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Tasmanian Institute of Agriculture

Improving Powdery scab management

Prof. Calum Wilson

Tasmanian Institute of Agriculture, University of Tasmania

6th August 2026 – PNZ Agronomy Summit, Pukekohe Golf Club

Hort Innovation POTATO – FRESH & PROCESSING FUNDS

Hort Innovation Frontiers

Potatoes NEW ZEALAND

UNIVERSITY of TASMANIA TIA Tasmanian Institute of Agriculture

SARDI RESEARCH AND DEVELOPMENT INSTITUTE

Simplot

UNIVERSITY of TASMANIA

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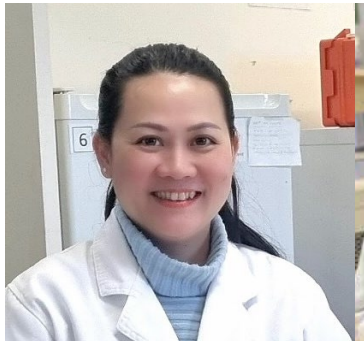

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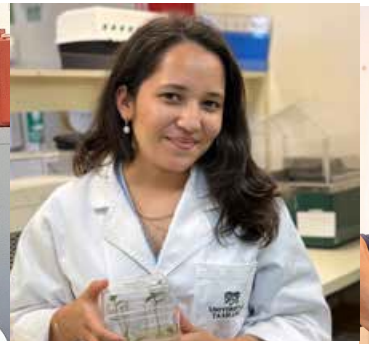

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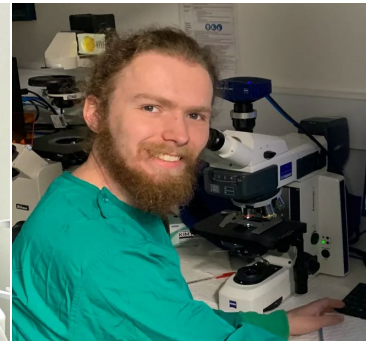

Thomas Verne

Integrated disease management

Pre-plant inoculum management

- Development of pathogen germination stimulants to reduce soil inoculum of dormant resting structures before planting.
- Volunteer potatoes.
- Alternative host within the rotation.

Innovative in-crop disease management

- Materials that disrupt pathogen movement to potato roots.
- Rhizosphere bacterial inoculants to control disease and boost yields.

IDM strategies and environmental drivers of epidemics

- Develop integrated disease management strategies, including plant defence stimulants, non-pesticide amendments, fungicides, and the use of novel biological agents to reduce disease pressure.
- Understand soil physical & environmental factors that contribute to disease development.

Development of a set of recommendations for growers to optimise integration of management tools for soil-borne disease control.

Hort Innovation POTATO – FRESH & PROCESSING FUNDS

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Hort Innovation POTATO – FRESH & PROCESSING FUNDS

Pre-plant treatments for inoculum reduction

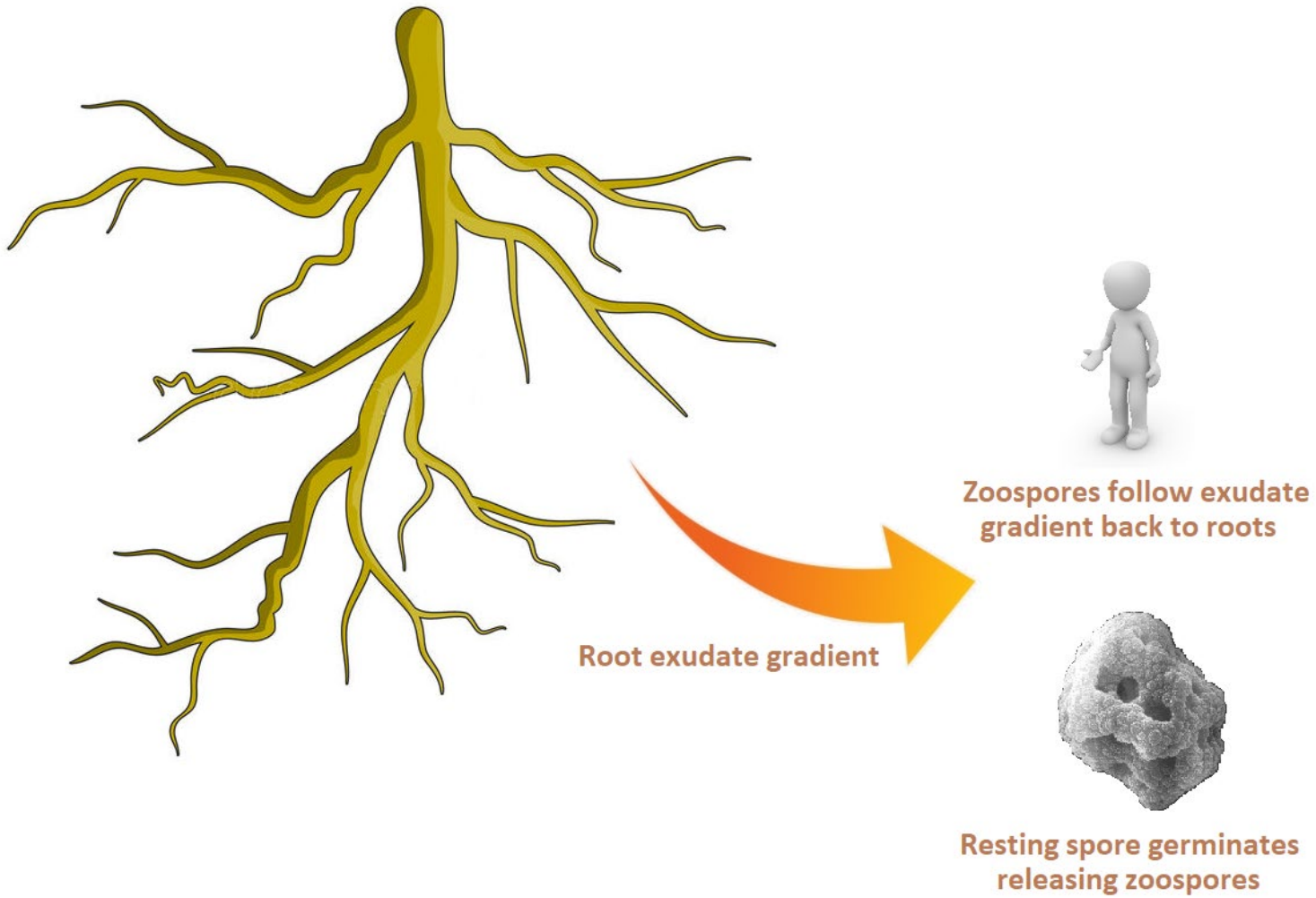
Germinate-to-Exterminate

Host-pathogen chemical conversations

Resting spores are stimulated to germinate by **root exudates**
(resting spores wait for a host plant)

Zoospores are then attracted to roots by **root exudates**
(short-lived spores efficiently find roots)

Very efficient of the pathogen



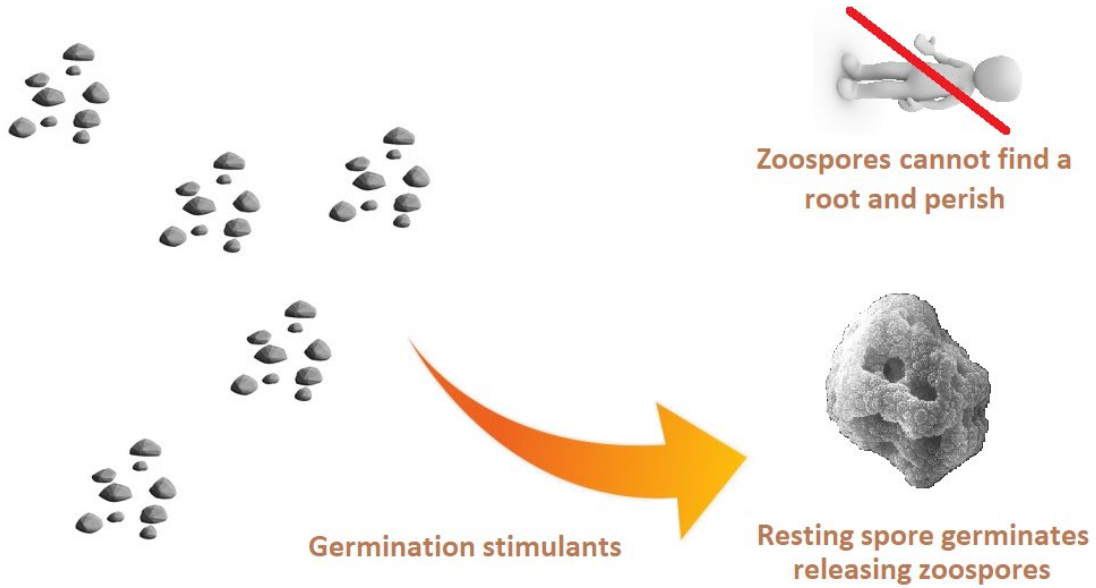
Balendres et al. (2016) J. Agric. & Food Chem. 64: 7466-74
Amponsah et al (2023) Phytopathology doi.org/10.1094/PHYTO-04-21-0176-R

