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IBA IMPACT AT DIFFERENT DOSE ON MULBERRY CUTTING (*Morus abla*)

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ABSTRACT

This research was conducted to identify the effects of different doses of auxin on the cutting of Mulberry (*Morus alba*). The study was conducted in Syangja district from April 2022 to June 2022. Stem cuttings of the plant were subjected to different treatments; IBA concentration (Control, 1000 ppm, 2000 ppm, 3000 ppm, and 4000 ppm). The experiment was carried out in a Randomization Complete Block Design (RCBD) and replicated thrice. The physiology of mulberry is highly affected by auxin, a rooting hormone. In the case of different IBA concentrations, the maximum rooting percentage (81.33%) was found in cuttings which were treated with a 4000 ppm concentration of auxin. Similarly, cuttings treated with 2000 ppm auxin develop an abundance of leaves (11), primary roots (9), and secondary roots (12). But in the case of root length (22.33 cm), the highest was found in cuttings which were treated with a 4000 ppm concentration of IBA. IBA was found to be most effective at 4000 ppm for best rooting and good root growth, and at 2000 ppm for healthy leaf growth and to enhance the number of primary and secondary roots in Mulberry.

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INTRODUCTION

The Moraceae family includes *Morus alba* L. Mulberry variants native to India mostly fall under the M. indica genus. Mulberry fruits have some therapeutic qualities, including laxative, fever-refrigerant, and local uses for sore throats, dyspepsia, and melancholia. Mulberry should be propagated as a clone since it is grown for fruit. Contrary to tissue culture propagation and layering systems for plant production, grafting and cutting propagation techniques are typically used (Hartmann et al., 1990; Guo et al., 2007). One of the simplest and least expensive methods of vegetative multiplication is the use of hardwood cuttings. Auxin treatments have recently been found to encourage cutting roots to develop plants (1984, Fourrier). In addition, the proliferation of roots and subsequent growth in plants grown from stem cuttings are greatly influenced by the rooting medium. The propagation system should be thought of as including rooting media. For citrus cuttings, Albouyeh (2007) suggests using simple peat or a peat, perlite, and coco-peat mixture in a 2:2:1 ratio to increase plant height and leaf number. Vermiculite, peat, and perlite mixtures have also produced successful outcomes.

Auxin hormone is used in stem cutting as it stimulates plant growth and involves the production of leaves, fruits, shoots, and lateral roots (Yamaguchi et al., 2010; Bertoni, 2011). They were utilized in stem cuttings, and in the study by Sokhuma et al. (2018) on the effects of IBA and NAA on rooting and axillary shoot outgrowth of "Chiangmai 60" Mulberry (*Morus alba* Linn.) stem cuttings, they were particularly IBA and NAA. They discovered that the 1,000 mg of IBA and NAA did not significantly boost the rooting percentage of the stem cutting (Sokhuma et al., 2018). Specific benefits like rapid parent material multiplication and maintenance of the appropriate plant characteristics, mulberry is commercially cultivated from hard wood cuttings. The amount and success of root formation in mulberry were significantly impacted by the timing of cutting preparation. The ideal time for cutting preparation and planting is influenced by the physiological state of the plant and the surrounding environment. The timing of cutting collection and the success of rooting depend on the weather and the current outside temperature. The source, position, and type of cutting taken; the juvenility and condition of the stock plant; wounding or leaf removal; stock plant wilting and girdling; and cutting date are just a few of the variables that might influence the rooting potential of stem cuttings (Hartmann et al., 2002).

In the context of Nepal, it is generally planted as feed for livestock and silkworms in less proportion, and grown in the terai and hilly regions. Therefore, high plantation of mulberry plants is of great significance which will contribute for increased livestock production. This research has been conducted in RCBD design during April to June 2022 to determine the best dose of IBA for rooting.

MATERIAL AND METHODS

From 5 to 7 year old plants, hardwood stem cuttings of the mulberry (*Morus alba* L.) were made from 15 cm long stem cuttings with the basal region. Before planting the cuttings in the different rooting medium (Sand+ FYM+ Clay), the basal ends were quickly dipped in diluted solutions of Indole-3-Butyric Acid at 1000 ppm, 2000 ppm, 3000 ppm, 4000 ppm, and 0 ppm for 10 seconds. The cutting was immediately planted in root trainers and put 7.5 cm deep into the rooting medium after the treatment. A total of 450 cuttings were planted in the three replications of the experiment, each with 50 cuttings, on plots measuring 1.5m^2.

Table 1. Number of cutting stem in control and treatments for 3 replication.

Experiment	No of Cutting stem		
	Replication 1	Replication 2	Replication 3
Control	50	50	50
1st treatment IBA 1000 ppm	50	50	50
2nd treatment IBA 2000 ppm	50	50	50
3rd treatment IBA 3000 ppm	50	50	50
4th treatment IBA 4000 ppm	50	50	50

The quantity of sprouted cuttings, number of leaves, survival rate, and quantity of primary roots, length of primary roots, secondary roots, and length of roots were observed. The recorded data was statistically analyzed using Cochran and Cox's Randomized Competition Block Design (RCBD) (1992).

