



ISSN Print: 2618-060X
 ISSN Online: 2618-0618
 NAAS Rating (2026): 5.20
 IJRA 2026; 9(10): 544-549
www.agronomyjournals.com
 Received: 03-08-2026
 Accepted: 25-09-2026
 Published: 09-10-2026

Sawant AS

PG Scholar, Department of Horticulture (Fruit Science), College of Agriculture, Latur, (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Bhosale AM

Assistant Professor, Department of Horticulture VNMKV Parbhani, (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Shinde VN

Professor (CAS), Department of Horticulture, College of Agriculture, Latur- 413512 (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

SS Ovhal

PG Scholar, Department of Horticulture (Fruit Science), College of Agriculture, Latur, (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Corresponding Author:

Sawant AS

PG Scholar, Department of Horticulture (Fruit Science), College of Agriculture, Latur, (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Studies on methods of propagation in Dragon fruit cultivars (*Hylocereus undatus*)

Sawant AS¹, Bhosale AM², Shinde VN³, SS Ovhal⁴

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i10g.6843>

ABSTRACT

The present study entitled Studies on methods of propagation in Dragon fruit (*Hylocereus undatus*) was undertaken at the Department of Horticulture VNMKV, Parbhani, during 2025–2026. The study was conducted to study seed germination, seedling growth and survival in red-pulped and white-pulped dragon fruit (*Hylocereus undatus*) under different pre-sowing seed treatments. The experiment followed a factorial randomized block design with two varieties and four seed treatments, with three replications. The treatments comprised GA_3 @ 50 ppm, chilling at 4 °C for 48 h, hot water treatment at 60 °C for 10 min and an untreated control. Forty seeds were used per treatment unit. Observations were recorded on days to first germination, germination percentage, root and shoot growth, seedling growth rate, biomass and survival. White-pulped variety generally recorded better germination and seedling performance. GA_3 @ 50 ppm produced the earliest germination and the highest germination and growth responses among the tested treatments.

Keywords: Dragon fruit, Seed propagation, GA_3 , Chilling, Hot water treatment, Seedling growth

Introduction

The perennial climbing cactus known as dragon fruit (*Hylocereus undatus* Britton & Rose) is a member of the Cactaceae family. It is one of India's recently introduced exotic fruit crops. Pitaya, Strawberry Pear, Night Blooming Cereous, Queen of the Night, and Honorable Queen are some of its common names. Dragon fruit (*Hylocereus undatus*) is a diploid species with $2n = 22$. Dragon fruit originated in tropical and subtropical forest areas of Central South America and Mexico.

It is well-known throughout the world as both an ornamental plant and fruit crop. It grows quickly and is a perennial climber that requires vertical support to develop. The stem is a succulent vine with numerous branches. Every single segment has one to three spines, or occasionally none at all, and three to five wavy wings. The plant is celebrated worldwide for its stunning night blooming flowers.

Dragon fruit is an emerging high-value fruit crop with excellent nutritional, medicinal and economic importance. Due to its adaptability to dry climates, low water requirement and increasing market demand, it has become a promising fruit crop for commercial cultivation in many parts of the world, especially in India.

The Pitaya's stem segments create aerial roots that cling to the support in order to ascend and maintain the plant upright. The fruit has a round shape and is coloured, red, pink, or yellow. The edible portion of fruit is either red or white in colour, containing many tiny black seeds and its skin is studded with green scales.

Rich in calcium, vitamin C, iron and phosphorus. Contains dietary fibre, betalains and polyphenols, especially in red-fleshed varieties. High in antioxidants and low in calories, making it suitable for weight management. Has relatively low sugar and low GI, beneficial for diabetic individuals. Supports digestion, immunity and cardiovascular health and helps reduce oxidative stress.

The plants can withstand both warm and cool temperatures. In their native countries, these crops thrive at temperature between 10°C to 25°C. For healthy plant growth, an average annual rainfall of 500-1500 mm is required. Therefore, it is regarded as a suitable crop for a wide range of climatic conditions.

Materials and method

The experiment was carried out at Department of Horticulture, VNMKV, Parbhani. Geographically it is located in latitude 19°16' North, Longitude: 76°47' East, and an Altitude: 409 m.

