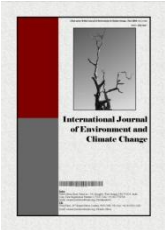

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Preparation of Fruit Leather by Blending Guava and Papaya

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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 present experiment entitled "Preparation of Fruit Leather by Blending Guava and Papaya" was carried out in post-harvest lab, Department of Horticulture, Sam Higginbottom university of Agriculture Technology and sciences, during the winter season 2021-2022.The experiment was laid out in CRD (Completely Randomized Design) with 7 treatments and 3 replications. Physico - chemical and sensory parameters were observed. the evaluation for other parameters like moisture content, acidity, TSS, ascorbic acid, total sugar, pH as well as organoleptic attribute colour, flavour, taste and overall acceptability of guava and papaya leather were evaluated 0 days to 90 days of storage. The highest moisture content (16.82%) in fruit bar at 0 days of storage was recorded in T_1 with (100%) guava pulp. The highest titrable acidity (1.15%) was recorded in fruit bar with 100 percent guava pulp T_1 and (0.75%) in 60 percent guava pulp + 40 percent papaya pulp T_3 at 90 days of storage. The highest total soluble solids 76.55°Brix was recorded in fruit bar with 60 percent guava pulp + 40 percent papaya pulp T_3 and low in 71.66°Brix in 100 percent guava pulp T_1 at 0 day of storage. In contrast, the lowest ascorbic acid content 109.56mg/100g was recorded in fruit bar with 100 percent guava pulp T_1 at 0days of storage. The highest total sugars of (58.37) percent was recorded in fruit bar made by 60 percent guava pulp + 40 percent papaya pulp T_3. The highest pH of 4.68 was recorded in fruit bar with 60 percent guava pulp + 40 percent papaya pulp T_3.

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Overall acceptability score had decreased with the advancement of storage period. Hence, the above parameters were taken for shelf life and better quality. An overall result of guava and papaya leather was found best in the treatment T_3 (Guava 60% + papaya 40%) proved to be best in terms of all aspects.

Keywords: Fruit leather; blending; guava; papaya.

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, Madhya Pradesh, and UP. It is a good source of ascorbic acid, pectin, carbohydrates, and several minerals. Guava plants can grow on a wide range of soil types, including shallow, medium black, and alkaline soil. However, it thrives on well-drained soil. 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. 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), high nutritional value, and popularity of processed guava products, guava has a high commercial potential [1,2]. 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 [3,4].

Papaya (*Carica papaya* L.) is regarded as the wonder fruit of the tropics and sub tropics. Presently, farmers are much interested in cultivation of papaya due to ease and convenient in its raising and the crop is of short duration .Though production technology of papaya is known and farmers are harvesting higher fruit yield .The main problem lies is its post-harvest handling and marketing. Papaya fruits are used for table purpose, good products like sauce, squash, bar, pickle, etc. are prepared. Fruits are also used in preparation of jam, tutty fruity, soft drinks, ice-cream, flavouring crystallised fruits and in syrup [5-7]. Fruit bars are dehydrated fruit-based products which are soft leathery sweet in taste. Fruit leathers are attractive, coloured products produced by pureeing and restructuring dehydrated sugar-acid-pectin gels, which degrade the original fruit structure [8-10]. Research on these products is now being increased. Fruit leathers are also useful for preserving over ripe fruits vennilla et al .,2004 [11,12].

Further, the good availability of both fruit almost throughout the year is another factor. Hence, an experiment to standardise nutritionally rich and tasty blended fruit leather from both fruits were carried out.

2. MATERIALS AND METHODS

The present investigation was carried out in Post – Harvest technology lab. Department of Horticulture,SHUATS, prayagraj.Guava (*Psidium gujava* L.)cv Allahabad safeda, and papaya (*carica papaya* L.)cv Taiwan red lady were obtained from local market of Alopi bagh, Allahabad during 2021-2022 winter season.

The study used a Completely Randomized Design (CRD) with seven 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 [13] 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.

2.1 Treatment Combinations

Treatment	Treatment combinations
T_1	100% (Guava)
T_2	80:20 (Guava – Papaya)
T_3	60:40 (Guava – Papaya)
T_4	50:50 (Guava – Papaya)
T_5	20:80 (Guava – Papaya)
T_6	40:60 (Guava – Papaya)
T_7	100% (Papaya)

3. RESULTS AND DISCUSSION

In present experiment quality of guava papaya leather was determined by checking physico-chemical parameters viz. moisture, Acidity, TSS, Ascorbic acid,Total sugar, pH and Organolpetic scores.The main objective of experiment was to find out the best quality and acceptable treatment.

