Effect of Mineral, Organic Nitrogen Fertilization and Some Other Treatments on vegetative growth of Picual Olive Young Trees.

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Abstract: This study was carried out through two successive seasons (2007& 2008) on cultivated Picual olive young trees grown at the Research Station Farm of National Research Center, El Nobarya, El Behera governorate. The investigation aimed to study the effect of applying mineral, organic fertilizers and some other treatments on growth parameters at the first two years of planting. Planting holes were prepared for control plants in the first season only. Each treatment received 100 g actual nitrogen/plant/year as recommended by M.A.R.L. (2007). The following treatments were applied: T1 : control (mineral nitrogen + planting hole preparation), T2(100%mineral nitrogen), T3(100% organic N as cattle manure), T4(50% mineral N + 50% organic N as chicken manure), T5 (100%mineral nitrogen + humic acid as soil application), T6(100% mineral nitrogen + activated dry yeast as soil application), T7 (100%mineral nitrogen + GA_3 spray) and T8 (100% mineral nitrogen + sea algae as soil application).At the end of each season, plant height, stem diameter, lateral shoot number, lateral shoot length, leave numbers per plant, Percentage of plant height increment, whole plant dry weight were determined and recorded. The obtained results revealed that as follow: plant height, shoot number, shoot length, leaves number and stem diameter were not affected by different treatments in both seasons. Meanwhile, whole plant dry weights were improved by humic acid treatment compared with control and all other treatments in Picual cv. [Journal of American Science. 2010;6(12):174-179]. (ISSN: 1545-1003).

Keywords: Nitrogen Fertilization; vegetative growth; Picual Olive.

1. Introduction

The olive tree (*Olea europaea* L.) Family Oleaceae is a widely distributed tree grown in many arid areas of the world. The Mediterranean region is its native habitat. Olive is adapted to extremely arid conditions because of its special leaf structure and ramified root system.The olive tree is an evergreen, one of the oldest cultivated tree, about 8000 years ago.

World olive production perform an important role in the economy of many countries such as Spain, Italy, Greece, Turkey and Tunisia.The olive tree yield has two main products:oil and table olives, produced from several cultivars such as Coratin,Klamata,Picual. Total cultivated area in Egypt with Picual cvs. Represent about60% of total olive cultivation. The Egyptian olive production reached about 507053 tons produced from 110764 Feddan according to the staticics of M.A.L.R (2007a). This investigation aimed to study the effect of some mineral and organic nitrogen fertilization sources as well as some other treatments (humic acid, activated dry yeast, GA3 and sea algae) on some growth parameters and leaf mineral contents of Kalamata young trees at the first two years of planting. However, it is hope also to find out a fertilization program can replace the mineral nitrogen one which will be beneficial for organic production of olives and save human health and environment.

Xiloyannis *et. al.* (2000) working on mineral nutrient uptake from the soil in irrigated olive trees, cultivar Coratina, over six years after planting they recorded that, the nutrient demand was relatively steady during the different stages of the year. The results showed that demand for P and K is minimal during the first four years after planting and can be fulfilled by naturally supplied soils. Low doses of N should be applied through localized fertilization during the year. Nawaf and Yara (2006) found that, young olive trees benefit from low levels of NPK and N alone and additional fertilizers would not be significant. However, NPK are considering being essential element for plant growth and development. The 16 g NPK and 32 g N significantly gave the highest shoot and root dry weight, this probably due to nitrogen concentration which increased dry matter accumulation in roots and decreased shoot: root ratio. Monge *et. al.* (2000) reported that, organic wastes fertilization did not lead to significant increases in olive mineral leaf concentrations in the first year trial. Hegazy *et. al.*(2007) studied the effect of organic and bio-fertilization on vegetative growth and flowering of Picual olive trees, they recorded that, N and K contents in leaf increased significantly with applying 100% organic fertilization (poultry manure), but no significant difference was observed on leaf P content in both seasons. The same treatment gave the highest Fe leaf content in both seasons and Mn in the second

season, while leaf Zn content increased in second season with using 100% mineral fertilization.

