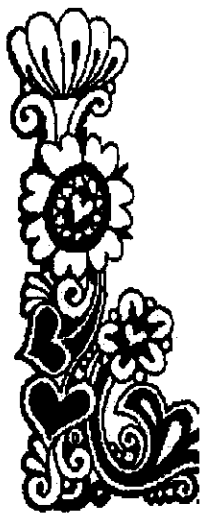

SUMMARY AND CONCLUSIONS

5 SUMMARY AND CONCLUSION

This study was conducted during two consecutive seasons of 1994 and 1995 at the nursery of the Faculty of Agriculture, Moshtohor, Qalyubia Governorate where 6 month old seedlings of annona cv. Cheriymoya guava cv. El. Maamora and mango cv. El-Hindi Bissinara were grown in clay pots (30 cm) in diameter) filled with sand and clay at the ratio of 1 : 1 by volume and the soil were subjected to one of the following treatments:

1- Without sterilization and rock phosphate fertilizeration (control).
2- Without sterilization, and rock phosphate fertilization at 0.25, 0.50 or 1.00 g rock phosphate per pot.
3- Without sterilization and mycorrhizal inoculation with *Glomus macrocarpum* or *Glomus australe* fungi.
4- Sterilization and inoculation with *Glomus macrocarpum* or *Glomus australe* fungi.
5- Sterilization and fertilization with rock phosphate at the rate of 0.25, 0.50 or 1.00 g / pot and inoculation with hycorrhizal fungi i.e. *Glomus macrocarpum* or *Glomus australe* fungi.

However, the treatments were arranged in a completely randomized block design with eight replicate (one seedling / pot) for each treatments.

The obtained results could be summarized as follows :

5.1. Annona seedlings.

5.1.1. Vegetative growth :

All tested treatments succeeded in improving most of the studied vegetative growth parameters i.e. shoot length, number of lateral shoots

per plant, stem diameter and number of leaves per plant as well as leaf content of chlorophyll a & b and carotene. Anyhow, the three levels of rock phosphate fertilization induced the least stimulating effect on shoot length, number of lateral shoots per plant and number of leaves per plant but they failed to affect leaf content of chlorophyll a & b and carotene. On the other hand, inoculating the soil with mycorrhizal fungi enhanced most of the studied vegetative growth parameters. However, soil sterilization increased the stimulating effect of mycorrhizal fungi, whereas *Glomus macrocarpum* surpassed *Glomus australe* in enhancing the vegetative growth parameters. Furthermore, the addition of rock phosphate fertilization at three levels to the sterilized and mycorrhizal inoculated soil induced high stimulating effect on all studied vegetative growth parameters. Briefly, annona seedlings grown in sterilized soil, received high rock phosphate level (1.00 g/pot) and inoculated with *Glomus macrocarpum* fungi had the best vegetative growth parameters (shoot length, number of lateral shoots per plant, stem diameter and number of leaves per plant as well as leaf content of chlorophyll a & b and carotene.

5.1.2. Root growth and dry weight:

The three levels of rock phosphate fertilization succeeded in improving root length, number of lateral roots per plant, shoot dry weight, root system dry weight and total seedling dry weight, but failed to induce any significant effect on top : root ratio. On the other hand, inoculating sterilized soil with mycorrhizal fungi induced more enhancing effect than when inoculation was conducted on unsterilized soil. Furthermore, soil inoculation with *Glomus macrocarpum* fungi exerted more stimulative effect than did *Glomus australe*, particularly when inoculation was conducted on sterilized soil. Moreover, the application of rock phosphate fertilization at three levels to sterilized and mycorrhizal - inoculated soil

caused high remarkable increase in root length, number of lateral roots per plant, shoot dry weight, root system dry weight and total seedling dry weight. Anyhow, under the same levle of rock phosphate fertilization *Glomus macrocarpum* exerted more enhancing effect than did *Glomus australe* fungi. Generally, seedlings grown on sterilized soil, fertilized with high level of rock phosphate and inoculated with *Glomus macrocarpum* had the highest values of root length, number of lateral roots per plant, shoot dry weight, root system dry weight and total seedling dry weight.

5.1.3. Mycorrhizal dependency ratio (MDR):

Mycorrhizal inoculated seedlings grown on sterilized soil showed high mycorrhizal dependency ratio than the analogous ones grown on unsterilized soil.Moreover, *Glomus macrocarpum* inoculated seedlings gave higher MDR than those inoculated with *Glomus australe* fungi- Furthermore, the addition of rock phosphate fertilization to sterilized and mycorrhizal inoculated soil, caused high increase in MDR. Anyhow, seedlings grown on sterilized soil, fertilized with different levels of rock phosphate (particularly the high level) and inoculated with *Glomus macrocarpum* fungi had higher MDR as compared with the analogous ones inoculated with *Glomus australe* fungi.

