SOME FACTORS AFFECTING MAGNESIUM UPTAKE BY CITRUS LEAVES

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A B S T R A C T

Pineapple sweet orange seedlings and rooted leaf bud cuttings of Meyer lemons were used to investigate the effects of some of the factors affecting magnesium uptake by leaves. Magnesium was determined by thiazole yellow method of Drosdoff and Nearpass (1948) and uptake was usually measured 24 hours after spray treatment.

It was shown that the addition of wetting agents to magnesium nitrate sprays significantly increased the uptake of magnesium by leaves. The nonionic wetter (Terric GN9) at the very low (0.01% a.i.) and high (0.08 - 0.1% a.i.) concentrations did not affect magnesium uptake, whereas at intermediate concentrations, magnesium uptake was increased.

Use of the humectant glycerine at 1 or 2 percent significantly increased the uptake of magnesium by leaves, compared with sprays to which no glycerine was added, but had no beneficial effect over sprays which contained a nonionic wetter (Terric GN9).

Magnesium uptake by leaves grown in 100% relative humidity for two weeks was greater than the uptake by leaves grown in average relative humidity of 71%

Both morning and the evening sprays resulted in greater uptake of magnesium by leaves, compared with afternoon sprays.

A significant increase in leaf magnesium concentration occurred after 2 hours of a magnesium nitrate spray application. Leaf magnesium concentration rose steeply for 24 hours after spraying, thereafter remaining constant. (Because it was not possible to measure the degree of magnesium transport out of the leaf, it is not clear whether magnesium uptake, in fact, stopped after 24 hours).

Of the three magnesium salts used, magnesium nitrate and magnesium chloride sprays resulted in greater magnesium uptake by leaves, compared with magnesium sulphate sprays.

Uptake varied with the concentration of magnesium in the leaves. The lower the concentration of magnesium in the leaves, the less the uptake of magnesium by leaves, and the higher the concentration of magnesium, the higher the uptake of magnesium.

Leaf nitrogen also affected uptake of magnesium by leaves. High leaf nitrogen (2.92% of dry weight) resulted in greater uptake of magnesium than the low leaf nitrogen (2.08% of dry weight). The average increase in the concentration of magnesium in the leaves of low nitrogen plants was 0.09% of dry weight, while in leaves of high nitrogen plants the increase was 0.19%.

Thus the increase in the % leaf concentration of magnesium in the high nitrogen plants was double that of the low nitrogen plants. This may be a direct effect of the low leaf nitrogen or an indirect one due to the induced low leaf magnesium in those plants.

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CHAPTER 1

1. INTRODUCTION

Nutrient sprays, these days, are becoming increasingly important to supplement the mineral requirements of the crops to increase crop production.

Nutrient sprays may be important in two directions.

(i) Where soil application of fertilizers is not responsive or very slow.

(ii) To prevent the development of a deficiency symptom very soon before the trouble is expected or immediately it has appeared.

But the responses of nutrient sprays are influenced by environmental factors (both physical and chemical) and plant factors. Magnesium absorption is not an exception to these factors. Leaves of some plant species do not show responses to magnesium salt sprays, while others do. Soil application of magnesium salts on the other hand, has been slow in action or has not been effective or partially effective. Foliage application of magnesium salts appears to be superior to soil application in increasing the concentration of magnesium in the leaves and in reducing deficiency syptoms. But the responses are not consistent.

The present study, therefore, was undertaken to determine the degree to which a number of likely factors might

affect the magnesium absorption by citrus leaves. The literature review, description of the methods and the discussion of the results have been presented with the aim of providing as much background information as possible in order to facilitate further detailed studies of magnesium absorption. For this reason, the literature review has been made more extensive than otherwise would have been required. The discussion of the results includes some hypotheses and speculations which lack evidence to support them, but they may be of value for future work.