Seed treatments for control of onion and seed corn maggots.

Mary Ruth McDonald
Dennis VanDyk,
Alan G. Taylor
Long day yellow bulb onions

Most grown on muck soil with 45-70% organic matter.
Seeded late late April – mid May,
harvested mid August-September
Onion maggots and seed corn maggots can be very damaging to onions- 70 to 100% loss
Onion maggot fly
(Delia antiqua Meigen)

- Major insect pest of onion
- Control is essential to onion production (70 to 100% stand loss)
- Growers use a granular insecticide Lorsban, or seed treatment Trigard (Governor, cyromazine) or both
Onion maggot life cycle

- Adult emergence
- Eggs oviposited at onion base
- 210 day degrees, base 4°C
- Eggs hatch into maggots
- Overwinter as pupae
- Maggots feed on onions causing seedling death and unmarketable bulbs

Three generations per year in Ontario, Canada
Onion maggot fly (*Delia antiqua*)

- Females deposit eggs in groups at base of onion plant

Damage in the field is aggregated, eggs are deposited in clusters and larvae migrate to adjacent plants if food is limiting.
Onion fly females locate onions sites through onion volatiles such as diallyl disulfide (Dindonis and Miller 1980) and visual cues. They are attracted to rotting onions because larvae can enter and feed more easily on rotting bulbs. Larvae may only be able to feed on damaged or rotten bulbs after the seedling stage (Finch et al. 1986).
Onion Maggot

Third generation damage

Onion maggot pupae on onion from storage
Seed corn maggot fly
(*Delia platura*)

- Overwinter as pupae in the soil
- Adults emerge in spring - March to May depending on location
- Females deposit eggs on or near seeds and rotting vegetation (ave. 270 eggs/female)
- Eggs hatch (7-9 days) and larvae feed on the seeds and seedlings
- Damage highest in cool years (active at temp of 40 °F and above) and in soils with high organic matter
- 3-5 generations a year in most of U.S.
- The first generation is most damaging to onion seedlings
Populations of adult maggot flies can be monitored with yellow sticky traps near the edges of the field.
Maggot flies on yellow sticky traps, monitored 2 x a week

There are high populations of onion maggot flies in the Holland Marsh area.

Three generations of onion maggot flies, the first generation has highest emergence
Onion maggot and Seed Corn Maggot

- About 20% of these are seed corn maggot
Seed Treatments for Onion Maggot and Seed Corn Maggot Control

• Seed treatments are important: onion maggot flies in Ontario have about 7 x resistance to Lorsban (chlopyrifos)
• Treatments applied in Al Taylor’s lab at NYSAES
• Film coat
• Seeded 3-4 May, harvested 20 September, 2010

Fungicides to control onion smut applied to all seed: Raxil (tebuconzole) 250 mg/100 g seed and thiram.
Insecticide trials: maggot damage in onions

- 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 - 30 June, 2nd generation - 19 Aug, and harvest) - 13 Sept., 2010
- 2 m of row harvested and all plants assessed for damage

Damage from first generation assessment, first plus second, and total cumulative damage
Field plots for onion maggot trials, Muck Crops Research Station
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Chemical name and concentration</th>
<th>Rate (g a.i./100 g seed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIA</td>
<td>50% flonicamid</td>
<td>5.13</td>
</tr>
<tr>
<td>AVICTA 400</td>
<td>37% avermectin</td>
<td>5.13</td>
</tr>
<tr>
<td>AVICTA + CRUISER</td>
<td>37% avermectin +47.6% thiamethoxam</td>
<td>5.13 + 5.13</td>
</tr>
<tr>
<td>CYAZYPYR</td>
<td>cyantraniliprole</td>
<td>5.13</td>
</tr>
<tr>
<td>DERMACOR X-100</td>
<td>50% chlorantraniliprole</td>
<td>5.13</td>
</tr>
<tr>
<td>ENTRUST</td>
<td>80% spinosad</td>
<td>5.13</td>
</tr>
<tr>
<td>ENTRUST + CRUISER</td>
<td>80% spinosad + 47.6% thiamethoxam</td>
<td>5.13 + 5.13</td>
</tr>
<tr>
<td>EXP- 3</td>
<td>thiodicarb</td>
<td>5.13</td>
</tr>
<tr>
<td>SEPRESTO</td>
<td>56.25% clothianidin + 18.75% imidicloprid</td>
<td>6.15</td>
</tr>
<tr>
<td>TRIGARD</td>
<td>75% cyromazine</td>
<td>5.0</td>
</tr>
<tr>
<td>Untreated check</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evaluation of Poncho for onion maggot control - 2006

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rate (mg ai/100 g seed)</th>
<th>First gen damage (%)</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poncho + Thiram + Raxil</td>
<td>188 + 250 + 4880</td>
<td>1.3 a^2</td>
<td>34.2 ns^3</td>
</tr>
<tr>
<td>Thiram</td>
<td>188</td>
<td>58.0 b</td>
<td>25.2</td>
</tr>
</tbody>
</table>

Poncho = clothianidin, Raxil = tebuconazole
Tonnes/ha x 17.8 = bushels per acre 34.2 t/ha = 609
Insecticide seed treatments for onion maggot control - 2008

<table>
<thead>
<tr>
<th>Product</th>
<th>Rate (mg ai/seed)</th>
<th>1st gen damage (%)</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepresto</td>
<td>0.147</td>
<td>5.0 a</td>
<td>41.2 a</td>
</tr>
<tr>
<td>Entrust</td>
<td>0.2</td>
<td>13.0 ab</td>
<td>43.7 a</td>
</tr>
<tr>
<td>Sepresto</td>
<td>0.1</td>
<td>14.3 ab</td>
<td>42.0 a</td>
</tr>
<tr>
<td>Entrust</td>
<td>0.15</td>
<td>18.0 ab</td>
<td>48.3 a</td>
</tr>
<tr>
<td>Entrust</td>
<td>0.1</td>
<td>22.2 b</td>
<td>30.0 a</td>
</tr>
<tr>
<td>Check</td>
<td></td>
<td>70.0 c</td>
<td>13.1 b</td>
</tr>
</tbody>
</table>

Rate is mg ai/seed

48.3 tonnes/ha = 860 bu/acre
First generation maggot damage - 2010

Percent damage

Untreated  thiodicarb  Cyazopyr  Dermacor  Aria  Entrust  Avicta + Cruiser  Avicta  Trigard  Sepresto  Entrust + Cruiser

Damage levels: d, c, bc, ab, a
Harvest assessment of cumulative maggot damage - 2010

Percent damage
Effect of insecticide seed treatment on yield - 2010

58 t/ha = 1044 bu/acre
Relationship between first generation maggot damage and yield - 2010

MktYield = 55.525 - 0.6719 * OM1perMag

$r^2 = 0.65$, $P = 0.00$
Conclusions: Maggot control

• Seed treatments can provide effective control of maggot damage

• Entrust plus Cruiser, Sepresto, Trigard and Avicta were very effective

• Highest yields were obtained with Entrust, Entrust plus Cruiser, Avicta, Avicta plus Cruiser, Trigard and Sepresto
Conclusions: Maggot control

• Yield was related to first generation maggot damage ($r^2 = 0.65$, $P = 0.00$)

• There was no advantage to adding Cruiser with Entrust or Avicta, either for maggot control or yield.

• However, there is some indication that the addition of Cruiser provided better season-long control
All research trials are summarized in the Annual Report

Download at the Muck Station web site:

www.uoguelph.ca/muckcrop

The 2010 data will be available in March 2011
Acknowledgements

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Questions?