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**Calendar of Events**

Dec. 14 Pesticide License Testing, Hills. Co. Extension Office. (813) 744-5519.

Jan. 11/05 Pesticide License Testing, Hills. Co. Extension Office. (813) 744-5519

A monthly newsletter of the University of Florida IFAS, Gulf Coast Research and Education Center, and Florida Cooperative Extension Service.
 Hillsborough County Cooperative Ext. Service
 5339 CR 579, Seffner, FL 33584
 (813) 744-5519 SC 541-5772
 Alicia Whidden, Editor Mary Chernesky, Director

Gulf Coast Research and Education Center
 13138 Lewis Gallagher Road, Dover, FL 33527
 (813) 744-6630 SC 512-1160
 Christine Cooley, Layout and Design
 Jack Rechcigl, Director

From Your Extension Agent...

Blueberry Cold Protection

Now that a couple of cold fronts have come through and we see the cold weather the rest of the country is having, we are starting to think about cold protection. An excellent publication entitled "Protecting Blueberries from Freezes in Florida" by Drs. Paul Lyrene and Jeff Williamson came out this year on EDIS. I will give a brief overview here, but be sure to read the paper to learn all the helpful information that it contains. The paper can be found at <http://edis.ifas.ufl.edu/HS216>, or get in touch with me for a copy.

Blueberries enter a dormant condition in the winter where there is no growth and this aids in surviving cold weather. If the blueberry plant is fully dormant it is very cold hardy, and in Florida air temperatures usually do not get low enough to cause plant damage. Also, blueberry plants need a certain amount of chilling to break dormancy and grow and flower well the next spring. Each variety has its own characteristic chilling requirement, and this is the main reason why some varieties do better in central Florida than others. Plants in our area of the state frequently do not lose all their leaves and this can affect the amount of chill time they accumulate. Plants that retain at least some of their leaves will not have their chill requirement satisfied as quickly as plants that lose all their leaves.

Since the industry in west central Florida is based on varieties

that produce early fruit, freezes in February and March are of great concern. Fruit and open flowers will freeze at higher temperatures than flowers that have not opened, and dormant buds are even more cold hardy.

Factors to pay attention to are temperature, wind speed, and dew point. The predicted low temperature plays a part in deciding whether to cold protect and the method of protection. Wind speed can influence the effectiveness of the sprinkler irrigation method of freeze protection. And dew point (an indicator of the amount of water vapor in the air) affects how quickly air temperature drops. Moist air retains more heat than dry air. Also, when the dew point is low, the rate of evaporative cooling is high, which is of concern when sprinkler irrigation is used for freeze protection.

Site selection can influence temperatures in the field. For example, hillsides can be warmer than bottomland when nights are still. Also, making sure soil is moist, compacted, and free of weeds prior to a freeze can help maximize moisture in the air, and thereby maximize air temperature.

If you use overhead irrigation for freeze protection you must be able to pump large volumes of water to get good protection. Remember that when the air is dry it will take even higher volumes of water to give protection to the plants. On calm nights, the sprinkler system can be turned on when the temperature in the coldest part of the

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field is 32°. If there is a low dew point (i.e., the air is very dry), the system should be turned on when the temperature is 34°. Turn the system off when icicles are falling from the plants, or the wet bulb temperature has risen above 32°. If wind speeds are high, it may be difficult to achieve uniform coverage, and watering may cause more damage than it prevents. Fortunately, windy freezes are not common in west central Florida.

In most situations, watering the field the afternoon before a freeze can reduce damage. For pot culture, water the pots and the ground around the pots – if possible.

Just remember: there are more factors to consider in a freeze event than just the expected minimum temperature. Watering for cold protection is not always the best choice. If you do use the sprinkler irrigation method, make sure the system 1) applies water uniformly over your planting, and 2) puts out the volume of water needed for adequate freeze protection.

A happy and joyous holiday season to everyone!

