

Effects of *P. agathidicida* infection on the nutrients of kauri (*A. australis*) leaves

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Background

The oomycete *Phytophthora agathidicida* (PA) colonises the vascular tissue of kauri, restricting nutrient movement through the tree.

Uptake of nutrients by trees, and return of these nutrients via leaf litterfall are critical components of nutrient cycling in the forest ecosystem.

Changes in leaf nutrient content may have long-term implications for forest ecosystem processes.



WE WANT TO KNOW

HOW KAURI LEAF NUTRIENTS ARE AFFECTED BY *P. AGATHIDICIDA* INFECTION

Methods

Fresh leaves and soil samples were collected from twenty-four trees across three sites in the Waitākere Ranges in Summer 2022.

Leaf samples were milled and analysed for carbon, nitrogen and macro- (P, K, S, Ca, Mg, Na) and micro-nutrients (Fe, Mn, Zn, Cu, B, Mo).

Soil was tested for PA using a LAMP assay and distinguished as PA 'detected' or 'undetected'.¹

Linear mixed-effects models were used to assess the effect of PA presence on leaf nutrient content.



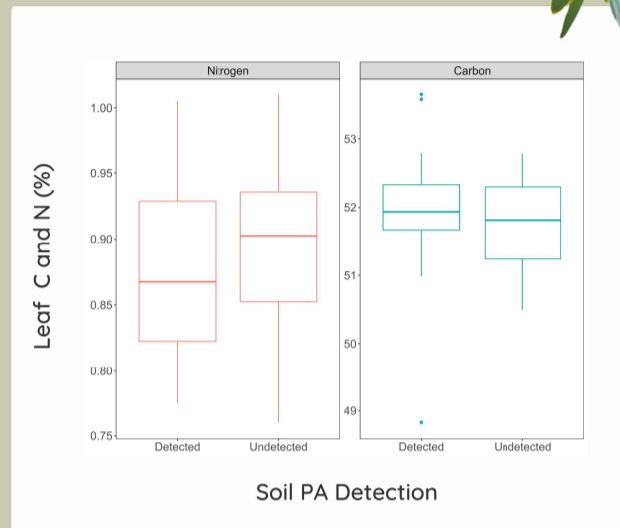
Leaf samples were collected from kauri canopies of varying health status.

References

- 1 - Winkworth *et al.*, (2020). A LAMP at the end of the tunnel: A rapid, field deployable assay for the kauri dieback pathogen, *Phytophthora agathidicida*. *PLoS one*, 15(1), e0224007.
- 2 - Wang *et al.*, (2013). The critical role of Potassium in Plant Stress Response. *International Journal of Molecular Sciences*, 14, 7370-7390.
- 3 - Amtmann *et al.* (2008). The effect of potassium nutrition on pest and disease resistance in plants. *Physiologia Plantarum*, 133, 682-691.

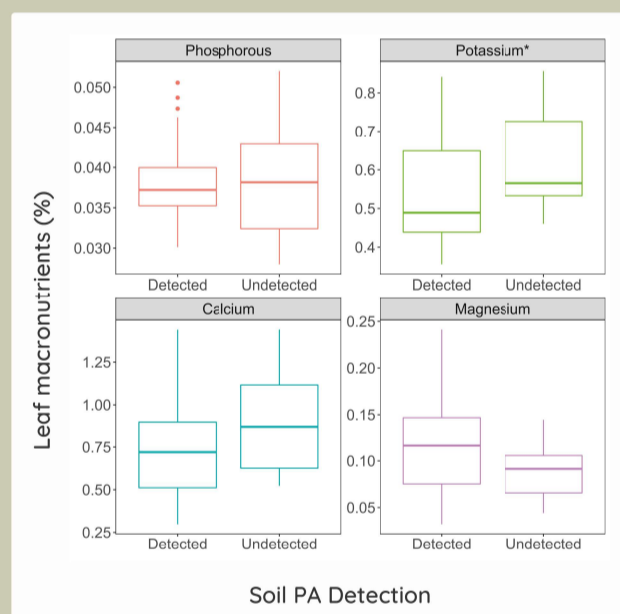
Results

Carbon and Nitrogen



Carbon and nitrogen were not significantly affected by PA detection in the soil

Macronutrients



No micronutrients were significantly affected by PA detection in the soil

Potassium was the only nutrient significantly affected by PA detection in the soil ($p = 0.017$)

Discussion

Potassium is critical for various biochemical plant processes, including those involved in growth and metabolism.²

Research suggests potassium also plays a critical role in plant defences against pathogens.³

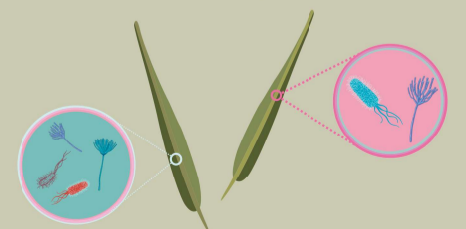
Significant reductions in potassium concentrations in kauri leaves under pathogen conditions may impact nutrient fluxes and be consequential for kauri forest ecosystems.

Next steps

Microbial communities

Leaves were also sonicated to remove surface microbes.

ITS and 16S sequencing will illustrate the composition of leaf bacterial and fungal communities, and how they may differ where PA is present.



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Ngā mihi nui ki a rātou.

