

EFFECT OF IBA ON ROOTING AND GROWTH OF (*Ixorachinensis* L.) TERMINAL CUTTING

ABSTRACT

The experiment was conducted at College of Horticulture, Dapoli under Dr. Balasaheb Konkan Krishi Vidyapeeth, Dapoli, in 2023. It comes under tropical location with an average well distributed rainfall 3500-4000 mm during June to October. The soil is under lateritic textural class varied with loam, clay, sandy loam. *Ixora* is a popular ornamental but difficult to root plant was used for the experiment. The experiment was laid out in randomized block design with eight treatments and three replications. Mature terminal cuttings of size 10-15 cm length with 4-5 leaves were dipped for 5 min in the solution consisting of different Indole Butyric Acid concentrations i.e. (control) 250, 500, 1000, 1500, 2000, 2500, 3000 ppm solutions. The cuttings under study recorded significant variation with respect to all the parameters. The results showed that among all treatments survival percentage (60%), maximum plant height (18.17 cm), maximum number of leaves (14.08), stem girth (3.91 mm), longest root length (9.03 cm), number of secondary roots (17.93), fresh and dry weight of shoot (3.55, 1.03 g), fresh and dry weight of root (1.40, 1.18 g) was recorded in T₄ treatment consisting 1000 ppm IBA solution. However, for maximum number of primary roots (7.27) was observed in T₃ (500 ppm) treatment.

Keywords: *Ixora*, IBA, terminal cuttings

INTRODUCTION:

Ixora botanically referred to as *Ixorachinensis* L. This blooming plant is often used as a hedge element in landscape design and is a member of the Rubiaceae family. Plant originated in South East Asia's tropical and subtropical regions. *Ixora* is also known as Rugmini (in India), and it goes by a number of common names in different regions including Chinese *ixora*, Jungle geranium, flame of the woods, jungle flame, West Indian Jasmine etc.

As space becomes scarce in urban areas vertical garden and rooftop greenery are becoming popular solutions, *ixora* is well-suited for both these applications which makes it a viable option for urban settings. *Ixora* can withstand relatively high levels of drought in urban landscapes where construction and land development areas are prone to erosion and water conservation is crucial. Its alluring appearance and adaptability in various landscape settings also drive demand in urbanization and support the cultivation of this species.

In natural settings, plant root capacity is mediocre, primarily depends on physiological state of mother plant, time at which cuttings are taken, type of plant growth regulator used such factors influence rooting success. Ixora propagation has numerous potential for generating profitable self-employment among small and marginal farmers, but seed propagation is unsuitable for the commercial output. As a result, ixora is vegetatively propagated typically by means of layering and cuttings. Ixora is a medium-to-root plant and generally during cuttings propagation, hardwood cutting is used which gives very low survival, but effective use of plant growth regulator and controlled environmental conditions like growth chamber can also give positive results in terminal, apical and tip cuttings. In the realm of propagation application of growth regulator for root initiation play a crucial role in field and additionally the presence of natural (IAA) and synthetic (IBA, NAA) auxins are critical for root development. Among the growth regulators IBA is the most often utilized growth regulator. Understanding the optimal use of growth regulators and demand for ixora by refining the method of propagation not only can guarantee a consistent supply of maximum planting material from a single plant by using terminal section multiple times in one year rather than only a single stem cutting in the year. All things considered, this research may result in useful application that advances nursery industry.

MATERIALS AND METHOD:

The present study was carried out during the academic year 2023 at College of Horticulture, Dapoli, under Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra. Among different ixora species 2-3 year old mother plant of Chinese ixora is used for obtaining terminal cuttings. The cuttings are planted in medium soil + vermicompost 3:1 ratio, lateritic clay loam soil is preferred for the media. For the desired quantities of IBA, 1 g was dissolved in 10 ml of ethanol taking in volumetric flask and then the volume was made to one liter by adding sufficient amount of distilled water, similarly different IBA concentrations i.e. T₁ (control), T₂ (250 ppm), T₃ (500 ppm), T₄ (1000 ppm), T₅ (1500 ppm), T₆ (2000 ppm), T₇ (2500 ppm) and (T₈ 3000 ppm) solutions were prepared. Only mature terminal cuttings are used with ideal size of 10-15 cm, 3-4 nodes with leaves intact (4-6) are dipped in IBA solutions for 5-6 min and are replanted in prepared medium at 30, 60, and 90 days after planting of cuttings, observations are recorded viz. Survival percentage, plant height, number of leaves, stem girth, length of longest root, number of primary and secondary root, fresh and dry weight of shoot, fresh and dry weight of root. The current research data was statistically analyzed using the conventional method of analysis of variance in accordance with the method given by Panse and Sukhatme (1995)

