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Effect of Different IBA concentration on survivability and rooting of Jasmine (*Jasminum sambac* (L.) Aiton) stem cuttings

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Abstract
An experiment was conducted in the Horticultural Research cum Instructional Farm at Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalya, Raipur (C.G.), during Kharif 2015 to investigate "Effect of Different IBA concentration on survivability and rooting of Jasmine *(Jasminum sambac* (L.) Aiton) stem cuttings". The experiment consists of four different concentrations of IBA (500, 1000, 1500 and 2000 ppm) each along with control (Distilled water treatment) were treated for root initiation in cutting of Jasmine under Chhattisgarh plain region. The experiment was laid out in a Completely Randomized Design with three replications and the cuttings were planted on portray and placed at mist chamber. Growth of stems and shoots of various plants and formation of roots in cuttings were remarkably stimulated by the application of various plant regulators. The result revealed that growth regulators IBA had significant effect on survival and rooting performance of Jasmine. The maximum survival percentage (88.33%) of rooted cuttings, less days to sprouting per cuttings (8.25), maximum number of buds per cutting (2.75), number of leaves per rooted cutting (10.58) and length of shoot per rooted cutting (3.30 cm) were recorded maximum with treatment of IBA at 1500 ppm. While the maximum number of main roots per rooted cutting (9.33) and length of root per rooted cutting (5.10 cm) was also recorded at 1500 ppm IBA.

Keywords: jasmine, stem cutting, survivability, IBA (Indole Butyric Acid), concentration

1. Introduction
Jasmine is one of the most popular fragrant loose flowers all over the world. Jasmine is one of the leading traditional flowers of India. It is commonly grown in open gardens in tropical and sub-tropical zone. The major jasmine producing states in India are- Andhra Pradesh, Maharashtra, Karnataka, Pondicherry, Telangana, Tamil Nadu, West Bengal, Madhya Pradesh and Chhattisgarh. Jasmine islocally known as *''Mongra''* which produces beautiful small size white flowers with single or multi-whorled petals. The Jasmine is highly prized for its fragrant flower, which is used for the preparation of perfumesand cosmetics, fresh flowers used for making garlands, bouquet, decorating hair of women, religious offering.

In *J. sambac* seeds are not formed therefore the vegetative propagation is the only reproductive method. Jasmine plants are propagated commercially by vegetative means. Normally vegetative propagation is achieved through ground layering but it is not convenient for transportation purpose of germplasm (Sharma & Brar, 2014). Cutting is the most popular way of multiplication of ornamental shrubs (Boss and Mukherjee, 1977), but rooting success rate through conventional method of hardwood cuttings is very low. However, treatment of cuttings with auxins has been reported to improve rooting in many woody and semi woody species. Various auxins such as Indole Acetic Acid (IAA), Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA) and 2,4- Dichloropheoxy Acetic Acid (2,4-D) have been reported to promote rooting in cuttings of the most of the plant species. Each auxin's concentration varies from plant to plant and type of the cuttings used. IBA or NAA or combination of both is mostly recommended for rooting of cuttings. These are available in liquid, talc, tablet, and gel formulations. Liquid formulations are generally sold as solvent based concentrates that may be diluted to the desired concentration for treating cuttings of specific crops (Blythe et. al., 2007). The treatment of cuttings with auxins (NAA or IBA) has been reported to improve rooting in many woody species including *Bougainvillea alba* (Singh *et al*. 2017).

Grewal *et al*., (2005) studied the effect of IBA and NAA on rooting of chrysanthemum terminal cuttings and indicated that cuttings with IBA at 400ppm performed well with respect to percentage of rooting. Renuka *et al*. (2014) studied the influence of different concentrations of IBA on carnation cv.

Dona and recorded maximum number of roots per cutting and maximum cumulative length of roots and highest percentage of establishment of rooted cuttings at 200 ppm IBA. Similar findings were observed by Hirapara *et al.* (2005) in Jasmine.
Application of plant growth regulators increases fast regeneration, growth and development of shoot and roots resulting in easy, early and more roots in cuttings. The present studies were, therefore, undertaken to standardize the growth regulator (IBA concentration) treatment for survival and improving the rooting of cuttings.

