



Citrus canker on Valencia fruit demonstrates how serious lesions can be when inoculum is high. Some of the fruit show signs of early coloring, which may lead to premature fruit drop.

# Planning for foliar disease management in 2020

By Megan Dewdney and Evan Johnson

In 2019, the trend of fewer problems with foliar fungal diseases for Florida citrus continued, which was good news for the industry. Despite the El Niño conditions during the spring, little postbloom fruit drop (PFD) was observed because the temperatures were low (< 75 F) when it rained during bloom. The southern parts of the state had more PFD because of the slightly warmer temperatures.

From the October El Niño, La Niña, and the Southern Oscillation forecasts for the upcoming 2020 spring, it appears Florida will be in a neutral pattern with average temperatures and average to slightly below average precipitation. One foliar disease that was problematic in 2019 was citrus canker, which was favored by frequent summer rains. This means that on susceptible cultivars, inoculum is high.

## CITRUS CANKER

The bacterium *Xanthomonas citri* subsp. *citri* causes citrus canker. While canker can affect all citrus, it is usually only a season-long problem on fresh fruit, especially grapefruit and Navel oranges, because of peel quality. Canker can cause significant fruit drop if infections happen in the spring and early summer, which is a problem on Hamlins. With heavy rains last summer and widespread canker within Florida, there was more disease on the less susceptible varieties, such as Valencia, last

year. However, this is not a major concern for management of juicing fruit unless early-season infections and fruit drop are seen.

The best management practice continues to be copper sprays at ≥ 0.5 pounds per acre every 21 days or following the Citrus Copper Application Scheduler copper model (<http://agroclimate.org/tools/citrus-copper-application-scheduler>) while fruit is at risk of fruit drop-inducing cankers (through June for Hamlins) or quality downgrade (through October for

grapefruit). Blockade can also be used postbloom before favorable conditions to reduce inoculum for fruit infections, but it is not a replacement for a copper program.

Recently, there has been a surge in planting of new sweet orange and tangerine/tangelo varieties. It is important to remember that the canker susceptibility of these varieties is not well studied. As more is learned about canker's virulence on these varieties, management programs will need to be developed. If you notice a new variety with severe canker in the coming season, please contact your regional Extension agent and Evan Johnson ([egjohnson@ufl.edu](mailto:egjohnson@ufl.edu)).

## GREASY SPOT

The fungus *Mycosphaerella citri* causes greasy spot and rind blotch, affecting all Florida citrus. If greasy spot or rind blotch was common in the previous season, increased control efforts are advised. Enhanced control can be achieved by more thorough wetting of the canopy with 250 gallons per acre, a slow tractor speed and/or applying a third spray in August. If a sizable leaf drop occurs over the winter, use an enhanced greasy spot program, as more inoculum will form in the leaf litter.

The fungus is most vulnerable to fungicides in the early summer because it is growing on the surface of leaves and fruit. The fungus does not infect plant tissues until late summer, and symptoms are normally seen from

**Table 1.** Products with modes of action to aid resistance management rotations for foliar pathogens

Fungicide	Mode of Action <sup>a</sup>
Abound (azoxystrobin)*	11
Amistar Top (azoxystrobin + difenoconazole)*	11 + 3
Blockade 50WG (acibenzolar-S-methyl)	21
Copper	M01
Enable 2F (fenbuconazole)	3
Ferbam (ferbam)*	M03
Gem 500 SC (trifloxystrobin)	11
Headline SC (pyraclostrobin)*	11
Luna Sensation (trifloxystrobin + fluopyram)	11 + 7
Petroleum oil	—
Priaxor (pyraclostrobin + fluxapyroxad)*	11 + 7
Pristine (pyraclostrobin + boscalid)*	11 + 7

<sup>a</sup>Mode of action class from the Fungicide Resistance Action Committee Code List 2019

\*Fungicides recommended for postbloom fruit drop. Ferbam is best mixed with a strobilurin (mode of action 11).

November to February. Severe greasy spot outbreaks cause major defoliation on untreated trees, leading to small, marred fruit and fruit drop.

The most economical product for greasy spot control remains copper, particularly for rind blotch and groves

with canker. Be mindful that high temperatures (> 94 F) and dry conditions promote copper phytotoxicity on fruit. When combined with petroleum oils, copper can cause rind defects during the summer months. Best practices with copper include applying it on

moderately warm days without any additives, particularly petroleum oils, at 2 pounds per acre or less.

For processing oranges, where the goal is to retain leaves, petroleum oils are a good alternative or additive to copper for controlling greasy spot. Strobilurin-containing fungicides [Fungicide Resistance Action Committee (FRAC) 11; see Table 1] or the demethylation inhibitor fungicide Enable (FRAC 3) are also effective control options with or without oil if phytotoxicity is of particular concern.

