



# Effect of Paclobutrazol and GA4+7 on Post-Harvest Storage of Dragon Fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

Dragon fruit undergoes rapid senescence during storage. This study identified the synergistic effect of Paclobutrazol and GA4+7 with different concentrations on the postharvest quality and shelf life of dragon fruits stored at ambient conditions. This study was conducted in completely randomized design. Dragon fruits were treated with different concentration of Paclobutrazol and GA4+7 and stored at ambient temperature for 13 days. Changes in fruit's physiological loss of weight, firmness, total soluble solid, titrable acidity, and ascorbic acid were periodically recorded. The results indicated that the Paclobutrazol treated with 200mg significantly reduced the decrease of physiological loss of weight, firmness, total soluble solids, titrable acidity and ascorbic acid content. The results showed that Paclobutrazol treated with 200mg is the most effective treatment than GA4+7 for improving the postharvest quality and prolong the shelf life of dragon fruits when stored at ambient condition.

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## 1. INTRODUCTION

The dragon fruit (*Hylocereus sp.*) is a perennial and long day plant Jiang et al., [1] and belongs to cactaceae family. Dragon fruit is also known by many other names like Pitaya, Night blooming cereus, Strawberry pear, Belle of the night and Cinderella plant [2]. It originated in tropical & sub-tropical region of Mexico, Central America and Northern South America [3]. Mostly three types of Dragon fruits cultivated in different zones of countries namely *Hylocereus undatus*, *Hylocereus costaricensis* and *Hylocereus megalanthus* according to Hunt, 2006 and Hamidah et al., [4]. According to Harithpriya K. & Jeychandran R., [5] the leading producer of dragon fruit is the Vietnam where it's introduced 100 years ago where it accounts for more than half (51.1%) of global production across an area of 55, 419 hectares. China is the second-largest producer of dragon fruit. According to Wakchaure et al., [6], dragon fruit productivity in India is estimated to be between 8.0 and 10.5 (MT/ha). The top three states in India for dragon fruit production are Gujarat, Karnataka, and Maharashtra, accounting for over 70% of total production. The dragon fruit contains the water (80-90g), Ascorbic acid (4-25mg), Ash (0.4-0.7g), Calcium (6-10mg), Calories (35-50) and Carbohydrates (9-14g) etc. The dragon fruit is beneficial for promoting the healing of wounds and cuts, improving appetite, improving eye sight and aid in weight reduction etc. Rao and Sasanka [7]. In the present experiment two chemicals were used that is Paclobutrazol and GA4+7 for improving the shelf life of dragon fruit. Khader, [8] reported that application of paclobutrazol at the rate of 2000mg and 3000mg per litre of water attained better quality as judged from the total soluble solids, total acidity, ascorbic acid content from harvest to 12 days of storage at ambient conditions. According to Jawandha et al., (2012), applying growth regulators such gibberellin influences the physicochemical characteristics of ber fruits and is known to extend their shelf life. Hence, the present study is conducted on the Effect of Paclobutrazol and GA4+7 on post-harvest storage of dragon fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]"

## 2. MATERIALS AND METHODS

The present experiment entitled that "Effect of Paclobutrazol and GA4+7 on storage of dragon

fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]" was carried out during the period 2022-23 to 2023-24 at Main Experimental Station of Fruit Science orchard and 28-28 fruits of each treatment (7 treatment) and each replication (three replications) was bring from the orchard for analysis of each parameters was done in the PG laboratory of fruit Science, College of Horticulture and Forestry, A.N.D.U.A. & T., Kumarganj, Ayodhya 224229 (UP) at ambient temperature (30-35°C temperature and 70-75% Relative humidity). Paclobutrazol and GA4+7 were applied in the field where Paclobutrazol (Culatr @ 23% a.i.) was applied as soil drench and GA4+7 (GA4+7 @ 98% a.i.) as foliar spray (after sun set) through Randomized Block Design. To determine the weight loss of the fruit during storage, both treated and control fruit were weighed at different sampling intervals of 0, 3, 5, 7, 9, 11 and 13 days after harvesting of fruit. The percentage of weight loss was calculated as the difference between initial fruit weight and the fruit weight at the time of measurement and expressed in percentage.

$$\text{PLW (\%)} = \frac{\text{Initial fruit weight} - \text{weight of fruit on observation day}}{\text{Initial fruit weight}} \times 100$$

