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Studies on Sensory Quality and Microbial Count of Papaya Guava Fruit Bar

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ABSTRACT

Among the different blending ratios of papaya cv. Red Lady and guava cv. Lalit (100:0, 80:20, 60:40, 50:50, 40:60) in preparation of fruit bar, 50% papaya pulp and 50 guava pulp (L) treatment (T_4) recorded as best blending ratio as the treatment recorded maximum sensory score viz., colour (8.85), texture (8.65), flavour (8.60), taste (8.60) and overall acceptability (8.67). The fruit bar prepared with different blended ratios of papaya and guava pulp was highly stable and safe from consumption point of view

Key words: *Blending ratio, Papaya, Guava, Fruit Bar, Sensory Score.*

INTRODUCTION

Papaya (*Carica papaya* L.) and Guava (*Psidium guajava* L.) are important tropical fruits and claim superiority over other fruits by virtue of their commercial and nutritional values. Papaya (*Carica papaya* L.) is regarded as the wonder fruit of the tropics and subtropics. It was originated in Mexico as a result of cross between the two species of the genus Carica. It is the fifth most important crop in India after mango, banana, citrus and guava.

The fruit is an excellent source of vitamin A (2020 IU/100g) and also rich source of other vitamins like thiamine, riboflavin, nicotinic acid Jain *et al* [4]., India is the largest producer of papaya in the world with an annual production of about 5508 lakh tones from an area of about 126 lakh hectare NHB[9] .In Andhra Pradesh, papaya was cultivated in an area of 18.40 lakh hectares with annual production of about 1471.68 tones NHB[9].

Guava, the poor man's apple, is one of the most common fruits grown widely in tropical and subtropical regions of the world. It was originated in tropical America, stretching from Mexico to Peru and gradually became a crop of commercial significance in several countries because of its hardy nature, prolific bearing, high vitamin C content, minerals and high remuneration with less maintenance.

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The high vitamin C content of guava makes it a power house in combating free radicals and oxidation which are key enemies that cause many degenerative diseases Kadam *et al*[5].,

In recent years, guava cultivation has become popular due to increasing international trade, nutritional value and value added products. Guava has well-established markets in more than 60 countries. The largest producers are India, Mexico, Brazil, Cuba, Venezuela, USA, Australia, New Zealand, China, Thailand Negi and Shailendra[8]

In India, guava has become an important fruit crop contributing to 4 per cent of total fruit production and ranks fourth in production after mango, banana and citrus with an estimated production of 4083 lakh tones from 251 lakh hectares NHB[9].

The fresh papaya and guava fruits have limited shelf life. Therefore, it is necessary to utilize this fruit for making different products to increase its availability over an extended period and to stabilize the price during glut season. Unfortunately papaya fruit has not caught the fancy of the consumers as much as it deserves, mainly because of its odour which is not appealing and thus limits its commercial exploitation at processing levels. However, papaya fruit has blood red pulp, good taste and low acid content hence; it can be used for blending with other fruits and also for preparation of nutritional enriched food products Attri *et al*[1]., Whereas guava emits a sweet aroma which is pleasant, refreshing and acidic in flavour and besides being rich source of pectin, its pulp shows compatibility and suitability for blending and making mixed fruit products *viz*., jam, jelly, candy, leather etc. However, blending of these two fruits could be an economic preposition to utilize them profitably Jain *et al*[4].

MATERIALS AND METHODS

The present investigation was carried out at College of Horticulture, Anantharajupeta, during the year 2015-16. The details of the materials used and methods adopted during the investigation were elucidated in this chapter under following headings.

Procurement of raw materials

Major area of papaya cultivation in Kadapa district is under Red Lady variety. It is early, vigorous and high-yielding papaya variety with excellent fruit quality. Fruits are short, oblong shaped with red flesh, aromatic and very sweet. Lalit is a very popular commercial variety of guava. Fruits are medium, round, smooth with skin colour yellow on ripening, white pulped, with few medium soft seeds and have good keeping quality. Fully matured ripened guava and papaya fruits were obtained from farmer field in and around Anantharajupeta.

Preparation of papaya and guava pulp

Red Lady and Lalit were used for extraction of pulp for fruit bar preparation of papaya and guava. These fruits were washed in clean tap water. Then, they were cut into pieces. By using pulp extractor papaya and guava pulp was extracted. Guava seeds were separated from pulp by sieve installed in the pulp extractor. The pulp recovery is more in papaya fruit (78.0%) when compared to guava fruit (54.5%). The papaya guava fruit bar was prepared by mixing the pulp (1kg) in different proportions as per the treatment with 250g sugar. The mixture was heated with continuous stirring till it reached to 50^0 Brix. The boiled mass was slightly cooled and 500 ppm of KMS was added.

