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Evaluation of Quality Attributes during Storage of Guava and Papaya Mixed Fruit Leather

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A B S T R A C T

This study was conducted to find out the effect of blended fruit pulp and sugar treatments on quality attributes of mixed fruit leather at 0, 20, 40, 60, 80 and 100 days of storage. Among 18 treatment combinations, six pulp ratio of guava and papaya and three levels of sugar were used for preparation of mixed fruit leather. Mixing of guava and papaya pulp in ratio of (80:20) with S2 (30 gm sugar/100 gm pulp) was recorded best in sensory evaluation. In case of qualitative characters (per cent TSS and per cent acidity), a slight increase in all the treatment was recorded. Treatments with higher ratio of guava pulp in mixed fruit leather resulted into higher TSS and acidity per cent. The result also showed the product was acknowledged by evaluators as well as other consumers due to its originality, superior quality, low cost technology and wide acceptability.

Introduction

Guava is a popular tropical fruit belongs to the family myrtaceae. In India Guava is extensively produced and is fourth most grown fruit crop following Mango, Banana and Citrus (Singh *et al.*, 2016). In year 2015-16 Guava cultivated area in India accounted 255 thousand Ha, produced about 4048 thousand MT of fruits according to the Horticultural statistics at a glance 2017. Guava fruits are good source of ascorbic acid ranging from 70-350 mg/100g., pectin ranging from 0.52 to 2% and minerals like calcium, phosphorus, iron etc. the fruit contains substantial quantity of vitamin A, pantothenic acid, riboflavin, thiamin and niacin. Papaya belongs to the family Caricaceae, one of the most appreciated tropical fruit with great economic and nutritional importance. Papaya fruit has a sweet, exotic flavor and is rich in Vitamin A and C and antioxidants. It also contains a proteolytic enzyme, papain, which helps in digestion of protein rich foods. The vitamin A content in papaya (2020 IU/100 g) is only next to mango (Singh, 2000) and one single medium Papaya fruit provides about 224 percent of daily requirement for Vitamin C.

Guava and Papaya exhibit climacteric pattern and that is why they are highly perishable in

nature and suffers great extent of postharvest losses. Processing can play an important role in minimizing the postharvest losses of fruits. Making of fruit leather from fresh fruits is an effective way to preserve fruits (Maskan *et al.*, 2002). Fruit leathers are often considered as a health food and health food marketing images such as "pure," "sun-dried," or "rich in vitamins" are used to describe them (Vatthanakul *et al.*, 2010). This study was conducted to evaluate the effect of blending of guava and papaya pulp with different ratio of sugar on quality of mixed fruit leather.

Materials and Methods

Fruits of Guava cv. Allahabad Safeda were collected from orchard of JNKVV while fruits of Papaya cv. Coorg Honey Dew were collected from fruit market, Jabalpur. Fully matured firm, ripe and healthy fruits were picked and cut into pieces. Small pieces of Guava were autoclaved at 10 psi for 5 min. pulp is cooled to room temperature and then straining of pulp was done. Papaya fruits were peeled off and cut into pieces after removal of seeds and were autoclaved at 10 psi for 3-4 min, cooled at room temperature and then homogenization of pulp was done with mixer. Sodium benzoate (750ppm) was added to pulp after dissolving in small quantity of warm water and mixed thoroughly.For the preparation of mixed fruit leather in six different ratios (P1-80:20, P2-70:30, P3-60:40, P4-50:50, P-540:60 and P6-70:30)Guava and Papaya fruit pulp were mixed. In first six recipes 105 gm sugar (S1), in next six 210 gm (S2) and in last six recipes 315 gm sugar (S3) was added. In each pulp-sugar mixture citric acid was added. Now each recipe was homogenized in mixer for 1 minute. Then mixture of fruit pulp was poured into trays for 6 mm thickness, after trays were placed into sunlight, dried leathers were cut into uniform pieces and packed in polythene bags. These leathers were stored at room temperature.

