# Effect of Paclobutrazol and $GA_{4+7}$ onpost-harvest storage of dragon fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]


## Abstract

Dragon fruit undergoes rapid senescence during storage. This study identified the synergistic effect of Paclobutrazol and $GA_{4+7}$ 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 $GA_{4+7}$ 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 $GA_{4+7}$for improving the postharvest quality and prolong the shelf life of dragon fruits when stored at ambient condition.



**Key words:** Dragon fruit, Paclobutrazol, $GA_{4+7}$, Ambient condition


## Introduction

The dragon fruit (*Hylocereus sp*.) is a perennial and long day plant (Jiang *et al.,* 2012) 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 Cindrella plant (Perween *et al.,* 2018). It originated in tropical & sub- tropical region of Mexico, Central America and Northern South America (Kakade *et al.,* 2020). 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.,* 2017. According to Harithpriya K. & Jeychandran R., (2019) 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.,* (2020), 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, 2015). In the present experiment two chemicals were used that is Paclobutrazol and GA4+7 for improving the shelf life of dragon fruit. Khader, (1990) reported that application of paclobutrazol at the rate of 2000mg and 3000mg per litre of waterattained 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 $GA_{4+7}$ onpost-harvest storage of dragon fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]"

**Materials and methods**

The presentexperiment entitled that "Effect of Paclobutrazol and $GA_{4+7}$ onstorage of dragon fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]" was carried out duringtheperiod2022-23 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$^0$ C temperature and 70-75% Relative humidity).Paclobutrazol and $GA_{4+7}$ were applied in the field where Paclobutrazol (Culatr @ 23% a.i.) was applied as soil drench and $GA_{4+7}$(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. Thepercentage 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.

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

Fruit firmness was measured with the help of Penetrometer by using a 5/16 plunger in kgcm-$^2$. 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 $^0$ 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 phenophthalein 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.

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

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.

$$\textbf{Vitamin} - \boldsymbol{C}\ (\boldsymbol{mg/100g}) = \frac{\textbf{Titre value} \times \textbf{Dye factor} \times \textbf{Volume made up}}{\textbf{Weight of aliquaot taken} \times \textbf{weight of the sample taken}}$$

**Statistical analysis**

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

## Result and discussion

**Physiological loss of weight (%)**

A perusal data of **Table no. - 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 ($GA_{4+7}$@ 200mg) respectively, on the 3rd day of storage. However, maximum physiological loss of weight (14.99%) was observed in treatment T1 (control) followed by the T7 ($GA_{4+7}$@ 600mg) 14.28% and T4 (Paclobutrazol @ 600mg) 13.54% respectively, on 11th 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 ($GA_{4+7}$@ 200mg) respectively, on the 3rd day of storage. However, maximum physiological loss of weight (14.18%) was observed in treatment T1 (control) followed by the T7 ($GA_{4+7}$@ 600mg) 13.47% and T6 ($GA_{4+7}$@ 400mg) 12.81% respectively, on 11th day of storage during the year 2023-24.Patel *et al.,* (2020) observed that paclobutrazol applied at the rate of 100mg per litre significantly increased the shelf life (days) in mango.Purohit *et al.,* (2003) reported that physiological loss in weight (PLW) and rotting were lowest in fruits treated with PBZ during twelve days of storage.

**Changes in firmness**

A perusal data of **Table No.- 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 ($GA_{4+7}$@ 200mg) 5.53 while, minimum firmness (4.79) was observed in the treatment T1 (control). However, minimum firmness (3.07) was observed on 11$^{th}$ day of storage followed by the T5 ($GA_{4+7}$@ 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 ($GA_{4+7}$@ 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$^{th}$ day of the storage followed by the T5 ($GA_{4+7}$@ 200mg) 3.62 on 13$^{th}$ 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.

**Changes in TSS ($^0$ Brix)**

A perusal data of **Table No.- 3** revealed that total soluble solids increased with the increases day of the storage up to 7$^{th}$ day after that decreased during both the years (2022-23 and 2023-24). Maximum total soluble solids (16.05$^0$ B and 15.97$^0$ B) were observed in the treatment T2 (Paclobutrazol @ 200mg) and T5 ($GA_{4+7}$@ 200mg) respectively, on 7$^{th}$ day of the storage. However, minimum total soluble solids (11.92$^0$ B) was observed in the treatment T1 (control) on 11$^{th}$ day of storage during the year 2022-23.Similarly, during 2023-24 maximum total soluble solids (16.29$^0$ B and 16.09$^0$ B) was observed in treatment T2 (Paclobutrazol @ 200mg) and T5 ($GA_{4+7}$@ 200mg) respectively, on the 7$^{th}$ day of storage. However, minimum total soluble solids (12.07$^0$ B) was observed in treatment T1 (control) on 11$^{th}$ day of storage. Khader, (1990) reported that application of paclobutrazol at the rate of 2000mg and 3000mg per litre of waterattained better quality as judged from the total soluble solidsfrom harvest to 12 days of storage at ambient conditions.