2. Materials and Method

The present investigation was conducted in 2015 in the mist chamber located at the Horticultural Research cum Instructional Farm at Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalya, Raipur (C.G.), India. Raipur is situated in the central part of the Chhattisgarh and lies at 21.16ºN latitude and 81.36ºE longitude at an altitude of 298 meters above the mean sea level under Chhattisgarh plains. It comes under seventh agro-climatic zone of the country, i.e. eastern plateau and hills. The annual average rainfall is 1200-1400 mm, out of which about 85 percent is received from third week of June to mid-September and very little during October to February. May is the hottest (47 °C) and December is the coolest (6 °C) month of the year.
Semi hardwood cuttings of *Janminum sambac* were collected from 2 to 3 year old plants and 10-15 cm long cuttings having 4 to 5 nodes with apical portion and one pair of leaves were prepared. Planted cuttings were treated with 1 per cent Bavistin to prevent the occurrence of fungal diseases. The well sieved sand, soil and FYM in 1:2:1 proportion was mixed to prepare growing media. Cells of protrays were filled well with this growing mixture. The experiment was laid out in completely randomized design. There were five treatments of growth regulator formulations used at different concentrations; ten cuttings were used for each treatment which was replicated thrice. Desired quantities of IBA were first dissolved in few drops of 1N NaOH and then volume was made up to 250 ml of distilled water to make the proper concentration of IBA. The prepared cuttings were planted in pots after dipping in solutions of IBA at 500ppm, 1000 ppm, 1500ppm, 2000ppm. The cuttings under control were dipped in distilled water instead of plant growth regulators. The basal 1.5-2.0 cm portion of the cuttings was dipped in growth regulator formulation for 5 minutes and immediately planted in medium to a depth of 6-8 cm. After cuttings were planted, placed it to mist chamber and the misting was started, which had the arrangement for intermittent misting to 60 seconds at every 10 minutes interval between 8 AM and 8 PM. The planted cuttings were allowed to root for 30 days. The cuttings were carefully removed from the pots and dipped in water to remove the soil particles adhering to roots to record the observations pertaining to roots viz., survival per cent after 60 days, number of roots per cutting, length of longest root. The data pertaining to root and shoot character were tabulated and statistically analysed by adopting Fishers analysis of variance techniques.

3. Results and Discussion

3.1 Effect of IBA on shoot part

3.1.1 Days of sprouting

Among all the tested treatments the minimum days to sprouting was noted under IBA 1500 ppm although it was at par to with IBA 2000 ppm whereas, maximum days was showed in control. This is may be due to the appropriate plant growth regulator and its concentration, which increase the cell division, cell elongation and early differentiation of callus tissue toward the root formation resulted early growth in cutting. During vegetative propagation, early differentiation and growth of leaf buds is dependent on food reserves available in the cuttings (Nanda 1975).This is followed by root formation, which early absorb nutrients and water there by encourage sprouting of leaf. Similar trend of finding was also confirmed by Nagaraja *et al.* (1991) in Jasmine and Chovatia *et al.* (1995) in Bougainvillea, Renuka *et al.* (2014) in Carnation.

3.1.2 Survival percentage

The survival percentages of rooted cutting were significantly affected by the treatments. Result revealed that the survival percentage of rooted cutting ranged from 88.33 to 67.05%. The maximum survival percentages (88.33%) of rooted cutting were recorded under 1500 ppm IBA treatments.

3.1.3 Number of vegetative buds sprouted per cutting

The numbers of buds sprouted per cutting were recorded, at 45 and 60 days after planting. It is apparent from the data that the plant growth regulators IBA at different concentrations significantly influenced the number of sprouted buds per cutting only at 60 days after planting of cutting. The two concentration of IBA at 1500 and 2000 ppm were recorded the highest number of sprouted buds per cutting (2.41) whereas, the lowest number of vegetative buds per cutting (1.41) was observed in control (untreated cutting), at 45 days after planting but the difference among the treatment were non-significant. Number of vegetative buds sprouted per cutting ranged from 1.58 to 2.75 at 60 days after planting cutting. The highest number of sprouted buds (2.75) per cutting was noted under 1500 ppm IBA and it was at par with all the treatment except control. It may be due to auxin and its concentration which enhance the formation of callus and tissue and differentiation of vascular tissue (Mitra and Bose, 1954).These finding agree with the finding of Singh *et al.* (2013) in Thuja and Rawat *et al.* (1994) in Night Jasmine.

3.1.4 Length of vegetative shoot per cutting (cm)

Vegetative shoot length is one of the main characters representing vegetative growth of plant. At 45 days after planting the maximum shoot length of (2.00 cm) was recorded with the application of 1500 ppm IBA and at par with IBA 2000 ppm. Similarly, at 60 days after planting, the maximum length (3.3 cm) of shoot per cutting was recorded under 1500 ppm IBA which was significantly highest than all the treatment. The lowest length (1.76 cm) of shoot per cutting was recorded under control. The maximum shoot length was recorded in 1500 ppm IBA and it may be due to early sprouting of vegetative buds which was noted with this treatment. Auxin enhanced cell division and cell enlargement, promotion of protein synthesis which might have resulted in enhanced vegetative growth (Evans, 1973). Similar findings were observed by Nagraja *et al.* (1991) and Sharma *et al.* (2014) in Jasmine.

3.1.5 Number of leaves per cutting

The number of leaves per cutting were recorded at the interval of 45 and 60 days after planting of cuttings. Data recorded on number of leaves per cutting 45 days after planting of cutting, indicate that the maximum (6.58) value for this attribute was noted with the application of 1500 ppm IBA which was found

to be at par with IBA 2000 ppm, In case of 60 days after planting, the number of leaves per cutting ranged from 5.33 to 10.58. The maximum number of leaves per cutting was observed under 1500 ppm IBA which was found remarkably more than all the treatments of this study. Increase in number of leaf may be due to vigorous growth and early initiation of root induced by the growth regulator which absorbs more nutrients and thereby producing more leaves as reported by Stancato *et al.* (2003). Similar findings were observed by Hirapara *et al.* (2005) in Jasmine.