Fruit firmness was measured with the help of Penetrometer by using a 5/16 plunger in kgcm<sup>-2</sup>. Total soluble solids of three randomly selected fruits from each replication in each treatment was measured by the using digital hand Refractometer (ATC, 0-32%) and expressed in °Brix. To determine the titrable acidity, 10g known quantity of fruit pulp was macerated, diluted, and filtered through muscling cloth using just a small amount of distilled water. The volume had been raised to 100 ml, after which a 5-ml aliquot was taken and titrated using phenolphthalein indicator against a 0.1 N sodium hydroxide solution. The end point was noted when pink colour appeared and sustained for 15 seconds. The result was expressed in percent.

$$\text{Titrable Acidity \%} = \frac{\text{Titre value} \times \text{Normality of alkali} \times 64 \times \text{Volume made up}}{\text{Aliquot taken} \times \text{Weight of Sample} \times 1000} \times 100$$

Ascorbic acid content of the fruits was measured by volumetric method using 2, 6- dichlorophenol indophenols dye according to the procedure suggested by Rangana (1977) and expressed in mg/100g pulp.

Vitamin - C (mg/100g) = Titre value × Dye factor × Volume made up / Weight of aliquot taken × weight of the sample taken

## 2.1 Statistical Analysis

The data recorded from the experiment were analyzed by SAS 9.1 statistical software for each treatment.

## 3. RESULTS AND DISCUSSION

### 3.1 Physiological Loss of Weight (%)

A perusal data of Table 1 revealed that physiological loss in weight increased with the increases day of the storage during both the years (2022-23 and 2023-24). Minimum physiological loss of weight (1.36% and 1.39%) was observed in treatment T2 (Paclobutrazol @ 200mg) and T5 (GA<sub>4+7</sub> @ 200mg) respectively, on the 3<sup>rd</sup> day of storage. However, maximum physiological loss of weight (14.99%) was observed in treatment T1 (control) followed by the T7 (GA<sub>4+7</sub> @ 600mg) 14.28% and T4 (Paclobutrazol @ 600mg) 13.54% respectively, on 11<sup>th</sup> day of storage during the year 2022-23. Similarly, during 2023-24 minimum physiological loss of weight (1.35% and 1.36%) was observed in treatment T2 (Paclobutrazol @ 200mg) and T5 (GA<sub>4+7</sub> @ 200mg) respectively, on the 3<sup>rd</sup> day of storage. However, maximum physiological loss of weight (14.18%) was observed in treatment T1 (control) followed by the T7 (GA<sub>4+7</sub> @ 600mg) 13.47% and T6 (GA<sub>4+7</sub> @ 400mg) 12.81% respectively, on 11<sup>th</sup> day of storage during the year 2023-24. Patel et al., [9] observed that paclobutrazol applied at the rate of 100mg per litre significantly increased the shelf life (days) in mango. Purohit et al., [10] reported that physiological loss in weight (PLW) and rotting were lowest in fruits treated with PBZ during twelve days of storage.

### 3.2 Changes in Firmness

A perusal data of Table 2 revealed that firmness decreased with the increases day of the storage during both the years (2022-23 and 2023-24). On first day of storage, maximum firmness (5.60) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5 (GA<sub>4+7</sub> @ 200mg) 5.53 while, minimum firmness (4.79) was observed in the treatment T1 (control). However, minimum firmness (3.07) was observed on 11<sup>th</sup> day of storage followed by the T5 (GA<sub>4+7</sub> @ 200mg) 3.55 during the year 2022-23. Similarly,

during 2023-24 on first day of storage, maximum firmness (5.62) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5 (GA<sub>4+7</sub> @ 200mg) 5.55 while, minimum firmness (4.84) was observed in the treatment T1 (control). However, minimum firmness (3.01) was observed in the treatment T1 (control) on 11<sup>th</sup> day of the storage followed by the T5 (GA<sub>4+7</sub> @ 200mg) 3.62 on 13<sup>th</sup> day of the storage. Bill et al., (2012) observed that PBZ decreased fruit firmness and increased the percentage soft fruit at the end of the shelf-life period in persimmon.