Fernández-Escobar *et. al.* (1999) mentioned that, under field conditions, foliar application of leonardite extracts (humic substances extracted) stimulated shoot growth and promoted the accumulation of K, B, Mg, Ca and Fe in leaves. However, when leaf N and leaf K values were below the threshold limit for the sufficiency range, foliar application of humic substances was ineffective to promote accumulation of these nutrients in leaves. Abdel Fatah *et. al*.(2008) mentioned that, soil drench application of humic acid to Tifway Bermodagrass hybrid improved growth parameters and NPK leaves cotents.

Mostafa and Abou Raya (2003) recorded that, all dry yeast soil application improved growth parameters of Grand Nain banana cv. Compared with control without dry yeast treatment.

Smith and Schwabe (1984) recorded that, top growth of *Quercus robur* could be further accelerated by application of gibberellic acid (GA_3) as foliar spray. Eman and Abd-Allah (2008) reported that, progressive increase on percentages of N, P, and K in the Superior grapevine leaves was observed as a result of increasing concentration of algae till 50%.

This investigation aimed to study the effect of mineral and organic nitrogen fertilization sources and some other treatments (humic acid, activated dry yeast, GA_3 and sea algae) on growth parameters of Picual young trees at first two years of planting. That to improve and push tree growth through these years.

2. Material and Methods

This study was carried out through two successive seasons (2007& 2008) on newly cultivated Picual olive cv. young trees in the Expermental research station of National Research Center at El Nobarya, El Behera governorate Egypt. The investigation aimed to study the effect of applying mineral, organic nitrogen fertilizers and some other treatments on young Picual cv. trees at the first two years of planting. The soil was characterized by: pH = 8.82, EC =1.11 dS/m, organic matter = 0.31%, $CaCO_3$ =12.8 %, Sand = 63 %, Silt = 13 % and clay = 3%. The soil texture grade was sandy. Drip irrigation system was applied using river Nile water. Planting distance was 5 × 5 meters apart.

In control plots, planting holes were prepared by adding 50 kg cattle manure, 1kg super phosphate, 1/4 kg potassium sulfate and 1/2 kg agricultural sulfur and each treatment received 100 g actual nitrogen/plant/year in each season as recommended by M.A.R.L. (2007a).

3. Results and discussion

The following treatments were applied:

1- Control: recommendation of M.A.R.L. (2007a) (100g actual nitrogen 500 g ammonium sulfate as mineral nitrogen source) + planting holes preparation.
2- Mineral nitrogen only 100 %.
3- Organic nitrogen source 100 % (cattle manure 100g actual nitrogen).
4- Mineral nitrogen source 50 % + organic nitrogen source 50 % (chicken manure).
5- Mineral nitrogen source 100 % + humic acid (monthly doses from March to November each 20 ml/plant).
6- Mineral nitrogen source 100 % + actived dry yeast as drench treatment three times in March, July and October each at 30 g/plant.
7- Mineral nitrogen source 100 % + one spray of GA_3 acid at 50 ppm in March.
8- Mineral nitrogen source 50 % + sea algae in March and June each at 50 g/plant.

- Cattle manure analysis was: N = 1.6%, P = 0 46% and K = 0.51%.
- Chicken manure analysis was: N =3.47%, P =0.67% and K = 0.64%.
- Sea algae analysis: N =8%, P = 2%, K = 4%, chelate microelements = 4% and traces of vitamins + amino acids.

Ammonium sulfate was divided into five equal doses through growing season. All these treatments were repeated in the second season except holes preparation with control plants only in the first season. The treatments were arranged in randomized complete block design in a simple experiment with four replicates for each treatment and each replicate was represented by one plant. At the end of each season at mid November four plants as replicates for each treatment were removed genteelly with their root system to estimate and record the following data for each cv individually:

1- Plant height (cm).
2-Stem diameter (cm) was measured at 10 cm above soil surface.
3- Lateral shoots length average (cm).
4- Leaf number per plant.
5- Lateral shoot number per plant.
6-Percentage of plant height increment
7- Whole plant dry weight (g).

