

NUTRITIONAL STATUS IN BEARING AND NON BEARING SHOOTS OF SIX TABLE OLIVE CVS. UNDER DESERT CONDITIONS

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ABSTRACT

Chemical constituents of six table olive cvs. was carried out through two successive seasons 2002 and 2003.

In (2002), N content in leaves of bearing shoots of Eggizi balady cv. was significantly higher (1.626%) than in other cvs., while it was the lowest (0.699%) in Kalamata cv. At first of July, N content was the highest (1.251%) in bearing shoots than in other dates, while in non bearing shoots N content of Mission leaves was the highest (1.519%) compared to other cvs., while it was the lowest in Dulci cv. as it averaged (0.675%).

In (2002), P content of Eggizi Shami was the highest (0.52%), while it was the lowest in Mission cv. with average (0.107%) in comparison with other cvs.

At first of July, P content in bearing shoots was higher (0.755%) than in other dates, while it was the lowest (0.071%) at first of May. C/N ratio in bearing shoots of Kalamata cv. was the highest (6.659), while it was the lowest (1.837) in Eggizi balady. C/N ratio in non bearing shoots of Eggizi balady was significantly higher (6.074) than in other cvs., while it was the lowest (2.069) in Kalamata. At 1/10, C/N ratio was significantly higher (5.320) in non bearing shoots than in other dates, while it was the lowest (3.441) at 1/6.

Carbohydrate content was significantly higher (5.152%) in Kalamata cv. compared to other cvs., while it was significantly lower in Eggizi Koprozi than in other cvs. with average (2.43%). At 1/6 carbohydrate content was significantly higher (5.369%) than in other dates, while it was lower (2.932 and 3.064%) at 1/10 and 1/5.

In non bearing shoots, carbohydrate content in Eggizi balady was significantly higher compared to other cvs. with average (5.112%), while it was the lowest (2.532%) in Dulci compared to other cvs.

At 1/10 carbohydrate content was the highest (5.686%) than in other dates, while it was the lowest at 1/5 with average (2.763%).

Ca content in bearing shoots of Eggizi Shami was the highest (0.949%) than in bearing shoots of other cvs., while it was the lowest (0.681%) in Dulci. At 1/5 Ca content was the highest in bearing shoots (1.221%) compared to other dates, while it was the lowest (0.552%) at 1/10. Ca content in non bearing shoots was significantly higher (1.008%) in Eggizi Koprozi than in other cvs. while it was the lowest (0.605%) in Eggizi Shami than in other cvs.

At 1/10 Ca content was higher (1.073%) in non bearing shoots than in other dates, while it was lower (0.297%) at 1/5 compared to other dates.

K content was the highest (0.868%) in bearing shoots of Kalamata while it was the lowest (0.581%) in shoots of Eggizi Shami than in other cvs. At 1/5 K content was the highest (0.819%), while it was the lowest (0.641%) at 1/10 compared to other dates. K content in non bearing shoots was the highest (0.978) in Eggizi Koprozi, while it was lower (0.68%) in Eggizi Shami than in other cvs.

At 1/10 K content was significantly higher (0.856%) in non bearing shoots than in other dates, while it was lower at 1/5 (0.723%) than in other dates.

From these results, it could be concluded that there were varietal difference between cultivars in N, P, K, Ca and carbohydrate contents in leaves of on and non bearing shoots.

Similar varietal differences was observed in C/N ratio in leaves in on and non bearing shoots.

Keywords: Olive, Vegetative growth, Leaf area, N, P, K, Ca, C/N ratio, Carbohydrates.

INTRODUCTION

Table olives are consumed throughout the world either processed as green olives or as black olives. World production of table olive recorded 1.463.500 ton (I.O.O.C, 2003). European community produced 46% of production and Egypt production was 82.800 ton (6% of the world production of table olives). Egypt consumption was 63.100 ton (5%) while Egypt export was 1% from world production (I.O.O.C, 2003).

Knowledge of the seasonal accumulation of nutrients is necessary to develop criteria for describing the optimum nutrient for both yield and quality of tree crops and to develop recommendations for fertilizer applications.

Olive fruit growth and oil accumulation are influenced by factors that regulate the production, translocation and conversion of assimilates to useful compounds (Proietti and Tombesi, 1996).

The olive fruit is a strong sink and nutrients for fruit development are supplied mostly by the leaves on the same shoot where the fruit is attached (Rallo and Suarez, 1989).

Biennial bearing is the most important problem facing the olive production (Sibbett and Ferguson, 2002).

The leaf mineral composition of fruit is affected by many factors such as the developmental stage of the plant, age and position of the leaves, regular practices like fertilization, pruning, and pest control, plant species, cultivars, rootstock, yield and environmental factors (Martin – Prevel *et al.*, 1984; Marschner, 1995).

