Insect Management in Onions: New and Special Registration Updates

Wisconsin Muck Farmers Association: Annual Meeting

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Target Pests: Seed Maggot

Onion Maggot
*Delia antiqua*

Seed corn Maggot
*Delia platura*

Maggot Damage
Problems Controlling Onion Maggot

- Chlorpyrifos (Lorsban) not as effective

- Performance of cyromazine seed treatment (Trigard) has varied
  - May not effectively control seedcorn maggot
  - Some onion maggot populations have likely developed resistance

- New insecticides are needed!
<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Company</th>
<th>Active Ingredient for OM</th>
<th>Chemical Class (IRAC\textsuperscript{2} group)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diazinon AG500</td>
<td>Makhteshim</td>
<td>Diazinon</td>
<td>OP (1)</td>
<td>Pre-plant broadcast &amp; incorporate</td>
</tr>
<tr>
<td>Diazinon 50WP Etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorsban 4E, 75WG,</td>
<td>Dow AgroSciences</td>
<td>Chlorpyrifos</td>
<td>OP (1)</td>
<td>At planting in-furrow, Post-planting banded spray over row</td>
</tr>
<tr>
<td>Advanced and OLF\textsuperscript{1}</td>
<td>(Lorsban), other companies for OLF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigard</td>
<td>Syngenta</td>
<td>Cyromazine</td>
<td>Triazine (17)</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Sepresto</td>
<td>Bayer Crop Sciences</td>
<td>Clothianidin + imidacloprid</td>
<td>Neonicotinoid (4) + Neonicotinoid (4)</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>FarMore FI500</td>
<td>Syngenta</td>
<td>Thiamethoxam + spinosad</td>
<td>Neonicotinoid (4) + Spinosyn (5)</td>
<td>Seed treatment</td>
</tr>
</tbody>
</table>

OLF: other labeled formulation such as Warhawk. \textsuperscript{2}IRAC: Insecticide resistance action committee
Sepresto 75 WS

• Combination of two neonicotinoids
  – 3:1 ratio of clothianidin (same active as Poncho) and imidacloprid (same active as Admire)

• Controls onion maggot & seedcorn maggot

• Available only as part of a seed treatment package: “CAPS”
  – ”C”=Coronet, “A”=Allegiance, “P”=Pro Gro and “S”=Sepresto

• Available exclusively on Nunhem’s onion varieties
  – e.g., Hendrix and Pulsar
Combination of spinosad & thiamethoxam

- Spinosad controls onion maggots and seedcorn maggots; thiamethoxam does not control onion maggot

Controls onion maggot & seedcorn maggot

Includes 3 fungicides

- Mefenoxan, Fludioxonil & Azoxystrobin

Must include fungicide for smut – Important!

- Pro Gro on seed OR mancozeb as drench treatment

Available on all onion varieties
Onion Maggot Control in Onion - 2012

Palmyra, WI

Mean Percent Plants Killed by Maggots

- Untreated
- Lorsban
- FarMore
- FarMore+Lorsban

$P = 0.0174$
Onion Maggot Control in Onion - 2012

Oswego, NY

Mean Percent Plants Killed by Maggots

- Untreated
- Lorsban
- Trigard
- Trigard+Lorsban
- Sepresto
- Sepresto+Lorsban
- FarMore
- FarMore+Lorsban

P < 0.0001
Summary

Onion maggot control with new seed treatments

- **FarMore Fl500** was effective for controlling onion maggot; inclusion of Lorsban not worthwhile
- **Sepresto** reduced onion maggot damage; inclusion of Lorsban seemed to help
- **Trigard** alone did not perform well
- **Lorsban** alone did not perform well
- **Trigard + Lorsban** was okay for controlling onion maggot in one location; not good in another
Insecticide Resistance is an Issue

- Onion maggots are resistant in some fields
  - Resistance likely to occur with continuous exposure
  - Trigard has performed poorly in some fields; resistance never confirmed, but suspected

- Resuscitating Lorsban (and Trigard)
  - Maggot populations may become controllable with Lorsban after eliminating exposure of population to it for a several years

- No new effective products on the horizon - lack of interest from companies to pursue new registrations for onion maggot control
  - Imperative to preserve the useful life of Sepresto and FarMore FI500.
Resistance Management Strategy