3.1.6 Fresh weight of shoots per cutting (gm)

It is evident from the table that, fresh weight of shoots per cutting recorded 45 and60 days after planting, ranged from 1.14 to 2.51 gm and 3.37 to 2.00 gm respectively. The maximum fresh weight of shoot per cutting was noted in the treatment in which cuttings were dipped in solution of 1500 ppm IBA in both day of observations and at par with all the treatments which contain PGR, it might be due early and fast cell division and cell enlargement with early and easy initiation of roots caused by auxin. Fresh matter accumulation of plant depends upon the vegetative growth parameter *viz.* plant height, spread or average number of branches and it is directly influenced by auxin. Thus it enhanced the fresh matter accumulation, resulted from photosynthesis or the hydrolysis of starch resulting in increase in concentration of sugar (Thimman, 1972).The results are in line with the findings observed by Girisha *et al.* (2012) in Daisy and Chaitnaya (2013) in Jasmine.

3.1.7 Dry weight of shoots per cutting (gm)

The dry weight of shoot was recorded at 45 and 60 days after planting. It is revealed from the table that dry weight of shoots per cutting was ranged from 0.58 to 1.15 gm and 0.80 to 1.26 gm after 45 and 60 days of planting respectively. The maximum dry weight of shoots per cutting was recorded with 1500 ppm IBA. It may be due to early sprouting and good length of shoot. This result is also supported by Patil *et al.* (1998) in his experiment on Jasmine.

3.2 Effect of IBA on root characters

3.2.1 Number of roots per cutting

The number of roots per cutting was recorded at an interval of 45 and 60 days after planting and the differences were found significantly. It is noticed from the data recorded 45 days after planting of cutting that the number of roots ranged from 2.00 to 5.33.In case of 60 days after planting the number of roots per cutting ranged from 6.00 to 9.33. The maximum number of roots per cutting was recorded under 1500 ppm IBA. The above finding indicated that the treated cutting by auxin with appropriate concentration induces early and better root initiation. Thus, maximum number of roots were produced in those treatment which received maximum concentration of auxin and it might be due to auxin application which initiate early and more root per cuttings. The number of roots are increases by the application of auxin is a common feature in many herbaceous perennial crops (Hartmann *et al*., 2002). Similar finding have been obtained by Sidhu and Singh (2002) and Pratibha (2012) in Chrysanthemum, Singh *et al.* (2013) in Night Queen.

3.2.2 Length of root per cutting (cm)

It is apparent from table that IBA significantly influence the length of root at 45 and 60 days after planting of cuttings. The longest root length per cutting (3.60 cm) and 5.10 cm was recorded at 45 & 60 days after planting respectively under treatment 1500 ppm. Similar findings were observed by Zaghloul *et al*. (1990) and Patil *et al.* (1998) in Jasmine and Renuka and Sekhar (2014) in Carnation.

Table 1: Effect of different concentration of IBA on cutting

Treatment		T_1	T_2	T_3	T_4	T_5	CD
		IBA 500	IBA 1000	IBA 1500	IBA 2000	Control	
Day of sprouting		10.10	9.23	8.25	8.55	10.51	
Survival Percentage (%)60 DAP		70.14	80.67	88.33	83.68	67.05	
No. of Buds	45 DAP	1.58	2.00	2.41	2.41	1.41	1.15^{ns}
	60 DAP	1.66	2.16	2.75	2.58	1.58	1.99^{*}
Length of Shoot	45 DAP	1.25	1.69	2.00	1.99	1.20	0.18^{**}
	60DAP	1.97	2.21	3.30	2.85	1.76	0.35^{**}
No. of Leaves	45 DAP	3.66	5.50	6.58	6.50	3.50	1.29**
	60DAP	5.66	6.91	10.58	8.83	5.33	1.69**
Fresh wt. of Shoot	45 DAP	1.15	1.86	2.51	2.43	1.14	1.77^{ns}
	60 DAP	2.24	2.36	3.37	3.15	2.00	0.88*
Dry wt. of Shoot	45 DAP	0.59	0.77	1.15	1.07	0.58	0.70^{ns}
	60 DAP	0.85	0.95	1.26	1.19	0.80	0.26*
No. of Roots/ Cutting	45 DAP	2.33	4.33	5.33	3.33	2.00	1.84*
	60 DAP	6.66	8.00	9.33	6.33	6.00	1.99*
Length of Roots/ Cutting	45 DAP	2.06	2.76	3.60	3.53	1.53	1.21^{*}
	60 DAP	3.70	4.13	5.10	4.86	3.70	0.66^{**}

Note: CD = Critical difference, (ns) $P > 0.05$, (*) $P \leq 0.05$, (**) $P \leq 0.01$.

4. Conclusion

On the basis of the results obtained and discussion given above, it can be concluded that as compare to non-treated cutting, IBA treated cutting is capable not only increasing the number of produced roots, but also improving the other shoots characters in *Jasminum sambac*. Among the four different IBA concentrations, 1500ppm IBA was found most effective for the rooting of *Jasminum sambac* cutting and may be used for easy and faster multiplication of jasmine.

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