There is a lack of knowledge concerning the influence of the cultivar on leaf-mineral composition of olive tree. The differences among olive cvs. may be partly explained by their distinct ability to uptake and translocate nutrients (Marschner, 1995).

The objective of this investigation is to examine ranges of leaf nutrients of six table olive cvs. under desert conditions in bearing and non bearing shoots. Seasonal variation in N, P, K, Ca, C/N ratio and carbohydrate content.

MATERIALS AND METHODS

This work was carried out through two successive seasons (2002 and 2003) on eight years old olive cvs. (Dulci, Kalamata, Eggizi Shami, Mission, Eggizi Koprosi and Eggizi balady). Trees are spaced at 5 x 5 meters in sandy soil of a private orchard at Wady El-Faregh valley region. Trees chosen for this investigation were of normal growth and were always subjected to the same horticultural practices.

Changes in nutrients of leaves:

Leaf sample were taken in July to measure seasonal changes in nutrient levels in leaves during the season for bearing and non bearing shoots. Leaves were taken from the middle portion of the shoot of studied

cvs. at distinct times 1/5, 1/6, 1/7, 1/8 and 1/10 for reproductive (on) and non reproductive (off). Leaf samples digested using wet-digestion method were prepared for nutrient analysis after washing, drying and grinding procedures (Ranganna, 1979). N was analyzed by Kjeldahl method, P was analyzed spectrophotometrically by (Jackson, 1967) method. K content was analyzed by method analysis of (Brown and Lilliand, 1946). Carbohydrate content was analyzed by (Duboise *et al.*, 1956) and C/N ratio by dividing carbohydrate to total N.

The obtained data were subjected to analysis of variance (ANOVA) according to snedecor and Cochran, (1980) using Mstat program-least significant difference (L. S. D) were used to compare between treatments according to waller and Duncan, (1969) at probability of 5%.

RESULTS AND DISCUSSION

Changes in nutrients in leaves

1. N content:

In the first season, N content in bearing shoots in Eggizi balady leaves was significantly higher (1.626 %) than in other cvs. (Table 1,a). While it was the lowest (0.699 %) in Kalamata.

At first of July, N content was significantly higher (1.251 %) in bearing shoots compared to other dates.

On the other hand, in non bearing shoots N content of Mission cv. was the highest (1.519%) compared to other cvs. (Table, 1 a), while it was the lowest in Dulci as it averaged (0.675%).

N content at first of October, was significantly higher (1.205%) compared to other cvs. (Table, 1a), while it was the lowest at first of May with average (0.992%).

In the second season, N content of leaves in bearing shoot of Eggizi balady was the highest (1.373%) compared to other cvs. (Table, 1 b) while, it was the lowest in Eggizi Shami (1.356%).

At first of July, N content was significantly higher (1.756%) than in other cvs., while it was the lowest at first of October (1.358%).

In non bearing shoots, N content of Mission cv. was the highest (2.362%) compared to other cvs. while, it was the lowest (1.164%) in Kalamata (Table, 1 b).

N content at first of October, was significantly higher (1.725%) than other dates. while it was the lowest at first of August with average (1.350%).

2. P content:

In (2002), in bearing shoots, P content of Eggizi Shami leaves was significantly higher (0.52%) compared to other cvs., while it was the lowest in Mission cv. with average (0.107%) (Table, 2 a). At 1/7 P content was significantly higher (0.755%) in bearing shoots compared to other cvs, while it was the lowest (0.071%) at 1/5.

On the other hand, P content in non bearing of Kalamata was significantly higher (0.235%) compared to other cvs., while it was lower in Eggizi balady and Dulci with average (0.04 and 0.045%). P content at 1/6 was significantly higher (0.185%) than in other dates.

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In (2003), P content in bearing shoots of Eggizi Koprosi was significantly higher (0.178%) than in other cvs. while, it was the lowest in Mission cv. with average (0.081%) (Table, 2 b). At 1/10 P content was significantly higher (0.223%) than in other dates. While it was the lowest at 1/5 with average (0.05%).

In non bearing shoots, P content of Eggizi balady was significantly higher (0.153%) compared to other cvs., while it was the lowest in Eggizi Shami compared to other cvs. with average (0.115%) . At 1/10 P content was significantly higher (0.241%) than in other dates, while it was the lowest at 1/6 with average (0.11%).

3. C/N ratio:

In the first season, C/N ratio in leaves of bearing shoots of Kalamata cv. was significantly higher (6.659) than in other cvs., while it was significantly lower (1.837) in Eggizi balady than in other cvs. (Table, 3a).

At 1/6, C/N ratio was significantly higher (5.163) than in other dates, while it was lower at 1/10 and 1/7 as it averaged (3.513 and 3.544).