Flow-chart for preparation of mixed fruit leather

Mixing of Guava and Papaya pulp

⇩

Addition and mixing of sugar and citric acid

⇩

Smearing of trays with butter

⇩

Spreading pulp on trays

⇩

Sun drying

⇩

Cutting dried sheets into pieces of suitable size

⇩

Wrapping in polythene bags

⇩

Storing in dry place

The Sensory parameters (i.e., colour, flavor, taste, texture and overall acceptability) and qualitative characters (i.e., TSS, acidity, pH, ascorbic acid, total sugar) were recorded for freshfruit and of guava pulp and papaya pulp separately. Organoleptic quality parameters were determined by adopting anine-point hedonic scale (1= Dislike extremely and 9= like extremely) (Amerine *et al.*, 1965). A semi trained test penal of 10 judges did the sensory evaluation. Total soluble solids in the pulp were measured with the help of hand refractometer and pH of extracted pulp was measured using Elemer pH meter after calibration of the instrument with standard buffer solution Jain *et al.*,

The titerable acidity and ascorbic acid content were determined by AOAC methods (1995). The data obtained in the study were subjected to statistical analysis (Snecdecor *et al.*, 1967).The organoleptic evaluation and testing of quality characters were carried out at 0, 20, 40, 60, 80 and 100 days of storage.

Results and Discussion

The TSS of guava pulp was recorded 17 per cent and in case of papaya pulp it was 12 per cent. However, the values of per cent acidity for guava and papaya was (0.45%) and (0.38%) respectively. The Ascorbic acid was calculated 182 mg/100gm for guava pulp and 58mg/100 gm for papaya pulp. pH of guava and papaya pulp were found 3.97 and 6.17 respectively. Total sugar was recorded 10.50% for guava pulp and 6.5% for papaya pulp.

The overall acceptability of mixed fruit leather was computed based on the organoleptic scores of various qualities as colour, flavor, texture and taste. The results showed that maximum score (8.47) for overall acceptability found in 80%guava + 20%papaya pulp combination (Fig. 1). It can be inferred that the blending of fruit pulp gives the better compatibility to pulp for preparation of quality leather. Combined effect of pulp ratio and different quantity of sugar was found non significant throughout the storage period of 100 days. During storage, it was observed that overall acceptability of mixed fruit leather slightly decreased as the days of storage were increased. These results are in agreements with those found by Mansy *et al.,* (2005) in mango papaya nectar and Saravanan *et al.,* (2004) in papaya jam. Baramanray *et al.,* (2005) showed that the organoleptic rating of freshly prepared product is highly acceptable and reduced significantly with increased storage period.

Data regarding TSS of mixed fruit leather during storage have been presented in (Table 1). The highest significant value (36.82%) of recipe (80% guava + 20% papaya) was observed at 0 day of storage. Data revealed that higher concentration of guava pulp increased the TSS percent of mixed fruit leather and this effect was observed upto 100 days of storage. Further it was seen that per cent TSS of mixed fruit leather was increased with increased concentration of sugar also persisted for 100 days of storage. As the period of storage increased, the TSS value of mixed fruit leather increased significantly up to 100 days of storage. The increase in TSS during storage might be due to the conversion of polysaccharides like starch and pectin into simple sugar. Similar inference was drawn by findings of Sharma *et al.*, (2008) and Jakhar *et al.*, (2012). This might be due to conversion of some of the insoluble fraction. Similar trend was reported by Sudha *et al.,* (2007). The increase in TSS might be due to moisture loss during storage. These findings have been well supported by Sreemathi *et al.*, (2008).

