Leap™: A New Dual Action Biorational Pesticide for Plant Disease Management and Insect Control

2nd Ag Innovation Conference
August 13, 2017

Russ Eldridge
Value of fruiting vegetable market (U.S.)

- **Bell peppers**
  - Approximately 45-50,000 acres planted
  - Approximate value of $618 million (2014 NASS)

- **Tomato**
  - Approximately 100,000 open field acres planted
  - Approximate value of >$2 billion (2016 NASS)
Caterpillar pests of tomato and pepper

- Tomato hornworm
  \textit{(Manduca quinquemaculata)}
- Southern armyworm
  \textit{(Spodoptera eridania)}
- Tomato fruit worm/corn earworm
  \textit{(Helicoverpa zea)}
Tomato and Pepper Bacterial Diseases

Disease Activity

- Xanthomonas spp.
- Pseudomonas spp.

Bacterial Spot—Peppers

Bacterial Spot—Tomatoes
Bacterial spot disease distribution

Areas where Xanthomonas campestris pv vesicatoria
WHY ARE BACTERIAL DISEASES IMPORTANT?

- Major disease issue, particularly in tomato, pepper with the main markets in the southeast U.S.
  - In SW Florida, annual yield loss caused by bacterial spot on fresh tomato is estimated at $3500/acre (Paret, 2013)
- Few control options
- Copper used significantly
  - Resistance developing due to over-use
  - Environmental concerns
- Actigard® (Acibenzolar-S-methyl)
  - Dominant SAR inducer
  - Can cause yield drag on some crops such as pepper
BTK + MESA OVERVIEW

- Active Ingredients
  - *Bacillus thuringiensis kurstaki*
    - Strain *ABTS-351* (same strain as found in the VBC commercial product DiPel®)
    - Lepidoptera-specific toxins
  - Methyl Salicylate (MeSA)
    - MeSA is oil of wintergreen
    - Triggers plant defense systems (SAR) against pathogen infection and spread
    - Not directly toxic to pathogens
Leap background

- **Product Concept:** A novel product containing both bacterial disease management and Lepidoptera control, providing a much needed new tool for bacterial disease, while decreasing the disease points of entry made by Lepidoptera pests

- “Remember that every bite an insect takes from your crop, the greater chance that plant will catch a disease, as a bite is an open wound.” “There are far more insects than ever, so more damage means more entry points for disease.” From: Brian Hefty, AgPhD newsletter, July, 2016.
LEAP PRODUCT CHARACTERISTICS

- ES Formulation
  - *Bt kurstaki* (64BIU/gal.; 17,600 IU/mg)
  - MeSA (5.9%)
  - Easy to mix
- Packaging: 2.5 gallon containers
- Labeled only on tomato and pepper
- Label Use rate: 0.5-2 quarts/acre
- Low potential of phytotoxicity at labeled use rates
  - Not to be used with adjuvants/surfactants
- No residue issues/0 hour PHI
- Basic PPE
- Leap does not have an organic listing
LEAP™ TRIAL LOCATIONS SOUTHEAST
LEAP™ HAS ACTIVITY ON TOMATO HORNWORM

Cooperator: Gary Cloud Consulting
Pest: Manduca quinquemaculata
Crop: Tomato
Site: Georgia
## LEAP PROGRAMS – LEPIDOPTERA CONTROL
(SOUTHERN ARMYWORM *SPODOPTERA ERIDINA*)

<table>
<thead>
<tr>
<th>Product</th>
<th>Rate</th>
<th>Unit</th>
<th>% Larvae control (based on No of larvae per 10 plants)</th>
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<tbody>
<tr>
<td>UTC</td>
<td>na</td>
<td>na</td>
<td>0</td>
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<tr>
<td>Delegate® (Spinetoram)</td>
<td>8.00</td>
<td>oz/a</td>
<td>a</td>
</tr>
<tr>
<td>Leap</td>
<td>1.00</td>
<td>Qt/A</td>
<td>a</td>
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</table>

**Product:**
- UTC
- Delegate® (Spinetoram)
- Leap

**Rate:**
- na
- 8.00
- 1.00

**Unit:**
- na
- oz/a
- Qt/A

**#Obs:**
- 4

*Graph showing % Larvae control (based on No of larvae per 10 plants) for UTC and Delegate® (Spinetoram) and Leap.*
Cabbage looper (*Trichoplusia ni*) control

