ADELAIDE, SOUTH AUSTRALIA

WPC 2024

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WORLD POTATO CONGRESS

Speaker Disclosure

The presenter has advised that the following presentation will NOT include discussion on any commercial products or service and that there are NO financial interests or relationships with any of the Commercial Supporters of this years ASM.

Unveiling the Potential of 2*E*-Hexenal: A Breakthrough in Potato Storage Disease Management

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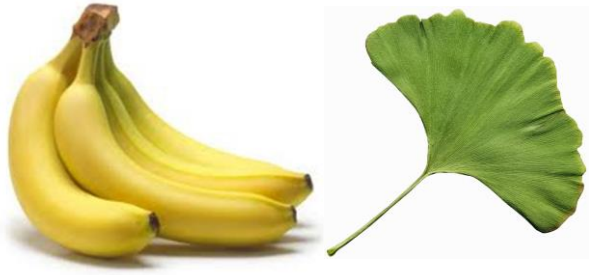
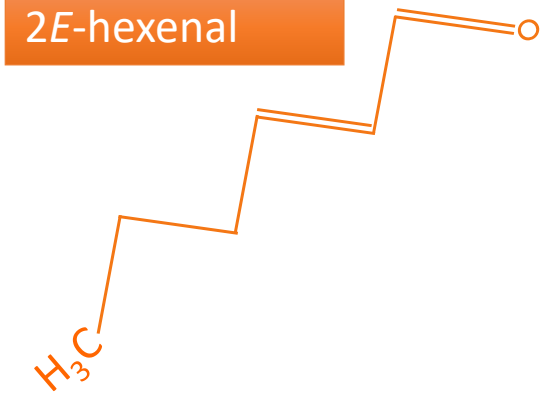


Volatile compounds to control disease

- 2*E*-hexenal is a naturally produced volatile compound (lipoxygenase pathway)
- Previous studies have shown anti-fungal and anti-bacterial properties
- Approved by the FDA as a food/flavor additive
- Volatile nature

2*E*-hexenal



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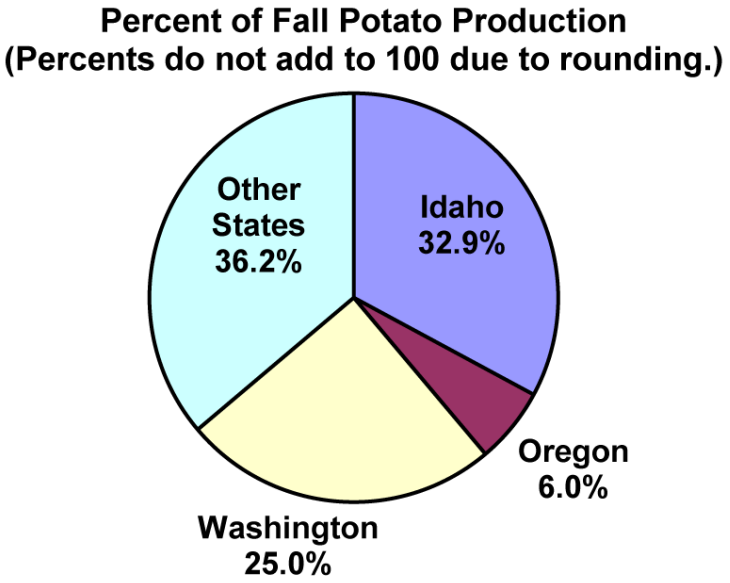
Market overview



- On average, Idaho growers produced 7 million metric tonnes of potatoes valued at $1.05 billion or approx. 5% of the Idaho economy.
- On average, 500,000 tonnes ($73 million) of the potatoes placed in storage are lost to diseases and shrinkage.
- Growers have few effective options for the control of potato diseases once potatoes have been placed in storage.
- At the University of Idaho, our research showed that the anti-fungal plant volatile 2*E*-hexenal is highly effective in controlling potato diseases in storage.

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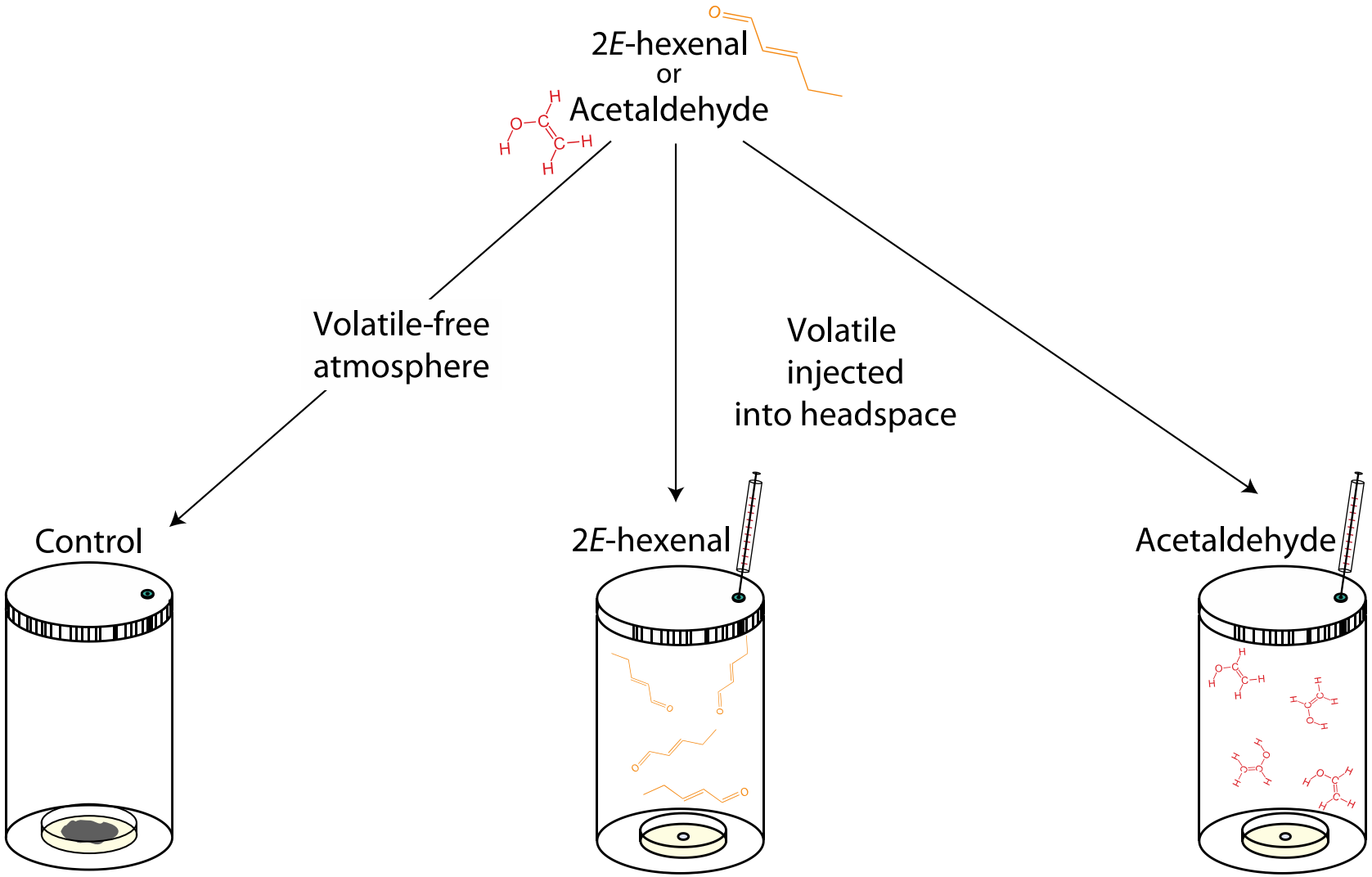
In vitro methods



