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RESEARCH ARTICEL

PHOTOGRAPHS SHOWING THE EFFECT OF GROWTH REGULATORS ON PROPAGATION OF CHINESE THUJA (*THUJA ORIENTALIS* L) IN SUBTROPICAL ZONE

***Chowdhuri, T. K.**

Department of Floriculture & Landscape Architecture, BCKV, Mohanpur, Nadia, WB

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ABSTRACT

The present investigation was carried out to study the effect of different growth regulators on propagation of Chinese juniper (*Thuja chinensis* L) in subtropical zone of West Bengal under natural ventilated polyhouse at Instructional farm of Jaguli, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, during 2014-15 and 2015-16. All parameters were significantly varied among the treatments during investigation (IAA @1000ppm, IAA@2000ppm, IAA @3000ppm, IBA @1000ppm, IBA @2000ppm, IBA @3000ppm, NAA @1000ppm, NAA @2000ppm, NAA @3000ppm, without any treatment (Control) and Local banded hormone(rootex). After studying of two consecutive years, it has been found that tip cutting of this plant treated with NAA (2000-300ppm) followed by IBA at 3000 ppm and IAA at 2000ppm in the month of June is found better for propagation towards of its multiplication in subtropical zone.

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INTRODUCTION

Chinese thuja (*Thuja chinensis* L) is a very important ornamental attractive foliage dwarf tree, natives of China growing wide range of climate all over the world belongs to family Cupressaceae. It is densely growing as bushy small tree or large evergreen compact shrub reaching up to 12 meter height with formal growth, tapering upwards to a conical or Pyramidal shape reported by Randhawa and Mukhapadhaya (2000). This plant is used for garden decoration around green lawn or besides garden paths at a centain distance to develop a symmetrical conical structure. This plant closely planting can make a good hedge or a wall. This plant is well responded in topiary work and potted plant for home gardening is also used. Now it is also used in indoor decoration for short duration during occasion of various ceremonies. However, there is a tremendous demand of this plant due to rapid urbanization in township area in the state of West Bengal, when it graceful foliage appeared very attractive round the year, besides these advantages, this plant is too much hardy and easy to maintenance for gardening. It is commonly propagated by seed, but it is unable to set seed in our situation. Sometimes seeds are set, but there is lengthy process of seed germination. So, multiplication is a problem faced by the different nursery growers.

****Corresponding author: Chowdhuri, T.K.***
Department of Floriculture & Landscape Architecture, BCKV, Mohanpur, Nadia, WB.

However, rapid multiplication of this plant is a problem and wastage of propagating material very often takes place due to sparse rooting and unavailability of a suitable combination of varieties of growth regulator in the sub-tropical environment. Bose *et al* (2008) said that this plant can be propagated by seed and cutting.

MATERIALS AND METHODS

The experiment was carried out under naturally ventilated poly house at Instructional farm, Jaguli, Bidhan Chandra Krishi Viswavidyalaya, West Bengal. The cuttings were taken from healthy mother plant, which is maintained scientifically in the university germplasm collection centre under AICRP-Floriculture of BCKV. Newly growing shoots (tip portion of branches) up to 4-5 inches were taken two times in a year on first day of June and July. After cutting, the cut ends were treated with 0.2% Copper oxy-chloride for 15 minutes followed by treatment with different growth regulator solutions. A cutting bed was prepared with sterilized coarse sand containing up to a depth of 6 inches. Then cut end of cuttings were placed inside sand bed up to a depth of one inch. During investigation micro-environment of the cuttings bed had temperature range of around 25-32^{o}C, light intensity 1500-1750 foot candle and humidity 85-90%. Every day misting with water was provided through forgers in the evening hours. Rooted cuttings were planted in the earthen pots (growing media content with soil and cowdung manure in the ratio of 3:1). The experiment was laid out in Randomized Block

Design with eleven treatments replicated thrice and the statistical analysis of the data was carried out following Fisher's Analysis of Variance Technique as described by Gomez and Gomez (1984). The treatments comprised of different concentrations of IAA (1000 ppm, 2000 ppm and 3000 ppm), IBA (1000 ppm, 2000 ppm and 3000 ppm) and NAA (1000 ppm, 2000 ppm and 3000 ppm),without treatment (control) and Local banded hormone(rootex). Observation was recorded up to three and half months (90 days for rooting and 15 days for plant survivability in earthen pots) with the parameters of percentage of rooting, number of roots per cutting, root length, days required for root initiation and percentage of plant survivability in pots.

