Response of Klamata 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 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 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 + GA_3 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: Leaves dry weight per plant the fifth treatment with humic acid showed higher value in the first season. In the second season, insignificant differences among treatments were found. Leaf nitrogen content with the second and fifth treatments showed the highest significant values compared with all other treatments in the first season. In the second season, the second treatment had higher significant value than those of the seventh and the eighth treatments. [Nature and Science 2010;8(11):59-65]. (ISSN: 1545-0740).

Key words: Klamata Olive; Nitrogen Fertilization; Mineral.

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. The Egyptian olive production reached about 507053 tons produced from 110764 Feddan according to the staticics of M.A.L.R (2007a)

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 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, 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 (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 Kalamata 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 Kalamata 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 leaf mineral contents of young Picual 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%, 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 genteelly 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^{o}C in an electric oven, grounded in electric mill and digested according to (Chapman and Prat, 1961). Nitrogen analyses were determined by MicroKjeldahl 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. Result Analysis

1- Leaves dry weight per plant:

Fig. (1) show that, with the fifth treatment with humic acid showed higher value (14.8 g.) than the third one in the first season, on the other hand, in the second season, insignificant differences among treatments were found. However, data illustrated that ,the third treatment with 100% cattle manure and the eighth treatment with sea algae recorded the lowest values compared with other treatments (43.5 g.&43 g.).

2-Effect of treatments on leaf minerals content:

A-leaf macro minerals contents.

Leaf nitrogen content

Fig. (2) show that, Leaf nitrogen content with the second and fifth treatments showed the highest significant values (1.64 %& 1.55%) compared with all other treatments in the first season.In the second season, the second treatment had higher significant value (1.63%) than those of the seventh and the eighth treatments(1.07% &1.29%).

Leaf phosphorus content

Fig. (3) show that, Leaf phosphorus content were the significantly lowest with the third and eighth treatments(023% & 0.23%),respectively in the first season. In the second season, the fifth treatment with humic acid recorded higher significant value (0.67%)than third treat.

Leaf potassium content

Fig. (4) show that, Leaf potassium content showed the lowest significant values with the third and eighth treatments (0.93%& 0.92%) compared with all other treatments in the first season. In the second season, the third treatment (100% cattle manure) showed the highest significant value (1.03%) compared with all other treatments.

Leaf calcium content

Fig. (5) show that, Leaf calcium content was significantly lower in the sixth ,seventh and eighth treatments than other studied treatments in the first season . In the second season the fifth treatment recorded the highest value (1.65%) and the lowest value was achieved by the eighth treatment although differences among all treatments are insignificant in such season.

Leaf magnesium content

Fig. (6) show that, no significant differences in leaf Mg% were detected among all studied treatments in first season. Whereas in the second season both seventh and eighth treatments showed significantly lower content than the other studied treatments.

B-Leaf micro minerals content:

Leaf iron content

Fig. (7) show that, Treatments 2,4 and 5 showed the significantly higher values than other treatments in the first season.In the second season,treat.4 exhibited the significantly greatest leaf Fe content (655ppm) followed in a decreasing order by treat.3(319ppm), then other studied treatments. Meanwhile, treat.7recorded the significantly lowest Fe content (64ppm).

Leaf zinc content

Fig. (8) show that, Leaf zinc content was the lowest significantly with the third, fourth and eighth treatments (10, 10 ppm & 9 ppm) respectively compared with all other treatments in the first seasons. In the second season, the first treatment (control) showed the highest significant value (22 ppm) compared with treat.3 and 6.(10 ppm &5ppm).

Leaf manganese content

Fig. (9) show that, Results indicated that treatments 2, 4 and 5 exhibited significantly higher leaf Mn content as compared with other studied treatments in the first season. On the other hand, treatments 1,2,3and 7 showed lower values than other treatments in the second season.