Alicia Whidden

(813) 744-5519 Ext. 134

AJWhidden@ifas.ufl.edu

Strawberry Freeze Protection

Craig Chandler

While strawberry crown tissue isn't usually injured until it reaches a temperature of about 20 °F, damage to flowers and fruit can start to occur when tissue temperature reaches 30 °F. Sprinkler irrigation is the standard method for protecting strawberry flowers and fruit from freeze damage. This method of protection is convenient and can be highly effective, although it can also damage fruit (water

soaking and cracking), spread disease inoculum, and result in the loss of bed integrity.

Most of the freeze events in Hillsborough and Manatee County (where the main strawberry production area is located) are radiation freezes (little or no wind), with air temperature typically bottoming out in the low 30s or high 20s. In this type of freeze, growers will generally wait to turn on their sprinkler irrigation system until the air temperature just above the plastic mulch, in an area open to the sky, is 31 °F. Standard practice for a system where sprinklers are spaced 50 ft. x 50 ft. is to use 9/64-inch nozzles in the sprinkler heads and run the system so that there is 75 pounds of water pressure to the heads. Such a system should apply water uniformly and in sufficient quantity (about 0.15 inch per hour). It is important that sprinklers make at least one revolution per minute for adequate freeze protection.

When an advective (windy) freeze is expected, and temperatures are predicted to drop into the low to mid 20s, it is common practice to use 11/64-inch nozzles (to provide the additional water needed for protection) and turn the sprinkler system on when the air temperature reaches 34 °F. However, if wind speeds are 10 mph or greater, at least some flower and fruit damage is likely to occur.

Once the sprinkler system has been turned on, it should remain on until the wet bulb temperature has risen above 32 °F.

Early Season Arthropod Pests in the Strawberry Crop: Cyclamen Mites

James F. Price and Silvia I Rondon

Almost every year from Thanksgiving into early January some Hillsborough County

strawberry farmer, and sometimes many farmers, discover cyclamen mites in their crops. The problem needs to be recognized early and treated immediately to avoid detrimental effects on yield. This mite can be a very serious pest in the area. Infested plants are stunted and produce a late and reduced crop. The cyclamen mite is found frequently on ornamental crops in Florida, particularly those crops produced in greenhouses. However, widespread infestations in Florida strawberry fields occur only occasionally. In the northeastern United States, California and the Pacific Northwest cyclamen mites in strawberry crops are common. The following summarizes points concerning this pest that are important to Florida strawberry growers.



Cyclamen mites.

Symptoms of Attack on Strawberries from Hillsborough County:

When local strawberry fields are infested we find that strawberry leaves are small, chlorotic, highly wrinkled, thickened, and possess short petioles. Runners oftentimes have numerous small "thorns" rather than a smooth texture. Additional symptoms include dark brown, dry flowers, russeted berries and poorly developed root systems.

Examination of plants under a stereomicroscope reveal cyclamen mites in the crevices of leaf wrinkles, on unopened and opened flowers, on newly formed fruit and in the plant bud. Some plants contain as many as a few hundred of these mites.

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Development of the Problem on Strawberries:

Problems with the cyclamen mite on strawberries in Florida develop from setting infested plants imported from the north. In more northern climates, where strawberries are grown for late spring fruiting, cyclamen mites overwinter as adult females in the crowns of infested strawberry plants. Populations begin to develop in the early spring and reach peaks in midsummer.

Cyclamen mites move along runners from mother plants to daughter plants. New fields established from the daughter plants are rarely heavily infested unless the daughter plants had been severely infested earlier. Plants grown for a second year are much more likely to be heavily infested, and thus should not be used as planting stock.

This pest, once introduced into fields in Florida, can move along runners to infest neighboring plants or can be carried by bees, other insects, birds, field workers or machinery to infest other fields. The movement of mites along the soil or on plastic mulch is not likely since the mite requires the humid environment of plant surfaces.

