Bull. Fac. Agric., Cairo Univ., 61: 182-190 (2010)

A STUDY ON ROOTING OF CUTTINGS OF SOME RECENTLY INTRODUCED OLIVE CULTIVARS IN NORTH SINAI
1. THE EFFECT OF PROPAGATION TECHNIQUES AND COLLECTION DATES

(Received: 16.1.2010)

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ABSTRACT

This study was conducted in North Sinai Research Station at El-Sheikh Zuwayid, Desert Research Center (D.R.C.) during the 2006 and 2007 seasons. It aimed at evaluating the effect of different propagation techniques and collection dates of cuttings on rooting ability of five recently introduced olive cultivars. Leafy subterminal cuttings of olive cultivars Chiperssino, Tanche, Jabaa, Conservollia and Itrana were prepared during March, June, September and December, treated with IBA at 4000 ppm and rooted using intermittent mist, vapor pressure deficit (V.P.D.) and wooden boxes propagation techniques. A wide variation in rooting ability of the studied cultivars was found. Cuttings of olive cv. Cheperssino had a significantly superior rooting percentage, whereas, cuttings of olive cv. Itrana gave the lowest significant percentage. Moreover, cuttings sown in wooden boxes exhibited the highest significant rooting percentage in comparison to V.P.D and mist propagation techniques. In addition, June collection date showed the highest significant rooting percentage, number of roots and root length under V.P.D. and mist propagation techniques. Meanwhile, the wooden boxes propagation technique significantly resulted in the highest rooting percentage during March collection date.

***Key words*:** *cultivar, cutting, collection, date, IBA, olive, propagation, technique, rooting.*

1. INTRODUCTION

Olive tree (*Olea europaea* L.) belongs to the family Oleaceae. Olive is considered one of the most important crops which can be grown under harsh conditions especially drought and salinity (Bailey, 1961 and Robinson, 1987).

Propagation by stem cuttings is considered the most important and widely commercial method as it provides a large number of plants with good quality from a limited source of parent material in a short time. It is also inexpensive, rapid and simple and does not require the special techniques necessary in grafting or budding. Using IBA treatment greatly improved cutting propagation (Chaari-Rkhiss and Trigui, 1996).

Some olive cultivars are easily rooted (Ascolano, Wetaken and Manzanillo), while others are hard to root (Sevillano, Morino and Kalamata). The variation among cultivars may be attributed to the differences in the rooting potentialities. Propagation by cuttings of these cultivars has also presented problems because of low rooting ability (Kilany, 1991).

Newly introduced olive cultivars Chiperssino, Tanche, Jabaa, Conservollia and Itrana, which were previously examined by Amar (2003), and Ghieth (2003), proved to be superior (in oil content – yield – fruit weight – flesh / fruit – etc.) under North Sinai conditions.

The present study aimed at determining the best technique to propagate the five promising cultivars, studying the effect of seasonal fluctuation on their rooting ability, and evaluating the differences in the rooting ability of the studied olive cultivars.

2. MATERIALS AND METHODS

This investigation was carried out during the two successive seasons of 2006 and 2007 to study the rooting ability of five olive cultivars Chiperssino, Tanche, Jabaa, Conservollia and Itrana and their fluctuations due to preparation at four seasonal intervals. Also, the effect of the three propagation techniques was determined. The selected trees were about 13 year old. Sub terminal leafy cuttings were taken from

moderately vigorous shoots of the current growth. The cuttings were 12-15 cm long; the four terminal leaves on each cutting were retained, and the basal cut was made just below a node.

Cuttings of the five cultivars were collected at four dates: the beginning of March, June, September and December during each season.

Just before planting, the basal end of cuttings (about 2.5 cm) was dipped for 5 seconds in indole butyric acid (IBA) solution 4000 ppm as recommended by (Ozelbaykal and Gezerel, 2005). The treated cuttings were then planted to a depth of 5 cm in plastic trays (45 cm length × 30 cm width × 15 cm height) or wooden boxes (1.0 m x 1.0 m x 0.25 m), filled with a mixture of vermiculite and sand (2:1 by volume) and each tray contained 100 cuttings representing a replicate, and each wooden box contained 300 cuttings (three replicates) and each replicate represented different olive cultivar.