Finally it could be noticed that, leaves dry weight per plant the fifth treatment with humic acid showed higher value in the first season, in the second season, insignificant differences among treatments were found. Leaf nitrogen content with the second and fifth treatments showed the highest significant values compared with all other treatments in the first season .In the second season, the second treatment had higher significant value than those of the seventh and the eighth 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 it's 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.

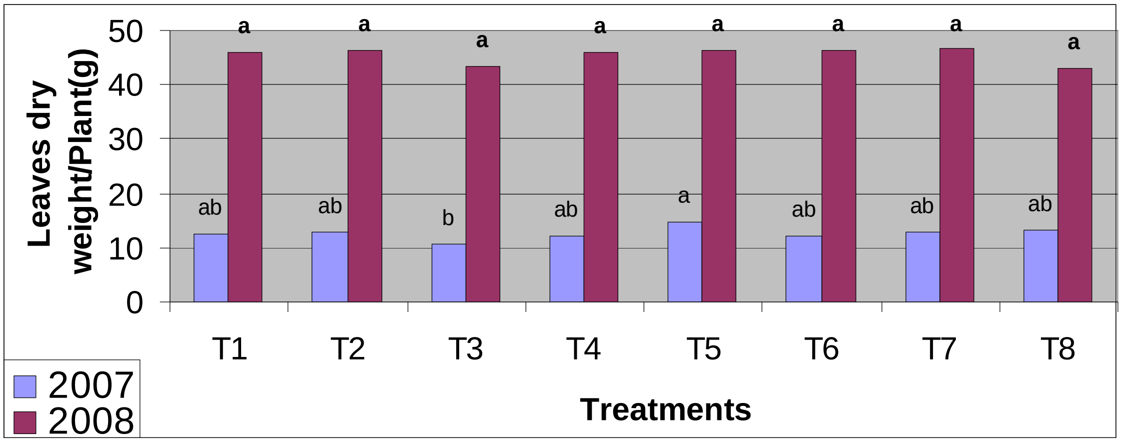

Fig. (1): Effect of mineral, organic nitrogen and some other treatments on leaves dry weight/plant (g) of Klamata olive cv. young trees in 2007 and 2008 seasons.

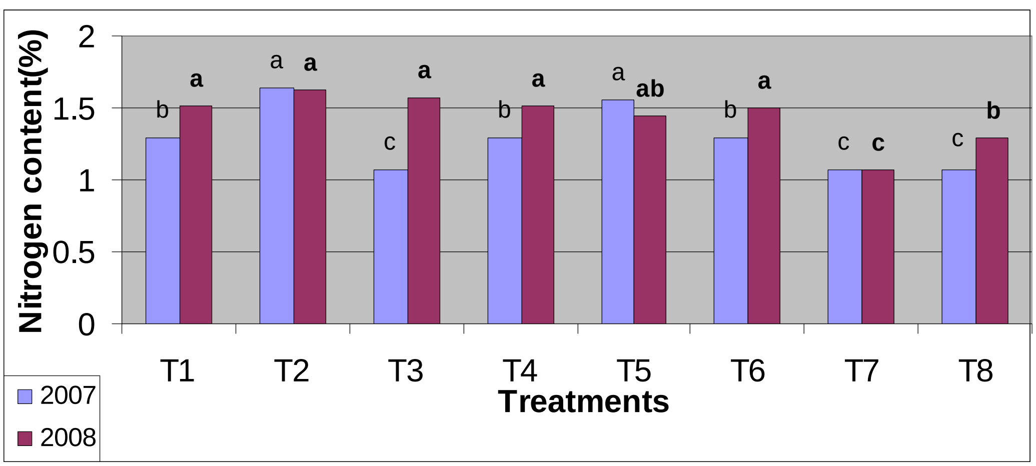

Fig. (2): Effect of mineral, organic nitrogen and some other treatments on leaf nitrogen content(%) of Klamata olive cv. young trees in 2007 and 2008 seasons.

