Original Research Article

Effect of IBA and NAA on rooting of stem cutting in dragon fruit [*Hylocereus undatus* (Haworth) Britton & Rose].

Abstract

Dragon fruit (*Hylocereus undatus* (**Haworth**) **Britton & Rose**) is promisingly a new and exotic crop, India has great potential for its cultivation in semiarid tracts. It can be propagated either sexually or asexually by stem cuttings. The sexually propagated seedlings will take 3 or more years for bearing than that of propagated through stem cuttings. The rootings in cuttings of some species occurs without exogenous auxins treatment, but majority do not root easily. An investigation was carried out to study the effect of IBA, NAA and their combinations on rootings in stem cuttings of Dragon fruit at the Department of Horticulture, BBAU, Lucknow during the year 2019-20, in order to standardize the type and concentration of growth regulators for rooting and success rate in stem cuttings. The experiment was laid out by following randomized block design with nine treatments and three replications. The stem cuttings of Dragon fruit treated with IBA, NAA and their combinations result reveals that, length of longest root (21.33 cm), average number of roots per cutting (41.76), diameter of the root cutting (1.38 mm), fresh weight of root cutting (2.22 g) and dry weight of root cutting (0.59 g) was recorded maximum in cutting treated with IBA 4000 ppm. This was probably because of simulative actions of exogenous auxin (IBA) in the formation of new root tips in stem cuttings.

Keywords: - Dragon fruit, rooting, stem cutting, auxins

1. Introduction

Dragon fruit [*Hylocereus undatus L.* (Haworth) Britton & Rose] is a perennial climbing cactus, belongs to the family Cactaceae and chromosome is 22. It is one of the newly introduced exotic fruit crop in India. The origin of Dragon fruit is tropical and subtropical forest regions of Mexico and Central South America **(Mizrahi and Nerd, 1996).** It has received worldwide recognition, as an ornamental plant and as a fruit crop. It is a perennial and fast-growing climber; it needs vertical support to grow. The stem is succulent vine, having many branched segments. Each segment has three-five wavy wings and one to three spines or sometimes spineless. Dragon fruit stem sections form aerial roots which adhere to the support to climb and keep the plant erect. Dragon fruit also possess medicinal properties especially the red-fleshed varieties are rich in anti-oxidants. Regular consumption of fresh

dragon fruit greatly controls the asthma, cough, cholesterol, high blood pressure, helps with stomach disorders, good for heart health, helps in preventing cancer, prevents congenital glaucoma, boosts immune power, reduce arthritis pain, good for pregnant women, prevent srenal bone disease, good for bone health, repairs body cells, helps in improving appetite, good for eye health, boosts brain health, flowers are used in Aromatherapy. Dragon fruit can be propagated either through sexual method by seeds or through asexual method by stem cutting. The crop propagated through seedlings will take 3 to 4 years or more time for bearing than the plants propagated through stem cuttings. The easiest, cheapest and convenient method of vegetative propagation is as it carries all the desirable characters of a mother plant in Dragon fruit. The information on use of IBA, NAA and their combination on rooting of stem cuttings in Dragon fruit is meager. Hence, the experiment is conducted to know the effect of growth regulators and their combinations on rooting of stem cuttings.

2. Materials and Methods

The present investigation was carried out on the Effect of IBA and NAA on rooting of stem cutting in dragon fruit [Hylocereus undatus (Haworth) Britton & Rose]during the year 2019-20 in low cost poly-house at the Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar Rae Bareli Road, Lucknow U.P (India).

The experiment was laid out in Randomized Block Design with Nine treatments and three replications viz., T1-IBA control (dipped in normal water), T2-IBA (2000 ppm), T3- IBA (4000 ppm), T4-NAA (200ppm), T5-NAA (400ppm), T6-IBA (2000ppm) + NAA (200ppm), T7-IBA (2000ppm) + NAA (400ppm), T8- IBA (4000ppm) + NAA (200ppm), T9-IBA (4000ppm) + NAA (400ppm). The cuttings were treated with varied levels of growth regulators as per the treatment and planted in the poly bags filled with Soil, Sand and FYM in 2:1:1 proportion for easy rooting one basal node was buried in the medium. The planted poly bags were kept inside low cost poly house for rooting.

