

Response of Picual Olive Young Trees to Mineral, Organic Nitrogen Fertilization and Some Other Treatments

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Abstract: This study was carried out through two successive seasons (2007 & 2008) on a 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 leaf mineral contents 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 + GA₃ spray) and T8 (100% mineral nitrogen + sea algae as soil application). At the end of each season, leaves dry weight per plant, and leaf mineral content were determined and recorded. The obtained results revealed that as follow: Effect of treatment on Leaves dry weight (g) per plant, fifth treatment with humic acid and sixth treatment with activated dry yeast gave the highest significant values in the first season, meanwhile in the second season fourth treatment with 50% cattle manure and fifth treatment with humic acid recorded higher significant values. Leaf nitrogen content revealed that first, fifth, sixth and seventh treatments showed higher significant values respectively than those of other treatments in the first season. In the second season, the first treatment had higher significant leaf nitrogen content compared with most of other treatments. [Journal of American Science. 2010;6(12):180-186]. (ISSN: 1545-1003).

Keywords: Picual Olive; Organic Nitrogen; Treatments

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).

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 considered 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, 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 Bermudagrass hybrid improved growth parameters and NPK leaves contents.

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 (GA3) 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 results 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, GA3 and sea algae)on leaf mineral contents 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 Picual cv. young trees in the Experimental 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 and leaf mineral contents of young Picual olive 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%, CaCO₃ =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).

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 GA3 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 gently with their root system to estimate and record the following data for each cv individually:

1- Leaves dry weight (g) per plant.

2-Leaf mineral content was determined as follow:

The leaves of each young tree at the end of each season were washed several times with tap water then rinsed with distilled water, dried at 70°C in an electric oven, grounded in electric mill and digested according to (Chapman and Prat, 1961). Nitrogen analyses were determined by Micro Kjeldahl method (Jakson, 1967). Phosphorus was determined by the method of (Truog and Meyer, 1929). Potassium was determined by the the flame photometer according to the method of (Brown and Lilleland, 1946). Calcium and magnesium were determined by titration against versenate solution (Chapman and Pratt, 1961). Iron, zinc and manganese were determined by using Atomic Absorption technique. All these macro and micro elements were determined through the two studied seasons. 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 Discussions

1- Effect of treatment on Leaves dry weight (g) per plant. Fig. (1) show that, fifth treatment with humic acid and sixth treatment with activated dry yeast gave the highest significant values (46.5 & 43.5), respectively compared with all other treatments in the first season, meanwhile in the second season fourth treatment with 50% cattle manure and fifth treatment with humic acid recorded higher significant values (255.8 &269.3 respectively) compared with most of other treatments.

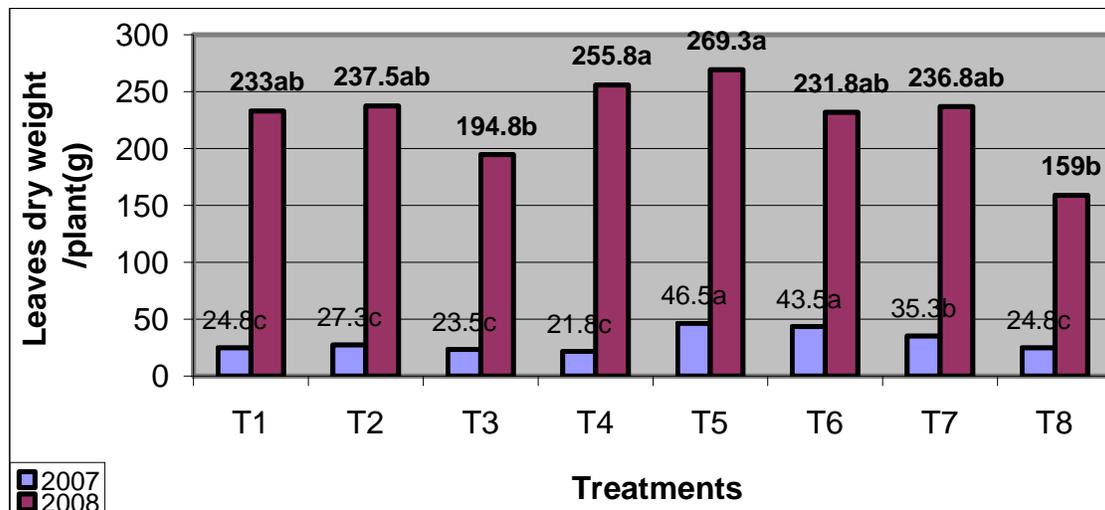


Fig (1): Effect of mineral, organic nitrogen and some other treatments on leaves dry weight/plant(g) of Picual olive cv. young trees in 2007 and 2008 seasons.

