

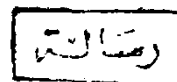
STUDIES ON THE EFFECT OF SALINITY ON SOME FRUIT PLANTS
(APPLE AND OLIVE)

BY

RAWHEYA BEDIER MOHAMED ATTIA

A thesis subbmitted in partial fulfiment
OF

THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY



IN

635.6
R. B

AGRICULTURAL SCIENCE
(POMOLOGY)

48128

DEPARTMENT OF HORTICULTURE
FACULTY OF AGRICULTURE
AIN SHAMS UNIVERSITY



1994

STUDIES ON THE EFFECT OF SALINITY ON SOME FRUIT PLANTS
(APPLE AND OLIVE)

BY

RAWHEYA BEDIER MOHAMED ATTIA

A thesis submitted in partial fulfillment
OF

THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

IN

AGRICULTURAL SCIENCE
(POMOLOGY)

DEPARTMENT OF HORTICULTURE
FACULTY OF AGRICULTURE
AIN SHAMS UNIVERSITY

1994



EFFECT OF SALINITY ON SOME FRUIT PLANTS

(APPLE AND OLIVE)

BY

RAWHEYA BEDIER MOHAMED ATTIA

B.Sc. Agric. (Horticulture), Ain Shams Univ., 1980.

M.Sc. Agric. (Fruit crops), Ain Shams Univ., 1986.

Under the Supervision of

Prof. Dr. Shawky E. Maximos.

Prof. of pomology, Fac. Agric. Ain Shams Univ.

Prof. Dr. Zeinab, H. Behairy.

Prof. of Pomology. Fac. Agric. Ain Shams Univ.

ABSTRACT

The present investigation was undertaken during the seasons 1989, 1990 and 1991 to study the durability of MM106 apple rootstock, Anna scion budded on MM106 and Agezi olive transplants to various irrigation salinity levels. The data reveal that the apple rootstock almost tolerated salt level up to 2000 ppm while the Agezi olive transplant tolerated almost salt concentration up to 4000 ppm. The Anna Scion budded on MM106 apple rootstock plants was the lowest in salt tolerance, due to the bud union flanks injury caused by increasing salts' concentrations.

Key words: Apple, Olive, Salinity, Vegetative growth, leaf and root mineral contents, anatomical structure, Salt tolerance.

APPROVAL SHEET

STUDIES ON THE EFFECT OF SALINITY ON SOME FRUIT
PLANTS. (APPLE AND OLIVE)

BY

RAWHEYA BEDIER MOHAMED ATTIA

B. Sc. Agric (Horticulture), Ain Shams Univ., 1980

M. Sc. Agric (Fruit crops), Ain Shams Univ., 1986

This thesis for Ph.D. degree has been approved by:

Prof. Dr. Essam A. Hasaballa .. *Essam A. Hasaballa*

Prof. of pomology and Chairman of Dept. of Horticulture
Fac. Agric.. Zagazig Univ.

Prof. Dr. Mohamed Abou-Rawash Badr ... *M. Abou-Rawash*

Prof. of pomology. Fac. of Agric.. Ain Shams Univ.

Prof. Dr. Shawky E. Maximos ... *S. E. Maximos*

Prof. of pomology. Fac. of Agric. Ain Shams Univ.

(Supervisor)

Date of examination 8 / 2 / 1994

ACKNOWLEDGEMENT

TO THE MEMORY
OF
LATE PROF. DR. AHMED LABIB EL-TOMI.

Professor of Horticulture, Faculty of Agriculture, Ain-Shams University who was a genius man in the horticulture field. I dedicate this work to the spirit of the unforgettable and alive man in our heart to my late Prof. Dr. Ahmed Labib El-Tomi for his supervision, valuable advices, fruitful encouragement, sincere help and unfailing effects during the course of this investigation.

ACKNOWLEDGEMENT

I wish to express my most sincere gratitude to Prof. Dr. Shawky E. Maximos, Prof. of pomology, Faculty of Agriculture, Ain-Shams University for suggesting the current study, his supervision, continuous guidance, kind support, revision of the manuscript, fruitful encouragement, and valuable advices.

