PHYSIOLOGICAL STUDIES ON ADAPTIVE MECHANISM RELATED TO SALT TOLERANCE IN SOME VEGETABLE CROPS

By

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

DOCTOR OF PHILOSOPHY
in
Agricultural Science
(Vegetable Crops)

Department of Horticulture
Faculty of Agriculture
Ain Shams University

1992

APPROVAL SHEET

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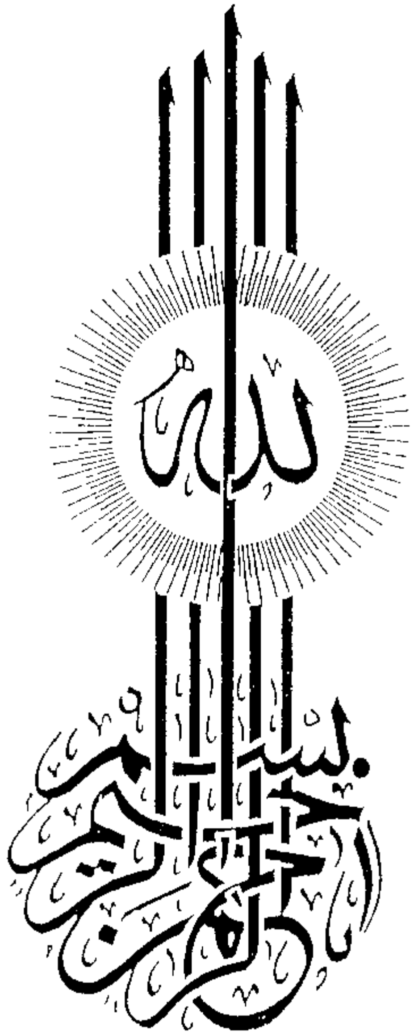
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ABSTRACT

Two experiments were carried out during two successive seasons 1989 and 1990, in the glasshouse of protected cultivation project, Ministry of Agriculture, Dokki, Giza, to investigate the effect of different levels of salinity, Ethrel and cobalt and their interaction on two crops, tomato (*Lycopersicon esculentum* Mill. c.v. Beto 86) and cucumber (*Cucumis sativus* L. c.v. Beta Alpha). Different concentrations of Rashidi salt and different concentration of Ethrel were used with or without cobalt ion. The aim of using cobalt ion was to study the possibility of reducing physiological process accompany salinity, hence increasing plants salt tolerance by external application. The results showed that cobalt reduce the injuring effect of both salt and Ethrel on plant growth. There was a positive interaction between cobalt ion and salinity (Rashidi salt). It can be seen that sodium in leaves of salinized tomato and cucumber plants increased due to salinity and decreased with cobalt.

It could be concluded that, the most beneficial effect of cobalt ion on growth of tomato and cucumber irrigated with saline water, is reducing the physiological processes and morphological changes accompany salinity.

Results were discussed in relation to the role of ethylene in the different crops used.

ACKNOWLEDGMENT

I would be honored to convey my deepest thanks and true gratitude to Prof. Dr. **MOHAMED ABDEL-MAKSOUD**, Professor of Vegetable Crops, Ain Shams University, for his true endeavors, advice, as well as his continuos and valuable guidance in this thesis.

My sincere gratitude to the Dr. **A.S. EL-BELTAGY**, Professor of Vegetable Crops, Department of Horticulture, Ain Shams University, and Prof. Dr. **M.S. EL-BELTAGY**, Professor of Vegetable Crops, Botany Dept., National Research Center, for planning, Supervising, and constructive guidance.

Great thanks are expressed as well to Dr. **AYMAN ABOU-HADID** Associate Professor of Vegetable Crops, Department of Horticulture, Ain Shams Univ. for his continuous advice and support throughout my thesis.

I also seize this great opportunity to express my special thanks to Dr. **S.O. EL-ABD**, Associate Professor of Vegetable Crops, Botany Dept., National Research Center on his serious assistance throughout my work.

Thanks to **UNDP/FAO**, Protected Cultivation Project, EGY/86/014 for the financial support.

Financially, may great thanks to the Botany Dept. at the National Research Center, for supporting during conducting the research.

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INTRODUCTION

1. INTRODUCTION

The expansion of reclaimed land is increased yearly in Egypt.

One of the major problems in these areas, is finding varieties of crops suitable for the frequent adverse growing conditions of these lands. For this reason it is important to conduct studies on different lines of crops, that can be planted in such areas, and to select the most suitable plants in terms of total production and yield under the conditions prevailing.

The limited supply of irrigation water particularly in the arid and semi-arid regions, is the most important factor for agricultural expansion, it creates a severe problem to plant production. This problem is accompaned by the fact that most of the irrigation water is saline.

It is well recognized that salinity has a detrimental effect on the growth of many plants. This aspect has been studied by many investigators (**Cale** *et al.*, **1977; Garg and Garg, 1980; Petolino and Leone, 1980; Sameni** *et al.*, **1980; Helal and Mengel, 1981**).

One of the most important differences between plants, which are either resistant or sensitive to salt stress, may be in plant hormone status. Retardation of growth may be brought about by either an increase in inhibitors accumulated, and/or a decrease in promotive compounds under stressed conditions, ultimately affecting total plant growth and development (**Ahoroni ,1978 ; Starck and Karwowska, 1978 ; Aloni and Pressman, 1981**). However, little attention has been paid to find out the possible role of plant hormones as to the response of plants to salinity stress.

Salt tolerance has been reported as an adaptation phenomenon. **Strogonove (1962)** refers to biological salt tolerances as the ability of plants to survive under accumulated low concentrations of salt in the dry matter and to complete their life cycle, irrespective of whether such plants are inhibited or not as to growth, development and yield.

In agronomical terms, salt tolerance means that plants can grow well and complete their life cycle and produce satisfactory yields. Hence, studies on the interrelationships between salinity, water stress and ethylene may be valued in extending our knowledge of germination under saline conditions.

Therefore, the goal of this research is to study major physiological and morphological changes that accompany salinization of some vegetable crops.

This may help the plant breeder in early screening for varieties and cultivars capable of resisting salinity.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1. Effect of salinity, Ethrel and cobalt on seed germination :

Plants were thought to be more sensitive to salinity during germination than at later stages of development because germination failures are prevalent in salt-affected soils. Seed germination is a complicated process, involving many individual reactions, interactions and phases. Each component of the germination process is affected by one or more environmental factors, such as temperature, light and water potentials. Seed germination is initiated with passive uptake of water and active water uptake by seed.

The lack of salt tolerance during germination, was reported by **Bernstein and Hayward (1958)** to be similar in several species with the exception of beet which were much less sensitive during germination and early seedling growth.

The mechanisms of resistance appear to be different in seedlings and mature plants (**Levitt, 1972**). The apparent greater sensitivity during germination in the field, was partially attributed to (**Bernstein 1975**) as to the tendency of salts to accumulate near the soil surface because of evaporation, hence increasing the salinity concentration of the residual soil water.