EFFECT OF ROOTSTOCK ON GROWTH AND PRODUCTIVITY OF SOME GRAPE CULTIVARS

By

EMAN SAMY MOHAMED EL-HADY

B.Sc. Agric. Sc (Horticulture), Cairo University, 2000
M.Sc. Agric. Sc (Horticulture), Ain Shams University, 2008

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This thesis for Ph. degree has been Approved by:

Dr. Ghobrial Farag Ghobrial **……**
Head of Research Emeritus, Hort. Research Institute, Agric. Research Center

Dr. Hussein Mahmoud El-Hennawy **……**
Prof Emeritus of Pomology, Faculty of Agric, Ain Shams University

Dr. Assem Dosoukey Shaltout **……**
Prof. Emeritus of Pomology, Faculty of Agric, Ain Shams University

Dr. Ibrahem Mohamed Dosoukey **……**
Prof Emeritus of Pomology, Faculty of Agric, Ain Shams University

Date of Examination: 2/3/2015

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EMAN SAMY MOHAMED EL-HADE

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Under the supervision of:

Dr. Ibrahem Mohamed Dosoukey
Prof. Emeritus of Pomology, Department of Horticulture, Faculty of Agric, Ain Shams University (Principal Supervisor)

Dr. Assem Dosoukey Shaltout
Prof. Emeritus of Pomology, Department of Horticulture, Faculty of Agric, Ain Shams University

Dr. Laila Foaud Haggag
Prof. Emeritus of Pomology, Department of Pomology, National Research Centre

ABSTRACT

Eman Samy Mohamed El-Hady: Effect of Rootstock on Growth and Productivity of some Grape Cultivars. Unpublished Ph. D. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2015.

This work was devided into three separate experiments. The first experiment was designed to evaluate some grapevine cultivars grafted on different root stocks comparing with the own rooted cultivars to resistance of root-knot nematode *Meloidogyne incognita* under green house condition at National Research Center, Giza, Doki. The obtained results revealed that Flame cultivar was highly susceptible to the infestation with *M. icognita* than other cultivars. On the other hand the rootstocks of Salt creek and Freedom were extremely highly resistance than the own rooted cultivars. *M. incognita* infestation caused a significant reduction in growth of the own rooted grapevine cultivars Flame, Early sweet, Red Glob and Superior comparing with grafted ones on the nematode resistant rootstocks, Salt creek and Freedom. The fiber fraction (ADL, Hemicellulose and Cellulose) recorded the highest percentage in cultivars grafted on Salt creek and Freedom rootstocks comparing with the own rooted ones. Proline and free amino acid were extremely higher in the own rooted cultivars than the rootstocks ones. Under field condition, grape vine varieties grafted on Salt creek and Freedom produced the highest average yield with nematode infestation, in the opposite own rooted ones produced the lowest average yield with nematode infestation. The second experiment was designed as a pot culture experiment to examine the tolerance of different cultivars under study to salinity as affect by different rootstocks. Different levels of salinity of irrigation water (1000, 2000 and 3000 ppm) were used. Results showed that vine growth properties (vine length, inter-node length and number of leaves per vine) were significantly decreased with the increase of salinity levels among all vines. At the highest salinity level (3000 ppm), the survival vine percentage was zero % for own rooted vines, except, the own rooted Flame seedless that recorded 50 percent of vine survival. Among the scion-rootstock vines, about 70-80% vine survival was observed with the vines grafted on Salt

