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Evaluation of different concentrations of IBA on stem cutting of croton (*Codiaeum variegatum* L.)

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Abstract

The present investigation titled “Evaluation of different concentrations of IBA on stem cutting of croton (*Codiaeum variegatum* L.)” Was conducted to determine the best at instructional cum research nursery of K.D. College of Horticulture and Research Station, Jagdalpur during the year 2024-2025. The experiment was laid out in Completely Randomized Design with nine treatments and three replications.

The treatment includes T₁: distilled water T₂: 250 ppm IBA, T₃: 300 ppm IBA, T₄: 350, ppm IBA T₅: 400 ppm IBA, T₆: 450 ppm IBA, T₇: 500 ppm IBA, T₈: 550 ppm IBA, T₉: 600 ppm IBA.

The result indicated that the minimum duration of number of days to for new sprout (21.48) recorded under T₃: Significantly maximum data recorded on number of leaves (18.25), number of shoots (2.92), length of main shoot (3.15 cm), girth of main shoot (1.75) was recorded under Treatment T₄ Whereas the minimum was recorded under treatment T₁: distilled water. Significantly maximum data recorded on length of longest root (13.25 cm), fresh weight of shoot (g) fresh weight of root (2.75 g), dry weight of shoot (2.83 g), dry weight of root (1.91 g), survival percentage (89.25%), mortality percentage (10.17%) success percentage (89.05%), root shoot ratio (0.55). was recorded under treatment T₃ where the minimum was recorded under treatment T₁: distilled water.

Based on the findings of the present investigation, it can be concluded croton sprouting exhibited superior performance when treated with IBA at 300 ppm T₃ and 350 ppm T₄. These treatments consistently resulted in earlier sprouting, enhanced growth, increased root and shoot length, greater number of leaves, and higher fresh and dry biomass.

Keywords: IBA, rooting media, croton, cutting growth, survival

1. Introduction

The decorative shrub known as croton (*Codiaeum variegatum* L.) is native to tropical woods. A plant species called Croton belongs to the genus Codiaeum, which is a part of the Euphorbiaceae family, which has about 322 genera and 8910 species (Bingtao *et al.* 2008) ^[1]. It is native to the Pacific

Islands, Malaysia and India. Croton is a popular landscape plant because it is an evergreen shrub with simple, alternating leaves that are mottled white and flowers that are either red or yellow.

Plants may change colour as they mature. Crotons are also widely known for their therapeutic benefits; leaf extracts include sedative, purgative, antifungal and anti-cancer effects, among other medical qualities (Deshmukh and Borle, 1975) ^[2]. crotons are just as common as *Ficus benjamina* as decorative tropical shrubs in the United States and Europe. The variety of leaf shapes found in croton is vast. Oval to linear, whole to highly lobed and appendicular in the middle, joined by a midrib, are some of the leaf shapes. Another important feature that sets each cultivar apart is the color and design of the leaves. Plant scientists are very interested in the phenotypic diversity seen in croton leaves since almost every leaf morphology may be found in a single species; the degree of leaf phenotypic plasticity is very high.

The majority of medicinal, fruitful and ornamental species are propagated vegetatively using cuttings, producing high-quality plants with agronomic traits that are highly effective in terms of survival in the final field; however, outcomes differ depending on the species and internal and external plant factors.

Crotons are known for their therapeutic benefits in addition to their visual appeal as an indoor plant. Numerous medicinal qualities, including purgative, sedative, antifungal, antiamebic and anticancer effects, have been reported for croton leaf extract (Deshmukh and Borle, 1975) [2]. Additionally, the plant is utilized to produce useful secondary metabolites of terpenes, alkaloids and flavonoids found in nature.

Additionally, the plant is a good natural source for the synthesis of flavonoids, terpenes and alkaloids' secondary metabolites. Croton can be propagated using a variety of techniques, including air layering, grafting, cuttings and seeds. Only 20 plants can be produced annually from a single mother/stock plant from shoot tip cuttings.

The most popular vegetative approach for multiplying various plant species is the cutting technique. Commercial propagators have created methods that effectively control environmental factors to increase cutting rooting. Numerous factors influence the success of cutting rooting, including the age and position of the plant part, the nutritional status of the stock plants, the time of year, the varieties of cuttings, the rooting media, environmental modification and hormonal treatments of cuttings.

