

Downy mildew and neck rot on onion and stem and bulb nematode on garlic.



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Holland Marsh , Ontario, Canada $44^{\circ} 15' N$, $79^{\circ} 35' W$

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



Onion Downy Mildew- 2014

There was no onion downy mildew in 2016
the weather was hot and dry

Disease forecasting with DOWNCAST was
effective – no fungicides recommended
and no disease

Downy mildew developed late in the season in 2014.

Fungicide treatments for downy mildew control – 2014, 2015, 2016

Treatment	Rate (per ha)
ZAMPRO (ametoctradin+dimethomorph)	1.0 L + 0.25% v/v Sylgard
ORONDIS (oxathiapiprolin formerly QGU42)	350 mL
DITHANE (macozeb 75%)	32.5 kg
QUADRIS TOP (azoxystrobin+difenoconazole)	1.0 L
RIDOMIL/ALIETTE ² (mefanoxam/ fosetyl-Al)	2.5/2.8 kg
OMEGA (Allegro, fluazinam 50%)	1.16 L
CABRIO (pyraclostrobin 20%)	840 g
Check	

Onion downy mildew- 2016



- Results from past years indicate that fungicides **Orondis** and **Zampro** are effective for downy mildew control
- **We will continue this work until downy mildew develops in the trial**

Onion neck rot

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



- Can be on onion seed
 - The cotyledon becomes infected from the seed coat, fungus can sporulate on the dying cotyledon, and infect other leaves.
- Airborne spores land on leaves during the growing season
- Infection takes place during cool, (50-68°F) humid weather
- “Latent” infection. Usually no symptoms until onions are in storage



Onion neck rot

- Infection can also occur at harvest if the necks have some green or moist tissue
- Does not spread from bulb to bulb in storage, but can become worse the longer the bulbs are stored.
- White onions and some late maturing red onions are very susceptible.



Onion neck rot-Objectives

- To evaluate fungicides for the control of onion neck rot
- To evaluate the timing of fungicide applications to optimize the control of neck rot
 - White dehydrator onion



Onion neck rot: Methods

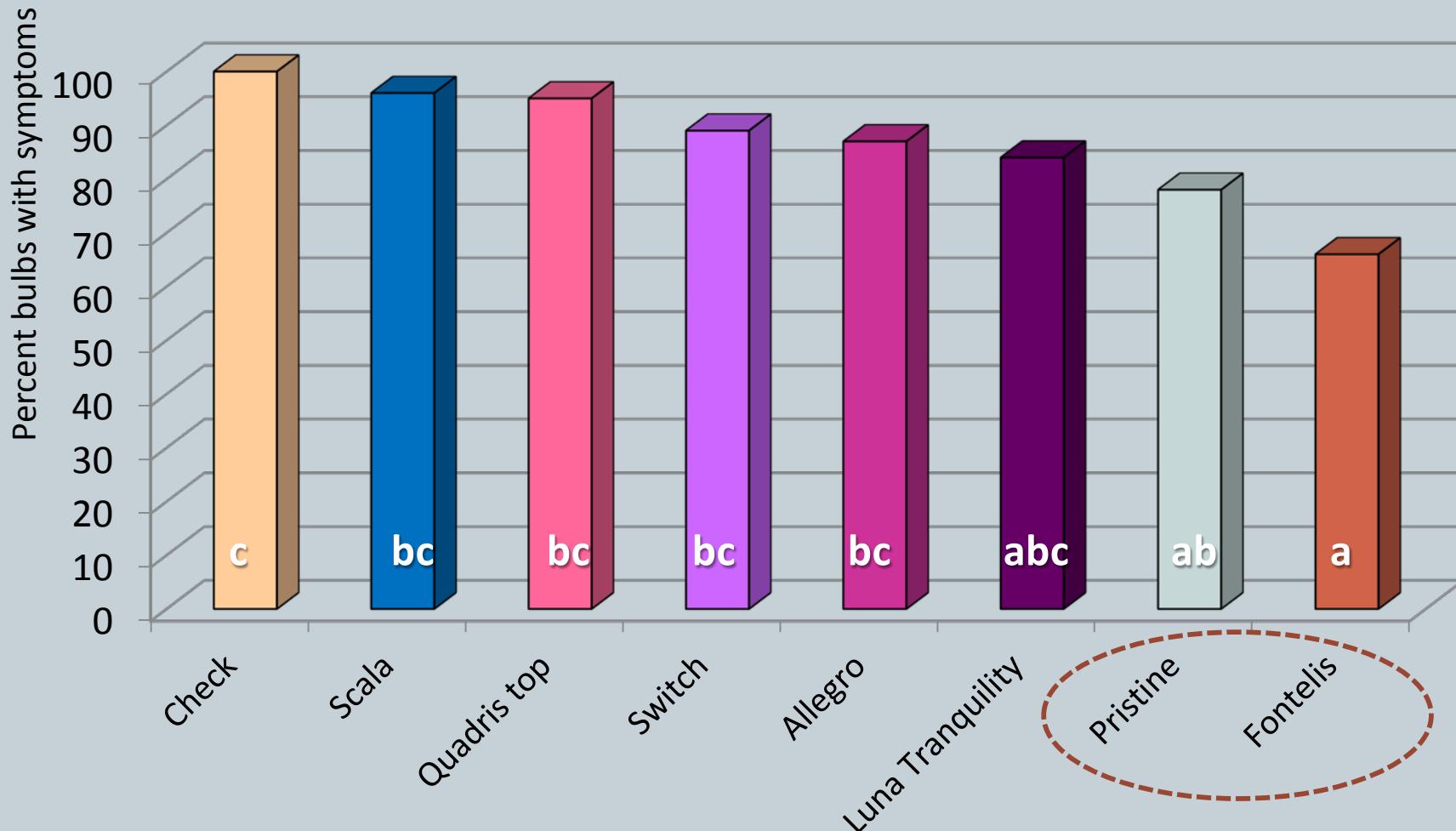
- Seeded mid May
- Fungicides sprays began mid July
- 5 sprays at ~ 10 day intervals)
- Onions pulled late Sept 29 to early October (late harvest)
 - not subjected to artificial curing.
 - 7.5 feet of row harvested
- All onions were assessed in late January to early February
- Bulbs were cut and examined for symptoms