5.1.4. Leaf mineral content:

Rock phosphate fertilization (0.25, 0.50 or 1.00 g / pot) improved leaf content of nitrogen, phosphorus and potassium of annona seedlings. On the other hand inoculating sterilized or unsterilized soil with *Glomus macrocarpum* or *Glomus australe* fungi enhanced leaf mineral content. Anyhow, mycorrhizal inoculation of sterilized soil caused better enhancement in leaf mineral content as compared with unsterilized soil.

This was more true when the soil was inoculated with *Glomus macrocarpum* fungi, rather than *Glomus australe*. The addition of rock phosphate fertilization to sterilized and mycorrhizal inoculated soil caused high significant increase in leaf content of nitrogen, phosphorus, potassium calcium, magnesium, zinc, manganese iron and copper. Generally, seedlings grown on sterilized soil fertilized with high rock phosphate level (1.00 g / pot) and inoculated with *Glomus* macrocarpum fungi had the highest values of leaf content of nitrogen, phosphorus, potassium, calcium, magnesium, zinc, manganese, iron and copper.

5.1.5. Mycorrhizal infection :

Vesicles formation (small spores) and arbuscules (big spores) increased with mycorrhizal inoculation. Vesicles, arbuscules and mycelia on roots of the control plants either fertilized or not were nill. On the other hand, vesicles, arbuscules and mycelia formation on roots of *Glomus macrocarpum* inoculated seedlings were higher than those formed on *Glomus australe* inoculated seedlings. Furthermore, the addition of rock phosphate to mycorrhizal inoculated seedlings grown on sterilized soil caused high significant increase in vesicles, arbuscules and mycelia formation, particularly high level of rock phosphate with *Glomus macrocarpum* fungi.

5.2. Guava seedlings :

5.2.1. Vegetative growth :

The three levels of rock phosphate fertilization caused significant increase in shoot length, stem diameter and number of leaves per plant, whereas number of lateral shoots per plant and leaf content of chlorophyll

a & b and carotene did not show any significant response to rock phosphate fertilization. Moreover, soil sterilization did not show any additional effect on the previously mentioned vegetative growth parameters. Furthermore, soil inoculation with *Glomus macrocarpum* or *Glomus australe* fungi enhanced all the aforementioned vegetative growth parameters. Anyhow, the two mycorrhizal species exerted statistically similar effect, except for leaf content of chlorophyll a & b and carotene in which *Glomus macrocarpum* induced more stimulating effect than did *Glomus australe* fungi. In addition, the addition of rock phosphate to inoculated soil with *Glomus macrocarpum* or *Glomus australe* fungi induced more enhancing effect on the studied vegetative growth parameters. Generally, all the combinations of rock phosphate fertilization and soil inoculation with mycorrhizal fungi induced statistically similar effect, except for the high level of rock phosphate with *Glomus macrocarpum* fungi which proved to be the superior treatment in improving the vegetative growth of guava seedlings.

5.2.2. Root growth and dry weight :

Rock phosphate treatments caused significant increase in root length and total seedling dry weight and failed to affect number of lateral roots per plant, shoot dry weight and root system dry weight. Furthermore, inoculating unsterilized or sterilized soil with *Glomus macrocarpum* or *Glomus australe* fungi enhanced the aformentioned parameters. Besides, the addition of rock phosphate fertilization to mycorrhizal inoculated soil induced more stimulating effect on root growth and dry weight. Both mycorrhizal species induced similar effect finally, seedlings grown on sterilized, fertilized with high level of rock phosphate and inoculated with

Glomus macrocarpum fungi showed the highest values of root growth and dry weight parameters.

5.3. Mycorrhizal dependency ratio (MDR) :

Seedlings grown on unsterilized soil and inoculated with *Glomus macrocarpum* or *Glomus australe* fungi showed relatively lower values of mycorrhizal dependency ratio as compared with the analogous ones grown on sterilized soil. Furthermore, seedlings grown on sterilized soil, fertilized with different levels of rock phosphate and inoculated with *Glomus macrocarpum* fungi gave higher MDR as compared with the analogous ones inoculated with *Glomus australe* fungi. In this concern, seedlings grown on sterilized soil, fertilized with high level of rock phosphate and inoculated with *Glomus macrocarpum* fungi showed the highest mycorrhizal dependency ratio.

