DEVELOPMENT OF FRESH VALUE ADDED GUAVA (Psidium guajava L.) AND PAPAYA (Carica papaya L.) NECTAR

ABSTRACT:

A lab experiment was conducted during winter season of 2021 at Post Harvest technology Laboratory department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, and Uttar Pradesh, India to determine the "**Development of fresh value added guava (*Psidium guajava* L.) and papaya (*Carica papaya* L.) nectar and standardization of its recipe**". The experimental material consisted of ten treatments with combination of different recipes including two standard recipes without blending of guava and papaya with varying levels of TSS for nectar. The treatment combinations were 10 and replicated thrice under Completely Randomized Design.

The fruits of guava and papaya were analysed for physic-chemical characteristics. The blended nectar prepared from different recipes and blending ratio were also analysed periodically at 4 days interval for their various chemical constituents. The blended nectar organoleptically evaluated by adopting 9 point Hedonic rating scale and observations were recorded for their chemical changes during storage for 12 days. A critical analysis of physical composition of guava and papaya fruits revealed that average fruit weight was recorded 163.65 g and 1610 g, pulp weight 158.20 g and 1430 g, seed weight 5.45 g and 10.50 g, weight of non-edible waste 7.13 g and 82 g and pulp seed ratio 29.02 and 136.19, respectively. Among the chemical composition, the TSS was recorded 12.31% and 8.36%, acidity 0.43% and 0.38%, ascorbic acid 243mg/100 ml and 66.62 mg/100 ml, pH 4.62 and 4.20, respectively. Among various recipe tried in this investigation, the nectar prepared from the treatment T4 (60% Guava: 40% Papaya: 18% TSS: 0.3% acidity) recorded highest TSS, Ascorbic acid, organoleptic score with respect to aroma, taste and overall acceptability. Whereas, the nectar containing the recipe T6 (45% Guava: 55% Papaya) recorded highest pH. During storage of nectar the acidity, TSS, showed an increasing trend with increasing period of storage (0 to 12 days) under ambient condition. While, there was a decreasing trend of ascorbic acid, pH and organoleptic score during storage period upto 12 days of storage under ambient condition. The lowest cost of production (Rs 1346.00), highest net return (Rs. 3154.00) and benefit: cost ratio (2.34) of blended guava and papaya nectar was recorded in the treatment of T4 (60% Guava: 40% Papaya).

Key words: *Guava-Papaya nectar, citric acid, no preservatives, recipe.*

INTRODUCTION

Fruits and vegetables contain many vitamins and minerals that are good for your health. These include vitamins A (beta-carotene), C and E, magnesium, zinc, phosphorous and folic acid. Fruit juice is a popular choice of beverage for both adults and children because of its attractive taste and color, and the fact it is associated with many health benefits. India is a country, well-known for its tradition and culture. Syrup or Sharbet are offered to guests and is an important homemade soft drink. Similarly, fruit juice and beverages also hold an important position due to their richness in essential minerals, vitamins and other nutritive constituents. Guava *(Psidium guajava* L.*)* is one the most important subtropical fruit crops. It belongs to family Myrtaceae. Guava is a native of tropical America perhaps from Mexico and Peru. It is widely distributed all over the equatorial regions of the tropical and subtropical climate. Guava can be grown easily in region with tropical and subtropical climate. Papaya (*Carica papaya* L.) is one of the tropical fruit crops. It belongs to family Caricaceae. The papaya is the plant *Carica papaya*, one of the 22 accepted species in the genus Carica of the family Caricaceae. Its origin is in the tropics of the Americas, perhaps from Central America and southern Mexico. Papayas grow in tropical climates and are also known as papaws or pawpaw. Their sweet taste, vibrant colour, and the wide variety of health benefits they provide make them a popular fruit.

