



Research Paper

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Standardization of a recipe for the preparation of candy (tuti fruiti) from unripe papaya

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ABSTRACT : An experiment was carried out at the Post graduate laboratory, Department of Horticulture, Junagadh Agricultural University, Junagadh (Gujarat) during the year 2011. The experiment consisted of 18 treatments viz., NaCl (10 %, 20 %, 30 % and 40 %), Ca(OH)₂ (0.5 % and 1.0 %) and sea water (15 ppt, 25 ppt and 35 ppt) and each level with sugar (add direct sugar and add 50 °Brix sugar syrup). The experiment was laid out in Completely Randomized Design with 3 repetitions. The results indicated that the quality observations and sensory evaluation affected by various treatments. The treatment T₃ (20 % NaCl and add direct sugar) recorded the maximum total sugar, non reducing sugar and sensory evaluation (colour, texture, flavour, taste and overall acceptability) during entire period of storage (Six months).

KEY WORDS : Papaya, Candy (tuti fruiti), Quality observations, Sensory evaluation

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The papaya, papaw or pawpaw is the fruit of the plant *Carica papaya* L. It is a common fruit in nearly all parts of tropical and subtropical world. It is an abundantly grown in India. Immature papaya fruits contain the enzyme papain which has several uses. The green fruit is used for papain, pectin and tuti fruiti (candy) and many products are prepared from ripe fruit. (Malathi *et al.*, 1986).

RESEARCH METHODS

An experiment was carried out at the Post graduate laboratory, Department of Horticulture, Junagadh Agricultural University, Junagadh (Gujarat) during the year 2011. The experiment consisted of 18 treatments viz., NaCl (10 %, 20 %, 30 % and 40 %), Ca(OH)₂ (0.5 % and 1.0 %) and sea water (15 ppt, 25 ppt and 35 ppt) and each level with sugar (with add direct sugar and add 50 °Brix sugar syrup). Matured unripe papaya fruits were used for the experiment. The fruits were peeled off and cut into small pieces in uniform size. One kg of papaya pieces soaked according to treatments in 1L water containing different concentrations of salt of NaCl, Ca(OH)₂ and sea water for 6 days, 12 hours and 3 days, respectively. Papaya pieces were drained and washed with tap water for desalinization and boiled. The pieces were used for preparing

tuti fruiti as per treatments. Then, 500-750 mg citric acid and 0.2 g food colour were added at 50 °Brix. Then, 500 mg sodium benzoate was added at 65 °Brix and boiled until the °Brix reached 70. Candy were dried under shade and packed in the polythene bags. The experiment was laid out in Completely Randomized Design with 3 repetitions.

Total sugars were estimated as per the procedure suggested by Sadasivam and Manickam (1992). Non reducing sugars were obtained by deducting the value for reducing sugar from total sugars. The sensory evaluation was performed by a panel of judges based on hedonic scale as described by Amerene *et al.* (1965). The data were analysed using Completely Randomized Design by Panse and Sukhatme (1985).

RESEARCH FINDINGS AND DISCUSSION

The total sugar (Table 1) and non reducing sugar (Table 2) were found significantly increased with increasing advancement of storage period. At end of storage period treatment T₃ (20 % NaCl and add direct sugar) observed highest total sugar (74.79%) and non reducing sugar (36.88%). It might be due to reduction in moisture, conversion of polysaccharides and non reducing sugars into reducing sugar and another probable reason was conversion of organic acids into sugars

Table 1 : Effect of different treatments on total sugar (%) of papaya candy (tuti fruiti) during storage							
Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	49.36	57.69	60.77	72.02	70.53	69.39	63.92
T ₂	52.18	52.81	59.72	66.63	71.18	68.02	63.84
T ₃	54.83	55.25	64.34	68.46	74.57	75.90	74.79
T ₄	47.78	52.82	59.07	64.51	62.40	66.97	68.09
T ₅	48.11	51.19	55.58	65.16	62.73	66.06	70.36
T ₆	49.08	52.81	57.77	68.09	71.18	70.13	66.30
T ₇	51.34	53.30	60.21	61.91	66.30	63.27	60.24
T ₈	50.87	46.78	54.93	66.30	65.00	62.87	60.73
T ₉	48.27	50.70	63.86	67.09	74.43	70.37	62.87
T ₁₀	42.00	52.81	58.83	68.74	67.93	70.61	68.09
T ₁₁	51.58	53.14	62.56	58.29	71.42	69.88	66.63
T ₁₂	48.76	52.16	57.93	60.26	64.35	64.66	66.95
T ₁₃	48.13	52.81	68.98	65.65	64.03	74.92	69.55
T ₁₄	50.65	49.89	57.12	58.31	68.90	66.30	66.14
T ₁₅	47.53	50.70	58.99	61.75	65.65	68.90	69.71
T ₁₆	50.35	48.59	58.09	66.46	69.55	68.41	64.03
T ₁₇	42.60	49.08	64.03	71.66	76.98	74.65	70.81
T ₁₈	50.78	50.21	57.85	66.35	69.23	70.37	65.49
S.E.±	2.23	1.82	2.55	2.87	3.06	2.65	2.67
C.D. (P=0.05)	6.40	5.22	7.32	8.23	8.78	7.62	7.67
CV%	7.87	6.07	7.36	7.59	7.71	6.66	6.95

