

# Original Research Article

## Standardisation for Preparation and Storage Stability of Papaya Candy (*Carica papaya*)

### ABSTRACT

The lab experiment was conducted in the year 2021-2022 at Post Harvest Lab, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, in order to Standardisation for preparation and Storage Stability of Papaya Candy (*Carica papaya*) to evaluate the physico-chemical properties and consumers acceptability of different treatments Quality Characters. The Experiment was laid out in Completely randomized design (CRD) with 9 Treatments and 3 Replications. Treatments T<sub>0</sub> (1Kg papaya slice + sugar syrup @75° B + Control), T<sub>1</sub> (1Kg papaya slice + sugar syrup @75° B +Common salt @ 2%), T<sub>2</sub> (1Kg papaya slice + sugar syrup @75° B +Calcium chloride @ 1%), T<sub>3</sub> (1Kg papaya slice + sugar syrup @75° B +Potassium metabisulphite @0.25%), T<sub>4</sub> (1Kg papaya slice + sugar syrup @75° B +0.2% citric acid), T<sub>5</sub> (1Kg papaya slice + sugar syrup @75° B +Betel leaves extract @5%), T<sub>6</sub> (1Kg papaya slice + sugar syrup @75° B +Tulsi extract@5%), T<sub>7</sub> (1Kg papaya slice + sugar syrup @75° B +Ginger extract@5%), T<sub>8</sub> (1Kg papaya slice + sugar syrup @75° B +Spices extract@5%), T<sub>9</sub> (1Kg papaya slice + sugar syrup @75° B +Rose extract@5%). Observations were recorded at 0,30,60,90(Days). From the above experiment T<sub>7</sub> showed better results in combination. Total soluble solids (T.S.S.), Total titratable acidity, Ascorbic acid content, Reducing sugar, non-reducing sugar, Total sugar, Organoleptic evaluation of candy, Colour, Texture, Flavour, Taste, Overall acceptability whereas minimum was observed in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75° B +Control).

**Keywords:** Papaya, Analysis of variance, Mean performance, Quality Characters, Organoleptic evaluation of candy

### 1. INTRODUCTION

The papaya (*Carica papaya* Linn.) belongs to the family Caricaceae is an important table fruit of tropical world which gives higher production of fruits per hectare next to banana. The production of papaya in India is about 59.51 lakh MT from 1.44 lakh hectares having productivity 41.3 MT/ha. (Anon, 2021). Papaya also seems to have antibacterial, antifungal, anti-viral, anti-inflammatory, antioxidant, and immune-stimulating effects. In addition, papaya is a source of the digestive enzyme papain, which is used as an industrial ingredient in brewing, meat tenderizing,

pharmaceuticals, beauty products, and cosmetics.

Papaya is considered one of the most beneficial fruits as a good source of nutrients, fiber, and proteolytic enzymes. Its consumption has been attributed to aid digestion. Previous researchers focused their study on papain activity from the latex of the unripe fruit or other parts of the plant, and also in the quantification of papain present in the pulp (Mezhlumyan *et al.*, 2003; Tripathi *et al.*, 2011).

After ripening, the papaya fruit softens immediately leading to transportation losses up to 40 per cent, therefore fruit requires conversion into processed products, to ensure extended availability throughout the year (Rajarathnam, 2010). But, perishable nature and flat odor of papaya limits its commercial processing, though different authors have reported its processing into various value-added products viz. jam, jelly, beverages, dried products, etc. Further, osmotic drying help to improve some nutritional, organoleptic and functional properties of the fruit and vegetables (Sutar and Sutar, 2013). Enzymatic and oxidative browning is prevented as the fruit's pieces are surrounded by sugar, thus making it possible to retain colour (Chaudhari *et al.*, 1993).

## 2. MATERIALS AND METHODS

The experimental was carried out to study the “Standardisation for preparation and storage stability of papaya candy (*Carica papaya*)” in the post-Harvest lab,

Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India, during 2021-2022. The area is situated on the south of Prayagraj on the right bank of Yamuna at Rewa road at a distance of about 6 km from Prayagraj city. It is situated at the 25.08°N Latitude and 81.50°E meters from sea level. Prayagraj has a sub-tropical climatic with uttermost in summer (in the month of May and June) with temperate reaching around 115°F with hot blazing winds and in winter (December and January the temperature falls down as low as 32°F. The average rainfall is around 1013.4 (mm) annually with maximum concentration during July to September with occasional showers in winter.

