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Response of Olive Hard Wood Cuttings to Different Growth Media and Basal Injuries for Propagation

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Abstract: Effect of different growth media and basal injuries on the propagation of olive through hardwood cuttings was investigated at Agricultural Research Institute, Tarnab Peshawar Pakistan during Spring-2002. The results revealed that maximum number of days to sprouting was taken in control while minimum number of days to sprouting was noted in 3 times injuries. Maximum sprouting percentage, number of shoots and leaves were recorded in 2 injuries. Minimum sprouting percentage, number of shoots and leaves were noted in control treatment. Maximum survival percentage was noted in 1 cut treatment while minimum survival percentage was recorded in 3 injuries and maximum shoot length was recorded in 3 cut while minimum shoot length was noted in control. Similarly maximum days to sprouting were noted in farmyard manure while minimum were observed in sand media. Maximum sprouting percentage, number of shoots was noted in clay media while minimum sprouting percentage and number of shoots were noted in farmyard manure. Maximum survival percentage, shoot length and number of leaves were noted in sand media while minimum survival percentage, shoot length and number of leaves were found in farmyard manure.

Key words: *Olea europaea*, media effect, basal injuries

Introduction

Olive (*Olea europaea* L.) belongs to the family Oleaceae and order Scraphulariales. Olive varieties thrive well and the tree produces a good crop where there are chilling winters (Baloch, 1994). The olive a symbol of prosperity and peace, is a subtropical evergreen tree but requires chilling for fruiting like other deciduous fruit plants. The tree is relatively slow growing but very long lived, some specimens reportedly being over 1000 years old. It attains a height of 3 to 15 m or even more. The wood is resistant to decay and if top dies, a new trunk will often grow from the roots. (Christakis *et al.*, 1980).

NWFP has been blessed with diverse climatic and soil factors, due to which all sort of tropical, subtropical and temperate fruit trees can be grown olive being a subtropical tree can be grown successfully in the subtropical mountainous regions of NWFP and Balochistan (Baloch, 1994). Abdel and Salman (1988) noted subtropical stem cuttings of Olive cv. Nebali taken in spring and wounded (3 vertical cuts) treated with 4000 ppm of Indole Butyric Acid (IBA) for 5 seconds or with 2% sucrose for 24 hrs or wounded and treated with 4000 ppm IBA. Cuttings were inserted into sand, sandy loam or sand+ sandy loam rooting medium for 90 days. Wounding IBA treatment gave the highest rooting percentage and the greatest number, long length and individual root weights of cuttings in both seasons. Treating cuttings with 2% sucrose had no effect on rooting. The type of rooting medium used had no effect on rooting in terms of root length, but weight per cutting was greatest in the sandy loam.

Abou Salim and Mansouri (1991) conducted experiment on semi hardwood cutting of olive cv. Picholine and Marocani. Taken in autumn and propagated in 3x0.6x0.4 m trench covered with transparent plastic film and a 10 cm layer of sand and gravel rooting medium was placed on the top. The rooting medium consisted of yellow and sphagnum peat + yellow sand. A relative humidity was maintained 95-97% inside the propagator. The temperature of the substrate varied between 17.2-20.7 °C. The cuttings were treated with 4000 mg L^{-1} of 25% Capton before being placed in the rooting medium. The highest rooting percentage of 95% was obtained for the cuttings taken from the middle part of the shoot and rooted in yellow sand. Rooting was least successful (65%) for apical axillary cutting in either rooting medium. Abou Salim and Mansouri (1991) treated semi- hardwood cuttings of olive with IBA, (4000 mg L^{-1} of 25% Capton) before insertion in the rooting medium. They obtained the highest rooting i.e. 95% for the cutting taken from the middle part of the shoots and rooted better in the yellow sand as compared with sphagnum peat yellow sand. Rooting was least successful (65%) for apical auxiliary cuttings in either rooting medium.

Burroni *et al.* (1993) reported that the olive cultivars Maurine and Leccino and the peach cultivars Armking

were grown in media containing 50% sand and different amounts and combinations of forest litter, poplar bark, grape talk, urban sludge and diary sludge. The control medium contained sand and peat in a 1:1 ratio. The substituted mixtures contained more nutrients than the control mixture and the humic acid: fulvic acid ratio was higher. The substituted mixtures were cheaper and plant development and commercial quality were improved, compared with the control mixture.

