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RESEARCH ARTICLE

EFFECT OF STENTING TECHNIQUES ON PLUM (*PRUNUS SALICINA* LINDL.)

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ABSTRACT

A field experiment on studies on Stenting Techniques in Plum (*Prunus salicina* Lindl.) was carried out at Horticulture Research Farm, Talwandi Sabo, Bathinda (Punjab) during January to June 2021. The experimental material consisted of plum 15-20 cm long and 1.0 to 1.25 cm thick stem cuttings with 3-5 nodes, taken from the middle basal portion of 9-10 month old dormant shoots. Cuttings were taken from seven year old mother plants of Plum cv. Kala Amritsari root stock by using Satluj purple scion on 23rd January and 3rd February 2021. These cuttings were tongue grafted with 3-4 buds, after treating them with different IBA concentrations. Thus, the experiment comprising of two planting dates and eight IBA concentrations (Control, 2000 ppm, 2500 ppm, 3000 ppm, 3500 ppm, 4000 ppm, 4500 ppm and 5000 ppm) were arranged in Factorial Randomize Block Design. The results revealed that sprouting success, graft height, number of leaves were maximum in 5000 ppm IBA which was significantly higher than all the other treatments. The sprouting success of grafts plated on 23rd January was higher than the grafts planted on 3rd February irrespective of treatments. The mortality of grafts in all the treatments were recorded up to June and after that no mortality was observed. The mortality rate was higher in control and lower doses of IBA treatments which may be due to failure of root growth in these treatments. The minimum mortality was recorded in 5000 ppm and being followed by 4500 ppm IBA treatment on both the planting dates.

INTRODUCTION

Plum (*Prunus salicina* Lindl.) is most important commercially grown temperate fruit belongs to family Rosaceae and genus *Prunus*. The most common species are; *Prunus domestica* Lindl. called European plum and *Prunus salicina* Lindl. known as Japanese plum. In India, plum is used mainly for table purposes and commercially for manufacturing jam, chutney, squashes, appetizers and fermented beverages. On the other hand, due to the presence of phytochemicals, fruits have beneficial effects on health, therefore used in traditional chinese medicine (Gonzalez-Flores *et al*., 2011). In stenting technique on the other hand, grafting and rooting occurs simultaneously. Thus, stenting can be an innovative technique to reduce the duration of plant multiplication, where rooting of clonal rootstock is not a complex phenomenon. In stenting technique, hard wood plum cuttings are difficult to root, hence; the rooting hormone IBA is used to induce rooting of stents as IBA is associated with stimulation of cell division at the graft union. The stents prepared from semi-soft pear (*Pyrus communis* L. x *Pyrus pyrifolia* Burm F.) scion grafted on the cuttings of rootstock 'Kainth' (*Pyrus pashia* Hamilton) after third week of January using higher doses of IBA exhibited higher success using this technique (Brar and Gill, 2014).

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IBA application significantly affects all aspects *viz*., lateral shoots, internodes length, root length and root number in both non-rooted and rooted stocks in stents made from sweet cherry and Colt (Negi and Upadhyay, 2016). Divin *et al.* (2011) also reported similar findings in apple rootstocks, Kaur (2015) in peachand Sharma and Aier (1989) in plum. Thus, stenting can be a valuable technique for rapid mass multiplication andyear-around production of plum plants to meet the increasing demand. Keeping in view the success of stenting and the use of IBA on the rooting of hardwood cuttings for the production of quality plants in a short period of time, the present investigations entitled "Studies on Stenting Techniques in Plum (*Prunus salicina* Lindl.)" was carried out at Talwandi Sabo, Bhatinda (Punjab) during January to June 2021.

MATERIAL AND METHODS

The experimental material consisted of plum 15-20 cm long and 1.0 to 1.25 cm thick stem cuttings with 3-5 nodes, taken from the middle basal portion of 9-10 month old dormant shoots. Cuttings were taken from seven year old mother plants of Plum cv. Kala Amritsari root stock by using Satluj purple scion on 23rd January and 3rd February 2021. These cuttings were tongue grafted with 3-4 buds, after treating them with different IBA concentrations. Thus, the experiment comprising of two planting dates and eight IBA concentrations (Control, 2000 ppm, 2500 ppm, 3000 ppm, 3500 ppm, 4000 ppm, 4500 ppm and 5000 ppm) were arranged in Factorial Randomize

Block Design. The data relating to each character were analyzed as per the procedure.

