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Quality of Guava and Papaya Fruit Pulp as Influenced by Blending Ratio and Storage Period

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ABSTRACT

Guava and papaya are the most widely grown commercial fruits of central India. Both the fruits are nutritive and may be used for processing. The analysis of organoleptic characters (i.e., colour, flavour, texture, taste and overall acceptability) and qualitative characters (i.e., TSS, pH, acidity, ascorbic acid content) of guava and papaya fruits was conducted on fresh fruit, prepared pulp and mixed pulp. During the storage of fruit pulp at low temperature (6±1°C), the decrease in overall acceptability of both the pulp was observed with increase in storage period. However, blending of both the pulp in different ratios influenced the organoleptic characters as well as the qualitative characters of the blended pulp.

Key words: Acidity, ascorbic acid, fruit pulp, organoleptic parameters, overall acceptability, pulp recovery

INTRODUCTION

Guava (*Psidium guajava* L.) is the fourth most important fruit crop after mango, banana and citrus in India and occupies the area of 178 thousand ha and production 1975 thousand MT with average productivity of 11.1 MT ha^{-1} fruit per year in 2007-08 (Indian Horticulture Database, 2008). It is considered as one of the exquisite, nutritionally valuable and remunerative crop. The fruit is an excellent source of ascorbic acid (260 mg/100 g), pectin (1.15%), minerals like phosphorous (23-27 mg/100 g), calcium (14-30 mg/100 g) etc as well as vitamins like vitamin A, thiamine, riboflavin, pantothenic acid and niacin etc. (Bose *et al*., 1999). Guava is normally consumed as fresh as desert fruit. It is also stewed and used in sauce, ice-cream, butter, marmalade, chutney etc, but it's diversified utilization gives potential to combat malnutrition by developing innovative and novel products which could be prepared from guava pulp as such and in combination with other fruit pulp by blending.

Papaya (*Carica papaya* L.) is the fifth most important crop in India, which is cultivated in about 80 thousand ha of land and production of 2686 thousand MT with average productivity of 33.4 MT ha^{-1} in 2007-08 (Indian Horticulture Database, 2008). The fruits are excellent source of vitamin A (2020 IU/100 g) next to mango (2500 IU/100 g) and also a rich source of other vitamins like thiamine, riboflavin, nicotinic acid and ascorbic acid. Papayas (100 g) contains 9% of the Dietary Reference Intake (DRI) for Cu, 6-8% of the DRI for Mg, but less than 3% of the DRI for other minerals (Wall, 2006). Unfortunately papaya fruit has not caught the fancy of the consumers

as much as it deserves, mainly because of its odour which is not highly appealing and thus limits it's commercial exploitation at processing levels whereas guava emits a sweet aroma which is pleasant, refreshing and acidic in flavour. Therefore, blending of these two fruits product could be an economic preposition to utilize them profitably. There is good possibility of enhancing the flavour and acceptability of papaya product by diversification i.e. by using blending technology. Sharma *et al.* (2008) have prepared ready to serve beverages from guava and papaya in different ratios and found that RTS beverage prepared from 15% juice of 80: 20 blend of guava-papaya was the best. Similarly an energy drinks from mixed tropical fruit was developed by De Sousa *et al.* (2007). Kumar *et al.* (2010) developed fruit leather by mixing 60% papaya and 40% guava pulp which significantly resulted in a better overall rating for sensory properties without impairing the nutritional and textural quality of the product. Nip (1979) prepared drum-dried guava-taro and papaya-taro flakes and carried out storage study at various temperatures and time intervals to test their stability. Effects of storage temperature and time on the quality of aseptically processed, bag-in-box packaged guava and papaya puree were investigated by Chan and Cavaletto (1982).

As guava fruit have pulp soft to melting, white having very pleasant flavour with excellent quality can be mixed with papaya fruit having pulp blood red, good taste, to give a quality product after blending. This shows their pulp compatibility and suitability of blending and making mixed fruit products i.e. jam, jelly, leather, candy etc. thus it was planned to analyse quantitatively both guava and papaya pulp and the effect of blending ratio and storage period.

