



E-ISSN: 2278-4136

P-ISSN: 2349-8234

[www.phytojournal.com](http://www.phytojournal.com)

JPP 2020; 9(4): 1052-1056

Received: 13-05-2020

Accepted: 15-06-2020

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## Studies on sensory evaluation of guava and papaya mixed fruit bar during storage

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**Abstract**

The mixed fruit bar was prepared by the different blending ratio of guava and papaya pulp in a ratio (80:20, 70:30, 60:40, 50:50) in preparation of mixed fruit bar. Among them, 50% guava pulp and 50% papaya pulp of treatment (P4) recorded as best blending ratio as the treatment recorded maximum sensory score viz., colour (8.86), taste (8.96), flavour (8.46), texture (8.03) and overall acceptability (8.90).

The prepared mixed fruit bar was stored at ambient temperature ( $25 \pm 2$  °C) for 100 days to study their storage feasibility. The storage studies indicate that there was a gradual decrease in colour, flavour, texture, taste, overall acceptability, with advancement of storage period. However mixed fruit bar was found to be acceptable in good condition even after 100 days of storage at ambient temperature.

**Keywords:** Guava, papaya, bar, blending ratio, sensory score, pulp, sensory

**Introduction**

Fruits are excellent source of energy, minerals, vitamins, bioactive compounds (Phenols, carotenoids) and fibre. It is, therefore, necessary to make them available for consumption throughout the year in fresh or processed/preserved form. Fresh fruits are more liable to deteriorate under tropical conditions due to high temperature, humidity, pest and disease infestation. The post harvest losses of fresh fruits are estimated to be 25-30% due to inadequate post-harvest handling and non-availability of good post harvest infrastructure. Preservation of the produce is one of the ways to control post-harvest losses.

Guava (*Psidium guajava* L.) and Papaya (*Carica papaya* L.) are important tropical fruits and claim superiority over other fruits by virtue of their commercial and nutritional values. Guava (*Psidium guajava* L.) is one of the dominant fruit crop of tropical and sub-tropical regions of India, which belongs to family myrtaceae. It has been popularly known as "Poor man's apple" because of its plenty availability to every person at a very low price. Guava is a fruit with excellent digestive and nutritive value, pleasant sour-sweet taste, high palatability and availability in abundance at moderate price. The fruit contains ascorbic acid (260 mg/100gm.), pectin (1.15%), minerals like phosphorous, calcium etc. Guava fruits are used both for fresh consumption and processing purposes.

Papaya is an important tropical fruit because of its nutritive contribution rich in vitamin A content (2020 IU/100g) and proteolytic enzymes papain which help in digestion of protein rich foods. Papaya fruits are called protective foods because of their nutritive contributions such as vitamins, minerals, bulk cellulose and protopectin. Fruit contains moisture (85%), protein (0.6%), sugar (10-13%), proteolytic enzyme, papain, which helps in digestion of protein rich foods. The vitamin A content in papaya (2020 IU/100g) is next to mango. Papaya is also a rich source of other vitamins like thiamine, riboflavin, nicotinic acid and ascorbic acid. It is available in plenty during particular season but fresh fruits being perishable in nature cannot be stored for a long time.

The fresh papaya and guava fruits have limited shelf life. Therefore, it is necessary to utilize this fruit for making different products to increase its availability over an extended period and to stabilize the price during glut season. Unfortunately papaya fruit has not caught the fancy of the consumers as much as it deserves, mainly because of its odour which is not appealing and thus limits its commercial exploitation at processing levels. However, papaya fruit has blood red pulp, good taste and low acid content hence; it can be used for blending with other fruits and also for preparation of nutritional enriched food products. (Attri *et al.*, 2014) [3]. Whereas guava emits a sweet aroma which is pleasant, refreshing and acidic in flavour and besides being rich source of pectin, its pulp shows compatibility and suitability for blending and making mixed fruit products viz., jam, jelly, candy, leather etc. However, blending of these two fruits could be an economic proposition to utilize them profitably (Jain *et al.*, 2011) [11].

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The present study aimed to standardize the blend ratio and recipe for better quality of mixed fruit bar, to evaluate sensory parameters during storage and to find out the consumer acceptability of mixed fruit bar.

