Original Research Article

STUDIES ON PREPARATION AND VALUE ADDITION ON GUAVA FRUIT BAR

ABSTRACT

The experiment was conducted at the Post Harvest Technology Lab, Department of Horticulture, SHUATS, Prayagraj (Uttar Pradesh) during the year 2021 - 2022. The experiment consisted of 10 different treatments and control comprising the Guava bar fortified with beetroot puree and different dry fruit powder like cashew, almond, pistachio with an aim to produce new value addition in guava fruit bar. The treatment consists of different blends of guava pulp and beetroot puree and different dry fruit powder were evaluated for physico-chemical and sensory characteristics and shelf life in ambient conditions and storage. The evaluation for other parameters, like moisture, total soluble solids, titratable acidity, pH and ascorbic acid were done up to 90 days at monthly intervals. The moisture, TSS and titratable acidity increased from storage period of 90 days, where as there is a slight decline in the parameters like pH, ascorbic acid, reducing sugar from 60 days to 90 days of storage. Fruit Bar was tested for the physico-chemical changes after preparation, and sensory evaluation was done based on the 9-point hedonic scale tested on a panel of 5 experts. This fruit bar was stored for about 90 days at ambient temperature. From storage studies, it was revealed that T_4 (84% guava pulp + 15% beetroot puree + 1% cashew powder) is most suitable in terms of their physicochemical properties and organoleptic test of bar. The effect of storage on Physico-chemical and organoleptic characteristics was also observed.

Keywords: - Guava, beetroot, fortified fruit bar

INTRODUCTION

Guava (Psidium guajava L.) is a commercial fruit crop that is widely consumed in India. It is fourth most important fruit in our country after banana, mango, and citrus It is widely grown in the states of Uttar Pradesh, Madhya Pradesh, Bihar and Maharashtra. It is a good source of ascorbic acid, pectin, sugars and certain minerals **(Adrees *et al*., 2010).**

The total area under guava in India is 2.03 lac ha with the production of 4.43 million metric tonnes (NHB database ,2020-21).

Guava is not only a wholesome fruit but also provides lot of vitamins and minerals. Guava's high vitamin C content (ascorbic acid) makes it a powerhouse in the fight against free radicals and oxidation, which are major enemies of many degenerative diseases. **(Kadam *et al*., 2012).**

Guava has a high commercial potential due to its ease of cultivation, high nutritional value, and popularity of processed Guava products. While ripe fruit is usually eaten as a dessert, processed products like juices, nectar, jam, jellies, baby foods, puree, beverage base, syrup and wine are also prepared from guava **(Shankar *et al.*, 2006)**

Among major processing techniques employed on industrial scale to preserve fruits such as canning, freezing, etc., dehydration of perishable fruits is best suited for developing countries, which have poor infrastructure for storage at low temperatures and processing. Dehydrated fruits processing is gaining importance now a days due to long shelf life. Therefore, preparation of fruit bar with different dry powder is beneficial.

Fruit leathers or bars are dehydrated fruit-based products. The destruction of original fruit structure through pureeing and restructuring in dehydrated sugar-acid-pectin gels known as "fruit leathers" results in attractive, coloured products, on which research is currently being expanded. Fruit leathers also allow for the preservation of overripe fruits. **(Natalia *et al.*, 2011).**

The guava fruit contains negligible vitamin B content. So, beetroots (vegetable)with high vitamin B9 content are selected to blend with and fortify guava fruit bar. Beetroots are rich in fibre, folate (vitamin B9), manganese, potassium, iron, and vitamin C. So, beetroot puree is used for enhancing the vit-B content of guava fruit bar. Future addition of beetroot not only enriches vitamin B, but also gives better colour to the fruit bar or leather.

MATERIAL AND METHODS

The experiment was conducted at the Post Harvest Technology Lab, Department of Horticulture, SHUATS, Prayagraj (Uttar Pradesh) during the year 2021 - 2022.

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 was conducted in Completely Randomized Design (CRD) with 10 treatments and replicated thrice. The bar was tested for the physico-chemical changes after preparation and during storage at ambient conditions. pH of the product was determined using digital pH meter, TSS using hand refractometer, titrable acidity using titrimetric method, moisture content by weighing the sample before and after drying and determining the difference whereas ascorbic acid was determined by titrating the product against 2, 6-dichlorophenol indophenol indicator (A.O.A.C, 1990). Sugars were estimated by Lane and Eynon‟s method (1923) in terms of sugar.The product was evaluated for colour, flavour, texture and overall acceptability. The characters with mean scores of 5 or more out of 9 marks were considered acceptable.

Flow chart for preparation of guava fruit bar

Guava and beetroot
↓
Washing
↓
Peeling and pulp
↓
Mixing of pulp
↓
Heating
↓
Addition of sugar
↓
Addition of citric acid
↓
Spread down stainless steel with Glycerine
↓
Drying
↓
Cooling in dried sheet
↓
Cutting and packing

List 1: TREATMENT TABLES

SL No.	Treatments	Treatment Combination
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**

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.

Physico-chemical and organoleptic quality of 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 content in the fruit bars creates favourable conditions for the growth of undesirable microorganisms & food hazards of various preserved foods **(Fontana, 2000).** 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 (2005) and **Irwandi *et al*. (1998).**

TSS (º Brix)

The best T.S.S. (79.56^0Brix) found in T_4 (84% guava pulp+ 15% beetroot puree+ 1 % cashew) followed by (79.23°Brix) found with T_5 (84% guava pulp+ 15% beetroot puree+ 1 % almond) and least T.S.S. was found with T_0 control (100 % guava pulp) (74.56^0Brix). 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.

