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EFFECT OF PLANT GROWTH REGULATORS ON ROOT DEVELOPMENT OF DRAGON FRUIT CUTTINGS [*HYLOCEREUSUNDATUS L.* (HAWORTH)]

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Abstract– An experiment was to conducted to know the influence of growth regulators NAA and their combination on rooting of stem cuttings in Dragon fruit [*Hylocereus undatus* (Haworth)] which was conducted during 2020-21 at Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow (226025). The experiment was laid out by following Complete Randomized Design with twelve treatments replicated thrice. The stem cuttings of Dragon fruit were treated with different dosesof plant growth regulator NAA. The result reveals that longest length of roots per cutting, average number of roots per cutting, diameter of root per cutting, fresh weight of root per cutting and dry weight of root per cutting was recorded significantly in cuttings treated with NAA @ 200 ppm and NAA @ 175 ppm, respectively.

INTRODUCTION

The family Cactaceae includes the perennial climbing cactus known as dragon fruit. It is one of the more recent exotic fruit crops to be grown in India. According to Mirzahi and Nerd (1996) the origin of Dragon fruit is in the tropical and subtropical forest regions of Mexico and Central South America. According to Martin *et al*. (1987), it is also known as Pitaya, Strawberry Pear, Night Blooming Cereus, Queen of Night, Honorable Queen, Cereus triangularis, Jesus in the Cradle, and Belle of the Night. Both as an ornamental plant and a fruit crop, it has gained attention on a global scale. Health benefits of Dragon fruit As indicated before, Dragon fruit is healthy and nutritious for human health due to its essential nutrients such as vitamins, minerals, complex carbohydrates, dietary fibers and antioxidants Studies show that Dragon fruit promoted the growth of healthy gut bacteria and Betacyanin which serves as a red or purple pigment with anti-oxidative properties (Liaotrakoon, 2013). It is low in calories, zero cholesterol and full of antioxidants; it minimizes cardio-vascular heart problems and maintains blood pressure (Patel and Ishnava, 2019). Dragon fruit flesh is rich in polysaccharides (Xu *et al.,* 2016) and mixed oligosaccharides (Wichienchot *et al.,* 2010); these are acting as stimulating factors for the growth of Lactobacilli and Bifidobacteria. These gastrointestinal microflora are called probiotics and suppress the growth of gastrointestinal pathogens. Dragon fruit is also used as a natural probiotic. Dragon fruit or pitahaya (*Hylocereushylocereus* Subject Category Organism Names see more details spp.) is considered as a heavenly fruit on the earth. It is eaten as fresh or dried fruit, as a vegetable, as a fodder, as a natural colouring agent in various drinks and beverages, as a pectin source. Most importantly, being rich in various nutrients, vitamins (Sonawane, 2017). The pulp is juicy and contains numerous small black seeds. It is also considered as a potential source of micronutrients and antioxidants (To *et al.,* 1999; Mahattanatawee *et al.,* 2006; Lim *et al.,* 2007; Ariffin *et al.*, 2009). The nutritional value of Dragon fruit varies depending

on the species, origin and harvesting time (Liaotrakoon, 2013). Nutritional composition and the phytochemical properties of red Dragon fruit significantly differ due to the influence of the growing environmental conditions (Nurul and Asmah, 2014). Dragon fruit contains significant amounts of minerals such as potassium, phosphorus, sodium and magnesium; higher than those of mangosteen, mango and pineapple (Gunasena *et al.,* 2007; Stintzing *et al.,* 2003; To *et al.,* 1999) and all sources of vitamins (Choo and Yong, 2011). Flowering and fruit setting time significantly affect the quality of fruits, especially on total soluble solids contents (Mallik *et al.*, 2018). Mature Dragon fruits have higher TSS, which is mainly higher in autumn fruits than in summer fruits (Nomura and Yonemoto, 2005). Dragon fruit is a good source of minerals, glucose, fructose, dietary fiber and vitamins (Rao and Md. Farid Hossain *et al. Int. J. Hort. Sci. Technol.* 2021 8(3): 259-269 263 Sasanka, 2015). It is well-known for its rich vitamin C, phosphorus, calcium as well as antioxidant contents (Morton, 1987). The fresh fruit contains 82.5-83.0% moisture, 0.16-0.23% protein, 0.21-0.61% fat, 0.7-0.9% fiber. 100 g of fresh fruit pulp contains 6.3-8.8 mg calcium, 30.2-36.1 mg phosphorous, 0.5-0.61 mg iron and 8-9 mg vitamin C (TFIDRA, 2005). The red flesh is additionally rich in Betalains, meeting the increasing trade interest in antioxidant products and natural food colorant (Perween *et al.,* 2018). It shows the components and minerals contain in 100 g edible Dragon fruits. There are few publications on research into the application of growth regulators for enhanced root growth and the production of Dragon fruit from cuttings. As a result, research was done on how to quickly multiply Dragon fruit by employing various growth regulators.

MATERIALS AND METHODS

The present study was conducted at Botanical Garden, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar, Rae Bareli Road, Lucknow during 2020-21 on dragon fruit plant. The experimental field was situated at $26^0 51^{0\prime}$N latitudes and $80^0\ 51^{0\prime}$ E longitudes and the elevation was 111 m above msl. The soil of the experimental plot was sandy clay loam having the pH of 8.25.

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 NAA was weighed at different doges (50, 75, 100, 125, 150, 175, and 200 ppm) and dissolved in water. After planting cuttings were examined and the following observation were recorded on days taken for length of longest root per cutting, average number of roots per cutting, root diameter, fresh and dry weight of root.