### 3.3 Changes in TSS (°Brix)

A perusal data of Table 3 revealed that total soluble solids increased with the increases day of the storage up to 7<sup>th</sup> day after that decreased during both the years (2022-23 and 2023-24). Maximum total soluble solids (16.05°B and 15.97°B) were observed in the treatment T2 (Paclobutrazol @ 200mg) and T5 (GA<sub>4+7</sub> @ 200mg) respectively, on 7<sup>th</sup> day of the storage. However, minimum total soluble solids (11.92°B) was observed in the treatment T1 (control) on 11<sup>th</sup> day of storage during the year 2022-23. Similarly, during 2023-24 maximum total soluble solids (16.29°B and 16.09°B) was observed in treatment T2 (Paclobutrazol @ 200mg) and T5 (GA<sub>4+7</sub> @ 200mg) respectively, on the 7<sup>th</sup> day of storage. However, minimum total soluble solids (12.07°B) was observed in treatment T1 (control) on 11<sup>th</sup> day of storage. Khader, [8] reported that application of paclobutrazol at the rate of 2000mg and 3000mg per litre of water attained better quality as judged from the total soluble solids from harvest to 12 days of storage at ambient conditions.

### 3.4 Changes in Titrable Acidity (%)

A perusal data of Table 4 revealed that titrable acidity decreased with the increases day of the storage during both the years (2022-23 and 2023-24). On 1<sup>st</sup> day of storage minimum titrable acidity (0.219%) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5 (GA<sub>4+7</sub> @ 200mg) 0.221% while, maximum titrable acidity (0.255%) was observed in the treatment T1 (control). However, minimum titrable acidity (0.062%) was observed in the treatment T1 (control) on 11<sup>th</sup> day of storage followed by the T5 (GA<sub>4+7</sub> @ 200mg) on 13<sup>th</sup> day of storage during 2022-23 year. Similarly, during 2023-24 on first day of storage minimum acidity (0.207%) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5

**Table 1. Effect of paclobutrazol and GA4+7 on physiological losses in weight of dragon fruit during storage at ambient condition**

Treatment	2022-23								2023-24								
	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean	Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean
T1(control)	0	3.31	5.74	8.29	11.11	14.99	*	8.68a	T1(control)	0	3.29	5.78	8.36	11.16	14.18	*	8.55a
T2(PBZ@ 200mg)	0	1.36	3.16	5.26	7.42	10.22	11.98	6.56d	T2(PBZ@ 200mg)	0	1.35	3.13	5.19	7.34	9.58	11.09	6.28d
T3(PBZ@ 400mg)	0	1.76	3.91	6.26	8.76	11.74	*	6.48f	T3(PBZ@ 400mg)	0	2.07	4.17	6.53	9.06	11.74	*	6.71e
T4(PBZ@ 600mg)	0	2.67	5.05	7.56	10.27	13.54	*	7.81d	T4(PBZ@ 600mg)	0	1.79	3.81	6.11	8.51	11.12	*	6.26f
T5(GA4+7@ 200mg)	0	1.39	3.34	5.59	7.90	11.05	12.27	6.92c	T5(GA4+7@ 200mg)	0	1.36	2.28	5.46	7.73	10.23	11.71	6.46c
T6(GA4+7@ 400mg)	0	2.09	4.27	6.70	9.32	12.50	*	6.97e	T6(GA4+7@ 400mg)	0	2.70	4.89	7.35	10.01	12.81	*	7.55d
T7(GA4+7@ 600mg)	0	3.10	5.51	8.18	10.96	14.28	*	8.40b	T7(GA4+7@ 600mg)	0	3.06	5.36	7.89	10.58	13.47	*	8.07b
<b>Mean</b>	0	2.24e	4.42d	6.83c	9.39b	12.61a	12.12f		<b>Mean</b>	0	2.23e	4.20d	6.69c	9.19b	11.87a	11.40f	
<b>LSD (0.05%)</b>	<b>Days=0.071 Treatment=0.077</b>								<b>LSD (0.05%)</b>	<b>Days=0.085 Treatment= 0.092</b>							