The treated cuttings were rooted by using three different techniques, and each technique was applied in a separate plastic house covered with shade net. Each propagation house contained two sensors; the first one HMP45C Temperature and Relative Humidity Probe was used to measure air temperature and relative humidity, and the other sensor, 107/107B Temperature Probe was used to measure soil temperature. These sensors were connected to a datalogger CR10(X). The dataloger's program was designed to record the readings of these sensors every hour for the three techniques during the two seasons (Table1). After each experiment the stored data were collected from the datalogger using a Storage module, and were saved and tabulated on the computer. Also, the quantity of water consumption was measured from each technique.

In the first technique (intermittent mist operating system (I.M.)), the planted trays were put in a rooting bed in the propagation house under intermittent mist, operating during day hours according to seasonal and daily weather conditions, within a range of 15–30 minutes between sprays and 5–10 seconds of mist duration to maintain sufficient humidity level for successful rooting. No bottom heat system was used in this technique.

The second technique (wooden boxes) was carried out by planting the treated cuttings in wooden boxes and tightly covering them with polyethylene sheets after being irrigated. These boxes were buried in such a way that the polyethylene cover was at the level of the ground

Table (1): The average air temperature, soil temperature, humidity percentage and quality of water consumption under different techniques in both seasons.

Tech.	Boxes	V.P.D.	I.M.	Mean	Boxes	V.P.D.	I.M.	Mean
Season	**2006**				**2007**			
Dates	**Air temperature (^{o}C)**							
March	28.67	25.64	19.99	**24.77**	27.96	25.44	19.85	**24.41**
June	39.72	34.74	26.94	**33.80**	40.55	35.09	27.75	**34.46**
Sep.	30.51	26.47	22.88	**26.62**	31.24	27.33	23.84	**27.47**
Dec.	16.79	15.55	13.96	**15.43**	16.56	15.31	13.47	**15.11**
Mean	**28.92**	**25.60**	**20.94**		**29.08**	**25.79**	**21.22**	
Dates	**Soil temperature (^{o}C)**							
March	23.98	22.10	18.18	**21.42**	23.79	22.17	18.61	**21.52**
June	31.70	30.59	24.90	**29.06**	32.50	31.34	25.89	**29.91**
Sep.	25.71	24.26	21.17	**23.71**	26.37	24.81	22.49	**24.55**
Dec.	15.44	13.93	13.06	**14.14**	14.92	13.27	12.26	**13.48**
Mean	**24.21**	**22.72**	**19.33**		**24.39**	**22.89**	**19.81**	
Dates	**Humidity percentage**							
March	82.37	78.21	67.58	**76.05**	84.40	72.61	64.85	**73.95**
June	80.59	73.13	67.95	**73.89**	82.03	70.94	65.53	**72.83**
Sep.	82.37	76.76	64.58	**74.57**	84.85	78.46	66.77	**76.69**
Dec.	84.59	80.41	69.29	**78.10**	89.22	81.78	67.87	**79.62**
Mean	**82.48**	**77.12**	**67.35**		**85.12**	**75.95**	**66.25**	
Dates	**Quantity of water consumption L./m^2**							
March	10.00	135.32	237.32	**382.64**	10.00	132.78	222.06	**364.84**
June	15.00	219.57	352.87	**587.44**	15.00	225.02	397.28	**637.30**
Sep.	10.00	129.61	232.37	**371.98**	10.00	146.81	259.52	**416.33**
Dec.	7.50	48.41	111.07	**166.98**	7.50	44.36	102.11	**153.97**
Mean	**42.50**	**532.91**	**933.63**		**42.50**	**548.97**	**980.97**	

surface of the wood trench and another polyethylene sheet was in the bottom of the wooden trench. High relative humidity (RH) was maintained by trapping the water vapor inside the boxes (Reddy and Singh, 1988).

In the third technique (Vapor pressure deficit (V.P.D.), planted trays were put in a propagation bed under intermittent mist supplied with soft water. Also, there were intermittent foggers at the sides inside the house. These foggers were given saline water to increase relative humidity in the propagation house. The plastic house was tightly closed to prevent losing humidity, and to decrease the quantity of water consumed in the propagation house. The computer system determined V.P.D. every 6 seconds and recorded the values. This accumulated V.P.D. was considered as an estimate of plant water use. The amount of accumulated V.P.D. was estimated as (0.15 Kpa) needed to start irrigation. V.P.D. was calculated using the method described by Goff and Gratch (1946), Lowe (1977) and Weiss (1977).

