Pest Management Options in Processing Snap Beans

January 17, 2013

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Wisconsin Vegetable Pest Management

Options for Insect Pest Management – More than ever before!

- Cultural controls
- Host plant resistance
- Transgenic plants IR traits
- Natural enemies
- Reduced-Risk Chemical Insecticides
- Baits and baiting systems
- Population disruption
- Entomopathogens

Vegetable IPM
With increasing affluence and trade with the developing world, there will be increasing concerns about pesticide usage and perceived environmental effects.

This has, and will continue to accelerate the shift to “softer” products and technologies.
Major food retailers are setting acceptable residue levels below those set by government regulatory agencies. "No detectable residues" will be a competitive advantage for food retailers.

Older insecticides that do not meet these requirements are not being re-registered, resulting in increased use of novel insecticides (reduced-risk & bio-pesticides).
Insecticides for Managing Snap Bean Pests

Recently Labeled in Wisconsin:

- Radiant SC (spinetoram)
- Coragen 1.67 SC (chlorantraniliprole) – foliar
- Blackhawk (spinosad) – foliar
- Beseige (chlorantraniliprole + lambda-cyhalothrin)
- Belt SC (flubendiamide) – foliar
- Entrust SC (spinosad) - foliar

In the Pipeline or in Review:

- Dermacor X (chlorantraniliprole) - not supported
- Voliam Flexi (chlorantraniliprole + thiamethoxam)
- Benevia, Verimark (cyantraniliprole) – 2013/14
Anthranillic Diamide Insecticides

- **Active ingredients**: rynaxypyr (aka chlorantraniliprole) and cyazypyr (aka cyantraniliprole).

- **Class**: anthranilic diamide (IRAC MoA Class 28)

- **Mode of action**: ryanodine receptor modulator
  - Systemic activity
  - Most effective through ingestion
  - Insects stop feeding, become paralyzed and die within 1 to 3 days
  - Applied to soil at planting, drip chemigation and foliar spray (seed treatment)
  - Exceptionally long residual control – xylem mobile
  - Active against Lepidopterans, Coleoptera, and Hemiptera
Major Snap Bean Pests in Midwest

- Seedcorn Maggot (SCM)
- Potato Leafhopper (PLH)
- European corn borer (ECB)
European Corn Borer Lifecycle

**Eggs**
- Laid in masses (20-50)
- Black dots at hatch, 5-7 days

**Larva**
- Overwinter in corn stalks
- 5 instars (2-4 weeks) 1st and 2nd external.

**Adult**
- 2 normal flight peaks June-Aug (1400 DD_{50} and 1733 DD_{50})

**Pupa**
- Inside stems 10-14 days

ECB SEASONAL LIFECYCLE
European Corn Borer: Snap bean damage

- Pods preferred if present
- Small larvae external
- Damage marginal
- Serious problem
- Later instars bore into stems
- Plants easily compensate
- Rejection threshold 1/1000
**European Corn Borer Management**

1. Predict flight with degree days:
   - $1^{st} = 375 \text{ DD}_{50}$, $2^{nd} 1400 \text{ DD}_{50}$ and $3^{rd} 1733 \text{ DD}_{50}$

2. Monitor flights:
   - Network of blacklight traps (DATCP)

3. Treat plants @ early bloom / pin bean stage:
   - $(15 \text{ & } 100 \text{ moths/night, } 1^{st} \text{ and } 2^{nd} \text{ generation})$
Processing Snap Bean: European Corn Borer, Pest Phenology

ECB Phenology

Date

Redrawn with permission, Brian Flood Del Monte Foods
Refine sustainable production practices to reduce environmental and economic risk

- Refined insect management in snap beans
  - at plant, in-furrow applications and fertilizer side-dress applications

**Need to protect green bean crop during vulnerable stages**

- **Early Planting**
- **Mid Planting**
- **Late Planting**

**Side-dress application(s) 2013**
**At-plant application(s) 2012**

- 15-Mar
- 14-Apr
- 14-May
- 13-Jun
- 13-Jul
- 12-Aug
- 11-Sep
- 11-Oct
Objective

- To evaluate the efficacy of chlorantraniliprole and cyantraniliprole when applied as in furrow and fertilizer pre-mix applications for managing seedcorn maggot, potato leafhopper and European corn borer
# Products Evaluated for Managing Insect Pests of Snap Bean in WI, 2011

