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Resistance of UF strawberry cultivars to Botrytis and anthracnose fruit rot

Craig Chandler and Jim Mertely

Two field trials were conducted last season to evaluate the new UF/IFAS strawberry cultivars 'Earlibrite', 'Strawberry Festival', and 'Carmine' (FL 95-256) for resistance to Botrytis fruit rot (gray mold), caused by *Botrytis cinerea*, and anthracnose fruit rot (black spot), caused by *Colletotrichum acutatum*. 'Sweet Charlie' was included in these trials as a standard (we know from past experience that 'Sweet Charlie' is very susceptible to Botrytis fruit rot, and resistant to anthracnose fruit rot). Fungicide spray programs were adjusted to allow Botrytis fruit rot to develop in one trial and anthracnose fruit rot in the other. Fruit were harvested and evaluated over a four-week interval (Botrytis trial) or a five-week interval (anthracnose trial), beginning on February 19, 2002.

'Strawberry Festival' plant

'Strawberry Festival' and 'Carmine' were less susceptible to Botrytis fruit rot than 'Sweet Charlie', while 'Earlibrite' was comparable to 'Sweet Charlie' in susceptibility to this disease (Table 1). With respect to anthracnose fruit rot, 'Strawberry Festival' was very susceptible while 'Earlibrite' and 'Carmine' appear to be moderately resistant (Table 1). Additional field trials will be conducted during the 2002-03 season to confirm these results.

Table 1. Percentage of strawberry fruit harvested from 19 February to 15 March that expressed symptoms of Botrytis or anthracnose fruit rot.

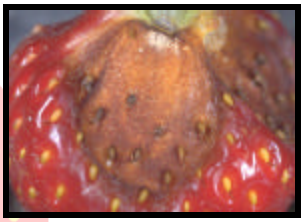
Cultivar	Botrytis fruit rot incidence (%)	Anthracnose fruit rot incidence (%)
Sweet Charlie	18.7 b[z]	2.4 a
Earlibrite	17.0 b	13.6 b
S. Festival	9.1 a	28.9 c
Carmine	7.2 a	9.6 b

[z] Percentages within columns followed by different letters are significantly different.

Pre-plant treatments for control of *Colletotrichum acutatum* and enhancement of strawberry transplant growth

Kirk D. Larson and Douglas V. Shaw, UC Davis Pomology Department

In the 2002 production season, significant losses and production delays occurred in fruit production fields due to use of planting stock infected with *Colletotrichum acutatum*. However, because the pathogen may be present at low levels and infected plants are often asymptomatic in the nursery, identifying infected planting stock is difficult.



Colletotrichum acutatum root and fruit rot

We conducted a field study to determine the effectiveness of pre-plant wash/dip treatments in suppressing *C. acutatum* and enhancing vegetative growth of bare-root 'Camarosa' transplants from commercial California high-elevation nurseries in mid-October, 2001. High-elevation plants were field-run commercial transplants destined for use as planting stock in fruit production fields this past fall. Plants were trimmed to California commercial standards (i.e. the leaves were removed), cooled and transported to Irvine, treated and planted in replicate plots of 12 plants each on October 23. The four treatments were: 1) non-treated control; 2) wash in water to remove all soil; 3) water wash followed by a 15-minute immersion in Quadris® (14.2 fl oz/100 gals water); 4) water wash followed by a 15-minute immersion in Switch® (11.0 fl oz/100 gals water). After planting, flowers of all plants were continuously removed to encourage vegetative growth and prevent confounding effects of fruit load between treatments. At periodic intervals, vegetative growth was assessed for all plants by measuring canopy diameters. Overall, plants treated with Wash+Quadris® had greater growth than Control plants; plants subjected to Wash alone also had improved growth compared to Control plants (Table 2). Switch® was ineffective in promoting growth at the rate used, and

actually may have been phytotoxic. However, recent dip trials using Switch at lower rates appear effective for control of *C. acutatum* in strawberry.

C. acutatum was not detected in 'Camarosa' plants prior to planting. Presumably, growth responses due to use of Wash or Wash+Quadris® treatment resulted from suppression of *C. acutatum*, which may have been present at undetectable, but harmful, levels in much of the experimental plant material. Treatments also may have controlled other harmful pathogens, or growth responses may have been due to beneficial root hydration. Additional pre-plant dip studies are needed.

