Citrus Production in China - in Face of Huanglongbing (HLB)

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Visalia, CA
US and China look like each other
Citrus Production, HLB, ACP, and Survey & Method Development in China
Citrus Production in China

• Quick factors & numbers:
  • Citrus is produced in 19 provinces, total 985 counties
  • 2.0 M hectares, 120-fold increase vs. 1950
  • 23.0 M tons of fruits
  • $4.0 billion domestic
  • $0.4 billion export
Cultivar/Species

- Tangerine: 37.3%
- Mandarin: 33.4%
- Pummelo: 11.0%
- Sweet Orange: 17.0%
- Others: 1.3%
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• HLB in China
Citrus Production, HLB, ACP, and Survey & Method Development in China

- **Major survey & method devlp. site**
- **HLB occurrence region**
- **Citrus cultivated in most area of the province**
- **Citrus cultivated in limited area of the province**
Background

HLB

- The most devastating citrus disease worldwide
- First reported in China > 100 years ago
- Occurring in almost all citrus production countries
- First reported in Florida in 2005, about 1/3 citrus production gone in the state
- Very recently, reported in Texas and California

Two Projects funded by US Farm Bill through USDA APHIS

- Huanglongbing and Asian Citrus Psyllid Field Research and Outreach
- Chinese Literature Review of Asian Citrus Psyllid and Huanglongbing
- USDA-APHIS-PPQ-CPHST is a strong supporter and collaborator
- Univ. of Florida and many others
- Almost all Chinese CG scientists
• However, there are old citrus trees left
The Youth Citrus Farm near HLB the Ground Zero

43-year old citrus tree (Lu mandarin, *Citrus reticulata*) with good yield (right) and reset generation of citrus plants next to older trees
A more than 200 year-old of *Citrus sunki* grows well in Guangxi, in spite of the fact that the province is one of the most serious HLB occurrence area in the world (credit: BAI XJ)
Highlight of Progress/Achievements

Major Findings

1) Review of Nutritional Approach
2) Heat-based Approach
3) A Potential New Vector
4) Biological Control
5) Literature Review
6) Survey
Resistance or tolerance?

- Ample evidence of different responses of mature citrus plants after HLB infection:
  - pomelo
  - sweet orange
  - mandarin
  1. Flushing patterns?
  2. Systemic-acquired resistance (SAR)?
Literature Review – nutritional approach

Outcomes

1. Despite long application/research history, **there is no inconsistent evidence that nutritional approach works.**

2. No widespread current use for HLB management in China. **But micronutrients, optimized irrigation are commonly used in well-managed groves**

A leaf spray micronutrient product used in China

. . . . . . . to be continued
Outcomes

3. However, nutritional approach seems to “do the trick” in the following cases:
   - infected **mature sweet orange** plants (> 10 years) can sustain production and survive up to 5 years, consistent with early study in Florida (Phil Stansly)
   - Specifically, **pomelo** survives and maintain productivity longer -- evidence being confirmed.
   - **Large citrus plants and plants grown from seeds** show a better response to nutritional approach, consistent with early US reports (Georges Vidalakis: http://acpnurseryworkshop.ucr.edu/georges.html)
Before

1 month after treatment
Plastic sheeting being placed over frame

Plastic sheeting

A treated plant showing frame under plastic

A non-treated control plant
Heat-based Approach – field study

Las titer changes in the individual plants one month post-treatment

Untreated plants

Treated plants
Plastic sheeting being placed over frame

A treated plant showing frame under plastic
A non-treated control plant
A Potential New Vector

In field
ACP → Asian HLB
Trioza erytreae → African HLB

In Lab
African HLB ↔ ACP ↔ Asian HLB
African HLB ↔ Trioza erytreae → Asian HLB
A Potential New Vector

African HLB

Asian HLB

800 meter
A Potential New Vector

*Cacopsylla (Psylla) citrisuga (?)* feeding on Lemon trees
A Potential New Vector

*Cacopsylla (Psylla) citrisuga (?)* and plant damage
Biological Control

Literature Review

• 1) A collection of 765 Chinese publications on HLB and ACP.
• 2) Complete (verbatim) translations of critical literature into English (the project first ranked the available publications by importance).
• 3) Additionally, US counterparts have requested specific projects supporting specific challenges to HLB management in Florida.
Literature Review

• 4) Collection, review, and survey of research in critical areas such as shoot (flush) control using chemicals and ACP and HLB distribution survey.
Thank You!