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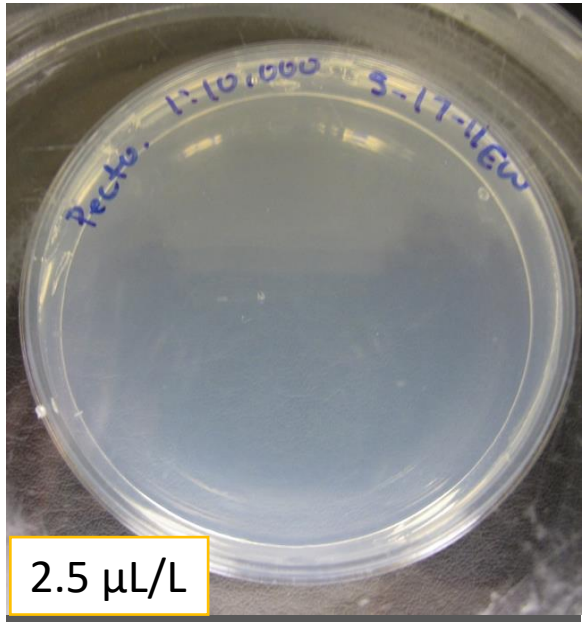
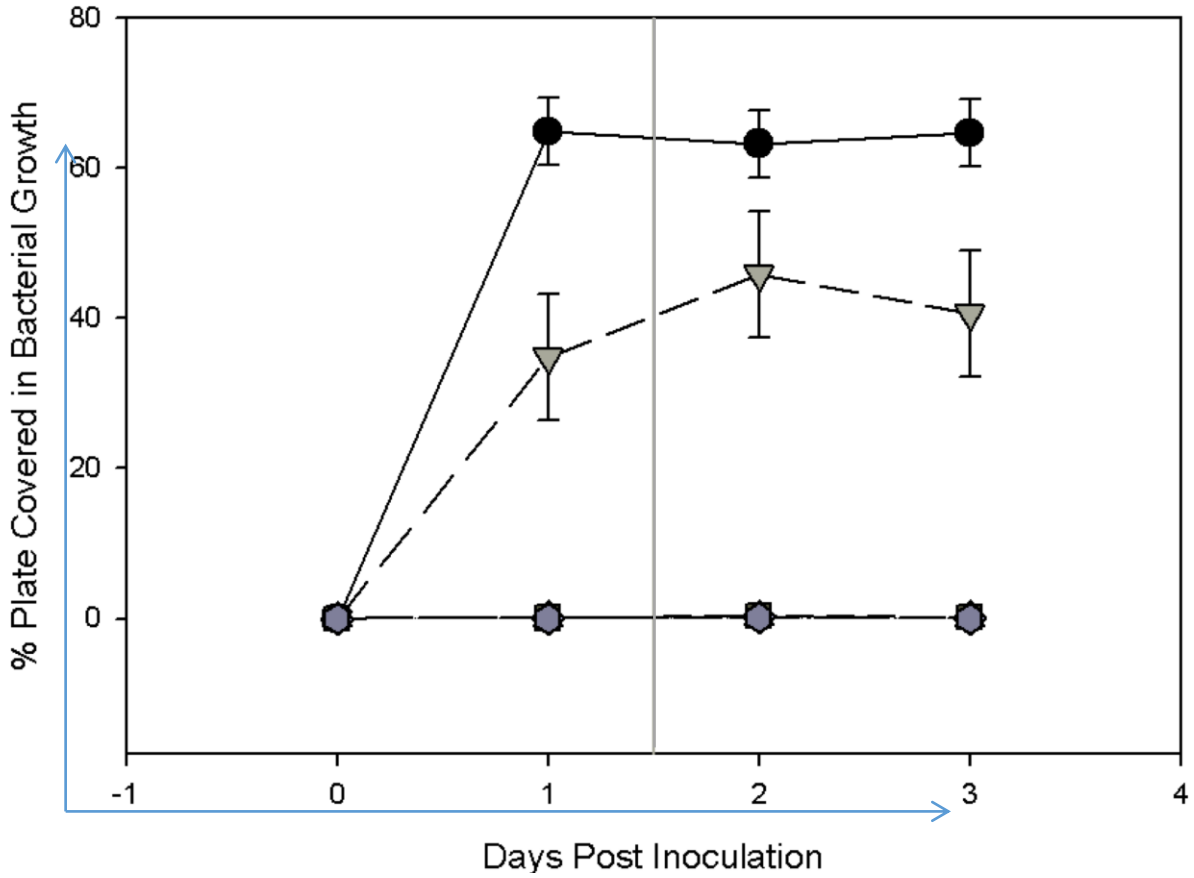


(●) UTC (▼) IS Check (■) 2.5 µL/L (◆) 5 µL/L (▲) 7.5 µL/L (⬢) 10 µL/L



Results: *Soft rot*

2.5 µL/L of 2*E*-hexenal was capable of inhibiting growth of *P. atrosepticum* completely *in vitro.*

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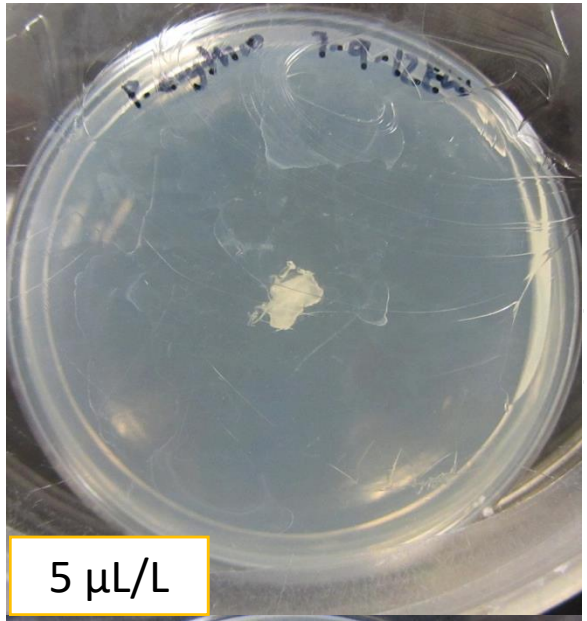

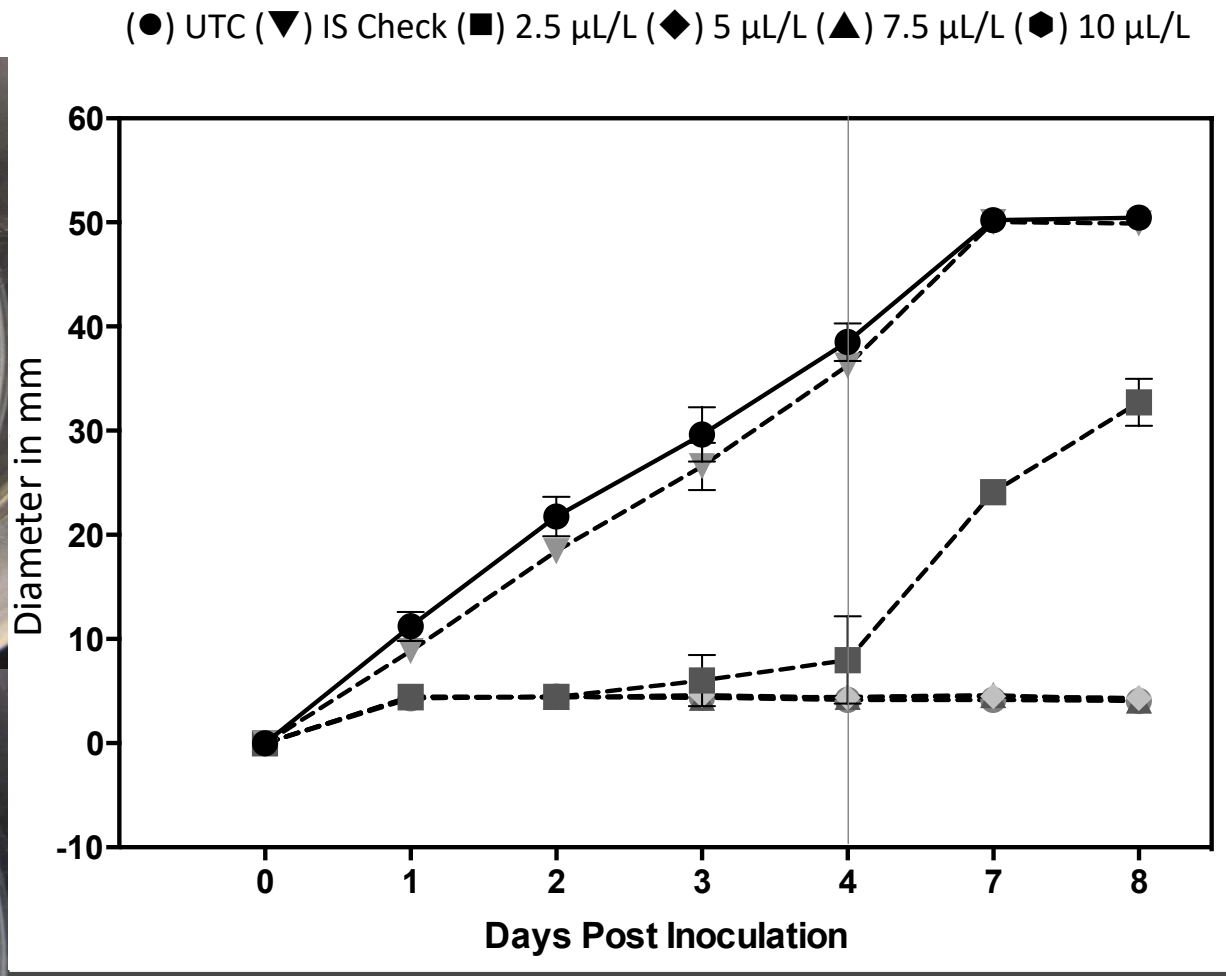

Results: *Pink Rot*

2.5 µL/L was capable of slowing *P. erythroseptica* growth, 5 µL/L capable of inhibiting growth completely *in vitro.*

