Will you be ready for postbloom fruit drop?

By Megan M. Dewdney

Again in 2016, postbloom fruit drop (PFD) caused widespread problems in Florida groves. There were multiple factors that contributed to the outbreak in 2016. The primary factor was likely the extended bloom that many saw because of a combination of tree stress caused by huanglongbing (HLB) and the very warm winter.

Bloom in some groves was observed from late November to April. This allows for inoculum to build up in a grove and be present for the major bloom. Growers also experienced a very wet two weeks in the middle of the major bloom from mid-March to the beginning of April. With the inoculum that was already present, it was difficult to get fungicide applications on in a timely manner, and the disease became explosive.

DISEASE CYCLE AND SYMPTOMS

The disease cycle of PFD, caused by the fungus *Colletotrichum acutatum*, is relatively simple. Between flowering periods, the inoculum survives as dormant infections on the buttons (persistent calyxes), leaves and twigs. When flowers first open, the fungal survival structures start to germinate and form a small number of spores. These spores are moved via rain splash to the open flowers, where they are able to germinate, infect and produce many more spores. The new spores are then moved to the next open flowers by subsequent rainfall events. The fungus is highly dependent on rainfall, especially frequent rain events when flowers are present in the grove.

Infection usually happens within 24 hours of a weather event, and symptoms occur in approximately four to five days. Flower symptoms of PFD start with water-soaked lesions on petals that turn from peach to orange-brown as

Figure 1. Left: Young lesions on citrus petals have an orange circular pattern caused by masses of spores produced by the fungus *Colletotrichum acutatum*, the causal agent of postbloom fruit drop in citrus. Right: As lesions age, the petals develop an orange-brown color.

they age (see Figure 1). The fungus continues the cycle from sporulation to symptoms for as long as there are susceptible flowers available.

While windblown rain is the main means of disease spread, human activity contributes to long-distance spread through equipment movement. Workers with petals on their person can also spread disease, especially if work is done while the canopy is wet.

Trees, groves or cultivars that have extended blooms, multiple blooms or off-season blooms tend to have more problems than locations where bloom is restricted to a short period. At the end of bloom, the fungus causes the young fruitlets to abscise, leaving the calyxes (also called buttons) (see Figure 2). Fruit in a cluster with late flowers can also abscise if those flowers become infected. The fungal population will diminish with the end of bloom, but *C. acutatum* will survive on the tree until more flowers appear.

Figure 2. This citrus tree shows persistent calyxes or buttons caused by *Colletotrichum acutatum*, the infection of flowers and the abortion of fruitlets from the calyxes. There are few other causes of these symptoms.

SPRING 2017 OUTLOOK

There are many uncertainties as to whether PFD will be a major problem in the spring of 2017. If we have another warm winter, the trees will again have an extended bloom which would favor the disease. However, there is approximately a 70 percent chance that La Niña conditions will occur this fall, and only a near 55 percent chance that they will persist during the winter (www.climate.gov/enso). There is still a lot of uncertainty in the forecast, unlike last year.

During a typical La Niña event, the weather is warmer and drier than average. So flowering may be promoted, but with limited rain. If the La Niña does not persist, then the rainfall could be problematic through bloom, or it may fall just at the wrong time.

Other factors can contribute to an extended bloom in a grove. Some cultivars, such as Navels, are prone to off-season or extended bloom. Trees that are stressed by decline diseases such as HLB, blight or phytophthora can bloom off-season, and there can be other physiological stressors. Whatever the reason for extended bloom in a grove, it allows *C. acutatum* to multiply

and increase inoculum. Considering that we have had three PFD seasons in a row, the potential for extended bloom periods and rain during flowering should have growers considering their PFD management strategies and preparing to manage it for 2017.

GROVE PROTECTION

Since a PFD outbreak is possible in 2017, what can be done to protect groves? Foremost, remove severely declined trees that are not economically productive; these cost more to protect than is profitable.

Groves should be prioritized for protection using cultivar susceptibility (e.g., Valencia and Navel) and potential yield as criteria. If a block does not have the potential to produce enough to cover the cost of fungicide application, it should not be a priority. The prioritized grove blocks should be scouted regularly on foot.

If the first indication of a problem is the current year's buttons, then it will be too late for management. It is important to know whether there was inoculum present from last year and when trees begin to flower. If inoculum (buttons) is present, plan for PFD management.

If you are considering fungicide applications for PFD, timing of those applications is critical. It is more complicated now than in the past because many trees with HLB have several waves of bud development and flowers. Therefore, applications need to be targeted toward the most profitable waves of flowers.

The optimal timing for the first application is around 10 percent bloom, if you are judging by the phenological stage. If further applications are needed, full bloom and then 90 percent open bloom would be good targets. However, the best way to time applications is by the use of the PFD-FAD (Fungicide Application Decisions) System (see http://pfd.ifas.ufl.edu). Timing is highly specific to the grove situation, including overall flowering stage and local weather conditions that the model will help pinpoint. Remember that a spray application without an effective fungicide would be enough to trigger an infection event.

