# PHYSIOLOGICAL RESPONSE OF TOMATOES TO SALINITY AND SOME HERBICIDES

BY

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# APPROVAL SHEET

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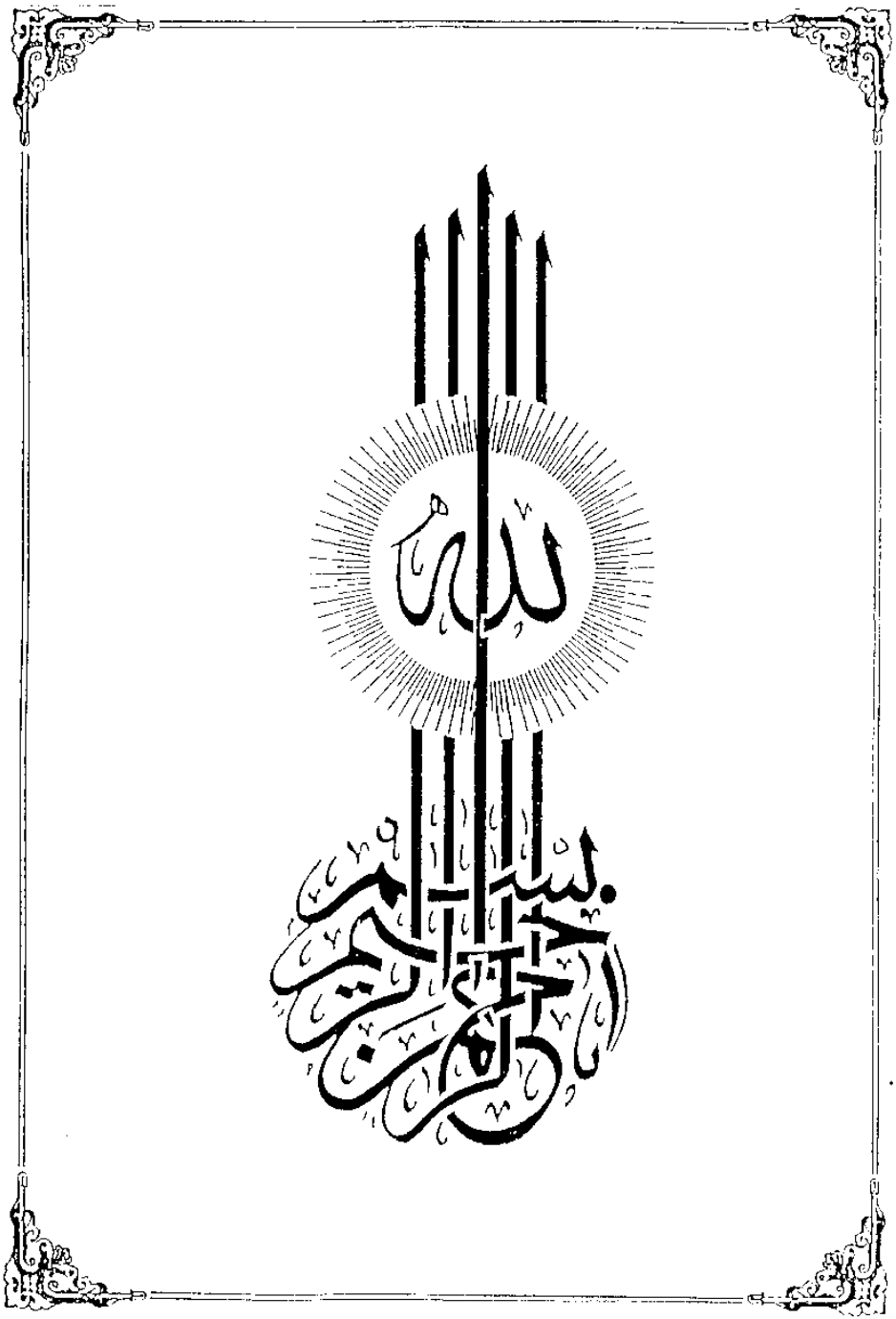


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## ABSTRACT

A set of experiments were carried out at the National Research Center, Dokki, Cairo for the successive seasons of 1990 and 1991, to study the effect of different levels of salinity and some chemical herbicides with using some cultivars of tomatoes on the germination, plant growth, chlorophyll content, mineral content, toxicity and ethylene production. The obtained results could be summarized as follows:

Germination percentage of Edkawy and Peto 86 cultivars were not significantly affected with increasing salinity levels up to 5000 ppm. Salinity level of 7500 ppm increased the number of days required for maximum seed germination by 239.6, 128.0, 140.0, 196.2, 110.1 and 23.3% for Edkawy, Ace, Peto 86, UC 82, Super marmand and Strain B cultivars, respectively compared with their control treatment. Increasing salinity level up to 10000 ppm sharply depressed hypocotyl length of the six tomato cultivars. Ace, UC 82 and Strain B cultivars were the more relatively suffering cultivars. Reduction in their hypocotyl length amounted to 987.0, 97.6 and 98.1%, respectively than their control.

