Vegetable research update

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Vegetable Research Update

- **Stem and bulb nematode on garlic**
  - **OMAFRA/U of G**
- **Celery leaf curl**
  - **OMAFRA/U of G**
- **Stemphylium on onion**
  - **OMAFRA/U of G**
- **Carrot insect IPM and beneficial insects**
  - **OMAFRA/U of G**
- **New proposals -**

Stem and Bulb Nematode

Ditylenchus dipsaci

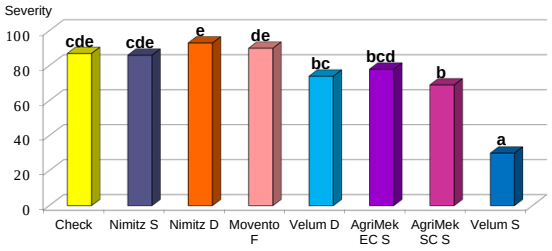
- **Major pest of garlic in Ontario**
- **Microscopic nematodes 1.2 mm long**
- **Live and feed inside bulb and stems of plants but travel in soil pores filled with water**
- **they are transferred easily in garlic cloves used for seed**
- **Light infection is difficult to detect, and may be confused with Fusarium. Heavy infection destroys the crop**

Soaking cloves in Agri-Mek (abemectin) for 4 hours is very effective

There is a problem getting this registered

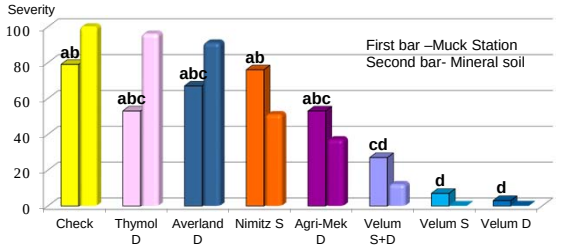
Products were compared to clean seed from the tissue culture facility at New Liskeard (Becky Hughes)

Severity of stem and bulb nematode- 2016



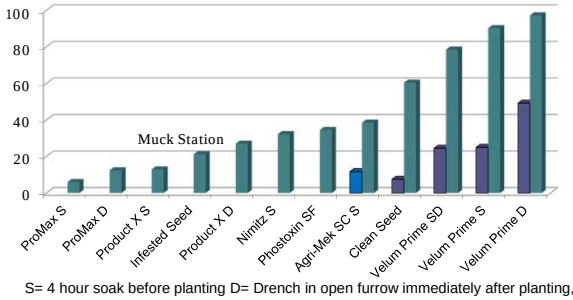
S= 4 hour soak before planting D= Drench in open furrow immediately after planting, F= foliar spray in spring (May) after emergence

Severity of stem and bulb nematode- Muck Station 2017



S= 4 hour soak before planting D= Drench in open furrow immediately after planting,

Marketable yield of garlic 2017



S= 4 hour soak before planting D= Drench in open furrow immediately after planting,
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Stem and bulb nematode- summary

- Velum Prime as a soak and drench provided excellent control of stem and bulb nematode, even at high levels of infection in the planting materials (830 nematodes/g)
- Velum Prime as a drench was very effective for nematode control
- No advantage to combining a soak and drench
- Important to get Velum Prime registered for this use on garlic
- Research continuing with grad student Lilieth Ives

Leaf curl on celery

- 2011/2012 in Holland Marsh, Ontario
- *Colletotrichum fioriniae*
  (Marcelino & Gouli) R.G. Shivas & Y.P. Tan)
- Symptoms:

-Leaf curling
-Petiole twisting
-Lesions
Crown rot
-Adventitious roots
-Stunting

Celery leaf curl

Colletotricum fioriniae on celery
Grad student project objectives: Stephen Reynolds

- **Screening cultivars for resistance**
- **-physiology of resistance**
- **Fungicide efficacy trials**
- **Disease forecasting to time fungicide applications**
- **Alternative hosts, asymptomatic hosts, overwintering sites**
- **Can the pathogen be spread on seed?**

Celery leaf curl

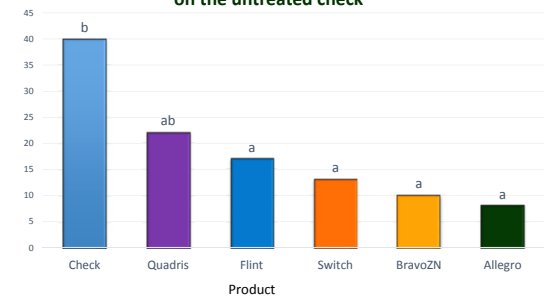
Fungicide trials:

Allegro (fluazinam)
Bravo ZN (chlorothalonil)
Switch (cyprodinil + fludioxinil)
Flint (trifloxystrobin)
Quadris (azoxystrobin)
Untreated check

