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Effect of Various Recipes on Organoleptic Evaluation Of Mixed Fruit Bar

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ABSTRACT
The study on the organoleptic evaluation of mixed fruit bar stored up to 100 days was carried out in the Post-Harvest Laboratory, Department of horticulture, JNKVV Jabalpur (M.P.) in the year 2016 - 2017. Statistical analysis and organoleptic evaluation of the data was carried out and it was observed that effect of storage of mixed fruit bar at room temperature up to 100 days on scores for organoleptic evaluation of mixed fruit bar viz Colour, Flaour, Texture, Taste, and Overall acceptability 8.78-8.24, 8.50-7.67, 7.93-7.06, 8.88-7.73 and 8.93-8.0, respectively.
Key words: *Custard apple, papaya, mixed fruit bar, Sugar.*

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INTRODUCTION

India is the seventh largest country in the world with a total geographical area of 328.73 million hectares and occupies the area of 67.05 Mha (NHB database 2014) under fruit crops. It ranks second in the world in fruit production with 76.42MT production and 11.4 MT/ha productivity. Custard apple (*Annona squamosa* Linn.) also known as Sitaphal belongs to the family *Annonaceae* one of the finest fruits gifted to India by Tropical America. Custard apple is considered as one of the delicious and nutritionally valuable fruit meant for table purpose. Annonas are mostly consumed as dessert fruits due to its soft, granular, juicy sugar pulp with mild flavour and slight acidity. Its fruits are considered for medicinal value, and have been found to be very useful for brain and nervous system, generally used in ice cream, certain milk products and in making jam, jelly and other products. It is considered as beneficial for cardiac disease, diabetes and cancer. The seeds contain about 30% oil which can be used in soaps and paint industry. In India, it is cultivated mainly under rainfed conditions and covers more than 42,000 ha area with an annual production of 31,500 tonnes while in Madhya Pradesh it is grown in about 265 ha area with an annual production of 1987.50 tonnes [1]. It contains about 28-55% of edible portion consisting of 73.30% moisture, 1.60 protein, 0.30% fat, 0.70% mineral matter, 23.90% carbohydrates, 0.20% calcium, 0.40% phosphorus, 1.0% iron, 12.4-18.15% sugar, 0.26-0.65% acidity and with caloric value of 105 K.Cal/100g.
India is a leading papaya producing country grown in an area of about 133.4 thousand ha with production of 5639.3 thousand MT and average productivity 42.3 MT per ha (NHB, 2014-2015). Papaya is an important fruit of tropical and sub-tropical regions of the world belonging to family Caricaceae. 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. The vitamin A content in papaya (2020IU/100g) is next to mango [2]. Papaya is also a rich source of other vitamins like thiamine, riboflavin, nicotinic acid and ascorbic acid. Due to its sweet taste and attractive colour, it has a great application in preparation of fruit salad and deserts. The fruits of custard apple and papaya are very delicate and highly perishable. The mature fruits after harvest ripen quickly and become excessively soft

within 2 to 3 days at ambient condition, thus unfit for consumption. Around 25 to 30% of harvested fruits are lost before consumption due to inadequate knowledge of processing technology of fruits as well as processing facilities. The processing of fruits into various products is one of the best ways to reduce the loss. Therefore, there is a need for standardization of techniques to reduce these post-harvest losses whereby maintaining the quality of the produce. It can also contribute to the economic development of rural population.

MATERIAL AND METHODS

The fresh, uniform sized, mature fruits of custard apple and papaya were procured during the monsoon season (2016-17) from the whole sale fruit market (mandi) and used for experimentation. The unripe, sorted diseased, damaged and off type fruits were discarded. The selected fruits were thoroughly washed with tap water to remove dirt and dust particles adhering to the fruit surface and were allowed for surface drying. The good quality/sorted fruits were picked up and used for the purpose of experimentation.

Experimental details

Crop : Custard apple + Papaya
Treatment : Factor A - 4 level of fruit pulp ratio
Factor B - 3 level of sugar
Total No of treatment : 12 (4x3)
Design : Completely Randomized Design (CRD).