**Table 2. Effect of paclobutrazol and GA4+7 on firmness of dragon fruit during storage at ambient condition**

Treatment	2022-23								2023-24								
	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean	Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean
T1(control)	4.79	4.61	4.30	3.87	3.49	3.07	*	4.02f	T1(control)	4.84	4.65	4.35	3.92	3.48	3.01	*	4.04f
T2(PBZ@ 200mg)	5.60	5.49	5.36	5.11	4.79	4.43	3.58	4.90a	T2(PBZ@ 200mg)	5.62	5.52	5.37	5.11	4.80	4.43	4.02	4.98a
T3(PBZ@ 400mg)	5.40	5.27	5.03	4.73	4.41	3.91	*	4.79c	T3(PBZ@ 400mg)	5.48	5.33	5.10	4.79	4.45	3.99	*	4.85c
T4(PBZ@ 600mg)	5.31	5.16	4.95	4.64	4.33	3.86	*	4.70d	T4(PBZ@ 600mg)	5.32	5.15	4.95	4.63	4.26	3.81	*	4.68d
T5(GA4+7@ 200mg)	5.53	5.43	5.28	5.10	4.71	4.38	3.55	4.85a	T5(GA4+7@ 200mg)	5.55	5.41	5.24	4.97	4.64	4.27	3.62	4.81b
T6(GA4+7@ 400mg)	5.44	5.32	5.17	4.93	4.52	3.98	*	4.89b	T6(GA4+7@ 400mg)	5.51	5.35	5.16	4.88	4.53	4.08	*	4.91c
T7(GA4+7@ 600mg)	5.14	4.98	4.70	4.37	3.99	3.56	*	4.45e	T7(GA4+7@ 600mg)	5.26	5.09	4.84	4.50	4.12	3.84	*	<b>4.60e</b>
<b>Mean</b>	5.31a	5.18b	4.97c	4.67d	4.32e	3.88f	3.56g		<b>Mean</b>	5.36a	5.21b	5.00c	4.68d	4.32e	3.91f	3.82g	

2022-23									2023-24								
Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean	Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean
LSD (0.05%)	Days= 0.071 Treatment= 0.076								LSD (0.05%)	Days=0.072 Treatment=0.078							

**Table 3. Effect of paclobutrazol and GA4+7 on total soluble solids of dragon fruit during storage at ambient condition**

2022-23									2023-24								
Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean	Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean
T1(control)	13.15	13.29	13.72	14.65	13.55	11.92	*	13.38d	T1(control)	13.17	13.31	13.68	14.61	13.90	12.07	*	13.45d
T2(PBZ@ 200mg)	14.32	14.51	15.00	16.05	15.23	13.80	12.01	14.41a	T2(PBZ@ 200mg)	14.63	14.82	15.26	16.29	15.37	14.08	12.61	14.72a
T3(PBZ@ 400mg)	14.18	14.39	14.83	15.86	15.04	13.49	*	14.63ab	T3(PBZ@ 400mg)	14.48	14.65	15.09	16.04	15.06	13.68	*	14.83bc
T4(PBZ@ 600mg)	14.22	14.43	14.88	15.53	14.76	13.23	*	14.50b	T4(PBZ@ 600mg)	14.29	14.46	14.87	15.81	14.88	13.42	*	14.62c
T5(GA4+7@ 200mg)	14.24	14.50	14.91	15.97	15.30	13.83	12.15	14.41a	T5(GA4+7@ 200mg)	14.51	14.73	15.08	16.09	15.12	13.79	12.27	14.51ab
T6(GA4+7@ 400mg)	14.16	14.33	14.72	15.91	15.03	13.45	*	14.60b	T6(GA4+7@ 400mg)	14.42	14.63	14.96	15.96	15.01	13.61	*	14.76bc
T7(GA4+7@ 600mg)	13.76	14.02	14.35	14.93	13.96	12.33	*	13.89c	T7(GA4+7@ 600mg)	14.34	14.57	14.86	15.85	14.92	13.47	*	14.66c
<b>Mean</b>	14.00d	14.21c	14.63b	15.55a	14.69b	13.15e	12.08f		<b>Mean</b>	14.26c	14.45c	14.82b	15.80a	14.89b	13.44d	12.44e	
LSD (0.05%)	Days=0.174 Treatment=0.188								LSD (0.05%)	Days=0.199 Treatment= 0.215							

**Table 4. Effect of Paclobutrazol and GA4+7 on titrable acidity of dragon fruit during storage at ambient condition**

2022-23									2023-24								
Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean	Treatment	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	Mean
T1(control)	0.255	0.239	0.220	0.194	0.150	0.062	*	0.186a	T1(control)	0.251	0.221	0.196	0.164	0.129	0.067	*	0.171a
T2(PBZ@ 200mg)	0.219	0.199	0.176	0.146	0.114	0.103	0.081	0.148e	T2(PBZ@ 200mg)	0.207	0.191	0.171	0.146	0.109	0.093	0.078	0.142b
T3(PBZ@ 400mg)	0.233	0.211	0.188	0.160	0.129	0.098	*	0.169c	T3(PBZ@ 400mg)	0.212	0.192	0.168	0.140	0.101	0.080	*	0.148c
T4(PBZ@ 600mg)	0.237	0.217	0.196	0.171	0.131	0.099	*	0.175b	T4(PBZ@ 600mg)	0.220	0.197	0.170	0.138	0.105	0.082	*	0.152b
T5(GA4+7@ 200mg)	0.221	0.202	0.180	0.151	0.117	0.085	0.064	0.145d	T5(GA4+7@ 200mg)	0.210	0.189	0.165	0.136	0.101	0.083	0.068	0.136c

