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Effect of growth regulators on rooting and shooting of stem cuttings in dragon fruit [*Hylocereus undatus* (*Haworth*) Britton & rose]

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Abstract
An experiment was to conducted to know the influence of growth regulators IBA, NAA and their combination on rooting of stem cuttings in Dragon fruit [*Hylocereus undatus* (Haworth) Britton & Rose] under low cost polyhouse of the Department of Horticulture, College of Agriculture, UAHS, Shivamogga, during the year 2017- 2018. The experiment was laid out by following Complete Randomized Design with twelve treatments replicated thrice. The stem cuttings of Dragon fruit treated with different plant growth regulators result reveals that, the least number of days taken for root initiation (14.54), the maximum values recorded with respect to percentage of rooting (57.75 %), length of the longest root (23.07 cm), average number of roots per cuttings (46.88), average length of roots per cuttings (12.41 cm), root volume (1.97 cc), root diameter (1.47 mm), fresh weight and dry weight of root (2.28 g and 0.67 g, respectively). The less number of days taken for first sprouting (7.34), sprouting percentage (58.67), number of sprouts per cutting (2.43),number, length of shoot (17.45 cm), diameter of shoot (3.53 mm), maximum fresh and dry weight of shoot (56.66 g and 11.12 g respectively) and maximum to shoot ratio (0.67) was recorded in cutting treated with IBA 7000 ppm.

Keywords: Dragon fruit, rooting, stem cutting, IBA, NAA and their combination

Introduction
Dragon fruit is a perennial climbing cactus, belongs to the family Cactaceae. It is one of the newly introduced exotic fruit crop in India. The origin is tropical and subtropical forest regions of Mexico and Central South America (Mirzahi and Nerd, 1996) [11]. It is commonly called as Pitaya, Strawberry pear, Night blooming cereus, Queen of night, Honorable queen, Cereus triangularis, Jesus in the cradle and Belle of the night (Martin *et al.*, 1987) [10]. It has received worldwide recognition, as an ornamental plant and as a fruit crop. 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, reduces arthritis pain, good for pregnant women, prevents renal 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. The vegetative propagation in Dragon fruit is utmost desirable in order to propagate true-to-type plants. Hence, vegetative methods of propagation *viz.*, stem cuttings is done which is inexpensive, rapid, simple and does not require the particular techniques as in case of other methods. The reports on an investigation on the propagation of Dragon fruit from cuttings and use of growth regulators for better root growth are scanty. Therefore, the study was undertaken on the propagation of Dragon fruit using different growth regulators for rapid multiplication.

Materials & Methods
The experiment was carried out in a low cost polyhouse of the Department of Horticulture, College of Agriculture, UAHS, Shivamogga, during 2017-18. The experiment was laid out in a complete randomized design with 12 treatments replicated thrice consisting of growth regulators IBA, NAA and their different combinations (T_1- IBA 5000 ppm, T_2- IBA 6000 ppm, T_3-IBA 7000 ppm, T_4- NAA 100 ppm, T_5- NAA 200 ppm, T_6- IBA 5000 ppm+NAA 100 ppm, T_7- IBA 5000 ppm+NAA 200 ppm, T_8- IBA 6000 ppm+NAA 100 ppm, T_9- IBA 6000 ppm+NAA 200 ppm, T_{10}- IBA 7000 ppm + NAA 100 ppm, T_{11}- IBA 7000 ppm + NAA 200 ppm and T_{12}- control (dipped in distilled water). Cuttings were collected from one year old shoots with 4-5 nodes each.

Length of the cuttings used for planting was ranging from 10-15 cm. The cuttings was treated with growth regulators by quick dip method and for this a required amount of growth regulator was weighed and dissolved in 0.2 N NaOH and then the volume was made up to 1 liter using distilled water and the cutting was dipped in solution for 2 minutes and planted in polybags. After planting cuttings were examined and the following observation were recorded on days taken for root initiation, per cent of cuttings rooted, length of longest root per cutting, average number of roots per cutting, average length of root, root volume, root diameter, fresh and dry weight of root, days taken for first sprouting, per cent sprouting, number of sprouts, length of shoot, diameter of shoot, fresh weight, dry weight of shoot and root to shoot ratio.

