International Journal of Plant & Soil Science

Volume 34, Issue 24, Page 9-13, 2022; Article no.IJPSS.94611
ISSN: 2320-7035

Effect of Indole-3-Butyric Acid on Growth of V-1 Mulberry Cuttings with Varying Number of Buds in Bangalore

H. S. Pooja [a++*] and Fatima Sadatulla [a#]

[a] *Department of Sericulture, GKVK, University of Agricultural Sciences, Bengaluru, Karnataka, India.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i242608

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/94611

Original Research Article

Received: 06/10/2022
Accepted: 11/12/2022
Published: 17/12/2022

ABSTRACT

The present study was conducted in Bangalore. It aims at studying the effect of different concentrations of indole-3-butyric acid (IBA) (1000, 2000 and 3000 ppm) on V-1 mulberry cuttings with varying number of buds (one, two, three and four) consist of twelve treatments which were replicated thrice in Factorial CRD. The results on interaction effect of various concentration of IBA on mulberry cuttings with varying number of buds recorded best results in three budded cuttings treated with 3000 ppm of IBA regarding number of sprouted cuttings (14.67) and survival percentage (96.66%) of the saplings. Number of leaves (10.60) and length of shoot (26.63 cm) was maximum in two budded cuttings treated with 3000 ppm of IBA and the results of this interaction were on par with three budded cuttings treated with 3000 ppm of IBA. Whereas, one budded cutting without IBA treatment recorded minimum number of sprouted cuttings (9.67), survival percentage (43.33%), number of leaves (5.67) and length of shoot (21.43 cm). From the present experiment, we can recommend to use two budded cuttings treated with 3000 ppm of IBA instead of three budded cuttings treated with 3000 ppm of IBA.

Keywords: Saplings; concentrations; auxin; sprouting.

[++] *M. Sc. Scholar;*
[#] *Professor;*
**Corresponding author: E-mail: phspoojahsgowda@gmail.com;*

1. INTRODUCTION

Sericulture is an ancient and important rural agro-based industry par excellence with agriculture base and industrial super structure, which aims at uplifting the socio-economic standards of people who are engaged in sericulture. The major activities in sericulture include establishment of mulberry garden, production of cocoon, production of raw silk and fabric [1]. Among these mulberry nursery management has gained the position of a commercial venture with its short gestation period and low investment. Mulberry propagation in nurseries has proven well to establish healthy mulberry garden. Direct planting of mulberry cuttings in main field leads to poor establishment rate and hence they are raised under nursery condition. Mulberry saplings are to be raised for about four to six months in nursery to establish mulberry bush garden and for a period of eight months to make a tree plantation [2].

Propagation of mulberry from semi hard wood cuttings has distinct advantages over the direct plantation of cuttings, majorly higher survival rate due to already developed root system. Saplings enable quick establishment and vigorous growth. Endogenous and exogenous factors such as genotype, timing, cutting types, rooting environment, and the age of the parent material from which obtained cuttings affecting rooting and survival rate of the saplings [3]. Application of exogenous plant growth promoting substances recommended for promoting adventitious roots in stem-cutting propagation for overcoming these problems is an alternative. Treatment of auxins to cuttings causes physiological changes during the adventitious root formation which helps in mobilization of carbohydrates from leaves and upper stem, and accelerates their transport to the rooting zone [4]. Auxin induces hydrolysis and mobilization of nutritional factors to the site of application, thereby promoting root initiation in stem cuttings. Auxin results in the breakdown of starch into soluble sugars bulk of which was used in rooting process [5]. Among auxin compounds, Indole-3-butyric acid (IBA) is the most widely used root promoting chemical in the nursery trade, because it is non toxic over a wide range of concentrations. IBA have higher stability and slow rate of conjugation, this will induce more rooting and will be available over a longer period of time for cuttings [6]. The present experiment was undertaken to evaluate the effect of IBA concentrations on growth of V-1 mulberry cuttings with varying number of buds to know the optimum concentration of IBA and number of buds required for planting.