Indole butyric acid (IBA) is an important synthetic auxin used in agriculture to stimulate the growth of cuttings used in plant propagation. This hormone is an effective tool in improving the rooting process especially for ornamental plants (Mohammed *et al.* 2024) IBA hormone is used on many crops and ornamentals but mainly horticultural plants to promote rooting of cuttings.

IBA effectively roots ornamental cuttings (Ibironke, 2017) [5]. Auxins are essential tools for rooting woody plant cuttings that are challenging to root. IBA is typically utilized in the propagation of woody plants and has been shown to exhibit greater activity and a wider range of effectiveness in numerous species. When examining the effects of IBA on the adventitious root production of woody cutting plants, looked at whether IBA is appropriate for rooting.

Plant growth regulators are commonly used to encourage roots in cuttings, including naphthalene acetic acid (NAA) indole-3-butyric acid (IBA) and 6-benzylaminopurine (BAP) (Hartmann *et al.*, 2002 [4]. Root apical dominance brought on by cytokines is broken by auxin, which promotes root development.

The fact that NAA and IBA exhibit a significant amount of adaptability when handling a range of concentrations makes them suitable auxins for these kinds of investigations. It is also noteworthy that IBA effectively raises the rooting and survival percentages of rooted cuttings.

2. Materials and Methods

2.1 Experimental site

The experiment was carried out, in 2024–2025 at instructional cum research nursery of K.D. College of Horticulture and Research Station, Jagdalpur, (C.G.).

2.2 Methodology adapted for observation

2.2.1 Number days taken to sprout

The number of days that passed between the planting day and the emergence of the first bud on any cutting in each treatment was noted and converted to days.

2.2.2 No. of leaves

The average number of leaves per cutting under each treatment was determined after recording the total number of leaves at 30, 60 and 90 days following planting.

2.2.3 No. of shoots

The mean number of shoots was determined by counting the total number of shoots per cutting at 30, 60 and 90 days following planting.

2.2.4 Length of main shoot (cm).

After 30, 60 and 90 days of planting, the length of the main shoot

per cutting under each treatment was measured using a scale and the average length of the main shoot was calculated

2.2.5 Girth of main shoot (cm)

Using vernier calipers, the main shoot girth per cutting under each treatment was measured after 30, 60 and 90 days of planting and the average main shoot girth were obtained.

2.2.6 Length of longest root (cm)

90 days after planting, the length of the longest root per cutting was measured using a scale and the average length of the longest root was calculated.

2.2.7 Fresh weight of shoot (g)

All of the shoots were removed from the five randomly chosen cuttings in order to weigh the fresh weight, which was then recorded using an electronic scale before the average was obtained.

2.2.8 Fresh weight of root (g)

Fresh roots were extracted from the uprooted cutting, their weight was measured using an electronic scale and an average was obtained.

2.2.9 Dry weight of shoot (g)

The separated material was left to dry after the fresh weight of the shoot and root was noted. After that, the shoots were stored in paper bags with holes in them, which were then dried in an oven until their weight remained consistent.

2.2.10 Dry weight of root (g)

Fresh weight was taken from the roots that had been separated from the cuttings. These roots were then stored in paper bags and dried in an oven until they reached a consistent weight. An electronic balance was used to weigh the oven-dried samples.

3. Result and Discussion

3.1 Number days taken to sprout

The data on number of days to new sprout are presented in table 1. Significantly the minimum number days to new sprout was recorded under treatment T₃: 300 ppm IBA (21.48) followed by T₂: 250 ppm IBA (22.36) whereas, the maximum days to new sprout was recorded under treatment T₁: distilled water (26.88). The observed results are likely due to the application of IBA at suitable concentrations, which increased IBA oxidase activity and thereby promoted early sprouting. In general, plant growth regulators play a significant role in enhancing the vegetative propagation of ornamental plants. The above result is in conformity with Devi *et al.* (2016) in phalsa [3].