Drying

The concentrated pulp mixture was spread on trays (smeared with ghee) up to 0.5 cm thickness and dried in cabinet drier at 60^0C. After five hours of drying, second layer of 0.5 cm thickness was spread over the first layer and continued for eight hours. The product was dried before packing.

Cutting, filling and packing

Dried sheets of each blend were cooled and cut into rectangular pieces of 3 × 0.5 cm size. The cut pieces were packed individually in butter paper and labeled with details of treatments and replications and stored at temperature 25.35° C. The fruit pulp from these varieties was blended at different proportions as per the treatments. Papaya guava fruit bar was prepared according to the methodology given

by Attri *et al*[1]., with slight modification. Then processed pulp mixture was loaded in aluminium trays and kept in cabinet dryer for drying The treatment combinations are given in table 1.

Table 1: Treatment details

Treatments	Red lady papaya pulp (%)	Lalit guava pulp (%)
T_1 (control)	100	-
T_2	80	20
T_3	60	40
T_4	50	50
T_5	40	60

Physico-chemical analysis

Organoleptic evaluation of papaya guava fruit bar was carried out at zero, 30 and 60 days after storage. Two samples per treatment were subjected to physic-chemical analysis. Microbial count in the fruit bar was measured based on the procedure described by Harrigan and Mccane[3].

Sensory evaluation during storage.

The papaya guava bar prepared from fresh fruits and which is stored over a period of 60 days were subjected to organoleptic evaluation by a panel of six judges following hedonic rating tests as described by Ranganna[12]. The product was evaluated for color, flavour, texture and overall acceptability. The characters with mean scores of 5 or more out of 9 marks were considered acceptable. The score given by them was averaged.

The scoring for all the sensory characters was done as shown in Table 2.

Category	Sensory score
Like extremely	9
Like very much	8
Like moderately	7
Like slightly	6
Neither like nor dislike	5
Dislike slightly	4
Dislike moderately	3
Dislike very much	2
Dislike extremely	1

Statistical analysis

The data for various physico-chemical attributes and sensory evaluation were analyzed by using Completely Randomized Design (CRD). The data was statistically analyzed according to Panse and Sukhatme[10].

Colour and appearance

The parameter concerning changes in colour and appearance of papaya guava (L) fruit bar was measured on 9-point hedonic scale influenced by various treatments during the storage. The colour and appearance of blended papaya- guava (L) fruit bar revealed that there were significant differences among treatments at zero, 30 and 60 days of storage on the basis of rating score shown in Table 3. The score for colour and appearance of fruit bar ranged from 7.96 (T_5 & T_3) to 8.85 (T_4) at different days of storage and were in acceptable range.

The colour and appearance scores recorded were 8.85, 8.70 and 8.49 in T_4 (50 per cent papaya pulp + 50 per cent guava pulp (L)), T_1 (100 per cent papaya pulp) and T_2 (80 per cent papaya pulp + 20 per cent guava pulp (L)), blended fruit bar respectively at zero days of storage and they are on par with each other. The lowest score for colour and appearance (8.25) was recorded in fruit bar made by 40 per cent papaya pulp + 60 per cent guava pulp (L) (T_5) at zero days of storage.

At 30 days of storage, highest score 8.75 for colour and appearance was recorded in fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4) which was on par with (T_1) 100 per cent papaya pulp (8.60) followed by treatment (T_2) 80 per cent papaya pulp + 20 per cent guava pulp (L) (8.32). In contrast, lowest score for colour and appearance of 8.15 was recorded in fruit bar with 40 per cent papaya pulp + 60 per cent guava pulp (L) (T_5) at 30 days of storage. The best score for colour (8.85) was observed in fruit bar with treatment (T_4) 50 per cent papaya pulp + 50 per cent guava pulp (L) might be to combine effect of both carotenoids and lycopene pigments Vishwasrao and Ananthanarayan[14].

The gradual decline in appeal for colour score of papaya-guava (L) fruit bar might be due to change in colour attributed to maillard, enzymatic browning and polymerization of anthocyanins with other phenolics Garcia *et al* [2]., The result of decline in colour score was also in conformity with report on guava leather by Safdar *et al*[13].

Texture

There was no significant difference among treatments for texture score in fruit bar at zero, 30 days and 60 days of storage The score for texture in fruit bar ranged from 8.05 (T_1) to 8.65 (T_4), which was in acceptable range shown in Table 3.

At zero day of storage, highest score 8.65 for texture was observed in fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4) followed by the treatment (T_5) 40 per cent papaya pulp + 60 per cent guava pulp (L) (8.50). In contrast lowest score for texture 8.25 was observed in fruit bar with 100 per cent papaya pulp (T_1) at zero days of storage. The score for texture was recorded were maximum (8.55) at 30 days of storage in fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4), whereas minimum (8.10) in fruit bar with 100 per cent papaya pulp (T_1). Similar trend was observed at 60 days of storage regarding texture score in blended fruit bar.

