

A Spoonful of Sugar Makes Early Dying Go Away: Novel Management Approaches for Soil-borne Inoculum of *Verticillium dahliae* in Potato

Uttpal Anand ¹*, Fazal ur Rehman ¹, Jonathan Amponsah ¹, Robert S. Tegg ¹, Audrey E. Leo ², Calum Wilson ¹*

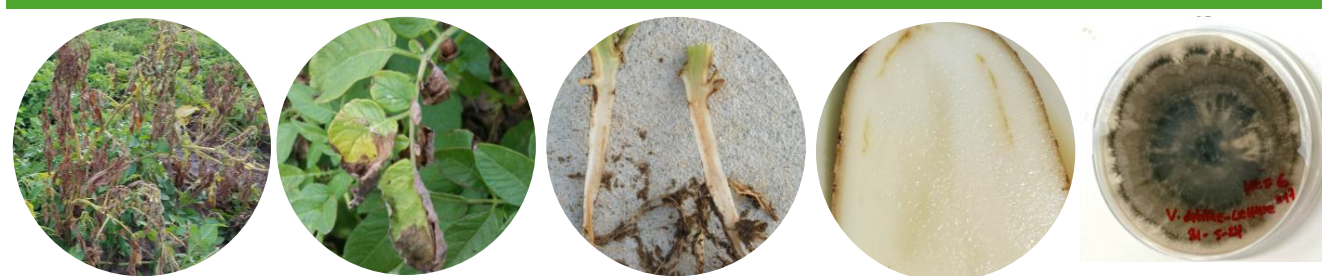
1. New Town Research Laboratories, Tasmanian Institute of Agriculture, University of Tasmania, 7008, Australia

2. Simplot Australia Pty Ltd, Chifley Business Park, Mentone, Victoria, Australia

* Corresponding authors: Uttpal Anand & Calum Wilson; Email: uttpal.anand@utas.edu.au; calum.wilson@utas.edu.au

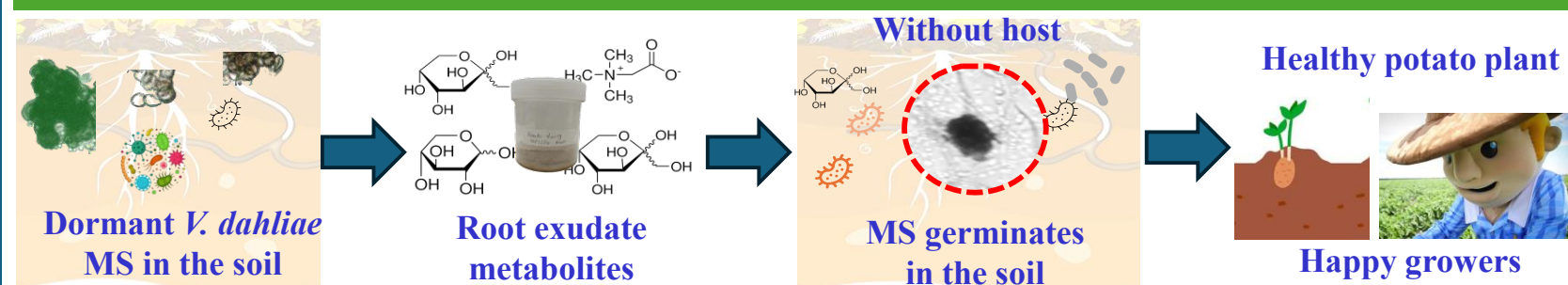


Background: The humble potato is increasingly threatened by *V. dahliae*



- Early-dying or *Verticillium* wilt, is a significant disease of potato worldwide caused by infections with *V. dahliae*.
- Management is problematic, as the pathogen has highly durable, resting structures called 'microsclerotia' (MS), which can persist in the soil for 14 years.
- MS germinates and invades a plant's roots, colonizing the xylem, leading to eventual plant death.
- There is no chemical cure for an infected plant.

