Hardy, G., Holmes, J., Wilkinson, C., Tynan, K., McDougall, K., Dell, B., Colquhoun, I., McComb, J. and Roos, G (1997) ***Phytotoxic effects of the fungicide phosphite when used to control Phytophthora cinnamomi in native plant communities.*** **In: 11th Biennial Conference of the Australasian Plant Pathology Society, 29 September - 2 October, Perth, Western Australia, pp 183.**

PHYTOTOXIC EFFECTS OF THE FUNGICIDE PHOSPHITE WHEN USED TO CONTROL *PHYTOPHTHORA CINNAMOMI* IN NATIVE PLANT COMMUNITIES

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INTRODUCTION

Phosphite controls many plant diseases caused by *Phytophthora,* even at concentrations *in planta* which only partially inhibit pathogen growth *in vitro*. It is unique among fungicides in that it is translocated in both the xylem and phloem (1). This property, along with their good water solubility, enables them to be applied to tree crops by trunk injection, aerial application or backpack spray units for the control of *Phytophthora* root rots. One of the consequences of phosphite treatment is that it induces a strong and rapid defence response in the challenged plant (2). These defence responses stop pathogen spread in a large number of hosts.

The Department of Conservation and Land Management (CALM) in Western Australia has conducted research on the potential of phosphite to control *Phytophthora* spp. in a few plant species. Recent work completed at Murdoch University in conjuction with Alcoa of Australia Ltd and CALM has indicated that some plants (i) vary in their response to phosphite as the concentration increases, (ii) are affected by and recover from phytotoxicity in different ways and time periods, (iii) distribute phosphite differently within the plant , and (iv) sometimes reduce flowering and seed set. A series of trials are currently being conducted to investigate these points on a range of native plant species from different areas within Western Australia.

MATERIALS AND METHODS

A semi-randomised experiment was established 200km N of Perth on the sandplains. Quadrats were pegged out for each of four phosphite concentrations (0, 0.5%, 1.0% and 2.0%). Eighteen plant species from the families Proteaceae, Casuarinaceae, Papilionaceae, Myrtaceae, Epacridaceae, Dasypogonaceae, Dillenaceae, Restionaceae, Cyperaceae and Rhamnaceae were selected and tagged from within these quadrats. Plants were individually sprayed to runoff with various phosphite concentrations (with the wetting agent synetrol added at 0.25%). The quadrats were separated to avoid spray drift. There were seven plants sprayed per species for each phosphite concentration.

Plants were initially rated two weeks after spraying for visual phytotoxic effects and these symptoms photographed. The following rating system was applied:

Leaf area affected

1 = > 0% but < 10%	(5%)
2 = > 10% but < 20%	(15%)
3 = > 20% but < 50%	(35%)
4 = > 50% but < 75%	(62.5%)
5 = > 75% but < 100%	(87.5%)

Proportion of plant

1 = > 0% but < 25%	(12.5%)
2 = > 25% but < 50%	(37.5%)
3 = > 50% but < 75%	(62.5%)
4 = > 75% but < 100%	(87.5%)
5 = 100%	(100%)

Where plants shed a proportion of their leaves due to phosphite it was recorded as defoliation. The number in brackets was the value used in calculations.

RESULTS AND DISCUSSION

Five of the 18 species assessed were significantly affected by 0.5% phosphite (Table 1). This was in contrast to the 2% phosphite spray for which 14 of the 17 species assessed were significantly affected. Only two species were apparently unaffected at all concentrations. Recovery, in terms of resprouting, might be expected over winter so further ratings are planned.

Preliminary assessments indicate that 0.5% phosphite causes fewer phytotoxic symptoms than higher concentrations. Observations also show that phosphite may be having an effect on flower production and seed set, two areas currently under investigation.

Table 1. The difference in % of plant apparently affected by phosphite spray at the northern sandplains site (phosphite concentration minus control spray [0% phosphite with surfactant]). A value is shown only where there was a significant difference ($P < 0.01$) as determined by ANOVA.

Difference in mean % of plant affected between control and phosphite concentration (%)	**0.5**	**1.0**	**2.0**
No. species affected	5	11	14
Total No. species	18	18	17
% species affected	**27**	**61**	**82**

ACKNOWLEDGMENTS

Funding for the project was provided by MERIWA and ARC grants. M. Calver for statistical advice.

REFERENCES

1. Ouimette, D.G. & Coffey, M.D. (1989). Phosphonates: antifungal compounds against Oomycetes. *Plant Disease* **73**, 212-15.
2. Guest, D.I. & Bompeix G. (1990). The complex mode of action of phosphonates. *Australasian Plant Pathology* **19**, 113-15.