3. Results and Discussion

1. Length of longest root (cm)

The data on the length of longest root per cuttings of Dragon fruit as influenced by different concentration of growth regulators with different combination are furnished in [Table 1] The maximum length of longest root (4.12 cm, 8.97 cm and 21.33 cm) was observed in IBA 4000

ppm and the minimum length of longest root was observed in control (2.65 cm, 5.99 cm and 12.01 cm respectively) at 30, 60 and 90 days after planting. The cuttings treated with IBA at 4000 ppm initiate the formation of longest roots per cuttings could be due to rapid hydrolysis of starch stored in the cuttings into physiologically active sugars, which provide energy through respiratory activity to the root primordia and helps in rapid elongation of the meristematic cells there by initiate the longest roots per cutting. Similar results were reported by Srivastava et al. (2005) in Kiwifruit, Singh et al. (2011) in Lemon, Porghorban et al. (2014) in Olive, Seran and Thiresh (2015) and Rahad et al. (2016) in Dragon fruit.

Table.1. **Effect of growth regulators on length of longest root per cutting in Dragon fruit at different days after planting (DAP)**

Treatments	Experiment details	Length of longest root per cutting		
		30DAP	**60DAP**	**90DAP**
T_1	Control	2.65	5.99	12.01
T_2	IBA@2000 ppm	3.99	8.89	20.93
T_3	IBA@4000 ppm	4.12	8.97	21.33
T_4	NAA@200 ppm	3.20	7.76	17.35
T_5	NAA@400 ppm	3.36	7.98	17.89
T_6	IBA@2000+NAA@200 ppm	3.46	8.25	18.92
T_7	IBA@2000+NAA@400 ppm	3.96	8.01	17.99
T_8	IBA@4000+NAA@200 ppm	3.21	8.26	18.05
T_9	IBA@4000+NAA@400 ppm	3.16	8.19	18.45
S. Em. (±)		**0.09**	**0.21**	**0.49**
C.D @ 5%		**0.27**	**0.65**	**1.47**

2. Average number of roots per cutting

The data on the average number of roots per cuttings of Dragon fruit as influenced by different concentration of growth regulators with different combination are furnished in [Table 2]. a greater number of roots per cutting (10.32, 14.63 and 14.63 respectively) at 30, 60 and 90 days after planting compared to control. This might be due to the presence of the reserved food materials present in the cuttings. Initial internal sugar concentration and their metabolism are important during the early period of rooting process (Denaxa et al., 2001).

Table. 2. Effect of growth regulators on average number of roots per cutting in Dragon fruit at different days after planting (DAP)

Treatments	Experiment details	Average number of roots per cutting		
		30DAP	60DAP	90DAP
T_1	Control	3.12	5.99	17.45
T_2	IBA@2000 ppm	9.92	14.01	40.96
T_3	IBA@4000 ppm	10.32	14.63	41.76
T_4	NAA@200 ppm	4.42	12.10	24.98
T_5	NAA@400 ppm	4.65	12.45	25.12
T_6	IBA@2000+NAA@200 ppm	6.05	12.47	28.99
T_7	IBA@2000+NAA@400 ppm	6.09	12.80	29.03
T_8	IBA@4000+NAA@200 ppm	6.14	12.62	29.07
T_9	IBA@4000+NAA@400 ppm	7.90	13.69	37.50
S. Em. (±)		**0.19**	**0.34**	**0.87**
C.D @ 5%		**0.58**	**1.01**	**2.61**

3. Diameter of roots per cutting (mm)

The data on root diameter of Dragon fruit stem cuttings as influenced by different concentration of growth regulators with different combination are furnished in[Table 3].The highest mean diameter (0.43, 0.72 and 1.38) was observed in the cuttings treated with IBA 4000 ppm and the lowest (0.11, 0.29 and 0.86 at 30, 60 and 90 days after planting) respectively was observed in control. The present findings can be confirmed by Singh and Singh (2005) in Poinsettia, they also reported that IBA has significant effect on root diameter compared to all other growth regulators like Indole acetic acid and Naphthalene acetic acid.