RESULTS

Cuttings rooted percentage

The research shows that the highest rooting percentage (81.33%) was found in treatment IBA 4000 ppm, followed by treatment control and IBA 3000 ppm (64%). Treatment IBA 2000 ppm had the lowest rooting percentage (56%) followed by treatment 1000 ppm (62%).

Table 2. Rooting percent of cutting stem

Treatment	No of rooted stem				
	Replication 1	Replication 2	Replication 3	Total rooted cutting	Percentage of rooted
Control	32	33	32	97	64.66
IBA 1000 ppm	34	28	31	93	62
IBA 2000 ppm	24	32	29	85	56.66
IBA 3000 ppm	32	29	35	96	64
IBA 4000 ppm	42	44	36	122	81.33

Number of leaves

The highest number of leaves was found in treatment 2000 ppm with 11 leaves, followed by treatment IBA 3000 ppm (8.3). An equal number of leaves were found in treatments IBA 1000 ppm and 4000 ppm, with 7 leaves each. The lowest number of leaves was found in the control, having leaf number 6.

Table 3. Number of leaves

Treatment	Number of Leaves
Control	6^{b}
IBA 1000 ppm	7^{bc}
IBA 2000 ppm	11^{a}
IBA 3000 ppm	8.3^{b}
IBA 4000 ppm	7^{bc}
Grand Mean	7.86
CD	1.29
CV	13.12
F-test	**

Number of primary roots

The result of the research shows that the highest number of primary roots was found in treatment IBA 2000 ppm (9), followed by treatment IBA 3000 ppm (7.6). The lowest number of primary roots was found in control (4), followed by treatment with IBA 1000 ppm (6).

Table 4. Number of primary roots

Treatment	Number of primary roots
Control	4[c]
IBA 1000 ppm	6[bc]
IBA 2000 ppm	9[a]
IBA 3000 ppm	7.6[ab]
IBA 4000 ppm	6.33[abc]
Grand Mean	6.6
CD	2.6
CV	21.5
F-test	*

Number of secondary roots

The research shows that the highest number of secondary roots (12) was found in treatment IBA 2000 ppm, followed by treatment IBA 3000 ppm (10.6). The lowest number of secondary roots was found in control (7), followed by treatment at 4000 ppm (9.33).

Table 5. Number of secondary roots

Treatment	Number of secondary roots
Control	7[c]
IBA 1000 ppm	9[bc]
IBA 2000 ppm	12[a]
IBA 3000 ppm	10.6[ab]
IBA 4000 ppm	9.33[abc]
Grand Mean	9.6
CD	2.67
CV	14.79
F-test	*

Length of roots

After the analysis of the data, the highest root length was found in treatment IBA 4000 ppm, having a length of 22.33 cm, followed by treatment IBA 3000 ppm, having a root length of 15.67 cm. The shortest root was found in control (12.33 cm), followed by treatment IBA 1000 ppm, having a root length of 14 cm.

Table 6. Length of roots

Treatment	Length of root (cm)
Control	12.33[b]
IBA 1000 ppm	14[b]
IBA 2000 ppm	15[b]
IBA 3000 ppm	15.67[b]
IBA 4000 ppm	22.33[a]
Grand Mean	15.86
CD	6.03
CV	20.21
F-test	**

DISCUSSION

The maximum rooting percentage was determined from black mulberry in 2000 ppm and 3000 ppm IBA dose applications (Kalyoncu et al. 2009). Slightly different results were found during this research. There are main factors that can affect the rooting potential of stem cuttings, including species and specific cultivar needs; the source and type of cutting taken; wounding or leaf removal; stock plant etiolating and planting time; or are influenced by growing conditions such as media, mist, use of hormones, fertilizer, and supplemental lighting (Hartmann et al., 2002). The hypothesis of our research was that dose doesn't affect in the cutting but different result was found. From the research, it was recorded that the highest number of leaves (11), the highest number of primary roots (9) and the highest number of secondary roots (12) were found in treatment IBA 2000 ppm. A similar result was found by Singh (2018). The longest root length was found in treatment IBA 4000 ppm, with a length of 22.33 cm. A similar result was found by Sokhuma et al. (2018). Highest survival rate was found in 3000 ppm, similar result was found by Sokhuma et.al (2018).

CONCLUSIONS

From the research results, it can be concluded that IBA concentration with different doses had a great impact on the success of survival, rooting, number of leaves, and roots. A concentration of 4000 ppm of IBA was found best for rooting and good root growth, and a 2000 ppm concentration of IBA was found suitable for proper growth of leaves and to increase the number of primary and secondary roots of Mulberry.

COMPETING INTEREST

The authors declare that they have no competing interests.

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