MATERIALS AND METHODS

The fully matured, firm ripe and healthy fruits of guava (cv. Allahabad Safeda) and papaya (Taiwan hybrid) were selected for this study. Both the fruits were collected from local farmer's field near Agriculture College Indore, Madhya Pradesh, India during 2006-07. For the experiment the guava pulp was prepared as per the procedure shown and discussed in detail by Jain and Asati (2004). For the preparation of papaya pulp matured and ripened papaya fruits were peeled using stainless steel knife and then cut into small pieces. Seeds and inner whitish layers were discarded manually. Papaya pieces were crushed in a mixer and boiled with water for 30 min. During boiling it was pressed with wooden pad. Straining of pulp was done with the help of stainless steel sieve. Both guava and papaya pulp were again boiled for 30 min and cooled to 30°C and potassium metabisulphite (KMS) was added at the rate of 750 ppm and the pulp was filled in airtight glass containers. The pulp was stored in glass jars at low temperature (6±1°C) for 60 days. For the preparation of blended pulp both the pulp were mixed in different ratios as shown in Table 4 and after blending it was boiled for 30 min and then cooled and KMS was added at the rate of 750 ppm. All the samples were subjected to qualitative analysis.

The organoleptic character (i.e., colour, flavour, texture, taste and overall acceptability) and qualitative character (i.e., TSS, pH, acidity, ascorbic acid content) were recorded for fresh fruit, both guava and papaya, pulp separately and in blended form. Organoleptic quality parameters were determined by adopting a nine-point hedonic scale (1= dislike extremely and 9 = like extremely) (Amerine *et al.*, 1965). A semi trained test panel of 10 judges did the sensory evaluation. The total soluble solids in the pulp were measured with the help of hand refractometer and pH of extracted pulp was measured using Elemer pH meter after calibration of the instrument with standard buffer solutions (Jain and Nema, 2007). The titratable acidity and ascorbic acid content were determined by AOAC (1995) methods. The data obtained in this study were subjected to statistical analysis (Snedecor and Cochran, 1967).

RESULTS AND DISCUSSION

The general quality characters of fresh guava and papaya fruit used in this study are given in Table 1. It can be observed that guava is rich in vitamin C and papaya in vitamin A, thus they can be blended to produce a vitamin rich product. The pulp recovery is more in papaya fruit (78.0%) as compared to the guava fruit (54.5%). Sandhu *et al.* (2001) have reported guava pulp recovery upto 59.3% in Allahabad safeda cultivar. The data of organoleptic quality attributes measured on 9-point hedonic scale are presented in Table 2, it is evident from the data that flavour, texture, taste and overall acceptability rating was higher in guava pulp (8.95, 9.00, 7.36, 7.72 at 0 day of storage, respectively) whereas the colour rating was higher in papaya pulp (9.00 at 0 day of storage) as compared to other fruit pulp. It was also observed that with the increase in storage period there was decrease in the rating of all organoleptic quality characters in both the fruit pulp. Jain and Asati (2004) have also reported decrease in overall acceptability of guava with storage period. Similar results were obtained by Harnanan *et al.* (1980) and Baramanray *et al.* (1995). The decrease in overall acceptability rating during storage is due to decrease in rating of colour, flavour, taste and texture of the fruit pulp. Similarly, Chan and Cavaletto (1982) have reported change in sensory quality of aseptically processed guava and papaya puree during storage.

The values of qualitative parameters of guava and papaya pulp are presented in Table 3 which indicates that TSS (%), acidity (%), ascorbic acid content (mg/100 g) was higher in guava pulp (13.24, 0.46 and 182.6, respectively) whereas, pH value (6.17) was higher in papaya pulp at 0 day of storage. It was also observed that with increase in the storage period, an increase in the value of TSS and acidity was noticed in both the fruit pulp, while the pH and ascorbic acid content was found to decrease irrespective of the fruit pulp. Increasing trend in TSS content during storage corroborates with findings of earlier researchers (Bajpai *et al.*, 1973; Tandon and Kalra, 1984; Baramanray *et al.*, 1995; Sandhu *et al.*, 2001; Sharma *et al.*, 2008). The reason assigned for

Table 1: Average quality characters of guava and papaya fresh fruit

Fruit	Cultivar	Pulp recovery (%)	TSS (°Brix)	pH	Acidity (%)	Ascorbic acid (mg/100 g)	Vitamin A (IU/100 g)
Guava	Allahabad Safeda	54.8	13.63	3.63	0.470	204.00	250
Papaya	Taiwan Hybrid	78.0	12.40	4.39	0.316	69.44	2020

Table 2: Effect of storage period on colour,flavour, taste and overall acceptability of guava and papaya pulp at 6±1°C temperature

	Storage period (days)											
	Colour				Flavour				Texture			
Pulp	0	30	60	Mean	0	30	60	Mean	0	30	60	Mean
Guava	5.72	5.64	5.59	5.65	8.95	8.88	8.78	8.87	9.00	8.82	8.74	8.85
Papaya	9.00	8.85	8.63	8.83	7.54	6.94	6.12	6.87	7.42	6.84	5.55	6.60
Mean	7.36	7.25	7.11	7.24	8.25	7.91	7.45	7.87	8.21	7.83	7.15	7.73