The various products such as jam, jelly, candy, nectar, puree, concentrate slab, toffee, tutti-fruity, freeze dried chunk, dried rolls, dried slices and pickles can prepared from papaya processing. Nectar juice is also called nectar drink, or pulp juice. It refers to the juice containing fruit pulps and flesh. Nectar juice is made of original fruit pulps or concentrated pulps, added with sugar and acid agent. It contains a large quantity of fruit pulps, fruit fibers and pectin, which can be drank together with the juice. As the nectar juice reserve some solid content in fruit peels and pulps, it presents more of the fruit original taste, color and nutrition. To be general, the production of nectar juice includes: raw material cleaning, cutting, destoning, heating, pulping, mixing with sweet water and additives, colloid milling, degassing, filling, sealing, sterilization, finished products.

MATERIALS AND METHODS

Raw Material

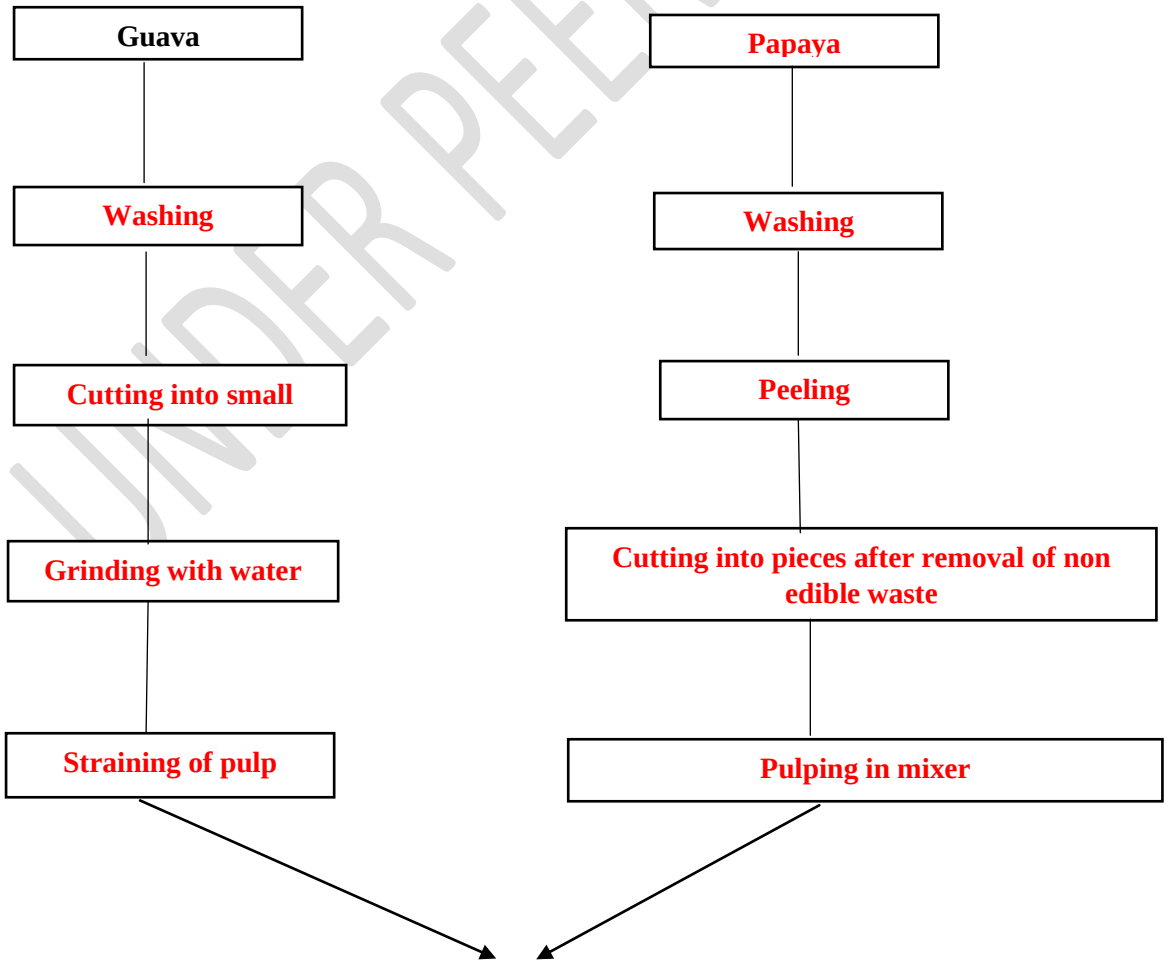
Healthy and ripen guava and papaya, free from disease, pest and insects were randomly selected and purchased from fruit mandi in Prayagraj (U.P). Other ingredients like sugar, citric acid were brought from local shops in prayagraj.