Rooting percentage, average number of roots and average root length per rooted cuttings were recorded after 3 months from planting.

The experiment was arranged in a split-split plot design with three replicates for each treatment. Main plots treatments were propagation techniques, sub-plots treatments were different collection dates and the sub-sub plots treatments were the cultivars. Analysis of variance was performed by MSTAT program, according to Snedecor and Cochran (1972). Means were compared using Duncan's multiple range test.

It is obvious from Table (1) that the differences in the average air temperature, soil temperature, humidity percentage and the quantity of water consumption among different propagation techniques were due to the variation in collection dates which were March, June, September and December. The highest average air temperature was obtained in June collection date, and also the highest average air temperature was observed under the wooden boxes propagation technique (during both seasons).

In both seasons, June collection date and wooden boxes propagation technique showed the highest average soil temperature.

Moreover, it was observed that the highest average humidity percentage was obtained in December collection date. In addition, wooden boxes propagation technique gave the highest average humidity percentage during both seasons of study.

Meanwhile, the highest level of water consumption was observed during June collection date, and also I.M. propagation technique consumed the highest level of water in both seasons of study.

3. RESULTS AND DISCUSSION

3.1. Rooting of subterminal olive cuttings

3.1.1. Rooting percentage

It is clear from Tables (2-a and b) that there were significant differences in rooting percentage among the cultivars studied due to collection dates and different propagation techniques during both seasons. The highest significant rooting percentage was obtained from olive cv. Chiperssino as it averaged 52.42 and 52.50% in the first and second seasons, respectively. On the other hand, olive cv. Itrana gave the lowest significant rooting percentage (8.98 and 7.78% in the two seasons of study). These results are in parallel with the findings of researchers who stated that the rooting percentage varied considerably among olive cultivars (Khabou, 2002 and Sghir *et al.*, 2003).

Generally, in both seasons, the highest significant rooting percentage was obtained in June collection as it averaged 37.96 and 38.20% in the first and second seasons, respectively. In contrast, December collection resulted in the lowest significant rooting percentage as it averaged only 15.67 and 8.89% in the two seasons, respectively. These results are in harmony with previous reports indicating that cuttings taken during the summer gave the highest rooting percentage, while those taken during winter gave the lowest percentage. On the other hand, cuttings collected in autumn and spring gave an intermediate rooting percentage (Gautam and Chauhan, 1991; Kilany, 1991; Hegazy, 2003 and Zietemann and Roberto, 2007).

As for the effect of different techniques on rooting percentage, it was clearly shown that cuttings sown in wooden boxes exhibited the highest significant rooting percentage as it averaged 37.32 and 32.75% in the two seasons, respectively. In contrast, cuttings rooted using I.M. technique gave the lowest significant percentage (21.22 and 21.72% in the two seasons). The obtained results are in line with the previous findings of Fontanazza and Rugini (1981) who stated that rooting percentage in heated boxes was higher than, or similar to, the rooting percentage under mist. Ozkaya and Celik (1994) found that rooting percentage was significantly higher in the tunnel than under mist.

Table (2): Effect of different cultivars, collection dates and propagation techniques on rooting percentage of sub terminal olive cuttings.

Table (2-a): The first season (2006).

