Wireworm research update 2014

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INSECTICIDE TRIALS
Seven insecticides with four replicates per insecticide, 2014
Method for Evaluating Tubers

Removing Holes and scars

If the tuber loses greater than 5% of its weight it is considered unmarketable for the processing industry
Figure 1: Mean number of blemishes (holes + scars) per tuber following an in-furrow insecticide application at planting in Russet Burbank potatoes. 2014
Figure 2: Efficacy of 7 insecticides applied in-furrow on marketable yield for the processing market in Russet Burbank potatoes, 2014

1mt = 22.05 cwt
Figure 3: Efficacy of 7 insecticides applied in-furrow on tuber yield with **no-damage** in Russet Burbank potatoes, 2014.
Figure 4: Efficacy of 7 insecticides applied in-furrow on unmarketable yield for the processing market in Russet Burbank potatoes, 2014

1mt = 22.05 cwt
Does the insecticide Capture kill wireworms?
LABORATORY STUDIES

Treatments

- Untreated Check
- Capture @ 200 gai/ha
- Capture @ 300 gai/ha
- Thimet @ 215 g/100 m row
- Mocap @ rate of 1.4 lb/1000 ft row

Four replicates per treatment
Figure 1: Percent mortality of wireworms exposed to different insecticides
Figure 2: Percent wireworm mortality over time when exposed to different insecticides in the laboratory.
Will wireworms move into soil treated with Capture
Laboratory Insecticide Trials

Capture treated soil (300gai/ha)

Untreated soil (Control)

Untreated soil
Laboratory Insecticide Trials

Control

Capture treatment
Laboratory Insecticide Trials
Figure 1: Percent of wireworms moving into capture treated soil towards a potato bait.
Farmer field trials
Figure 1. Mean number of blemishes (hole + scars) in tubers grown
Figure 1: Mean number of blemishes (holes+scars) in tubers following a fall planting of four different rotation crop.
POTATO VARIETY TRIAL
Twenty varieties and six replicates per variety
Doing on Farm research
Figure 1. Mean number of holes per tuber in different potato varieties grown without an insecticide application to protect against wireworm damage.
Figure 2. Mean number of blemishes (holes+scars) in different potato varieties grown without an insecticide application to protect against wireworm damage
Wireworm Research Across Canada

Areas of research
1. Insecticide trials
2. Insecticide treated Wheat trials
3. Rotation Crops
4. Monitoring
5. Biological Control
6. Canadian Click Beetle Survey

Cluster project with the Canadian Horticulture Council – funding is a combination of industry and matched by AAFC - 2014-18.
Insecticide Efficacy Trials at PARC, Agassiz, 2013

Mean wireworm blemishes per market-sized tuber

Harvest 1 (100 DAP)

Harvest 2 (120 DAP)
Wireworm Efficacy Trials (Agassiz: 2003-2013)

- Control: N = 13
- Thimet 15G (phorate): N = 13
- Pyrinex 480EC (chlorpyrifos): N = 9
- Capture 2EC (bifenthrin) (300g): N = 5

% of Control

- Blemishes
- Large wws
- Small wws
Wireworm Efficacy Trials (Agassiz: 2003-2013)

- Control (N = 13)
- Thimet 15G (N = 13)
- Pyrinex 480EC + Titan ST (6.3g) (N = 9)
- Capture 2EC (200g) + Titan ST (6.3g) (N = 4)

Bar chart showing the efficacy of different treatments on Wireworm Efficacy. The treatments include Control, Thimet 15G, Pyrinex 480EC + Titan ST (6.3g), and Capture 2EC (200g) + Titan ST (6.3g). The chart compares the percentage of control across different wireworm categories: Blemishes, Large wws, and Small wws.
Click Beetle BioControl

Most beetles attracted in as few as 6 hours!
Pheromone granules improve the efficacy of *Metarhizium* when targeting click beetles using a banded application.

Percent mortality of click beetles

*(beetles become fatally infected in as little as 6 hours)*

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<thead>
<tr>
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<th>High rate Metarhizium (2 x 10^{14} conidia/ha)</th>
<th>Low rate Metarhizium (2 x 10^{13} conidia/ha)</th>
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<tbody>
<tr>
<td>No pheromone granules in Metarhizium band</td>
<td><img src="image1.png" alt="Graph 1" /></td>
<td><img src="image2.png" alt="Graph 2" /></td>
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<tr>
<td>With pheromone granules in Metarhizium band</td>
<td><img src="image3.png" alt="Graph 3" /></td>
<td><img src="image4.png" alt="Graph 4" /></td>
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Granules might also be used for Mating Disruption
Advantages of granular formulation of click beetle pheromone

- the majority of beetles are attracted to the pheromone granules and become fatally infected in as little as 6 hours

- farm-equipment friendly: both the pheromone and Metarhizium granules

- attracts beetles to a biological control

- opens up the possibility for beetle mating disruption

- dual ‘attract and kill’ / mating disruption
A Comprehensive Approach to the Biological Control of Wireworms includes:

- Reducing the input of new larvae from adults
- Reducing the larvae to sub-threshold levels
- Preventing wireworm build-up once a sub-threshold level is achieved
- Achieving management with a minimal environmental impact (soft on beneficials)
Comprehensive Wireworm Biocontrol

Year 1 rotation crop
Click beetle attract and kill

Year 2 rotation crop
Click beetle attract and kill

Year 3 cropping year
Attract and kill / or broadcast Metarhizium targeting the remaining wireworms
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