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# Rooting of Some Olive (*Olea Europaea L.*) Cultivars Under Shaded Polyethylene Tunnel at Middle Egypt Region Conditions

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## ABSTRACT

**The present study was conducted during 2008 and 2009 seasons on fifteen olive cultivars as a source of cuttings and planted in the experimental orchard of Horticultural Research Station, Seds, Beni- Suef Governorate, Egypt. The cultivars namely: Aggizi Aksi, Aggizi Shami, Arbequin, Coratina, Dolce Frantoio, Hamed, Kalamata, Koroneiki, Manzanillo, Maraki, Nabali Mohassan, Picual, Toffahi and Wardan. The cuttings were planted under a white plastic tunnel inside a shaded net house. This study included the two experiments:**

**Experiment (1): The aim of this experiment was to study rooting ability parameters of the fifteen olive cultivars under study, the results showed that, cuttings of Manzanillo, Picual, Aggizi Shami, Aggizi Aksi, Koroneiki and Coratina gave the highest values of most of the studied rooting parameters as, rooting percentage, number of roots and total roots length.**

**Experiment (2): The main objective was to study the effect of time of cutting preparation dates (February, May, August and November) of three olive cultivars (Coratina, Kalamata and Manzanillo) as well as interaction effect of their combinations on rooting ability parameters. Cuttings of Manzanillo cv. had good rooting characters 66.25 & 66.14 followed by Coratina cv. 62.39 & 59.91 then Kalamata cv. 12.52 & 10.81 during 2008 & 2009 seasons. August and November were considered the best date of cutting preparation under the same conditions of this study. Cuttings of Manzanillo prepared at August gave the highest rooting percent .The highest survival percentage after two months from transplanting was recorded from cuttings prepared and planted at August and November in both studied seasons.**

**As a conclusion we can say that rooting of some olive cuttings under shaded Polyethylene tunnel consider the best method compared with the other methods because it do not need a very expensive equipments.**

## INTRODUCTION

Olive (*Olea europaea* L.) has an important role in agricultural production especially where the soil is unsuitable for other crops due to its capability to grow under several conditions. In Egypt, olive tree is planting in new reclaimed lands and the total acreage exceeded rapidly during the last years. The total acreage reaches about 158.058 feddans (according to the latest statistics of the Ministry of Agriculture, 2009). Rooting is generally affected by internal and external factors i.e., cultivars, rooting media and time (Gerakakis and Ozkaya, 2005). Leaf is an important organ that affects rooting for its nutritive function and the hormonal supply, which translocate towards the root forming sites. Many researchers working on propagation of olive cultivars by using sub terminal leafy cuttings treated with IBA and planted in media of sand and peat moss (2:1, v/v) in greenhouse under mist propagation ( Hartman and Loreti, 1965; El- Nabawy *et al* ., 1983a; Salama *et al*., 1987; Foud *et al*., 1989 ; El- Said *et al*., 1990 and Emtithal El- Said *et al*., 1995; Proietti *et al*., 2003; Gerakakis and Ozkaya, 2005 and Turkoglu & Durmus, 2005). Using of soft and semi – woody cuttings in propagation, had received great deal of impetus during recent years because of its ability to root in relatively short period of time and high percentage (Gosh *et al*., 1988). The ability of cuttings to produce roots varies from one variety to another (Hartman and Kester 1978, El- Nabawy *et al*., 1983a; Salama *et al*., 1987; Foud *et al*., 1989; El- Said *et al*., 1990; Emtithal El- Said *et al*., 1995 and Osman *et al*., 2009). Mist propagation technique costly whereas in areas characterized by poor facilities (electricity and equipments). Propagation under white plastic tunnels is cheaper and can be used commercially. Thus, the present work was to investigate the rooting ability and survival of the fifteen studied olive cultivars. In addition, the study aimed to investigate the rooting of three olive cvs. in response to time of cutting preparation.

