

Original Research Article

Effect of IBA concentration (Indolbutaric acid) and growing condition on performance of cuttings in Mogra (*Jasminum sambac*)

Abstract

An experiment was laid out to study influence of different levels of IBA and growing condition on cuttings of Mogra (*Jasminum sambac*) at Sheth D. M. polytechnic in Horticulture College, Anand Agricultural University, Model farm, Vadodara during 2022 to 2024. The study was conducted using completely randomized design with factorial concept and three replications for each treatment. Total 10 treatment combination of two factors viz., growing condition (open and NVPH) and IBA concentration (500, 1000, 1500 and 2000 ppm) were compared with control (deepen in distilled water). IBA significantly improved the performance of cuttings under naturally ventilated poly-house condition. 1500 ppm IBA concentration recorded significantly lower days to sprout (13.83 days), higher shoot length at 30, 45 and 60 DAP (2.80 cm, 7.64 cm and 11.63 cm), root length (4.18 cm), number of leaves at 30, 45 and 60 DAP (2.87, 6.03 and 8.47), fresh weight (11.63g), dry weight (4.18g) and survival percentage (66.11%). Where as in growing condition, naturally ventilated poly-house recorded significantly lower days to sprout (13.27 days), higher shoot length at 30, 45 and 60 DAP (2.40cm, 7.26 cm and 11.80 cm), root length (3.89 cm), number of leaves at 30, 45 and 60 DAP (2.72 , 4.80 and 7.85), fresh weight (11.80 g), dry weight (3.89 g) and survival percentage (64.56%). Semi hardwood cuttings of *Jasminum sambac* treated with 1500 ppm IBA concentration treatment for 5 min and planted in polybags under Naturally ventilated poly-house showed promising growth with higher sprouting and survival percentage as compared to other treatments.

Keywords : *Jasminum sambac*, cuttings, IBA, Naturally ventilated poly-house, plant growth regulators

Introduction

In India, jasmines are cultivated throughout the country but the commercial cultivation is confined to Coimbatore, Madurai, and Dindigul (Tamil Nadu); Bangalore, Bellary, Mysore and Kolar (Karnataka); Knnauj, Jaunpur and Gazipur (Uttar Pradesh); Udaipur, Jaipur, Ajmer and Kota (Rajasthan); Ranaghat, Kolaghat, Pancskura (West Bengal); parts of Andhra Pradesh, Maharashtra and Gujarat. Gujarat has established itself as a major companion in the floriculture sector with about 22 thousand ha area under flower crops and approximately 201 Thousand MT of production (DOH, 2024). In *Jasminumsambac* seeds are not formed therefore the vegetative propagation is the only reproductive method. Normally vegetative propagation is achieved through ground layering but it is not convenient for transportation purpose of germplasm (Sharma & Brar, 2014). Pruning is the most important practice in jasmine that can enhance the health, vigour and aesthetic of Mogra plant. The left over material of pruned benches may become easy source of vegetative propagation to produce new plants and also generating extra income for farmers. Rushabh *et al.* (2024) studied influence of time of pruning on flower yield and observed that pruning during December month gives higher yield in Jasmine (*Jasminum sambac*). Cutting is the most popular way of multiplication of ornamental shrubs (Boss and Mukherjee, 1975), but rooting success rate through conventional method of hardwood cuttings is very low. Renuka and Sekhar (2014) studied the influence of different concentrations of IBA on carnation cv. Dona and recorded highest percentage of establishment of rooted cuttings at 200 ppm IBA. Similar finding have Similar findings were observed by Hirapara (2005) in Jasmine. Hence an experiment is been laid out to optimise best IBA concentration and growing conditions for cutting in *Jasminumsambac* cv. Local.

Material and methods

The present investigation was carried out during 2022 and 2023 at Sheth D. M. Polytechnic in Horticulture college research farm, Anand Agricultural University, Model farm, Vadodara to study the effect

of levels of IBA (Indolbutyric acid) and growing condition on performance of cuttings in Mogra (*Jasminum sambac*) with ten treatment combination of two factors viz., growing condition (Open and Naturally ventilated poly-house) and level of IBA (500, 1000, 1500 and 2000 ppm) in completely randomized design with factorial concept and three replications for each treatment. Semi hardwood cuttings of *Janminumsambac* were collected on second week of December from 3 year old plants having 25-30 cm long cuttings with 5 to 8 nodes. 60 cutting for each treatment was selected and basal end of 2-3 cm portion of the cuttings was dipped in growth regulator formulation according to the treatment for 5 minutes and divided in 20 cuttings per replication and immediately planted in polybags containing prescribed media to a depth of 6-8 cm and placed under NVPH condition and another set of same treatment was placed in open condition. The cuttings under control were dipped in distilled water instead of plant growth regulators. Planted cuttings were treated with 1 per cent Bavistin to prevent the occurrence of fungal diseases. IBA was diluted in 1N NaOH and growing media was prepared with mixing the well sieved sand, soil and vermicompost (1:2:1) in polybags. Various observations like days to sprouting, plant height at 30, 45 and 60 days after planting (DAP), number of leaves at 30, 45 and 60 days after planting root length, fresh weight, dry weight and survival percentage at were taken during the experiment period. The experiment was conducted for two years and pooled data was taken to statistical analysis by the method proposed by Panse and Sukhatme (1978).

