected upon opening produce small black fruit. Black spots are produced on green fruit, and sunken brown lesions develop on ripening fruit. Where does the fungus come from? Assuming the previous strawberry crop was properly destroyed and incorporated into the soil, *C. acutatum* does not normally persist in the field over our hot wet summers. In addition, disease inoculum is not thought to come from weeds or other crops outside the strawberry field. Wild strawberry, a potential host, is not native to our state. Therefore, infected runner plants probably account for the first disease outbreaks here in Florida. This hypothesis is supported by the detection of *C. acutatum* on Canadian runner plants by our laboratory, and several reports of *C. acutatum* on nursery plants from California.

The control of anthracnose fruit rot ultimately depends on the production of healthy runner plants in the nursery. But for the moment, the fight must be carried on in the field. *C. acutatum* produces enormous numbers of spores

on diseased fruit. This inoculum is spread by splashing water, wind-driven rain, and people or equipment in the fields. If possible, harvest healthy fields first, and avoid picking berries when the plants are wet. Captan is the foundation of an effective anthracnose control program, and should be applied regularly when susceptible varieties such as Aromas, Camarosa, Festival, and Treasure are grown. Applications should begin immediately after plants have been "watered in", and continue at weekly intervals throughout the season. Reduced rates can be used initially, but full rates should be applied later in the season when inoculum build-up and mild weather facilitate the development of epidemics. If the disease is detected and conditions favor its spread, Quadris or Cabrio can be mixed with Captan to enhance control. Both products belong to the strobilurin class of fungicides. To avoid the development of resistance, avoid more than five applications of strobilurins per season, as well as more than two successive applications of either product. Switch is a possible alternative to the strobilurins, but growers should be aware of its plant-back restrictions. If strawberries are to be followed by a second crop, Switch should not be used.



Evidence of anthracnose flower blight.

C. acutatum attacks the plant as well as the fruit, and is often responsible for establishment problems after planting. When the fungus is present on the old roots of runner plants, it causes a root rot of new roots emerging from the crown. This phase of the disease is called root necrosis and was first discovered in Israel. Many infected plants survive, but are slow to establish, and produce a poor first crop. However, such plants often recover over the winter, and may produce a sizeable spring crop if the weather is dry. Unfortunately, such fields are at high risk for epidemics of anthracnose fruit rot during rainy periods.

Spotlight on Diagnosis - Teresa Seijo and Jim Mertely

Over 60 samples have been submitted to the Strawberry Diagnostic Lab in December and January. *Colletotrichum acutatum* (the cause of anthracnose fruit rot and Colletotrichum slow decline) continues to plague us, infecting a third of the samples. In early December the majority of *C. acutatum* infected plants showed vegetative symptoms (i.e., slow establishment, poor growth, stunting), but since late December, anthracnose fruit rot and blossom blight have predominated. Nearly a quarter of the samples consisted of plants collapsing from crown rot. Another anthracnose fungus (*Colletotrichum gloeosporioides*) was isolated from the majority of these plants; however *Colletotrichum fragariae* and *Phytophthora spp.* were recovered from a few specimens.

Leather rot is caused by Phytophthora cactorum, which eventually engulfs the entire fruit.



Two cases of leather rot on fruit (*Phytophthora cactorum*) were received in January. This disease had not been seen in the UF Strawberry Diagnostic Lab in recent years. Symptoms of leather rot usually begin with a brown lesion, which eventually engulfs the entire fruit, giving it a shrunken, leathery appearance. Sometimes white fungal growth is visible on the lesion. On ripe fruit, young lesions are occasionally dark purple, making diseased fruit more difficult to spot. Infection can occur on fruit at all stages of development. Fruit with leather rot have an unpleasant odor and taste.



Examples of disease caused by phytoplasmas.

Several growers have brought in plants or fruit infected with phytoplasmas. Phytoplasmas are an unusual class of bacteria, which cause aster yellows, green petal, multiplier, and other strawberry diseases. Some phytoplasmas may be transmitted locally by leafhoppers, but others are brought in on infected runner plants. The symptoms we are currently observing include stunted

plants with small, distorted new leaves yellowing at the edges (marginal chlorosis), and reddening at the margin of older leaves. Berry samples showed leafy growths coming out of the seeds (phyllody) and occasionally, elongation or malformation. Phytoplasma infection is tentatively diagnosed by symptoms, and elimination of other possible causes such as cyclamen mites and nematodes. Confirmation currently requires that samples be sent out for expensive tests. However, phyllody and green petal symptoms (see photos) are good diagnostic indicators of phytoplasma infection.