*in an ideal world…*

- Rotate among chemical classes on all acreage every year
- Consider a long-range insecticide rotation plan for your farm
- Coordinate resistance plans with neighbors
Next major onion pest: Onion thrips

Onion Thrips, *Thrips tabaci* Lindeman

Onion Thrips Damage

larva

adult

‘silvering’
Evaluating Insecticides for Thrips Management in Onion

- First application @ 1 larva/leaf
- 2 - Weekly sprays – 2012 (22 and 29 June)
- Record number of thrips larvae per plant from 10 plants per plot 3, 7, 14, and 21 days after spray
New Products

Product Now Registered on onion in U.S. including NY:

- Agri-Mek 0.15EC & Agri-Mek SC (abamectin)

Products in the Pipeline:

- Movento (spirotetramat) – has federal label on many vegetable crops, but still not onion (target 2013-14: IR-4)
- Benevia 10 OD (cyantraniliprole) – not labeled; (target 4th quarter 2012)
- Tolfenpyrad 15EC (tolfenpyrad) – labeled on greenhouse crops, but not onion (target 2014)

Section 18 for 2013 season:

- Movento (Re-submission to WI-DATCP and EPA)
## 2012 Foliar Insecticide Evaluations

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Rate (amnt/unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Warrior II</td>
<td>lambda-cyhalothrin</td>
<td>1.92 fl oz</td>
</tr>
<tr>
<td>Benevia 10OD</td>
<td>cyantraniliprole</td>
<td>10.1 &amp; 13.5 fl oz</td>
</tr>
<tr>
<td>Radiant SC</td>
<td>spinetoram</td>
<td>6.0 &amp; 8.0 fl oz</td>
</tr>
<tr>
<td>Movento 2SC</td>
<td>spirotetramat</td>
<td>3.5 &amp; 5.0 fl oz</td>
</tr>
<tr>
<td>Agri-Mek 0.7SC</td>
<td>abamectin</td>
<td>3.5 fl oz</td>
</tr>
<tr>
<td>Agri-Mek 0.15EC</td>
<td>abamectin</td>
<td>16.0 fl oz</td>
</tr>
<tr>
<td>Torac 4EC</td>
<td>tolfenpyrad</td>
<td>24.0 fl oz</td>
</tr>
<tr>
<td>Lannate LV</td>
<td>methomyl</td>
<td>3.0 pt</td>
</tr>
<tr>
<td>Assail 30SG</td>
<td>acetamiprid</td>
<td>4.0 oz</td>
</tr>
</tbody>
</table>

Note: Products highlighted in yellow are labeled on onion in WI in 2012

Experiment arranged as RCBD with 4 replicates.
Foliar Applied Insecticides for Onion Thrips Control 2012 (7 days after 2\textsuperscript{nd} application)

Note: Plot sprayed on 6/22 and 2/29 @ threshold of 1 thrips/leaf.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean number of larvae / leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>a</td>
</tr>
<tr>
<td>Warrior (10.1)</td>
<td>a</td>
</tr>
<tr>
<td>Benevia (13.5)</td>
<td>c</td>
</tr>
<tr>
<td>Radiant (6.0)</td>
<td>c</td>
</tr>
<tr>
<td>Radiant (8.0)</td>
<td>c</td>
</tr>
<tr>
<td>Movento (3.5)</td>
<td>c</td>
</tr>
<tr>
<td>Movento (5.0)</td>
<td>c</td>
</tr>
<tr>
<td>Agri-Mek 0.7 (3.5)</td>
<td>c</td>
</tr>
<tr>
<td>Agri-Mek 0.15 (16.0)</td>
<td>c</td>
</tr>
<tr>
<td>Torac (24.0)</td>
<td>c</td>
</tr>
<tr>
<td>Lannate (3.0)</td>
<td>b</td>
</tr>
<tr>
<td>Assail (4.0)</td>
<td>ab</td>
</tr>
</tbody>
</table>

Action threshold (1.0 thrips/leaf)

P < 0.0001
Application Sequence and Thresholds

• **Product should not be applied more than twice**
  - *Movento, Agri-Mek and Radiant*

