Original Research Article
Response of different stem cutting to IBA on sprouting and survivalof Night-blooming jasmine (*Cestrumnocturnum*)

Abstract

The present investigation was assessed at Floriculture farm of College of Horticulture, Dapoli, Dist. Ratnagiri, (Maharashtra state) during *Rabi* season of the year 2023-24. The experiment was designed in Factorial Randomized Bock Design replicated thrice comprised two factors as types of stem cutting (Factor A) as C_1 (softwood cutting), C_2 (semi-hardwood cutting) and C_3 (hardwood cutting) and IBA levels (factor B) as I_0 (control), I_1 (IBA @ 1500 ppm), I_2 (IBA @ 2000 ppm), I_3 (IBA @ 2500 ppm) and I_4 (IBA @ 3000 ppm).C_1 (softwood cutting) recorded early days taken for first sprout (6.33 days), highest days required for sprouting (29.22 days). C_3 (hardwood cutting)registered highersprouting percentage (85.60 %) and survival percentage (80.93 %). I_0 (control) recorded for minimum days taken for first sprout(6.11 days), days required for highest sprouting (29.22 days)and maximum sprouting percentage (88 %). C_1I_2 (softwood cutting treated with IBA @ 2000 ppm) recorded early appearance of first sprout (4.00 days). C_1I_0 (softwood cutting treated without IBA) took least days for highest sprouting (29.22 days). The highest sprouting percentage (100 %) was recorded in C_3I_1 (hardwood cutting treated with IBA @ 1500 ppm) and C_3I_2 (hardwood cutting treated with 2000 ppm IBA). C_3I_2 (hardwood cutting treated with 2000 ppm IBA) recorded 100 % of survival percentage.

Keywords: Night-blooming jasmine, *Cestrum nocturnum*, stem cutting, IBA, sprouting, survival

Introduction

Night-blooming jasmine *(Cestrum nocturnum* L.) is an underutilized fragrant perennial plant, belongs to Solanaceae family and native from West Indies and Central America.Night-blooming jasmine is deciduous, brushwood and heavily scented flowering shrub. The flowers bloom start from late spring and over summer season. This flowering species refers to opening of white-cream corolla at night, thus it is popularly known as '*Raat-ki-rani*' and releases the musky aroma spread a roundly 165 to 200 feet used in preparation of '*Attar*' in perfumery industry.The volatile oil from *C. nocturnum*play major role as mosquito repellent.Night-blooming Jasmine is an important ornamental plant used in landscaping for border or as background plantation due to its showy and scented nature in night. The agro-climatic conditions of Konkan region are more favourable for planting of night-blooming jasmine. In recent years, landscaping site getting developed and thus they demand for rooted cuttings for early growth. Stem cutting is more preferably mean for multiplication and IBA is a root promoting hormone (Singh *et al.* 2013)[10]. Well rooted plants for planting having more chances of survival after transplanting are needed by gardeners. With this view an attempt has been made to assess the response of different stem cutting to IBA on sprouting and survival of Night-blooming jasmine (*Cestrumnocturnum*).

Material and methods

The present research work was carried out during *Rabi* season of the year 2023-24 at Floriculture farm of College of Horticulture, Dapoli, Dist. Ratnagiri, (Maharashtra state). The experiment was laid out in Factorial Randomized Bock Design replicated thrice comprised of two factors types of stem cutting (Factor A) as C_1 (softwood cutting), C_2 (semi-hardwood cutting) and C_3 (hardwood cutting) and IBA levels (Factor B) as I_0 (control), I_1 (IBA @ 1500 ppm), I_2 (IBA @ 2000 ppm), I_3 (IBA @ 2500 ppm) and I_4 (IBA @ 3000 ppm).Types of stem cutting like softwood, semi-hardwood and hardwood having 3-4 nodes and 12-15 cm length per cutting were taken from a healthy, vigorous and mature plant. A slanting cut was given at the basal end of cuttings and transverse cut at the top of each cutting.Planted cuttings were treated with 1 per cent Bavistin followed by basal portion of about 2 cm length with last node was dipped in their respective IBA concentrations for 10 minutes and then planted in polythene bags (4”×6”) filled with mixing soil and vermicompost (3:1)**.** Stock solution was prepared by weighing and dissolving in 20 ml of Ethyl alcohol after getting well dissolved and transparent solution, volume was made up 1 L by adding distilled water. pH was adjusted as neutral.For control treatments, cuttings are directly planted in polythene bag media without any IBA treatment. After planting, the soil at the base was pressed firmly and light irrigated was given immediately with the help of rose water can. Daily observation was noted for sprouting parameters whereas survival percentage was recorded at the end of the experiment (90 DAP). The data were analyzed by standard method of analysis of variance described by Panse and Sukhatme (1985)[7].

