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Development of Multifruit Bar

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Abstract
An experiment entitled, "Development of Multifruit bar" was conducted in the Department of Post-Harvest Management of Fruit, Vegetable and Flower Crops, PGI of PHTM Killa-Roha during the year 2022-23. It was aimed to develop the Multifruit bar by using mango, banana, jamun and karonda fruit pulps. The first three treatments i.e. T_1, T_2 and T_3 had separate layers of fruit pulp while the three treatments i.e. T_4, T_5 and T_6 had blended fruit pulp. The Multifruit bar was evaluated for chemical and sensory quality parameters during 90 days of storage period. From the present investigation, the chemical parameters such as Titratable acidity content exhibited an increasing trend while decreasing trend was observed in TSS, Ascorbic acid and β-carotene content of the Multifruit bar irrespective of treatments during storage. As regard the organoleptic evaluation, the Multifruit bar with layers of Banana-Mango-Karonda pulp obtained highest sensory score at 90th day of storage.

Keywords: Alphonso, grand naine, jamun, karonda, layers, blended, storage

Introduction
Fruits and vegetables are the best sources of nutrients such as vitamins, minerals, antioxidants and fiber that support good health. The provision of food and nutritional security depends heavily on these valuable commodities. Having a diet that is well-balanced and healthful is greatly facilitated by the consumption of fruits and vegetables. Because they can enhance the health and wellbeing, healthier food products manufactured from fruits and vegetables are being sought after by customers with a growing awareness of cultural issues. According to Lydia *et al.*, (2002) [12] and Yahia *et al.*, (2019) [31], eating more fruits and vegetables can reduce your risk of developing a number of non-communicable diseases, including obesity, bone disorders, diabetes, cardiovascular disease and stroke.
Fruit bars or leather are shelf-stable dehydrated confections. Fruit bars are created by drying fruit purees and additional ingredients into a thin layer (Quintero *et al.*, 2012) [18]. It is made by adding sugar, citric acid, pectin and any other authorized preservatives, after which it is dried in a cabinet dryer to produce sheets. Bars with natural, ripe fruit pulps have a better flavor and contain additional healthy ingredients including dietary fibers, vitamins, and minerals. According to the "Food Safety and Standard Authority of India", the specifications for fruit bars are as moisture less than 20.0%, total soluble solids less than 75.0%, fruit content not less than 25.0%, and yeast and mold count positive and is not more than 100 count/g. Fruit bars are products made from dehydrated fruit with low water activity and low moisture content (15-25%), high sugar content and high concentrations of natural acidity which results in a low pH (Tiwari, 2019) [28].

Mango
Mango (*Mangifera indica* L.) is a member of the Anacardiaceae family. It is a well-known and significant tropical fruit for commerce and is referred to as "King of Fruits". India is the top country in the world for mango production, generating nearly 50% of all mangoes. China, Thailand, Mexico, Pakistan, Philippines, Indonesia, Brazil, Nigeria and Egypt are further prominent mango-producing nations. According to Jori *et al.* (2015) [11].

The post-harvest losses in mangoes have been calculated to be between 25 and 40 per cent from harvest to consumption. Mangoes are praised for their tasty texture, high levels of carotenoids, vitamins C and E, phenolic compounds, minerals and fiber, as well as their high nutritional value. The mangoes contain antioxidants and the regular consumption in the diet helps to prevent cancer and cardiovascular disorders (Danalache *et al.*, 2015) [7].

Banana

The banana (*Musa spp*.) is one of the most significant crops in the world. After cereals, sugarcane, coffee and cocoa, bananas are the fifth most important agricultural product for international trade with an annual export volume of about 15 million tonnes. Almost 80 per cent of these exports come from Latin America (Maselkowski and Olenius, 2014) [14]. According to the Food and Agriculture Organization (2021), global banana exports in 2019 increased by 5% from the previous year to a record-high 10.2 million tonnes. Banana (*Musa spp.)* is a plant that is grown in Indonesia and has considerable nutritional, cultural, and economic importance. In Indonesia, 7.3 million tonnes of bananas were produced (Badan Pusat Statistik, 2019) [3].

Jamun

The Indian blackberry, or jamun (*Syzygium cumini* L.) Skeels a member of the Myrataceae family, is referred to as the fruit of the Gods. These fruits are also known by the names like Jamun, Jambul, Black Plum, Java Plum, Indian Blackberry and Jamblang. It is a fruit from a very large, continuously green tropical tree that is indigenous to Indonesia, Bangladesh, India, Pakistan, Sri Lanka and the Philippines and has astringent properties and purple-skinned fruit (Suradkar *et al.*, 2021) [27].