Table 2. Vegetative growth of high elevation Camarosa transplants treated with four different wash/dip treatments

Treatment	Plant diameter. (cm)
Water wash + Quadris® [y]	19.56 a
Water wash	16.98 b
Control (no wash)	14.30 c
Water wash + Switch® [z]	14.25 c

[y] 15 min dip in Quardis® @ 14.2 oz/100 gal
[z] 15 min dip in Switch® @ 11 oz/100 gal

Note: Switch® and Quadris® are NOT currently labeled for use as a pre-plant dip in strawberry. Also, while washing transplants may reduce incidence of certain pathogens and enhance transplant growth, this same treatment may spread *Xanthomonas fragariae* (angular leaf spot) and other harmful pathogens.
LABEL INFORMATION:
http://strawberry.ifas.ufl.edu/chemicalinfo/quardis.pdf
http://strawberry.ifas.ufl.edu/chemicalinfo/switch.pdf

Update on use of Quadris® as a pre-plant dip for the control of plant establishment problems caused by *Colletotrichum acutatum*

Dan Legard

We have heard that anthracnose has been observed in some nurseries this season. Hopefully this will not result in major problems like last season when many growers in Florida and California had plant establishment / root rot problems caused by *Colletotrichum acutatum* in early season transplants. In Florida, these problems were most common on plants set before October 15th. This was probably due to the greater stress and slower establishment that transplants experience when they are set before mid- October due to the warmer weather and the lack of chilling in the nursery. Therefore, we recommend that growers consider not planting cultivars that are susceptible to anthracnose root rot, such as 'Camarosa', before October 15.

The FSGA, FFVA and Syngenta are currently working to get a label for pre-plant dipping of strawberry plants in Quadris®. Currently, Syngenta has requested a supplemental Federal label for Quadris® that will include pre-plant dip applications. Unfortunately, it looks like it will be late October or early November before Federal approval is obtained. Syngenta considers pre-plant dipping the best way to use Quadris® for the control of root rot caused by *C. acutatum* and is not pursing a label for application through drip tape. It is unlikely that drip applications are effective due the large volumes of water used and the difficulty of getting material into the root zone. There are also concerns about the development of resistance to Quadris® in the pathogen when it is applied through drip lines.

Plants stunted by *Colletotrichum acutatum*

This is a draft of the **proposed** supplemental Quadris dip label:

Products: QUADRIS™ Fungicide
EPA Reg. No. 10182-415

Use: For suppression of root and crown rot caused by *Colletotrichum* spp. in strawberry plants intended for commercial strawberry fruit production.

Directions for Use

It is violation of federal law to use this product in a manner inconsistent with its labeling.

Apply as a pre-plant dip to strawberry roots and crowns at the rate of 5 to 8 fluid ounces per 100 gallons of water. Completely immerse planting stock in solution. DO NOT reuse water solution. It is recommended that transplants be washed to remove excess soil prior to dipping. Dip or expose plants for a minimum of 2 to 5 minutes. Dispose of dip solution according to local restrictions.

Plant treated plants as quickly as possible. For continued anthracnose control, follow with foliar applications of Quadris or other labeled fungicide beginning 2-3 weeks after transplant.

Do not use in strawberry nurseries, or on plants intended for use in strawberry plant propagation, lathe houses, greenhouses, or other nursery setting.

Do not mix Quadris with other pesticides in dip solution.

Quadris® is not currently labeled for use as a pre-plant dip application.

Spotlight on Diagnosis: The proper procedure for collecting plant samples for examination by the GCREC-Dover disease diagnostic lab

Jim Mertely and Dan Legard

Within the next several weeks, strawberry plants will be in the field, and we hope the establishment process goes well. If something goes wrong, and the transplants grow poorly or begin to die, the UF Strawberry Disease Clinic is available to help diagnose the problem. It is important to collect a good sample to help us provide an accurate diagnosis . A good sample typically consists of 5 to 10 plants which are still green, but representative of the problem in the field. Dead plants are already colonized by decay organisms, which outgrow the disease organisms and so they do not make useful samples. Be sure to dig, rather than pull up the plants. Root-rotting fungi such as *Colletotrichum acutatum*, *Clyindrocladium*, *Phytophthora* , *Pythium*, and *Rhizoctonia* can be responsible for many establishment problems. The more complete the root system is, the better the chances of finding out which of these fungi are involved, and what might be done to help the crop. Shake off excess soil from the roots and place the plants in a plastic bag, then place the sample in a cooler (if available). Do not add excess water to the bags, or expose the plants to excessive heat or sun.

Typical samples include 5 to 10 plants

Bring the sample to GCREC-Dover as soon as possible. We prefer that samples arrive between 9 and 12 in the morning. Be prepared to fill out a form that asks about the strawberry variety, planting date, agrochemicals used, etc. Your personal observations concerning pattern of disease in the field and what you think might be wrong are also very helpful. For this reason, the grower or someone familiar with the problem should bring in the sample. After we receive the sample, be prepared to wait 4-6 days for a diagnosis. This allows us time to isolate and identify the disease organisms. Usually we will respond by phone, though it may be necessary to return to the lab to pick up a fact sheet describing the disease and how to control it.