Treatment	2022-23								Mean	Treatment	2023-24								Mean
	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	13 <sup>th</sup> Day			1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day		
T6(GA4+7@ 400mg)	0.234	0.215	0.192	0.164	0.134	0.101	*	0.173b	T6(GA4+7@ 400mg)	0.215	0.193	0.167	0.135	0.100	0.078	*	0.148c		
T7(GA4+7@ 600mg)	0.243	0.221	0.194	0.162	0.129	0.091	*	0.173b	T7(GA4+7@ 600mg)	0.217	0.193	0.164	0.129	0.092	0.090	*	0.148d		
<b>Mean</b>	0.234a	0.214b	0.192c	0.164d	0.130e	0.091f	0.072g		<b>Mean</b>	0.218a	0.196b	0.171c	0.141d	0.105e	0.081f	0.073g			
<b>LSD (0.05%)</b>	<b>Days= 0.002</b> <b>Treatment=0.003</b>									<b>LSD (0.05%)</b>	<b>Days=0.0028</b> <b>Treatment=0.003</b>								

**Table 5. Effect of paclobutrazol and GA4+7 on ascorbic acid of dragon fruit during storage at ambient condition**

Treatment	2022-23								Mean	Treatment	2023-24								Mean
	1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day	13 <sup>th</sup> Day			1 <sup>st</sup> Day	3 <sup>rd</sup> Day	5 <sup>th</sup> Day	7 <sup>th</sup> Day	9 <sup>th</sup> Day	11 <sup>th</sup> Day	13 <sup>th</sup> Day		
T1(control)	12.04	11.78	11.44	11.02	10.38	9.41	*	11.01e	T1(control)	12.08	11.89	11.63	11.29	10.87	10.23	*	11.33e		
T2(PBZ@ 200mg)	12.81	12.68	12.52	12.32	12.05	11.66	10.21	12.03a	T2(PBZ@ 200mg)	12.98	12.88	12.75	12.59	12.38	12.10	11.13	12.40a		
T3(PBZ@ 400mg)	12.74	12.54	12.28	11.95	11.44	10.70	*	11.94bc	T3(PBZ@ 400mg)	12.91	12.78	12.61	12.39	12.09	11.63	*	12.40abc		
T4(PBZ@ 600mg)	12.76	12.59	12.36	12.04	11.58	10.91	*	12.04bc	T4(PBZ@ 600mg)	12.78	12.61	12.38	12.08	11.69	11.09	*	12.10d		
T5(GA4+7@ 200mg)	12.78	12.63	12.43	12.16	11.77	11.23	10.07	11.86ab	T5(GA4+7@ 200mg)	12.93	12.81	12.67	12.47	12.20	11.81	10.61	12.21ab		
T6(GA4+7@ 400mg)	12.71	12.50	12.23	11.88	11.32	10.49	*	11.85c	T6(GA4+7@ 400mg)	12.87	12.73	12.53	12.27	11.94	11.43	*	12.29bcd		
T7(GA4+7@ 600mg)	12.55	12.32	12.02	11.63	11.03	10.14	*	11.61d	T7(GA4+7@ 600mg)	12.83	12.67	12.46	12.19	11.84	11.28	*	12.21cd		
<b>Mean</b>	12.62a	12.43a	12.18b	11.85c	11.36d	10.64e	10.14f		<b>Mean</b>	12.76a	12.62ab	12.43b	12.18c	11.85d	11.36e	10.87f			
<b>LSD (0.05%)</b>	<b>Days= 0.209</b> <b>Treatment= 0.225</b>									<b>LSD (0.05%)</b>	<b>Days=0.209</b> <b>Treatment= 0.226</b>								

(GA<sub>4+7</sub> @ 200mg) 0.210% while, maximum titrable acidity (0.251%) was observed in the treatment T1 (control). However, minimum titrable acidity (0.067%) was observed in the treatment T1 (control) on 11<sup>th</sup> day of storage followed by the T5 (GA<sub>4+7</sub> @ 200mg) 0.068% on 13<sup>th</sup> day of the storage. Purohit et al., [10] reported that acidity contents of the fruits decreased with the increases days of the storage fruits that treated by Paclobutrazol.