Table 2 : Effect of different treatments on non reducing sugar (%) of papaya candy (tuti fruiti) during storage							
Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	25.22	27.52	17.67	22.15	37.90	37.46	30.90
T ₂	23.38	27.68	21.44	19.56	25.26	24.22	19.88
T ₃	25.71	25.39	31.90	29.80	34.51	38.05	36.88
T ₄	24.94	25.09	28.55	32.73	28.68	32.12	28.89
T ₅	24.96	27.81	24.66	31.62	25.87	24.57	26.39
T ₆	22.79	19.27	18.32	16.81	24.79	22.82	13.34
T ₇	25.75	20.75	28.09	26.00	27.82	26.45	24.28
T ₈	13.12	19.04	21.85	19.32	26.57	24.97	23.36
T ₉	16.26	14.40	31.24	16.36	34.54	34.30	29.78
T ₁₀	16.72	15.64	25.78	24.65	23.02	22.73	15.22
T ₁₁	25.30	18.30	26.88	27.27	30.31	31.07	26.67
T ₁₂	25.15	19.22	25.16	22.28	24.29	20.88	22.72
T ₁₃	16.19	13.77	23.03	25.55	31.94	23.08	14.98
T ₁₄	18.03	17.18	28.93	22.54	32.30	31.24	25.12
T ₁₅	15.63	15.45	27.81	28.28	28.23	20.70	19.21
T ₁₆	14.86	12.14	17.33	27.02	34.25	19.97	16.54
T ₁₇	15.10	14.85	20.00	31.55	25.33	23.86	21.27
T ₁₈	14.80	12.78	17.73	25.93	25.60	24.07	16.69
S.E.±	0.96	0.92	1.15	1.21	1.37	1.28	1.09
C.D. (P=0.05)	2.76	2.65	3.31	3.49	3.94	3.67	3.13
CV%	8.23	8.30	8.24	8.43	8.20	8.26	8.25

Table 3 : Effect of different treatments on colour (score out of 10) of papaya candy (tuti fruiti) during storage							
Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	8.27	7.77	7.33	6.90	6.70	6.58	3.00
T ₂	6.33	5.83	5.23	5.20	5.10	5.00	4.00
T ₃	9.10	8.93	8.63	8.33	8.10	8.00	7.50
T ₄	6.93	6.43	5.83	5.40	2.33	2.33	2.33
T ₅	8.57	8.20	8.10	7.80	7.80	7.57	2.00
T ₆	6.83	6.33	5.67	5.23	2.00	2.00	2.00
T ₇	8.50	8.00	7.50	6.70	6.47	2.00	2.00
T ₈	6.00	5.50	5.00	4.83	4.73	4.60	4.00
T ₉	6.00	5.50	5.00	2.00	2.00	2.00	2.00
T ₁₀	6.50	6.00	5.50	5.17	2.00	2.00	2.00
T ₁₁	6.53	6.03	5.33	2.00	2.00	2.00	2.00
T ₁₂	5.83	5.33	4.83	2.00	2.00	2.00	2.00
T ₁₃	5.83	5.33	5.00	5.00	5.00	2.00	2.00
T ₁₄	7.33	6.83	6.33	6.10	5.93	5.00	5.00
T ₁₅	5.83	5.33	4.83	4.50	4.40	2.00	2.00
T ₁₆	6.33	5.83	5.33	5.33	5.23	5.20	5.00
T ₁₇	7.67	7.17	6.67	6.40	2.00	2.00	2.00
T ₁₈	7.00	6.50	6.00	6.00	6.00	6.00	2.00
S.E.±	0.31	0.29	0.25	0.23	0.19	0.17	0.13
C.D. (P=0.05)	0.88	0.85	0.71	0.65	0.53	0.48	0.36
CV%	7.61	7.85	7.17	7.49	7.26	7.57	7.43