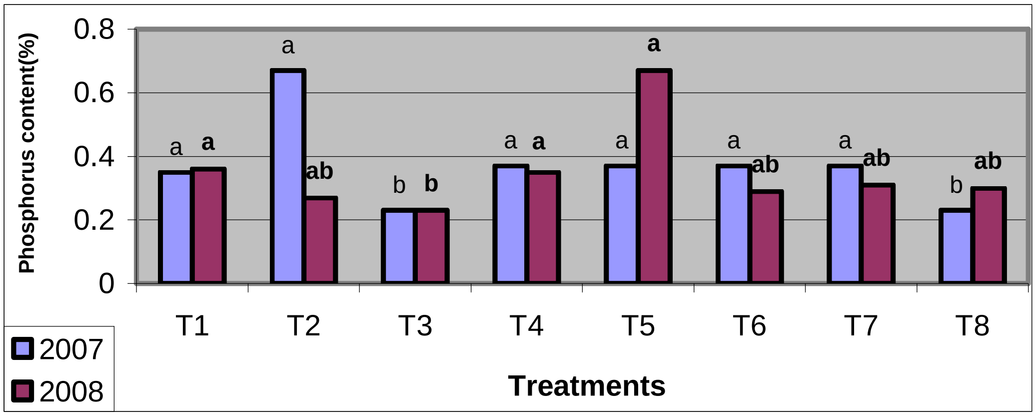

Fig. (3): Effect of mineral, organic nitrogen and some other treatments on leaf phosphorus content(%) of Klamata olive cv. young trees in 2007 and 2008 seasons.

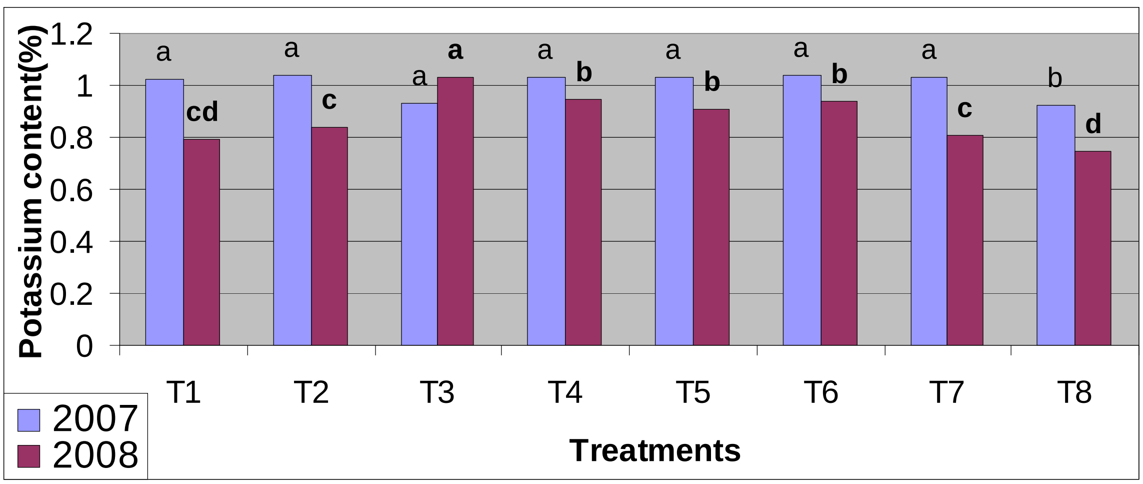

Fig. (4): Effect of mineral, organic nitrogen and some other treatments on leaf potassium content(%) of Klamata olive cv. young trees in 2007 and 2008 seasons.

