

Citrus black spot fungicide trials



Figure 1. Valencia fruit with hard spot symptoms of citrus black spot.



Figure 2. Valencia fruit with citrus black spot collected from under a tree.

By Pamela Roberts and Megan Dewdney

Citrus black spot (CBS), caused by the fungus *Phyllosticta citricarpa* (*Guignardia citricarpa*), was an exotic disease to Florida. That changed in March 2010 when the first fruit with CBS symptoms were found in a commercial grove near Immokalee (Figure 1). Since then, the number of blocks identified with CBS-positive trees is increasing each season in the southwest production region with nearly 38,000 acres in quarantine, as of March 2014. Maps of the current quarantine areas are available through our citrus black spot webpage (www.citrusblackspot.org).

Currently, the majority of CBS-affected blocks are Valencia oranges, which are the majority of citrus plantings in Southwest Florida. Lemon is the species most susceptible to CBS, but sweet oranges, especially mid- to late-maturing cultivars, are also highly susceptible to this disease. Valencia oranges are the most susceptible of the commonly grown cultivars in Florida, but nearly all cultivars are susceptible. Hamlin sweet orange and tangerine/mandarin types are moderately susceptible, in part because there is limited overlapping of fruit cycles. From our experience in Florida, grapefruit appears moderately susceptible. Tahiti limes are asymptomatic, but *P. citricarpa* can form spores in the leaves, allowing the fungus to complete its life cycle. Sour oranges and sour orange hybrids are also asymptomatic, but whether spores can be formed in the leaves is still unknown.

CBS can cause many different types of lesions on the fruit, making it unsuitable for the fresh market. Fruit intended for the juice market are blemished, but the internal quality of the fruit remains unaffected. However, a serious consequence of fruit infection for those producing for juice is that the disease can cause the fruit to drop prematurely (Figure 2). In our trials, we saw fruit drop increase nearly 30 percent from trees with severely affected fruit, compared to trees with lower incidence and severity of CBS-infected fruit.

Leaf symptoms are rare in groves with management for CBS. Despite the scarcity of the leaf symptoms, the most important spores, ascospores, for continuing the disease come from the leaf litter as it decomposes. The infections that produce these spores are not visible to the eye and are often termed latent infections. The majority of airborne spores are released between mid-March and late-August. Fruit are susceptible for five to six months after petal fall and must be moist to be infected. The fruit-ripening process, along with warm weather and sunlight, stimulates appearance of symptoms. When scouting for symptoms in a grove,

a good rule of thumb is to look for symptoms on the sunny side of a declining tree where the symptoms are most likely to appear first and to search for heavy fruit drop under a tree and then examine hanging fruit.

FUNGICIDE TIMING

Like most diseases and pests, fungicide application timing for CBS control will be important. The beginning of May is the recommended time to apply the first treatments. April in Florida is usually a dry month, but if rains start early, the first application should start in April. Applications should continue at monthly intervals until late August/early September. Currently, we only have two fungicide groups that are registered and found to be efficacious in other countries for black spot control: the copper-based fungicides and Quinone outside inhibitor (QoI) fungicides that include the strobilurins (FRAC Group 11; Abound, Gem, Headline). (FRAC is the Fungicide Resistance Action Committee.) Fortunately, many of the fungicide applications for other diseases will also control CBS. An aggressive canker suppression program will likely be enough to control, but not eliminate, CBS on grapefruit. For other cultivars, canker applications would need to be extended into late summer. Applications for greasy spot and melanose will also help, but again the season will need to be extended. Many alternaria and most scab applications will be too early for CBS control, but may serve as a first application in April/early May.

Strobilurin applications are recommended for improved control over copper alone and also for fresh fruit production. Because of copper phytotoxicity concerns, strobilurins should be used when the temperature is greater than 94°F. Since this class of fungicides has historically had many problems with resistance, applications are restricted to only four per year for all uses. Resistance has already become a problem with alternaria brown spot and we do not want to lose this valuable tool for CBS control. Be careful to stay within label rates.

FUNGICIDE TRIALS

While the future of managing this disease under Florida conditions is still unfolding, the use of effective, timely fungicide applications will undoubtedly continue to be part of the integrated approach. To expand our fungicide options and confirm timing recommendations, evaluation of fungicides and timing regimes were initiated in a commercial block in 2011. Fungicides currently labeled for use on citrus

were used in the first two seasons of evaluations. The trials in 2013 and subsequent trials will include products not currently labeled on citrus, but selected for potential efficacy against this disease.

Fungicides labeled for use on citrus included in these trials were: Headline SC (pyraclostrobin; FRAC 11), Gem 500SC (trifloxystrobin; FRAC 11), Abound 2.08SC (azoxystrobin; FRAC 11), Enable 2F (fenbuconazole; FRAC 3), Quadris Top 2.71SC (azoxystrobin and difenoconazole; FRAC 11 and 3), Pristine 38WG (pyraclostrobin and boscalid; FRAC 11 and 7) and various copper formulations. The FRAC grouping indicates mode of action; for example, FRAC 11 includes the strobilurins. Sprays were initiated in May and continued at approximately monthly intervals through early fall. Selected fungicide regimes tested were: Kocide 3000 for all applications; Kocide 3000 at first application rotated with Quadris Top 2.71F; Pristine 38WG at the first application rotated with Kocide 3000; and Enable 2F plus 5 percent Citrus Oil for all applications.