Karonda

Karonda (*Carissa carandas* L.), which belongs to the Apocyanaceae family, is an underutilized fruit plant, flourishes in tropical and subtropical climates. It originates from India and is also widely cultivated in other regions of the world, including Nepal, Afghanistan, South Africa, Malaysia, Indonesia, Sri Lanka and Australia. It grows naturally in the Indian states of Bihar, West Bengal, Uttar Pradesh, the lower, outer, and middle Himalayas, as well as in Uttarakhand, Maharashtra, Rajasthan and some regions of southern India (Malik *et al.*, 2010) [13]. Fruits are edible and containing full of minerals such as iron, calcium, magnesium and phosphorus. The antioxidant abilities of the karonda fruit are enhanced by the presence of anthocyanin and vitamin C (Sawant and Godghate, 2013) [21].

The research on blended fruit bar has been carried out by many scientists [(Vashney and Srivasta *et al.* (2007) [29], Patel and Kulkarni, (2017) [17], Ramalingam *et al.* (2010) [19]. Where in different fruit pulps/juices are blended and then dehydrated in two-three layers for preparing fruit bar. However, in the present research project, the separate layers of three different fruit pulp were used for preparing Multifruit bar instead of blending the pulps together. Such Multifruit bar would be more nutritious and delicious than the blended fruit bar with better consumer acceptability.

Materials and Methods

The present research entitled "Development of Multifruit Bar" was conducted at the Department of Post-Harvest Technology of Fruit, Vegetable and Flower Crops, Post Graduate Institute of Post-Harvest Technology and Management, Killa-Roha, Dist. Raigad, (18°25'35.16312" N,73°10'45.77484" E) during the year 2022-2023.

Experimental material

The fruits required for conducting research were procured from the APMC market Vashi, Navi Mumbai. The fresh and mature Mango, Banana, Jamun and Karonda were selected and brought to laboratory for conducting the research. The experiment entitled "Development of Multifruit Bar" was laid out with six main treatments, four sub treatments and three replications. The experimental details are as given below.

Experimental details

- Crop: Mango (*Mangifera indica*)
  Banana (*Musa paradisiaca*)
  Jamun (*Syzygium cumini*)
  Karonda (*Carissa carandas*)
- Varieties: Mango-Alphonso
  Banana-Grand naine
  Jamun-Bold type
  Karonda-Local type
- Design: F.C.R.D.
- Number of treatments: 6×4=24 Combinations
- Replications: 3

Details of treatments

The experiment will comprise of 6 main treatments and 4 sub treatments with 3 replications.

Main Treatments: Fruit pulp for different layers and blends of Multifruit bar

Treatments	Fruit pulp
T_1	Layers of Jamun-Mango-Karonda pulp
T_2	Layers of Banana-Mango-Jamun pulp
T_3	Layers of Banana-Mango-Karonda pulp
T_4	Blended pulp of Jamun-Mango-Karonda
T_5	Blended pulp of Banana-Mango-Jamun
T_6	Blended pulp of Banana-Mango-Karonda

Sub treatments: Storage period (days)

Sub treatments	Storage period (days)
S_1	0 day
S_2	30 days
S_3	60 days
S_4	90 days

Methods

Chemical parameters of Multifruit bar

The following chemical parameters of Multifruit bar were determined during the course of investigation.

Total soluble solids (°B)

The total soluble solids were determined by using Hand Refractometer (Atago Japan, 0 to 32°B) and the values were corrected at 20°C with the help of temperature correction chart (AOAC. 2020) [1].

Titratable acidity (%)

A known quantity of sample was titrated agains T_0 1N NaOH solution using phenolphthalein as an indicator (AOAC 2020) [1]. The sample of known quantity with 20 ml distilled water was transferred to 100 ml volumetric flask, made up the volume and filtered. A known volume of aliquot (10 ml) was titrated against 0.1N sodium hydroxide (NaOH) solution using phenolphthalein as an indicator (Ranganna, 1986) [20]. The results were expressed as per cent anhydrous citric acid.