Table 1: Effect of different concentration of IBA on number of days to new sprout in croton

S. No	Treatment detail	Number of days to new sprout
T ₁	Distilled water	26.88
T ₂	250 ppm IBA	22.36
T ₃	300 ppm IBA	21.48
T ₄	350 ppm IBA	22.52
T ₅	400 ppm IBA	24.85
T ₆	450 ppm IBA	24.67
T ₇	500 ppm IBA	23.87
T ₈	550 ppm IBA	23.57
T ₉	600 ppm IBA	25.45
	SEm ±	0.46
	CD (5%)	1.39

3.2 No. of leaves

The data on number of leaves are presented in table 2. At 30 DAS, the maximum number of leaves was recorded under treatment T₄: 350 ppm IBA (15.32) but it was significantly at par with T₃: 300 ppm IBA (15.22) and T₅: 400 ppm IBA (14.96), T₇: 500 ppm IBA (15.25) whereas, the minimum number of leaves was

recorded under treatment T₁: distilled water (10.25). The increase in leaf number may be attributed to the significant role of growth regulators in inducing a vigorous rooting system, which enhanced nutrient absorption and resulted in the production of more leaves. This result is in agreement with the findings of Singh *et al.* (2013) in night queen ^[8].

Table 2: Effect of different concentration of IBA on no. of leaves in croton

S. No	Treatment	No. of leaves
		30 day
T ₁	Distilled water	10.25
T ₂	250 ppm IBA	11.45
T ₃	300 ppm IBA	15.22
T ₄	350 ppm IBA	15.32
T ₅	400 ppm IBA	14.96
T ₆	450 ppm IBA	14.25
T ₇	500 ppm IBA	15.25
T ₈	550 ppm IBA	13.09
T ₉	600 ppm IBA	13.25
	SEm ±	0.29
	CD (5%)	0.86

3.3 No. of shoots

The data on number of shoots are presented in table 3. At 30 DAS, the maximum number of shoots was recorded under treatment T₄: 350 ppm IBA (2.92) but it was significantly at par with T₃: 300 ppm IBA (2.77) whereas, the minimum number of shoots was recorded under treatment T₁: distilled water (2.07). This effect could be due to improved physiological activity in the cuttings at the optimum concentration

Table 3: Effect of different concentration of IBA on no. of shoots in croton

S. No	Treatment	No. of shoots
		30 day
T ₁	Distilled water	2.07
T ₂	250 ppm IBA	2.71
T ₃	300 ppm IBA	2.77
T ₄	350 ppm IBA	2.92
T ₅	400 ppm IBA	2.65
T ₆	450 ppm IBA	2.52
T ₇	500 ppm IBA	2.35
T ₈	550 ppm IBA	2.25
T ₉	600 ppm IBA	2.15
	SEm ±	0.05
	CD (5%)	0.15

3.4 Length of main shoot (cm)

Table 4: Effect of different concentration of IBA on length of main shoot no. of shoots in croton

S. No	Treatment	Length of main shoot
		30 day
T ₁	Distilled water	2.21
T ₂	250 ppm IBA	2.89
T ₃	300 ppm IBA	3.00
T ₄	350 ppm IBA	3.15
T ₅	400 ppm IBA	2.85
T ₆	450 ppm IBA	2.79
T ₇	500 ppm IBA	2.75
T ₈	550 ppm IBA	2.65
T ₉	600 ppm IBA	2.63
	SEm ±	0.05
	CD (5%)	0.17

The data on length of main shoot are presented in table 4. At 30 DAS, the maximum length of main shoot was recorded

under treatment T₄: 350 ppm IBA (3.15 cm) but it was significantly at par with T₃: 300 ppm IBA (3.00 cm) whereas, the minimum length of main shoot was recorded under treatment T₁: distilled water (2.21cm). As a growth promoter, IBA enhances cell division, resulting in early root initiation, improved mineral nutrient absorption, and consequently increased shoot length. This result is in agreement with the findings of Jan *et al.* (2015) in olive in *Ceratonia siliqua* ^[6].

3.5 Girth of main shoot (cm)

The data on girth of main shoot are presented in table 5. At 30 DAS, the maximum girth of main was recorded under treatment T₄: 350 ppm IBA (1.75 mm) but it was significantly at par with T₃: 300 ppm IBA (1.72 cm) and T₂: 250 ppm IBA (1.71 mm) whereas, the minimum girth of main shoot was recorded under treatment T₁: distilled water (1.15 mm). These effects could be due to the increased number of roots and leaves. This result is in agreement with the findings of Jan *et al.* (2015) in olive and in *Ficus Hawaii* ^[6].

