Foliar disease management in 2021

By Megan Dewdney

There were many challenges in 2020, but fortunately the Florida season for foliar citrus diseases was relatively normal. Little to no postbloom fruit drop (PFD) was reported during the 2020 bloom because of a sudden dry spell as the flowers opened.

As spring 2021 approaches, the forecast is for a La Niña weather pattern with slightly warmer than average temperatures and lower than average precipitation. I am hopeful that 2021 will also be an uneventful year in terms of citrus foliar diseases, but here is a refresher on some that may cause trouble for growers.

CITRUS CANKER

Citrus canker can be damaging on all citrus types but generally is only a season-long headache for fresh fruit because of peel quality defects. It is caused by the bacterium *Xanthomonas citri* subsp. *citri*.

On processing fruit, it can cause significant fruit drop if infections happen in the spring and early summer, particularly in early and mid-season cultivars like Hamlin. The dry spell in the early season reduced that sort of damage in 2020. The La Niña weather pattern may also provide some canker relief in 2021. However, even if the average amount of rainfall is lower, the damage could be great if it falls at a crucial time in fruit development.

Copper continues to be the backbone of canker management. Applications of ≥0.5 pounds per acre should be applied every 21 days or following the Citrus Copper Application Scheduler (a copper model found at agroclimate.org/tools/citrus-copper-application-scheduler) during the high-risk period of fruit-drop-inducing cankers (through June for Hamlins) or quality downgrade (through October for grapefruit).

The newer strategy of using Blockade can be helpful, particularly with young tree establishment. Blockade should be used post-bloom, but before favorable canker conditions, to reduce inoculum on leaves that cause fruit infections. However, it is not a replacement for a copper program.

Interesting new cultivars are being planted, but little is known about their canker susceptibility, so be vigilant to prevent the disease. If you notice a new cultivar with severe canker, please contact your regional Extension agent and Evan Johnson (egjohnson@ufl.edu).

GREASY SPOT

Greasy spot and rind blotch are problematic for all citrus, but particularly for fresh fruit cultivars. Defoliation from greasy spot, observable from November to February, can reduce productivity. The disease cycle takes nearly a year to complete but affects the following season through the leaf litter underneath the trees where the fungus (*Mycospherella citri*) reproduces. The spores are ejected from the leaf litter and germinate on fruit and leaves, but the fungus does not immediately infect, leaving it vulnerable to fungicides in the early summer.

If greasy spot has been problematic, wet the canopy more thoroughly by slowing the tractor speed, increase the application volume to >250 gallons per acre and consider a third application in August.

Copper is still the most economical product for greasy spot management, particularly for rind blotch and groves with canker. Remember that high temperatures (>94° F) and dry conditions promote copper phytotoxicity on fruit. Copper combined with petroleum oils can cause rind defects in summer heat, so be cautious. A best practice is to apply copper on moderately warm days without any additives, particularly oils, at 2 pounds per acre or less.

If worried about phytotoxicity, strobilurin-containing fungicides [Fungicide Resistance Action Committee (FRAC) 11; see Table 1, page 12] or the demethylation inhibitor fungicide Enable (FRAC 3) are also effective control options with or without oil. The most appropriate timing for these fungicides is late May to early June because they are good for melanose, too. To keep leaves on processing oranges, petroleum oils are a good option. Fungicide resistance is problematic with *M. citri*. Do not use two consecutive applications of a mode of action (see Table 1) for greasy spot.

MELANOSE

Melanose inoculum is formed in the canopy's dead twigs. The fungus (*Diaporthe citri*) rapidly colonizes these twigs and in the spring forms spores. Live twigs are also infected, but no spores are formed until twig death. Hedging will help remove some of these twigs.

Melanose is most severe with extended leaf wetness periods. Infection only needs 10 to 12 hours of leaf wetness at temperatures between 70 and 80° F. With cooler temperatures,

the fungus needs up to 24 hours of leaf wetness. These are not unusual wetting periods in Florida. Leaf and fruit lesions do not spread disease and are a dead-end for the fungus because no spores are produced.

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

Off-season fruit complicate timing; maintaining rind quality on these fruit for the fresh market will be difficult. 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.

BLACK SPOT

Areas affected with black spot continue to expand in Florida. The fungal disease is in Collier, Hendry, Lee, Charlotte and Glades counties. Late-hanging oranges are the most susceptible to black spot in Florida, but most citrus cultivars and species are susceptible.

Spores are formed on dead twigs, some fruit symptom types, and in the leaf litter where they are present all year. Spread is mostly by rain splash. The wind-spread ascospores are formed in the leaf litter but are yet to be found in Florida. May to September are the primary fruit infection months, but applications are recommended in April if it is wet.

Phyllosticta citricarpa, the causal agent of black spot, needs long wetting periods of at least 18 hours for infection. In Florida, with the heavy dews, prolonged wetting 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 also will keep black spot at low levels. However, most late-hanging oranges, particularly Valencia, need additional applications for good management. Any non-copper-containing fungicides are recommended where phytotoxicity is a concern or if there was severe disease the previous season. Rotate modes of action when planning a fungicide program to reduce resistance selection.

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

Fungicide	Mode of Action[a]
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

[a]Mode of action class from the Fungicide Resistance Action Committee (FRAC) Code List 2020
*Fungicides recommended for postbloom fruit drop. Ferbam is best mixed with a strobilurin (mode of action 11).

POSTBLOOM FRUIT DROP

Fortunately, little PFD has been observed in Florida since 2016. If climate forecasts are correct, the 2021 PFD risk should be low, but remain vigilant with highly susceptible cultivars like Navel and Valencia. If persistent calyxes (buttons) from previous years are present, scout flowers for the reddish brown signs of infection. 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 will provide the most fruit.

Fungicide efficacy greatly improves when it is well-timed. A PFD forecasting tool (agroclimate.org/tools/cas) released in January 2018 is simple to use and improves application timing. All the currently 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 PFD.

Further information on foliar diseases is available on the Citrus Research and Education Center (CREC) website, as well as in the Florida Citrus Production Guide (crec.ifas.ufl.edu/resources/production-guide) and the Electronic Data Information Source (edis.ifas.ufl.edu). Assistance is also available from your county agent or statewide specialist.

Megan Dewdney (mmdewdney@ufl.edu) is an associate professor at the University of Florida Institute of Food and Agricultural Sciences CREC in Lake Alfred.