C/N ratio in leaves of non bearing shoots of Eggizi balady was significantly higher (6.074) compared to other cvs., while it was the lowest (2.069) in Kalamata cv. At 1/10, C/N ratio was significantly higher (5.320) in non bearing than in other dates, while it was lower at 1/6 as it averaged (3.441).

In 2003, C/N ratio in leaves of bearing shoots of Kalamata cv. was significantly higher (2.764) than in other cvs. while it was significantly lower (1.576) in Mission than in other cvs. (Table , 3b).

At 1/7 and 1/8 C/N ratio was significantly higher (2.760) and (2.758) than in other dates. In non bearing C/N ratio was significantly higher (4.333) in Eggizi balady than in other cvs. while, it was the lowest in Eggizi Koprosi as it averaged (1.401).

At 1/8, C/N ratio was significantly higher (3.893) than in other dates. While, it was lower at 1/5 as it averaged (1.765).

4. Carbohydrate content:

In the first season, it was observed that carbohydrate content in leaves was significantly higher (5.152%) in Kalamata compared to other cvs., while it was significantly lower in Eggizi Koprosi than in other cvs. with average (2.43%) (Table, 4a). At 1/6 carbohydrate content was significantly higher (5.369%) than in other dates, while it was lower at 1/10 and 1/8 with average (2.932 and 3.064).

In non bearing shoots, carbohydrate content in leaves of Eggizi balady was significantly higher compared to other cvs. with average (5.112%), while it was the lowest (2.532%) in Dulci compared to other cvs.

At 1/10 carbohydrate content was the highest (5.686%) than in other dates, while it was the lowest at 1/5 with average (2.763%).

In 2003, carbohydrate content was significantly higher in Kalamata cv. (4.486%) than in other cvs., while it was lower in Mission as it averaged (2.162%) (Table, 4b).

Carbohydrate content was significantly higher (4.848) at 1/7 than in other dates, while it was lower at 1/5 with average (2.416%) .

Carbohydrate content in non bearing shoots of Eggizi balady was significantly higher (5.076%) than in other cvs., while it was lower in Eggizi Koprozi than in other cvs. with average (2.62%). Carbohydrate content was significantly higher (4.848) at 1/7 than in other dates, while it was lower at 1/5 with average (2.416%) .

Carbohydrate content in non bearing shoots of Eggizi balady was significantly higher (5.076%) than in other cvs., while it was lower in Eggizi Koprozi than in other cvs. with average (2.62%).

At 1/10 Carbohydrate content was significantly higher (5.89%) than in other dates. While it was lower (2.112%) than in other dates.

5. Ca content:

In the first season, it was observed that Ca content of Eggizi Shami was the highest (0.949%), while it was the lowest in Dulci as it averaged (0.681%) (Table, 5 a). At 1/5 Ca content was the highest in bearing shoots (1.221%) compared to other dates while, at 1/10 Ca content was the lowest (0.552%) than in other dates.

Ca content in non bearing shoots was significantly higher (1.008%) in Eggizi Koprozi than in other cvs., while it was lower in Eggizi Shami (0.605%) than in other cvs. At 1/10 Ca content was higher (1.073%) than in other dates, while it was lower (0.297%) at 1/5 compared to other dates.

In (2003), Ca content in leaves of Mission cv. was significantly higher (0.751%) than in other cvs., while it was lower in Dulci as it averaged (0.518%) (Table, 5 b).

Ca content was significantly higher (0.818) at 1/5 than in other dates, while it was lower at 1/10 as it averaged (0.556%).

Ca content in non bearing shoots was significantly higher (0.809%) in Eggizi Koprozi than in other cvs. while it was the lowest in Kalamata with average (0.578%). At 1/10 Ca content was significantly (0.913%) than other cvs. while it was the lowest at 1/5 with average (0.446%) .

6. K content:

In the first season, K content in leaves of bearing shoots of Kalamata was significantly higher (0.868%) than in other cvs., while it was significantly lower (0.581%) in Eggizi Shami than in other cvs. (Table, 6a).

At 1/5 K content was significantly higher (0.819%) than in other dates, while it was lower (0.641%) at 1/10 than in other dates.

K content in non bearing shoots was significantly higher (0.978) in Eggizi Koprozi than in other cvs., while it was lower (0.68%) in Eggizi Shami than in other cvs.

At 1/10 K content was significantly higher (0.856) in non bearing than in other dates, while it was lower at 1/5 than other dates as it averaged (0.723%).

In (2003), K content in bearing shoots was significantly higher in Kalamata cv. (0.736%) than in other cvs., while it was significantly lower Dulci cv. with average (0.578%) (Table, 6 b).

At 1/5 K content was significantly higher (0.69%) than in other cvs. K content in non bearing shoots was the highest in Eggizi Koprozi (0.87%) than in other cvs., while it was the lowest in Mission cv. with average (0.687%).