Appearance and Development of the Mite: All forms are so small that they are only faintly visible without optical magnification. In the field, they can be seen with a 14X or stronger hand lens. Eggs, nymphs and adult females are the forms most frequently observed. Eggs are about half as large as adult females, oval and smooth, opaque white. Several eggs may be found bunched together. The adult female is slightly tan with its hind legs reduced to thread-like structures. Males are smaller and with hind legs modified with claspers to hold onto and transport adult females and immobile pupae. Nymphs (larvae) are opaque white with a triangular enlargement on their posteriors.

Controlling a Cyclamen

Mite Infestation: Control of an outbreak of cyclamen mites is difficult to achieve, so strategies should be directed toward preventing an outbreak through the use of plants certified to be free of the pest. To control cyclamen mites established in a fruiting crop in Florida, it is extremely important to detect the infestation early before plant growth has been affected significantly and before the numbers of mites have become too large. A regular program of crop scouting should insure the earliest detection of this pest. Thiodan[?] (endosulfan), Kelthane[?] (dicofol) and diazinon are the miticides available for cyclamen mites on strawberries, but none provides the rapid control of this pest that is desired. Thiodan[?] should be applied at 2 pounds of active ingredient in 400 gallons of preparation per acre. This material cannot be applied more than once in 35 days. There is a 4-day waiting period between application of the product and the earliest permissible harvest.

Kelthane[?] should be applied twice at 1.5-2 pounds of active ingredient in 400 gallons preparation per acre at 10 to 20-day intervals. There is a 3-day waiting period between application of Kelthane[?] and the earliest permissible harvest.

Diazinon should be applied at 1 pound of active ingredient in 100 gallons of preparation per acre and directed to the plant crown and leaves. A maximum of four applications can be made, but no application should be made within 5 days of harvest.

High volumes of spray preparations are favored for miticides to contact the mites deep in the plant bud. At least 150 psi is required to penetrate the strawberry canopy and contact mites in crevices. Application machinery and methods must be adjusted in order to achieve proper delivery of Thiodan[?] or

Kelthane[?]. All pesticide label restrictions must be observed. Special predatory mites are sold to control cyclamen mites, however the predators cannot control an infestation sufficiently under our conditions to avoid excessive losses.

Summary of Precautions Against Cyclamen Mites:

1. Plant only stock from reputable nurseries that has been and is strawberries free of cyclamen mites.
2. Inspect fields regularly for outbreaks.
3. Restrict movements of possibly contaminated personnel and machinery into noninfested sites.
4. As the cyclamen mite has few weed hosts on which to survive the non-cropped summer, the elimination of strawberry plants from the area of an infested farm is important to prevent reinfestation in the following year.
5. Kelthane[?], Thiodan[?] or diazinon should be used to control any infestations discovered.

Early Season Arthropod Pests in the Strawberry Crop: Lepidopterous Larvae, Aphids

Silvia I. Rondon and James F. Price

After strawberries are established, growers must pay attention for the next several weeks to early-season pests such as lepidopterous larvae ("worms"), aphids, cyclamen mites and spider mites. Scouting should start as soon as transplant establishment irrigation ends to determine level of pest infestations and to be in position to choose among the best control methods. This article discusses the early-season aphid and worm problems. Another article discusses cyclamen mites.

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Lepidopterous Larvae.

There are two principal species of worms that cause early losses in the Plant City production area. These are the fall armyworm (Fig. 1) and southern armyworm (Fig. 2). These worms are the immature stage of the Lepidoptera family of moths and develop through a complete metamorphosis including egg, plant eating larvae (worm), hidden and resting pupae and the night flying adult (moth) stage.



Fig. 1. Larva of the fall armyworm (Credit. J.L. Capinera, UF). Larva has two characteristic dark bands along the side of the body.



Fig. 2. Larva of the southern armyworm (Credit J.L. Capinera, UF). Larva has triangular patterns on its upper surface.