The Experiment was laid out in Completely randomized design (CRD) with 9 Treatments and 3 Replications. Observation to be recorded at 0,30,60,90(Days)

**Table.no. 1. Treatment combinations**

Treatment	Combination
T <sub>0</sub>	1Kg papaya slice + sugar syrup @75° B + Control
T <sub>1</sub>	1Kg papaya slice + sugar syrup @75° B + Common salt @2%
T <sub>2</sub>	1Kg papaya slice + sugar syrup @75° B + Calcium chloride@1%
T <sub>3</sub>	1Kg papaya slice + sugar syrup @75° B + Potassium metabisulphite @0.25%
T <sub>4</sub>	1Kg papaya slice + sugar syrup @75° B + Citric acid @0.2%
T <sub>5</sub>	1Kg papaya slice + sugar syrup @75° B + Betel leaves extract @5%
T <sub>6</sub>	1Kg papaya slice + sugar syrup @75° B + Tulsi extract@5%
T <sub>7</sub>	1Kg papaya slice + sugar syrup @75° B + Ginger extract@5%
T <sub>8</sub>	1Kg papaya slice + sugar syrup @75° B + Spices extract@5%

<b>T<sub>9</sub></b>	1Kg papaya slice + sugar syrup @75° B + Rose extract@5%
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Fruit uniform in size, free from diseases and pests were selected. They were sorted based on maturity and washed thoroughly under running tap water and air dried to remove adhering water. The papaya candy packed in plastic bags was kept at ambient temperature and evaluated at 0 to 90 DAS (days of storage). First observation was recorded immediately after preparation of papaya candy and other readings were recorded after every 30 days interval. The last observation was recorded on 90 DAS (days of storage).

The following parameters were measured and evaluated in this study.

### 1. Quality Characters

i. TSS (°Brix)

ii. Acidity (%)

iii. Ascorbic acid (Vitamin-C)

iv. Reducing sugar

v. Non- Reducing sugar

vi. Total sugar

vii. Storage stability

### 2. Organoleptic Tests

i. Colour and appearance

ii. Texture

iii. Flavor

iv. Taste

v. Overall acceptability

### 3. RESULTS AND DISCUSSION

Papaya candy was stored for 3 months and observations were recorded at the interval of 30 days on various physico-chemical and organoleptic parameters. Data were analyzed statistically and results were presented and discussed in the light of research work done in India.

**Quality characters:** TSS has shown an increasing trend during storage and maximum TSS was recorded 80.33 in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract @5%) and minimum 77.66<sup>0</sup>

Brix in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75°B + Control

Acidity has shown an increasing trend during storage and maximum Acidity was recorded 0.113% in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract @5%) and minimum 0.104% in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75°B + Control).

Ascorbic acid has shown decreasing trend during storage and maximum Ascorbic acid was recorded 3.10 mg/100gm in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract @5%) and minimum is 2.82 mg/100g in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75°B + Control).

Reducing sugar has shown an increasing trend during storage and maximum Reducing sugar was recorded 54.27% in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract @5%) and minimum is 51.97% in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75°B + Control).

Non-reducing sugar has shown an increasing trend during storage and maximum Non-reducing sugar was recorded 29.68% in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract @5%) and minimum is 28.00% in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75°B + Control).

Total sugar has shown an increasing trend during storage and maximum Total sugar was recorded 83.95% in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract @5%) and minimum is 79.97% in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75°B + Control).

The maximum Storage Stability was found 87 Days in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75°B + Ginger extract@5%) followed by 85 days in T<sub>6</sub>(1Kg papaya slice + sugar syrup @75°B + Tulsi

extract@5%) and minimum was found 78 Days in T<sub>0</sub>(1Kg papaya slice + sugar syrup @75oB + Control).

**Organoleptic Tests:** Based on organoleptic test the colour and appearance has shown decreasing trend during storage and maximum score for colour and appearance was recorded 8.27 in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75oB + Ginger extract @5%) and lowest is 6.80 in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75oB + Control).

Based on organoleptic test the texture has shown decreasing trend during storage and maximum score for texture was recorded 8.27 in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75oB + Ginger extract @5%) and lowest is 7.00 in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75oB + Control).

Based on organoleptic test the flavor has shown decreasing trend during storage and maximum score for flavor was recorded 8.27 in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75oB + Ginger extract @5%) and lowest is 7.50 in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75oB + Control).

Based on organoleptic test the taste has shown decreasing trend during storage and maximum score for taste was recorded 8.27 in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75oB + Ginger extract @5%) and lowest is 7.33 in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75oB + Control).