Result and discussion:

From the data depicted in table 1 and 2 revealed that Level of IBA and growing condition influenced the seedling parameters viz., days to sprouting, plant height at 30, 45 and 60 DAP, number of leaves at 30, 45 and 60 DAP, length of roots, fresh weight and dry weight and survival percentage while interaction was found significant for length of roots, fresh weight, dry weight, survival percentage, shoot length at 30 and 60 DAP and number of leaves at 30 DAP whereas, interaction effect was found non-significant for days to sprouting.

Effect of IBA

Days to Sprouting

In case of level of IBA, cutting treated with 2000 ppm IBA treatment T5, recorded significantly lower days to sprouting (13.75 days) which was at par with 1500 ppm IBA treatment T4 (13.83 days) whereas, maximum days to sprouting was recorded in control (17.75 days). This is may be due to the perfect amount of plant growth regulator and its concentration, which enhance the process of cell division, cell elongation and early differentiation of callus tissue toward the root formation ultimately resulted early growth of cuttings. In vegetative propagation, early differentiation and growth of shoot largely relies on food reserves available in the cuttings (Nanda 1975). This is followed by early root formation, which ultimately absorbs more nutrients and water there by encourage sprouting of shoot. Similar trend of finding was also confirmed by Netam *et al.* (2018), Santhosha *et al.* (2021) and Nagaraja *et al.* (1991) in Jasmine and Chovatia *et al.* (1995) in Bougainvillea, Renuka and Sekhar (2014) in Carnation.

Length of shoot

In cuttings length of the vegetative shoot is one of the main character which represents the vegetative growth of cuttings. In experiment, length of shoot was recorded at 30, 45 and 60 days after planting of cuttings. The data clearly showed that cutting treated with 1500 ppm IBA concentration treatment T4 recorded significantly higher shoot length at 30, 45 and 60 DAP (2.80 cm, 7.64 cm and 11.63 cm respectively) which was at par with 2000 ppm concentration of IBA treatment T5 at 30 and 60 days after planting. The significant difference in length of shoot might be due to early sprouting of vegetative buds in IBA treated cuttings. 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 Nagaraja *et al.* (1991) and Netam *et al.* (2018) and Sharma and Brar (2014) in Jasmine.

Length of roots

Data presented in table 1 showed that cuttings treated with 1500 ppm IBA treatment T4, recorded maximum length of roots per cuttings (4.18 cm) which was at par with cuttings treated with 2000ppm IBA treatment T5 (4.15 cm). Similar findings were observed by Santhosha *et al.* (2021), Netam *et al.* (2018), Zaghoul *et al.* (1990) and Patil *et al.* (1998) in Jasmine and Renuka and Sekhar (2014) in Carnation.

Number of leaves

The number of leaves were recorded at time interval of 30, 45 and 60 DAP of cuttings in this experiment. Data presented in table 2 recorded cuttings treated with 1500 ppm IBA treatment T4 recorded highest number of leaves at 30, 45 and 60 DAP (2.87, 6.03 and 8.47 respectively), which was at par with cuttings treated with 2000 ppm IBA at 30 and 60 DAP. Increase in number of leaf in shoot might be due to vigorous growth and early initiation of root induced by the application of growth regulator which helps to absorb more nutrients and thereby producing more leaves as reported by Stancato *et al.* (2003). Similar findings were observed by Netam *et al.* (2018) and Hirapara (2005) in Jasmine.

Fresh weight and dry weight

From the data depicted in table 2, it was evident that cutting that was deepened in 1500 ppm IBA solution treatment T4 recorded significantly higher fresh weight (11.63 g/plant) and dry weight (4.18 g/plant) which was at par with cutting treated with 2000 ppm IBA solution treatment T5. It might be due to early and fast cell division and cell enlargement process with early and easy initiation of roots due to presence of 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 Netam *et al.* (2018) and Chaitanya (2013) in Jasmine.

Survival percentage

Survival percentage is ultimate observation to check the final outcome of the cutting during experimental period. Cutting treated with 1500 ppm IBA solution recorded highest survival percentage (66.11 %) which was at par with treatment T5. Increase in survivability of cutting may be due to initiation of more roots and number of leaves with IBA treatments. The finding agrees with the finding of Chowdhuri *et al.* (2017) and Shanthosha *et al.* (2021) in Jasmine.