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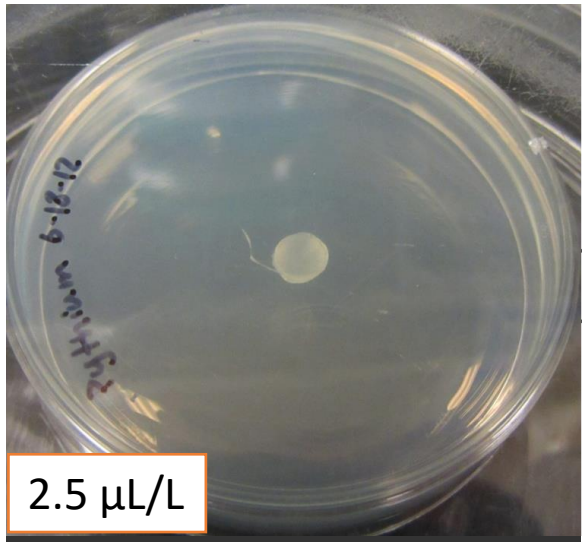
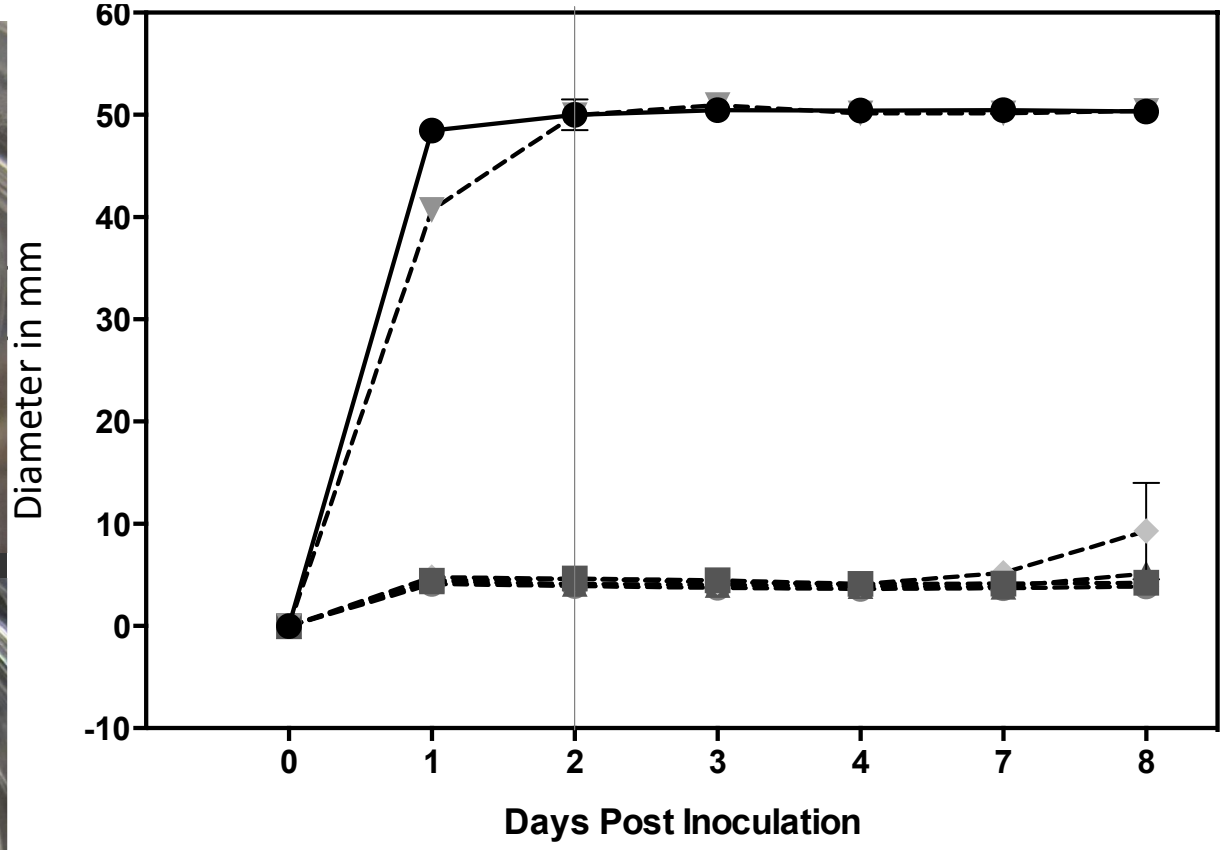
(●) UTC (▼) IS Check (■) 2.5 µL/L (◆) 5 µL/L (▲) 7.5 µL/L (⬢) 10 µL/L





Results: *Pythium Leak*

2.5 µL/L was capable of capable of inhibiting *P. ultimum* growth completely *in vitro.*

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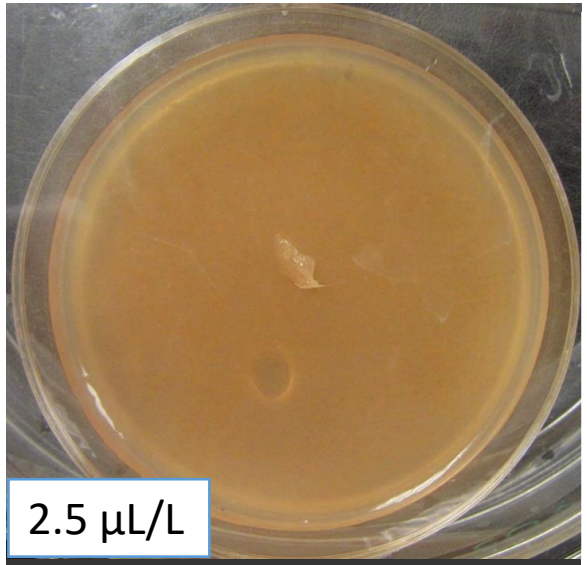
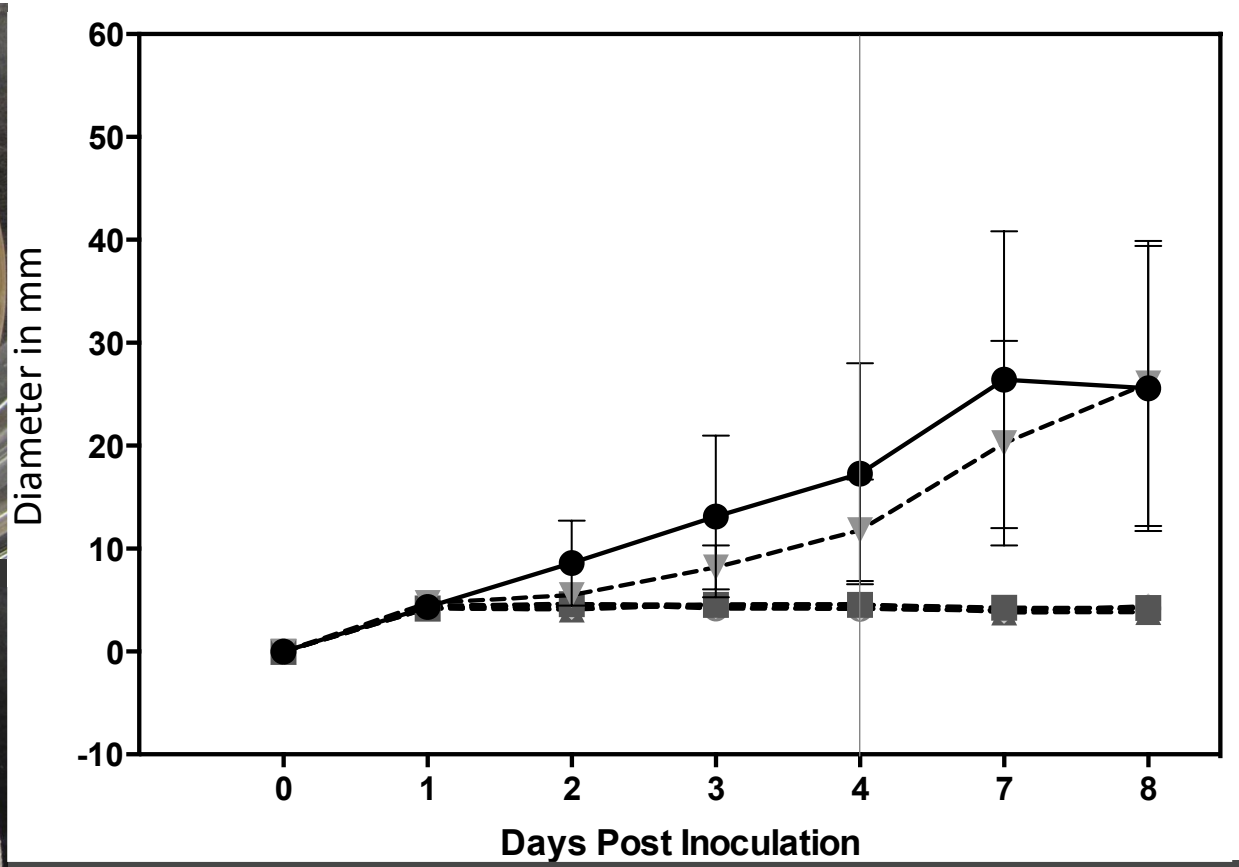
(●) UTC (▼) IS Check (■) 2.5 µL/L (◆) 5 µL/L (▲) 7.5 µL/L (⬢) 10 µL/L





