THE RELATIONSHIP BETWEEN AVOCADO TREE CONDITION AND DOSE RATES OF FOSETYL-AL INJECTIONS FOR ROOT ROT CONTROL

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INTRODUCTION
Experiments on the control of Phytophthora root rot of avocados (Persea Americana Mill.) by trunk injection with fosetyl-Al at Westfalia Estate and results on the efficacy of the method were reported by Darvas, Toerien & Milne (1983). In a later publication Darvas et al. (1984) discussed the role of fosetyl-Al concentration and the initial disease rating of trees in the first year's reaction to root rot control by trunk injection.

In this paper the practical implications of root rot control by means of trunk injections with fosetyl-Al are being discussed.

MATERIALS AND METHODS
Some 2115 randomly selected avocado trees, including Fuerte, Mass, Edranol and Ryan cultivars, varying between 1 and 17 m in drip-line diameter were injected in commercial orchards, using fosetyl-Al doses of between 0.1 and 2.5 g a.i. per m² of canopy area. The disease rating of the trees ranged from 0 to 8 on the root rot severity index scale of 0 (healthy) to 10 (dead). Trees were injected with the fungicide solution in the main trunk by using a modified form of the injection technique of Buitendag & Bronkhorst(1980)as described by Darvas et al. (1983). Trees were injected in July and again in October 1981 and the reaction was assessed in July 1982.

Disease rating differences that occurred in the first year were then correlated with the dose rates used and the initial disease condition of the trees. A multiple linear regression model was also constructed to forecast the first year's reaction.
RESULTS
A highly significant correlation was found between the quantities of fosetyl-Al injected into the trunk and tree response (Fig.1). This shows that dose rates below 0.3g a.i. per m² canopy area are ineffective in the first year of the treatment.
A similar, highly significant correlation was found between the initial disease condition of avocado trees and tree response (fig. 2). This indicates that trees with full foliage require more fosetyl-Al than similar sized, but less foliated trees in order to produce equivalent responses.

\[
y = 0.54 - 0.29x
\]
\[F = 372.96\]

**FIG. 2:** The correlation between initial disease rating of trees and tree response in the first year of fosetyl-Al trunk injection.

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y = 0.50 - 1.50x
\]
\[F = 25.03\]

**FIG.1:** The correlation between fosetyl-Al dose rates by trunk injection and tree response in the first year of the treatment.

It was found possible to compute a forecast of tree response with the following multiple linear regression equation: \( Z = 0.85 - 1.17x - 0.29y \), where \( Z \) = the forecast of tree response on a disease index scale of 0-10, \( x \) = fosetyl-Al dose rate (in g a.i. /m² of canopy area) injected twice a year and \( y \) = initial disease rating on a disease index scale of 0-10 (FforZ = 198.26, F for x = 20.18 and F for y = 378.20).

DISCUSSION
According to the correlation found between fosetyl-Al dosages injected into the trunk and tree reaction, the 0.4g a.i. per m² canopy area injected twice a year as reported by Darvas et al. (1983) falls in the effective dose rate regime. Rates under 0.3 g a.i. per m² usually failed to control the disease, but caused a slowdown of the rate of tree decline. Rates above 0.8g a.i. per m² produced phytotoxic symptons on leaves of some trees. Phytotoxicity was more severe in trees in the advanced stages of root rot with
considerably less foliage than in healthy trees. However, all trees that developed phytotoxic symptoms continued a normal recovery and these symptoms disappeared in the second year when trees became more densely foliated. These observations indicate that the occasional phytotoxicity at the 0.4g a.i. per m² rate is primarily due to inability of defoliated trees to properly dilute and distribute the chemical within the plant.

An important finding with trunk injection with fosetyl-Al was that trees in the more advanced stages of root rot reacted faster to the same amount of material than healthier trees of the same size. This may indicate that trees which have started to recover need progressively more material in order to maintain the rate of recovery. This phenomenon may also be explained by the larger volume of foliage of healthier trees that dilutes and distributes the fungicide in the plant.

The multiple regression equation used to predict the first year's tree response proved to be accurate in commercial applications. It has, however, no value in forecasting recovery rate in the second year of the injection treatment. The second year's reaction is generally faster recovery.

It was observed that when trees were injected from only one side, phytotoxicity appeared on that side and tree reaction was also one sided. It is, therefore, important to space the injection holes evenly right around the trunk for a uniform reaction.

Some fosetyl-Al injected trees were recorded which did not respond at the expected rate or showed no response at all. Further investigation of such trees revealed that factors other than Phytophthora root rot may be responsible for the decline at Westfalia. These factors include the chemical and physical condition of the soil and rootstock/scion incompatibility.

REFERENCES