Germinate-to-Exterminate

Deplete soil inoculum before planting

Resting spores persist for 10^{+} years but zoospores survive for only a few hours

If we stimulate germination in absence of a host - the pathogen will die



Similar approaches suggested in the management of:

- Clubroot of brassicas (Mattey and Dixon, 2015)
- White rot of onion (Davis *et al.* 2007)

Germinate-to-Exterminate

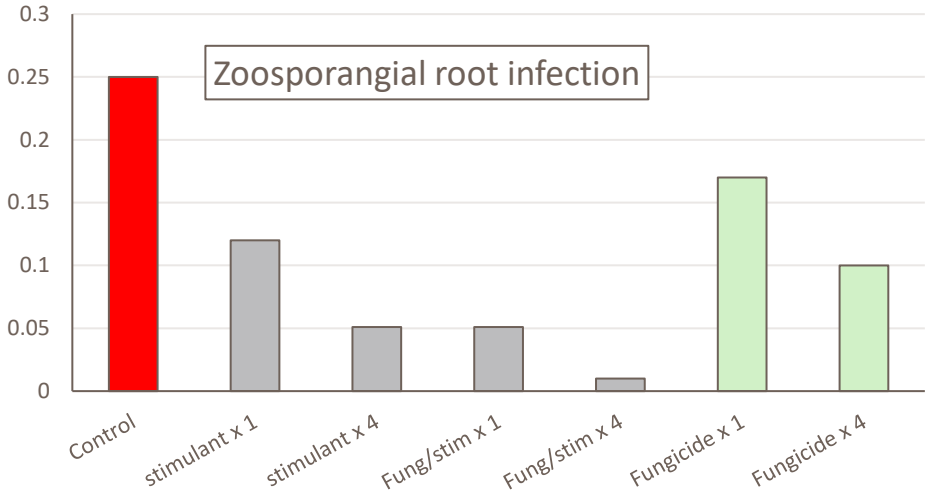
- Focus on pathogens with long-lived resting structures that persist in the soil across rotations
- AIM: stimulate premature germination of resting structures in the soil prior to potato planting

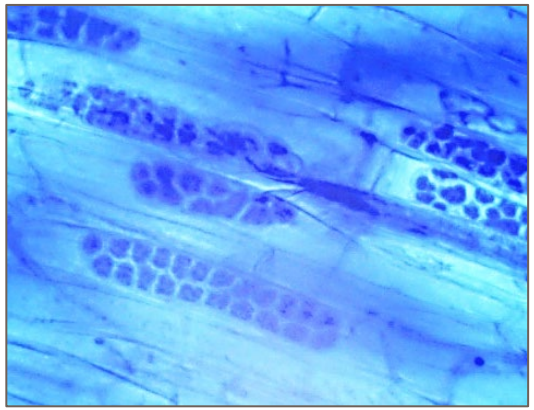
Target disease	Identification of stimulants	Proof-of-concept testing	Preliminary field testing	Commercial field testing
Powdery scab	√	√	√	
Verticillium wilt	√	√		
Black dot	√			

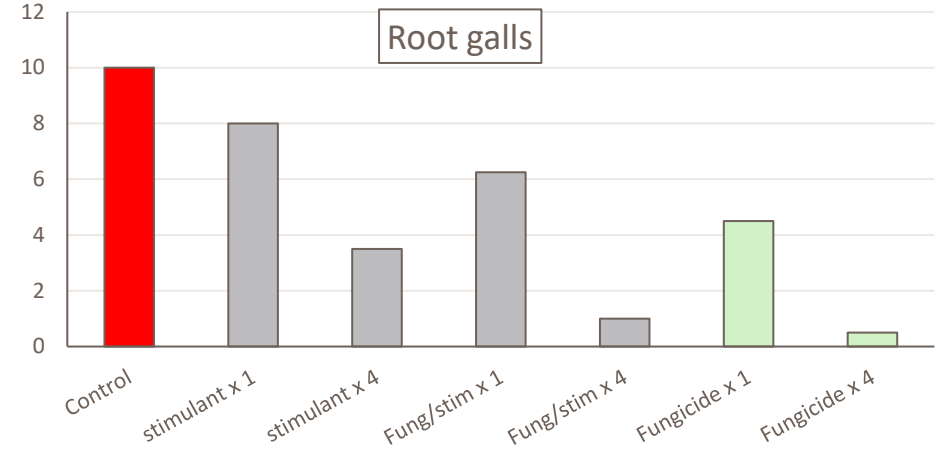
Germinate-to-exterminate – Powdery scab

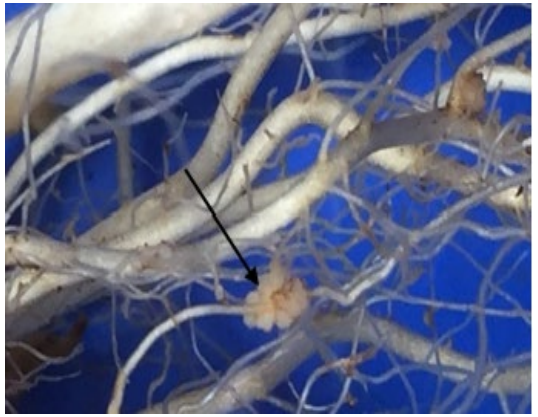
In field plot trials:

Germination stimulant and fungicide applied once or four times 12 month prior to planting with cv. Kennebec



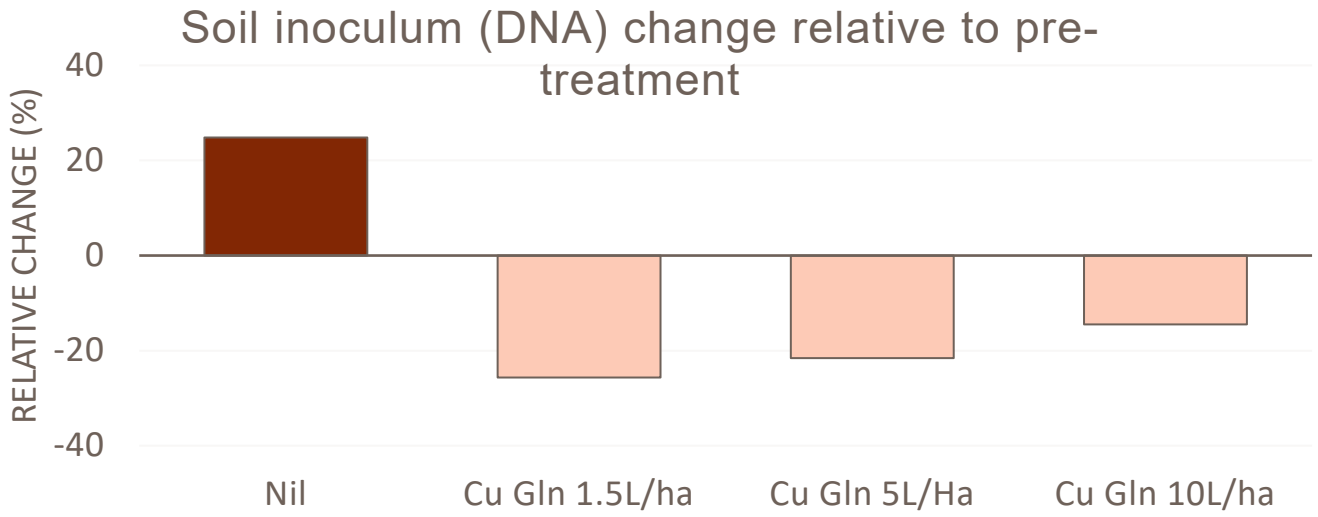






Germinate-to-exterminate – Powdery scab

In a semi-commercial field trial – 2023/24



Application of a copper gluconate (Sergomil L60) directly to the soil surface two months prior to planting resulted in a notable decrease in soil inoculum levels at 10-30cm (by 14-25%).

Subsequent cultivation reintroduced inoculum from depth suggesting a requirement for application during cultivation to obtain better distribution through the profile.

