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Influence of Iba on Rooting Potential of Torch Glory *Bougainvillea glabra* During Winter Season

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Abstract: The hardwoods cutting of *Bougainvillea glabra* variety Torch Glory were collected from healthy vigorous shoots of 3 year old plants. The cuttings were collected from November 15 at monthly interval upto February 15. The 15 cm long cuttings were prepared and treated with different concentration of IBA solutions by quick dip method. The cuttings were planted in 1 kg capacity polythene bags containing soil, sand and FYM mixture in 1:1:1 (v/v) ratio and kept under net house condition (25% filtrations) for rooting. The maximum (100.00%) rooting and sprouting in cutting was recorded at IBA 2000, 2500 and 3000 mgL^{-1}. The maximum length of sprout/cutting (18.77 cm) and number of roots/cutting (21.22) were found in 3000 $mg.L^{-1}$ in the month February 15. Length of root/cutting was maximum (15.32 cm) in 5000 $mg.L^{-1}$ concentration of IBA in February 15.

Key words: Stem cutting · IBA · Torch Glory *Bougainvillea* · Rooting percentage

INTRODUCTION

Bougainvillea is a Brazilian vine adapted to other tropical and subtropical areas, including Florida Hawaii and India. It withstands pruning well, developing as a shrub if you trim it regularly to a shorter size. Its flowers are small and pale white. But they're surrounded by colourful petal-like structures called bracts that make this vine appealing as a landscape plant. In India, it is very popular garden plant and is appreciated for its brightly coloured bracts and profuse flowering throughout the year. *Bougainvillea* is a versatile plant and rich in its varietals wealth which can be used in different ways like bush, standard shrub, climber, hedge, pot plant, bonsai and ground cover for sloppy lands and to make the garden colourful for most part of the year. There are large numbers of varieties of *Bougainvillea* available in India and suitable varieties can be selected for planting in the various situation and purposes. The success in propagation by cutting is very limited in most of the varieties; rooting response varies from variety to variety. It has also been observed that the cuttings of *Bougainvillea* rooted better in one season but failed to produce roots during another season [1]. Although a large number of varieties could be easily multiplied by cutting, yet there are also some varieties like Thimma and Dr Rao, which are difficult to root and therefore, need proper handling and careful manipulation of rooting conditions. Mishra and Singh [2] observed that varietal differences and weather conditions affect rooting in *Bougainvillea* cuttings. Several research workers used growth regulators to induce rooting of cuttings. Singh and Rathore [3] treated cuttings with IBA and found low survival of rooted softwood cuttings should be in comparison with hardwood cuttings. In this respect, the present work is taken and conducted to find suitable propagation method in winter months for Torch Glory *Bougainvillea*.

MATERIALS AND METHODS

This study was conducted at the Horticultural Research Centre (30° 13’ 25.26’’ N and 78° 48’ 04.93’’ E and 563 m amsl) of HNB Garhwal University, Srinagar (Garhwal), Uttarakhand, India during winter months of 2008-2009. The experimental materials consisted of 15 cm long hardwood stem cuttings of Torch Glory *Bougainvillea* were collected from 3 year old plants growing on sloppy land. While preparing the cuttings, a smooth cut in each cutting was given on distal end and

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slanting cut was given at lower end just below lower node. The experiment was replicated thrice with 10 cuttings in each treatment and a total of 1330 cuttings were tested. The planting of treated cuttings was started from November 15 at interval of one month and last up to February 15. The basal ends of the cuttings were dipped in dilute solutions, 500 mg.L^{-1} onwards up to 5000 mg.L^{-1} with a difference of 500 mg.L^{-1}, of indole-3-butyric acid by quick dip method for 10 seconds before planting them in the rooting medium. For preparing the rooting media, the soil, sand and farm yard manure (FYM) in ratio of 1:1:1 by v/v were mixed thoroughly, cleaned for stones and grasses, then the mixture was filled in perforated white polythene bags of 1 kg capacity, tightly leaving one inch space at the top. Two cuttings were planted in each bags placing under net house condition. The trail was replicated thrice for each treatment. The number of sprouted/cuttings, length of sprout/cutting, number of sprouts/cutting, number of primary roots/cutting, length of root/cutting and the rooting percentage of cuttings were recorded after three months of planting. The data recorded were subjected to statistical analysis for least significant difference (RBD) as described by Cochran and Cox [4].