RESULTS AND DISCUSSION

The effect of different growth regulators at various concentrations were significant among the treatments for percentage of rooting, number of roots per cutting, root length, days required for root initiation and plant survivability in pots as reflected in Table1 and 2.

earthen pots. Here, IBA(June and July, 11.00 and 9.00) at higher concentration(3000ppm) brought maximum number of roots per cutting and very few number of roots was observed in Control (3.33 and 3.0) in comparison to others treatments. The magnitude of root production in terms of root length of cuttings was markedly influence by NAA of 2000ppm((June and July, 11.67 and 9.33cm) and very stunted growth was noticed in Control (2.2 and 2.0 cm). Overall June month cutting is better than July month cutting in all most all the growth regulators. The earliest emergence of root was noticed (in both the months) at NAA @2000ppm (45.00 and 44.0 days respectively), whereas most delayed root development process was noticed in Control (84.33 and 79.00 days). Plant survivability of newly rooted cuttings in pots (rooted cuttings were transferred in the earthen pots) also differed significantly among the treatment. Highest plant survivability of 95 % (June month cutting) was recorded(fig.2) with NAA @2000ppm followed by NAA @ 3000ppm(94%),IBA@3000ppm(92%) and IAA @2000ppm(90%) and very poor response in this aspect was noticed in control (70%). Same trend was found in July month cutting also, but percentage of success was less in

Table 1. Effects of different growth regulators on rooting behaviour of *Thuja orientalis* L

Treatments	% of root appeared		No. Of roots/cutting		Root length(cm)	
	Cutting taken on 1st day of June	Cutting taken on 1st day of July	Cutting taken on 1st day of June	Cutting taken on 1st day of July	Cutting taken on 1st day of June	Cutting taken on 1st day of July
T_1:IAA @1000ppm	20.00	18.33	4.33	3.33	3.53	3.10
T_2:IAA @2000ppm	58.00	54.67	8.33	6.67	5.47	5.10
T_3:IAA @3000ppm	14.00	12.00	3.33	3.00	4.20	3.93
T_4:IBA @1000ppm	10.00	9.67	2.00	2.00	4.33	4.00
T_5:IBA @2000ppm	42.00	39.33	6.33	5.67	5.33	4.93
T_6:IBA @3000ppm	56.67	51.33	11.00	9.00	7.53	7.00
T_7:NAA @1000ppm	30.67	30.00	2.00	2.00	2.50	2.30
T_8:NAA @2000ppm	49.33	45.33	5.33	4.67	11.67	9.33
T_9:NAA @3000ppm	60.33	53.00	7.33	6.33	8.47	7.00
T10:Control	10.00	9.33	3.33	3.00	2.20	2.00
T_{11}:Rootex	16.33	12.67	5.67	4.33	4.20	3.33
SE(±)	1.26	1.35	0.29	0.3	0.19	0.24
CD at 5%	3.74	4	0.85	0.9	0.56	0.72
CV(%)	6.52	7.65	9.29	11.49	6.03	8.84

Table 2. Effects of different growth regulators on days required for rooting and plant survivability in pots of *Thuja orientalis* L cuttings

