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EFFECT OF DIFFERENT GROWTH REGULATORS ON PROPAGATION OF CHINA ROSE (*HIBISCUS ROSA-SINENSIS*) IN SUBTROPICAL ZONE OF WEST BENGAL

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ABSTRACT

The present investigation was carried out to study the effect of different growth regulators on propagation of China rose (*Hibiscus rosa-sinensis*) in subtropical zone of West Bengal under natural ventilated polyhouse at Jaguli farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, during 2014-15 and 2015-16. All parameters were significantly varied among the treatments during investigation (T_1:IAA @1000ppm, T_2:IAA@2000ppm, T_3:IAA @3000ppm, T_4:IBA @1000ppm, T_5:IBA @2000ppm, T_6:IBA @3000ppm, T_7:NAA @1000ppm, T_8:NAA @2000ppm, T_9:NAA @3000ppm, T_{10}:Rootex, T_{11}:Control). After studying of two consecutive years, it has been found that NAA at all concentrations(1000-3000 ppm) may taken for rooting of *China rose,* but higher doses is more beneficial in this aspect during rainy season in subtropical zone, the second best growth regulator of IBA at 3000 ppm may also be considered. Semi hard wood cutting is better than tip cutting for propagation of *China rose*.

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INTRODUCTION

China rose (*Hibiscus rosa-sinensis*) is a very important ornamental flowering shrubs growing wide range of climate all over the world. This plant is used for loose flower production for offering to the God, garden decoration in the shrubbery border and potted plant for home gardening, Sometimes its demand time to time increase during different Puja festivals. However, there is a tremendous demand of this plant due to rapid urbanization in township area in state of West Bengal throughout year, because its flower emerged all most round the year, besides these, this plant is too much hardy and easy to maintenance for gardening. Nursery growers collected different varieties of china roses in various sources and they raised a problem to this university that what are the methods of application for multiplication.

This plant has no capacity to produce seed in this climate, so vegetative propagation is only process of multiplication and cuttings of stem would be the best method of propagation. But types of stem, time of cutting and concentration of growth regulators are the major criteria for obtaining maximum success. However, In view of the above, an experiment was conducted in this university to solve the above cited problem.

Review and Literature

Ahmad Nazarudin (2012) reported that uniconazole was found to be more effective in promoting flowers and increased the root length as compared to the controls in *Hibiscus rosa-sinensis*. The shoots were rooted of *Hibiscus rosa-sinensis* in half-strength modified MS medium containing 2.7 µM NAA observed by Brian Christensen *et al* (2008). *Hibiscus rosa-sinensis* was studied in order to explore the effect of the

cutting rooting, which were treated all the shoot basis 12 hour by different kinds of plant growth regulators, like IAA, 6-BA,2,4-D,IBA etc(water was control).The results showed that the effect differs from different kinds of plant growth regulators on taking root of *Hibiscus rosa-sinensis*, and even different densities of the same plant growth regulators has different influence too. There into, using 400 mg/L of IAA,20 mg/L of 6-BA,2mg/L of 2,4-D,400 mg/L of IBA to handled the shoot basis 12 hour was the most effective method of *Hibiscus rosa-sinensis* to taking root. Supplemental irradiance to the stock plant of *Hibiscus rosa-sinensis* during winter and treated with IBA Rooting was enhanced reported by Wang and Andersen (1989). There are another experiment conducted by Bhattacharjee and Balakrishna (1986) that fifteen centimetre tip cuttings with four leaves treated with IBA and planted in sand under mist give best performance in rooting and survival of rooted cuttings.

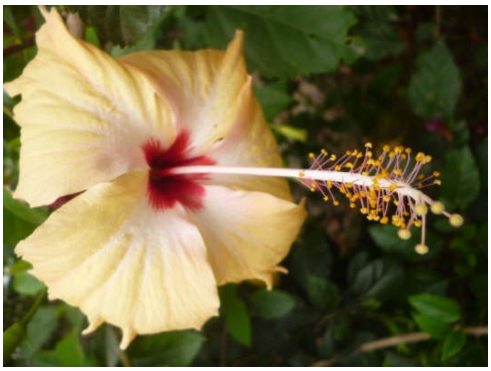

Fig.1 Hibiscus rosa-sinensis

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 June of every year. There are two types of cuttings were taken for propagation. New growth of tip portion of the branches up to 4-5 inches (two to three leaves) and semi-hardwood branches (3-4 nodes, without leaves) were taken for cuttings. After cutting, the cut ends were treated with 0.2% (Cuppor oxy-choloride) for 15 minutes followed by treated with above growth regulators solution. A cutting bed was prepared with only the coarse sand containing up to a depth of 6 inches and it is also treated with above mentioned fungicides. Then cut end of cuttings were placed inside sand bed up to one inches depth. During investigation micro-environment provided to the cuttings with temperature (25-32^{o}C), light intensity (1500-1750 foot candle) and humidity (85-90%). Every day misting with water provided through forgers in the evening hours. The experiment 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 details of treatments comprising under mentioned.

