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Studies on Preparation and Value Addition on Guava Fruit Bar

Archa Gireesh [a*#], Saket Mishra [a†], Gaurav Singh Vishen [b‡], Vishnu Gopan G. M. [c#] and Prince Jose [d#]

[a] Department of Horticulture (Fruit Science), Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India.
[b] Department of Horticulture (Fruit Science), Naini Agricultural Institute, Uttar Pradesh, India.
[c] Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India.
[d] Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was conducted at the Post Harvest Technology Lab, Department of Horticulture, SHUATS, Prayagraj (U.P) during the year 2021 - 2022. The experiment comprised of 10 different treatments including control and to produce new value addition in guava fruit bar, beetroot puree and other dry fruit powders, such as cashew, almond, and pistachio, are added to the bar. Different blends of guava pulp and beetroot puree as well as various dry fruit powders used in the treatment were assessed for their Physico-chemical and sensory properties as well as their shelf life under ambient settings and storage. The evaluation for other parameters, like moisture content, titratable acidity, ascorbic acid and pH measurements were taken every month for up to 90 days. The parameters like pH, ascorbic acid, and reducing sugar slightly decreased from 60 days to 90 days

[#] M. Sc Scholar;
[†] Assistant Professor;
[‡] Ph.D. Scholar;
**Corresponding author: E-mail: archagireesh7025@gmail.com;*

of storage, however the moisture content, titratable acidity, and TSS increased. The physical and chemical changes that occurred following the preparation of the guava fruit bar were studied, and a panel of five experts using the 9-point hedonic scale to assess the sensory evaluation of the product. This fruit bar was kept at room temperature for almost 90 days. According to storage studies, T_4 (84% guava pulp, 15% beetroot puree, and 1% cashew powder) is the most suited formulation for fruit bars in terms of its physicochemical properties and organoleptic test. Also, the effect of storage on Physico-chemical and organoleptic properties was observed.

Keywords: Fortified fruit bar; 9-point hedonic scale; beetroot; guava.

1. INTRODUCTION

Guava (*Psidium guajava* L.) is an important commercial fruit crop in India. After banana, mango, and citrus, it's the fourth-most important fruit in our country. It is widely grown in the states of Maharashtra, Bihar, Madhya Pradesh, and UP. It is a good source of ascorbic acid, pectin, carbohydrates, and several minerals. Guava is significant because it is a resilient plant that can grow on a wide range of soil types, including shallow, medium black, and alkaline soil. However, it thrives on well-drained soils that are at least 0.5 to 1 m deep [1].

India has a total of 2.03 lac hectares under guava, producing 4.43 million metric tons (NHB database, 2020-21). Guava is not only a wholesome fruit, but it also provides a wide range of minerals and vitamins [2,3]. Guava is a powerhouse in the fight against free radicals and oxidation, which are key adversaries of many degenerative diseases because of its high vitamin C content (ascorbic acid) [4].

Due to its ease of cultivation, high nutritional value, and popularity of processed guava products, guava has a high commercial potential [5,6]. By converting the fruit into fruit products, we can reduce the fruit loss after harvesting. While ripe fruit is usually enjoyed as a dessert, guava can also be utilized to produce processed products such as juices, nectar, jam, jellies, baby foods, puree, beverage base, syrup, and wine [7].

Dehydration of perishable fruits is best suited for developing countries, which have poor infrastructure for storage at low temperatures and processing. Because of their prolonged shelf life, dehydrated fruits are now becoming extremely prevalent [8,9]. As a result, making a fruit bar with different dry powders is beneficial.

Fruit bars are dehydrated fruit-based products. Fruit leathers are attractive, colored products produced by pureeing and restructuring dehydrated sugar-acid-pectin gels, which degrade the original fruit structure. Research on these products is now being increased. Fruit leathers are also useful for preserving over ripe fruits [10].

2. MATERIALS AND METHODS

During the academic year 2021-2022, the experiment was carried out in the Post-Harvest Technology Lab, Department of Horticulture, SHUATS, Prayagraj (UP).Guava (*Psidium guajava L*.) cv VNR Bihi and Beetroot (*Beta vulgaris L*.) were obtained from local market of Rambagh, Allahabad during 2021-22 winter season.

The study used a Completely Randomized Design (CRD) with ten treatments and replicated thrice.