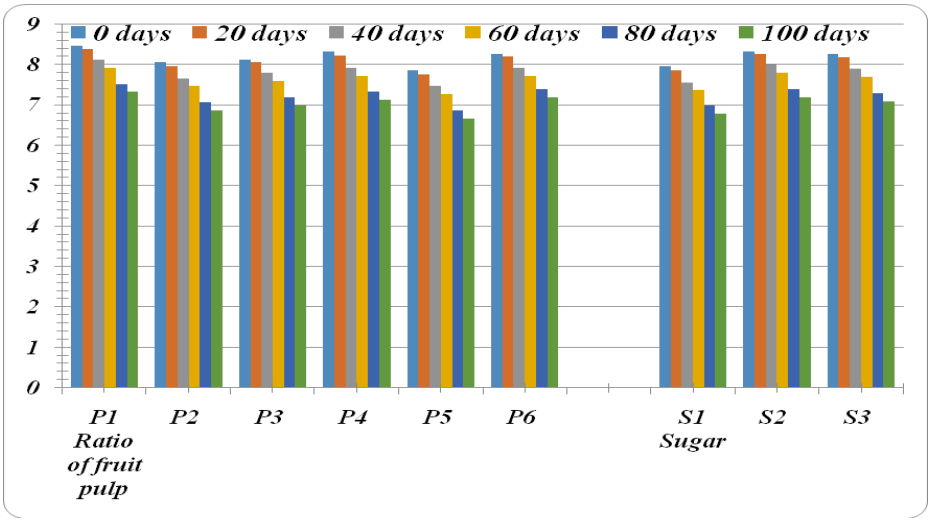

Table.1 Effect of different recipes on TSS (%) of mixed fruit leather during storage

Ratio of fruit pulp FactorA	0 days				20 days				40 days				60 days				80 days				100 days			
	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean
	S1	S2	S3		S1	S2	S3		S1	S2	S3		S1	S2	S3		S1	S2	S3		S1	S2	S3	
P1	30.4	38.03	42.03	**36.82**	30.87	38.63	43.07	**37.52**	31.53	38.87	43.37	**37.92**	32.03	39.63	43.87	**38.51**	32.73	39.87	44.03	**38.88**	33.03	40.07	44.20	**39.10**
P2	30	37.37	41.4	**36.26**	30.53	38.03	41.83	**36.80**	30.87	38.17	42.43	**37.16**	31.07	38.90	43.37	**37.78**	32.03	39.07	43.40	**38.17**	32.40	39.60	43.60	**38.53**
P3	29.03	36.90	41.07	**35.67**	29.67	37.70	42.70	**36.69**	30.60	38.00	43.07	**37.22**	31.20	38.63	43.07	**37.63**	31.37	39.00	43.23	**37.87**	31.63	39.17	43.40	**38.07**
P4	28.23	34.90	40.67	**34.60**	28.67	35.83	41.57	**35.36**	29.27	36.13	41.60	**35.67**	29.90	36.83	42.37	**36.37**	30.40	37.07	42.67	**36.71**	30.80	37.27	42.83	**36.97**
P5	27.27	33.13	39.00	**33.13**	28.07	34.17	40.07	**34.10**	28.47	34.83	40.17	**34.49**	29.13	35.80	41.70	**35.54**	29.73	36.17	42.07	**35.99**	30.10	36.40	42.13	**36.21**
P6	26.07	33.07	38.07	**32.40**	26.50	33.57	40.07	**33.38**	27.97	34.10	40.30	**34.12**	28.63	34.47	41.03	**34.71**	29.03	34.80	41.47	**35.10**	29.17	35.23	41.60	**35.33**
MEAN	**28.50**	**35.57**	**40.37**		**29.05**	**36.32**	**41.55**		**29.78**	**36.68**	**41.82**		**30.33**	**37.38**	**42.57**		**30.88**	**37.66**	**42.81**		**31.19**	**37.96**	**42.96**	
Factor	**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**	
SE_m ±	0.10	0.07	0.18		0.07	0.05	0.12		0.03	0.02	0.10		0.04	0.02	0.07		0.04	0.03	0.07		0.04	0.03	0.07	
CD at 5% level	0.31	0.22	0.54		0.21	0.15	0.36		0.10	0.06	0.15		0.11	0.08	0.20		0.12	0.08	0.07		0.12	0.08	0.21	

Table.2 Effect of different recipes on Acidity of mixed fruit leather during storage

