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 H₃PO₃.

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 H₃PO₃ (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./m² at 60 days interval. The H₃PO₃ 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 and 0.1% 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 macerated 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 H₃PO₃ was applied, a treatment where *Pc* was added as well as three H₃PO₃ injections 60 days apart (*Pc* + H₃PO₃, Figs. 1-4) and a treatment where *Pc* added, but without H₃PO₃ injections (*Pc* - H₃PO₃, 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 H₃PO₃ 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 H₃PO₃ 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* recovered from the potting mixture are assessed in Fig. 2. This shows that either the % *Pc* decreased in the treatment where *Pc* and H₃PO₃ were added, or that the % *Pc* increased where no H₃PO₃ 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 H₃PO₃ 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 H₃PO₃, but a significant difference between them and the treatment receiving no H₃PO₃.
FIG. 1 The effect of $\text{H}_3\text{PO}_4$ 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 $\text{H}_3\text{PO}_4$ 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 $\text{H}_3\text{PO}_4$ injections and $P. \text{cinnamomi}$ 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 $\text{H}_3\text{PO}_4$ injections and $P. \text{cinnamomi}$ 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 \textit{in vitro} results of linear colonisation of excised root tips of Edranol seedlings injected with \( H_3PO_3 \) (Van der Merwe \textit{et al.}, 1992) and results obtained from a potted trial where 18 month old rooted cuttings of Duke 7 were used and injected with \( H_3PO_3 \).

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REFERENCES