Table 4 : Effect of different treatments on texture (score out of 10) of papaya candy (tuti fruiti) during storage							
Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	8.07	7.67	7.20	6.97	6.70	6.47	2.67
T ₂	7.67	7.17	6.60	6.40	6.07	5.87	3.00
T ₃	9.00	8.77	8.27	8.00	7.90	7.53	7.33
T ₄	7.27	6.77	6.43	6.30	2.00	2.00	2.00
T ₅	8.50	8.00	7.60	7.30	7.27	7.02	2.00
T ₆	7.17	6.67	6.13	6.00	2.00	2.00	2.00
T ₇	7.83	7.40	6.77	6.50	6.27	2.00	2.00
T ₈	7.33	6.90	6.33	6.17	5.83	5.67	3.00
T ₉	6.50	6.13	5.83	2.00	2.00	2.00	2.00
T ₁₀	7.17	6.77	6.17	6.00	2.00	2.00	2.00
T ₁₁	7.33	6.83	6.33	2.00	2.00	2.00	2.00
T ₁₂	6.67	6.27	5.67	2.00	2.00	2.00	2.00
T ₁₃	6.17	5.67	4.83	4.63	4.50	2.00	2.00
T ₁₄	7.33	6.93	6.33	6.17	5.70	2.00	2.00
T ₁₅	6.00	5.67	5.00	4.73	4.53	2.00	2.00
T ₁₆	7.33	6.83	6.33	6.07	5.73	5.40	5.00
T ₁₇	7.17	6.83	6.50	6.33	2.00	2.00	2.00
T ₁₈	7.17	6.73	6.43	6.23	6.23	6.07	2.00
S.E.±	0.34	0.33	0.30	0.26	0.22	0.18	0.13
C.D. (P=0.05)	0.98	0.94	0.87	0.75	0.63	0.51	0.36
CV%	8.06	8.22	8.24	8.17	8.48	8.42	8.33

Table 5 : Effect of different treatments on flavour (score out of 10) of papaya candy (tuti fruiti) during storage							
Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	7.33	6.93	6.50	6.30	6.20	5.77	2.00
T ₂	6.83	6.47	6.10	5.90	5.80	5.37	2.00
T ₃	7.87	7.50	7.10	6.87	6.73	6.20	6.00
T ₄	6.83	6.33	5.90	5.90	2.00	2.00	2.00
T ₅	7.67	7.30	6.73	6.57	6.40	6.03	2.00
T ₆	6.83	6.43	5.90	5.90	2.00	2.00	2.00
T ₇	7.67	7.13	6.70	6.60	6.13	2.00	2.00
T ₈	6.90	6.43	6.20	6.07	5.93	5.60	2.00
T ₉	6.17	5.60	5.37	2.00	2.00	2.00	2.00
T ₁₀	6.83	6.40	5.73	5.57	2.00	2.00	1.88
T ₁₁	6.50	6.10	5.67	2.00	2.00	2.00	2.00
T ₁₂	6.67	6.27	5.60	2.00	2.00	2.00	2.00
T ₁₃	6.83	6.50	5.83	5.57	5.57	2.00	2.00
T ₁₄	6.93	6.57	6.17	5.70	5.70	2.00	2.00
T ₁₅	6.33	5.93	5.33	5.33	5.33	2.00	2.00
T ₁₆	6.87	6.53	6.17	6.07	5.93	5.57	2.00
T ₁₇	6.90	6.57	6.17	6.07	2.00	2.00	2.00
T ₁₈	6.83	6.53	6.00	6.00	5.93	5.63	2.00
S.E.±	0.32	0.31	0.29	0.25	0.22	0.17	0.11
C.D. (P=0.05)	0.92	0.90	0.84	0.73	0.62	0.49	0.32
CV%	8.01	8.29	8.38	8.17	8.43	8.49	8.76

Table 6 : Effect of different treatments on taste (score out of 10) of papaya candy (tuti fruiti) during storage							
Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	7.80	7.60	7.40	7.20	6.90	6.50	2.00
T ₂	7.33	6.70	6.50	6.20	6.00	6.00	2.00
T ₃	8.67	8.40	7.83	7.60	7.30	7.00	6.87
T ₄	7.17	6.77	6.33	5.90	2.00	2.00	2.00
T ₅	7.93	7.53	7.13	6.90	6.70	6.50	2.00
T ₆	7.33	7.07	6.67	6.37	2.00	2.00	2.00
T ₇	7.83	7.50	7.10	6.87	6.27	2.00	2.00
T ₈	7.33	7.00	6.50	6.23	6.13	5.80	2.00
T ₉	6.00	5.77	5.50	2.00	2.00	2.03	2.03
T ₁₀	7.33	6.63	6.33	6.07	2.00	2.00	2.00
T ₁₁	6.33	6.10	5.50	2.00	2.00	2.03	2.00
T ₁₂	6.83	6.50	6.00	2.00	2.00	2.00	2.00
T ₁₃	6.33	6.00	5.67	5.57	5.33	2.00	2.00
T ₁₄	7.00	6.67	6.17	6.07	5.73	2.00	2.00
T ₁₅	6.33	6.03	5.50	5.40	5.30	2.00	2.00
T ₁₆	6.83	6.27	5.83	5.73	5.57	5.40	2.00
T ₁₇	7.50	6.93	6.50	6.33	2.00	2.00	2.00
T ₁₈	7.50	6.67	6.40	5.90	5.60	5.27	2.00
S.E.±	0.34	0.32	0.31	0.27	0.22	0.18	0.11
C.D. (P=0.05)	0.98	0.92	0.89	0.78	0.62	0.51	0.33
CV%	8.22	8.21	8.39	8.41	8.39	8.62	8.74