3.1 Moisture Content (%)

"The highest moisture content (16.82%) in fruit bar at 0 days of storage was recorded in T1 (with 100% guava pulp). The lowest moisture content (%) was recorded in fruit bar T_7 (14.46 with 100 percent papaya pulp) at 0 days of storage furnished in Table 2. At 30 days of storage, highest moisture content (16.64%) was recorded in fruit bar with 100 percent guava pulp (T_1) and the lowest moisture content (14.25%) with 100 percent papaya pulp (T_7). The moisture content recorded were maximum (16.46%) at 60 days of storage in fruit bar with 100 percent guava pulp (T_1), whereas minimum (14.02%) in fruit bar with 100 percent papaya pulp (T_7). The moisture content recorded were maximum (16.18%) at 90 days of storage with 100 per cent guava pulp (T_1), whereas minimum (13.87%) in fruit bar with 100 percent papaya pulp (T_7)" [14]. Similar results have been reported by Aleem et al. [15] in composite flour-based biscuits. High moisture content in the fruit bars creates favourable conditions for the growth of undesirable microorganisms & food hazards of various preserved foods [16]. While low moisture content can inhibit microbial growth and enhance shelf-life of the product. In case of fruit leather, it may negatively influence the texture quality Huang and Hsieh [6].

3.2 Titrable Acidity (%)

The highest titrable acidity 1.06% was recorded in fruit bar with 100 percent guava pulp (T_1) and low 0.62% in 60 percent guava pulp+ 40 percent papaya pulp (T_3) at 0 day of storage. The highest titrable acidity 1.01% was recorded in fruit bar with 100 percent guava pulp (T_1) and (0.66%) in 60 percent guava pulp+ 40 percent papaya pulp (T_3) at 30 days of storage, lowest titrable acidity. The highest titrable acidity 1.13% was recorded in fruit bar with 100 percent guava pulp (T_1) and 0.67% in 60 percent guava pulp+ 40 percent papaya pulp (T_3) at 60 days of storage, lowest titrable acidity. The highest titrable acidity (1.15%) was recorded in fruit bar with 100 percent guava pulp (T_1) and (0.75%) in 60 percent guava pulp+ 40 percent papaya pulp (T_3) at 90 days of storage.increase in acidity with increase of guava pulp [17]. 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. [18] in peach -soy fruit leather.similar observations were found by sravanthi et al.

3.3 Total Soluble Solids (°Brix)

"Total soluble solids ranged from 74.15°Brix (T_1) to 80.05 °Brix (T_5) among the treatments (Table 2). The highest total soluble solids 76.55°Brix was recorded in fruit bar with 60 per cent guava pulp + 40 percent papaya pulp (T_3) and low in 71.66°Brix in 100 percent guava pulp (T_1) at 0 day of storage. At 30 days of storage the highest total soluble solids was recorded in fruit bar prepared with 60 percent guava pulp + 40 percent papaya pulp (T_3) was maximum (76.88 °Brix) and low in 71.86°Brix in 100 percent guava pulp (T_1) at 30 days of storage. At 60 days of storage the highest total soluble solids was recorded in fruit bar prepared with 60 percent guava pulp + 40 percent papaya pulp (T_3) was maximum (77.25 °Brix) and low in (72.30 °Brix) in 100 percent guava pulp (T_1) at 60 days of storage. At 90 days of storage the highest total soluble solids was recorded in fruit bar prepared with 60 per cent guava pulp + 40 percent papaya pulp (T_3) was maximum (77.66 °Brix) and low in 72.76°Brix in 100 percent guava pulp (T_1) at 90 days of storage (Table 1)" [14]. The results of present investigation are in accordance with the findings of Baramanray et al. [19] in evaluation of

guava (*Psidium guajava* L.) hybrid for making nectar.

3.4 Ascorbic Acid (mg/100 mg)

At 0 day of storage, the highest ascorbic acid content (114.89 mg/ 100 g) was recorded in fruit bar (T_1). In contrast, the lowest ascorbic acid content 109.56 mg/100g was recorded in fruit bar with 100 percent papaya pulp (T_7) at 0 day of storage the highest ascorbic acid content (113.49 mg/ 100 g) was recorded in fruit bar with 100 percent guava pulp (T_1). In contrast, the lowest ascorbic acid content 107.68 mg/100g was recorded in fruit bar with 100 percent papaya pulp (T_7) at 30 days of storage. the highest ascorbic acid content (112.94 mg/ 100 g) was recorded in fruit bar with 100 percent guava pulp (T_1). In contrast, the lowest ascorbic acid content 107.68 mg/100g was recorded in fruit bar with 100 percent papaya pulp (T_7) at 60 days of storage. the highest ascorbic acid content (111.49 mg/ 100 g) was recorded in fruit bar with 100 percent guava pulp (T_1). In contrast, the lowest ascorbic acid content 106.59 mg/100g was recorded in fruit bar with 100 percent papaya pulp (T_7) at 90 days of storage [20-22].

