Management of onion maggot on seeded onions

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Onion maggot (*Delia antiqua*) life cycle

- **Eggs**: oviposited at onion base
- **Maggots**: feed on onions causing seedling death and unmarketable bulbs
- **Overwinter**: as pupae
- **Adult emergence**:

Three generations per year in Ontario, Canada

- **210 day degrees, base 4°C**
**Onion maggot**  
(*Delia antiqua*)

- Attacks seedling onions
- Attracted by scent of rotting onions
- 3 generations a year, most damage in the spring
- Overwinter as pupae in soil
- Damage is higher in cool, wet seasons and in high organic matter soils

**Seed corn maggot**  
(*Delia platura*)

- Attacks many crops, including onions and corn
- Attracted by rotting plant material
- 3 – 5 generations per year, most damage in spring
- Overwinter as pupae in soil
- Damage is higher in cool, wet seasons and in high organic matter soils
Onion maggot and seed corn maggot

3:1 onion maggot to seed corn maggot
## Registered Insecticides for Maggot Control in Ontario

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active Ingredient</th>
<th>Class</th>
<th>Method of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepresto</td>
<td>clothianidin + imidaclorpid</td>
<td>Neonicotinoid + Neonicotinoid</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Governor</td>
<td>cyromazine</td>
<td>Triazine</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Lorsban</td>
<td>chlorpyrifos</td>
<td>OP</td>
<td>In furrow at seeding</td>
</tr>
<tr>
<td>Diazinon</td>
<td>diazinon</td>
<td>OP</td>
<td>Soil drench at seeding</td>
</tr>
</tbody>
</table>
Field Trials from 2010 to 2019

• Lorsban has been the standard treatment for many years
• Resistance to Lorsban has been observed
• Can seed treatments be as effective?
• Seed treatments may not work for transplants, need to investigate alternatives
Benefits of Seed Treatments

- Seed treatments are important for control of maggots and onion smut:
- Easy to use
- Accurate rate on each seed
- Low rates of products
- Safer for the environment
- Minimal exposure when handling
Regulatory Issues

- Pest Management Regulatory Agency – similar to EPA
- All neonicotoides are under review including seed treatments
- Future use patterns unknown
- Drenches or in furrow need to be investigated
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Active Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aria</td>
<td>50% flonicamid</td>
</tr>
<tr>
<td>Avicta 400</td>
<td>37% avermectin</td>
</tr>
<tr>
<td>Avicta + Cruiser</td>
<td>37% avermectin + 47.6% thiamethoxam</td>
</tr>
<tr>
<td>Cyazapyr</td>
<td>47% cyantraniliprole</td>
</tr>
<tr>
<td>Dermacor-X</td>
<td>50% chlorantraniliprole</td>
</tr>
<tr>
<td>Entrust</td>
<td>80% spinosad</td>
</tr>
<tr>
<td>Entrust + Cruiser</td>
<td>80% spinosad + 47.6% thiamethoxam</td>
</tr>
<tr>
<td>Sepresto</td>
<td>56.25% clothianidin + 18.75% imidicloprid</td>
</tr>
<tr>
<td>Governor</td>
<td>75% cyromazine</td>
</tr>
</tbody>
</table>
Maggot trials: Methods

- Randomized complete block with 4 reps per treatment
- Shortly after onions emerge, 2 m sections are staked out in each plot
- Stand counts 3 times after emergence
- Maggot (and onion smut) damage assessed visually each week
- Onion maggot assessed after each generation: 1st generation (early July), 2nd generation (mid August), and 3rd generation (harvest)
- 2 m of row harvested and all plants assessed for damage
Onion maggot and seed corn maggot

- 2012 - 2014
  - In-furrow treatments:
  - **Force** (tefluthrin) granular 37.5 g/ 100 m of row
  - **Capture** (bifenthrin) drench 0.3 fl oz/1000 ft row
  - **Actara** (thiamethoxam) drench 4.4 mL/100 m of row
  - **Verimark** (cyantraniliprole) drench 1.0 L/ha
  - **Movento** (spirotetramat) foliar at 350 ml/ha
Total maggot damage - 2012
1st generation maggot damage - 2014

In-furrow applications

% damage

Check, Actara, Capture, Vermark, Force, Lorsban, Entrust, Governor, Sepresto, Entrust+Cruiser

bcd, d, d, cd, cd, abcd, abc, ab, ab, a
Onion maggot and seed corn maggot

- 2015 - 2019
  - Seed treatments:
    - Regard (spinosad)
    - Cruiser (thiamethoxam)
    - Sepresto (clothianidin + imidacloprid)
    - Governor (cyromazine)
1st generation maggot damage - 2017

- Regard + Cruiser
- Sepresto + EverGol
- Regard
- Sepresto
- Governor
- Regard + Cruiser

% damage:
- a
- ab
- ab
- ab
- bc
- c
Marketable Yield - 2017

- Check: c
- Trigard: bc
- Sepresto: abc
- Regard: ab
- Sepresto + EverGol: ab
- Regard + Cruiser: a

Yield in t/ha
1st generation maggot damage - 2018

% damage

ns

Governor  Sepresto  Regard + Cruiser  Sepresto + EverGol  Lorsban  Check
1st generation maggot damage - 2019

% damage

- Lorsban
- Regard + Cruiser
- Govenor
- Regard
- Sepresto
- Check

The diagram shows the percentage damage for different treatments. The treatments are ranked from least to most damage, with 'c' indicating the highest damage level. The letter codes 'a', 'ab', 'abc', 'bc' indicate statistical significance groups based on treatments.
Summary of 2017-2019 trials

• Seed treatments Sepresto and Entrust most effective
• Governor when used with new fungicides is effective
• Lorsban – growers still use at low rates
• Unknown future of neonics for use in onions
• Growers need to additional new tools for effective maggot control
Onion Transplants

- Lorsban (chloropyrifos) is the only product registered for use at transplanting
- Up to 10% of Ontario onion production are transplants
- Sepresto, Governor pelleted seed treatments
- Delegate, Verimark drench
Onion Transplants
Transplant Results 2016

% damage

DELEGATE  VERIMARK  SEPRESTO  LORSBAN  GOVERNOR  Check

a     A       a     A       a     AB      a     B       B     a     C

1st Generation  Season Total
Transplant Results 2019

% damage

VERIMARK, DELEGATE, GOVERNOR, LORSBAN, SEPRESTO, Check

1st Generation

(Additional details related to the chart, such as significance of letters a, b, c, can be inferred from the context but are not explicitly stated.)
Conclusions: transplants

- Delegate and Verimark were most effective in reducing maggot damage and increasing yields in transplanted onions.
- Sepresto more effective in only 2016 and Governor were also effective.
- 2019 cool and wet spring, maggot damage occurred later and Sepresto seed treatment seemed less effective.
- Need more work to verify results.
All research trials are summarized in the Annual Report
Download at the Muck Station web site:
www.uoguelph.ca/muckcrop
Research Team

Mary Ruth McDonald
Laura Riches
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Thank you
Questions?