South African Avocado Growers' Association Yearbook 1993. 16:73-74

THE EFFECT OF PHOSPHITE IN ROOTED CUTTINGS OF DUKE 7 AVOCADO ON *PHYTOPHTHORA CINNAMOMI*

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ABSTRACT

Dry root mass, dry leaf mass and % roots infected with P. cinnamomi *indicated (Pc) • that a good correlation can be drawn between a potted trial under glass house conditions and* in vitro *results of linear colonisation of excised root tips when plants are treated with* H_3PO_3

INTRODUCTION

The use of excised root tips for determining tolerance in avocado rootstocks was described by various researchers (Kellam & Coffey, 1985; Dolan & Coffey, 1986 and Botha, Wehner & Kotzé, 1989).

The detached root technique described by Botha *et al.,* 1989 proved to be an excellent *in vitro* method of testing the effectiveness of antifungal activity of systemic fungicides when a highly susceptible plant is used (Van der Merwe, *et al*., 1992). The purpose of this paper is to establish whether a correlation could be drawn between a potted trial where 18 month old rooted cuttings of Duke 7 are used and *in vitro* results of linear colonisation of excised root tips of Edranol seedlings injected with H_3PO_3 (Van der Merwe *et al.,* 1992)

MATERIALS AND METHODS Plant material

18 Month old moderately tolerant *P. Americana* selection Duke 7 rooted cuttings were used for this experiment.

Plant medium

Plants were planted in 10 K plastic pots in a pasteurized soil mixture consisting of 1 part peat moss, 1 part loam soil and 1 part silica sand (ca. 0.7 mm).

Treatments

Plants were injected 3 times with a 10% phosphorous acid solution at a rate of 0.4 g a.i./m^2 at 60 days interval. The H_3PO_3 solution was partially neutralized with potassium hydroxide to a pH of 6.1.

Pathogen isolate

P. cinnamomi (Pc) isolated from the Nelspruit area was used. The pathogen was grown on PDA for 7 days. Agar discs containing *Phytophthora* mycelium were then inoculated in B Erlenmyer flasks containing 500ml broth consisting of 1% glucose and0.1%yeast extract. The flasks were incubated at 25°C on a shaker for 14 days. After harvesting the fungal mass by filtration through a Whatman no 1 filter paper, it was blotted dry with paper cloth. Mycelium was added to a 0.1% agar solution at a concentration of 0.5% (W/V) and mascerated for 30 s with an Ultra Turrax.

The inoculum was added to the planting medium at a ratio of 100ml per 1 ℓ of planting mixture. After mixing the media and inoculum by shaking it in a plastic bag, the trees were planted. The trial was evaluated after a period of 10 months under greenhouse conditions at temperatures ranging from 8°C-32°C.

The treatments consisted of a control where no Pc-inoculum was added and no H_3PO_3 was applied, a treatment where *Pc* was added as well as three H_3PO_3 injections 60 days apart (*Pc* + H_3PO_3, Figs. 1-4) and a treatment where *Pc* added, but without H_3PO_3 injections (*Pc* - H_3PO_3, Figs. 1-4). Five plants were used per treatment and the trial was done twice, initiating within the same week.

The parameters used to quantify differences were % roots infected with Pc, % *Pc* recovered from potting mixture, dry leaf mass and dry root mass.

RESULTS

The % roots infected with *Pc* are reflected in Fig. 1. The % infection in control plants was 0% as expected. Where *Pc* was added and H_3PO_3 injected, 95% of the root system looked healthy but 6.6% of roots were infected, although not a big difference it was significant. Where *Pc* was added but no H_3PO_3 injected no *Pc* could be recovered from roots, for all the roots were already dead indicating a 100 % root infection. This conclusion can be drawn especially when the % Pc re- covered from the potting mixture are assessed in Fig. 2. This shows that either the % *Pc* decreased in the treatment where *Pc* and H_3PO_3 were added, or that the % *Pc* increased where no H_3PO_3 was applied.

Considering the dry root mass there is a significant difference between each of the different treatments with the only exception that the roots of the uninoculated control was 100% healthy, and that of the treatment with *Pc* and H_3PO_3 was 94 % healthy. The roots of the treatment receiving only *Pc* were dead, indicating an even bigger difference between the last two treatments (Fig. 3).

Looking at the dry leaf mass in Fig. 4 there is no significant difference between the control and the treatment receiving H_3PO_3, but a significant difference between them and the treatment receiving no H_3PO_3.