Treatments	Days required for root initiation		% of plant survivability in pots	
	Cutting taken on 1st day of June	Cutting taken on 1st day of July	Cutting taken on 1st day of June	Cutting taken on 1st day of July
T_1:IAA @1000ppm	81.00	77.67	70.00	67.33
T_2:IAA @2000ppm	70.00	67.00	90.00	87.33
T_3:IAA @3000ppm	78.67	76.33	75.00	71.33
T_4:IBA @1000ppm	77.67	71.67	50.00	49.67
T_5:IBA @2000ppm	67.67	66.33	69.67	67.67
T_6:IBA @3000ppm	60.00	53.00	92.00	90.00
T_7:NAA @1000ppm	66.33	60.67	60.00	58.33
T_8:NAA @2000ppm	45.00	44.00	95.00	92.00
T_9:NAA @3000ppm	50.00	48.67	94.00	90.67
T10:Control	84.33	79.00	60.00	56.67
T_{11}:Rootex	80.00	78.00	70.00	68.00
SE(±)	1.38	1.18	1.78	1.31
CD at 5%	4.1	3.52	5.27	3.9
CV(%)	3.46	3.12	4.1	3.13

There is also variability of success rate in terms of above cited parameters, when cuttings were taken from June to July month each year. After three months of observation, it had been found that the highest percentage (fig.1) of rooting in cutting bed was obtained with NAA @ 3000ppm (60.33% and 53.30% in June and July month respectively) followed by IAA @ 2000ppm(58% and 54.67%),whereas very low percentage of rooting was found in Control (10.00% and 9.33%). Number of roots per plant is an important factor for plant survivability in

comparision to June month cutting. From above results in Chinese thuja (*Thuja chinensis* L) cuttings, with increase of IBA and NAA doses from 1000 to 3000 ppm proportionately increased percentage of rooting, number of roots per cutting, but in case of IBA beneficial effect was found up to 2000ppm, beyond that negative response was found in both the both of cutting. In case of promotion of root length, growth regulators of IAA, IBA and NAA of 2000, 3000 and 2000 ppm respectively was found very effective. According to Jason *et al*

(1998) rooting percentages and root length were optimized at the har~wood stage with either cutting type treated with 3000,6000 or 9000 ppm (0.3%,0.6% or 0.9%) IBA resulting in >10 roots per cutting.

Andriana *et al* (1996) observed that *Thuja occidentalis* L. fastigiata cuttings is best to be made in spring, on perlit, using stimulators for rooting, conditioned as powder (2000 ppm ANA) or the immersion of the cuttings in a solution (100 ppm ANA for two hours).

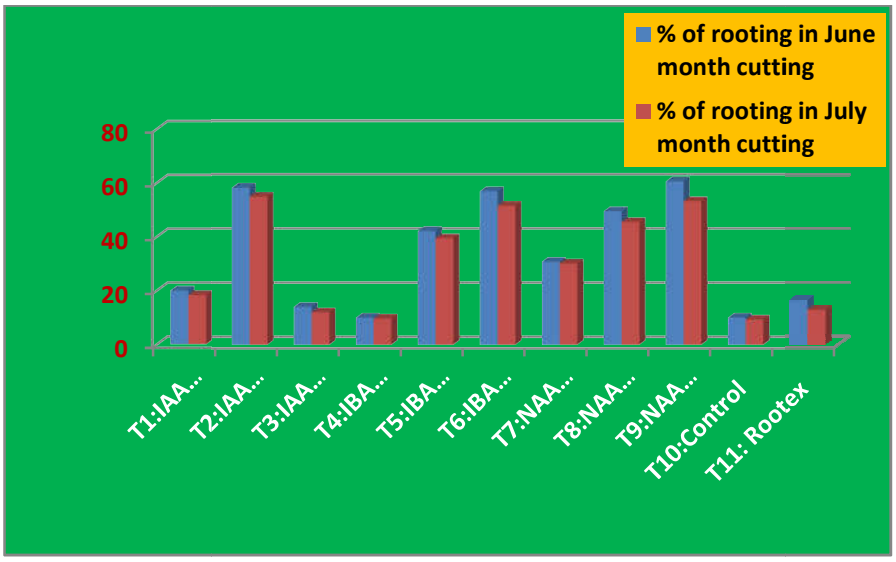

Fig.1. Effects of different growth regulators on rooting behaviour of *Thuja orientalis* L.

