Pest Management Options in Processing Snap Beans

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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
Factors Influencing Insect Pest Management

‘Food Safety and Residues’

– 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)
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.
<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>rynaxypryr</td>
<td>IF</td>
<td>3.5 fl oz/acre</td>
</tr>
<tr>
<td>3. Coragen</td>
<td>rynaxypryr</td>
<td>IF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>4. Coragen</td>
<td>rynaxypryr</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>
</tr>
<tr>
<td>6. Coragen</td>
<td>rynaxypryr</td>
<td>LF</td>
<td>3.5 fl oz/acre</td>
</tr>
<tr>
<td>7. Coragen</td>
<td>rynaxypryr</td>
<td>LF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>8. Coragen</td>
<td>rynaxypryr</td>
<td>LF</td>
<td>7.0 fl oz/acre</td>
</tr>
<tr>
<td>9. Verimark</td>
<td>cyazypyr</td>
<td>LF</td>
<td>10.2 fl oz/acre</td>
</tr>
<tr>
<td>10. Coragen</td>
<td>rynaxypryr</td>
<td>DF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>11. Coragen</td>
<td>rynaxypryr</td>
<td>DF</td>
<td>7.0 fl oz/acre</td>
</tr>
<tr>
<td>12. Verimark</td>
<td>cyazypyr</td>
<td>DF</td>
<td>10.2 fl oz/acre</td>
</tr>
<tr>
<td>13. Coragen</td>
<td>rynaxypryr</td>
<td>LF</td>
<td>3.5 fl oz/acre**</td>
</tr>
<tr>
<td>14. Coragen</td>
<td>rynaxypryr</td>
<td>LF</td>
<td>5.0 fl oz/acre**</td>
</tr>
<tr>
<td>15. Coragen</td>
<td>rynaxypryr</td>
<td>LF</td>
<td>7.0 fl oz/acre**</td>
</tr>
<tr>
<td>16. Verimark</td>
<td>cyazypyr</td>
<td>LF</td>
<td>10.2 fl oz/acre**</td>
</tr>
</tbody>
</table>

*IF = in furrow application; LF = liquid fertilizer; DF = dry fertilizer

**Trts 13-16 pre-mixed 10:1 with H₂O before mixing with fertilizer
## Products Evaluated for Managing Insect Pests of Snap Bean in WI, 2012

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Type*</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UTC</td>
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<td></td>
</tr>
<tr>
<td>2. Coragen 1.67 SC</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>3.5 fl oz/acre</td>
</tr>
<tr>
<td>3. Coragen 1.67 SC</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>4. Coragen 1.67 SC</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>7.0 fl oz/acre</td>
</tr>
<tr>
<td>5. Verimark 20 SC</td>
<td>cyazypyr</td>
<td>IF</td>
<td>10.2 fl oz/acre</td>
</tr>
<tr>
<td>6. Verimark 20 SC</td>
<td>cyazypyr</td>
<td>IF</td>
<td>13.5 fl oz/acre</td>
</tr>
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<td>7. Coragen 1.67 SC</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>8. Coragen 1.67 SC</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>7.0 fl oz/acre</td>
</tr>
<tr>
<td>9. Verimark 20 SC</td>
<td>cyazypyr</td>
<td>LF</td>
<td>10.2 fl oz/acre</td>
</tr>
<tr>
<td>10. Verimark 20 SC</td>
<td>cyazypyr</td>
<td>LF</td>
<td>13.5 fl oz/acre</td>
</tr>
<tr>
<td>11. Coragen 1.67 SC</td>
<td>rynaxypyr</td>
<td>F</td>
<td>5.0 fl oz/acre</td>
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<tr>
<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**
Seedcorn Maggot (SCM)
Percent Snap Bean Seedlings Damaged by Seedcorn Maggot

Plover, WI 2011

Mean % damaged seedlings (20 ft rows)

Treatments

In-furrow

LF Pre

DF Pre

LF Pre

P = 0.0812  N=4
Percent Snap Bean Seedlings Damaged by Seedcorn Maggot Plover, WI 2012

Mean % damaged seedlings (20 ft rows)

P = 0.014  N=4

In-furrow

Liq Fert
Pre-Mix
Foliar

Treatments

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
Potato Leafhopper (PLH)

Treated with insecticides

Untreated
Number of Adult Potato Leafhoppers per 25 sweeps (avg. for 18 and 25 June) Arlington, WI 2010

Mean number of PLH per 25 sweeps

Treatments
- Untreated
- Dermacor (low)
- Dermacor (med)
- Dermacor (high)
- Dermacor (low) + Exp
- Verimark (low)
- Verimark (high)
- Cruiser
- Coragen (5.0)
- Coragen (7.0)
- Coragen (10.1)
- Benveia 10SE (10.1)
- Coragen (3.5)

Seed treatments
- In-furrow
- Foliar

N=4

Legend:
- a
- b
- bc
- c
Number of Adult Potato Leafhoppers per 25 sweeps (22 June)  Plover, WI 2012

