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EVALUATION OF CRITICAL LEVELS OF ZINC
IN SOME SOILS OF EGYPT IN RELATION TO
PLANT RESPONSE TO ZINC FERTILIZATION

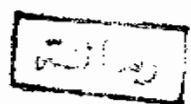
BY
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A thesis submitted in partial fulfillment of
the requirements for the degree of

MASTER OF SCIENCE

in

Agriculture (Soil Science)



26/12/7

Soils Department

FACULTY OF AGRICULTURE

AIN SHAMS UNIVERSITY



1988

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ACKNOWLEDGEMENT

The author wishes to express his deep gratitude to Dr. A.I. Metwally and Dr. A.S. Ismail, Professors of Soils Science, Faculty of Agriculture, Ain Shams University for suggesting the problem, Supervision, contentious help and introducing all facilities needed through out the whole investigation and during writing the manuscript.

Thanks were also extended to all members of Soils and Water Research Institute, Department of Plant Nutrition, Micronutrient Research Unit., Ministry of Agriculture for their sincere help in providing all needed facilities .

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1- INTRODUCTION

In Egypt, increasing crop yields have resulted in more attention being given to the need for the micronutrients. As yields have risen, the incidence of micronutrient deficiencies has become more frequent. Higher yields also mean greater removal of micronutrients from the soil. This factor, coupled with less addition of these elements in the more concentrated fertilizers in use today, has caused concern about the depletion of micronutrients in the soil. Zinc deficiency in agricultural crops is one of the most common micronutrient deficiencies. This may be due to the interactions that occur between Zn and other macro- and/ or micronutrients. Also, Zn deficiency in some soils because of too little total Zn being present in their parent materials and/ or unfavourable soil reactions.

Using chemical extractants give information on whether a soil is deficient in a nutrient or not. The level of the extractable nutrient in soil that separates these two groups of soils is called " the critical level " of that nutrient. The nutrient concentration, in the plant tissue associated with a 10 % growth reduction from maximum growth due to a deficiency, is called the critical level for plant . Naturally, this level differs from soil to soil and from one plant species to another. This information is important for

determining soils that can supply adequate Zn for optimum crop production grown in different soils. Therefore, the aim of the current work was to evaluate, chemically and biologically, the critical level of Zn in some alluvial and calcareous soils as well as its critical concentration in corn and alfalfa plant tissues .

2. REVIEW OF LITERATURE

2.1. Estimation of critical Zn level :

Critical level for Zn have been determined for different plant species grown on different soil types or nutrient solution under greenhouse conditions. Rosell and Ulrich (1964) studied critical Zn concentration and leaf minerals of sugar beet plants. The plants were transplanted from Zn-free conditions to a series of 10 nutrient solutions provided stepwise with 0 to 200 ug of Zn per litre of solution. The plants were harvested and the tops were separated into immature, mature, and old leaves, and each was further subdivided into petioles and blades. They found that tissues most suitable for assessing the Zn status of sugar beets are the blades from mature and old leaves. However, because of less contamination under field conditions, the blades of recently matured leaves, rather than those of old leaves, are recommended for Zn analysis. They added that the critical Zn concentration is approximately 8 to 10 ppm for oven-dried mature blade. However, the Zn concentrations in the petioles vary in a unique manner and do not provide a well correlated yield-concentration curve. Also, visual symptoms of Zn deficiency are unique and can be used as a preliminary guide in assessing the Zn status of sugar beet plants. Also, Dhki (1977) studied critical levels of Zn relating to concentration and

growth of soybean plants grown in the greenhouse for 41 days in modified Hoagland solution with total Zn rates of 0, 5, 10, 20, 50, 100, 200, 300, 400, 500, 700, and 1000 μg Zn/liter, leaf blades were sampled at harvest. He found that the critical nutrient deficient levels for Zn were 15, 15, and 14 $\mu\text{g}/\text{g}$ dry weight in blades 1 (young developing leaf), 2, and 3 (recently matured leaf), respectively. He added that the recently matured leaf (blade 3) is suggested as the tissue to sample, whereas the blade 1 had the sharpest transition zone. Also, he reported that Zn deficiency reduced top and root dry weights, plant height, flower number, and branching. Ohki and Ulrich (1977) described the concept of the critical nutrient level in relation to plant growth. They reported that critical deficiency level (CDL) is the nutrient concentration in the tissue associated with a 10 % growth reduction from maximum growth due to a deficiency, while the critical toxicity level (CTL) is the nutrient concentration in the tissue associated with a 10 % reduction in growth from the maximum due to toxicity. They added that critical Zn deficiency and toxicity levels in cotton (blade 3) were determined as 11 and 200 $\mu\text{g}/\text{g}$, respectively. Later, Ohki (1984) studied Zn nutrition related to critical deficiency and toxicity levels for sorghum which was grown in nutrient solutions containing 14 Zn treatments ranging from 0.0 to 91.78 nmol L^{-1} as ZnSO_4 under greenhouse conditions and individual