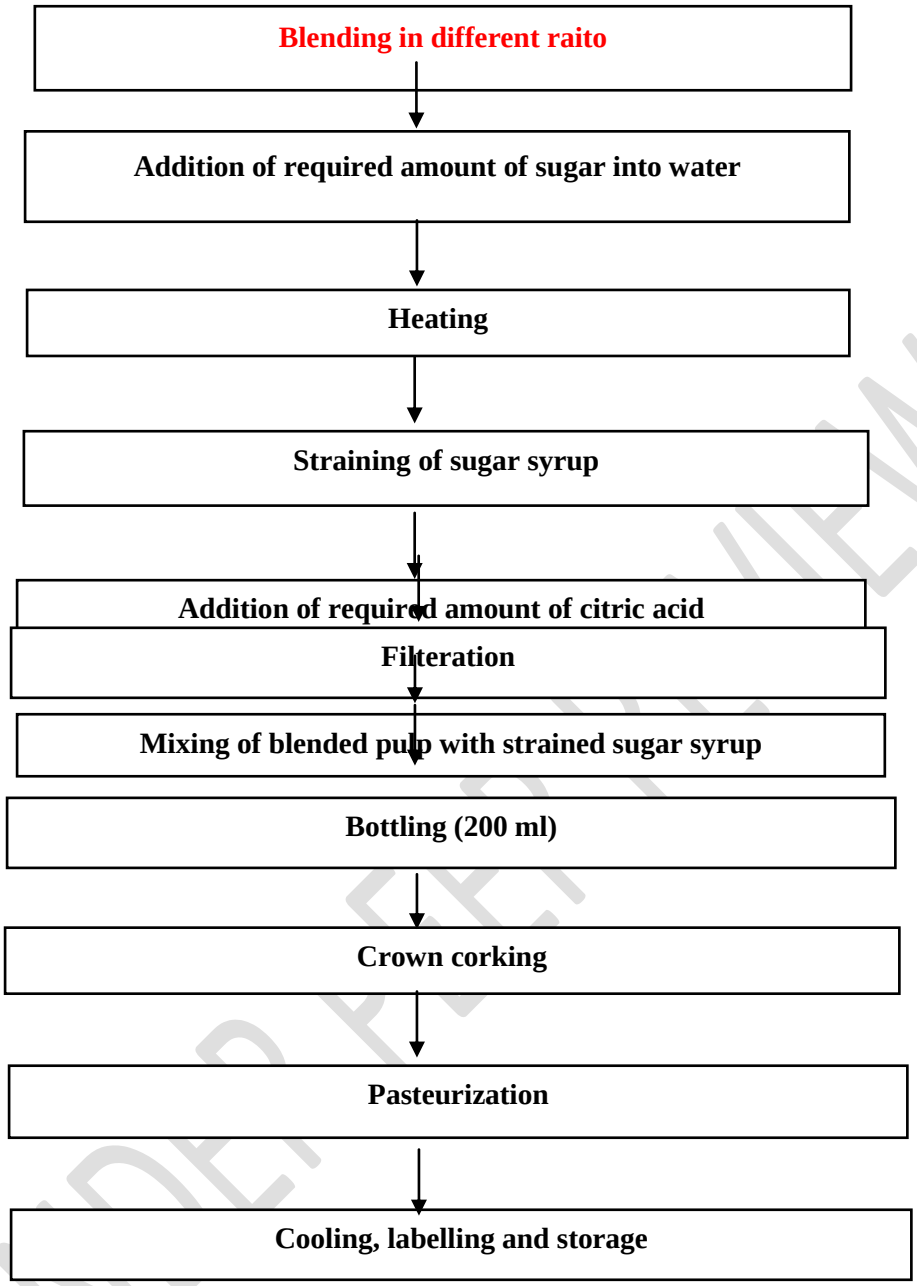
Preparation of blended nectar of guava and papaya