Fig. 3. Egg masses of armyworms (Credit. J.K. Clark, UC).

Eggs of both are laid in masses and covered with the

mother's body scales (Fig. 3). Larvae feed on young strawberry leaflets and buds as they develop. Dark, small fecal pellets on the tops of the leaves or on the plastic mulch indicate larval feeding.

Scouting should be performed once or twice per week during the early season to check for young leaves with holes and missing margins. When larvae are found, pesticidal interventions are usually warranted and most insecticides offer better control when they are applied at early stages of larval development. Several products are available to control these worms. SpinTor® and formulations of Bacillus thuringiensis ("B.t.") can be effective and neither of these is very hazardous to beneficial arthropods, although, of the two, B.t. is the less damaging. For instance, in moderate usage these insecticides are compatible with Phytoseiulus persimilis, the predatory mite widely used to control the twospotted spider mite. Lannate® Brigade® and Danitol® can also be effective; however, they are broad-spectrum insecticides that have a detrimental effect on many parasites and predators. None of the latter three insecticides should be applied if P. persimilis predators have been released. These predators should not be released within 3 weeks of a Lannate® application or within 6 weeks of a Brigade® or Danitol® application.

Aphids. There are two species of aphids found in Florida strawberries, the strawberry root aphid and the cotton aphid (the cotton aphid has another accepted name, the melon aphid). Aphids may be green, black, brown or some other color depending on the sap color of the host plant. These slow-moving insects with pear-shaped bodies ranged from 1 /16 to 1 /8 inch long (Fig. 4). Only a few aphids have wings (Fig. 5), but all have a pair of cornicles, siphons or "exhaust pipes", one on each side of the rear



Fig. 4. The cotton aphid (Credit. S.I. Rondon, UF). Notice the characteristic dark relatively short cornicles.



Fig. 5. The 'winged form' of cotton aphid (Credit S.I. Rondon, UF).

Aphids are sucking insects that feed by thrusting their long beaks into the strawberry plant tissue and can cause wrinkling of the leaves. They remove great quantities of sap then excrete the sugary excess as "honeydew". The honeydew makes the plant sticky and the fruits displeasing. A sooty mold often develops with the honeydew that can blacken stems, foliage and fruit. Aphid damage reduces photosynthesis when leaves are distorted. Well established strawberry plants can tolerate low to medium levels of aphids. Usually parasitic wasps, predators and diseases that contribute greatly to aphid control can be found in the field (Fig. 6).

The use of trade names in this publication is solely for the purpose of providing specific information. It is not a guarantee or warranty of the products names and does not signify that they are approved to the exclusion of others of suitable composition. Use pesticides safely. Read and follow directions on the manufacturer's label.



Fig. 6. Brown paper-like texture of a parasitized aphid (right). (Credit S.I. Rondon, UF).

Among the products registered in Florida for aphid control are: Diazinon, malathion, methomyl, naled, azadirachtin, Beauveria bassiana, bifenthrin, endosulfan, oils, and soap. Good control of early-season worms and aphids leave the crop in excellent condition for the high-value, early-season yields. This alone is sufficient to give these problems very special attention at this time of the year.

Pesticide Registrations and Actions

?? Based on a request by FMC Corporation and IR-4, tolerances are approved for the herbicide carfentrazone (Aim®). This is a triazolinone herbicide that controls many broadleaf weeds. Tolerances of importance to Florida include all tropical fruits, herbs and spices (group 19), fig, citrus, okra, peanut, persimmon, strawberry, sugarcane, bulb vegetables (group 6), fruiting vegetables (group 8), legume foliage vegetables (group 7), leafy vegetables (group 4), leaves of root and tuber vegetables (group 2) and root and tuber vegetables (group 1). (Federal Register, 9/29/04).