S.No.	Factor A (Pulp Ratio)	Notation
1.	90% Custard apple pulp + 10% Papaya pulp	P1
2.	80% Custard apple pulp + 20% Papaya pulp	P2
3.	70% Custard apple pulp + 30% papaya pulp	P3
4.	60% Custard apple pulp + 40% Papaya pulp	P4

S.No.	Factor B (Sugar Level)	Notation
1.	15g	S1
2.	30g	S2
3.	45g	S3

Details of treatment combination

Treatment	Combinations	Custard apple pulp (%)	Papaya pulp (%)	Sugar(g)
T1	P1S1	90	10	15
T2	P1S2	90	10	30
T3	P1S3	90	10	45
T4	P2S1	80	20	15
T5	P2S2	80	20	30
T6	P2S3	80	20	45
T7	P3S1	70	30	15
T8	P3S2	70	30	30
T9	P3S3	70	30	45
T10	P4S1	60	40	15
T11	P4S2	60	40	30
T12	P4S3	60	40	45

Procedure of pulp preparation

Preparation of fruits for pulping

The fruits were washed in running tap water for removing the adhering dirt. After washing of fruits, The pulp was extracted using the following procedure.

Extraction of pulp from custard apple and papaya fruit

Fully ripened fruits were selected and the pulp was extracted manually under hygienic conditions. The seeds and pulp were separated from each other by rubbing the mixture on a 30 mesh sieve leaving the seeds and the covering sheath of the capillary pulp and in case of papaya mature and ripe papaya fruits were peeled using stainless steel knife and cut into two halves and then seed were discarded. The papaya pulp was obtained by crushing it in mixer then heated up to 60 to 65 ˚C temperature for 10 minute and allowed to cool. The cooled pulp was passed through stainless steel sieve.

Pulp percent in fruit

The pulp from known weight of custard apple and papaya fruit were extracted out. The weight of both fruit pulp was recorded separately. It was done in 3 replications to minimize the experimental error. The weight of pulp in relation to weight of whole fruit was recorded.

Storage

The prepared mixed fruit bar was stored in dried place at ambient temperature which ranged from 18.20 ^{0}C (minimum) to 31.90^0 C (maximum).

Flow sheet for the preparation of mixed fruit bar

Mixing of custard apple and papaya pulp

↓

Mixing pulp with sugar

↓

Transferring pulp to pan

↓

Cooking till sufficiently solid or up to 82 ^{0}brix

↓

Adding citric acid

↓

Remove from fire

↓

Spreading mass uniformly in 1 to 2 cm thick

↓

Layer on a smeared tray (with glycerin)

↓

Cooling to room temperature

↓

Cutting into pieces of suitable size

↓

Wrapping in moisture proof

↓

Filling in dry jars

↓

Sealing and labeling

↓

Storage(At ambient temp.)

Organoleptic evaluation

The present investigation was carried out in the Post-Harvest Laboratory, Department of Horticulture, JNKVV, Jabalpur (M.P.) The preparation of mixed fruit bar was evaluated for various Organoleptic evaluation like Colour, Flaour, Texture, Taste, and Overall acceptability.

RESULT AND DISCUSSION

The present investigation entitled "Standardization of recipe for development of value added products of custard apple (*Annona squamosa L.)"* was carried out to observe the effect of different blend ratio of custard apple and papaya pulp along with sugar etc. on preparation of mixed fruit bar and to find out acceptability of the products during storage.

Colour

The data presented in mixed fruit bar Table 1 clearly indicated that all treatments have slight difference in colour and colour rating value of mixed fruit bar and diminished gradually during storage from 0 to 100 days. Decrease of colour in mixed fruit bar might be due to the emphatic browning during storage. Browning of the mixed fruit bar could have resulted from non-enzymatic oxidation of vitamin C and enzymatic oxidation of polyphenols and caramelization of sugar. More the percentage of sugar more would be the caramelization with high darkness of bars. Similar findings were obtained by Thakre and Jain [11] in the blended nectar (50:50) of papaya and banana which was acceptable only for 15 days under ambient condition and up to 45 days under refrigerated condition. Jadhavar *et al.* [7] in papaya fruit bar. similarly, Cheman and Taufic [3] in jackfruit leather. In mixed fruit bar also different ratio of

custard apple and papaya pulp and different concentration of sugar might be the reason of the difference in colour rating values. Highest colour rating value (8.78) was observed with P_4 (60% custard apple + 40% papaya) perhaps due to dominant effect of papaya blending for colour appearance. Colour in mixed fruit bar is mainly due to persistence of more colour in papaya which is due to the presence of carotinoids (caricaxanthin) upto 100 days.