Based on organoleptic test overall acceptability has shown decreasing trend during storage and maximum score for overall acceptability was recorded 8.29 in T<sub>7</sub> (1Kg papaya slice + sugar syrup @75oB + Ginger extract @5%) and lowest is 7.36 in T<sub>0</sub> (1Kg papaya slice + sugar syrup @75oB + Control).

**Table no.2. Change in the Total Soluble Solids in ° Brix, Total Titrable acidity and Ascorbic acid (mg/100g) of papaya candies as affected by various treatments.**

Treatments	TSS (° Brix)				Acidity (%)				Ascorbic acid (mg/100g)			
	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS
T <sub>0</sub>	75.66	75.66	76.66	77.66	0.082	0.082	0.091	0.104	3.44	3.23	3.04	2.82
T <sub>1</sub>	76	76.33	77.66	78	0.083	0.083	0.093	0.105	3.55	3.32	3.08	2.83
T <sub>2</sub>	76.33	77	78	78.33	0.087	0.088	0.095	0.111	3.61	3.34	3.12	2.84
T <sub>3</sub>	77.66	77.66	77.33	79.33	0.087	0.086	0.103	0.11	3.56	3.42	3.14	2.9
T <sub>4</sub>	76.66	77	77.66	78	0.086	0.089	0.097	0.111	3.64	3.47	3.1	2.99
T <sub>5</sub>	78	78	78.66	79	0.085	0.088	0.099	0.108	3.59	3.46	3.17	2.87
T <sub>6</sub>	78	78.66	79.33	80	0.087	0.089	0.097	0.112	3.8	3.61	3.25	3.07
T <sub>7</sub>	78	79.33	79.33	80.33	0.091	0.096	0.104	0.113	3.84	3.64	3.28	3.1
T <sub>8</sub>	76.66	77.33	78.33	79.33	0.086	0.088	0.1	0.106	3.62	3.39	3.14	2.85
T <sub>9</sub>	76.33	77	77.66	78.33	0.088	0.088	0.097	0.111	3.55	3.39	3.21	2.85
<b>F value</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>S Em ±</b>	0.42	0.59	0.49	0.55	0	0	0.01	0.01	0.07	0.08	0.05	0.06
<b>CD 5%</b>	1.27	1.78	1.47	1.66	0	0	0.01	0.01	0.22	0.23	0.14	0.19
<b>CV</b>	0.95	1.31	1.08	1.2	1.98	2.78	3.47	3.03	3.43	3.71	2.48	3.74

**Table no. 3. Change in the Reducing Sugars, Non-Reducing Sugar, Total Sugar and Storage stability of papaya candies as affected by various treatments.**

Treatments	Reducing Sugar (%)				Non-Reducing Sugar %				Total Sugar %				Shelf-Life (days)
	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	
T <sub>0</sub>	41.21	43.82	47.7	51.97	26.72	27.03	27.69	28	67.93	70.85	75.39	79.97	78
T <sub>1</sub>	41.74	44.28	48.28	53.13	27.06	27.36	27.96	28.32	68.8	71.64	76.24	81.45	79
T <sub>2</sub>	41.47	44.85	48.31	53.58	27.65	27.78	27.95	28.65	69.12	72.63	76.26	82.23	83
T <sub>3</sub>	41.63	44.72	48.45	53.69	27.93	27.96	28.06	28.92	69.56	72.68	76.51	82.61	81
T <sub>4</sub>	41.6	44.7	49.28	54.17	27.35	27.65	28.13	28.68	68.95	72.35	76.41	82.85	83
T <sub>5</sub>	41.75	44.76	48.69	54.02	27.61	27.94	28.12	29.13	69.36	72.7	76.81	83.15	80
T <sub>6</sub>	42.31	46.03	50.02	54.19	28.02	28.19	29.01	29.32	70.52	74.22	79.03	83.51	85
T <sub>7</sub>	42.36	46.08	50.06	54.27	28.17	28.65	29.06	29.68	70.53	74.73	79.12	83.95	87
T <sub>8</sub>	41.58	45.68	48.93	53.49	27.95	28	28.63	28.56	69.53	73.68	77.56	82.05	79
T <sub>9</sub>	41.33	44.64	48.89	53.29	27.56	28.06	28.45	28.55	68.89	72.7	77.34	81.84	83
<b>F value</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	
<b>S Em ±</b>	0.12	0.36	0.29	0.26	0.7	0.16	0.14	0.13	0.38	0.48	0.41	0.59	
<b>CD 5%</b>	0.38	0.99	0.89	0.8	0.16	0.44	0.37	0.34	1.05	1.44	1.25	1.54	
<b>CV</b>	0.52	1.25	1.04	0.85	0.32	0.75	0.54	0.51	1.42	1	0.89	1.16	