A district of Maharashtra is situated in the Marathwada region and forms part of the Deccan Plateau. The climate is generally hot and dry, except during the southwest monsoon season. The elevation ranges from about 375 to 475 m above mean sea level. Summer temperatures may reach 40–42 °C, while winter temperatures decline to around 12–14 °C. The district receives approximately 960–1000 mm annual rainfall, mainly during June to September.

The experiment was laid out in Factorial Randomized Block Design with eight treatment combination and each treatment was replicated three times. Treatment involved two varieties of dragon fruit (red purple variety

and white purple variety i.e. factor A and factor B respectively) combined with GA_3 -50 ppm, Chilling treatment of seed at 4 °C for 48 hours, Hot water treatment of seed at 60 °C for 10 min, Control. Observations were recorded on various growth parameters including Days to first germination (g), Germination percentage (%), Root

length (cm), No. of roots per rooting, Height of seedling (cm), Seedling growth rate (cm /d), Length of shoot (cm), No. of shoots, Dry weight of seedling (g), Survival percentage of seedling (%), Fresh weight of root (g)

Table 1. Treatment combinations

Treatments	Treatment Details
T1	Red purple variety + GA_3 @ 50 ppm
T2	Red purple variety + chilling treatment @ 4°C for 48 hours
T3	Red purple variety + Hot H ₂ O at 60 c for 10 min
T4	Red purple variety control
T5	White purple variety + GA_3 @ 50 ppm
T6	White purple variety + chilling treatment @ 4°C for 48 hours
T7	White purple variety + Hot H ₂ O @ 60 C for 10 min
T8	White purple variety (control)

The statistical analysis of data was done according to standard procedure given by Panse and Sukhatme (1996). Germination percentage

(%), Seedling growth rate, Survival percentage of seedling recorded by following formula.

$$\text{Germination percentage (\%)} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds sown}} \times 100$$

$$\text{Seedling growth rate} = \frac{H_2 - H_1}{t_2 - t_1}$$

Where H_1 and H_2 were seedling height at time t_1 and t_2 respectively.

$$\text{Survival percentage of seedling} = \frac{\text{Number of seedling survived}}{\text{Total number of seedlings}} \times 100$$

Result and discussion

1. Days to first germination (g)

The data presented in Table 2 showed that number of days required for first germination as influenced by varieties, various seed treatments, and their interaction.

The data revealed significant differences among the varieties with respect to days required for first seed germination. The white-pulped variety recorded earlier germination (6.00 days) than the red-pulped variety (6.16 days).

Among the seed treatments, GA_3 @ 50 ppm recorded the minimum days required for first seed germination (4.45 days), followed by chilling treatment at 4 °C for 48 h (5.80 days) and hot water treatment at 60 °C for 10 min (5.90 days). The control required the maximum period (8.33 days).

The interaction effect was significant. The red-pulped variety treated with GA_3 @ 50 ppm recorded the earliest germination (4.20 days), whereas the white-pulped variety under control recorded the maximum days (7.40 days).

The earlier germination with GA_3 treatment may be attributed to enhanced hydrolysis of reserve food materials through activation of hydrolytic enzymes, facilitating water absorption, cell wall loosening and early germination. Similar findings were reported by Gholap *et al.* (2000) [1] in aonla and Ratan *et al.* (2004) [2], Gawade (2008) [3], Palepad *et al.* (2016) [4] and Parmar *et al.* (2016) [5] in custard apple.

2. Germination percentage (%)

The data presented in Table 2 showed that germination percentage of dragon fruit as influenced by varieties, different seed treatments and their interaction.

The white-pulped variety recorded significantly higher seed germination percentage (83.27%) than the red-pulped variety (82.38%).

Among the seed treatments, GA_3 @ 50 ppm recorded the highest germination percentage (89.21%), while the control recorded the lowest (78.80%).

The interaction between varieties and seed treatments was significant. The highest germination percentage (90.13%) was recorded in the red-pulped variety treated with GA_3 @ 50 ppm, whereas the lowest (77.36%) was observed in the white-pulped variety subjected to hot water treatment at 60 °C for 10 minutes.

The variation in germination between varieties may be attributed to inherent genetic differences. The promotive effect of GA_3 may be due to the activation of hydrolytic enzymes such as α -amylase, which converts stored starch into soluble sugars, providing energy for germination. The present findings are in agreement with Gawade (2008) [3], Jadhav *et al.* (2015) [6] in custard apple, Ramteke *et al.* (2015) [7] in papaya, and Palepad *et al.* (2016) [4] and Parmar *et al.* (2016) [5] in custard apple.