	Storage period (days)							
	Taste				Overall acceptability			
Pulp	0	30	60	Mean	0	30	60	Mean
Guava	7.36	7.14	7.04	7.18	7.72	7.62	7.53	7.62
Papaya	7.16	6.36	5.05	6.32	7.63	7.34	6.33	7.10
Mean	7.29	6.95	6.04	6.76	7.68	7.48	6.93	7.36

Table 3: Effect of storage period on TSS, pH, acidity (%) and ascorbic acid content (mg/100g) of guava and papaya pulp at 6+1°C temperature

	Storage period (days)															
	TSS				pH				Acidity (%)				Ascorbic acid (mg/100 g)			
Pulp	0	30	60	Mean	0	30	60	Mean	0	30	60	Mean	0	30	60	Mean
Guava	13.24	13.28	13.34	13.29	4.10	4.05	3.99	4.05	0.46	0.72	0.86	0.68	182.60	178.00	173.50	178.03
Papaya	12.00	12.05	12.11	12.05	6.17	6.12	6.05	6.11	0.32	0.83	1.07	0.74	85.70	79.30	73.10	79.37
Mean	12.62	12.67	12.73	12.67	5.14	5.09	5.02	5.08	0.39	0.78	0.97	0.71	134.15	128.65	123.30	128.70

Table 4: Effect of blending ratio of guava and papaya fruit pulp on various quality parameters

	Organoleptic parameters					Chemical parameters			
Fruit pulp blending ratio (Guava: Papaya)	Colour	Flavour	Taste	Texture	Overall accepta-bility	TSS (%)	pH	Acidity (%)	Ascorbic acid (mg/100 g)
C1 (100 : 0)	5.72	8.95	7.22	9.00	8.01	13.24	4.10	0.46	182.6
C2 (80 : 20)	7.94	8.78	9.00	8.85	9.00	12.95	4.27	0.43	172.4
C3 (60 : 40)	6.25	8.72	8.92	8.75	8.94	12.60	5.10	0.40	169.3
C4 (40 : 60)	6.85	8.32	7.75	8.22	8.08	12.48	5.50	0.39	132.4
C5 (20 : 80)	8.75	7.97	7.42	7.89	7.97	12.30	6.05	0.36	108.0
C6 (0 : 100)	9.00	7.54	7.36	7.42	7.42	12.00	6.17	0.32	85.7
Mean	7.42	8.38	7.95	8.36	8.24	12.60	5.20	0.39	141.7

increased TSS content during storage might be due to conversion of left over polysaccharides into soluble sugar (Baramanray *et al.*, 1995). Increasing trends in acidity with increasing storage period have been observed earlier by Kalra and Revathi (1981) and Sandhu *et al.* (2001) as well which may be due to formation of various organic acids in the fruits such as sulphurous acid (Baramanray *et al.*, 1995). Trends of decreasing pH and increasing acidity found in these studies are well supported by previous researchers (Tandon *et al.*, 1983; Sandhu *et al.*, 2001). Bajpai *et al.* (1973) observed decreasing trend of ascorbic acid after 60 days storage of guava pulp. Similar results were observed by Kalra and Revathi (1981), Baramanray *et al.* (1995), Sandhu *et al.* (2001) and Sharma *et al.* (2008). In aseptic processing, loss of ascorbic acid was about 6% in papaya and no loss in guava puree but when the same were stored at ambient conditions the ascorbic acid losses are about 30 and 56% after 6 months, respectively (Chan and Cavaletto, 1982). The reduction in ascorbic acid might be due to oxidation and might be because of presence of residual oxygen in glass bottle and eliminating oxygen during filling can minimize it.

The values of organoleptic and chemical quality parameters of blended pulp are given in Table 4. On the basis of rating for organoleptic quality attributes of blended pulp, it is revealed that the highest rating value of colour, flavour, taste, texture and overall acceptability were recorded as 9.0, 8.95, 9.0 and 9.0 in C6, C1, C2 and C1 blended fruit pulp respectively. It was also observed that the highest overall acceptability rating value 9.0 was found in blended pulp C2 (80% guava +20% papaya) followed by C3 (60% guava +40% papaya) which were better than other blending ratios. All the organoleptic quality attributes (colour, flavour, taste, texture and overall acceptability) are also affected by fruit pulp blending ratios. The pooled data presented in Table 4 revealed that the various chemical and qualitative parameters were influenced by the fruit pulp blending. The TSS percentage, acidity and ascorbic acid content decreases with increase in the ratios of papaya pulp in blended fruit pulp, whereas the pH value increases. It can also be noticed

that in ratio C2, the value of TSS percentage, acidity and ascorbic acid content was 12.95, 0.43 and 172.4 mg/100 g, respectively, though it is close to guava pulp quality but better in colour and overall acceptability rating.