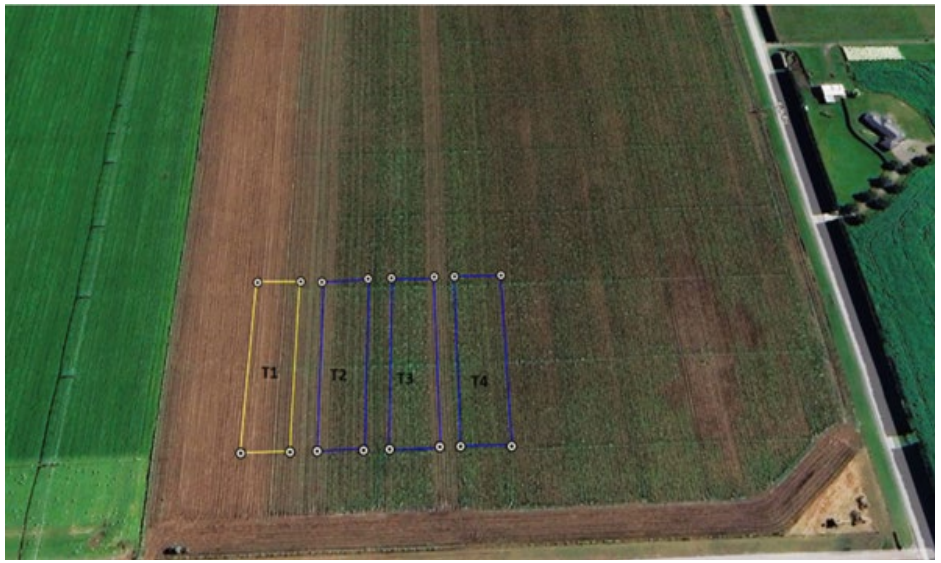
Germinate-to-exterminate – Powdery scab

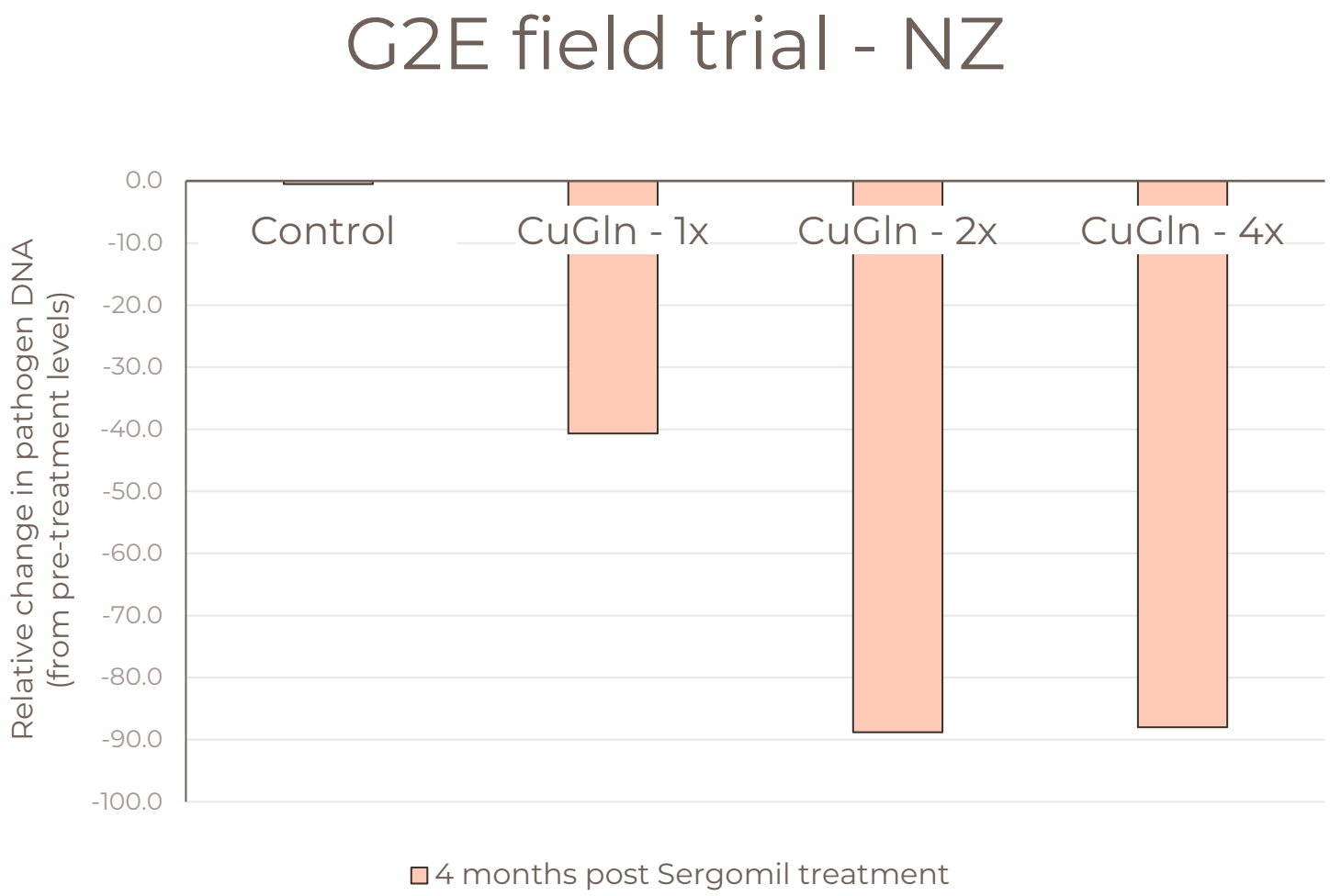
Field trials – 5 x Tas, 1 x NZ

Targeting powdery scab disease.

NZ trial treatments:

- 1.5L/Ha Sergomil L-60 (copper gluconate)
- Applied once, twice or four times every 4 months

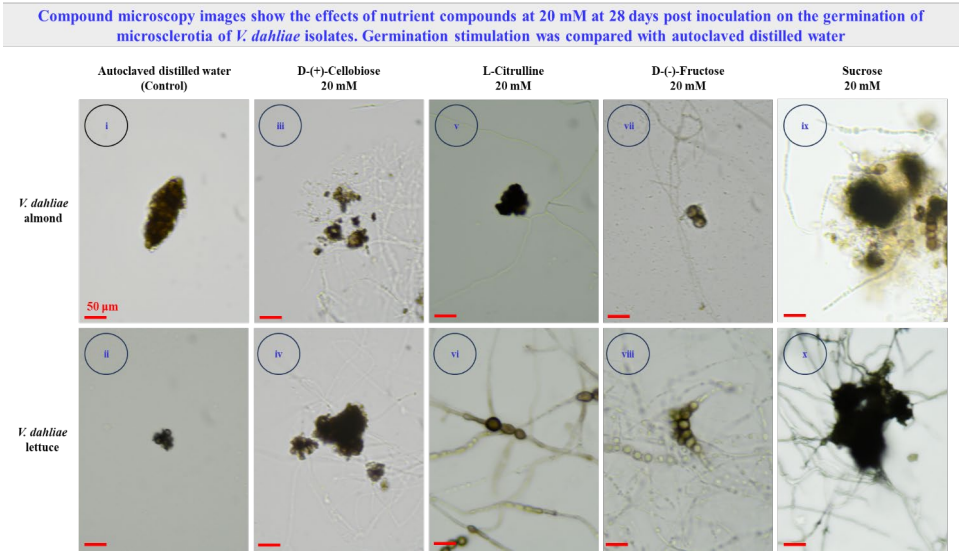


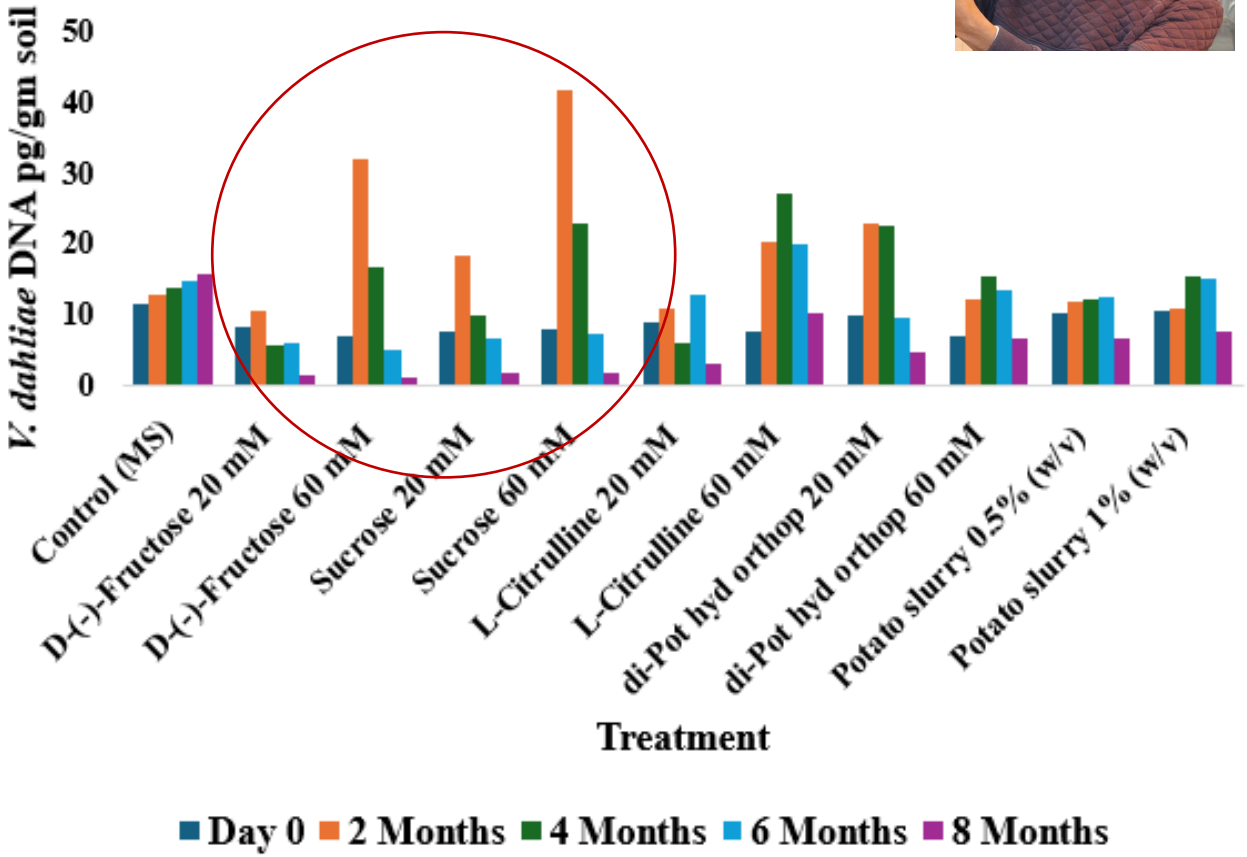


Germinate-to-Exterminate - Verticillium

Proof-of-concept

- Optimal stimulants identified.
- Optimal concentrations of stimulants for germination have been determined
- Field plot testing underway