Flavour

The aroma results from volatile substances such as esters, ketones, terpences, aldehydes and others. The loss of these volatiles leads to a decrease in aroma detection. The mean panelist score for flavour profile of mixed fruit bar under storage showed a decreasing trend with increase in sugar quantity. It was also clear from the data presented in Table 2 that the higher custard apple percentage imparted more flavour to mixed fruit bar highest value (8.5) for flavour was found in P_1 (90% custard apple + 10% papaya) A decreasing pattern of flavour rating value was observed during storage of mixed fruit bar for 100 days. This is due to production of off flavour which adversely affects taste and aroma of product. There are certain enzymatic, physiological or biochemical changes, which result in production of off flavour of product. Similar results were also reported by Cherian and Cherian [4] in case of blended papaya leather, and Jakhar and Pathak, [8]) reported that the flavour score decreased continuously during entire period of storage.

Texture

The result recording texture of mixed fruit bar different stages of storage has been presented in Table 3. In mixed fruit bar highest value (7.93) for texture was found in P_4 (60% custard apple + 40% papaya). As storage period increased, a very slight change in texture of mixed fruit bar was observed. This might be due to absorption of moisture at the time of sensory evaluation and formation of brown pigment might be responsible for deterioration of appearance of product. Similar results were found Cheman and Taufik [7] with jackfruit leather and Aruna *et al.* [1] during storage of papaya fruit bar. Harsimrat and Dhawan [6] reported a significant reduction in organoleptic rating in guava fruit bar.

Taste

The result recording taste of mixed fruit bar different stages of storage has been presented in Table 4. It is obvious from the data that the taste of mixed fruit bar was influenced by the different of pulp ratio, sugar, and storage period. The score rating decreases continuously with the increase in quantity of sugar in also reduces the taste rating. This is due to higher TSS value with storage period up to100 days. While in case of mixed fruit bar P_4 (60% custard apple + 40% papaya) for taste were (8.88) preferred and which was significantly superior in comparison to others. Increase in the amount of sugar beyond optimum amounts may, however, reduce the taste rating these requiring optimization and in this study 30g sugar was found optimum.

During storage, a significant reduction in taste of mixed fruit bar was observed. This may be due to Production of off flavour which adversely affects taste of product and there are certain enzymatic, physiological or biochemical changes, which result in production of off flavour of product. Similar results were found by Punam *et al.* [9] who reported that organoleptic quality like taste reduced significantly with increased storage period. These findings are supported by other workers Jakhar and Pathak [8] in blended RTS of ber and jamun, Deka *et al.* [5] in mango-pineapple spiced beverages.

Overall acceptability

The result recording overall acceptability of mixed fruit bar different stages of storage has been presented in Table 5.The overall acceptability of mixed fruit bar dependent on colour, texture, flavour and taste rating of the product. However, in the mixed fruit bar showed that highest score (8.93) for overall acceptability found in P_4S_2 (60% custard apple + 40% papaya with 30 g sugar) as optimum quantity of sugar is the main reason for its better quantity and acceptability of bar.

During storage, it was observed that overall acceptability of mixed fruit bar was highest at 0 day of storage and it was slightly decreased as the days of storage were increased. Similar results were found by Baramanray *et al.* [2] in guava nector. Relekar *et al.* [10] with value added products of sapota. Similar results were also supported by Jakhar and Pathak [8] and Harsimart and Dhawan [6] in guava bar.