Data obtained throughout this study were statistically analyzed using the analysis of variance method as reported by (Snedecor and Cochran, 1980), and the differences between means were differentiated by using Duncan's range test.

Effect of treatments on growth characters:

Plant height fig. (1) show that, insignificant differences were recorded among treatments in both seasons. But the tallest plants were recorded by control treatment in the first season (85.8 cm) and in the second season (141 cm). while the lowest plant height in both seasons was obtained by cattle manure supply alone (67.8 cm & 137 cm) respectively.

Stem diameter fig. (2) show that, the eighth treatment with sea algae had the lowest significant value (1.23 cm) compared with most other treatments in the first season whereas, in the second season the differences lake significance among treatments .However, the lowest value in the second season was recorded by 100%cattle manure (3.55 cm).

Shoot number fig.(3) show that, number of shoot per plant showed insignificant differences among treatment in both seasons. But we can notice that , control treatment recorded the highest value in first season(18.3) .In the second season the eighth treatment with sea algae had the highest value (38.3) and the lowest value in both seasons was recorded by 100% cattle manure (15.5&37 respectively).

Shoot length fig.(4) show that, average of shoot length is obvious that the sixth treatment with dry yeast recorded the highest significant value .(29.0 cm)as compared with the third one in the first season but in the second season no significant differences could be noticed among treatments. However in the second season the highest value was achieved by fifth treatment with mineral nitrogen+humic acid (57.5 cm) and the lowest value was recorded by the first treatment (37 cm).

Leaf number fig.(5) show that, leaf number per plant, result indicated in table 1 during the first season that the highest number of leaves per plant were significant for treatment of mineral nitrogen only (treatment2) compared to all organic treatments, while humic acid treatment gave the best results compared to improve the vegetative growth of other, however, in second season sea algae was less impact on number of leaves per plant.

Percentage of plant height increment Fig. (6) show that, the seventh treatment recorded the highest significant values in both seasons compared with most of other treatments (120.6% & 89.22% respectively).

Whole plant dry weight fig.(7) show that, the fifth treatment with humic acid showed the highest significant value (183.5 g.) compared with all other treatment in the first season. In addition, in the second season the same treatment had higher significant value (873.3 g.) than those of the third and eighth treatments.

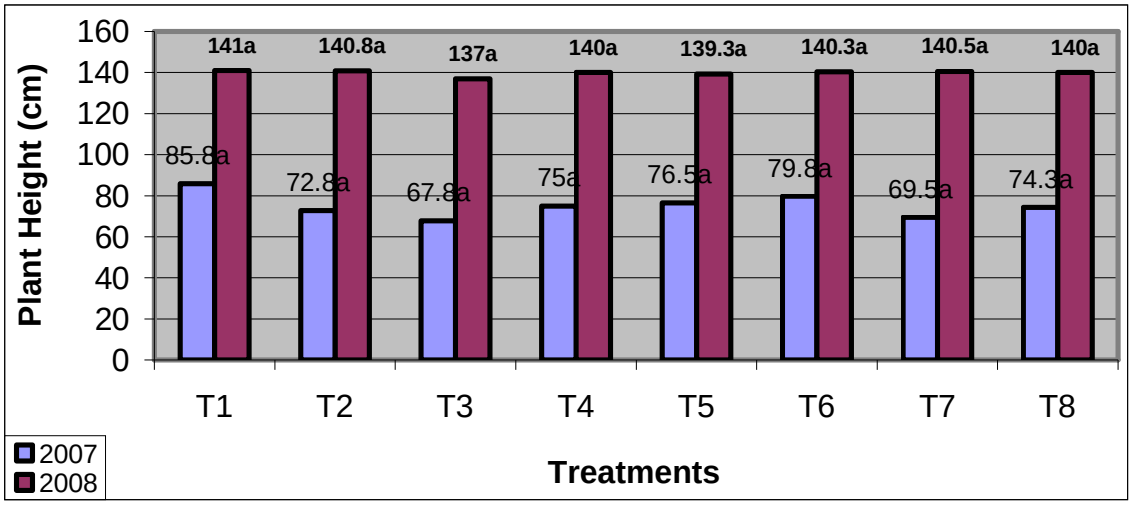

Fig (1): Effect of mineral, organic nitrogen and some other treatments on plant height (cm) of Picual olive cv. young trees in 2007 and 2008 seasons.