Table. 3. Effect of growth regulators on root diameter of stem cuttings in Dragon fruit at different days after planting (DAP)

Treatments	Experiment details	Root diameter of stem cuttings		
		30DAP	60DAP	90DAP

T_1	Control	0.11	0.29	0.86
T_2	IBA@2000 ppm	0.40	0.68	1.33
T_3	IBA@4000 ppm	0.43	0.72	1.38
T_4	NAA@200 ppm	0.21	0.49	1.16
T_5	NAA@400 ppm	0.23	0.51	1.20
T_6	IBA@2000+NAA@200 ppm	0.27	0.49	1.14
T_7	IBA@2000+NAA@400 ppm	0.25	0.43	1.07
T_8	IBA@4000+NAA@200 ppm	0.28	0.50	1.16
T_9	IBA@4000+NAA@400 ppm	0.26	0.46	1.01
S. Em. (±)		**0.01**	**0.01**	**0.03**
C.D @ 5%		**0.02**	**0.04**	**0.09**

4. Fresh weights of the rootsper cutting (g)

The data on the fresh weight of the roots per cuttings as influenced by different concentration of growth regulators with different combination are differed significantly among the treatments at 30, 60 and 90 days after planting are furnished in [Table 4]. Among the treatments, it was found that the cuttings treated with (T_3) IBA 4000 ppm (2.22 g) showed highest fresh weight and it was found at par with (T_2) 2000 ppm (2.09 g). The least fresh weight was seen in cuttings dipped in tap water (T_1) control (1.44g). The present findings are also in conformity with the results of Singh et al. (2013) in Lemon, Porghorban et al. (2014) in Olive, Seran and Thiresh (2015) and Rahad et al. (2016) in Dragon fruit.

Table. 4. Effect of growth regulators on fresh weight of the root in stem cuttings of Dragon fruit at different days after planting (DAP)

Treatments	**Experiment details**	**Fresh weight of the root in stem cuttings**		
		30DAP	**60DAP**	**90DAP**
T_1	Control	0.11	0.97	1.44

T_2	IBA@2000 ppm	0.36	1.80	2.09
T_3	IBA@4000 ppm	0.39	1.82	2.22
T_4	NAA@200 ppm	0.19	1.52	1.66
T_5	NAA@400 ppm	0.22	1.69	1.85
T_6	IBA@2000+NAA@200 ppm	0.21	1.54	1.69
T_7	IBA@2000+NAA@400 ppm	0.20	1.57	1.62
T_8	IBA@4000+NAA@200 ppm	0.26	1.63	1.75
T_9	IBA@4000+NAA@400 ppm	0.24	1.60	1.69
S. Em.(±)		**.007**	**0.04**	**0.04**
C.D @ 5%		**0.02**	**0.12**	**0.14**

5. Dry weights of the roots (g)

The data on dry weight of roots per cutting as influenced by different concentration of growth regulators with different combination are differed significantly among the treatments at 30, 60 and 90 days after planting are furnished in [Table 5]. The dry weight of the roots per cuttings at 90 days after planting was found highest in the cuttings treated with (T_3) IBA4000ppm (0.59 g) and it was found at par with (T_2) IBA 2000 ppm (0.55 g). The least dry weight was seen in cuttings dipped in tap water (T_1) control (0.31g).The results are in agreement with the earlier findings of Kaur et al. (2002) in Grape, Deb et al. (2009) in Lemon, Saed (2010) in Pomegranate, Galavi et al. (2013) in Grape and Sharad (2014).

Table 5. Effect of growth regulators on dry weight of the root in stem cuttings of Dragon fruit at different days after planting (DAP)

Treatments	**Experiment details**	**Dry weight of the root in stem cuttings**		
		30DAP	**60DAP**	**90DAP**
T_1	Control	0.02	0.19	0.31
T_2	IBA@2000 ppm	0.18	0.37	0.55
T_3	IBA@4000 ppm	0.18	0.42	0.59

T_4	NAA@200 ppm	0.06	0.27	0.36
T_5	NAA@400 ppm	0.08	0.29	0.39
T_6	IBA@2000+NAA@200 ppm	0.07	0.30	0.41
T_7	IBA@2000+NAA@400 ppm	0.05	0.24	0.36
T_8	IBA@4000+NAA@200 ppm	0.10	0.31	0.40
T_9	IBA@4000+NAA@400 ppm	0.08	0.28	0.39
S. Em. (±)		**.003**	**.008**	**0.12**
C.D @ 5%		**.009**	**0.02**	**0.03**

4. Conclusion- The findings of present investigation, torch up our paths in the way to standardize the type and concentrations of growth regulators for rooting and success rate in stem cuttings of Dragon fruit. Among all the treatment, IBA 4000 ppm gave better results with respect to rooting and shooting parameters followed by the treatment, IBA 2000 ppm. Based on these findings, it is recommended that vegetative method of propagation through stem cuttings in Dragon fruit is reliable for commercial production of planting materials, as it is quick and economical method of vegetative propagation.

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