New In-Furrow and Fertilizer Pre-Mix Insecticides for Use in Snap Bean

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Insecticides for Managing Snap Bean Pests

Recently Labeled in Wisconsin:

• Radiant SC (spinetoram)
• Coragen 1.67 SC (chlorantraniliprole) – foliar
• Entrust (spinosad) – seed treatment
• Voliam Xpress (chlorantraniliprole + lambda-cyhalothrin)

In the Pipeline:

• Dermacor X (chlorantraniliprole) - not supported
• Durivo, Voliam Flexi (chlorantraniliprole + thiamethoxam)
• Benevia, Verimark (cyantraniliprole)
• Belt 480SC (flubendiamide)
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
# Products Evaluated for Managing Insect Pests of Snap Bean in WI, NY and VA in 2010

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Type*</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Dermacor X</td>
<td>rynaxypyr</td>
<td>ST</td>
<td>1.28 fl oz/cwt of seed</td>
</tr>
<tr>
<td>Dermacor X</td>
<td>rynaxypyr</td>
<td>ST</td>
<td>2.56 fl oz/cwt of seed</td>
</tr>
<tr>
<td>Dermacor X</td>
<td>rynaxypyr</td>
<td>ST</td>
<td>3.84 fl oz/cwt of seed</td>
</tr>
<tr>
<td>Dermacor X DPX YX860</td>
<td>rynaxypyr</td>
<td>ST</td>
<td>3.84 fl oz/cwt of seed</td>
</tr>
<tr>
<td>Dermacor X DPX YX860</td>
<td>experimental</td>
<td>ST</td>
<td>1.28 fl oz/cwt of seed</td>
</tr>
<tr>
<td>HGW86 60FS</td>
<td>cyazypyr</td>
<td>ST</td>
<td>1.28 fl oz/cwt of seed</td>
</tr>
<tr>
<td>HGW86 60FS</td>
<td>cyazypyr</td>
<td>ST</td>
<td>3.84 fl oz/cwt of seed</td>
</tr>
<tr>
<td>Cruiser</td>
<td>thiamethoxam</td>
<td>ST</td>
<td>1.28 fl oz/cwt of seed</td>
</tr>
<tr>
<td>Coragen 1.67SC</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>5 fl oz/acre</td>
</tr>
<tr>
<td>Coragen 1.67SC</td>
<td>rynaxypyr</td>
<td>IF</td>
<td>7 fl oz/acre</td>
</tr>
<tr>
<td>HGW86 10SE + MSO</td>
<td>cyazypyr</td>
<td>F</td>
<td>10.1 fl oz/acre</td>
</tr>
<tr>
<td>Coragen 1.67SC + MSO</td>
<td>rynaxypyr</td>
<td>F</td>
<td>3.5 fl oz/acre</td>
</tr>
</tbody>
</table>

*ST = seed treatment; IF = in furrow application; F = foliar
**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>
</tr>
<tr>
<td>6. Coragen</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>3.5 fl oz/acre</td>
</tr>
<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>
<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>rynaxypyr</td>
<td>DF</td>
<td>5.0 fl oz/acre</td>
</tr>
<tr>
<td>11. Coragen</td>
<td>rynaxypyr</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>rynaxypyr</td>
<td>LF</td>
<td>3.5 fl oz/acre**</td>
</tr>
<tr>
<td>14. Coragen</td>
<td>rynaxypyr</td>
<td>LF</td>
<td>5.0 fl oz/acre**</td>
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<tr>
<td>15. Coragen</td>
<td>rynaxypyr</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
Seedcorn Maggot (SCM)
Percent Snap Bean Seedlings Damaged by Seedcorn Maggot

Plover, WI 2011

Mean % damaged seedlings (20 ft rows)

In-furrow   LF Pre   DF Pre   LF Pre

Treatments

P = 0.0812   N=4

Untaxed: Coragen 3.5: Coragen 5.0: Verimark (10.2): Coragen 7.0: Coragen 3.5: Coragen 5.0: Verimark (10.2): Coragen 5.0: Verimark (10.2): Coragen 3.5: Coragen 5.0: Verimark (10.2)
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