Deep thanks are offered to Prof. Dr. Zeinab, H. Behairy, Prof. of pomology, Faculty of Agriculture, Ain-Shams University for her supervision, sincere help, useful criticism during the whole investigation and preparing this manuscript.

I would like to express my great thanks to Prof. Dr. M.A. Salama, Prof. of Pomology, Faculty of Agriculture, Cairo University, El-Fayoum, for his advice, kind help for carrying out the anatomical studies.

My sincere gratitude to all for their kind help during the research.

I also feel that I must extend my deep gratitude for the greatest parent in my life, my father, my mother and my daughter.

CONTENTS

	Page
1- INTRODUCTION	1
2- REVIEW OF LITERATURE	3
3- MATERIALS AND METHODS	17
4- RESULTS	28
4-1- Part - 1 - APPLE TRANSPLANTS:-	28
4-1-1- Malling Merton 106 apple rootstocks:-	28
4-1-1-1- Plants' Salt Tolerance And Injury:-.....	28
4-1-1-2- Organic and Inorganic Endogenous constituents as affected by salinity:-	40
4-1-2 Anna scion budded on MM106 rootstocks:-	61
4-1-2-1- Plants' Salt Tolerance and Injury:-	61
4-1-2-2- Organic and Inorganic Endogenous constituents as affected by salinity:-	70
4-1-2-3- Anatomical structure as affected by salinity:..	79
4-2- Part - 2 - OLIVE TRANSPLANTS:-	82
4-2-1- Plants' Salt Tolerance and Injury:-	82
4-2-2- Organic and Inorganic Endogenous constituents as affected by salinity	94
5-DISCUSSION	114
6- SUMMARY AND CONCLUSIONS	120
7-REFERENCES	126
ARABIC SUMMARY	

LIST OF TABLES

	Page
1- The tap water analysis	18
2- Macronutrient composition of Long Ashton standard complete nutrient solution based on ammonium sulphate at me. equiv. /l. and details of stock solutions used for the preparation of 100 L	20
3- Composition of Hoagland Arnon solution	20
4- Periods for salt injury appearance in Malling Merton 106 apple rootstock plants	29
5- Number of salt injured Malling Merton 106 apple rootstock plants at the end of each season	30
6- Growth of Malling Merton 106 apple rootstock plants as affected by increasing salinity	32
7- Growth of Malling Merton 106 apple rootstock plants as affected by increasing salinity	33
8- Fresh weight of Malling Merton 106 apple rootstock plants as affected by increasing salinity	34
9- Fresh weight of Malling Merton 106 apple rootstock plants as affected by increasing salinity	35
10- Dry weight of Malling Merton 106 apple rootstock plants as affected by increasing salinity	36
11- Dry weight of Malling Merton 106 apple rootstock plants as affected by increasing salinity	37
12- Stems' sugars' fractions of Malling Merton 106 apple rootstock plants as affected by increasing salinity..	41

	page
13- Stems's sugars' fractions of Malling Merton 106 apple rootstock plants as affected by increasing salinity..	42
14- Amino acids content in the leaves of Malling Merton 106 apple rootstock plants as affected by increasing salinity	43
15- Leaves total chlorophylls' content in Malling Merton 106 apple rootstock plants as affected by increasing salinity	46
16- Leaves total chlorophylls' content in Malling Merton 106 apple rootstock plants as affected by increasing salinity	47
17- Leaves' N, P and K percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	49
18- Leaves' N, P and K percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	50
19- Leaves' Ca, Mg, Na and cl percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	52
20- Leaves' Ca, Mg, Na and cl percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	53
21- Roots' N, P and K percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	56

