Managing Wireworms in Root Crops

Teresa Rusinek/NEFV
The Eastern New York Commercial Horticulture Program is a Cornell Cooperative Extension partnership between Cornell University and the CCE Associations in 17 counties.
Biology: Wireworm (larva) / Click Beetle (adult)

• Order: Coleoptera (beetles)
  Family: Elaterdae

• ~30 species in Northeast- primarily wheat (Agriotes), corn (Melanotus) and eastern field wireworm (Limonius)

• Lay eggs in grassy fields May thru late-June

• Up to 5 yrs in soil as wireworm
High Risk Fields

• Long-term grass- pasture, or grass hay (timothy/legume mix)
• Planted after small grains (wheat, barley)
• Weedy cultivated fields
• Poorly drained & irrigated soils favorable for certain wireworm species, *Ctenicera* do better in drier soils
• Red/sweet clover rotations more than one year promote millipede populations often found with wireworms, similar damage to wireworms

High Risk Crops

• Root Crops: carrots and potatoes, sweet pots, beets, rutabagas
• Germinating seeds of cucurbits, sweet corn, beans and peas (warm soil /fast germination)

Wireworm tunneling in corn seed on left and in a cucurbit stem on right. 
Photo credit John Obermeyer. Perdue University
Biology: Lifecycle of the Click Beetle/Wireworm

- **Eggs laid**
- **Larval and adults stages overwinter in the soil**
- **Pupae**
- **Larvae in soil 3-5 years to maturity**

Jan Feb March April May June July Aug Sept Oct Nov Dec
Damage

- Wireworms have an aggregated distribution
- Damage to crops may be spotty
Monitoring Bait Traps

• Baits are most effective when crops or decaying crop residues are not present to release CO2

• Set Bait traps in the spring when soil temps exceed 45 F in top 2”

• Different types of bait traps, they all work about the same

• Pre-soaking cereals, cut up potatoes, carrots in mesh bags/pots

• Bury ~ 7”

• ~ 2 weeks

• At least 4 traps per field <30 acres (more is better)

• Don’t Forget to flag bait traps

• Sift 1 square foot soil to 14” depth (6-12 samples) low wet areas

• Potato Threshold- if more than half bait traps + then treat soil or don’t plant
Management Options

Chemical: No Rescue Treatments!

Seed treatments, pre-plant, or planting time applications

Neonics - under scrutiny
Labeled for Seed Piece and Soil App. for Wireworm on potato, NOT sweet potato

- Imidacloprid Admire pro, Macho- has SP on label but only for Aphids, Flea beetles Leafhoppers Thrips, Whiteflies. Soil app and foliar.

Labeled on Sweet pots for Wireworm
- Bifenthrin 2EC [Sniper] - max. 0.5 lb AI/a/season (at plant) (lay-by) (foliar)

- Ethoprop [Mocap 15% Granular] – banded *(not LI Nassau/Suffolk County)
Management Options

Chemical

Broadcast Application:

**Diazinon**- carrots, beets, onions, radish, beans, lettuce, broadcast just before planting and incorporate into top 4-8 inches (soil should be 50 F)

.........Sweet pots not on label !
Management Options

Cultural:

Crop rotation strategies: complex & poorly understood

- Rotations with crops such as onions, lettuce, alfalfa, sunflowers and buckwheat may reduce wireworm populations.

- mustard crops, canola? Isocyanates (Agriculture Canada)

- Survive two years summer fallow rotation

- Wireworm/click beetle populations drop significantly after several years cultivation
Management Options

Cultural:

• Knowing the cropping history of fields and **avoiding rotations with grasses and pastures**

• **Keeping land free of grass during the egg-laying period** (May through mid July) will greatly reduce the potential for infestation.
  
  Control weeds in cultivated fields
  Cover crops

• **Carbon dioxide attracts wireworms**: decomposing residue, recently broken sod, germinating seeds

• **Cultivation**, late summer, long term management, only pupae susceptible
Management Options

Biological:

- Ground beetles study (Agriculture Canada)
- *Beauveria Bassiana* - (Netherlands, Ester and Huiting 2007)
- Entomopathogenic nematodes or EPNs

Entomopathogenic Fungi

Nematodes are reared in waxworms
Biologicals: Entomopathogenic Nematodes EPNs

Combo of two nematodes strains is recommended, reared separately.

- **Steinernema carpocapsae (SC):** SC can be found on the upper two inches of the soil and remain in that location.
- **Steinernema feltiae (SF):** stays in one location- below the top two inches
- **Heterorhabditis bacteriophora (HB):** wander and hunts out prey

SC turns waxworm brown color  SF turns waxworm a dark gray color  HB nematode turns waxworm brick-red
Spring 2017- Professor Elson Shields of Cornell University applies NY Native entomopathogenic (EPN) nematodes to the plots at HV Farm Hub.
Fall 2017 - HV Farm Hub - We evaluated 800 sweet potatoes per treatment were evaluated or 200 per rep

EPN treated plots overall had 36% less wireworm
EPNs applied Fall 2018 at PVF
Sweet pots evaluated Fall 2019

PVF Wireworm Evaluation
Covington & Burgandy EPN vs Non-EPN Covington

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average # Mines</th>
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<tbody>
<tr>
<td>UT Covington</td>
<td>1.05</td>
</tr>
<tr>
<td>Treated Burgandy</td>
<td>0.01</td>
</tr>
<tr>
<td>Treated Covington</td>
<td>0.18</td>
</tr>
</tbody>
</table>

# of mines
Diakon Radishes
EPN vs NT

<table>
<thead>
<tr>
<th>Date of Evaluation</th>
<th># WW Mines</th>
<th># Grub Channels</th>
<th># Flea Beetle Larvae</th>
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<tbody>
<tr>
<td>9/12/2019-EPN</td>
<td>0.129</td>
<td>0.828</td>
<td>1.065</td>
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<tr>
<td>9/12/2019-NT</td>
<td>0.226</td>
<td>2.069</td>
<td>4.207</td>
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<tr>
<td>10/16/2019-EPN</td>
<td>0.206</td>
<td>0.881</td>
<td>7.253</td>
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<tr>
<td>10/16/2019-NT</td>
<td>1.042</td>
<td>2.420</td>
<td>16.441</td>
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</table>
Diakon Radish in EPN treated field
Used about 80 gal. acre
2 gal/minute /6 foot swath
2-3 mph.
20 million IJ per cup / .5 acre (use two strains)
$100 for Nematodes per acre
For more info on Entomopathogenic Nematodes

https://www.alfalfasnoutbeetle.org/

My email: tr28@cornell.edu

Thanks to:
Elson Shields, Tony Testa- Cornell University, Dept. Entomology
Chuck Bornt - ENYCHP
Hudson Valley Farm Hub
NY Farm Viability Institute /USDA SCBG Program