# Effect of Mineral, Organic Nitrogen Fertilization and some other Treatments on Vegetative Growth of Kalamata Olive Young Trees.

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**Abstract:** This study was carried out through two successive seasons (2007& 2008) on Klamata 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, leaves numbers per plant, percentage of plant height increment, whole plant dry weight were determined and recorded. The obtained results revealed that plant height, shoots number, shoot length, leaves number and stem diameter were not affected by different treatments. However the fifth treatment with humic acid and seventh treatment with $GA_3$ spray gave highest significant values of leaf numbers per plant compared with all other treatments in the first season, but in the second one, the differences among treatments lake significance. As for Whole plant dry weight, no significant differences among treatments could be noticed in both seasons. [Journal of American Science 2010;6(12):338-343]. (ISSN: 1545-1003).

**Keywords:** Klamata olive; mineral fertilizer; organic fertilizer; growth parameter; plant

## 1. Introduction:

The Egyptian olive production reached about 507053 tons produced from 110764 feddan and the total area reached about 135692 feddan (according to the statistics of M.A.L.R. (2007).

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.

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, the highest values of the studied growth characters were obtained with 100% organic fertilization (poultry manure).

Fernández-Escobar *et. al.*(1999) mentioned that, foliar application of leonardite extracts(humic substances extracted) to young olive plants stimulated shoot growth when they were growing without the addition of mineral elements to the irrigation water, but did not promote growth when applied to plants watered with a nutrient solution, although growth of fertilized plants was greater than that of unfertilized ones. Under field conditions, foliar application of leonardite extracts stimulated shoot growth and promoted the accumulation of K, B, Mg, Ca and Fe 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.

Sidahmed (1987) working on eight-month-old seedlings of sour orange were sprayed with 0, 25, 50, 75, 100 and 200 ppm of the water soluble salt of gibberellic acid at 15-day intervals.Data collected two months later revealed that $GA_3$ significantly increased ($P < 0.05$) seedling height by internodal expansion and that the seedling height was positively

correlated with $GA_3$ level. The percentage increase in height was 13.95, 18.68, 19.63, 25.90, 31.80 and 38.80 respectively for 0, 25, 50, 75, 100 and 200 ppm $GA_3$ treatments. Smith and Schwabe (1984) recorded that, top growth of *Quercus robur* could be further accelerated by application of gibberellic acid (GA3) as foliar spray. Sheo (1999) mentioned that, the seedling growth of Karun Jamir (*C. aurantium*) and Cleopatra mandarin (*C. reshni*) was significantly increased by spraying with urea and $GA_3$ alone or in combination. However, $ZnSO_4$ alone did not have any significant effect on growth. Seedling growth of both the species was greater with the combinations 0.5% urea + 50 ppm $GA_3$ + 0.2% ZnSO4 and 0.5% urea + 50 ppm $GA_3$. The results indicated that the seedling growth of Karun Jamir and Cleopatra mandarin can be increased considerably by two sprays of 0.5% urea + 50 ppm $GA_3$ in the 3rd and 8th months after sowing.

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 Kalamata young trees at first two years of planting.

**2. Materials and Methods:**

This study was carried out through two successive seasons (2007& 2008) on Kalamata olive young trees grown at 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 vegetative growth characters of young Kalamata olive 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.

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 5cm above the grafting zone.
3- Lateral shoot 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.

**3. Results and Discussion:**

Effect of treatments on growth characters:

In control plots, planting holes were prepared by adding 50 kg c

Fig.( 1 ) show that, Insignificant differences among treatment were found in both seasons in values of plant height But one can notice that the second treatment (100% mineral nitrogen) gave the highest value in the first season(38.8 cm) and the lowest value was obtained by humic acid and sea algae treatments (35 cm &35 cm). In the second season the sixth treatment recorded the highest value (78.3 cm) and the lowest values were shown by the forth treatment with 50% chicken manure and seventh treatment with $GA_3$ (77 cm &77 cm).

Stem diameter fig.( 2 ) show that, data showed insignificant differences among treatments in

both seasons . In addition all treatments recorded the same value in the second season (1.5 cm).

Lateral shoot number per plant, fig.( 3 ) show that, insignificant differences among treatments in both seasons. However, the first treatment (control) recorded the lowest value in first season (3.5) compared with other treatments. In the second season sixth treatment with yeast showed the lowest value (7.3).

Lateral shoot length fig.( 4 ) show that, Insignificant differences among treatments in both seasons were recorded. But one can notice that, the sixth treatment with yeast gave the highest value in both seasons (18.3 cm &68.7 cm respectivly).