The physicochemical changes in the bar were examined after preparation and during storage at room temperatures. The pH of the product was determined using a digital pH meter, TSS with a hand refractometer, Titrable acidity with a titrimetric method, moisture content by weighing the sample before and after drying and calculating the difference, and ascorbic acid by titrating the product against a 2, 6-dichlorophenol indophenol indicator (A.O.A.C, 1990). Lane and Eynon's (1923) approach were used to calculate sugars in terms of sugar. The color, flavor, texture, and overall acceptability of the product were all evaluated. Characters with mean scores of 5 or higher out of 9 were considered acceptable.

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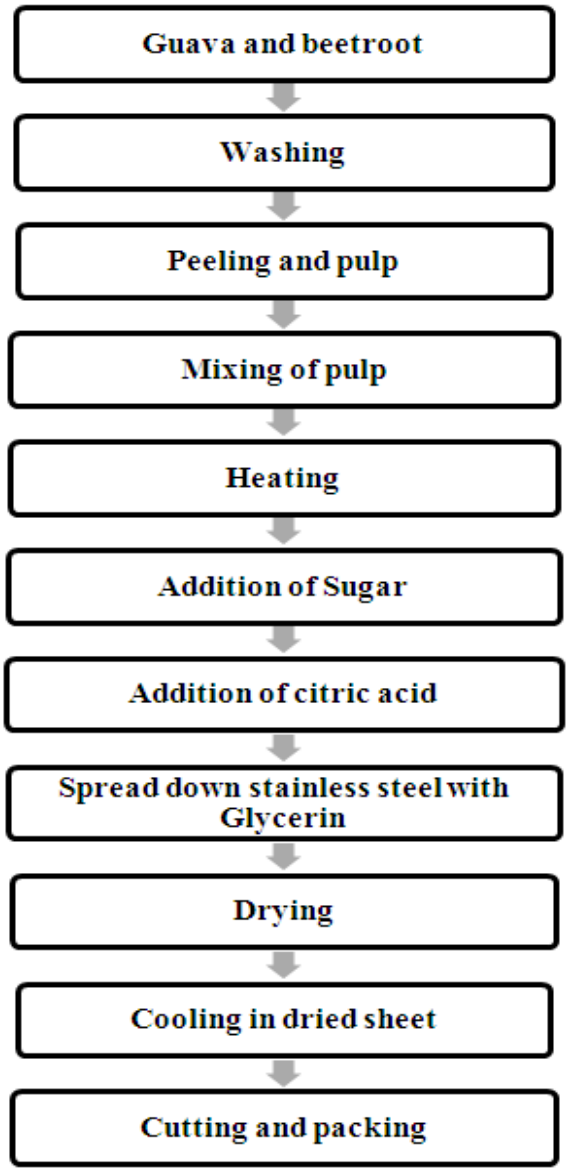

Flow chart for preparation of guava fruit bar

Table 1. Treatment tables

SL No.	Treatments No	Treatment Combinations
1.	T_0	Control
2.	T_1	94% pulp + 5% beetroot puree + 1% cashew
3.	T_2	94% pulp + 5% beetroot puree + 1% almond
4.	T_3	94% pulp + 5% beetroot puree + 1% pistachio
5.	T_4	84% pulp + 15% beetroot puree + 1% cashew
6.	T_5	84% pulp + 15% beetroot puree +1% almond
7.	T_6	84% pulp + 15% beetroot puree + 1% pistachio
8.	T_7	74% pulp + 25% beetroot puree + 1% cashew
9.	T_8	74% pulp + 25% beetroot puree + 1% almond
10.	T_9	74% pulp +25% beetroot puree + 1% pistachio

3. RESULTS AND DISCUSSION

In the present investigation, possibilities were explored for preparation of fortified guava fruit bar blended with beetroot puree and different dry fruit using different recipes.

3.1 Organoleptic Quality and Physico-chemical Properties of Guava Fruit bar Moisture Content

The highest moisture content (14.89%) found in T_4 (84% guava pulp+ 15% beetroot puree+ 1% cashew) followed by (14.75%) found with T_5 (84% guava pulp+ 15% beetroot puree+ 1% almond) and least moisture content was found with T_0 control (100% guava pulp) (13.43%). Similar results have been reported by Aleem et al. (2012) in composite flour-based biscuits.