Results: *Late blight*

2.5 µL/L was capable of capable of inhibiting *P. infestans* growth completely *in vitro.*

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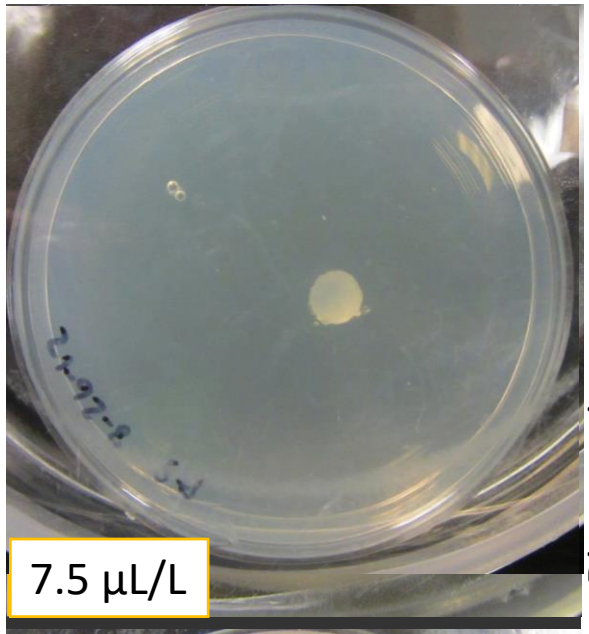

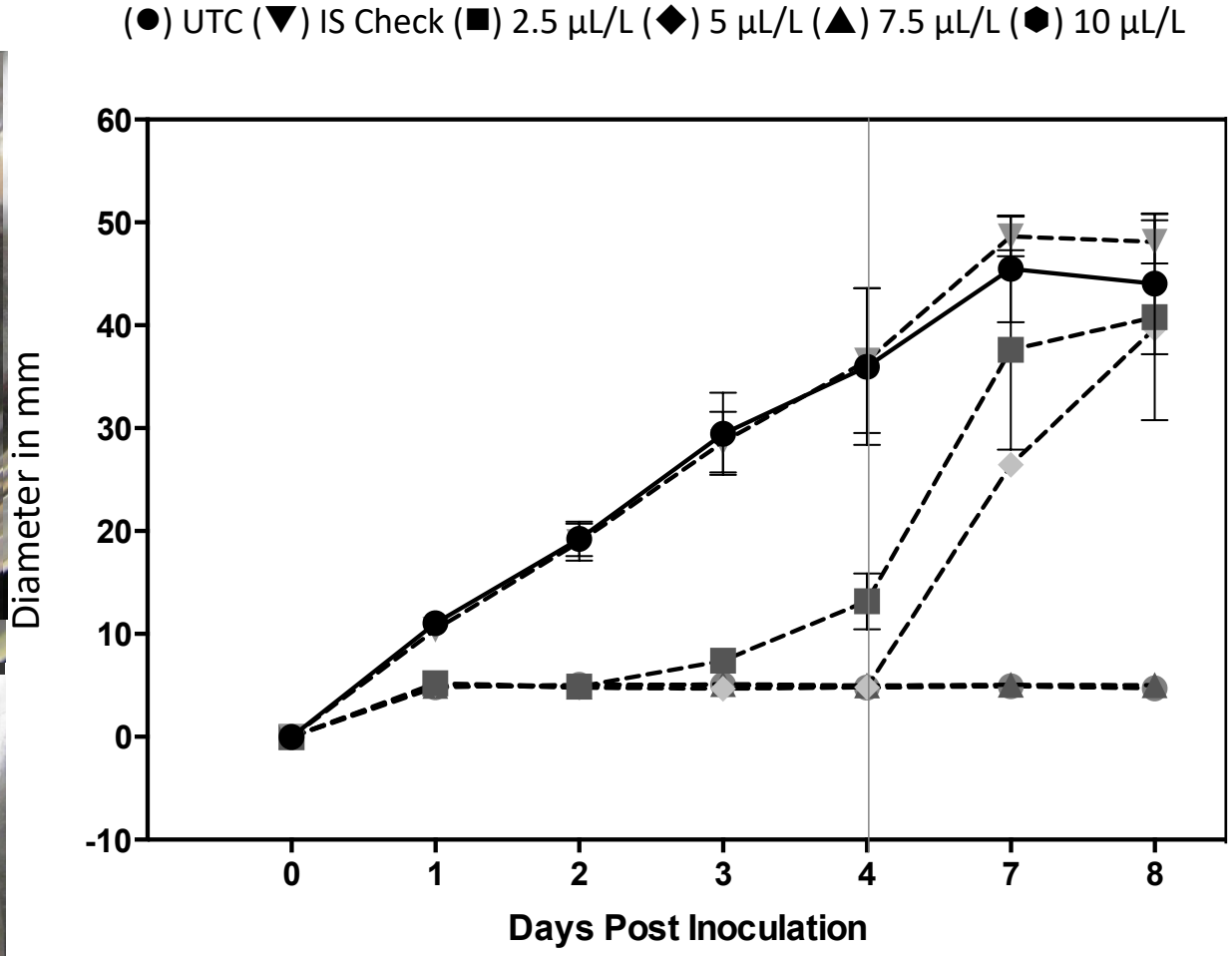

Results: *Fusarium dry rot*

7.5 µL/L was capable of inhibiting *F. sambucinum* growth completely *in vitro*, with 2.5 and 5 µL/L able to slow the growth of the pathogen *in vitro*.

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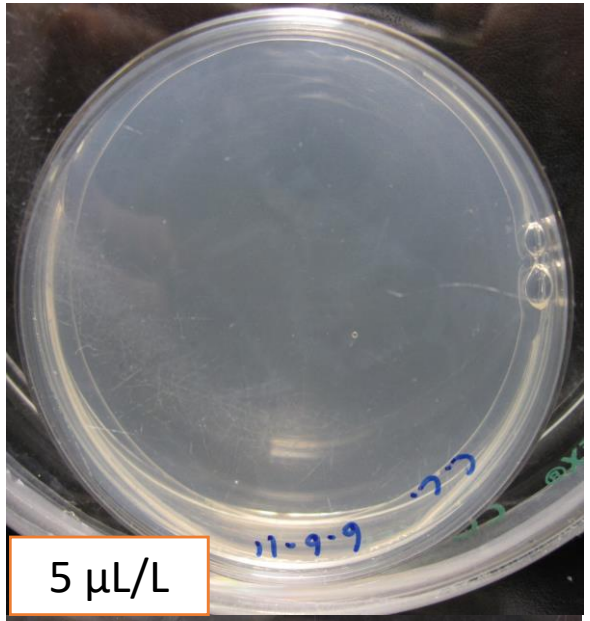

