Populations of Beneficial Insects in Sweet Corn Using Methyl Salicylate Based PredaLure® Insect Attractant

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Kentucky Sweet Corn Facts

- Sweet corn is among the major vegetables grown in Kentucky during the summer months
- Produced on small farms throughout the state
- Helping to replace lost tobacco income through sales at farmers’ markets, roadside stands, KY Marketing Coops, KY Produce Auction and KY Produce Shippers
- In 2002 the total acreage in Kentucky was estimated to be 810 ha (2,000 acres)
- Since then production in Kentucky increased 39% to 1,134 ha (2,800 acres)
- Value of the crop is > $5 million
Methods of Insect Control

• Primarily insecticide use (Warrior®, Mustang®, Pounce®)
• Transgenic insecticidal cultivars (Bt corn)
• Traditional resistant varieties
• Organic insecticide use (some Bts, Entrust®)
• Biological Control (predators, parasites, pathogens: naturally occurring vs. augmented)
• Mechanical removal of insects
Conservation Biological Control

• Incorporates practices (e.g., chemical ecology) that attract predators and parasitoids into crop systems

• Strengthening the natural enemy community by increasing density and species diversity to suppress pests is the goal

• Exploiting beneficial insect attractants (semiochemicals) is a growing field of CBC
Examples of Semiochemicals

- **2-phenylethanol** attractive to pink lady beetle (Coccinellidae) and green lacewing (Chrysopidae), developed into a lure for predaceous insects (**Benallure®**)

- **Methyl salicylate** attractive to *Geocoris pallens* (Lygaeidae); syrphid flies (Syrphidae); *Stethorus punctum* (Coccinellidae); green lacewing (Chrysopidae) in hops (**PredaLure®**)

- **Methyl salicylate** attractive to green lacewing (Chrysopidae); *Hemerobius* sp. (Hemerobiidae); *Deraecoris brevis* (Miridae); *Stethorus punctum* (Coccinellidae); and *Orius tristicolor* (Anthocoridae) in grapes and hops (**PredaLure®**)

- **Methyl salicylate** attractive to *Coccinella septempunctata* (Coccinellidae) in laboratory studies
Objective

To determine the effects of PredaLure® beneficial insect attractant on populations of beneficial insects in organically and conventionally grown sweet corn
Materials and Methods

- Experimental plots located in the certified organic section of KSU’s Agricultural Research and Demonstration Farm
- Experimental plots located at the UK South Farm Horticulture Research Farm
- Sweet corn plots planted using Syngenta’s untreated ‘Garrison’ hybrid for organic plots and treated ‘Garrison’ seed for conventional plots
- Plots were 21 m long X 12 m wide (0.03 ha)
- Row spacing was 0.9 m and plant spacing was 20 cm
- Standard organic agricultural practices were used
- Conventional agricultural practices were used (double row raised bed rows and no insecticides applied)
Materials and Methods con’t.

• Organic plots were plowed and disced and a preplant application of Nature Safe fertilizer (10-2-8) was made

• Organic plots were roto tilled between rows when plants were 6 leaf stage, hand weeded within rows thereafter

• A RCBD was used with three replicates of baited and non baited plots

• A minimum of 50 m between plots
Materials and Methods con’t.

- Conventional plots were plowed and disced and a preplant application of 10-10-10 was made
- Bicep II Magnum® herbicide used for weed control
- A RCBD was used with four replicates of baited and non baited plots
- A minimum of 50 m between plots
Lure and Trap Placement Organic Plots

- Five lures were placed in each plot and hung at tassel height.
- One 15 cm X 15 cm sticky trap was deployed at each trap location.
Lure and Trap Placement
Conventional Plots

- Six lures were placed in each plot and hung at tassel height
- One 15 cm X 15 cm sticky trap was deployed at each trap location
Materials and Methods

• Traps were changed weekly through anthesis
• Sticky traps were wrapped individually in clear plastic wrap, labeled, and transported to the laboratory for insect identification and enumeration

• SAS ANOVA used to analyze all data
Beneficial Insects Organic Plots

- Pink lady beetle, *Coleomegilla maculata*
- Asian lady beetle, *Harmonia axyridis*
- Spotless lady beetle, *Cycloneda munda*
- 7-Spotted lady beetle, *Coccinella septempunctata*
- Parenthesis lady beetle, *Hippodamia parenthesis*
- Big eyed bug, *Geocoris punctipes*
- Green lacewing, *Chrysoperla carnea*
Pink Lady Beetle Organic Plots