3. Root length (cm)

The data presented in Table 2 showed the root length as influenced by varieties, different seed treatments, and their interaction effect.

The white-pulped variety recorded significantly higher root length (3.56 cm) than the red-pulped variety (3.36 cm). This variation may be attributed to genotypic differences in the utilization of stored food reserves and adaptability to prevailing environmental conditions.

Among the seed treatments, the maximum root length (2.90 cm) was recorded with GA_3 @ 50 ppm, followed by hot water treatment at 60 °C for 10 minutes (2.65 cm), while the minimum (2.07 cm) was recorded in the control. The variation may be due to differences in seed coat permeability, water and oxygen uptake, and mobilization of stored food reserves, which support embryo development and root growth.

The interaction between varieties and seed treatments significantly influenced root length. The maximum (3.40 cm) was recorded in white-pulped variety with GA₃ @ 50 ppm, while the minimum (1.45 cm)

was observed in red-pulped variety under control. Similar findings were reported by Ratan *et al.* (2004) [2], Gawade (2008) [3], Ramteke *et al.* (2015) [7] and Palepad *et al.* (2016) [4].

Table 2. Effect of different treatments on Days to first germination, Germination percentage, Number of roots per seedling

Treatment	Days to first germination (d)	Germination percentage (%)	Root length (cm)	Number of roots per seedling.
Varieties (V)				
V ₁	6.16	82.38	1.97	3.36
V ₂	6.07	83.27	3.03	3.56
SEm±	0.006	0.13	0.009	0.011
C.D. at 5%	0.018	0.39	0.029	0.34
Treatments (T)				
T ₁	4.45	89.21	2.90	4.30
T ₂	5.80	81.53	2.40	3.21
T ₃	5.90	81.76	2.65	3.43
T ₄	8.33	78.80	2.07	2.89
SEm±	0.008	0.184	0.01	0.01
C.D. at 5%	0.025	0.564	0.04	0.05
Interaction effect (V × T)				
V ₁ T ₁	4.20	90.13	2.41	5.01
V ₁ T ₂	6.00	80.10	1.88	1.71
V ₁ T ₃	5.20	86.16	2.15	4.01
V ₁ T ₄	9.26	73.13	1.45	2.71
V ₂ T ₁	4.70	88.30	3.40	3.58
V ₂ T ₂	5.60	82.96	2.19	4.71
V ₂ T ₃	6.60	77.36	3.15	2.86
V ₂ T ₄	7.40	88.46	2.68	3.08
General mean	6.12	83.32	2.41	3.45
SEm±	0.012	0.26	0.019	0.025
C.D. at 5%	0.036	0.79	0.057	0.076

4. Number of roots per seedling

The data presented in Table 2 shows the average number of roots per seedling as influenced by varieties, different seed treatments, and their interaction.

The data revealed that the white-pulped variety produced significantly more roots per seedling (3.56) than the red-pulped variety (3.36). This variation may be attributed to inherent genotypic differences and efficient mobilization of reserve food materials towards developing root primordia, promoting root initiation and development. The higher root production may also indicate better adaptability of the white-pulped variety to the prevailing climatic conditions.

Among the seed treatments, GA₃ @ 50 ppm recorded the highest average number of roots per seedling (4.30), while the control recorded the lowest (2.89). The increased root production under GA₃ treatment may be attributed to enhanced hydrolysis and mobilization of reserve food materials, facilitating cell division, elongation and root initiation. Similar findings were reported by Digby and Wanerman (1965) in pea, Dhankhar *et al.* (1996) [8] in aonla and Palepad *et al.* (2016) [4] in custard apple.

5. Height of seedling (cm)

The data presented in Table 3 showed the height of seedling as influenced by varieties, different seed treatments, and their interaction effect.

The data clearly showed that seedlings of the white-pulped variety produced significantly more roots (3.56) than the red-pulped variety (3.36).

Among the seed treatments, GA₃ @ 50 ppm recorded the significantly highest average number of roots per seedling (4.30), compared

with the control (2.89) across both varieties.