## MATERIALS AND METHODS

This study was carried out during two successive seasons of 2008 and 2009 on fifteen olive cultivars

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namely (Aggizi Aksi, Aggizi Shami, Arbequin, Coratina, Dolce, Frantoio, Hamed, Kalamata, Koroneiki, Manzanillo, Maraki, Nabali Mohassan, Picual, Toffahi and Wardan). Trees were grown in silty clay loam and flooded irrigation at the experimental orchard of Seds, Horticulture Research Station, Beni-Suef Governorate, Egypt. Three productive and uniform trees of each cultivar, similar in their vigour, diseases free and subjected to the same horticulture practices were carefully selected and devoted as a source for the required cuttings from each cultivar. This study included the two experiments:

**Experiment (1):**

In this experiment, rooting ability of olive sub terminal stem leafy cuttings was investigated in relation to fifteen studied cultivars. Each group cuttings of fifteen cultivars was distributed in four replicates with 50 cuttings/ replicate and planted in September of each season. This experiment was arranged in a randomized complete block design.

**Experiment (2):**

Second experiment was conducted on sub terminal leafy cuttings of three olive cultivars characterized by variation in rooting ability i.e , Manzanillo, Coratina and Kalamata and prepared at February, May, August and November as well as interaction effect of their combinations. This study was set in a factorial experiment design with four replication (50 cuttings/ each). Main plots were assigned to the tested cultivars. Sub plots included the four dates.

All cuttings were prepared as being 12-15 cm. in length, 4-6 mm in diameter and with 4 leaves left per each, and dipped the base of cuttings (5cm) for 10 sec. in a preparation solution of IBA at 4000 ppm before planting. Olive cuttings were planted in one liter black plastic container (8 cuttings/ bag).The containers were filled with media of mixture of clay and sand (1:2 v/v) under white plastic tunnels 80 micron in thickness and placed in a shaded net – house about 65 percentage porosity.

Rooting percentage, number of vegetative growth/ cutting, root number, total roots length (cm.), fresh root weight (gm.). Moreover, survival percentage was calculated after two months from transplanting. Total indoles in olive cuttings before planting were determined colourmetrically at wave length 530 nm by using P.di-methyl amino benzaldehyde test according to Larson et al., (1962).Total phenols in olive cuttings before planting were determined colourmetrically at wave length 730 nm described by A.O.A.C.(1970) and modified by Daniel and George (1972). All collected data were subjected to statistical analysis for each year according to Snedecor and Cochran (1980) using the method of New Least Significant Differences (New, L.S.D.) to compare the means at 0.05 level.

## RESULTS AND DISCUSSION

### I. Experiment (1): Rooting ability parameter of fifteen studied olive cultivars

#### I.1. *Rooting percentage and number of vegetative growth:*

Table (1) reveals significant differences between the studied cultivars with respect to their rooting percentage and number of vegetative growth/ cutting. Cuttings taken from Manzanillo (68.11 & 70.9 0) and Picual (67.16 & 68.33) had the highest values of rooting percentage, however, the cuttings of Kalamata produced the lowest rooting percentage (6.68 & 9.51) during 2008 and 2009 seasons, respectively, and the other cultivars were in between. Concerning the number of vegetative growth/ cutting, the highest records were obtained from Aggizi Aksi (6.25 & 6.29), Aggizi Shami (5.42 & 4.25) and Koroneiki (5.22 & 4.75), in both seasons, respectively, while, Kalamata cv. was the lowest (1.03&1.50) compared with the other tested cultivars.

