Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(3): 1278-1281
Received: 14-03-2020
Accepted: 18-04-2020

Sandeep Kumar
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Rakesh Gehlot
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Rekha
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Ritu Sindhu
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Tanu Malik
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Sandeep Kumar
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Changes in chemical constituents and overall acceptability of guava-papaya jam during storage

Sandeep Kumar, Rakesh Gehlot, Rekha, Ritu Sindhu and Tanu Malik

DOI: https://doi.org/10.22271/phyto.2020.v9.i3u.11484

Abstract
Jam prepared from guava-papaya blends was analyzed for changes in chemical constituents and overall acceptability at monthly interval for three months storage period. Total sugars, reducing sugars and browning increased, while ascorbic acid, total carotenoids and total phenols decreased significantly in jam during storage. Jam prepared with 40 guava:60 papaya pulp ratio was most acceptable. The overall acceptability of jam decreased significantly during three months storage.

Keywords: Guava, papaya, blends, jam, chemical constituents, overall acceptability, storage

Introduction
Fruits and vegetables are important constituents of our diet and provide significant quantity of nutrients especially, vitamins, minerals, fibre and sugars. Daily consumption of fruits and vegetables reduces the risk of cancer, heart disease, premature aging, stress and fatigue, primarily due to integrated action of oxygen radical scavengers such as β-carotene and ascorbic acid.

Guavas (*Psidium guajava* L.) are popularly known as “poor man’s apple” and are rich in dietary fibre and vitamin C (150 to 250 mg/100 g), with moderate levels of folic acid.

Ginat *et al.* (2013) [6] reported that fresh guava juice contains TSS (8.70°Bx), reducing sugars (2.68%), non-reducing sugar (4.78%), total sugars (7.84%), pH (4.21) and titratable acidity (0.44%) The fruit contains carbohydrates (14.5%), protein (1.5%), fat (0.2%), vitamin B_1 (30 mg/100 g), vitamin B_2 (30 mg/100 g), iron (1.00%), phosphorus (0.04%) and calcium (0.01%). Having a generally broad, low calorie profile of essential nutrients, a single fruit contains about four times more the amount of vitamin C than in orange. It also possesses anticancer properties.

Papaya (*Carica papaya* L.) belongs to family Caricaceae. It is a common man’s fruit due to its reasonable price and high nutritive value. It is also regarded as “the wonder fruit of the tropics and subtropics”. It is an excellent source of vitamin A (2020 IU/100 g) and also a rich source of other vitamins (Addai *et al.*, 2013) [1]. It has anti-inflammatory, anti-tumour, anti-fungal, anti-bacterial and wound healing medicinal properties (Aravind *et al*., 2013) [3].

Traditionally, papaya fruit has been used in preparation of salads, juice, ready-to-serve drink, nectar, squash, sherbets, jam and confections like tutti-frutti and candy slices. However, consumers’ trend towards papaya products emphasizes the need of its value enhancement with fortification of novel ingredients and promote it as a high valued product.

Blending of papaya pulp with guava pulp can supplement its blended products with vitamins (especially vitamin A), minerals, besides improving its colour and appearance, taste, flavour and overall acceptability. Keeping the above facts in view, the present research work was planned to standardize appropriate combination of guava-papaya blends for preparation of jam and to evaluate the storage quality of the blended product.

Materials and Methods
The present investigation was carried out in Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar during 2018-19. Ripe guava fruits cv. Hisar Safeda were procured from Experimental Orchard of Deptt. of Horticulture, CCSHAU, Hisar and ripe papaya fruits were procured from local market, Hisar for collecting pulp for making jam from guava-papaya blends (Fig. 1 and 2).

Ripe guava fruits
↓
Washing
↓
Cutting thin slices
↓
Mixing 40% water
↓
Heating at 90°C
↓
Grinding
↓
Sieving
↓
Mixing sodium benzoate (1 g/kg pulp)
↓
Packing in polypropylene jars
↓
Storing in deep freezer

Fig 1: Flow sheet for collection of pulp from guava fruits

Papaya fruit
↓
Washing in clean running water
↓
Peeling off and cutting in halves
↓
Slicing
(removing seeds and white portion)
↓
Blending slices in a mixer
↓
Mixing sodium benzoate (1 g/kg pulp)
↓
Packing in polypropylene jars
↓
Storing in deep freezer