At 1/10, K content was significantly higher (0.862%) than in other dates, while it was the lowest at 1/5 with average (0.625%).

From the obtained results, it was noticed that there were varietal differences between olive cultivars in N, P, K and Ca content and these results are in line with (Marschner, 1995) that differences among olive cvs. may be partly explained by their distinct ability to uptake and translocate nutrients.

It was observed that Eggizi balady was higher in N and P content than in other cvs. in bearing shoots, while non bearing shoots of Mission and Kalamata cvs. was higher than in other cvs. in N and P content, respectively.

It is appeared that there are seasonal variation in (bearing shoots) and non productive (non bearing) in nutrients content and these results are in line with (Soyergin and Katkat, 2002) that N, P, K and Ca contents of leaves follow seasonal variability for both bearing and non bearing shoots and N, P, K and Ca contents of leaves were higher in non bearing shoots. In our results, it was noticed that nutrient content in non bearing shoots was higher at (1/10) and lower at previous times but in bearing shoots nutrients contents was higher at mid date (1/7) but it was lower after and before this time because at (1/7) mid time and after that nutrient decrease because fruits did not need nutrients. This trend was noticed in N, Carbohydrate but in P, K and Ca nutrient level was high in bearing shoots at the first time (1/5) and decreased continuously and reached the lowest level at (1/10) but in non bearing shoots, nutrient levels was high at (1/10) and decreased at previous times due to the lack of fruits.

The results obtained are in line with Fahmy (1958) that there were significant seasonal changes in leaf nitrogen content and the high % of N occurred during the winter preceding the bearing year, then dropping after fruit set in summer and reaching the high level in summer of the following non bearing year and leaf nitrogen content was low in the winter preceding the non bearing year in Souri olive cv. (Fahmy, 1958).

Carbohydrate results are contradicted with Fahmy, (1958) who found that during the period of flower development and fruit set, leaf starch and consequently carbohydrate (sugar and starch) were significantly higher in the bearing year as compared to the non bearing year and there was twice as much starch at the beginning of spring growth in the bearing year as in the non bearing year but in our results it was observed that carbohydrate content was higher in non bearing than in bearing shoots because leaves produce assimilates and consumed with fruits but in non bearing leaves produce assimilates but not consumed because there was no fruits.

Concerning C/N ratio it was higher in Kalamata cv. than in other cvs. while, it was lower in Eggizi Koprosi than in other cvs. this trend noticed in bearing shoots but in non bearing shoots there were differences in C/N ratio as it was higher at 1/10 than in previous dates in non bearing but in bearing shoots C/N was higher in early dates than at 1/10.

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الحالة الغذائية للأفرع المثمرة والغير مثمرة لستة أصناف من زيتون المائدة تحت الظروف الصحراوية

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أجريت هذه الدراسة بغرض تقدير مستوى العناصر المغذية لستة أصناف من الزيتون خلال موسمي (٢٠٠٢، ٢٠٠٣). في موسم (٢٠٠٢) بلغ محتوى الأوراق من النيتروجين في الأفرع الحاملة للثمار (bearing) (١,٦٢٦%) وكان أعلى معنويًا في صنف العجيزي البلدي مقارنة بباقي الأصناف بينما كان محتوى الأوراق من النيتروجين أقل معنويًا (٠,٦٩٩%) في صنف الكالاماتا.

كان محتوى الأوراق من النيتروجين أعلى معنويًا (١,٢٥١%) في أول يولييه في الأفرع الحاملة مقارنة بباقي الأصناف بينما كان أقل معنويًا (١,٥١٩%) في صنف الميشن مقارنة بباقي الأصناف. وكان

محتوى الأوراق من النيتروجين أقل معنويا في صنف الدولسى مقارنة بباقي الأصناف وبلغ (٠,٦٧٥%) فى (٢٠٠٢). كان محتوى الأوراق من الفوسفور أعلى معنويا (٠,٥٢%) مقارنة بباقي الأصناف بينما كان أقل معنويا فى أوراق صنف الميثن وبلغ (٠,١٠٧%) وكان محتوى الأوراق من الفوسفور فى أول يوليو أعلى معنويا (٠,٧٥٥%) فى الأفرع الحاملة مقارنة بباقي المواعيد. بينما كان أقل معنويا (٠,٠٧١%) فى أول مايو.

كانت نسبة C/N فى أوراق الأفرع الحاملة لصنف الكالاماتا أعلى معنويا (٦,٦٥٩%) مقارنة بباقي الأصناف بينما كانت أقل معنويا (١,٨٣٧) فى صنف العجيزى البلدى. كانت نسبة C/N فى أوراق الأفرع الغير حاملة أعلى معنويا (٦,٠٧٤) مقارنة بباقي الأصناف بينما كانت أقل معنويا (٢,٠٦٩) فى صنف الكالاماتا.