The variation between varieties may be attributed to inherent genotypic differences. Efficient mobilization and translocation of reserve food materials towards developing root primordia might have promoted cell division and root initiation, resulting in greater root production. This was supported by earlier germination (6.07 days) and higher germination percentage in the white-pulped variety (Tables 4.1.1 and 4.1.2). Better root production may also indicate greater adaptability to the prevailing climatic conditions.

Among the seed treatments, soaking seeds in GA₃ @ 50 ppm for 24 h resulted in the highest number of roots per seedling. This may be attributed to the stimulatory effect of GA₃ on enzymatic hydrolysis and mobilization of reserve food materials, enhancing their

Table 3. Effect of different seed treatments on Height of Seedling at 30, 60 and 90 days

Treatment	30 Days	60 Days	90 Days
Varieties (V)			
V ₁	3.67	8.15	11.73
V ₂	3.99	8.65	12.64
SEm±	0.003	0.002	0.002
C.D. at 5%	0.008	0.007	0.005
Treatments (T)			
T ₁	4.44	9.76	14.01
T ₂	3.62	7.91	11.75

(continued on next page)

Treatment	30 Days	60 Days	90 Days
T ₃	3.71	8.20	12.09
T ₄	3.56	7.73	10.89
SEm±	0.004	0.003	0.002
C.D. at 5%	0.012	0.010	0.007
Interaction effect (V × T)			
V ₁ T ₁	3.68	8.16	12.22
V ₁ T ₂	3.30	6.83	10.60
V ₁ T ₃	4.80	10.12	14.26
V ₁ T ₄	2.90	7.50	9.854
V ₂ T ₁	5.20	11.36	15.80
V ₂ T ₂	3.95	9.00	12.90
V ₂ T ₃	2.62	6.28	9.920
V ₂ T ₄	4.22	7.96	11.94
General mean	3.83	8.40	12.18
SEm±	0.006	0.005	0.003
C.D. at 5%	0.017	0.015	0.011

availability to developing root primordia and promoting cell division and root initiation. Activation of cambial tissues involved in root initiation may also contribute to increased root production, as reported by Digby and Wanerman (1965) in pea. Similar findings were reported by Dhankhar *et al.* (1996) [8] in aonla and Palepad *et al.* (2016) [4] in custard apple.

6. Seedling growth rate (cm d⁻¹)

The data on mean seedling growth rate as influenced by varieties, seed treatments and their interaction are presented in Table 4. The growth rate increased gradually from 30 to 90 days after seedling emergence. The white-pulped variety recorded significantly higher growth rate (0.11, 0.12 and 0.12 at 30, 60 and 90 days, respectively) than the red-pulped variety.

Among the seed treatments, GA₃ @ 50 ppm recorded the highest seedling growth rate (0.11, 0.11 and 0.12), followed by hot water treatment at 60 °C for 10 minutes (0.09, 0.10 and 0.10), while the control recorded the lowest values (0.07, 0.08 and 0.08) at 30, 60 and 90 days, respectively.

The interaction effect showed that white-pulped variety treated with GA₃ @ 50 ppm recorded the maximum growth rate (0.13, 0.14 and 0.14), whereas red-pulped variety under control recorded the minimum (0.07, 0.06 and 0.06) at 30, 60 and 90 days, respectively. The higher growth rate under GA₃ treatment may be attributed to enhanced cell elongation and growth-promoting activity. Similar findings were reported by Choudhary *et al.* (1981) [9] in Rangpur lime, Gholap *et al.* (2000) [1] in aonla and Gawade (2008) [3] in custard apple.

Table 4. Effect of different seed treatments on Seedling growth rate at 30, 60 and 90 days

Treatment	30 Days	60 Days	90 Days
Varieties (V)			
V ₁	0.071	0.074	0.077
V ₂	0.116	0.12	0.12
SEm±	0	0	0
C.D. at 5%	0.001	0	0
Treatments (T)			
T ₁	0.11	0.11	0.12
T ₂	0.08	0.09	0.09
T ₃	0.09	0.10	0.10
T ₄	0.07	0.08	0.08
SEm±	0	0	0

Treatment	30 Days	60 Days	90 Days
C.D. at 5%	0.001	0	0
Interaction effect (V × T)			
V ₁ T ₁	0.08	0.08	0.09
V ₁ T ₂	0.06	0.07	0.07
V ₁ T ₃	0.07	0.07	0.08
V ₁ T ₄	0.05	0.06	0.06
V ₂ T ₁	0.13	0.14	0.14
V ₂ T ₂	0.10	0.11	0.11
V ₂ T ₃	0.12	0.12	0.13
V ₂ T ₄	0.09	0.09	0.10
General mean	0.08	0.09	0.09
SEm±	0.001	0	0
C.D. at 5%	0.002	0	0

7. Shoot length (cm)

The data pertaining to mean shoot length as influenced by varieties, seed treatments and their interaction are presented in Table 5.