Supplemental calcium as a means to increase shelf life of strawberry - Camille Esmel and John R. Duval

Post harvest integrity of strawberry is a major concern to growers because it affects how far and how long a berry can be shipped and stored. It has been suggested that calcium plays a major role in post harvest shelf life. Many growers currently apply supplemental calcium to their strawberry crop. However, studies to test the effectiveness of calcium to improve post harvest quality of berries have been inconclusive. 'Sweet Charlie' tends to produce soft fruit, which can bruise easily and has a short shelf life; therefore it makes an ideal test cultivar for study. Two different methods to apply supplemental calcium are being studied at GCREC-Dover. They are a pre-plant soil amendment of calcium sulfate as gypsum and foliar applications of calcium sulfate or calcium chloride. The rates of the pre-plant soil applied gypsum are 0 lbs/A, 200 lbs/A, and 400lb/A of calcium. The rates for foliar applied calcium are a water spray-control, 400 ppm calcium sulfate, 400 ppm calcium chloride, and 800 ppm calcium chloride. The treatments are being assessed for differences in calcium concentration within the leaves, fruit and calyx, yield, shelf life, and fruit firmness. This study could potentially lead to non-destructive firmness measurements and a recommendation on supplemental calcium applications to increase post harvest quality of strawberry.

Early planting important for early yield this season - Craig Chandler and John Duval

A planting date trial at GCREC-Dover has demonstrated the importance of planting early. 'Sweet Charlie', 'Earlibrite', 'Strawberry Festival', and 'Carmine' produced their highest Nov./Dec. yield when planted on Oct. 2nd (Table 1). Significantly lower Nov./Dec. yields were generally obtained when these cultivars were planted on Oct. 9th, 17th, or 25th. 'Earlibrite', 'Strawberry Festival', and 'Carmine' had greater than a 25% reduction in Nov./Dec. yield when planted on the 9th, compared to the 2nd. In a similar trial conducted during the 2001-02 season, a reduction in Nov./Dec. yield did not occur between plants sets on the 2nd and 9th, but reductions of 15 to 50% did occur between plants set on the 9th and 17th. Weather

undoubtedly interacts with planting date to affect a cultivar's performance. Nov./Dec. 2001 was warmer than average, while Nov./Dec. 2002 was cooler than average. The large planting date effect in this season's trial is likely due to the fact that earlier set plants had a longer time to grow vegetatively (i.e. "make a bush") before the weather cooled down in Nov.

Based on this season's and last season's trial, 'Earlibrite' appears to be the new UF/IFAS cultivar least affected by planting date. It has generally had higher Nov./Dec. yields of marketable fruit than the other cultivars, regardless of planting date, but has also produced the highest percentage of cull fruit. 'Carmine's marketable yields were similar to those of 'Earlibrite' for plants set on Oct. 2nd and 9th (both this season and last), and it generally produced significantly fewer cull fruit than 'Earlibrite.

'Strawberry Festival' had lower Nov./Dec. yields than the other UF/IFAS cultivars, especially when planted on Oct. 17th and Oct. 25th (Table 1). On the positive side, it produced very uniform fruit, with few culls early in the season.

Nov./Dec. production has amounted to only 10% of the total crop yield in Florida over the last 10 seasons (1991-2001; Florida Agricultural Statistics, www.nass.usda.gov/fl), but that production is valuable. It returned the highest average value per flat, \$16.25, compared to \$12.86, \$10.13, and \$7.00 for January, February, and March respectively. Increasing the supply of Nov./Dec. strawberries by growing higher yielding cultivars (or planting earlier) may force prices lower, but it seems to us that this product (fresh strawberries available during the major holiday season) should be amenable to marketing campaigns aimed at increasing its demand. Fresh strawberries help make holiday parties and meals more colorful and festive.

Nov./Dec. production is also important because it generally occurs before damaging freezes or pests and diseases have had a chance to significantly affect fruit quality.

In conclusion, an on-going field trial at GCREC-Dover has shown the importance of planting early to obtain high Nov./Dec. yield – at least during a cool El Nino season. The January, February, and March yields of cultivars in this trial will be reported in a later issue of the Berry Times.

Table 1. Effect of planting date on Nov./Dec. fruit yield of strawberry cultivars planted at Dover, Florida in October 2002.