Fungicides for neck rot control-2014, 2015

Treatment	Active ingredient	Rate L/ha
Fontelis	penthiopyrad	1.75
Pristine	boscalid + pyraclostrobin	1.3
Luna Tranquility	fluopyram+pyrimethanil	1.2
Omega	fluzainam	1.16
Switch	cyprodinil+fludioxonil	975 g
Quadris Top	azoxystrobin + difenoconazole	1.0
Scala	pyrimethanil	2.0
Check		

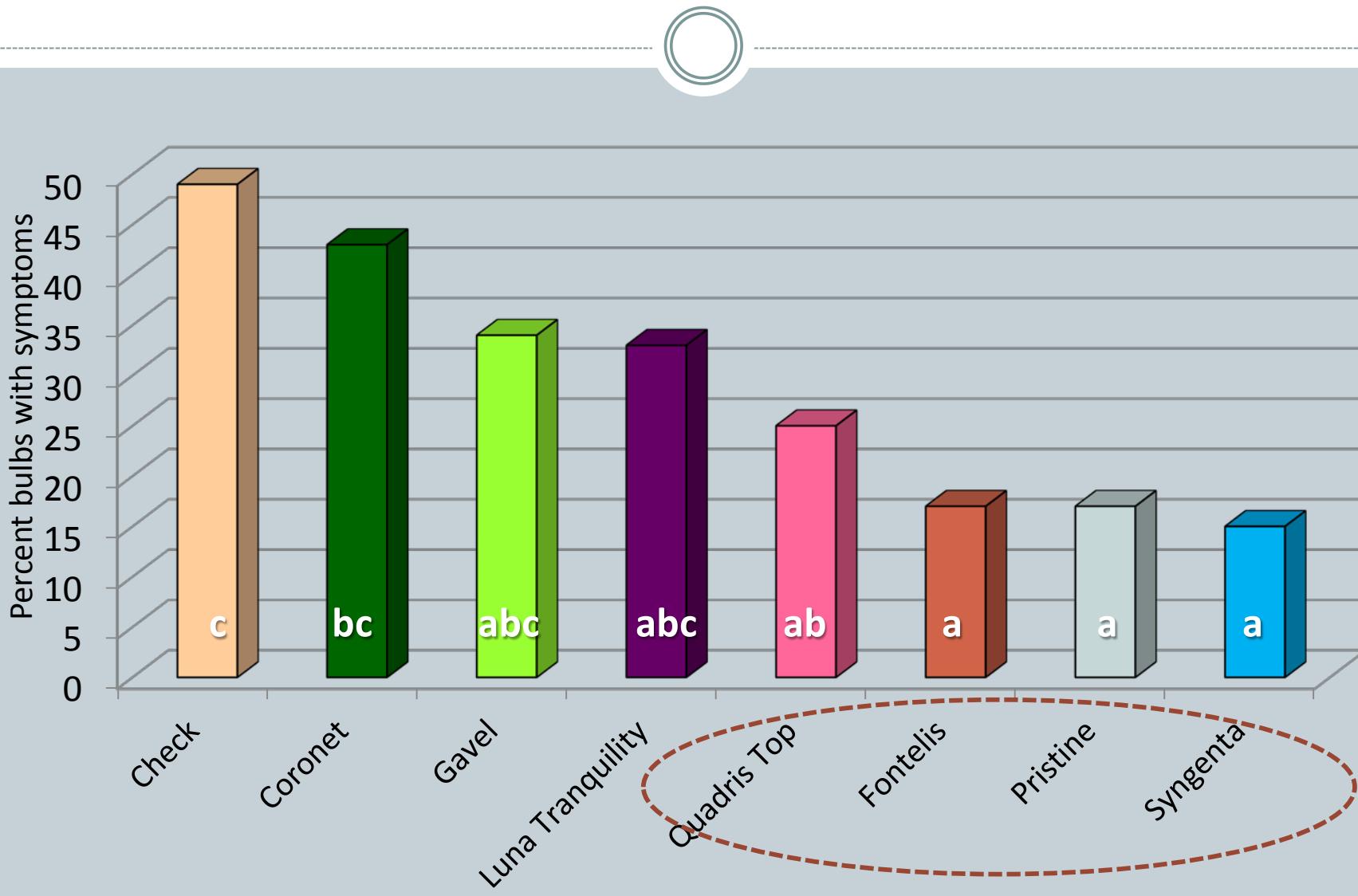
Evaluation of fungicides for the control of onion neck rot: dehydrator onion- 2014