I**.2.** ***Number of roots and total roots length,*** data in Table (1) show the significant variation between the studied cultivars .The average number of roots and total roots length which developed on cuttings of Nabali Mohassan (27.39 & 32.67 and 102.5 & 100.7cm, respectively) had a significant highest values followed by the cuttings of Picual (25.67 & 28.64 and 98.00 &. 93.90, respectively). On contrary, the kalamata cuttings gave the lowest ones (6.23 &5.20 and 14.77 &17.33 ,respectively). Other cultivars were in between in both studied seasons. The varietal differences can be attributed to the ability of cuttings to manufacture the essential substances for rooting such as IAA and other substances which may act as co- factors with IAA in the difficult to root cuttings. Similar results were obtained by El- Nabawy *et al.*, (1983a); Salama *et al*., (1987); Foud *et al*., (1989); El- Said *et al* ., (1990) and Emtithal El- Said *et al*., (1995);Proietti *et al*., 2003; Osman *et al*., (2009) who reported that there are a wide variation between olive cultivars concerning their rooting ability.

#### I.3. *Fresh weight of roots, survival percentage after two months from transplanting,*

The obtained data in (Table 2) show that such variation concerning these characters distribution between the fifteen tested cultivars. Cuttings of Aggizi Shami. and Dolce cvs. gave the highest values of fresh weight of roots (3.18 & 4.58 and 3.12 & 3.42 respectively) while the lowest ones were recorded form cuttings of Kalamata, Arbequin and Koroneiki cvs (1.76 &1.70, 1.96 & 1.76 and 1.95 & 1.86 respectively).

**Table 1. Rooting percentage, number of vegetative growth, number of roots and total roots length / cutting of some olive cultivars at middle Egypt region conditions during 2008and 2009 seasons**

| Cultivars | Rooting % | | Number of vegetative growth/cutting | | Number of roots/ cutting | | Toot roots length / cutting (cm) | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2008 | 2009 | 2008 | 2009 | 2008 | 2009 |
| **Aggizi Aksi** | 63.73 | 62.17 | 6.25 | 6.29 | 21.50 | 19.28 | 84.60 | 81.84 |
| **Aggizi Shami** | 62.58 | 61.79 | 5.42 | 4.25 | 15.56 | 9.70 | 87.08 | 85.83 |
| **Arbequin** | 50.51 | 47.11 | 3.19 | 4.16 | 12.76 | 10.92 | 38.58 | 42.17 |
| **Coratina** | 60.91 | 61.73 | 2.39 | 2.53 | 13.46 | 17.58 | 80.70 | 75.78 |
| **Dolce** | 43.43 | 46.25 | 3.26 | 4.39 | 16.56 | 12.61 | 37.39 | 41.00 |
| **Frantoio** | 51.41 | 44.70 | 2.77 | 3.64 | 17.55 | 12.48 | 33.97 | 70.77 |
| **Hamed** | 55.75 | 53.90 | 1.86 | 2.25 | 12.29 | 16.42 | 79.73 | 81.33 |
| **Kalamata** | 6.68 | 9.51 | 1.03 | 1.50 | 6.23 | 5.20 | 14.77 | 17.33 |
| **Koroneiki** | 62.21 | 64.77 | 5.22 | 4.75 | 19.29 | 13.97 | 32.40 | 25.33 |
| **Manzanillo** | 68.11 | 70.90 | 3.94 | 2.86 | 15.72 | 16.44 | 85.50 | 82.72 |
| **Maraki** | 50.47 | 48.73 | 1.95 | 2.08 | 20.68 | 19.33 | 72.74 | 71.33 |
| **Nabali Mohassan** | 43.46 | 43.31 | 1.66 | 2.56 | 27.39 | 32.67 | 102.5 | 100.7 |
| **Picual** | 67.16 | 68.33 | 3.22 | 2.93 | 25.67 | 28.64 | 98.00 | 93.90 |
| **Toffahi** | 53.44 | 58.43 | 2.77 | 3.78 | 11.52 | 12.45 | 54.64 | 38.22 |
| **Wardan** | 45.56 | 46.33 | 1.83 | 2.33 | 16.84 | 18.00 | 73.18 | 65.44 |
| **New L.S.D. at 0.05 level.** | **6.94** | **11.91** | **1.42** | **1.00** | **3.93** | **5.43** | **23.28** | **17. 60** |