Effect of growing condition

Naturally ventilated poly-house provide favorable conditions for plants as well as newly developed cutting for better growth. Application of plant growth regulators under favorable growing conditions significantly improve the performance of the cuttings in rose (Kentelkyet *et al.*, 2023). Present investigation was conducted to compare open field condition (G1) with the naturally ventilated poly-house (G2). Growing condition showed significant influence on all the parameters over open field condition (control). Cuttings placed under naturally ventilated poly-house recorded significantly lower days to sprout (13.27 days), higher shoot length at 30, 45 and 60 DAP (2.40cm, 7.26 cm and 11.80 cm), root length (3.89 cm), number of leaves at 30, 45 and 60 DAP (2.72 , 4.80 and 7.85), fresh weight (11.80 g), dry weight (3.89 g) and survival percentage (64.56%). It was evident cuttings performed well under naturally ventilated poly-house that might be due to better favorable condition to grow. Poly-house decreases 66% global solar intensity which becomes advantage to cutting for better growth. Solar radiation is a determining factor of the climatic variable inside the protected structures. Micro climate including temperature, relative humidity, moisture *etc* plays important role for growth of cuttings. These results are in agreement with the findings of Ahmed *et al.*, (2019) and Chakir *et al.*, (2022).

Table 1: Effect of levels of IBA and growing condition on days to sprouting (days), shoot length at 30, 45 and 60 DAP and length of roots at 60 DAP in Jasmine (*Jasminum sambac*).

| Treatments | Days to sprouting | Shoot length at (cm) | | | Length of roots (cm) |
|-------------------------------------|-------------------|----------------------|--------|--------|----------------------|
| | | 30 DAP | 45 DAP | 60 DAP | |
| Factor A: Growing conditions | | | | | |
| G ₁ : Open Conditions | 17.87 | 2.03 | 5.95 | 9.13 | 3.01 |
| G ₂ : NVPH | 13.27 | 2.40 | 7.26 | 11.80 | 3.89 |
| C.D. (p=0.05) | 0.46 | 0.09 | 0.25 | 0.34 | 0.17 |
| Factor B: IBA Concentrations | | | | | |
| T ₁ : Distill water | 17.75 | 1.52 | 5.59 | 9.01 | 2.65 |
| T ₂ : 500 ppm | 16.58 | 1.98 | 6.36 | 9.81 | 2.82 |
| T ₃ : 1000 ppm | 15.92 | 2.01 | 6.68 | 10.31 | 3.46 |
| T ₄ : 1500 ppm | 13.83 | 2.80 | 7.64 | 11.63 | 4.18 |
| T ₅ : 2000 ppm | 13.75 | 2.76 | 6.74 | 11.55 | 4.15 |
| C.D. (p=0.05) | 0.72 | 0.14 | 0.39 | 0.54 | 0.26 |
| Interaction effect (G x T) | NS | Sig | NS | Sig | Sig |

Table 2: Effect of levels of IBA and growing condition on number of leaves at 30, 45 and 60 DAP, fresh weight, dry weight and survival percentage at 60 DAP in Jasmine (*Jasminum sambac*).

| Treatments | Number of leaves | | | Fresh weight (g/plant) | Dry weight (g/plant) | Survival percentage (%) |
|-------------------------------------|------------------|--------|--------|------------------------|----------------------|-------------------------|
| | 30 DAP | 45 DAP | 60 DAP | | | |
| Factor A: Growing conditions | | | | | | |
| G ₁ : Open Conditions | 2.27 | 4.32 | 6.14 | 9.13 | 3.01 | 46.00 |
| G ₂ : NVPH | 2.72 | 4.80 | 7.85 | 11.80 | 3.89 | 64.56 |
| C.D. (p=0.05) | 0.13 | 0.09 | 0.30 | 0.34 | 0.17 | 2.49 |
| Factor B: IBA Concentrations | | | | | | |
| T ₁ : Distill water | 2.20 | 3.28 | 5.45 | 9.01 | 2.65 | 39.72 |
| T ₂ : 500 ppm | 2.30 | 3.55 | 6.00 | 9.81 | 2.82 | 51.67 |
| T ₃ : 1000 ppm | 2.42 | 4.45 | 7.02 | 10.31 | 3.46 | 53.61 |
| T ₄ : 1500 ppm | 2.87 | 6.03 | 8.47 | 11.63 | 4.18 | 66.11 |
| T ₅ : 2000 ppm | 2.70 | 5.48 | 8.03 | 11.55 | 4.15 | 65.28 |
| C.D. (p=0.05) | 0.20 | 0.30 | 0.48 | 0.54 | 0.26 | 3.94 |
| | Sig | NS | NS | Sig | Sig | Sig |

Conclusion :

It was concluded from the present investigation that *Jasminum sambac* var. Local cutting treated with 1500 ppm IBA concentrated solution for 5 minutes provided better growth with early initiation and higher survival percentage under naturally ventilated poly-house condition.

Future scope :

Jasmine cutting are difficult to root and there are several species of jasmine which have different growth habit and response to propagated by cuttings. More research in terms of response under various month and season effect can be taken to understand the response of cuttings in jasmine crop to different kind of plant growth regulators.

Consent

As per international standards or university standards, respondents' written consent has been collected and preserved by the author(s).

Ethical Approval

We believe that our findings could be of interest to the scientist, farmers, nurseryman and reader of the journal. We certainly certify about this article is an original research work and the same is not submitted or published earlier elsewhere. We declare that there are no conflicts of interests associated to this manuscript. Additionally, this manuscript meets all applicable standards of an agricultural research with regard to the ethics of experimentation and research work; also there is no duplicate publication, fraud, plagiarism, or concerns about animal or human experimentation during the research work.

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