2-Effect of treatment on leaf mineral content:

Leaf nitrogen content:

Fig. (2) show that, Leaf nitrogen content revealed that first, fifth, sixth and seventh treatments showed higher significant values (1.51, 1.54, 1.52 & 1.54) respectively than those of other treatments in the first season. In the second season, the first treatment had higher significant leaf nitrogen content (1.54) compared with most of other treatments.

Leaf phosphorus content:

Fig. (3) Show that, Leaf phosphorus content recorded insignificant differences among treatments in both season.

Leaf potassium content:

Fig.(4) show that, Leaf potassium content, differences among treatments like significances in the first season. In the second season, second treatment with 100% mineral nitrogen gave the highest significant value (0.39) of leaf potassium content compared with all other treatments.

Leaf calcium content:

Fig. (5) show that, Leaf calcium content with the first, fifth, sixth and eighth had higher significant values than those of other treatments in the first season.

In the second season, seventh treatment by GA3 spray showed higher significant leaf calcium content (1.89) compared with most of other treatments.

Leaf magnesium content:

Fig. (6) show that, Leaf magnesium content had lower significant values with the third and eighth

treatments (0.17&0.18 respectively), compared with all other treatments in the first season. In the second season, second treatment with 100% mineral nitrogen had the highest significant leaf magnesium content (0.92) compared with all other treatments.

Leaf iron content:

Fig. (7) show that, Leaf iron content differences among treatments like significance in the first season. In the second season, second treatment with 100% mineral nitrogen recorded higher significant leaf iron content (2373) compared with most of other treatments.

Leaf zinc content:

Fig. (8) show that, Leaf zinc content with the fifth treatment by humic acid recorded highest significant.

In the second season, second treatment with 100% mineral nitrogen showed higher significant leaf zinc content (52) compared with most of other treatments.

Leaf manganese content:

Fig. (9) show that, Leaf manganese content gave insignificant differences among treatments in the first season. In the second season, fifth treatment with humic acid had higher significant leaf manganese content (42.3) compared with all other treatments. Value (40) compared with all other treatments in the first Season.

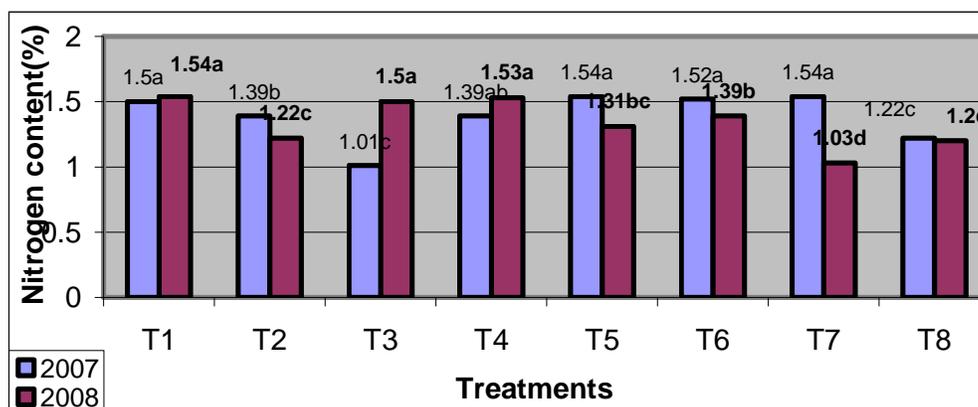


Fig (2): Effect of mineral, organic nitrogen and some other treatments on leaf nitrogen content(%) of Picual olive cv. young trees in 2007 and 2008 seasons.