### Materials and Methods

The present experiment was carried out in Post-Harvest Laboratory, Department of Horticulture, College of Agriculture, JNKVV, Jabalpur (M.P.) The fully matured fresh guava fruits were collected from the orchard of the College of Agriculture, JNKVV and papaya fruits from the local market for this study. Mixed fruit bar was prepared from pulp of guava and papaya, sugar and citric acid. The experiment comprised of 12 treatment combinations consisting of 4 levels of fruit pulp i.e. guava and papaya ratio and 3 levels of sugars. The various recipes used for preparation of mixed fruit bar were arranged in a factorial completely randomized design with three replications and then recorded data were analyzed accordingly. For assessing the organoleptic qualities of stored guava and papaya mixed bar sample were analyzed at an interval of 20 days from 0 to 100 days.

S. No.	Factor A (Pulp ratio)	Notation
1.	80% Guava pulp + 20% Papaya pulp	P1
2.	70% Guava pulp + 30% Papaya pulp	P2
3.	60% Guava pulp + 40% Papaya pulp	P3
4.	50% Guava pulp + 50% Papaya pulp	P4
S. No.	Factor B (Sugar level)	Notation
1.	200 g	S1
2.	250 g	S2
3.	300 g	S3

Details of treatment combinations

Treatment	Combinations	Guava pulp (%)	Papaya Pulp (%)	Sugar (g)
T1	P1S1	80	20	200
T2	P1S2	80	20	250
T3	P1S3	80	20	300
T4	P2S1	70	30	200
T5	P2S2	70	30	250
T6	P2S3	70	30	300
T7	P3S1	60	40	200
T8	P3S2	60	40	250
T9	P3S3	60	40	300
T10	P4S1	50	50	200
T11	P4S2	50	50	250
T12	P4S3	50	50	300

**Selection of fruit:** The fully mature uniformly ripe, disease free, fresh guava and papaya fruits were selected for the preparation of pulp.

**Preparation of fruit for pulping:** The fruits were washed in running tap water for removing the adhering dirt. After washing of fruits, preliminary trial was conducted to standardize the method of extraction of pulp. The pulp was extracted out using the following procedure.

**Extraction of pulp:** In pulp preparation procedure, pulp, was extracted separately from both the fruits. The fruits were cut into small pieces with the help of stainless steel knife. Small pieces of guava, then grind in a mixer for 5-10 min for making pulp. The seeds were separated from pulp with the help of stainless steel sieve. Potassium meta bisulphate was added to pulp and mixed thoroughly before filling it in sterilized glass jars.

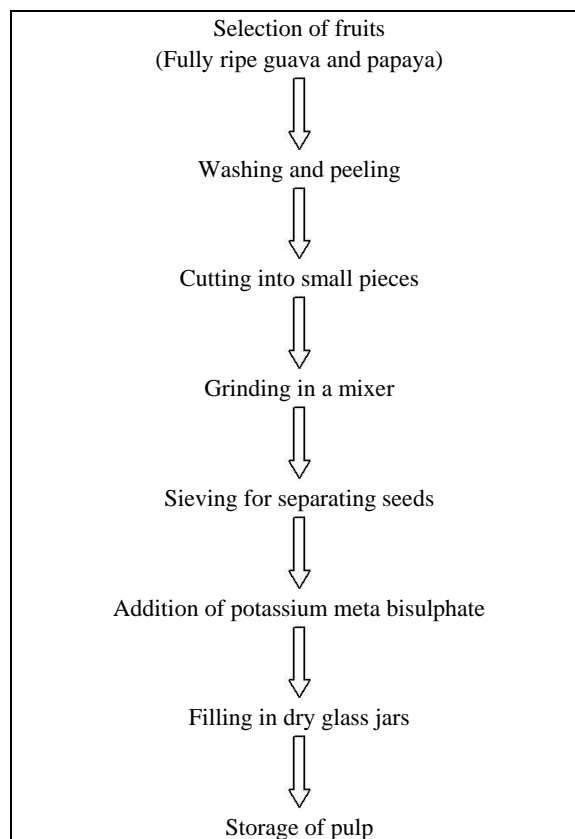


Fig 1: Flow chart for extraction of guava and papaya pulp

Table 1: Physico-chemical characteristics of the Guava pulp

Chemical composition	Guava	Papaya
Colour of pulp	Creamish white	Deep orange
TSS (° Brix)	12	8.5
Acidity (%)	0.42	0.32
Ascorbic acid (mg/100gm)	202	56
pH of fruit pulp	3.5	4.2
Total sugar (%)	11.60	6.85