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Type*</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UTC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Coragen</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>3.5 fl oz/acre</td>
</tr>
<tr>
<td>3. Coragen</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>4. Coragen</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>7.0 fl oz/acre</td>
</tr>
<tr>
<td>5. Verimark</td>
<td>cyazypyr</td>
<td>IF</td>
<td>10.2 fl oz/acre</td>
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<tr>
<td>6. Coragen</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>3.5 fl oz/acre</td>
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<tr>
<td>7. Coragen</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>8. Coragen</td>
<td>rynaxypyr</td>
<td>LF</td>
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<td>9. Verimark</td>
<td>cyazypyr</td>
<td>LF</td>
<td>10.2 fl oz/acre</td>
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<tr>
<td>10. Coragen</td>
<td>rynaxypyr</td>
<td>DF</td>
<td>5.0 fl oz/acre</td>
</tr>
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<td>11. Coragen</td>
<td>rynaxypyr</td>
<td>DF</td>
<td>7.0 fl oz/acre</td>
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<td>12. Verimark</td>
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<td>13. Coragen</td>
<td>rynaxypyr</td>
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<td>15. Coragen</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>7.0 fl oz/acre**</td>
</tr>
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<td>16. Verimark</td>
<td>cyazypyr</td>
<td>LF</td>
<td>10.2 fl oz/acre**</td>
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*IF = in furrow application; LF = liquid fertilizer; DF = dry fertilizer

**Trts 13-16 pre-mixed 10:1 with H₂O before mixing with fertilizer
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<td>7.0 fl oz/acre</td>
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<tr>
<td>5. Verimark 20 SC</td>
<td>cyazypyr</td>
<td>IF</td>
<td>10.2 fl oz/acre</td>
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<tr>
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<td>cyazypyr</td>
<td>IF</td>
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<td>rynaxypyr</td>
<td>F</td>
<td>5.0 fl oz/acre</td>
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<td>12. Exirel 10SE</td>
<td>cyazypyr</td>
<td>F</td>
<td>13.5 fl oz/acre</td>
</tr>
</tbody>
</table>

*IF = in furrow application; LF = liquid fertilizer; F = foliar

**Trts 7-10 pre-mixed, 10:1 with H₂O before mixing with fertilizer**
Infested 10 plant row with ~ 500 ECB larvae
Percent Snap Bean Pods Damaged by European corn borer

Plover, WI 2010

1st pinning 13 July 2010  N=4

Seed treatments

Mean % damaged pods

Treatments

Untreated  Dermacor (low)  Dermacor (med)  Dermacor (high)  Dermacor (low) + Exp  HGW86 (low)  HGW86 (high)  Cruiser  Coragen (5.0)  Coragen (7.0)  HGW86 10SE (10.1)  Coragen (3.5)

In-furrow  Foliar
Percent Snap Bean Stems Damaged by European corn borer  
Plover, WI 2011

Mean % damaged stems (25 plants)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Percent Snap Bean Stems Damaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-furrow</td>
<td></td>
</tr>
<tr>
<td>LF Pre</td>
<td></td>
</tr>
<tr>
<td>DF Pre</td>
<td></td>
</tr>
<tr>
<td>LF Pre</td>
<td></td>
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</table>

P < 0.0001   N=4
Percent Snap Bean Pods with Larvae of European corn borer Plover, WI 2011

Mean % infested pods (25 plants)

P < 0.0001   N=4

Treatments

In-furrow

LF Pre

DF Pre

LF Pre

Percent Snap Bean Pods with Larvae

P < 0.0001   N=4

Treatments

Mean % infested pods (25 plants)
Percent Snap Bean Stems Damaged by European Corn Borer

Plover, WI 2012

Mean percent ECB damaged stems

Treatments

In-furrow

Liq Fert Pre-Mix

Foliar

Untreated, Coragen 3.5, Coragen 5.0, Coragen 7.0, Verimark 10.2, Verimark 13.5, Coragen 5.0, Coragen 7.0, Verimark 10, Verimark 13.5, Coragen 5.0, Exirel 13.5

P = 0.0890   N=4
Percent Snap Bean Stems with Larvae of European Corn Borer  Plover, WI 2012

Mean percent ECB damaged stems

P = 0.0421   N=4

Treatments

- In-furrow
- Liq Fert Pre-Mix
- Foliar
2012 Field Trial
‘Pickle Pete’
### 2012 Del Monte Field Trial
Products Evaluated for Managing Insect Pests

