

## Original Research Article

### **Value addition and standardization of recipe on dragon fruit jelly (*Hylocerous undatus* L.)**

#### **Abstract**

The present investigation entitled “Value addition and standardization of recipe on dragon fruit jelly (*Hylocerous undatus* L. )” was conducted at Post-Harvest Laboratory of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2022. The experiment was laid down in Complete randomized design ( RBD) with 3 replications and 10 treatments viz . T<sub>0</sub> = (Control ) Dragon fruit extract 1000ml+sugar 550g, T<sub>1</sub> =Dragon fruit extract 1000ml + Mint 2.5g + sugar 550g T<sub>2</sub> =Dragon fruit extract 1000ml + Mint 5g + sugar 550g , T<sub>3</sub> =Dragon fruit extract 1000ml + Mint 7.5g + sugar 550g, T<sub>4</sub> =Dragon fruit extract 1000ml + Cardamom 2g + Sugar 550g, T<sub>5</sub>= Dragon fruit extract 1000ml + Cardamom 3g + Sugar 550g, T<sub>6</sub> = Dragon fruit extract 1000ml + Cardamom 4g + Sugar 550g, T<sub>7</sub> = Dragon fruit extract 1000ml + Ginger 2.5g + Sugar 550g, T<sub>8</sub> =Dragon fruit extract 1000ml + Ginger 5g + Sugar 550g and T<sub>9</sub> =Dragon fruit extract 1000ml + Ginger 7.5 g + Sugar 550g. Study results revealed that, there was significant statistical variation TSS( °Brix) , Reducing Sugar( %), Non Reducing Sugar( %), total Sugar( %) , titrable acidity (%), pH , ascorbic acid( mg/100gm), and Benefit cost Ratio. Maximum TSS ( 67.01 °Brix), pH ( 4.41), Reducing Sugar(36.16 %), Non reducing Sugar ( 53.92%), Total sugar ( 72.08%) , Titratable acidity (0.62%), Ascorbic acid ( 2.44mg/100gm), Colour appearance ( 8.45) , Consistency ( 8.26), flavour and Taste ( 8.67) , Aroma ( 6.07) , overall acceptability ( 8.58) , transparency ( 8.34), self-life 89.65) and benefit cost ratio 2.33 was recorded in T<sub>6</sub> = Dragon fruit extract 1000ml + Cardamom 4g + Sugar 550g. Basis on this study Treatment T<sub>6</sub> can be suggested to farmers to obtain better quality and higher benefit in jelly production.

Keywords: *Ascorbic Acid, Dragon fruit extract, Jelly and Shelf life*

#### **Introduction**

Pitayas or pitahayas belong to the genus *Hylocereus* (sweet pitaya). In Latin America, Pitaya (*Hylocereus* spp.) is primarily found in tropical and subtropical forest regions, particularly in North, Central, and South America (Crane and Balerdi 2005; Luders and McMahon, 2006). The fruit is known as dragon fruit in Asia due to its bracts (scales) that resemble dragons. Its large, fragrant, night-blooming flowers have prompted worldwide recognition of dragon fruit (*Hylocereus* spp.) as an ornamental plant. There are three different types of dragon fruit: *Selenicereus megalanthus*, which has white flesh and a yellow peel, *Hylocereus undatus*, which has white flesh and a red peel, and *Hylocereus polyrhizus*, which has red flesh and a red peel. The most widely farmed and consumed species of dragon fruit is *Hylocereus undatus*. Due to their highly appealing sensory qualities, this species' fruits are in high demand on the market. In its native country, it has been extensively consumed by the general population since the pre-Columbian era (Crane and Balerdi, 2005). According to Le-Bellec et al. (2006), this fruit is non-climacteric, with rosy-red exterior covered in green scales and white flesh that is filled with numerous tiny black seeds. A century ago, the French imported the tree from its original area to Vietnam, which was grown exclusively for the king as an ornamental crop. Dragon fruit is also known as a strawberry pear, a night-blooming cereus, a conderella plant, or the queen of the night. The area under dragon fruit is still quite tiny in India. It has been grown on a very minor scale in India. Particularly a small number of farmers in the states of Karnataka, Kerala, Tamil Nadu, Maharashtra, Gujarat, and Andhra Pradesh have started growing dragon fruit. Less than 100 acres are used for dragon fruit production overall (Tripathi et al., 2014).