Titratable acidity (%)

$$= \frac{\text{Normality of alkali} \times \text{Titre reading} \times \text{Volume made} \times \text{Equivalent weight of acid}}{\text{Weight of sample taken} \times \text{Volume of sample taken for estimation} \times 1000} \times 100$$

Vitamin C (mg/100 g)

The ascorbic acid was determined by 2, 6-dichlorophenol indophenol dye method of Johnson (1948) [10] as described by Ranganna (1986) [20]. A known quantity of sample was blended with 3 per cent metaphosphoric acid (HPO_3) to make the final volume of 100 ml and then filtered. A known quantity of aliquot was then titrated against 0.025 per cent 2, 6 dichlorophenol-indophenol dye to a pink coloured end point. The ascorbic acid content of the sample was calculated taking into consideration the dye factor and expressed as mg of ascorbic acid per 100 g.

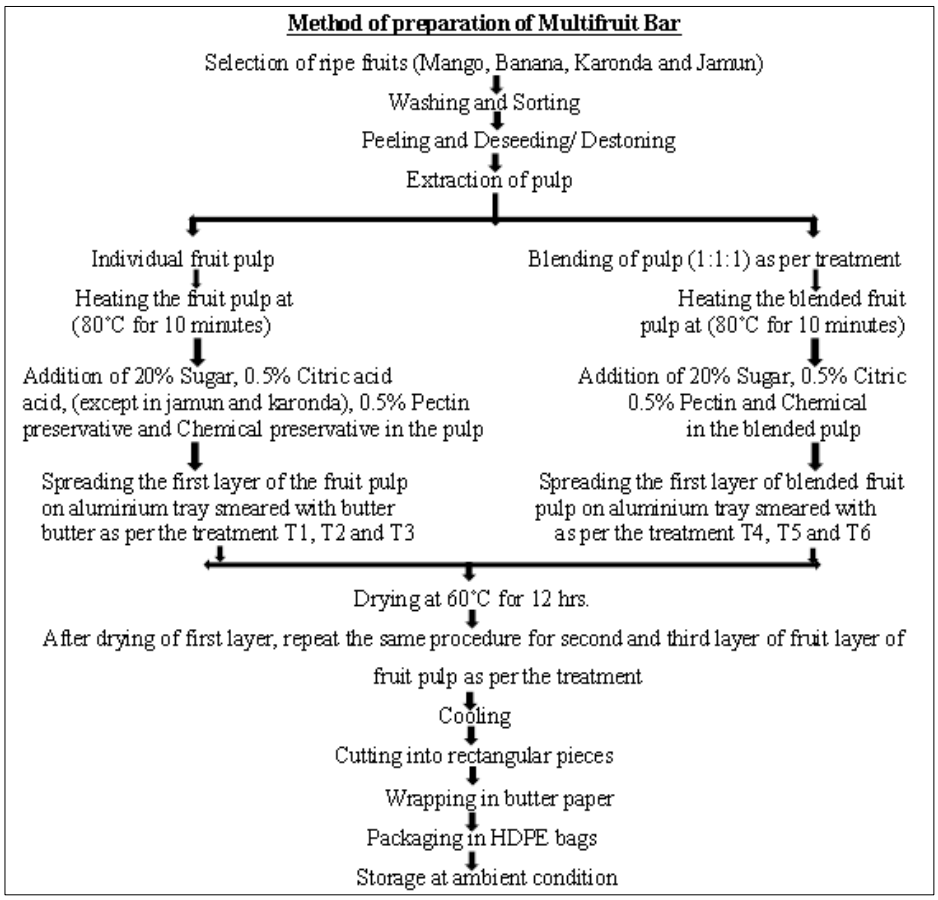
$$\textbf{Ascorbic acid (mg/100 g)} = \frac{\text{Titre reading X Dye factor X Volume made up}}{\text{Aliquot taken for estimation X Weight of sample}} X\ 100$$

Carotene (µg/100): Five grams of sample was taken in mortar and pestle and crushed into 10-15 ml of acetone, adding a few crystals of anhydrous sodium sulphate. The supernant was decanted into a beaker. The process was repeated twice and the combined supernant was then transferred to a separatory funnel. 10-15 ml petroleum ether was added and mixed thoroughly. Two layers were separate out. The lower was discarded and the upper layer was then collected in a 100 ml volumetric flask, and volume 100 ml volume with petroleum ether. The optical density of sample was recorded at 452 nm using petroleum ether as blank (Srivastava and Kumar, 2002) [25].

$$\beta - \text{Carotene} = \frac{O.D. \times 13.9 \times 104 \times 100}{wt.\ of\ samples \times 560 \times 1000}$$

Storage behaviour of Multifruit bar

The Multifruit bar was stored at ambient storage temperature condition to study the storage behaviour of Multifruit bar with respect to the changes in physical, chemical and sensory qualities during storage. The product was evaluated immediately after preparation and at an interval of 30, 60 and 90 days of storage.