RESULTS

The significant ($P<0.05$) variations was recorded between different concentrations of IBA at different months. The rooting and sprouting percentage was successfully achieved 100% in 2000, 2500 and 3000 mg. L^{-1} IBA treatment in the month of February. In control set, sprouting and rooting percentage was 23.30%. The maximum sprouts length was recorded in the cuttings collected from month of February in 3000 mg.L^{-1} IBA treatment (Table 1). The lowest sprout/cutting was 3.70 cm in the month of December in the control set.

Table 1: Effect of time of planting and IBA concentration on vegetative propagation of Torch Glory variety of Bougainvillea

Treatment	Month of planting	sprouted cuttings %	Rooting %	Length of sprouts/cutting (cm)	Number of sprouts/cutting	Number of roots/cutting	Length of roots/cutting (cm)
Control	November	23.30^{f}	23.30^{f}	5.60g	4.33^{cd}	3.83^{cd}	4.46^{e}
500 mg.L^{-1} IBA		33.30^{e}	33.30^{e}	6.25^{bc}	4.88^{b}	6.66^{b}	6.31^{c}
1000 mg.L^{-1} IBA		40.00^{de}	40.00^{de}	6.20^{bcd}	4.00^{de}	4.83^{c}	5.35^{d}
1500 mg.L^{-1} IBA		46.60^{cd}	46.60^{cd}	6.09^{de}	4.66^{bc}	4.50^{cd}	5.31^{d}
2000 mg.L^{-1} IBA		53.30^{bc}	53.30^{bc}	6.15^{cde}	5.22^{a}	6.16^{bc}	6.22^{c}
2500 mg.L^{-1} IBA		56.60^{b}	56.60^{b}	6.32^{b}	3.88^{de}	6.66^{b}	5.20^{d}
3000 mg.L^{-1} IBA		60.00^{b}	60.00^{b}	6.03^{ef}	4.88^{b}	6.66^{b}	6.72^{c}
3500 mg.L^{-1} IBA		70.00^{a}	70.00^{a}	5.69g	4.22^{cd}	8.66^{a}	9.90^{a}
4000 mg.L^{-1} IBA		40.00^{de}	40.00^{de}	6.49^{a}	3.77^{e}	7.50^{b}	4.87^{e}
4500 mg.L^{-1} IBA		33.30^{e}	33.30^{e}	5.93^{f}	3.88^{de}	7.00^{b}	6.88^{c}
5000 mg.L^{-1} IBA		43.30^{d}	43.30^{d}	5.95^{f}	2.99^{f}	4.00^{cd}	8.15^{b}
CD at 5%		7.42	7.42	0.14	0.35	0.84	0.87
Control	December	56.60^{f}	56.60^{f}	3.70^{e}	4.44^{a}	5.66g	2.13g
500 mg.L^{-1} IBA		70.00^{e}	70.00^{e}	8.73^{c}	3.88^{cd}	11.33^{bcd}	9.54^{cd}
1000 mg.L^{-1} IBA		73.30^{de}	73.30^{de}	9.77^{bc}	3.99^{c}	12.33^{b}	8.49^{def}
1500 mg.L^{-1} IBA		76.60^{cd}	76.60^{cd}	10.14^{b}	3.88^{cd}	9.16^{cde}	9.20^{cde}
2000 mg.L^{-1} IBA		76.60^{cd}	76.60^{cd}	10.79^{ab}	3.88^{cd}	11.66^{bc}	11.30^{ab}
2500 mg.L^{-1} IBA		80.00^{bc}	80.00^{bc}	8.06^{cd}	3.77^{d}	10.83^{cd}	10.03^{bc}
3000 mg.L^{-1} IBA		90.00^{a}	90.00^{a}	6.69^{d}	3.99^{c}	7.16^{f}	7.00^{ef}
3500 mg.L^{-1} IBA		83.30^{b}	83.30^{b}	11.46^{a}	3.88^{cd}	15.83^{a}	11.73^{a}
4000 mg.L^{-1} IBA		80.00^{bc}	80.00^{bc}	5.25^{d}	4.21^{b}	9.66^{cde}	6.61^{f}
4500 mg.L^{-1} IBA		80.00^{bc}	80.00^{bc}	8.06^{cd}	3.55^{e}	11.50^{bc}	10.19^{bc}
5000 mg.L^{-1} IBA		80.00^{bc}	80.00^{bc}	6.17^{d}	3.77^{d}	8.00^{cde}	9.71^{cd}
CD at 5%		4.64	4.64	1.32	0.13	1.52	1.47
Control	January	40.00^{e}	40.00^{e}	5.77i	3.55^{a}	0.00^{e}	10.71^{b}
500 mg.L^{-1} IBA		70.00^{bc}	70.00^{bc}	5.66i	3.11^{a}	10.83^{bc}	10.66^{b}
1000 mg.L^{-1} IBA		66.60^{cd}	66.60^{cd}	6.63gh	3.11^{a}	10.50^{c}	10.98^{b}
1500 mg.L^{-1} IBA		60.00^{d}	60.00^{d}	6.06hi	3.00^{a}	7.16^{d}	9.47^{d}
2000 mg.L^{-1} IBA		66.60^{cd}	66.60^{cd}	6.95^{f}g	3.11^{a}	11.33^{bc}	10.10^{c}
2500 mg.L^{-1} IBA		76.60^{ab}	76.60^{ab}	9.06^{ab}	3.22^{a}	13.00^{ab}	10.60^{b}
3000 mg.L^{-1} IBA		80.00^{a}	80.00^{a}	9.83^{a}	3.44^{a}	13.83^{a}	9.50^{d}
3500 mg.L^{-1} IBA		76.60^{ab}	76.60^{ab}	8.11^{de}	3.00^{a}	15.16^{a}	12.35^{a}
4000 mg.L^{-1} IBA		60.00^{d}	60.00^{d}	7.57^{ef}	3.11^{a}	14.83^{a}	10.68^{b}
4500 mg.L^{-1} IBA		43.30^{e}	43.30^{e}	8.95^{bc}	3.00^{a}	10.83^{bc}	10.66^{b}
5000 mg.L^{-1} IBA		76.60^{ab}	76.60^{ab}	8.27^{cd}	3.33^{a}	8.00^{d}	9.21^{d}
CD at 5%		7.32	7.32	0.78	1.63	2.35	0.48