creek and 60-65% in vines grafted on Freedom rootstock. Increasing salt concentration significantly reduced the N, P and K contents in the leaf petioles. On the contrary, leaf proline, Na and Ca content were increased with increasing the salinity level. Based on the gained results, all cultivars grafted on Salt creek rootstock were more tolerant to irrigation with the studied salinity treatments. The third experiment was carried out during three seasons (2011 - 2013) on Flame seedless, Superior seedless and Early sweet cultivars grafted onto Salt Creek, Freedom and Harmony rootstocks, while Thompson seedless cultivar grafted only onto Salt Creek and Harmony rootstocks. In addition, the same cultivars were grown on own roots and served as control. Results revealed that leaf chlorophyll a and b (mg/gm fresh wt), Leaf Nitrogen, Phosphorus and Potassium content (%) were significantly increased in grafted vines onto all the three rootstock compared with ungrafted vines. Yield (kg)/vine, cluster weight (gm), length and width of cluster (cm) of Flame seedless, Superior seedless and Early sweet cultivars were markedly increased in grafted vines compared with ungrafted ones. Superior seedless and Early sweet cultivars grafted onto Harmony rootstock resulted in a significant higher values in berry weight (gm), berry size (cm^3), length/ diameter ratio of berry and Juice volume of 100 berry (cm^3) compared with other rootstocks and grown on own rooted. On the other hand Flame seedless cultivar grafted onto Freedom rootstock gave the best results. Chemical berry characteristic including SSC percentage, low acidity and high SSC/acid ratio were generally noticed when Flame seedless cultivar grafted onto Harmony rootstock and Superior seedless grafted onto Salt Creek rootstock. Early sweet cultivar grafted onto Harmony followed the similar trend except for juice acidity which recorded high percentage values compared with other grafted rootstocks. Flame seedless and Early sweet cultivars recorded higher fruiting bud percentage when grafted onto Harmony rootstock compared with other rootstocks and own rooted ones. Meanwhile, highest bud burst percentage and fruiting bud percentage of Superior seedless cultivar was obtained when grafted onto Salt creek rootstock. The own rooted Thompson seedless vines resulted in a significant higher values of yield, cluster weight, some physical properties of berries. Chemical berry characteristic including SSC

percentage, low acidity and high SSC/acid ratio were generally noted with own rooted vines of Thompson seedless. Thompson seedless cultivar recorded higher fruiting bud percentage with ungrafted vines compared with the other rootstocks. Meanwhile, highest bud burst percentage was obtained when Thompson seedless cultivar grafted onto Salt creek rootstock. Generally, yield, cluster and berry characteristics of grafted vines i.e. Flame seedless, Superior seedless and Early sweet cultivars on Salt creek, Freedom and Harmony rootstocks were better when compared with own rooted vines. On the other hand, yield, cluster and berry characteristics of own rooted vines of Thompson seedless were best when compared with vines grafted onto rootstocks under this study.

Key word: Grapevine, *vitis vini*fera, Rootstock, Nematode resistance, *M. incognta*, Salinity tolerance, Growth properties, Yield, Fruit quality, Nutrient content,

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INTRODUCTION

Grape (*Vitis vinifera* L.) is one of the most important and favorable fruit crops in Egypt, it is considered the second fruit crop after citrus. The planted area reached 188543 feddan producing 1378815 tons **(Ministry of Agriculture statistics, 2013).** The production of grapes increased as a result of introducing of new varieties and rootstocks and improving culture practices.

Rootstocks have been used in vineyards since the second half of 19th century as a consequence of the phylloxera (*Daktulosphaira vitifoliae*) invasion in Europe. Rootstocks, as a link between the soil and the scion, play an important role in vine adaptation with the environmental factors.

Choosing the rootstock is one of the most important decisions when establishing vineyards. Rootstocks are employed in grape cultivation to overcome several biotic stresses (phylloxera, nematodes, root diseases, etc.), a biotic stresses (soil and water salinity, water scarcity, frost effect, etc.), and controlling vegetative growth, precocity and fruit quality. **Reynolds and Wardle (2001)** outlined some major criteria for rootstocks choice in the order of their importance as phylloxera and nematode resistance, adaptability to high pH soils, saline soils, wet or poorly drained soils and drought. In this respect, Salt creek "Ramsey" rootstock imports great vigor to its scions. It is quite resistant to nematodes and moderately resistant to phylloxera, it is performed well in light sandy soils of low fertility, has good tolerance to salt, perform well in slightly acid and calcareous soils. Freedom (1613C x *V. Champini*) is highly resistant to phylloxera and nematodes, it renders scions more vigorous but less than Dog Ridge, it is highly resistant to drought, well adapted to acidic soils and moderate resistant to salinity. Harmony (1613C x *V. Champini*), it is moderate in vigor of moderate resistant to phylloxera and highly resistant to nematodes, well adapted to acidic soil, moderate resistant to salinity and highly resistant to drought **(Mc Carthy & Cirami, 1990; Mullins *et al.*, 1992; Southey, 1992; Gao *et al.*, 1993;**