Research Paper Agriculture

Effect of Different Citric Acids Levels on Quality Papaya Candy Prepared by Various Methods

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ABSTRACT

Experiments were conducted to investigate the effect of different processing methods, citric acid levels and packaging materials on physico-chemical and sensory quality of fresh as well as stored papaya candy. The citric acid levels of 0.5%, 0.75% and 1.0% were used for all three processing methods. After preparation of papaya candy, the finished products were packed in three packaging materials viz; glass jars, PET jars and PP pouches and stored at room temperature for quality evaluation at 30, 60 and 90 days interval. The data obtained for acidity of fresh samples of papaya candy indicated that with increase in citric acid levels, the acidity increased in processing method.

KEYWORDS Papaya, candy, packaging, citric acid and benzoic acid

Introduction

India is the second largest producer of fruits and vegetables. However, about 25 to 30% produce are wasted due to inadequate facilities of processing, preservation, storage, handling and transportation. The edible portion of papaya is composed mostly of water (89.6%) and carbohydrate (9.5%) which together makes up 99.10% of the fruits. Also, papaya fruits contain 6.5 to 13 ^{0}Brix of TSS in the Pusa varieties (Ram, 1982) and 9.8 ^{0}Brix in Loorg honey dew (Singh and Sirohi, 1977). Several changes occur within the papaya during its development. Presently, only the changes in sugar content and papain concentration have been reported in the literature. Changes in the sugar content and composition were reported by Chan et al. (1979). The principal carbohydrate in papaya is the sugars, with little or no starch being present (Chan et al. 1978). Total soluble solids in papaya puree have been found to vary between the values of 11.5 to 13.5^0 Brix (Brekke et al., 1973). The edible portion of papaya is composed mostly of water (89.6%) and carbohydrate (9.5%) which together makes up 99.10% of the fruits. Also, papaya fruits contain 6.5 to 13 ^{0}Brix of TSS in the Pusa varieties (Ram, 1982) and 9.8 ^{0}Brix in Loorg honey dew (Singh and Sirohi, 1977). Several changes occur within the papaya during its development. Presently, only the changes in sugar content and papain concentration have been reported in the literature. Changes in the sugar content and composition were reported by Chan et al. (1979). The principal carbohydrate in papaya is the sugars, with little or no starch being present (Chan et al. 1978). Total soluble solids in papaya puree have been found to vary between the values of 11.5 to 13.5^0 Brix (Brekke et al., 1973).

Materials and Methods

Studies were also carried out to evaluate the quality of papaya candy in terms of physico-chemical and sensory characteristics just after preparation and after 30, 60 and 90 days of storage in glass Jars, PET jars and PP pouches at ambient temperature conditions.

Preservative and Acid

Benzoic acid @ 600 ppm (Qualiqens Fine chemical, Mumbai) was used as preservative in papaya candy. Citric acid was used within the permissible limit to increase the acidity and clarify the sugar syrup.

Packaging Materials

Finished papaya candies were packed in glass Jars, PET Jars and PP pouches for storage studies.

Preparation of Papaya Candy

Variables/ Parameters	Levels	Descriptions	Measuring Parameters
Sample size	1	750 gm	(a) Physico-chemical quality-Moisture content, TSS, Acidity, optical density, Vitamin-C, (b) Sensory quality attributes-(Colour, Taste, Flavour and Texture and Overall acceptability)
TSS (initial)	1	50 °Brix	
TSS (final)	1	75 °Brix	
Citric acid	3	0.5%, 0.75%, 1.0% (w/w)	
Yellow Colour (edible)	1	4 ml	
Preservative (benzoic acid)	1	600 ppm	
Packaging materials	3	Glass Jar, PET Jar and PP pouches	
Replications	3	-	

Papaya candy was prepared by adopting the procedure as reported by Srivastava and Kumar (1994) with little modification in process. The procedure is described below:

Table 1. Experimental layout for papaya candy

The unripe papaya fruits were washed with fresh water, peeled, pricked, deseeded and cut into rectangular pieces of 3 cm long and 1.5-2.0 cm thick, followed by steeping into 2% commercial salt (sodium chloride) and 1% calcium chloride for 2 hours and thoroughly washed with fresh water. Papaya pieces were blanched by dipping into hot water (90°C) for 10 minutes. The blanched papaya pieces were dipped in syrup prepared using different levels of citric acid and sugar for 24 hours at 50 °Brix TSS. The strength of syrup was increased by 5 °Brix TSS at alternate day to a final strength of 75 °Brix TSS at which steeping was done continuously for 3 days. After draining syrup, the candy pieces were quickly washed with hot water to remove syrup adhering to the surface followed by drying in tray dryer at 60°C for 6 to 6.5 hours. Dried samples were then packed in glass jars, PET jars and polypropylene pouches for further studies. The process flow chart is given in Fig.