?? Based on a request by Bayer CropScience, tolerances are approved for fenamidone. This is an imidazolinone fungicide, which inhibits respiration in water molds as well as some ascomycetes and *Alternaria*. Tolerances of importance to Florida include cucurbits (group 9), tomato, and tuberous and corm vegetables (group 1C). (Federal Register, 8/29/04).

?? Based on a request by IR-4, tolerances are approved for the fungicide fludioxonil (Maxim®/Scholar®). This is a phenylpyrrole fungicide that is active against a number of fungi including *Fusarium*, *Rhizoctonia*, *Aspergillus*, *Alternaria*, *Sclerotinia*, and *Septoria*. Tolerances of importance to Florida include snap bean, citrus (group 10), leafy greens except spinach (group 4A), melon subgroup 9!, and yam (Federal Register, 9/29/04).

?? On September 1, the FDACS conditionally registered the fumigant Profume® (sulfuryl flouride) for control of Postharvest pests and rodents. (FDACS PREC Agenda).

?? On September 1, the FDACS issued the Special Local Needs registration SLN FL-040008 to Syngenta for the use of Bravo® Weatherstik on blueberry plants after harvest to control rust. (FDACS PREC Agenda, 10/7/04).

?? Based on a request by Dow AgroSciences and IR-4, tolerances are approved for the insecticide methoxyfenozide (Intrepid®). Tolerances of importance to Florida include black sapote, mango, papaya, pea, and succulent bean (subgroup 6A & 6B), sapodilla, star apple, strawberry, legume foliage vegetables (group 7), leafy vegetables (group 4), leaves of root and tuber

vegetables (group 2) and root and tuber vegetables (group 1). (Federal Register, 9/29/04).

?? Based on a request by ISK Biosciences Corporation, tolerances are approved for the fungicide cyazofamid. This is a cyanoimidazole, which inhibits mitochondrial transport. It is reportedly efficacious against water molds and downy mildew. Tolerances of importance to Florida include cucurbits (group 9), potato, and tomato. (Federal Register, 8/30/04).

?? Based on a request by Dow Agrosciences and IR-4, tolerances are approved for the insecticide tebufenozide (Confirm®). Tolerances of importance to Florida include citrus (group 10) and tuberous and corm vegetables except potato (subgroup 1D). (Federal Register, 9/24/04).

?? **ORGANIC**—Oro Agri Inc. is developing a new organic miticide/insecticide/fungicide that contains orange oil, borax, and surfactants. The use sites include berries, fruits and nuts, vegetables, and ornamentals. (Agricultural Chemical News, 9/15/04).

?? **OTHER ACTIONS**—The EPA has begun movement on the methyl bromide critical use exemption allocation process. The following are the amounts (in metric tons) available to Florida growers of tomato (2,347), pepper (721), strawberry (344), and eggplant (58). (FFVA Presentation of 9/1/04).

Pesticide Potpourri

?? The EPA recently released “Pesticide Industry Sales and Usages: 2000 and 2001 Market Estimates.” As of 2001, conventional pesticide use was

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nearly one billion pounds per year. Addition of chlorine and wood preservatives brought that figure to nearly 5 billion pounds. Herbicides were the number one type of pesticide based on user expenditures and volume. With 85 to 90 million pounds used in 2001, the herbicide glyphosate replaced atrazine as the most widely used pesticide in the agricultural market. (EPA Pesticide Program Update, 10/5/04).

?? An industry group (RISE) recently commissioned a poll of Americans regarding pesticide and repellent use in light of West Nile virus. The survey examined respondent's knowledge of the virus, their perceptions of the severity of the threat and the measures they have taken to prevent being bitten by mosquitoes. The survey found that 73 percent of respondents have used insect repellents containing DEET, while 25 percent have used non-DEET repellents. Seventy percent also removed standing water around their residence. Sixty-three percent made sure their family members used a repellent, and 77 percent said communities "definitely should" or "probably should" implement mosquito control measure such as fogging or spraying when the threat of the virus is present. (Pesticide & Toxic Chemical News, 8/30/04).

