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REVIEW ARTICLE

PERFORMANCE EVALUATION OF DIFFERENT GROWTH REGULATORS ON PROPAGATION OF FIREBUSH (*HAMELIA PATENS JACQ.*) IN SUBTROPICAL ZONE

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ABSTRACT

The present investigation was carried out to study the effect of different growth regulators on propagation of firebush (*Hamelia patens Jacq.*) in subtropical zone of West Bengal under naturally ventilated polyhouse equipped with foggers at Instructional Farm, Jaguli, Bidhan Chandra Krishi Viswavidyalaya, West Bengal. Significant differences among the treatments (IAA @1000ppm, IAA@2000ppm, IAA @3000ppm, IBA @1000ppm, IBA @2000ppm, IBA @3000ppm, NAA @1000ppm, NAA @2000ppm, NAA @3000ppm and Control) on root emergence and proliferation were noticed. After two consecutive years of studied, this plant can successfully propagate by tip cutting with IAA @ 3000ppm followed by IBA @ 3000ppm and NAA @ 1000ppm for rapid multiplication of this plant in sub-tropical zone of West Bengal during rainy season.

INTRODUCTION

Firebush (*Hamelia patens Jacq.*) belonging to family Rubiaceae, is an important handsome, perpetual flowering ornamental evergreen shrub, native to tropical America (Umrao Singh *et al* 1996). It grows well under wide range of climate all over the world in both sun and semishade situation (Bose *et al* 2008). This plant is used for garden decoration in the shrubbery border in home gardening, parks and public gardens or along roadsides, streets, byways and highways. It is also great for landscaping as a single decorative specimen. There is a tremendous demand of this plant due to rapid urbanization. Besides these advantages, this plant is very hardy and easy to maintain in garden. 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. Randhawa and Mukhapadhaya (2000) said that best method of propagation of *Hamelia patens* is cutting or layering, whereas Bose *et al*(2008) reported that this plant can successfully propagated by cutting and Mohy Eldeen Nour Eldaim Elgimabi(2009) observed that in plastic tunnels with water mist gave the best rooting and vegetative growth followed by the cutting under plastic tunnels without mist and winter season cutting gave good growth compared to other seasons.

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MATERIALS AND METHODS

The experiment was carried out under naturally ventilated poly house at Jaguli farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, during 2014-15 and 2015-16. The cuttings were taken from the mother block of germplasm collection under instructional farm of BCKV in the month of 15th Jun. There are two types of cuttings were taken for propagation. First one is new growth of tip portion of the branches up to 4-5 inches (three to four leaves) and second is semi-hardwood branches (3-4 nodes, without leaves) were taken from the same branches. 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°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 ten 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 under

mentioned of different concentrations of IAA, IBA, NAA and without any treatment.

Treatments	Treatments	Treatments
T_1:IAA @1000ppm	T_4:IBA @1000ppm	T_7:NAA @1000ppm
T_2:IAA @2000ppm	T_5:IBA @2000ppm	T_8:NAA @2000ppm
T_3:IAA @3000ppm	T_6:IBA @3000ppm	T_9:NAA @3000ppm
		T_{10}: without any treatment

Observation was recorded up to two and half month (60 days for rooting and 15 days for plant survivability in 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.

Fig. 1. Firebush (*Hamelia patens Jacq.*)

The different concentrations of growth regulators (1000, 2000 and 3000ppm) like IAA, IBA and NAA were prepared in the laboratory of Bidhan Chandra Krishi Viswavidyalaya.