Fungicides for neck rot control-2016

Treatment	Active ingredient	Rate L/ha
Fontelis	penthiopyrad	1.75
Pristine	boscalid + pyraclostrobin	1.3
Luna Tranquility	fluopyram + pyrimethanil	1.2
Gavel 75 DF	zoxzmide and mancozeb	2.2 kg
Syngenta A19649B	experimental	0.75
Quadris Top	azoxystrobin + difenoconazole	1.0
Coronet seed treatment	boscalid + pyraclostrobin	
Check		

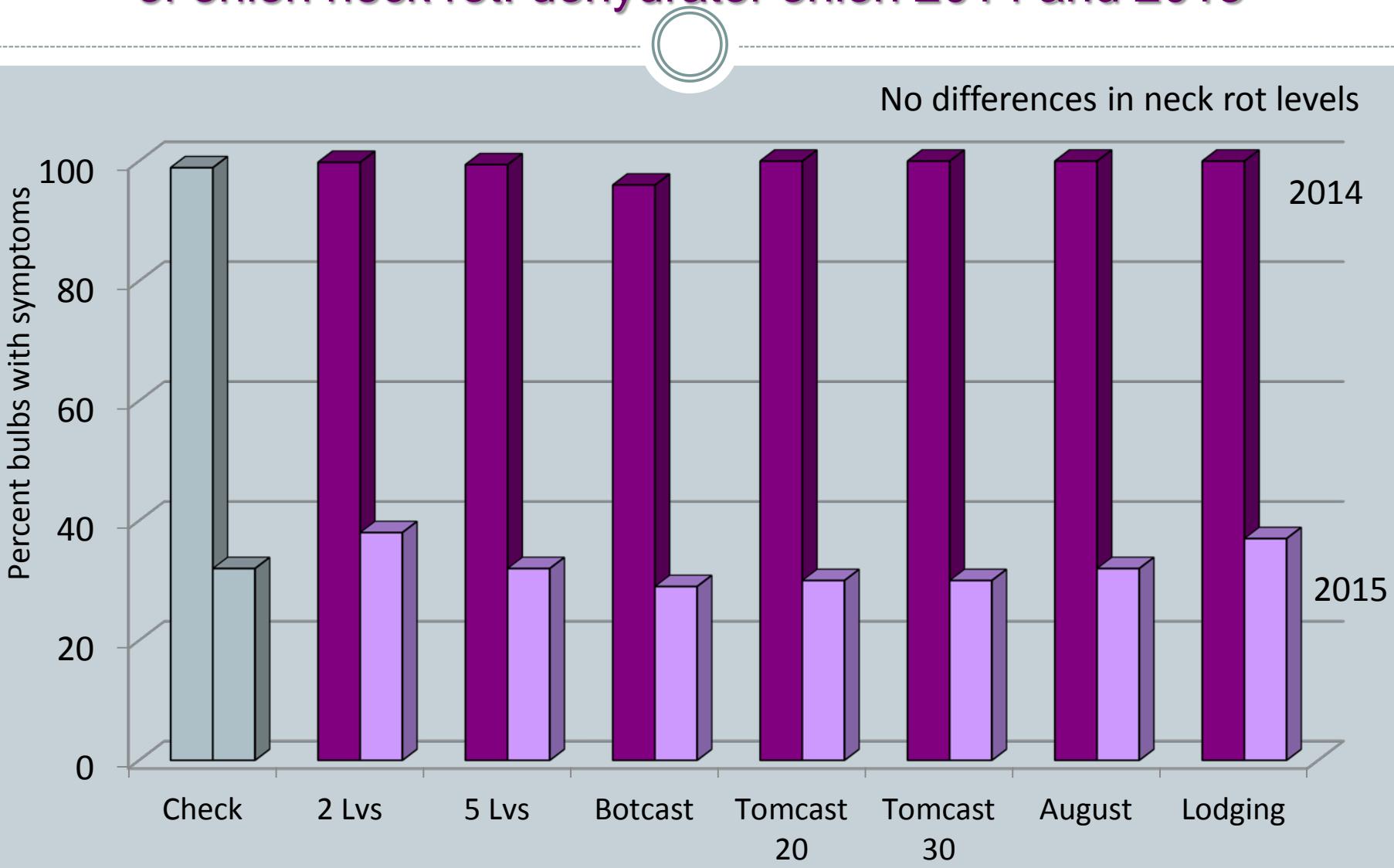
Evaluation of fungicides for the control of onion neck rot: dehydrator onion- 2016



Fungicide spray timing for control of neck rot 2014, 2015

- **Disease forecasting systems were tested**
 - First true leaf (to prevent infection from cotyledon) (1)
 - **Botcast** – developed for Botrytis leaf blight (4,6) (combination of temp. and leaf wetness)
 - **Tomcast** with Disease Severity Values of 20 and 30 (combination of temp. and leaf wetness) (8,7)
 - 5th or 6th true leaf (6, 5)
 - 2nd week of August (before lodging) (3, 2)
 - Just before lodging (1)
 - Unsprayed (0)

