

## RESPONSE OF OLIVE CULTIVARS TO AIR-LAYERING AT VARIOUS TIMINGS

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An experiment was conducted to evaluate asexual propagation of olive cultivars through air layering. The experiment was laid out in randomized complete block design with split plot arrangements having four replications. Timing factor was allotted to main plot while various cultivars were kept in sub plots. Layering was done at different times, i.e. 15<sup>th</sup> May, 15<sup>th</sup> June and 15<sup>th</sup> July in various olive cultivars i.e. Pendallino, Coratina and Hamdi. Shoots were wounded by complete removal of ring bark just below the buds in the month of May, June and July. Garden soils were used to cover the wounds on shoots. Maximum number of days to rooting (30.12) was taken by layering in Pendallino, root diameter (0.15) cm in Hamdi and Coratina and root length (5.84 cm) in Hamdi, while maximum number of roots (10.97) was observed in Pendallino and percent plant survival (60.24%) was recorded in Coratina. Minimum no of days to rooting (28.11) and number of roots (6.22) were recorded in Coratina. While minimum root diameter (0.14 cm) and root length (2.78 cm) were observed in Pendallino and minimum percent plant survival (55.16%) in Hamdi. In case of timing Maximum days to root initiation (37.19) was taken by layer made on 15 May. While higher root diameter (0.16 cm), root length (5.21 cm) and number of roots (12.25) were noticed by the layers, which were made on 15 June. Maximum plant survival (64.44%) was recorded in the layers, which were made on 15 July. While minimum days to rooting (21.97) and lower root diameter (0.13 cm) were noticed by layer made on 15 July. Minimum root length (3.08 cm) and percent plant survival (47.55%) was recorded by the layer made on 15 May.

**Keywords:** Olive, air layering, propagation, time factor

### INTRODUCTION

Olive (*Olea europaea* L.) locally known as Zaitoon is an attractive evergreen tree with grey-green foliage. It is a slow and steady growing tree having a long life of about 900 to 1000 years (Simmonds, 1976). Asexual propagation methods can probably be the most widely used commercial method of propagation in olive. Asexual propagation methods include cutting, budding, grafting and air-layering (Wilson, 1920). Misra and Jaiswal (1993) studied the propagation of *Anthocephalus Chinensis* soon by air layering with the aid of indole butyric acid. Sharma and Grewel (1989) studied propagation in *Litchi chinensis* sonn. In trials with cultivars Calcutta and Dehradum one year old shoots were air layered in sphagnum moss at weekly intervals between 7<sup>th</sup> July and 18<sup>th</sup> August. In Calcutta 100% rooting was obtained in air layers prepared on 14, 21 and 28 July whereas survival was highest (88%) in those prepared on 14<sup>th</sup> July. In 'Dehradum' the best rooting (96%) was obtained in air layers prepared on 11<sup>th</sup> August and survival was the best (89%) in those prepared on 28<sup>th</sup> July. Bolt and Joubert (1980) recommended air layered litchi trees for orchard establishment in 10 years trials; they compared marcoted vs grafted trees. The percentage of trees, which established was higher with grafted trees. Root growth was

much better with grafted trees, but differences in tree growth were slight after 4 years. Initial yields were higher with grafted trees, but yields of 10 years old marcotted trees were 4 kg per tree higher. It has been recommended that marcotted tree should be kept in the nursery for at least six months after removal from parent trees. Kadman (1983) studied propagation in sub tropical fruit trees by air layering. The branch to be air layered was girdled and a prepared peat moss bag wrapped immediately around the girdled portion. Rooted plants were ready in 4 months. Litchi and macadamize have been propagated in this way. Sharifuddin (1983) studied the effect of pruning and the survival of detached rooted air layers in litchi. It was observed that sixty days after air layering the detached plants were pruned heavily, moderately or lightly and were then potted and kept in shade. Heavy pruning gave the best plant survival 72.7% compared with moderate 45.4% and light 36.6% pruning. Kanwar and Kahlon (1986) air layered one year old shoots on several dates between July and November. Rooting percentages and establishment (in three cultivars), survival after transplanting (in two cultivars) and the effect of defoliation on nursery establishment were observed. The Seedless late gave higher mean rooting (75.14%) followed by Muzaffarpur (69.08%) and Calcutta (61.07%). Then mean percentage establishment in the nursery was highest in