RESULTS AND DISCUSSION

Sprouting success: The data (Table 1) showed that sprouting was maximum (64.60%) in the grafts planted on 23rd January, 2021 and it was significantly higher than the plants shown on 3rd February (63.53%). Among all the treatments the maximum mean sprouting (78.12%) was recorded in IBA 5000 ppm, planted on 23rd January, 2021. While, the minimum mean sprouting success (62.33%) was recorded in 2000 ppm irrespective of planting time. The mean sprouting success of the sprouts planted on 23rd January, 2021 (64.60%) and 3rd February (63.53%) irrespective of treatments. The data further showed that the IBA 4500 and 5000 ppm as maximum sprouting success. The interaction between the treatments and planting time was found to be significant. The results are in agreement with Sandhawalia *et al.* (1996) they tested four rootstocks *viz*. Sharbati peach, Kabul green guage, Kala Amritsari plum and wild apricot to assess their suitability for the new genotype. The data recorded for six months on the nursery performance showed that Sutlej purple scion worked on Kala Amritsari Plum were superior in respect of sprouting (56.7%) and plant vigour being followed by Kabul green guage. Gautam and Negi (1997) also reported that semi hardwood cuttings of apricot, plum and wild peaches dipped in 2000 ppm IBA gave significantly better sprouting success.

Table 1: Effect of different IBA treatments on sprouting success (%) of plum grafts

IBA	23rd January	3rd February	Mean
Control	12.24	11.37	11.80
2000 ppm	63.42	61.25	62.33
2500 ppm	67.34	66.45	66.89
3000 ppm	70.33	69.51	69.92
3500 ppm	72.61	71.23	71.92
4000 ppm	75.34	74.56	74.95
4500 ppm	77.36	76.54	76.95
5000 ppm	78.12	77.32	77.72
Mean	64.60	63.53	
CD at 5%			
Time (A)		0.61	
Treatments (B)		1.53	
Time x Treatment (A x B)		0.93	

Graft height (cm): The data presented in Table 2-4 showed that the mean plant height was maximum in grafts sown on 23rd January, 2021 and it was higher than those sown on 3rd February, 2021. In all the treatments the mean height was the highest in IBA 5000 ppm, it was significantly better than rest of the treatments. The mean graft height was lowest in IBA 2000 ppm.

The data revealed that the maximum height was recorded in IBA 5000 ppm sown on 23rd January which was closely followed by the treatment sown on 3rd February. Similar results were recorded by Gill *et al.* (2014) and Brar and Khehra(2017) with the application of IBA in stents of peach causing increased plant height. Kaundal *et al.* (1993) reported the maximum plant height in peach cv. Florida Sun,Shan-i-Punjab, Florida Red when treated with 1000 ppm IBA. Brar and Gill (2014) also observed the positive effect of IBA on enhancing the plant height in pear cuttings grafted on Kainth. Similarly, Jawanda *et al.* (1990) also noticed the promoting effect of IBA on shoot length in plum cuttings.

Table 2: Effect of different IBA treatments on graft height (cm) of plum during April, 2021

IBA	23rd January	3rd February	Mean
Control	12.35	11.28	11.81
2000 ppm	34.25	33.64	33.94
2500 ppm	37.54	36.25	36.89
3000 ppm	40.34	39.64	39.99
3500 ppm	45.67	43.78	44.72
4000 ppm	50.27	47.61	48.94
4500 ppm	58.67	54.94	56.80
5000 ppm	65.74	61.87	63.80
Mean	43.10	41.13	
CD at 5%			
Time (A)		1.59	
Treatments (B)		1.12	
Time x Treatment (A x B)		NS	

Table 3. Effect of different IBA treatments on graft height (cm) of plum during May, 2021

