

## Integrated Pest Management of HLB and ACP in California Citrus – June 2018

J. E. Adaskaveg, E. E. Grafton-Cardwell, University of California, Riverside; and J. Cranney, CCQC

Huanglongbing (HLB) is a fatal, introduced disease of citrus in the United States, including California. The bacterial disease is caused by *Candidatus Liberibacter asiaticus* (CLAs) and other species and is vectored by the introduced Asian citrus psyllid (ACP), *Diaphorina citri*.

In the summer of 2017, the California Citrus Quality Council (CCQC) submitted an emergency registration (Section 18) petition to the California Department of Pesticide Regulation (CDPR) and the United States Environmental Protection Agency (EPA) for the use of the bactericides streptomycin (trade name FireWall® 50WP – FRAC Group 25) and oxytetracycline (FireLine® 17WP - FRAC 41) on citrus for the management of HLB. The Section 18 – Quarantine action (restrict the spread of an invasive pathogen) was issued on 26 February 2018. These products have been used in Florida under an emergency registration exemption for the last two years and approval has been granted for a third year with benefits for HLB-infected trees including increased yields (e.g.,  $\geq 15\%$ ) as compared to non-treated trees.

In Florida, the disease has been devastating citrus groves for over a decade before the bactericides were registered. The situation in California is quite different, and the disease has not been found in commercial orchards to date but has been confirmed in hundreds of citrus trees in urban areas in Los Angeles and Orange Co., a few trees in Riverside Co. and one in San Bernardino Co. The best use practice for bactericides as well as most fungicides and other bactericides is as protective, pre-infection treatments as planned for California and not as post-infection treatments as bactericides are currently being used in Florida. Since there is no known cure for the disease, the best way to prevent or minimize infection is to have a simultaneous, IPM approach for maintaining tree health:

- Monitoring for ACP and use of early HLB detection technologies (when available)
- Aggressive ACP control using insecticide treatments
- Judicious use of bactericides for managing the disease
- Root health promotion using precise irrigation and *Phytophthora* fungicides
- Removal of trees that are designated positive by state-approved disease-detection thresholds using molecular methods

***Insecticides alone will not fully protect citrus trees against ACP vectors of HLB, and bactericide programs are also critically important to protect trees from infection. The immediate proposed plan for use of bactericides in California as described in the Section 18 is as preventative treatments in high-risk, commercial production areas to prevent or slow the spread of HLB.*** Commercial orchards should be treated when they are located: 1) within HLB-quarantine regions; 2) within 15 miles of designated HLB-quarantine regions; and 3) within 15 miles of a detection of a CLAs-positive (HLB pathogen) ACP. Initial counties approved include Imperial, Riverside, San Bernardino, San Diego, and Ventura. The list of approved counties can be expanded by DPR if new outbreaks of HLB occur in citrus or if an ACP-positive detection for CLAs (HLB pathogen) occurs in other counties. Guidelines for using bactericides is as follows:

- **The Section 18 is specifically for the bactericides products FireWall 50WP (streptomycin) and FireLine 17WP (oxytetracycline)**
  - Total amount of FireWall is 2.07 lb product/yr (0.69 lb /application) or 1.36 lb a.i./yr (0.45 lb a.i./application)
  - Total amount of FireLine is 4.5 lb product/yr (1.5 lb/application) or 0.81 lb a.i./yr (0.27 lb a.i./application)
- **Application Limits:**
  - The bactericides are only labeled for air-blast ground application
  - The minimum re-treatment interval is 21 days.
  - The preharvest interval (PHI) is 60 days (requested 40 days similar to FL Section 18).
  - The maximum number of applications for each bactericide is three per calendar year.
  - Do not use antibiotics in groves fertilized with raw animal manure. This addresses concerns that antibiotic resistance could be transferred to *E. coli* or other pathogenic bacteria in the feces.
- **Usage and Timing of Bactericides:**
  - **Rotation of the two bactericides** for a total of six applications per year (3 FireWall and 3 FireLine).
  - **The bactericides must be used with registrant-designated adjuvants** (e.g., Tactic®) with scientifically proven activity for allowing the bactericides to become systemic within the tree.
  - **Optimum application timing is on flushes of new citrus tree growth** that are also targets for feeding and reproducing by ACP. Under California conditions, the goal for most citrus is to target four applications in the spring and two applications in late summer/fall using volumes of water (e.g., 100 gal/A) that provide adequate coverage of new growth.

