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SOME FACTORS AFFECTING MAGNESIUM  
UPTAKE BY CITRUS LEAVES

A thesis presented in partial fulfilment of  
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by  
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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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TABLE OF CONTENTS

Page

CHAPTER 1

1. INTRODUCTION 1

CHAPTER 2

2. FOLIAR APPLICATION OF NUTRIENTS 3

CHAPTER 3

3. LITERATURE REVIEW 7

- 3.1. Pathways of penetration of nutrients, herbicides and other substances into the leaf. 7
- 3.1.1. Entry through stomata 7
- 3.1.2. Structure of the cuticle 8
- 3.1.2.1. Physical nature of the plant cuticle 8
- 3.1.2.2. Chemical nature of the plant cuticle 12
- 3.1.2.3. The role of the cuticle 15
- 3.1.3. Structure and nature of the cell wall 16
- 3.1.4. Structure of the plasma-membrane 21
- 3.1.5. Mechanisms of foliar penetration 22
- 3.1.5.1. Mechanisms of penetration in the cuticle 22
- 3.1.5.2. Mechanisms of penetration in the cell wall 26
- 3.1.5.3. Mechanisms of penetration in the plasma-membrane 26

	<u>Page</u>
3.2. <u>Factors affecting penetration and movement</u>	30
3.2.1. <u>Plant factors</u>	30
3.2.1.1. Physio-chemical nature of the plant cuticle	30
3.2.1.2. Age of the leaf	32
3.2.1.3. Leaf surfaces and morphology	32
3.2.1.4. Mineral status of the leaf	33
3.2.2. <u>External factors</u>	34
3.2.2.1. Light	34
3.2.2.2. Temperature	35
3.2.2.3. Humidity	36
3.2.2.4. pH of the spray solu- tions	37
3.2.2.5. Surfactants	39
3.2.2.6. Humectants	41
3.2.2.7. Solute characteristics	43
3.3. <u>The citrus leaf</u>	44
3.4. <u>Uptake of magnesium by leaves of citrus and other crops</u>	49
3.4.1. <u>Glasshouse and laboratory studies</u>	49
3.4.1.1. The effect of different magnesium salts on magnesium absorption	49
3.4.1.2. The effect of differ- ent spreaders and hygroscopic agents on magnesium absorption	51



	<u>Page</u>	
3.4.1.3.	The rate of magnesium absorption . . . . .	53
3.4.1.4.	The effect of spraying at different hours of the day . . . . .	55
3.4.1.5.	The effect of nitrogen level . . . . .	57
3.4.1.6.	The effect of magnesium level . . . . .	60
3.4.2.	<u>Plant responses to field conditions</u> . . . . .	62
3.4.2.1.	Responses to citrus . . . . .	62
3.4.2.2.	Miscellaneous responses . . . . .	66
3.4.2.3.	The effect of nitrogen level . . . . .	69
3.4.2.4.	The effect of magnesium level . . . . .	69
3.5.	<u>Magnesium mobility studies</u> . . . . .	71
3.6.	<u>Literature review Summary</u> . . . . .	74

CHAPTER 4

4.	<u>MATERIALS AND METHODS</u>	76
4.1.	<u>The experiments</u>	76
4.2.	<u>Composition and preparation of concentrated nutrient stock solution for experiments</u>	77
4.3.	<u>Techniques used in growing pineapple sweet orange seedlings</u>	78
4.3.1.	Sowing of seeds	78
4.3.2.	Planting out	78
4.3.3.	Feeding the plants	79
4.4.	<u>Growing of Meyer lemon leaf bud cuttings</u>	79
4.5.	<u>Experimental methods</u>	80
4.5.1.	Spraying techniques	80
4.5.2.	Experimental design	81
4.6.	<u>Leaf samples and analysis</u>	88
4.6.1.	Sampling techniques	88
4.6.2.	Cleaning	89
4.6.3.	Ashing	91
4.6.4.	Techniques of leaf magnesium analysis	91
4.7.	<u>Statistics</u>	92

5.	<u>RESULTS</u>	93
5.1.	<u>Experiment I</u> The effect of different wetting agents on the uptake of magnesium by leaves.	93
5.2.	<u>Experiment II</u> The effect of different concentrations of a nonionic wetter (Terric GN9) on the uptake of magnesium by leaves.	96
5.3.	<u>Experiment III</u> The effect of different concentrations of glycerine on the uptake of magnesium by leaves.	101
5.4.	<u>Experiment IV</u> The effect of humidity on the uptake of magnesium by leaves.	103
5.5.	<u>Experiment V</u> The effect of spraying at different times of the day on the uptake of magnesium by leaves.	105
5.6.	<u>Experiment VI</u> The rate of uptake of magnesium by leaves.	107
5.7.	<u>Experiment VII</u> The effect of different magnesium salts on the uptake of magnesium by leaves.	110
5.8.	<u>Experiment VIII</u> The effect of leaf magnesium level on the uptake of magnesium by leaves	112

5.9. Experiment IX

The effect of leaf nitrogen level on the  
uptake of magnesium by leaves.

