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Effect of different Stem Cuttings and IBA on Morphology and Rooting of Damas Plant (*Conocarpus lancifolius*)

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ABSTRACT: *Conocarpus lancifolius* L. is much esteemed plant for landscape owing to its growth habit. Thus, availability of good planting material has vital importance. Plant propagation is an important practice in gardening. Looking into the importance of dam as plant the study was carried out to determine the impact of various cutting methods and IBA concentrations on its roots and survival. Two different cutting kinds (tip cutting and semi-hardwood cutting), four different IBA concentrations (300, 400, 500, and 600 mg l^{-1}), and a control were all used in the treatment. When compared to other forms of cuttings, tip cuttings took least days for 50%sprouting (21.07 days), had the longest shoots (12.03 cm), maximum leaf area (7.93 cm^2) after 60 days of planting and more leaves per cutting (5.17 and 9.60) at 30 and 60 days of planting, respectively. In contrast, IBA concentration of 500 mgl^{-1}showed earliest sprouting (21.00 days), longest shoot (12.95 cm), largest leaf area (7.85 cm^2) at 60 DAP and maximum number of leaves per cutting (5.83 and 10.10) at 30 and 60 DAP, respectively. Following a 60-day planting period, cuttings were transplanted in polybags. After three months of transplanting, tip cutting in combination with IBA at 500 mg l^{-1} significantly boosted height and width of plant in the North-South and East-West directions, with the highest successful plants in polybags. According to the aforementioned results, tip cutting that was submerged in a 500 mgl^{-1} IBA (C_1I_3) concentration was the best treatment.

Keywords: *Conocarpus lancifolius*, Cutting type, Growth regulator, IBA, Vegetative propagation, Rooting.

INTRODUCTION

Conocarpus is a genus of two species that is a member of the combretaceae family. The tree produces solid wood that works well for charcoal. The leaves have tannin in them. It typically tolerates salt and is only mildly drought-sensitive. It is great for landscaping planting since it has a screening effect and lowers noise pollution. The damas plant can readily be fashioned into a wide range of diverse forms due to its symmetrical growth pattern. It can be shaped into both short and tall hedges, and it works well to block sight or sound. It can also be grown as a hardy, single-stem tree that provides good shade with the right plant spacing. The tree has been widely utilised for screening needs as well as landscaping along avenue plantations. *C. lancifolius* L. is a highly regarded plant for landscaping because of its growth pattern. The availability of high-quality planting material is therefore crucial.

Rapid propagation methods become essential in this setting when planting material is limited due to clone shortages or fast acreage growth (Sundarrajan *et al.*, 2022). As a result, it inspires the idea of using distinct stem cuttings as a quick growth method in damas plant. Cuttings can be used to propagate a variety of plants. Cutting is the simplest and least expensive method for mass producing plants that are more uniform and genetically close to their ancestors. The mother plant's physiological stage and the timing of the cuttings are crucial components for cutting success. Stem cuttings are any cuts made from a plant's main shoot or additional side shoots that emerge from the same plant or stem. Generally speaking, the shoots with a high glucose content root well. Softwood, semi-hardwood, and hardwood cuttings are the four main categories of stem cuttings. When cuttings are treated with various growth hormones, roots form successfully (Sharma and Srivastav 2004).

IBA is the best auxin for general use because it is safe for plants and encourages rooting in a wide range of plant types. IBA is a relatively stable substance, cold and darkness can lengthen its shelf life (Hartman *et al.* 2011). IBA, also known as indole-3-butyric acid, is essential for the growth of both roots and shoots. To begin production when a plant is rooted, a specific concentration of IBA is needed. The amount of hormone administered determines how active growth regulators are, and a specific concentration of growth regulator may be more efficient for starting roots in stem cutting (Taiz and Zeiger 2010). According to Shadparvar *et al.* (2011) application of IBA and NAA developed efficient vegetative propagation system for enhancing rooting which provides healthy planting material. Specific concentration of IBA is required to start production in rooting of plant. Activity of growth regulators depend upon the amount of hormone applied and a particular concentration of growth regulator may be more effective for initiation of root in stem cutting. Thus, optimum concentration of growth regulator needs to be determined for different plant species.