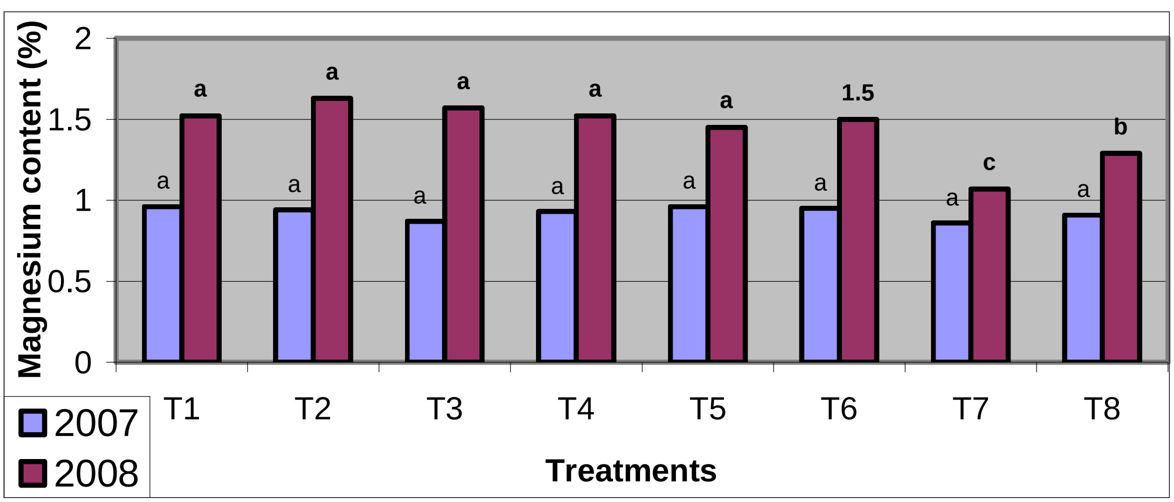

Fig. (6): Effect of mineral, organic nitrogen and some other treatments on leaf magnesium content (%)of Klamata olive cv. young trees in 2007 and 2008 seasons.

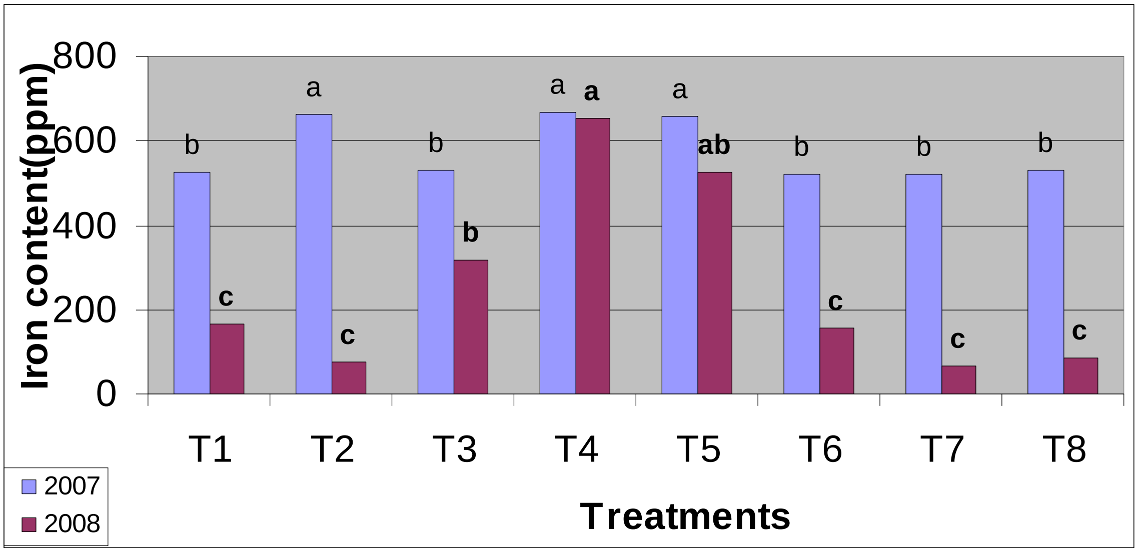

Fig. (7): Effect of mineral, organic nitrogen and some other treatments on leaf iron content(ppm) of Klamata olive cv. young trees in 2007 and 2008 seasons.