Tech.	**1- Wooden boxes**					**Dates x Tech.**
	Cultivar					
Dates	Chiper.	Tanche	Jabaa	Conser.	Itrana	
March	86.00 a	56.33 b-d	51.00 c-e	37.67 d-j	20.33 i-s	**50.27 a**
June	59.00 b-d	40.67 d-h	31.33 e-l	19.67 i-s	8.67 o-y	**31.87 c**
Sep.	67.67 bc	58.67 b-d	46.33 d-g	15.33 l-u	26.67 g-n	**42.93 b**
Dec.	39.33 d-i	28.33 f-m	23.33 h-o	22.00 h-p	8.00 p-y	**24.20 d**
Mean	**37.32 a**					
Tech.	**2- V.P.D.**					
Dates	**Cultivar**					
March	58.33 b-d	51.00 c-e	38.00 d-j	17.33 k-u	5.33 u-y	**34.00 c**
June	74.00 ab	57.67 b-d	49.33 c-e	24.00 h-o	11.33m-x	**43.27 b**
Sep.	44.00 d-g	31.33 e-l	19.67 j-t	8.67 o-y	6.33 t-y	**22.00 d**
Dec.	31.33 e-l	22.00 h-q	**11.67m-w**	7.00 s-y	2.67 w-z	**14.93 e**
Mean	**28.55 b**					
Tech.	**3- Intermittent mist**					
Dates	**Cultivar**					
March	47.33 d-f	35.00 e-k	22.67 h-p	7.33 q-y	6.00 t-y	**23.67 d**
June	69.00 bc	48.67 c-f	44.33 d-g	21.00 i-r	10.67 n-x	**38.73 b**
Sep.	33.33 e-l	20.00 i-s	13.33m-v	4.67 v-z	1.67 yz	**14.60 e**
Dec.	19.67 j-t	10.33 n-x	7.00 r-y	2.33 x-z	0.00 z	**7.87 f**
Mean	**21.22 c**					
Mean	**52.42 a**	**38.33 b**	**29.83 c**	**15.58 d**	**8.97 e**	
Mean of dates		March	June	Sep.	Dec.	
		35.98 a	**37.96 a**	**26.51 b**	**15.67 c**	

In this table and the following tables, means having similar letter(s) in the same row or column were not significantly different at 0.05 probability.

Table (2-b): The second season (2007).

Tech.	**1- Wooden boxes**					**Dates x Tech.**
	Cultivar					
Dates	Chiper.	Tanche	Jabaa	Conser.	Itrana	
March	78.33 a	53.33 b-e	41.67 c-h	29.67 g-l	22.67 i-o	**45.13 a**
June	48.00 b-g	25.33 h-n	28.33h-m	9.33 o-s	4.00 r-u	**23.00 bc**
Sep.	81.33 a	60.67 bc	56.67 b-d	18.00 k-p	23.67 i-o	**48.07 a**
Dec.	36.00 e-j	21.67 i-p	10.00 o-s	5.67 q-t	0.67 tu	**14.80 d**
Mean	**32.75 a**					
Tech.	**2- V.P.D.**					
Dates	**Cultivar**					
March	55.00 b-e	47.00 b-g	31.33 g-l	8.00 p-s	2.33 s-u	**28.73 b**
June	78.33 a	55.00 b-e	56.67 b-d	19.67 j-p	16.33 l-p	**45.20 a**
Sep.	47.67 b-g	38.33 d-i	33.67 f-k	10.33 o-s	5.67 q-t	**27.13 b**
Dec.	25.33 h-n	11.33 n-r	8.67 p-s	0.00 u	0.00 u	**9.06 e**
Mean	**27.53 b**					
Tech.	**3- Intermittent mist**					
Dates	**Cultivar**					
March	51.67 b-f	29.67 g-l	13.00m-q	3.33 q-u	2.33 r-u	**20.00b-d**
June	77.00 a	61.67 b	52.67 b-e	28.33h-m	12.33 n-r	**46.40 a**
Sep.	41.67 c-h	23.33 h-o	11.67 n-r	8.33 p-s	3.33 r-u	**17.67 cd**
Dec.	9.67 o-s	4.33 q-t	0.00 u	0.00 u	0.00 u	**2.80 f**
Mean	**21.72 c**					
Mean	**52.50 a**	**35.97 b**	**28.69 c**	**11.72 d**	**7.78 e**	
Mean of dates		March	June	Sep.	Dec.	
		31.29 b	**38.20 a**	**30.96 b**	**8.89 c**	

In wooden boxes, the highest significant rooting percentage resulted from March collection date. However, V.P.D. and I.M. propagation techniques resulted in the highest significant rooting percentage during June collection dates as it averaged (43.27 and 38.73%) for the two techniques in the first season and (45.20 and 46.40%) in the second season.