RESULTS AND DISCUSSION

The effect of different growth regulators with various concentration were significantly differ among the treatments on percentage of rooting, number of roots per cutting, root length, days required for root initiation and plant survivability in pots of tip cutting of firebush (*Hamelia patens Jacq.*) reflected in Table 1 and 2. After two months of observation, the highest percentage(fig.2) of rooting in tip cutting was obtained in T_3:IAA @3000ppm(80%), whereas very least percentage of rooting in such type of cuttings(10%) was recorded in T_{10}:Control, but in case of semi-hard wood cutting comparatively reduced the percentage of success in rooting, here higher concentration of IAA brought maximum percentage of rooting @3000ppm (44.67%) and very poor result was noted in T_{10}:Control (7.67%) over others treatments. Number of roots per plant is important factor to plant survivability in pots, here it has been found that both the types of cutting, maximum number of roots produced per cutting in T_6: IBA @3000ppm (Tip cutting: 18.0 and semi hard wood cutting: 11.0) and fewer number of roots found in control (tip cutting:3.33 and semi hard wood cutting:2.67) incomparision to others treatments. Regarding other parameter of root growth like root length, when both the cuttings(tip and semi hard wood cutting) were treated with IBA at 2000ppm to extend maximum root length up to 7.77 and 8.67cm respectively followed by IBA 3000ppm (7.33 and 6.33cm), whereas very stunting growth of roots was recorded in control(0.73 and 1.77cm respectively).

Table 1. Effects of different growth regulators on rooting behaviour of firebush (*Hamelia patens Jacq.*)

Treatments	% of rooting		No. of roots/cutting		Root length(cm)	
	Tip cutting	Semi hard wood cutting	Tip cutting	Semi hard wood cutting	Tip cutting	Semi hard wood cutting
T_1:IAA @1000ppm	48.33	27.67	8.33	4.67	2.57	3.50
T_2:IAA @2000ppm	62.67	32.00	11.33	7.67	3.33	4.33
T_3:IAA @3000ppm	80.00	44.67	13.33	9.00	5.60	5.67
T_4:IBA @1000ppm	33.33	22.33	8.33	4.67	4.40	3.67
T_5:IBA @2000ppm	50.67	30.00	12.67	10.00	7.33	6.33
T_6:IBA @3000ppm	60.00	33.00	18.00	11.00	7.77	8.67
T_7:NAA @1000ppm	62.00	36.67	11.33	7.67	4.57	5.33
T_8:NAA @2000ppm	40.67	21.33	10.67	6.33	4.53	5.33
T_9:NAA @3000ppm	34.00	18.67	10.67	6.27	4.43	5.27
T_{10}:Control	10.00	7.67	3.33	2.67	0.73	1.77
SE(±)	1.61	1.57	0.54	0.67	0.21	0.26
CD at 5%	4.79	4.66	1.61	2.00	0.62	0.78
CV(%)	5.8	9.92	8.52	16.55	7.37	8.52

Table 2. Effects of different growth regulators on days required for rooting and plant survivability in pots of firebush (*Hamelia patens Jacq.*) cuttings

Treatments	Days required for root initiation		% of plant survivability in earthen pots	
	Tip cutting	Semi hard wood cutting	Tip cutting	Semi hard wood cutting
T_1:IAA @1000ppm	40.00	43.67	74.00	71.33
T_2:IAA @2000ppm	36.00	40.67	80.67	80.67
T_3:IAA @3000ppm	27.67	36.33	92.00	90.67
T_4:IBA @1000ppm	36.67	43.00	54.00	50.67
T_5:IBA @2000ppm	34.67	37.67	84.67	84.33
T_6:IBA @3000ppm	30.00	34.67	90.00	90.33
T_7:NAA @1000ppm	30.00	42.00	91.33	90.33
T_8:NAA @2000ppm	35.00	36.67	80.67	79.00
T_9:NAA @3000ppm	36.67	32.67	76.00	75.00
T_{10}:Control	44.00	43.67	50.00	48.67
SE(±)	1.24	1.37	1.38	1.21
CD at 5%	3.69	4.06	4.11	3.6
CV(%)	6.13	6.05	3.10	2.76

