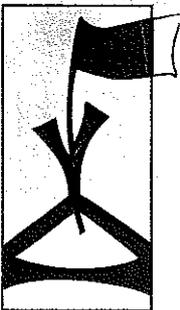


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# A COMPARISON OF THE *IN VITRO* AND *IN PLANTA* RESPONSES OF *PHYTOPHTHORA CINNAMOMI* ISOLATES TO PHOSPHITE

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## INTRODUCTION

Research in plant pathology often relies on testing interactions between a fungicide and a pathogen *in vitro* and extrapolating from these results what may happen *in planta*. Likewise, results from glasshouse experiments are used to estimate what will happen if the fungicide is applied in the field. However, it is difficult to obtain conditions *in vitro* and in the glasshouse which reflect the conditions where the fungicide may eventually be used, in the field.

The aim of this paper is to compare results of the effect of phosphite on *P. cinnamomi* isolates *in vitro* and *in planta*.

## MATERIALS AND METHODS

Two *P. cinnamomi* isolates sensitive to phosphite *in vitro* (MP 62 and MP 94-03) and two tolerant isolates (MP 97 and MP 125) were used.

*In vitro* Isolates were grown on Ribeiro's Modified Medium (RMM), with the omission of  $\beta$ -sitosterol and the addition of 0, 40, 80, 160  $\mu\text{g/mL}$  phosphite. A 6 mm plug of colonised agar was placed in the centre of each Petri-plate and the plates were incubated in the dark at 24°C for 7 days. Mycelial growth was measured at three points on the plate and the average growth per day was calculated.

**Glasshouse trial** *Eucalyptus marginata* (18-months old) were sprayed to run-off with 0 and 5 000  $\mu\text{g/mL}$  phosphite. Three months after spray application the plants were underbark inoculated with *P. cinnamomi* colonised Mira cloth discs. Two weeks after inoculation the plants were harvested, plated onto selective agar and *P. cinnamomi* growth rate was determined. The inoculated stems were analysed for phosphite using High Performance Ion Chromatography (HPIC) (1).

**Field trial** *E. marginata*, in an 18-month old rehabilitated bauxite mine (Alcoa Worldwide Alumina-Australia), were sprayed with 0, 5 000 and 10 000  $\mu\text{g/mL}$  phosphite in spring. Plants were underbark inoculated 2 weeks after spray application. The inoculated stems were harvested 1 month later and *P. cinnamomi* growth rate was determined. The inoculated stem was analysed for phosphite using HPIC.

## RESULTS AND DISCUSSION

- Plants sprayed with 5 000  $\mu\text{g/g}$  phosphite in the glasshouse had a phosphite concentration in the stem at least 8 times greater than plants sprayed with the same phosphite concentration in the field (Figure 1b and 1c). Plants in both situations were actively growing and were not water stressed.
- There was a difference between isolates in phosphite tolerance *in vitro* (Figure 1a).
- There was no difference between isolates in phosphite tolerance *in planta* (Figure 1b and 1c).
- P. cinnamomi* isolates grew at an equivalent rate in glasshouse plants which contained approximately 668  $\mu\text{g/g}$  dry weight phosphite as they did in plants in the field not treated with phosphite.

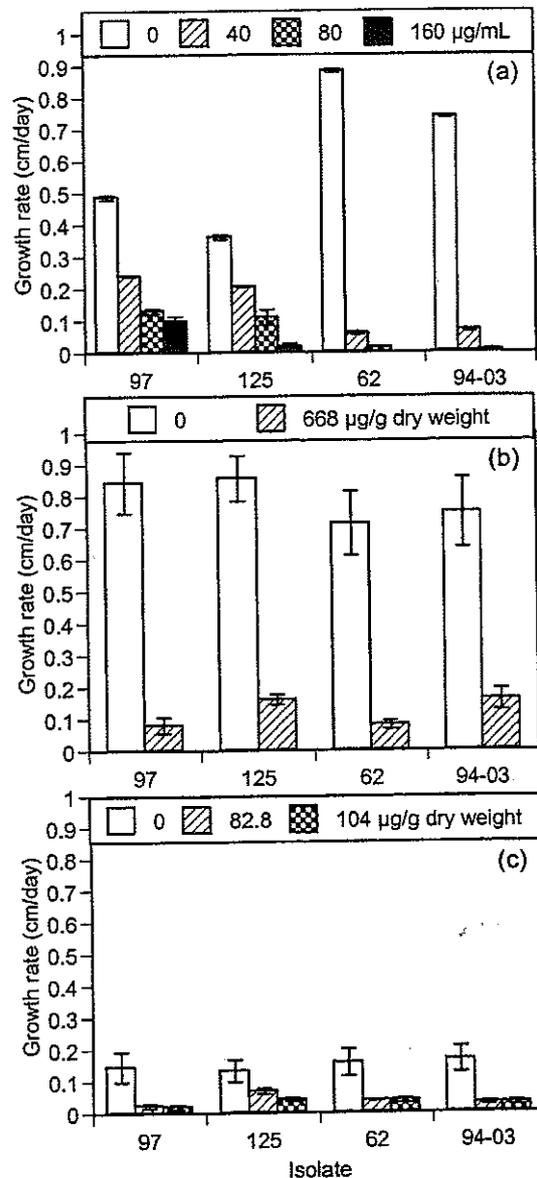


Figure 1. A comparison of the growth rate response of four *Phytophthora cinnamomi* isolates to phosphite (a) *in vitro* and (b), (c) *in planta*. *Eucalyptus marginata* growing (b) in a glasshouse and (c) in a rehabilitated minesite. The bars represent growth at (a) the phosphite concentration added to RMM ( $\pm$ SE) or (b), (c) the phosphite concentration *in planta* determined using HPIC ( $\pm$  SE).

These results indicate that care needs to be taken when extrapolating results from *in vitro* to *in planta*. Researchers must remain aware that it is impossible to replicate field conditions in the glasshouse.

## REFERENCES

- Roos, G.H.P., Loane, C., Dell, B., Hardy, G. E. St. J. (1999) Facile performance ion chromatographic analysis of phosphite and phosphate in plant samples. *Communications in Soil Science and Plant Analysis* (in press).