Mean number of PLH / 25 sweeps

P = 0.1131   N=4

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
European Corn Borer (ECB)
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

In-furrow Foliar

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)
Percent Snap Bean Stems Damaged by European corn borer Plover, WI 2011

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Mean % damaged stems (25 plants)</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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</tbody>
</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

Untreated  Coragen 3.5  Coragen 5.0  Coragen 7.0  Verimark (10.2)  Coragen 3.5  Coragen 5.0  Verimark (10.2)  Coragen 3.5  Coragen 5.0  Coragen 7.0  Verimark (10.2)
Percent Snap Bean Stems Damaged by European Corn Borer

Plover, WI 2012

Mean percent ECB damaged stems

- In-furrow
- Liq Fert Pre-Mix
- Foliar

Treatments:
- Untreated
- Coragen 3.5
- Coragen 5.0
- Verimark 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

Untreated  Coragen 3.5  Coragen 5.0  Coragen 7.0  Verimark 10  Verimark 13.5  Coragen 5.0  Coragen 7.0  Verimark 10  Verimark 13.5  Coragen 5.0  Exirel 13.5
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>
</tr>
</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>
<td>--</td>
<td>5.1 ± 0.3 a</td>
<td>0.0</td>
<td>1.7 ± 0.2</td>
<td>4.26</td>
</tr>
<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 treatments and refinement of foliar uses
Brown Marmorated Stink Bug
Know Your Stink Bug’s

BMSB

GSB

BSB
Identifying the Brown Marmorated Stink Bug

Look for these unique identifying features…

- red eyes & ocelli
- black and white banding
- white banding
Ventral side - light colored; may have black or gray markings

Legs – brown with faint white bands
Current BMSB Distribution in the United States

Survey Status of Brown Marmorated Stink Bug - *Halyomorpha halys*
2008 to present

Stages of Invasion by Alien Species
Arrival → Establishment → Integration → Spread
Factors Contributing to BMSB Abundance

• Wide host range
  – >300 plants are hosts
  – Allows for populations to buildup in many non-managed habitats (woods) or field crops with few insecticide sprays (i.e., soybean)

• Absence of effective natural enemies
  – % parasitism in US by native *Trissolcus* spp. <5%
  – % parasitism in China 50-80%

• Highly mobile and “nervous” insect
Crops less preferred by BMSB than other vegetables
Vegetable crops that are probably not suitable host plants by BMSB
Management recommendations for BMSB

- Check field margins next to woodlots for the first sign of invasion.

- Direct examinations for adults and nymphs, as well as for injured fruit.

- No treatment thresholds for fruit or vegetable crops.

- Treating areas 30-50 ft from field edges next to woodlots may stop invasion.

- Multiple applications spaced 5-7 days apart may be necessary, if re-invasion occurs.
<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Active Ingredient(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endosulfan</td>
<td>Thionex 3EC</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Scorpion 3.24</td>
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<tr>
<td>Thiamethoxam</td>
<td>Actara 50WG</td>
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<tr>
<td>Dinotefuran</td>
<td>Venom 70SG</td>
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<tr>
<td>Methomyl</td>
<td>Lannate LV</td>
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<tr>
<td>Clothianidin</td>
<td>Belay</td>
</tr>
<tr>
<td>Thiacloprid</td>
<td>Calypso</td>
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<tr>
<td>Acephate</td>
<td>Acephate 97UP</td>
</tr>
<tr>
<td>Oxamyl</td>
<td>Vydate L</td>
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<tr>
<td>Carbaryl</td>
<td>Sevin XLR Plus</td>
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<tr>
<td>Acetamiprid</td>
<td>Assail 30SG</td>
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<tr>
<td>Imidacloprid</td>
<td>Provado 1.6F</td>
</tr>
<tr>
<td>Flubendiamide</td>
<td>Belt SC</td>
</tr>
</tbody>
</table>

Green Bean Dip Lab Assay by Tom Kuhar VPI
If you see (suspect) a Brown Marmorated Stink Bug...

- Contact your County Extension Educator at [http://www.csrees.usda.gov/Extension](http://www.csrees.usda.gov/Extension)

- Stinkbugs that are suspected to be the BMSB should be sent for positive identification. Stinkbug samples from Wisconsin will be processed for free at UW; please send stinkbug samples to:
  
  Attn: BMSB Reports  
  Phil Pelleterri and Pest Diagnostic Clinic  
  Department of Entomology, Rm. 240  
  1630 Linden Drive,  
  University of Wisconsin  
  Madison, WI  53706

- DO NOT ship live insects. Please place dead insects in a leak-proof, crush-proof container (e.g., plastic medicine bottle or film canister).

- Additional details regarding submitting insect specimens are available at: [http://www.entomology.wisc.edu/diaglab/entodiag.html#submit](http://www.entomology.wisc.edu/diaglab/entodiag.html#submit)
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