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Effect of IBA concentrations on rooting of mulberry cuttings with varying number of buds

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Abstract

The present investigation was done to study the effect of IBA concentrations (0, 1000, 2000 and 3000 ppm) on rooting of V-1 mulberry cuttings with varying number of buds (one, two, three and four). The experiment was taken in factorial completely randomized design (FCRD) with sixteen treatment and they were replicated thrice. The results recorded highest in three budded cuttings treated with 3000 ppm of IBA with respect to rooting percentage (93.33%), length of longest root (11.83 cm) and fresh weight of roots (1.52 g), which was followed by two budded cuttings treated with 3000 ppm of IBA. Poor rooting percentage (60.00%), length of longest root (5.70 cm) and fresh weight of roots (0.45 g) recorded in one budded cuttings without IBA treatment. Hence treatment of cuttings with IBA has proven to be crucial for improving the rooting of mulberry saplings.

Keywords: Buds, rooting, IBA, mulberry

Introduction

Morus alba L. (mulberry) is cultivated as a fast-growing shrub or moderate-sized tree and thrives well in all types of climate. It yields large quantity of renewable. biomass in the form of branches, shoots, leaves and fruits. A mulberry garden yields up to 20–30 tonnes of green leaves and 4 tonnes of mulberry sticks per hectare per year. It is cultivated largely in Asian countries for its foliage and is considered as the main food for silkworm (*Bombyx mori*). Versatile role of mulberry has made it possible to disseminate all over the world as an economic commercial plant. Mulberry propagation in nurseries has proven well to establish healthy mulberry garden. The use of cuttings for propagation is cost effective and simplest method of vegetative propagation. Direct planting of mulberry cuttings in main field leads to poor establishment rate and hence they are raised under nursery condition and then transplanted after 90 to 120 days. Saplings in nursery can be raised two times a year depending on the water availability in ideal monsoon periods (Devarassou *et al.*, 2017) [2]. Any newly evolved mulberry variety can be systematically multiplied to ensure adequate availability of saplings for its rapid spread in farmers field.

Rooting of cuttings is influenced by a number external and internal factors and the rooting response also varies with variety, planting season and the nature and concentration of harmones present in cuttings (Hartman and Kester, 1968) [3]. Application of growth regulators on cuttings was superior to the grafting process and was most economical for large scale multiplication of mulberry plant (Rao and Khan, 1963) [11]. The commercially available plant growth regulators are auxins, gibberellins, cytokinins, abscisic acid and ethylene. Among them auxins have emerged as central players in stimulating adventitious root (AR) formation. Natural auxins and synthetic analogs being the most powerful exogenous stimulators of AR formation, used empirically for rooting of cuttings in different species (Daniel *et al.*, 2014) [1]. Auxins and its components gave better results for rooting, among which indole-3-butyric acid (IBA) was highly effective for rooting of the cuttings and this exogenously applied IBA is slowly destroyed by auxin destroying enzyme system thereby available to plant for a longer period of time (Stoutemeyer, 1942) [13]. IBA induces basipetal transport of assimilates, with sink strength successively enhanced by increased IBA concentration. This process may account for the increase in number of roots per rooted cutting with increasing IBA concentration (Hartmann and Kester, 2002) [4].

Material and Methods

The present study was carried out at Department of Sericulture, University of Agricultural Sciences, Bengaluru. The investigation was carried out in factorial completely randomized design method. Planting material were taken from eight month old V-1 mulberry garden. The basal and middle portion of mature stems were used as a planting material. The basal end of the mulberry cuttings of different buds (one, two, three and four) were dipped in respective solutions of 0, 1000, 2000 and 3000 ppm of indole-3-butyric acid (IBA) by quick dip method for 10 seconds before planting of cuttings in polythene bag. After the treatment, the cuttings were immediately planted in rooting media which consisting of soil, sand and farm yard manure (FYM) in ratio of 1:1:1 by v/v. The observation for rooting parameters were taken on ninety days after planting.

Results and Discussion

The results on effect of IBA concentrations on rooting of V-1 mulberry cuttings with varying number of buds are presented in Table 1. Significantly highest rooting percentage (89. 44%), length of longest root (10.65 cm) and fresh weight of roots (1.48 g) were recorded in three budded cuttings. While the results showed lowest rooting percentage (73.33%), length of longest root (6.56 cm) and fresh weight of roots (0.44 g) in one budded cuttings. With respect to various concentrations of IBA, the maximum rooting percentage (88.33%), length of longest root (10.06 cm) and fresh weight of roots (1.26 g) were recorded significantly in cuttings treated with 3000 ppm of IBA. Whereas minimum rooting percentage (72.77%), length of longest root (6.56 cm) and fresh weight of roots (0.44 g) were observed in cuttings without IBA treatment.