3.5 Total Sugars (%)

"Total sugars in fruit bar made with different blending ratios of papaya and guava pulp at 0, 30 and 60,90 days of storage. among the treatments, the highest total sugars of 58.37 per cent was recorded in fruit bar made by 60 percent guava pulp + 40 percent papaya pulp (T_3). In contrast, the lowest total sugar percent of 57.39 was recorded in fruit bar made by 100 percent guava pulp (T_1) at 0 days of storage. At 30 days of storage, highest percent of total sugars (58.29%) recorded in fruit bar made with by 60 percent guava pulp + 40 percent papaya pulp (T_3) and lowest (57.34%) was recorded with 100 percent guava pulp. The total sugars recorded were maximum (58.19%) at 60 days of storage in fruit bar with by 60 per cent guava pulp + 40 percent papaya pulp (T_3). AT 90 days the highest total sugars of 56.84 percent was recorded in fruit bar made by 60 percent guava pulp + 40 percent papaya pulp (T_3)" [14]. In contrast, the lowest total sugar per cent of 56.84 was recorded in fruit bar made by 100 percent guava pulp (T_1) at 90 days of storage. "The slight decrease in total sugars per cent of the fruit bar samples were noted throughout the storage period (Table 2). There were significant differences among treatments for the ascorbic acid mg/100 g in papaya guava fruit bar at 0, 30 and 60 ,90 days of storage". The results of present investigation are in conformity with the findings of Kuchi et al. [23] in standardization of recipe for preparation of guava jelly bar.

3.6 pH

There were significant differences among treatments for pH in papaya guava fruit bar at 0, 30 and 60, 90 days of storage. Among the treatments highest pH of 4.68 was recorded in fruit bar with 60 percent guava pulp + 40 per cent papaya pulp (T_3), the lowest pH of 3.18 was recorded in fruit bar with 40 percent guava pulp + 60 percent papaya pulp (T_6) at 0 days of storage. At 30 days highest pH of 4.58 was recorded in fruit bar with 60 percent guava pulp + 40 percent papaya pulp (T_3), the lowest pH of 3.12 was recorded in fruit bar with 40 percent guava pulp + 60 percent papaya pulp (T_6) at 30days of storage. At 60 days highest pH of 4.48 was recorded in fruit bar with 60 percent guava pulp + 40 percent papaya pulp (T_3), the lowest pH of 3.08 was recorded in fruit bar with 40 percent guava pulp + 60 percent papaya pulp (T_6) at 60days of storage. At 90 days highest pH of 4.38 was recorded in fruit bar with 60 percent guava pulp + 40 percent papaya pulp (T_3), the lowest pH of 3.02 was recorded in fruit bar with 40 percent guava pulp + 60 percent papaya pulp(T_6) at 90 days of storage. Similar results of pH were reported in pineapple leather by Phimpharian et al. [24,25], mango leathers by Azeredo et al. [26], pawpaw and guava leathers by Babalola et al. [27] and Apple leathers by Natalia et al. [28]

3.7 Overall Acceptability

Overall acceptability score (out of 9 points) of guava and papaya based fruit bar influenced by various treatments during the storage period. It is seen from the Table 3 and figure that score for overall acceptability parameter had decreased with the increasing storage period. Overall acceptability score had decreased with the advancement of storage period [29,30]. At initial stage, significantly higher overall acceptability score was obtained in treatment T_3 (60:40 guava: papaya) i.e. 8.72, 8.62, 8.52, 8.34 on 0, 1, 2, 3 months respectively Whereas, significantly lower overall acceptability score was obtained in treatment T_1 (100:0 guava : papaya) i.e., 6.58, 6.47, 6.32, 6.24. Similar results have been reported with regard to overall acceptability by Sujatha and Sayantan [31] in fortified sapota-papaya fruit bar.similar results were found by Kannan et al.

