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Comparative effect of IAA, IBA and NAA on rooting of hardwood stem cuttings of *Celtis australis* Linn.

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Abstract

Celtis australis is widely cultivated in Jammu and Kashmir as an agroforestry species mainly for fodder, fuel and small timber. Effect of growth hormone (IAA, IBA and NAA) on hardwood stem cuttings of *Celtis australis* revealed that IAA and NAA at 100 ppm concentration gave higher rooting per cent (17.33%) and (15.99%) respectively. IBA at 300 ppm concentration gave significantly better results in terms of rooting percentage (23.99), average root number (11.60), average root length (30.54 cm), average plant height (37.70 cm) and average collar diameter (0.45 cm). The encouraging results were not observed in case of IAA, IBA and NAA at 900 ppm concentration.

Key words : *Celtis australis,* Growth regulators, Hardwood cuttings, Rooting.

Introduction

Celtis australis is a member of family ulmaceae. It is found in sub-Himalayan tracts and it is an important tree of north-western Himalaya. The plant is frost and drought hardy and grows both on swampy and dry rocky soils. It provides highly palatable and nutritious leaf fodder (Singh, 1982). The wood is used for making agricultural implements, sports goods and building purposes. The fruit is sweet, edible and is used as a remedy for amenorrhoea and colic disorders (Kirtikar and Basu, 1975).

Vegetative propagation in general and growth hormone treated cuttings in particular have become an indispensable tool in mass propagation of desired genotypes. It has been proved time and again that it provides a rapid as well as astonishingly economical mode of propagation. *Celtis* species is hard to root so it is not commonly propagated through vegetative means. Treating cuttings with auxins or other plant growth regulators (PGRs) are believed to promote root initiation and also help in root cell multiplication and elongation.

Considerable attention has been paid by many workers in understanding the physiological mechanisms responsible for root formation in cuttings (Bhatnagar and Joshi, 1973) various studies aimed at improving rooting techniques with forest tree species have involved the physiology of rooting with particular reference to auxins and nutritional relationship (Wilson, 1993; Nautiyal and Rawat, 1994; Kanwar *et al*., 1996; Mitter and Sharma, 1999).

This tree is widely cultivated in Himachal Pradesh and in Jammu and Kashmir as an agroforestry species mainly for fodder, fuel and small timber. To make its cultivation a success and in order to produce healthy vigorous and uniform nursery stock, the present study was undertaken to find out the effect of PGRs on rooting response and growth of shoot cuttings of Hackberry (*Celtis australis* L.).

Materials and Methods

A survey was conducted in the Srinagar district of Jammu and Kashmir for locating phenotypically superior trees. Fully grown healthy trees at different locations were selected for the collection of vegetative material (Branch cuttings). In order to determine the effect of different plant growth regulators on root initiation of *Celtis* cuttings, the hardwood cuttings were treated with following PGR's at given concentrations in 5 replications.

S. No.	Name of PGR	Concentration used (ppm)
1	Indole-3-acetic acid (IAA)	100, 300, 500, 700, 900
2.	Indole-3 butyric acid (IBA)	100, 300, 500, 700, 900
3.	Indole-3 Nepthalene acetic acid (NAA)	100, 300, 500, 700, 900

The propagation through cuttings was carried out at Forest Nursery Division of Forestry, SKUAST-K, Shalimar during the year 2004-05. Hardwood cuttings of uniform size 22 cm in length of pencil thickness were collected in the month of January and bulked together. The hard wood cuttings were buried in soil and taken out in 1st week of March 2005. They were treated with growth hormones for 24 hours and planted immediately in well prepared nursery beds at a spacing of 22x22 cm. The beds were irrigated and kept weed free. Hardwood cuttings were treated with ethyl alcohol for maintaining control. The observations of 8 month old seedling were taken with regard to rooting percentage, average root number, average root length, average plant height and average collar diameter.

The data thus obtained were subjected to the appropriate statistical analysis as per procedure given by Gomez and Gomez (1984).

Results and Discussion

Vegetative propagation in forest tree species has gained an increasing importance since last two decades. In Jammu and Kashmir people have been using forest tree species as fuel wood and fodder but due to over exploitation some of them have become threatened and presently exist only in small patches here and there. Hackberry is not commonly propagated through vegetative means as it is hard to root. Studies therefore were undertaken to propagate it vegetatively through hardwood cuttings, treated with plant growth regulators (PGRs) at varying concentrations. Studies conducted (Table 1) revealed that the lower concentrations of auxins effectively improved root initiation and development in hardwood cuttings, when dipped for 24 hours. Rooting was enhanced to 23.99, 17.33 and 15.99 per cent by use of IBA, IAA and NAA @ 300 ppm, 100 ppm and 100 ppm, respectively as against 2.66 per cent in control.

IBA 300 ppm was significantly superior with average root number of 11.6/cutting. Root length was also more in case of IBA 300 ppm and in all cases of growth hormone treated cuttings compared with control. Subsequently the plant height and collar diameter (Table 1) in all growth hormone treated cuttings were found to be significantly superior than control. As against 15.40 cm of plant height in control, the cuttings treated with hormone gave average plant height ranging from 19.50 to 37.70 cm and also as against 0.17 cm of collar diameter in control, the cuttings treated with different concentrations of hormones gave average collar diameter ranging from 0.21 to 0.45 cm. The encouraging results were not observed in case of IAA, IBA and NAA at 900 ppm concentration.

