



Effect of Some Citrus Rootstocks on Gold Nugget Mandarin Behavior and Improve Productivity and Quality under Delta Condition

BY

Ragab Farhat Mohamed Ali

B. Sc. Of Agric. Sci. (Horticulture) Cairo Univ., El Fayoum Branch, 2002

M. Sc. Of Agric. Sci. (Horticulture - Fruit science) Benha Univ., 2017

DESSERTATION

Submitted in partial fulfillment of
The requirements for the degree of

Doctor of Philosophy

In

Agricultural Science

(Fruit science)

**Department of Horticulture
Faculty of Agriculture, Moshtohor
Benha University**

2021

ABSTRACT

This investigation was carried out during three seasons (2018/2019;2019/2020; 2020/2021) through two sub- main experiments on 12 years old identical “Gold Nugget” trees *Citrus reticulata* Blanco (Wilking mandarin x Kincy mandarin). Grown at 2×6^M in silt soil under an Immersion irrigation system in a private orchard at Al Qalyubia Governorate, Egypt. Experimental I: studied the effect of some citrus rootstocks troyer citrange *Citrus sinensis* 'Washington' x *Poncirus trifoliata* “Tr”; sour orange (*Citrus aurantium* L.) “SO” and volkamer Lemon (*Citrus volkameriana*) “VOL” on Gold Nugget mandarin trees performance. Experimental II: improving tree productivity and fruit quality of Gold Nugget trees budded on volkamer Lemon (*Citrus volkameriana*) “VOL” by using some horticultural treatments (fruit thinning, foliar nutrition substances and Climate anti stresses) treatments. Results indicated that **Experimental I:** the three rootstocks fluctuated in its effect on Gold Nugget tree growth performance, whereas, “Tr” rootstock gave the highest values of spring cycle flushes, increasing of tree canopy, fruit set %, leaf photosynthesis pigments, total carbohydrates%, leaf K%, “Fe & Zn” ppm, productivity and TSS%. “SO” rootstock record the highest: shoot thickness, increasing of the tree canopy, number of spring flushes, total carbohydrates %, leaf N%, peel thickness and juice vitamin C & TSS/ Acid ratio. “VOL” rootstock gave the highest: number of leaves/shoot, leaf area, tree canopy volume, number of summer flushes, number of flowers, leaf “N &Ca” %, “Fe & Zn” ppm, fruit weight & peel thickness and TSS/ acid ratio. **Experimental II:** fruit thinning significantly increased: leaf area, tree canopy volume and TSS/ Acid ratio, both spring or Summer growth cycles, leaf carbohydrates, leaf “N &” K %, “Fe & Zn” ppm; Potassium nitrate foliar application statistical improved: shoot thickness, number of leaves/ shoot, spring growth cycles, chlorophyll a and total chlorophylls, Dry Matter%, leaf K %, “Fe &Zn” ppm; *spirulina platensis* algae gave the highest: number of leaves/ shoot, number of flowers and fruit set %, leaf K %, “Fe, Zn & Mn “ ppm, number of fruits/tree and tree yield efficiency, juice Vitamin C and a mixture from potassium sulfate+ zinc sulfate + salicylic acid significantly increased: both spring or summer growth cycles, leaf chlorophyll a & b, total chlorophylls, leaf: N %, “Zn& Mn” ppm, tree yield as kg/tree and kg/ M³ and physical properties.

Keywords: Gold Nugget, Thinning, KNO₃, *spirulina platensis* algae, Fruit quality.

CONTENTS

Title	Page
I. INTRODUCTION.....	1
II. REVIEW OF LITERATUR.....	5
II.1- Effect of rootstock type and some treatments on vegetative growth performance.	5
II.2- Effect of rootstock type and some treatments on flowering characteristics.	9
II.3- Effect of rootstock type and some treatments on physiological Parameters.	12
II.4- Effect of rootstock type and some treatments on chemical contents.	15
II.5.a. Effect of rootstock type and some treatments on Tree productivity and yield efficiency.	21
II.5.b Effect of rootstock type and some treatments on fruit physical and chemical properties.	29
III. MATERIALS and METHODS.....	41
IV. RESULTS and DISCUSSION.....	47
Experimental (I) :	
IV- I -1: Vegetative growth behavior	47
IV- I -2: Physiological parameters:	
IV- I -2-a. Leaf pigments contents	49
IV- I -2-b. Dry matter & total carbohydrates :	49
IV- I-3. Leaf mineral contents.....	
IV- I-3.a. Leaf macro element content.....	50
IV- I-3.b. Micro elements contents	51
IV- 1 - 4 – Tree productivity and fruiting efficiency	52
IV- 1 - 5 - Fruit physical and chemical properties:	53

