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Influence of different levels of rooting hormone and growing media on apical cutting of *Ixora*

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Abstract

An experiment entitled, studies on influence of different levels of rooting hormone and growing media on apical cutting of *Ixora* was carried out under greenhouse condition for three trials with total twenty eight treatments. The experiment was conducted in Factorial Completely Randomized Design with three replications. The results of pooled data revealed that, significantly minimum days taken to sprouting (12.77) was found in control treatment whereas, the maximum survival percentage (81.96) at 45 DAP, number of roots per cutting (32.11) at 60 DAP, length of roots per cutting (6.95 cm) at 60 DAP, height of rooted cutting (12.98 cm) at 60 DAP, survival percentage (100) after bagging and height of plant (22.77 cm) at 90 DAP was recorded with treatment i_1 (5000 ppm IBA). From the pooled data of media, it was noted that significantly minimum days taken to sprouting (11.83), maximum survival percentage (71.11) at 45 DAP, number of roots per cutting (27.77) at 60 DAP, length of roots per cutting (7.41 cm) at 60 DAP, height of rooted cutting (11.72 cm) at 60 DAP, survival percentage (100) after bagging and height of plant (20.05 cm) at 90 DAP was recorded with treatment m_2 (Vermiculite: Poultry Manure (1:1)+ *Trichoderma viride*).

Keywords: Green house, IBA, *Ixora*, media, propagation

Introduction

Ixora (Ixora chinensis) is the most commonly grown flowering shrubs in beautification of open spaces, residential areas and public parks. The genus *Ixora* belongs to the family Rubiaceae and has more than 150 species with variable morphological characters. The *Ixora* is not fully exploited on large scale being difficult-to-root plant species, as they do not root easily through stem cuttings under normal weather conditions. Presently, these are propagated commercially by layering.

Among the various vegetative methods, propagation from cuttings is the easiest, simple, rapid and less expensive and large number of plants can be propagated from a single pedigree plant. The success of propagation of plants through cuttings depends mainly on planting environment, plant material used and treatment with plant growth regulators.

Among the environmental factors, relative humidity is the most important condition affecting the rooting in cuttings. Particularly, in propagation of leafy cuttings, one of the main problem is to maintain them without wilting until roots are formed. In order to reduce the transpiration losses from the leaves and cuttings, the vapour pressure in the atmosphere surrounding the leaves and cuttings should be maintained as nearly equal as possible to the water pressure in the intercellular spaces with in the leaves. Mahlstedt and Haber (1966) [3] advocated the maintenance of constant humidity of 90 per cent during the initial stage of the rooting. Several workers propagated *Ixora* and other difficult-to-root ornamental plants successfully through stem cuttings under intermittent mist with the aid of growth regulators (Mukhopadhyay and Bose 1979; Singh 1979; Singh 1980; Singh 1981 and Kumar and Vijaya Kumar 1984) [5, 7, 8, 9, 2].

In India, very little work was carried out on propagation of *ixora*; therefore, present investigation was executed on influence of different levels of rooting hormone and growing media on apical cutting of *ixora*.

Material and Methods

An experiment entitled, influence of different levels of rooting hormone and growing media on apical cutting of *ixora*, was carried out under greenhouse condition at Department of Horticulture, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. Present experiment were evaluated with two factors *viz.*,

IBA with four levels and media with seven levels thus making total twenty eight treatment combinations viz; IBA 0 ppm (i_0), 5000 ppm (i_1), 10000 ppm (i_2), 15000 ppm (i_3) and different media viz., Vermiculite: Poultry Manure (1:1) (m_1), Vermiculite: Poultry Manure (1:1)+ *Trichoderma viride* (m_2), Vermiculite: Poultry Manure (1:1)+ PSB (m_3), Vermiculite: Poultry Manure (1:1)+ *Pseudomonas* (m_4), Vermiculite: Poultry Manure (1:1)+ *Trichoderma viride* + PSB (m_5), Vermiculite: Poultry Manure (1:1)+ *Trichoderma viride* + *Pseudomonas* (m_6), Vermiculite: Poultry Manure (1:1)+ *Trichoderma viride*+ PSB+ *Pseudomonas* (m_7).

The IBA treatments were applied through quick dip method to the apical cutting. *Trichoderma viride*, *Pseudomonas* treated @50ml/10 kg media and PSB @50ml/10 kg media as per treatment. The three trials were carried out viz., First trial: 15th May to 15th August, Second trial: 20th July to 20th October, Third trial: 25th September to 25th December were carried out in plug tray under greenhouse condition.

The experiment was laid out in Factorial Completely Randomized Design as described by Nigam and Gupta (1979)^[6] with three replications. The treatments evaluated and observations were recorded periodically in relation to sprouting, survival of cutting and height of plant of *Ixora chinensis*.

