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SEEKING EFFECTIVE TIME OF PLANTING FOR IBA TREATED JOJOBA (*SIMMONDSIA CHINENSIS*) CUTTINGS UNDER POLY-TUNNEL

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ABSTRACT

Semi-hardwood cuttings of jojoba (*Simmondsia chinensis*) treated with 4000 mg L^{-1} IBA, were planted at fortnightly interval starting from 1st October to the end of March of next year under microclimatic conditions of polythene sheet tunnel during two consecutive years. Average of two years data depicted that planting time of cuttings significantly affected mortality (%), rooted cuttings (%) out of total cuttings and rooted cuttings (%) out of healthy green cuttings. The cuttings planted on 1st November resulted in maximum rooted cuttings (56%) out of total cuttings with mortality (33%) and rooted cuttings (82%) out of healthy green cuttings, followed by the cuttings planted on 16th October which showed 53% rooted cuttings out of total cuttings with 36% mortality and 83% rooted cuttings out of healthy green cuttings. Both the time of planting remained statistically at par. Minimum rooted cuttings (2%) with minimum rooted cuttings out of healthy green cuttings (3%) were found in the cuttings planted on 16th March. Inside the poly-tunnel the optimum temperature for rooting of cuttings were about 14°C (minimum) and 36°C (maximum) with relative humidity (52-80%). The minimum temperature less than 10°C inside the poly-tunnel is not favorable for rooting of cuttings even under the favorable R.H. range.

Key Word: *Simmondsia chinensis*, poly-tunnel, cuttings, propagation, rooting, IBA

INTRODUCTION

Jojoba [*Simmondsia chinensis* (Link) Schneider] is a dioecious drought-tolerant oilseed perennial shrub native to Sonoran Desert of northern Mexico and the south-western USA. Its seeds contain about 50% oil (liquid wax) which has been proved a good substitute to the sperm whale oil as well as has potential to be used in lubricants, cosmetics and pharmaceuticals etc. Time factor is involved in various propagation methods used for jojoba: e.g., through seeds [3], via layering [5,10], grafting [6], saplings [8] or plantlets from tissue culture [7]. Rooting of stem cuttings is the most easiest and commonly used asexual propagation method in jojoba [4,9]. Proper time of planting for jojoba cuttings is also very important factor, as any attempt to propagate jojoba cuttings in an unknown time may not always be successful. Several researchers have noticed difference in rooting of jojoba cuttings at different times of the year [11]. In Pakistan, semi-hardwood cuttings of jojoba taken in October, treated with IBA, planted under partially shaded polyethylene sheet tunnel having high humidity with mild temperature rooted well [4,9]. Different planting times have been recommended by different researchers for different plant species under different ecological zones. The highest rooting percentage (82%) in IBA treated Olive cuttings were obtained when planted under mist in fiber glasshouse and the higher plant survival (90-93%) in the cuttings planted during 15th October to 1st December [1]. The best results were obtained from the cuttings of Bougainvillea (cv. Bush) planted on 19th August among the cuttings planted on 30th July, 9th, 19th, 29th August and 8th September [2].

Keeping in view the importance of time of planting on the percent rooting and success of jojoba cuttings, the present experiment was conducted to search out the ideal planting time for IBA treated jojoba cuttings and the range of time suitability for their planting under the microclimatic conditions of partially shaded polythene sheet tunnel.

MATERIALS AND METHODS

Semi-hardwood cuttings (about 1-year-old with brownish green bark) 20-30 cm long and 0.25-0.50 cm in diameter having 4-6 pairs of leaves were taken from 15-year-old selected female plants in October-March at fortnightly interval, during two consecutive years. The leaves from basal 1/3rd portion of the cuttings were trimmed off. The whole cuttings were fully dipped in 5000 mg L^{-1} Benomyl (fungicide) solution for 1 hour to disinfect fungi; then the cuttings were taken out and dried completely in shade. The basal portion of the cuttings was dipped in 4000 mg L^{-1} Indole Butyric Acid (IBA) solution for 10 seconds. The cuttings were planted in polythene bags filled with sand and silt (1:1) medium and kept under partially shaded polythene sheet tunnel in which high humidity was maintained. The bags were

arranged in Completely Randomized Design (CRD) with four replications. The bags were watered with sprinklers, sprayed with fungicide solution at fortnightly interval and kept under poly-tunnel till the end of March onward depending upon the prevailing temperature and humidity. All the bags containing rooted or un-rooted cuttings were taken out from the tunnel at the end of March and kept under shade for hardening of rooted cuttings and for rooting of un-rooted cuttings till the end of April. During the experimental period, data were recorded on the following parameters by the given formulae.

$$\text{1. Mortality percentage of cuttings} = \frac{\text{Number of cuttings died}}{\text{Number of cuttings planted}} \times 100$$

$$\text{2. Rooted cuttings (\%) out of total cuttings} = \frac{\text{Number of cuttings rooted}}{\text{Number of cuttings planted}} \times 100$$

3. Rooted cuttings (%) out of healthy green cuttings
(Healthy green cuttings are those which remained healthy green inside or outside the poly-tunnel till the end of April).

$$= \frac{\text{Number of cuttings rooted}}{\text{(No. cuttings planted - No. of cuttings died)}} \times 100$$

Two years data were pooled and subjected to statistical analysis by using Analysis of Variance technique. The means obtained from the analysis were compared by Duncan's Multiple Range test at $\alpha = 0.05$.