Results & Discussion

Significant variation was observed between different treatments of growth regulators for root parameters of Dragon fruit stem cuttings. Earliest rooting initiation (14.54 days) was observed in cutting treated with IBA 7000 ppm while, the untreated cutting recorded maximum days (22.08) for root initiation. This may be due to the exogenous application of auxin which breaks starch into simple sugars. This is needed to a greater extent for the production of new cells and increased respiratory activity in the regeneration of tissue at the time of initiation of new primordial, the results are in conformity with Nanda, (1975) [12]. The percentage (57.75) of rooted cuttings was significantly highest when the stem cuttings were treated with IBA 7000 ppm and lowest rooting percentage (34.36) was recorded in control. This might also be due to the fact that optimum concentration of IBA leads to mobilization and utilization stored of carbohydrates and nitrogen fraction with the presence of co-factor at the wound site, which may have helped in better root initiation. Similar results were reported by Karimi *et al.* (2012) [8] in Pomegranate. The maximum length of longest root was observed in the treatment IBA 7000 ppm (23.07 cm) and minimum length of the longest root was recorded in control (12.06 cm). This could be due to rapid hydrolysis of polysaccharides stored in cuttings in to physiologically active sugars, which provide energy through respiratory activity which helps in rapid elongation of meristematic tissues there by initiate longest roots. Similar results were reported by Srivastava *et al.* (2005) [20] in Kiwifruit. The maximum number of roots (46.88) was observed in IBA 7000 ppm and the minimum number of roots (17.87) was observed in control this may be due to increase in carbohydrate and metabolic activities. This result is accordance with the findings of Ghosh *et al.* (1988) [6] in Pomegranate and Patel *et al*. (2017) [13] in Fig. Maximum length of root (12.41 cm) was observed in cutting treated with IBA 7000 ppm respectively. While, the minimum length of the root (5.62 cm) was recorded in control. It might be due to an auxin application has been found to enhance the histological features like the formation of callus, tissue and differentiation of vascular tissue. Jadav (2007) [7] reported that early initiation of roots at higher concentrations of IBA may be due to more utilization of the nutrients. Similar result was reported by Abdulqader *et al.* (2017) [1] in Olive and Akram *et al*. (2017) [2] in Guava. Maximum root volume (1.97 cc) was recorded in IBA 7000 ppm and the minimum (1.34 cc) root volume was observed in control. This might be due to the greater portion of available photosynthates used in root growth and development resulted in higher root volume. Similar results are in accordance with Shashidhar (2014) [16] in litchi. The highest mean diameter of the root was observed in IBA 7000 ppm (1.47 mm), while minimum was observed in control (0.87 mm). This might be due to IBA has significant effect on root diameter compared to all other growth regulators. The present findings are in conformity with Singh and Singh (2005) [17] in Poinsettia. Maximum fresh weight of root (2.28 g) was recorded in IBA 7000 ppm and the minimum fresh weight of roots (1.45 g) was observed in control. Also maximum dry weight of roots (0.67 g) was recorded in IBA 7000 ppm and minimum dry weight of root (0.32 g) were observed in control. This might be due to the cuttings treated with plant growth regulators help in the better mobilization and translocation downward of primary metabolites for better root formation and nutrient uptake. Similar results were reported by Kaur and Kaur (2017) [9] in fig and Galavi *et al.* (2013) [5] in grape.

The date on shoot parameters showed significant differences among different treatments the cuttings treated with IBA 7000 ppm taken minimum number of days for sprouting (14.54) and maximum number of days taken was observed in control (22.08). This might be due to the fact that auxins are known to induce stimulus for regeneration of roots by promotion of hydrolysis, mobilization and utilization of nutritional reserves. Similar findings were reported by Swetha (2005) [21] in lavender. While maximum per cent of sprout was recorded in IBA 7000 ppm (33.36) and minimum was observed in control (13.35). This might be due to the presence of endogenous auxins in cuttings might have brought early breakage of bud dormancy and caused in early bud sprouting. Similar investigation was noticed by Singh (2017) [19] in pomegranate. The maximum number of sprouts per cutting (2.43) was observed in IBA 7000 ppm and the minimum number of sprouts per cutting (1.41) was observed in control. This might be due to the enhancement of physiological activities in the cuttings. Similar result was reported by Baghel *et al* (2016) [3] in Guava. Maximum shoot length (17.45 cm) and diameter of shoot (3.43 mm) was observed in IBA 7000 ppm of IBA while, minimum shoot length (2.93 cm) and minimum diameter (1.45 mm) was observed in control. This may be due to maximum number of roots with helps in nutrition and water absorption. Chandramouli in (2001) [4] stated that earliness in sprouting, increase in number of sprouts, shoots and sprout length might be due to better utilization of stored carbohydrates, nitrogen and other factors with the aid of growth regulators. Similar result was reported by Singh (2013) [18] in *Citrus limon.*