5.2.4. Leal mineral content :

The three levels of rock phosphate increased only leaf phosphorus content, and failed to affect other studied leaf mineral content. Furthermore, inoculating unsterilized or sterilized soil with *Glomus macrocarpum* or *Glomus australe* fungi improved leaf conetn of phosphorus, potassium, zinc, managenese and iron. The two mycorrhizal species induced similar effect in this respect. Anyhow, seedlings grown on sterilized soil, fertilized with high level of rock phosphate and inoculated with *Glomus macrocarpum* produced leaves high in their content of nitrogen, phosphorus potassium, zinc, managanese and iron.

5.2.5. Mycorrhizal infection percent:

Vesicles, arbuscules and mycelia formation on roots of uninoculated plants control whether fertilized or not were nill. On the other hand, vesicles and arbuscules on roots of *Glomus macrocarpum* inoculated seedlings were higher as compared with the analogous ones inoculated with *Glomus australe* fungi, whether seedlings were grown on sterilized or unsterilized soil. Generally, *Glomus macrocarpum* inoculated seedlings, fertilized with different levels of rock phosphate had higher percent of vesicles and arbuscules on their roots than the analogous ones inoculated with *Glomus australe* regardless of rock phosphate level.

5.3. Mango seedlings :

5.3.1. Vegetative growth :

Rock phosphate fertilization increased shoot length, stem diameter and number of developed leaves per plant, whereas, number of lateral shoots per plant and leaf content of chlorophyll a & b and carotene didn ot respond to rock phosphate fertilization. Moreover, soil sterilization had no additional effect on the studied vegetative growth parameters. Soil inoculation with *Glomus macrocarpum* or *Glomus australe* fungi enhanced the previously mentioned vegetative growth parameters. Anyhow, the addition of rock phosphate fertilization to the inoculated soil increased the stimulating effect of mycorrhizal fungi on vegetative growth. Generally, seedlings grown in sterilized soil fertilized with different levels of rock phosphate (particularly, the high level) and inoculated with *Glomus macrocarpum* fungi were superior in their vegetative growth parameters as compared with the analogous ones inoculated with *Glomus australe* fungi.

5.3.2. Root growth and dry weight :

Rock phosphate fertilization improved root length, and shoot dry weight, but failed to affect number of lateral roots per seedlings root system dry weight and total seedling dry weight. Moreover, inoculating the soil with *Glomus macrocarpum* or *Glomus australe* fungi improved the previously mentioned parameters. Anyhow, *Glomus macrocarpum* surpassed *Glomus australe* in this respect. Furthermore, the addition of rock phosphate fertilization to mycorrhizal inoculated seedling increased the stimulating effect of mycorrhizal fungi particularly the high level of rock phosphate with *Glomus macrocarpum* fungi.

5.3. Mycorrhizal dependency ratio MDR:

Seedling grown on sterilized or unsterilized soil and inoculated with *Glomus macrocarpum* fungi had higher values of mycorrhizal dependency ratio as compared with that of *Glomus australe* inoculated seedlings whether grown on sterilized or unsterilized soil. Moreover, seedlings grown on sterilized soil, fertilized wtih different levels of rock phosphate and inoculated with *Glomus macrocarpum* fungi (particularly, those received high level of rock phosphate) gave higher mycorrhizal dependency ratio as compared with the analogous ones inoculated with *Glomus australe* fungi.

5.3.4. Leaf mineral content :

Rock phosphate fertilization improved only leaf phosphorus content and failed to affect leaf content of nitrogen, potassium, calcium, magnesium, zinc, iron, manganese and copper. On the other hand, inoculating unsterilized soil with *Glomus macrocarpum* or *Glomus*

australe fungi enhanced leaf content of the previously mentioned minerals except for nitrogen and calcium. Besides, both mycorrhizal species induced similar effect in this respect. Furthermore, the addition of rock phosphate fertilization to mycorrhizal inoculated soil enhanced the stimulative effect of mycorrhizal species on leaf mineral content.

5.3.5. Mycorrhizal infection percent:

Vesicles and arbuscules formation on roots of *Glomus macrocarpum* inoculated seedlings were higher as compared with the analogous ones inoculated with *Glomus australe*. Moreover, the addition of rock phosphate fertilization to the mycorrhizal inoculated seedlings increased the infection percentage, particularly when *Glomus macrocarpum* fungi were concerned.