<table>
<thead>
<tr>
<th>Sampling Date</th>
<th>Avg. No. per Trap</th>
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<tbody>
<tr>
<td>Aug 3</td>
<td>PredAlure: a, No PredAlure: a</td>
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<tr>
<td>Aug 10</td>
<td>PredAlure: a, No PredAlure: a</td>
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<tr>
<td>Aug 17</td>
<td>PredAlure: a, No PredAlure: a</td>
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Asian Lady Beetle Organic Plots

![Bar chart showing the average number of Asian lady beetles per trap with PredAlure and No PredAlure treatments on Aug 3, Aug 10, and Aug 17. The chart indicates that the presence of PredAlure significantly reduces the number of beetles.](chart.png)
Seven Spotted Lady Beetle Organic Plots

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<td>Aug 3</td>
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<td>Aug 10</td>
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<td>Aug 17</td>
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Legend:
- PredAlure
- No PredAlure
Big Eyed Bug Organic Plots

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<td>Aug 3</td>
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<td>Aug 10</td>
<td>PredAlure: 6, No PredAlure: 4</td>
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<tr>
<td>Aug 17</td>
<td>PredAlure: 7, No PredAlure: 5</td>
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Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 3
Aug 10
Aug 17

Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 3
Aug 10
Aug 17

Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 3
Aug 10
Aug 17

Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 3
Aug 10
Aug 17

Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 3
Aug 10
Aug 17

Sampling Date
Beneficial Insects Conventional Plots

- Pink lady beetle, *Coleomegilla maculata*
- Asian lady beetle, *Harmonia axyridis*
- Spotless lady beetle, *Cycloneda munda*
- 7-Spotted lady beetle, *Coccinella septempunctata*
- Parenthesis lady beetle, *Hippodamia parenthesis*
- Large parenthesis lady beetle, *Hippodamia glacialis*
- Convergent lady beetle, *Hippodamia convergens*
- Variegated lady beetle, *Hippodamia variegata*
- Mildew eating lady beetle, *Psyllobora vigintinmaculata*
- Big eyed bug, *Geocoris punctipes*
- Green lacewing, *Chrysoperla carnea*
Pink Lady Beetle Conventional Plots

Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 13  Aug 19  Aug 26

Avg. No. per Trap

PredAlure  No PredAlure

Aug 13
Aug 19
Aug 26

Sampling Date

Avg. No. per Trap
Asian Lady Beetle Conventional Plots

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<td>Aug 19</td>
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<tr>
<td>Aug 26</td>
<td>No PredAlure</td>
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Sampling Date

Avg. No. per Trap

PredAlure
No PredAlure

Aug 13

Aug 19

Aug 26

a

b

a

a

a

a
Summary and Conclusions

- Five species of lady beetles, one species of big eyed bug and the green lacewing were caught in organic sweet corn plots.
- Pink lady beetle and big eyed bug were the two most abundant predators caught in organic plots.
Summary and Conclusions cont.

• Pink lady beetle, Asian lady beetle and big eyed bug represented 61%, 16% and 20% of the total beneficial insects caught, respectively, remaining species represented only 3%

• There was a tendency toward higher numbers of Asian lady beetles in plots where PredaLure had been deployed
Summary and Conclusions cont.

• Nine species of lady beetles, one species of big eyed bug, one species of green lacewing and one species of brown lacewing were found in the conventional study plots.

• Pink lady beetle and Asian lady beetle were the most abundant predators in the conventional sweet corn plots.

• Pink lady beetle and Asian lady beetle accounted for 56% and 28% of the predatory insects caught in the conventional sweet corn plots.
Summary and Conclusions cont.

• The big eyed bug, green lacewing and seven spotted lady beetle represented 6%, 4% and 3%, respectively, of the total number caught

• The remaining seven species represented 3% of the total number caught

• There were significantly greater numbers of pink lady beetle, Asian lady beetle, green lacewing and big eyed bugs caught in PredaLure baited plots
Summary and Conclusions cont.

- No significant differences between baited and unbaited organic plots could be due to odors of MeSa being masked by odors of pigweed in the plots.
- Experiments need to be repeated with greater weed control in the organic plots.
- Experiments need to be repeated with greater separation between baited and unbaited plots, saturation of study areas with MeSa could impact the numbers caught in control plots.
Summary and Conclusions cont.

• PredaLure lures show some promise of attracting greater numbers of predatory insects to sweet corn

• Need to quantify and analyze damage to sweet corn ears in baited vs. non baited plots

• Need to deploy these lures in other vegetable and fruit crops
Acknowledgments

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