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DETERMINATION OF CRITICAL ROOT CONCENTRATIONS OF PHOSPHONATE TO CONTROL PHYTOPHTHORA ROOT ROT IN AVOCADO

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Abstract

Phytophthora cinnamomi (Rands.) is one of the most debilitating diseases in avocados and has been responsible for widespread destruction of orchards throughout the world. Today, in most cases, the soil-borne fungus is held in check by an integrated approach incorporating both cultural practices and chemical control. The latter has relied heavily on the use of phosphonate fungicides which are known to act against the Oomycetes. Past experience has shown that continued use of one systemic fungicide against a pathogen increases the likelihood of the development of resistance due to increased pressure on the mode of action. Fortunately, phosphonate to date has proven effective in controlling *Phytophthora* root rot. A complex horizontal mode of action has been suggested for phosphonate fungicides where, in addition to a direct effect on Phytophthora, there is activation of host defence mechanisms. In recent years, concern has developed over the recovery of orchards following injection with recommended rates of phosphonate fungicides. Suggestions have been made that the poorer results were due either to changes in injection technology or the evolution of *P. cinnamomi* strains less sensitive to phosphonate.

P. cinnamomi isolates were collected from trees with a ten year history of phosphonate treatment, and their *in vitro* sensitivity to phosphonate determined and compared to isolates from trees without prior treatment with phosphonate fungicides. Growth was prevented by 100 $g \cdot ml^{-1}$ of phosphonate in all isolates from the untreated trees whereas only 35% of isolates from treated trees were inhibited by 100 $g \cdot ml^{-1}$. Indeed several

isolates from the treated trees grew at 1000 $g \cdot ml^{-1}$ of phosphonate.

Phosphonate was applied fortnightly to the stems of ten avocado trees growing aeroponically in rhizotrons until a range of *in vivo* concentrations were obtained in the roots. Trees were then inoculated with strains of *Phytophthora cinnamomi* which continued growing at *in vitro* concentrations of 100-1000 $g \cdot ml^{-1}$ of phosponate, and critical concentrations of phosphonate in avocado roots at which *Phytophthora cinnamomi* was inhibited were subsequently determined. Our results are discussed in the context of commercial recommendations.