In crop/planting treatments to minimise or slow root infection

Diffuse-to-Confuse

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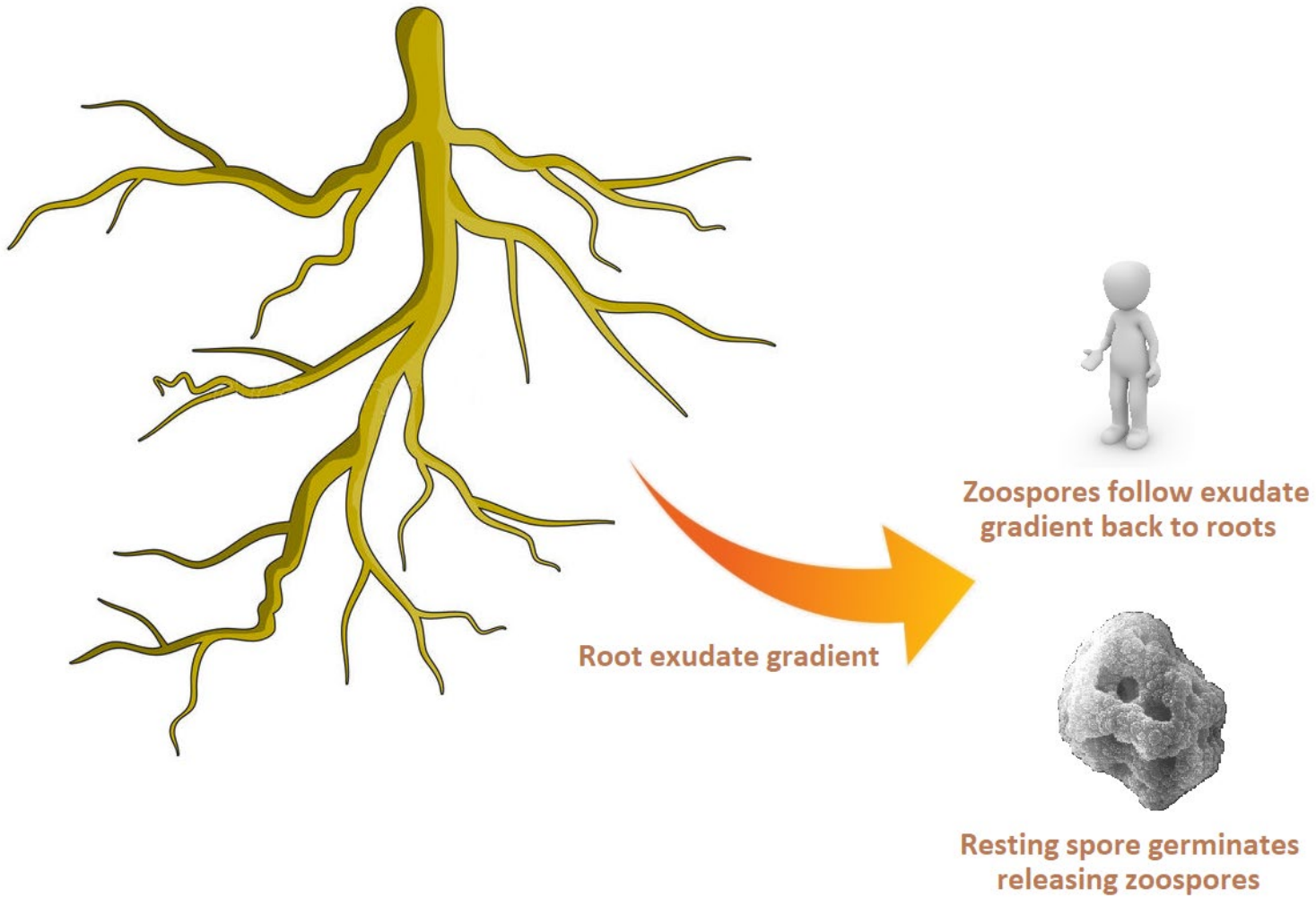

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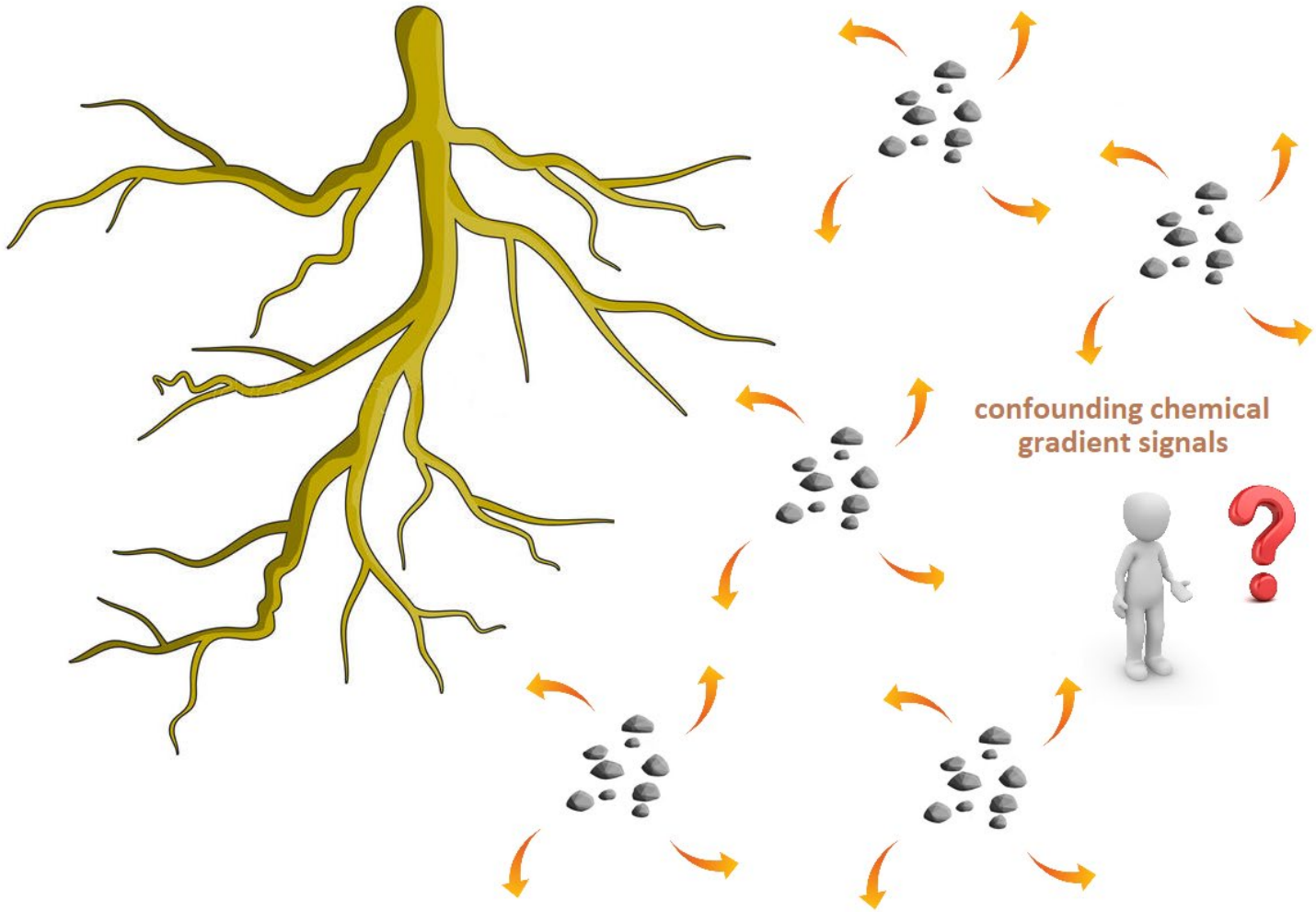
Diffuse-to-confuse

Confuse the zoospores

What if we add decoy compounds into cropping soil to draw the zoospores away from roots

(just like the pheromone traps in orchards work against coddling moth!)