These fungicides are most appropriate in late May to early June because they are also effective for melanose management. To avoid fungicide resistance in *M. citri*, do not use more than one application of a strobilurin alone or in a mixture within a season. Enable is especially effective for mid-to late-season rind blotch control, but do not follow it with Amistar Top since they share the same mode of action.

## MELANOSE

Dead twigs (< 0.25 inch) in the canopy are the greatest indicator of

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Source: Scientists, M. Edenfield and J. Curtis for Agronomic data completed from 2014 to 2019 within the Florida State

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melanose risk. The melanose-causing fungus (*Diaporthe citri*) rapidly colonizes and sporulates on small twigs formed from freeze damage and other causes of shoot dieback, including HLB. *D. citri* also infects live twigs, which produce spores upon twig death. Hedging reduces dead wood and lowers disease pressure, although some dead twigs will remain.

Historically, groves under 10 years old had less melanose since there were few dead twigs, but a freeze or HLB can cause young blocks to be affected. Fortunately, high numbers of spores only occur for a year. So if there is not a major dieback of twigs, melanose inoculum should return to lower levels.

Melanose is not usually severe without extended leaf wetness periods. Infection only needs 10 to 12 hours of leaf wetness at temperatures between 70 and 80 F. With cool temperatures, the fungus needs up to 24 hours of leaf wetness. Leaf and fruit lesions do not spread disease and are a dead end for the fungus because no spores are produced.

Copper is highly economical for melanose control because of long

residual activity, but fruit expansion and rainfall erode the protection. The copper model improves copper application timing by estimating copper residue on the fruit surface, leading to better control of melanose and other diseases. Without residue estimation, copper applications to the whole canopy are needed every 21 days from early May until fruit become resistant in early July. This is most important for grapefruit, which is the most susceptible cultivar.

Off-season fruit complicate timing, and it will be difficult to maintain rind quality on these fruit for the fresh market. Copper application in early June also serves as the first greasy spot application. Strobilurin-containing fungicides can be used if phytotoxicity is problematic but follow the same restrictions as greasy spot. Residual activity of strobilurins is shorter than copper, so more frequent applications are needed.

### CITRUS BLACK SPOT

While still concentrated in Collier and Hendry counties, citrus black spot areas expanded to Lee and Charlotte counties recently. Most citrus cultivars

and species are susceptible to black spot. The spores in Florida are formed on dead twigs, some fruit symptom types and in the leaf litter, where spores are present all year.

Like melanose, rain splash is the primary means of black spot spread. A second, wind-spread spore type is formed in the leaf litter, but it is yet to be found in Florida. Monitoring for the presence of the second spore type continues. Fruit infection occurs mainly from May to September. However, applications in April are recommended if it is a wet month.

*Phyllosticta citricarpa*, the causal agent of black spot, needs long wetting periods of at least 18 hours for infection. With the heavy dews that occur in Florida, prolonged periods are routine. Several fungicides are recommended for black spot management, including the strobilurin fungicides, Enable, copper and the pre-mixes Amistar Top and Pristine. Copper applications for canker will also control black spot. However, most late-harvest oranges, principally Valencia, need additional applications for black spot. Any



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noncopper-containing fungicides are recommended where phytotoxicity is a concern or if there was severe disease the previous season.

## POSTBLOOM FRUIT DROP

PFD has been quiet for the last three years, but some was observed last year, especially on Navels. If the climate forecasts are correct, the 2020 PFD risk should be low. However, growers should remain vigilant with Navel and Valencia, the most susceptible cultivars. Scout flowers for reddish brown discoloration, a sign of infection, particularly if persistent calyxes (buttons) from previous years are present.

Inoculum stays dormant in the canopy, and the fungus (*Colletotrichum acutatum*) is stimulated to grow and produce spores by flower exudates. Off-season or prolonged bloom periods favor PFD and make control difficult. Many blocks have multiple bloom periods because of HLB, so target applications to the bloom that is likely to provide the most fruit.

Fungicide efficacy greatly improves when well timed. A new PFD forecasting tool (<http://agroclimate.org/tools/cas>), released in January 2018, is simple to use and will improve application timing. All the recommended treatments contain a strobilurin. The straight strobilurin fungicides, tank-mixed with Ferbam, still give the best control. Strobilurins have resistance risks, but the last six years of trials have not yielded any further modes of action. Copper is generally ineffective.

## FOR MORE

Further information on the control and biology of foliar diseases is available on the Citrus Research and Education Center (CREC) website (<https://crec.ifas.ufl.edu/resources/production-guide>) as well as in the Florida Citrus Production Guide and the Electronic Data Information Source of the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) Extension (<http://edis.ifas.ufl.edu>). Assistance is also available from your county agent or statewide specialist. 🍊

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