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STUDIES ON THE FERTIGATION OF GRAPE

By

MOSTAFA MOHAMMED AFIFY
B.Sc. Agric. Sci. (Soil), Fac. Agric.,Cairo Univ., Egypt, ٢٠٠٢

THESIS
Submitted in Partial Fulfillment of the Requirements for the Degree of

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Department of Soil Science
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APPROVAL SHEET

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Abstract

Field experiment was conducted with grapevine grown in sandy soil under drip irrigation at El Sadat city, Menoufiya Governorate, Egypt for two consecutive seasons (٢٠٠٦ and ٢٠٠٧) to investigate the effect of different phosphorous fertilizers on Thompson seedless grapevine bud behavior, leaf area, yield, average cluster weight, berry measurements, berry juice measurements, (TSS, acidity, TSS/Acidity), chemical composition of blades and phosphorus concentration in soil samples. Four sources of phosphorus were used, phosphoric acid ($H_٣PO_٤$), monoammonium phosphate (MAP), ammonium polyphosphate (APP) and urea phosphate (UP) with two rates ٢٠ and ٤٠ kg $P_٢O_٥$/fed., applied as once, twice and three times/week through irrigation water. Phosphorus at ٤٠ kg $P_٢O_٥$/fed. increased significantly vine yield and improved fruit quality more than ٢٠ kg $P_٢O_٥$/fed. under all treatments. As regards to sources of phosphorus, all the measured parameters were better with UP and APP than $H_٣PO_٤$ and MAP under the two rates and the different patterns of applications. Also, the results showed that application of phosphorus fertilizers at three times /week was the best.

Key words: Grapevine,Thompson seedless,phosphorus fertilizers, fertigation.

DEDICATION

I dedicate this work to whom my heart felt thanks; to the soul of ***Prof. Dr.Mostafa El-Gabaly*** *and* ***Prof. Dr. Nabila H.Bassioni****, as well as to my wife* ***Dr. Manar,*** *my sons* ***Mohammed and Abd El-Rhman,*** *my parents and brothers for all the support they lovely offered along the period of my post graduation.*

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INTRODUCTION

On worldwide basis, grapes (*vitis vinefera, L*) considered the fourth crop while it ranked the first largest deciduous fruit crop. Egypt ranks on the world production scale as ١٤th largest producer of grapes. Grapevines are heavily planted in the newly reclaimed areas in Egypt. According to the latest static of the ministry of agriculture in ٢٠٠٥, the area occupied by grapevines was estimated as ١٦٥٠٠٠ fed. While grape quality is affected by vineyard conditions; it also depends on cultural practices such as variety and fertilization. Grape growers in newly reclaimed areas, though, have inadequate information about suitable fertilization rates for vines especially for Phosphorus. Such rates are usually added in improper wayes and rates which result in over and under supply, and which is usually associoted with poor berry color, irregular and late rippning and low productivity in the following years. Therefor, the follwing study was carried out to determinae the optimum rates and sources of phosphorus fertilizers for grapevine.

Phosphorous is an essential plant nutrient and commonly limiting nutrient for grape especially in newly reclaimed soil. Because of the low mobility of P in the soil, P fertilizers should be placed near the roots, using the most efficient methods of application. Banding the fertilizer in concentrated zone near the plant root should be more efficient than broadcasting, Randall and Hoeft (١٩٨٨). Although the use of P fertilizers in fertigation may cause clogging problems to the system, these problems can be overcome by using acidic fertilizers sources such as H_3PO_4 and UP (Mikkelsen, ١٩٨٩).

Fertigation minimizes leaching of water and nutrients from the rhizosphere, thus minimizes ground water contamination, Hagin and Lowengart (١٩٩٥) and improves fertilizers use efficiency compared to preplant incorporation Mohammed *et al.* (١٩٩٩), Hagin *et al.* (٢٠٠٢) and Mohammad *et al.* (٢٠٠٤) .

Kafkafi (١٩٩٤) considered fertigation as an efficient method for providing and supplying available forms of immobile elements such as P, at a desirable level in root zone. Also successful P fertigation has been reported by Papadopoulos (٢٠٠٠) who found that the superiority of P fertigation over conventional methods was through maintaining continuous higher concentration of P in the soil solution. In addition Jagdev *et al.* (٢٠٠٨) reported that fertigation treatment in Thompson seedless grapevine increased P fertilizer use efficiency by ٧٣,٦٪ and gave higher yield than the conventional method of P fertilizer application.

This study was initiated to evaluate the effect of different sources, rates and suitable application patterns of phosphorus fertilizers on Thompson seedless grapevine production grown in sandy soil under fertigation system.

REVIEW OF LITERATURE

١. A view on phosphorus fertigation in grapevine

Fertigation is the application of nutrients through irrigation water. This method is suitable for usage with drip irrigation system. Because it is possible to directly reach the root structure, fertigation is the best way to provide water and fertilizers. Bravdo and Hepner (١٩٨٧) reported that the availability of NPK fertilizers were increased by fertigation, mainly via drip irrigation, compared with conventional methods in grapevine. From the results obtained by Colapietra (١٩٨٧) who compare fertigation and manually applied fertilizer in grapevine, it was abolished that the costs of fertigation were considerably lower than those of manual application, also, the yield and sugars level were higher. Similar results obtained by Bachchhav (١٩٩٥) who made a field experiment on different farms of pruned grape in Maharashtra, India with medium black clay loam soils, revealed that the weekly fertigation program was convenient for farmers and the benefit: cost ratio was better than that of control plant. Also Carrijo and Hochmuth (٢٠٠٠) reported that fertigation was more efficient than preplant incorporation of phosphorus for soils that tested low in phosphorus.

Fertigated plants recorded higher nutritional states as regards to N, P and K content, leaf N and K content, physiological efficiency, photosynthesis, water use efficiency, relative water content, fruit number, weight, length, circumferance, volume, pulp thickness and total soluble solids compared with plants not subjected to fertigation (control), reported by Jeyakumar *et al.* (٢٠٠١). Also, Murthy *et al.*