RESULTS AND DISCUSSION:

Survival%

At end of experiment 90 days after planting, treatment T₄ with 1000 ppm IBA concentration recorded statistically highest survival (60.00%) which was at par with treatment T₃ (57.33 %) (i.e. 500 ppm). However lowest survival (36.00 %) was found in treatment T₈ (cuttings dip in 3000 ppm IBA solution). The reason for the highest survival in T₄ and T₃ may be that these roots have the greatest number of secondary and fibrous roots from the primary roots, which likely absorb more nutrients from the soil and aid in the growth of plants. The reason for the lowest survival could be attributed to the toxicity of IBA at high treatment concentration. These similar findings are recorded by Laleta *l.*, 2008 in henrietta cuttings and Tangawade, 2022 in croton cuttings.

Plant height (cm)

At 90 days after planting, there was significant variation seen in plant height due to different IBA concentration. The maximum plant height was recorded in T₄ (18.17 cm) which was at par with T₃ (16.73 cm). However minimum plant height (13.30 cm) was obtained in T₈. Rapid root initiation increases the surface area accessible for absorption of nutrients from the soil, and higher assimilation leads to increased metabolic activity which promotes shoot growth. Similar findings are reported by Gad 2019 (*Tabernaemontana divaricata*) and Mehuri et al., 2019 in (*Duranta erecta*) tip cutting.

Number of leaves

At 90 days after planting the numbers of leaves are statistically influenced by IBA concentration. The treatment T₄ (14.08) produced more number of leaves which was on par with T₃ (13.90 mm) T₂ (13.57 mm) T₁ (13.07 mm). However treatment T₈ exhibited minimum number of leaves (11.99 mm) after cuttings. The result achieved could be attributed to cuttings treated with 1000 ppm IBA solution, which promotes shoot growth, resulting in an increased number of nodes and the formation of more leaves. The best result obtained for 1000 ppm IBA regards to number of leaves are in agreement with the results of Wazir, 2014 in camellia cuttings and (Halder *etal.*, 2002) in ixora cuttings.

Stem girth

At 90 days after planting, significantly higher value for stem girth was recorded in T₄ (3.91 mm) containing

1000ppmsolutionwhichwasatparwithT₃(3.55mm)stemgirth.AndminimumvalueforstemgirthwasrecordedinT₈treatment (2.81mm).Themaximum numberofrootsand longer rootsmayaidintheabsorptionofnutrientsandwater,increasingxylemandphloemwidthandoverallplantvigour.Eventuallyhelpsinexpandingthestemgirth.TheresultsobtainedareinaccordwiththeresultsofGad, 2019 in *Tabernaemontanadiverticatatip* cutting.

Table1:EffectofIBAongrowthof ixoracuttingsafter90daysofplanting.

Treatments	Survival(%)	Plant height(cm)	Number ofleaves	Stem girth(cm)
T₁-Control	48.00	15.73	13.07	3.26
T₂-IBA @ 250ppm	50.67	16.40	13.57	3.30
T₃-IBA @ 500ppm	57.33	16.73	13.90	3.55
T₄-IBA @ 1000ppm	60.00	18.17	14.08	3.91
T₅-IBA @ 1500ppm	45.33	15.47	12.54	3.00
T₆-IBA @ 2000ppm	43.33	15.20	12.47	2.96
T₇-IBA @ 2500ppm	40.00	14.39	12.34	2.88
T₈-IBA @ 3000ppm	36.00	13.30	11.99	2.81
Mean	47.58	15.68	13.00	3.21
SEm±	2.7	0.5	0.5	0.1
CDat5%	8.1	1.6	1.4	0.4
Ftest	SIG	SIG	SIG	SIG

Lengthoflongestroot

At 90 days after planting statistically maximum length of root was recorded under T₄ (1000ppm)IBAwhichwas(9.03cm)andwasatparwithtreatmentT₃(8.31cm)andT₂(7.91cm).While the minimum value for length of longest root (5.71 cm) was noted in T₈ treatment. The resultscan be attributed to the efficiency of suitable doses of rooting hormone in early stimulation of callusdevelopment, increased hydrolytic activity and faster emergence of roots from treated cuttings. ThisresultisincloseconformitywiththefindingsofRamtinetal.,2011forpoinsettiacuttingsandSinghet al., 2010 forBougainvilleacuttings.