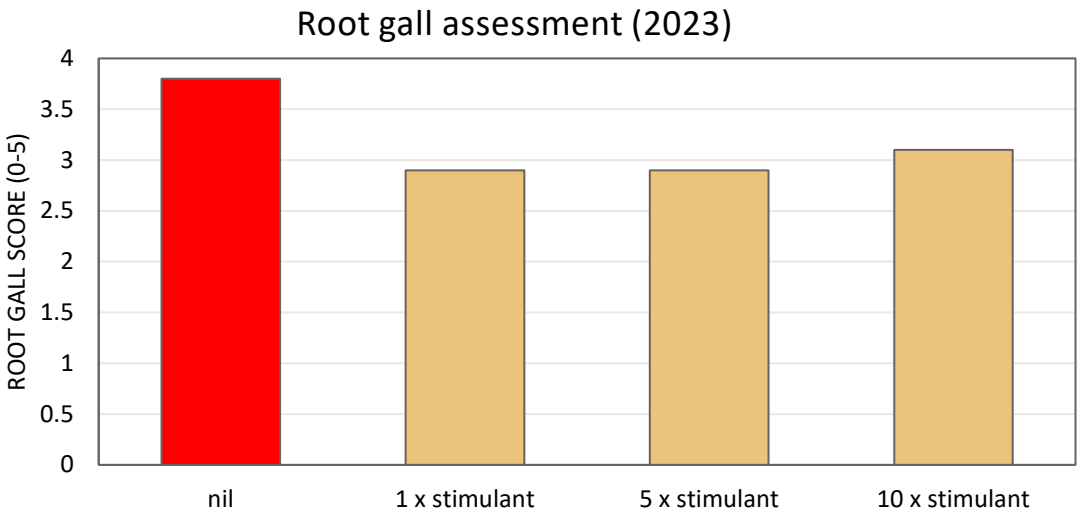
Diffuse-to-confuse

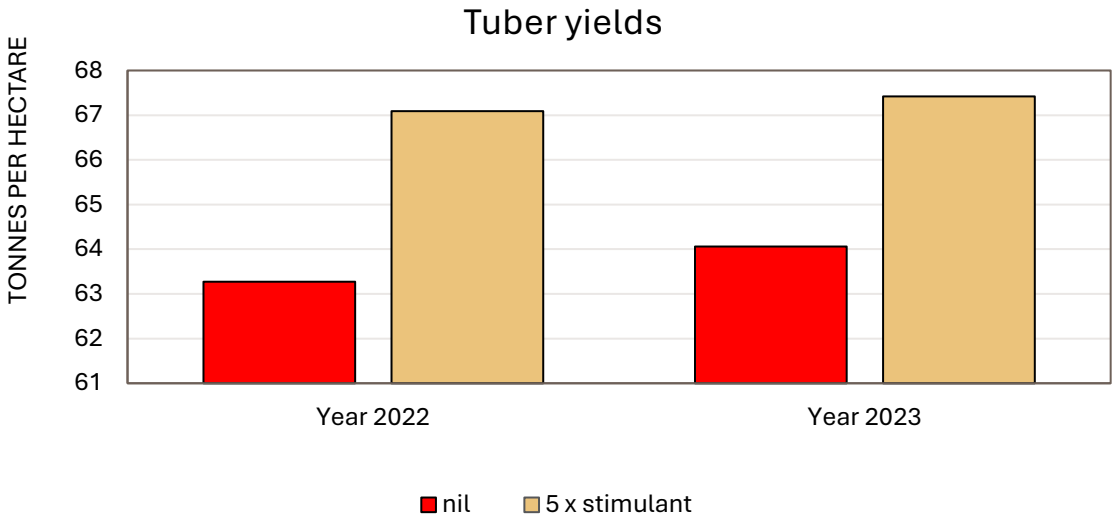
Field trials - 2022/23 and 2023/24

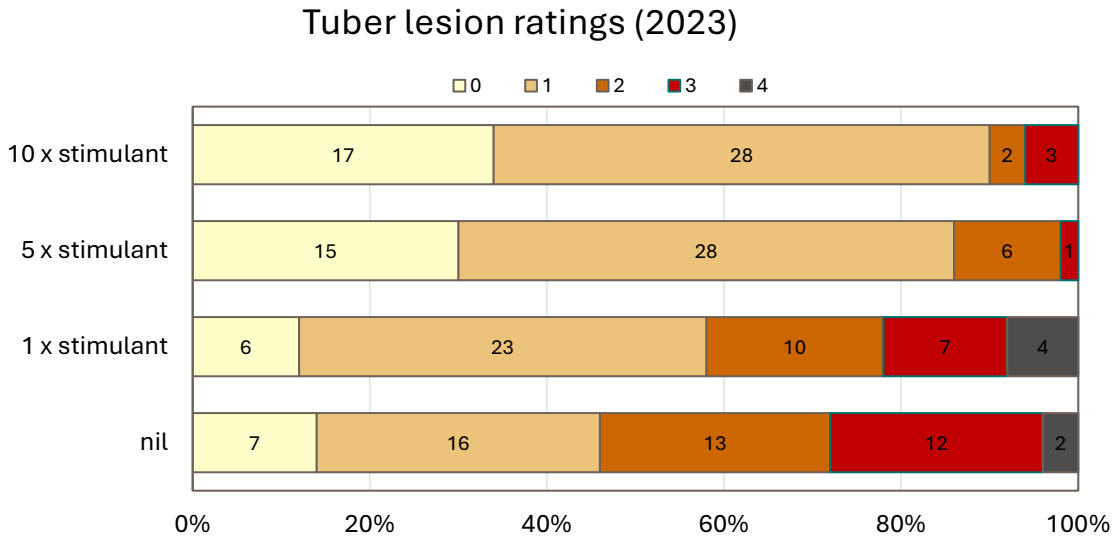
Stimulant (with biocidal action) was applied four times during the cropping season.

Under disease challenge (2023/24) root and tuber diseases were diminished.

In both years, tuber yields were increased.



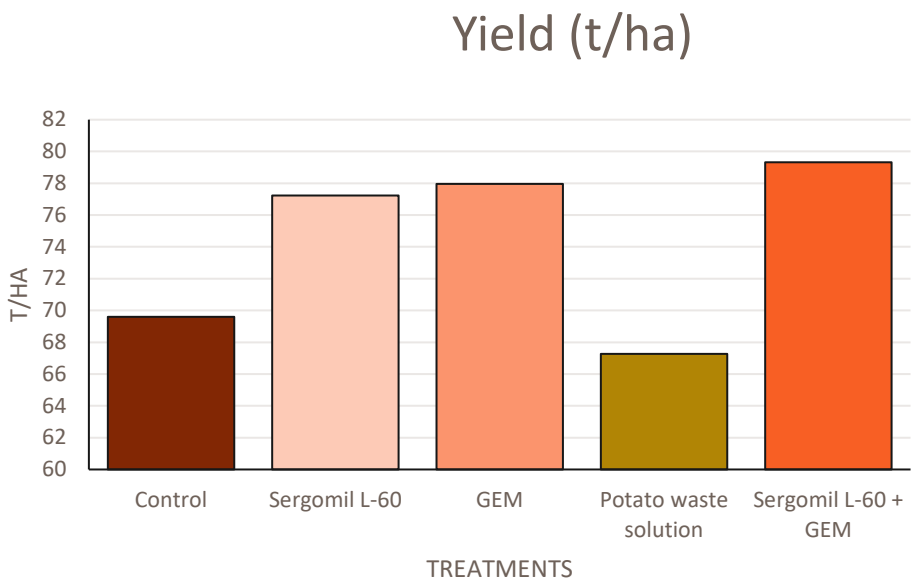


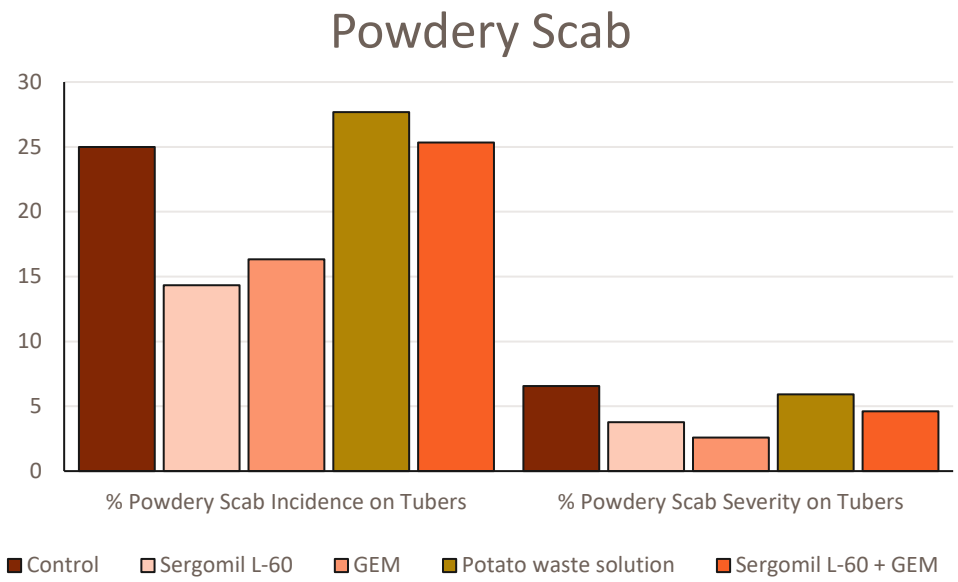


New Zealand trials

Diffuse-to-confuse # 1

Treatments	Active ingredient	Application timing
Control	-	-
Sergomil L-60	Copper monogluconate	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)
GEM	Fluazinam	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)
Potato waste solution	Industry potato waste	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)
Sergomil L-60 + GEM	Copper monogluconate + Fluazinam	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)