MATERIALS AND METHODS

An experiment was conducted at the Horticultural Polytechnic Farm of the Navsari Agricultural University in Navsari, Gujarat during Kharif 2020. The factorial concept included three replications, and the experiment was set up using a Randomized Block Design. Total 630 cuttings planted per replication and each replication consists combination of 10 treatment *viz.* tip cutting (C_1), semi hardwood cuttings (C_2): different IBA concentration *viz.* 300 mg l^{-1}(I_1), 400 mg l^{-1} (I_2), 500 mg l^{-1} (I_3) and 600 mg l^{-1} (I_4) along with control (I_5). Cuttings were obtaining from 4-5 years old tree of damas plant. From developing shoots, tip cutting and semi-hardwood cutting measuring 7 cm to 10 cm in length and having thicknesses of 3.0 mm to 5.0 mm and 5.0 mm to 10 mm, respectively, were obtained. Each cutting was prepared by making a flat cut 2.0 cm away from the top node and a slant round cut at the basal area immediately below the lower bud. To prevent excessive water loss, all bottom leaves on the cuttings were removed. IBA solution was made by first preparing a 5000 mg l^{-1} stock solution, then accurately weighing 5 g of IBA on a digital scale and dissolving it in 1 litre of distilled water to create the working solution for treatments;

$N_1V_1 = N_2V_2$

Where,

N_1= Initial concentration of chemical

N_2= Required concentration of chemical

V_1= Required volume of chemical

V_2= Final volume of chemical

By submerging the base of the cuttings in IBA solutions for 10 minutes, different IBA concentrations were applied to the cuttings. The cuttings were initially planted in a sand bed (Sand: Vermi compost (3: 1 v/v)) and then moved to a polybag at 60 days for three months. A media composition of soil, FYM, and sand (2: 1: 1 v/v) was placed within polybags. All parameters for the shoot and roots were observed and recorded.

Treatment combinations:

C_1I_1 = tip cutting + IBA 300 ppm
C_2I_1 = semi hardwood cutting + IBA 300 ppm
C_1I_2 = tip cutting + IBA 400 ppm
C_2I_2= semi hardwood cutting + IBA 400 ppm
C_1I_3 = tip cutting + IBA 500 ppm
C_2I_3= semi hardwood cutting + IBA 500 ppm
C_1I_4 = tip cutting + IBA 600 ppm
C_2I_4 = semi hardwood cutting + IBA 600 ppm
C_1I_5= tip cutting + control
C_2I_5 = semi hardwood cutting + control

RESULTS AND DISCUSSION

Effect of different types of cutting. Data of several shoot characters indicated a considerable impact across all treatments (Table 1). The findings showed that tip cutting required the least days (21.07) for 50 % sprouting whereas semi-hardwood cutting required more days. At 60 days after planting, tip cutting produced the highest length of shoot (12.03 cm), highest diameter of longest shoot (3.15 mm), maximum leaf area (7.93 cm^2), maximum fresh and dry weight of root (255.60 mg/plant and 27.59 mg/plant, respectively) at 60 days of planting and the highest number of leaves (5.1 and 9.60) at 30 days and 60 days of planting, respectively. Furthermore, after 3 months after transplanting, tip cutting demonstrated considerably highest plant height (18.82 cm), plant spread (14.30 cm and 13.22 cm) in North-South and East-West directions, respectively and maximum successful plants (68.51%).