Table 1: Continued

Treatment	Month of planting	sprouted cuttings %	Rooting %	Length of sprouts/cutting (cm)	Number of sprouts/cutting	Number of roots/cutting	Length of roots/cutting (cm)
Control	February	76.60^{d}	76.60^{d}	13.65^{e}	3.33^{b}	7.50^{f}	8.12^{f}
500 mg.L^{-1} IBA		83.30^{c}	83.30^{c}	15.40^{c}	3.55^{a}	9.16^{ef}	10.02^{e}
1000 mg.L^{-1} IBA		83.30^{c}	83.30^{c}	15.17^{cd}	3.00^{de}	9.90^{de}	10.91^{de}
1500 mg.L^{-1} IBA		96.60^{a}	96.60^{a}	14.58^{d}	3.00^{de}	10.50^{de}	12.04^{cd}
2000 mg.L^{-1} IBA		100.00^{a}	100.00^{a}	15.20^{cd}	2.88^{ef}	11.33^{cd}	10.54^{e}
2500 mg.L^{-1} IBA		100.00^{a}	100.00^{a}	14.77^{cd}	3.11^{cd}	12.83^{c}	9.77^{e}
3000 mg.L^{-1} IBA		100.00^{a}	100.00^{a}	18.77^{a}	2.99^{de}	21.22^{a}	13.80^{b}
3500 mg.L^{-1} IBA		96.60^{a}	96.60^{a}	14.67^{cd}	3.22^{bc}	15.66^{b}	10.19^{e}
4000 mg.L^{-1} IBA		90.00^{b}	90.00^{b}	17.15^{b}	2.77^{f}g	10.66^{de}	13.03^{bc}
4500 mg.L^{-1} IBA		80.00^{c}	80.00^{c}	15.35^{cd}	2.55g	17.00^{b}	13.18^{bc}
5000 mg.L^{-1} IBA		80.00^{c}	80.00^{c}	16.59^{b}	2.66g	17.33^{b}	15.32^{a}
CD at 5%		5.04	5.04	0.78	0.16	2.30	1.16

Means followed by same letter within each column are not significant ($P < 0.05$).