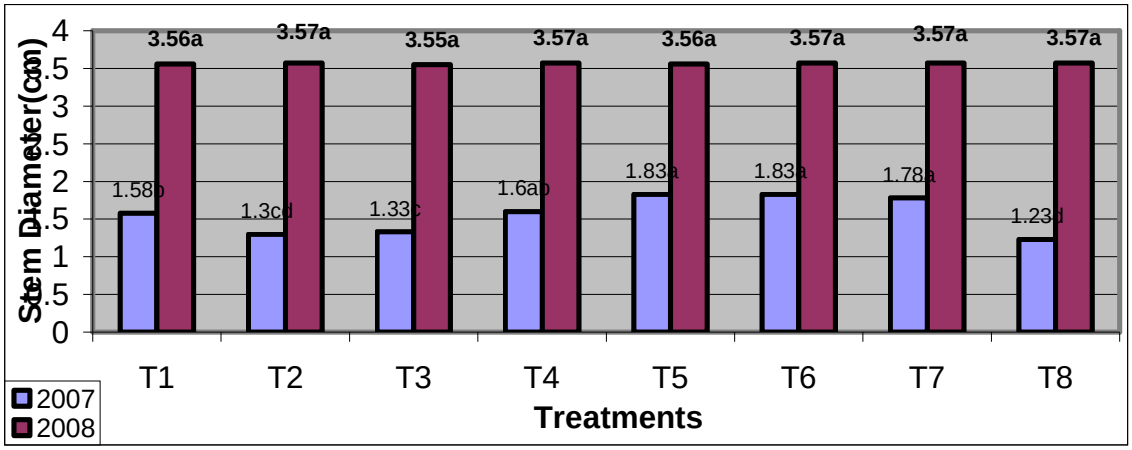

Fig (2): Effect of mineral, organic nitrogen and some other treatments on stem diameter(cm) of Picual olive cv. young trees in 2007 and 2008 seasons.

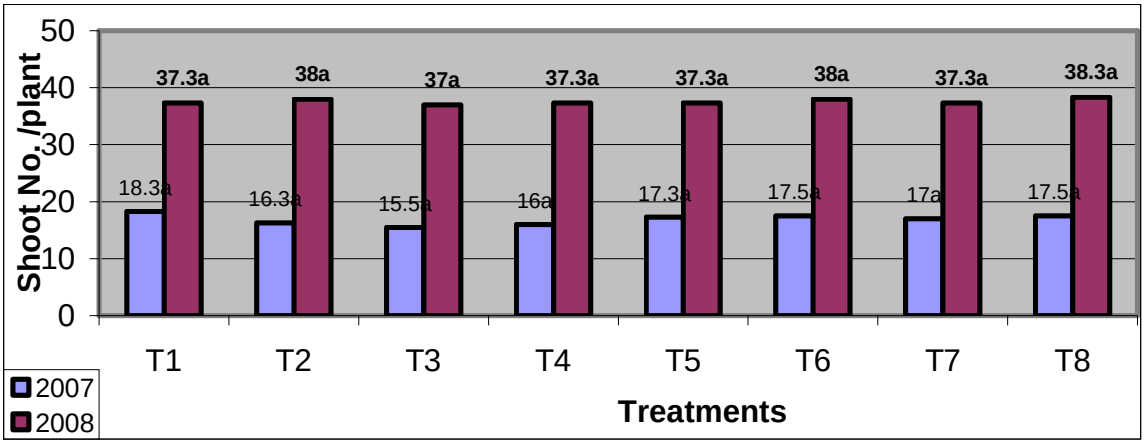

Fig (3): Effect of mineral, organic nitrogen and some other treatments on shoot No./plant of Picual olive cv. young trees in 2007 and 2008 seasons.