Fig 2: Flow sheet for collection of pulp from papaya fruits

Guava-Papaya jam was prepared from guava-papaya blends (100:0, 80:20, 60:40, 40:60, 20:80 and 0:100) as per standard procedure (Fig. 3). One kg blended pulp, 650 to 700 g sugar, 4.0 to 5.0 g citric acid and 1.0 to 2.0 g pectin were used for preparation of guava-papaya jam. The mixture of pulp, sugar and citric acid was cooked with a ladle with constant stirring to obtain desired consistency. Pectin dissolved in lukewarm water was then mixed with the cooking mass. The end point was judged by sheet test and total soluble solids (68%) were measured using hand refractometer (58-92%). The product was packed in 150 g capacity sterilized glass bottles and stored at room temperature for analyzing its sensory quality. Based on sensory evaluation of all the blended products, guava-papaya jam (100:0, 40:60, 0:100) were selected for further analysis for changes in chemical constituents and overall acceptability at monthly interval during three months storage period.

Guava-Papaya blends
↓
Mixing sugar
↓
Cooking with occasional stirring
↓
Mixing citric acid
↓
Cooking until 60% TSS
↓
Mixing pectin dissolved in lukewarm water
↓
Cooking until end point (68% TSS)
↓
Filling hot in glass bottles
(150 g capacity)
↓
Sealing with cap
↓
Cooling in air
↓
Labeling
↓
Storing at room temperature (at 21-35°C)

Fig 3: Flow sheet for preparation of guava-papaya jam

Total sugars and reducing sugars were estimated by the method of Hulme & Narain (1931) [7]. Ascorbic acid was determined by method of Ranganna (2014) [11]. Total carotenoids were analyzed by Rodriguez-Amaya method (1999) [12]. Total phenols were analysed by Amorim *et al.* (1997) [2] and browning was estimated by method of Ranganna (2014) [11]. The overall acceptability of guava-papaya jam was based on mean scores obtained for all the sensory characters *i.e.*, colour and appearance, flavour, taste and mouthfeel. The characters with mean scores of 6 and above out of 9 were considered acceptable (Ranganna, 2014) [11]. The treatments were replicated thrice and the data were analyzed statistically using completely randomized design. The critical difference value at 5 per cent level was used for making comparison among different treatments during storage.

Results and Discussion

There was a gradual and significant increase in total and reducing sugars of guava-papaya jam with the advancement in storage period. The increase in level of sugars might be attributed to hydrolysis of polysaccharides into sugars and inversion of sugars. The results are in conformity with those of Brandao *et al.* (2018) [5] in mixed cerrado fruit jam and

Rahman *et al*. (2018) [10] in guava jam. The ascorbic acid content decreased significantly in guava-papaya jam during storage. It was probably due to the fact that ascorbic acid was sensitive to oxygen, light, enzymatic and non-enzymatic catalyst heat. The differences in chemical composition of raw materials in the recipes might be responsible for these changes. These findings are in conformity with those of Singh *et al.* (2014) in whey guava beverage and Rahman *et al*. (2018) [10] in guava jam.

A significant decrease in total carotenoids of guava-papaya jam was observed during storage. This might be due to auto-oxidation of β-carotene leading to loss of total carotenoids and also due to its highly unsaturated chemical structure, which made the constituent very susceptible to thermal degradation and oxidation. The results are in accordance with those of Arshad *et al*. (2018) [4] in protein fortified jackfruit jam.

There was also significant decrease in total phenols of guava-papaya jam during storage. Total phenols are easily volatile and oxidized, hence, its content decreased in the samples regardless of exposure to light or darkness. Moreover, cell structure disrupted during processing and the materials became more prone to non-enzymatic oxidation, which could be one of the major causes for loss in total phenols of the products. Similar decrease in total phenols was also reported by Lafarga *et al*. (2018) [8] in blueberry jam.

There was significant increase in browning of guava-papaya jam during storage. This was due to condensation of tannins into brown pigments and inversion of non-reducing to reducing sugars, which participated in the Maillard browning. This might also be due to action of acidity, which enhanced hydrolytic reaction causing browning. Polyphenolic compounds present in fruit pulp also reacts with the enzymes to get discolouration. Similar increase in browning was also reported by Paravisini *et al*. (2018) [9] in apple juice.

Jam prepared with 40 guava:60 papaya pulp ratio was most acceptable and the overall acceptability of guava-papaya jam decreased significantly during three months storage period. Similar results were reported by Ullah *et al.* (2018) [13] in carrot and apple blended jam.