Results and Discussion

Effect of IBA level (I)

From the pooled data, it was noted that significantly highest survival percentage at 45 DAP was recorded with treatment i_1 (5000 ppm IBA) i.e. 81.96 and 22.77 cm, respectively and it was found statistically superior over all other treatments. The days taken to sprouting produced non-significant results but control treatment recorded minimum days taken to sprouting (12.77).

Pooled data revealed that the significant maximum number of roots per cutting (32.11) at 60 days after planting was found in treatment i_1 (5000 ppm IBA) and minimum number of roots per cutting (19.93) at 60 days after planting was found i_0 (Control) treatment.

The significantly maximum length of roots per cutting (6.95 cm) at 60 days after planting was found in treatment i_1 (5000 ppm IBA) which was at par with treatment i_2 (10000 ppm IBA).

Pooled data shows the significantly highest height of rooted cutting (12.98 cm) at 60 days after planting was found in treatment i_1 (5000 ppm IBA) which was superior all over the treatment.

On the basis of pooled data found significant of maximum survival percentage after bagging (100) in treatment i_1 (5000 ppm IBA), i_2 (10000 ppm IBA) and i_3 (15000 ppm IBA)

From the pooled data, it was noted that significantly maximum height of plant at 90 DAP was recorded with treatment i_1 (5000 ppm IBA) i.e. 81.96 and 22.77 cm and it was found statistically superior over all other treatments.

Mukherjee *et al.* (1976)^[4]; Mukhopadhyay and Bose (1979)^[5] also reported better rooting in *Ixora singaporensis* with IBA 3000 ppm under intermittent mist. Singh (1981) also reported more number of roots per cutting with IBA 2000, 3000 and 4000 ppm compared with IBA 1000 ppm under

intermittent mist in *Ixora bandhuca*. Bose *et al.* (1975)^[1] reported that in *Ixora singaporensis* both softwood and semi-hardwood cuttings produced more number of roots compared with hardwood cuttings under mist.

Effect of media (M)

From the pooled data, it was noted that significantly minimum days taken to sprouting (11.83) was recorded with control treatment and it was found statistically superior over all other treatments.

The significantly highest survival percentage at 45 DAP (71.11) was recorded with treatment m_2 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*) and it was found statistically at par with m_6 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*+ *Pseudomonas*) and m_7 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*+ PSB+ *Pseudomonas*).

The pooled data revealed that the significantly maximum number of roots (27.77) per cutting at 60 days after planting was found in treatment m_2 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*) which was found at par with treatment m_4 (Vermiculite: Poultry Manure (1:1)+ *Pseudomonas*), m_6 (Vermiculite: Poultry Manure (1:1)+*Trichoderma viride*+*Pseudomonas*) and m_7 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*+ PSB+ *Pseudomonas*).

The pooled data shows the significantly maximum length of roots per cutting (7.41 cm) at 60 days after planting was found in treatment m_2 (Vermiculite: Poultry Manure (1:1)+ *Trichoderma viride*) which was at par with treatment m_6 (Vermiculite: Poultry Manure (1:1)+*Trichoderma viride*+*Pseudomonas*).

The significantly maximum height of rooted cutting (11.72 cm) at 60 days after planting was found in treatment m_2 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*) which was at par with treatment m_6 (Vermiculite: Poultry Manure (1:1) +*Trichoderma viride*+ *Pseudomonas*).

Pooled data revealed that the significantly maximum survival percentage (100) after bagging was found in treatment m_2 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*), m_4 (Vermiculite: Poultry Manure (1:1) + *Pseudomonas*), m_6 (Vermiculite: Poultry Manure (1:1) +*Trichoderma viride*+*Pseudomonas*) and m_7 (Vermiculite: Poultry Manure (1:1) +*Trichoderma viride*+ PSB+ *Pseudomonas*).

Pooled data shows the significantly maximum height of plant (20.05 cm) at 90 days after planting was found in treatment m_2 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride*) which was statistically at par with treatment m_6 (Vermiculite: Poultry Manure (1:1) + *Trichoderma viride* + *Pseudomonas*) and m_7 (Vermiculite: Poultry Manure (1:1)+*Trichoderma viride*+ PSB+ *Pseudomonas*).

Interaction effect

The interaction effect of IBA and media on days taken to sprouting, survival percentage at 45 DAP, number of roots per cutting at 60 DAP, length of roots per cutting at 60 DAP, height of rooted cutting at 60 DAP, survival percentage after bagging and height of plant at 90 DAP was found non-significant.

