REDUCING AGROCHEMICAL RESIDUES IN GRAPES BY USING DIFFERENT SOURCES FROM BIO AND ORGANIC FERTILIZERS

BY

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B. Sc. Agric. (Hort.), Fac. Agric., Ain Shams University, (1999)
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A Thesis Submitted in Partial Fulfillment of
The Requirements for the Doctor of Philosophy Degree in
Environmental Sciences

Department of Agricultural Science
Institute of Environmental Studies and Research
Ain Shams University

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Approval Sheet

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ABSTRACT

Two field experiments were carried out during 2005, 2006, and 2007 seasons in two private vineyards on Superior grapevines 10 years-old at Cairo- Alexandria desert road. The first one was organically fertilized farm and the second was chemically farm, all agricultural practices were same in the two farms except fertilization. The vines were pruned during the last week of December for the three seasons of this study so as to level 84 buds (7canes X 12 buds/cane) and trellised by the "T" shape system. Vines were planted at 3 x1.5 meters in a sandy soil and irrigated with drip irrigation system at the two farms.

The goal of the two experiments was to study the effect of natural sources of fertilizers: Compost, Phosphorus (rock Phosphate) and Potassium (Feldspar) compared with chemical sources on vegetative growth, microbiological activity in the soil, yield and bunch quality of “Superior” grapevines. The complete randomized block design was adopted for the experiment. First experiment including applying of 4, 6 and 8 kg compost for vine in combination with 200 or 400 g Rock phosphate or Feldspar. Data in this experiment showed that the highest yield was given by vines fertilized with 8kg compost + 400g Rock phosphate + 400g Feldspar, while, the lowest was given by control vines. All physical characteristics of berries (average berry weight, average berry size, average berry length, average berry diameter and average berry firmness) were found to increase with the treatments of vines fertilized with 8kg compost + 400g Rock phosphate + 400g Feldspar, while, the lowest was given by vines control. The treatment of vines fertilized with 8kg compost + 400g Rock phosphate + 400g Feldspar gave the highest values of TSS and TSS / acid ratio and the lowest values of juice acidity. However, the treatment control gave the lowest values of TSS and TSS/acid ratio and the highest values of juice acidity.

All vegetative growth parameters (average shoots length, average number of leaves/shoot, total leaf area/vine and weight of annual prunings) were found to increase with the treatments of vines fertilized with 8kg compost + 400g Rock phosphate + 400g Feldspar. On the other hand, the lowest was obtained with vines control. With respect to leaf content of total chlorophyll, the highest value of this estimate was given by vines fertilized with 8kg compost + 400g Rock phosphate + 400g Feldspar. On other hand, the lowest was given by vines control. The highest value was obtained with the treatments of vines fertilized with 8kg compost + 400g Rock phosphate + 400g Feldspar recorded the highest values of (N, P and K),while, the lowest value was given by vines control.

Additionally, second experiment conducted to study the effect of applying 4, 6 and 8 kg compost / vine on the same pervious characters mentioned in organically farms. Data showed that the highest yield was given by vines fertilized with 8kg compost followed by vines fertilized with 6kg compost. While, the lowest was given by vines fertilized with without compost (control). All physical characteristics of berries (average berry weight, average berry size, average berry length, average berry diameter and average berry firmness) were found to increase with the treatments of vines fertilized with 8kg compost followed by vines fertilized with 6kg compost, while, the lowest was given by vines control.

The treatment of vines fertilized with 8kg compost gave the highest values of TSS and TSS / acid ratio and the lowest values of juice acidity. However, the treatment control gave the lowest values of TSS and TSS/acid ratio and the highest values of juice acidity. All vegetative growth parameters (average shoots length, average number of leaves/shoot, average leaf area/shoot and weight of annual pruning) were found to increase with the treatments of vines fertilized with 8kg compost followed by vines fertilized

with 6kg compost. On the other hand, the lowest was obtained with vines control. With respect to leaf content of total chlorophyll, the highest value of this estimate was given by vines fertilized with 8kg compost followed by vines fertilized with 6kg compost. On the other hand, the lowest was obtained with vines control. The highest value was obtained with the treatments of vines fertilized with 8kg compost recorded the highest values of (N, P and K), while, the lowest value was given by control vines.

Regarding microbiological studies in the organic farm, it showed that the highest total number of microbial count and spore forming at three stages were found with the treatment of (8kg compost + 400g Rock phosphate + 400g Feldspar), followed by treatment (6kg Compost + 400g Rock 400g Feldspar), while, the lowest values was given by vines fertilized without compost (control). While, microbiological in the chemical farm it showed that the highest total number of microbial count and spore forming at three stages were found in at treatment (8kg Compost), followed by treatment (6kg Compost) while, the lowest values was given by vines fertilized without compost (control).

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

1- INTRODUCTION

Grape (*Vitis vinifera L.*) is considered the first major fruit crop with regard to its production all over the world. In Egypt, grape ranks second after citrus. The total acreage of grape in Egypt exhibited an obvious increase in the recent few years till it reached 167.048 feddan with a production of 1.531.418 tons according to the latest statistics of Ministry of Agriculture (2008).

Fertilization is considered one of the important practices carried out during the growing season of fruit trees, especially nitrogen, phosphorus and potassium fertilization. Nitrogen is one of the major plant nutrients being a part of proteins, enzymes, amino acids, polypeptides and many other biochemical compounds in the plant system. It is required for the survival and growth of each plant cell (**Mengel and Kirkby, 1987**). N plays an important role in plant life being a constituent of amino acids and proteins, a promoter for cell division and development of meristeniatic tissue (**Nijjar, 1985**).

Phosphorus content of soil can be assimilated only as soluble phosphate. Hence the use of rock phosphate as a fertilizer for phosphorus deficient soils has received a significant interest in the recent years since it is natural, inexpensive and available fertilizer. However the solubilization of this fertilizer rarely occurs in alkaline soils (**Caravaca *et al.*, 2005**). Physical and chemical weathering of rock phosphate is mainly realized along plant roots in the rhizosphere. This part of soil supports large microbial communities that facilitate weathering of minerals by several mechanisms such as lowering of pH by producing organic acids, phenolic compounds, siderophores, ion chelation and exchange reactions in the growth environment which have been reported to play a role in phosphate solubilization by phosphate solubilizing microorganisms (**Drever and Vance, 1994**). Numerous studies identified microbial groups which could