Khabou *et al.* (1997) sampled hardwood cuttings of different diameters and length from structural or substructural 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 IBA at 1500-3000 ppm, before assessment of rooting. The highest rooting percentages were obtained for the cultivars Meski (40.08%), Chemlali (36.1%) and Chemchali (31.5%). The best dates for taking cuttings were December and January (46.71 and 36.14%, respectively). The optimum diameter of cuttings was 15-20 mm (average 36% rooting). Regarding treatment of cuttings before rooting, the best treatment was scarification alone, which increased rhizogenesis by 15-22%, depending on the cultivars.

Materials and Methods

An experiment to study the " Effect of different growing media and basal injuries on the propagation of olive through hardwood cuttings" was conducted at the Pakistan Oilseed Development Board (PODB), Agricultural Research Institute Tarnab, Peshawar during Spring-2002. The experiment was laid out in two factorial Randomized Complete Block Design (RCBD) with four replications. Uniform hardwood cuttings of 15 cm length having no leaves were selected and were injured in their basal portions by removing slices of the bark with a clean sterilized knife. The injuries were given in the following intensities, i.e. 1 cut, 2 cuts and 3 cuts of 1 cm respectively. All the cuttings were then treated with 3000 ppm Indole Butyric Acid solution for 5 sec. The cuttings were then planted with two third portion of the cuttings buried in growing media in slanting position. Four different growth media were used in the study i.e. sand, silt, FYM and clay in the ground beds. The cuttings were irrigated with mist system three times daily for 15 sec to maintain proper micro climatic conditions for sprouting and survival.

Data were collected on the following parameters during the course of the experiment,

- Days to sprouting
- Sprouting percentage
- Survival percentage
- Number of shoots per cutting
- Shoot length (cm)
- Number of leaves per cutting

After completion of the experiment, the data was analyzed using the statistical procedure for RCB design and upon obtaining significant difference among the treatment means, Least Significant Difference test was used for comparison of treatment means.

Results and Discussion

Days to sprouting of olive cuttings: Data regarding effect of different growing media and basal injuries to olive cuttings on days to sprouting is given in Table 1. Statistical analysis of the data revealed that the different growing media, basal injuries or their interaction has no significant effect on days to sprouting. It is evident from the data recorded for different growing media that maximum number of days to sprouting were recorded in Farm Yard Manure (71) while cuttings planted in sand took least number of days (66) to sprouting. Data recorded for basal injuries showed that maximum number of days to sprouting (71) were recorded in control while minimum number of days to sprouting (65) was obtained in cutting given three basal injuries. Similarly, it is clear from the data recorded for media and basal injuries interaction exhibited that maximum days to sprouting (77) were recorded in treatments that were given no injury and planted in Farm Yard Manure whilst minimum days to sprouting (58) were recorded in cuttings given a single basal injury and planted in sand.

Late sprouting or maximum days to sprouting were noted with no cut Control treatment because the cambium was not exposed fully to develop root primordial while minimum days to sprouting were noted in cuttings given 3 times injuries, which exposed maximum cambium for root development. Similarly early sprouting have been noted in sand media which has provided ideal condition for growth similarly maximum days have been recorded for farm yard manure which may be due to toxic chemical which inhibit or delay sprouting.

Sprouting percentage: Data in Table 2 reveal that maximum sprouting percentage was recorded in second treatment while minimum-sprouting percentage was noted in non injured cuttings. Maximum sprouting percentage was recorded in clay media while minimum-sprouting percentage was observed in farm yard manure media. Maximum sprouting percentage was observed in 2 cuts treatment which exposed maximum cambium for root development while minimum sprouting percentage was recorded in control due to minimum exposure of cambium

Table 1: Mean value table for Days to sprouting

	M1 (sand)	M2 (silt)	M3 (FYM)	M4 (clay)	Means
I_0 (control)	72	71	77	65	71.25
I_1 (1cut)	58	69	69	69	66.25
I_2 (2cut)	67	68	66	76	69.25
I_3 (3cut)	66	61	73	61	65.25
Means	65.75	67.25	71.25	67.75	

Table 2: Sprouting percentage

	M1 (sand)	M2 (silt)	M3 (FYM)	M4 (clay)	Means
I_0 (control)	28.308	40.000	7.515	50.000	31.45B
I_1 (1cut)	55.008	49.150	7.508	72.350	46.004A
I_2 (2cut)	67.500	63.350	12.490	60.850	51.05A
I_3 (3cut)	69.990	51.675	10.850	63.325	48.96A
Means	55.201A	51.044A	9.591B	61.631A	

