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A STUDY OF THE POTASSIUM NUTRITION OF THE LEMON TREE

(Citrus limon Linn)

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in Plant Science

by

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ABSTRACT

Villafranca lemon trees were grown for two years in containers and provided with a standard nutrient feed. Potassium was supplied differentially, usually as foliar sprays of potassium chloride. The magnitude of the effect of varying numbers of sprays on leaf potassium was determined, the main response being the short-term nature of this effect. Similarly the considerable benefits of a limited number of manganese or zinc sprays on the leaf concentration of these elements was demonstrated.

Determinations of the levels of the main minerals in the leaves showed the seasonal variations of each one, and led to a recommendation on sampling time for the determination of each element. It was also possible to demonstrate possible mineral element interactions, the most interesting being the lack of a potassium - magnesium antagonism. It was shown calcium levels fell with increased leaf-potassium to maintain the cation balance. But in another situation the range in plant nutrient status was such as not to maintain an equivalence in the cation/anion ratio or the total leaf cation content. In this latter instance this did not result in a predicted effect on leaf organic acid content.

The possible dangers of excessive chloride accumulation were considered; and the problem of leaf chlorosis where potassium is in low supply. A recommendation was made on the use of nutrient solution feeds for young citrus trees, especially with respect to trace element supply. Various effects of potassium supply on fruit quality were also demonstrated.

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CHAPTER I

INTRODUCTION

Citrus is an important crop in many countries of the World, and in the literature there are numerous references to the culture and physiology of these fruits. In the field of mineral nutrition, a considerable body of information exists on this crop. Nutrition is a complex field, and with the effects of a given mineral supply depending on so many other factors it is not surprising that each important citrus growing area has its own research projects on mineral nutrition.

However, few detailed reports exist concerning the nutrition of citrus in New Zealand. Various reasearch projects are currently under way, mainly on a field scale, and in many cases detailed results will not be available for some time. The N.Z. - produced citrus fruits are mainly for local consumption, but there is a place for continued expansion in the industry. There is also a growing export trade in certain citrus products, of a processed nature. For such outlets fruit composition studies are particularly important. The citrus industry is then an important one, with good prospects for continued development in certain fields. Therefore it was considered useful to obtain some quantitative data on citrus nutrition, and in the present study selected aspects have been studied.

Of the many types of citrus, sweet oranges are of greatest commercial importance, and so it is natural that they will be the most studied of the citrus fruits.

The great bulk of citrus nutrition trials, involving such aspects as plant uptake, fruit quality effects, and leaf analysis, have been concerned with the sweet oranges. The opportunity was therefore taken to study mineral nutrition in the lemon.

This work was in large part a study in leaf analysis of this crop - mainly mineral elements, but also certain other constituents. In modern crop production we find a special interest in leaf absorption of the various foliar - applied substances used, and uptake of foliar nutrient sprays is one aspect of this, and also was studied. For many years it has been considered by many authors there is no known specific role of potassium in plants, although many reports detail its considerable influence in citrus production. We often associate potassium with crop quality, and with the requirement for increasingly high quality this makes it a useful element to study in the hope also, of providing more information on its physiological role. An attempt was made also to obtain some information of this type.

With reference to the mineral elements, the following abbreviations are used:

N	- nitrogen	Fe	- iron	Al	- aluminium
P	- phosphorous	Mn	- manganese	B	- boron
K	- potassium	Zn	- zinc	Na	- sodium
Ca	calcium	Cu	- copper	Cl	- chlorine
Mg	magnesium				