Moreover, rooting percentage responded significantly to the interaction among different cultivars, collection dates and propagation techniques in both seasons. In the first season, the highest significant value of rooting percentage was obtained from olive cv. Chiperssino during March using wooden boxes propagation technique as it averaged 86%. On the other hand, cuttings of olive cultivar Itrana failed completely to root during December using I.M. technique. In the second season, cuttings taken from cv. Chiperssino during September recorded the highest significant value of rooting percentage in wooden boxes propagation technique as it averaged 81.33%. However, no rooting was observed in olive cv. Conservollia and Itrana during December in I.M. and V.P.D. propagation techniques and also in olive cv. Jabaa cultivar prepared in December using I.M. technique.

3.1.2. The average root number per rooted cutting

Data presented in Tables (3- a and b) showed marked differences among the five olive cultivars concerning the number of roots per rooted cuttings which differed with different collection dates and propagation techniques in both seasons of the study. The highest significant number of roots per rooted cutting was obtained from olive cv. Chiperssino which averaged 7.42 and 7.95 roots/cutting in the first and second seasons, respectively, as it was easy to root. In contrast, Itrana olive cv. gave the lowest significant number of roots per rooted cutting as it averaged 2.37 and 1.92 roots/cutting in the two seasons. The correlation between rooting ability and average number of roots for different olive cultivars was reported by several workers (Sghir *et al.*, 2003 and Turkoglu and Durmus, 2005).

In general average, June collection date gave the highest significant number of roots per rooted cutting for the different cultivars as it averaged 6.13 and 6.46 roots/cutting in the two seasons, respectively, whereas cuttings prepared during December resulted in the lowest significant number of roots per cutting as it averaged 2.66 and 1.92 roots/cutting in the two seasons. These results are in harmony with the findings of workers who reported that summer was the best time for collecting cuttings and for maximizing root number per cutting, whereas the minimum was in autumn and winter (Gautam and Chauhan, 1991, and Hegazy, 2003).

Meanwhile, in both seasons, cuttings rooted using the wooden boxes propagation technique gave the highest significant number of roots, with averages of 5.73 and 5.31 roots/cutting in the two seasons. In contrast, rooted cuttings resulting from I.M. propagation technique had the lowest significant average of the number of roots.

Furthermore, the interaction between the different propagation techniques and the collection dates was significant in both seasons. When the wooden boxes propagation technique was used, the highest significant number of sprouted roots per cuttings was recorded during March collection date (8.08 and 6.88 roots/cutting in the two seasons, respectively). However, it was found that using V.P.D and I.M. propagation techniques gave the highest significant number of roots per rooted cutting in June collection during both seasons.

Also, the number of roots developed per rooted cuttings was significantly affected by the interaction between cultivars, collection dates and different techniques. In the first season, the highest significant number of roots was observed in olive cv. Chiperssino during March using wooden boxes as it averaged (12 roots/cutting), whereas olive cv. Itrana completely failed to root when the cuttings were taken in December, and rooted under I.M. technique. In the second season, Chiperssino cultivar had the highest significant number of roots during June when the cuttings were rooted using the V.P.D technique as it averaged 11.93 roots/cutting. On the other hand, the lowest significant number of roots was obtained from cuttings of cvs. Conservollia and Itrana in December from V.P.D and I.M. propagation techniques and also those of olive cv. Jabaa during December using I.M., as these cultivars failed to form roots.

3.1.3. The average root length

Data in Tables (4-a and b) showed that the root length of rooted cuttings differed significantly due to collection dates and different propagation techniques during both seasons. The rooted cuttings of Chiperssino cultivar gave significantly the tallest roots (with averages of 6.27 and 5.99 cm in the first and second seasons, respectively). On the other hand, those of olive cv. Itrana produced significantly the shortest roots which averaged 3.62 and 3.34 cm in the two seasons. These results are in parallel with previous findings of Kilany (1991), Hegazy (2003) and Turkoglu and Durmus (2005) who found that the average root length per rooted cutting differed with different olive cultivars.

Regarding the effect of collection dates on root length, it is clear that the highest significant root length of rooted cuttings was obtained during March in 2006 and June in 2007, whereas

Table (3): Effect of different cultivars, collection dates and propagation techniques on the average number of roots of sub terminal olive cuttings.

Table (3-a): In the first season (2006).