?? A recent comparison between U.S. Air Force veterans who sprayed herbicides in Vietnam with those who served in Vietnam but did not spray herbicides revealed little difference between cancer rates. However, the comparison did reveal that incidence of prostate cancer increased with the amount of time served in Vietnam. (Chemical Regulation Reporter, 9/13/04).

GCREC Center Update

Christine Cooley

Construction will soon be completed at the new Balm Research Center and occupancy for the Bradenton faculty and staff is slated for January 16th. The Dover faculty and staff will be relocating to the new center during the month of April 2005. The address for the center is: **Gulf Coast Research and Education Center, 14625 Balm Road, Wimauma, FL 33598.**

The Dover research center will be closed for the holidays on December 24 and will remain closed until January 3rd. However, the faculty and staff will be checking their voice mail and email messages throughout the holiday closing.



Congratulations to *Dr. Joe Noling* with the Citrus Research Center in Lake Alfred. Dr. Noling was recently presented with the Public Service Award at the Strawberry Jam held by the Florida Strawberry Growers Association. Dr. Noling has worked extensively with local strawberry growers on various nematode problems, and his hard work and dedication is truly appreciated by the industry.

A Strawberry Farmer's Christmas

Twas the night before harvest
and all through the farm
not a creature was stirring
till they hear the alarm.

A hard freeze was a'coming,
and all they could do
is get that water going,
sit up, and stew.

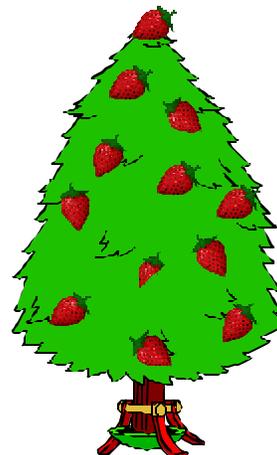
With the water's protection
the berries were fine.
The farmers were tired,
but got their pickers in line.

Soon baskets were full
and off to market they went.
To places up north is
where they were sent.

The strawberries of Florida
are a northerner's treat.
During the holiday season
they can't be beat.

So thanks to the farmers
and their hard working hands
for bringing some sweetness
to those cold barren lands.

Happy Holidays!



SPECIAL GCREC FACT SHEET**Powdery Mildew of Strawberries**

Natalia Peres and Jim Mertely

Pathogen and Symptoms. Powdery mildew, caused by *Sphaerotheca macularis*, occurs in most areas of the world where strawberries are grown. The disease affects leaves, flowers and fruit. Early foliar infections are characterized by small white patches of fungus growing on the lower leaf surface. On susceptible cultivars, dense mycelial growth and numerous chains of conidia (spores) give these patches a powdery appearance (Figure 1). Under favorable conditions, the patches expand and coalesce until the entire lower surface of the leaf is covered (Figure 2). At times, round fruiting structures (cleistothecia) are produced in the mycelia on the undersides of leaves (Figure 3). Cleistothecia are initially white but turn black as they mature. In some cultivars, relatively little mycelium is produced, making it difficult to see the white patches. Instead, irregular yellow or reddish brown spots develop on colonized areas on the lower leaf surface, and eventually break through to the upper surface (Figure 4). The edges of heavily infected leaves curl upward (Figure 4). The fungus can also infect the fruit, producing fuzzy mycelia growth on the achenes (seeds) (Figure 6). Infection of flowers and fruit may reduce fruit quality and marketable yields.

Disease Development and Spread. *Sphaerotheca macularis* is an obligate parasite that only infects living tissue of wild or cultivated strawberry. In temperate areas, the pathogen may survive by producing cleistothecia, but these structures are rarely produced in Florida. The fungus readily infects living, green

leaves in the nursery. Thus, infected transplants are normally the primary source of inoculum in fruiting fields. When conditions are favorable, conidia produced on infected plants are wind dispersed to infect new growth. Development and spread of powdery mildew is favored by moderate to high humidity and temperatures (60 to 80 F). Rain, dew and overhead irrigation inhibit the fungus. Because dry conditions and high humidity are common in greenhouses and plastic tunnels, powdery mildew is typically more severe in protected culture. In open fields in Florida, the disease is typically most severe in November and December, usually subsides in January and early February, but may reappear in late February and March.