	Page
22- Roots' N, P and K percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	57
23- Roots' Ca, Mg, Na and Cl percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	58
24- Roots' Ca, Mg, Na and cl percentages of Malling Merton 106 apple rootstock plants as affected by increasing salinity	59
25- Number of injured Anna scion budded on MM106 apple rootstock transplants at the end of each season.....	62
26- Periods for salt injury appearance in Anna scion budded on MM106 apple rootstock transplants	63
27- Growth of Anna scion budded on MM106 apple rootstock transplants as affected by increasing salinity.....	65
28- Fresh weight of Anna scion budded on MM106 apple rootstock transplants as affected by increasing salinity	66
29- Dry weight of Anna scion budded on MM106 apple rootstock transplants as affected by increasing salinity	67
30- Stems' sugars' fractions of Anna budded on MM106 apple rootstock transplants as affected by increasing salinity	71
31- Amino acids content in the leaves of Anna scion budded on MM106 apple rootstock transplants as affected by increasing salinity	72

	Page
32- Leaves total chlorophylls' content in Anna scion budded on MM106 apple rootstock transplants as affected by increasing salinity	75
33- Leaves N, P and K percentages of Anna scion budded on MM 106 apple rootstock transplants as affected by increasing salinity	76
34- Leaves Ca, Mg, Na, and Cl percentages of Anna scion budded on MM 106 apple rootstock transplants as affected by increasing salinity	77
35- Union-bud anatomy of Anna scion budded on MM106 apple rootstock transplants as affected by increasing salinity	80
36- Periods for salt injury appearance in Agezi olive transplants	83
37- Number of salt injured Agezi olive transplants at the end of each season	84
38- Growth of Agezi olive transplants as affected by increasing salinity	86
39- Growth of Agezi olive transplants as affected by increasing salinity	87
40- Fresh weight of Agezi olive transplants as affected by increasing salinity	88
41- Fresh weight of Agezi olive transplants as affected by increasing salinity	89
42- Dry weight of Agezi olive transplants as affected by increasing salinity	90

	Page
43- Dry weight of Agezi olive transplants as affected by increasing salinity	91
44- Stems' sugars' fractions of Agezi olive transplants as affected by increasing salinity	95
45- Stems' sugars' fractions of Agezi olive transplants as affected by increasing salinity	96
46- Amino acids content in the leaves of Agezi olive transplants as affected by increasing salinity	97
47- Leaves, total chlorophylls' content in Agezi olive transplants as affected by increasing salinity	100
48- Leaves N, P and K percentages of Agezi olive transplants as affected by in creasing salinity	102
49- Leaves N, P and K percentages of Agezi olive transplants as affected by increasing salinity	103
50- Leaves Ca, Mg, Na and Cl percentages of Agezi olive transplants as affected by increasing salinity	105
51- Leaves Ca, Mg, Na and Cl percentages of Agezi olive transplants as affected by increasing salinity	106
52- Roots' N, P and K percentages of Agezi olive transplants as affected by increasing salinity	109
53- Roots' N, P and K percentages of Agezi olive transplants as affected by increasing salinity	110
54- Roots' Ca, Mg, Na and Cl percentages of Agezi olive transplants as affected by increasing salinity	111
55- Roots' Ca, Mg, Na and Cl percentages of Agezi olive transplants as affected by increasing salinity	112

LIST OF FIGURES

	Page
1- Effect of salinity on amino acids content in leaves of MM106 apple rootstocks	44
2- Leaves N, p and k content of Malling Merton 106 apple rootstocks as affected by increasing salinity (1991 season)	54
3- Leaves Ca, Mg, Na and Cl content of Malling Merton 106 apple rootstocks as affected by increasing salinity (1991 season)	54
4- Roots, N, P and K content of Malling Merton 106 apple rootstocks as affected by increasing salinity (1991 season)	60
5- Roots Ca, Mg, Na and Cl content of Malling Merton 106 apple rootstocks as affected by increasing salinity (1991 season)	60
6- Effect of salinity on amino acids content in leaves of Anna apple scion budded on MM106	73
7- Leaves N, P and K content of Anna scion budded on MM106 apple transplants as affected by increasing salinity (1991 season)	78
8- Leaves Ca, Mg, Na and Cl content of Anna scion budded on MM 106 apple transplants as affected by increasing salinity (1991 season)	78
9- Effect of salinity on amino acids content in leaves of olive cv. (Agezi)	98