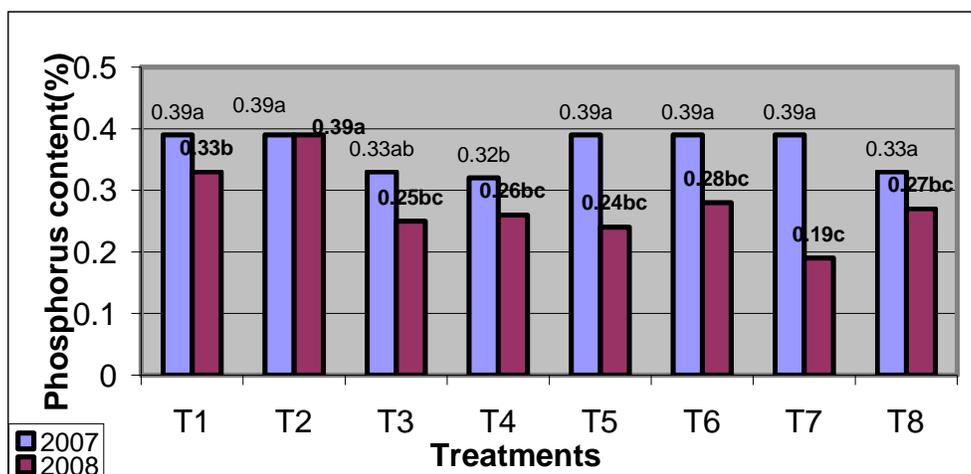


Fig (3): Effect of mineral, organic nitrogen and some other treatments on leaf phosphorus content(%) of Picual olive cv. young trees in 2007 and 2008 seasons

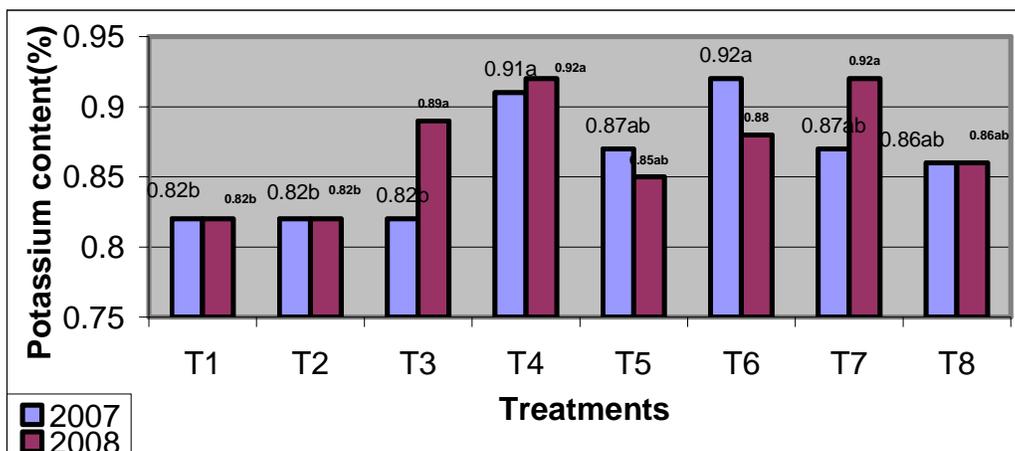


Fig (4): Effect of mineral, organic nitrogen and some other treatments on leaf potassium content(%) of Picual olive cv. young trees in 2007 and 2008 seasons.

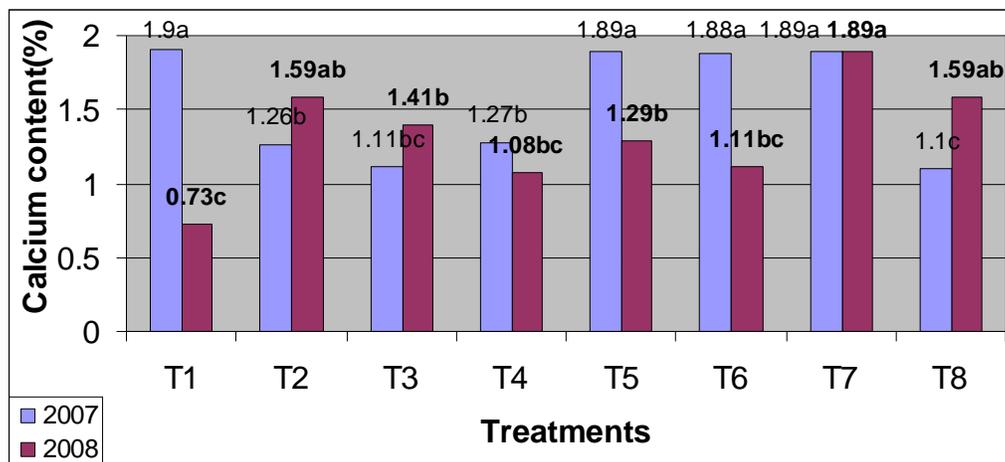


Fig (5): Effect of mineral, organic nitrogen and some other treatments on leaf calcium content(%) of Picual olive cv. young trees in 2007 and 2008 seasons.