Table 1: Effect of different recipes on Colour 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)			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	7.40	7.45	7.50	7.45	7.38	7.42	7.45	7.41	7.35	7.38	7.40	7.37	7.30	7.30	7.34	7.31	7.22	7.24	7.26	7.24	7.16	7.19	7.24	7.19
P2	7.68	7.70	7.75	7.71	7.620	7.30	7.70	7.54	7.57	7.6	7.650	7.60	7.51	7.52	7.58	7.53	7.42	7.44	7.53	7.46	7.36	7.38	7.46	7.40
P3	8.10	8.20	8.30	8.20	8.040	8.14	8.24	8.14	8.00	8.08	8.18	8.08	7.90	7.94	8.12	7.98	7.84	7.86	8.02	7.90	7.72	7.76	7.92	7.80
P4	8.60	8.75	9.00	8.78	8.520	8.65	8.90	8.69	8.48	8.61	8.82	8.63	8.38	8.52	8.68	8.52	8.26	8.46	8.57	8.43	8.14	8.22	8.38	8.24
MEAN	7.94	8.02	8.13		7.89	7.88	8.07		7.85	7.9	8.01		7.77	7.82	7.93		7.68	7.75	7.84		7.59	7.63	7.75	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.019	0.017	0.034		0.056	0.049	0.097		0.017	0.015	0.030		0.016	0.014	0.028		0.016	0.014	0.027		0.014	0.012	0.024	
CD at 5% level	0.057	0.050	0.099		0.165	0.143	NS		0.050	0.043	0.087		0.048	0.042	0.083		0.046	0.040	0.079		0.040	0.035	0.069	

Table 2 : Effect of different recipes on Flavour 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	S1	S2	S3	Mean
P1	8.60	8.50	8.40	8.50	8.60	8.50	8.20	8.43	8.40	8.36	8.00	8.25	8.40	8.20	7.80	8.13	8.20	7.80	7.60	7.86	8.03	7.60	7.40	7.67
P2	8.20	8.20	8.00	8.13	8.13	8.00	7.80	7.97	8.13	7.80	7.60	7.84	8.00	7.60	7.20	7.60	7.80	7.40	7.20	7.46	7.50	7.20	7.00	7.23
P3	7.00	6.76	6.60	6.78	6.76	6.60	6.60	6.65	6.76	6.40	6.20	6.45	6.60	6.20	6.00	6.26	6.40	6.00	5.80	6.06	6.20	6.00	5.80	6.00
P4	6.83	6.83	6.60	6.75	6.60	6.83	6.60	6.67	6.60	6.60	6.40	6.53	6.40	6.20	6.20	6.26	6.20	6.20	5.80	6.06	6.00	6.20	5.80	6.00
MEAN	7.65	7.57	7.40		7.52	7.48	7.30		7.47	7.29	7.05		7.35	7.05	6.80		7.15	6.85	6.60		6.93	6.75	6.50	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.074	0.064	0.128		0.071	0.062	0.124		0.057	0.049	0.099		0.052	0.045	0.090		0.065	0.056	0.112		0.074	0.064	0.128	
CD at 5% level	0.217	0.188	NS		0.210	0.181	NS		0.167	0.145	NS		0.152	0.132	NS		0.190	0.164	NS		0.218	0.188	NS	

Table 3 : Effect of different recipes on Texture 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	S1	S2	S3	Mean
P1	7.00	7.30	7.30	7.20	6.80	6.80	7.00	6.86	6.60	6.80	6.80	6.73	6.40	6.40	6.60	6.53	6.20	6.40	6.40	6.33	6.20	6.20	6.20	6.20
P2	7.60	7.60	8.00	7.73	7.20	7.40	7.50	7.36	7.20	7.40	7.40	7.33	7.00	7.06	7.20	7.08	6.80	6.96	7.20	6.98	6.80	6.70	7.00	6.83
P3	7.60	7.90	8.00	7.83	7.40	7.60	7.80	7.60	7.30	7.30	7.40	7.36	7.20	7.20	7.40	7.26	7.00	7.00	7.40	7.13	6.80	6.80	7.20	6.93
P4	7.80	7.80	8.20	7.93	7.40	7.80	8.20	7.80	7.20	7.60	8.00	7.60	7.20	7.60	7.80	7.53	7.00	7.40	7.60	7.33	6.60	7.20	7.40	7.06
MEAN	7.50	7.65	7.87		7.20	7.40	7.62		7.07	7.27	7.40		6.95	7.11	7.25		6.75	6.94	7.15		6.60	6.72	6.95	
Fac-tor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.045	0.039	0.078		0.043	0.037	0.075		0.036	0.031	0.062		0.042	0.037	0.073		0.054	0.047	0.093		0.044	0.038	0.076	
CD at 5% level	0.133	0.115	0.230		0.126	0.109	0.219		0.106	0.092	0.183		0.124	0.108	0.215		0.158	0.137	0.274		0.129	0.112	0.224	