### Preparation of mixed fruit bar

The mixed fruit bar was prepared by mixing the pulp of both fruits according to different recipe. Then bar was dried, packed and stored at room temperature. The detail description of preparation of mixed fruit bar is as follows:-

### Blending of guava and papaya pulp for mixed fruit bar

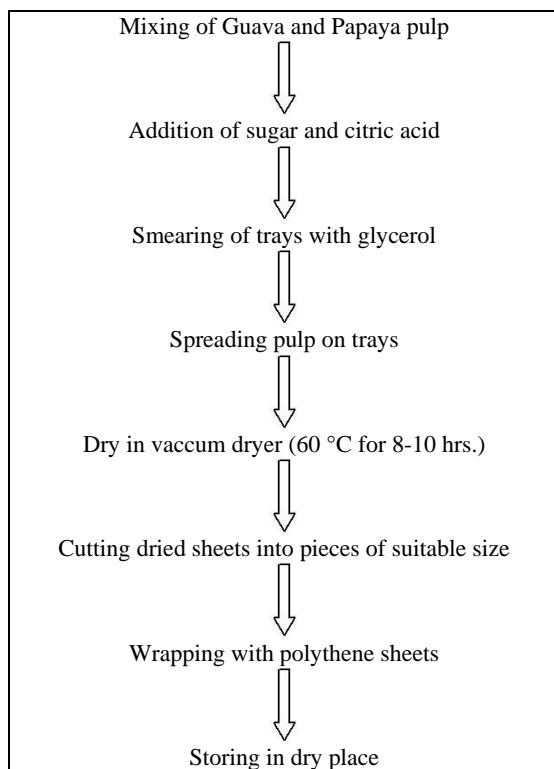
The freshly prepared guava and papaya pulp was used for preparation of mixed fruit bar as per their pulp compatibility. In four different ratio of pulp both fruits were mixed to make a definite weight of 1000 gm or 1kg.

### Spreading on polythene sheets

Polythene sheet was cut according to size of trays and greased with glycerol. Then mixture of fruit pulp was poured into trays of 0.5-1.0cm thick layer. After that, trays placed into vacuum dryer at 60 °C for 8-10 hrs.

### Packaging and Storage

Dried mixed fruit bar was cut into uniform pieces of 3x4cm size and wrapped with polythene sheets. The leather and bar was stored at room temperature.



**Fig 2:** Flow chart for preparation of Mixed Fruit Bar

The organoleptic character (i.e. colour, flavour, texture, taste and overall acceptability) of mixed fruit bar were recorded for each recipes. For evaluation of various organoleptic quality attributes, the method discussed by Amerine *et al.* (1965) [11] was adopted using a nine-point hedonic scale basis (1 = dislike extremely and 9 = like extremely). Thickness of the bar was measured with the help of micrometer before and after drying of mixed fruit bar. The data obtained in this study were subjected to statistical analysis by adopting the factorial completely randomized design to test the significant differences between the treatment mean for different recipes (Snedecor and Cochran, 1967) [17].

## Result and Discussion

The results of organoleptic parameters of the mixed fruit bar prepared using twelve different recipes are summarized below:

### Colour

As per the results recorded from present investigation indicated that all treatments have slight differences in colour during storage of 100 days, colour rating value of mixed fruit bar diminished gradually with increase in storage. Highest colour rating value 8.86 was observed for mixed fruit bar with P4 (50% guava + 50% papaya) Table 2. Decrease in colour of stored mixed fruit bar may be due to emphatic browning during storage. The changes probably occurred due to browning reactions, that proceeds oxidative (non enzymatic vitamin C oxidation and enzymatic oxidation of polyphenols) and enzymatically controlled processes and caramelization of sugar. More the percentage of sugar more would be the caramelization with higher darkness of the leathers. Similar findings were obtained by Jadhavar *et al.* (2014) [10] in papaya fruit bar. Similarly, Mukisa *et al.* (2010) [13] in jack fruit leather and Aruna *et al.* (1999) [2] reported that higher deterioration in colour, appearance and texture on 6 and 9 months storage was observed at higher temperature in papaya fruit bar. Similarly, Baramanray *et al.* (1995) [5] reported that

colour of guava nectar deteriorated with increase in storage time. Prasad and Mali (2006) [15] reported that in ber jam original colour disappeared at ambient temperature after 3 months of storage. The difference of colour in mixed fruit bar may be due to different blend ratio of guava and papaya pulp and different concentration of sugar might be the reason of the difference in colour rating values and persistence of more colour in papaya is due to the presence of carotenoids (caricaxanthin) up to 100 days.