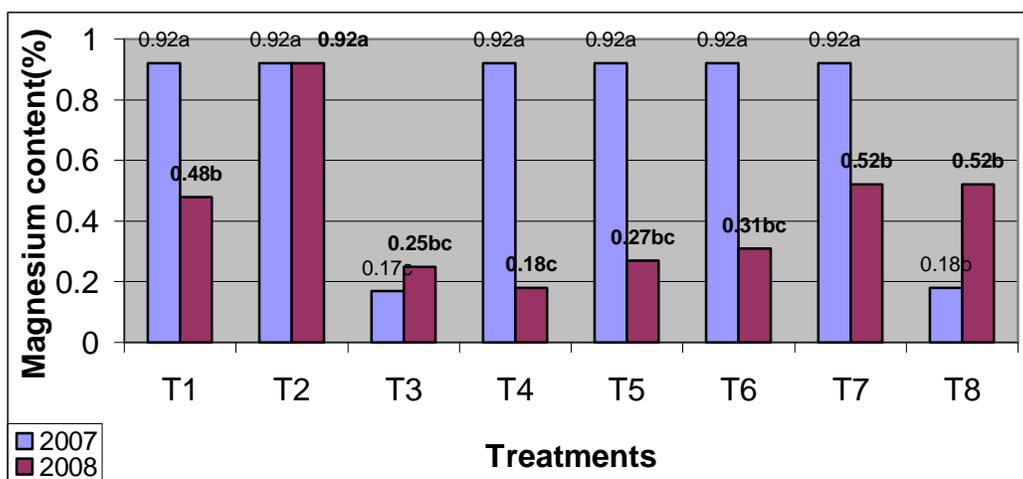


Fig (6): Effect of mineral, organic nitrogen and some other treatments on leaf magnesium content(%) of Picual olive cv. young trees in 2007 and 2008 seasons.

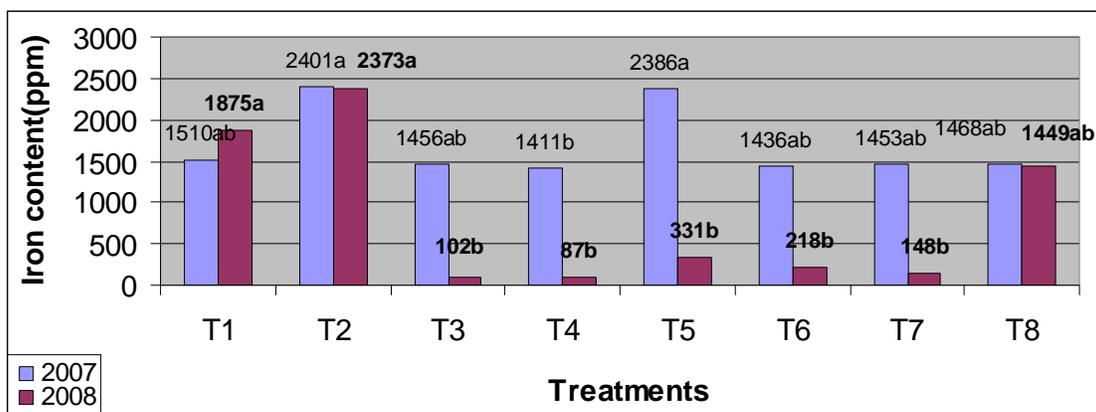


Fig (7): Effect of mineral, organic nitrogen and some other treatments on leaf iron content(ppm) of Picual olive cv. young trees in 2007 and 2008 seasons.