RESULTS AND DISCUSSION

Highest root length per cut at 60, 30 and 90 days after planting were noted in cuttings treated with (T_8) NAA 200 ppm (3.97 cm., 8.97 cm.,17.85 cm) respectively, Fallowed by treated with (T_7) NAA 175 ppm (3.79cm, 7.79 cm, 17.65 cm). While the least length of the longest root was recorded in control (T_1) (2.56cm, 5.49 cm, 12.17 cm). It is supported by Reddy *et al.* (2005) who observed minimum Length of longest root was observed with control in scented geranium cuttings and maximum with IBA at 2000 ppm.the result are in confirming with the findings of it.

The highest average number of roots per dragon fruit cutting at 30, 60, and 90 days after planting was noted in cuttings treated with (T_8) NAA @ 200 ppm (5.43 cm, 13.90 cm and 25.69 cm.), followed by (T_7) NAA 175 ppm (5.19 cm, 13.77 cm and 25.49 cm). During this time, the least average number of roots per cutting was observed in control (T1) (3.43 cm, 5.99 cm and 17.35 cm) respectively. Bajwa *et al.* (1977) found treatment with IBA at a concentration of 100 ppm not only induced more roots per cutting but also the length of the roots. Sharma *et al.* (2002) observed the highest length of root per cutting in Gradenia lucida when treated with 2000 ppm IBA

The data on root diameter of Dragon fruit stem cuttings as effected by different concentration of growth regulators are differed significantly among the treatments at 30, 60 and 90 days after planting are The data revealed that the highest root diameter was seen in cuttings treated with (T_8) NAA 200 ppm (0.26 mm, 0.50 mm, 1.16 mm), and followed by with the treatment (T_7) NAA 175 ppm (0.22 mm, 0.22 mm, 0.48mm, 1.16mm). While, least root diameter of Dragon fruit cuttings was seen in (T_1) control (0.11 mm, 0.29 mm, 0.86 mm) at 30, 60 and 90days respectively days after planting. The Maximum fresh weight of the roots per cuttings was observed in cuttings treated with (T_8) NAA 200 ppm (0.26g, 1.62g, 1.88g) fallowed with treatment (T_7) NAA 175 ppm (0.24g, 1.58g, 1.84g), the least was seen in (T_1)

Table 1. Effect of growth regulators on length per cutting, Avg. number of root per cutting, Root diameter of stem cutting, fresh weight of the root in stem cuttings (g) and Dry weight of the root cuttings (g) stem cuttings in Dragon fruit at different days after planting (DAP)

Treatments	Length of root per cutting (cm)			Avg. number of root per cutting			Root diameter of stem cutting (mm)			Fresh weight of the root in stemcutting (g)			Dry weight of the root cutting (g)		
	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP
T_1	2.56	5.49	12.17	3.43	5.99	17.35	0.11	0.29	0.86	0.12	0.98	1.34	0.02	0.18	0.30
T_2	3.10	6.25	15.37	3.97	11.85	22.35	0.16	0.41	0.98	0.14	1.29	1.62	0.05	0.21	0.31
T_3	3.03	6.57	15.99	4.39	11.98	23.63	0.17	0.43	1.04	0.16	1.32	1.67	0.08	0.23	0.32
T_4	3.47	6.65	16.45	4.47	12.49	24.49	0.18	0.43	1.07	0.18	1.36	1.72	0.10	0.24	0.33
T_5	3.55	7.03	16.85	4.85	12.87	24.75	0.18	0.45	1.09	0.21	1.48	1.74	0.12	0.27	0.36
T_6	3.70	7.39	17.53	5.03	12.98	24.87	0.20	0.46	1.12	0.23	1.56	1.79	0.14	0.29	0.37
T_7	3.79	7.79	17.65	5.19	13.77	25.49	0.22	0.48	1.16	0.24	1.58	1.84	0.16	0.32	0.39
T_8	3.97	8.97	17.85	5.43	13.90	25.69	0.26	0.50	1.16	0.26	1.62	1.88	0.18	0.36	0.40
S. Em. (±)	0.001	0.002	0.003	0.001	0.003	0.046	0.006	0.007	0.004	0.004	0.001	0.005	0.002	0.001	0.001
C.D @ 5%	0.004	0.005	0.008	0.004	0.008	0.142	0.018	0.020	0.014	0.013	0.0031.34	0.016	0.006	0.004	0.004

control (0.12 g, .98g and 1.34g) at 30, 60 and 90 days respectively days after planting. These results were confirmed by Sharma *et al.* (2002) who recorded the highest fresh weight of roots per cuttings of Gardenia lucida when treated with auxin. IBA stimulates root growth (Shofiana *et al.,* 2013). Root growth in the terms of highest dry weight of the roots per cuttings was observed in cuttings treated with (T_8) NAA 200 ppm (0.18g, 0.36g and 0.40g) fallowed with treatment (T_7) NAA 175 ppm (0.16g, 0.328g and 0.39g), the least was seen in (T_1) control (0.02 g, 0.18g and 0.30g) at 30, 60 and 90 days respectively days after planting. Among the different levels of IBA and NAA, maximum dry weight of shoot, i.e. 1.42 and 2.42 g was observed in IBA 4000 ppm at 30 and 60 DAP. It might be due to fact that IBA enhanced development of shoot initials and their further development. These results are in conformity with Chawla *et al.* (2012) in litchi.

CONCLUSION

On the basis of present study, it is concluded that the applications of plant growth regulators have great potential to induce rooting in stem cuttings of Dragon fruit. Among all the treatments, NAA 200 ppm gave better results with respect to rooting and shooting parameters followed by the NAA 175 ppm. Based on the findings of current investigation, 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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