Calcutta (90.5%) followed by Muzaffarpur (84.72%) and Seedless late (76.8%) layering was successful when carried out between mid July and early October. They recommended to retain 20 leaf lets at transplanting. Khabou *et al.* (1999) took hardwood cuttings of different diameters and lengths from structural or sub structural units of adult trees of 7 olive cultivars between November and April. Cuttings were scarified at the base and/or soaked for a few seconds in IBA at 1500-3000 ppm, before assessment of rooting. The highest rooting percentage was obtained for the cultivars Meski, Chemlali and Chemchali. The best dates for taking cuttings were December and January, respectively. The optimum diameter of cuttings was 15–20 mm, regarding treatment of cuttings before rooting; the best treatment was scarification along, which increased rhizogenesis by 15-22%, depending on the cultivar.

## MATERIALS AND METHODS

The experiment on “response of olive cultivars to air layering at various timings” was conducted at Pakistan Oilseed Development Board (PODB) Tarnab, Peshawar during 2009. The experiment was laid out in randomized complete block design with split plot arrangements having four replications. Timing factor was allotted to main plot while various cultivars were kept in sub plots. Layering was done at different times, i.e. 15<sup>th</sup> May, 15<sup>th</sup> June and 15<sup>th</sup> July in various olive cultivars i.e. Pendallino, Coratina and Hamdi. Garden soils were used for air layering. In order to initiate rooting in olive, branches were wounded by complete removal of ring bark just below the buds in the month of May, June and July. When a good ball of roots had formed, the branches were cut off below the media (garden soil) and were placed in beds to become more firmly established before being set out permanently. All other cultural practices were kept constant for all the treatments.

The data were recorded on number of days to root appearance, number of roots plant<sup>-1</sup>, root length (cm), number of fruits plant<sup>-1</sup> and percent plant survival.

The data was statistically analyzed by using randomized complete block design with split plot arrangements through State-C program and the means were separated by using LSD test as recommended by (Steel and Torrie, 1981).

## RESULTS AND DISCUSSION

*Days to rooting:* Data regarding days to rooting are reported in Table 1. Statistical analysis of the data showed that different timing of layering significantly affected days to rooting of olive layer. Whereas various cultivars did not significantly affected days to rooting. Interaction between cultivars and time was significant for days to rooting. Mean value of the data indicated that more days to rooting (37.19) in olive seedling were taken by layer made on 15<sup>th</sup> May, followed by 15<sup>th</sup> June (27.92), whereas lesser days to rooting (21.97) were recorded in layer made on 15<sup>th</sup> July. Cultivars did not affected days to rooting however; higher days to rooting (30.12) were recorded in Pendallino cultivars followed by Hamdi (28.84), while minimum number of days to rooting was recorded by Coratina (28.11). The findings of Butt *et al.* (1996) and Kareem *et al.* (2013) also resemble with our results, who found that the number of days to root appearance were different in different olive Cultivars due to their genetic makeup. Interaction between C x T indicted that days to rooting decreased with delay in layering in all cultivars, however Coratina decreased drastically as compared to Pendallino and Hamdi (Fig. 1) and lesser days to rooting were found in 15<sup>th</sup> July in all cultivars. It might be due to maximum rainfall and water availability in the month of July resulted an early root appearance, whereas in May the less rainfall and higher temperature resulted in stress condition for olive layers that took more days to

**Table 1. Effect of various olive air layering cultivars and timing on days to rooting, root diameter, root length, number of roots and plant survival**

Timing	Root diameter (cm)	Root length (cm)	Number of roots	Plant survival (%)	Days to rooting
15-May	0.15 a	3.08 b	10.31 a	47.55 c	37.19 a
15-June	0.16 a	5.21 a	12.25 a	59.03 b	27.92 b
15 July	0.13 b	3.66 b	4.94 b	64.44 a	21.97 c
LSD	0.01	1.14	3.63	5.04	2.59
Cultivars					
Hamdi	0.15	5.84 a	10.31a	55.16 b	28.84
Pendallino	0.14	2.78 b	10.97 a	55.62 b	30.12
Coratina	0.15	3.34 b	6.22 b	60.24 a	28.11
LSD	NS	1.81	2.42	3.54	NS
Interaction (between Tx C)					