كانت نسبة C/N فى ١٠/١ أعلى معنويا (٥,٣٢٠) فى أوراق الأفرع الغير حاملة مقارنة بباقي المواعيد بينما كانت أقل معنويا (٣,٤٤١) فى ٦/١ مقارنة بباقي المواعيد.

كان محتوى الأوراق من الكربوهيدرات أعلى بدرجة ملحوظة (٥,١٥٢%) فى صنف الكالاماتا مقارنة بباقي الأصناف. بينما كانت أقل معنويا (٢,٤٣%) فى صنف العجيزى القبرصى.

كان محتوى الكربوهيدرات فى ٦/١ أعلى معنويا (٥,٣٦٩) مقارنة بباقي المواعيد بينما كان أقل معنويا (٢,٩٣٢, ٣,٠٦٤%) فى ١٠/١، ٨/١ وكان محتوى الأوراق فى الأفرع الغير حاملة من الكربوهيدرات فى صنف العجيزى البلدى أعلى معنويا مقارنة بباقي الأصناف وبلغت (٥,١١٢%) بينما كانت أقل معنويا (٢,٥٣٢%) فى صنف الدولسى.

كان محتوى الأوراق من الكربوهيدرات فى ١٠/١ أعلى بدرجة ملحوظة (٥,٦٨٦%) مقارنة بباقي المواعيد بينما كان أقل معنويا (٢,٧٦٣%) فى ٥/١.

كان محتوى الأوراق من الكالسيوم أعلى معنويا (٠,٩٤٩%) فى صنف العجيزى الشامى مقارنة بباقي الأصناف بينما كانت أقل معنويا (٠,٦٨١%) فى صنف الدولسى.

كان محتوى الأوراق من الكالسيوم فى ٥/١ أعلى معنويا فى الأفرع الحاملة (١,٢٢١%) مقارنة بباقي المواعيد بينما كان أقل معنويا فى ١٠/١ وبلغ (٠,٥٥٢%) وكان محتوى الأوراق من الكالسيوم للأفرع الغير حاملة أعلى معنويا (١,٠٠٨%) فى صنف العجيزى القبرصى مقارنة بباقي الأصناف بينما كان أقل معنويا (٠,٦٠٥%) فى صنف العجيزى الشامى مقارنة بباقي الأصناف.

كان محتوى الأوراق من الكالسيوم أعلى معنويا فى الأفرع الغير حاملة (١,٠٧٣%) مقارنة بباقي المواعيد بينما كان أقل معنويا (٠,٢٩٧%) فى ٥/١ مقارنة بباقي المواعيد.

كان محتوى الأوراق من البوتاسيوم أعلى معنويا (٠,٨٦٨%) فى الأوراق للأفرع الحاملة لصنف الكالاماتا بينما كان أقل معنويا (٠,٥٨١%) فى صنف العجيزى الشامى مقارنة بباقي الأصناف.

كان محتوى الأوراق من البوتاسيوم فى ٥/١ أعلى بدرجة ملحوظة (٠,٨١٩%) مقارنة بباقي المواعيد. بينما كانت أقل معنويا (٠,٦٤١%) فى ١٠/١ مقارنة بباقي المواعيد.

كان محتوى الأوراق من البوتاسيوم فى الأفرع الغير حاملة أعلى معنويا (٠,٩٧٨%) فى صنف العجيزى القبرصى مقارنة بباقي الأصناف بينما كان أقل معنويا (٠,٦٨%) فى صنف العجيزى الشامى مقارنة بباقي الأصناف.

كان محتوى الأوراق من البوتاسيوم فى ١٠/١ أعلى معنويا (٠,٨٥٦%) فى الأفرع الغير حاملة مقارنة بباقي المواعيد بينما كان أقل معنويا (٠,٧٢٣%) فى ٥/١ مقارنة بباقي المواعيد.

من هذه النتائج نخلص إلى أنه توجد اختلافات بين الأصناف فى محتوى الأوراق من النيتروجين، الفوسفور، البوتاسيوم، الكالسيوم والكربوهيدرات وكذلك إختلافات بين الأفرع الحاملة والغير حاملة للثمار. لوحظ كذلك إختلافات بين الأصناف فى نسبة C/N فى الأفرع الحاملة والغير حاملة للثمار.

Table (1-a): N content % in leaves of six table olive cvs. in bearing and non bearing shoots (season 2002).

