Growth and Nutritional Status of Apple Plants in the Nursery in Response to Various Fertilization Strategies

T. Sotiropoulos[1], G. Ebert[2], S. Pavlakos[3], I. Therios[4], E. Chatzigiannakis[5], N. Koutinas[6].

[1]Greek Agricultural Organization 'Demeter', Pomology Institute, R.R. Station 38, 59035 Naoussa, Greece. (thosotir@otenet.gr)

[2]Head of R&D, COMPO GmbH & Co KG. Gildenstrasse 38, 48157 Munster, Germany.

[3]Product and R&D manager, COMPO Hellas S.A. Egialias 54, 15125 Marousi, Athens, Greece.

[4]School of Agriculture, Laboratory of Pomology, Aristotle University of Thessaloniki, 54124, Thessaloniki, Greece.

[5]Greek Agricultural Organization 'Demeter', Land Reclamation Institute, 57400 Sindos-Thessaloniki, Greece.

[6]Alexander Technological Educational Institute of Thessaloniki, Department of Crop Production, P.O. Box 141, 57400, Thessaloniki, Greece.

INTRODUCTION

In most nurseries, fruit trees are usually produced after a two-year cycle. In the first year, rootstocks are planted and in the summer, the selected cultivars are budded onto them. To ensure optimal growing conditions for rootstocks in conventional nurseries, different mineral fertilizers are used. Controlled release fertilizers offer the benefit to minimize N loses and increase nutrient use efficiency (Allen, 1986; Fernandez-Escobar et al., 2004). The use of controlled release fertilizers as part of a best management program to improve nutrient uptake efficiency and mitigate nutrient runoff is considered by many nurseries. The aim of this research was to study the efficacy of various fertilization strategies on growth and nutritional status of apple plants in the nursery.

METHODS

The research was conducted in a commercial nursery in northern Greece. For the experimental purposes, rooted cuttings of the apple rootstock 'PI 80' were planted at a spacing 75 x 75cm in the nursery. The experiment included the following fertilization treatments:

1. Control (no fertilization)
2. Hydrocomplex (12-11-18+2.65 MgO+19.9 SO_3+0.02 Zn+0.015 B) 55 kg/0.1 ha, Nitrabor (15.5-0-0+19.2Ca+0.3B) 30 kg/0.1 ha, Amidas (40-0-0+ 5.6S) 100 kg/0.1 ha
3. 2nd treatment plus 'basacote plus 6M' 16-8-12 + 2+0,02B, 0,05Cu, 0,4Fe, 0,06Mn, 0,015Mo, 0,02 Zn (10g/plant)
4. 2nd treatment plus 'basacote plus 6M' (20g/plant)
5. 2nd treatment plus 'basacote plus 6M' (30g/plant)
6. 2nd treatment plus 'basacote plus 9M' 16-8-12 + 2+0,02%B, 0,05%Cu, 0,4%Fe, 0,06%Mn, 0,015%Mo, 0,02%Zn (10g/plant)
7. 2nd treatment plus 'basacote plus 9M' (20g/plant)
8. 2nd treatment plus 'basacote plus 9M' (30g/plant)

During planting, the fertilizers 'Basacote plus 6M', 'Basacote plus 9M', and 'Hydrocomplex' were applied. In April 13 and May 17, the fertilizers 'Nitrabor' and 'Amidas' were applied respectively. Basacote are coated

controlled release fertilizers that were applied in the planting hole, whereas the rest ones were split applied by hand.

The following measurements were performed: trunk diameter, plant height, number of shoots per plant and fresh weight of roots and shoots (at the end of the experiment). Furthermore, leaf and soil analyses were performed at different intervals during season. The experimental design was a randomized block with four replications of eight treatments (six plants per replication). Differences between means were evaluated by using the Duncan's multiple range test at $P \leq 0.05$.

RESULTS AND DISCUSSION

The higher trunk diameter was measured in the treatment No 7, however it was not significantly different than the treatments 4, 5, 6 and 8. When increasing the dose of the fertilizers 'Basacote plus 6M' and 'Basacote plus 9M' from 10 to 30 g, trunk growth was not affected significantly.

The higher height of the plants (measured on the central leader) was measured in the treatment No 7, however it was not significantly different than 8. By increasing the dose of the fertilizers 'Basacote plus 6M' and 'Basacote plus 9M' from 10 to 30 g, shoot height was not affected significantly.

The higher number of the total shoots per plant was recorded in the treatments No 5 and 8. Increasing the dose of the fertilizers 'Basacote plus 6M' and 'Basacote plus 9M' from 10 to 30 g, resulted in the formation of more shoots per plant.

The higher total length of all shoots per plant was measured in the treatment No 5, however it was not significantly different than the treatment 8. Increasing the dose of the fertilizers 'Basacote plus 6M' and 'Basacote plus 9M' from 10 to 30 g, resulted in the formation of higher total length of all shoots per plant which was significantly higher than the treatments 1 and 2.

The higher weight of the root system was measured in the treatment No 5, however it was not significantly different than the treatment 8. Increasing the dose of the fertilizers 'Basacote plus 6M' and 'Basacote plus 9M' from 10 to 30 g, resulted in the formation of higher weight of the root system which was significantly higher than the treatments 1 and 2.

Before planting, soil N concentration of the control was just below the critical levels and was diminished during the next sampling dates. Soil N concentration in the treatments No 3, 4, 5 ,6 , 7 and 8 was higher than treatment 2.

CONCLUSIONS

Our results showed that the application of the controlled release fertilizers improved the growth parameters of apple trees in the nursery, thus increasing their quality.

REFERENCES

Allen, S.E. 1986. Slow release nitrogen fertilizers in crop production. ASA., CSSA, Madison: 192-206.

Fernández-Escobar, R., M. Benloch, E. Herrera and J. Garcia-Novelo. 2004. Effect of traditional and slow-release N fertilizers on growth of olive nursery plants and N losses by leaching. *Sci. Hort.* 101:39-49.