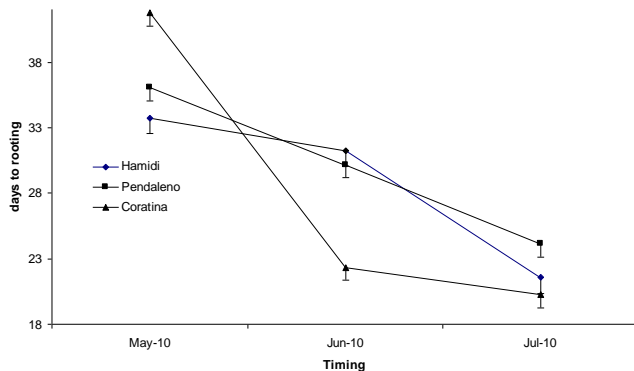
\*(Fig. 3)

\*(Fig. 2)

\*(Fig. 4)

\*(Fig. 1)

rooting. These results were confirmed by the work of Ray (1952) who reported that month of July is the best time for layering in Litchi (*Litchi chinensis*).

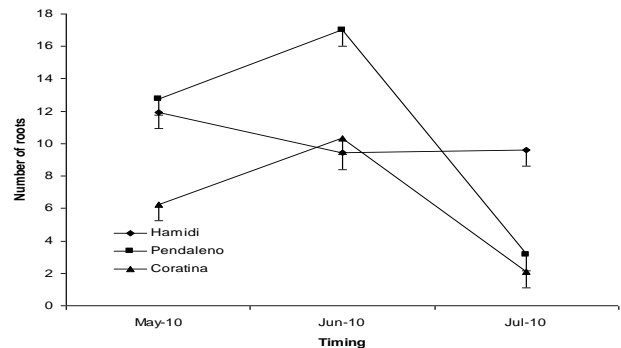


**Figure 1. Days to rooting as affected by timing and olive cultivars**

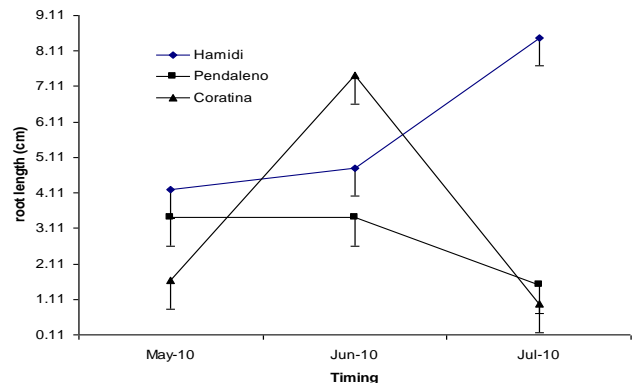
**Root diameter (cm):** Perusal of the data revealed that effect of timing of air layering was significant on root diameter, whereas olive cultivars did not significantly affected root diameter. Interaction between timing and cultivars also remained non-significant. Higher root diameter (0.16 cm) was recorded by layer which was made on 15<sup>th</sup> June, followed by layer made on 15<sup>th</sup> May (0.15 cm) which were at par with each other, whereas lower root diameter (0.13 cm) was recorded by layer made on 15<sup>th</sup> July. In case of cultivars, non significant effect was found; however, higher root diameter (0.15 cm) was recorded in Hamdi and Coratina as compared to Pendallino (0.14 cm). The differences in root diameter in different olive cultivars may be due to its genetic makeup and similar was reported by Butt *et al.* (1996) and Kareem *et al.* (2013). The possible reason for narrow root diameter would be comparatively high rainfall and low temperature at the end of June and in the beginning of July which affected root diameter (Wilson, 1920).

**Root length (cm):** Root length of olive air layers were significantly affected by timing and different olive cultivars. Interaction between timing and cultivars was also significant. Mean value of the data showed that longer roots (5.21 cm) were recorded in layers, which were made on 15<sup>th</sup> June, followed by 15<sup>th</sup> July (3.66 cm), whereas shorter roots (3.08 cm) were recorded in layers made on 15<sup>th</sup> May, which were statistically at same level with 15<sup>th</sup> May air layered. In case of cultivars, lengthy roots (5.84 cm) were produced by layers made on Hamdi cultivars, followed by Coratina (3.34 cm); however it was at par with Pendallino (2.78 cm). Interaction between T x C indicated that root length increased with delay in layering till 15<sup>th</sup> June for Coratina but further delay drastically decreased (Fig. 3). Pendallino cultivar with delay did not increase lengthy roots till 15<sup>th</sup> June and further delay significantly reduced root length.

