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## Rooting ability of different olive cultivars through cuttings in basal heating system

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**Abstract:** Propagation is one of the main issues of olive cultivation. Olive not produces roots easily through asexual methods of propagation. The main objective of this study was selection of olive cultivars for propagation in basal heating system because it installed first time in Pakistan. For this purpose leafy cuttings of three olive cultivars "Arbequina, Arbosana and Koroneiki" were made in dormant season and planted in coco peat inside the greenhouse after treating with 3000ppm IBA. Arbosana cultivar developed roots in minimum days (46 days) followed by Arbequina (59.75 days) and Koroneiki (66.25 days). Mortality percentage of 50.06% was highest in Arbequina followed by 29.31% in Koroneiki and 20.56% in Arbosana. The significant difference was observed in success rate of Arbosana cultivar with 56.44% while there was no significance difference for success rate in Arbequina and Koroneiki. The Arbosana cultivar proved better with highest success rate and minimum days for root initiation as compared to Arbequina and Koroneiki under controlled conditions of greenhouse. Experiment was conducted according to CRD (completely randomized design) by using 4 replications each having two plug (200 cuttings in one tray) trays. Data subjected to analysis of variance and LSD test at 5% probability level for comparison of means.

**Keywords:** Olive, Cuttings, Basal heating system, Rooting, IBA.

### Introduction

*Olea europaea* L. belongs to family Oleaceae and genus *Olea* having at least 30 different species and crosses between many of them are possible and successful. It is one of the important and old fruit tree in the world [1] and is successfully grown in areas having mean annual temperature 15-20°C, with a minimum of 4°C and maximum of 40°C [2]. The main problem in the production of olive is propagation. It can be propagated by seed as well as asexual methods but sexual propagation is not generally recommended as plants produced from seeds are not true to type and take much more time for bearing fruit [3]. Asexual or Vegetative propagation methods are usually being used for commercial propagation in olive. Asexual propagation methods are cuttings, budding, grafting and air-layering [4]. In the world Olive propagated by different ways such as hardwood and semi-hardwood cuttings, suckers and budding or grafting. However propagation by leafy cuttings under mist has become the most acceptable method throughout the world [5]. At the same time Fabbri *et al.* concluded that some olive cultivars show poor rooting in some olive producing countries [6]. The famous cultivar of Turkey 'Domat' shown poor

results of rooting ranged between 10-33% when propagated through leafy cuttings [7,8]. To improve rooting ability some scientists started use of different root promoting hormones. Indole butyric acid (IBA) applications had been reported to be successful for rooting in olive cuttings [9].

The famous cultivar "Domat" was studied by applying SA, IBA and NAA. This cultivar is considered hardy and not produces roots easily. Among all the treatments, 5g/L of IBA has shown best results with 63.3% success rate. The experiment was conducted in misted tunnels with 25 °C ( $\pm 2^\circ$ ) temperature [10].

Aslmoshtaghi *et al.* studied the rooting behavior of Olive in advanced basal heating system. They maintained temperature at 23 ( $\pm 2$ ) °C with misting for humidity maintenance. They used two chemical one was IBA solution and other Putrescine in different concentrations. They observed that the combined effect of both chemicals was more significant than the individual applied IBA or Putrescine. The best results were obtained by using 4000ppm IBA along with 300ppm of Putrescine [11].

Olive plant is very hardy and rooting of olive is not an easy task through asexual means of propagation. Alam *et al.* succeeded to get maximum rooting of 42.40 % through air layering of plants in 47.92 days minimum in the month of August [12].

Afzal *et al.* concluded that local cultivars of Pehsawar region take minimum days (54) for rooting through air layering while Pendolino takes maximum days (62) for rooting through air layering but it produces heavy and dense roots [13].

The highest success rate of 23.64% in "Ottobrtaiica" followed by 19.48% in "Manzanilla" and least success rate was recorded in "Pendolino" 9.73%. Secondly highest success rate of 18.33% was observed through Semi-hard wood cuttings followed by 15.23% through tip cuttings and least 14.47% through hard-wood cuttings in different cultivars in conditions of Mardan in shaded plastic tunnels (SPT) technology [14].