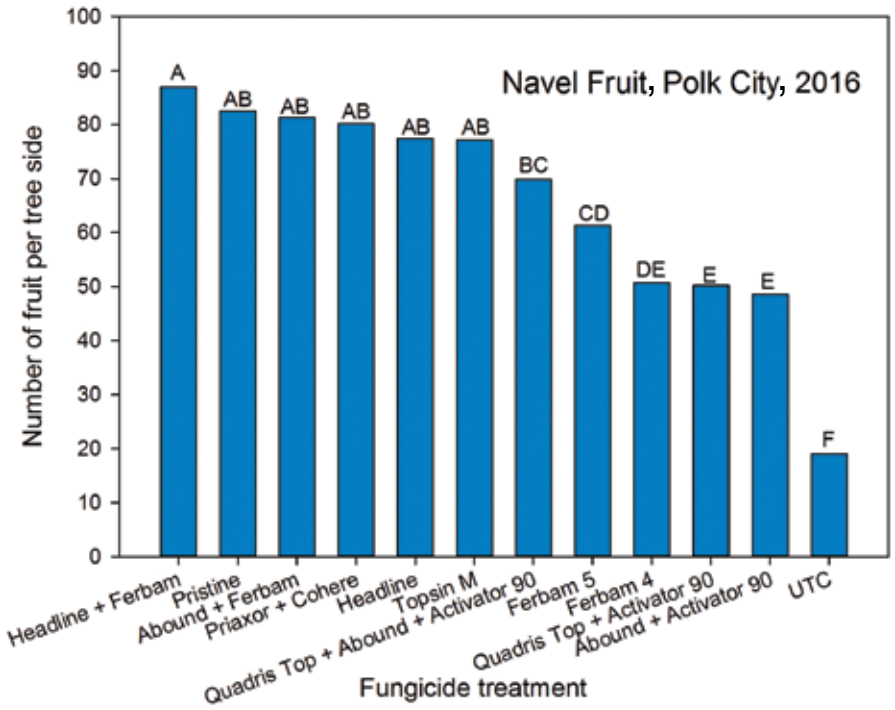

Figure 3. The average number of fruit per tree side for 11 fungicide treatments compared with an untreated control (UTC) in the 2016 postbloom fruit drop trial conducted in a Navel block in the Polk City, Florida area. Fungicide treatments with the same letter are not significantly different in fruit numbers at the 95 percent confidence level.

While timing is very important for PFD control, it is necessary to know which product to put in the sprayer tank. Currently, the 2016 Florida Citrus Pest Management Guide recommends any of the three strobilurin fungicides: Abound, Gem or Headline with or without ferbam. These provide moderately good PFD control.

Keep in mind that products like copper have no demonstrated efficacy on PFD and are not recommended. If a product does not have a pesticide label for citrus, it is not legal to use. Additionally, be careful about claims for untested products as they may have limited efficacy or not any residual activity.

FUNGICIDE TRIAL FINDINGS

Until 2015, there had been no work with the more recently registered fungicides because there had not been enough disease to conduct a trial. A second year of trials was conducted in a Polk City Navel block that was highly affected by HLB, had significant off-season bloom and PFD in 2014 and 2015. The block was hedged in January, which concentrated the bloom from the middle to the end of March. Applications were made on the recommendation of the PFD-FAD system. The application dates were March 16 and 22, 2016. The treatments and rates per acre used in this field trial on Navel orange are listed in Table 1 (page 20.

Eleven treatments were tested along with an untreated control. The number of fruit per tree side was counted between June 23 and 24, 2016. The averages of those counts are presented in Figure 3. The number of fruit was counted in late June to give those fruit that were going to be dropped during the June drop an opportunity to fall but not in time for the HLB-induced fruit drop to occur.

All treatments produced significantly more fruit per tree than the untreated control. Headline +

ferbam and Pristine had the greatest number of fruit, but the number of fruit was not significantly greater than most other treatments. From the 2016 results, Pristine, Headline with or without ferbam, Abound with ferbam, or Priaxor with Cohere performed best. Topsin M did not perform better than these fungicides and is *not* registered for use in citrus. The trial is expected to be repeated in 2017. Although there are several reasonably effective fungicides, at the moment, there is no product that would equal the historical effectiveness of benomyl.

PFD will potentially be problematic again in 2017 because of the uncertain climate pattern and the extended bloom from HLB-infected trees. There are fungicides that can be effective, but if applications are not well timed, no fungicidal treatment will be effective. Growers should be proactively scouting their groves for buttons and deteriorating trees. Observe the number of flowers that are available to be infected and whether they are likely to be the major bloom. These are the flowers where protection should be targeted and timed.

Table 1. Treatments and per-acre rate used in the 2016 Polk City, Florida, postbloom fruit drop trial on Navel oranges.

Product	Rate/acre
Control	—
Quadris Top + Activator 90	15.4 fl. oz. + 0.25% v/v
Quadris Top + Abound + Activator 90	15.4 fl. oz. + 3.2 fl. oz. + 0.25% v/v
Abound + Activator 90	15.5 fl. oz. + 0.25% v/v
Abound + Ferbam	15.5 fl. oz. + 6 lbs.
Headline	15 fl. oz.
Headline + Ferbam	15 fl. oz. + 6 lbs.
Pristine	18.5 oz.
Priaxor + Cohere	6 fl. oz. + 16 fl. oz.
Topsin M	2 lbs.
Ferbam	4 lbs.
Ferbam	5 lbs.

v/v = volume/volume

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