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RESEARCH ARTICLE

INFLUENCE OF DIFFERENT GROWTH REGULATORS ON PROPAGATION OF LANTANA (*LANTANA CAMARA DEPRESSA AND LANTANA CAMARA SANGUINEA*) IN SUB-TROPIAL ZONE

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ABSTRACT

The present investigation was carried out to study the effect of different growth regulators on propagation of *Lantana Spp*. in subtropical zone under naturally ventilated polyhouse equipped with foggers at Mandouri farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, 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, (*Lantana camara Depressa and Lantana camara Sanguinea*), can successfully propagated by tip cutting in the month of June with the treatment of NAA @ 3000 ppm for rapid multiplication of this plant in sub-tropical zone. The second best growth regulators may be considered like IAA @2000ppm, IBA@1000ppm and NAA@ 2000ppm for this purpose.

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INTRODUCTION

Lantana (*Lantana camara Depressa and Lantana camara Sanguinea*) belonging to family Verbenaceae, is an important flowering shrub, native to Tropical and Sub-tropical America, grows well under wide range of climate all over the world. There are several name of *Lantan* like Spanish Flag, West Indian Lantana, Lava, Feston Rose plant, Red Sage, Yellow Sage, Wild Sage and Lantana Weed. This plant is used for garden decoration in the shrubbery border in different types of gardens, parks, along roadsides, streets, byways and highways as a graceful outdoor plant, which flower appear all most round the year. It is also great for landscaping as a single decorative specimen or amidst a crowd of low-growing plants in a border. According to Bose *et al* (2008) reported that this plant is suitable for rock garden, ground cover, trailing types in hanging busket. 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 ro oting and unavailability of a suitable combination of variety and growth regulator in the sub-tropical environment.

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Randhawa and Mukhapadhaya (2000) said that best method of propagation of *Lantana spp.* is Air and ground layering and seed. Nagla (2006) reported that *Lantana camara* L. cuttings insertion of basal cuttings in either peat moss or coarse sand rooting media gave the best values.

MATERIALS AND METHODS

The experiment was carried out under naturally ventilated poly house at Mandouri farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, during 2014-15 and 2015-16. The cuttings of two species were taken from the mother block of germplasm collection under instructional farm of BCKV in the month of 15th June. New growth of tip portion of the branches up to 4-5 inches (three to four leaves) were taken for cuttings. 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).

Fig. 1 ***Lantana camara Depressa***

Fig. 2. ***Lantana camara Sanguinea***

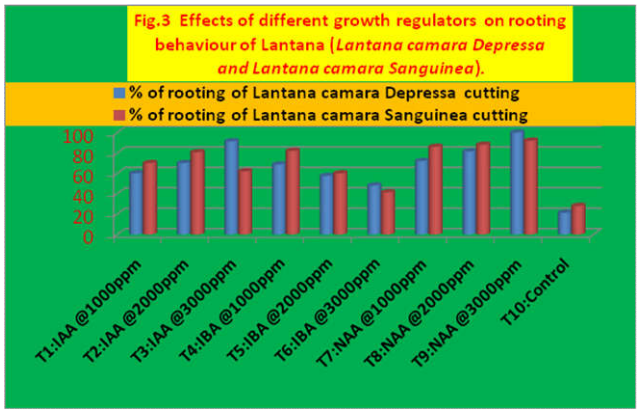
The experiment was laid out in Randomized Block Design with ten treatments replicated thrice and the statistical analysis of the data was carried out following Fisher's Analysis of Variance Technique as described by Gomez and Gomez (1984). The treatments comprised under mentioned of different concentrations of IAA, IBA, NAA and without any treatment.

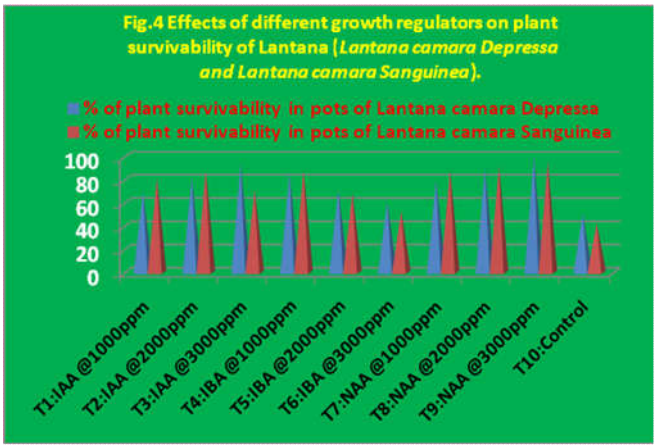
Treatments	Treatments	Treatments
T_1:IAA @1000ppm	T_4:IBA @1000ppm	T_7:NAA @1000ppm
T_2:IAA @2000ppm	T_5:IBA @2000ppm	T_8:NAA @2000ppm
T_3:IAA @3000ppm	T_6:IBA @3000ppm	T_9:NAA @3000ppm
		T_{10}:Control

Observation was recorded up to two and half months (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. 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 Lantana (*Lantana camara Depressa and Lantana camara Sanguinea*) reflected in Table1 and 2. After two months of observation, the highest percentage (fig.3) of rooting in *Lantan camara Depressa* (100%) and *Lantana camara Sanguinea* (92%) in tip cutting were obtained in T_9: NAA @3000ppm, whereas very poor performance was recorded in control(21.33 and 28.00 respectively) over others treatments.