Results and discussion

Days taken for first sprout and days required for highest sprouting

The data gathered on days taken for first sprout and days required for highest sprouting as influenced by different stem cutting and IBA concentrations are presented in Table 1.

Types of stem cutting (C)

The data revealed that the days taken for first sprout and days required for highest sprouting significantly influenced by types of stem cutting. Initiationof first sprout (6.33 days) was observed earlier in C_1 (softwood cutting) which statistically at par with C_3 (hardwood cuttings) whereas the maximum days (7.73 days) to first sprout was noticed in C_2 (semi-hardwood cuttings).

The minimum days for highest sprouting (29.22 days) were observed in C_1 (softwood cutting) and maximum days (47.13 days) in C_3 (hardwood cutting).

The variation in days to first sprout and highest sprouting among different stem cuttings might be due to maturity level of wood and prevailing environmental condition. Softwood cutting contain more active meristematic cells and higher endogenous auxin taken from new flush having higher hormonal activities than hardwood which divide the cells rapidly which may responsible for early sprout emergence. The findings were in accordance with the research ofPawar *et al.* (2022) in ixora[7].

IBA concentrations (I)

The significantly least days (6.11 days) were noticed for fist sprout in I_0 (without IBA) which statistically at par with I_2 treatment (2000 ppm of IBA concentration) and maximum days (7.56 days) I_1 (IBA @ 1500 ppm).

Days required for highest sprouting has significantly influenced in night-blooming jasmine. The least days (29.22 days) were required for completion of highest sprouting was recorded in I_0 (without IBA) which was at par with I_1 (IBA @ 1500 ppm). While the maximum days were taken to complete highest sprouting (46.44 days) was noticed in I_3 (IBA @ 2500 ppm) and it was at par with I_2 and I_4.

IBA applied at lower concentrations create more sensitive response and hormonal regulation causes less stress to the cuttings leads to positive signal for minimum days required for sprouting by rapid cell division and cell elongation. Increase in IBA concentration expressively results in maximum days required for sprouting. It might be due to over activation of auxin causing uncontrolled cell division and differentiation. Higher auxin content in cell can disturb balance of other hormones like cytokinine, abscisic acid and ethylene which may leads to abnormal growth and development of cell.Similar trend was reported by Pawar *et al.* (2022) in ixora[7] and Malaviya *et al.* (2023) in dracaena[4].

Interaction effect (C×I)

The interaction effect between types of stem cutting and IBA levels on days taken for first sprout and days required for highest sprouting on night-blooming jasmine was found significant. Early appearance of first sprout (4.00 days) was noticed in C_1I_2 (softwood cutting treated with IBA @ 2000 ppm) which was at par with C_2I_0 (semi-hardwood cutting treated with control) which took 4 days and 5 days respectively, whereas maximum days to first sprout (9.67 days) was observed in C_2I_2 (semi-hardwood cutting treated with IBA @ 2000 ppm) at par with $C_2I_3$and C_2I_4.

Least days (29.67 days) were required for highest sprouting in a treatment combination of C_1I_0 (softwood cutting treated with no IBA) and maximum days (60 days) was noticed in C_2I_2 (semi-hardwood cutting treated with IBA @ 2000 ppm) and C_3I_4 (hardwood cutting treated with IBA @ 3000 ppm).

Cells developed at base of cutting are more sensible to the treatment applied to cuttings have higher sensitivity improve water uptake leads to early sprout. Accumulation of endogenous auxin at the base of softwood cutting when treated with suitable concentration of exogenous auxin gave rise to hydrolysis of carbohydrates converted into simple sugar which might be results in early sprout emergence. Above results are not in agreement with Kumarsean*et al.* (2019) in pink kakada[3] and Shrestha *et al.* (2023) in bougainvillea[8].

Sprouting percentage and survival percentage

The data pertaining to the effect of types of stem cutting and IBA concentrations on sprouting and survival percentage of night-blooming jasmine are presented in Table 2.