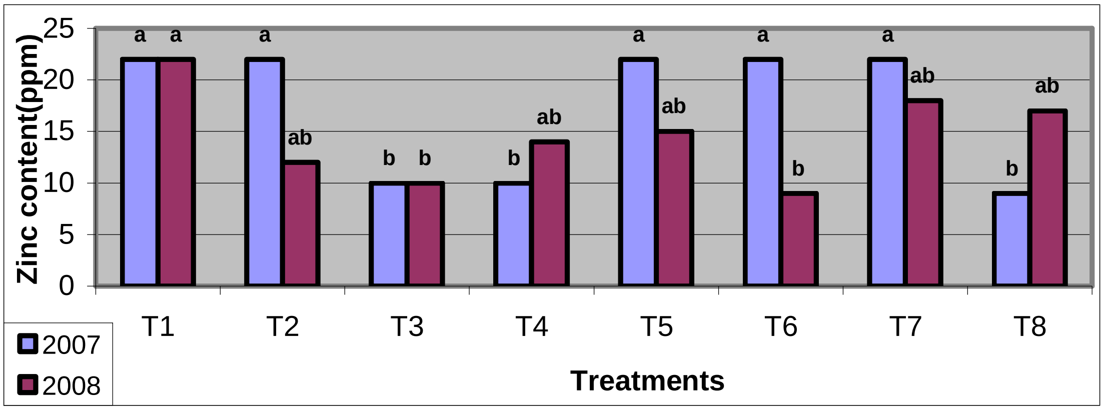

Fig. (8): Effect of mineral, organic nitrogen and some other treatments on leaf zinc content(ppm) of Klamata olive cv. young trees in 2007 and 2008 seasons.

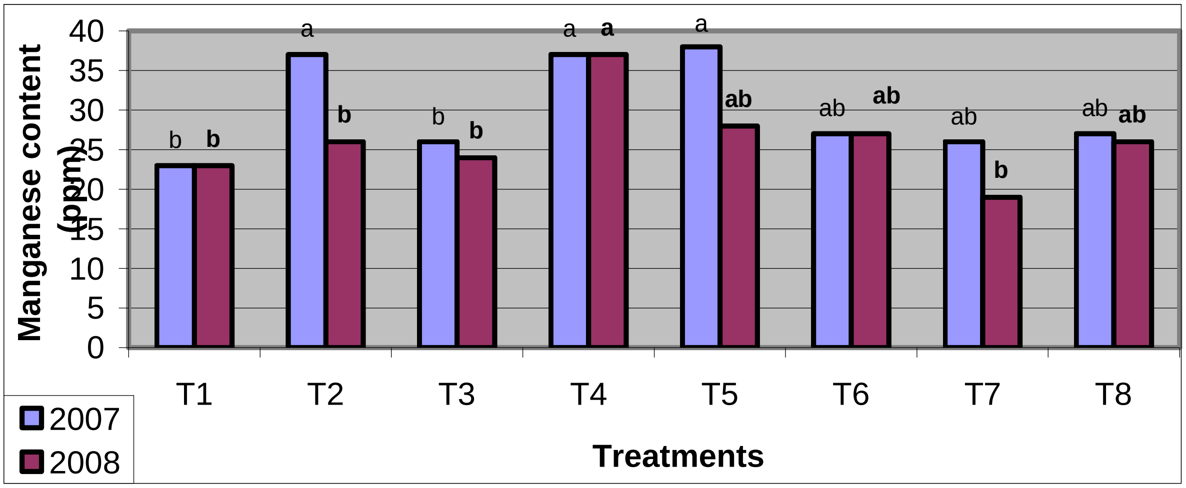

Fig. (9): Effect of mineral, organic nitrogen and some other treatments on leaf manganese content(ppm) of Klamata olive cv. young trees in 2007 and 2008 seasons.

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