Due to its low water and tillage requirements, farmers in Karnataka and Maharashtra are currently becoming much more knowledgeable about the cultivation of dragon fruit. As a result of this, The area used for dragon fruit farming will increase in the upcoming years. The major benefit of this crop is that, once planted, it will keep growing successfully for approximately 20 years and can sustain between 1000 and 2000 dragon fruit plants per hectare. It begins to produce fruit in the second year after planting and reaches its maximum yield in five year. Each plant yields 40 to 100 fruits annually, weighing between 300 and 800 g. According to Tripathi et al. (2014), one plant typically produces 15 to 25 kilogrammes of fruits. According to Tripathi et al. (2014), the edible portion of dragon fruit, which accounts for 64.5% of the fruit's weight, comprises moisture 82.5-83%, protein 0.16-0.23%, fat 0.21-0.61%, calcium 6.3-8.8 mg, phosphorus 30.2-36.1 mg, iron 0.5-0.61 mg, and vitamin C 8-9 mg. [36]. Additionally, it contains nutrients including glucose, polyphenol, thiamine,

flavonoids, niacin, and pyridoxine (Vaillant and Imbert, 2006). According to Charoensiri et al. (2009), the dragon fruit has average amounts of beta-carotene, lycopene, and vitamin E of 1.4 mg/100 g, 3.4 mg/100 g, and 0.26 mg/100 g, respectively. According to Ariffin et al. (2009), Rui H et al. (2009), and Azis et al. (2009), 50% of the important fatty acids in dragon fruit seed are linoleic acid, which makes up 48%, and linolenic acid, which makes up 1.5%.

In India, native fruits are processed into a variety of products with added value, including jam, juice, jelly, cheese, and preserves. The jelly is a semi-solid product composed of a clear, strained solution of pectin with fruit extract, free of pulp, cooked with sugar and acid to produce a semi-solid product. Jelly should have the authentic flavour of the fruit, be translucent, and be well-set but not stiff. If it is removed from the mold, it should keep its shape and have an attractive color. Despite being firm enough to maintain a sharp edge, it should also be soft enough to quiver when squeezed. Crystallized sugar, gummy or sticky texture, or a syrupy consistency are not good. No dullness, little or no syneresis (weeping) and no rubbery or tough texture are desirable.

According to Kanjana *et al.* (2006), dragon fruit has 0.20-1.04% pectin, hence its jam and jelly typically calls for additional pectin (Islam et al., 2012 and Sharma *et al.*, 2017). Jelly's organoleptic and physico-chemical qualities might vary depending on the amount of added pectin. The growth of the nation's burgeoning food businesses depends heavily on the creation of different products like jam, jelly, and squash using local ingredients. For this fruit, however, there is not a lot of product diversification or preservation practised in India. Due to the therapeutic and nutritional potential of dragon fruit, this study was designed with that in mind. By processing the fruit into jelly and other value-added products, dragon fruit might be used commercially.

## **Materials and methods**

The Experimental work of “Value addition and standardization of recipe on dragon fruit jelly (*Hylocereus undatus*)” was conducted in the Post-Harvest Laboratory of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2022.

### **Formulation of dragon fruit jelly**

The jelly prepared from dragon fruit with different treatments was coded as: Jelly T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub>, T<sub>8</sub> and T<sub>9</sub>. The formulation of different dragon fruit jelly was shown in Table 1.