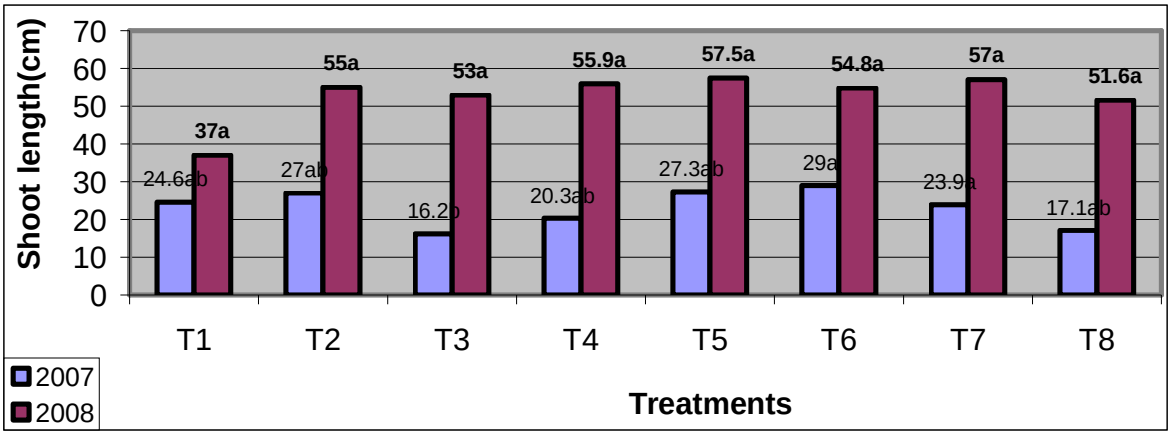

Fig (4): Effect of mineral, organic nitrogen and some other treatments on average shoot length(cm) of Picual olive cv. young trees in 2007 and 2008 seasons.

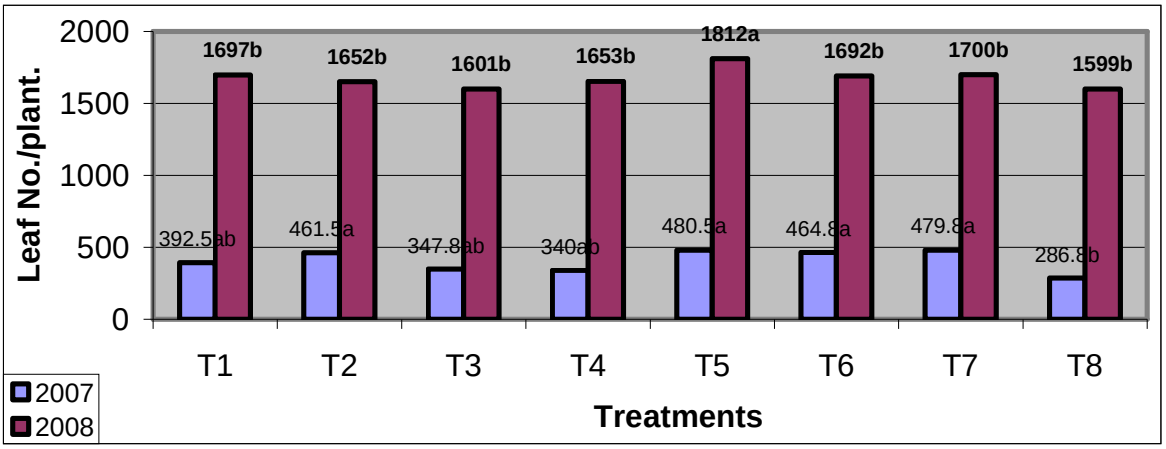

Fig (5): Effect of mineral, organic nitrogen and some other treatments on leaf no. /plant of Picual olive cv. young trees in 2007 and 2008 seasons.