Table 5: Effect of different concentration of IBA on girth of main shoot in croton

S. No	Treatment	Girth of main shoot
		30 day
T ₁	Distilled water	1.15
T ₂	250 ppm IBA	1.71
T ₃	300 ppm IBA	1.72
T ₄	350 ppm IBA	1.75
T ₅	400 ppm IBA	1.66
T ₆	450 ppm IBA	1.65
T ₇	500 ppm IBA	1.59
T ₈	550 ppm IBA	1.46
T ₉	600 ppm IBA	1.25
	SEm ±	0.02
	CD (5%)	0.08

3.6 Length of longest root (cm)

The data on length of longest root are presented in table 6. Significantly the maximum length of longest root was recorded under treatment T₃: 300 ppm IBA (13.25 cm) Followed by T₄: 350 (11.95 cm) and T₂: 250 ppm IBA (11.89) whereas, the minimum length of longest root was recorded under treatment T₁: (8.99 cm). The enhanced root length may be due to the maximum number of branches per shoot, as the growing shoot tips synthesize higher levels of auxin, leading to increased root elongation and improved metabolite translocation and carbohydrate metabolism. This result is in agreement with the findings of Jan *et al.* (2015) in olive ^[6].

Table 6: Effect of different concentration of IBA on length of longest root in croton

S. No	Treatment	Length of longest root
T ₁	Distilled water	8.99
T ₂	250 ppm IBA	11.89
T ₃	300 ppm IBA	13.25
T ₄	350 ppm IBA	11.95
T ₅	400 ppm IBA	11.65
T ₆	450 ppm IBA	10.98
T ₇	500 ppm IBA	10.83
T ₈	550 ppm IBA	10.73
T ₉	600 ppm IBA	10.68
	SEm ±	0.19
	CD (5%)	0.58

3.7 Fresh weight of shoot (g)

The data on fresh weight of shoot are presented in table 7. The significantly maximum fresh weight of shoot was recorded under treatment T₃: 300 ppm IBA (4.99 g) but it was statically at par with T₂: 250 ppm IBA (4.92 g) whereas, the minimum fresh

weight of shoot was recorded under treatment T₁: distilled water (3.25 g). The increase in leaf number and leaf area enhanced photosynthetic activity, relative growth rate, and lateral shoot branching, which in turn increased the fresh biomass of the shoots. This result is in close approximately with the findings of Shalini (2017) ^[7] in marigold.

Table 7: Effect of different concentration of IBA on fresh weight of shoot in croton

S. No	Treatment	Fresh weight of shoot
T ₁	Distilled water	3.25
T ₂	250 ppm IBA	4.92
T ₃	300 ppm IBA	4.99
T ₄	350 ppm IBA	4.46
T ₅	400 ppm IBA	4.43
T ₆	450 ppm IBA	4.06
T ₇	500 ppm IBA	3.95
T ₈	550 ppm IBA	3.85
T ₉	600 ppm IBA	3.94
	SEm ±	0.11
	CD (5%)	0.33

3.8 Fresh weight of root (g)

The data on fresh weight of root are presented in table 8. The significantly maximum Fresh weight of root was recorded under treatment T₃: 300 ppm IBA (2.75 g) followed by T₂: 250 ppm IBA (2.52 g) whereas, the minimum fresh weight of root was recorded under treatment T₁: distilled water (0.97g). His fresh weight of roots was found to be directly related to their number and size, with increases in root number and length leading to higher fresh root weight. This may be due to enhanced hormonal translocation that promotes cell division and elongation, along with increased enzymatic activity. This result is in agreement with the findings of Shalini (2017) ^[7] also reported that IBA is responsible to increase the fresh weight of roots in marigold.

Table 8: Effect of different concentration of IBA on fresh weight of root in croton

S. No	Treatment	Fresh weight of root
T ₁	Distilled water	0.97
T ₂	250 ppm IBA	2.52
T ₃	300 ppm IBA	2.75
T ₄	350 ppm IBA	2.45
T ₅	400 ppm IBA	2.11
T ₆	450 ppm IBA	1.58
T ₇	500 ppm IBA	1.62
T ₈	550 ppm IBA	1.33
T ₉	600 ppm IBA	1.25
	SEm ±	0.04
	CD (5%)	0.12

3.9 Dry weight of shoot (g)

The data on dry weight of shoot are presented in table 9. The significantly maximum dry weight of shoot was recorded under treatment T₃: 300 ppm IBA (2.83 g) followed by T₂: 250 ppm IBA (2.56 g) whereas, the minimum dry weight of shoot was recorded under treatment T₁: distilled water (1.31 g). The increased production of leaves and expansion of leaf area enhanced photosynthesis, relative growth rate, and lateral shoot branching, which in turn increased the fresh biomass and consequently the dry biomass of the shoot. His result is in close approximately with the findings of Shalini (2017) ^[7] in marigold.

