EFFECT OF MICROELEMENTS, AMINO ACIDS AND HUMIC ACID ON GROWTH, FLOWERING AND FRUITING OF SOME MANGO CULTIVARS

By

SHADY IBRAHIM MAHMOUD RADWAN

B.Sc. Agric. Sci. (Pomology), Fac. Agric., Cairo Univ., Egypt, ٢٠٠٥

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

In

Agricultural Sciences

(Pomology)

Department of Pomology
Faculty of Agriculture
Cairo University
EGYPT

٢٠١١

APPROVAL SHEET

EFFECT OF MICROELEMENTS, AMINO ACIDS AND HUMIC ACID ON GROWTH, FLOWERING AND FRUITING OF SOME MANGO CULTIVARS

M.Sc. Thesis
In Agric. Sci. (Pomology)

By

SHADY IBRAHIM MAHMOUD RADWAN
B.Sc. Agric. Sci. (Pomology), Fac. Agric., Cairo Univ., Egypt, ٢٠٠٥

APPROVAL COMMITTEE

Dr. MOHAMED MAHMOUD ALI ABD-ELGELIL.....
Head Research of Pomology, Agriculture Research Center

Dr. EL-SAID IBRAHIM BAKR.....
Professor of Pomology, Fac. Agric., Cairo University

Dr. IBRAHIM EL-SHENAWY GHOUNIM.....
Assistant Professor of Pomology, Fac. Agric., Cairo University

Dr. SAMY EL-KOSARY MELEGY.....
Professor of Pomology, Fac. Agric., Cairo University

Date: / / ٢٠١١

SUPERVISION SHEET

EFFECT OF MICROELEMENTS, AMINO ACIDS AND HUMIC ACID ON GROWTH, FLOWERING AND FRUITING OF SOME MANGO CULTIVARS

M.Sc. Thesis
In Agric. Sci. (Pomology)

By

SHADY IBRAHIM MAHMOUD RADWAN

B.Sc. Agric. Sci. (Pomology), Fac. Agric., Cairo Univ., Egypt, ٢٠٠٥

SUPERVISION COMMITTEE

Dr. SAMY EL-KOSARY MELEGY
Professor of Pomology, Fac. Agric., Cairo University

Dr. IBRAHIM EL-SHENAWY GHOUNIM
Assistant Professor of Pomology, Fac. Agric., Cairo University

Name of Candidate: Shady Ibrahim Mahmoud Radwan **Degree:** M.Sc.
Title of Thesis: Effect of Microelements, Amino Acids and Humic Acid on Growth, Flowering and Fruiting of Some Mango Cultivars.
Supervisors: Dr. Samy El-Kosary Melegy
Dr. Ibrahim El-Shenawy Ghounim
Department: Pomology **Branch:** **Approval:** ٣٠/١١/٢٠١١

ABSTRACT

This investigation was carried out during two successive seasons (٢٠٠٨/٢٠٠٩ and ٢٠٠٩/٢٠١٠) on ٦ years old "Keitt" and "Ewais" mango (*Mangifera indica* .L). The trees are grown in a sandy soil under drip irrigation system. The treatments were: T١: ٠,٥ g Tradecorp AZll/l., T٢: ٠,٥ g Tradecorp AZll/l + ٤٠ cm Helpstar/tree., T٣: ٣cm Delfan/l., T٤: ٣cm Delfan/l + ٤٠ cm Helpstar/tree., T٥: ٣cm Aton AZ plus/l., T٦: ٣cm Aton AZ plus/l + ٤٠ cm Helpstar/tree., T٧: ٤٠cm Helpstar/tree., T٨: Control (sprayed with water). The results indicated that both cultivars sprayed by ½ g Tradecorp AZll/l and soil supplementation by ٤٠ cm Helpstar/tree produced the highest values of growth cycle number, shoot length, diameter of newly formed shoots, leaf length, leaf width and leaf area comparing with other treatments used in the two seasons. "Ewais" mango cultivar produced the highest malformation percentage and setting fruits number than "Keitt" mango cultivar in both seasons. Whereas, retained fruits% was higher with "Keitt" mango cultivar in the two seasons. "Keitt" mango cultivar sprayed by ½ g Tradecorp AZll/l with or without ٤٠ cm Helpstar/tree produced the lowest malformation% in the two seasons. In addition, spraying ½ g Tradecorp AZll/l + soil supplementation by ٤٠ cm Helpstar/tree significantly increased the yield per tree of the two cultivars. Adding ٤٠cm Helpstar/tree only or with spraying ½ g Tradecorp AZll/l improved fruit weight, fruit length, fruit width, fruit size and fruit firmness in the two seasons. Spraying ½ g Tradecorp AZll/l with soil supplementation by ٤٠ cm Helpstar/tree with "Ewais" fruits gave the highest significant fruit total soluble solids, total sugar % and lowest acidity % comparing with other interactions used in the two seasons. Adding ٤٠cm Helpstar/tree as soil supplementation only or with spraying ٣cm Delfan/l improved leaves N, Ca and total amino acids content of both cultivars.