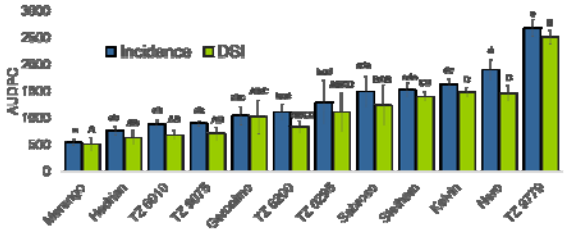
The first fungicide spray was applied BEFORE the plot was inoculated.
Six sprays in total

Fungicides for control of celery leaf curl - 2016

In 2017, there was only 2% disease on the untreated check



Celery cultivar susceptibility to leaf curl - 2016

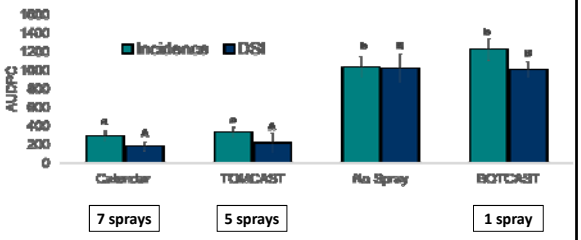


Note: AUDPC = Area Under Disease Progress Curve

Disease forecasting for celery leaf curl- 2016

- TOMCAST: 15 DSV threshold
- BOTCAST: 1st threshold (21-30 CDSI)
- Calendar spray: 7-10 days
- No spray
- Quadris Flowable (azoxystrobin 25.0%) alternated with Switch 62.5WG (cyprodinil 37.5% and fludioxonil 25.0%)

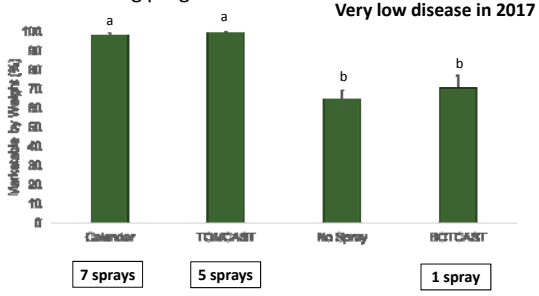
Disease forecasting programs for celery leaf curl- 2016



Note: AUDPC = Area Under Disease Progress Curve

Marketable yield of celery as influenced by disease forecasting program - 2016

Very low disease in 2017



Note: Marketable by weight (%) = Marketable weight / total weight

Celery leaf curl

- Growers can select a less susceptible cultivar
- No cultivar is completely resistant
- Several fungicides effectively reduce celery leaf curl
- There are several products that should be registered.
- Disease forecasting using TOMCAST can achieve a high level of disease control with fewer fungicide sprays (in 2016)
- Better disease control translates to higher marketable yield

Stemphylium leaf blight on onions

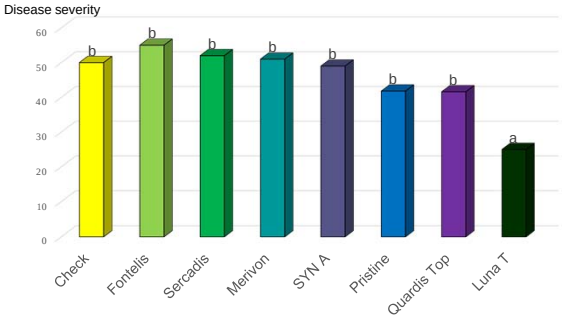
Initial symptoms

- Small, yellow to light brown water soaked oval lesions
- Lesions expand and coalesce
- Produces toxin that initiates extensive tip necrosis (Singh et al., 2000, 1999)

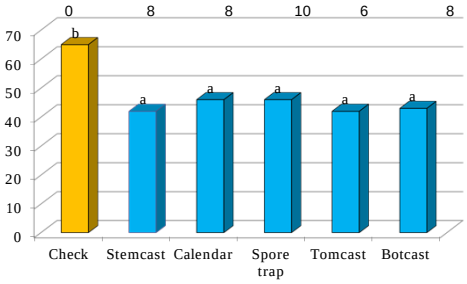
Later symptoms

- Spots of initial lesions turn brown to dark olive brown as sporulation occurs.
- Entire leaf gradually dies

Fungicides for Stemphylium on onions 2017



Spray timing for Stemphylium control - 2015



Assessed 13 August, 6 to 10 sprays, starting June 13, 2015
Luna Tranquilility (fluopyram)

Management of Stemphylium on onions

- Only a few fungicides reduce disease
- Disease forecasting for spray timing is not very helpful, possibly because the fungicides are not effective