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}:Rootex
		T_{11}:Control

Observation was recorded up to three months from the date of cuttings(two months for rooting in cutting bed and one month 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 as well as semi- hard wood cutting (*Hibiscus rosa-sinensis*) reflected in Table1 and 2. After three months of observation of each year, the highest percentage (fig.1) of rooting in tip and semi hard wood cutting were obtained in T_9: NAA @3000ppm with76% and 96% respectively, whereas very least percentage of rooting in such types of cuttings (32% and 42.67%) recorded in T_3: IAA @3000ppm over others treatment. 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_9 (Tip cutting: 15 and semi hard wood cutting: 15.67) and fewer number of roots found in control (tip cutting:2.00 and semi hard wood cutting: 2.33) incomparision to others treatment.

Regarding root length, when tip cuttings were treated with NAA at 3000ppm to extent maximum root length up to 16 cm and root growth markedly reduced by the IAA @3000ppm(2.0cm) over others treatments. The treatment T_9 also dominated in root production in semi hard wood cutting in terms of length, here we found that healthy milky colour roots were emerged out up to a length of 16.33 cm and very lanky growth of roots were developed in T_3(3cm) over others treatments. The early emergence of root initiation in both the cuttings(Tip and semi-hard wood cuttings) were recorded in T_7:NAA @3000ppm by 29.00 days and 27 days respectively, whereas most delayed root development process was started in T_3: (IAA @3000ppm) followed by T_2: (IAA @2000ppm) over others treatments. There is delayed root development found in tip cuttings as compared to semi hard wood cuttings, when cuttings were treated with different growth regulators. Regarding new plant survivability in pots, when rooted cuttings were potted in the earthen pots, highest plant survivability of 96.33% was recorded from cuttings were treated with NAA @3000ppm (fig.2) followed by NAA @2000ppm (94.00%) and same magnitude was found in this aspect in semi hard wood cuttings (NAA @3000ppm: 98%), very poor response was found in control (54%) in comparison to the others treatments. The all concentration of IAA treated plants was showed lanky growth as compared to NAA treated plants.

From above results in *China rose* cuttings, with increase of IAA doses from 1000 to 3000 ppm simultaneously decreases of percentage of rooting, number of roots/cutting and also reduced root length, but in case of IBA and NAA with same doses of treatments were found opposite direction like higher doses proven maximum outcome rather than lower concentration in both the types of cutting.

Table 1: Effects of different growth regulators on rooting behaviour of China rose (*Hibiscus rosa-sinensis*)

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	48.67	57.67	3.67	4.00	3.33	4.33
T_2:IAA @2000ppm	36.67	45.67	3.00	3.67	2.33	3.67
T_3:IAA @3000ppm	32.00	42.67	2.67	3.33	2.00	3.00
T_4:IBA @1000ppm	55.00	68.67	8.00	9.33	5.67	6.33
T_5:IBA @2000ppm	60.00	80.00	8.67	10.33	7.67	7.33
T_6:IBA @3000ppm	67.00	87.33	11.00	12.33	11.00	11.67
T_7:NAA @1000ppm	66.00	82.67	8.33	11.00	9.67	10.67
T_8:NAA @2000ppm	70.00	90.00	12.33	13.00	13.67	14.33
T_9:NAA @3000ppm	76.00	96.00	15.00	15.67	16.00	16.33
T_{10}:Rootex	55.33	77.33	5.67	8.00	7.33	8.00
T_{11}:Control	34.00	51.00	2.00	2.33	3.33	4.00
SE(±)	1.68	1.44	0.41	0.43	0.42	0.44
CD at 5%	4.98	4.27	1.23	1.27	1.25	1.3
CV(%)	5.32	3.52	9.83	8.78	9.77	9.28