**Table 2. Fresh root weight, survival percentage after 2 months, cutting total indoles and phenols of some olive cultivars at middle Egypt region conditions during 2008 and 2009 seasons**

| Cultivars | Fresh weight of roots / cutting(gm) | | Survival (%) after 2 month | | Indols mg/g fresh weight of cutting | | Phenols mg/g fresh weight of cutting | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2008 | 2009 | 2008 | 2009 | 2008 | 2009 |
| **Aggizi Aksi** | 2.85 | 3.05 | 90.44 | 91.08 | 7.96 | 8.28 | 4.15 | 4.17 |
| **Aggizi Shami** | 3.18 | 4.58 | 93.56 | 93.32 | 8.21 | 8.41 | 3.99 | 3.84 |
| **Arbequin** | 1.96 | 1.79 | 72.65 | 72.67 | 5.72 | 5.62 | 6.42 | 6.32 |
| **Coratina** | 2.43 | 3.78 | 71.59 | 78.95 | 7.92 | ٧,٩١ | 6.12 | 5.96 |
| **Dolce** | 3.12 | 3.42 | 83.13 | 79.06 | 6.64 | 7.02 | 4.32 | 4.94 |
| **Frantoio** | 2.20 | 2.98 | 74.33 | 75.35 | 5.73 | 5.73 | 6.44 | 6.48 |
| **Hamed** | 3.08 | 3.18 | 88.65 | 90.07 | 5.53 | 6.21 | 6.18 | 5.94 |
| **Kalamata** | 1.76 | 1.70 | 73.94 | 77.46 | 5.36 | 5.28 | 6.39 | 6.22 |
| **Koroneiki** | 1.95 | 1.86 | 70.26 | 75.88 | 6.42 | 6.68 | 5.74 | 5.31 |
| **Manzanillo** | 2.34 | 3.14 | 84.92 | 87.63 | 8.50 | 8.46 | 3.98 | 3.42 |
| **Maraki** | 2.41 | 1.92 | 69.38 | 73.75 | 6.00 | 6.35 | 5.09 | 5.11 |
| **Nabali Mohassan** | 2.80 | 3.20 | 80.18 | 79.02 | 7.60 | 8.36 | 4.27 | 4.48 |
| **Picual** | 2.84 | 3.24 | 80.69 | 79.04 | 7.52 | 7.80 | 4.04 | 3.79 |
| **Toffahi** | 2.73 | 2.87 | 89.35 | 89.18 | 6.49 | 7.00. | 4.58 | 4.37 |
| **Wardan** | 2.83 | 3.07 | 87.07 | 90.53 | 6.43 | 6.74 | 5.92 | 6.05 |
| **New L.S.D. at 0.05 level.** | **0.71** | **0.48** | **4.58** | **3.77** | **0.62** | **0.50** | **0.32** | **0.24** |

Regarding the survival percentage after two months, Aggizi Shami and Aggizi Aksi had the highest values (93.56 & 93.32 and 90.44 & 91.08, respectively) while Maraki cv. gave the lowest survival percentage after two months (69.38 and 73.75) in both tested seasons.

**I.4. Total Indoles and phenols,**

As for the response of total cuttings contents of indoles and phenols of all studied cultivars was significant, data presented in Table (2) show that the cuttings of Manzanillo, Aggizi Shami and Aggizi Aksi gave higher contents of total indoles (8.50 & 8.46, 8.21 & 8.41 and 7.96 & 8.28 respectively) and lower contents of total phenols (3.98 & 3.42, 3.99 & 3.84 and 4.15& 4.17 respectively) .On the other hand, the cuttings of Kalamata, Frantoio and Arbequin cvs. had the lower content of total indoles (5.36 & 5.28, 5.73 & 5.73 and 5.72 & 5.62 respectively) and higher content of total phenols (6.39 & 6.22, 6.44 & 6.48 and 6.42 & 6.32 respectively) in both studied seasons. Generally, it can be concluded that the rooting ability of olive studied cultivars was differed according to cultivar and the environmental conditions. Decreasing the root ability of Kalamata olive cultivar may be attributed to the anatomical factors are responsible for difficulty in rooting of cutting (Wally et al., 1981; Foud et al., 1989 and Emtithal El- Said et al., 1995)

**II. Experiment, 2: Effect of date of cutting preparation on three olive studied cultivars.**

Data in (Table 3-6) show the differences between the dates and three studied olive cultivars; Manzanillo, Coratina and Kalamata cvs.characterized by variation in rooting ability during 2008 and 2009 seasons.