Types of stem cutting (C)

Types of stem cutting significantly influenced sprouting and survival percentage of night-blooming jasmine. Highest sprouting percentage (85.60 %) was registered in C_3 (hardwood cutting) whereas lowest sprouting percentage (73.07 %) was noticed in C_2 (semi-hardwood cutting) which was followed by C_1 (softwood cutting).

As in hardwood cutting, great storage of energy reserves in form of carbohydrates and other nutrients, when they get favorable conditions these reserves can get mobilized which utilized to recreate new cell wall of damaged cells and it also helps to maintain cell osmotic pressure of cell. Water potential significantly affect maximizing sprouts in cuttings by higher water regulation in cells which results increase turgor pressure in cells and cell wall loses leads to cell expansion and initiation of sprouts. Similar trend was reported by Singh *et al.* (2013) in thuja[10] and Kaur (2017) in peach[1].

Highest survival percentage (80.93 %) was recorded significantly in C_3 (hardwood cutting) followed by C_1 (softwood cutting) and least survival observed in C_2 (semi-hardwood). Hardwood cutting recorded higher survival percentage due to maximum carbohydrates present which stimulate early callus formation at the base of the cuttings which leads to adventitious root formation from vascular cambium. Maximum wound area can be another reason for maximum rooting may results in greater survival rate observed in hardwood rather than semi-hardwood and softwood cuttings.The results are in accordance with Nagaraja *et al.* (2001) in jasmine[5].

IBA concentrations (I)

IBA concentration significantly influences on sprouting and survival percentage. Maximum sprouting percentage (88 %) was recorded in I_0 (control treatment) which was statistically at par with each I_1 (IBA @ 1500 ppm) and I_2 (IBA @ 2000 ppm) treatments (84 %). The lowest sprouting percentage (58.67 %) was noticed in I_4 (IBA @ 3000 ppm).

Sprouting started earlier in without or low concentrated IBA treatment because of the endogenous auxin and applied IBA at low level maintain hormonal balance, increase cellular sensitivity and minimize water and nutrient stress. Progressively decrease in sprouting percentage was observed with increasein IBA concentration above the optimal level.IBA at suitable concentration can only increase the sprouting percentage hence higher concentration can cause adverse effect on cuttings. Similar trend was followed by Krishnamoorthy *et al.* (2017)[2] and Singh *et al*. (2011) in *Bougainvillea glabra*[9].

Significant diversification was observed in survival percentage. I_2 (IBA @ 2000 ppm) recorded maximum survival percentage (84.67 %) which was statistically at par with I_1 (IBA @ 1500 ppm) at 82.00 % of survival. The lowest survival percentage (60.11 %) was recorded in I_4 (IBA @ 3000 ppm).

Survival percentage steadily increases up to optimal level of IBA concentration but suddenly decreases above its limit. It might be due to the fact that IBA helps in formation of maximum number of roots, root hairs and length of longer roots which absorb adequate amount of water and nutrients by penetrating in potting media.There is strong correlation between survival of plant and number of roots. Above the optimum level of IBA concentration that inhibit the elasticity of cell wall and cell division (Kaur, 2017)[1]. These results are in close accordance with Kaur (2017) in peach[1]and Malaviya (2013) in dracaena[4].

Interaction effect (C×I)

The interaction effect between types of stem cutting and IBA levels on sprouting and survival percentage on night-blooming jasmine was found significant. The highest sprouting percentage (100 %) was recorded in C_3I_1 (hardwood cutting treated with IBA @ 1500 ppm) and C_3I_2 (hardwood cutting treated with 2000 ppm IBA) and lowest sprouting percentage (57.33 %) was found in C_1I_4 (softwood cutting treated with 3000 ppm IBA).

Due to great storage of carbohydrates and nitrogen in hardwood cutting treated with suitable concentration of IBA maintain optimum requirement of auxin in cell which stabilize hormonal balance for sprouting results in higher sprouting percentage. Water and nutrients availability in media can also be responsible for maximum sprouting percentage. The results are in agreement with Krishnamoorthy *et al.* (2017) in rose[2], Singh *et al.* (2011) in *Bougainvillea glabra*[9], Kaur (2017) in peach[1].