Table 1: Effect of IBA, NAA and their combination on rooting parameters

Tr. No	Days taken for root initiation	Per cent of rooted cutting	Length of the longest root	Av. number of roots (cm)	Av. length of root (cm)	Root volume (cc)	Root diameter (mm)	Fresh weight of roots (g)	Dry weight of roots (g)
T_1	15.95	54.58	21.13	41.88	12.15	1.84	1.33	2.13	0.59
T_2	15.04	56.48	21.83	43.74	12.26	1.92	1.35	2.19	0.64
T_3	14.54	57.75	23.07	46.88	12.41	1.97	1.47	2.28	0.67
T_4	22.09	40.64	17.20	24.45	8.29	1.56	1.10	1.56	0.34
T_5	21.59	43.50	17.45	25.09	9.23	1.60	1.13	1.63	0.35
T_6	17.85	50.74	18.89	37.86	11.31	1.75	1.24	1.87	0.46
T_7	20.69	44.72	18.27	29.17	9.59	1.64	1.15	1.72	0.37
T_8	17.56	52.28	19.25	40.26	11.72	1.76	1.28	1.96	0.51
T_9	20.53	46.84	18.10	33.51	10.36	1.69	1.18	1.73	0.41
T_{10}	17.33	53.20	19.42	41.15	11.78	1.81	1.30	1.97	0.54
T_{11}	19.34	48.68	18.31	37.23	10.40	1.71	1.21	1.82	0.44
T_{12}	22.08	34.36	12.06	17.87	5.62	1.34	0.87	1.45	0.32
S. Em ±	0.73	1.44	0.61	1.10	0.32	0.02	0.04	0.09	0.02
C.D @ 5 %	2.14	4.20	1,77	3.21	0.93	0.06	0.10	0.25	0.04

Table 2: Effect of IBA, NAA and their combination on shoots parameters

Tr. No	Days taken for first sprouting	Per cent sprouting (%)	No. of sprouts per cutting	Shoot length (cm)	Shoot diameter (mm)	Fresh weight of shoot (g)	Dry weight of shoot (g)	Root to shoot ratio
T_1	8.39	51.76	2.08	15.21	3.47	53.87	10.69	0.59
T_2	7.65	55.45	2.13	15.70	3.51	55.91	11.10	0.63
T_3	7.34	58.67	2.43	17.45	3.53	56.66	11.12	0.67
T_4	12.66	25.55	1.64	7.43	3.22	35.06	8.86	0.37
T_5	12.80	28.74	1.71	8.05	3.26	37.48	9.30	0.40
T_6	10.78	41.32	1.84	12.62	3.38	47.41	9.81	0.48
T_7	12.35	31.45	1.73	8.65	3.32	40.60	9.56	0.42
T_8	10.50	44.88	1.88	13.15	3.41	49.80	10.18	0.52
T_9	11.65	33.14	1.77	9.68	3.34	40.71	8.82	0.43
T_{10}	8.67	49.32	1.94	13.41	3.45	50.38	10.39	0.54
T_{11}	11.15	37.79	1.82	10.65	3.36	43.50	9.60	0.46
T_{12}	16.33	18.25	1.41	2.93	1.45	25.52	6.85	0.20
S. Em ±	0.43	1.16	0.09	0.34	0.10	1.40	0.31	0.01
C.D @ 5 %	1.26	3.39	0.25	0.98	0.30	4.10	0.89	0.04

Maximum fresh weight of shoot (56.66 g) and dry weight of shoot (11.12 g) was recorded in IBA 7000 ppm and minimum fresh weight of shoot (25.52 g) and dry weight of shoot (6.85 g) was observed in control. Data clearly indicated that maximum fresh and dry weight of shoots was associated with IBA 7000 ppm which might have increased the number of shoots resulting in increased higher accumulation of fresh and dry weight in shoots. A similar finding was noticed by Kaur and Kaur (2017) [9] in fig. Minimum root to shoot ratio was recorded in IBA 7000 ppm (0.67) and minimum root to shoot ratio was recorded in control (0.20). This might be due to the resource supply and other experimental factors. The results are in accordance with the findings of Seran and Thiresh [15] (2015) and Rahad *et al.* (2016) [14] in Dragon fruit.

Conclusion

On the basis of results obtained in the present experiment, it can be concluded that among the 12 treatments, IBA 7000 ppm showed comparatively good results with respect to rooting and shooting parameters followed by the IBA 6000 ppm. Based on the findings of the current investigation, it is recommended that vegetative method of propagation through stem cuttings in Dragon Fruit is reliable for commercial plant production as it is quick and economical method of vegetative propagation.