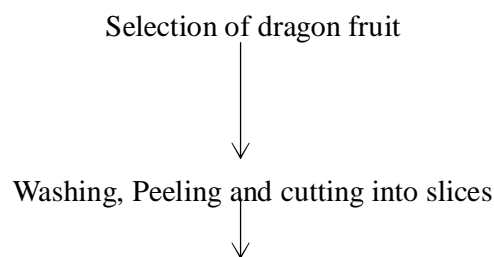
**Table 3.1 Treatments Details**

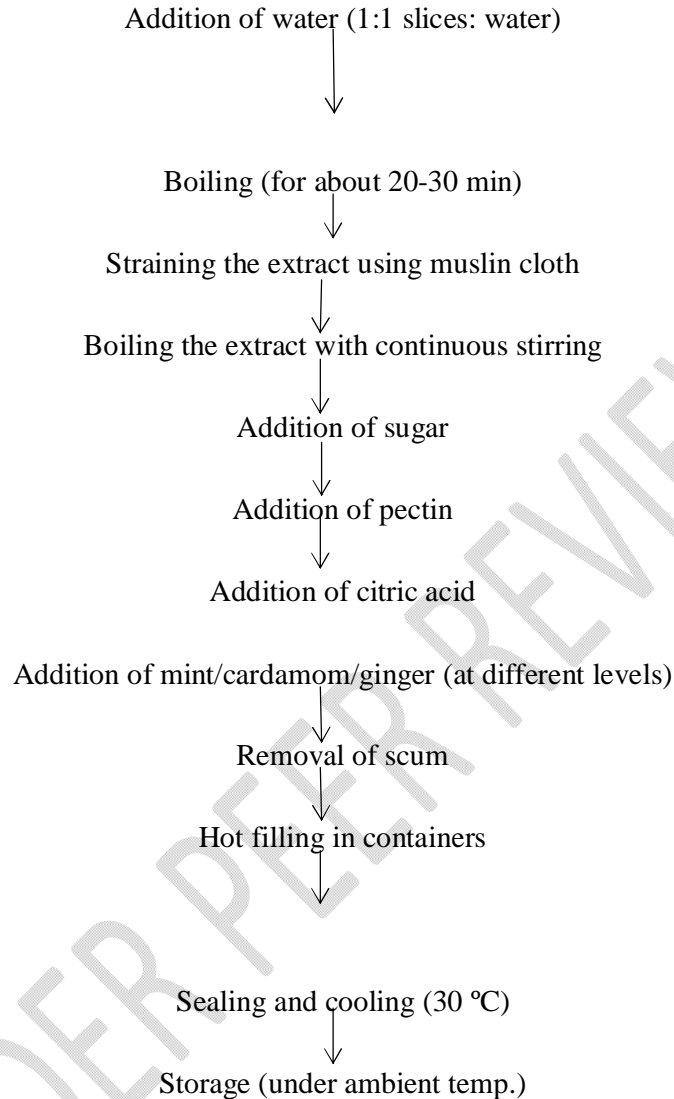
NOTATIONS	TREATMENT COMBINATION
T <sub>0</sub>	(Control) Dragon fruit extract 1000ml+sugar 550g
T <sub>1</sub>	Dragon fruit extract 1000ml + Mint 2.5g + sugar 550g
T <sub>2</sub>	Dragon fruit extract 1000ml + Mint 5g + sugar 550g
T <sub>3</sub>	Dragon fruit extract 1000ml + Mint 7.5g + sugar 550g
T <sub>4</sub>	Dragon fruit extract 1000ml + Cardamom 2g + Sugar 550g
T <sub>5</sub>	Dragon fruit extract 1000ml + Cardamom 3g + Sugar 550g
T <sub>6</sub>	Dragon fruit extract 1000ml + Cardamom 4g + Sugar 550g
T <sub>7</sub>	Dragon fruit extract 1000ml + Ginger 2.5g + Sugar 550g
T <sub>8</sub>	Dragon fruit extract 1000ml + Ginger 5g + Sugar 550g
T <sub>9</sub>	Dragon fruit extract 1000ml + Ginger 7.5g + Sugar 550g

**Fruit Selection:**

Matured and quality dragon fruits were procured from the department of horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the course of experiment 2022 and stored in the Post Harvest Laboratory of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj at room temperature.