High moisture level in fruit bars promotes the growth of undesirable microorganisms and food risks in many preserved foods (Fontana, 2000). Low moisture content, on the other hand, can hinder microbial development and enhance shelf-life of the product. In case of fruit leather, it may negatively influence the texture quality Huang and Hsieh (2005) and Irwandi et al. (1998).

3.2 TSS (°Brix)

The best T.S.S. (79.56° Brix) found in T_4 (84% guava pulp+ 15% beetroot puree+ 1% cashew) followed by (79.23°Brix) found in T_5 (84% guava pulp+ 15% beetroot puree+ 1% almond) and least T.S.S. was found with T_0 control (100% guava pulp) (74.56° Brix). The findings of this investigation are consistent with the findings of Baramanray et al. (1995) in evaluation of guava (*Psidium guajava L*.) hybrid for making nectar.

3.3 Titrable Acidity (%)

The best Titrable acidity (0.91%) found in T_4 (84% guava pulp + 15% beetroot puree + 1% cashew) followed by (0.90%) found in T_5 (84% guava pulp + 15% beetroot puree+ 1% almond) and least Titrable acidity was found in T_0 (100% guava pulp) (0.71%). The product remained significant up to 90 days of storage The results of present investigation are in accordance with the findings of Anju et al (2014) in peach-soy fruit leather.

3.4 pH

The best pH (3.98) found in T_4 (84% guava pulp + 15% beetroot puree + 1% cashew) followed by (3.94) found in T_6 (84%pulp + 15% beetroot puree+ 1% pistachio) and least pH was found in T_0 control (100% guava pulp) (3.61). Similar results of pH were reported in pineapple leather by Phimpharian et al (2011), mango leathers by Azeredo et al. (2006), pawpaw and guava leathers by Babalola et al (2002) and Apple leathers by Natalia et al (2012).

3.5 Total Sugars

The best total sugar (67.48%) was found in T_4 (84% guava pulp + 15% beetroot puree+ 1% cashew) followed by (66.69%) found in T_5 (84% guava pulp + 15% beetroot puree + 1% almond) and least total sugar was found in T_0 control (100% guava pulp) (63.21). The results of present investigation are in conformity with the findings of Kuchi et al. (2014) in standardization of recipe for preparation of guava jelly bar.

3.6 Ascorbic Acid (mg/ 100 g)

The best ascorbic acid (225.51 mg/100 g) was found in T_0 (100% guava pulp) followed by (225.03mg/100g) found in T_2 (94% guava pulp+ 5% beetroot puree+ 1% almond) and least ascorbic acid was found in T_7 (74% guava pulp + 25% beetroot puree + 1% cashew). Similar results have been reported by Fennema, (1996) who reported that the decrease in ascorbic acid content during drying was due to prolonged heating in the presence of oxygen during processing.

3.7 Organoleptic Analysis

Sensory scores for treatment T_4 (84 % Guava pulp + 15 % beetroot pulp + 1 % cashew) were shown to be the highest in all organoleptic properties such as color and appearance, taste, scent, and overall acceptability. The greatest overall acceptance score (8.) indicates that the judges liked it.

Table 2. Effect of different treatments of guava fruit bar on moisture content and total sugars (%)

Treatment No	Moisture content (%)				Total soluble solids			
	Storage period (In days)				Storage period (In days)			
	0 days	30 days	60 days	90 days	0 days	30 days	60 days	90 days
T_0 (Control)	14.01	13.88	13.65	13.43	73.95	74.16	74.35	74.56
T_1	14.10	13.98	13.76	13.55	74.59	74.78	74.92	75.19
T_2	14.12	13.96	13.70	13.58	74.05	74.26	74.43	74.62
T_3	14.19	13.91	13.68	14.50	74.65	79.82	74.98	75.25
T_4	15.98	15.87	15.08	14.89	78.94	79.15	79.37	79.56
T_5	15.85	15.66	15.10	14.75	78.65	78.82	79.01	79.23
T_6	15.79	15.59	15.09	14.88	78.25	78.46	78.65	78.86
T_7	15.12	14.98	14.72	14.52	75.95	76.18	76.35	76.54
T_8	14.98	14.88	14.67	14.48	76.12	77.35	77.52	77.79
T_9	14.58	14.38	14.10	13.92	76.25	76.62	76.95	77.64
F-test	NS	NS	NS	NS	S	S	S	S
S.Ed(±)	0.22	0.23	0.24	0.21	1.032	1.321	1.456	1.576
CD @ 5%	0.44	0.46	0.49	0.43	20.025	2.731	2.834	3.015

