Diseases Threatening Vegetables Crops in Ontario

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Project Goals

Asparagus - $16.5 M - Stemphylium
Onions - $32.0 M - Stemphylium leaf blight
Spinach - $4.0 M - Fusarium Wilt
Carrots - $29.0 M - Fusarium Root Rot

- Spray timing using disease forecasting systems
  BOTCAST, TOM-cast
- Variety trials
- Bio and Chemical control
Stemphylium on Asparagus

- Caused by *Stemphylium versicarium* commonly referred to as Purple Spot
- Disease affects spears and ferns
- Severe disease can result in early fern defoliation and reduce yield
Variety Trial Results:

Purple spot incidence (%) at Plattsville, eight harvests

Bars which share a letter in common are not statistically different (Tukey’s HSD, $P=0.0189$, $n=40$). Error bars represent the standard error. Data were transformed to satisfy normality assumptions. Means and standard errors are non-transformed.
2015 field trials - Objectives

Importance of foliar fungicides in asparagus

1. Reduce disease severity on the fern
2. Prevent premature defoliation

Goal: Reduce the inoculum that overwinters

Maximize the carbs that returns to the crown

What effect does spray timing have on disease control?

What effect does nitrogen have on preventing premature defoliation?
Spray Timing Trial

Brady soil (sandy) site

*Treatments are significantly different (Tukey’s HSD, $P \leq 0.05$, n=16).

**Fungicide treatments are significantly different from the untreated control (Tukey’s HSD, $P \leq 0.05$, n=16).

Data were transformed, if required, to satisfy normality assumptions. Means and standard errors are non-transformed.
Spray Timing Trial

Wauseon/Berrien soil (sandy loam) site

*Untreated
15DSV (9 apps)
30DSV (5 apps)


*Treatments are significantly different (Tukey’s HSD, $P \leq 0.05$, n=16).
**Fungicide treatments are significantly different from the untreated control (Tukey’s HSD, $P \leq 0.05$, n=16).

Data were transformed, if required, to satisfy normality assumptions. Means and standard errors are non-transformed.
*Treatments are significantly different (Tukey’s HSD, $P \leq 0.05$, n=4).
**Fungicide treatments are significantly different from the untreated control (Tukey’s HSD, $P \leq 0.05$, n=4).
Data were transformed, if required, to satisfy normality assumptions. Means and standard errors are non-transformed.
Asparagus Summary

• Variety Trial
  • Generally, UG010 had the least amount of disease on the harvested spears.
  • Following significant rainfall, all of the varieties were severely infected.

• N application did not affect disease development

• Tomcast forecasting model reduced fungicide applications higher DSV had similar disease control

• Higher disease was observed at the sandy site than at the sandy loam site.
  • Did the low rainfall have a greater effect on lighter soil?
  • Drought stress may contribute to disease
Spinach - Fusarium wilt

• Develops under long term monoculture
• Multi-cropping and lack of rotation cause inoculum to build up in soil:
  • Chlamydospores remain in soil for 15 years
• Seed-borne and soil-borne
• Most aggressive in high soil temperatures (25-28°C)
• No truly resistant cultivars
• No effective fungicides registered for spinach
• Low tolerance for disease in commercial production
Soil amendments and fumigants

2013 Treatments:

- **MustGrow** (*Brassica juncea*) 1,120 kg/ha
- Perlka (calcium cyanamide) 1,000 kg/ha
- Basamid (dazomet) 500 kg/ha
- Busan 1236 (metam sodium) 730 L/ha
- Tarped Busan 1236 - 730 L/ha
- Nitrogen Control 200 kg N/ha (465 kg XCU/ha)
- Untreated control

2014 Treatments:

- Spent mushroom compost 23 tons/ha
- Pic-Plus (chloropicrin) 108 L/ha
- Tarped Busan 1236 - 730 L/ha
Materials and Methods
Disease Severity Index (DSI)