On the other hand, fig (5) showed that the fifth treatment with humic acid and the seventh treatment with GA3 spray gave the highest significant values of leaf number fig.( 5 ) show that, per plant compared with all other treatments in the first season, but in the second season, the differences among treatments lake significance.

Percentage of plant height increment fig.( 6 ) show that, The seventh and the eighth treatments gave lower significant values than other treatments in the first season .But in the second season differences among treatments lake significant .

Whole plant dry weight fig.( 7 ) show that, result indicated that treat.5(100% mineral N+HA) showed the significantly greatest value (80g) compared with treat. 8 (50%mineral N +sea algae )(34g) in the first season. Differences among other studied treatments were insignificant. In the second season, no significant differences could be detected, although the eighth treatment showed the lowest value (144.30 g.).

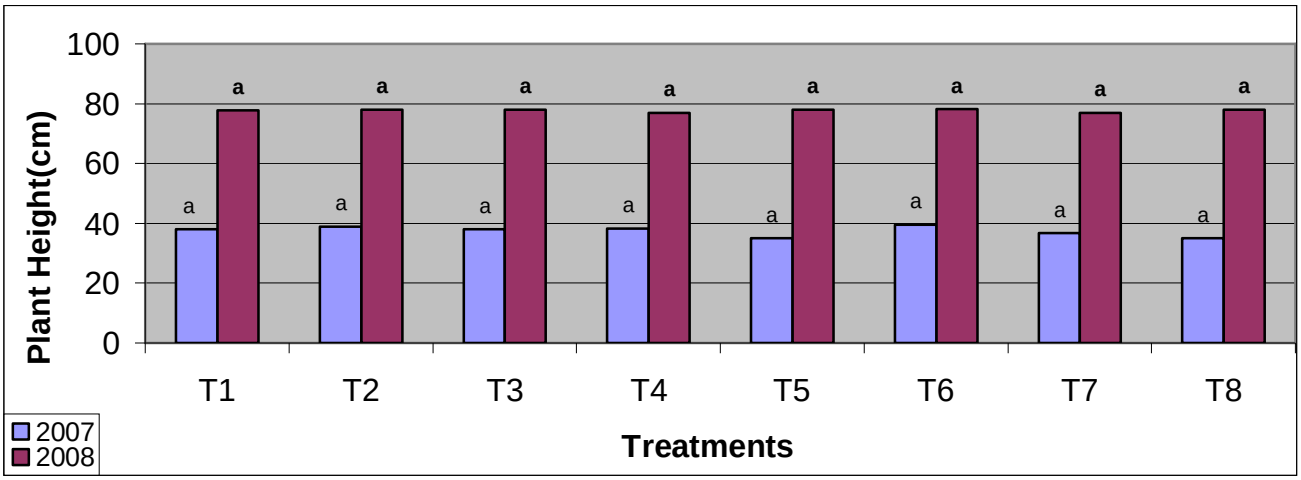


Fig. (1): Effect of mineral, organic nitrogen and some other treatments on plant height(cm) of Klamata olive cv. young trees in 2007 and 2008 seasons.