*F- test: $\frac{larger\ sample\ variance}{smaller\ sample\ variance}$

*S. Ed (±): Standard Error of Deviation

*CD @ 5%: Critical Difference @ 5%

Table 3. Effect of different treatments of guava fruit bar on Titrable acidity and pH

Treatments	Percentage of titrable acidity				pH			
	Storage periods (In days)				Storage periods (In days)			
	0 days	30 days	60 days	90 days	0 days	30 days	60 days	90 days
T_0	0.77	0.75	0.73	0.71	3.58	3.59	3.60	3.61
T_1	0.90	0.88	0.85	0.83	3.65	3.66	3.67	3.68
T_2	0.89	0.85	0.82	0.79	3.61	3.62	3.63	3.64
T_3	0.95	0.93	0.90	0.88	3.66	3.67	3.68	3.69
T_4	1.02	0.98	0.95	0.91	3.95	3.96	3.97	3.98
T_5	0.98	0.95	0.92	0.90	3.87	3.88	3.89	3.90
T_6	0.95	0.92	0.89	0.86	3.91	3.92	3.93	3.94
T_7	0.93	0.90	0.87	0.84	3.81	3.82	3.83	3.84
T_8	0.89	0.86	0.83	0.80	3.82	3.83	3.84	3.85
T_9	0.91	0.87	0.85	0.83	3.84	3.85	3.86	3.87
F-test	S	S	S	S	S	S	S	S
S.Ed(±)	0.02	0.01	0.02	0.01	0.004	0.006	0.006	0.008
CD @ 5%	0.05	0.04	0.48	0.39	0.17	0.015	0.016	0.014

Table 4. Effect of different treatments of guava fruit bar on total sugar and ascorbic acid

Treatments	Total sugar				Ascorbic acid			
	Storage periods (In days)				Storage periods (In days)			
	0 days	30 days	60 days	90 days	0 days	30 days	60 days	90 days
T_0	63.58	63.45	63.33	63.21	226.59	225.95	225.75	225.51
T_1	64.89	64.79	64.65	64.49	225.56	225.12	224.89	224.67
T_2	64.75	64.61	64.48	64.32	225.86	225.65	225.34	225.03
T_3	64.95	64.6	64.71	64.59	225.31	224.95	224.56	224.10
T_4	67.89	67.75	67.60	67.48	223.35	223.05	222.82	222.62
T_5	67.25	67.02	66.88	66.69	223.89	223.51	223.31	223.05
T_6	67.78	67.10	66.80	66.51	223.64	223.31	223.05	222.82
T_7	66.88	66.67	66.42	66.21	221.13	220.95	220.67	220.38

Treatments	Total sugar				Ascorbic acid			
	Storage periods (In days)				Storage periods (In days)			
	0 days	30 days	60 days	90 days	0 days	30 days	60 days	90 days
T_8	66.59	66.34	66.15	65.98	221.35	221.02	220.76	220.51
T_9	66.75	66.52S	66.31	66.05	221.82	221.64	221.31	221.08
F-test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
S.Ed(±)	0.95	0.93	0.92	0.96	2.95	2.93	2.92	2.96
CD @ 5%	1.79	1.83	1.85	1.93	4.79	4.83	4.85	4.95

**F- test:* $\frac{larger\ sample\ variance}{smaller\ sample\ variance}$

**S. Ed (±): Standard Error of Deviation*

**CD @ 5%: Critical Difference @ 5%*

Plate 1. Guava Fruit Bar (Leather)

Plate 2. Display of different treatments

4. CONCLUSION

Based on the results of the current experiment, it can be concluded that treatment T_4 84 % guava pulp + 15 % carrot puree + 1 % cashew was found to be the best in terms of T. S. S. (79.56°Brix), Titrable acidity (0. 91 percent), pH (3. 98), total sugar (67.48 percent), ascorbic acid (53.57mg /100 g), sensory evaluation scores (2.50). The moisture content was negligible (14.89%).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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