Table 9: Effect of different concentration of IBA on dry weight of shoot in croton

S. No	Treatment	Dry weight of shoot
T ₁	Distilled water	1.31
T ₂	250 ppm IBA	2.56
T ₃	300 ppm IBA	2.83
T ₄	350 ppm IBA	2.03
T ₅	400 ppm IBA	1.65
T ₆	450 ppm IBA	1.60
T ₇	500 ppm IBA	1.59
T ₈	550 ppm IBA	1.53
T ₉	600 ppm IBA	1.49
	SEm ±	0.03
	CD (5%)	0.10

3.10 Dry weight of root (g)

The data on dry weight of root are presented in table 10. The significantly maximum dry weight of root was recorded under treatment T₃: 300 ppm IBA (1.91 g) followed by T₂: 250 ppm IBA (1.28 g) whereas, the minimum dry weight of root was recorded under treatment T₁: distilled water (0.45 g). Auxin treatment stimulated the formation of more roots and enhanced root cell elongation and division, thereby contributing to increased fresh weight and subsequent dry weight of roots. This result is in agreement with the findings of Shalini (2017) ^[7] in marigold.

Table 10: Effect of different concentration of IBA on dry weight of root in croton

S. No	Treatment	Dry weight of root
T ₁	Distilled water	0.45
T ₂	250 ppm IBA	1.28
T ₃	300 ppm IBA	1.91
T ₄	350 ppm IBA	1.25
T ₅	400 ppm IBA	0.95
T ₆	450 ppm IBA	0.88
T ₇	500 ppm IBA	0.79
T ₈	550 ppm IBA	0.75
T ₉	600 ppm IBA	0.65
	SEm ±	0.01
	CD (5%)	0.05

4. Conclusion

Based on the overall assessment of the findings of the present investigation, it may be inferred that the performance of croton was based on the experimental findings; it is evident that among the various concentrations of IBA, treatment with 300 ppm IBA, 350 ppm IBA was the most effective for croton cuttings. This concentration resulted in enhanced performance across all observed parameters, such as earlier sprouting, higher success percentage at 30 days after planting, increased number of leaves and shoots, improved shoot length and girth at 30, 60 and 90 days after planting, and length, higher fresh and dry weight of shoots and roots, improved root: shoot ratio, higher survival percentage, and lower mortality at 90 days after planting. Hence, 300 ppm IBA is considered optimal for semi-hardwood cuttings of croton. However, T₁ (Distilled water) consistently recorded the lowest value across all growth and germination parameters.

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Reference

1. Li B, Huaxing Q, Jin-Shuang M, Hua Z, Michael G, Hans-Joachim G, *et al.* Flora of China. 2008 Sep 22. 11:163. <http://www.efloras.org>
2. Deshmukh SD, Borle MN. Studies on the insecticidal properties of indigenous plant products. Indian Journal of Entomology. 1975;37(1):11-18.
3. Devi J, Bakshi P, Wali VK, Kiran K, Sharma N. Role of auxin and dates of planting on growth of cutting raised plantlets of phalsa (*Grewia asiatica* L.). An International Quarterly of Life Sciences. 2016;11(1):535-537.
4. Hartmann HT, Kester DE, Davis FT Jr, Geneve RL. Plant propagation: Principles and practices. New Jersey: Prentice Hall. 2002. p. 250-251.
5. Ibironke OA. Response of selected ornamentals to rooting hormone in different propagation media. Journal of Botany Research. 2017;1(1):22-28.
6. Jan I, Sajid M, Rab A, Iqbal A, Khan O, Jamal Y, *et al.* Effect of various concentrations of indole butyric acid (IBA) on olive cuttings. Mitt Eilungen Klosterneuburg. 2015;65:49-55.
7. Shalini K. Effect of IBA and NAA and their combination on rooting in stem cuttings of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gaiinda [MSc thesis]. Raipur: Krishi Vishwavidyalaya. 2017.
8. Singh KK, Kumar A, Tomar YK, Kumar P. Effect of length of cutting and concentration of IBA on rooting in shoot tip cutting of sawan (*Lagerstromia indica* L.) under mist condition. Hort Flora Research Spectrum. 2013;2(2):153-157.