IBA	23rd January	3rd February	Mean
Control	13.24	12.78	13.01
2000 ppm	36.74	35.64	36.19
2500 ppm	40.21	39.54	39.87
3000 ppm	43.29	42.34	42.81
3500 ppm	48.95	45.67	47.31
4000 ppm	51.24	48.78	50.01
4500 ppm	61.24	58.91	60.07
5000 ppm	69.42	65.87	67.64
Mean	45.54	43.69	
CD at 5%			
Time (A)		1.66	
Treatments (B)		1.15	
Time x Treatment (A x B)		NS	

Table 4. Effect of different IBA treatments on graft height (cm) of plum during June, 2021

IBA	23rd January	3rd February	Mean
Control	15.27	14.57	14.92
2000 ppm	39.56	37.89	38.72
2500 ppm	43.67	42.37	43.02
3000 ppm	46.97	45.61	46.29
3500 ppm	51.23	48.51	49.87
4000 ppm	54.24	51.23	52.73
4500 ppm	64.97	61.57	63.27
5000 ppm	72.54	68.31	70.42
Mean	48.56	46.26	
CD at 5%			
Time (A)		1.73	
Treatments (B)		1.23	
Time x Treatment (A x B)		NS	

Number of laves: The data presented in Table 5-7 showed that the mean number of leaves was maximum in grafts sown on 23rd January, 2021 and it was higher than those sown on 3rd February, 2021. In all the treatments the mean number of leaves was the highest in IBA 5000 ppm, it was significantly better than rest of the treatments. The mean number of leaves was lowest in IBA 2000 ppm. The data revealed that the maximum number of leaves was recorded in IBA 5000 ppm sown on 23rd January which was closely followed by the treatment sown on 23rd January. The differences in number of leaves among the stents/cuttings are attributed to varying rooting capacity. The increased number of leaves may be due to the fact that IBA formed healthier lengthy roots and hence absorbed more nutrients and water which enhance the vegetative growth. The more number of roots in the cuttings due to auxin application may have increased the photosynthetic and other activity carried out in leaves (Taiz and Zeiger, 2006).

In parallel to our findings, Singh and Singh (2002) observed that the application of IBA and NAA have played some role in augmenting the number of leaves per cutting in Bougainvillea. These observations are also in agreement with the work of Jawanda *et al*. (1990) who obtained maximum number of leaves in plum cuttings. Similarly, Kaur (2015); Kaur and Kaur (2017) and Sivaji *et al.*(2014) in fig, Raut *et al.* (2015) in pomegranate, Mehraj *et al*. (2013) in bougainvillea reported the increase in number of leaves with respect to application of IBA on cutting and stents.

Table 5. Effect of different IBA treatments on number of leaves of plum during April, 2021

IBA	23rd January	3rd February	Mean
Control	7.2	6.3	6.75
2000 ppm	22.3	20.2	21.25
2500 ppm	24.5	22.4	23.45
3000 ppm	27.8	27.5	27.65
3500 ppm	29.9	29.8	29.85
4000 ppm	33.8	32.4	33.10
4500 ppm	38.9	36.5	37.70
5000 ppm	46.8	44.8	45.80
Mean	28.9	27.5	
CD at 5%			
CD (Time A)		1.93	
CD (Treatments B)		1.31	
CD (Time x Treatment A x B)		NS	

Table 6. Effect of different IBA treatments on number of leaves of plum during May, 2021

IBA	23rd January	3rd February	Mean
Control	12.6	11.8	12.20
2000 ppm	26.5	24.6	25.55
2500 ppm	28.5	27.6	28.05
3000 ppm	30.2	29.4	29.80
3500 ppm	33.6	31.4	32.50
4000 ppm	36.9	35.8	36.35
4500 ppm	40.2	39.7	39.95
5000 ppm	48.9	46.3	47.60
Mean	32.2	30.8	
CD at 5%			
CD (Time A)		1.99	
CD (Treatments B)		1.38	
CD (Time x Treatment A x B)		NS	

Table 7: Effect of different IBA treatments on number of leaves of plum during June, 2021

IBA	23rd January	3rd February	Mean
Control	15.7	14.5	15.10
2000 ppm	29.6	27.9	28.75
2500 ppm	30.5	29.6	30.05
3000 ppm	33.8	32.7	33.25
3500 ppm	36.7	35.9	36.30
4000 ppm	39.1	38.9	39.00
4500 ppm	42.8	41.3	42.05
5000 ppm	50.3	48.5	49.40
Mean	34.8	33.7	
CD at 5%			
CD (Time A)		1.87	
CD (Treatments B)		1.12	
CD (Time x Treatment A x B)		NS	

Mortality of grafts (%): The data showed in Table 8that the highest mortality stents (98.73 and 98.84%) in control (without IBA) where total stents failed on both the sowing dates. Among the treatments, IBA 5000 ppm exerted lowest mortality (32.18%) which was statistically lower than rest of the treatments. The next best treatment was the in which mortality (36.60%) of the grafts was observed.