**II.1. Rooting percentage and number of vegetative growth:** Data in Table (3) revealed that the cuttings of Manzanillo olive cultivar had the highest rooting percentage and number of vegetative growth (55.21 & 54.92 and 2.40 & 2.16, respectively) followed by Coratina cv cuttings. While the cuttings of Kalamata olive cultivar gave the lowest values (8.58 & 8.00 and 1.34 & 1.23, respectively)during both studied seasons. Concerning the date of cutting preparation, the cutting prepared in August in the first season gave the highest rooting percent (66.25, 62.39 and 12.52 respectively) and number of vegetative growth (3.76, 3.02 and 1.76 respectively) while in the second one the cuttings collected in November had the highest rooting percent (66.14, 59.91 and10.81 respectively). On contrary the cuttings prepared in May in both seasons gave the lowest rooting percentage (42.55 & 43.61, 39.74 & 42.04 and 5.58 & 6.31 respectively) and number of vegetative growth (1.40 & 1.41, 1.29 & 1.27and 0.99 & 0.89 respectively). As for the interaction between date preparation of cuttings and cultivars, the cuttings of Manzanillo olive cultivar prepared at August 2008 and at November 2009 seasons gave the highest percent of rooting. Highest number of vegetative growth was obtained from cuttings of Manzanillo olive cv. prepared at August in both seasons.

**II.2. Number of roots and total roots length**, it is clear from Table (4) that Manzanillo cuttings had the highest values of number of roots/cutting and root length (21.27 & 18.93 and 85.89 & 79.53, respectively) followed by Coratina cultivar (15.73 & 14.32 and 73.26 & 73.39 respectively) while cuttings of Kalamata gave the lowest values (6.98 & 6.64 and 15.25 & 13.93, respectively) in both seasons. The cuttings prepared in August gave the best results compared with the other preparing dates. Moreover, the Manzanillo olive cuttings planted in August 2008 and 2009 seasons had the highest values in this respect. This may be attributed to the variance in the environmental conditions prevailing during both seasons which could be certainly reflected on characteristics, nutritional status and rooting potentiality of cuttings. Moreover, the pronounced influence of preparation date of cuttings obtained in this work has been emphasized by Hore and Sen, 1995; Emtithal El- Said et al., (1995) on olives; Abo-Taleb et al., 1998 on pomegranate;

**II.3. Fresh weight of roots and survival percentage after two months from transplanting,** Data presented in Table (5) shown that significant differences were observed between cultivars. Manzanill olive cultivar had the highest values of fresh weight of roots (3.10&2.82 )and the survival percentage after two months from transplanting (79.00 & 80.53) followed by Coratina cv. (2.68 & 2.93 and 75.51 & 75.68 respectively while Kalamata olive cultivar gave the lowest ones (1.52 & 1.44 and 71.39 & 73.13 respectively) in both studied seasons. As for the date preparation of cuttings, data indicated that the cuttings collected at August and Novmber 2008 and 2009 seasons gave the heaviest roots and the highest survival percentage in addition the differences between them were no significant in both seasons. Lowest values in this respect were recorded for cuttings prepared at May in both seasons. Interaction between cultivars and dates of preparing cuttings was significant in both seasons. Manzanillo cuttings prepared at August and November gave the highest values in this respect. These results are in general agreement with Osman et al., (2009) on olives who reported that the varietal variations might be attributed