C_3I_2 (hardwood cutting treated with 2000 ppm IBA) recorded 100 % of survival percentage which was statistically at par with 98.00 % in C_3C_1 (hardwood cutting treated with 1500 ppm IBA) and lower survival percentage was recorded in C_1I_4 (softwood cutting treated with 3000 ppm IBA).

Hardwood cutting have maximum surface for callus formation which may increases roots. After the hydrolysis of carbohydrates callus get formed. IBA is a most reliable, non-toxic and stable compound which helps in stimulate root production in cuttings. Increase in rooting ultimately increases survival of cutting. The observed results were in line with Nagaraja *et al.* (2001) in jasmine[5].

Table 1: Effect of different stem cutting and IBA levels on days taken for first sprout and days required for higher sprouting of night-blooming jasmine.

Types of stem cutting	Days taken for first sprout*						Types of stem cutting	Days required for highest sprouting*					
	Levels of IBA concentration					Mean		Levels of IBA concentration					Mean
	I_0	I_1	I_2	I_3	I_4			I_0	I_1	I_2	I_3	I_4	
C_1	6.33	7.67	**4.00**	6.67	7.00	**6.33**	C_1	**26.67**	32.67	30.00	34.00	37.00	**32.07**
C_2	6.00	7.33	9.67	8.67	8.00	7.73	C_2	32.67	32.67	60.00	52.67	35.00	42.60
C_3	7.00	7.67	6.33	6.67	7.00	6.93	C_3	38.33	52.67	42.00	52.67	60.00	47.13
Mean	**6.11**	7.56	6.67	7.33	7.33	7.00	Mean	**29.22**	39.33	44.00	46.44	44.00	40.60
	S.Em. ±	C.D. at 5%	Result					S.Em. ±	C.D. at 5%	Result			
C	0.28	0.80	SIG				C	2.72	7.89	SIG			
I	0.36	1.03	SIG				I	3.52	10.19	SIG			
C × I	0.62	1.78	SIG				C × I	6.09	17.64	SIG			

*Days after planting

Table 2: Effect of different stem cutting and IBA levels on sprouting and survival (%) of night-blooming jasmine.

Types of stem cutting	Sprouting %						Survival %					
	Levels of IBA concentration					Mean	Levels of IBA concentration					Mean
	I_0	I_1	I_2	I_3	I_4		I_0	I_1	I_2	I_3	I_4	
C_1	84.00 (66.42)	68.00 (55.55)	81.33 (64.40)	84.00 (66.42)	60.00 (50.77)	75.47 (60.31)	65.33 (53.93)	66.67 (54.74)	80.33 (63.67)	82.67 (65.40)	58.00 (49.60)	70.60 (57.17)
C_2	90.67 (72.21)	84.00 (66.42)	74.67 (59.78)	66.00 (54.33)	64.33 (53.33)	75.93 (60.62)	73.00 (58.69)	81.33 (64.40)	73.67 (59.13)	62.00 (51.94)	61.00 (51.35)	70.20 (56.91)
C_3	89.33 (70.94)	**100.00 (90.00)**	**100.00 (90.00)**	77.33 (61.57)	61.33 (51.55)	**85.60 (67.70)**	70.67 (57.21)	98.00 (81.87)	**100.00 (90.00)**	74.67 (59.78)	61.33 (51.55)	**80.93 (64.11)**
Mean	**88.00 (69.73)**	84.00 (66.42)	85.33 (67.48)	75.78 (60.52)	61.89 (51.88)	79.00 (62.73)	69.67 (56.58)	82.00 (64.90)	**84.67 (66.95)**	73.11 (58.77)	60.11 (50.83)	73.91 (59.37)
	S.Em. ±	C.D. at 5%	Result				S.Em. ±	C.D. at 5%	Result			
C	2.51	7.28	SIG				2.55	7.37	SIG			

I	3.24	9.39	SIG	3.29	9.52	SIG
C × I	5.62	16.27	SIG	5.69	16.49	SIG

* The figure in parenthesis indicates arcsine transformed values

Factor A: Types of stem cutting	**Factor B: Levels of IBA concentration**	
C_1- Softwood	I_0- Control	I_3- 2500 ppm
C_2- Semi-hardwood	I_1-1500 ppm	I_4- 3000 ppm
C_3- Hardwood	I_2-2000 ppm	

Conclusion

From the present investigation it could be inferred that hardwood cutting treated with 2000 ppm of IBA which proved to be superior treatment combination for successfully sprouting and survival.

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