Chart for the preparation of value-added dragon fruit jelly





### **Methods used for the preparation of dragon fruit jelly**

The clear fruit extract was poured in a stainless steel pan and boiled. The boiled extract was drained through coarse muslin cloth to remove the small black seed. After meshing well, the sieving was started where all the pulp and juice were sieved through muslin cloth until all the juice was collected. The juice was collected in a stainless steel vessel. The strained extract was used for preparation dragon fruit jelly then required amount of pectin (High Methoxy pectin: DE > 50) took place after sugar was added into the mixture. Pectin helps in the gel like formation and thickens the jelly. The citric acid was added and until the TSS reaches 67° Brix and the required consistency, the boiling should be

maintained. Next, the addition of flavours i.e mint, cardamom, ginger (at different levels) was done for each treatment. At the end the KMS was added and the scum which appeared on the top of the boiling mass was removed occasionally with the help of laddle.

### **Determination of end point of jelly**

The end point was determined by the sheet test once the material had thickened enough in consistency.

**Sheet test:** A tiny amount of jelly was spooned out while it was cooking. Then it was permitted to fall. If the product separates into sheets or flakes rather than flowing continuously, that was regarded as the jelly's end point.

### **Storage**

The jelly was poured and sealed into tight glass containers (250ml) and stored at ambient temperature for a period of 90 days. The bottles were opened only at an interval of 30 days for the sensory as well as chemical analysis. At intervals of 0, 30, 60, and 90 days of storage, preserved dragon fruit jelly underwent chemical and organoleptic evaluation.

### **Sensory evaluation of jelly**

The standard procedure developed by Amerine et al. was used to conduct the sensory evaluation of dragon fruit jelly samples. The mean score minimum 10 semi-trained judges for each quality parameter viz., colour and appearance, taste, flavour, consistency, transparency and overall acceptability was recorded.

### **Chemical analysis of jelly**

Total soluble solids of each fruit was determined with the help of hand refractometer of 0-32 scale while that of jelly was determined by hand refractometer of 32-80 scale (AOAC, 1990). Ranganna (2001) described the procedure used to determine the titratable

acidity. According to Ranganna (2009), the ascorbic acid concentration of the items was calculated using the titrimetric method. Using the dye 2,6-dichlorophenol indophenol and sugars were determined by Lane and Eynon (1923) as reported by Ranganna (1986) method. The pH was determined by using pH meter (Elico, India) which was standardized with buffers of pH 4.0 and 9.2.

### **STATISTICAL ANALYSIS**

According to the "Analysis of Variance" technique, the data collected during the course of the research were subjected to statistical analysis using CRD (Complete Randomised Design) (Panse and Sukhatme, 1967). The significant Difference between the treatments means were tested at 5% level of significance.

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TREATMENTS	TSS (OBrix)	pH	Reducing sugars (%)	Nonreducing sugar (%)	Total sugars (%)	Titration acidity (%)	Ascorbic acid (mg/100g)	Colour and Appearance	Consistency	Flavour and taste	Aroma	Overall acceptability	transparency	Self life	Benefit cost ratio
T0 (Control)	64.62	4.03	31.75	34.12	65.64	0.45	2.3	5.50	6.08	6.05	3.95	6.45	6.24	76.56	2.01
T1 (mint 2.5g)	64.73	4.11	31.88	33.89	66.5	0.49	2.33	6.53	7.57	6.33	4.90	7.4	7.06	78.62	2.19
T2 (mint 5g)	64.79	4.18	32.79	34.62	66.91	0.47	2.07	6.32	7.43	6.53	5.20	7.7	7.36	79.26	2.18
T3 (mint 7.5g)	65.89	4.03	33.23	33.76	66.99	0.49	2.22	6.91	6.60	7.02	5.55	8.05	7.31	80.35	2.18
T4 (cardamom 2g)	66.83	4.32	34.11	35.67	69.78	0.59	2.36	6.71	7.91	8.46	5.84	8.34	7.92	85.16	2.17
T5 (cardamom 3g)	66.59	4.26	32.51	34.72	67.23	0.50	2.27	7.35	7.43	8.02	4.78	7.28	6.58	83.69	2.16
T6 (cardamom 4g)	67.01	4.41	36.16	35.92	72.08	0.62	2.44	8.45	8.26	8.67	6.08	8.58	8.34	89.65	2.33
T7 (ginger 2.5g)	65.91	4.13	32.57	35.53	68.1	0.56	2.34	7.14	6.97	6.77	5.49	7.99	7.72	87.46	2.19
T8 (ginger 5g)	66.21	4.36	32.77	35.67	68.44	0.59	1.79	7.07	7.20	7.03	4.80	7.3	7.51	86.59	2.18
T9 (ginger 7.5g)	66.23	4.41	33.02	35.37	68.39	0.57	1.71	7.36	6.45	7.56	4.05	6.55	7.07	88.91	2.17
F Test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Sed.	0.291	0.228	0.382	1.415	0.952	0.028	0.401	0.829	0.076	0.012	0.410	0.489	0.118	2.753	
C.D.@5%	0.738	0.442	0.78	2.891	1.95	0.057	0.792	1.754	0.165	0.025	0.820	0.965	0.256	5.621	