### Flavour

The aroma results from volatile substances such as esters, ketones, terpenes, aldehydes and others. The loss of these volatiles leads to a decrease in aroma detection. The mean panellist score for flavour profile of mixed fruit bar under storage indicated a decreasing trend with increase in sugar quantity. It was also clear from the data presented in Table 3 that the higher guava percentage imparted more flavour to mixed fruit bar therefore the highest value obtained 8.93 was observed for mixed fruit bar with P1 (80% guava + 20% papaya). Similar results were found by Jain and Nema (2007) [12] in guava leather. A decreasing pattern of flavour rating value observed during storage of products for 100 days. The result was in conformity with Baramanray *et al.* (1995) [5] as they reported that organoleptic quality like colour, flavour and taste of guava nector deteriorated with increase in storage time. Cherian and Cherian (2003) [8] also reported a little downfall in each sensory parameter in case of blended papaya leather.

### Texture

The highest value 8.96 for texture was found in P1 (80% guava + 20% papaya), while minimum 8.03 in P4 (50% guava + 50% papaya) shown in Table 4. The result exhibited that higher proportion of guava pulp in comparison to papaya pulp was found better in improving the texture of mixed fruit bar. This might be due to the difference in their genetic makeup, rate of water absorption and protein content. Similar conclusions were drawn by Jain *et al.* (2011) [11] with guava and papaya blend leather, Che Man and Taufik (1995) [7] with jack fruit leather and Babalola *et al.* (2002) [4] with pawpaw and guava leather. As storage period increases, a very slight change in texture of mixed fruit bar was observed. This might be due to reduction of moisture at the time of storage. Similar result was reported by Aruna *et al.* (1999) [2] during storage papaya fruit bar. Harsimrat and Dhawan (2001) reported a significant reduction in organoleptic rating in guava fruit bar.

### Taste

The taste attributes scores presented in Table 5 clearly indicated that P4 (50% guava + 50% papaya) combination was preferred most by judges in case of mixed fruit bar. Increase in the amount of sugar beyond optimum amounts may however, reduce the taste rating thus requiring optimization and in this study S3 (300gm sugar) was found optimum. Begum *et al.* (1983) [6] reported some preference for the 50:50 blend with mixed squash prepared from pineapple juice and mango pulp. Pandove (2007) [14] also reported 1:1 ratio of carrot and amla juice as the best treatment for the preparation of low alcoholic self-carbonated beverages from carrot and its blends. Cherian and Cherian (2003) [8] reported that blended leather was superior in most of the quality parameter.

**Overall acceptability**

The overall acceptability of mixed fruit bar is dependent on colour, texture, flavour and taste rating of the product. The results obtained showed that highest score (8.90) for overall acceptability of mixed fruit bar was found in P4 (50% guava + 50% papaya) combination in Table 6. El-Mansy *et al.* (2005) [9] found the similar results and reported that nector consisting of 80% mango puree and 20% papaya puree with 17 °Brix and having a sensory score of 93.1 was found to be the best. Jain *et al.* (2011) [11] reported that blending of both

pulps in different ratios, however, positively influenced sensory properties, which were found optimal at a ratio of 80% guava: 20% papaya. Cherian and Cherian (2003) [8] also reported that blended leather was superior in most of the quality parameters. Saravanan *et al.* (2004) [16] evaluated papaya jam and concluded that blending of fruit extracts improve the acceptability. Hence, it would be concluded that the blending of fruit pulp gives the better compatibility to pulp for preparation of quality mixed fruit bar.

