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A COMPARATIVE STUDY ON FRUIT QUALITY PARAMETERS AND YIELD OF FOUR OLIVE CULTIVARS GROWN IN SANDY SOIL

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ABSTRACT

Four olive cultivars namely Manzanello, Picual, Coratina and Arbicon grown at Wadi El-Natroon area, Egypt under drip irrigation system in sandy soil were compared for optimizing their own yield as well as fruit quality parameters during 2001 (off-year) and 2002 (on-year), by application of an integrated and balanced fertigaion program including macro and micro-nutrients. Results showed that remarkable and significant differences in leaf mineral contents, yield and yield quality parameters were detected by using well distributed fertilizer program during the growing season of olive trees. The treated four cultivars attained higher yield in the "on" and "off" year than the control. The most outstanding olive cultivars having greater yield were Picual, Manzanello, Coratina and Arbicon in a descending order. Oil percentage was maximized with Picual olive while, Arbicon olive had the lowest value. Free fatty acids (%), Iodine number as well as Acidity (%) were minimized in Coratina olive and the lowest peroxide number as was in Picual olive. It is apparent that for planting Picual olive variety proved to be the promising one due to its greatest yield and best fruit quality specially when the actual requirements of macro and micro nutrients were used through the drip irrigation system.

Key words: Olive; Cultivars; Fertigation; Yield; Quality

INTRODUCTION

The olive, *Olea europaea* L. is usually cultivated for its ripe and grown edible fruit and its valuable oil. Olive oil is almost unique among the vegetable oils in that it can be consumed in the crude form **(El-Sharkawy and Ibrahim, 1982).** In Egypt, in spite of acreage and production have been progressively increased during the last few years (117886 fed., 336442 ton in 2002). The total production of oil is still insufficient to cover the local consumption. For facing high demand of edible oil and more production, has become necessary

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to increase the production through improving horticultural practices, specially fertilization.

Previous studies indicated that olive trees are suffering from nutrient deficiencies **(Jordao *and* Leitao 1990 and Abdel Maguid *et al* 2004).** Moreover, many authors pointed out that nutrient status of olive trees varied not only to variety **(Procopiou and Wallace, 1979, Fehr, 1982, Saric, 1987 and Mobarak *et al* 1992)** but also affected by soil properties **(El-Damaty *et al* 1970, Amberger, 1979, Mengel, 1982, Awad *et al 1984 and Alba et al* 1995).**

There is also considerable differences in the absorption and transport patterns among plant species and varieties of the same species **(Zaharieva, 1982)**. Therefore, this work was undertaken to determine the differences among olive varieties in their response to specific fertilizer recommendation under drip irrigation system and evaluate the prime olive varieties with higher productivity and greatest fruit quality.

MATERIAL AND METHODS

Two field trials were conducted on an olive private farm at Wadi El-Natroon area, Egypt during two consecutive seasons. Four drip irrigated olive cultivars (Manzanello, Picual, Coratina and Arbicon) were selected. The 8-year-old trees were grown in sandy loam calcareous soil. Two fertilizer program treatments were applied which are the control : 300 g N,100 g P_2O_5,400g K_2O,0 g MgO/tree year for the two seasons and the integrated balanced program : 400, 500 g N,200, 250 g P_2O_5,500, 750 g K_2O,25, 50 g MgO, 1.0 g Fe,1.0 g Mn,1.0 g Zn,0.1 g B/tree year for 2001, and 2002 respectively. All micronutrients were in EDTA chelated form and sprayed 3 times alone or in combination during the growth season, i.e. before flowering, after fruit set and one month later.

The experimental design was a randomized complete block with 4 replicates each one was represented by 16 trees for each cultivar.

A representative leaves samples in mid of growing season and fruit samples at harvest time from each replicate were collected for leaves nutrient contents determination and for fruit quality measurements which include: oil percent, Free Fatty acid, iodine number, peroxide number and total acidity as outlined in **Chapman and Pratt (1978) and A.O.A.C. (1985)**. Fruit olive yield was determined as Kg/tree. All yield measurements were on the fresh weight bases.

The obtained data were subjected to statistical analysis according to **Snedecor and Cochran (1981).**

RESULTS

Results in Tables (1, 2) revealed that the leaf mineral content of four olive cultivars was significantly affected by the modification of fertilizer program in the two seasons. Data in the same tables showed that the leaf mineral content i.e.,

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N, P, K, Ca, Mg, Fe, Mn and Zn in treated trees of the four olive cultivars were higher than the control.

In comparing the four studied cultivars in their leaf mineral content regardless of fertilizer program, results indicated that Arbicon cultivar showed the highest leaf P-content, whereas Picual culivar exhibited the greatest values of K in leaves. In addition, the other nutrients were differ among the varieties in both seasons.