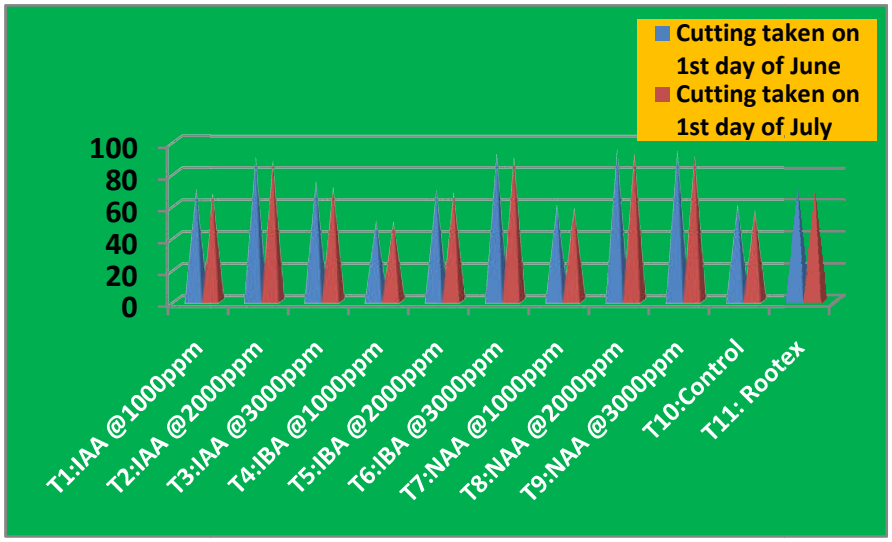

Fig.2. Effects of different growth regulators on plant survivability in pots of *Thuja orientalis* L

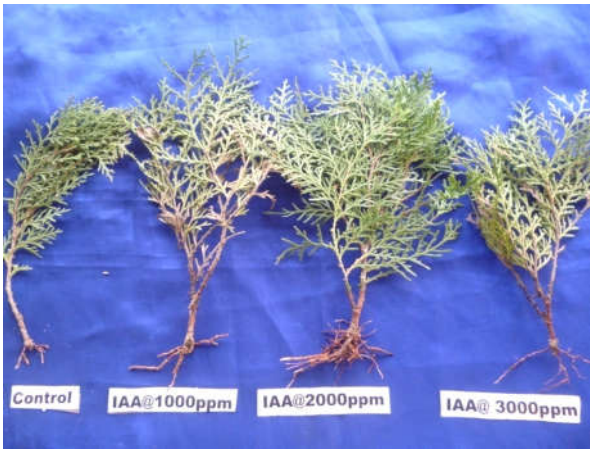

Fig. 3. Effect of different IAA concentration on rooting of Chinese thuja

Fig. 4. Effect of different IBA concentration on rooting of Chinese

Fig. 5. Effect of different NAA concentration on rooting of Chinese thuja

Fig. 6. Effect of rootex branded hormone and without any treatment on rooting of Chinese thuja

All most all the growth regulators, when doses were increase simultaneously to effectively reduce the days required for rooting. Plant survivability in earthen pots containing 3 parts soil and one part cowdung manure of newly rooted cutting, it was observed that with higher concentration from 2000 to3000ppm of NAA, and IBA of highest dose (3000ppm) and IAA of 2000ppm markedly influence in plant survivability up to 28.57-35.74% more than control.

Conclusion

However, the above results it may be concluded that all growth regulators have positive response on all parameters studied related to propagation of Chinese thuja (*Thuja chinensis* L). The most remarkable findings were noted that tip cutting of this plant with NAA @ 2000 to 3000ppm is the best followed by IBA @ 3000ppm and IAA @2000ppm for rapid multiplication of this plant in sub-tropical zone of West Bengal during rainy season.

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