Results and Discussion

T_1: Layers of Jamun-Mango-Karonda pulp
T_2: Layers of Banana-Mango-Jamun pulp
T_3: Layers of Banana-Mango-Karonda pulp
T_4: Blended Jamun-Mango-Karonda pulp
T_5: Blended Banana-Mango-Jamun pulp
T_6: Blended Banana-Mango-Karonda pulp

Changes in chemical quality parameters of Multifruit bar during storage

Total soluble solids (˚B)

The data with respect to the changes in the total soluble solid content of Multifruit bar are presented in Table 1. According to the data recorded for total soluble solid content of the Multifruit bar, the maximum (64.590°B) mean value for total soluble solid in the treatment T_3 (Layers of Banana-Mango-Karonda), followed by the treatment T_6 (Blended Banana-Mango-Karonda pulp). The treatment T_4 (Blended Jamun-Mango-Karonda pulp) showed minimum mean value (59.305°B) for total soluble solid content, followed by the treatment T_1 (Layers of Jamun-Mango-Karonda pulp). The TSS content of Multifruit bar decreased significantly throughout the storage period of 90 days. It was maximum 62.120˚B at the time of preparation which decreased to 61.518˚B at 90 days of storage period.

Table 1: Effect of different layers and blends of fruit pulp on the total soluble solid content of Multifruit bar during storage

Treatments	Total soluble solids (°B)				
	Storage period (Days)				
	0	30	60	90	Mean
T_1	60.000	59,830	59.550	59.260	59,660
T_2	62.240	62.110	61.880	61.870	62.025
T_3	64,940	64,820	64,480	64,120	64.590
T_4	59.620	59,480	59.120	59.000	59.305
T_5	62.000	61.920	61.780	61.520	61.805
T_6	63.920	63.800	63.560	63.340	63.655
Mean	62.120	61.993	61.728	61.518	
		S.Em ±		CD at 5%	
Treatments (T)		0.010		0.028	
Storage (S)		0.008		0.023	
Interaction (TxS)		0.020		0.057	

With the advancement of storage period of 90 days, total soluble solid content of Multifruit bar decreased. This might be due to pickup of the moisture from the atmosphere which lowered the concentration of total soluble solids of Multifruit bar. Similar findings observed by Vennilla (2004) [30] in guava-papaya bar and Parab *et al.* (2014) [15] in mango bar.

Titratable acidity

The data related to the changes in the titratable acidity of the Multifruit bar during storage period presented in Table 2. It was observed from the data that the titratable acidity of Multifruit bar varied significantly. Maximum titratable acidity (2.305%) recorded by the treatment T_4 (Blended Jamun-Mango-Karonda pulp) and minimum titratable acidity (1.29%) recorded by the treatment T_3 (Layers of Banana-Mango-Karonda pulp). It could be revealed from the data in Table 2 that the titratable acidity of Multifruit bar increased significantly throughout the storage period of 90 days. Maximum mean (1.773%) value for titratable acidity was reported at 90 days of storage while minimum mean (1.648%) value for titratable acidity was reported at initial day of storage.

Table 2: Effect of different layers and blends of fruit pulp on the titratable acidity of Multifruit bar during storage

Treatments	Titratable acidity (%)				
	Storage period (Days)				
	0	30	60	90	Mean
T_1	1.530	1.580	1.600	1.620	1.583
T_2	1.400	1.420	1.450	1.480	1.438
T_3	1.200	1,260	1.320	1.380	1.290
T_4	2.200	2.280	2.340	2,400	2.305
T_5	1.860	1.880	1.920	1.940	1,900
T_6	1.700	1.730	1.790	1.820	1,760
Mean	1.648	1.692	1.737	1.773	
		S.Em ±		CD at 5%	
Treatments		0.004		0.013	
Storage (S)		0.004		0.010	
Interaction (TxS)		0.009		0.02	

An increase in acidity might be due to the formation of acid by the breakdown of polysaccharides or oxidation of reducing sugars during storage. Similar trend of increase in acidity during storage was recorded by Sharma *et al.* (2013) [22] in wild apricot bar; Bhalerao *et al.* (2017) [4] in mango-papaya blended bar; Avhad *et al.* (2019) [2] in papaya-guava blended bar and Srivastava *et al.*, (2019) [26] in guava-orange fruit bar.