## Results and Discussion

### Physico-chemical parameters

The data showed maximum TSS content in dragon fruit jelly was recorded in T<sub>6</sub> with 67.01 °B followed by with 66.83 °B and the minimum was recorded in T<sub>0</sub> with 64.62 °B. A slight increase in total soluble solids during storage might be due to conversion of polysaccharides into sugars during hydrolysis process. This result corroborated **Vikram and Prasad's (2014)** study regarding compositional changes in value-added Kinnow. The TSS level in the aonla RTS beverage increased over the course of the six-month storage period, according to Aonla RTS (**Jain et al., 2007**).

The maximum pH value in dragon fruit jelly was recorded in T<sub>6</sub> with 4.41 followed by T<sub>4</sub> with 4.32 and the minimum was recorded in T<sub>0</sub> (Control) with 4.03 pH value. Alterations in chemical characteristics that are impacted by storage conditions may be the cause of pH variations during storage. The results of **Rayguru et al. (2008)** and **Vikram and Prasad (2014)**, who also showed a similar tendency in apple jam, corroborated this observation.

The maximum acidity % content in dragon fruit jelly was recorded in with 0.62 % followed by T<sub>4</sub> with 0.59 % and the minimum was recorded in T<sub>0</sub> with 0.45% . According to **Jaiswal et al. (2008)**, the breakdown of pectic components into soluble solids may have increased the amount of acidity in aonla jam during storage.

The maximum ascorbic acid (mg/100g) content in dragon fruit jelly was recorded in T<sub>6</sub> (Dragon fruit extract 1000ml + Cardamom 4g + Sugar 550g) with 2.44 mg/100g followed by T<sub>4</sub> (Dragon fruit extract 1000ml + Cardamom 2g + Sugar 550g) with 2.36 mg/100g and the minimum was recorded in T<sub>9</sub> with 1.71mg/100g.

The maximum reducing content in dragon fruit jelly was recorded in T<sub>6</sub> at 36.16 % followed by T<sub>4</sub> with 34.11 % and the minimum was recorded in T<sub>0</sub> (Control) with 31.75 % . The slightly larger increase in reducing sugar in storage conditions could be ascribed to the polysaccharides' quicker breakdown and subsequent conversion to sugars.. and **Deka et al., (2004)** reported similar finding with lime- aonla blended RTS.

The maximum non reducing sugar content in dragon fruit jelly was recorded in T<sub>6</sub> with 35.92 % followed by T<sub>4</sub> with 35.67 % and the minimum was recorded in T<sub>0</sub> (Control)

with 34.12 %. The non-reducing sugar of guava jam show an increasing trend in all treatment during storage and it may be due to increase in time interval and Similar temperature readings in citrus juice were obtained by **Bajaj and Mehta (2007)**.

The maximum total sugar content in dragon fruit jelly was recorded in T6 with 72.08 % followed by T4 with 69.78 % and the minimum was recorded in T0 with 65.64%. A slight increase in total sugar during storage might be due to conversion of polysaccharides (present in fruits) into sugars during hydrolysis process. This result was consistent with that of Vikram and Prasad's (2014) research on compositional changes in value-added Kinnow-Aonla RTS, which revealed that the amount of TSS increased during the storage period (six months) and (Jain et al., 2007) in aonla RTS beverage.