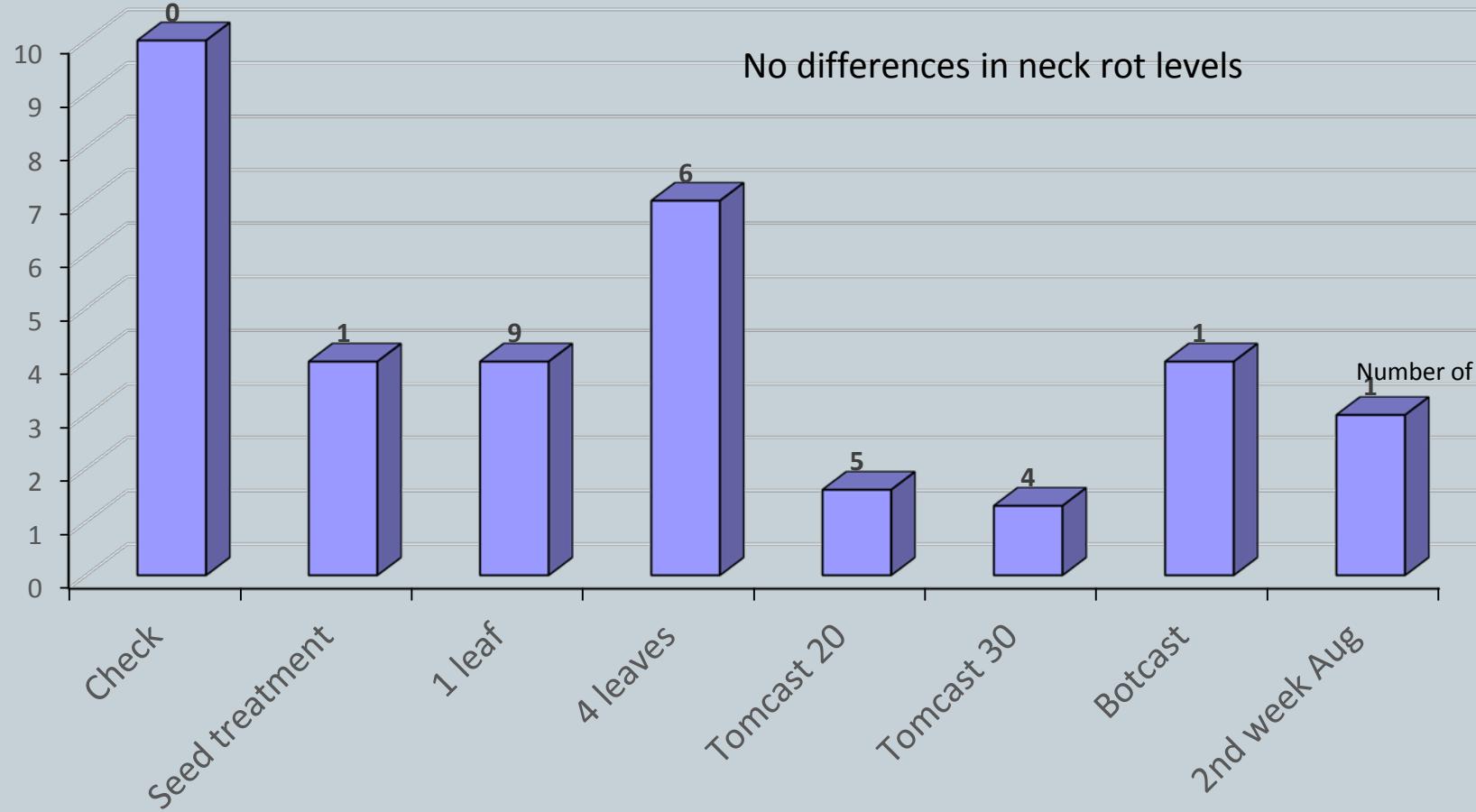
Evaluation of spray timing with Fontelis for the control of onion neck rot: dehydrator onion 2014 and 2015



Spray timing with Fontelis for neck rot - 2016



Evaluation of spray timing with Fontelis for the control of onion neck rot: 2016



Fungicides and spray timing for the control of onion neck rot- Conclusions

- White dehydrator onions are very susceptible.
- High disease pressure in 2014, lower ~ 50% in 2016.
- **Fontelis, Pristine, and a new fungicide from Syngenta** were very effective. Quadris Top also reduced disease.
- Fungicide sprays starting at the 4-5 leaf stage and seed treatments and Tomcast 30 for further testing.
- Cultural methods to ensure dry necks at harvest are important to reduce neck rot



Garlic Production in Ontario

Small industry:

- **200- 300 acres officially, probably ~ 600**
- **In Canada: up to 1000 acres?**
- **Many farms are less than 5 acres**
- **Many organic growers**
- **There is a high demand for local garlic**
- **Stem and bulb nematode is the limiting factor**

Garlic is planted in October and harvested in July



Stem and Bulb Nematode



Ditylenchus dipsaci

- microscopic nematodes 1.2 mm long
- migratory endo-parasites
- live and feed inside bulb and stems of plants but travel in soil pores filled with water
- live in plants and feed on stems, leaves, bulbs, buds, rhizomes and flowers but rarely roots
- they are transferred easily in garlic cloves used for seed