Control. Use of transplants free of powdery mildew is a good method for controlling the disease but even disease free fields can become infected by conidia blown in from neighboring fields. Cultivars differ widely in their resistance to powdery mildew. Unfortunately, the most popular cultivars, 'Strawberry Festival' and 'Camarosa' are fairly susceptible to the disease. Fields with susceptible cultivars should be surveyed regularly for powdery mildew, especially during the early season. To control powdery mildew on susceptible cultivars, fungicides should be applied at the first sign of disease. This is especially important when using protectant fungicides such as elemental sulfur. Systemic fungicides like the benzimidazoles (Topsin M®) and the sterol inhibitors (Nova® and Procure®) can effectively control powdery mildew if the pathogen population has not become resistant to them. Strobilurin fungicides such as Abound®, Cabrio®, and Pristine® are also effective in suppressing the disease, but caution should be taken not to exceed four to five applications per season. Controlling

the foliar infections helps to prevent fruit infections.

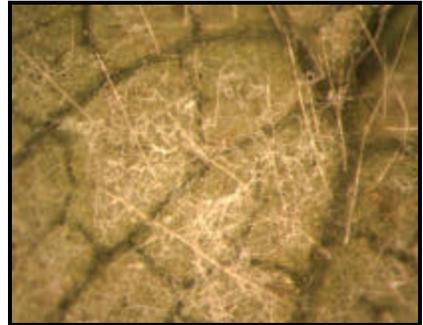


Fig. 1. Mycelia of *Sphaerotheca macularis* on leaf surface. Photo: UF, GCREC



Fig. 2. Lower leaf surface covered with powdery mildew. Photo: UF, GCREC

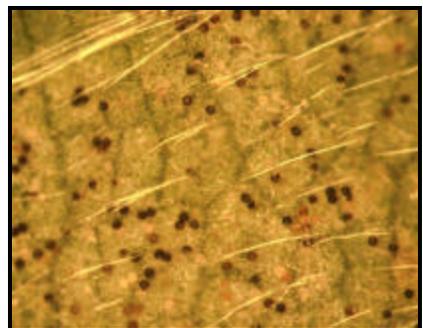


Fig. 3. Microscope picture of cleistothecia on leaf surface. Photo: UF, GCREC

Trade name	Active ingredient	Type	PHI or REI (hours)	Comments
Abound	azoxystrobin	strobilurin	4	Do not add silicone surfactants or mix with EC formulations
Cabrio	pyraclostrobin	strobilurin	24	No more than two sequential applications.
Nova	myclobutanil	sterol inhibitor	24	Do not apply more than 40 oz./A/season.
Pristine	boscalid + pyraclostrobin	carboxamide + strobilurin	24	No more than 115 oz. product per season.
Procure	triflumizole	sterol inhibitor	24	No more than 32 oz./A/season.
Topsin M	thiophanate methyl	benzimidazole	24	No more than 4 lbs. product/A/season.
Armicarb, Kaligreen	potassium bicarbonate	protectant	4	Do not mix it with highly acidic products.
Wettable sulfurs (numerous trade names)	elemental sulfur	protectant	24	Supresses mites, including predatory populations in biological control programs.



Fig. 4. Necrotic spot reaction caused by *Sphaerotheca macularis* in some cultivars. Photo: UF, GCREC



Fig. 5. Curling leaves on severely infected plants. Photo: UF, GCREC



Fig. 6. *Sphaerotheca macularis* on achenes (seeds). Photo: UF, GCREC