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As shown in Table (3) yield was varied due to the olive cultivar. Picual had the greatest yield compared with other olive cvs. Manzanello and Coratina gave satisfactory yield. The lowest yield was for Arbicon olive trees. These results were true in both seasons.

It is clearly observed that oil percentage was significantly affected by olive cultivar (Table, 3). In this respect, oil percentage of Picual was generally the highest and Arbicon was the smallest. The same observation was true with oil yield as Kg/tree (Fig. 1).

The treated four cultivars induced lower free fatty acids (%) in the "on" year and "off" year than the control. Free fatty acids (%) with the lowest value was produced by trees of Coratina variety. Conversely, free fatty acid (%) was the highest in Arbicon variety.

It can be noticed from Table (3) that Iodine number of fruit oil of Coratina had the lowest value as compared with Iodine number of fruit oil on Manzanella, Picual and Arbicon varieties.

Results in Table (3) clearly show that there was a wide variation between different olive cultivars in their Peroxide number (mg/kg). Different olive cultivars had no significant trend to peroxide number in the "on" year season. Meanwhile, Picual trees had the lowest value (6.3%), while the value in other olive cultivars varied from (7.5 to 13.3%) in 2002 season.

With respect to the total acidity percentage, data in Table (3) indicated that there was a noticeable variation in total acidity percentage between the four olive varieties.

However, total acidity percentage ranged between 0.4 to 0.8% in the "off" year and ranged between 0.5 to 0.8% in the "on" year season. The lowest value of total acidity percentage was found in Coratina fruit oil followed by Manzanello and Picual, respectively.

DISCUSSION

The above mentioned results revealed that the soil is mainly poor in most nutrient contents experimented and high in calcium carbonate content and pH values. Such results are confirmed by **El-Sayed *et al* (1992) and Nofal *et al* (1999).** In addition, **El-Fouly and Fawzi (1982), Mobarak *et al* (1992)** mentioned that nutrients imbalance and deficiency of micronutrients, one of the major limiting factors in Egypt. The specific fertilizer recommendation of olive cultivars included modification and adjusted the amount of macronutrients as well as micronutrients. In this connection, **Zaharieva, (1982)** reported that some plant species and varieties adapt better to unfavourable soil condition than others as well as there are big differences among varieties in their nutrient requirements i.e., P, K, Ca, Mg, Fe, Zn and Cu. He also added that the genotype factor has a considerable effect on the concentrations of the above mentioned elements. On the other hand, foliar application of micronutrients improved nutritional uptake of plants not only for

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micronutrients but also for macronutrients, this might be attributed to the improvement in plant physiological processes including more nutrient absorbance by roots **(Wittwar and Bukovac 1969, Amberger, 1980 and Hahr, 1987)** and reflecting that on yield and its quality **(Nofal *et al* 1999).**

It can be concluded that the studied varieties markedly differed in their response to specific fertilizer program and

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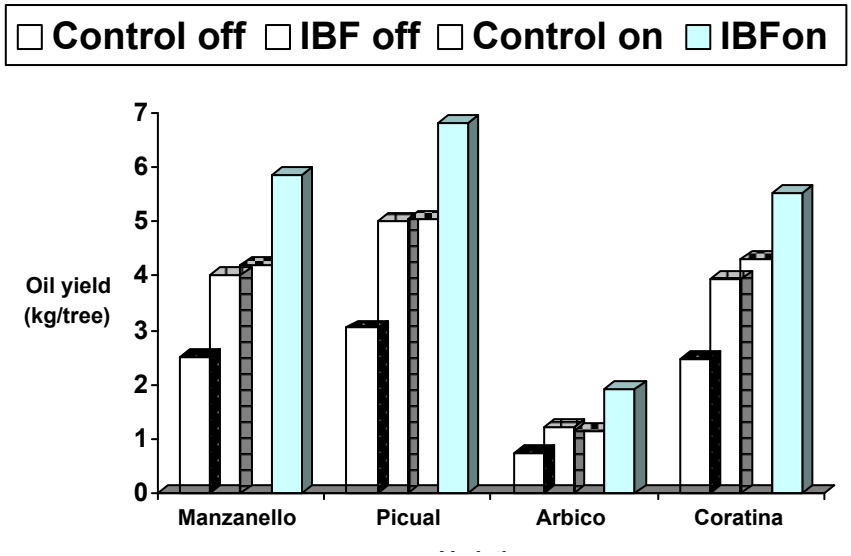

Fig. 1. Effect of integrated and balanced fertigation program on oil yield of olive varieties in the two seasons 2001 and 2002

the best olive cultivar for planting in new reclaimed soils was Picual for its highest leaf K-content, yield and best fruit quality.

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1- قسمتكنولوجياالتسميدالمركزالقوميللبحوث الدقي القاهرة

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