Treatments	Storage period in months						
	Initial	1	2	3	4	5	6
T ₁	7.85	7.49	7.11	6.84	6.58	6.33	2.42
T ₂	7.04	6.54	6.11	5.93	5.74	5.56	2.75
T ₃	8.66	8.40	7.96	7.70	7.51	7.23	6.93
T ₄	7.05	6.58	6.13	5.88	2.08	2.08	2.08
T ₅	8.17	7.76	7.35	7.14	7.00	6.68	2.00
T ₆	7.04	6.63	6.09	5.88	2.00	2.00	2.00
T ₇	7.96	7.51	6.99	6.67	6.28	2.00	2.00
T ₈	6.89	6.46	6.01	5.83	5.66	5.42	2.75
T ₉	6.17	5.75	5.43	2.00	2.00	2.01	2.01
T ₁₀	6.96	6.45	5.93	5.70	2.00	2.00	1.97
T ₁₁	6.68	6.27	5.71	2.00	2.00	2.01	2.00
T ₁₂	6.50	6.09	5.53	2.00	2.00	2.00	2.00
T ₁₃	6.29	5.88	5.33	5.19	5.10	2.00	2.00
T ₁₄	7.15	6.75	6.25	6.01	5.80	2.75	2.75
T ₁₅	6.13	5.74	5.17	4.99	4.93	2.00	2.00
T ₁₆	6.84	6.37	5.92	5.80	5.62	5.39	3.50
T ₁₇	7.31	6.88	6.46	6.28	2.00	2.00	2.00
T ₁₈	7.13	6.61	6.21	6.03	5.94	5.74	2.00
S.E.±	0.24	0.21	0.19	0.12	0.08	0.07	0.05
C.D. (P=0.05)	0.68	0.60	0.55	0.35	0.23	0.19	0.16
CV%	5.82	5.42	5.34	3.90	3.16	3.19	3.76

during metabolism. Similar results were found by Rokhade *et al.* (2006) in aonla, Kannan and Susheela (2002), Unde *et al.* (1998) in ber, Mehta *et al.* (2005) in citrus, Sawate *et al.* (2005) in papaya.

The sensory evaluation of papaya candy (tuti fruiti) by different treatments was done periodically during storage at initial, 1st, 2nd, 3rd, 4th, 5th and 6th month of storage. It was found that all the sensory parameters were significantly influenced by different treatments during the entire period of storage. In general there has been a tendency of decline in terms of colour (Table 3), texture (Table 4), flavour (Table 5), taste (Table 6) and overall acceptability (Table 7) during the entire period of storage but the acceptability values varied due to treatments. Among various treatments, the colour (7.5), texture (7.3), flavour (6.0), taste (6.8) and over all acceptability (6.9) of the treatment T₃ (20 % NaCl and add direct sugar) recorded maximum score at the end of entire storage period. The decline in colour acceptability of dried product during storage has been due to increase in browning of cubes. Similar results were obtained by Hiremath and Rokhade (2012) in Sapota, Mehta and Tomar (1980) in dehydrated papaya. This variation and decline trend in texture acceptability has been due to fluctuations in moisture levels and increasing sugar content. Similar results were obtained by Sharma and Lal (1999) in plum. This variation and decline trend in flavour acceptability was due to loss of moisture and added preservative. Similar

results were obtained by Sharma *et al.* (1998) in apple. Taste decline was due to development of browning, caramelization and loss of flavour during the entire period of storage. Similar results were obtained by Ray and Kikani (1999) in aonla.

Conclusion:

The results indicated that the quality observations and sensory evaluation were affected by various treatments. The treatment T₃ (20 % NaCl and add direct sugar) recorded the maximum total sugar, non reducing sugar and sensory evaluation (colour, texture, flavour, taste and overall acceptability) during entire period of storage (Six months).

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