However delaying air layering in Hamdi cultivar resulted in increased in lengthy roots and thus longer roots were produced in layering made on 15<sup>th</sup> July. The increase in Coratina and Hamdi was significantly higher at 15<sup>th</sup> June and 15<sup>th</sup> July, respectively. Genetically Hamdi has the potential to show higher root length followed by Coratina due to change in environmental condition. They respond well to the month of mid June and July. Because maximum rainfall increased humidity in the atmosphere, which was best for layering. Pendaleno resulted in poor roots length in July. These findings are in agreement with Kanwar and Kaholon (1986) who air layered one year old shoot on several dates between July and November. They recommended retaining 20 leaflets at transplanting.



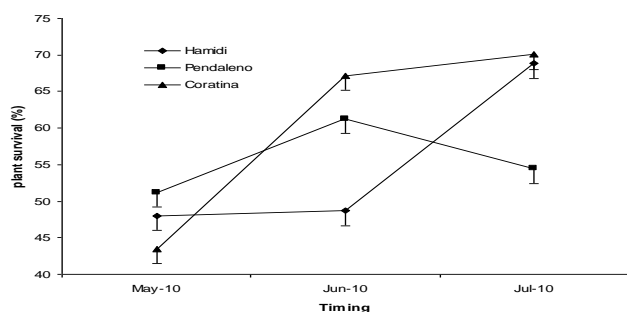
**Figure 2. Number of roots as affected by timing and olive cultivars**



**Figure 3. Roots length (cm) as affected by timing and olive cultivars**

**Number of roots:** Data regarding Number of roots are presented in Table 1. Statistical analysis of the data showed that number of roots of various cultivars and timing of the layering significantly affected number of roots of olive layer, the interaction between the two factor were also significant. Mean value of the data revealed that maximum number of root (10.97) was observed in Pendallino followed by Hamdi (10.31), while minimum number of roots (6.22) were recorded in Coratina. In case of timing significantly higher

of roots (12.25) was taken by layer, which was made on 15<sup>th</sup> June followed by (10.31) on 15<sup>th</sup> May, while lower number of roots (4.94) was recorded by the layer made on 15<sup>th</sup> July. For interaction maximum number of roots (17.00) was noticed in Pendallino on 15<sup>th</sup> June while minimum (2.08) was observed in Coratina on 15<sup>th</sup> July. Data indicates that in case of number of roots Pendallino, and Hamdi shows good results. As far as timing is concerned more number of roots was observed in the layer made on 15<sup>th</sup> June. The results are supported by Ahmad (1994) who studied propagation in different plants. Trials were conducted to study the vegetative propagation of guava and litchi in areas where rainfall is abundant and humidity is very high to sufficient roots were developed with in 3-4 months.



**Figure 4. Plant survival (%) as affected by timing and olive cultivars**

**Plant survival percentage (%):** Data related to plant survival percentage (%) are presented in Table 1. Statistical analysis of the data revealed that different timing and various cultivars and their interactions are significant. Mean value of the data showed that maximum plant survival (60.24%) was observed in Coratina followed by (55.62%) in Pendallino, while minimum plant survival (55.16%) in Hamdi, however in case of timing higher plant survival (64.44%) was found in the layers which were made on 15<sup>th</sup> July followed by (59.03%) which was 15<sup>th</sup> June, while minimum plant survival (47.55%) was recorded by the layer made on 15<sup>th</sup> May. As far as interaction is concerned maximum (70.06%) was recorded in Coratina on 15<sup>th</sup> July while minimum (43.50%) was noticed in the same cultivar on 15<sup>th</sup> May. Olive plant growth is also affected by cutting length (Awan *et al.* 2012) and pathogens (Laouane *et al.* 2011). These results are supported by Sharma and Grewal (1989) who studied propagation in *Litchi chinensis sonn.* In trials with cultivars Calcutta and Dehradum one year old shoots were air layered, where the survival was highest (88%) in those prepared on 14<sup>th</sup> July.

**Conclusion:** It was concluded from the above experiments that air layering in Coratina cultivars resulted in maximum survival percentage and root diameter, and took lesser days to root appearance. In case of timing of air layering in olive,

mid June to end of July resulted in higher number of plants survival and other parameters.

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