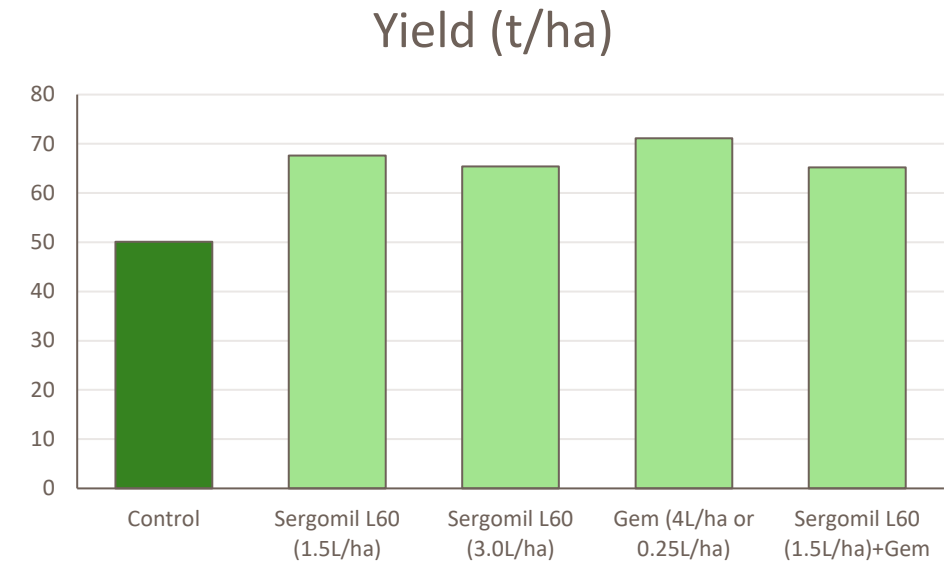


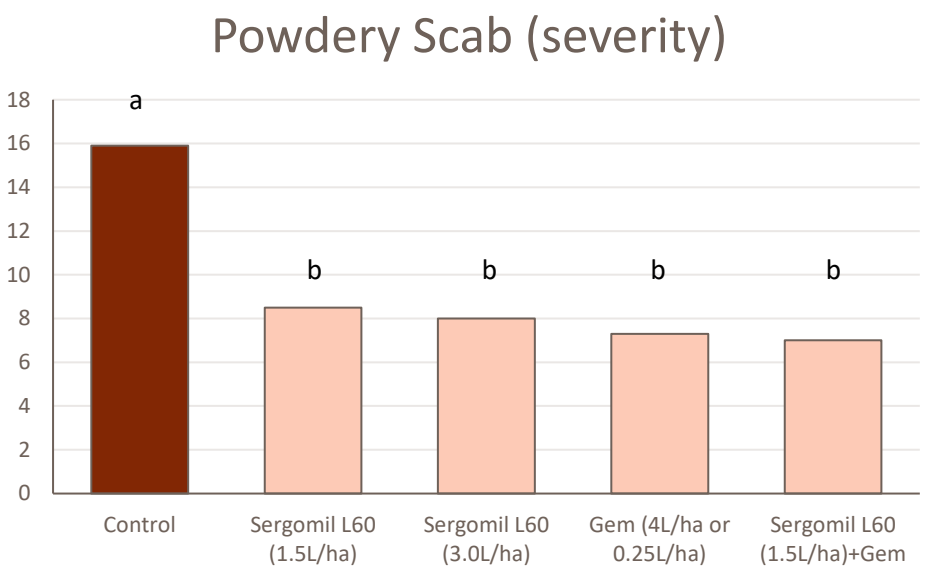


New Zealand trials

Diffuse-to-confuse # 2

Treatments	Active ingredient	Application timing
Control	-	-
Sergomil L-60	Copper monogluconate (1.5 L/ha)	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)
Sergomil L-60	Copper monogluconate (3.0 L/ha)	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)
GEM	Fluazinam (500 g/L)	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)
Sergomil L-60 + GEM	Cooper monogluconate (1.5 L/ha) + Fluazinam (500 g/L)	A. In furrow at planting B. At emergence C. At 50-70% row closure D. At tuber bulking (80-100 days)





Diffuse-to-confuse (+) – semi-commercial

Copper gluconate & Phosphonic acid

- Commercial paddocks were treated with:
    1) Sergomil L60 (CuGluc) alone
    2) Phos acid alone
    3) Sergomil L60 and Phos acid combination
- Timing of applications for CuGluc: In-furrow & 3 foliar applications:
    1) between emergence and tuber initiation,
    2) 50-75% row closure, and
    3) Tuber bulking ~80 DAP
- Timing of applications for Phos acid: 4 foliar applications
    1) Between emergence and tuber initiation,
    2) 50-75% row closure,
    3) Tuber bulking ~80 DAP
    4) Tuber bulking ~94 DAP
- Yield were assessed by hand digging 5m x 5 reps per treatment

Copper gluconate & Phosphonic acid

PROGRAM	NO. FIELDS	AVG YIELD CHANGE (%)	AVG PINK ROT / BACTERIAL ROT REDUCTION (%)	POWDERY SCAB INCIDENCE (%) *	POWDERY SCAB SEVERITY (%) *
CUGLUC ONLY	8	+1.3%	~56.6%	-12%	-19.3%
PHOS ACID ONLY	4	+5.8%	~62.8%	+9.7%	+15.9%
CUGLUC + PHOS ACID	8	+3.2%	~64.1%	+2.5%	-7.8%

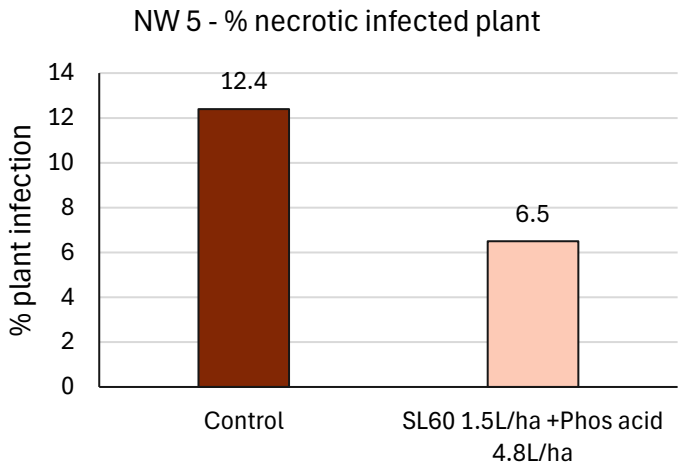
*** For powdery scab incidence and severity.**