• **Product should be applied consecutively**
  - Limits number of thrips generations exposed to product (thrips generation time ~ 2 to 3 wks)

• **Do not use the same chemistry class more than one time per season**

• **Minimize use (time sprays using thresholds)**

* Specifications on Section 18s*
Insecticide Treatment Programs
(Small Plot Study, Friendship, WI)

### Sequence of Insecticide Application Programs

<table>
<thead>
<tr>
<th>Insecticide Application Program</th>
<th>Week 1  (June 22)</th>
<th>Week 2  (June 29)</th>
<th>Week 3  (July 6)</th>
<th>Week 4  (July 13)</th>
<th>Week 5  (July 20)</th>
<th>Week 6  (July 27)</th>
<th>Week 7  (Aug. 3)</th>
<th>Week 8  (Aug. 10)</th>
<th>Week 9  (Aug 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>IRM P1</strong></td>
<td>Movento (5.0)</td>
<td>Movento (5.0)</td>
<td>Agri-Mek (3.5)</td>
<td>Agri-Mek (3.0)</td>
<td>Lannate (3.0)</td>
<td>Lannate (2.5)</td>
<td>Radiant (8.0)</td>
<td>Radiant (6.0)</td>
<td>-</td>
</tr>
<tr>
<td><strong>IRM P2</strong></td>
<td>Movento (5.0)</td>
<td>Movento (5.0)</td>
<td>Radiant (8.0)</td>
<td>-</td>
<td>Agri-Mek (3.5)</td>
<td>Agri-Mek (3.0)</td>
<td>Lannate (3.0)</td>
<td>Lannate (3.0)</td>
<td>Silencer (1.92)</td>
</tr>
<tr>
<td><strong>IRM P3</strong></td>
<td>Radiant (8.0)</td>
<td>-</td>
<td>Movento (5.0)</td>
<td>Movento (5.0)</td>
<td>Agri-Mek (3.5)</td>
<td>-</td>
<td>Lannate (3.0)</td>
<td>Lannate (3.0)</td>
<td>Silencer (1.92)</td>
</tr>
<tr>
<td><strong>IRM P4</strong></td>
<td>Silencer (1.92)</td>
<td>Silencer (1.92)</td>
<td>Lannate (3.0)</td>
<td>Lannate (3.0)</td>
<td>Movento (5.0)</td>
<td>Movento (5.0)</td>
<td>Radiant (8.0)</td>
<td>Radiant (8.0)</td>
<td>Silencer (1.92)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Products</th>
<th>(Rate per acre)</th>
<th>Action Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movento</td>
<td>5.0 fl. oz</td>
<td>1 larva/leaf</td>
</tr>
<tr>
<td>Agri-Mek SC</td>
<td>3.5-3.0 fl. oz</td>
<td>1 larva/leaf</td>
</tr>
<tr>
<td>Lannate LV</td>
<td>3.0-2.5 pts</td>
<td>1 larva/leaf</td>
</tr>
<tr>
<td>Radiant SC</td>
<td>6.0-8.0 fl. oz</td>
<td>3 larvae/leaf</td>
</tr>
<tr>
<td>Silencer</td>
<td>3.84 fl. oz</td>
<td>1 larva/leaf</td>
</tr>
</tbody>
</table>
Onion Thrips Densities in Untreated Control Plots (Small Plot Study)

Mean number of thrips/leaf

Date

Untreated Control


0 5 10 15 20 25 30 35
Onion Thrips Densities in Untreated Control Plots (Small Plot Study)

Total Number of Sprays = 8

<table>
<thead>
<tr>
<th>Date</th>
<th>Untreated Control</th>
<th>IPM Program 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-Jun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22-Jun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29-Jun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Jul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-Jul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-Jul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27-Jul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-Aug</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-Aug</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-Aug</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Products**
- Movento 2SC
- Agri-Mek 0.75C
- Lannate LV
- Radiant SC

**Mean number of thrips / leaf**

**Date**
Onion Thrips Densities in Untreated Control Plots (Small Plot Study)

Total Number of Sprays = 8

Mean number of thrips/leaf

Date


Products
Movento 2SC
Agri-Mek 0.75C
Lannate LV
Radiant SC
Silencer EC

Untreated Control
IPM Program 2
Onion Thrips Densities in Untreated Control Plots (Small Plot Study)