A low level of infection may results in no symptoms, but heavy infection destroys the bulbs



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

There is a problem getting this registered, so alternative products were investigated:

Agri-Mek (abamectin)

Nimitz (fluensulfone)

Movento (spirotetramat)

Velum Prime (fluopyram)

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



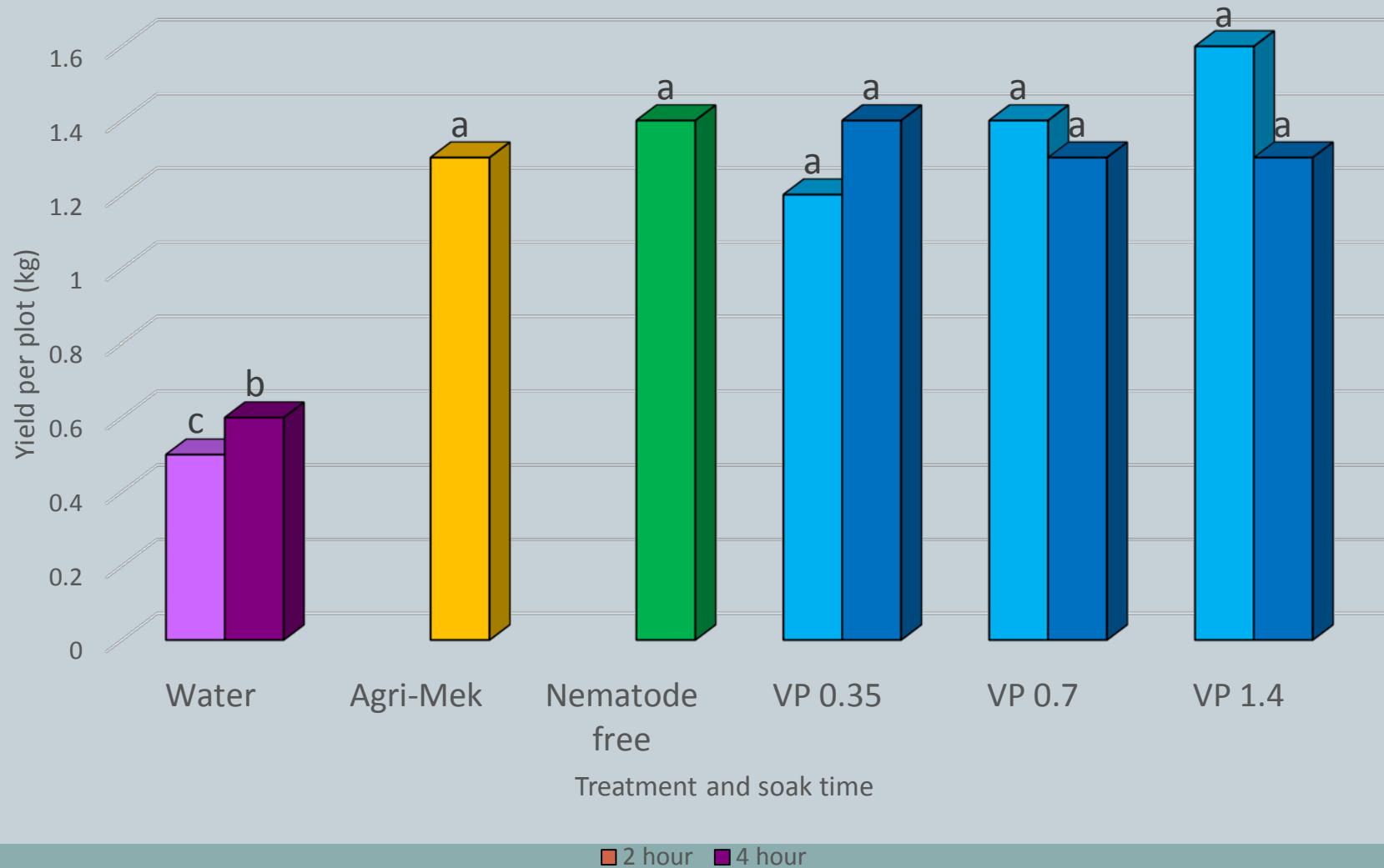
Worker exposure is an issue for hand-planted garlic

Rates and preplant soak time for cloves treated with Velum Prime (fluopyram) and Agri-Mek 2015- 2016

Product	Rate ml/L	Duration
Nematode free		
Water		2 and 4 hours
Agri-Mek	0.83	4 hours
Velum Prime	0.35	2 and 4 hours
Velum Prime	0.7	2 and 4 hours
Velum Prime	1.4	2 and 4 hours

Infected cloves had an average of 380 nematodes per gram of dry bulb

Effect of pre-plant treatment on yield of garlic



Nematicide Trials 2015-2016

- Nematode infected garlic cloves (av. 830 nematodes/g) were treated in the Fall of 2015, prior to planting.
Harvested July 2016
- Planted in non-infested soil
- Products:
 - Agri-Mek (abamectin)
 - Nimitz (fluensulfone)
 - Movento (spirotetramat)
 - Velum Prime (fluopyram)
- Severity rated 0-4: 0 = no symptoms, 1- slight damage, 4- dead