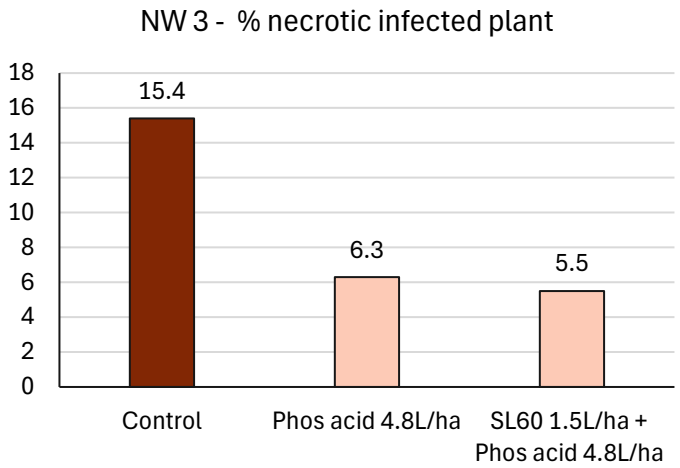
CuGluc only n = 8 trials

Phos acid only n = 3 trials

CuGluc and Phos acid = 6 trials

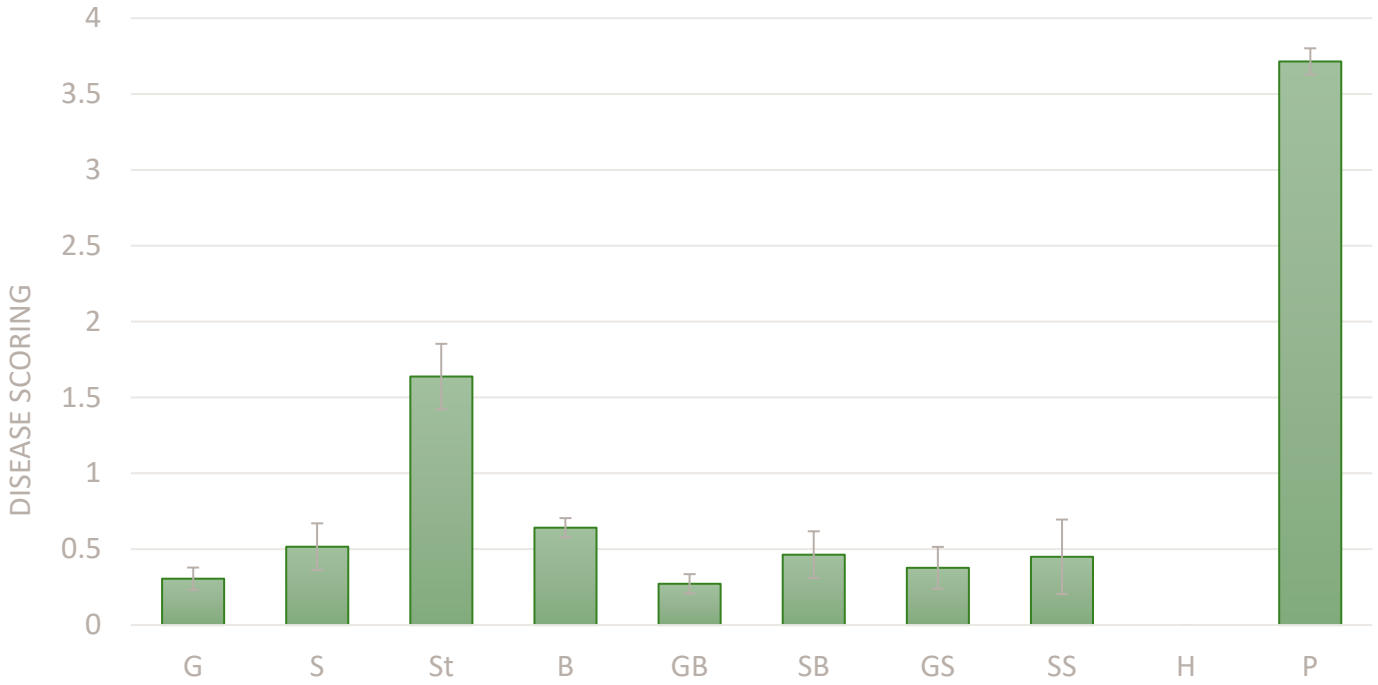
Black leg /stem disease





Diffuse-to-Confuse - glutamine

Powdered and pelleted forms

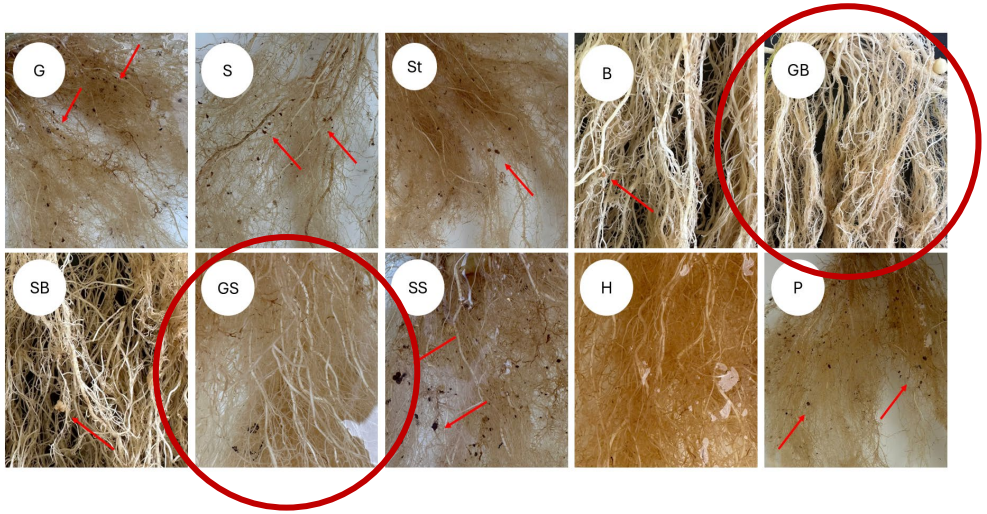


Effect of different bioformulations on powdery scab

G – Stimulant, S – Potato waste, St & B – Carriers, H – Healthy, P – Pathogen

Glasshouse trial

- Glutamine & potato waste formulations all reduced root & tuber disease.
- Root galls were completely suppressed with some treatments.



Diffuse-to-Confuse - glutamine

Field trial

Using adapted Gandy unit
Three rates applied to 15m x 2 row plots

PROGRAM	YIELDS	POWDERY SCAB INCIDENCE (%)	POWDERY SCAB INCIDENCE (%) CHANGE	POWDERY SCAB SEVERITY (%)	POWDERY SCAB SEVERITY (%) CHANGE
CONTROL	61.7	62.7	-	14.1	-
GLUTAMINE PELLET 75 KG/HA	63.6	38.4	-38.8	8.6	-39.0
GLUTAMINE PELLET 150 KG/HA	65.6	39.0	-37.8	8.4	-40.7
GLUTAMINE PELLETS 300KG/HA	62.5	31.4	-50.0	6.5	-54.1
GLUTAMINE 150KG/HA + SERGOMIL L60	63.4	30.7	-51.1	6.3	-55.7

In crop/planting treatments to minimise or slow root infection

Ellie Brock

LINCOLN UNIVERSITY
TE WHARE WĀNAKA O AORAKI

McCain
Potatoes NEW ZEALAND

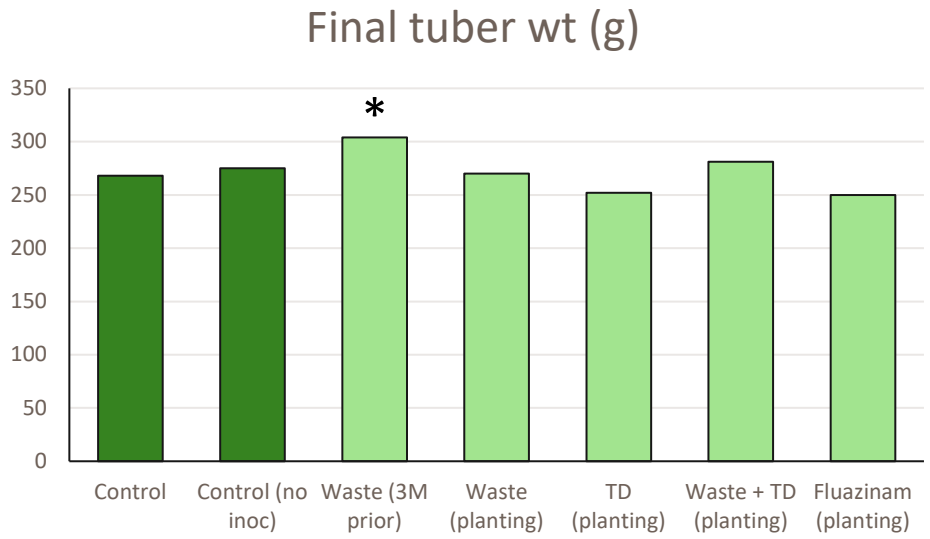
Ellie's trials

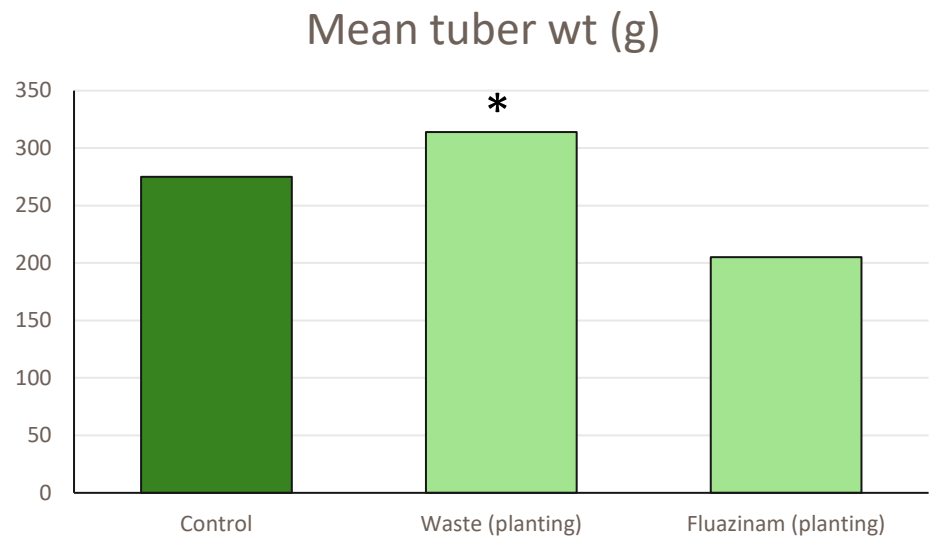
Glasshouse

Treatments	Application timing
Control	-
Control (no inoc)	-
Potato waste	3 month prior to planting
Potato waste	At planting
Trichoderma	At planting
Waste + Trichoderma	At planting
Fluazinam	At planting

Field

Treatments	Application timing
Control	-
Potato waste	At planting
Fluazinam	At planting





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Bacterial rhizosphere amendments

Can we alter the rhizosphere chemistry using biological approaches?