Mean number of thrips/leaf

Total Number of Sprays = 7

Products
- Movento 2SC
- Agri-Mek 0.75C
- Lannate LV
- Radiant SC
- Silencer EC

Date
- 15-Jun
- 22-Jun
- 29-Jun
- 6-Jul
- 13-Jul
- 20-Jul
- 27-Jul
- 3-Aug
- 10-Aug
- 17-Aug

Untreated Control
IPM Program 3
Onion Thrips Densities in Untreated Control Plots (Small Plot Study)

Mean number of thrips/leaf

Date


Total Number of Sprays = 8

Untreated Control
IPM Program 4

Products
- Movento 2SC
- Agri-Mek 0.75C
- Lannate LV
- Radiant SC
- Silencer EC

Total Number of Sprays = 8
Example of Insecticide Application Sequence

Need to protect crop from thrips for 8 weeks

* Movento
* Agri-Mek
* Radiant

Onions


Harvest

* Section 18 Emergency Exemption Registration in Wisconsin
Action Thresholds for Onion Thrips in Onion

- Radiant SC: 3 larvae per leaf
- Lannate LV: \( \leq 1 \) larva per leaf
- *Movento*: 1 larva per leaf
- Agri-Mek: 1 larva per leaf

* Section 18 Emergency Exemption Registration in Wisconsin
Summary: Sequences and Action Thresholds

- Movento should be used early in the season when adults thrips populations are low.
- Agri-Mek must be used early as well because of a 30 d pre-harvest interval.
- Radiant should be used later in the season when populations are high - adulticidal.
- Consider timing sprays based on action thresholds rather than the calendar.
Impact of **Fungicide** on Density of Thrips Larvae Treated with Movento (5.0 fl oz)

![Bar chart showing impact of fungicides on thrips larvae](image)

Elba, NY 2012: $P = 0.0209$

- **N=4**
- **Mean Total Number Larvae/Plant**

- **None**: a
- **Chloronil**: b
- **Dithane**: a
- **Rovral**: a
- **Scala**: a
- **Quadris**: a

** NOTE: 12-35% reduction in thrips control with Chloronil in tank mix!**
# Impact of Rates of Induce on Insecticide Performance (2012)

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Rate of Induce</th>
<th>Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>None</td>
<td>Chloronil</td>
</tr>
<tr>
<td>Untreated</td>
<td>0.5% v:v</td>
<td>Chloronil</td>
</tr>
<tr>
<td>Movento</td>
<td>None</td>
<td>Chloronil</td>
</tr>
<tr>
<td>Movento</td>
<td>0.05% v:v</td>
<td>Chloronil</td>
</tr>
<tr>
<td>Movento</td>
<td>0.1% v:v</td>
<td>Chloronil</td>
</tr>
<tr>
<td>Movento</td>
<td>0.25% v:v</td>
<td>Chloronil</td>
</tr>
<tr>
<td>Movento</td>
<td>0.5% v:v</td>
<td>Chloronil</td>
</tr>
</tbody>
</table>
Onion Thrips Control in Onion - 2012
(Total after 2 weekly sprays)

Elba, NY 2012

Mean Total Number Larvae/Plant

- Untreated
- Induce@0.5% only
- Movento only
- Movento+Induce@0.05%
- Movento+Induce@0.1%
- Movento+Induce@0.25%
- Movento+Induce@0.5%

P < 0.0001
Summary

Evaluating Performance of Insecticides when Mixed with Fungicides

- **Movento and Agri-Mek** must include a penetrating surfactant to maximize thrips control

- **Chloronil** co-applied with either Movento or Agri-Mek reduced thrips control; **APPLY SEPARATELY or INCLUDE HIGH RATE OF PEN. SURFACTANT**

- **Dithane F45 Rainshield, Rovral 4F, Scala SC and Quadris F** co-applied with either Movento or Agri-mek did not reduce thrips control

- Higher rates of Induce improved thrips control in tank mixes of **Movento and Chloronil**
Acknowledgements

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- Wisconsin Muck Farmers Association
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- Bayer Crop Science

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- Shiprock Farms, Friendship, WI

**Research Cooperators**
- Brian Nault, Cornell University