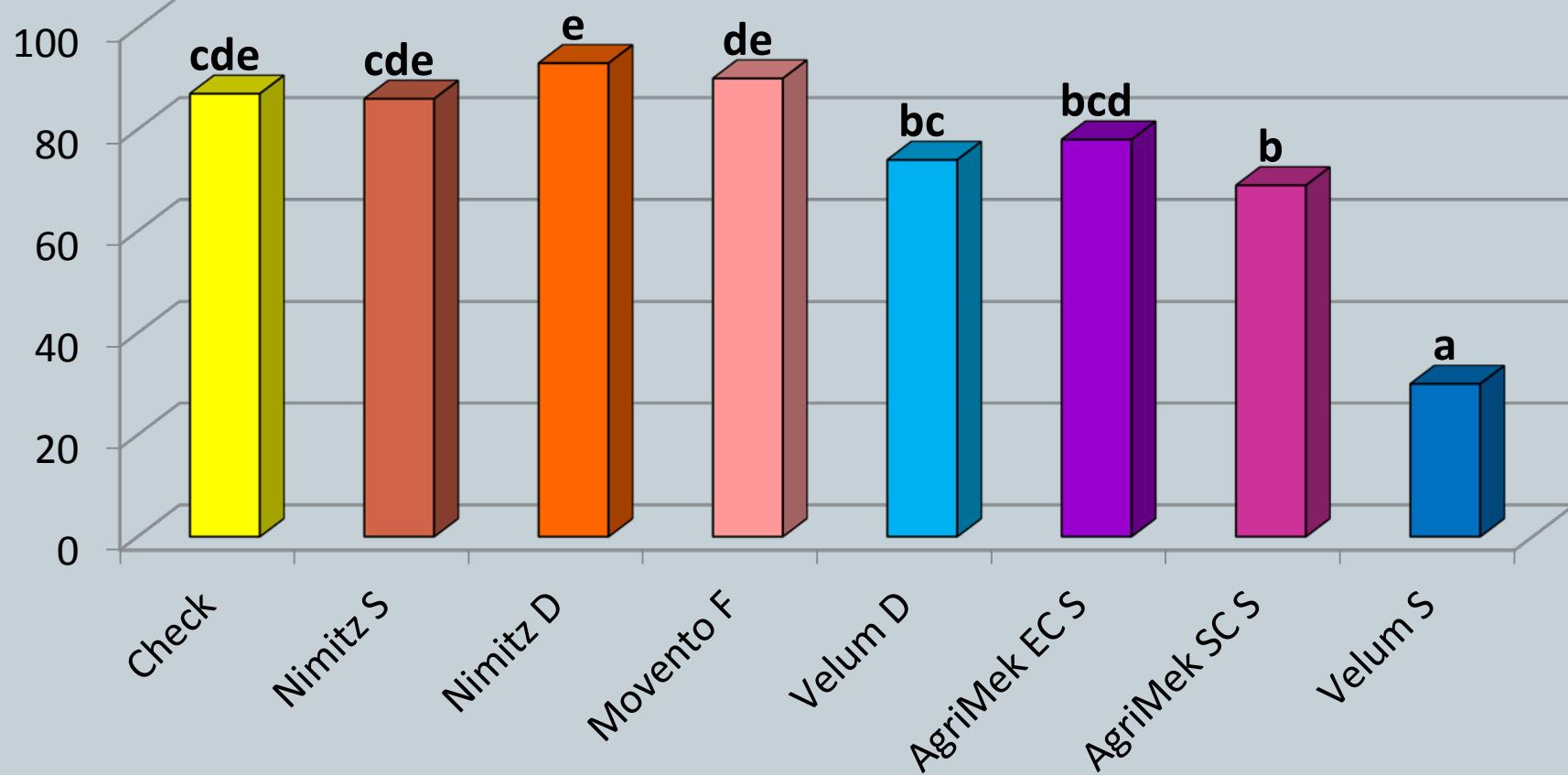
Products and application methods 2015 - 2016

Product	App'n Method	Rate	Details
AGRI-MEK SC	Soak	0.9 mL/L	4 hour soak
AGRI-MEK EC	Soak	3.76 mL/L	soak
AGRI-MEK SC	Dbl rate soak	1.7 mL/L	soak
VELUM PRIME	Soak	1.67 mL/L	soak
VELUM PRIME	Drench	0.5 mL/L	over-the-open-row drench at planting
NIMITZ 480 EC	Soak	20 mL/L	4 hour soak
NIMITZ 480 EC	Drench twice	6 mL/L	drench at planting and 3 May
NIMITZ 15G & NIMITZ 480 EC	In-furrow & drench	0.768 g/m, 6 mL/L	in-furrow at planting and drench 3 May
MOVENTO	Foliar	400 mL/ha	foliar applications on 3, 18 May & 1, 15 June