	Marketable fruit yield (pounds per acre)			
	Planting Date			
	Oct. 2	Oct. 9	Oct. 17	Oct. 25
Sweet Charlie ^z	3473	3149	1716	1855
Earlibrite	4107	2915	2755	2414
S. Festival	3131	2317	815	254
Carmine	3906	2812	1663	1224

^z Plants of each cultivar were dug (with leaves on) from a high elevation nursery in northern California. The plants were shipped to GCREC-Dover via overnight courier, and planted immediately.

Whitefly in California Strawberry - Jim Price

Some of California's strawberry production is affected by a relatively new pest of strawberry, the greenhouse whitefly (*Trialeurodes vaporariorum*). This insect is not new to California, and it has been a part of Florida's fauna for many decades. The problem in California became intense about 3 years ago and is not restricted to strawberry. Beans and many other annual crops are attacked too. As a matter-of-fact, control concerns there are shifting from the silverleaf whitefly (*Bemisia argentifolii*) to the greenhouse whitefly.



Greenhouse whitefly pupa (right), empty pupal case (left), and black pupa parasitized by *Encarsia formosa* (center). Photo by Jack Kelly Clark. Printed with permission from Regents, University of California.

There are no reports of the greenhouse whitefly infesting strawberry in Florida, but there is a small but increased presence of silverleaf whitefly and banded wing whitefly (*Trialeurodes abutiloneus*). It is not known if one or both of these two Florida residents will become problematic on our strawberry. Certainly, the silverleaf whitefly has caused more than its share of problems in Florida's tomato, melon, squash and other horticultural industries.

Also unknown is whether the California problem with the greenhouse whitefly on vegetables and strawberry will manifest in Florida. Mechanisms for such a scenario could be that our resident strain would adapt to our horticulture or that the California strain would be transported and established here. Changes in our horticultural practices (crops, crop rotations, crop growing periods, pesticides used and their use patterns, etc.) can drive formerly innocuous resident insects into pest status. More simply, the California strain could hitchhike on leafy, host vegetables or ornamentals and find a suitable home here. Neither scenario is a certainty.

Florida horticultural interests should insist that only clean produce enter Florida, remain vigilant to detect a new problem early, practice wise crop culture, and develop management plans to minimize any new whitefly problems.

Center Update – Christine Cooley

Most people might not know that we have a dedicated group of volunteers that come to our farm and harvest strawberries for area charities. John Gibson helps organize a group called the Gleaners from Lake Magdalene United Methodist Church. This biblical term refers to groups of people in the Old Testament that would gather by hand any usable parts of a crop that remain after a harvest. At GCREC-Dover, John brings a group of volunteers to pick strawberries and then delivers them to organizations such as The Spring, First Baptist Church of College Hill, Angels Unaware, Hope Children's Home and many other charitable organizations and individuals. We wanted to acknowledge John and his group for all their hard work year after year, and thank them for allowing us to be part of such an important cause.



*The Gleaners (left to right):
Otto Wiesneth, John Perry, Rob
Smucker, John Gibson, and
Roger Dierkes.*

GCREC-Dover is pleased to welcome Alicia Whidden as the new Hillsborough County Extension Agent. Alicia is a former GCREC employee who worked with our soil science and plant pathology programs. A long-time resident of Polk County, Alicia is knowledgeable in the many aspects of the strawberry industry and is well known by many of the local growers. Her experience and expertise will be a major benefit to the extension program. You can contact her at the Hillsborough County Extension Office (813) 744-5519, Ext. 134.

Committees are continuing to meet regarding our relocation to Balm, which is now slated for September 2005. Several architects in the Tampa Bay area have already expressed interest in working on the project and proposals should be arriving in the near future. Our excitement continues to grow as plans and ideas come together for this state-of-the-art research center.

Don't forget to attend our **Strawberry Field Day on Thursday, February 13 at 2 pm. The faculty and staff will be presenting information regarding the field trials for the 2002-2003 growing season and will be available to answer your questions. Presentations in the field will include disease research, arthropod trials, effects of planting dates on new cultivars, transplant establishment trials, nitrogen and calcium studies, and nematode research. This will be the last scheduled Strawberry Field Day at the Dover center, and we will be marking the event by celebrating 40 years of research at this location. For information call (813) 744-6630 Ext. 60 or visit our website <http://strawberry.ifas.ufl.edu>.**

See you there.