The maximum texture score of 8.45 was recorded in T_4 (50% papaya pulp + 50% guava pulp (L)) followed by T_5 (40% papaya pulp + 60% guava pulp (L)) (8.20) and T_3 (60 per cent papaya pulp + 40 per cent guava pulp (L) (8.06). The lowest texture score 8.05 was observed in fruit bar with 100 per cent papaya pulp (T_1) at 60 days of storage. There was a gradual decrease in the texture score of papaya guava fruit bar with the progress of storage period. The decrease in texture score during storage might be due to absorption of moisture in fruit bar Parekh *et al*[11].The result of decline in texture score was also in conformity with report on papaya toffee and papaya leather by Attri *et al*[1].

Flavour

The sensory quality for flavour score of papaya guava (L) fruit bar measured on 9-point hedonic scale. There were no significant differences among treatments for flavour in fruit bar at zero, 30 and 60 days of storage shown in Table 3. The score for flavour ranged from 8.03 (T_1) to 8.60 (T_4).

The rating value of flavour score were recorded as 8.60, 8.45, 8.36 and 8.32 in T_4 (50 per cent papaya pulp + 50 per cent guava pulp (L)), T_3 (60 per cent papaya pulp + 40 per cent guava pulp (L)), T_2 (80 per cent papaya pulp + 20 per cent guava pulp (L)) and T_5 (40 per cent papaya pulp + 60 per cent guava pulp (L)) blended fruit bar respectively at zero day of storage. Lowest rating for flavour score (8.24) was recorded in T_1 (100 per cent papaya pulp) at zero days of storage. The score for flavour was recorded were maximum (8.55) at 30 days of storage in fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4), whereas minimum (8.14) in fruit bar with 100 per cent papaya pulp (T_1).

Score rating received for flavour of blended fruit bar was 8.50, 8.12, 8.09, 8.05 and 8.03 in T_4 (50% papaya pulp + 50 % guava pulp (L)), T_5 (40% papaya pulp + 60% guava pulp (L), T_2 (80% papaya pulp + 20 % guava pulp (L)), T_3 (60% papaya pulp + 40 per cent guava pulp (L)) and T_1 (100 per cent papaya pulp) respectively at 60 days of storage. The score for flavour showed a declining trend on storage of papaya-guava (L) fruit bar. The decline in flavour score might be attributed to the loss of aromatic compounds

during storage period Kaushal *et al* [6]. The decline in flavour score was also in conformity with report on papaya leather by Attri *et al*[1].

Taste

There was no significant difference among treatments for taste score in fruit bar at zero, 30 and 60 days of storage. The taste score for fruit bar ranged from 7.95 (T_5) to 8.60 (T_4). At zero day of storage, the maximum score of 8.60 for taste was observed in fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4) followed by the treatment (T_2) 80 per cent papaya pulp + 20 per cent guava pulp (L) (8.50). In contrast, the minimum score 8.30 for taste was observed in fruit bar with 60 per cent papaya pulp + 40 per cent guava pulp (L) (T_3) at zero days of storage shown in Table 4. The taste scores recorded were 8.45, 8.06 and 8.05 in T_4 (50 per cent papaya pulp + 50 per cent guava pulp (L)), T_2 (80 per cent papaya pulp + 20 per cent guava pulp (L)) and T_1 (100 per cent papaya pulp), blended fruit bar respectively at 60 days of storage. The lowest score for taste (7.95) was recorded in fruit bar made by 40 per cent papaya pulp + 60 per cent guava pulp (L) (T_5) at 60 days of storage.

The taste score of papaya guava fruit bar showed decreasing trend during storage period. The decline in taste score of papaya guava fruit bar might be due to fluctuations in acids, pH and sugar acid ratio Safdar *et al*[13]. The result of decline in taste score was also in conformity with report on fortified mango bar by Parekh *et al*[11].,

Overall acceptability

The parameter concerning changes in overall acceptability score of papaya guava fruit bar influenced by various treatments during the storage are furnished under Table 4. Significant difference among treatments was observed at 60 days of storage. At zero and 30 days of storage the highest score for overall acceptability 8.67 and 8.58 were recorded in fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4). The least score for overall acceptability 8.32 and 8.17 was recorded in fruit bar with 60 per cent papaya pulp + 40 per cent guava pulp (L) (T_3) at zero and 30 days of storage respectively.