Plate 1. Finished papaya candy samples packed in Glass jars, PET jars and PP pouches

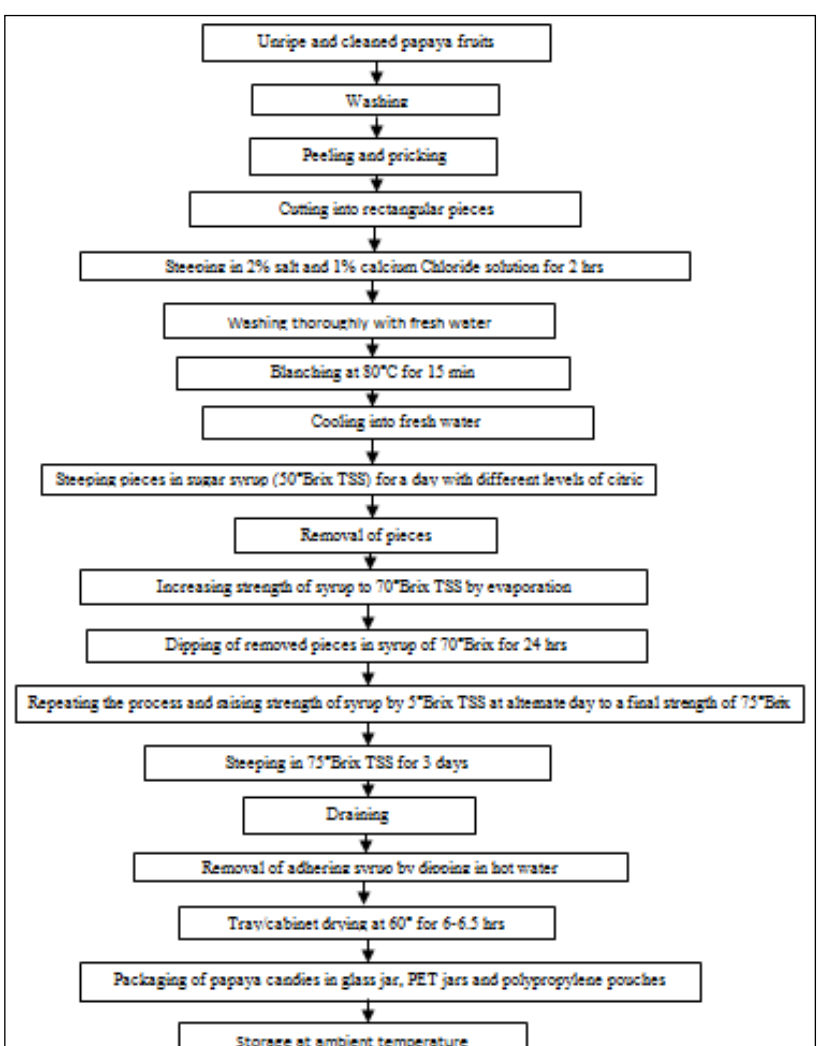


Fig. 1 Process flow chart for preparation of papaya candy

Result and Discussion

Experiments were conducted to the study the effect of processing methods and packaging materials on physico-chemical and sensory quality of fresh as well as stored papaya candy. The levels of citric acid and sugar were selected on the basis of preliminary trial runs. The physico-chemical quality namely moisture content, TSS (total soluble solids), acidity, browning index (optical density), vitamin C and sensory quality attributes (colour, texture, flavour, taste, overall acceptability) were evaluated just after preparation and after 30, 60 and 90 days of storage in glass jars, PET jars and PP pouches. Results are discussed in the following sections.