0 = Healthy
1 = Yellowing
2 = Slightly Wilted
3 = Severely Wilted
4 = Dead
Cultivar Results - 2012 & 2013

- Norgreen
- Unipack12
- Greyhound
- ImperialG
- POH-0438
- Carmel
- Sardinia
- C2606

Severity Index

DSI
Field Trial Results

- **Disease Incidence (%):**
  - Untreated: AB (CD)
  - Chloropicrin: a (bc)
  - Dazomet: ab (CD)
  - High N check: ab (BC)
  - Metam sodium: a (BC)
  - Calcium cyanamide: A (cd)
  - Brassica seed meal: A (d)
  - Compost: A

- **Yield (g):**
  - Untreated: AB (CD)
  - Chloropicrin: a (bc)
  - Dazomet: cd
  - High N check: ab (CD)
  - Metam sodium: a (BC)
  - Calcium cyanamide: A (cd)
  - Brassica seed meal: A (d)
  - Compost: A

Legend:
- **Yellow** = Disease Incidence (%)
- **Green** = Yield (g)
Spinach Summary

- Cultivar selection can be a useful tool in management
- Tested 23 different chemical and biological fungicides which were not effective
- High nitrogen is as effective as chemical fumigants
- Only Pic Plus controlled disease
Stemphylium leaf blight

*Stemphylium vesicarium*

A severe leaf blight reported in 2008 in a few fields, Holland Marsh, ON.

Starts with small light brown lesions, these expand and black conidia develop

Usually limited to leaves and doesn’t extend to bulbs

Infection may kill entire leaves, results in reduced yield
Onion – Research Objectives

- Improve the management of Stemphylium leaf blight on onion:
  - Evaluate fungicides. Do existing products work?
  - Test disease forecasting models. How early should we start to spray?
  - Screen onion cultivars for susceptibility to Stemphylium
  - Do surfactants used for insect control increase the susceptibility of onions to Stemphylium?
Disease Forecasting - 2015

Stemphylium Incidence

- Incidence (%)

- 2-Jul
- 23-Jul

- SPORE
- TOMCAST
- BotCAST
- STEMCAST
- Calendar
- Check

- C
- BC
- B
- B
- AB
- A
Effect of surfactants, 2014

Disease severity index

Check  WSMax  Hasten  Sylgard  QuadrisTop  QT+WSM  QT+Hasten  QT+Sylgard

NS
Onion Summary

- Forecasting reduced disease severity but the efficacy is lower than desired
- Current fungicides for onions are not as effective for Stemphylium leaf blight
- Spray timing could be improved
  - Stemphylium produces phytotoxins. It may be extremely important to prevent the first infections.
- Differences in cultivar susceptibility, but all are susceptible, onion maturity can impact disease
Fusarium root rot was identified in the Holland Marsh, Ontario in 2008.

*Fusarium solani* is a soilborne fungus, disease affects the carrot root, significantly reducing the marketable yield.

Currently, there are no registered fungicides to control the disease.

Need to assess cultivars.
Cultivar field trial - 2013

% Fusarium

- Envy
- Fontana
- Bastia
- Bonfire
- Jerada
- Cellobunch
- Olympus
- Warmia
- Belgrado

Mid season

Harvest

NS
Carrot Fusarium - Summary

- No differences in susceptibility among carrot cultivars in the Holland Marsh.

- Assessed several different products at seeding and found none to be effective.

- Several lab studies were conducted.

- Observed different isolates of the pathogen.
Evaluation of Pic Plus

% Fusarium

- 108 L/ha
- 62 or 70 L/ha
- 54 L/ha
- check

2014
2015

108 L/ha: a
62 or 70 L/ha: A, ab
54 L/ha: A, b
check: B, b
Carrot Fusarium - Summary

- Disease is most severe in late harvested carrots
- Pic Plus fumigant is the only product that significantly decreased fusarium incidence in the field
- High rate of Pic Plus increased forking, need to assess timing of applications
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Thank you
Questions?