The highest number of sprout 5.22 to sprouted cutting recorded with IBA at 3000 mg.L^{-1} in month of November. The lowest number of sprout to sprouted cuttings was 2.55 at 4500 mg.L^{-1} IBA treatment in the month of February. However, maximum ratio of root to rooted cutting was 21.22 in 3000 mg.L^{-1} IBA treatment in the month of February, while lowest ratio of root to rooted cutting was 3.83 in the control set. Length of root to rooted cuttings was maximum 15.32 cm in 5000 mg.L^{-1} IBA treatment in month of February. Similarly, the minimum root length to rooted cutting was 2.13 cm in the month of December in the control set (Table 1).

DISCUSSION

The results of present study revealed that month of planting was significantly influenced rooting and sprouting of *Bougainvillea glabra.* The different concentrations of IBA also affected significantly ($P<0.05$) on rooting and sprouting response of *B. glabra.* The branch cutting was collected for the month of February gives better rooting and sprouting as compared to the other months. Similarly, the different concentrations of IBA gave different rooting and sprouting responses. The 3000 mg.L^{-1} IBA treatment had the best result in all the months as compared to the other treatments. In general all the IBA treatments produced more roots and sprouts as compared to the control once (Table 1). The increase in length of roots in cuttings treated with growth regulators may be due to the enhanced hydrolysis of carbohydrates, accumulation of metabolites at the site of application of auxins, synthesis of new proteins, cell enlargement and cell division induced by the auxins [5]. Ramdayal *et al*. [6] obtained highest rooting percentage, maximum number of roots per cutting, length of roots in the hard wood cuttings of *Bougainvillea* var Mary Palmer. Gupta *et al*. [7] reported that treatment of *Bougainvillea* cuttings with 1000 ppm IBA gave maximum rooting (100%) with higher number of roots in soaking method. Panwar *et al.* [8] observed the best rooting in hardwood cuttings of *Bougainvillea* var. Alok treated with IBA 2000 ppm. The effect of growth regulators in enhancing the root characters of cuttings have been reported by Sherer *et al*. [9] in different horticultural crops.

Many workers reported that cuttings collected from late winter rooted more than those from early winter; however it is the species specific and also varies from variety to variety [10, 11]. The highest percentage of rooting was obtained in hardwood cuttings of *Bougainvillea* planted in August month [1]. Gautum and Chauhan [12] obtained maximum rooting success in olive cuttings treated with IBA 5000 ppm in the month of spring (April) followed by summer (July) planting of cuttings. The minimum rooting was recorded in autumn planting by them. The hydrolytic activity and percentage of rooted cuttings were increased which might be due to the application of IBA concentrations with appropriate planting time. High carbohydrate and low nitrogen level have been reported to favour root formation [13].

Application of IBA at right time proved beneficial effect on the cutting of *bougainvillea peruviana* [14]. The synthetic root promoting chemicals that have been found most reliable in stimulating adventitious root production in cuttings are indole-3-butyric acid (IBA), indole-3-acetic acid (IAA) and naphthalene acetic acid (NAA). Indole-3-butric acid has been used more widely because it is non toxic to plants over a wide concentration range [15]. Ahmad *et al*. [16] observed the significant influence of indole-3-beutric acid on the root production of *Bougainvillea glabra* Variegata.

CONCLUSION

Plants can be transplanted when they have rooted, but good results are often achieved if the plants do not have too many longer roots but have more number of roots. It is possible to multiply the Torch Glory *Bougainvillea* by hardwood stem cuttings treating them with IBA at 3000 mg. L^{-1} during February as this time maximum of cuttings rooted and produced good number of roots with average root length.

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