The maximum mortality (53.73%) of the grafts in treatments which were sown on 3rd February, 2021 and it was significantly higher mortality rate of the observed on 23rd January (52.41%). The data further showed that the maximum mortality was recorded in control and minimum mortality (68.99%) in IBA 2000 ppm. The similar results were observed on 1st sowing date (23rd January, 2021), maximum mortality rate was again in control and minimum mortality IBA 2000 ppm. In both the planting dates, the mean mortality rate was statistically at par with each other it was 53.73 % in 3rd February planting date and 52.41% in 23rd January, 2021 planting date.

Table 8. Effect of different IBA treatments on mortality of grafts June, 2021

IBA	23rd January	3rd February	Mean
Control	98.73	98.84	98.78
2000 ppm	68.45	69.54	68.99
2500 ppm	53.17	54.24	53.70
3000 ppm	48.34	49.67	49.00
3500 ppm	43.81	45.67	44.74
4000 ppm	39.87	41.19	40.53
4500 ppm	35.64	37.56	36.60
5000 ppm	31.24	33.12	32.18
Mean	52.41	53.73	
CD at 5%			
CD (Time A)		1.56	
CD (Treatments B)		0.63	
CD (Time x Treatment A x B)		1.52	

The interaction of the treatments was found to be significant. The interaction between time of planting and planting treatment was also showed significant results. Similar results on the effect IBA has been reported by Manan *et al*. (2002) they recorded the maximum mortality in control and minimum in 1000 ppm IBA treatment in hardwood cuttings of Guava. Application of natural or synthetic auxins induces the initiation of adventitious roots in cutting (Haissig, 1972). Hence, exogenous application of IBA supplements the endogenous levels of the auxins leading to enhanced rooting and vegetative growth. This is possibly due to the fact that IBA concentrations have increased cell division and cell elongation simultaneously. The increase in rooting and vegetative parameter is due to the successful rooting. Apart from ensuring optimal hormone concentration, the sensitivity of hormone to adventitious root formulation for a particular species has to be taken into account when rooting stem cuttings. It has been suggested that in plants the endogenous auxins level influence the impact of exogenously supplied IBA on rooting of *Prunnus persica* (Tworkoski and Takeda, 2007).

CONCLUSION

From the above results of data, it may be inferred that sprouting success, graft height, number of leaves was maximum in 5000 ppm IBA which was significantly higher than all the other treatments. The sprouting success of grafts plated on 23rd January was higher than the grafts planted on 3rd February irrespective of treatments. The mortality of grafts in all the treatments were recorded up to June and after that no mortality was observed. The mortality rate was higher in control and lowed doses of IBA treatments which may be due to failure of root growth in these treatments. The minimum mortality was recorded in 5000 ppm and being followed by 4500 ppm IBA treatment on both the planting dates. This practice will cut short the period of propagation by a period of one year. However, more research technology work is required in the direction to refine this technology.

REFERENCES

Brar, J. S. and Gill, M. S. 2014. Rapid propagation of pear through stenting. *IndianJournal of Horticulture Research*, 51(1): 33-35.

Brar, J. S. and Khehra, S. 2017. Stenting: A technique for rapid multiplication ofpeach (*Prunus persica*L. Batsch) Plants. *Journal of Current Microbiology andApplied Science,* 6(8): 1449-1453.

Divin, R. S.; Moghadam, E. G. and Kiani, M. 2011. Roooting response of hardwoodcuttings of MM 111 apple clonal rootstock to indole butyric acid and rootingmedia. *Asian Jounal of Applied Science,* 4: 453-58.