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.652	0.842	1.333	1.484	1.545	1.171	0.538	0.615	0.779	0.689	0.755	0.675
Kalamata	0.553	0.762	0.95	0.596	0.635	0.699	0.727	1.55	1.559	1.511	1.608	1.391
Eggizi Shami	0.604	0.634	1.493	0.696	0.735	0.832	1.585	0.78	1.74	0.669	0.754	1.105
Mission	1.628	1.541	1.474	0.635	0.665	1.188	0.798	1.774	1.525	1.735	1.764	1.519
Eggizi Koprosi	1.950	1.550	0.614	0.745	0.835	1.138	1.649	0.654	0.849	0.933	0.964	1.009
Eggizi Balady	1.625	1.725	1.642	1.539	1.603	1.626	0.655	0.642	0.758	1.327	1.385	0.953
Mean	1.169	1.176	1.251	0.949	1.003		0.992	1.003	1.202	1.144	1.205	

Bearing :

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

LSD AxBxC = 0.016

Table (1-b): N content % in leaves of six table olive cvs. in bearing shoots and non bearing shoots (season 2003).

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.873	1.707	1.856	1.728	1.454	1.541	0.955	1.728	1.582	1.615	1.744	1.528
Kalamata	1.235	1.614	1.810	1.510	1.654	1.564	0.767	1.740	0.625	0.835	1.856	1.164
Eggizi Shami	1.624	1.455	1.574	1.298	0.831	1.356	1.255	1.662	1.655	1.675	1.805	1.610
Mission	2.142	1.469	1.664	1.505	0.750	1.506	4.820	1.669	2.110	1.505	1.710	2.362
Eggizi Koprosi	1.530	1.716	1.739	1.605	1.615	1.641	0.844	1.760	1.539	1.537	1.550	1.446
Eggizi balady	1.566	1.591	1.891	1.657	1.755	1.373	1.620	1.550	0.797	0.935	1.682	1.316
Mean	1.495	1.592	1.756	1.551	1.358		1.710	1.685	1.385	1.350	1.725	

Bearing:

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.0066

LSD (cv.) 5% = 0.0073

LSD AxBxC = 0.016

Table (2-a): P content % in leaves of six table olive cvs. in bearing shoots and non bearing shoots (season 2002)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.134	0.06	0.369	0.018	0.024	0.121	0.05	0.054	0.08	0.019	0.025	0.045
Kalamata	0.067	0.086	0.415	0.078	0.095	0.148	0.231	0.634	0.115	0.097	0.099	0.235
Eggizi Shami	0.075	0.149	2.196	0.085	0.096	0.520	0.035	0.049	0.079	0.111	0.105	0.075
Mission	0.075	0.015	0.343	0.047	0.055	0.107	0.126	0.268	0.273	0.014	0.018	0.139
Eggizi Koprosi	0.029	0.075	0.77	0.138	0.153	0.233	0.09	0.08	0.089	0.108	0.114	0.096
Eggizi Balady	0.044	0.117	0.437	0.195	0.215	0.201	0.04	0.024	0.035	0.045	0.058	0.040
Mean	0.071	0.084	0.755	0.093	0.106		0.095	0.185	0.071	0.066	0.070	

Bearing :

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.007

LSD (cv.) 5% x dates = 0.006

LSD AxBxC = 0.016

Table (2-b): P content % in leaves of six table olive cvs. in bearing shoots and non bearing shoots (season 2003)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.068	0.082	0.046	0.125	0.21	0.106	0.059	0.062	0.079	0.206	0.284	0.138
Kalamata	0.084	0.265	0.052	0.088	0.274	0.143	0.025	0.081	0.052	0.168	0.395	0.162
Eggizi Shami	0.072	0.155	0.012	0.118	0.241	0.119	0.025	0.081	0.207	0.109	0.155	0.115
Mission	0.013	0.03	0.318	0.024	0.023	0.081	0.075	0.082	0.08	0.17	0.178	0.117
Eggizi Koprosi	0.013	0.209	0.182	0.194	0.293	0.178	0.074	0.159	0.209	0.229	0.242	0.182
Eggizi Balady	0.049	0.129	0.026	0.025	0.294	0.104	0.11	0.195	0.089	0.182	0.192	0.153
Mean	0.050	0.145	0.106	0.095	0.223		0.061	0.11	0.119	0.177	0.241	

Bearing :

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.059

LSD (cv.) 5% = 0.007

LSD AxBxC = 0.088

Table (3-a): C/N ratio in leaves of six table olive cvs. in bearing shoots and non bearing shoots (season 2002).