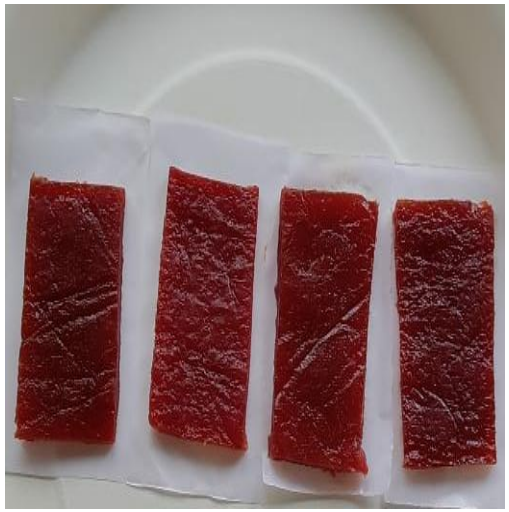

Fig. 1. Guava and papaya leather

Fig. 2. Display of different treatments

Table 1. Influence of different blending ratios of guava and papaya fruit leather on moisture content (%),acidity (%), total soluble solids (˚Brix) at different storage days

Treatments	Moisture content (%)				Acidity (%)				TSS(˚Brix)			
	Days after storage				Days after storage				Days after storage			
	0	30	60	90	0	30	60	90	0	30	60	90
T_1	16.82	16.64	16.46	16.18	1.06	1.11	1.13	1.15	71.66	71.86	72.30	72.76
T_2	15.89	15.67	15.45	15.21	0.70	0.75	0.76	0.83	75.81	76.22	76.61	76.98
T_3	15.57	15.56	15.32	15.14	0.62	0.66	0.67	0.75	76.55	76.88	77.25	77.66
T_4	15.69	15.47	15.25	15.01	0.92	0.92	0.95	0.97	75.41	75.86	76.46	76.93
T_5	15.00	14.99	14.97	14.95	0.88	0.93	0.96	0.98	75.28	75.64	75.97	76.37
T_6	14.59	14.38	14.12	13.89	0.91	0.94	0.99	1.02	74.36	74.65	75.18	75.66
T_7	14.46	14.25	14.02	13.87	0.82	0.77	0.82	0.86	73.58	73.95	74.33	74.72
Result	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed ±	0.034	0.023	0.020	0.056	0.016	0.021	0.018	0.022	0.538	0.514	0.527	0.559
CD@5%	0.073	0.049	0.043	0.040	0.035	0.045	0.040	0.047	1.166	1.113	1.142	1.211

Table 2. Influence of different blending ratios of guava and papaya fruit leather on ascorbic acid(mg /100g), total sugar (%),pH during storage

Treatments	Ascorbic acid (mg /100 g)				Total sugar (%)				PH			
	Days after storage				Days after storage				Days after storage			
	0	30	60	90	0	30	60	90	0	30	60	90
T_1	114.89	113.49	112.94	111.49	57.39	57.34	56.22	56.84	3.72	3.66	3.58	3.51
T_2	112.56	111.64	110.59	109.64	58.19	58.12	58.01	57.65	4.26	4.17	4.05	3.96
T_3	111.89	110.78	109.67	108.49	58.37	58.29	58.19	57.83	4.68	4.58	4.48	4.38
T_4	110.75	109.79	108.85	107.82	58.00	57.92	57.79	57.45	3.59	3.53	3.45	3.35
T_5	110.49	109.64	108.47	107.36	57.87	57.79	57.68	57.33	3.88	3.78	3.72	3.63
T_6	109.78	108.62	107.89	106.92	57.72	57.67	57.55	57.21	3.18	3.12	3.08	3.02
T_7	109.56	108.46	107.68	106.59	57.58	57.53	57.41	57.05	3.37	3.34	3.27	3.19
Result	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed ±	0.123	0.106	0.132	0.136	0.209	0.204	0.195	0.202	0.082	0.086	0.080	0.077
CD@5%	0.266	0.230	0.286	0.294	0.61	0.60	0.57	0.59	0.178	0.187	0.173	0.167

Table 3. Influence of different blending ratios of guava and papaya fruit leather on overall acceptability score at different days of storage.

Treatments	Overall Acceptability 0 Days after storage	Overall Acceptability 30 Days after storage	Overall Acceptability 0 Days after storage	Overall Acceptability 90 Days after storage
T_1	6.58	6.47	6.32	6.24
T_2	8.34	8.20	8.10	7.92
T_3	8.72	8.62	8.52	8.34
T_4	7.44	7.30	7.20	7.06
T_5	7.71	7.58	7.50	7.36
T_6	7.64	7.54	7.44	7.31
T_7	6.84	6.76	6.67	6.49
Result	S	S	S	S
S. Ed $\pm$	0.170	0.154	0.145	0.118
CD@5%	0.369	0.334	0.315	0.256

4. CONCLUSION

Based on the results of current experiment the Treatment (T_3) with maximum (60 percent guava pulp + 40 percent papaya pulp) (8.34) found to be best in terms of overall acceptability and in T1 100 Percent guava (6.24) minimum overall acceptability therefore, the fruit leather treatment (T_3) (60 percent guava pulp + 40 percent papaya pulp) found to be best treatment for guava papaya leather with highest organoleptic score for colour, taste, aroma and overall acceptability.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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