Ratio of fruit pulp Factor A	0 days				20 days				40 days				60 days				80 days				100 days			
	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean	Sugar (Factor B)			mean
	S1	S2	S3		S1	S2	S3		S1	S2	S3		S1	S2	S3		S1	S2	S3		S1	S2	S3	
P1	0.98	0.95	0.89	**0.94**	0.99	0.97	0.92	**0.96**	1.00	0.98	0.94	**0.97**	1.00	0.98	0.97	**0.98**	1.01	0.98	0.98	**0.99**	1.02	0.99	0.98	**1.00**
P2	0.92	0.81	0.70	**0.81**	0.94	0.84	0.72	**0.83**	0.95	0.87	0.75	**0.86**	0.98	0.88	0.76	**0.87**	0.98	0.88	0.78	**0.88**	0.99	0.92	0.79	**0.90**
P3	0.84	0.79	0.66	**0.76**	0.87	0.80	0.68	**0.78**	0.89	0.81	0.70	**0.80**	0.90	0.84	0.71	**0.82**	0.91	0.84	0.72	**0.82**	0.92	0.85	0.74	**0.84**
P4	0.74	0.67	0.58	**0.66**	0.75	0.69	0.59	**0.67**	0.78	0.70	0.67	**0.72**	0.80	0.74	0.69	**0.74**	0.81	0.75	0.70	**0.75**	0.84	0.76	0.71	**0.77**
P5	0.71	0.65	0.57	**0.64**	0.72	0.66	0.60	**0.66**	0.75	0.67	0.63	**0.69**	0.76	0.69	0.66	**0.70**	0.78	0.71	0.68	**0.72**	0.78	0.71	0.69	**0.73**
P6	0.69	0.61	0.55	**0.61**	0.70	0.62	0.57	**0.63**	0.72	0.65	0.60	**0.66**	0.74	0.65	0.62	**0.67**	0.76	0.65	0.65	**0.69**	0.76	0.67	0.67	**0.70**
MEAN	**0.81**	**0.75**	**0.66**		**0.83**	**0.76**	**0.68**		**0.85**	**0.78**	**0.72**		**0.86**	**0.80**	**0.74**		**0.87**	**0.80**	**0.75**		**0.88**	**0.82**	**0.76**	
Factor	**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**		**A**	**B**	**AB**	
$SE_m \pm$	0.004	0.003	0.007		0.004	0.003	0.007		0.004	0.003	0.007		0.004	0.003	0.007		0.004	0.003	0.06		0.004	0.003	0.007	
CD at 5% level	0.012	0.008	0.02		0.012	0.008	0.02		0.012	0.009	0.021		0.011	0.008	0.019		0.011	0.008	0.019		0.012	0.008	0.021	

The data pertaining to the Acidity of different recipes of mixed fruit leather as affected by storage duration has been specified in (Table 2). From the study of Table 2 it can be concluded that the effect of guava pulp on acidity was prominent at every stage (0, 20, 40, 60, 80 and 100 days) of storage. Acidity was increased as days of storage were increased up to 100 days storage period. With regard to the effect of sugar content S1 (15gm sugar) had maximum acidity percent value and with increased concentration of sugar, value of per cent acidity was decreased. Further it was observed that acidity of the leather also decreased significantly with increase in sugar content. Similar result was also reported by (Jain *et al.,* 2007)

The results inferred that formation of organic acid by degradation of ascorbic acid accounted for Increase in acidity during storage. A slight increase in acidity during storage was also reported by (Shakir *et al.*, 2008). These findings are in conformation with the findings of (Chaudhary *et al.,* 2006), (Manimegalai *et al.*, 2001)and (Byanna *et al.*, 2012).

In conclusion, on basis of Sensory scores and important quality attributes, it might be concluded that treatment where guava and papaya pulp were in ratio of (80:20) with S2 (30 gm sugar/100 gm pulp) was most efficient to retain the fruit quality attributes upto 100 days of storage under room temperature. In case of storage of mixed fruit leather at room temperature, a slight decrease in sensory attributes (colour, texture, flavor and taste) and overall acceptability in mixed fruit leather was noticed under all the treatments under study. While, in case of qualitative characters (per cent TSS and per cent acidity), a slight increase in all the treatment was recorded. The change in the quality parameters was largely dependent on different fruit pulp suagr ratio and days of storage.

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Author Contributions

Rajani Singh - Principal Author, performed analysis, interpreted data, wrote manuscript and acted as corresponding author. Dr C.S. Pandey - Research Guide, supervised development of work. R.K. Jhade Co-Author, helped to evaluate and edit of manuscript.

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