Tech.	**1- Wooden boxes**					**Dates x Tech.**
	Cultivar					
Dates	Chiper.	Tanche	Jabaa	Conser.	Itrana	
March	12.00 a	9.31 cd	8.83 c-e	5.70 h-l	4.55 k-q	**8.08 a**
June	11.14 ab	7.58 e-g	5.83 h-k	3.56 n-t	2.44 t-x	**6.11 bc**
Sep.	8.03 d-f	6.25 g-j	5.75 h-k	2.91 r-w	3.11 q-w	**5.21 d**
Dec.	5.03 j-n	4.45 k-q	3.64 n-t	2.43 t-x	1.97 u-x	**3.50 f**
Mean	**5.73 a**					
Tech.	**2- V.P.D**					
Dates	**Cultivar**					
March	8.72 c-e	6.82 f-h	5.60 h-l	3.17 q-w	2.58 s-x	**5.38 d**
June	9.66 bc	8.19 c-f	6.71 f-i	4.51 k-q	3.61 n-t	**6.54 b**
Sep.	5.94 h-k	4.73 k-p	3.42 o-u	2.33 t-x	2.02 u-x	**3.69 ef**
Dec.	4.22 l-r	3.60 n-t	2.56 s-x	1.81 v-x	1.11 xy	**2.66 g**
Mean	**4.57 b**					
Tech.	**3- Intermittent mist**					
Dates	**Cultivar**					
March	6.97 f-h	5.20 j-m	4.00 m-s	3.08 q-w	2.34 t-x	**4.32 e**
June	8.60 c-e	6.83 f-h	7.02 f-h	3.30 p-v	2.94 r-w	**5.74 cd**
Sep.	5.26 i-m	4.89 j-o	3.12 q-w	1.87 v-x	1.75 wx	**3.38 f**
Dec.	3.41 o-u	2.50 t-x	2.00 u-x	1.13 xy	0.00 y	**1.81 h**
Mean	**3.81 c**					
Mean	**7.42 a**	**5.86 b**	**4.87 c**	**2.98 d**	**2.37 e**	
Mean of dates		March	June	Sep.	Dec.	
		5.93 a	**6.13 a**	**4.09 b**	**2.66 c**	

Table (3-b): In the second season (2007).

Tech.	**1- Wooden boxes**					**Dates x Tech.**
	Cultivar					
Dates	Chiper.	Tanche	Jabaa	Conser.	Itrana	
March	11.06 ab	9.28 cd	6.80 e-j	3.67 n-s	3.61 o-s	**6.88 b**
June	9.56 bc	5.20 k-n	6.25 h-k	2.36 s-y	1.63 v-y	**4.99 c**
Sep.	10.94 ab	7.86 d-g	6.78 f-j	2.70 q-x	3.56 o-t	**6.37 b**
Dec.	4.36 l-p	3.83 m-s	3.53 o-t	1.89 u-y	1.33 x-z	**2.99 f**
Mean	**5.31 a**					
Tech.	**2- V.P.D**					
Dates	**Cultivar**					
March	8.36 c-e	6.25 h-k	4.39 l-p	2.63 r-y	1.42 x-z	**4.61 cd**
June	11.93 a	9.05 cd	8.29 c-f	5.36 j-m	3.94 m-r	**7.71 a**
Sep.	7.44 e-i	5.88 i-l	4.47 l-o	3.10 o-w	1.72 v-y	**4.52 cd**
Dec.	3.34 o-u	2.82 p-x	3.16 o-v	0.00 z	0.00 z	**1.86 g**
Mean	**4.68 b**					
Tech.	**3- Intermittent mist**					
Dates	**Cultivar**					
March	7.91 d-g	5.36 j-m	3.06 o-w	1.87 u-y	1.56 w-z	**3.95 de**
June	11.31 a	7.81 d-h	6.66 g-k	4.46 l-o	3.16 o-v	**6.68 b**
Sep.	6.54 g-k	4.53 l-o	4.25 m-q	2.00 t-y	1.06 yz	**3.67 ef**
Dec.	2.60 r-y	1.93 u-y	0.00 z	0.00 z	0.00 z	**0.91 h**
Mean	**3.80 c**					
Mean	**7.95 a**	**5.82 b**	**4.80 c**	**2.50 d**	**1.92 e**	
Mean of dates		March	June	Sep.	Dec.	
		5.15 b	**6.46 a**	**4.86 b**	**1.92 c**	

Table (4): Effect of different cultivars, collection dates and propagation techniques on the average root length (cm) of sub terminal olive cuttings.