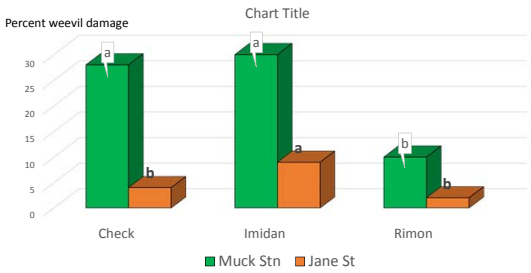
- Fungicide resistance?
- Better forecasting program needed, with effective fungicides
- Other factors – herbicides? Not Chateau
- Grad student starting in January

Carrot insects and beneficial insects

Carrot weevil

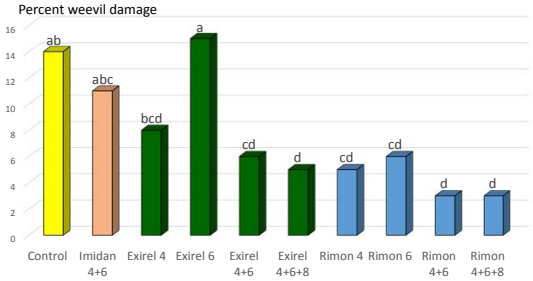
Haskap shrub on berm

Insecticides and IPM for carrot weevil control



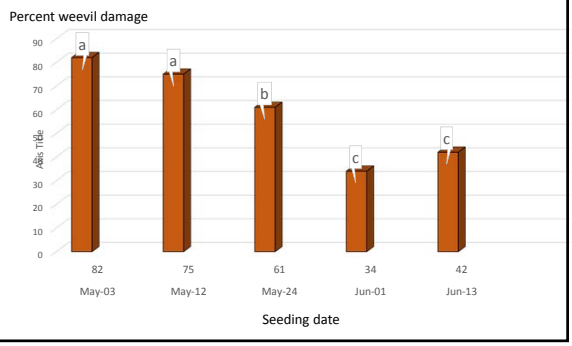
Effect of insecticides and IPM on carrot yield- 2017

Effect of insecticides on carrot weevil damate - 2017



Product and spray timing- 4, 6 or 8 leaf stage

Carrot weevil damage and seeding date



Management of carrot weevil:

- Rimon is more effective than Imidan – but need a rotation product
- Exirel has some efficacy against carrot weevil
- Seeding carrots early increases risk of weevil damage or need to spray

- Very low carrot rust fly in these trials
- Berm project to enhance beneficial insects just starting – established 2017

New Proposals for 2018:

- Disease and insect forecasting for onions and carrots in other regions of Ontario – CHC and CAP (Growing Forward 3)
  - 5 years , 3 grad students
- Survey and management of carrot cyst nematode – OMAFRA/Univ of Guelph
  - 3 years, 1 grad student
- Survey, pathotype and management of clubroot on vegetable crops – OMAFRA/Univ. of Guelph: 3 years, I grad student

Acknowledgements

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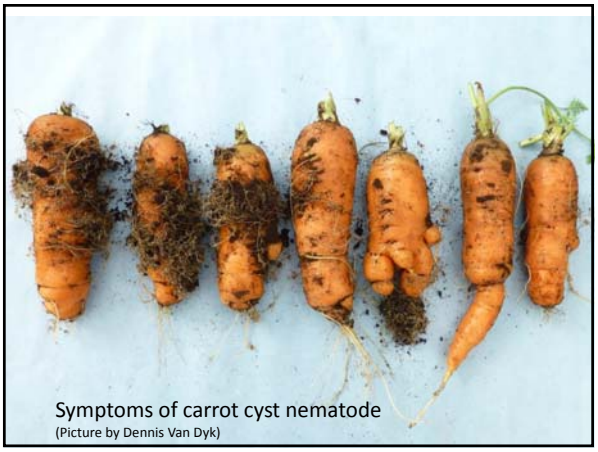
IPM for other regions of Ontario

- Monitoring and forecasting to time fungicide and insecticide applications
- - or know when fungicides are not needed
- Also to compare and improve IPM for onion downy mildew, Stemphylium and other diseases and insect pests



Symptoms of carrot cyst nematode
(Picture by Dennis Van Dyk)

Carrot cyst nematode: Objectives

1. **Conduct a carrot cyst nematode survey of carrot growing regions in Ontario.**
2. **Identify products to manage carrot cyst nematode, and provide data to support minor use registrations.**
3. **To determine action thresholds for carrot cyst nematode in field soils.**
4. **To screen carrot germplasm with resistance to root knot nematodes, for resistance to carrot cyst nematodes.**

Untreated and untarped check
Mostly 3's (0- 3 scale)