Key words: Tradecorp AZll, helpstar, delfan, aton AZ plus, growth, malformation, fruiting, Keitt and Ewais mango.

DEDICATION

I dedicate this work to whom my heart felt thanks; to my Father Ibrahim Radwan, my mother and my brothers Waleed and Khaled for their patience and for all the support they lovely offered along the period of my post graduation.

ACKNOWLEDGEMENT

First of all, praise is to ***Allah****, Lord of the worlds.*

The author feels deeply grateful to ***Dr. SAMY EL-KOSARY MELEGY*** *Professor of Pomology, Faculty of Agriculture, Cairo University For his ideal supervision, suggesting the problems, willing advise, continuous encouragement, sincere help, criticism, patience and precious advise, fruitful discussion fatherly attitude and valuable help during the preparation of the manuscript of this investigation.*

My deepest appreciation and gratitude to ***Dr. IBRAHIM EL-SHENAWY GHOUNIM*** *Associate Professor of Pomology, Faculty of Agriculture, Cairo University, for his ideal supervision, valuable guidance, continuous encouragement, fruitful discussions and helpful advices during the course of this investigation.*

My thanks are directed to all staff members of Pomology Department, Faculty of Agriculture, Cairo University.

Grateful deep appreciation is given to my father, my mother and my brothers.

I feel deeply thankful to ***Technogreen Company Tradecorp Sector, Dr. Ayman Shaban, Dr. Hany Mostafa and Dr. Abdo Mohamed*** *for great assistant offered by them.*

CONTENTS

INTRODUCTION

The mango (*Mangifera indica* L.,) is one of the most important fruit trees in the tropicals and subtropicals regions, which belongs to family Anacardiaceae. Its trees are evergreen, native to south Eastern Asia from India to the Philippine. Egypt is considered one of the major mango producing countries in Africa. Also, mango is considered the most popular fruit in Egypt and occupies the third place in acreage after citrus and grapes. The area under mango orchards reached ١٣٠٠٠٠ Ha in ٢٠٠٩, producing about ٤٥٠٠٠٠ tons of fruits annually (F.A.O. statistics, ٢٠١١) (Table ١). Many cultivars are grown in Egypt such as Keitt, "Ewaise" and "Sedik", facing many problems i.e. poor fruit set, high fruit drop, irregular bearing, lower productivity, malformation disease (Syed *et al.* ٢٠٠٩). Moreover trees grow under sandy conditions are poorly yielded with low fruit quality this may be due to lacking of mineral constituents. Improving yield and quality of mango cvs can be achieved through better cultural practices such as fertilization treatments.

Foliar fertilization containting different elements are needed by plants in small quantities i.e., Zn, Fe, B, Cu and Mn. for producing healthy mango trees as well as producing productive trees. In addition, they are responsible for improving physical and chemical fruits characteristices. (Hamdy *et al.* ٢٠٠٧). Some micronutrients are required at specific times such as boron

during flowering stage, when foliar application was reported to be benefit to subsequent fruit set. (Sanna and Abd El-Migeed. ٢٠٠٥).

Table ١. Area planted with mango and its productivity of fruits in Egypt during the period from ٢٠٠٠ to ٢٠٠٩.