Table (4-a): In the first season (2006).

Tech.	**1- Wooden boxes**					**Dates x Tech.**
	Cultivar					
Dates	Chiper.	Tanche	Jabaa	Conser.	Itrana	
March	10.63 a	9.27 ab	8.93 bc	7.79 c-f	7.70 c-g	**8.86 a**
June	8.58 b-d	5.47 k-t	4.37 q-y	6.61 f-m	6.75 f-k	**6.36 bc**
Sep.	7.06 e-i	6.40 g-n	5.73 i-q	4.44 p-x	5.19 n-t	**5.76 cd**
Dec.	5.07 n-u	4.54 p-w	4.21 t-y	3.11 x-z[3]	2.58 z-z[4]	**3.90 f**
Mean	**6.22 a**					
Tech.	**2- V.P.D**					
Dates	**Cultivar**					
March	8.19 b-e	7.14 e-h	5.76 i-p	5.65 j-r	3.79 u-z	**6.10 bc**
June	7.54 d-g	6.66 f-l	6.89 e-j	5.28 l-t	5.77 h-p	**6.43 b**
Sep.	5.26 m-t	4.27 s-y	3.68 v-z	3.59 w-z[1]	2.73 z-z[3]	**3.91 f**
Dec.	3.39 w-z[2]	2.76 z-z[3]	2.28 z[1]-z[5]	1.82 z[3]-z[5]	1.17 z[5]-z[6]	**2.29 h**
Mean	**4.68 b**					
Tech.	**3- Intermittent mist**					
Dates	**Cultivar**					
March	5.63 j-s	5.51 k-t	4.99 o-v	5.15 n-u	2.73 z-z[3]	**4.80 e**
June	6.99 e-j	6.14 h-o	6.06 h-o	4.20 t-y	3.80 u-z	**5.44 d**
Sep.	4.35 r-y	3.00 y-z[3]	3.56 w-z[2]	2.78 z-z[3]	1.22 z[4]-z[6]	**2.98 g**
Dec.	2.54 z-z[5]	2.21 z[2]-z[5]	1.99 z[3]-z[5]	0.89 z[6]	0.00 z[6]	**1.53 i**
Mean	**3.69 c**					
Mean	**6.27 a**	**5.28 b**	**4.87 c**	**4.28 d**	**3.62 e**	
Mean of dates	March	June	Sep.	Dec.		
	6.59 a	**6.07 b**	**4.22 c**	**2.57 d**		

Table (4-b): In the second season (2007).

Tech.	**1- Wooden boxes**					**Dates x Tech.**
	Cultivar					
Dates	Chiper.	Tanche	Jabaa	Conser.	Itrana	
March	9.08 ab	7.42 b-e	7.15 c-f	7.18 c-f	6.86 c-h	**7.54 a**
June	7.66b-d	5.23 h-p	6.22 d-k	4.51 l-s	4.06 m-u	**5.54 c**
Sep.	8.19 a-c	6.85 c-h	6.50 d-j	5.60 f-n	6.34 d-k	**6.70 b**
Dec.	3.94 n-u	3.22 r-x	2.67 u-y	1.79 w-z	0.89 z-z[1]	**2.50 f**
Mean	**5.57 a**					
Tech.	**2- V.P.D**					
Dates	**Cultivar**					
March	5.79 e-l	5.27 h-o	4.96 j-q	4.00 m-u	2.82 t-y	**4.57 d**
June	9.79 a	7.14 c-f	8.38 a-c	6.83 c-i	5.59 f-n	**7.55 a**
Sep.	5.45 g-n	4.78 k-r	4.28 l-u	4.14 l-u	3.36 q-w	**4.40 d**
Dec.	2.88 s-y	2.24 v-z	2.12 v-z	0.00 z[1]	0.00 z[1]	**1.45 g**
Mean	**4.49 b**					
Tech.	**3- Intermittent mist**					
Dates	**Cultivar**					
March	4.96 j-q	4.40 l-t	4.21 l-u	3.68 o-v	2.66 u-y	**3.98 de**
June	7.39 c-e	6.97 c-g	7.30 c-e	5.02 j-q	5.62 f-m	**6.46 b**
Sep.	5.17 i-p	4.35 l-t	3.06 s-y	3.59 p-v	1.83 w-z	**3.60 e**
Dec.	1.68 x-z	1.53 y-z[1]	0.00 z[1]	0.00 z[1]	0.00 z[1]	**0.64 h**
Mean	**3.67 c**					
Mean	**5.99 a**	**4.95 b**	**4.74 b**	**3.86 c**	**3.34 d**	
Mean of dates	March	June	Sep.	Dec.		
	5.36 b	**6.51 a**	**4.90 c**	**1.53 d**		