Gautam, D. R. and Negi, B. H. 1997. Influence of some pre-conditioning of some*Prunus species* in relation to type of cuttings. *Journal of Hill Research,* 10: 16-19.

Gill, J. K.; Singh, H.; Thakur, A. and Jawanda, S. K. 2014. Studies on simultaneousgrafting and rooting of peach on Floridagourd rootstock. *HortFlora ResearchSpectrum,* 3(3): 259-262.

Gonzalez-Flores, D.; Velardo, B.; Garrido, M.; Gonzalez-Gomez, D.; Lozano, M.;Ayuso, M. C.; Barriga, C.; Paredes, S. D. and Rodriguez, A. B. 2011. Ingestionof Japanese plums (*Prunus salicina* Lindl. cv. Crimson Globe) increases the urinary6-sulfatoxymelatonin and total antioxidant capacity levels in young, middle-agedand elderly humans: Nutritional and functional characterization of their content.*Journal of Food and Nutrition Research,* 50(4): 229-236.

Haissig B.E. (1972). Metabolic processes in adventitious rooting of cuttings. *In*:JACKSON M.B. *ed*. New root formation in plants and cuttings. Dordrecht,Martinus Nijhoff Publishers, 141-189.

Jawanda, J. S.; Josan, J. S. and Singh, S. N. 1990. Propagation of *Prunus* species bycuttings. Effect of IBA and the type of cuttings on rooting in plum. *Journal ofHorticulture Research,* 17(1): 17-21.

Kaundal, G. S.; Kanwar, J. S.; Brar, S. S.; Chanana, Y. R. and Grewal, S. S. 1993.Effect of growth regulators on the rhyzogenesis of peach cultivars. *IndianJournal of Horticulture,* 50: 117-121.

Kaur, A. and Kaur, A. 2017. Effect of IBA concentrations on success of cuttings offig cv. Brown Turkey. *International Journal of Recent Scientific Research,*11(8): 21576-21579.

Kaur, S. 2015. Effect of different treatments of Indole-3-butyric acid (IBA) on therooting and growth performance of hardwood cuttings of peach (*Prunus persica*L. Batch). *Agricultural Science Digest,* 35(1): 41-45.

Manan, A.; Khan, M. A.; Ahmad, W. and Sattar, A. 2002. Clonal propagation ofguava (*Psidium guajava*). *International Journal of Agriculture and Biology,* 4:143-144.

Mehraj, H.; Shiam, I. H.; Taufique, T.; Shahrin, S. and Uddin, A. F. M. 2013.Influence of Indole-3-Butyric Acid (IBA) on sprouting and rooting potential ofbougainvillea spectabilis cuttings. *Bangladesh Research Publications Journal*,9(1): 44-49.

Negi, N. D. and Upadhyay, S. K. 2016. Stenting-A new technique for sweet cherryand pear propagation under polyhouse conditions. *Indian Journal ofHorticulture,* 73(2): 296-299.

Raut, U. A.; Bharad, S. G. and Bhogave, A. F. 2015. Effect of different types ofcuttings and IBA levels on pomegranate cuttings. *Research on Crops*, 16(3):526-530.

Sandhawalia *et al*. (1996). Rooting of cuttings of different rootstocks. Indian Journal of Horticulture, 51(4): 162-164.

Sharma, S. D. and Aier, N. B. 1989. Seasonal rooting behavior of cuttings of plumcultivars as influenced by IBA treatments. *Scientia Horticulturae*, 40(4): 297-303.

Singh, A. K. and Singh, V. S. 2002. Influence of wood maturity and auxins on theregeneration of bougainvillea cuttings. *Progressive Horticulture*, 34(2): 196-199.

Sivaji, T.; Madhavi, K. and Vani, V. S. 2014. Effect of type of cuttings and IBAconcentrations on the propagation of fig (*Ficus carica*) cv. Poona Fig underopen conditions. *Trends in Biosciences*, 7(11): 1087-1089.

Taiz, L. and Zeiger, E. 2006. Plant Physiology, *4th edition*, Sinauer Associates Inc.Publisher, 286 p.

Tworkoski, T. and Takeda, F. 2007. Rooting response of shoot cuttings from threepeach growth habits. *Scientia Horticulturae*, 115(1): 98-100.

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