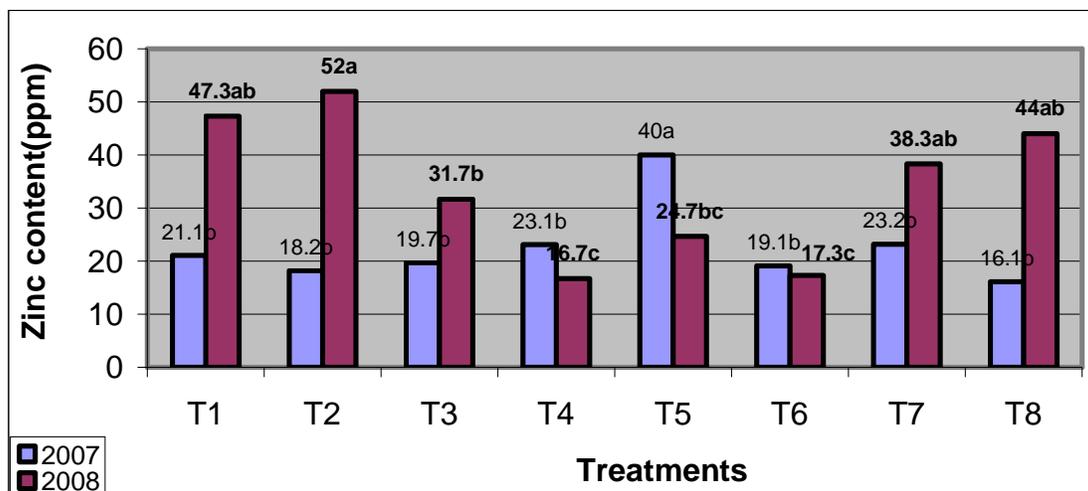


Fig (8): Effect of mineral, organic nitrogen and some other treatments on leaf zinc content(ppm) of Picual olive cv. young trees in 2007 and 2008 seasons

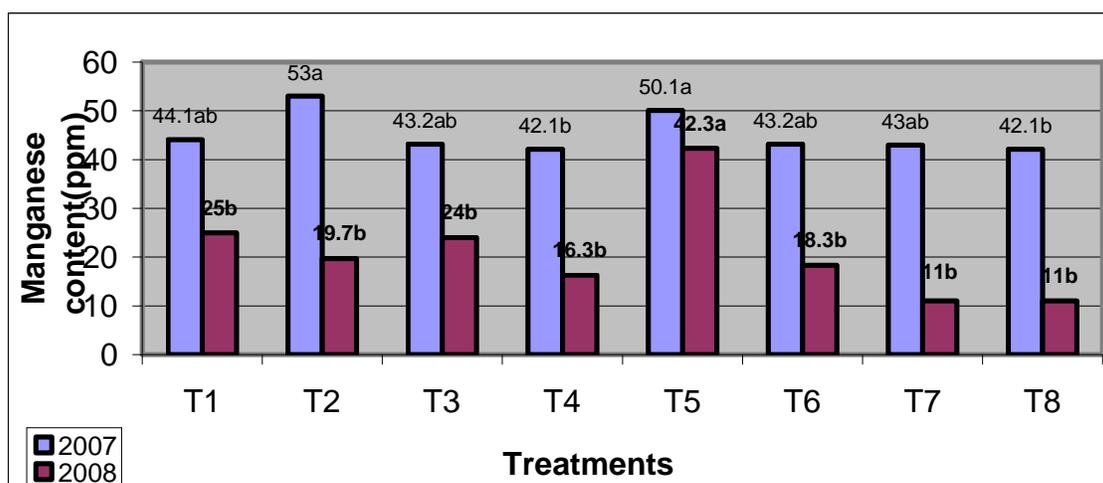


Fig (9): Effect of mineral, organic nitrogen and some other treatments on leaf manganese content(ppm) of Picual olive cv. young trees in 2007 and 2008 seasons.

Finally it could be noticed that, effect of treatment on Leaves dry weight (g) per plant, fifth treatment with humic acid and sixth treatment with activated dry yeast gave the highest significant values in the first season, meanwhile in the second season fourth treatment with 50% cattle manure and fifth treatment with humic acid recorded higher significant values. Leaf nitrogen content revealed that first, fifth, sixth and seventh treatments showed higher significant values, respectively than those of other treatments in the first season. In the second season, the first treatment had higher significant leaf nitrogen content compared with most of other treatments. 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 plant 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. From obtained data P, K, Ca and Mg were higher than their critical levels but nitrogen was lower than its critical level with most treatments especially in the second season that may be attributed to more vegetative growth in second season than first one which need more demand of nitrogen. These results are contrary with those found by Hegazy *et. al.*(2007) Whose reported that the applying 100% organic fertilization (poultry manure) to Picual olive trees 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.

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