Severity of stem and bulb nematode- 2016



Severity

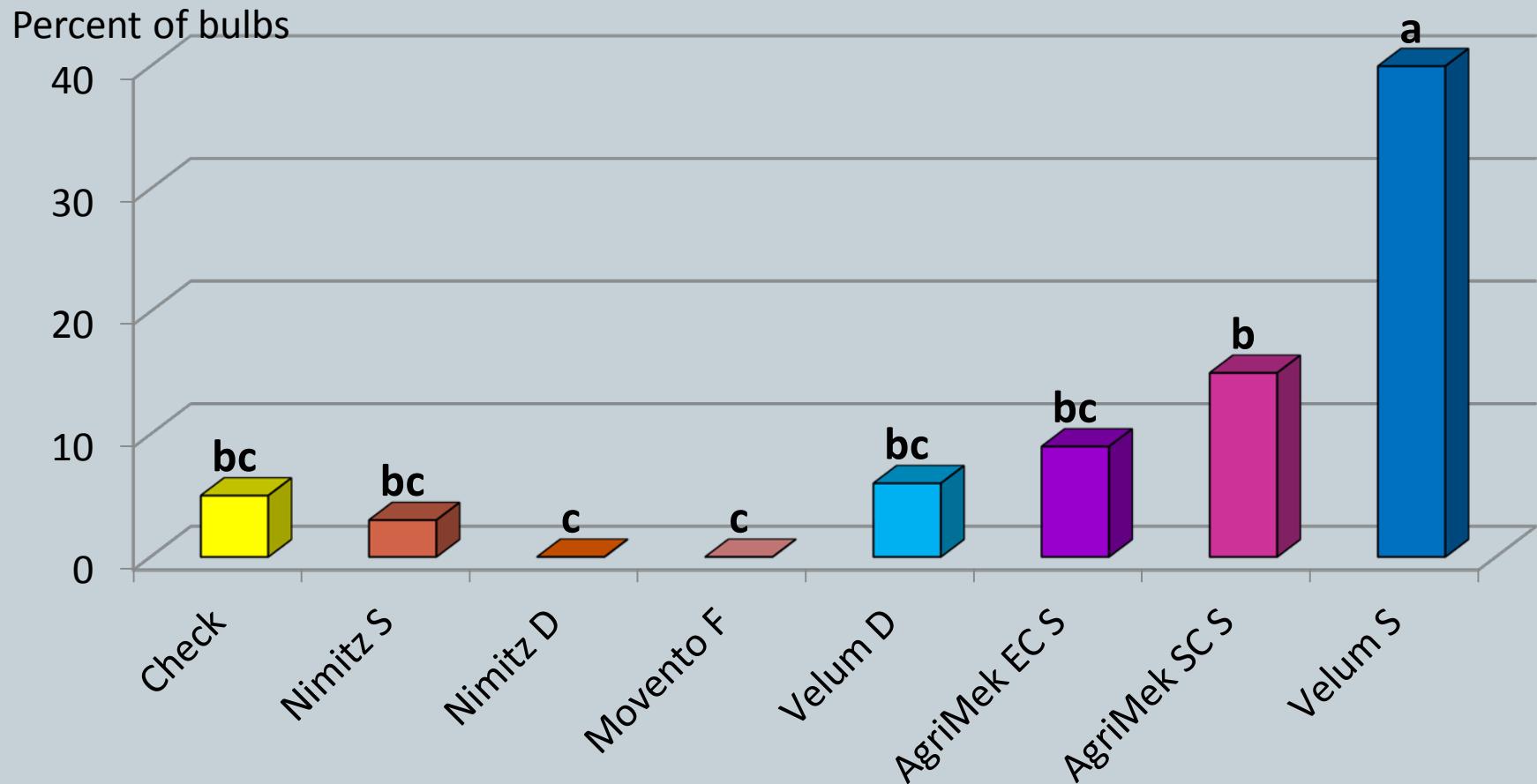


S= 4 hour soak before planting D= Drench in open furrow immediately after planting, F= foliar spray in spring (May) after emergence