Table 1: Changes in chemical constituents and overall acceptability of guava-papaya jam during storage

Treatments* (G:P)	Storage period (months)	Total sugars (%)	Reducing sugars (%)	Ascorbic acid (mg/100 g)	Total carotenoids (mg/100 g)	Total phenols (mg/100 g)	Browning (440nm)	Overall acceptability (9 point hedonic scale)
100:0	0	47.14	20.86	102.67	0.62	86.24	0.28	7.68
	1	47.96	21.73	92.38	0.60	84.32	0.30	7.39
	2	48.63	22.80	84.24	0.57	81.08	0.34	7.26
	3	49.38	23.54	76.36	0.52	78.36	0.39	7.10
60:40	0	49.74	22.68	66.24	1.68	67.16	0.17	8.56
	1	50.45	23.34	54.18	1.63	65.38	0.19	8.40
	2	51.32	24.02	47.48	1.55	63.24	0.22	8.25
	3	52.08	24.86	41.04	1.49	60.78	0.26	8.04
0:100	0	51.13	23.32	37.26	2.92	54.78	0.10	8.50
	1	51.89	24.38	31.42	2.86	52.26	0.12	8.33
	2	52.74	25.29	24.73	2.77	50.12	0.15	8.16
	3	53.58	26.02	19.81	2.69	47.35	0.18	8.00
CD at 5%	Treatment	0.01	0.04	0.03	0.01	0.02	0.01	0.01
	Storage	0.01	0.05	0.03	0.01	0.02	0.01	0.01
Treatment x Storage		0.02	0.09	0.06	0.01	0.04	0.01	NS

*Recipe- One kg blended pulp, 650 to 700 g sugar, 4.0 to 5.0 g citric acid and 1.0 to 2.0 g pectin
G:P- Guava:Papaya, NS-Non-significant

References

1. Addai ZR, Abdullah A, Mutalib SA, Musa KH, Eqbal MA. Antioxidant activity and physicochemical properties of mature papaya fruit (*Carica papaya* L. cv. Eksotika). Advance Journal of Food Science and Technology. 2013; 5(7):859-865.
2. Amorim HV, Dougall DK, Sharp WR. The effect of carbohydrate and nitrogen concentrations of phenol synthesis in plant scarlet rose cells grown in tissue culture. Physiologia Plantarum. 1977; 39:91-95.
3. Aravind G, Debjit B, Duraivel S, Harish G. Traditional and medicinal use of *Carica papaya* L. Journal of Medicinal Plant Studies. 2013; 1(1):7-15.
4. Arshad M, Vasudeva KR, Krishna HC, Shankarappa TH, Halesh GK. Effect of Storage Conditions on the Nutritional Quality of Protein Fortified Jackfruit Jam. International Journal of Current Microbiology and Applied Sciences. 2018; 7(4):1018-1024.
5. Brandão TM, do Carmo EL, Elias HES, de Carvalho EEN, Borges SV, Martins GAS. Physico-chemical and Microbiological Quality of Dietetic Functional Mixed Cerrado Fruit Jam during Storage. The Scientific World Journal, 2018.
6. Ginat ES, Alghamdi E. Influence of Drying Methods on Physicochemical Constituents of Guava Juice. Journal of American Science, 2013, 9(11).
7. Hulme AC, Narain R. The ferricyanide method for determination of reducing sugars. A modification of Hagedom-Jensen-Hanes technique. Biochemical Journal. 1931; 25:1051-1061.
8. Lafarga T, Aguiló-Aguayo I, Bobo G, Chung AV, Tiwari BK. Effect of storage on total phenolics, antioxidant capacity, and physicochemical properties of blueberry (*Vaccinium corymbosum* L.) jam. Journal of Food Processing and Preservation. 2018; 42(7):e13666.
9. Paravisini L, Peterson DG. Role of Reactive Carbonyl Species in non-enzymatic browning of apple juice during storage. Food chemistry. 2018; 245:1010-1017.
10. Rahman TU, Amanullah NT, Tahir A, Rahman AU, Khan A. Evaluation and preparation of guava jam stored at ambient temperature. Pure and Applied Biology. 2018; 7(3):1064-1073.
11. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products (2nded.). Tata McGraw Hills Publishing Co. Ltd., New Delhi, 2014.

12. Rodriguez-Amaya DB. A Guide to Carotenoids Analysis in Foods. ILSI Press, Washington, 1999, 63.
13. Ullah N, Ullah S, Khan A, Ullah I, Badshah S. Preparation and Evaluation of Carrot and Apple Blended Jam. Journal of Food Processing Technology. 2018; 9(725):2.