

Reasons for inconsistent citrus canker control

By Jim Graham and Clive Bock

Crop losses from citrus canker in 2014 for Hamlin due to premature fruit drop, or for grapefruit from unacceptable severity of fruit lesions, were highly variable. This was due to periodic rains that in certain locations were coincident with grapefruit flushes in February–March or with early Hamlin fruit development in late April–early May. During this period, fruit are at the most susceptible stage of expansion (one-quarter inch to half-inch diameter for Hamlins and half-inch to three-quarter inch diameter for grapefruit). In 2014, huanglongbing (HLB) caused premature fruit drop in grapefruit and Hamlin trials that overshadowed losses due to canker.

The purpose of this article is to discuss 1) how HLB interacts with canker and 2) why control efforts at times fall short based on research trials and on grower experiences with integrated canker management.

EFFICACY OF WINDBREAKS

For fresh grapefruit, the objective is to maximize packout by minimizing canker incidence and severity on fruit. This past season, evaluations of 6- and 7-year-old red grapefruit blocks surrounded by *Corymbia torelliana* windbreaks (20 feet to 30 feet tall) again confirmed they do an excellent job of reducing incidence and severity (number of lesions per fruit) of canker. As expected, distance from the windbreak determines the level of control. The closer the proximity of the windbreak to the grove edge (Figure 1), the better the performance of the windbreak.

Where gaps occur in the windbreak, the adjacent trees show higher incidence and severity of canker on foliage and fruit. Vortexing between the

windbreak trees accelerates bacteria-laden rain droplets above the threshold for infection. The gaps occur naturally at vehicle entries or where trees have declined or died due to lightning

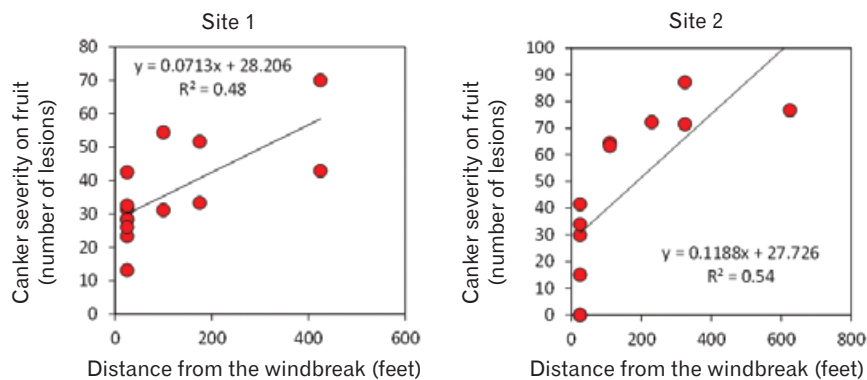


Figure 1. Effect of distance from the windbreak on severity of canker in red grapefruit blocks surrounded by a *Corymbia torelliana* windbreak (20 feet to 30 feet tall). Results confirm that the closer citrus trees are to windbreaks in Site 1 and Site 2, the lower the incidence and severity of canker on fruit. In each graph, 'y =' is the equation for the line, and 'R²' is the coefficient of variability that expresses the proportion of data variation explained by the line.

strikes. Replacement of missing trees is not just desirable; it's necessary to maintain the integrity of the windbreak wall. The 2014 results confirm that windbreaks are highly effective and necessary for protection of grapefruit.

INTERACTION WITH HLB

As HLB greatly disrupts cycles of flowering, fruit set and foliar flushing, canker has been observed to be either reduced or exacerbated, depending on the amount of inoculum present and horticultural management within the grove. In a trial with 3-year-old Hamlins, it was expected that canker would greatly increase after the rains started coinciding with summer flushes to support inoculum development. This past season, the young trees were markedly reduced in vigor by HLB attenuation of foliar flush cycles in conjunction with a low number of significant rainfall events in April–May. Hence, inoculum failed to build up as expected based on experience prior to the prevalence of HLB.