References

1. Abdulqader SM, Abdulrhman AS, Ramazan ZI. Effect of wounding and different concentration of IBA on the rooting and vegetative growth of stem cutting of three olive cultivars. Kufa J Agri. 2017; 2(9):203-225.
2. Akram MT, Qadri RW, Khan I, Bashir M, Jahangir. Clonal multiplication of guava (*Psidium guajava*) through soft wood cuttings using IBA under low-plastic tunnel. Int. J Agri. Biol. 2017; 19(3):417-422.
3. Baghel M, Raut UA, Ramteke V. Effect of IBA concentrations and time of air layering in Guava cv. L-49. Res. J Agri Sci. 2016; 7(1):117-120.
4. Chandramouli H. Influence of growth regulators on the rooting of different types of cuttings in *Bursera penicilliatai* (DC) Engl. M.Sc. Thesis, Univ. Agric. Sci. Bangalore, 2001.
5. Galavi M, Karimian MA, Roholla S, Mousavi. Effects of different auxin (IBA) concentrations and planting-beds on rooting grape cuttings (*Vitis vinifera*). *Annu.* Rev. Res. Biol. 2013; 3(4):517-523.
6. Ghosh D, Bandyopadhyay A, Sen SK. Effect of NAA and IBA on adventitious root formation in stem cuttings of pomegranate under intermittent mist. Indian Agriculturist. 1988; 32(4):239-243.
7. Jadav AS. Studies on propagation of phalsa by cuttings. M.Sc. Agri. Thesis, Univ. Agric. Sci., Dharwad, Karnataka (India), 2007.
8. Karimi H, Mostafa A, Mansouri MZ. The effect of IBA and salicylic acid on rooting and vegetative parameters of pomegranate cuttings. Int. J Agri. Res. Review. 2012; 2:1085-91.

9. Kaur A, Kaur A. Effect of IBA concentrations on success of cuttings of fig cv. Brown turkey. Int. J Sci. Res. 2017; 8(11):1576-1579.
10. Martin FW, Camel CWA, Ruberte RM. Perennial edible fruits of the tropics: an invention. ARS Series: Agriculture Handbook. USDA 0065-4612, 1987, 642.
11. Mirzahi Y, Nerd A. New crops as a possible solution for the troubled Israeli export market. Wanatca Yearbook. 1996; 20:41-51.
12. Nanda KK. Physiology of adventitious root formation. Indian J Pl. physiol. 1975; 18:80-89.
13. Patel HR, Patel MG, Singh S. Effect of different levels of IBA and NAA on rooting of hardwood and semi hardwood cutting in fig. Int. J Agri. Sci. Res. 2017; 7(4):519-523.
14. Rahad MK, Islam MA, Rahim MA, Monira S. Effects of rooting media and varieties on rooting performance of dragon fruit cuttings (*Hylocereus undatus* Haw.). Res. Agric. Livest. Fish. An open Access Peer Reviewed J. 2016; 3(1):67-77.
15. Seran TH. Thiresh A. Root and shoot growth of dragon fruit (*Hylocereus undatus*) stem cutting as influenced by IBA. Agric and Biological Sci. J. 2015; 1(2):27-30.
16. Shashidhar NG. Studies on growth regulators on rooting and success of air layers in litchi (*Litchi chinensis* Sonn.) under hill zone of Karnataka. M. Sc. Thesis, Univ. Agric. Hort. Sci. Shivamogga, Karnataka India, 2014.
17. Singh AK. Singh R. Influence of growth regulating substances on rooting of cuttings of poinsettia cv. Flaming Sphere. Prog. Hort. 2005; 37(1):85-88.
18. Singh KK. Choudhary T. Kumar P. Effect of IBA concentrations on growth and rooting of *Citrus limon* cv. Pant Lemon cuttings. Biol. sci. Agric. Advancement Soc. 2013; 2(3):268-270.
19. Singh KK. Effect of IBA concentrations on the rooting of pomegranate (*Punica granatum* L.) cv. Ganesh hardwood cuttings under mist house condition. International. J Horti. And Flori. 2017; 5(4):318-323.
20. Srivastava K. Biswajit DK. Bhatt KM. Effect of indolebutyric acid and variety on rooting of leafless cutting of kiwifruit under zero energy-humidity chamber. Himalayan Ecol. 2005; 14(1):31-34.
21. Swetha H. Propagation of Indian lavender (*Bursera delpechiana* Poiss.) through cuttings under mist. M.Sc. (Hort.) thesis, Univ. Agric. Sci., Dharwad, Karnataka (India). 2005, 32.