December collection date significantly produced the shortest roots (2.57 and 1.53 cm in the two seasons). The obtained results are in agreement with Kilany (1991) and Hegazy (2003) who found that the highest average root lengths were obtained successfully during spring and summer in comparison to those obtained during fall and winter.

Also, in both seasons, the wooden box propagation technique significantly recorded the tallest roots on rooted cuttings, with averages of 6.22 and 5.57 cm in the two seasons, respectively. On the other hand, I.M. propagation technique gave significantly the shortest roots.

In addition, a significant interaction was observed between different collection dates and techniques in both seasons. Wooden box propagation technique resulted in the highest significant root length per rooted cuttings during March as it averaged (8.68 and 7.54 cm). However, June collection dates gave significantly the tallest roots under V.P.D and I.M. propagation techniques during both seasons.

Moreover, there was a significant response of root length to the interaction between different cultivars, collection dates and propagation techniques in both seasons. In the first season, cuttings of olive cv. Chiperssino prepared during March and rooted using wooden boxes produced the highest significant root length as it averaged 10.63 cm. In contrast, the lowest significant values of root length was obtained from olive cv. Itrana cuttings collected in December and rooted using I.M. technique which completely failed to root. In the second season, V.P.D. propagation technique resulted in the highest significant value of root length of roots formed on cuttings of cv. Chiperssino collected in June as it averaged 9.79 cm, whereas the lowest significant average root length was obtained from cuttings of cvs. Conservollia and Itrana collected in December and rooted using V.P.D and I.M. propagation techniques, and also those of olive cv. Jabaa collected during December and rooted using I.M. propagation technique, as these cultivars failed completely to form roots.

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دراسة على تجذير عقل بعض أصناف الزيتون المدخلة حديثاً بشمال سيناء
1- تأثير تقنيات التجذير ومواعيد تجهيز العقل

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ملخص

أجريت هذه الدراسة بمحطة بحوث شمال سيناء بالشيخ زويد (مركز بحوث الصحراء) خلال موسمى 2006و2007 على العقل الساقية الورقية (تحت الطرفية) المجهزة من أصناف زيتون جديدة (تشيبرسينو- تانش- جبع- كونسرفوليا - أترانا) خلال أربعة مواعيد مختلفة (مارس- يونيو- سبتمبر- ديسمبر) ثم تم معاملة قواعد العقل بهرمون (أندول حمض البيوتيريك 4000 جزء فى المليون) وتم تجذيرها باستخدام تقنيات مختلفة (تحت الضباب – العجز الرطوبى – الصناديق الخشبية) وذلك بهدف معرفة مقدرة هذه الاصناف على التجذير وأفضل ميعاد لتجذير العقل وكذلك أفضل تقنية للتجذير فى المواعيد المختلفة. ويمكن تلخيص النتائج كالتالى.

1- تتفاوت الآصناف فيما بينها في مقدرتها على التجذير، حيث وجد أن الصنف تشيبرسينو كان أفضل الآصناف مقارنة بالصنف أترانا الذى كان أقل الآصناف قدرة على التجذير.
2- كانت الصناديق الخشبية أفضل التقنيات لتجذير العقل مقارنة بالتقنيات الآخرى خلال موسمى الدراسة.
3- كان شهر يونيو أفضل ميعاد لتجذير العقل حيث أعطى أعلى نسبة تجذير، وأكبر عدد من الجذور وطول الجذر على العقلة تحت ظروف نظام تحت الضباب والعجز الرطوبى ، بينما كان شهر مارس أفضل ميعاد لتجذير العقل باستخدم تقنية الصناديق الخشبية.

المجلة العلمية لكلية الزراعة – جامعة القاهرة – المجلد (61) العدد الثاني (أبريل 2010):182-190.