IV- 1 – 5-a. Physical properties	53
IV- 1 – 5-b. Chemical properties	55
Experimental (II) :	
IV- II-1- Vegetative growth:	57
IV- II-2- Physiological parameters :	59
IV- II-2- a. Leaf pigments contents:	59
IV- II-2- b. Leaf dry matter percentage & total carbohydrates	60
IV- II- 3- Leaf chemical contents:	61
IV- II- 3- a. Macro- Elements	61
IV-II- 3- b. Micro- Elements	62
IV-II-4-Tree yield.	63
IV-II-5- Fruit Physical and chemical properties:	64
IV-II-5- a. Fruit physical properties	64
IV- II- 5 - b. Fruit chemical properties	67
V- SUMMARY And CONCLUSION.....	71
VI-LITERATURE CITED.....	79
VII - الملخص العربي ٧-١	٧-١

LIST OF TABLES

No.	Title	Page
Table (1)	Chemical analysis of <i>spirulina platensis</i> algae	42
Table (2a)	Effect of some rootstocks type on some vegetative growth behavior of Gold Nugget mandarin during the two seasons (2018/2019 & 2019/2020).	48
Table (2b):	Effect of some rootstocks type on some vegetative growth and flower behavior of Gold Nugget mandarin during the two seasons (2018/2019 & 2019/2020).	49
Table (3)	Effect of some rootstocks type on Physiological behavior of Gold Nugget mandarin during the two seasons (2018/2019 & 2019/2020).	50
Table (4a)	Effect of some rootstocks type on Gold Nugget mandarin leaf macro elements during the two seasons (2018/2019 & 2019/2020).	51
Table (4b)	Effect of some rootstocks type on Gold Nugget mandarin leaf micro-elements during the two seasons (2018/2019 & 2019/2020).	52
Table (5a)	Effect of some rootstocks type on Gold Nugget mandarin tree yield & efficiency during the two seasons (2018/2019 & 2019/2020).	53
Table (5b):	Effect of some rootstocks type on Gold Nugget mandarin fruit physical properties during the two seasons (2018/2019 & 2019/2020).	54
Table (5c)	Effect of some rootstocks type on Gold Nugget mandarin fruit physical properties during the two seasons (2018/019 & 2019/020).	54
Table (5d)	Effect of some rootstocks type on Gold Nugget mandarin fruit chemical properties during the two seasons (2018/2019 & 2019/2020).	55
Table (6a)	Effect of treatments on Gold Nugget mandarin trees vegetative growth performance during the two seasons (2019/2020 & 2020/2021).	58
Table (6b)	Effect of treatments on Gold Nugget mandarin tree growth cycles and blooming performance during the two seasons (2019/2020 & 2020/2021).	59
Table (7)	Effect of treatments on some physiological parameters of Gold Nugget mandarin during the two seasons (2019/2020 & 2020/2021).	60

Table (8a)	Effect of treatments on Gold Nugget mandarin leaf N, P, K &Mg contents during the two seasons (2019/2020 &2020/2021).	61
Table (8b)	Effect of treatments on Gold Nugget mandarin leaf Fe, Zn & Mn contents during the two seasons (2019/2020 &2020/2021).	62
Table (9)	Effect of treatments on Gold during mandarin tree yield during the two seasons (2019/2020 &2020/2021).	64
Table(10a)	Effect of treatments on Gold Nugget mandarin fruit physical properties during the two seasons (2019/2020 &2020/2021).	65
Table(10b)	Effect of treatments on Gold Nugget mandarin fruit physical properties during the two seasons (2019/2020 &2020/2021).	66
Table(10c)	Effect of treatments on Gold Nugget mandarin fruit physical properties during the two seasons (2019/2020 &2020/2021).	67
Table (11)	Effect of treatments on Gold Nugget mandarin fruit chemical properties during the two seasons (2019/2020 &2020/2021).	69