LSD at 5% = 11.88

Table 3: Survival percentage

	M1 (sand)	M2 (silt)	M3 (FYM)	M4 (clay)	Means
I_0 (control)	30	31.650	4.172	44.175	27.449
I_1 (1cut)	50	31.665	5.015	47.500	33.545
I_2 (2cut)	42.475	34.150	4.165	35.075	28.966
I_3 (3cut)	48.318	20.025	5.850	35.000	27.298
Means	42.698A	29.372B	4.801C	40.438A	

LSD at 5% = 9.89

Table 4: Number of shoots per cutting

	M1 (sand)	M2 (silt)	M3 (FYM)	M4 (clay)	Means
I_0 (control)	1.340	1.425	0.658	1.583	1.251B
I_1 (1cut)	1.750	1.825	0.925	2.150	1.662A
I_2 (2cut)	2.100	2.350	0.575	2.925	1.988A
I_3 (3cut)	2.075	1.675	1.075	1.900	1.681A
Means	1.816A	1.819A	0.808B	2.139A	

LSD at 5% = 0.323

Table 5: Shoot length (cm)

	M1 (sand)	M2 (silt)	M3 (FYM)	M4 (clay)	Means
I_0 (control)	4.600	3.833	1.425	3.538	3.349
I_1 (1cut)	4.900	4.650	1.407	3.333	3.573
I_2 (2cut)	4.825	3.575	0.750	5.582	3.683
I_3 (3cut)	5.075	3.950	1.750	5.582	4.689
Means	4.850A	4.002A	1.333B	4.509A	

LSD at 5% =1.038

Table 6: Number of leaves per cutting

	M1 (sand)	M2 (silt)	M3 (FYM)	M4 (clay)	Means
I_0 (control)	7.400	5.875	3.000	5.225	5.375
I_1 (1cut)	6.400	7.550	2.475	5.875	5.575
I_2 (2cut)	7.275	7.375	2.800	7.150	6.150
I_3 (3cut)	7.475	6.300	2.650	6.95	5.844
Means	7.138A	6.775A	2.731B	6.300A	

LSD at 5% = 1.194

for root development. Similarly maximum sprouting percentages was witnessed in clay media because clay media contains all the nutrients for growth. While minimum sprouting percentage was found in farm yard manure due to high water holding capacity which provided favourable conditions for fungal growth.

Survival percentage: It is clear from Table 3 that maximum survival percentage was obtained in one cut treatment while minimum survival percentage was noted in treatment of 3 times injuries. Maximum survival percentage was obtained in sand media while minimum survival percentage was recorded in farmyard manure. Maximum survival have been observed in 1 cut injury while minimum in 3 cuts because in 1cut. Maximum area was exposed to soil born fungi which red in return reduced the survival of cuttings. Likewise maximum survival have been recorded in sand which provide ideal condition for growth and minimum survival percentage was noted in farm yard manure due to high water holding capacity which produced favourable condition for fungal growth.

Number of shoots per cutting: Data in Table 4 reveal that maximum number of shoots per cutting in treatment injured in two places while minimum number of shoots per cutting was noted in control. Maximum number of shoots per cutting was obtained in clay media while minimum number of shoots per cutting was noted in farm yard manure media Maximum number of shoots were obtained in two cut which can be attributed to sprouting percentage while minimum number of shoots were noted in control due to minimum exposure to root development. Similarly maximum number of shoots were recorded in clay media may be due to maximum sprouting percentage and may be due to media contains all the growing nutrients while minimum number of shoots have been noted in farm yard manure because it produce toxic chemicals which cause the cottoning of cuttings.

Shoot length (cm): Table 5 reveal maximum shoot length in three cut treatment while minimum shoot length was noted in no cut treatment. Maximum shoot length was recorded in sand media while minimum shoot length was noted in farm yard manure media. Maximum shoot length were found in olive cutting with three cut which may be attributed to early sprouting due to availing maximum time for shoot development and minimum shoot length in one cut due to low sprouting. Similarly maximum shoot length were obtained in sand media.

Number of leaves per cutting: It is clear from Table 6 that maximum number of leaves was noted in 2 cuts treatment while minimum number of leaves was noted in 0 cut. Maximum number of leaves was obtained in sand media while minimum number of leaves was noted in farm yard manure media. Maximum number of leaves in 2 cuts may be due to maximum exposed area, which initiate early root development and vice versa. Similarly minimum number of leaves in control may be due to minimum exposed area for root development and subsequent growth. Similarly maximum leaf area in sand was recorded due to early sprouting and shoots developed which subsequently produced more number of leaves.

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