Eggs and nymphs on young flush

Adults on any leaves
As the psyllid feeds, it injects a salivary toxin that causes the tips of new leaves to easily break off. If the leaf survives, then it twists as it grows.

Twisted leaves can be a sign that the psyllid has been there.
Huanglongbing/Citrus Greening Disease
HLB causes yellowing of leaves, odd fruit shape, color and size and bitter juice
Thin, unproductive trees with bitter juice and fruit that falls off easily.
Trees can die in as little as 5 years.
HLB was discovered in one tree in 2012

**Urban ACP treatment program:**
- Pyrethroid: foliar cyfluthrin (Tempo)
- Neonicotinoid: systemic imidacloprid (Merit)

HLB found in a single tree in an urban area Mar 2012
HLB Update

HLB in Hacienda Heights California
1 tree in a backyard Mar 2012

HLB in Hidalgo Texas
9 trees in two orchards Jan 2012

2 years to appear in Mexico and spread to the west coast
Asian Citrus Psyllid Control Program Goals
Suppress the psyllid to buy time for researchers to develop solutions to the disease problem
1) Slow the spread of the psyllid to new areas
2) Prevent the psyllid from finding HLB-infected trees
3) If it does find an infected tree, slow spread of HLB by reducing the vector population
**Phase 1:** 1-2 psyllids are found on a single trap. The combination of two broad spectrum insecticides (a foliar and a systemic such as the pyrethroid + imidacloprid) suppresses the psyllid below detectible levels for many months.

**Phase 2:** The psyllids are found in multiple sites in both urban and commercial citrus and coordinated, areawide application of the two insecticides (such as the pyrethroid+imidacloprid) is needed. ACP are not found for many months.

**Phase 3:** The psyllids are found in < 9 months and the continuous areawide management program starts. Minimum of 3 ACP treatments per year focusing on flushes and overwintering populations.
ACP Effective Insecticides for Commercial Citrus

Foliar insecticides

*Pyrethroids: fenpropathrin (Danitol), cyfluthrin (Baythroid), zeta cypermethrin (Mustang)
OPs: chlorpyrifos (Lorsban Advanced), dimethoate, Imidan, Supracide, malathion
Carbamates: carbaryl (Sevin), formetanate (Carzol), methomyl (Lannate)
spinetoram (Delegate)
+ diflubenzuron (Micromite)
abamectin (Agri-Mek)
rynaxypyr (Altacor)
+ fenpyroximate (Fujimite)

Broad spectrum
Soft on natural enemies
*best control
+ effective against nymphs

Systemic insecticides

*Neonicotinoids: imidacloprid (Admire), thiamethoxam (Platinum)
+ spirotetratramat (Movento – foliarly systemic)
Phase 1&2 Treatment Principles

1. Apply two ACP effective insecticides from different chemical classes as soon as possible after detection of ACP, with at least one of the insecticides in the broad spectrum group. The best combination is a foliar pyrethroid + systemic imidacloprid or Platinum.

2. If the systemics or Movento are not feasible, then use 2 foliars. In this situation, use a broad spectrum foliar (pyrethroid, organophosphate, carbamate, neonicotinoid) first and broad or soft insecticide second. Apply the two insecticides within a life cycle of the insect (<1 mo apart).

3. Treat the find site and all blocks that intersect an 800 m radius as close to the same time as possible, preferably within 2 weeks of each other to achieve the ‘area treatment effect’

4. You can use normal treatments for other pests as part of the program, if they are ACP effective and applied in a timely fashion.
Phase 1: 1-2 psyllids are found on a single trap. The combination of two broad spectrum insecticides (a foliar and a systemic such as the pyrethroid + imidacloprid) suppresses the psyllid below detectible levels for many months.

Phase 2: The psyllids are found in multiple sites in both urban and commercial citrus and coordinated, areawide application of the two insecticides (such as the pyrethroid+imidacloprid) is needed. ACP are not found for many months.