According to the data on different shoot characteristics, early sprouting in cuttings of damas plants may be caused by food reserves, which aid in root formation through early absorption of water and nutrients and encourage leaf sprouting. Conversely, the active root growth and more roots per cutting, which boosted water and nutrient intake, may be the cause of the longest shoots. Plant propagation through tip cutting produced observable outcomes because food material migrated from the cutting's tip to the base, expanding the diameter of the shoot. The reason for the increased leaf area in the tip cutting may be due to the active development of root and shoot parameters. The creation of more and longer roots, along with increased water and nutrient absorption from the medium, may be the cause of the roots' highest fresh and dry weight. This enhanced growth also contributes to the roots' higher weight. The stimulation of shoot growth, which likely raised the number of nodes that resulted in the creation of higher number of leaves, may be the cause of the increased leaf count. The outcome is consistent with Benabise's (2012) findings for tindalo, Kumar *et al.* (2018) 's findings for Indian borage, and Neelima *et al.* (2018) 's findings for jasmine.

Effect of various IBA concentration. The findings (Table 1) showed that tip cutting required fewer days for 50% sprouting (21.00 days). The tip cutting had the longest shoot (12.95 cm), largest longest shoot diameter (3.45 mm), largest leaf area (7.85 cm^2), fresh and dried root weights (294.33 mg/plant and 34.17 mg/plant, respectively) at 60 days of planting, and the highest leaves (5.83 and 10.10) at 30 days and 60 days. At three months after transplanting, tip cuttings had the highest plant height (20.49 cm), spread (10.13 cm) in the North-South and East-West directions, respectively, and success rate (74.78%).

Neelima *et al.* (2018) speculate that the correct plant growth regulator and its concentration, which boost cell division, cell elongation, and early differentiation of callus tissue towards the formation of roots, may be the reason why tip cuttings sprout 50% of the time in the shortest amount of time and produce early growth. By promoting cell division, cell elongation, and protein synthesis, auxin may have aided in healthy vegetative growth and contributed to the shoot's maximum length. Shoot diameter results from increased sprouting and increased leaf production in auxin-treated cuttings, particularly at high doses. Increased fresh and dry weight of roots may be the result of vascular cell differentiation and direct root development using greater IBA concentrations. The extra leaves could be a result of exogenous auxin administration, which stimulates callus cell separation, cell expansion, and protein synthesis, resulting in improved root and improved shoot growth. According to Sundarrajan *et al*. (2022) the administration of IBA has been reported to enhance the cambial activity, leading in the mobilisation of reserve food material to the site of root initiation. A similar trend for plant survival was also shown in earlier reports by Pooja *et al.* (2013) in *Lonicera japonica*, Rahbin *et al.* (2012) in night jasmine, Kumaresan *et al.* (2019) in jasmine, Benabise (2012) in tindalo, Abdel-Rahman (2016) in *Conocarpus erectus*, Anuradha *et al*. (2018) in marigold and Kumar *et al.* (2018) in Indian borage. As food material in tip cutting is triggered by auxin treatment, which produced more vigorous vegetative growth and more rooting, improvement in plant height and plant spread may be attributable to the synergistic effect of tip cutting and IBA application. Auxin produced a greater number of roots in cutting and its ability to promote rooting, which enhanced the speed of translocation and movement of sugar to the base of cutting and subsequently stimulated rooting.

Interaction effect of different types of cuttings and various IBA concentration. The data on different shoot characters showed significant effect in all the treatments (Table 1).

Tip cuttings dipped in 500 mg l^{-1} IBA (C_1I_3) concentration showed increased early sprouting in 50% of cuttings (18.33 days), length of longest root (9.08 cm), leaf area (10.37 cm^2), and survival percentage (89.68) at 60 DAP. While the longest sprout (14.84 cm) was found in tip cuttings that had been treated with 400 mg/l IBA. Tip cuttings treated with 500 mg l^{-1} IBA concentration resulted in an increase in plant height (24.28 cm), spread (17.89 cm and 17.51 cm in N-S and E-W directions, respectively), and success of plants (89.28%) in polythene bags at three months after transplanting. The differential root promoting effect of different auxin at various concentrations could be due to their respective difference in initiating hydrolysis of nutritional resources which forms the basis for rooting (Bhatt and Chauhan 2012).

Table 1: Effect of different types of cuttings and IBA concentration on rooting of *Conocarpus lancifolius* L.

