Impact of Systemic Acquired Resistance Elicitors and Insecticidal Control of Asian Citrus Psyllid on Incidence and Severity of HLB Disease in Citrus

H. Alejandro Arevalo
&
Phillip A. Stansly
SWFREC/ University of Florida
HLB or Huanglongbing

- *Candidatus* Liberibacter asiaticus
- Found in Miami, FL in 2005 (Halbert 2005)
- Visual symptoms
  - Often confused with deficiency symptoms
- All citrus are susceptible
- No cure
HLB symptoms
Asian citrus psyllid (*Diaphorina citri* Kuwayama)

– Only vector known in the US
– Detected in Florida 1998 (Halbert 2005)
Citrus producing States and risk of HLB

USDA – APHIS (2006 to 2008)
Induced and acquired resistance to insects and diseases

Induced resistance to insects
- Jasmonic Acid
- PPO & PIN
  - Oxidative burst
  - Local wound response
- Systemin

Systemic Acquired resistance to pathogens
- Salicylic Acid
- PR Proteins
  - Oxidative burst
  - Cell death
  - Salicylic Acid
  - Local responses

Insect injury

Bostock et al 2001

Elicitor

Photo: R. H. Briansky and M. E. Rogers (2007)
- 6 ha field Valencia oranges
- Special Foliar Treatment (SFT):
  - SAR inducers
    - (Serenade ® -Bacillus subtilis- & Saver ® -Salicylic acid-)
  - Macro and Micronutrients
  - Fungicide/ Bactericide (Hydrogen Peroxide & K₃PO₃)
  - Emulsifier (435 Oil)
- 2 x 2 factorial (RCBD 4 reps)

<table>
<thead>
<tr>
<th></th>
<th>No- Insecticide</th>
<th>Insecticide</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-SAR</td>
<td>Control</td>
<td>Insecticide</td>
</tr>
<tr>
<td>SFT</td>
<td>SFT</td>
<td>SFT+ Insecticide</td>
</tr>
</tbody>
</table>
– Psyllid sampling
  • 10 trees
  • 2 tap per tree
  • Average per tree

– HLB sampling
  • 10 trees (+ or -) for HLB symptoms
- HLB since 2005
- Evenly distributed
- SFT 4 times a year
- Insecticide application based on scouting
Effect of the treatments on ACP populations

Average No of ACP per tree

Danitol (fenpropathrin 16 oz/acre)  Delegate (spinetoram 4 oz/acre)

- Insecticide + SFT
- Control
- Insecticide
- SFT

SFT

Effect of Insecticide treatments on ACP populations

Average No of ACP per tree

22-Mar 1-May 10-Jun 20-Jul 29-Aug 8-Oct

2008

Danitol (fenpropatrin 16 oz/acre)
Delegate (spinetoram 4 oz/acre)

Insecticide

No insecticide

Enpropath 
Delegat 
Danitol (fenpropatrin 16 oz/acre)
Effect of STF on ACP populations

Average No of ACP per tree

22-Mar 1-May 10-Jun 20-Jul 29-Aug 8-Oct

2008

No STF STF

* SFT
Effect of the treatments on HLB symptoms

- Insecticide + SFT
- Control
- Insecticide
- Delegate (spirolopan 4 oz/acre)
- Deblitot (fenpropatrin 16 oz/acre)

Proportion of trees w/ HLB symptoms

Date:
- 22-Mar
- 1-May
- 10-Jun
- 20-Jul
- 29-Aug
- 8-Oct

** SFT
Effects of STF on HLB symptoms

Proportion of trees w/ HLB symptoms


No SFT SFT

* SFT
Effect of Insecticide on HLB Symptoms

Proportion of trees w/ HLB symptoms

- Insecticide
- No insecticide

Danitol (fenpropathrin 16 oz/acre)
Delegate (spider pham 4 oz/acre)

22-Mar 1-May 10-Jun 20-Jul 29-Aug 8-Oct
2008
Effects on Psyllids

- Insecticides prove to be effective maintaining low psyllid populations
- Insecticide protection may last for more than 3 months
- Psyllids seem to stay in the same area, without moving to un-colonized areas within the same field
- STF has no effect on psyllids
Effect on HLB symptoms

- Differences due to STF observed during the first 5 months (March-July)
- No differences due to STF during the last 5 months (August-November)
- Insecticides had no effect on symptoms
Future Research

- Continue with the evaluation of long term effects of STF and insecticides on HLB symptoms, psyllid populations, and yield
- Determine the effect of STF on individual symptoms
- Correlate HLB detection based on PCR and visual symptoms with treatments applied
Effect on HLB symptoms

– Bryant (Barron Collier Co.)
– Maury Boyd (Orange Hammock Grove)
– Florida Citrus Production Research Advisory Council (FCPRAC)
– Aimee Fraulo
– Miriam Ortez
– Entomology Group at the SWFREC/UF