Table 2. Change in moisture content of papaya candy during storage as affected by processing methods, levels of citric acid and packaging materials

Processing Methods	Storage Period	Moisture Content								
		$M_1PC_{0.5}$			$M_1PC_{0.75}$			$M_1PC_{1.0}$		
		GJ	PJ	PP	GJ	PJ	PP	GJ	PJ	PP
I	Fresh	17.25 ± .046	17.25 ± .021	17.25 ± .134	17.75 ± .044	17.75 ± .112	17.75 ± .032	18.25 ± .021	18.25 ± .011	18.25 ± .042
	30 days	17.27 ± .081	16.90 ± .084	17.02 ± .034	17.85 ± .121	17.36 ± .034	17.45 ± .041	18.45 ± .022	18.10 ± .028	18.15 ± .081
	60 days	17.27 ± .033	16.55 ± .011	16.70 ± .011	17.98 ± .028	17.02 ± .096	17.10 ± .032	18.65 ± .012	17.95 ± .012	18.00 ± .128
	90 days	17.28 ± .041	16.04 ± .042	16.38 ± 0.24	18.05 ± .132	16.68 ± .011	16.74 ± .011	18.78 ± .018	17.80 ± .022	17.87 ± .004
II		$M_2PC_{0.5}$			$M_2PC_{0.75}$			$M_2PC_{1.0}$		
		GJ	PJ	PP	GJ	PJ	PP	GJ	PJ	PP
	Fresh	17.40 ± .046	17.40 ± .044	17.40 ± .011	18.12 ± .048	18.12 ± .018	18.12 ± .032	18.50 ± .048	18.50 ± .080	18.50 ± .021
	30 days	17.42 ± .024	16.98 ± .011	17.10 ± .023	18.32 ± .128	17.87 ± .022	17.80 ± .096	18.75 ± .011	18.39 ± .044	18.42 ± .022
	60 days	17.45 ± .012	16.58 ± .026	16.90 ± .084	18.53 ± .032	17.58 ± .048	17.48 ± .054	18.98 ± .042	18.30 ± .024	18.31 ± .044
	90 days	17.47 ± .011	16.18 ± .086	16.60 ± .044	18.65 ± .012	17.30 ± .011	17.10 ± .038	19.28 ± .081	18.13 ± .084	18.18 ± .026
III		$M_3PC_{0.5}$			$M_3PC_{0.75}$			$M_3PC_{1.0}$		
		GJ	PJ	PP	GJ	PJ	PP	GJ	PJ	PP
	Fresh	17.12 ± .064	17.12 ± .034	17.12 ± .061	17.48 ± .011	17.48 ± .046	17.48 ± .012	17.90 ± .032	17.90 ± .092	17.90 ± .089
	30 days	17.14 ± .024	16.65 ± .011	16.80 ± .024	17.65 ± .056	17.30 ± .048	17.28 ± .120	18.25 ± .081	17.80 ± .096	17.85 ± .044
	60 days	17.17 ± .111	16.20 ± .026	16.48 ± .028	17.80 ± .032	16.95 ± .081	17.05 ± .012	18.53 ± .032	17.72 ± .012	17.78 ± .048
	90 days	17.19 ± .210	15.82 ± .011	16.18 ± .022	17.92 ± .064	16.58 ± .082	16.67 ± .011	18.78 ± .081	17.60 ± .046	17.67 ± .052

M_1P = Processing method-I **$C_{0.5}$ = 0.5% Citric acid level**

M_2P = Processing method -II **$C_{0.75}$ = 0.75% Citric acid level**

M_3P = Processing method-III **$C_{1.0}$ = 1.0%Citric acid level**

GJ = Glass Jar

PJ = PET Jar

PP = Poly propylene

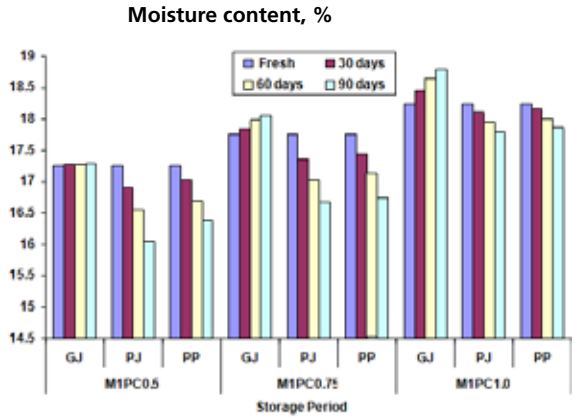


Fig 2. Effect of first processing method, citric acid levels and packaging materials on moisture content of fresh and stored papaya candy