**Table 3. Rooting percentage and number of vegetative growth / olive cutting as affected by olive cvs. and date of preparing at middle Egypt region conditions during 2008 and 2009 seasons**

| Treatments | Rooting % | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 54.12 | 50.14 | 7.25 | 37.17 | 54.85 | 52.08 | 7.57 | 38.17 |
| May | 42.55 | 39.74 | 5.58 | 29.30 | 43.61 | 42.04 | 6.31 | 30.65 |
| August | 66.25 | 62.39 | 12.52 | 47.05 | 55.09 | 53.05 | 7.31 | 38.49 |
| November | 57.94 | 52.11 | 8.68 | 39.68 | 66.14 | 59.91 | 10.81 | 45.62 |
| Mean | 55.21 | 51.09 | 8.58 | | 54.92 | 51.77 | 8.00 | |
| *New LSD at 0.05 level | Cultivars © | Dates (D) | | CxD | Cultivars © | Dates (D) | | CxD |
| | 1.55 | 1.79 | | 3.32 | 1.86 | 2.17 | | 4.24 |
| | Number of vegetative growth / cutting | | | | | | | |
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 1.98 | 1.77 | 1.12 | 1.62 | 1.97 | 1.77 | 1.16 | 1.63 |
| May | 1.40 | 1.29 | 0.99 | 1.23 | 1.41 | 1.27 | 0.89 | 1.19 |
| August | 3.76 | 3.02 | 1.76 | 2.85 | 2.88 | 2.71 | 1.57 | 2.39 |
| November | 2.46 | 2.25 | 1.50 | 2.07 | 2.39 | 2.00 | 1.28 | 1.89 |
| Mean | 2.40 | 2.09 | 1.34 | | 2.16 | 1.94 | 1.23 | |
| New LSD at 0.05 level | Cultivars © | Dates (D) | CxD | | Cultivars© | Dates (D) | CxD | |
| | 0.20 | 0.17 | 0.38 | | 0.13 | 0.15 | N.S. | |

**Table 4. Number of roots and root length / olive cutting as affected by olive cvs. and date of preparing at middle Egypt region conditions during 2008 and 2009 seasons**

| Treatments | Number of roots/ cutting | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 18.67 | 14.04 | 6.84 | 13.19 | 16.00 | 12.54 | 5.62 | 11.39 |
| May | 16.32 | 13.24 | 5.43 | 11.66 | 17.33 | 14.40 | 7.94 | 13.22 |
| August | 27.33 | 18.86 | 7.48 | 17.89 | 24.03 | 16.00 | 6.39 | 15.47 |
| November | 22.77 | 15.33 | 8.16 | 15.42 | 18.37 | 14.35 | 6.61 | 13.11 |
| Mean | 21.27 | 15.37 | 6.98 | | 18.93 | 14.32 | 6.64 | |
| New LSD at | Cultivars © | Dates (D) | CxD | | Cultivars © | Dates (D) | CxD | |
| 0.05 level | 0.98 | 1.13 | 2.22 | | 0.88 | 1.05 | 1.89 | |
| | Root length / cutting | | | | | | | |
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 82.62 | 70.86 | 14.43 | 55.99 | 76.69 | 72.87 | 13.51 | 54.36 |
| May | 72.67 | 61.04 | 11.52 | 48.41 | 61.25 | 55.59 | 9.25 | 42.03 |
| August | 99.47 | 84.96 | 19.06 | 67.83 | 93.30 | 83.93 | 16.31 | 64.61 |
| November | 88.72 | 76.20 | 15.99 | 60.30 | 86.86 | 81.15 | 16.66 | 61.56 |
| Mean | 85.89 | 73.26 | 15.25 | | 79.53 | 73.39 | 13.93 | |
| *New LSD at | Cultivars © | Dates (D) | CxD | | Cultivars © | Dates (D) | CxD | |
| 0.05 level | 2.44 | 2.81 | 4.88 | | 1.74 | 2.00 | 3.48 | |