Production of roots in terms of number per plant is an important factor to plant survivability in pots, here it has been found that profuse rooting was found in *Lantan camara Depressa* (17.67), when treated with IAA @ 3000ppm followed by IBA @ 1000ppm(17.00) and NAA @ 3000ppm (16.67), Whereas cutting of *Lantana camara Sanguinea* brought excellent rooting by IAA @ 2000ppm(23.33) followed by IBA @ 3000ppm(21.67) and very worst result was recorded in control(3.67 and 4.33 respectively) incomparision to others treatments. The growth of the roots in term of length was markedly influenced of tip cutting of *Lantana camara Depressa* by IBA @ 1000ppm (8.50cm) and NAA @ 3000ppm (7.87cm), whereas tip cutting *Lantana camara Sanguinea* of new roots were extended maximum up to 11.33 cm, when cuttings were treated with IAA 2000ppm and very stunted growth was noted in control (1.4 and 2.7cm respectively) over others treatments. Root initiation process was started earlier in *Lantana camara Depressa*(20 days), when cutting was treated with IBA @ 1000ppm and NAA @ 3000ppm and same growth regulators also very effectively brought earliness of root initiation in *Lantana camara Sanguinea* by 20 and 18.67 days respectively. Here root development process was delayed in control in both the cases by 42.33 days over others treatments. Regarding new plant survivability in pots, when rooted cuttings were potted in the earthen pots (pot containing 3 parts soil + one part cowdung manure), highest plant survivability of *Lantana camara*

Table 1. Effects of different growth regulators on rooting behaviour of Lantana (*Lantana camara Depressa and Lantana camara Sanguinea*)

Treatments	% of rooting of Lantana cutting		No. Of roots/cutting of Lantana		Root length(cm) of Lantana cutting	
	Depressa	*Sanguinea*	*Depressa*	*Sanguinea*	*Depressa*	*Sanguinea*
T_1:IAA @1000ppm	60.00	70.00	14.00	20.67	3.33	6.33
T_2:IAA @2000ppm	70.00	80.67	16.00	23.33	4.70	11.33
T_3:IAA @3000ppm	91.33	62.00	17.67	15.00	5.33	6.33
T_4:IBA @1000ppm	68.67	82.00	17.00	15.00	8.50	4.23
T_5:IBA @2000ppm	57.33	60.00	13.33	17.00	5.33	6.50
T_6:IBA @3000ppm	48.00	41.33	8.67	21.67	3.63	5.33
T_7:NAA @1000ppm	72.00	86.00	12.00	16.67	2.23	6.67
T_8:NAA @2000ppm	81.33	88.00	13.33	17.67	3.80	6.90
T_9:NAA @3000ppm	100.00	92.00	16.67	20.00	7.87	9.33
T_{10}:Control	21.33	28.00	3.67	4.33	1.40	2.70
SE(±)	1.97	1.38	0.44	0.8	0.22	0.24
CD at 5%	5.84	4.08	1.3	2.37	0.65	0.72
CV(%)	5.08	3.45	5.73	8.08	8.21	6.35

Table 2. Effects of different growth regulators on days required for rooting and plant survivability of Lantana (*Lantana camara Depressa and Lantana camara Sanguinea*).

Treatments	Days required for root initiation of Lantana cuttings		% of plant survivability in pots of Lantana cutting	
	Depressa	*Sanguinea*	*Depressa*	*Sanguinea*
T_1:IAA @1000ppm	35.67	35.00	70.00	81.33
T_2:IAA @2000ppm	30.67	23.67	82.00	88.00
T_3:IAA @3000ppm	25.00	37.67	94.00	71.33
T_4:IBA @1000ppm	20.00	20.00	85.00	88.00
T_5:IBA @2000ppm	24.00	28.00	71.33	68.67
T_6:IBA @3000ppm	26.00	30.67	60.67	52.67
T_7:NAA @1000ppm	32.00	22.00	80.00	88.00
T_8:NAA @2000ppm	27.33	19.33	89.67	92.00
T_9:NAA @3000ppm	20.00	18.67	100.00	96.00
T_{10}:Control	42.33	42.33	50.67	42.00
SE(±)	1.29	1.33	1.26	1.09
CD at 5%	3.83	3.96	3.75	3.24
CV(%)	7.9	8.32	2.79	2.46