Applications were applied with an airblast sprayer calibrated to deliver 126 GPA (gallons per acre) operating at 200 psi and 3 mph with a 25-gallon mix. The trial was a randomized block design with four replications of each treatment containing at least five trees. Data was collected from the center three trees while adjacent trees were used as buffers.

Fruit from test plots were evaluated for CBS lesions beginning in December and continued through harvest. They were considered to be diseased if they had a single lesion identifiable as CBS. Fruit drop was assessed twice by raking all of the fruit from under the treatment trees. The number of dropped fruit with CBS lesions and without visible symptoms was counted. (Figure 3). On the tree, the percentage of total fruit with CBS was calculated (Figure 4).

Preliminary results for selected fungicide regimes are presented in the figures. As expected, these fungicide applications were for the most part effective in reducing the number of fruit dropped and the number of fruit with symptoms of CBS. The one exception was Kocide 3000 alternated with Quadris Top treatment. There were more symptomatic fruit on the tree with this treatment than the untreated control, despite having the least fruit drop. This was because more symptomatic fruit were retained on the tree than dropped, unlike other treatments.

Since fruit are thought to be

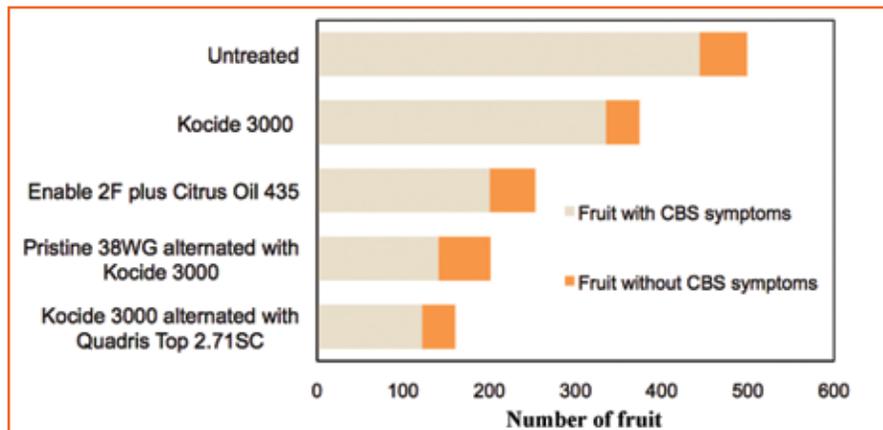


Figure 3. Field trials in which the number of dropped fruit with or without citrus black spot symptoms was determined. This was determined from fruit collected under Valencia trees in plots receiving fungicide treatments to manage citrus black spot in 2013.

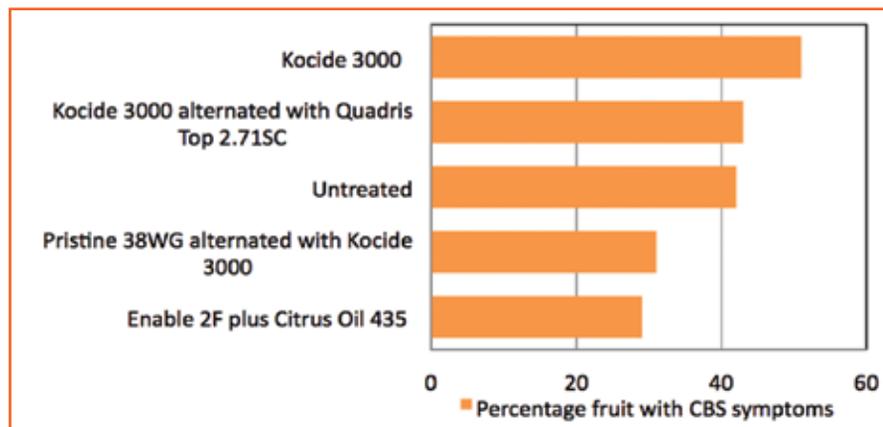


Figure 4. The percentage of Valencia fruit on a tree with symptoms of citrus black spot calculated from the total number of fruit counted within a square meter.

susceptible for five to six months post-bloom, the current University of Florida-IFAS recommendations are that monthly fungicide treatments for CBS be initiated in the early spring and continue through fall to coincide with the peak release of inoculum. From the currently labeled fungicides, a rotation of copper and a strobilurin fungicide — such as Headline SC, Gem 500SC, and Abound 2.08SC — is recommended. By field testing these and other products, it is hoped that

additional, efficacious fungicides and the best application schedule will be available to effectively manage CBS.

This work was done in collaboration with Henry Yonce and Carol Brooks with KAC Agricultural Research.

Pamela Roberts is a University of Florida (UF) professor of plant pathology at the Southwest Florida Research and Education Center; Megan Dewdney is an assistant professor of plant pathology at the Citrus Research and Education Center.