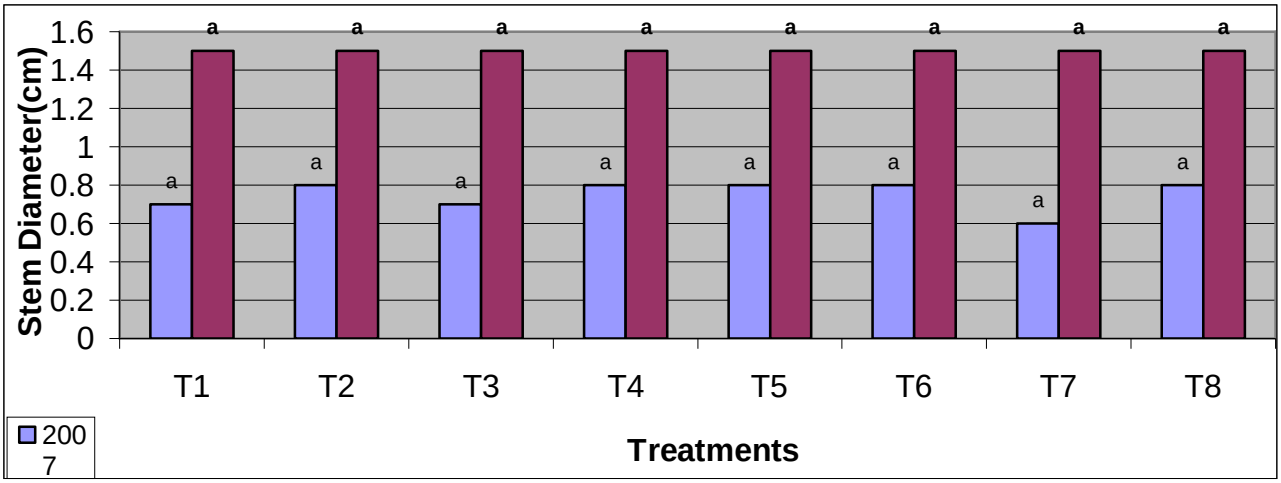


Fig. (2): Effect of mineral, organic nitrogen and some other treatments on stem diameter(cm) of Klamata olive cv. young trees in 2007 and 2008 seasons.

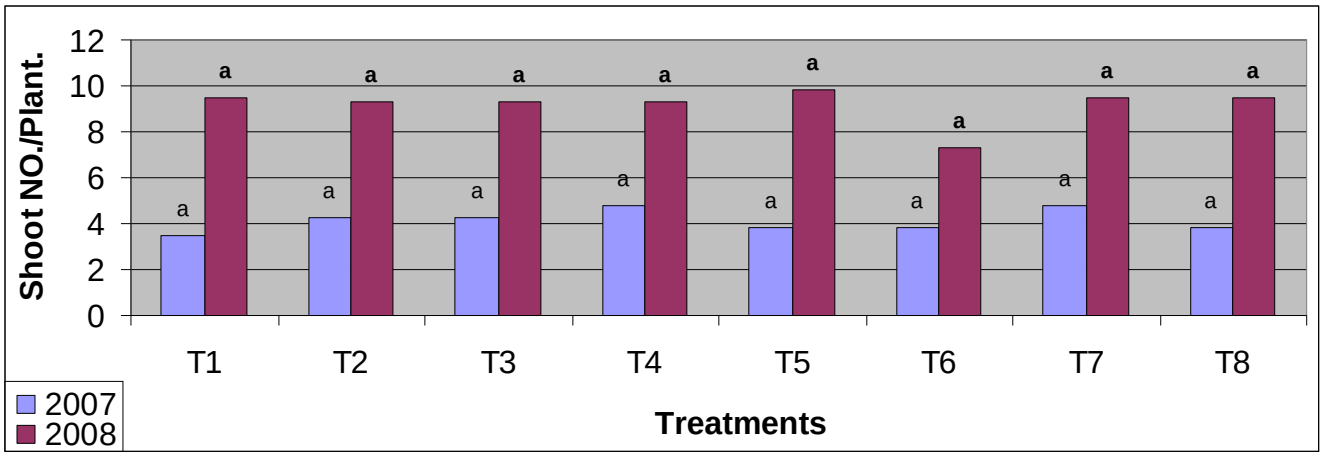


Fig. (3): Effect of mineral, organic nitrogen and some other treatments on shoot No./plant of Klamata olive cv. young trees in 2007 and 2008 seasons.