### 3.5 Changes in Ascorbic Acid (mg/100g)

A perusal data of Table 5 revealed that ascorbic acid decreased with the increases day of the storage during both the years (2022-23 and 2023-24). On first day of storage, maximum ascorbic acid (12.81mg) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5 (GA<sub>4+7</sub> @ 200mg) 12.78mg while, minimum ascorbic acid (12.04mg) was observed in the treatment T1 (control). However, minimum ascorbic acid (9.41mg) was observed on 11<sup>th</sup> day of storage followed by the T5 (GA<sub>4+7</sub> @ 200mg) 10.07mg during the year 2022-23. Similarly, during 2023-24 on first day of storage, maximum ascorbic acid (12.98mg) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5 (GA<sub>4+7</sub> @ 200mg) 12.93mg while, minimum ascorbic acid (12.08mg) was observed in the treatment T1 (control). However, minimum ascorbic acid (10.23mg) was observed in the treatment T1 (control) on 11<sup>th</sup> day of the storage followed by the T5 (GA<sub>4+7</sub> @ 200mg) 10.61mg on 13<sup>th</sup> day of the storage. Purohit et al., [10] reported that ascorbic acid contents of the fruits decreased with the increases days of the storage fruits that treated by Paclobutrazol [11,12].

### 4. CONCLUSION

It is concluded that the application of Paclobutrazol treated with 200mg noted significantly better results in terms of minimum physiological losses, increases the shelf life, highest firmness, and quality parameter such as total soluble solids, titrable acidity and ascorbic acid content. It was followed by T5 (GA<sub>4+7</sub> @ 200mg) dragon fruits storage at ambient conditions.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

### REFERENCES

1. Jiang YL, Liao YY, Lin TS, Lee CL, Yen CR, Yang WJ. The photoperiod-regulated bud formation of red pitaya (*Hylocereus sp.*). Hortscience. 2012;47(8):1063-1067.
2. Perween T, Mandal KK, Hasan MA. Dragon fruit: An exotic super future fruit of India. Journal of Pharmacognosy and Phytochemistry. 2018;7(2):1022-1026.
3. Kakade V, Jinger D, Dayal V, Chavan S, Nangare DD, Wakchaure GC. Dragon Fruit: Wholesome and remunerative fruit crop for India. Food and Scientific Reports. 2020;1(12).
4. Hamidah H, Rosmanida. Analysis of *Hylocereus spp.* diversity based on phenetic method. In AIP Conference Proceedings. 2017;1854(1):020012.
5. Harithpriya K, Jeyachandran R. *In-vitro* immunomodulatory activity of dragon fruit extract. International Journal of Pharma and Bio Sciences. 2019;10(3):99-106
6. Wakchaure GC, Satish Kumar, Meena KK, Rane J, Pathak H. Dragon fruit cultivation in india: scope, marketing, constraints and policy issues. Technical Bulletin No. 46. ICAR–National Institute of Abiotic Stress Management, Baramati, Pune, Maharashtra, India. 2020;54.
7. Rao CC, Sasanka VM. Dragon Fruit ‘The Wondrous Fruit for the 21st century. Global Journal for Research Analysis. 2015;4(10): 261-262.
8. Khader SESA. Orchard application of paclobutrazol on ripening, quality and storage of mango fruits. Scientia horticulturae. 1990;41(4):329-335.
9. Patel T, Pandey AK, Desai KD, Ahlawat TR. Effect of pre-harvest treatments of paclobutrazol and calcium chloride on physical quality traits of mango cv. Amrapali. Journal of Pharmacognosy and Phytochemistry. 2020;9(5):1009-1012.
10. Purohit AK, Rawat TS, Kumar A. Shelf life and quality of ber [*Zizyphus mauritiana* Lamk.] fruit cv. Umran in response to post harvest application of ultraviolet radiation and paclobutrazol. Plant Foods for Human Nutrition. 2003;58:1-7.
11. Bill M, Theron KI, Ungerer SF, Steyn WJ. Effect of paclobutrazol on harvest maturity,

- fruit storability and vegetative growth of 'Triumph' persimmon (*Diospyros kaki* Thunb.). In II All Africa Horticulture Congress. 2012;1007:849-856.
12. Rangana S. Ascorbic acid. Manual Analysis of Fruit and Vegetable Products. 1977;94-101.

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