DOWNY MILDEW AND NECK ROT ON ONION, AND STEM AND BULB NEMATODE ON GARLIC 2017

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The research was conducted in the Holland Marsh. Onions and carrots are the two major crops on the marsh. High organic matter soil: 48 -80% om, pH 5.0-7.2

Holland Marsh, Ontario, Canada 44° 15’ N, 79° 35’W
A few cycles of downy mildew sporulation and infection can destroy a crop.

This crop was not sprayed on time. However, downy mildew came in late, so bulbs are still a good size.
Severe onion downy mildew in 2017. In this field, probably applied fungicides that were not specific for downy mildew.
Onion downy mildew

- Develops in cool, humid weather
- Fungicides must be applied before infection takes place
- Disease forecasting important

- Sporulation when temperatures below 75 °F, (24 °C) previous day
- **Temperatures over 81 °F inhibit sporulation**
- Temp 38 - 75 °F (4 – 24 °C) at night
- Humidity above 95%, but not rain at night,
- Infection: 43-79 °F, 3-6 hours leaf wetness
- Takes 9 to 16 days from infection until sporulation
- No symptoms until sporulation occurs
### Fungicide treatments for downy mildew control – 2017

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (per ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZAMPRO (ametoctradin+dimethomorph)</td>
<td>1.0 L + 0.25% v/v Sylgard</td>
</tr>
<tr>
<td>RIDOMIL/ALIETTE (mefanoxam/ fosetyl-Al)</td>
<td>2.5/2.8 kg</td>
</tr>
<tr>
<td>REVUS (mandipropamid 250g/L)</td>
<td>400 mL</td>
</tr>
<tr>
<td>REASON (fenamidone 500 g/L)</td>
<td>401.5 m</td>
</tr>
<tr>
<td>ORONDIS (oxathiapiprolin 100 g/L, formerly QGU42)</td>
<td>350 mL</td>
</tr>
<tr>
<td>DITHANE (mancozeb 75%)</td>
<td>32.5 kg</td>
</tr>
<tr>
<td>CUEVA (copper)</td>
<td>2% solution</td>
</tr>
<tr>
<td>Check</td>
<td></td>
</tr>
</tbody>
</table>
Fungicides for the control of downy mildew on onion - 2017
To control onion downy mildew, it is important to apply fungicide before infection takes place

Several fungicides provide effective control: Orondis (oxathiopipronil), Zampro (ametoctradin + dimethomorph), Ridomil (mefanoxam) alternated with Aliette (fosetyl-Al). And (surprisingly) Dithane (mancozeb). Good timing of fungicide applications

Issue: Fungicide resistance can develop quickly
Evaluation of fungicides for onion neck rot

(*Botrytis allii, B. aclada, B. byssoida*)

- Infection takes place during cool, (50-68°F) humid weather

- “Latent” infection. Usually no symptoms until onions are in storage

- Seeded 16 May

- Fungicides sprays began 19 July

- 5 sprays at ~ 10 day intervals

- Onions harvested 17 October (late harvest)
  - *no artificial curing.*

- Placed in cold storage, assessed 26 Jan.
# Fungicides for neck rot control-2016, 2017

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Active ingredient</th>
<th>Rate (L/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fontelis</td>
<td>penthiopepyrad</td>
<td>1.75</td>
</tr>
<tr>
<td>Pristine</td>
<td>boscalid + pyraclostrobin</td>
<td>1.3</td>
</tr>
<tr>
<td>Syngenta A19649B</td>
<td>experimental</td>
<td>0.75</td>
</tr>
<tr>
<td>Gavel 75 DF</td>
<td>zoxzmide and mancozeb</td>
<td>2.2 kg</td>
</tr>
<tr>
<td>Luna Tranquility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadris Top</td>
<td>azoxstrobin + difenoconzole</td>
<td>1.0</td>
</tr>
<tr>
<td>Coronet seed treatment</td>
<td>boscald + pyraclostrobin</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evaluation of fungicides for the control of onion neck rot: dehydrator onion - 2016
Major flooding occurred on 23 June, 2017. (First time in over 70 years)

All of the onion trials were under water for at least 24 hours

Enough onions recovered for a smaller trial.

Three fungicides and a check, also a yellow onion check
Evaluation of fungicides for the control of onion neck rot: dehydrator onion- 2017

Sprayed 5 x from 19 July to 8 Sept.
Harvested 17 Oct.
Assessed 29 January
Fungicides and spray timing for the control of onion neck rot - Conclusions

- White dehydrator onions are very susceptible.
- Moderate to high disease pressure in 2017.
- **Fontelis**, **Pristine**, and a new fungicide from Syngenta were very effective. **Quadris Top** also reduced disease in 2016 trials.
- Fungicide sprays starting at the 4-5 leaf stage are effective.
- Cultural methods to ensure dry necks at harvest are important to reduce neck rot
- Yellow bulb onions not as susceptible (no disease in 2017)
Stem and Bulb Nematode

*Ditylenchus dipsaci*

- Microscopic nematodes 1.2 mm long
- Live and feed inside bulb and stems of plants but travel in soil pores filled with water
- Attack garlic, onions and other crops - some host specificity
- They are transferred easily in garlic cloves used for seed
Trials 2016-2017

Planted October 2016

- Nematode infested garlic cloves ~ 830 nematodes /g were treated in the Fall of 2016, prior to planting
- Planted in (relatively) non-infested soil
- 2 sites: muck and mineral soil