RESULTS AND DISCUSSION

Mortality percentage of cuttings: The average of two years data on mortality percentage of cuttings (Table 1) revealed that the cuttings planted on 1st January showed the minimum mortality (21%) and remained statistically at par with the cuttings planted on 16th December, 1st December and 16th January. The reasons of low mortality percentage may be due to the less favourable conditions i.e. low temperature and low humidity (Table 2) that may hinder fungus development under poly-tunnel; as fungus infection is the major factor causing death of cuttings [4].

Rooted cuttings percentage out of total cuttings: The data on rooted cuttings percentage out of total cuttings (Table 1) revealed that the cuttings planted on 1st November excelled with 56% rooted cuttings over the other time of planting, followed by the cuttings planted on 16th October (53%). The cuttings planted on 1st October or 16th November remained statistically at par with about 46-47% rooted cuttings. The rooted cuttings percentage decreased gradually from 1st December to 16th March (from about 34 to 2%). The very low rooting percentage during this period could be due to improper physiological conditions of the plants [1]. The cuttings planted on 16th March resulted in the minimum rooted cuttings (2 %). The inability of cutting to roots may be attributed improper physiological condition of cutting (continuation of new flushes) and unfavorable climatic conditions which prevented growth hormones to stimulate the rooting and less time availability for initiation of rooting under the poly-tunnel. The high rooting percentage in other times of the year could be attributed to favorable physiological conditions when cutting were taken from the plant and microclimatic conditions in the poly-tunnel. When the microclimatic conditions become favorable, at moderate temperature, cells in the cambium region divide actively producing callus followed by its differentiation resulting into root initiation and development. The findings supported Bashir *et al*. [4] who recorded 55% rooting in semi-hardwood cuttings of jojoba when treated with 2000 mg L^{-1} IBA and further increase (61%) at 4000 mg L^{-1} when the cuttings were planted in October under partially shaded polythene sheet tunnel. They also reported that root initiation in jojoba cuttings started about one and half month after the application of IBA solution. Earlier researchers like Zhou [11] related the rooting rates of jojoba cuttings to age of mother plant, temperature and humidity as the rooting rates of cuttings from young and old female jojoba shoots were 60 - 64 and 3 - 5%, respectively at a temperature of 19 – 23°C and 80 - 85% relative humidity. He also related the rooting time to temperature as he found that the rooting time for jojoba cuttings ranged from 125 to 261 days when the temperature decreased to 17 °C.

Rooted cuttings percentage out of healthy green cuttings: The data recorded on the rooted cuttings percentage out of healthy green cuttings (Table 1) exhibited significant differences among the planting times. The cuttings planted on 16th October has the maximum value (83%), followed by 1st November (82%) and 1st October (81%) for the parameter under study. However, all these three times of planting were statistically non-significant. The percentage decreased gradually since 16th November to 16th March (from about 65 to 3%). The cuttings planted on 16th November, 1st December, 16th December, 1st January ranked 4th, 5th, 6th and 7th with 65, 44, 35 and 17% rooted cuttings respectively out of healthy green cuttings. While the cuttings planted on 16th January (14%) and 1st February (11%) remained statistically at par with each other. However, the cuttings planted on 16th February (8%) and those planted on 1st March (5%) were statistically different. The cuttings planted on 16th March had the minimum value (2%) for this parameter. The trend of this parameter was almost the same as was noted in case of rooted cuttings percentage out of total cuttings in the previous parameter. Similarly, it is reported previously by Bashir *et al*. [8] that jojoba saplings established from rooted cuttings and planted in October, resulted in higher survival than those planted in March.