**Table 2:** Effect of different recipes on colour of guava and papaya mixed fruit bar during storage

Ratio of fruit pulp (Factor A)	0 days			20 days			40 days			60 days			80 days			100 days								
	Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)								
	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean				
P1	76.99	77.02	77.38	77.13	77.60	77.80	77.89	77.76	78.10	78.30	78.50	78.30	78.80	78.99	79.02	78.93	79.30	79.52	79.77	79.53	79.90	79.99	80.07	79.98
P2	75.25	75.38	75.81	75.48	75.56	75.74	75.88	75.72	76.05	76.21	76.50	76.25	76.70	76.89	76.99	76.86	77.20	77.38	77.57	77.38	78.22	78.43	78.66	78.43
P3	73.05	73.38	73.95	73.46	73.62	73.75	73.92	73.76	73.99	74.06	74.23	74.09	74.55	74.66	75.51	74.90	74.95	75.00	75.20	75.05	75.36	75.51	75.63	75.50
P4	71.40	71.60	71.98	71.66	71.98	72.00	72.10	72.02	72.08	72.55	72.77	72.46	72.88	72.92	73.00	72.93	73.30	73.53	73.66	73.49	73.75	73.89	73.98	73.87
MEAN	74.17	74.34	74.78		74.69	74.82	74.94		75.05	75.28	75.50		75.73	75.86	76.13		76.18	76.35	76.55		76.80	76.95	77.08	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.003	0.002	0.004		0.002	0.001	0.003		0.055	0.048	0.095		0.111	0.096	0.193		0.002	0.002	0.004		0.005	0.004	0.009	
CD at 5% level	0.007	0.006	0.013		0.005	0.004	0.008		0.161	0.140	NS		0.327	0.283	NS		0.007	0.006	0.012		0.015	0.013	0.026	

**Table 3:** Effect of different recipes on flavour of guava and papaya mixed fruit bar during storage

Ratio of fruit pulp (Factor A)	0 days			20 days			40 days			60 days			80 days			100 days								
	Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)								
	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean				
P1	9.0	9.0	8.8	8.93	8.9	8.9	8.6	8.80	8.8	8.7	8.0	8.70	8.6	8.6	8.4	8.53	8.4	8.3	8.1	8.30	8.2	8.2	7.8	8.06
P2	8.8	8.8	8.6	8.73	8.8	8.6	8.4	8.60	8.6	8.4	8.4	8.46	8.4	8.2	8.2	8.26	8.2	8.0	7.8	8.00	8.0	7.8	7.6	7.80
P3	8.6	8.6	8.4	8.53	8.6	8.5	8.4	8.46	8.4	8.2	8.2	8.26	8.2	8.0	8.0	8.06	8.0	8.0	7.8	7.93	7.8	7.7	7.5	7.63
P4	8.6	8.4	8.4	8.46	8.5	8.2	8.1	8.33	8.4	8.0	8.0	8.13	8.2	7.8	7.8	7.93	8.0	7.6	7.6	7.73	7.7	7.4	7.3	7.53
MEAN	8.75	8.70	8.50		8.72	8.52	8.40		8.55	8.35	8.27		8.35	8.15	8.00		8.15	8.00	7.82		7.95	7.77	7.55	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.047	0.041	0.082		0.044	0.038	0.076		0.053	0.046	0.091		0.055	0.048	0.096		0.044	0.038	0.076		0.055	0.048	0.096	
CD at 5% level	0.138	0.120	NS		0.129	0.112	NS		0.155	0.134	NS		0.162	0.141	NS		0.129	0.112	NS		0.162	0.141	NS	

**Table 4:** Effect of different recipes on texture of guava and papaya mixed fruit bar during storage

Ratio of fruit pulp (Factor A)	0 days			20 days			40 days			60 days			80 days			100 days								
	Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)								
	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean				
P1	8.8	8.8	9.0	8.86	8.7	8.7	8.9	8.76	8.6	8.6	8.8	8.66	8.4	8.5	8.6	8.500	8.1	8.4	8.5	8.33	7.8	8.0	8.2	8.00
P2	8.7	8.8	8.9	8.76	8.6	8.8	8.9	8.80	8.4	8.6	8.7	8.56	8.2	8.4	8.5	8.367	7.9	8.2	8.2	8.10	7.5	7.6	7.6	7.56
P3	8.6	8.6	8.7	8.66	8.4	8.4	8.6	8.46	8.2	8.2	8.4	8.26	8.0	8.1	8.3	8.133	7.6	8.0	8.1	7.90	7.2	7.6	7.8	7.53
P4	7.8	7.9	8.4	8.03	7.6	7.8	8.2	7.86	7.4	7.6	8.0	7.66	7.1	7.4	7.8	7.433	6.9	7.0	7.4	7.10	6.7	6.9	7.2	6.93
MEAN	8.50	8.57	8.80		8.32	8.45	8.65		8.15	8.25	8.47		7.92	8.10	8.30		7.62	7.90	8.05		7.30	7.52	7.70	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.053	0.046	0.091		0.050	0.043	0.087		0.050	0.043	0.087		0.058	0.050	0.100		0.041	0.035	0.071		0.044	0.038	0.076	
CD at 5% level	0.155	0.134	NS		0.162	0.141	NS		0.147	0.127	NS		0.170	0.147	NS		0.120	0.104	NS		0.129	0.112	NS	