Table 4 : 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	S1	S2	S3	Mean
P1	8.20	8.40	8.60	8.40	8.20	8.20	8.50	8.30	8.00	8.20	8.40	8.20	7.80	8.00	8.20	8.00	7.60	7.80	7.80	7.73	7.40	7.60	7.60	7.53
P2	8.40	8.80	8.70	8.63	8.40	8.60	8.60	8.53	8.20	8.40	8.20	8.26	8.00	8.20	8.00	8.06	7.80	8.00	7.80	7.86	7.60	7.80	7.60	7.66
P3	8.70	8.93	8.93	8.85	8.60	8.70	8.60	8.63	8.40	8.40	8.40	8.40	8.20	8.20	8.00	8.13	8.00	8.20	7.80	8.00	7.80	7.80	7.60	7.73
P4	8.80	8.93	8.93	8.88	8.60	8.80	8.70	8.70	8.40	8.40	8.60	8.46	8.20	8.40	8.20	8.26	7.80	8.20	8.00	8.00	7.60	7.80	7.80	7.73
MEAN	8.52	8.76	8.79		8.45	8.57	8.60		8.25	8.35	8.40		8.05	8.20	8.10		7.80	8.05	7.85		7.60	7.75	7.65	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.055	0.047	0.095		0.036	0.031	0.062		0.036	0.031	0.062		0.043	0.037	0.075		0.041	0.035	0.071		0.033	0.029	0.058	
CD at 5% level	0.161	0.139	NS		0.106	0.092	0.183		0.106	0.092	0.183		0.126	0.109	0.219		0.120	0.104	NS		0.098	0.085	0.169	

Table 5 : Effect of different recipes on Overall acceptability 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)			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	8.40	8.50	8.20	8.36	8.20	8.40	8.20	8.26	8.20	8.40	8.20	8.26	8.00	8.20	8.20	8.13	7.80	8.00	7.80	7.86	7.60	7.80	7.60	7.66
P2	8.60	8.80	8.60	8.66	8.40	8.80	8.60	8.60	8.20	8.60	8.40	8.40	8.20	8.40	8.40	8.33	8.00	8.20	8.20	8.13	7.80	8.20	8.00	8.00
P3	8.80	8.60	8.70	8.70	8.60	8.70	8.60	8.63	8.40	8.40	8.23	8.34	8.40	8.20	8.00	8.20	8.40	8.20	7.80	8.13	8.00	7.80	7.60	7.80
P4	8.93	8.93	8.80	8.88	8.80	8.80	8.800	8.80	8.60	8.60	8.80	8.66	8.40	8.40	8.40	8.40	8.40	8.20	8.20	8.26	8.20	8.00	8.00	8.06
MEAN	8.68	8.70	8.57		8.50	8.67	8.55		8.35	8.50	8.40		8.25	8.30	8.25		8.15	8.15	8.00		7.90	7.95	7.80	
Factor	A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB		A	B	AB	
SEm±	0.049	0.042	0.084		0.033	0.029	0.058		0.032	0.028	0.056		0.038	0.033	0.067		0.038	0.033	0.067		0.043	0.037	0.075	
CD at 5% level	0.143	NS	NS		0.098	0.085	NS		0.095	0.082	0.165		0.113	NS	0.196		0.113	0.098	0.196		0.126	0.109	0.219	

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