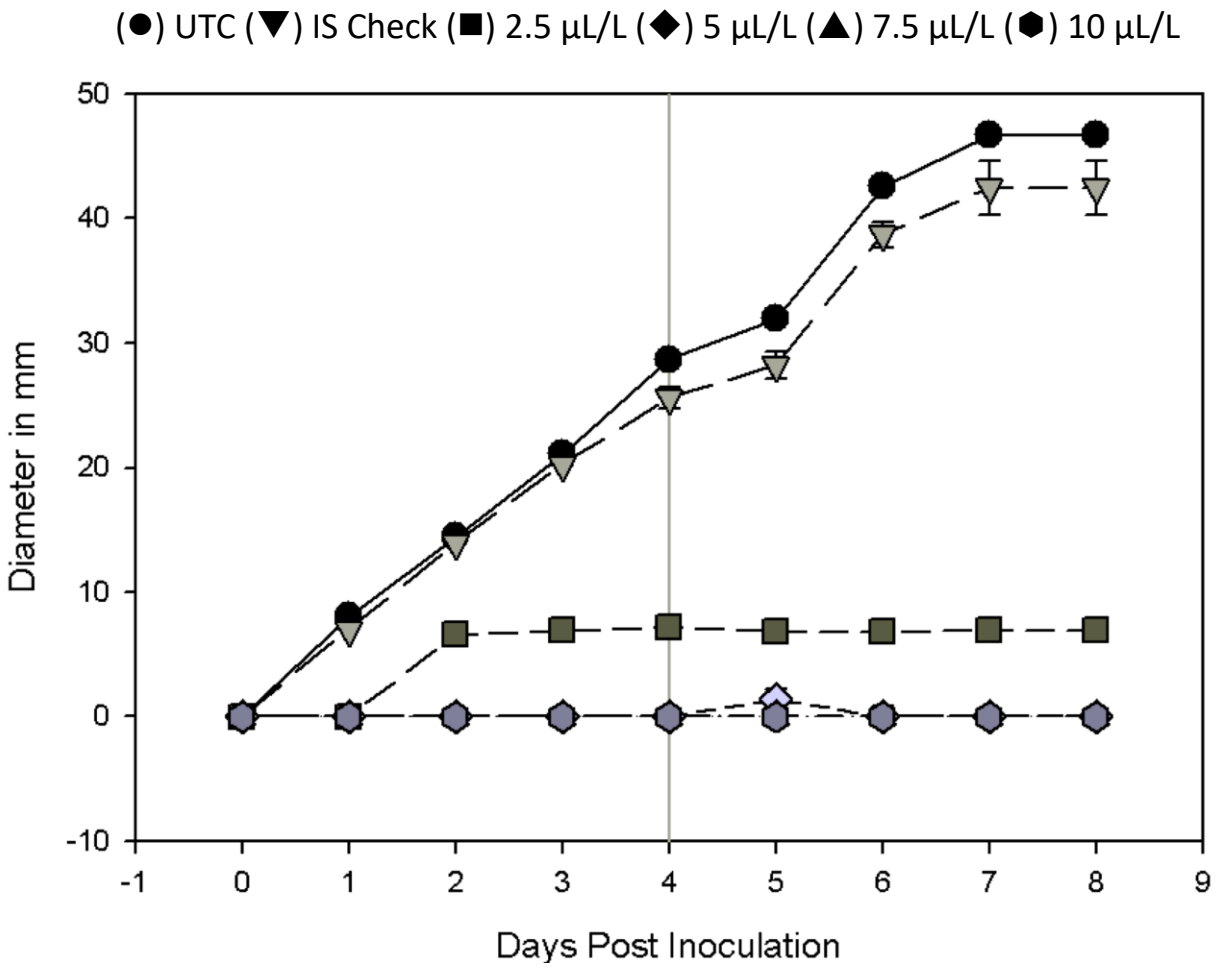

Results: *Black dot*

2.5 µL/L of 2*E*-hexenal was capable of slowing *C. coccodes* growth, but 5 µL/L completely inhibited growth *in vitro.*

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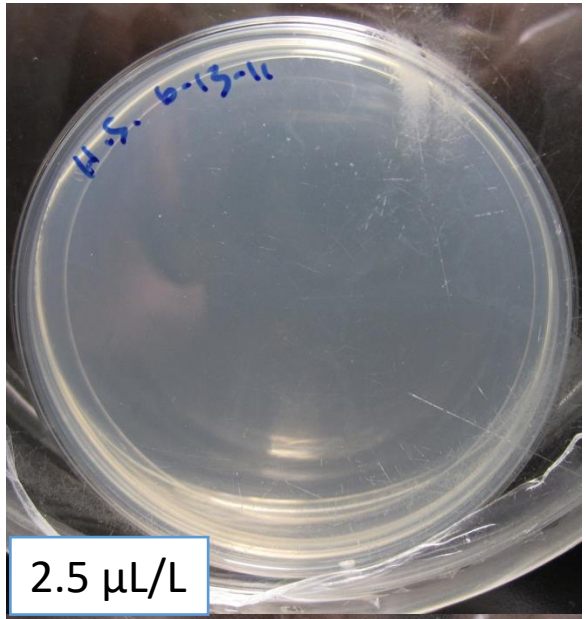
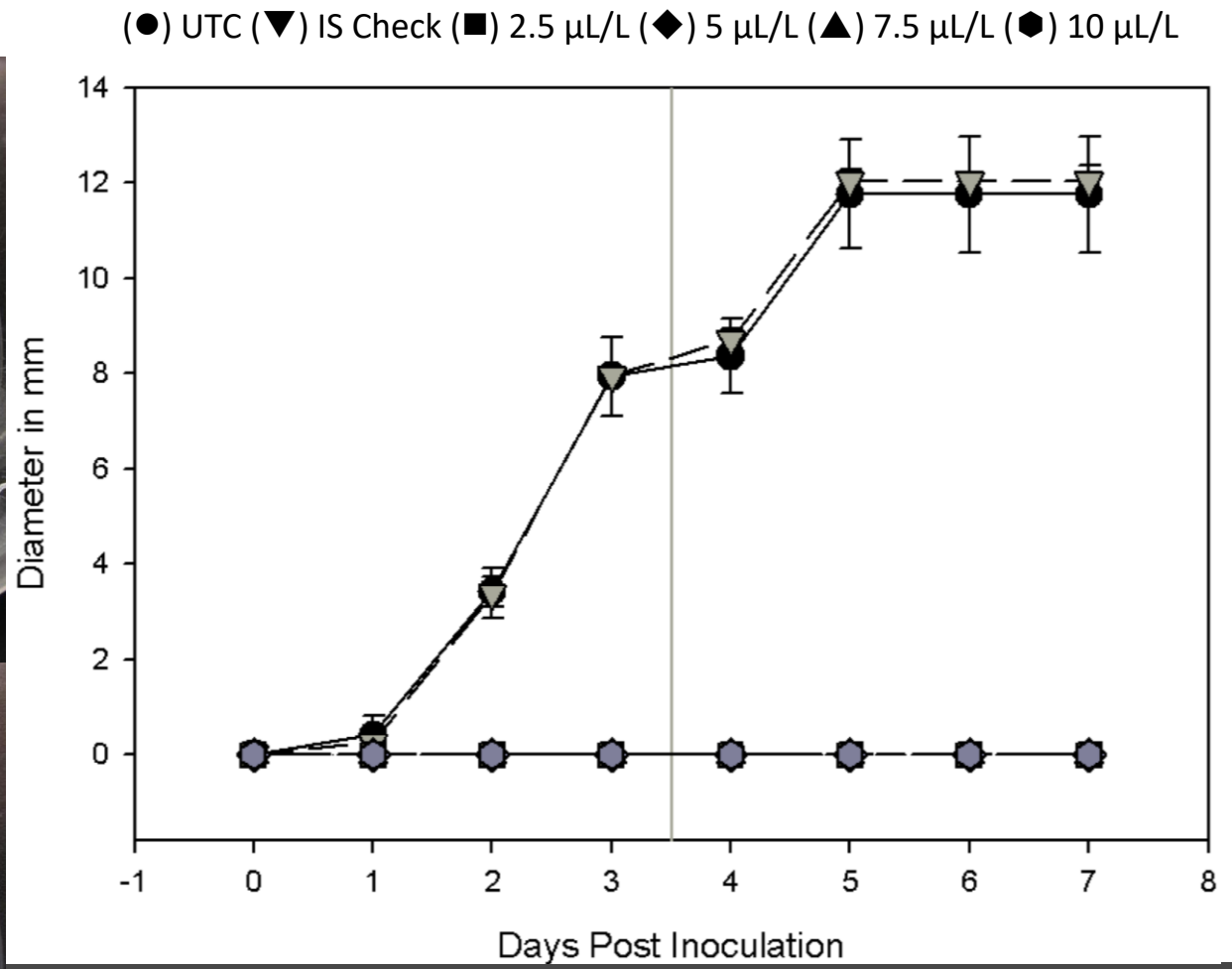