NumberofPrimaryandsecondaryroots

At90daysafter plantingthedatafornumberofprimaryrootsshowedthatT₃(7.27)recodedstatisticallymorenumberofprimary rootswhichwasatparwithT₂(6.47)andT₄(6.73)Whiletreatment T₈ shows lesser growth of primary roots(4.53).The reason behindthe maximumgrowthofprimaryandsecondaryrootscouldbeappropriate

concentration of solution increases the

rate of

cell division and enlargement which further helps in early sprouting, increase in height of plant, number of leaves, stem girth which was recorded in T₄ followed by T₃ and T₂. "More the source more the sink" leads to facilitating the number of primary and secondary roots.

Fresh weight of shoot

At the end of experiment 90 days after planting it is observed that T₄ treatment shows a significantly maximum fresh weight of shoot (3.55g) which is on par with treatment T₃ (3.27 g) and treatment T₈ which showed a poor result (2.11g) for fresh weight. This result is in conformity with the results of Baldotto *et al.*, 2012 concluded that increased size of root system affects in its ability to enhance optimal shoot development and growth, resulting in the increasing fresh weight of shoot.

Dry weight of shoot

At 90 days after planting Treatment T₄ (1000 ppm) recorded statistically maximum weight (1.03g) which was at par with T₂ (0.86 g) and minimum result for dry weight was observed in T₈ than the control treatment which was (0.32 g). The result for dry weight of shoot is best at optimum concentration in T₄ and shows poor results below and above the optimum concentration and therefore the trend is in descending order as given below. Similar result was observed by Gad, 2019 in Terbernaemontan cuttings and Tangawade, 2022 in croton cutting.

Fresh weight of root

The fresh weight was found maximum (1.40 g) in T₄ which was at par with T₃ (1.37 g) while minimum was observed in treatment T₈ (0.76 g) containing 3000 ppm IBA. This might be due to when IBA concentration is optimum it promotes uptake and production of food material in roots and cell density of root become high which increase root fresh weight. This finding is in accordance with the result of Singh *et al.*, 2014 in duranta goldencuttings and Saudagar *et al.*, 2020 in ixora cuttings.

Dry weight of root

The significantly highest rate of dry weight of root (1.23 g) was found in T₃ which was at par with T₂ (1.07 g) and T₄ (1.18 g) while minimum value for dry weight found in T₈ (0.66 g) treatment. This might be due to cutting treated with appropriate concentration of IBA helps in better mobilization and translocation downwards the primary metabolites for heather adventitious root formation and nutrient uptake ultimately results in maximum dry weight of roots. The results are partially supported by the reports of Manjunath *et al.*, 2022 in chrysanthemum and Halder *et al.*, 2002 in ixora cuttings.

CONCLUSION

Based on the result obtained, it can be concluded that as compared to higher concentrations above 2000 ppm of IBA, lower concentration upto 1000 ppm can improve rooting characters as well as helps in improving the shoot characters in ixora. Optimum concentration of IBA useful for easy and faster multiplication of ixora through terminal cuttings.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Table 2: Effect of different concentration of IBA on rooting characters of ixora cuttings after 90 days of planting .

Treatments	Length of longest root (cm)	Root number		Shoot weight		Root weight	
		Primary	Secondary	Fresh (g)	Dry (g)	Fresh (g)	Dry (g)
T ₁	7.51	6.20	14.67	2.82	0.66	1.07	0.94
T ₂	7.91	6.47	16.80	3.07	0.86	1.34	1.07
T ₃	8.31	7.27	16.60	3.27	0.68	1.37	1.23
T ₄	9.03	6.73	17.93	3.55	1.03	1.40	1.18
T ₅	7.12	5.67	12.73	2.61	0.55	0.98	0.83
T ₆	6.72	5.53	10.20	2.48	0.53	0.90	0.78
T ₇	6.51	5.07	8.20	2.20	0.44	0.83	0.72
T ₈	5.71	4.53	9.93	2.11	0.32	0.76	0.66
Mean	7.35	5.93	13.38	2.76	0.63	1.07	0.93
SEm±	0.4	0.3	1.0	0.1	0.1	0.1	0.1
CD at 5%	1.3	1.0	3.1	0.4	0.3	0.4	0.2
F test	SIG	SIG	SIG	SIG	SIG	SIG	SIG

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