The Role of Bactericides in Huanglongbing Management

Stephanie Slinski, IRCHLB 3/15/2017
CRDF Bactericide program

• What are the goals of this program?
• How do we try to achieve these goals?

Less of this

More of this
How to Help Citrus Growers

What the growers need *now*
- Keep trees in production
- Slow the decline of infected trees
- Improve fruit quality
- Protect replants
- How?

Soon?
Resistance
Tolerance
CRDF Bactericide Program

Goal – get effective bactericides to growers

• First step - identification of potential bactericides
  • R & D Libraries
    • Agricultural Chemical Companies
    • Pharmaceutical Companies
  • Other Industries
  • Researchers
  • Agricultural Chemicals (Labeled for other crops)
CRDF Bactericide Discovery

• What have we been looking at?
  • More than 1000 chemicals tested *in vitro*
    • Antibiotics
    • Nanomaterials
    • New molecular entities
    • Minimum risk
    • Biopesticides
    • Agricultural chemicals

• How to prioritize?
Bactericide Discovery

- Average development of a new active is 11.3 years

Panel of studies:
- Ecological Risk Assessment
- Human Health Risk Assessment

Required residue trials for Citrus Subgroup:
- 12 trials in Region 3 (FL)
- 2 in Region 6 (TX)
- 9 in Region 10 (CA)

Bactericide Discovery

2010-14

Registration 11.7%
Chemistry 17.1%
Total research 37.3%
Biology 17.8%
Tox/Environmental Chemistry 2.4%
Development Chemistry 12.3%
Field trials 16.5%
Toxicology 10.0%
Environmental Chemistry 51.0%
Total development 51.0%

Total =$286 m.

Bactericide Discovery

• First step in the bactericide discovery process
  • What works in the petri plate?
  • More than 1000 chemicals tested
    • Antibiotics
    • Nanomaterials
    • New molecular entities
      • Minimum risk
      • Biopesticides
      • Agricultural chemicals

• Near-term therapies needed
• Next-generation bactericides are also important

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Some bactericides are easier to register

- **Biopesticide**
  - Derived from natural materials such as animals, plants, bacteria, and certain minerals.
  - Considered reduced risk pesticides
  - May require a significantly reduced data set compared to conventional registrations.
  - Registration time and fees
    - Biopesticide = 19 months and $48,621
    - Conventional Pesticide = 24 months and over $590,000

**Minimum-Risk**

- Exempt from registration under FIFRA section 25(b)
- Exempt Ingredients, both active and inert, are demonstrably safe for the intended use
Bactericide Discovery

• Labeled pesticides are a good solution
  • Time-to-market ~ 3 years
• Streptomycin and OTC

~ 1 year plus 24 month PRIA timeline (EPA)

Required residue trials for Citrus Subgroup:
• 12 trials in Region 3 (FL)
• 2 in Region 6 (TX)
• 9 in Region 10 (CA)

Bactericide Evaluations

- How do we test materials
  - Assay system

- Several field trials are in place to test bactericides
Bactericide Evaluation

Biopesticide Trial

• All botanical oil products
  • Thyme Guard (Agro Research International)
  • Ecotrol Plus (Keyplex)
  • Onguard EO (AgXplore)
  • Xplode (AgXplore)
  • Research EO

• Company application recommendations/adjuvants (foliar)
• Applications every 60 days
Bactericide Evaluation

Biopesticide Trial
• Two nearby blocks
  • One with no HLB detected
  • One 100% HLB detection

• After one year: no significant improvement in any treatment at either site

• Evaluations
  • Disease severity
  • Bacterial titer
  • Growth measurements
  • Leaf Nutrition
  • Canker
  • Fruit Drop
  • Yield
Bactericide Evaluations

Grower Bactericide Trials

• Non-RCB

• Evaluating grower bactericide programs
  • Any adjuvant, tank mix, timing etc.

• Evaluation methods
  • 20 trees in four blocks in control and treatment row
    • Disease Severity (3x/year)
    • PCR (3x/year)
    • Yield
    • Fruit Drop

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<tr>
<th>Variety</th>
<th>Number of Trials</th>
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<tr>
<td>Valencia</td>
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<td>Hamlin</td>
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<td>Grapefruit</td>
<td>11</td>
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<td>Other</td>
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• 20 sites harvested
# Grower Bactericide Trials

## Valencia

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<th>Control</th>
<th>Treatment</th>
<th>p</th>
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## Graphs

- **PG-1**
  - Control
  - Treatment

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## Grower Bactericide Trials

<table>
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<th>Grapefruit</th>
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[Graph of BG6-B showing control vs treatment with p values indicated]
Bactericide Delivery

• Are the bactericides effective, but delivery not?
  • Improved delivery may improve efficacy
  • Trunk injection has been evaluated in the past
    • Are new formulations more effective?
    • Less phytotoxic?
• Concerns
  • Multiple injections are not economical
• Residues
  • Modification of the pesticide label requires new residue study
Bactericide Delivery

- CRDF Field Trial - Trunk injection versus foliar application
  - 2 Injection events versus three foliar applications
  - Results - No significant improvement in health

- What next?
  - Change concentration?
    - Residue problem?
  - Change Volume?
  - Change Injection Technology
    - Are there other application technologies that will improve uptake?
  - More work to be done
Conclusions

• What is the role of bactericides in HLB management?
  • Effect bactericides may support the industry in the short-term
• Why do we still have so few bactericides?
  • New effective materials have a long timeline
  • Need significant financial support
    • Citrus is a minor crop
• Regulatory
  • Important cross-resistance concerns/human health
• Delivery
  • How do we deliver bactericides to the phloem?
Thank you

CRDF is proud to provide support to the Florida citrus industry