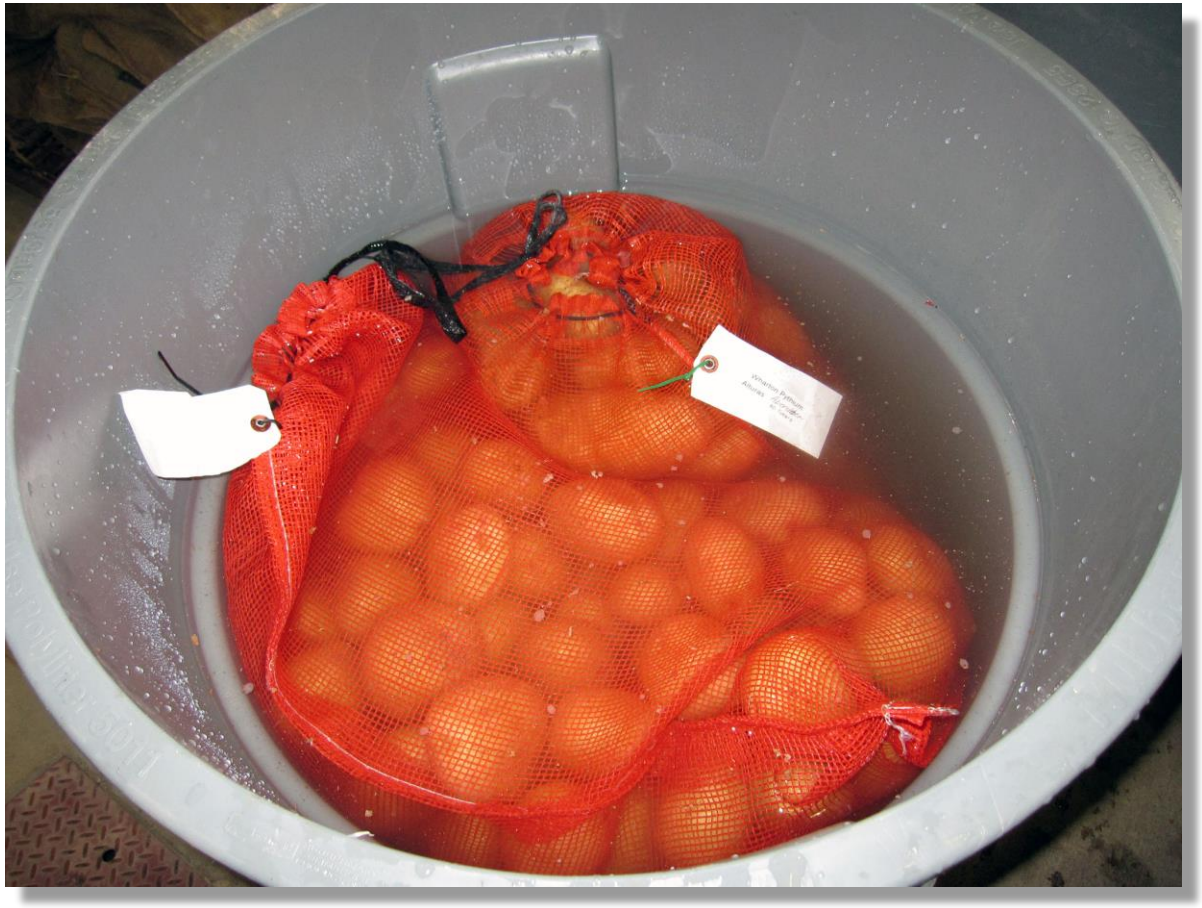


Results: *Silver scurf*

2.5 µL/L of 2*E*-hexenal was able to inhibit the growth of *H. solani* completely *in vitro*.

Storage Rot Inoculation Methods

Tubers were inoculated by immersion in an inoculum suspension of either *Phytophthora erythroseptica* (pink rot) or *Pythium ultimum* (Pythium leak), or *Fusarium sambucinum* (dry rot)



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Inoculation results

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Storage Trial Methods

- Treatments consisted of 4 replicates of 25 tubers (cv. Russet Burbank) in a fully randomized design. For Fusarium dry rot experiments all tubers were inoculated. For Pythium and pink rot experiments one inoculated tuber was placed with 25 healthy tubers.
- Onion sacks containing the tubers were placed in 113-liter barrels and treated with 2*E*-hexenal.
- Tubers were fumigated for 16 hours. After fumigation, tubers were stored at 16 C for 3 weeks before being rated.
- Treatment rates of 2*E*-Hexenal were 0 (control), 8 mL/ton, 16 mL/ton, 32 mL/ton and 65 mL/ton.
- Tubers were rated for volume of internal rot (severity) and incidence.

Treatment apparatus

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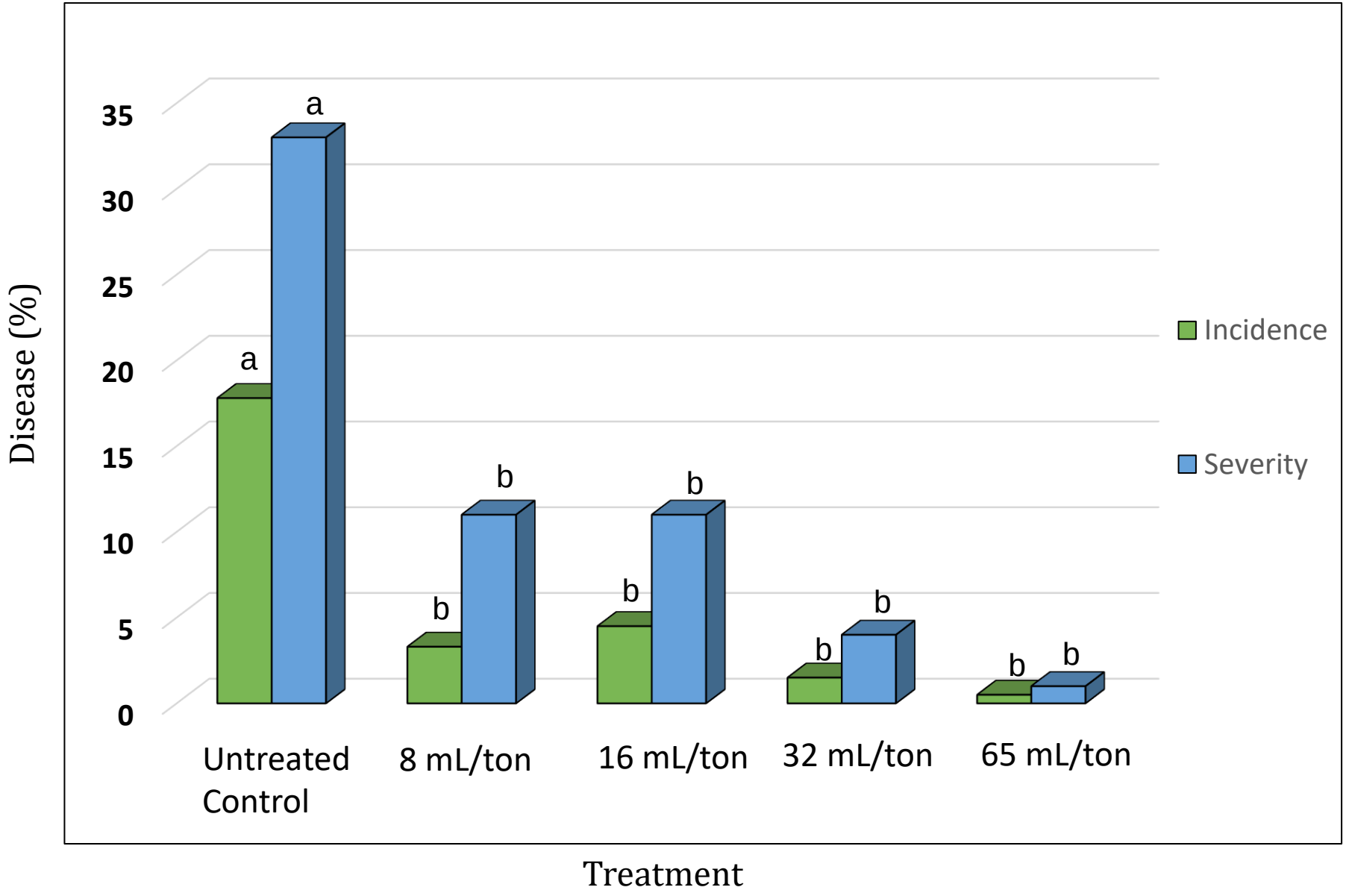
Pink rot Results