Titrable acidity (%)

The best titrable acidity (0.91%) found in T4 (84% guava pulp + 15% beetroot puree + 1 % cashew) followed by (0.90%) found with T_5 (84% guava pulp + 15% beetroot puree+ 1 % almond) and least titrable acidity was found with 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.

pH

The best pH (3.98) found in T_4 (84% guava pulp + 15% beetroot puree + 1 % cashew) followed by (3.94) found with T_6 (84%pulp + 15% beetroot puree+ 1 % pistachio) and least pH was found with 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).**

Total sugars

The best total sugar (67.48%) found in T_4 (84% guava pulp + 15% beetroot puree+ 1% cashew) followed by (66.69%) found with T_5 (84% guava pulp + 15% beetroot puree + 1 % almond) and least total sugar was found with 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.

Ascorbic acid (mg/ 100 g)

The best ascorbic acid (225.51 mg/100 g) found in T_0 (100% guava pulp) followed by (225.03mg/100g) found with T_2 (94% guava pulp+ 5% beetroot puree+ 1% almond) and least ascorbic acid was found with T_7 (74 % guava pulp + 25 % beetroot puree + 1% cashew). Similar results have been reported by of **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**.**

Organoleptic evaluation

In the organoleptic evaluation such as color and appearance, taste, aroma, and overall acceptability. Sensory scores for treatment T_4 (84% Guava pulp + 15% beetroot pulp + 1% cashew) were found to be highest in all parameters of organoleptic attributes. The highest overall acceptability score (8.) indicated that it was well-received by the judges.

Table 1. Effect of different treatments of guava fruit bar on moisture content and total sugars (%).

Treatments	MOISTURE CONTENT				TSS			
	Storage period (days)				Storage period (days)			
	0	30	60	90	0	30	60	90 120
T_0	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

Table 2. Effect of different treatments of guava fruit bar on titrable acidity and pH.

Treatments	TITRABLE ACIDITY				pH			
	Storage period (days)				Storage period (days)			
	0	30	60	90	0	30	60	90
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 2. Effect of different treatments of guava fruit bar on total sugar and ascorbic acid.

Treatments	TOTAL SUGAR				ASCORBIC ACID			
	Storage period (days)				Storage period (days)			
	0	**30**	**60**	**90**	**0**	**30**	**60**	**90**
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
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%	1.789	1.832	1.845	1.925	4.789	4.832	4.845	4.925

Fig 1. guava fruit bar

CONCLUSION

Based on the findings of the present experiment it is concluded that treatment T_4 (84% guava pulp + 15% Carrot puree + 1% cashew) was found to be the best in respect of moisture (14.89 %), T. S.S.(79.56°Brix), titrable acidity (0. 91%), pH (3. 98), total sugar (67.48 %), ascorbic acid (53.57mg /100 g), and also based on the sensory evaluation scores as well as highest cost benefit returns (2.50).

REFERENCES

Adree, M., M. Younis, U. Farooq and K. Hussain (2010). Nutritional quality evaluation of different guava varieties. Pak. J. Agri. Sci., 47(1): 1-4.

Kadam, D.M, Prathibha, K and Ramesh Kumar. 2012. Evaluatio of guava products quality.

Int. J. Food Sci. Nutrition Engi., 2(1): 7-11.

Natalia, A., Q. Ruiz, S.M. Demarchi and S. A. Giner. 2011. Research on dehydrated fruit leathers: A Review. Journal of Food Sci. Technol., 41(6): 684-686.

Shankar S, Dilip J, Narayana RY (2006). Fermentation of guava pulp with grape grown yeast (S.cerevisae var. ellipsoideus) for wine production. Indian J. Hort., 60: 171-173.

Natalia, A, Q; Ruiz, M; Silvana, J; Demarchi, F, Massolo, M, L, Rodoni, A. s. and Giner. (2012). Evaluation of quality during storage of apple leather. *Food Science and Technology*. **47***: 485-492*

Phimpharian, C; Jangchud, A; Jangchud, K; Therdthai, N; Prinyawiwatkul, W and No, H.K. (2011). Physico-chemical characteristics and sensory optimisation of a pineapple leather snack as affected by glucose syrup and pectin concentrations. *International Journal of Food Science and Technology.****46****(5): 972-981.*

Sagar, V.R and Suresh Kumar, P. (2007)**.** Processing of guava in the form of dehydrated slices and leather. *Acta Horticulture.735, ISHS.579-589.*

Pushpa,G; Rajkumar, P; Gariepy, Y and Raghavan, G.S.V. (2006)**.** Microwave Drying of Enriched Mango Fruit Leather. *The Canadian Society for Engineering in Agricultural, Food ' Environmental, and biological systems.206: 208*

Shaheen, B; Nadeem, M; Kauser, T; Mueen-ud-Din, G and Mahmood, S. (2013). Preparation and Nutritional Evaluation of Date Based Fibre Enriched Fruit Bars. *Pakistan Journal of Nutrition,***12** *(12):1061*.

Sharma, R. (2011). Nutritional quality evaluation and value addition of Dheu (*Artocarpuslakoocha*) and Karonda (*Carissa carandas*) fruits. M.Sc. Thesis. CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur.

Sujatha, Y and Sayantan, B. (2014). Optimization of ingredients in papaya fruit bar. *International Quarterly Journal of Biology & Life sciences* **2***(1) ·377-380.*