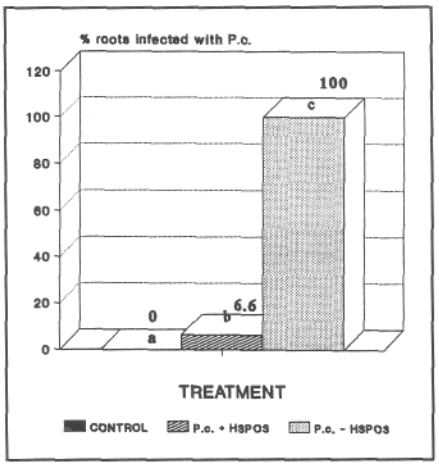

FIG. 1 The effect of H_3PO_3 injections and *P. cinnamomi* on the % of roots of Duke 7 rooted cuttings infected with *P. cinnamomi*. Bars not sharing a common letter are significantly different (P = 0,05) According to Duncan's multiple range test.

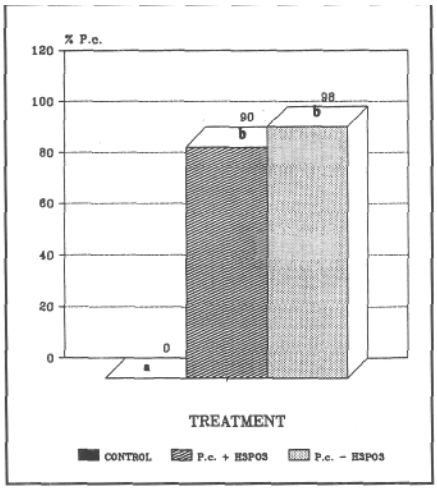

FIG. 2 The effect of H_3PO_3 injections and *P. cinnamomi* on the % of *P. cinnamomi* recovered from the potting medium. Bars not sharing a common letter are significantly different (P = 0,05). According to Duncan's multiple range test.

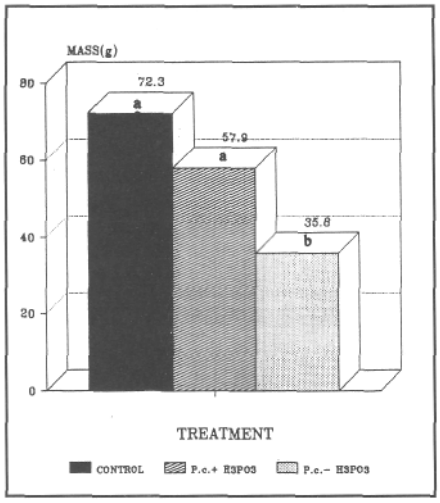

FIG. 3 The effect of H_3PO_3 injections and *P. cinnamomi* on the dry leave mass of rooted Duke 7 cuttings. Bars not sharing a common letter are significantly *different* (P = 0,05). *According* to Duncan's multiple range test.

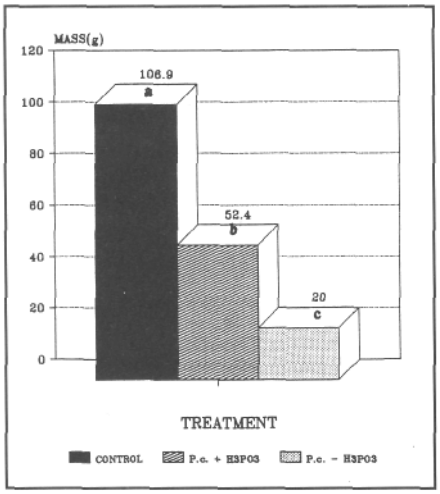

FIG. 4 The effect of H_3PO_3 injections and *P. cinnamomi* on the dry root mass of rooted Duke 7 cuttings. Bars not sharing a common letter are significantly different (P = 0,05). According to Duncan's multiple range test.

DISCUSSION

The control differed significantly in all cases where it was compared with the treatment receiving *Pc* and no H_3PO_3 but was basically incorporated to indicate the correctness and precision with which the trial was carried out. Although the % *Pc* recovered from the potting mixture after 10 months is lower in the treatment receiving the three H_3PO_3 injections than the treatment receiving only the *Pc* inoculum, this is the only parameter not indicating a significant difference between the two treatments.

Dry root mass, dry leaf mass and % roots infected with *Pc* gave significant differences between the treatment receiving three H_3PO_3 injections and the treatment without the H_3PO_3 injections. A very clear correlation can therefore be drawn between *in vitro* results of linear colonisation of excised root tips of Edranol seedlings injected with H_3PO_3 (Van der Merwe *et al.,* 1992) and results obtained from a potted trial where 18 month old rooted cuttings of Duke 7 were used and injected with H_3P0_3.

ACKNOWLEDGEMENTS

The author would like to thank Dr A. Hough from Schagen for providing the plant material for this trial.

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