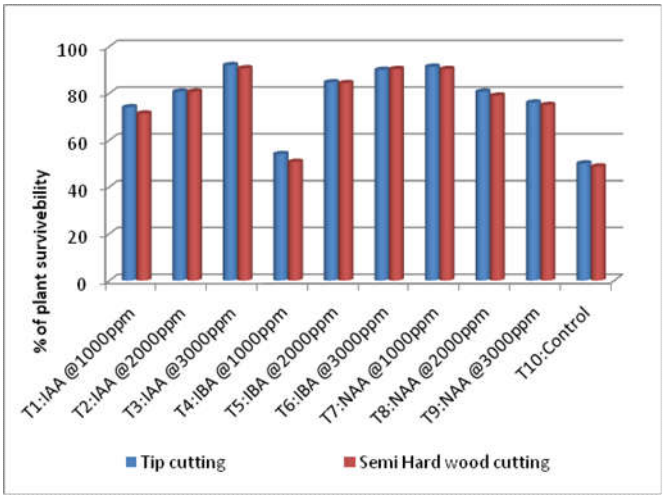

Fig. 2. Effects of different growth regulators on percentage of rooting in cutting of Firebush (Hamelia patens)

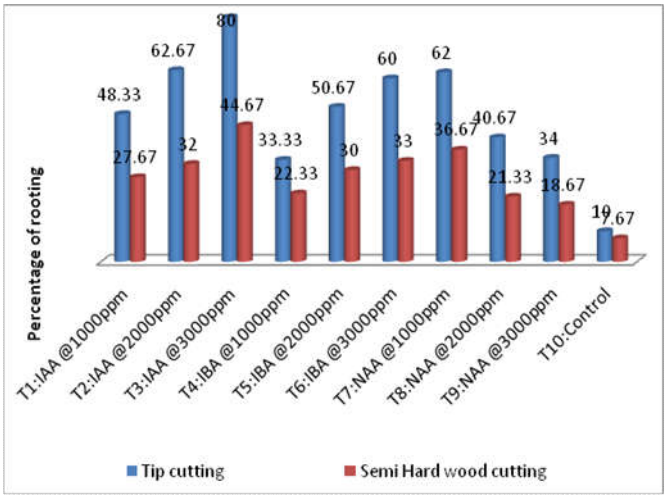

Fig. 3. Effects of differenet growth regulators on percentage of plant survivebility in pots of Firebush (Hamelia patens)

Fig. 4. Effect of different IAA concentration on rooting of firebush (*Hamelia patens* Jacq.)

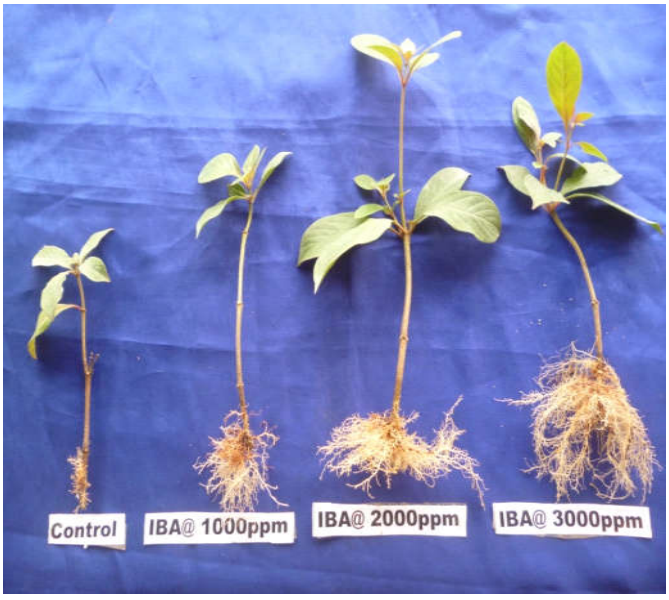

Fig. 5. Effect of different IBA concentration on rooting of firebush (*Hamelia patens* Jacq.)