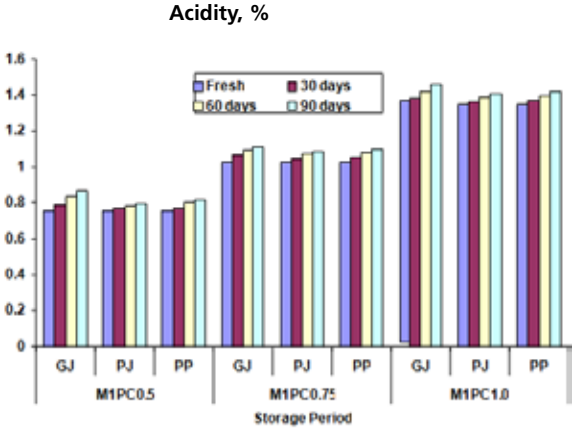


Fig. 3 Effect of first processing method, citric acid level and packaging material on acidity of fresh and stored papaya candy

Effect on Sensory Quality

Sensory quality of papaya candy just after preparation and after 30, 60 and 90 days of storage were evaluated on 9-point scale by hedonic rating test method. Score awarded by the panelist to the individual sensory quality attributes namely, colour, flavour, taste, texture and overall acceptability are presented in Table 1. Bar charts for sensory quality attributes of fresh as well as stored papaya candy is shown in Fig. 2 to 3. Study revealed that the fresh samples of third processing method exhibited better sensory scores for colour, flavour and overall quality attributes. Sensory scores decreased rapidly in case of samples prepared by third method than those of first and second processing method at the citric acid level of 0.5%, 0.75% and 1% during storage. The reason may be attributed to increase in the values of TSS, browning index and acidity of papaya candy samples which exhibited darkened colour, hard texture and developed off flavour. Samples prepared by first processing method gave the highest overall sensory scores as 7.4725, 7.445 and 7.4325 for samples packed in PET jar, PP pouches and glass jar respectively after 90 days of storage period at the level of 0.75% citric acid. Study indicated that the samples prepared by all three processing methods exhibited highest sensory score at 0.75% citric acid level than those of 0.5 and 1% citric acid levels respectively after 90 days of storage.

Conclusion

Experiments were conducted to investigate the effect of different processing methods, citric acid levels and packaging materials on physico-chemical and sensory quality of fresh as well as stored papaya candy. The citric acid levels of 0.5%, 0.75% and 1.0% were used for all three processing methods. After preparation of papaya candy, the finished products were packed in three packaging materials viz glass jars, PET jars and PP pouches and stored at room temperature for quality evaluation at 30, 60 and 90 days interval. The methodology is described below:

- The study revealed that the moisture content increased with citric acid levels in case of all three processing methods. The values of moisture content were found to have decreased after 30, 60 and 90 days of storage.
- The samples having citric acid levels of 0.5%, 0.75% and 1.0% prepared with first processing method had moisture content values of 16.04% and 16.38%, 16.68 and 16.74%, 17.80% and 17.87% respectively after 90 days of storage in PET jars and PP pouches. The data showed that the samples packed in PET jars underwent decline in moisture content than the samples packed in PP pouches.
- The study revealed that irrespective of processing methods, the TSS decreased with increase in the level citric acid. The samples prepared by first processing methods had TSS values of 79.2, 78.20 and 77.80 °Brix at citric acid levels of 0.5%, 0.75% and 1.0%, respectively. It was concluded that first processing method gave better products after 90 days of storage followed by second and third processing methods at the level of 0.75 percent citric acid level. The PET jar was found suitable packaging material for storage of papaya candy.

REFERENCES

Brekke, J.E., Chan, H.T., Jr., and Cavaletto, C.G. (1973). Papaya puree and nectar. Res. Bull. 170 Honolulu, Hawaii, Hawaii Agric. Exp. Sta. | Chan, H.T., Jr., Hibbard, K.L., Goo, T., and Akamine, E.K. (1979). Sugar composition of papaya during fruit development. Hort. Sci. 14: 140-141. | Chan, H.T., Jr., Tam, S.Y.T. and koide, R.T. (1978). Isolation and characterization of catalase from papaya. J. Food Sci. 43 : 989-990. | Ram B. (1982). Studies on processing and preservation of aonla fruit beverages M.Sc. Thesis, N.D.U.A. & T, Kumarganj, Faizabad. | Singh and Sirohi (1977). Timing of the ethephon application ripening and quality of rasin grape c.v. Block Corianth Haryana Agri. University, J. Res. 7, 97. | Srivastave R.P. and Kumar S. (1994). Fruits and vegetables preservation (Principles and facts). International Book Distributing Company, Charbagh, Lucknow. |