Considering various combination and parameters studied, it was concluded that best results have been observed in cuttings treated with IBA @ 300 ppm concentration where rooting percentage, average root

Table 1 : Comparative effect of IAA, IBA and NAA on rooting of hardwood stem cuttings of *Celtis australis* Linn.

S.No.	Treatment (growth hormones)	Average rooting (%)	Average root number	Average root length (cm)	Average plant height (cm)	Average collar diameter (cm)
1.	Control (Ethyl alcohol)	2.66 (1.707)	4.60	16.00	15.40	0.17
	IAA					
2.	100 ppm	17.33 (4.091)	7.00	21.96	29.06	0.27
3.	300 ppm	14.66 (.721)	6.00	28.98	27.50	0.31
4.	500 ppm	5.99 (2.522)	5.00	25.80	23.20	0.21
5.	700 ppm	5.99 (2.532)	5.20	25.80	19.50	0.19
6.	900 ppm	1.99 (1.350)	2.40	25.80	8.60	0.09
	IBA					
7.	100 ppm	11.99 (3.499)	7.40	26.46	28.66	0.26
8.	300 ppm	23.99 (4.897)	11.60	30.54	37.70	0.45
9.	500 ppm	17.33 (4.179)	10.20	29.26	23.72	0.32
10.	700 ppm	10.66 (3.254)	4.00	27.88	29.40	0.32
11.	900 ppm	5.99 (2.453)	4.00	27.88	23.40	0.22
	NAA					
12.	100 ppm	15.99 (3.995)	4.40	25.10	20.10	0.81
13.	300 ppm	11.99 (3.510)	6.40	29.40	19.40	0.23
14.	500 ppm	9.32 (3.093)	4.20	26.00	18.60	0.25
15.	700 ppm	5.33 (2.203)	4.20	18.40	14.00	0.15
16.	900 ppm	1.99 (1.350)	2.60	9.90	6.00	0.07
	CD (0.05)	6.330 (0.9106)	2.102	6.856	5.799	0.072

Figures in parenthesis are arc sine transformation

number, average root length, average plant height and average collar diameter was observed as 23.99, 11.60, 30.54, 37.0 and 0.45 cm respectively.

The purpose of treated cuttings with auxin type growth regulators (hormones) is to increase the percentage of cuttings that form roots, to hasten root initiation, to increase the number and quality of root produced per cuttings (Hartmann and Kester, 1976). Wilson (1993) studied the effect of growth regulators on Eucalyptus and found that it stimulated root formation. Sharma and Pandey (1999) also found that lower concentrations were the most effective for cuttings of *Ulmus wallichaiana* when dipped for 24 hours. Treating stem cuttings with auxins or other PGR's are believed to promote root initiation and also help in root cell multiplication and elongation, produced numerous and long roots. It is probably due to this effect that hard wood cuttings of hackberry *Celtis australis* stated as a very difficult to root species (Puri and Shamet, 1988), when treated with various auxins at varying concentrations produced roots more in number and larger in length as compared to untreated ones.

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References

Bhatnagar, H. P. and D. N. Joshi 1973. Vegetative propagation of *Eucalyptus teriticornis* through lignotubers. *Indian Forester* 99 : 508-509.

Gomez, K. A. and A. A. Gomez. 1984. *Statistical procedure for agricultural research* 2nd edition. John Wiley and Sons, New York, 680 p.

Hartman, H. T. and D. E. Kester. 1976. *Plant propagation principles and practices*. Prentice Hall, New Delhi 662 p.

Kanwar, B. S., S. D. Bhardwaj and G. S. Shamet. 1996. Vegetative propagation of *Ulmus laevigata* by stem cuttings. *Journal of Tropical Forestry Sciences* 8 : 333-338.

Kirtikar, K. R. and B. D. Basu. 1975. *Indian medicinal plants*. M/S Periodical experts D-42, Vivek Vihar, Delhi Vo. III. pp. 2294-95.

Mitter, H. and A. Sharma. 1999. Propagation of *Taxus baccata* Linn. by stem cuttings. *Indian Forester* 125 : 159-162.

Nautiyal, S. and M. S. Rawat. 1994. Macropropagation of teak. *Indian Forester* 120 : 142-145.

Puri, S. and G. S. Shamet. 1988. Rooting of stem cuttings of social forestry species. *International Tree Crop* 5 : 63-69.

Sharma, L. K. and O. N. Pandey. 1999. Effect of plant growth regulators in rooting behaviour of cuttings of *Dalbergia latifolia* Roxb. and *Dalbergia sissoo* Roxb. *Indian Forester* 125 : 421-426.

Singh, R. V. 1982. *Fodder trees of India*. Oxford and IBH Publication Co., New Delhi, pp. 102-107.

Wilson, P. J. 1993. Propagation characteristics of *Eucalyptus globules* Labill spp. globules stem cuttings in relation to their original position in the parent shoot. *J. Hort. Sci.* 68 : 715-724.