Marketable yield of garlic - 2016



Marketable Yield %



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



Check

AgriMek
soak

Velum
Prime soak

June 24, 2016

Stem and bulb nematode- summary

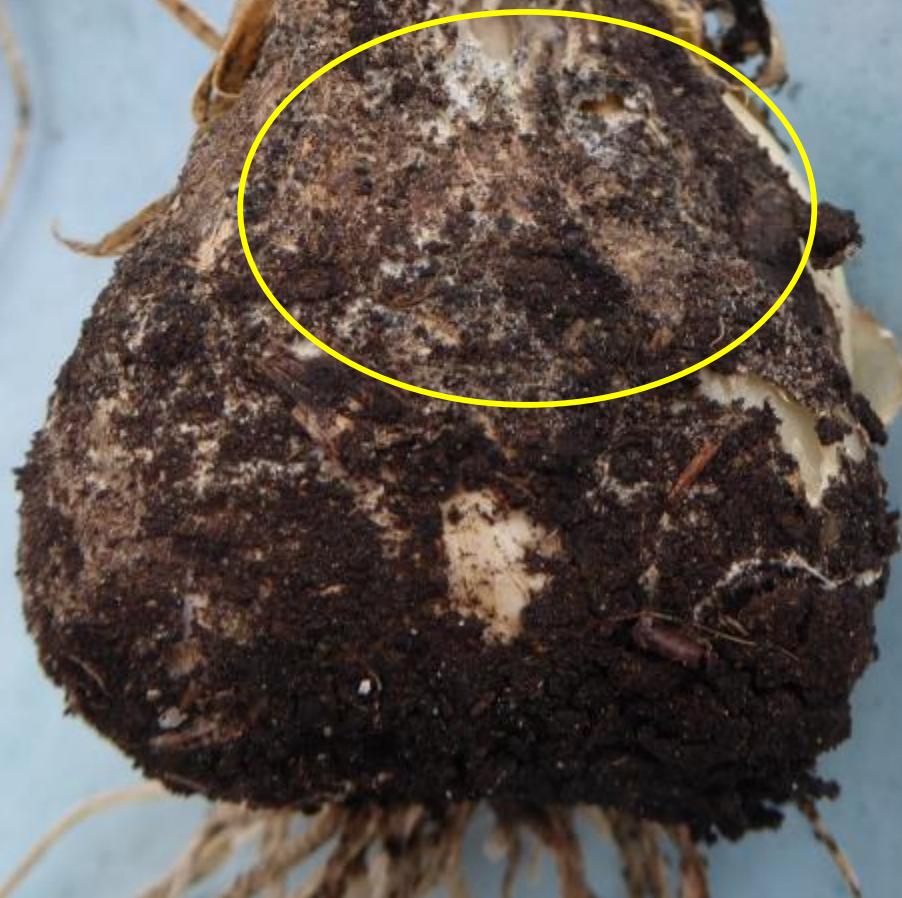


Velum Prime as a soak provided excellent control of stem and bulb nematode, even at high levels of infection in the planting materials (830 nematodes/g)

Velum Prime and Agri-Mek soaks resulted in yields similar to those of the nematode-free seed, when levels of infection were lower (380 nematodes/g)

Important to get Velum Prime registered for this use on garlic

Since fluopyram is a fungicide, will it control white rot also?





Rotation crops and possible hosts: white beans, kidney beans, dry and fresh peas, soybeans, wheat, onions, alfalfa.

Trials 2016-2017

Planted October 2016



- Nematode infested garlic cloves were treated in the Fall of 2016, prior to planting
- Planted in non-infested soil – 2 sites
- Treatments:
 - Agri-Mek (abamectin) - soak
 - Averland Reach (nano formulation of abamectin)- drench
 - Velum Prime (fluopyram)- soak
 - Nimitz (fluensulfone)- soak
 - ProMax (thymol)- soak
 - Phostoxin gas – preplant fumigation of seed
 - Nematode free cloves

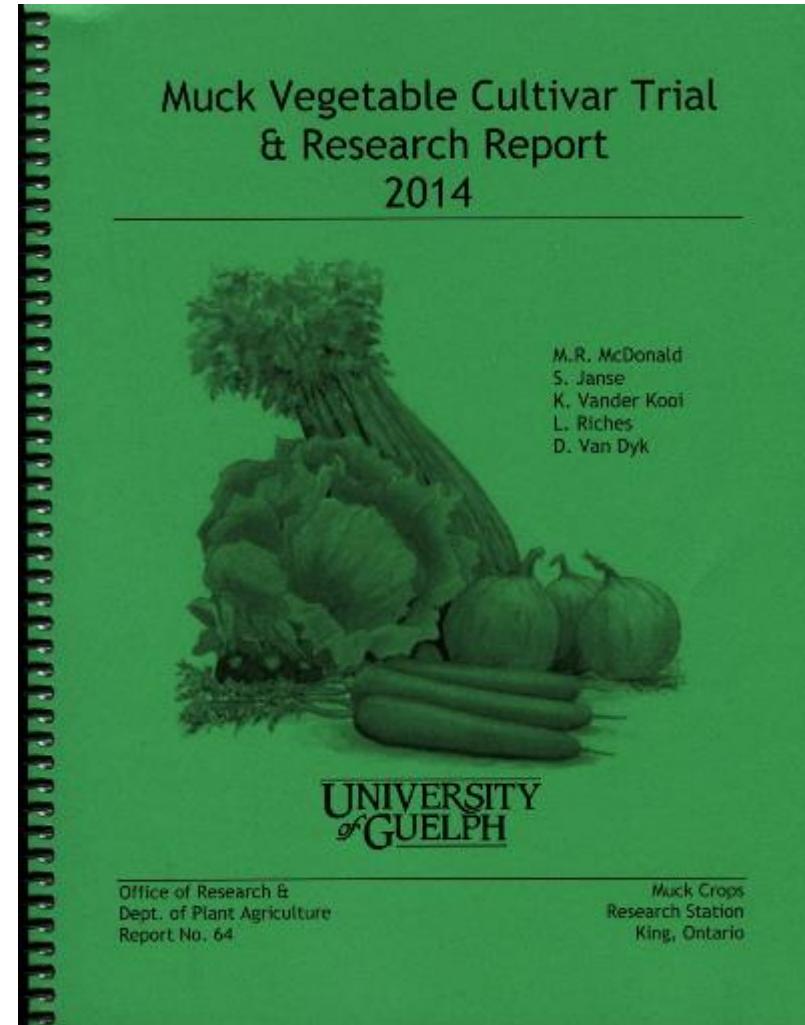
All research trials are summarized in the Annual Report

Download at the Muck Station web site:

www.uoguelph.ca/muckcrop

2016 report will be available by the end of March

**Annual Muck Vegetable
Growers Conference April 12
and 13, 2017
Onion Day: Thursday, April 13**



Acknowledgements

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