Vitamin C

The changes in vitamin C content of the Multifruit bar during storage are presented in Table 3. It could be observed

from the Table 3 that there was a significant difference among the treatments with respect to vitamin C content of Multifruit bar. The treatment T_4 (Blended Jamun-Mango-KaroDnda pulp) showed the highest (16.960 mg/100g) mean vitamin C content, followed by the treatment T_1 (Layers of Jamun-Mango-Karonda pulp). The minimum (11.878 mg/100g) mean vitamin C content was observed in the treatment T_3 (Layers of Banana-Mango-Karonda pulp), followed by the treatments T_6 (12.183 mg/100g) and T_2 (13.958 mg/100g). It was observed from the data, that the vitamin C content of Multifruit bar significantly decreased with increase in the storage period of 90 days. It was decreased from 15.937 to 12.573 mg/100 g up to 90 days of storage.

Table 3: Effect of different layers and blends of fruit pulp on the vitamin C content of Multifruit bar during storage

Treatments	Vitamin C (mg/100 g)				
	Storage period (Days) I				
	0	30	60	90	Mean
T_1	18.830	17.020	16.470	14.610	16.733
T_2	15.070	14.460	13.800	12.500	13.958
T_3	13.400	12.150	11.760	10.200	11.878
T_4	18.980	17.470	16.630	14.760	16.960
15	15.480	14.620	13.900	12.870	14.218
T_6	13.860	12.410	11.960	10.500	12.183
Mean	15.937	14.688	14.087	12.573	
		S.Em ±		CD at 5%	
Treatments (T)		0.005		0.013	
Storage (S)		0.004		0.010	
Interaction (TiS)		0.009		0.026	

Similar findings for decreasing trend in vitamin C was mentioned by Chavan *et al.* (2016) [5] in mango sapota fruit bar that was from 269.30 to 142.36 mg/100 g and Avhad *et al.* (2019) [2] in papaya guava fruit bar

β-Carotene

The data pertaining to the changes in β-carotene content of the Multifruit bar during storage are reported in Table 4. The mean value for β-carotene content of the Multifruit bar in the treatment T_1 (Layers of Jamun-Mango-Karonda pulp) was significantly highest (2965 µg/100 g) followed by the treatment T_4 (Blended Jamun-Mango-Karonda pulp) i.e. 2957.25 µg/100 g. The lowest µg/100 g) mean value for β-carotene content was observed in the treatment T_5 (Blended Banana-Mango-Jamun) followed by the treatments T_2 (Layers of Banana-Mango-Jamun).

Significant difference was observed in the mean values of β-carotene content of Multifruit bar during 90 days of storage period. Highest (3267.83 µg/100 g) mean value was observed at initial day of storage while lowest (2509.16 µg/100 g) mean value was observed at 90 days of storage period.

Table 4: Effect of different layers and blends of fruit pulp on the β-carotene content of Multifruit bar during storage

Treatments	β-Carotene (pg/I00 g)				
	Storage period (Days)				
	0	30	60	90	Mean
Ti	3280	3160	2885	2535	2965
T_2	3264	3119	2832	2491	2926.50
T_3	3269	3138	2857	2516	2945
T_4	3276	3155	2876	2522	2957.25
T_5	3257	3110	2824	2482	2918.25
T_6	3261	3127	2849	2509	2936
Mean	3267.83	3134.83	2853.83	2509.16	
		S.Em +		CD at 5%	
Treatments (T)		0.456		1.302	
Storage (S)		0.373		1.063	
Interaction (TxS)		0.913		2.604	

β-Carotene content of Multifruit bar decreased significantly throughout the storage period of 90 days. It might be due to oxidative and non-oxidative changes (thermal degradation) which altered the β-carotene content, the colour of the product and lowered the flavour and nutritive value of the product. Similar result reported by Parab *et al.* (2014) [15] in mango bar; Avhad *et al.* (2019) [2] in papaya guava fruit bar

Changes in the sensory quality parameters of Multifruit bar during storage Colour

The sensory score for colour of Multifruit bar during storage of 90 days are presented in Table 5. Significantly maximum (7.538) mean sensory score for colour of Multifruit bar was recorded in the treatment T_3 (Layers of Banana-Mango-Karonda pulp) followed by the treatment T_2 (Layers of Banana-Mango-Jamun pulp) was (7.195). Minimum (6.895) mean sensory score for colour of Multifruit bar which was recorded in the treatment T_6 (Blended Banana-Mango-Karonda pulp) followed by the treatment T_4 (Blended Jamun-Mango-Karonda pulp). Sensory score for colour of Multifruit bar significantly decreased with increase in the storage period upto 90 days.