**Table 5. Fresh weight of roots/ olive cuttings and survival percentage after 2 months as affected by olive cvs. and date of preparing at middle Egypt region conditions during 2008 and 2009 seasons**

| Treatments | Fresh weight of roots/ cutting | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 2.88 | 2.27 | 1.35 | 2.27 | 2.76 | 2.19 | 1.29 | 2.08 |
| May | 2.52 | 2.25 | 1.20 | 1.99 | 2.24 | 2.10 | 1.22 | 1.85 |
| August | 3.59 | 2.88 | 1.80 | 2.76 | 3.20 | 2.65 | 1.60 | 2.48 |
| November | 3.44 | 3.01 | 1.74 | 2.73 | 3.08 | 2.61 | 1.64 | 2.45 |
| Mean | 3.10 | 2.68 | 1.52 | | 2.82 | 2.39 | 1.44 | |
| New LSD at 0.05 level | Cultivars © | Dates (D) | CxD | | Cultivars © | Dates (D) | CxD | |
| | 0.07 | 0.09 | 0.18 | | 0.08 | 0.12 | 0.23 | |
| | Survival percentage after 2 months | | | | | | | |
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 73.21 | 66.88 | 61.52 | 67.21 | 72.07 | 61.41 | 60.42 | 64.57 |
| May | 64.76 | 62.37 | 60.51 | 62.54 | 64.39 | 60.37 | 60.01 | 61.59 |
| August | 89.60 | 85.82 | 82.33 | 85.92 | 91.89 | 89.67 | 85.04 | 88.87 |
| November | 88.45 | 86.96 | 81.19 | 85.53 | 93.78 | 91.28 | 83.24 | 89.43 |
| Mean | 79.00 | 75.51 | 71.39 | | 80.53 | 75.68 | 73.13 | |
| *New LSD at 0.05 level | Cultivars © | Dates (D) | CxD | | Cultivars© | Dates(D) | CXD | |
| | 1.74 | 2.00 | N.S | | 1.24 | 1.43 | 2.81 | |

**Table 6. Total indoles and phenols (mg /g fresh weight) in olive cuttings as affected by olive cvs. and date of preparing at middle Egypt region conditions during 2008 and 2009 seasons**

| Treatments | Number of roots/ cutting | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 7.31 | 5.86 | 5.10 | 6.09 | 7.52 | 5.75 | 5.06 | 6.11 |
| May | 6.56 | 4.99 | 4.55 | 5.36 | 6.65 | 5.74 | 5.25 | 7.30 |
| August | 7.66 | 7.49 | 6.88 | 7.35 | 8.26 | 7.30 | 6.35 | 5.88 |
| November | 7.68 | 7.02 | 6.71 | 7.12 | 7.95 | 6.12 | 5.44 | 6.50 |
| Mean | 7.30 | 6.34 | 5.81 | | 7.59 | 6.23 | 5.52 | |
| New LSD at 0.05 level | Cultivars © | Dates (D) | CxD | | Cultivars © | Dates (D) | CxD | |
| | 0.24 | 0.28 | 0.56 | | 0.25 | 0.30 | N.S | |
| | Root length / cutting | | | | | | | |
| | 2008 | | | | 2009 | | | |
| | Manzanillo | Coratina | Kalamata | Mean | Manzanillo | Coratina | Kalamata | Mean |
| February | 5.44 | 6.38 | 6.08 | 6.11 | 5.07 | 6.43 | 6.97 | 6.16 |
| May | 5.18 | 6.94 | 6.06 | 6.20 | 5.15 | 6.53 | 7.12 | 6.27 |
| August | 4.91 | 5.86 | 6.14 | 5.77 | 4.79 | 5.72 | 5.71 | 5.84 |
| November | 4.72 | 6.34 | 6.84 | 6.10 | 4.76 | 6.23 | 6.55 | 5.41 |
| Mean | 5.06 | 6.38 | 6.28 | | 4.94 | 6.23 | 6.59 | |
| *New LSD at 0.05 level | Cultivars © | Dates (D) | CxD | | Cultivars © | Dates (D) | CxD | |
| | 0.16 | 0.19 | 0.37 | | 0.16 | 0.19 | 0.370. | |

to differences in their ability to invent naturally the essential substances required for rooting (Wazier et al., 2001 and Gerakakis & Ozkaya, 2005).