Phase 3: The psyllids are found in < 9 months and the continuous areawide management program starts. Minimum of 3 ACP treatments per year focusing on flushes and overwintering populations.
Notes: All treatments in red are ACP effective and when applied for other pests would assist with ACP control.
**Ventura**

- Bud mite: Abamectin + oil
  - Abamectin + oil (Oct-Nov)
  - Chlorpyrifos + oil (Jul-Nov) rotated with Spirotetramat

- Citrus thrips

- Silver mite: Sulfur, Spirodiclofen

- Ants: Lorsban ground app

- California red scale: Aphytis, Pyriproxyfen, Chlorpyrifos

- Asian citrus psyllid

**Phytophagous Insects**

- Pyrethroid
- Systemic Imidacloprid or Thiamethoxam
- OP
Yellow Sticky traps
1 trap/0.5 mi of perimeter (every 40 acres)

Note wing pattern, brown border with a clear spot in it.
Visual Searches of Flush

**Adults:** psyllid tilt their abdomens up and tend to line up on leaf veins.

**Nymphs:** produce waxy tubules

**Eggs:** yellow to orange and tucked inside tiny flush.
Tap samples for adult stages: moisten the plastic
Asian Citrus Psyllid Sampling plan

Scouted by: _____________________ Date: ___________
Orchard name: __________________ Leaf status (circle one): feather flush/growing flush/fully expanded
Block name or number: _______________ Variety: ___________ GPS: ___________

Instructions:
1. Sample 10 trees on the north, east, south, west borders rows/trees of the orchard and in the center of the orchard.
2. Hold clipboard with white paper 1 foot below a branch and strike the branch 3 times, counting the total number of winged adult psyllids per 3 taps.
3. Examine 1 young flush per sample tree for all psyllid stages. Note if eggs or nymphs are seen.

<table>
<thead>
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<th>North trees</th>
<th>#ACP / tap</th>
<th>#ACP / flush E/N/A</th>
<th>East trees</th>
<th>#ACP / tap</th>
<th>#ACP / flush E/N/A</th>
<th>South trees</th>
<th>#ACP / tap</th>
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<th>#ACP / tap</th>
<th>#ACP / flush E/N/A</th>
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Organic Citrus Treatment Protocol – when ACP is detected

Insecticide choices
Petroleum oils
Ecotrol (rosemary+peppermint oil)
Trilogy (neem oil)
Pyganic (pyrethrins)
Aza-Direct (azadirachtin)
Grandevo (*Chromobacterium subtsugae*)

Sampling Frequency
Conduct tap and visual surveys every two weeks throughout the season.

Treatment frequency
Every 10-14 days until ACP are not detectible by tap sample, visual inspection of leaf flush or yellow sticky cards for 3 sampling periods.
Key Points for Citrus Growers

When psyllid appears:

➢ Be aggressive in sampling for ACP
  • Do not rely on yellow sticky cards
  • Have your PCAs use tap and visual sampling to check orchards
    o Conventional orchards: every 2 months
    o Organic orchards: every 2 weeks

➢ Be aggressive in controlling ACP to reduce the risk of HLB from appearing in your orchard
  • When ACP is found treat quickly
  • Treat over a wide area
  • Use two of the most effective insecticides

UCIPM guidelines

http://ucipm.ucdavis.edu/EXOTIC/diaphorinacitri.html
How do I choose insecticides?

http://ucanr.org/sites/KACCitrusEntomology

How do I choose insecticides?

Treatment Strategies

Phase 1 or 2: When the psyllid first appears in a region, the best strategy is to use two insecticides with the greatest efficacy over as wide an area as possible to knock the psyllid so low that retreatment is not needed for a long time. Insecticides that exert the greatest efficacy are shown in red.

Phase 3: Once the psyllid becomes established, and insecticide treatments become more routine, then the strategy is to use organophosphates and pyrethroids during fall and early spring to exert the greatest impact on overwintering adults. During the rest of the season, rotate through other modes of action to avoid selecting for resistance and make your insecticide choice based on the time of year it works best for psyllids and other insects.

Modes of Action

To avoid selecting for resistance in the psyllid, avoid using an insecticide from any one mode of action number more than once a year for any insect.

Insecticides in red are broad spectrum and have a greater effect and/or last longer than softer insecticides shown in green.

ACP Effective Insecticides

- Chemical group
- Pesticides
- Mode of Action

<table>
<thead>
<tr>
<th>Chemical group</th>
<th>Pesticides</th>
<th>Mode of Action</th>
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<tbody>
<tr>
<td>Organophosphate</td>
<td>Lorsban, Supracide, Dimethoate, Imidan, malathion</td>
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</tr>
<tr>
<td>Carbamate</td>
<td>Sevin, Lannate, Carzol</td>
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<tr>
<td>Pyrethroid</td>
<td>Baythroid, Danitol, Mustang</td>
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<tr>
<td>Neonicotinoid</td>
<td>Provado, Admire, Platinum, Actara</td>
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<td>Tetracic acid</td>
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<td>Ryanodine</td>
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