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CONTROL OF PHYTOPHTHORA ROOT ROT ON YOUNG REPLANTED AVOCADO TREES

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OPSOMMING

Van die verskillende behandelings wat uitgetoets is teen Phytophthora-wortelvrot op Jong avokadoboompies, het grondtoedienings met CGA 48988 (Ridomil) die siekte doeltreffend beheer. Die aanduidings is dat CGA 48988 nie die organisme oor die lang termyn uitwis nie, maar dat herinfeksie plaasvind.

SUMMARY

Of the various treatments which were tested against Phytophthora root rot of avocado seedlings, soil applications with CGA 48988 (Ridomil) controlled the disease effectively. Examinations of the roots showed that reinfection occurred.

INTRODUCTION

Several chemical treatments may be useful to reduce or eradicate *Phytophthora cinnamomi* in soil before planting (Zentmyer & Klotz, 1949; Zentmyer, 1955; Milne, Brodrick & Hughes, 1975; Donald & von Broembsen, 1977). These treatments may be useful for nurseries but under field conditions treated soils soon become reinfected through orchard practices and the movement of water. Chemical treatment of diseased trees in the field has been under investigation for the past three years. Darvas, Kotzé and Toerien (1978) reported preliminary results on the control of *P. cinnamomi* with several fungicides and the results achieved with CGA 48988 (Ridomil) were quite remarkable. Several subsequent experiments confirmed the original indications that Ridomil is a fungicide of considerable promise for the control of Phytophthora root rot.

This report describes the results of an experiment which started in 1977, in which several treatments were evaluated for the control of Phytophthora root rot on avocado seedlings in a naturally infected soil.

MATERIALS AND METHODS

As test plants, Guatemalan avocado seedlings were used which were planted in

naturally infected soil in 1977. Nine-year old, badly diseased Fuerte on Guatemalan trees were cut right back to the trunk and the soil was thoroughly mixed to ensure even distribution of the fungus The soil was tested for the presence of *P. cinnamomi before,* during and on completion of the experiment. Around each tree base in the dripline, eight beds, 1,5 m in extent were prepared and three seedlings planted 50 cm apart in each bed. There were three data trees per plot, replicated eight times for each treatment.

TREATMENTS

1. LS 74-783 80% a.i. WP sprayed on foliage at 0,3% a.i. six weekly in the first year and monthly in the second year.
2. CGA 48988 5% a.i. granular in 1977 at 0,4 g a.i./tree eight weekly in 1977 and twelve weekly at 1,0 g a.i./tree in 1978.
3. CGA 48988 5% a.i. granular first at 1,6 g a.i./tree eight weekly in 1977. This was increased to 4,0 g a.i./tree with twelve weekly intervals in 1978.
4. DPX 3217 50% a.i. WP sprayed on foliage at 0,025% a.i. two weekly but a combined treatment of leaf spray and soil drench was applied in the second year, two weekly.
5. Ethazole 10% a.i. granular at 1,5 g a.i./tree six weekly in the first year and at 3,0 g a.i./tree in the second year applied monthly.
6. Combination of LS 74-783 and Ethazole, as above.
7. Soil drench with culture filtrates of *Phytophthora* — inhibiting bacteria, monthly.
8. Untreated control.

All the above treatments were applied only in the rainy summer months from October to March.

The plants in the combined treatment of LS 74-783 and Ethazole were better than those in the untreated control after the first year. It was thought that a more frequent foliar spray with LS 74-783 would result in better efficacy and the time intervals between applications were reduced. Similarly, Ethazole was applied monthly and in the EC form after the first year. DPX 3217 treatment was intensified with soil drenches every fortnight in addition to the leaf spray. After the excellent results obtained with Ridomil in the first year, the application intervals were increased to 12 weeks.

RESULTS

The condition of replanted seedling trees was assessed at the end of

1977/78 and 1978/79 growing season by using the disease severity rating system worked out by Zentmyer (1973). Height measurements were also taken and with the final assessment the mass of fresh plant material was recorded. The results are given in Table 1.

The plants treated with CGA 48988 at both rates, were significantly taller and produced

significantly more roots, branches and leaves than any of the other treatments. In spite of the superiority of CGA 48988, root rot symptoms occurred during the second season. *P. cinnamomi was* also isolated from these treatments as in any of the other treatments.

The combination of Ethazole and LS 74-783 gave statistically comparable results to CGA 48988 based on visual disease ratings alone.

DISCUSSION

The technique of evaluating different treatments in small plots in naturally infected soil proved successful with relatively little variation between the replications. This method may therefore be applied for the evaluation of rootstock resistance where results in laboratories and greenhouses are inclined to vary.

The outstanding feature of this experiment was the consistently good results achieved with CGA 48988 (Ridomil). Although the Ridomil treated plants retained their vigorous growth throughout the duration of the experiment, root rot symptoms were observed in 1979. A possible explanation for the limited root infection may be that the roots penetrated untreated soil and that the systemic movement of the fungicide was insufficient to control the fungus. The Ridomil treated plants developed a dense root system which differed in this respect from the other treatments. *P. cinnamomi* was isolated from the roots and soil of all the treatments which indicates that the fungus was not eradicated permanently in any treatment.

The long term effects of Ridomil applications under commercial conditions are unknown at this stage. During the course of this experiment no undesirable side effects were observed.

The combination of Ethazole plus LS 74-783 should be further investigated. The trees in this treatment exhibited a healthy appearance but the growth was less spectacular than in the case of Ridomil. Ethazole and LS 74-783 used separately gave disappointing results in this experiment. The soil drench with culture filtrates of bacteria which inhibited *P. cinnamomi* in vitro, failed under field conditions.

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TABLE 1: *Control of root rot by various treatments on replanted avocado seedlings in naturally infested soil*

Treatments	Mean disease rating (rated from 0 to 5)		Mean height of plants in cm		Total or mean mass of fresh plant material in g		Top/root mass ratio	Presence of the fungus
	1978	1979	1978	1979	Root	Top		
1. LS 74-783	2,5 a	2,8 a	53 a	73 a	107 a	257 a	2,4	+
2. CGA 48988 low rate	0,2 b	1,5 b	87 b	180 b	618 b	1835 b	3,0	+
3. CGA 48988 high rate	0,3 b	1,3 b	97 b	214 b	820 b	2854 c	3,5	+
4. DPX 3217	2,7 a	2,8 a	57 a	67 a	67 a	122 a	1,8	+
5. Ethazole	2,1 a	2,1 a	50 a	74 a	100 a	220 a	2,2	+
6. Ethazole & LS 74-783	1,5 b	1,4 b	58 a	89 a	126 a	315 a	2,8	+
7. Biological control	3,2 a	3,0 a	52 a	64 a	89 a	197 a	2,2	+
8. Untreated Control	3,0 a	3,4 a	48 a	54 a	54 a	82 a	1,5	+

Statistical differences: a, b and c at 0,05 level (ratings with the same letter do not differ significantly)

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