Table-1. Mortality and rooting of jojoba cuttings affected by various times of planting under poly-tunnel

Treatments	Mortality (%) of cuttings			Rooted cuttings (%) out of total cuttings			Rooted cuttings (%) out of healthy green cuttings		
	Year-I	Year-II	Average	Year-I	Year-II	Average	Year-I	Year-II	Average
1st October	43 a	44 [a]	43 [a]	46 [b]	45 [b]	46 [c]	81 [a]	80 [a]	81 [a]
16th October	35 [bc]	38 [a]	36 [b]	55 [a]	50 [b]	53 [b]	85 [a]	80 [a]	83 [a]
1st November	34 [bc]	31 [b]	33 [c]	55 [a]	56 [a]	56 [a]	83 [a]	82 [a]	82 [a]
16th November	29 [cd]	26 [bcd]	28 [d]	48 [b]	46 [b]	47 [c]	67 [b]	63 [b]	65 [b]
1st December	21 [e]	24 [cd]	23 [e]	33 [c]	35 [c]	34 [d]	41 [c]	46 [c]	44 [c]
16th December	21 [e]	23 [d]	22 [e]	26 [d]	28 [d]	27 [e]	33 [c]	36 [d]	35 [d]
1st January	20 [e]	21 [d]	21 [e]	11 [e]	16 [e]	14 [f]	14 [d]	21 [e]	17 [e]
16th January	21 [e]	24 [cd]	23 [e]	10 [e]	11 [ef]	11 [g]	13 [d]	15 [ef]	14 [f]
1st February	24 [de]	26 [bcd]	25 [d]	8 [f]	9 [fg]	8 [h]	10 [de]	12 [ef]	11 [f]
16th February	25 [de]	28 [bcd]	26 [d]	4 [fg]	8 [fg]	6 [i]	5 [def]	10 [ef]	8 [g]
1st March	29 [cd]	30 [bc]	29 [cd]	3 [fg]	5 [fg]	4 [j]	3 [ef]	7 [f]	5 [h]
16th March	36 [ab]	38 [a]	37 [b]	1 [g]	3 [g]	2 [k]	2 [f]	4 [f]	3 [i]

Means sharing similar letters in a column under each parameter are non-significant at $\alpha = 0.05$ (DMR test).

Table 2. Microclimatic conditions (temperature & relative humidity percentage on average basis) under poly-tunnel at Bahawalpur during the experimental period.

During fortnightly interval starting from	Average Maximum Temperature (^oC)	Average Minimum Temperature (^oC)	Relative Humidity (%) Range
1st October	36	20	52-78
16th October	30	17	70-80
1st November	29	14	72-80
16th November	27	10	70-79
1st December	26	9	62-78
16th December	24	8	76-82
1st January	20	6	58-76
16th January	23	7	73-84
1st February	24	7	75-82
16th February	26	8	68-82
1st March	27	9	70-82
16th March	31	13	70-78

Data shown is average of 2 years

Conclusion: Jojoba cuttings planted during mid October to mid November may result in maximum rooting under poly-tunnel. Inside the poly-tunnel the optimum minimum temperature for rooting should be 14^oC and optimum maximum temperature must be under 36^oC with relative humidity (52-80%). The minimum temperature less than 10^oC inside the poly-tunnel is not favorable even under the favorable relative humidity range.

REFERENCES

Ahmad, M., M. H. Laghari, I. Ahmad and K.M. Khokhar (2002). Seasonal variation in rooting of leafy olive cuttings. Asian J. Plant Sci., 1: 228-229.

Alam, R., K. Rahman, M.A. Rauf, M. Ilyas and M. Shah (2004). Effect of different planting dates on the cuttings of Bougainvillea (cultivar Bush). Sarhad J. Agric., 20: 489-492.

Asad, M. N., M.A. Bashir, A.M. Iqbal and M.Y. Rana (2000). Effect of sowing date on germination of jojoba seeds. The J. Anim. Plant Sci., 10: 19-21.

Bashir, M. A., A. M. Iqbal, M. N Asad, M.Y. Rana and S. F. H. Shah (2001). Propagation of jojoba through cuttings. The J. Anim. Plant Sci., 11: 24 - 29.

Bashir, M. A.; M. Ahmed and M. A. Anjum. (2005). Response of six promising jojoba strains to air layering. Bioscience Research. 3:172-177.

Bashir, M. A.; M. Ahmed and M. A. Anjum (2006). Propagation of six promising jojoba strains through veneer grafting. Int. J. Agric. Biol., 8: 482-484.

Bashir, M.A., M.A. Anjum and H. Rashid (2008). *In vitro* propagation of some promising genotypes of jojoba (*Simmondsia chinensis*). African J. Biotech., 7: 3878-3886.

Bashir, M.A., M.A. Anjum and M. Ahmad (2009). Planting time impact on growth of saplings/plantlets from promising strains of jojoba (*Simmondsia chinensis*). Annals of Arid Zone, 48:67-70.

Bashir, M.A., M.A. Anjum, Z. Chaudhry and H. Rashid (2009). Response of jojoba (*Simmondsia chinensis*) cuttings to various concentration of auxins. Pakistan J. Bot., 41: 2831-2840.

Reddy, Y.N. (2003). Effect of different concentration of auxins on rooting and root characters of air and ground layers of jojoba (*Simmondsia chinensis* (Link) C.K. Schneider). Ethopian J. Sci., 26: 155 - 159.

Zhou, Y. (2002). A preliminary study on propagation by cutting of *Simmondsia chinensis* (in Chinese). Plant Physiol. Communic., 38: 564 - 566.