Treatments:
- Agri-Mek (abamectin) - soak
- Vive-Aba (nano formulation of abamectin)- drench
- Velum Prime (fluopyram)- soak
- Nimitz (fluensulfone)- soak
- ProMax (thymol)- soak
- Phostoxin gas – preplant fumigation of seed
- Nematode free cloves
Soak in product solution for 4 hours,
Allow to dry,
Plant the following day

Drench in to the open furrow on top of cloves, then cover with soil
Muck soil site
June 2017

Hail damage and recovery
Mineral soil site

Symptoms of stem and bulb nematode
<table>
<thead>
<tr>
<th>Product</th>
<th>App'n Method</th>
<th>Rate</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRI-MEK SC</td>
<td>Soak</td>
<td>0.9 mL/L</td>
<td>4 hour soak</td>
</tr>
<tr>
<td>AGRI-MEK EC</td>
<td>Soak</td>
<td>3.76 mL/L</td>
<td>soak</td>
</tr>
<tr>
<td>AGRI-MEK SC</td>
<td>Dbl rate soak</td>
<td>1.7 mL/L</td>
<td>soak</td>
</tr>
<tr>
<td>VELUM PRIME</td>
<td>Soak</td>
<td>1.67 mL/L</td>
<td>soak</td>
</tr>
<tr>
<td>VELUM PRIME</td>
<td>Drench</td>
<td>0.5 mL/L</td>
<td>over-the-open-row drench at planting</td>
</tr>
<tr>
<td>NIMITZ 480 EC</td>
<td>Soak</td>
<td>20 mL/L</td>
<td>4 hour soak</td>
</tr>
<tr>
<td>NIMITZ 480 EC</td>
<td>Drench twice</td>
<td>6 mL/L</td>
<td>drench at planting and 3 May</td>
</tr>
<tr>
<td>NIMITZ 15G &amp; NIMITZ 480 EC</td>
<td>In-furrow &amp; drench</td>
<td>0.768 g/m, 6 mL/L</td>
<td>in-furrow at planting and drench 3 May</td>
</tr>
<tr>
<td>MOVENTO</td>
<td>Foliar</td>
<td>400 mL/ha</td>
<td>foliar applications on 3, 18 May &amp; 1, 15 June</td>
</tr>
</tbody>
</table>
Severity of stem and bulb nematode - 2016

S= 4 hour soak before planting
D= Drench in open furrow immediately after planting,
F= foliar spray in spring (May) after emergence
## Treatments: garlic trial at two sites 2016 - 2017

<table>
<thead>
<tr>
<th>Product</th>
<th>Active ingredient</th>
<th>Treatment method</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRI-MEK SC</td>
<td>Abamectin</td>
<td>4 hr soak</td>
<td>0.9 mL/L</td>
</tr>
<tr>
<td>PHOSTOXIN</td>
<td>Phosphine</td>
<td>Seed fumigation</td>
<td></td>
</tr>
<tr>
<td>PROMAX</td>
<td>Thyme oil</td>
<td>4 hr soak</td>
<td>50 mL/L</td>
</tr>
<tr>
<td>PROMAX</td>
<td>Thyme oil</td>
<td>Drench</td>
<td>11.23 mL/L</td>
</tr>
<tr>
<td>NIMITZ</td>
<td>Fluenzsulfone</td>
<td>4 hr soak</td>
<td>20.00 mL/L</td>
</tr>
<tr>
<td>VELUM PRIME</td>
<td>Fluopyram</td>
<td>4 hr soak</td>
<td>1.67 mL/L</td>
</tr>
<tr>
<td>VELUM PRIME</td>
<td>Fluopyram</td>
<td>Drench</td>
<td>0.5 mL/L</td>
</tr>
<tr>
<td>VELUM PRIME</td>
<td>Fluopyram</td>
<td>4 hr soak + drench</td>
<td></td>
</tr>
<tr>
<td>VIVE-ABA</td>
<td>Abamectin</td>
<td>4 hr soak</td>
<td>0.63 mL/L</td>
</tr>
<tr>
<td>VIVE-ABA</td>
<td>Abamectin</td>
<td>Drench</td>
<td>0.189 mL/L</td>
</tr>
</tbody>
</table>
Severity of stem and bulb nematode - 2017 – Muck soil

S= 4 hour soak before planting  D= Drench in open furrow immediately after planting,  F= foliar spray in spring (May) after emergence
Severity of stem and bulb nematode-2017 – Mineral soil

S = 4 hour soak before planting
D = Drench in open furrow immediately after planting
F = Foliar spray in spring (May) after emergence
Yield of garlic on two soil types - 2017

Yield g/plot

Left bar - muck soil
Right bar - mineral soil

S= 4 hour soak before planting  D= Drench in open furrow immediately after planting,  F= foliar spray in spring (May) after emergence
Stem and bulb nematode-summary

Velum Prime as a soak or drench provided excellent control of stem and bulb nematode, even at high levels of infection in the planting materials (830 nematodes/g).

In 2017 – 2018 we are using a ‘high’ and ‘low’ level of infested seed.

Velum Prime could be a very useful product on garlic.
All research trials are summarized in the Annual Report

Download at the Muck Station web site:

www.uoguelph.ca/muckcrop

2017 report will be available by the end of March
Acknowledgements

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The California Garlic and Onion Research Advisory Board
The Fresh Vegetable Growers of Ontario,
The Bradford Cooperative Storage,
and
The OMAFRA/University of Guelph partnership
Questions?
Rotation crops and possible hosts: white beans, kidney beans dry and fresh peas, soybeans, wheat, onions, alfalfa
Downy mildew developed late in the season in 2014.