The white-pulped variety recorded significantly higher shoot length (4.21, 8.33 and 12.52 cm) than the red-pulped variety at 30, 60 and 90 days after seedling emergence, respectively.

Among the treatments, GA₃ @ 50 ppm (T₁) recorded the maximum shoot length (4.06, 8.06 and 12.22 cm), followed by hot water treatment (T₃), while the control (T₄) recorded the minimum (3.17, 6.43 and 9.95 cm) at 30, 60 and 90 days, respectively.

The interaction was significant at all observations. The maximum shoot length was recorded in white-pulped variety × GA₃ @ 50 ppm (T₁) (4.61, 9.06 and 13.52 cm), while the minimum was observed in red-pulped variety × control (T₄) (2.49, 5.16 and 8.22 cm).

Higher shoot growth under GA₃ treatment may be attributed to enhanced mobilization of reserve food and stimulation of cell division and elongation. The findings are in conformity with Gholap *et al.* (2000) [1], Gawade (2008) [3], Al-Hayez (2013) and Parmar *et al.* (2016) [5].

Table 5. Effect of different seed treatments on Shoot length at 30, 60 and 90 days

Treatment	30 Days	60 Days	90 Days
Varieties (V)			
V ₁	3.03	6.17	9.60
V ₂	4.21	8.33	12.52
SEm±	0.007	0.002	0.09
C.D. at 5%	0.022	0.005	0.27
Treatments (T)			
T ₁	4.06	8.06	12.22
T ₂	3.60	7.21	10.96
T ₃	3.65	7.31	11.11
T ₄	3.17	6.43	9.95
SEm±	0.010	0.002	0.12
C.D. at 5%	0.031	0.008	0.38
Interaction effect (V × T)			
V ₁ T ₁	3.51	7.06	10.92
V ₁ T ₂	2.92	5.91	9.10
V ₁ T ₃	3.22	6.57	10.16
V ₁ T ₄	2.49	5.16	8.22
V ₂ T ₁	4.61	9.06	13.52
V ₂ T ₂	4.29	8.50	12.82
V ₂ T ₃	4.08	8.50	12.06

(continued on next page)

Treatment	30 Days	60 Days	90 Days
V ₂ T ₄	3.85	7.71	11.68
General mean	3.74	7.30	13.04
SEm±	0.014	0.004	0.18
C.D. at 5%	0.044	0.011	0.55

8. Number of shoots

The data pertaining to the mean number of shoots per seedling as influenced by varieties, seed treatments, and their interaction are presented in Table 6.

Significant variations were observed among varieties, seed treatments, and their interaction. At 90 days after seedling emergence, the white-pulped variety recorded the maximum number of shoots per seedling (3.05) compared with the red-pulped variety (2.43). Among seed treatments, GA₃ @ 50 ppm (T₁) recorded the highest number of shoots (3.16), followed by hot water treatment at 60 °C for 10 min (2.50), while the control (T₄) recorded the minimum (2.11). The interaction was also significant, with white-pulped × GA₃ @ 50 ppm recording the maximum (3.51) and red-pulped × control the minimum (2.34) number of shoots per seedling.

The varietal variation may be attributed to genotypic differences. The higher number of shoots under GA₃ treatment may be due to enhanced hormonal activity, cell division, and shoot development. Similar findings were reported by Gehan *et al.* (2011) in desert date (*Balanites aegyptiaca*).

9. Fresh weight of seedling (g)

The data pertaining to fresh weight per seedling as influenced by varieties, seed treatments and their interaction are presented in Table 6.