Project hypothesis: Germinate to exterminate (G2E) in the absence of host potato



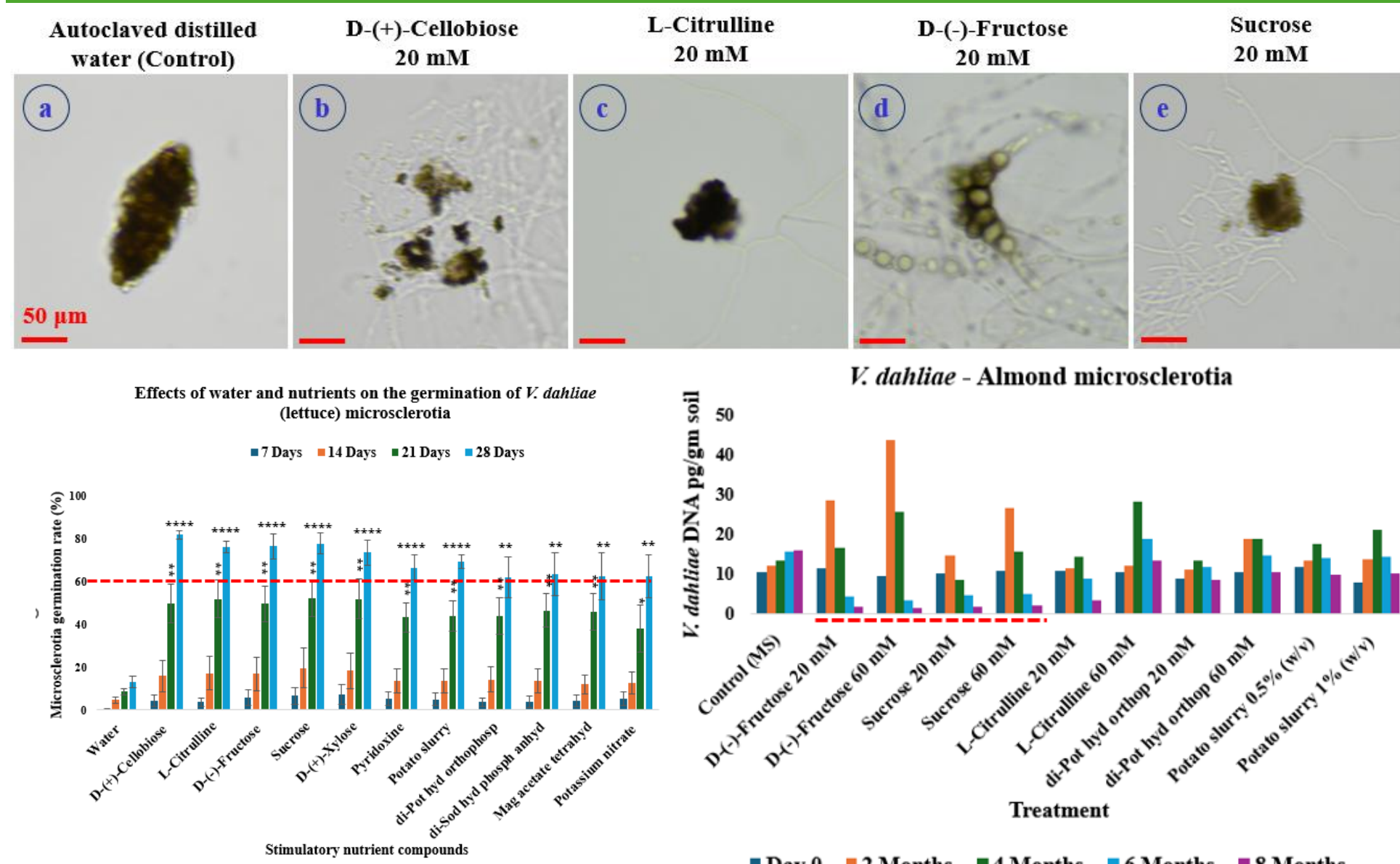
- It is known that root exudates stimulate MS germination, but which specific compounds are bioactive is unknown.
- We are testing a G2E approach that uses chemical cues to "trick" MS into premature germination in the absence of a host plant to exhaust *V. dahliae* soil inoculum before potato planting.
- Our primary goals are to find which root exudate compounds (and their threshold concentration) stimulate MS germination and to determine how efficacious soil treatment with these may be on inoculum reduction.

Methodology

- We tested a range of compounds for the capacity to germinate MS of *V. dahliae* *in-vitro* and then trialed them in glasshouse & mini-field plot studies.



Novel Findings from *in vitro* and Glasshouse Trials



- *In-vitro* results showed that out of eighty compounds tested, five successfully stimulated the germination of MS at an optimal concentration of 20 mM.
- The compounds which showed the maximum stimulatory effect were amino acids, sugars, potato industrial waste, and inorganic salts.
- Glasshouse trial results showed that out of 5 compounds, fructose and sucrose demonstrated significantly greater MS germination and subsequent inoculum decline over 8 months of soil treatment than the other treatments.
- Multiple applications appear superior to a single application in both powder and liquid form.

Ongoing Trials and Future Research Questions

1. Identify genes and proteins regulating *V. dahliae* MS germination to create a soil-based molecular marker for monitoring MS germination *in situ*.
2. Examine soil treatments (rates, frequency, formulation) to optimise MS germination and disease control.
3. Understand the impact of treatments (MS germination stimulants) on the natural soil microbiome.

For more information please contact: uttpal.anand@utas.edu.au | 0456775068 | utas.edu.au/tia

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