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	10.010	3.333	2.582	2.692	2.244	4.172	2.647	2.111	2.526	5.299	5.916	3.699
Kalamata	7.280	7.012	2.582	9.475	6.947	6.659	2.12	3.538	0.686	1.825	2.179	2.069
Eggizi Shami	7.504	9.212	0.677	7.50	6.508	6.280	0.725	1.586	3.194	9.102	8.605	4.642
Mission	1.688	3.681	3.91	0.808	3.244	2.666	6.798	0.418	1.098	3.687	3.804	3.161
Eggizi Koprosi	0.581	4.066	5.209	1.707	1.318	2.576	0.729	3.982	5.629	6.872	7.091	4.860
Eggizi Balady	1.412	3.671	2.372	0.919	0.814	1.837	9.197	9.052	4.516	3.286	4.322	6.074
Mean	4.745	5.163	3.544	3.851	3.513		3.703	3.441	2.942	5.012	5.320	

Bearing :

LSD cvx Dates 5% = 0.130
LSD (cv.) 5% = 0.142

Non bearing:

LSD cvx Dates 5% = 0.059
LSD (cv.) 5% = 0.117
LSD AxBxC = 0.245

Table (3-b): C/N ratio in leaves of six table olive cvs. in bearing shoots and non bearing shoots (season 2003).

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	5.480	0.889	1.318	1.703	2.545	2.320	1.70	1.444	1.757	2.633	3.111	2.129
Kalamata	1.076	1.620	3.754	4.22	3.15	2.764	2.54	5.117	5.118	5.270	3.110	4.231
Eggizi Shami	1.198	1.210	3.802	2.702	1.706	2.123	1.925	2.892	3.238	3.446	3.862	3.072
Mission	1.071	1.428	1.524	1.448	2.412	1.576	1.628	1.699	2.725	3.846	4.441	2.867
Eggizi Koprosi	1.608	2.123	2.717	2.246	1.33	2.004	0.428	1.572	1.121	2.05	2.016	1.401
Eggizi Balady	0.811	1.213	3.45	4.232	3.808	2.702	2.551	2.244	6.906	6.113	3.855	4.333
Mean	1.874	1.413	2.760	2.758	2.436		1.765	2.494	3.477	3.893	3.399	

Bearing :

LSD cvx Dates 5% = 0.021
LSD (cv.) 5% = 0.023

Non bearing:

LSD cvx Dates 5% = 0.141
LSD (cv.) 5% = 0.154
LSD AxBxC = 0.051

Table (4-a): Carbohydrate content % in leaves of six table olive cvs. in bearing and non bearing shoots season 2002)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	6.43	2.80	3.45	4.10	3.55	4.066	1.46	1.30	1.94	3.56	4.40	2.532
Kalamata	4.06	5.40	6.26	5.59	4.45	5.152	1.50	5.91	1.04	2.85	3.50	2.96
Eggizi Shami	4.48	6.50	1.06	5.38	4.85	4.454	1.21	1.28	5.49	6.05	6.50	4.106
Mission	2.74	5.71	5.85	0.56	2.24	3.42	5.45	0.75	1.74	6.54	6.81	4.258
Eggizi Koprosi	1.12	5.31	3.27	1.30	1.15	2.43	1.25	2.64	4.70	6.40	6.85	4.368
Eggizi Balady	2.25	6.48	3.87	1.44	1.35	3.078	5.81	5.79	3.45	4.46	6.05	5.112
Mean	3.517	5.369	3.692	3.064	2.932		2.763	2.948	3.964	4.979	5.686	

Bearing :

LSD cvx Dates 5% = 0.218
LSD (cv.) 5% = 0.238

Non bearing:

LSD cvx Dates 5% = 0.051
LSD (cv.) 5% = 0.056
LSD AxBxC = 0.382

Table (4-b): Carbohydrate content % in leaves of six table olive cvs. in bearing and non bearing shoots (season 2003)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	4.89	1.56	2.43	2.90	3.92	3.14	1.65	2.5	2.89	4.35	5.42	3.362
Kalamata	1.43	1.94	6.31	6.40	6.35	4.486	1.90	8.92	3.25	4.50	5.81	4.876
Eggizi Shami	1.94	1.91	7.30	4.65	3.03	3.766	2.35	4.85	3.35	5.80	6.95	5.06
Mission	2.35	2.10	2.38	2.25	1.73	2.162	1.33	3.08	4.25	5.90	6.94	4.30
Eggizi Koprosi	2.50	3.71	2.74	3.61	2.16	3.344	1.26	2.64	2.43	3.05	3.72	2.62
Eggizi balady	1.75	2.43	5.90	5.58	2.65	3.662	4.15	3.52	5.59	5.65	6.47	5.076
Mean	2.416	2.279	4.848	4.233	3.312		2.112	4.252	3.964	4.875	5.890	

Bearing :

LSD cvx Dates 5% = 0.051
LSD (cv.) 5% = 0.056

Non bearing:

LSD cvx Dates 5% = 0.076
LSD (cv.) 5% = 0.083
LSD AxBxC = 0.153

Table (5-a): Ca content % in leaves of six table olive cvs. in bearing and non bearing shoots (season 2002).

