hossam maghraby

شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

hossam maghraby

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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بالرسالة صفحات
لم ترد بالأصل

RESPONSE OF BANANA AND GUAVA PLANTS TO SOME BIOLOGICAL AND MINERAL FERTILIZERS

A Thesis

Presented to The Graduate School
Faculty of Agriculture, Alexandria University
in Partial Fulfillment of the Requirements for the Degree of

Master of Science

in

SOIL AND WATER SCIENCES

By

MONA GAMIL ATTIA SOLIMAN

2001

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Examiners' Committee:

Approved

Prof. Dr. T. M. El-Essawi
Prof. of Soil and Water Sciences,
Faculty of Agriculture,
Tanta University.

Prof. Dr. A. H. Shahein
Prof. and Head of Pomology Dept.,
Faculty of Agriculture,
Alexandria University.

Prof. Dr. M. H. Shalaby
Prof. of Soil Fertility and Plant Nutrition,
Faculty of Agriculture,
El- Menoufiya University.

Prof. Dr. A. A. Kaloosh
Prof. of Soil and Water Sciences,
Faculty of Agriculture,
Alexandria University.

Date: 27/ 8 /2001

Advisors' Committee

Prof. Dr. K. M. Fawaz

Prof. of Soil and Water Sciences,

Faculty of Agriculture,

Alexandria University.

Prof. Dr. A. H. Shahein

Prof. and Head of Pomology Dept.,

Faculty of Agriculture,

Alexandria University.

Prof. Dr. A. A. Kaloosh

Prof. of Soil and Water Sciences,

Faculty of Agriculture,

Alexandria University.

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CONTENTS

I.INTRODUCTION

Agriculture is mainly dependent on chemical fertilizers particularly in Egypt, wherever its consumption per hectare is more than the average of the whole world. However, because of shortages in some fertilizer supplies and the current cost of energy, which is used for its production, the cost of fertilizers has risen tremendously and will continue to rise. In addition to that the efficiency of fertilizers used in Egypt is low, either as result of high pH of soil and calcium carbonate levels in the case of chemical P-fertilizers, or due to nitrate leaching and NH_3 volatilization from the nitrogen fertilizers. In view of the economical and environmental problems of using the chemical fertilizers, utilization of biofertilizers would not only result in increasing soil fertility and crop production through its additional nutrient supply, but would also help in solving sanitary and environmental problems, as well as would save foreign currency for Egypt.

Recent developments and insights regarding the potential of vesicular-arbuscular mycorrhizal (VAM) symbiosis in horticultural practice are discussed by many investigators such as Azcon-Aguilar and Barea (1997). Given the effects of VAM inoculation on plant growth and health, as biofertilizers and bioprotectors, it is accepted that an appropriate management of this symbiosis would permit a satisfactory reduction of chemical fertilizer and pesticide inputs, key aspects for sustainable horticultural plant production.

Most Egyptian Soils are rich in asymbiotic N_2-fixers (Saber and Gomaa, 1993). Beneficial effects of inoculation with *Azotobacter* on the growth of cereals and other crops were reported by many investigators that this might be due to supplementing the growing

plants with fixed nitrogen and growth promoting substances. Studies in this field showed that inoculation with these microorganisms could save half the normal field rate of inorganic N fertilizers and at the same time they promote plant production.

Although soils are known to contain yeast, relatively little information is known about their role in mineral cycling in soils.

Interactions between VAM fungi and rhizobacteria or yeast are potential biotechnological tools for benefiting plant development and health through an integrated management approach.

Banana and guava are two of the oldest fruits cultivated by man from pre-historic times. It is well known that banana needs large amounts of fertilizers especially nitrogen and potassium inversely guava which needs small amounts of fertilizers.

So, the present work was carried out to evaluate the effect of soil inoculation with different biofertilizers (VAM fungi, Halex biofertilizer, yeast and combination between them) alone or combined with different levels of mineral fertilization on vegetative growth of banana and guava seedlings as well as the mineral content of their roots and leaves.

II. REVIEW OF LITERATURE

1. Banana and bio or chemical fertilizers:

Banana (*Musa spp.*) is one of the oldest fruits cultivated by man from pre-historic times (Bose et al., 1988). It is grown widely in tropical and sub-tropical climates where sufficient moisture is present to sustain the plants and not enough frost and /or wind to kill them (Samson, 1980). Nowadays it is the leading tropical fruit in the world markets with a highly organized and developed industry, where the world production attained about 58.618 million tons (FAO estimation, 1998). In Egypt, the total cultivated area in 1997 was 44339 feddans with a total production of about 635.115 tons (Ministry of Agriculture statistics, 1997).

It is well known that banana needs large amounts of fertilizers especially nitrogen and potassium. Moreover, it draws nutrients from a very limited soil depth because of its shallow root system (Saleh, 1996).

In Egypt, chemical fertilization is an important and limiting factor for growth and productivity of banana plants that remove large amounts of nutrients from the soil. However, because of shortages in some fertilizer supplies, and the current cost of fertilizers has risen tremendously and well continue to rise, in addition to that the efficiency of fertilizers used in Egypt is low, either as a result of high pH of soil and calcium carbonate levels in the case of P-fertilizers, or due to nitrate leaching, and NH_3 volatilization from the nitrogen fertilizers. From the economical and environmental problems of using the

chemical fertilizers, point of view utilization of biofertilizers would not only increase soil fertility and crop production through its additional nutrient supply, but would also help in solving sanitary and environmental problems, as well as would save foreign currency for Egypt (El-Ghandour, 1992).

Most Egyptian soils are rich in asymbiotic N_2-fixers. Beneficial effect of inoculation with *Azotobacter* on the growth of cereals and other crops was reported but it was hard to find research work dealing with *Azotobacter* inoculation on banana plants grown in pots. Fernandez- Falcon et al.(1998) found that a commercial mixture of microorganisms (including N-fixing bacteria and other microorganisms) decreased the *Helicotylenchus* nematode number and, in some cases, increased P, Ca and Fe levels in root and leaf of banana as well as improved pseudostem circumstance. Tiwary et al.(1998) showed that inoculation banana plants with free N_2 fixing bacteria caused maximum plant height and leaf size in plants receiving 50% of the recommended N dose.

Field studies showed that inoculation with *Azotobacter chroococcum* could save about 20% of inorganic N fertilizers without changing the yield banana corresponding (Alvarrez et al.,1996).

Vesicular- arbuscular mycorrhizae (VAM) are the fungi that penetrate the living cells of plant root without harming them, and whose hyphae can spread into the bulk soil, establishing equally intimate contact with the microbiota of soil aggregates and microsites. These fungi link plant and soil, transport nutrients to the plant and carbon compounds to the soil and its biota (Kandil, 1997). It is well known that VAM fungi increase nutrient uptake and enhance plant