## Materials and Methods

The study was conducted during internship at Izhar Olive Farm Kallar Kahar. For propagating olive through cuttings, healthy plants were selected to make cuttings. Cuttings were made from healthy selected branches of fruit bearing trees. Three early cultivars of olive "Arbosana, Arbequina and Koroneiki" were selected to check their performance first time the greenhouse structure/mist propagation unit. Leafy cuttings of 3-4 inches long were made by leaving a pair of leaves at upper end. The thickness of cuttings was ¼ of pencil with slanting cut away from bud at upper end and round cut near to bud at base. Cuttings planted within 24 hours of pruning in coco peat. Plastic plug trays of 200 holes were used for plantation of cuttings. Cuttings treated with hydro alcoholic IBA solution by quick dip method. The solution of IBA made by dissolving 1.5g of IBA in 60ml ethanol and mixed in hot water to make the final volume of 500ml. Cuttings planted on movable and basal heated beds inside the greenhouse. The temperature maintained at 22 (±2) °C inside the greenhouse by heating constantly through basal heating system. Relative humidity was maintained above 80 % through proper misting. Fungicide spray applied continuously with gap of 7 days to prevent the attack of fungus in humid conditions. The following parameters selected and data recorded:

- Number of days for root initiation
- Callusing percentage
- Mortality percentage

- Success percentage

For counting days of root initiation, cuttings were selected randomly and observed daily and noted the days of root initiation. After 100 days, all the cuttings uprooted and number of rooted cuttings noted and success percentage calculated by dividing number of rooted cuttings with total planted cuttings and multiplied with hundred to get percentage. Similarly mortality percentage calculated by following formula:

$$\text{Mortality \%} = \frac{\text{No. of dead cuttings}}{\text{number of cuttings}} \times 100$$

Some cuttings not rotted even after 100 days but developed callus, they counted separately and noted their percentage by dividing with total planted cuttings and multiplying with hundred.

The experiment was laid out according to Completely Randomized Design (CRD) with 4 replications. Each replication was consisting upon two trays of cuttings with 200 cuttings in one tray means 400 cuttings per replication. Data were analyzed by using Statistix-8.1 software [15]. Then the data subjected to Least Significant Difference Test (LSD,  $P \leq 0.05$ ), for comparison of means [16].

## Results and Discussions

Significance difference was observed in all three cultivars responding to days of root initiation. Koroneiki cultivar has taken maximum (66.25) days for root initiation followed by Arbequina (59.75) while Arbosana cultivar proved earliest rooted just in 46 days. Alam *et al.* succeeded to get maximum rooting of 42.40 % through air layering of plants in 47.92 days minimum in the month of August [12]. Afzal *et al.* concluded that local cultivars of Pehsawar region take minimum days (54) for rooting through air layering while Pendolino takes maximum days (62) for rooting through air layering but it produces heavy and dense roots [13]. The highest percentage of callusing observed 55.31% in Koroneiki cultivar which was significantly different. There was no significant difference in other two cultivars for callusing percentage. Highest mortality percentage (45.06%) was observed in Arbequina cultivar followed by Koroneiki (29.31%) and (Arbosana 20.56%). Mortality percentage was significantly high in Arbequina than other cultivars (Table 1). Koroneiki has taken more number of days for root initiation but mortality in Koroneiki is less than Arbequina.

**Table 1. Days of root initiation and percentages of callusing, mortality and success.**

Name of Cultivar	Parameters			
	Days of Root Initiation	Callusing (%)	Mortality (%)	Success (%)
Arbequina	59.75 B	26.63 B	50.06 A	23.31 B
Arbosana	46.00 C	23.00 B	20.56 C	56.44 A
Koroneiki	66.25 A	55.31 A	29.31 B	15.38 B

Arbosana significantly shown highest success percentage with 56.44% rooted cuttings. There was no significant difference in means for success percentage of Arbequina and Koroneiki. Alam *et al.* obtained success rate of 23.64% in “Ottobrtaica” followed by 19.48% in “Manzanilla” and “Pendolino” 9.73% in shaded plastic tunnels [14]. They tried different types of cuttings and observed semi-hard wood cuttings best with 18.33% success rate. Our study is also showing the comparison of shaded plastic tunnels (old technology) and basal heating system in controlled temperature and humidity (modern technology). In previous year, 42.40% success in rooting was observed by Alam *et al.* through air layering of plants [12]. The famous cultivar of Turkey ‘Domat’ shown poor results of rooting ranged between 10-33% when propagated through leafy cuttings [6;7]. Aslmoshtaghi *et al.* achieved highest rooting rate of 63.3% with 5g/L IBA treatment in misted tunnels with 25 (±2) °C temperature [11]. In other experiment it was observed that untreated cuttings entirely failed to produce roots [9]. The highest rooting percentage 43.75% detected when IBA at 6000 mg/L + putrescine 150 at mg/L applied in basal heated system at 23 (±2) °C temperature [11]. But we succeeded to get 56.44% success in Arbosana cuttings with half dose of IBA and without adding putrescine.

## Conclusion

It concluded that Arbosana cultivar is better for propagation in basal heated greenhouse through cuttings as compared to Koroneiki and Arbequina. Arbosana not only rooted in less time but also produced highest success rate with lowest mortality. Koroneiki has taken long time for rooting with lowest success rate. So Arbosana should be propagated through this technology while for other cultivars I am suggesting that you should check

different other rooting media, different concentrations of IBA and other rooting hormones to get better results.

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