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.868	0.778	0.644	0.561	0.557	0.681	0.555	0.675	0.744	1.251	1.308	0.906
Kalamata	1.234	0.85	0.652	0.512	0.518	0.753	0.189	0.273	0.65	1.205	1.238	0.711
Eggizi Shami	1.891	0.91	0.739	0.631	0.578	0.949	0.188	1.16	0.789	0.383	0.507	0.605
Mission	1.08	0.88	0.712	0.666	0.606	0.788	0.247	0.648	0.695	0.789	0.854	1.091
Eggizi Koprozi	1.233	0.783	0.723	0.591	0.30	0.726	0.094	0.834	0.972	1.527	1.616	1.008
Eggizi Balady	1.02	0.835	0.735	0.695	0.755	0.808	0.51	0.417	0.787	0.839	0.913	0.693
Mean	1.221	0.839	0.701	0.609	0.552		0.297	0.668	0.773	0.999	1.073	

Bearing :

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

LSD AxBxC = 0.051

Table (5-b): Ca content % in leaves of six table olive cvs. in bearing and non bearing shoots (season 2003)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.755	0.541	0.457	0.422	0.416	0.518	0.398	0.643	0.67	0.705	1.018	0.686
Kalamata	0.70	0.601	0.602	0.646	0.601	0.63	0.279	0.415	0.604	0.789	0.805	0.578
Eggizi Shami	0.695	0.647	0.649	0.612	0.556	0.631	0.551	0.657	0.759	0.88	0.929	0.755
Mission	0.995	0.826	0.709	0.701	0.526	0.751	0.281	0.453	0.603	0.676	0.930	0.588
Eggizi Koprozi	0.863	0.695	0.832	0.701	0.61	0.740	0.61	0.561	0.929	0.96	0.988	0.809
Eggizi Balady	0.902	0.746	0.695	0.692	0.625	0.732	0.605	0.743	0.756	0.796	0.809	0.741
Mean	0.818	0.676	0.657	0.629	0.556		0.446	0.640	0.725	0.801	0.913	

Bearing :

LSD cvx Dates 5% = 0.006

LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.0066

LSD (cv.) 5% = 0.007

LSD AxBxC = 0.016

Table (6-a): K content % in leaves of six table olive cvs. in bearing and non bearing shoots (season 2002)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.843	0.780	0.703	0.614	0.564	0.699	0.759	0.767	0.785	0.794	0.830	0.787
Kalamata	0.958	0.835	0.895	0.827	0.829	0.868	0.77	0.789	0.799	0.878	0.888	0.824
Eggizi Shami	0.807	0.537	0.535	0.522	0.508	0.581	0.572	0.659	0.693	0.697	0.781	0.680
Mission	0.778	0.755	0.73	0.719	0.661	0.728	0.552	0.659	0.738	0.752	0.767	0.693
Eggizi Koprosi	0.807	0.728	0.648	0.619	0.624	0.685	0.945	0.967	0.983	0.995	1.00	0.978
Eggizi Balady	0.73	0.649	0.635	0.617	0.66	0.658	0.742	0.780	0.788	0.828	0.871	0.801
Mean	0.819	0.731	0.691	0.653	0.641		0.723	0.770	0.798	0.824	0.856	

Bearing :

LSD cvx Dates 5% = 0.006
LSD (cv.) 5% = 0.007

Non bearing:

LSD cvx Dates 5% = 0.006
LSD (cv.) 5% = 0.007
LSD AxBxC = 0.016

Table (6-b): K content % in leaves of six table olive cvs. in bearing and non bearing shoots (season 2003)

CV.	Bearing					Mean	Non bearing					Mean
	5	6	7	8	10		5	6	7	8	10	
Dulci	0.693	0.579	0.558	0.529	0.531	0.578	0.533	0.646	0.704	0.75	0.88	0.702
Kalamata	0.79	0.759	0.692	0.653	0.789	0.736	0.689	0.719	0.870	0.888	0.90	0.813
Eggizi Shami	0.694	0.675	0.651	0.631	0.592	0.648	0.548	0.71	0.605	0.854	0.919	0.727
Mission	0.725	0.674	0.628	0.615	0.595	0.647	0.662	0.67	0.685	0.699	0.719	0.687
Eggizi Koprosi	0.628	0.61	0.602	0.577	0.548	0.593	0.739	0.838	0.888	0.904	0.984	0.870
Eggizi Balady	0.609	0.549	0.525	0.543	0.763	0.597	0.578	0.725	0.737	0.752	0.771	0.712
Mean	0.690	0.641	0.609	0.591	0.636		0.625	0.718	0.748	0.808	0.862	

Bearing :

LSD cvx Dates 5% = 0.029
LSD (cv.) 5% = 0.032

Non bearing:

LSD cvx Dates 5% = 0.0066
LSD (cv.) 5% = 0.0073
LSD AxBxC = 0.072