Table 1: Influence of different levels of rooting hormone and growing media on days taken to sprouting & survival percentage at 45 days after planting of ixora

Treatments	Days taken to sprouting				Survival percentage at 45 days after planting			
	Trial I	Trial II	Trial III	Pooled	Trial I	Trial II	Trial III	Pooled
Levels of IBA (I)								
i ₀ (Control)	12.28	13.09	12.95	12.77	54.80	53.71	56.04	54.85
i ₁ (5000 ppm IBA)	12.19	13.47	12.85	12.84	81.57	81.23	83.09	81.96
i ₂ (10000 ppm IBA)	12.47	13.66	13.14	13.09	69.00	69.23	70.90	69.71
i ₃ (15000 ppm IBA)	12.38	13.66	13.04	13.03	66.14	65.38	67.42	66.31
S.Em.±	0.24	0.20	0.17	0.12	0.43	0.91	0.41	0.36
C.D. at 5%	NS	NS	NS	NS	1.22	2.60	1.16	1.02
Levels of media (M)								
m ₁ (Vermiculite: Poultry Manure 1:1)	13.25	14.25	13.91	13.80	65.33	65.08	67.16	65.86
m ₂ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i>)	11.33	12.16	12.00	11.83	71.08	70.08	72.16	71.11
m ₃ (Vermiculite: Poultry Manure (1:1)+ PSB)	13.00	14.16	13.66	13.61	66.58	66.58	68.08	67.08
m ₄ (Vermiculite: Poultry Manure (1:1)+ <i>Pseudomonas</i>)	12.33	13.33	13.00	12.88	66.66	66.50	69.08	67.41
m ₅ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB)	12.66	14.00	13.33	13.33	67.33	66.83	68.16	67.44
m ₆ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + <i>Pseudomonas</i>)	11.66	12.91	12.33	12.30	69.66	68.75	71.00	69.80
m ₇ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB+ <i>Pseudomonas</i>)	12.08	13.50	12.75	12.77	68.50	67.91	69.91	68.77
S.Em.±	0.31	0.26	0.23	0.15	0.56	1.21	0.54	0.48
C.D. at 5%	0.90	0.75	0.67	0.44	1.61	NS	1.54	1.35
I X M								
S.Em.±	0.63	0.53	0.47	0.31	1.13	2.42	1.08	0.96
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Season x Treatment								
S.Em.±				0.55				1.66
C.D. at 5%				NS				NS
CV%	8.93	6.87	6.28	7.38	2.90	6.22	2.71	4.23

Table 2: Influence of different levels of rooting hormone and growing media on number of roots per cutting and length of roots per cutting (cm) at 60 days after planting of ixora

Treatments	Number of roots per cutting at 60 days after planting				Length of roots per cutting (cm) at 60 days after planting			
	Trial I	Trial II	Trial III	Pooled	Trial I	Trial II	Trial III	Pooled
Levels of IBA (I)								
i ₀ (Control)	15.52	18.52	16.76	16.93	4.61	5.95	5.28	5.28
i ₁ (5000 ppm IBA)	30.66	33.66	32.00	32.11	6.28	7.61	6.95	6.95
i ₂ (10000 ppm IBA)	27.33	30.38	28.66	28.79	6.14	7.47	6.80	6.80
i ₃ (15000 ppm IBA)	24.42	27.42	25.76	25.87	5.42	6.76	6.09	6.09
S.Em.±	0.80	1.70	0.98	0.57	0.20	0.31	0.13	0.13
C.D. at 5%	2.27	3.33	2.79	1.62	0.58	0.90	0.38	0.37
Levels of media (M)								
m ₁ (Vermiculite: Poultry Manure 1:1)	22.75	25.66	23.91	24.11	4.66	6.00	5.33	5.33
m ₂ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i>)	23.36	29.33	27.66	27.77	6.75	8.08	7.41	7.41
m ₃ (Vermiculite: Poultry Manure (1:1) + PSB)	23.41	26.33	24.75	24.83	4.91	6.25	5.58	5.58
m ₄ (Vermiculite: Poultry Manure (1:1) + <i>Pseudomonas</i>)	24.33	27.41	25.66	25.80	5.50	6.83	6.16	6.16
m ₅ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB)	23.83	26.50	25.16	25.16	5.16	6.50	5.83	5.83
m ₆ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + <i>Pseudomonas</i>)	25.75	28.91	27.08	27.25	6.33	7.66	7.00	7.00
m ₇ (Vermiculite: Poultry Manure (1:1) + <i>Trichoderma viride</i> + PSB+ <i>Pseudomonas</i>)	25.00	28.33	26.33	26.55	6.00	7.33	6.66	6.66
S.Em.±	1.06	1.55	1.30	0.76	0.27	0.41	0.17	0.17
C.D. at 5%	NS	NS	NS	2.14	0.77	1.19	0.50	0.49
I X M								
S.Em.±	2.12	3.10	2.60	1.52	0.54	0.83	0.35	0.35
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS
Season x Treatment								
S.Em.±				2.63				0.61
C.D. at 5%				NS				NS
CV%	15.00	19.54	17.48	17.63	16.82	20.88	9.82	16.89