	Days taken for 50 % sprouting	Shoot length (cm)	Longest shoot diameter (mm)	Number of leaves		Leaf area (cm^2)	Plant height (cm)	Plant spread (cm)		Fresh weight of root (mg/plant)	Dry weight of root (mg/plant)	Successful plants (%)
				30 DAP	60 DAP			N-S	E-W			
C_1 Tip cutting	21.07	12.03	3.15	5.17	9.60	7.93	18.8	14.30	13.22	255.60	27.59	68.51
C_2 Semi hardwood cutting	25.80	10.15	2.74	4.20	8.17	4.42	15.0	12.2	10.7	170.40	22.00	56.73
S. Em. ±	0.56	0.24	0.07	0.14	0.23	0.19	0.3	0.3	0.3	4.04	0.41	1.62
C. D. at 5%	**1.66**	**0.71**	**0.22**	**0.40**	**0.70**	**0.56**	**1.0**	**0.9**	**1.0**	**12.00**	**1.21**	**4.80**
I_1 300 mg l^{-1}	25.50	9.88	2.57	4.20	8.00	5.46	15.2	11.6	10.3	161.33	17.05	55.63
I_2 400 mg l^{-1}	22.67	12.77	3.04	5.17	9.03	5.89	17.9	13.9	12.6	212.00	26.76	60.79
I_3 500 mg l^{-1}	21.00	12.95	3.45	5.83	10.10	7.85	20.4	15.6	14.6	294.33	34.17	74.78
I_4 600 mg l^{-1}	21.50	12.67	3.31	5.67	10.07	7.78	15.2	15.1	14.6	293.67	33.52	71.81
I_5 control	26.50	7.17	2.34	2.57	7.23	3.88	12.2	10.1	7.6	103.67	12.48	50.09
S. Em. ±	0.88	0.38	0.12	0.21	0.37	0.30	0.5	0.4	0.5	6.39	0.64	2.55
C. D. at 5%	**2.62**	**1.12**	**0.35**	**0.63**	**1.10**	**0.89**	**1.7**	**1.4**	**1.5**	**1.90**	**1.91**	**7.59**
C_1I_1	24.33	10.18				7.73	15.7	11.9	11.2	179.33	18.07	57.81
C_1I_2	20.67	14.84				8.20	19.8	15.4	14.0	240.00	31.44	65.78
C_1I_3	18.33	14.53				10.37	24.2	17.8	17.5	380.67	38.40	89.28
C_1I_4	20.33	13.01				8.60	19.7	15.8	15.2	350.67	35.27	78.62
C_1I_5	21.67	7.59				4.73	14.4	10.4	8.0	127.33	14.79	51.05
C_2I_1	26.67	9.58				3.19	14.6	11.3	14.0	143.33	16.03	53.44
C_2I_2	24.67	10.71				3.57	16.0	12.4	11.3	184.00	22.07	55.79
C_2I_3	23.67	11.36				5.33	16.7	13.4	11.8	208.00	29.93	60.28
C_2I_4	22.67	12.33	**NS**	**NS**		6.97	17.7	14.3	13.9	236.67	31.77	65.00
C_2I_5	31.33	6.75				3.03	10.1	9.7	7.2	80.00	10.18	49.13
S. Em. ±	1.25	0.38				0.42	0.8	0.6	0.7	9.04	0.91	3.61
C. D. at 5%	**3.70**	**1.59**				**1.25**	**2.4**	**2.0**	**2.2**	**26.85**	**2.70**	**10.73**

CONCLUSION

From the results of the present study, it can be concluded that tip cuttings dipped in 500 ppm IBA for 10 minutes found more effective for higher root and shoot growth with better survival as well as success of dam as plant cutting.

FUTURE SCOPE

Conocarpus is a new crop for the Gujarat region. It is very much popular here because of its hardy nature. It is excellent for landscape planting, for creating screening effect and reduces noise pollution. Looking into the importance of the plant, this experiment is to be carried out to standardize the proper propagation technique for nursery man.

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Conflict of Interest. None.

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