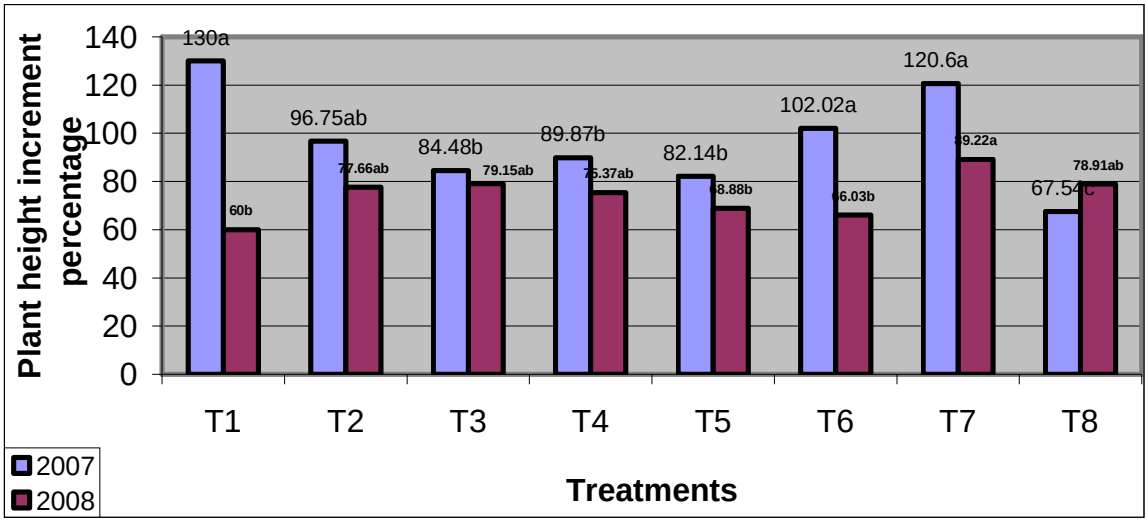

Fig (6): Effect of mineral, organic nitrogen and some other treatments on percentage of plant height increment of Picual olive cv. young trees in 2007 and 2008 seasons.

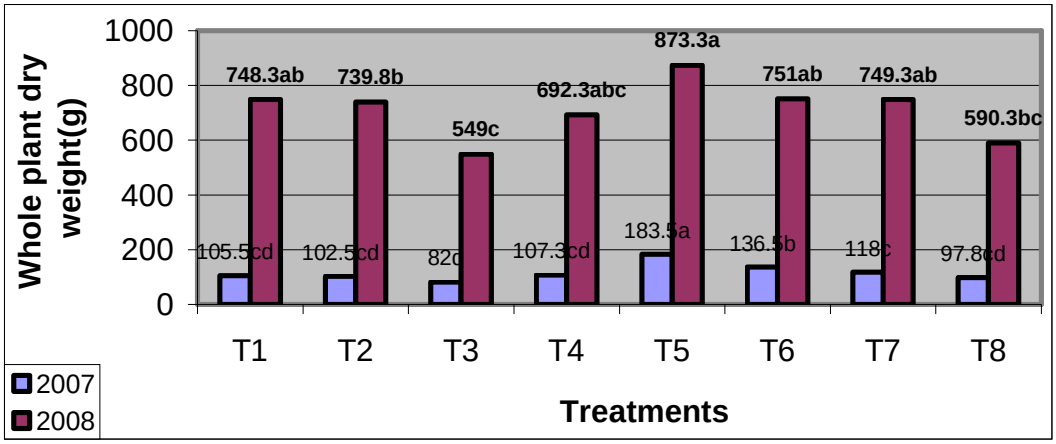

Fig (7): Effect of mineral, organic nitrogen and some other treatments on whole plant dry weight(g) of Picual olive cv. young trees in 2007 and 2008 seasons.