At 60 days of storage, significantly highest overall acceptability score of 8.50 was recorded in fruit bar blended with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4) followed by T_2 (80 per cent papaya pulp + 20 per cent guava pulp (L)) (8.11). The least score for overall acceptability of 8.01 was recorded in fruit bar with 60 per cent papaya pulp + 40 per cent guava pulp (L) (T_3). There was a gradual decrease in overall acceptability score with the advancement of storage period. Among all the treatments overall acceptability score of papaya guava fruit bar with 50 per cent papaya pulp + 50 per cent guava pulp (L) (T_4) was recorded as best blending ratio. The gradual decrease in overall acceptability score during storage might be due to change in composition of the product and loss of colour and flavour Parekh *et al* [11]. The result of decline in overall acceptability score during storage was also in conformity with report on papaya toffee and leather by Attri *et al*[1]., and guava jelly bar by Kuchi *et al*[7] .

Microbial count (cfu/g)

Data related to microbial analysis of fruit bar blended with different ratios of papaya and guava pulp at different stages of storage are presented in Table 4. It was evident from the data on yeast and mould count of different treatments and control at zero days of storage was 100 per cent negative (free from microbes).

The fruit bar prepared with 100 per cent papaya pulp (T_1) recorded maximum yeast and mould growth at 30 (0.4×10^2) and 60 days (0.6×10^2) of storage, when compared to other treatments. However, the acceptable amount of microbes (yeast and mould) was observed at the end of 30 and 60 days of storage, which were negligible in number and safe to consume according to World Health Organization WHO[15]. As per WHO [15] guidelines, the total microbial count should be less than 1×10^4 cfu/g. Therefore, the fruit bar prepared with different blended ratios of papaya and guava pulp was highly stable and safe from consumption point of view.

Table 3: Influence of different blending ratios of papaya guava fruit bar on colour and appearance, Texture and Flavour score at different days of storage

Treatments	Colour and appearance score			Texture score			Flavour score		
	Days after storage			Days after storage			Days after storage		
	0	30	60	0	30	60	0	30	60
T_1	8.70	8.60	8.50	8.25	8.10	8.05	8.24	8.14	8.03
T_2	8.49	8.32	8.15	8.40	8.25	8.15	8.36	8.24	8.09
T_3	8.26	8.16	7.96	8.30	8.15	8.06	8.45	8.25	8.05
T_4	8.85	8.75	8.65	8.65	8.55	8.45	8.60	8.55	8.50
T_5	8.25	8.15	7.96	8.50	8.40	8.20	8.32	8.25	8.12
SEM ±	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
CD 5 %	0.37	0.37	0.36	NS	NS	NS	NS	NS	NS

NS: Non-significant; **T_1**: (100% Papaya pulp), **T_2**: (80% Papaya pulp + 20% Guava pulp), **T_3** : (60% Papaya pulp + 40% Guava pulp), **T_4**: (50% Papaya pulp + 50% Guava pulp), **T_5**: (40% Papaya pulp + 60% Guava pulp); (L) Lalit

Table 4: Influence of different blending ratios of papaya guava fruit bar on taste, overall acceptability score and microbial count at different days of storage

Treatments	Taste score			Overall acceptability score			Microbial count (yeast and mould) (cfu/g)		
	Days after storage			Days after storage			Days after storage		
	0	30	60	0	30	60	0	30	60
T_1	8.40	8.25	8.05	8.39	8.27	8.03	0	0.4×10^{2}	0.6×10^{2}
T_2	8.50	8.35	8.06	8.43	8.29	8.11	0	0.2×10^{1}	0.3×10^{1}
T_3	8.30	8.15	8.00	8.32	8.17	8.01	0	0.2×10^{2}	0.4×10^{2}
T_4	8.60	8.50	8.45	8.67	8.58	8.50	0	0.1×10^{1}	0.2×10^{1}
T_5	8.35	8.05	7.95	8.35	8.21	8.05	0	0.3×10^{2}	0.5×10^{2}
SEM ±	0.12	0.12	0.12	0.12	0.12	0.12	-	-	-
CD 5 %	NS	NS	NS	NS	NS	0.34	-	-	-

NS: Non-significant; **T_1**: (100% Papaya pulp), **T_2**: (80% Papaya pulp + 20% Guava pulp), **T_3** : (60% Papaya pulp + 40% Guava pulp), **T_4**: (50% Papaya pulp + 50% Guava pulp), **T_5**: (40% Papaya pulp + 60% Guava pulp);(L) Lalit.

CONCLUSION

According to the sensory evaluation of papaya- guava (L) fruit bar, it was elicited that overall acceptability (8.67) of fruit bar with the respect to colour (8.85), flavour (8.60), texture (8.65) and taste (8.60) the treatment (T_4) with 50 per cent papaya pulp + 50 per cent guava pulp (Lalit) noticed as best blending ratio.

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