CONCLUSION

The guava fruits are rich in ascorbic acid content (Vitamin C) whereas, the papaya fruits are rich in Vitamin A content and with better pulp colour. The pulp recovery was more in papaya fruits as compared to the guava fruits and pulp of both the fruits may be used for processing purpose alone or in blended form. During the cold storage of pulp colour, flavor, texture and ascorbic acid content was reduced. However, TSS and acidity was increased with the increased storage period. When fruit pulps were mixed, it's acceptable upto 40% papaya pulp blending.

REFERENCES

AOAC, 1995. Official Methods of Analysis. Association of Official Analytical Chemists, Washington, DC.

Amerine, M.A., R.N. Pangbnor and E.B. Roseller, 1965. Principles of Sensory Evaluation of Food. Academic Press, New York and London, pp: 16-69.

Bajpai, P.N., H.S. Shukla and A.M. Chaturvedi, 1973. Studies on the effect of pruning on the composition of guava. Prog. Hortic., 5: 73-80.

Baramanray, A., O.P. Gupta and S.S. Dhawan, 1995. Evaluation of guava (*Psidium guajava* L.) hybrid for making nectar. Haryana J. Hortic. Sci., 24: 102-109.

Bose, T.K., S.K. Mitra, A.A. Farooqui and M.K. Sandhu, 1999. Tropical Horticulture. 1st Edn., Nava Prokash Publication, Kolkata, pp: 297.

Chan, H.T. Jr. and C.G. Cavaletto, 1982. Aseptically packaged papaya and guava puree: Changes in chemical and sensory quality during processing and storage. J. Food Sci., 47: 1164-1169.

De Sousa, P.H.M., G.A. Maia, H.M.C. De Azeredo, M.S.M.S. Filho, D.S. Garruti and C.A.S. De Freitas, 2007. Mixed tropical fruit nectars with added energy components. Int. J. Food Sci. Technol., 42: 1290-1296.

Harnanan, S.W., G.S. Bains and K.K. Singh, 1980. Studies on the processing of the pink and white-fleshed guava varieties for pulp. Punjab Hortic. J., 20: 179-189.

Indian Horticulture Database, 2008. National horticultre board. Ministry of Agricultre, Govt. of India, Gurgaon. http://nhb.gov.in/online/information-bulletin.html.

Jain, P.K. and P.K. Nema, 2007. Processing of pulp of various cultivars of guava (*Psidium guajava* L.) for leather production. Agric. Eng. Int. CIGR Ejournal., Vol. 9.

Jain, P.K. and V.K. Asati, 2004. Evaluation of guava cultivars for pulp preparation. J. Food Sci. Technol., 41: 684-686.

Kalra, S.K. and G. Revanthi, 1981. Storage studies on guava (*Psidium guajava* L.) pulp. Indian Food Packer, 37: 29-33.

Kumar, R., R.T. Patil and G. Mondal, 2010. Development and evaluation of blended papaya leather. Acta Hort., 851: 565-570.

Nip, W.K., 1979. Development and storage stability of drum-dried guava- and papaya-taro flakes. J. Food Sci., 44: 222-225.

Sandhu, K.S., M. Singh and P. Ahluwalia, 2001. Studies on processing of guava into pulp and guava leather. J. Food Sci. Technol., 38: 622-624.

Sharma, I., R.K. Kaul and B. Anju, 2008. Effect of different treatment combinations of guava and papaya on quality and storability of ready to serve beverages. J. Res. SKUAST J., 7: 1-8.

Snedecor, G.W. and W.G. Cochran, 1967. Statistical Methods. Oxford and Ibh, New Delhi.

Tandon, D.K., S.K. Kalra, J.K. Kulkarni and K.L. Chadha, 1983. Chemical and microbial evaluation of stored guava pulp in PVC container. J. Food Sci. Technol., 20: 118-120.

Tandon, D.K. and S.K. Kalra, 1984. Pectin changes during the development of mango fruit cv Dashehari. J. Hort. Sci., 59: 283-286.

Wall, M.M., 2006. Ascorbic acid, vitamin A and mineral composition of banana (*Musa* sp.) and papaya (*Carica papaya*) cultivars grown in Hawaii. J. Food Comp. Anal., 19: 434-445.