**Table No. 1:**Effect of Paclobutrazol and GA4+7 on physiological losses in weight of dragon fruit during storage at ambient condition.

| 2022-23 | | | | | | | | | 2023-24 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th Day** | **Mean** | **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th 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** |
| **Mean** | **0** | **2.24e** | **4.42d** | **6.83c** | **9.39b** | **12.61a** | **12.12f** | | **Mean** | **0** | **2.23e** | **4.20d** | **6.69c** | **9.19b** | **11.87a** | **11.40f** | |
| **LSD (0.05%)** | **Days=0.071** **Treatment=0.077** | | | | | | | | **LSD (0.05%)** | **Days=0.085** **Treatment= 0.092** | | | | | | | |

**Table No. 2:**Effect of Paclobutrazol and GA4+7 on firmness of dragon fruit during storage at ambient condition.

| 2022-23 | | | | | | | | | 2023-24 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th Day** | **Mean** | **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th 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 | * | **4.60e** |
| **Mean** | **5.31a** | **5.18b** | **4.97c** | **4.67d** | **4.32e** | **3.88f** | **3.56g** | | **Mean** | **5.36a** | **5.21b** | **5.00c** | **4.68d** | **4.32e** | **3.91f** | **3.82g** | |
| **LSD (0.05%)** | **Days= 0.071** **Treatment= 0.076** | | | | | | | | **LSD (0.05%)** | **Days=0.072** **Treatment=0.078** | | | | | | | |

**Table No. 3:**Effect of Paclobutrazol and GA4+7 on total soluble solids of dragon fruit during storage at ambient condition.

| 2022-23 | | | | | | | | | 2023-24 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th Day** | **Mean** | **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th 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** |
| **Mean** | **14.00d** | **14.21c** | **14.63b** | **15.55a** | **14.69b** | **13.15e** | **12.08f** | | **Mean** | **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 No. 4:**Effect of Paclobutrazol and GA4+7 on titrable acidity of dragon fruit during storage at ambient condition.

| 2022-23 | | | | | | | | | 2023-24 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th Day** | **Mean** | **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th 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** |
| **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** |
| **Mean** | **0.234a** | **0.214b** | **0.192c** | **0.164d** | **0.130e** | **0.091f** | **0.072g** | | **Mean** | **0.218a** | **0.196b** | **0.171c** | **0.141d** | **0.105e** | **0.081f** | **0.073g** | |
| **LSD (0.05%)** | **Days= 0.002**<br>**Treatment=0.003** | | | | | | | | **LSD (0.05%)** | **Days=0.0028**<br>**Treatment=0.003** | | | | | | | |

**Table No. 5:**Effect of Paclobutrazol and GA4+7 on ascorbic acid of dragon fruit during storage at ambient condition.

| 2022-23 | | | | | | | | | 2023-24 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th Day** | **Mean** | **Treatment** | **1st Day** | **3rd Day** | **5th Day** | **7th Day** | **9th Day** | **11th Day** | **13th Day** | **Mean** |
| **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** |
| **Mean** | **12.62a** | **12.43a** | **12.18b** | **11.85c** | **11.36d** | **10.64e** | **10.14f** | | **Mean** | **12.76a** | **12.62ab** | **12.43b** | **12.18c** | **11.85d** | **11.36e** | **10.87f** | |
| **LSD (0.05%)** | **Days= 0.209**<br>**Treatment= 0.225** | | | | | | | | **LSD (0.05%)** | **Days=0.209**<br>**Treatment= 0.226** | | | | | | | |

**Changes in titrable acidity (%)**

A perusal data of **Table No.- 4** revealed that titrable acidity decreased with the increases day of the storage during both the years (2022-23 and 2023-24).On 1st day of storage minimum titrable acidity (0.219%) was observed in the treatment T2 (Paclobutrazol @ 200mg) followed by the T5 ($GA_{4+7}$@ 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 11th day of storage followed by the T5 ($GA_{4+7}$@ 200mg) on 13th 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 ($GA_{4+7}$@ 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 11th day of storage followed by the T5 ($GA_{4+7}$@ 200mg) 0.068% on 13th day of the storage.Purohit *et al.,* (2003) reported thatacidity contents of the fruits decreased with the increases days of the storage fruits that treated by Paclobutrazol.

**Changes in Ascorbic acid (mg/100g)**

A perusal data of **Table No.- 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 ($GA_{4+7}$@ 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 11th day of storage followed by the T5 ($GA_{4+7}$@ 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 ($GA_{4+7}$@ 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 11th day of the storage followed by the T5 ($GA_{4+7}$@ 200mg) 10.61mg on 13th day of the storage.Purohit *et al.,* (2003) reported thatascorbic acidcontents of the fruits decreased with the increases days of the storage fruits that treated by Paclobutrazol.

## 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 ($GA_{4+7}$@ 200mg) dragon fruits storage at ambient conditions.

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