In contrast, a commercial grove of Hamlins managed with an aggressive foliar nutritional program constantly flushed coincident with periodic rains. These canker-conducive conditions rendered a well-timed, 21-day copper spray protection of fruit almost completely ineffective.

In the past, failure to control canker was associated with sprays applied too late, at intervals greater than 21 days

or when spray mixtures lacked copper. For highly susceptible grapefruit, the foliar nutrient program had even greater consequences for promotion of disease in foliage and fruit (Figure 2). In addition, foliar nutrients appeared to increase the risk of rind burn on grapefruit because they were tank-mixed with copper in almost every spray application. A program of less frequent foliar nutrient sprays balanced with fertigation may provide for more regular flushes of shorter duration that are less susceptible. This practice also lowers the risk of deleterious interactions with copper in the spray mix.

CANKER EPIDEMICS IN HAMLINS

In young groves where trees have not formed hedgerows and are wind-exposed, early-season spray timing in relation to fruit size and application of sufficient metallic copper are crucial to protect fruit until midsummer. Fruit infected before July are induced to drop prematurely by ethylene produced from canker lesions. After midsummer, smaller lesions that form do not develop to a large enough size to trigger fruit drop, so further protection of fruit is unnecessary. On



Figure 2. Flush on a Hamlin tree managed with a foliar nutritional program that stimulated vigorous, off-cycle activity and promoted canker infection.

the other hand, after applications of copper sprays end, canker inoculum continues to build up on the leaves.

Growers often ask if this late-season inoculum is a risk. Successive trials in 2011 and 2012 illustrate that this late-season inoculum is not the source of canker-related fruit drop risk. In 2011, we measured the highest canker losses ever recorded due to intense rains in April–May spreading the inoculum to young, highly susceptible fruit (Figure 3, page 25). In the following 2012 season, early rains were less frequent, and fruit drop losses for copper-sprayed trees were 10 times lower in the very same grove location. In 2011, the April–May rains were the cause of the severe

epidemic, not the residual inoculum that was present later in the season.

The good news/bad news from the 2014 canker trial of 3-year-old Hamlins is that while less than 10 fruit per tree with canker dropped prematurely, as much or more dropped due to HLB. Obviously, crop loss from HLB is much more serious depending on how soon after planting the trees become infected and express symptoms. Hence, stringent protection of young trees with soil drenches of systemic neonicotinoids and foliar insecticide sprays as recommended in the Florida Citrus Pest Management Guide (www.crec.ifas.ufl.edu/extension/pest/) are *essential*. On younger trees, loss of leafminer and psyllid control on summer flushes occurs when flush production dilutes the neonicotinoid below the concentration in the leaf that provides protection. The objective is to maintain levels of neonicotinoid for the most efficacious insect control by adjusting the frequency and dosage of soil applications in relation to tree size.

INTEGRATED MANAGEMENT WITH SAR

Use of all soil-applied neonicotinoids available is not only crucial for insect control, but also for systemic acquired resistance (SAR) protection of foliage against canker infection. In 2014, we confirmed the limitation of SAR inducers for control of foliar infection and reduction of canker incidence on grapefruit trees. As the trees exceeded 8 feet in height, control was reduced in spite of the combination of soil applications of Admire Pro® (imidacloprid), Platinum® (thiamethoxam) and Belay® (clothianidin), in rotation with soil applications of the commercial SAR elicitor, Actigard® (acibenzolar-S-methyl).