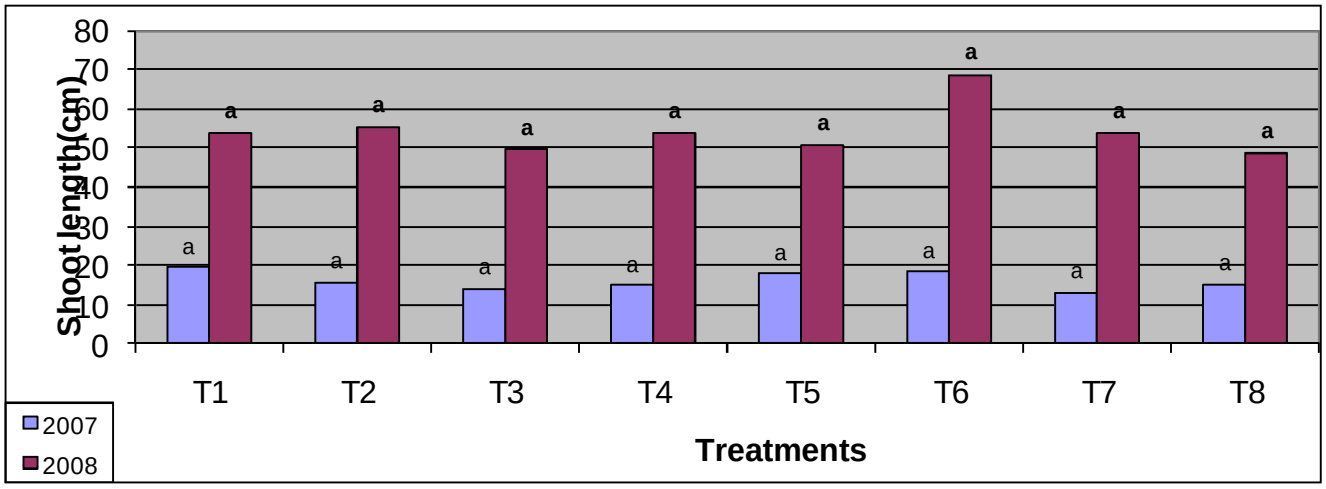


Fig. (4): Effect of mineral, organic nitrogen and some other treatments on average shoot length(cm) of Klamata olive cv. young trees in 2007 and 2008 seasons.

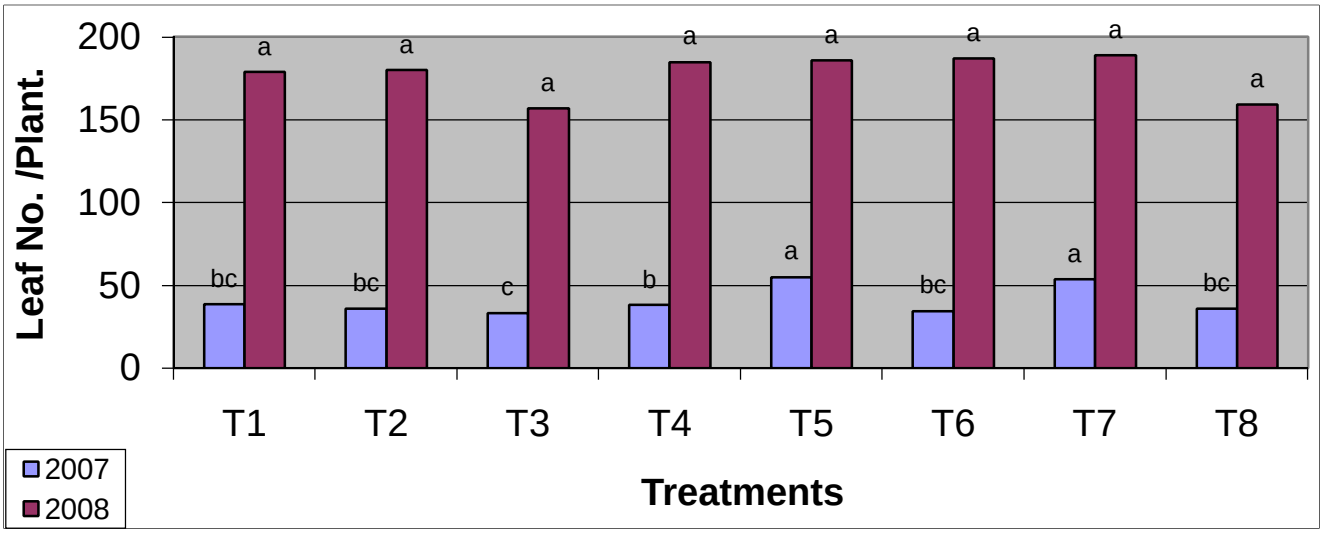


Fig. (5): Effect of mineral, organic nitrogen and some other treatments on leaf No. /plant of Klamata olive cv. young trees in 2007 and 2008 seasons.