115

CHAPTER 6

6. DISCUSSION OF THE DATA

117

CHAPTER 7

7. CONCLUSION

131

APPENDICES

BIBLIOGRAPHY

LIST OF TABLES

<u>TABLE</u>		<u>PAGE</u>
1	Stomatal pore sizes of citrus leaves (Turrell, 1947).	48
2	The effect of different magnesium salts on magnesium absorption (Fisher and Walker, 1955).	50
3	The effect of three spreaders on magnesium absorption from a 5 per cent $MgSO_4 \cdot 7H_2O$ spray application (Fisher and Walker, 1955)	52
4	The effect of glycerine, carbowax and methyl cellosolve on magnesium absorption from a 5 per cent $MgSO_4 \cdot 7H_2O$ spray application (Fisher and Walker, (1955)	53
5	The rate of magnesium absorption over a 12 day period (Fisher and Walker, 1955)	55
6	The effect of $MgSO_4 \cdot 7H_2O$ solution applied at different hours during the day (Oland and Opland, 1956).	57
7	Mean concentration of elements (% dry weight) in leaves (Ford, 1967).	62
8	Effects of magnesium treatments on the concentration of magnesium in the leaves of Valencia orange (Embleton and Jones, 1959)	65
9	Magnesium concentration in grape leaves as affected by spray and soil application of $MgSO_4 \cdot 7H_2O$ (Scott and Scott, 1951)	68

- 10 Nitrogen and mineral content of McIntosh apple leaves from trees receiving three level of nitrogen fertilization and three Epsom salts spray treatments in factorial combination (Forshey, 1959). 70
- 11 Mean concentration of elements (% dry weight) in leaves, stems and roots (Ford, 1966). 73
- 12 The effect of different wetting agents on the uptake of magnesium by leaves from a 2.5 per cent  $Mg(NO_3)_2 \cdot 6H_2O$  spray application. 94
- 12a The effect of different wetting agents used on the uptake of magnesium by leaves from a 2.5 per cent  $Mg(NO_3)_2 \cdot 6H_2O$  spray application, at 80% wettability of the leaf area. 95
- 13 The effect of different concentrations of a nonionic wetter (Terric GN9) on the uptake of magnesium by leaves from a 2.5 per cent  $Mg(NO_3)_2 \cdot 6H_2O$  spray application. 97
- 13a The visual assessment of the wetting of the upper surface of the citrus leaves by Terric GN9. 99
- 14 The effect of different concentrations of glycerine on the uptake of magnesium by leaves from a 2.5 per cent  $Mg(NO_3)_2 \cdot 6H_2O$  spray application. 102
- 15 The effect of humidity on the uptake of magnesium by leaves from a 2.5 per cent  $Mg(NO_3)_2 \cdot 6H_2O$  spray application. 104

TABLEPAGE

16	The effect of spraying at different times of the day on the uptake of magnesium by leaves from a 2.5 percent $Mg(NO_3)_2 \cdot 6H_2O$ spray application.	106
17	The rate of uptake of magnesium by leaves from a 2.5 percent $Mg(NO_3)_2 \cdot 6H_2O$ spray application.	108
18	The effect of different magnesium salts on the uptake of magnesium by leaves.	111
19	The effect of leaf magnesium level on the uptake of magnesium by leaves from a 2.5 percent $Mg(NO_3)_2 \cdot 6H_2O$ spray application.	113
20	The effect of leaf nitrogen level on the uptake of magnesium by leaves from a 2.5 percent $Mg(NO_3)_2 \cdot 6H_2O$ spray application.	116

LIST OF FIGURES AND PLATES

<u>FIGURE</u>		<u>Page</u>
1	Hypothetical structure of the functional aspects of the plant cuticle (Foy et al; 1967).	10
1a	A diagram showing the substances that may compose the cell wall (Miller, 1938).	18
2	The level of P <sup>32</sup> activity found in the petiole following a 4-hour period of translocation from the blade as a function of pH of the applied solution (Swanson and Whitney, 1953)	38
3	The rate of absorption of nitrogen, phosphorus and magnesium from sprays applied to the lower surface of McIntosh apple leaves (Fisher and Walker, 1955).	54
4	Standard wetting chart for citrus leaves	83
5	The standard curve of wettability of the upper surface of the citrus leaves for different wetting agents.	84
6	The effect of different concentrations of a nonionic wetter (Terric GN9) on the uptake of magnesium by leaves.	98
6a	The effect of different concentrations of a nonionic wetter (Terric GN9) on the wetting of the upper surface of the citrus leaves.	100
7	The rate of uptake of magnesium by leaves.	109
8	The effect of leaf magnesium level on the uptake of magnesium by leaves.	114
 <u>PLATE</u>		
1	Pineapple sweet orange seedling supplied with high and low level of nitrogen.	38 (facing page)



LIST OF APPENDICES

<u>APPENDIX</u>	<u>PAGE</u>
1	Composition of concentrated nutrient stock solution for experiments I, II, III, V, VI, VII and VIII. 134
2	Composition of concentrated nutrient stock solution for experiment IX. 135
3	Quantitative micro determination of magnesium in plant tissue and soil extracts. A rapid colorimetric method. 136
4	Nitrogen analysis. 139
5	Analysis of variance of the effect of different wetting agents on the uptake of magnesium by leaves. 142
6	Analysis of variance of the effect of different wetting agents used on the uptake of magnesium by leaves, at 80% wettability of the leaf area. 142
7	Analysis of variance of the effect of different concentrations of a nonionic (Terric GN9) on the uptake of magnesium by leaves. 143
7a	Analysis of variance of the visual assessment of the wetting of the upper surface of the citrus leaves by Terric GN9. 143
8	Analysis of variance of the effect of different concentrations of glycerine on the uptake of magnesium by leaves. 144

APPENDIXPAGE

9	Analysis of variance of the effect of humidity on the uptake of magnesium by leaves.	145
10	Analysis of variance of the effect of spraying at different times of the day.	146
11	Analysis of variance of the rate of uptake of magnesium by leaves.	146
12	Analysis of variance of the effect of different magnesium salts on the uptake of magnesium by leaves.	147
13	Analysis of variance of the effect of leaf magnesium level on the uptake of magnesium by leaves.	148
14	Analysis of variance of the effect of leaf nitrogen level on the uptake of magnesium by leaves.	149

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 symptoms. 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.