2. MATERIALS AND METHODS

The present investigation was carried out in Department of Sericulture, GKVK, University of Agricultural Sciences, Bangalore. As the experiment was carried out during the month of October to January, the mean temperature and relative humidity recorded was 24˚C and 78 per cent respectively. For preparing the rooting media soil, sand and farm yard manure in ratio of 1:1:1 by v/v were mixed thoroughly and filled in a black polythene bag [2]. The variety used in the present experiment was 'Victory-1' (V-1), which is a hybrid obtained from S 30 and Ber C776. Cuttings were taken from eight months old V-1 mulberry garden and they were free from pest and diseases. The basal and middle portion of mature stem were used as cuttings which were of uniform size of 21-22 cm length for four budded cuttings, 15 cm for three budded cuttings, 10 cm for two budded cuttings and 5-6 cm for one budded cutting.

Indole-3-butyric acid (IBA) solution was prepared by dissolving the required quantity of IBA (1000, 2000 and 3000 ppm) and the required volume was made by adding distilled water. The basal ends of the mulberry cuttings were dipped in dilute solutions of 1000, 2000 and 3000 ppm of indole-3-butyric acid by quick dip method for 10 seconds before planting of cuttings [7]. After treating cuttings with IBA, cuttings were planted in a polythene bag of size 14×5 cm. The experiment was laid out in factorial completely randomized design (FCRD) which consists of two factors, namely, number of buds (one, two, three and four) and various concentrations of IBA (1000, 2000 and 3000 ppm), thereby making total treatment twelve. Each treatment were replicated thrice and each replication consists of twenty saplings to measure the number of sprouted saplings, survival percentage, number of leaves and length of shoot and they were statistically analyzed using Analysis of Variance (ANOVA). Where the treatment were significant, critical differences were calculated at a 1 % probability level [8].

3. RESULTS

3.1 Effect of IBA Concentration on Growth Parameters of V-1 Mulberry Cuttings

The effect of IBA on growth parameters of mulberry saplings showed significant differences

Table 1. Effect of IBA concentration on growth parameters of V-1 mulberry cuttings with varying number of buds

Ⅰ No. of Buds	Number of sprouted cuttings at 15th DAP	Survival percentage of saplings at 30th DAP	Number of leaves per sapling at 90th DAP	Length of shoot at 90th DAP (cm)
1 bud	10.1	51.25	6.01	22.56
2 buds	12.0	75	8.73	24.80
3 buds	13	88.75	8.92	25.18
4 buds	11.3	79.58	8.15	24.53
F test	S	S	S	S
S. Em.±	0.23	1.02	0.26	0.18
CD at 1%	0.87	3.94	1.00	0.69
Ⅱ Concentration of IBA				
0 ppm	10.6	61.25	6.86	23.26
1000 ppm	11.4	70.83	7.79	24.15
2000 ppm	11.9	79.58	8.96	24.69
3000 ppm	12.5	82.91	8.2	24.98
F test	S	S	S	S
S. Em.±	0.23	1.02	0.26	0.18
CD at 1%	0.87	3.94	1.00	0.69

DAP- days after planting, S-Significant

among number of buds (Table 1). The maximum number of sprouted cuttings (13 at 15th DAP), survival percentage (88.75% at 30th DAP), number of leaves (8.92 at 90th DAP) and length of shoot (25.18 cm at 90th DAP) was observed in three budded cuttings. While, minimum number of sprouted cuttings (10.1 at 15th DAP), survival percentage (51.25% at 30th DAP), number of leaves (6.01 at 90th DAP) and length of shoot (22.56 cm at 90th DAP) were observed in one budded cutting. With respect to various concentrations of IBA, cuttings treated with 3000 ppm of IBA were found highest regarding number of sprouted cuttings (12.5 at 15th DAP), survival percentage (82.91% at 30th DAP) and length of shoot (24.98 cm at 90th DAP). Number of leaves were found maximum (8.96 at 90th DAP) in cuttings treated with 2000 ppm of IBA. Whereas cuttings without any treatment observed minimum number of sprouted cuttings (10.16 at 15th DAP), survival percentage (61.25% at 30th DAP), number of leaves (6.86 at 90th DAP) and length of shoot (23.26 cm at 90th DAP).