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Implement spider mite management plan now

James F. Price

The first arthropod pest we experience each season is the twospotted spider mite and plans for managing it must be made before the season begins. The steps in developing a management plan include ordering high-quality transplants as free of spider mites as possible, assessing the pest status of the plants as they arrive, and scouting and deciding the scheme of remediation when spider mites become problematic. The last two steps are important this time of the season and will be discussed below.

Examine mite infestation with 5X lens.

As plant shipments arrive, boxes of transplants should be selected for inspection that represent each production site, as far as that can be determined, and variety within that shipment. The lower surface of all the leaves of one transplant per bundle within a selected box should be examined with a 5X hand lens. Records should be made of the number of transplants on which spider mites or their eggs are found. The number of boxes examined determines, to a large extent, the reliability of the estimate of spider mite infestation. If more than 1% of the transplants carry spider mites, then growers can expect a quick emergence of spider mite problems after the transplants are established.

There are two schemes for spider mite remediation available in the fruiting field, biological control with predatory mites and chemical control with miticides. Contacts with reliable producers of predators must be made early if the biological control option is exercised and predators should be released at one per transplant as soon as 5%-8% of sampled leaflets possess a spider mite or egg, but not before the strawberry plants have four fully expanded new leaves. If mites exceed the treatment levels before the plants have grown sufficiently, then one of the miticides mentioned below can be applied to control mites temporarily and allow for the necessary growth.

Miticidal control has become more reliable than in the past. This is because of the availability of Savey® and Acramite® in addition to Agri-Mek® and Vendex®. Producers of Savey® advocate early use of their product once more than 2% of transplant leaflets possess one or more spider mites or eggs. Since Savey® is an ovicide/larvacide it is necessary to apply an adulticidal miticide such as Agri-Mek® or Vendex® along with it. Manufactures usually suggest that the

other miticides also be applied when mite populations are low, or when about 5% of the samples leaflets are infested. Careful planning in the use of miticides based on scouting is very important because seasonal applications are limited to one of Savey®, two of Acramite® or Vendex® and four of Agri-Mek®.

Big disasters can occur if spider mites are not detected in a timely fashion and appropriate action taken. Early planning and scouting can avoid the loss.

Intermittent sprinkler irrigation for establishment

John Duval

The application of overhead (sprinkler) irrigation is necessary to minimize desiccation and mortality of strawberry transplants due to their limited and damaged root system and high temperatures on black plastic mulched beds in Florida With the advent of computer controlled irrigation systems, it is now possible to apply sprinkler irrigation intermittently to minimize the amount of water needed for establishment. Research that was done by Drs. Albregts and Howard in the 1980's on the optimization of intermittent irrigation for establishment showed that pulsing overhead irrigation in on/off cycles for 5/15, 10/20, 5/10 and 15/15 minutes did not reduce strawberry yields as compared to continuous irrigation during the establishment period. Through the use of computerized control systems, water usage for establishment of strawberry can be cut by up to 75%. Humidity and wind speed need to be taken into account when determining on/off cycle durations. For example under high wind conditions, a 5/10 minute on/off cycle should be used instead of a 10/20. While the amount of water used is the same, the length of time when plants can become dry and bed temperature increases are reduced. The use of intermittent overhead irrigation during establishment not only saves water but can reduce pumping costs, keep water use below permitted amounts, and reduce leaching of fertilizer in the bed.

Drip irrigation school

John R. Duval

Do you want to make the most efficient use of your water, fertilizer, and chemical resources? Then come to the **Drip Irrigation School taking place on November 13 from 10 AM to 4 PM at the GCREC-Dover** and find out how. Topics to be covered include injection of fertilizers and chemicals, irrigation scheduling, drip system trouble shooting, soil water monitoring, and irrigation BMPs. Lunch will be provided and CEU and CCA credits will be available. If you are interested in attending please call Christine Manley at 813-744-6630 ext 60 or e-mail her at cmanley@ufl.edu.

Special Thanks

We would like to express our appreciation to 3 Star Farm, Strawberry Ranch, and Sydney Farm for providing the equipment and labor to fumigate and bed our field for the upcoming season; to Hendrix and Dail, Inc. for supplying the fumigant; to ProSource One and Pliant Corp. for supplying the plastic mulch; to James Irrigation, Inc. for supplying the drip tape; and to Gro-Mor Company for supplying the pre-plant fertilizer. Through the combined efforts of the local industry and growers, we are able to continue our research and provide the strawberry industry with up-to-date recommendations to improve the productivity of the industry.