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INORGANIC FERTILISATION OF POTTED AVOCADO PLANTS: RESULTS OF POT EXPERIMENTS

R O Barnard
Department of Soil Science and Plant Nutrition, University of Pretoria, Pretoria 0002

PROGRESS REPORT

ABSTRACT

Tendencies in the effect of elimination of macroelements on nutrient levels in the leaves of potted avocado plants in sand culture are discussed. Interactions between N and Ca were especially noted.

UITTREKSEL

Tendense in die invloed van eliminasie van makroelemente op die voedingselementvlakke in die blare van avokadoplante in 'n sandkultuur potproef word bespreek. Interaksies tussen N en Ca is veral opgemerk.

INTRODUCTION

Several aspects of the inorganic nutrition of avocados, and factors affecting this, have been undertaken and reported on (Barnard, 1988; Barnard &Slabbert, 1988; Barnard, 1989, 1990).

The latest investigation has focused on deficiency symptoms obtained in sand culture with nutrient solutions. Details of the experimental layout have been reported (Barnard, 1990) and the publication of the deficiency symptoms themselves is at an advanced stage. The focus of this report is on leaf analysis of leaves taken from plants showing deficiency symptoms.

PROCEDURE

Towards the completion of the investigation mentioned above, leaf samples were taken for analysis to give some indication of the effect of different elimination treatments on nutrient levels. Leaf analysis was carried out according to standard analytical procedures. It should be emphasised that leaves were not sampled at a specific growth or physiological stage, or even position on the shoots, so they should not be seen in terms of comparable orchard situations.

Actual levels obtained are also not given in this paper. Attention is focused on the tendencies concerning the major nutrients in particular.

Comparisons of different rootstocks, although the data is limited, were also made where applicable.

DISCUSSION OF RESULTS

1 The elimination of a particular element generally resulted in a strong decline in the level of that element, as is to be expected.

2. The P-levels were in many cases extremely low. This undoubtedly, has to do with its level of application. It will need attention in future work of this nature.

3. Some well-known interactions were apparent, both competitive and synergistic. Other, less well-known interactions were also apparent.

4. The elimination of S resulted in considerably higher levels of N and P, indicating some competition for uptake of NO_3^- and $H_2PO_4^-$.

5. The elimination of Mg resulted in slightly higher Ca, but considerably higher K, again indicating competition during uptake between these elements. Mg : K interactions are, of course, well-known.

6. The elimination of K resulted in higher Mg, but especially higher Ca. This is not a generally recognised interaction, but it is an extremely interesting one, and one that warrants further investigation. The pertinent question that can be posed in this regard is whether Ca-uptake could be increased by careful management of K. With the observations noted above for Mg, it may be possible to boost Ca uptake by keeping Ca high, Mg reasonable and K low.

   The interactions between these elements are obviously important and have received considerable attention in plant nutrition generally and avocados in particular (Koen & Langenegger, 1980; 1981; Du Plessis & Koen, 1987; Partridge, 1989).

7. The elimination of N and of Ca, in their turn, gave extremely interesting results. Without N, the levels of N, P, K, Mg and especially Ca were low. On the other hand, those of Mn and Zn were very high. The latter is a specific observation in this rather special system, but it is nevertheless symptomatic of what happens in practice, *as* will be discussed later.

Without Ca, Ca levels were extremely low. Interestingly enough, it appeared that Duke 7 was more efficient in Ca uptake than either G6 or G755.

Together with low Ca, N was also low, although K tended to be higher. There was little effect on Mg. As with minus N, both Mn and Zn were very high.

This similarity in nutrient pattern obtained with the elimination of Ca and N is extremely interesting, and in line with results obtained in other work.

In a study on acid soil infertility with wheat (Barnard & Fölscher, 1980) a strong interaction between N, Ca and Mo nutrition was found. It is postulated that, over and above the well-known requirement of Mo in nitrate reduction, it was also involved in NO_3-uptake. There was also a definite connection between NO_3-N and Ca-uptake and nutrition. If the latter is inadequate, it appears that metals present in the system (Mn and

Zn in this study; Fe, Mn and Al under acidified soil conditions) tend to accumulate at the expense of Ca, causing serious nutrient imbalances.

On studying the leaf analyses from this controlled sand culture study, it was interesting to note the very similar results.

Molybdenum was not studied here in sufficient detail, and it is primarily a problem of many acid soils.

CONCLUSIONS

From the above it is clear that N and Ca, as of course many other elements, are closely interrelated in basic nutrition. It is interesting to note that this is a general observation, and not specifically for acid conditions.

It serves to emphasise, once again, the extreme importance of Ca in the nutrition of plants, the avocado is particular, and underlines the importance of continued research on this aspect.

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