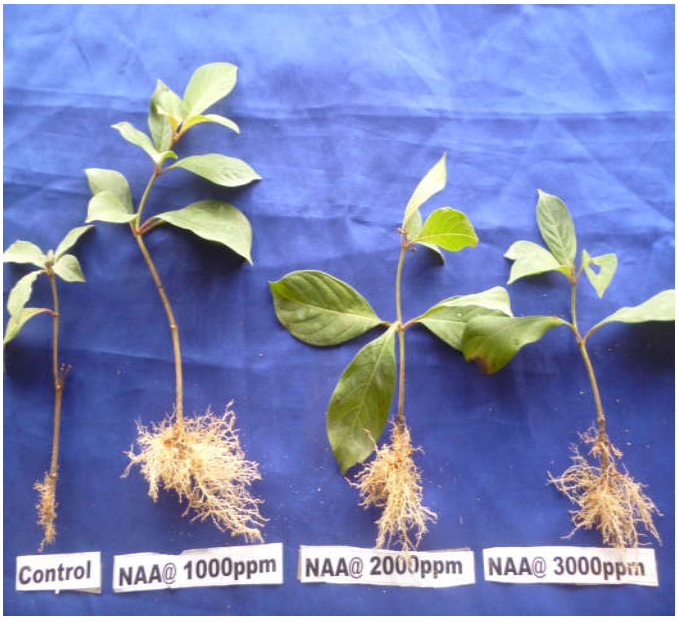

Fig. 6. Effect of different NAA concentration on rooting of firebush

Fig. 7. Effect of different concentrations of growth regulators on rooting of firebush

The early emergence of root initiation take place in tip cuttings recorded in IAA @3000ppm by 27.67 days followed by 30 days in IBA @ 3000ppm and NAA @1000ppm, whereas most delayed root development process was started in Control(44 days) over others treatments. In case of semi hard wood cutting NAA higher concentration of 3000ppm induced to cutting in early rooting (32.67 days) followed by IBA 3000ppm(34.67 days) and roots in cuttings appeared delayed, when cuttings were treated with IAA and IBA at 1000ppm and without treatment.

Regarding new plant survivability in pots, when rooted cuttings were potted in the earthen pots, highest plant survivability of 92% was recorded from cuttings were treated with IAA @3000ppm (fig.3) followed by NAA @ 1000ppm (91.33%) and IBA @ 3000ppm (90%) same magnitude was found in semi hard wood cuttings, but success was comparatively little less. From above results in firebush cuttings, with increase of IAA and IBA doses from 1000 to 3000 ppm proportionately increased percentage of rooting, number of roots per cutting and root length in both types of cutting, but in case of NAA negative response was found with increase of growth regulators concentration from 1000 to 3000 ppm in all most all the cases. IAA and IBA growth regulators of higher concentration (3000ppm) and lower dose of NAA (1000ppm) were effectively reduced the days required for rooting. Saad Farhan Alshammary and Mohamed Ahmed Shahba (2013) reported that hard wood cutting of firebush treated with IBA at 500ppm in 12 hours soaking obtained highest rooting percentage (65.6%), greater number of roots per cutting (30.5), longer roots per cutting (36.6 mm) and Lindsey Fox and Thayne Montague (2004) observed that number of roots and length of longest root for firebush cuttings was greatest for cuttings treated with PGR(0.3% auxin talc formulation). 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 (3000ppm) of IAA, IBA and lower concentration of NAA markedly influence in plant survivability up to 80% more than control.

Conclusion

From the above results it may be concluded that all growth regulators have positive response on all parameters studied related to propagation of *Hamelia patens*. The most remarkable findings were noted that tip cutting of this plant with IAA @ 3000ppm is the best followed by IBA @ 3000ppm and NAA @ 1000ppm for rapid multiplication of this plant in sub-tropical zone of West Bengal during rainy season.

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