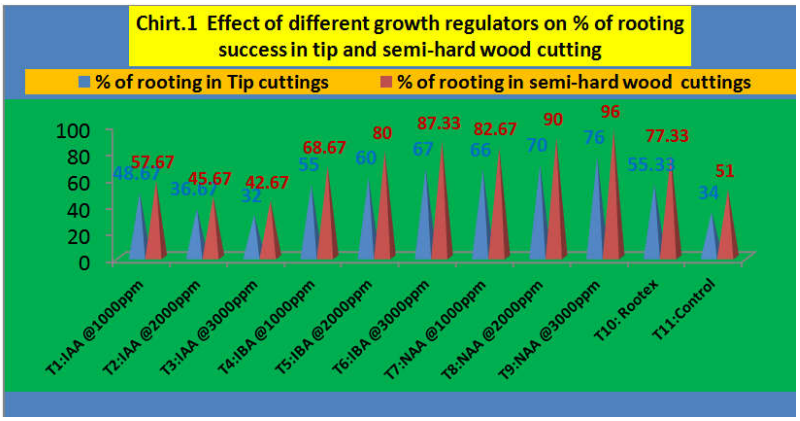

Table 2. Effects of different growth regulators on days required for rooting and plant survivability of China rose (*Hibiscus rosa-sinensis*) in pots

Treatments	Days required for root initiation		% of plant survivability in pots	
	Tip cutting	Semi hard wood cutting	Tip cutting	Semi hard wood cutting
T_1:IAA @1000ppm	46.00	43.33	74.33	76.67
T_2:IAA @2000ppm	53.67	51.33	62.33	71.33
T_3:IAA @3000ppm	55.33	51.67	57.67	59.33
T_4:IBA @1000ppm	42.00	40.00	70.00	77.67
T_5:IBA @2000ppm	37.67	36.00	72.67	82.00
T_6:IBA @3000ppm	34.67	33.00	84.00	90.00
T_7:NAA @1000ppm	32.67	31.33	90.67	92.00
T_8:NAA @2000ppm	31.00	29.00	94.00	94.67
T_9:NAA @3000ppm	29.00	27.00	96.33	98.00
T_{10}:Rootex	45.33	40.00	72.00	79.33
T_{11}:Control	50.00	46.00	50.33	54.00
SE(±)	1.20	1.20	1.88	1.17
CD at 5%	3.57	3.57	5.60	3.48
CV(%)	5.00	5.34	4.35	2.55

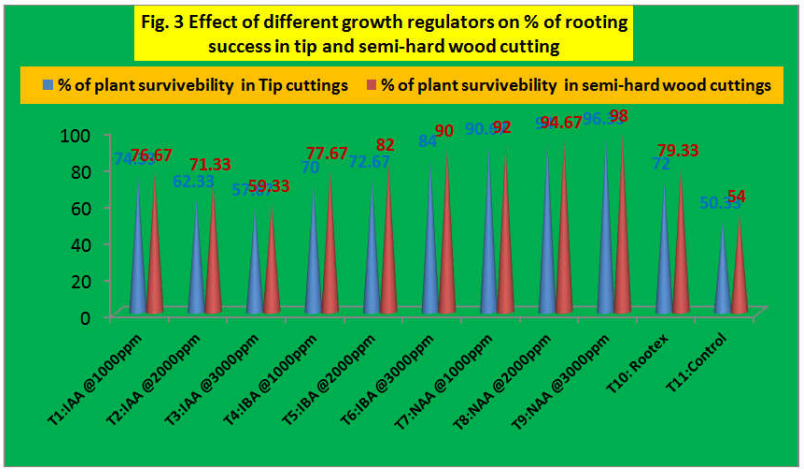

Fig.2 Effect of different IAA concentration on rooting of *Hibiscus rosa-sinensis*

Fig.3 Effect of different IBA concentration on rooting of *Hibiscus rosa-sinensis*

Fig.4 Effect of different NAA concentration on rooting of *Hibiscus rosa-sinensis*

Fig.5 Effect of rootex and control on rooting of *Hibiscus rosa-sinensis*

Photographs showing the effect of growth regulators on propagation of China rose (*Hibiscus rosa-sinensis.L*) in subtropical zone of West Bengal

Here the efficacy of NAA is better than IBA and rootex is better than control, whereas control is better than IAA at higher concentration in all respect. Earliness of root initiation found in *China rose* in semi-hard wood cutting incomparision to cutting taken from terminal branches. NAA growth regulator found accelerate to earliness of root initiation of *China rose* by increase of concentration levels from 1000 to 3000 ppm in all types of cuttings and same direction has been followed by IBA also. The most delayed root induce from cutting was found with used of higher doses of IAA. Same trend was also found in plant survivability in pot, *China rose* cuttings treated with higher concentration (3000ppm) of NAA found better to obtain maximum percentage of plant survivability in pots in both the cuttings that is 91.39 and 81.48% more than control. The IAA treated cuttings were very poor performance in plant survivability in pots.

Summery and Conclusion

However, from the above results and discussion, NAA at all concentrations(1000 to 3000 ppm) may be taken for rooting of *China rose* towards multiplication as production of quality planting materials during rainy season in subtropical zone, the second best growth regulator may be considered of IBA at 3000 ppm for this purpose. Semi hard wood cutting is better than tip cutting for propagation of *China rose*.

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