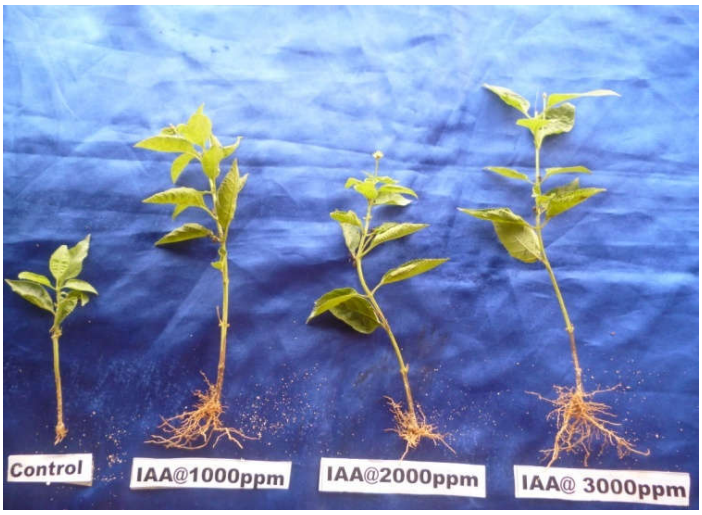


Fig.5 Effect of different IAA concentrations on rooting of *Lantana camara Depressa*

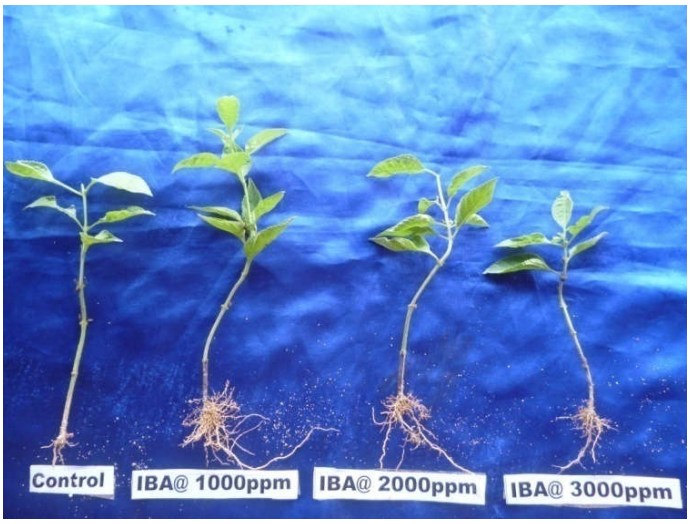


Fig. 6. Effect of different IBA concentrations on rooting of *Lantana camara Depressa*

Depressa (100%) and *Lantana camara Sanguinea* (96.00%) was recorded from cuttings were treated with NAA @3000 over others treatments(Fig.4). From the above results for the propagation of *Lantana camara Depressa*, with increase of IAA and NAA doses from 1000 to 3000 ppm simultaneously increased of percentage of rooting, number of roots/cutting and root length, but reverse effect was found in IBA. In case of *Lantana camara Sanguinea* level of IAA up to 2000 ppm is very much effective in all respect, whereas IBA concentration increased proportionally reduced the percentage of rooting and reverse effect was found in production of roots (Fig.5,6,7,8,9 and 10). Higher concentration of NAA (3000ppm) and lower concentration of IBA(1000ppm) brought early emergence of root within three weeks in *Lantana camara Depressa* and *Lantana camara Sanguinea*. There is an experiment conducted by Yasuhiko Koike (2017) to determine effect of indole 3-butyric acid (IBA) on rooting of Lantana camara L. cuttings were treated with 1, 10, 100 and 1000mg/liter of IBA. Tap water was used as control. Except at 1mg/liter, IBA improved rooting of Lantana camara L.cuttings in all concentrations

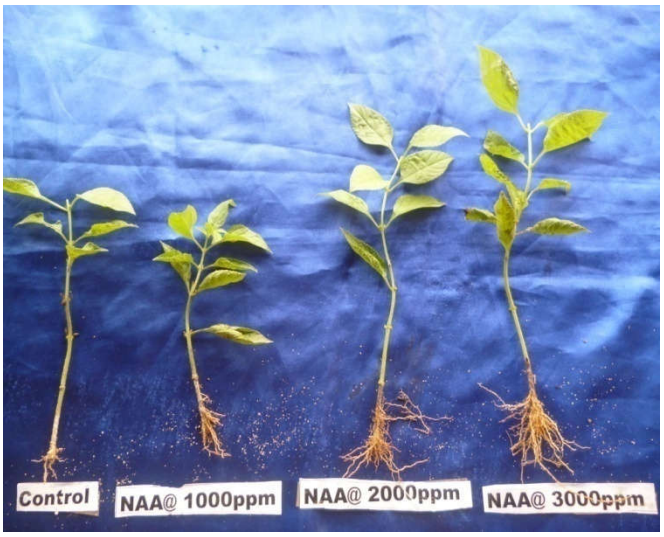


Fig.7 Effect of different NAA concentrations on rooting of *Lantana*

Fig. 8. Effect of different IAA concentrations on rooting of *Lantana camara Sanguinea*