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Pink rot example results

Untreated

Treated (32 ml/tonne)

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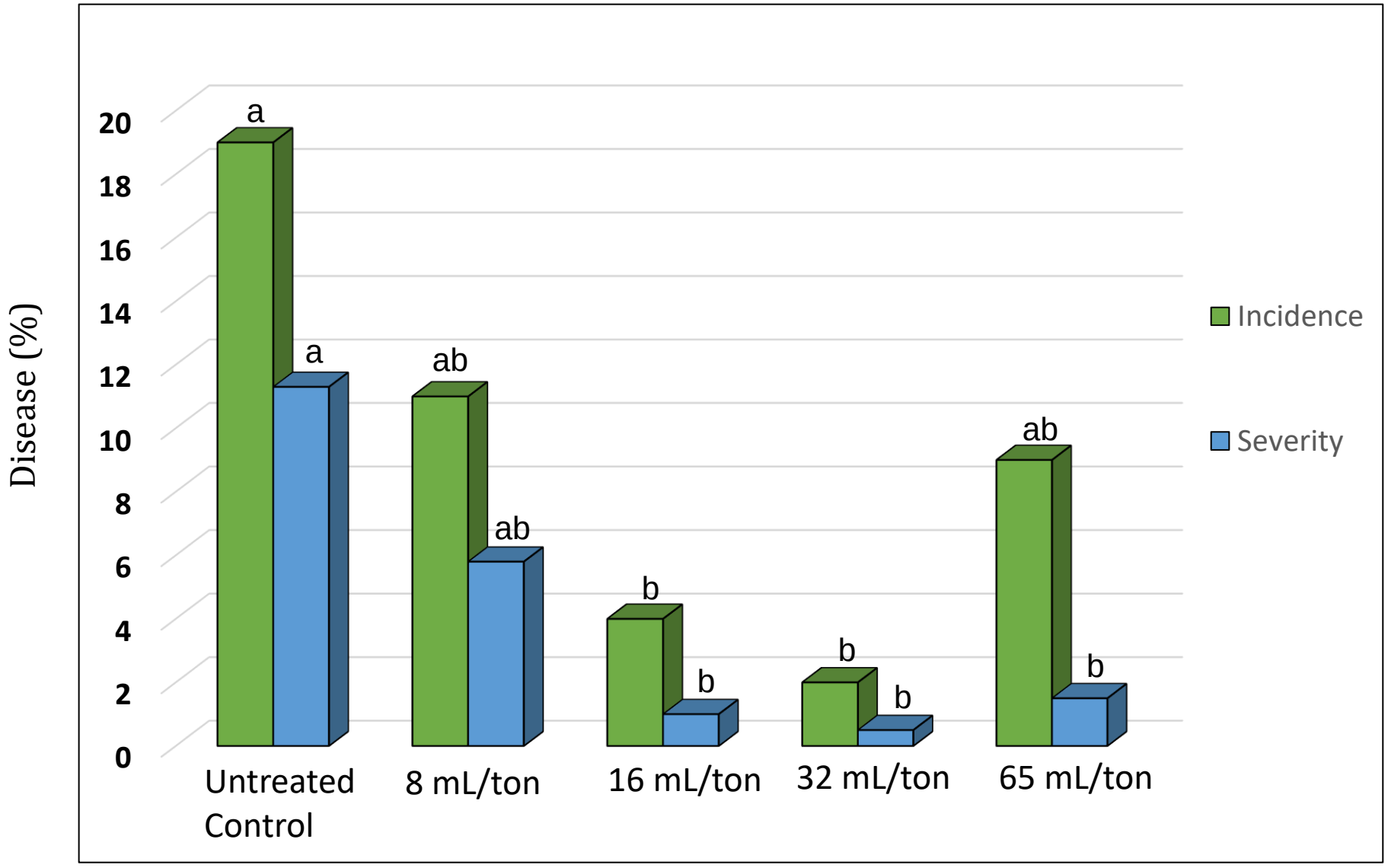
Pythium Results



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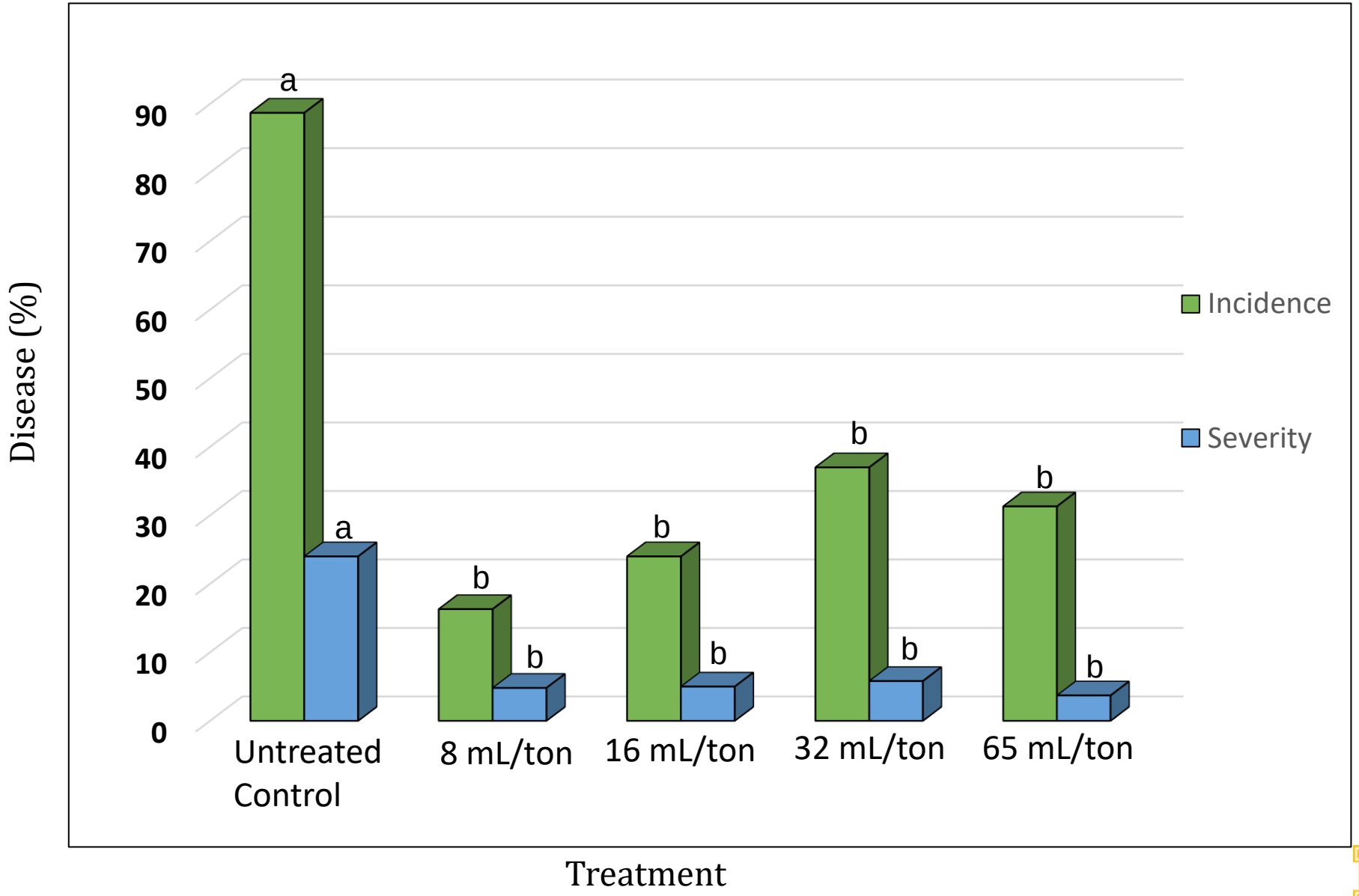
Pythium example results

Untreated

Treated (16 ml/tonne)

Fusarium Results



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Dry rot example results

Untreated

Treated (8 ml/tonne)