Table 5: Effect of different layers and blends of fruit pulp on sensory score for colour of Multifruit bar during storage

Treatments	Sensory score for colour				
	Storage period (Days)				
	0	**30**	**60**	**90**	**Mean**
T_1	7.490	7.370	6.700	6.500	7.015
T_2	8210	7.570	6.600	6.400	7.195
T_3	8.450	7.600	7.100	7.000	7.538
T_4	7.980	7.200	6.400	6.300	6.970
T_5	7.700	7.100	6.710	6.500	7.003
T_6	7.500	7.280	6.500	6.300	6.895
Mean	7.888	7.353	6.668	6.500	
		S.Em ±		CD at 5%	
Treatments (T)		0.005		0.014	
Storage (S)		0.004		0.011	
Interaction (TxS)		0.010		0.028	

It was observed from the data that the likeness for colour of the bar decreased during storage period of 90 days. It might be due to the darkening of the bar due to browning reactions during storage. The observation in accordance with this finding was reported by Bhalerao *et al.* (2017) [4] in mango papaya bar, Avhad *et al.* (2019) [2] in fruit bar prepared from papaya and guava and Singh *et al.* (2020) [23] in blended guava papaya fruit leather.

Flavour

The data pertaining to the sensory score for flavour of Multifruit bar during storage interval of 90 days are presented in Table 6. It is apparent from the results that the mean sensory score for flavour of Multifruit bar varied significantly due to the treatments and storage period. The treatment T_3 (Layers of Banana-Mango-Karonda pulp) recorded the maximum (7.725) score for flavour followed by the treatment T_1 (Layers of Jamun-Mango-Karonda pulp) recorded (7.235). The lowest sensory score for flavour (6.738) was recorded in the treatment T_5 (Blended Jamun-Mango-Karonda pulp), followed by the treatment T_4. As regards storage, the mean score for flavour of Multifruit bar was significantly decreased with the advancement of storage period.

Table 6: Effect of different layers and blends of fruit pulp on sensory score for flavour of Multifruit bar during storage

Treatments	Sensory score for flavour				
	Storage period (Days)				
	0	**30**	**60**	**90**	**Mean**
TI	7.980	7.500	6.800	6.660	7.235
T_2	7.500	7.380	7.000	6.800	7.170
T_3	8.420	7.980	7.500	7.000	7.725
T_4	7.720	7.100	6.200	6.000	6.755
TS	7.370	7.180	6.300	6.100	6.738
T_6	7.650	7.500	6.600	6.400	7.038
Mean	7.773	7A40	6.733	6.493	
		S.Em ±		CD at 5%	
Treatments (T)		0.005		0.013	
Storage (S)		0.004		0.011	
Interaction (TxS)		0.009		0.027	

Similar findings was observed by Parekh *et al.* (2014) [16] in mango bar with fortified desiccared coconut powder and Chavan and Shaikh (2015) [5] in guava fruit leather.

Texture: The data related to the changes in the sensory score for texture of Multifruit bar during storage of 90 days are presented in Table 7. It is revealed from data presented in Table 7 that the effect of different layers and blends of fruit pulp on sensory score for texture of Multifruit bar during storage of 90 days at ambient storage conditions. Significantly maximum mean score for texture (7.385) of the Multifruit bar was obtained by the treatment T_3 (Layers of Banana-Mango-Karonda pulp), followed by the treatment T_1 (6.953). The treatment T_4 (Blended Jamun-Mango-Karonda pulp) showed significantly minimum (6.253) score for texture followed by the treatment T_5 (Blended Banana-Mango-Jamun pulp).

The mean score for texture of the Multifruit bar decreased significantly with increase in the storage period. The identical result for decreasing trend was reported by Gayathri and Uthira (2008) [9] in mango-papaya bar and Sreemathi *et al.* (2008) [24] in *Sapota-papaya* bar.

