THE POTENTIAL OF COPPER SULPHATE TO CONTROL *Phytophthora cinnamomi* IN BAUXITE MINING OPERATIONS

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INTRODUCTION

Phytophthora cinnamomi Rands is present in many areas prior to mining by Alcoa of Australia, Ltd. To reduce the risk of spreading this pathogen to non-infected areas the company employs a range of control measures at all stages of mining. There is a need to develop a treatment to eradicate *P. cinnamomi* from relatively small volumes (<60m^3) of soil. This study examined the efficacy of $CuSO_4$ as a fungicide for rapid death (<2h) of *P. cinnamomi* in topsoil and gravel soil taken from a mining area.

MATERIALS AND METHODS

The *P. cinnamomi* isolates were obtained from the Murdoch University collection.

The inhibition of *P. cinnamomi* growth by $CuSO_4$ was determined by incorporating 0, 30, 50, 100, 200, 300, 400, 500 and 550mg $CuSO_4$/L in potato dextrose agar (PDA) - adjusted to pH 6.3. The amount of Cu bound to agar was determined to assess the concentration in solution and thus available for uptake by the mycelia.

Pathogen suppression was assessed by recovering *P. cinnamomi* colonised vermiculite from the soils containing 0-5g $CuSO_4$/kg soil.

Disease suppression was assessed by baiting the soils with *Pimelea ferruginea* leaves and *Eucalyptus sieberi* cotyledons.

RESULTS

Neither *P. cinnamomi* isolate was killed by any of the $CuSO_4$ concentrations tested in agar, however, the growth rate declined with increasing concentration (Figure 1). At concentrations above 50mg/L $CuSO_4$ mycelial growth was sparse and irregular.

Applications of up to 5g $CuSO_4$/kg soil were insufficient to kill *P. cinnamomi* after two hours exposure in both soil types (Figure 2). After 5 days in topsoil, *P. cinnamomi* was recovered from >60% of the baits at all concentrations tested. In contrast, no *P. cinnamomi* was reovered from the gravel after 5 days exposure.

PDA solid media effectively bound up to 30% of Cu^{2+} (Table 1).

Table 1. Concentrations of $CuSO_4$ added to PDA solid media.

$CuSO_4$ mg/L	Cu^{2+} mg/L	unbound Cu^{2+} mg/L
0	0	0.3
50	12.5	11
200	50	36
400	100	47
550	137.5	84

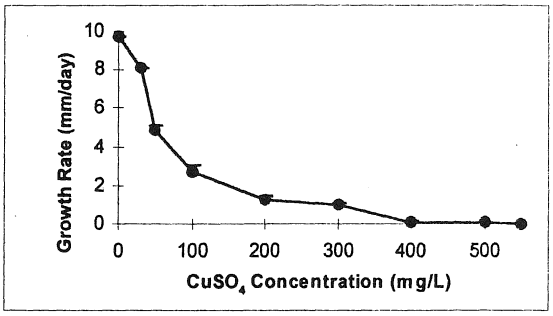

Figure 1. Average growth rate of *Phytophthora cinnamomi* on PDA containing $CuSO_4$.

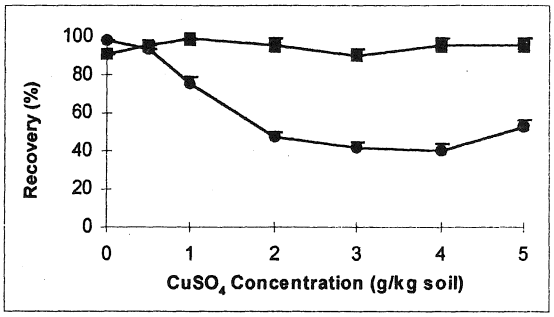

Figure 2. Recovery of *Phytophthora cinnamomi* from vermiculite retrieved from topsoil and gravel after 120min exposure to different concentrations of $CuSO_4$.

DISCUSSION

While applications of up to 5g $CuSO_4$/kg soil did not meet the desired requirement of killing *P. cinnamomi* in soil within 2h, the pathogen was unable to cause disease in either soil type after 5 days exposure to 2-5g $CuSO_4$/kg soil. Therefore there maybe other applications where the use of $CuSO_4$ for the eradication of *P. cinnamomi* is practicable.

It was observed that copper adsorbed more to the topsoil than the gravel, consequently, to achieve the same fungicidal effect, markedly more $CuSO_4$ needs to be added to topsoil. Additionally, it was found that a significant proportion of Cu^{2+} bound to the agar medium used, which must be taken into account in all future experiments.

ACKNOWLEDGMENTS

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