Table 1: Effect of IBA concentrations on rooting parameters of V-1 mulberry cuttings with varying number of buds

I No. of Buds	Rooting percentage at 90 DAP	Length of longest root at 90 DAP (cm)	Fresh weight of roots at 90 DAP (g)
1 bud	73.33	6.56	0.44
2 buds	86.11	8.91	1.09
3 buds	89.44	10.65	1.48
4 buds	82.22	9.92	1.37
CD at 1%	5.10	0.63	0.09
II Concentration of IBA			
0 ppm	72.77	8	0.93
1000 ppm	82.22	8.69	1.04
2000 ppm	87.77	9.3	1.15
3000 ppm	88.33	10.06	1.26
CD at 1%	5.10	0.63	0.09

The data pertaining to interaction effect of IBA on V-1 mulberry cuttings with varying number of buds are presented in Table 2. Among the treatments, both two and three budded cutting treated with 3000 ppm of IBA recorded maximum rooting percentage (93.33%) and fresh weight of roots (1.52 g). Whereas, length of longest root (11.83 cm) was recorded in three budded cuttings treated with 3000 ppm of IBA. However, minimum rooting percentage (60.00%), length of longest root (5.70 cm) and fresh weight of roots (0.45 g) were recorded in one budded cutting without IBA treatment.

Present results of rooting percentage is supported by the findings of Sokuma *et al.*, (2018) [12] who observed that the cuttings of mulberry treated with IBA at 3000 ppm resulted in highest percentage of rooting (86.67%). Similarly, Husen and Pal (2007) [5] came up with the same results that higher concentration of IBA (3000 ppm) resulting in maximum rooting percentage (87%) and reported that in IBA treated cuttings, enzyme IAA-oxidase and peroxidase (POX) help in auxin catabolism and in triggering the root initiation processes, the former is basically having a role in triggering and initiating the root primordium, while the latter in both the initiation and elongation processes. The results on length of longest root are in line with the findings of Polat (2008) [10] who reported that 'Sami' mulberry cultivar treated with 2500 ppm of IBA resulted in maximum root length (9.05 cm). Similarly, Nanda *et al.*, (1970) [7] reported that auxins helps in the breakdown of starch into soluble sugars, bulk of which was used in rooting process. The reason for recording longest root in IBA treated cuttings might be because of the action of auxin activity which caused hydrolysis and translocation of carbohydrates and nitrogenous substances towards the base of cuttings and resulted in accelerated cell division and cell elongation under suitable environmental condition (Pallavi *et al.*, 2018) [9]. Present findings revealed that growth regulator IBA had significant effect on root weight of mulberry saplings. Krishna (2005) [6] reported that the increase in fresh weight of roots might be due to better physiological maturity of cuttings coupled with better mobilization of secondary metabolites resulting in better root formation with the help of growth regulators (IBA at 200 ppm). Neelima *et al.*, (2018) [8] reported that maximum number of roots in jasmine cuttings was produced in those treatment which received maximum concentration of auxin (1500 ppm of IBA). It might be due to auxin application which initiate early and more roots per cutting resulting in maximum weight of roots.

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

Treatments	Rooting percentage at 90 DAP	Length of longest root at 90 DAP (cm)	Fresh weight of roots at 90 DAP (g)
1 bud with 0 ppm of IBA	60.00	5.70	0.45
1 bud with 1000 ppm of IBA	71.11	6.43	0.47
1 bud with 2000 ppm of IBA	80.00	6.90	0.52
1 bud with 3000 ppm of IBA	82.22	7.20	0.55
2 buds with 0 ppm of IBA	75.56	7.47	0.75
2 buds with 1000 ppm of IBA	86.67	8.10	1.01
2 buds with 2000 ppm of IBA	88.89	9.03	1.09
2 buds with 3000 ppm of IBA	93.33	11.07	1.52

3 buds with 0 ppm of IBA	82.22	9.00	1.21
3 buds with 1000 ppm of IBA	88.89	10.33	1.26
3 buds with 2000 ppm of IBA	93.33	11.43	1.50
3 buds with 3000 ppm of IBA	93.33	11.83	1.52
4 buds with 0 ppm of IBA	73.33	9.83	1.43
4 buds with 1000 ppm of IBA	82.22	9.90	1.48
4 buds with 2000 ppm of IBA	88.89	9.83	1.51
4 buds with 3000 ppm of IBA	84.44	10.13	1.50
CD at 1%	10.19	1.27	0.19

DAP- days after planting

Conclusion

In the present investigation on effect of IBA concentrations on rooting of V-1 mulberry cuttings with varying number of buds, the data of two budded cuttings treated with 3000 ppm of IBA showed on par results with three budded cuttings treated with 3000 ppm of IBA on rooting parameters. Hence we can use two budded cuttings as a propagation material instead of three budded cuttings which helps in saving planting material and more number of saplings can be produced by a limited amount of planting material. And also present experiment proved that IBA play a significant role in rooting of mulberry saplings.

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