The white-pulped variety recorded significantly higher fresh weight (2.85 g) than the red-pulped variety (2.05 g), which may be attributed to genotypic differences and better seedling growth. Among treatments, GA₃ @ 50 ppm recorded the maximum (2.74 g), followed by hot water treatment (2.57 g), while control recorded the minimum (2.10 g).

The interaction was significant, with the maximum fresh weight (3.06 g) in white-pulped × GA₃ @ 50 ppm and the minimum (1.60 g) in

red-pulped × control. The beneficial effect of GA₃ may be due to enhanced mobilization of seed reserves, promoting root and shoot growth. Similar findings were reported by Gurung *et al.* (2014) [10], Ramteke *et al.* (2015) [7], Palepad *et al.* (2016) [4] and Parmar *et al.* (2016) [5].

10. Seedling dry weight (g)

The data pertaining to dry weight per seedling as influenced by varieties, seed treatments and their interaction are presented in Table 6.

Significant differences were observed among the varieties, with white pulped variety recording higher dry weight (0.23 g) than red pulped variety (0.20 g). Among seed treatments, GA₃ @ 50 ppm recorded the highest dry weight (0.32 g), while the control recorded the lowest (0.11 g).

The interaction effect was significant, with the highest dry weight (0.32 g) recorded in red pulped variety treated with GA₃ @ 50 ppm and the lowest (0.11 g) in red pulped variety under control. The higher dry weight with GA₃ may be attributed to early germination, better seedling establishment and enhanced root and shoot development, resulting in greater dry matter accumulation. Similar findings were reported by Choudhary *et al.* (1981) [9], Vasantha *et al.* (2014) [11], Lay *et al.* (2015) [12], Ramteke *et al.* (2015) [7], Palepad *et al.* (2016) [4] and Parmar *et al.* (2016) [5].

11. Seedling survival percentage (%)

The data pertaining to seedling survival percentage as influenced by varieties, seed treatments and their interaction are presented in Table 6.

The white-pulped variety recorded significantly higher survival (90.00%) than the red-pulped variety (87.70%). Among the treatments, GA₃ @ 50 ppm recorded the highest survival (92.43%), followed by hot water treatment (90.60%) and chilling treatment (89.05%), while control recorded the lowest (83.33%).

The interaction was significant, with the highest survival (93.10%) in white-pulped variety × GA₃ @ 50 ppm, followed by red-pulped variety × GA₃ @ 50 ppm (92.76%). The lowest survival (81.90%) was recorded in red-pulped variety × control at 90 days after seedling emergence. Similar findings were reported by Dhaka *et al.* (2009) [13] in lime and Ramteke *et al.* (2015) [7] in papaya.

Table 6. Effect of different seed treatments on Number of shoots, Fresh weight of seedling, Seedling dry weight, Seedling survival percentage.

Treatment	Number of shoots	Fresh weight of seedling (g)	Seedling dry weight (g)	Seedling survival percentage (%)
Varieties (V)				
V ₁	2.43	2.05	0.20	87.70
V ₂	3.05	2.85	0.23	90.0
SEm±	0.009	0.004	0.003	0.11
C.D. at 5%	0.028	0.013	0.008	0.342
Treatments (T)				
T ₁	3.16	2.74	0.32	92.43
T ₂	2.61	2.38	0.19	89.05
T ₃	2.70	2.57	0.25	90.60
T ₄	2.50	2.10	0.11	83.33
SEm±	0.013	0.006	0.007	0.17
C.D. at 5%	0.039	0.018	0.022	0.53
Interaction effect (V × T)				
V ₁ T ₁	2.81	2.43	0.32	92.76
V ₁ T ₂	2.11	1.97	0.15	87.83
V ₁ T ₃	2.49	2.20	0.23	56.30
V ₁ T ₄	2.34	1.60	0.11	81.90
V ₂ T ₁	3.51	3.06	0.31	93.10
V ₂ T ₂	3.11	2.80	0.23	90.26

(continued on next page)

Treatment	Number of shoots	Fresh weight of seedling (g)	Seedling dry weight (g)	Seedling survival percentage (%)
V ₂ T ₃	2.92	2.94	0.28	91.90
V ₂ T ₄	2.66	2.61	0.12	84.76
General mean	2.74	2.45	0.21	84.85
SEm±	0.018	0.008	0.010	0.24
C.D. at 5%	0.056	0.026	0.031	0.75