Finally it could be noticed that plant height, shoot number, shoot length, leaves number and stem diameter were not affected by different treatments in both seasons. Meanwhile, whole plants were improved by humic acid treatment compared with control and all other treatments in Picual cv. These results are harmony with those found by Fernández-Escobar *et. al.*(1999) they reported that, foliar application of leonardite extracts(humic substances extracted) under field conditions, stimulated shoot growth of young olive plants. Moreover we can added that, growth parameters were not affected by most treatment may be attributed to low nutritional demand of young olive trees as mentioned by Xiloyannis *et. al.* (2000) they showed that, demand of irrigated olive trees, cultivar Coratina for P and K is minimal during the first four years after planting and can be fulfilled by naturally supplied soils. Low doses of N should be applied through localized fertilization during the year. Moreover Nawaf and Yara (2006) found that, young olive trees benefit from low levels of NPK and N alone and additional fertilizers would not be significant. However, NPK are consider to be essential element for plant growth and development. The 16 g NPK and 32 g N significantly gave the highest shoot and root dry weight, this probably due to nitrogen concentration which increased dry matter accumulation in roots and decreased shoot: root ratio.

References

1. Abdel Fatah H. Gehan; Boshra A. El Sayed and S.M. Shahin (2008):The role of humic acid in reducing the harmful effect of irrigation with saline water on tifway turf.J. Bio. Chem. Environ. Sci...Vol.3 (1):75-89.
2. EmanA. Abd El Moniem and A.S.E. Abd-Allah (2008): Effect of algae extact as foliar spray on vegetative growth, yield and berries quality of Superior grapevines. America Eurasian J. Agic. &Environ.Sci., 4(4):427-433.
3. Fernández-Escobar R.; M. Benlloch; D. Barranco; A. Dueñas and J. A. Gutérrez Gañán (1999): Response of olive trees to foliar application of humic substances extracted from leonardite . Scientia Horticulturae Vol. 66, 3-4, October, Pages 191-200.
4. Hegazy, E. S.; M. R. El-Sonbaty ; Ahmed M. Dorria and T. F. El-Sharnoby (2007): Effect of organic and bio-fertilization on vegetative growth and flowering of Picual olive trees.Wold Journal of Agricultural Science 3(2):210-217.
5. M.A.L.R. (2007): Ministry of Agriculture and Land Reclamation Economic Affairs - Study of Important the Agriculture Statics, Vol.(2)p 353.
6. M.A.L.R. (2007a): Ministry of Agriculture and Land Reclamation.Modern technique for olive cultivation and production.Horticultur Reseasch Institute, Agriculture Research Center bulletin No. 15(in Arabic).
7. Monge, E., J. Val; J.L. Espada; F. Orús and J. Betran (2000): Effects of organic wastes on olive mineral nutrition and its influence on fruit quality. Preliminary results for macronutrients. Acta Horticulturae 512:199-208.
8. Mostafa, E. A. M. and M. S. Abou Raya (2003): Effect of soil application of active dry yeast on growth, yield and fruit qulity of Grand Nain banana cv.. Arab Univ. J. of Agric. Sci. Vol. 12(2):693-704.
9. Nawaf, M. Ferihat and Yara K. Masa`deh (2006): Response of two-year-old tree of four olive cultivars to fertilization. Amrican-Erasian J. Agric. & Environ. Sci., 1 (3): 185-190.
10. Smith D. J. And W. W. Schwabe (1984): Acceleration of early growth of seedlings and rooted cuttings of *Quercus robur* L.. Forestry , 57(2):143-157
11. Snedecor , G. W. and W. G. Cochran (1980) Statistical Methods . 7th Ed.507 pp Iowa State Univ. Press, Ames . Iowa , U.S.A.
12. Xiloyannis C.; G. Celano; A.M. Palese; B. Dichio and V. Nuzzo (2000): Mineral nutrient uptake from the soil in irrigated olive trees, cultivar Coratina, over six years after planting. Acta Horticulturae 586:

7/1/2010