**Table 5:** Effect of different recipes on taste of mixed fruit bar during storage

Ratio of fruit pulp (Factor A)	0 days			20 days			40 days			60 days			80 days			100 days								
	Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)			Sugar (Factor B)								
	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean				
P1	8.4	8.6	8.7	8.60	8.4	8.6	8.6	8.53	8.2	8.3	8.4	8.30	7.9	8.1	8.2	8.06	7.6	7.8	8.0	7.80	7.2	7.4	7.5	7.36
P2	8.6	8.7	8.8	8.80	8.6	8.5	8.8	8.63	8.4	8.5	8.6	8.50	8.1	8.2	8.3	8.20	7.8	7.9	8.0	7.90	7.4	7.6	7.7	7.56
P3	8.7	8.8	8.8	8.76	8.6	8.7	8.8	8.70	8.6	8.6	8.7	8.63	8.3	8.5	8.6	8.42	8.0	8.2	8.4	8.20	7.8	8.0	8.0	7.93
P4	8.9	9.0	9.0	8.96	8.8	8.9	9.0	8.93	8.6	8.8	8.9	8.76	8.4	8.6	8.7	8.56	8.2	8.3	8.5	8.33	7.9	8.2	8.4	8.16
MEAN	8.72	8.85	8.92		8.65	8.75	8.85		8.45	8.60	8.69		8.19	8.37	8.40		7.90	8.10	8.20		7.57	7.80	7.90	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.055	0.048	0.096		0.047	0.041	0.082		0.48	0.042	0.084		0.054	0.047	0.093		0.044	0.038	0.076		0.051	0.043	0.087	
CD at 5% level	0.162	0.141	NS		0.138	0.120	NS		0.142	0.123	NS		0.158	0.137	NS		0.129	0.112	NS		0.146	0.126	NS	



**Table 6:** Effect of different recipes on overall acceptability of guava and papaya mixed fruit bar 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	8.4	8.4	8.6	8.46	8.2	8.4	8.4	8.33	8.2	8.2	8.4	8.26	7.8	8.0	8.2	8.00	7.5	7.8	7.9	7.73	7.2	7.4	7.6	7.40
P2	8.6	8.6	8.7	8.70	8.4	8.5	8.6	8.51	8.2	8.3	8.4	8.30	8.0	8.1	8.2	8.10	7.6	7.8	7.9	7.76	7.4	7.6	7.6	7.53
P3	8.7	8.8	9.0	8.83	8.7	8.8	8.9	8.80	8.5	8.6	8.8	8.63	8.2	8.4	8.6	8.40	7.8	8.2	8.4	8.13	7.5	7.8	8.0	7.76
P4	8.8	8.9	9.0	8.90	8.8	8.8	9.0	8.86	8.6	8.7	8.8	8.73	8.4	8.6	8.6	8.53	8.2	8.2	8.4	8.26	8.0	8.0	8.2	8.06
MEAN	8.62	8.67	8.82		8.52	8.62	8.72		8.37	8.45	8.60		8.10	8.27	8.40		7.75	8.0	8.15		7.52	7.70	7.85	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.053	0.046	0.091		0.056	0.049	0.098		0.053	0.046	0.091		0.052	0.045	0.090		0.055	0.048	0.096		0.050	0.043	0.087	
CD at 5% level	0.155	0.134	NS		0.166	0.143	NS		0.155	0.134	NS		0.154	0.133	NS		0.162	0.141	NS		0.147	0.127	NS	

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