<table>
<thead>
<tr>
<th>Product</th>
<th>Appl. Type*</th>
<th>Mean PLH (25 sweeps)</th>
<th>Mean % Damaged Pods</th>
<th>Mean % Damaged Stems</th>
<th>Mean Yield (tons/acre)</th>
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</thead>
<tbody>
<tr>
<td>1. Coragen 1.67 SC</td>
<td>SD</td>
<td>2.0 ± 0.3 ab</td>
<td>0.0</td>
<td>0.0</td>
<td>5.88</td>
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<tr>
<td>2. Coragen 1.67 SC</td>
<td>IF</td>
<td>2.4 ± 0.4 b</td>
<td>0.0</td>
<td>0.0</td>
<td>5.43</td>
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<tr>
<td>3. UTC</td>
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<td>5.1 ± 0.3 a</td>
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<td>1.7 ± 0.2</td>
<td>4.26</td>
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<tr>
<td>4. Coragen 1.67 SC</td>
<td>F</td>
<td>0.4 ± 0.2 b</td>
<td>0.0</td>
<td>0.0</td>
<td>5.23</td>
</tr>
<tr>
<td>5. Brigade 2SC</td>
<td>F</td>
<td>0.3 ± 0.15 b</td>
<td>0.0</td>
<td>0.0</td>
<td>4.9</td>
</tr>
</tbody>
</table>

*SD=side dress, IF = in furrow, F = foliar application

**Trts 1 & 2 pre-mixed ,10:1 with H₂O before mixing with fertilizer
Advantages of Novel Application Technologies

• Reduced risk to environment and farm workers
  – Drift to non-target areas is eliminated
  – Farm workers do not come into contact with residues on exterior of plant
  – Beneficial organisms not directly exposed

• Longer residual activity
  – Not subject to loss from rain and UV light
  – Not subject to plant growth dilution effects

• More cost-effective
Summary

• Rynaxypyr and cyazypyr appear to have activity some activity against seedcorn maggot, but limited effects on potato leafhopper.

• Rynaxypyr and cyazypyr were effective against ECB when applied as a in-furrow and as a liquid fertilizer pre-mix applications.

• 2013, broadcast dry fertilizer, side-dress treatments and refinement of foliar uses.
Building Market Foundations for Sustainable Vegetable Production and Processing: A Consumer and Metrics-Based Approach


Goal. “Enhanced potential for improved efficiency, productivity, and profitability for the vegetable production and processing industry based on an improved understanding of the role of consumer markets”

Approach. “Beginning with the market, work with growers, processors, and distributors to explore how to generate market rewards through science-based sustainability that is measurable and profitable”

Specialty Crop Research Initiative

http://ipcm.wisc.edu/SCRI/
Project Objectives

**Objective 1.** Identify consumer preferences and willingness to pay for sustainably produced and processed vegetables and quantify market segments.

**Objective 2:** Create and test sustainability assessment tools and sustainability metrics for commercial vegetable growers.

**Objective 3:** Validate and improve the relationship between practice-based sustainability assessments and environmental and economic outcomes at the farm scale in each region.

- Implement sustainable practices to identify opportunities for improved water, nitrogen, and pesticide use efficiency at the field and farm level (Bland, Colquhoun, Mitchell, Ruark).

- Refine sustainable production practices to reduce environmental and economic risk (Bland, Colquhuon, Hutchison, Groves, Gevens, Nault, Ruark).

**Objective 4:** Build critical mass of support for sustainably grown and processed vegetables.
Can Timing of Insecticide Application be Improved for ECB Control - 2013?

Current Recommendations for ECB Control

- Planting (May 31)
- Spray (July 16)
- Harvest (Aug. 3)
- Bud Bloom Pin

Alternative Timing for ECB Control?

- Planting (May 31)
- Co-apply with fungicide (July 10)?
- Harvest (Aug. 3)
- Bud Bloom Pin
Can Timing of Insecticide Application be Improved for ECB Control - 2013?

Current Recommendations for ECB Control

Alternative Timing for ECB Control?
Can Timing of Insecticide Application be Improved for ECB Control – 2013?

Current Recommendations for ECB Control

- Planting (May 31)
- Spray (July 16)
- Harvest (Aug. 3)

Alternative Timing for ECB Control?

- Planting (May 31)
- Co-apply side-dress (June 16)?
- Harvest (Aug. 3)
Acknowledgements

Collaborators
Brian Nault
Tom Kuhar

Technical Support
Ryan Curtin
Kelly Kohrs
Trisha Pernsteiner
Seth Abbott
Christina Stiff
Adam Ruechel

Funding
Midwest Food Processors Association
DuPont Crop Protection