Table 3: Influence of different levels of rooting hormone and growing media on height of rooted cutting (cm) at 60 days after planting and survival percentage after bagging of ixora

Treatments	Height of rooted cutting (cm) at 60 days after planting				Survival percentage after bagging			
	Trial I	Trial II	Trial III	Pooled	Trial I	Trial II	Trial III	Pooled
Levels of IBA (I)								
i ₀ (Control)	6.28	8.28	6.95	7.70	99.53	99.90	99.61	99.68
i ₁ (5000 ppm IBA)	12.09	14.09	12.76	12.98	100.0	100.0	100.0	100.0
i ₂ (10000 ppm IBA)	11.33	13.33	12.00	12.22	100.0	100.0	100.0	100.0
i ₃ (15000 ppm IBA)	9.23	11.23	9.90	10.12	100.0	100.0	100.0	100.0
S.Em.±	0.20	0.47	0.15	0.18	0.11	0.04	0.06	0.04
C.D. at 5%	0.57	1.36	0.43	0.50	0.33	NS	0.19	0.13
Levels of media (M)								
m ₁ (Vermiculite: Poultry Manure 1:1)	8.58	10.58	9.25	9.47	99.63	99.83	99.66	99.71
m ₂ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i>)	10.83	12.83	11.50	11.72	100.0	100.0	100.0	100.0
m ₃ (Vermiculite: Poultry Manure (1:1)+ PSB)	9.16	11.16	9.83	10.05	99.72	100.0	99.66	99.79
m ₄ (Vermiculite: Poultry Manure (1:1)+ <i>Pseudomonas</i>)	9.66	11.66	10.33	10.55	100.0	100.0	100.0	100.0
m ₅ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB)	9.41	11.41	10.08	10.30	99.83	100.0	100.0	99.94
m ₆ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + <i>Pseudomonas</i>)	10.41	12.41	11.08	11.30	100.0	100.0	100.0	100.0
m ₇ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB+ <i>Pseudomonas</i>)	10.08	12.08	10.75	10.97	100.0	100.0	100.0	100.0
S.Em.±	0.26	0.63	0.20	0.23	0.15	0.06	0.08	0.06
C.D. at 5%	0.75	NS	0.57	0.67	NS	NS	0.25	0.17
I X M								
S.Em.±	0.53	1.26	0.40	0.47	0.30	0.12	0.17	0.12
C.D. at 5%	NS	NS	NS	NS	NS	NS	0.50	0.35
Season x Treatment								
S.Em.±				0.82				0.21
C.D. at 5%				NS				NS
CV%	9.44	18.68	6.71	13.47	0.53	0.22	0.31	0.38

Table 4: Influence of different levels of rooting hormone and growing media on height of plant (cm) at 90 days after planting of ixora

Treatments	Height of plant (cm) at 90 days after planting			
	Trial I	Trial II	Trial III	Pooled
Levels of IBA (I)				
i ₀ (Control)	14.00	15.66	15.80	15.15
i ₁ (5000 ppm IBA)	21.38	23.04	23.90	22.77
i ₂ (10000 ppm IBA)	17.52	19.19	20.38	19.03
i ₃ (15000 ppm IBA)	15.90	17.57	18.61	17.36
S.Em.±	0.45	0.74	0.21	0.29
C.D. at 5%	1.29	2.10	0.62	0.84
Levels of media (M)				
m ₁ (Vermiculite: Poultry Manure 1:1)	16.58	18.25	18.33	17.72
m ₂ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i>)	18.75	20.41	21.00	20.05
m ₃ (Vermiculite: Poultry Manure (1:1)+ PSB)	16.66	18.33	19.00	18.00
m ₄ (Vermiculite: Poultry Manure (1:1)+ <i>Pseudomonas</i>)	16.58	18.25	19.58	18.13
m ₅ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB)	16.50	18.16	19.25	17.97
m ₆ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + <i>Pseudomonas</i>)	17.66	19.33	20.58	19.19
m ₇ (Vermiculite: Poultry Manure (1:1)+ <i>Trichoderma viride</i> + PSB+ <i>Pseudomonas</i>)	17.66	19.33	20.00	19.00
S.Em.±	0.60	0.97	0.28	0.39
C.D. at 5%	NS	NS	0.82	1.11
I X M				
S.Em.±	1.20	1.95	0.57	0.79
C.D. at 5%	NS	NS	NS	NS
Season x Treatment				
S.Em.±				1.36
C.D. at 5%				NS
CV%	12.12	17.96	5.08	12.75

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