Years	Area harvested (Hectare)	Production (Tonnes)	Yield (Kg/Ha)
٢٠٠٠	٣٨٨٥٤	٢٩٨٨٨٠	٧٦٩٢٣
٢٠٠١	٤٣٠٠٥	٣٢٥٤٦٧	٧٥٦٨١
٢٠٠٢	٢٨٨٠٣	٢٨٧٣١٧	٩٩٧٥٢
٢٠٠٣	٣٠٦٨٤	٣١٨٧٩١	١٠٣٨٩٤
٢٠٠٤	٣٤١٩١	٣٧٥٤٦١	١٠٩٨١٢
٢٠٠٥	٣٥٠٠٠	٣٨٠٠٠٠	١٠٨٥٧١
٢٠٠٦	١١٠٣٣٦	٥٩٦٧٦٠	٥٤٠٨٥
٢٠٠٧	١١٥٥٢٩	٥٣٢٤٢٢	٤٦٠٨٥
٢٠٠٨	١٣٢٠٧٨	٤٦٦٤٣٦	٣٥٣١٥
٢٠٠٩	١٣٠٠٠٠	٤٥٠٠٠٠	٣٤٦١٥

Source: Statistics of Food and Agriculture Organization of the United Nations (٢٠٠٩).

The use of amino acids as leaf spraying, are becoming more frequent but its function is still under investigation. The importance of amino acids for the plant is connected to the primary and secondary metabolism. They synthesize many important compounds for increasing panicle length, improving fruit retention, fruit quality and production of mango.

On the other hand humic acids are complex substances derived from organic matter decomposition. Humic substances have indirect effects involving improvements of soil properties

such as aggregation, aeration, permeability, water holding capacity, micronutrient transport and availability (Tan, ٢٠٠٣).

The target of this investigation is to study the effect of some microelements, amino and humic acids on vegetative growth, as well as flowering and fruiting of “Keitt” and “Ewais” mango cultivars. Aiming to improve fruit quality of both mango cultivars under reclaimed lands.

REVIEW OF LITERATURE

The available review of literature of the present study includes mango cultivars affecting by different nutritives such as: micronutrients, amino acids and humic acid. These reviews are arranged under main topics, mango vegetative growth, flowering and fruiting parameters.

١. Effect of different fertilization treatments on mango vegetative growth

Rajput *et al.* (١٩٧٦) reported that foliar application of ٠,٨٪ boric acid significantly increasd the growth of “Langra” mango cultivar.

Also, Banik *et al.* (١٩٩٧) investigated the effect of zinc, iron and boron in combination with urea on growth of mango “Fazli”. They mentioned that all micronutrients significantly influenced the growth particularly at higher application rates. Application of boron at the higher rate (٠,٤٪ + ١٪ urea) promoted vegetative growth as indicated by plant height, trunk girth and spread of the young “Fazli” mango plants.

In the same trend, Banik and Sen (١٩٩٧) treated ٦-years-old of “Fazli” mango by foliar applications of Zn (٠,١, ٠,٢ and ٠,٤%, as zinc sulfate), Fe (٠,١, ٠.٢ and ٠,٤٪, as ferrous sulfate) and B (٠,١, ٠,٢ and ٠,٤٪, as borax) in July and October. They reported that either Zn or B was promoted plant height, trunk girth and spread

of the young plants. The effect of Fe was less pronounced than those of B and Zn.

In addition, Lal and Zora (١٩٩٨) studied the effect of foliar application of Zn at ٠,٢٥, ٠,٥٠, ١,٠٪ and soil applications at ٠,٥, ١,٠, ٢,٠ kg/tree on growth of ٢٦-years-old mango "Dusheri" trees. They found that the stem girth of trees was the highest with soil application at ٠,٥ kg/tree followed by foliar application of zinc sulfate at ١,٠٪..

Moreover, Khamis *et al.* (٢٠٠١) stated that all growth parameters of ٦-month-old mango seedlings, i.e. number of leaves per plant, plant height, and stem thickness were significantly affected by the fertilizer treatments. The highest values for the different growth parameters were obtained by ١٠٠ ppm P + ٢٠ ppm Zn as soil application or ٠,٥٠٪ Zn as foliar application.

Dutta (٢٠٠٤) evaluated the effects of boric acid solution, sprayed on the trees to runoff at the late bud swelling stage at ٠, ٥٠٠, ١٠٠٠, ٢٠٠٠, ٣٠٠٠ and ٤٠٠٠ ppm, on the growth. The results showed that, boric acid at ٣٠٠٠ ppm was found to be optimum for increase mango growth parameters of "Himsagar" mango trees.

Moreover, Hamdy *et al.* (٢٠٠٧) concluded that leaf area of "Hindy Bisinara" mangoes was enhanced by application of single