Fumigated with chloropicrin, mostly 0's and 1's

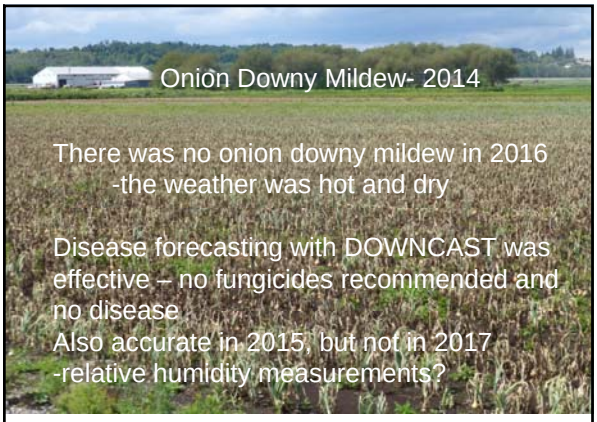
Survey and management of clubroot on vegetable Brassica crops

1. Determine the extent of clubroot in Ontario vegetable fields, and identify pathotypes.
2. Screen vegetable cultivars grown in Ontario for resistance to pathotypes found in Ontario.
3. Evaluate rotation crops and cover crops that can reduce the population of the pathogen.
4. Develop methods to deal with small or new infestations of the pathogen such as solarization and fumigation.

Onion downy mildew

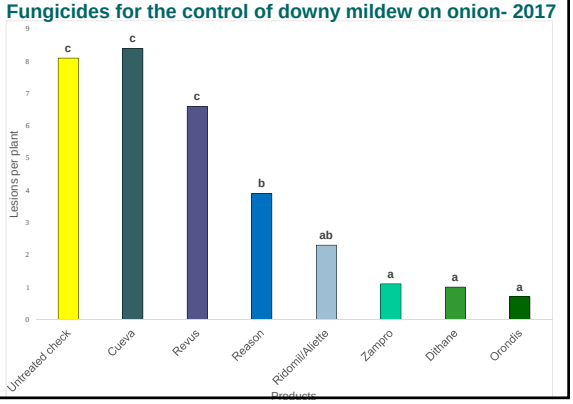
- Develops in cool, humid weather
- Fungicides must be applied before infection takes place
- Disease forecasting important

- Sporulation when temperatures below 75 ºF, (24 ºC) previous day
- **Temperatures over 81 ºF inhibit sporulation**
- Temp 38 - 75 ºF (4 – 24 ºC) at night
- Humidity above 95%, but not rain at night,
- Infection: 43-79 ºF, 3-6 hours leaf wetness
- Takes 9 to 16 days from infection until sporulation
- No symptoms until sporulation occurs



Downy mildew developed late in the season in 2014.

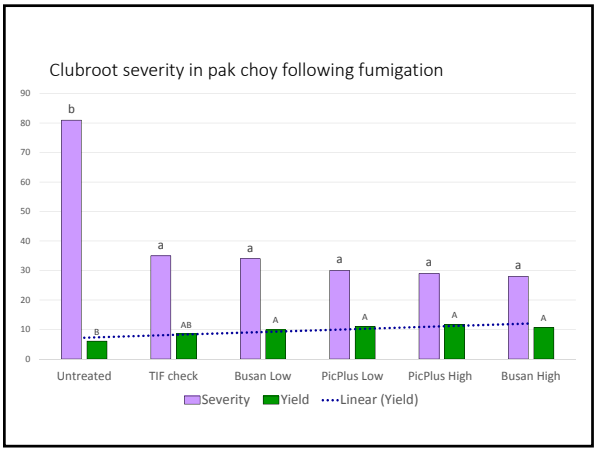
Fungicides for the control of downy mildew on onion- 2017



Disease forecasting is essential for management of downy mildew of onion

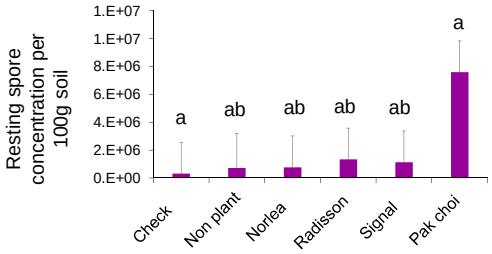
Several fungicides provide effective control:
Orondis (oxathiopipronil)
Zampro
Ridomil (metalaxyl) alternated with Aliette (fosetyl-Al)
And (surprisingly) Dithane (mancozeb)

This demonstrates the importance of spray timing prior to infection
Issue: Fungicide resistance can develop quickly



Grass cover crop

Results



Relationship between spore concentration and grass species grown for 60 days in the soil inoculated with $5x10^5$ resting spores mL-1. n=6.

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