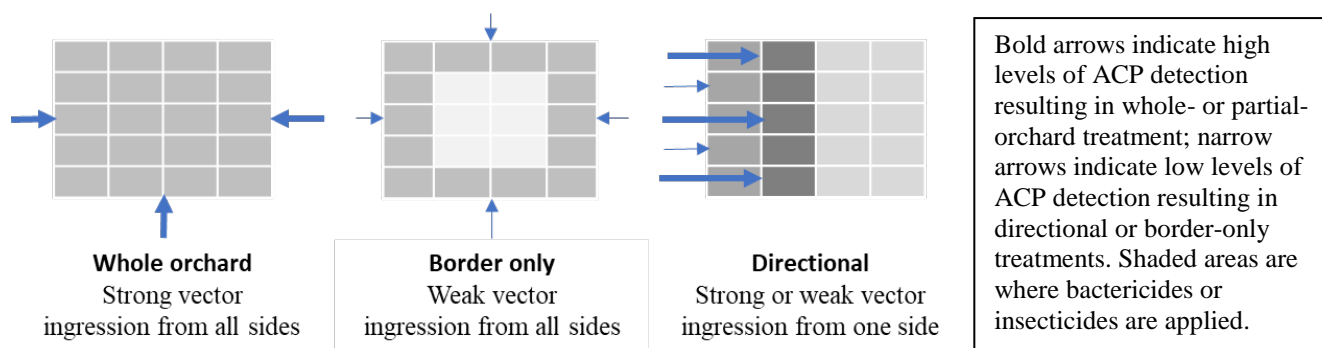
## Suggested guidelines of application timings\*

Citrus *	Jan.	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Navels		STP	OXY	STP	OXY			STP	OXY			
Mandarins		STP	OXY	STP	OXY			STP	OXY			
Valencias			STP	OXY	STP	OXY		STP	OXY			
Grapefruit			STP	OXY	STP	OXY		STP	OXY			
Lemons**			STP	OXY	STP			OXY	STP	OXY		
Min. Interval (days)		21	21	21	21	21		21	21	21		

\*- Initiate applications of streptomycin (STP) and oxytetracycline (OXY) with the first new flush of shoot growth. Minimal re-application interval is 21 days, but this may be extended based on orchard conditions. The PHI is 60 days. Suspend use of bactericide if harvest is within 60 days. Use approved insecticides for ACP management in this interval and resume bactericide applications after harvest is complete.

\*\* - Applications to lemons may vary depending on the growing district. The program is for District 2 (coastal region).

### Strategies for bactericide/insecticide applications:



**Management of ACP**– (See [www.ucanr.edu/sites/ACP](http://www.ucanr.edu/sites/ACP) for monitoring guidelines and follow UC ANR guidelines for pesticides most active against ACP)

**Bactericides alone will not fully protect citrus trees against HLB, and area-wide treatment programs to suppress the ACP vector are also critically important.** We are currently recommending that Southern California growers apply a minimum of 3 treatments for ACP/year: a coordinated late winter/early spring treatment to reduce overwintering populations of adult psyllids, a grower choice ACP-effective insecticide application during the spring or summer when treating for other pests, and a coordinated insecticide treatment in late summer/fall (Aug-Nov) when ACP populations are the highest. The goal is to suppress psyllids below 0.5 nymphs per flush. Research is showing that orchards in Ventura, Riverside, and San Bernardino Co. have particularly high populations of psyllids in the fall, and two fall treatments are necessary in those regions.

Studies are also demonstrating that psyllids often begin establishing on the borders of orchards in late summer, and thus, one of the fall treatments could be a coordinated whole-orchard treatment and one a ‘border-only’ treatment. Sampling the flush for psyllid nymphs on ten trees along each border and in a center row provides information to determine if a whole orchard treatment is necessary.

### Maintaining healthy citrus roots

Maintaining root health is an essential component of an integrated HLB management program. Once a tree is infected, the HLB pathogen concentrates in the roots and lower crown. This inhibits root growth, and root diseases such as Phytophthora root rot may have a major impact on tree decline. Trees with a compromised root structure decline much faster once infected with HLB than trees with a healthy root system. Over watering favors Phytophthora root rot and therefore, irrigation management is an essential cultural practice to promote tree health.

Fortunately, highly effective fungicides against Phytophthora root rot are available including phosphonates (FRAC 33) and the newly registered oxathiapiprolin (Orondis® FRAC 49). Another product is fluopicolide (Presidio®- FRAC 42) that is pending registration in California. Together with mefenoxam (Ridomil Gold®- FRAC 3) four modes of action will be available to use in rotation to prevent resistance from developing in *Phytophthora* populations. UC Guidelines include two applications timed around root flushes of growth: the first in May-June and the second in late Aug. to Sept.