Table 7: Effect of different layers and blends of fruit pulp on sensory score for texture of Multifruit bar during storage

Treatments	Sensory score for texture				
	Storage period (Days)				
	0	**30**	**60**	**90**	**Mean**
Ti	7.900	7.510	6.400	6.000	6.953
T_2	7.720	7.300	6.600	6.100	6.930
T_3	8.340	7.700	7.000	6.500	7.385
T_4	7.110	6.700	5.800	5.400	6.253
15	7.400	6.650	6.200	6.000	6.563

T_6	7.550	6.810	6.600	6.400	6.840
Mean	7.670	7.112	6.433	6.067	
		S.Em ±		CD at 5%	
Treatments (T)		0.004		0.012	
Storage (S)		0.003		0.010	
Interaction (TxS)		0.008		0.024	

Overall acceptability

The sensory score for overall acceptability of Multifruit bar during storage of 90 days are shown in Table 8. Maximum mean score for overall acceptability (7.475) of the Multifruit bar was obtained by the treatment T_3 (Layers of Banana-Mango-Karonda pulp), which was significantly superior to other treatments, followed by the treatment T_1. The treatment T_5 (Blended Banana-Mango-Jamun pulp) showed minimum (6.608) mean score for overall acceptability which was at par with the treatment T_4 (6.628). It was observed from the data presented in Table 8 that the overall acceptability of Multifruit bar significantly decreased with increase in the storage period of 90 days.

In terms of overall acceptability, layered fruit bar i.e combinations of T_1, T_2 and T_3 possess different distinct colour of layer, flavour and texture as compared to other combinations i.e. T_4, T_5 and T_6. With the advancement of storage, the overall acceptability of Multifruit bar decreased. Similar trend for overall acceptability were mentioned by Chavan and Shaikh (2015) [5]; Bhalerao *et al.* (2017) [4] and Singh *et al.* (2020) [23].

Table 8: Effect of different layers and blends of fruit pulp on sensory score for overall acceptability of Multifruit bar during storage

	Sensory score for overall acceptability				
Treatments	**Storage period (Days)**				
	0	**30**	**60**	**90**	**Mean**
T_1	7,720	6,980	6,830	6,500	7,008
T_2	7,980	7,340	6,400	6,000	6.930
T_3	8,400	7,600	7,000	6.900	7,475
T_4	7,210	6.600	6.500	6.200	6.628
T_5	7.500	6.730	6.200	6,000	6.608
T_6	7,200	7,170	6,300	5,900	6,650
Mean	7,668	7,070	6,543	6,250	
		S.Em *		CD at 5%	
Treatments (1)		0.014		0.039	
Storage (S)		0.011		0.032	
Interaction (TxS)		0.028		0.079	

Mango pulp

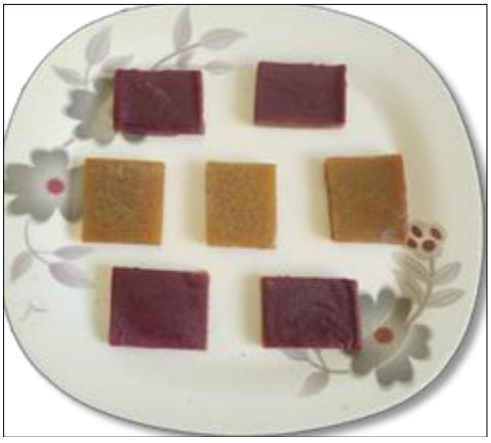
Banana pulp

Jamun pulp

Karonda pulp

Effect of different layers and blends of fruit pulp at 0 day of storage

T_1: Layers of Jamun-Mango-Karonda pulp



T_2: Layers of Banana-Mango-Jamun pulp

T_3: Layers of Banana-Mango-Karonda pulp

T_4: Blended pulp of Jamun-Mango-Karonda

T_5: Blended pulp of Banana-Mango-Jamun

T_6: Blended pulp of Banana-Mango-Karonda

Conclusion

It is observed from the data that the layered treatments (T_1, T_2 and T_3) had highest sensory score for colour, texture, flavour and overall acceptability as compare to the blended treatments (T_4, T_5 and T_6). The three different distinct colours were most liked by the panelist as compared to other combinations along with their flavour and texture. It can be concluded from the present investigation that the treatment T_3 having separate layers of Banana-Mango-Karonda fruit pulps had higher overall organoleptic score during 90 days of storage period.

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