Host-pathogen chemical conversations

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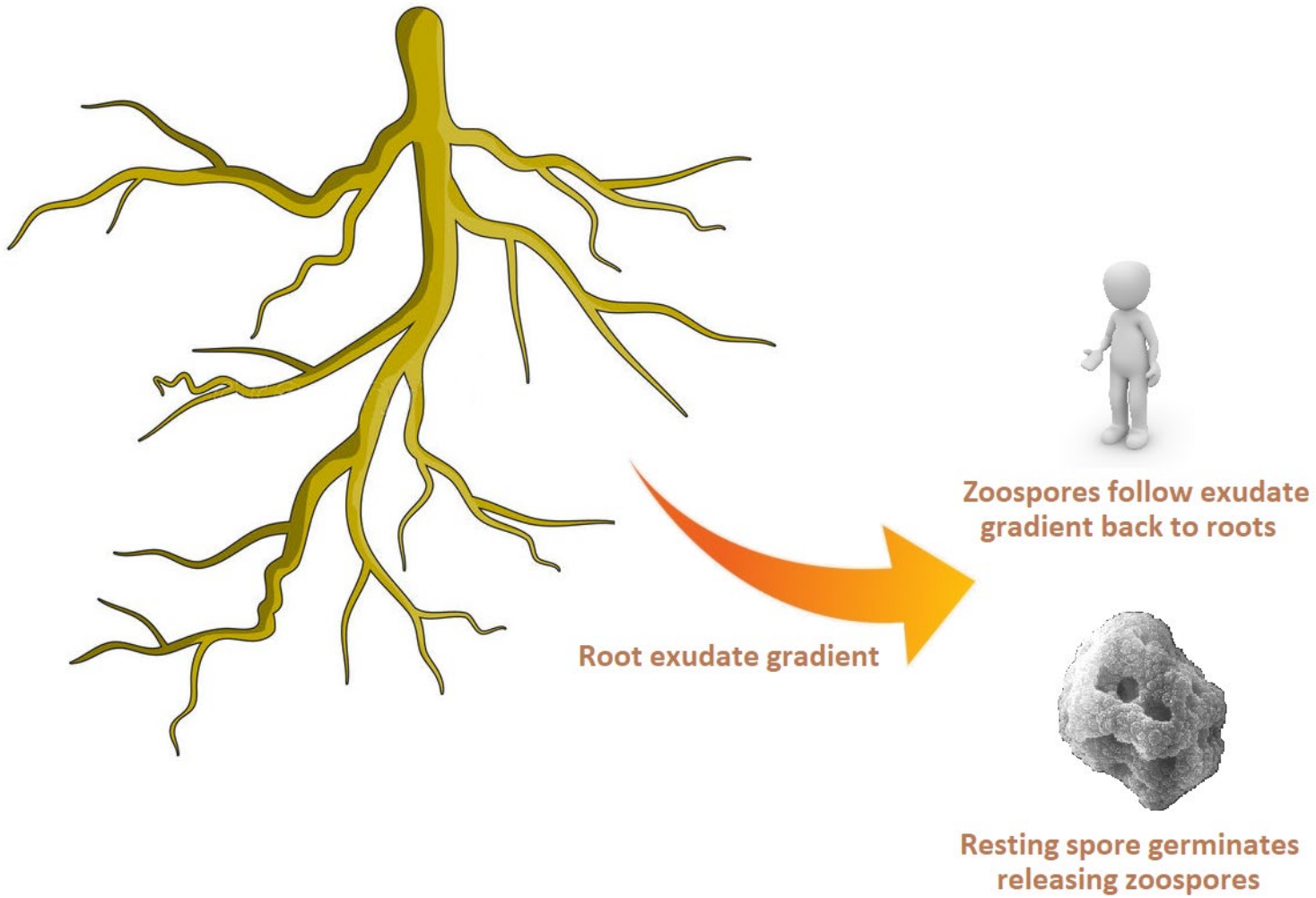

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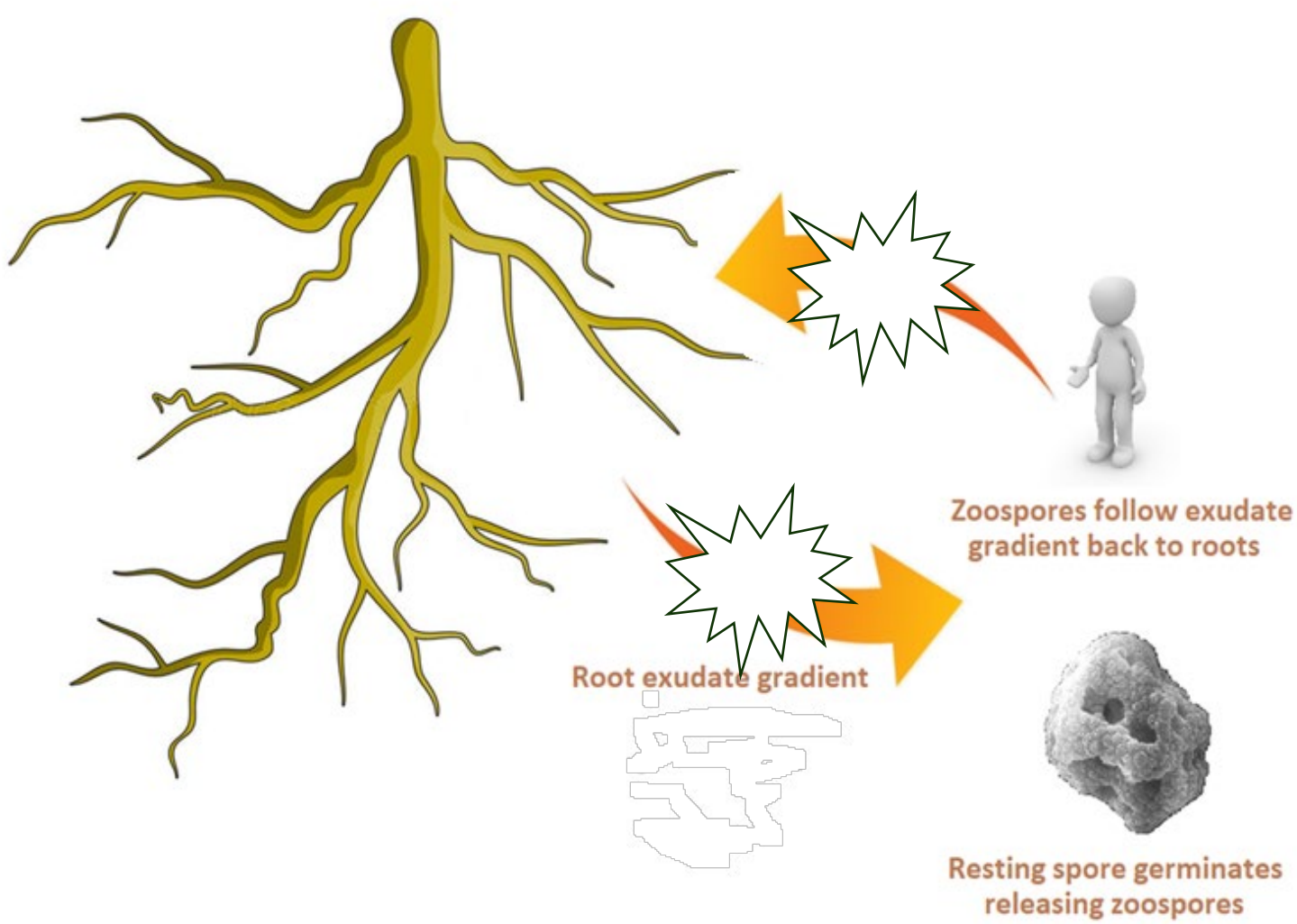
Rhizosphere bacterial inoculant

Can we use rhizosphere bacteria to remove the stimulatory compounds from root exudates



Bacterial inoculant – powdery scab

- Inoculant depletes pathogen stimulants in the soil reducing pathogen activation
- Also – boosts root development and yields
- Inoculant has been tested in **seven field trials** under commercial production systems
- Treatments applied as seed dusts, sprays, or as granules
- Consistent increases in root mass, tuber yields and decrease in powdery scab disease

TREATMENT	AVG YIELD CHANGE (%)	POWDERY SCAB DISEASE (%) *
CONTROL	-	-
INOCULANT	+12.0	-55.6

* For powdery scab n = 3 trials

Key Outcomes to date

Pre-plant

- Pre-crop (G2E) soil treatments show early promise for reducing powdery scab inoculum and potential for Verticillium

In crop treatments & Integrated controls

- In crop CuGln and Phos acid treatments show promise for improving yields and reducing disease under commercial production systems
  (We need to examine further the impact of Phos acid on powdery scab)
- Glutamine treatments are attractive as a fully non-pesticide approach
- Novel treatments (Cu Gln) may act synergistically with conventional fungicides
- Bacterial inoculant treatment may offer additional commercial benefits

Where to from here

Pre-plant

- Monitor established G2E trials (powdery scab); possible interstate trial(s)
- Formulate for Verticillium trials

In crop treatments & Integrated controls

- Expand the field testing of promising materials (Cu Gln) across Australia & overseas (Canada, 3 x USA, China)
- Increase studies on verticillium, black dot & black leg
- Assist in commercial development of new treatments (Cu Gln, biologicals)
- Test additional treatments
  (fungicides, biologicals, defence enhancers, humates, haulm removal/burning)

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