#### **Organoleptic parameter:-**

The maximum colour and appearance value in dragon fruit jelly was recorded T6 (Dragon fruit extract 1000ml + Cardamom 4g + Sugar 550g) with 8.45% followed by T4 (Dragon fruit extract 1000ml + Cardamom 2g + Sugar 550g) with 6.71 and the minimum was recorded in T0 (Control) with 5.50. Deterioration of colour due to enzymatic and non-enzymatic reactions on pigment during storage of fruit products impair the quality of the products. It could be attributed to non enzymatic reactions, which occur between nitrogenous compounds and sugars or organic acid and organic acids with sugars. **Syed et al.** reported similar outcomes in sweet orange-based products.

The maximum flavor and taste value in dragon fruit jelly was recorded T6 with 8.67 followed by T4 with 8.46 and the minimum was recorded in T0 with 6.05. The decreasing trend was observed for flavour, taste and texture with increase storage period. This might be due to degradation of volatile substance and flavor constituents. Similar result was reported by Nayak et al., (2011) in aonla segments-in-syrup prepared from stored fruits. **Jain et al. (2007)** in aonla RTS beverage. It could be attributed to non enzymatic reactions, which occur between nitrogenous compounds and sugars or organic acid and organic acids with sugars. **Syed et al.** reported similar outcomes. in sweet orange-based products.

The maximum consistency value in dragon fruit jelly was recorded T6 with 8.26 followed by T4 with 7.91 and the minimum was recorded in T0 (Control) with 6.08. Deterioration of consistency due to enzymatic and non-enzymatic reactions on pigment during storage of fruit products impair the quality of the products. It could be attributed to

non enzymatic reactions, which occur between nitrogenous compounds and sugars or organic acid and organic acids with sugars. **Syed et al.** reported similar outcomes in sweet orange-based products.

The maximum transparency value in dragon fruit jelly was recorded T6 with 8.34 followed by T4 with 7.92 and the minimum was recorded in T0 with 6.24. Deterioration of transparency due to enzymatic and non-enzymatic reactions on pigment during storage of fruit products impair the quality of the products. It could be attributed to non enzymatic reactions, which occur between nitrogenous compounds and sugars or organic acid and organic acids with sugars. Similarly results were reported that there was decrease in transparency from 8.63 to 8.03 during storage study of wood apple jelly (**Kumar and Deen, 2017**)

The maximum aroma value in dragon fruit jelly was recorded T6 with 6.08 followed by T4 with 5.84 and the minimum was recorded in T0 (Control) with 3.95. Deterioration of aroma due to enzymatic and non-enzymatic reactions on pigment during storage of fruit products impair the quality of the products. It could be attributed to non enzymatic reactions, which occur between nitrogenous compounds and sugars or organic acid and organic acids with sugars. **Syed et al.** reported similar outcomes in sweet orange-based products.

The maximum overall acceptability value in dragon fruit jelly was recorded T6 with 8.58 followed by T4 with 8.34 and the minimum was recorded in T0 with 6.45. The maximum number of days for shelf life of the product among the treatment used was found to be T6 with (89.65) days have highest shelf life mean value followed by T9 with (88.91 days) which were significantly superior than T0 with (76.56) days. Deterioration of enzymatic and non-enzymatic reactions on pigment during storage of fruit products impair the quality of the products. Similar findings according to **Rafia et al.,(2018)** Guava RTS overall acceptability dropped with the increased storage time period. The unfavourable change in jelly was the cause of the drop in the overall acceptability score. Temperature has a significant impact on the jelly's ability to undergo certain unfavourable biochemical changes that result in the development of an off flavour as well as discoloration (browning), minimising the jelly's natural colour and flavour. On the whole, it can be said that addition of mint, cardamom and ginger flavour at different rates in dragon fruit jelly exhibited better acceptability than control

treatment. Hence, such combination of ingredients for preparation of value added dragon fruit jelly stands better.

## Conclusion

It can be concluded from the present findings that that the treatment T<sub>6</sub>(Dragon fruit extract 1000ml + Cardamom 4g + Sugar 550g) could be gainfully utilized for enhancing the value of dragon fruit jelly preparation in the terms of better organoleptic properties as well as chemical composition and good storage stability upto 3months.

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