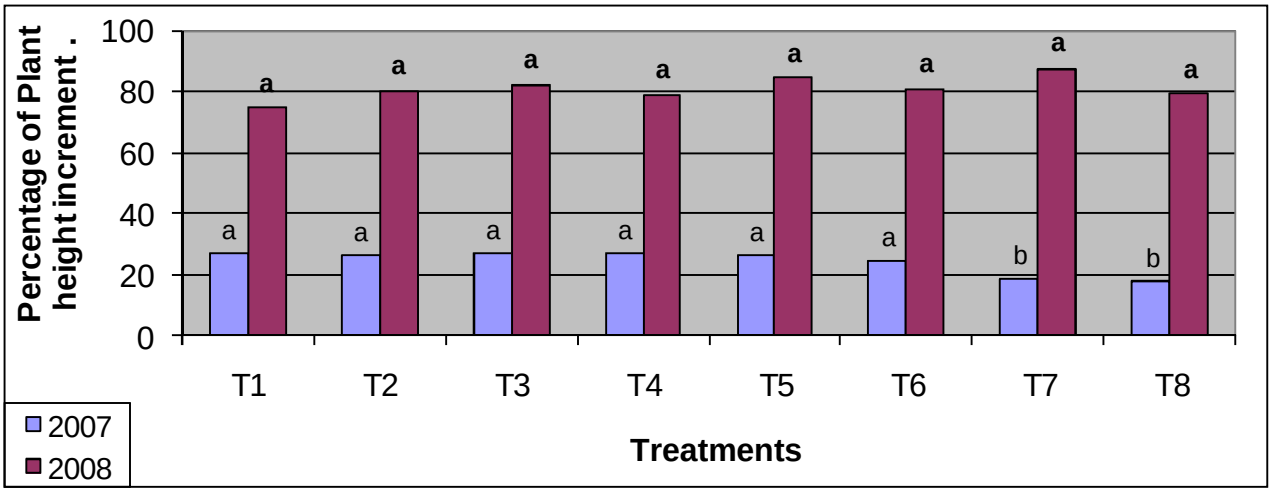


Fig. (6): Effect of mineral, organic nitrogen and some other treatments on percentage of plant height increment of Klamata olive cv. young trees in 2007 and 2008 seasons

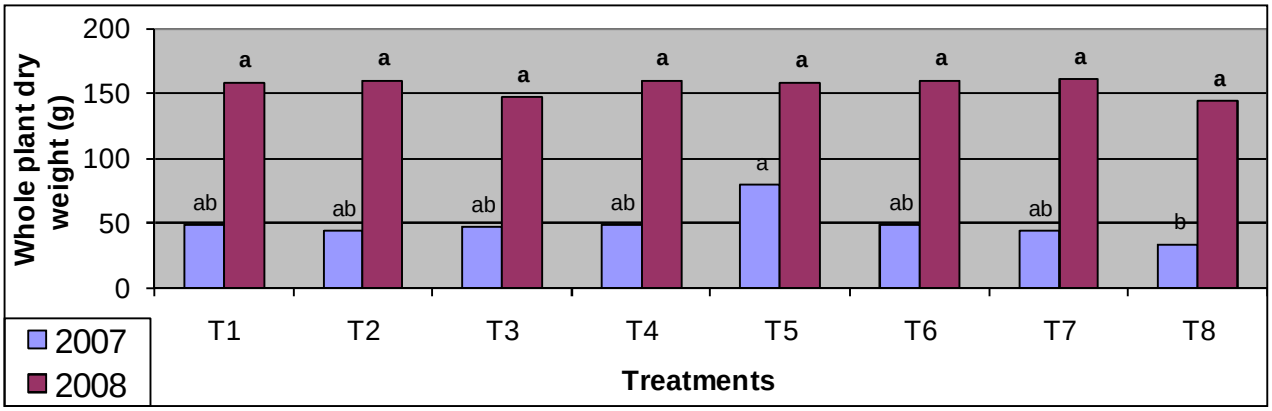


Fig. (7): Effect of mineral, organic nitrogen and some other treatments on whole plant dry weight (g) of Klamata olive cv. young trees in 2007 and 2008 seasons.

Finally it could be noticed that plant height, shoot number, shoot length, leaves number and stem diameter were not affected by different treatments Insignificant differences among treatment in both seasons in values of plant height, , stem diameter lateral shoot number per plant and lateral shoot length average. Meanwhile, the fifth treatment with humic acid and seventh treatment with $GA_3$ spray gave highest significant values of leaf number per plant compared with all other treatments in the first season, but in the second season, the differences among treatments lake significance. Concerning the whole plant dry weight, no significant differences among treatments could be noticed in both seasons. These results are in 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 treatments, this 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.

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**4. 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. 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.
3. 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.
4. M.A.L.R. (2007): Ministry of Agriculture and Land Reclamation Economic Affairs - Study of Important the Agriculture Statics, Vol.(2)p 353.
5. 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).
6. 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.
7. 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.
8. 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.
9. Sheo, G. S. I. P. (1999): Effect of foliar application of urea, GA3 and ZnSO4 on seedling growth of two citrus species. J. Appl. Hort., 1(1):51-53.
10. Sidahmed O.A. (1987): Effects of different levels of gibberellic acid ($GA_3$) on growth of sour orange (*C.Aurantium* L.) Seedlings. Acta Horticulturae 84: V Africa Symposium on Horticultural Crops.
11. 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
12. Snedecor, G. W. and W. G. Cochran (1980) Statistical Methods. 7th Ed.507 pp Iowa State Univ. Press, Ames. Iowa, U.S.A. .
13. 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: IV International Symposium on Olive Growing.

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