In 2014, Actigard®, which is not yet registered, was also evaluated in conjunction with grower standard copper spray programs in two commercial operations under an EPA-approved experimental use program. In

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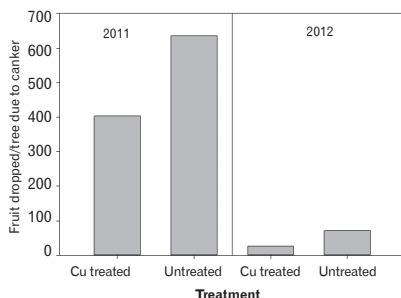
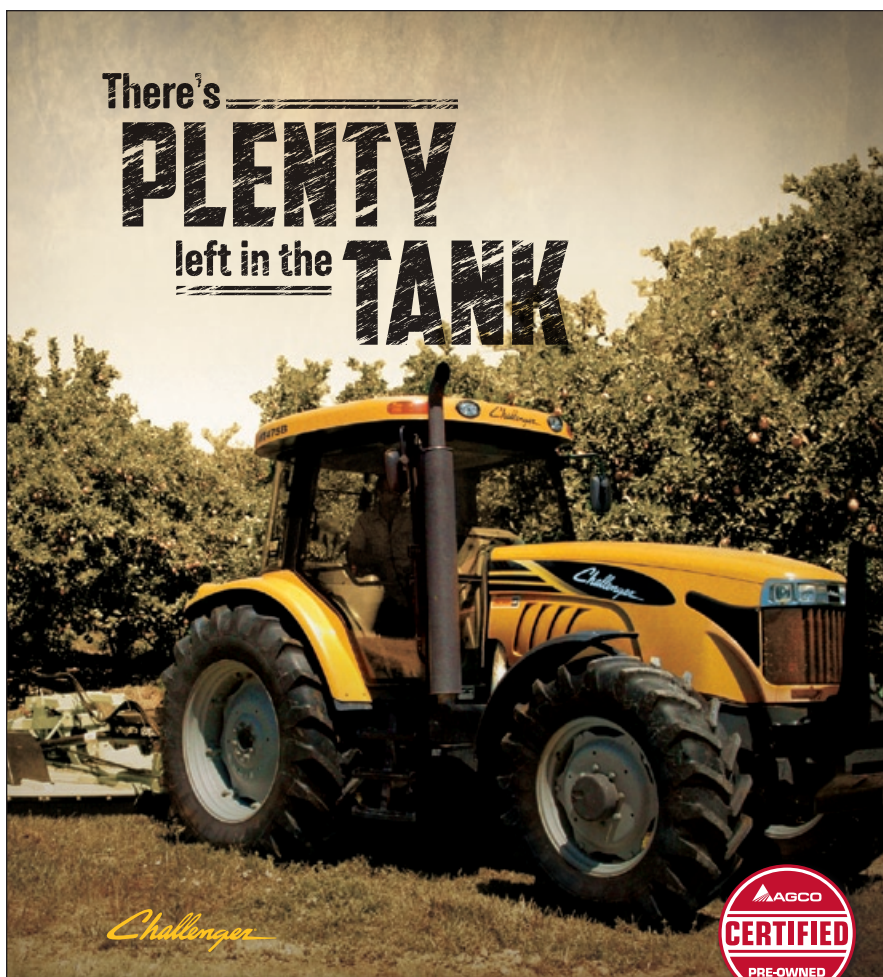


Figure 3. Effect of copper sprays on number of canker fruit dropped per tree for 5- and 6-year-old Hamlin trees in 2011 and 2012. In 2011, periodic heavy rains in April and May created highly conducive conditions for fruit infection at the most susceptible size of development (one-quarter inch to half-inch diameter). This resulted in severe fruit infection and 80 percent fruit drop by the end of the season. Residual inoculum present in late 2011 had little effect on fruit infection and drop with less conducive rainfall conditions in spring 2012.

each grapefruit grove, four drenches of Actigard® at 60-day intervals between April and October produced better control of foliar and fruit disease than the copper program alone. This evaluation will be repeated in 2015, and the efficacy data will be used to support registration of Actigard® for integrated canker management with copper sprays. This may permit a reduction in copper rate for optimal control.

For additional information regarding current management recommendations, consult the 2015 Florida Citrus Pest Management Guide. 🍊

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