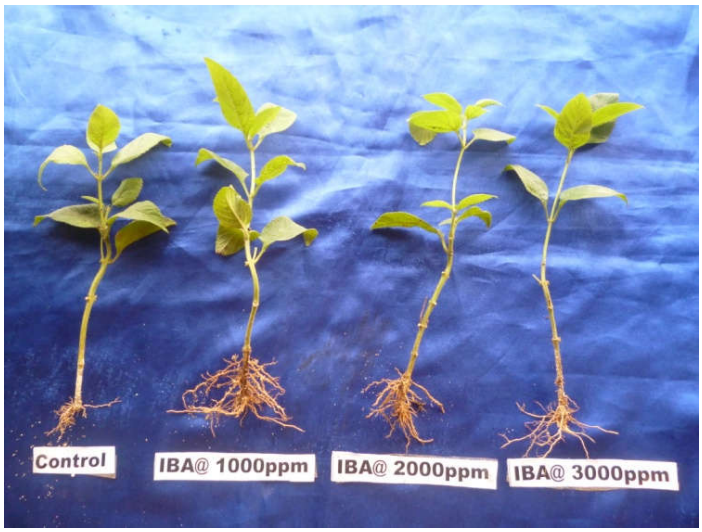


Fig. 9 Effect of different IBA concentrations on rooting of *Lantana camara Sanguinea*

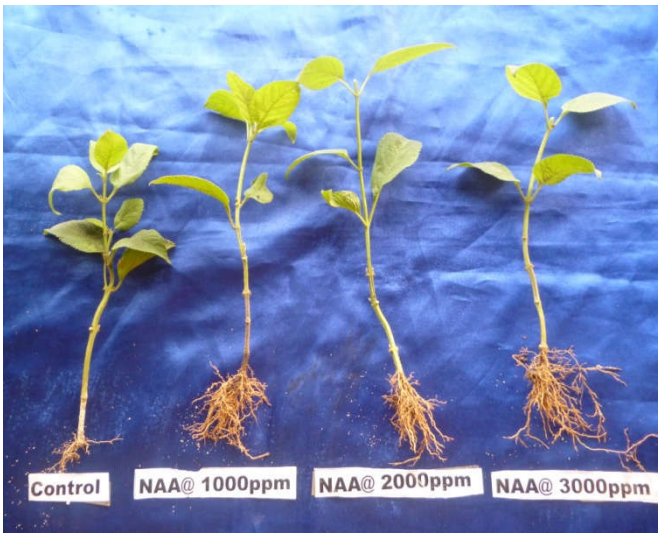


Fig. 10 Effect of different NAA concentrations on rooting of *Lantana camara Sanguinea*

used, however, IBA at 100mg/liter gave the greatest root production rate as indicated by highest rooting percentage, highest primary root number and longest roots, whereas according to Ehsan Naderi Samani (2014) reported that maximum number of roots was obtained in treatment with 0.5mg/lit. of IAA and he also said that the highest number of roots was induced in MS media with 0.25 mg/l IBA. IBA is one of the strong PGRs in culture medium for stimulating and increasing the number of roots (Ehsan Naderi Samani,2016). Regarding plant survivability in earthen pots, up to above 80% may be considered for propagation, in this aspect *Lantana camara Depressa* cuttings performed better in medium to higher concentration of IAA@2000-3000(82-94%), lower concentration of IBA@1000ppm(85%) and NAA @1000-3000ppm(80-100%). Same trend was found in *Lantana camara Sanguinea* also.

Conclusion

It may be concluded that all growth regulators have positive response on all parameters studied related to propagation of *Lantana spp.*

The most remarkable findings were noted that tip cutting in the month of June with NAA @ 3000ppm brought the cuttings maximum rooting and plant survivability in earthen pots, that is (rooting: 368.82%, plant survivability: 97.35% in *Lantana camara Depressa* and rooting: 228.57%, plant survivability: 128.57% in *Lantana camara Sanguinea*) more than control and this growth regulator has beneficial effect for rapid multiplication of this plant in sub-tropical zone. The second best growth regulators may be considered like IAA @2000ppm, IBA@1000ppm and NAA@ 2000ppm for this purpose.

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