3.2 Interaction Effect of IBA Concentration on Growth Parameters of V-1 Mulberry Cuttings

Results showed that the three budded cuttings treated with 3000 ppm of IBA recorded significantly maximum number of sprouted cuttings (14.67 at 15th DAP), survival percentage (96.66 % at 30th DAP). Number of leaves (10.60 at 90th DAP) and length of shoot (26.63 cm at 90th DAP) were noticed highest in two budded cuttings treated with 3000 ppm of IBA. Here we can observe that, the results of two budded cuttings treated with 3000 ppm of IBA showed on par results with three budded cuttings treated with 3000 ppm of IBA with respect to all growth parameters. The interaction effect of the treatment recorded lowest in one budded cuttings without IBA treatment with regard to number of sprouted cuttings (9.67 at 15th DAP), survival percentage (43.33% at 30th DAP), number of leaves (5.67 at 90th DAP) and length of shoot (21.43 cm at 90th DAP) (Table 2).

4. DISCUSSION

Our results regarding number of sprouted cuttings were in agreement with the findings of Krishan [9] in Chauras campus (India) who has reported that the number of sprouted cuttings (8.33) of mulberry were higher in IBA (2000 ppm) treated cuttings. The increase in number of sprouted cuttings may be due to the use of IBA (4000 ppm) which caused 11 to 15% increase in total sprouting of mulberry cuttings because of early completion of physiological process involved in rooting and sprouting of cuttings [10]. Neelima et al. [11] stated that increase in number of sprouted cuttings might be due to the use of appropriate plant growth regulator (IBA) and its concentration (1500 ppm), which increase the cell division, cell elongation and early

Table 2. Interaction effect of IBA concentration on growth parameters of V-1 mulberry cuttings with varying number of buds

Treatments	Number of sprouted cuttings at 15th DAP	Survival percentage of saplings at 30th DAP	Number of leaves per sapling at 90th DAP	Length of shoot at 90th DAP (cm)
1 bud with 0 ppm of IBA	9.67	43.33	5.67	21.43
1 bud with 1000 ppm of IBA	10.33	50	6.00	22.63
1 bud with 2000 ppm of IBA	10.67	53.33	7.37	23.10
1 bud with 3000 ppm of IBA	10.00	58.33	5.00	23.10
2 buds with 0 ppm of IBA	11.00	55	6.83	23.43
2 buds with 1000 ppm of IBA	11.33	66.66	8.33	24.50
2 buds with 2000 ppm of IBA	12.00	85	9.17	24.67
2 buds with 3000 ppm of IBA	14.00	94.33	10.60	26.63
3 buds with 0 ppm of IBA	11.00	73.33	7.17	24.17
3 buds with 1000 ppm of IBA	12.33	88.33	8.50	24.77
3 buds with 2000 ppm of IBA	14.00	92.1	10.50	26.43
3 buds with 3000 ppm of IBA	14.67	96.66	9.53	25.37
4 buds with 0 ppm of IBA	11.00	73.33	7.77	24.03
4 buds with 1000 ppm of IBA	11.67	78.33	8.33	24.70
4 buds with 2000 ppm of IBA	11.00	83.33	8.83	24.57
4 buds with 3000 ppm of IBA	11.67	83.33	7.67	24.83
F test	S	S	S	S
S. Em.±	0.45	2.03	0.52	0.36
CD at 1 %	1.75	7.87	2.01	1.39

DAP- days after planting, S- Significant

differentiation of callus tissue towards the root formation resulted in early growth of cuttings. Similar findings for survival percentage of mulberry saplings were obtained for Sokuma et al. [12] who observed that treatment of mulberry cuttings with IBA (3000 ppm) resulted in maximum survival percentage (93.33%) in Thailand. The increased concentration of IBA is correlated with endogenous auxins that are present in the cuttings which led to optimization of auxin levels and subsequently improved rooting and survival percentage of plants [4]. The result of the present experiment on number of leaves were similar to the work of Singh et al. [13], who conducted experiment in Srinagar (India) and observed that the mulberry cuttings of medium length (15-16 cm) resulted in maximum number of leaves (8.33) in IBA (5000 ppm) treated cuttings. The appropriate planting time, application of IBA as well as genetic makeup of genotype might have played some role in increasing the number of leaves per sapling in IBA treated cuttings [14]. In supportive to the present investigation, Devarassou et al. [15] opined that the increase in shoot length might be due to the geotropism effects, as the nursery raised cuttings were kept at a slant position during the entire nursery period. Ismail and Asghar [16] observed that cuttings treated with IBA (4000 ppm) gave more rooting which helped in more nutrient uptake and ultimately increased the plant height.