Conclusion

Based on present investigation entitled “Studies on methods of propagation in Dragon fruit cultivars (*Hylocereus undatus*)” it can be concluded that, seed propagation of dragon fruit revealed significant variation among varieties and seed treatments with respect to germination, seedling growth and survival. The white-pulped variety exhibited better overall performance than the red-pulped variety for most of the seedling growth parameters. Among the seed treatments, GA₃ @ 50 ppm (T₁) recorded superior performance for germination and early seedling establishment, followed by chilling treatment and hot water treatment, while the untreated control generally recorded lower values. The interaction between variety and seed treatment also showed variation in several parameters, with the white-pulped variety and GA₃ @ 50 ppm treatment showing favourable performance for seedling growth and establishment.

Overall, the study demonstrated that pre-sowing treatment of dragon fruit seeds, particularly GA₃ @ 50 ppm, can improve germination, seedling growth and survival under the conditions of the present investigation. The results indicate that seed propagation can be effectively utilized for raising healthy dragon fruit seedlings, although varietal response should be considered when selecting suitable propagation practices.

References

- Gholap SV, Dod VN, Bhuyar SA, Bharad SG. Effect of plant growth regulators on seed germination and seedling growth in aonla (*Phyllanthus emblica* L.) under climatic condition of Akola. *Crop Research*. 2000;20(3):546-48.
- Ratan PB, Reddy YN. Influence of gibberellic acid on custard apple (*Annona squamosa* L.) seed germination and subsequent seedling growth. *Journal of Research ANGRAU*. 2004;32(2):93-95.
- Gawade US. Seed viability, germination and seedling growth studies in custard apple. M.Sc. Thesis. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India; 2008.
- Palepad KB, Bharad SG, Bansode GS, Reshma UR. Seed germination and seedling growth studies in custard apple. *Advances in Life Sciences*. 2016;5(13):5509-12.
- Parmar RK, Patel MJ, Thakkar RM, Tsomu T. Influence of seed priming treatments on germination and seedling vigour of custard apple (*Annona squamosa* L.) cv. Local. *The Bioscan an International Quarterly Journal of Life Sciences*. 2016;11(1):389-93.
- Jadhav AC, Bhagure YL, Raundal RM. Effect of PGR, chemicals and plant extract on seed germination and seedling growth of custard apple (*Annona squamosa*). *Asian Journal of Horticulture*. 2015;10(1):184-86.
- Ramteke V, Paithankar DH, Kamatyanatti M, Baghel MM, Chauhan C, Khichi P. Seed germination and seedling growth of papaya as influenced by GA₃ and potting media. *Journal of Progressive Agriculture*. 2015;6(1):129-33.
- Dhankhar DS, Singh M. Seed germination and seedling growth of aonla (*Phyllanthus emblica* Linn.) as influenced by gibberellic acid and thiourea. *Crop Research*. 1996;12(3):363-66.
- Choudhary BK, Chakrawar VK. Note on the effect of some chemicals on the germination of rangpur lime seeds. *Indian Journal of Agricultural Science*. 1981;51(5):201-03.
- Gurung N, Swamy GSK, Sarkar SK, Ubale NB. Effect of chemicals and growth regulators on germination, vigour and growth of passion fruit (*Passiflora edulis* Sims.). *The Bioscan*. 2014;9(1):155-57.
- Vasantha PT, Vijendrakumar RC, Guruprasad TR, Mahadevamma M, Santhosh KV. *Plant Archives*. 2014;14(1):155-60.
- Lay P, Basvaraju GV, Pashte VV, Gowri M. Studies on effect of Gibberellic acid (GA₃) and Potassium nitrate (KNO₃) on breaking of seed dormancy of papaya (*Carica papaya*) Cv. Surya. *The Ecoscan*. 2015;9(1-2):111-15.
- Dhaka SS, Pal SL. A study on lime (*Citrus aurantifolia*) seed germination as affected by gibberellic acid. *Annals of Horticulture*. 2009;228-29.

How to cite this article: AS S, AM B, VN S, Ovhal S. Studies on methods of propagation in Dragon fruit cultivars (*Hylocereus undatus*). *International Journal of Research in Agronomy*. 2026;9(10):544-549. doi: <https://www.doi.org/10.33545/2618060X.2026.v9.i10g.6843>