The dry weight of Edkawy tomato seedlings at the second stage (21 day after treating) decreased less than control by 23, 48 and 77% for salinity of 2000, 4000 and 8000 ppm, respectively. Increasing salinity levels of irrigation water to 2000, 4000 and 8000 ppm for one week decreased total chlorophyll of tomato seedlings than control by 5.8, 17.8 and 33.6%, respectively.

Metribuzin (0.5 kg/fed.), diphenamid (4.0 kg/fed.), EPTC (6.0 lit/fed.) and acifluorfen (0.25 lit./fed.) treatments decreased to different extents the lengths of roots and stems, number of leaves and the area of third leaf, fresh and dry weight of total plants and its different parts as well as the chlorophyll content of treated tomato seedlings. Acifluorfen decreased values of these assessments than the control plants by 23, 39% for the area of third leaf, 40, 59% for total dry weight of plant and 25, 42% for total chlorophyll content in 1st and 2nd sample, respectively.

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The highest fresh and dry weights of roots and shoots resulted from the plants irrigated with the highest level of salinity (8000 ppm) and treated with herbicides i.e., metribuzin, diphenamid, EPTC and acifluorfen. Acifluorfen is the most inhibitor herbicides on the growth of tomato seedlings. The treatments of highest values of salinity (8000 ppm) with acifluorfen, metribuzin, EPTC and diphenamid resulted the lowest values of total chlorophyll.

Increasing salinity levels up to 8000 ppm generally increased the $Na^+$, $Mg^{2+}$, P and $Cl^-$ and/or decreased $K^+$ and N uptake in the tissues of tomato seedlings at the different growth stages.

Treating tomato seedlings with herbicides, i.e. metribuzin, diphenamid, EPTC and acifluorfen reduced the $Na^+$, $Ca^{2+}$, $K^+$, $Mg^{2+}$, P and $Cl^-$ contents in different tissues of the plant. On the contrary, the N accumulation increased by herbicides application. Salinity-herbicides interaction had no significant effect on $Mg^{2+}$, P and N content in tissue of both roots and shoots of tomato seedlings. Tomato seedlings treated with acifluorfen under salinity conditions, were suffered from a marked reduction in the mineral content in tissues of their roots, and shoots.

No toxicity symptoms were recorded when AOA was applied without metribuzin, acifluorfen and bifenox.

Applying herbicides induced a great toxicity on the apices and 1st, 2nd leaf of tomato seedlings. AOA with herbicides greatly reduced the toxicity symptoms. The ethylene production increased and the chlorophyll content decreased with herbicides application. Also AOA applying prior the herbicides application, the previous inhibitory effect was decreased greatly.

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# INTRODUCTION

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# INTRODUCTION

In developing countries such as Egypt presses hard to increase the food produced to meet the requirements of the population pressure, one of the important efforts is to develop the lands for long agricultural use. The west north coast of Egypt from Alexandria to Salum as well as Sinia deserts seem to be the most promising areas for this purpose. A great portion of this land is salty, and the growth of economical cultivated plants in such areas is limited. In some parts, farmers have to irrigate plants from wells. The water of these wells contains appreciable concentration of salts ranging from 2000 to 8000 ppm. Soils are frequently more less salinized and their productive capacity is very low. Reclamation of lands under such conditions is the introduction of salt tolerant plants or to increase the ability of plant to withstand the saline condition. This could be attributed through the use of some chemical components.

Generally, salinity causes a disturbance in plant metabolism in order to counteract or minimize the deleterious effects which develop. One of these is the treatment of some with herbicides. Nowadays, there are a shortage in farm labour and therefore, chemical

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control of weeds should be put into consideration. Elimination of weeds by herbicides may cause a deleterious effect on growth and chemical composition of tomato plants.

In recent years the new technical of herbicide safeners has been used increasingly in chemical weed control field. Herbicide safeners are chemical substances that selectively protect crop plants against herbicide injury (**Hatzios, 1989**).

Special consideration was also given to evaluate the uses of α-aminooxy acetic acid (AOA) as a safeners substance in pot experiment to protect tomato seedlings against the toxicity symptoms of metribuzin, acifluorfen and bifenox herbicides.

The aim of this study is to investigate the response of different tomato cultivars to salinity and herbicides, as well as to counteract or minimize the deleterious effect of herbicides by using AOA as a safeners substance.

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# REVIEW OF LITERATURE

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# REVIEW OF LITERATURE

In order to fulfill the objective of this study, the literature is reviewed under the following two main categories:

A) Effect of salinity.

B) Effect of herbicides.

Sub divisions of each category are concerned with results obtained on germination, growth and mineral and chlorophyll contents of tomato plants.

## A) Effect of salinity on:

### 1. Germination of tomato seeds:

In selecting crops for saline soils, particular attention should be given to the salt tolerance of the crop during germination and seedling growth because poor crops frequently result from failure to obtain a satisfactory stand. This problem is complicated by the fact that some crop species which are very salt tolerant during later stages of growth may be quite sensitive to salinity during germination (**Richard, 1954**).

**Taha (1971)** found that the addition of sodium chloride to seven tomato varieties depressed the germination percentage along with the elongation of the period required for seed to germinate. No

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