**Table no. 4. Change in the colour and appearance, Texture, Flavour of papaya candies as affected by various treatments.**

Treatments	Colour				Texture				Flavour			
	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS
T <sub>0</sub>	8	7.6	7.05	6.8	7.5	7.4	7.06	7	7.8	7.73	7.63	7.5
T <sub>1</sub>	8.23	8.16	7.2	7.3	7.76	7.53	7.4	7.33	8.11	8.1	8.03	7.63
T <sub>2</sub>	8.2	8.19	7.36	7.6	8.1	7.73	7.7	7.53	8.19	8.1	8.09	7.73
T <sub>3</sub>	8.21	8.2	7.5	7.66	8.06	7.83	7.56	7.5	8.2	8.2	8.19	7.66
T <sub>4</sub>	8.22	8.21	7.53	7.6	8.11	7.96	7.73	7.63	8.22	8.21	8.2	7.83
T <sub>5</sub>	8.21	8.2	7.33	7.6	8.16	8.12	7.83	7.66	8.28	8.28	8.27	7.83
T <sub>6</sub>	8.27	8.25	8.1	8.2	8.22	8.21	8.19	8.16	8.29	8.29	8.28	8.21
T <sub>7</sub>	8.3	8.29	8.28	8.27	8.3	8.3	8.29	8.27	8.3	8.3	8.29	8.27
T <sub>8</sub>	8.22	8.22	7.8	7.86	8.19	8.1	7.96	7.73	8.24	8.23	8.22	8.2
T <sub>9</sub>	8.26	8.21	7.7	7.76	8.2	7.93	7.76	7.73	8.16	8.1	7.96	7.86
<b>F value</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>S Em ±</b>	0.25	0.21	0.2	0.18	0.18	0.17	0.12	0.1	0.19	0.17	0.15	0.11
<b>CD 5%</b>	0.68	0.6	0.57	0.48	0.47	0.45	0.3	0.28	0.51	0.46	0.38	0.28
<b>CV</b>	5.01	3.91	3.89	2.89	3.19	3.11	2.34	3.28	3.41	3.36	2.31	2.02

**Table no. 5. Change in the Taste and Overall Acceptability of papaya candies as affected by various treatments.**

Treatments	Taste				Overall Acceptability			
	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS
T <sub>0</sub>	7.73	7.66	7.6	7.33	7.63	7.53	7.46	7.36
T <sub>1</sub>	7.8	7.73	7.66	7.5	7.93	7.86	7.76	7.7
T <sub>2</sub>	7.8	7.76	7.63	7.56	8.13	8.11	8	7.8
T <sub>3</sub>	7.97	7.9	7.8	7.63	8.13	8.1	8.06	7.83
T <sub>4</sub>	8.03	8	7.93	7.9	8.16	8.15	8.13	7.96
T <sub>5</sub>	8	7.93	7.76	7.7	8.23	8.23	8.2	8.18
T <sub>6</sub>	8.26	8.25	8.19	8.12	8.27	8.27	8.26	8.24
T <sub>7</sub>	8.3	8.29	8.28	8.27	8.3	8.3	8.29	8.29
T <sub>8</sub>	8.24	8.2	8.12	8.11	8.24	8.23	8.22	8.2
T <sub>9</sub>	8.25	8.2	8.05	8	8.25	8.24	8.23	8.1
<b>F value</b>	S	S	S	S	S	S	S	S
<b>S Em ±</b>	0.17	0.15	0.14	0.12	0.19	0.16	0.15	0.13
<b>CD 5%</b>	0.49	0.42	0.38	0.33	0.57	0.47	0.43	0.37
<b>CV</b>	2.93	2.86	2.83	2.76	3.88	3.13	2.89	2.58



Fig.1 Cutting of papaya



Fig.2 Blanching of papaya slices



Fig. 3 Drying of papaya candy slices



Fig. 4 Papaya candy After Drying

## CONCLUSION

Based on present investigation, it is concluded that treatment T<sub>7</sub> (1Kg papaya slice + sugar syrup @75%B + Ginger extract @5%) was best in terms of best recipe with value addition for preparation of papaya candy. The same treatment T<sub>7</sub> (1Kg papaya slice + sugar syrup @75%B + Ginger extract @5%) was again found best in terms of Quality, Storage stability and maximum B:C ratio.

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