5. CONCLUSION

The present study on effect of different concentration of IBA on V-1 mulberry cuttings with varying number of buds revealed that IBA played a significant role in rapid multiplication and vigorous growth of mulberry saplings. In order to produce more number of mulberry saplings with lesser amount of planting material. It is recommended to use two budded cuttings treated with 3000 ppm of IBA, in areas where the propagation material is limited, instead of three budded cuttings treated with 3000 ppm of IBA. So that the remaining planting material can be used in silkworm rearing, mulching and as a fodder for animals.

ACKNOWLEDGEMENT

Acknowledgement authors are thankful to all the faculty members of the Department of Sericulture, GKVK, University of Agricultural Sciences, Bengaluru for providing encouragement and support.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sujathamma P, Savithri G, Neeraja, P. Sericulture- A potential agro base enterprise. Int J Adv Res Eng. 2018;7: 203-207.
2. Krishna KS. Influence of growth regulators on rooting of mulberry (*Morus alba* L.) with differential nodes and modes of planting. M Sc (Agri) Thesis, Univ Agril Sci, Bengaluru. 2005.
3. Sulaiman MK. The effect of auxin IBA and kinetin in budding success percentage of mulberry (Morus sp.). Int J Pure Appl Sci Technol. 2012;13(1):50-56.
4. Azmal H, Muhammad I, Shahab NS, Sayed SS Getinet M. Effect of IBA on clonal propagation of mulberry (*Morus alba* L.) stem cutting: rooting and associated biochemical changes. Sect Biol Sci. 2017; 87(1):161-166.
5. Nanda KK, Anand VK, Kumar, P. 1970, Investigation on the use of auxins in vegetative reproduction of forest plants. Indian Forester. 1970;96(3):171-187.
6. Sachs T. Auxin's role as an example of the mechanisms of shoot/root relation. Plant Soil. 2005;268:13-19.
7. Polat AA. Effect of IBA on rooting of mulberry cuttings. Acta Hort. 2008;774: 351-354.
8. Gomez KA, Gomez AA. Statistical procedures for agricultural research. John wiley & sons; 1984.
9. Krishan KS. 2018, Effect of auxins and rooting media on rooting in stem cutting of mulberry (*Morus nigra* L.). The Pharma Innovation Journal. 2018;7(11): 12- 15.
10. Boschini C, Rodriguez AM. The stimulation of rooting in mulberry (*Morus alba* L.) with IBA. Agromania Mesoamericana. 2002;13 (1):19-24.
11. Neelima N, Neeraj S, Gaurav S, Jitendra KS. Effect of different IBA concentration on survivability and rooting of jasmine (*Jasminum sambac* L.) stem cuttings. Journal of Pharmacognosy and Phytochemistry. 2018;614-617.
12. Sokuma P, Intorrathed S, Phonpakdee R. Effect of IBA and NAA on rooting and auxillary shoot outgrowth of Himalayan mulberry stem cutting. Int J Agri Technol. 2018;14(7): 1939-1948.
13. Singh KK, Dev KJ, Mehta SK. Rootability of hardwood cuttings of mulberry (*Morus alba* L.) influenced by planting time and growing conditions under valley condition of Garhwal Himalayas. Plant Archives. 2015;15(2): 1031- 1036.
14. Singh AK, Singh VS. Influence of wood maturity and auxins on the regeneration of Bougainvillea cuttings. Prog Hort. 2002; 34(2):196-199.
15. Devarassou K, Prakash D, Nivedha RM, Pushpadarini K, Ramazeame L, Vasanth S et al. Root and shoot growth of semi-hard wood cuttings of mulberry (*Morus alba* L.) influenced by water imbibitions using net cloth wrapping technique. Int J Sci Res Publ. 2017;7:371-380.
16. Ismail SM, Asghar HI. Effect of indole butyric acid and types of cuttings on root initiation of Ficus Hawaii. Sarhad Journal of Agriculture. 2007;23(4): 919-925.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/94611