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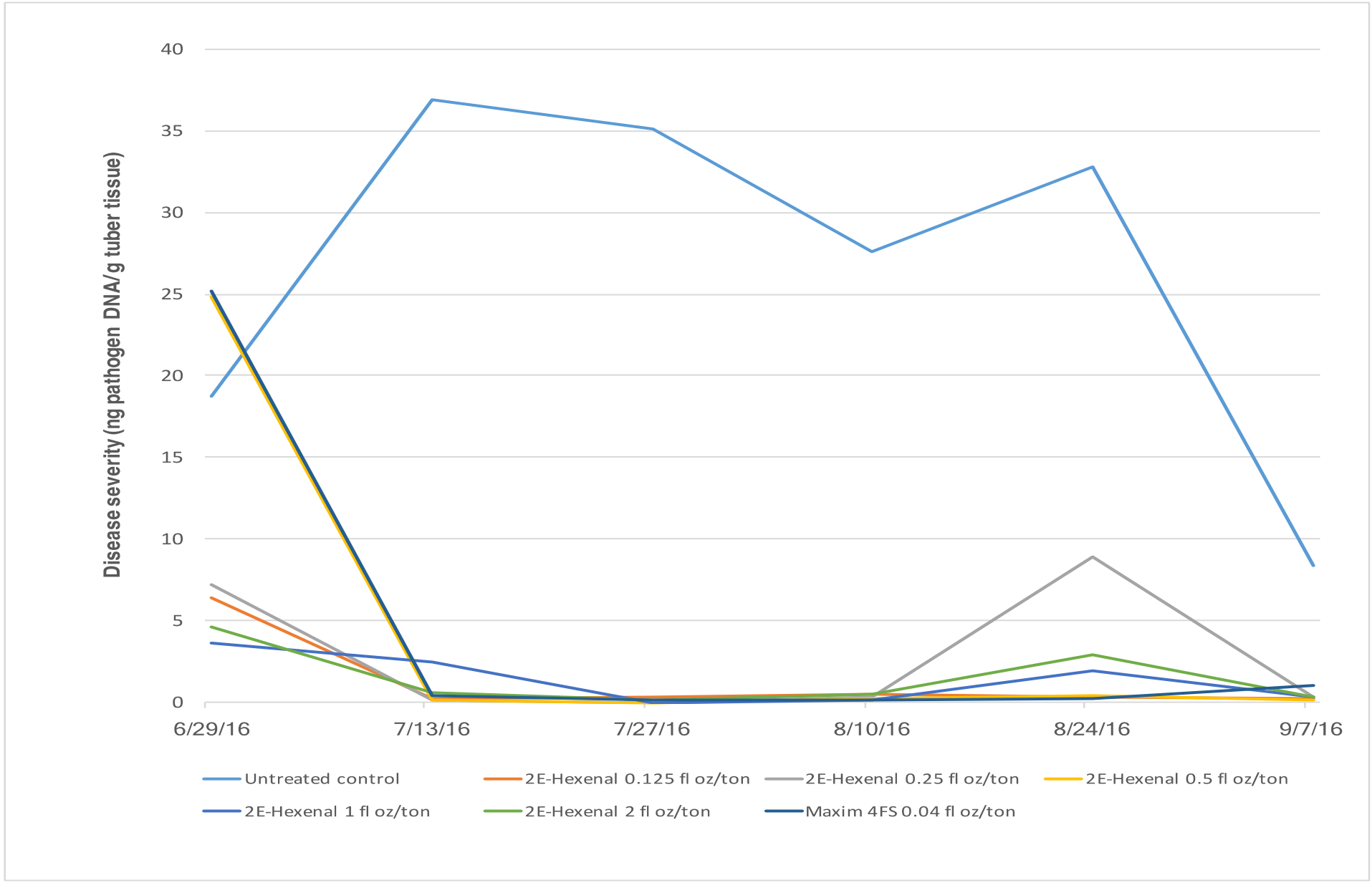
Blemish disease methods

- Treatments consisted of 4 replicates of 25 tubers in a fully randomized design.
- Tubers (cv. Melody) naturally infected with black dot or silver scurf were used.
- Onion sacks containing the tubers were placed in 113-liter barrels and treated with 2*E*-hexenal.
- Tubers were fumigated for 16 hours. After fumigation, tubers were stored at 12 C for 12 weeks before being rated.
- Treatment rates of 2*E*-Hexenal were 0 (control), 8 mL/ton, 16 mL/ton, 32 mL/ton and 65 mL/ton.
- Levels of pathogen DNA on the tuber surface was quantified by qPCR every two weeks.

Silver Scurf results



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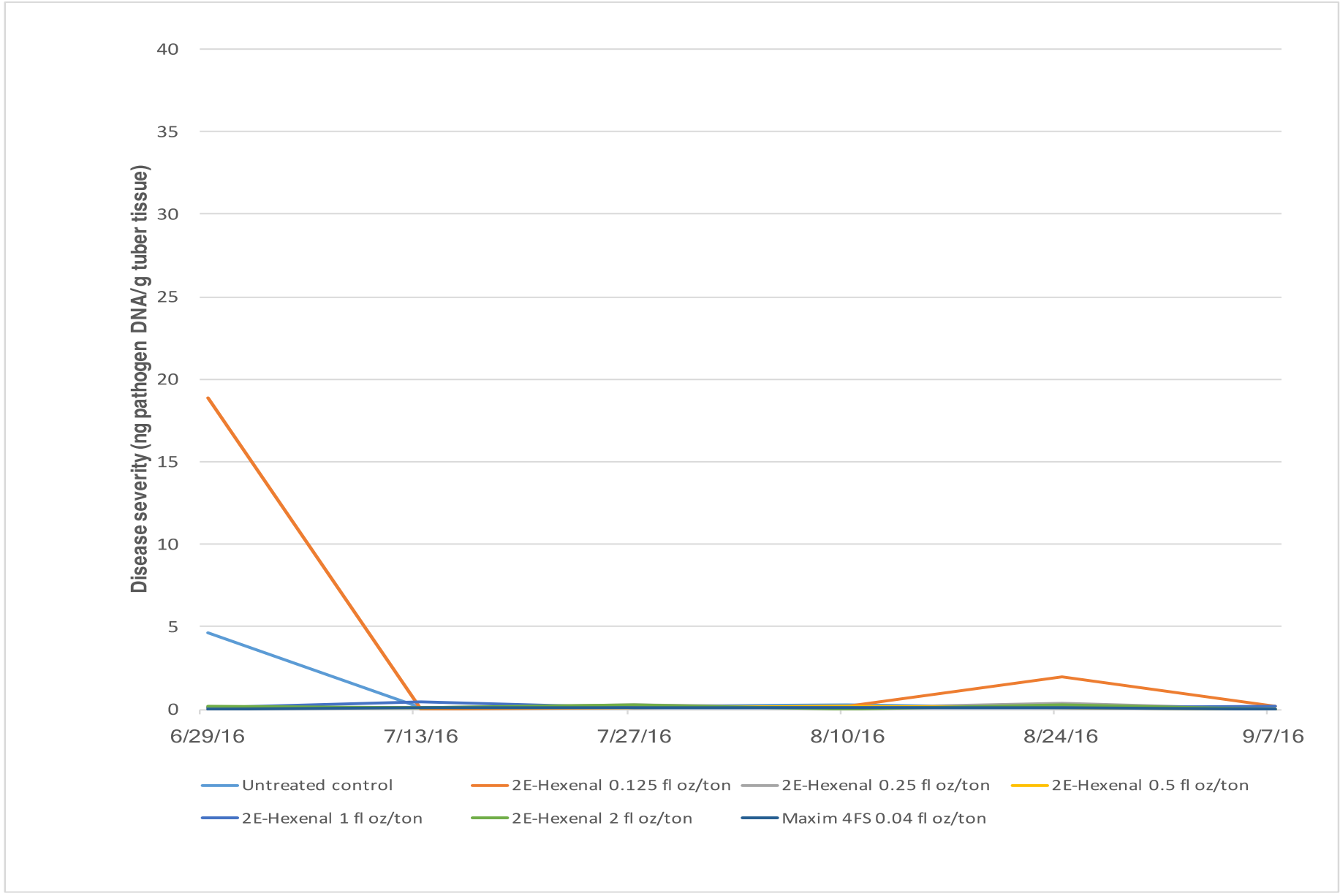
Black dot results



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Overall Conclusions

- *In-vitro*, as little as 2.5 µL/L of 2*E*-hexenal is effective at inhibiting growth of all potato storage pathogens.
- 2*E*-hexenal significantly reduced disease incidence and severity in tubers placed in storage with tubers inoculated with pink rot or pythium or inoculated with Fusarium dry rot.
- Over a 3-month period, the levels of silver scurf DNA in naturally infected tubers were significantly lower in those treated with 2*E*-hexenal.
- For black dot, there was no significant difference between treated and non-treated tubers.

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