**II.4. Total Indoles and phenols,1**

Concerning of the effect of cultivars on total indoles and phenols Table (6), it is clear that total indoles and phenols were significantly differed according to cultivars and the date cuttings preparing in both seasons. Cuttings of Manzanillo olive cv. had higher content of indoles (7.30 and 7.59) and lower content of phenols (5.06 and 4.94) compared with the two other cultivars in both seasons. Concerning the date cuttings preparing, the differences were significant affect on total indoles and phenols. The cuttings prepared at August gave the highest values of indoles (7.35 & 7.30) and lowest ones of phenols (5.77 & 5.41) while that preparing at May had the lowest content of indoles (5.36 & 5.88) and highest of phenols (6.20 & 6.27) in both seasons. As regard to the interaction between cultivars and dates on total indoles, it was only significant in the first season and Manzanillo cv. prepared at August and Novmber 2008 season gave the highest values in this respect. Moreover, this interaction on total phenols was significant in both seasons. (Santos,1994) assures that the plant internal conditions can be evidenced by the hormonal balance between the promoters, inhibitors and cofactors that interfere on the root growth. The process of rooting begins when the hormonal balance between the promoters and inhibitors favours the promoters. Generally, it can be concluded that the rooting ability of Manzanillo olive cuttings prepared at August and November was the best results followed by Coratina cultivar.

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## الملخص العربي

# تجذير بعض أصناف الزيتون تحت الأنفاق البلاستيكية المظللة في ظروف منطقة مصر الوسطى

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أجريت هذه الدراسة خلال عامى ٢٠٠٨ و ٢٠٠٩ على ١٥ صنف زيتون والمترعة فى المزرعة البحثية لمحطة بحوث البساتين بسدس-محافظة بنى سويف وهذه الأصناف هى: العجيزى العقصى- العجيزى الشامى- أربيكوين-كوراتينا- دولسى- فرانتويو- حامض- كلاماتا- كورونا كى- متزانيللو- مراقى- نيبال محسن-بيكوال- التفاحى- وردان. وتم زراعة العقل تحت نفق بلاستك أبيض داخل صوبة مظللة . واشتملت هذه الدراسة على تجربتين:

**الأولى:** دراسة المقدره على التجذير لعدد ١٥صنف زيتون تحت الدراسه:- أوضحت النتائج أن عقل أصناف الزيتون المتزانيللو والعجيزى الشامى والعجيزى العقصى والبيكوال والكورونا كى والكوراتينا قد أعطت أعلى القيم فى معظم صفات التجذير المدروسة مثل نسبة التجذير وعدد الجذور ومجموع أطول الجذور/ عقلة.

**لثانية:** دراسة تأثير ميعاد تجهيز العقله لثلاثة أصناف زيتون ( المتزانيللو والكوراتينا والكلاماتا) علي مقدرتها على التجذير وأوضحت النتائج أن:

-عقل المتزانيللو قد أعطت أفضل صفات تجذير يليها الكوراتينا ثم الكلاماتا.

-يعتبر شهرى أغسطس ونوفمبر هى أفضل وقت لتجهيز وزراعة العقل تحت ظروف هذه الدراسة.

-عقل المتزانيللو التى تم تجهيزها فى أغسطس أعطت أعلى نسبة تجذير.

-نسبة البقاء بعد شهرين من التفريد كانت أعلى مع العقل المترعة فى شهور أغسطس ونوفمبرخلال الموسمين.

من هذه الدراسه يمكن القول ان تجذير بعض اصناف الزيتون تحت الأنفاق البلاستيكيه المظلله نعتبر من الطرق السهله وقليلة التكاليف اذا ما قورنت بطرق التجذير الاخري.