Seed treatments

In-furrow

Foliar

N=4

0 10 20 30 40 50

Untreated

Dermacor (low)

Dermacor (med)

Dermacor (high)

Dermacor (low) + Exp

Verimark (low)

Verimark (high)

Cruiser

Coragen (5.0)

Coragen (7.0)

Benevia 10SE (10.1)

Coragen (3.5)
European Corn Borer (ECB)
Infested 10 plant row with ~ 500 ECB larvae
Percent Snap Bean Pods Damaged by European corn borer Plover, WI 2010

Mean % damaged pods

Treatments

1st pinning 13 July 2010  N=4

Seed treatments

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

P < 0.0001  N=4

In-furrow  LF Pre  DF Pre  LF Pre

Mean % damaged stems (25 plants)

Treatments

Untreated  Coragen 3.5  Coragen 5.0  Verimark (10.2)  Coragen 3.5  Coragen 5.0  Verimark (10.2)  Coragen 5.0  Verimark (10.2)  Coragen 3.5  Coragen 5.0  Verimark (10.2)
Mean Percent of Damaged Pods Damaged by European Corn Borer

Plover, WI 2011

P = 0.0232   N=4

Mean % damaged pods (25 ft rows)

In-furrow  LF Pre  DF Pre  LF Pre

Treatments

- Untreated
- Coragen 3.5
- Coragen 5.0
- Verimark (10.2)
- Coragen 7.0
- Coragen 3.5
- Coragen 5.0
- Verimark (10.2)
- Coragen 7.0
- Coragen 3.5
- Coragen 5.0
- Verimark (10.2)
Percent Snap Bean Pods with Larvae of European corn borer Plover, WI 2011

Mean % infested pods (25 plants)

Untreated  Coragen 3.5  Coragen 5.0  Coragen 7.0  Verimark (10.2)  Coragen 3.5  Coragen 5.0  Verimark (10.2)  Coragen 7.0  Verimark  Coragen 3.5  Coragen 5.0  Verimark (10.2)

Treatments

P < 0.0001  N=4
Mean Yield of Snap Bean Pods
Arlington, WI 2010

P = 0.0427    N=4

Seed treatments

<table>
<thead>
<tr>
<th>Treatments</th>
<th>In-furrow</th>
<th>Foliar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dermcor (low)</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Dermcor (med)</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Dermcor (high)</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Dermcor (low) + Exp</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Verimark (low)</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Verimark (high)</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Cruiser</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Coragen (5.0)</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Coragen (7.0)</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Benevia 10SE (10.1)</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Coragen (3.5)</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>
Mean Yield of Snap Bean Pods
Plover, WI  2011

Mean yield snap bean pods (tons ac\(^{-1}\))

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Mean Yield (tons ac(^{-1}))</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>
</tr>
</tbody>
</table>

P = 0.9390   N=4

Treatments:
- Untreated
- Coragen 3.5
- Coragen 5.0
- Verimark (10.2)
- Coragen 3.5
- Coragen 5.0
- Verimark (10.2)
- Coragen 5.0
- Verimark (10.2)
- Coragen 3.5
- Coragen 5.0
- Verimark (10.2)
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 have activity against seedcorn maggot, potato leafhopper and European corn borer.

• Rynaxypyr and cyazypyr were effective against the target pest when applied as a in-furrow and when applied as a liquid fertilizer pre-mix application.
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

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.
BMSB Management Tactics

Insecticidal control

- Lab and field tests suggest that certain pyrethroids and neonicotinoids provide the best control.
- Disruptive to natural enemies, undermine IPM programs.
- Repeated use fosters outbreaks of secondary pests.
- Depending on the crop, adult stink bugs sometimes recover after knocked down by pyrethroids.
- Very hazardous to bees.
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

• 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
Acknowledgements

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