ManKocide = Mancozeb
### LEAP PROGRAM WITH SEQUENTIAL APPLICATIONS (LEAP FB LEAP....) ON TOMATOES

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<th>Unit</th>
<th>#Obs</th>
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<tbody>
<tr>
<td>UTC</td>
<td>na</td>
<td>na</td>
<td>9</td>
</tr>
<tr>
<td>Actigard</td>
<td>0.50</td>
<td>oz/a</td>
<td>9</td>
</tr>
<tr>
<td>Leap</td>
<td>1.00</td>
<td>Qt/A</td>
<td>9</td>
</tr>
<tr>
<td>Leap</td>
<td>2.00</td>
<td>Qt/A</td>
<td>9</td>
</tr>
</tbody>
</table>

% bacterial spot disease severity versus msl

- UTC: 0
- Actigard: 1.00 oz/a
- Leap: 2.00 Qt/A

Legend:
- a
- b
- na

Note: Confidential - Internal Use Only

Creative Hybrid Chemistry
LEAP PROGRAM WITH SEQUENTIAL APPLICATIONS (LEAP FB LEAP....) ON TOMATOES

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</table>
Crop: Tomato
Pest: Bacterial spot; *Xanthomonas euvesicatoria*
Application: Leap and Actigard alternated weekly with ManKocide (3 lb/A); 4 apps of each;

Crop Yield (lb./plot)

Stats on Total

- 3rd Harv
- 2nd Harv
- 1st Harv

Harvest Date: 6/3, 10, 17
Site: Quitman, GA
Country: USA

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# Tomato Bacterial Spot Disease Efficacy

<table>
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<tr>
<th>TRT</th>
<th>Desc</th>
<th>App Code</th>
<th>Rate</th>
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<tr>
<td>1UTC</td>
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<td>NA</td>
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<tr>
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<td>2Actgrd</td>
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<tr>
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<td>CG</td>
<td>8 oz/a</td>
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</tr>
<tr>
<td>2ManKocide</td>
<td>DH</td>
<td>3 lb/a</td>
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<tr>
<td>3Leap</td>
<td>A-H</td>
<td>1 qt/a</td>
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<tr>
<td>4Leap</td>
<td>ACEG</td>
<td>1 qt/a</td>
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<tr>
<td>4Actinovate</td>
<td>ACEG</td>
<td>8 oz/a</td>
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<tr>
<td>4ManKocide</td>
<td>BDFH</td>
<td>3 lb/a</td>
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</tr>
</tbody>
</table>

**AUDPC**

- T1: 43.3
- T2: 13.2
- T3: 30.2
- T4: 8.3

*Actigard® = Acibenzolar-S-methyl*  
*Actinovate® = Streptomyces lydicus*  
*ManKocide® = Mancozeb*
LEAP FOR BLACK ROT DISEASE (XANTHOMONAS CAMPESTRIS) MANAGEMENT

Final evaluation 48 days after planting

Leap and Actigard Comparison for Management of Cabbage Black Rot

ManKocide = Mancozeb

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SUMMARY

▪ New product for bacterial disease and Lepidoptera pest control in tomato and pepper
▪ Two way protection based on methyl salicylate (disease) and *Bt kurstaki* (insecticide) active ingredients
▪ Proven results as stand-alone or in a rotation program
▪ Biorational pesticide
  ▪ Non-restricted use
  ▪ No residue issues
  ▪ Easy on beneficial insects
Listed Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Trademark Status</th>
<th>Company</th>
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<tbody>
<tr>
<td>Leap™</td>
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<tr>
<td>DiPel®</td>
<td>registered trademark of Valent BioSciences LLC</td>
<td>Valent BioSciences LLC</td>
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<tr>
<td>Actigard®</td>
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<tr>
<td>Delegate®</td>
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<tr>
<td>ManKocide®</td>
<td>registered trademark of Kocide LLC</td>
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<tr>
<td>Actinovate®</td>
<td>registered trademark of Novozymes BioAg Inc.</td>
<td>Novozymes BioAg Inc.</td>
</tr>
</tbody>
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Thank You!