Ripen fruits were selected for the preparation of blended nectar from guava and papaya. The fruits were washed with clean water to remove dirt and dust particles. The guava fruits were cut into small pieces with the help of knife, after that little amount of water was added and crushed it in mixer-grinder, while the mature and ripened papaya fruit were peeled from peeler and then cut into two equal halves and then seeds were removed. The papaya pulp was obtained by crushing in grinder. Straining was done by with the help of sieve. After extraction of pulp, 20 per cent for nectar was taken as per required ratio for blending of guava and papaya. Sugar syrup was prepared by heating required amount of sugar and water to adjust the total soluble solids as per requirement in different recipe for

nectar. The acidity was maintained to 0.3 per cent by the addition of required amount of citric acid in the sugar syrup. The blended guava and papaya pulp was mixed with sugar syrup to obtain final product.The prepared nectar was again filtered by sieving through a muslin cloth to obtain a product of uniform consistency. The product was poured into hot, sterilized bottles of 200 ml capacity and packed air-tight. The filled bottles were pasteurized in boiling water till the temperature of product reaches 100°C. It took about 15 minutes to attain required temperature. The bottles of nectar was kept at ambient condition for further studies up to 12 days.

Chart 1 : FLOW CHART OF GUAVA-PAPAYA NECTAR





TREATMENT DETAILS

Treatment	Treatment Combinations
T_0	Guava Juice (100%) + Papaya juice (0%) + Sugar (110g) + citric acid (2.6g)
T_1	Guava Juice (25%) + Papaya juice (75%) + Sugar (115g) + citric acid (2.6g)
T_2	Guava Juice (50%) + Papaya juice (50%) + Sugar (105g) + citric acid (2.6g)
T_3	Guava Juice (75%) + Papaya juice (25%) + Sugar (105g) + citric acid (2.6g)

T_4	Guava Juice (60%) + Papaya juice (40%) + Sugar (105g) + citric acid (2.6g)
T_5	Guava Juice (70%) + Papaya juice (30%) + Sugar (105g) + citric acid (2.6g)
T_6	Guava Juice (45%) + Papaya juice (55%) + Sugar (105g) + citric acid (2.6g)
T_7	Guava Juice (40%) + Papaya juice (60%) + Sugar (105g) + citric acid (2.6g)
T_8	Guava Juice (35%) + Papaya juice (65%) + Sugar (105g) + citric acid (2.6g)
T_9	Guava Juice (0%) + Papaya juice (100%) + Sugar (90g) + citric acid (2.6g)

Physico-chemical and organoleptic quality of guava-papaya nectar.

Titrable acidity (%)

Titratable acidity was determined by titrating a known quantity of sample (10ml) of homogenized sample was taken and made up to 100 ml volume in a volumetric flask. The contents were filtered through Whatman No. 1 filter paper. An aliquot of 10 ml was taken for titration against 0.1N NaOH using phenolphthalein as in indicator. The turn of aliquot to light pink colour which persists for 15 seconds was considered as an end point. The titratable acidity was estimated in terms percent citric acid (Ranganna, 1986).

pH

The sample was taken into the beaker. Then the pH was noted with the help of an electronic pH meter.

Total soluble solids (%)

The percentage of total soluble solids was determined by using hand refractometer (Erma, Japan) by placing a drop of the filtered juice on the prism of the refractometer and observing the coincidence of shadow of the sample with the reading on the scale and expressed as °Brix.

Ascorbic acid (mg/100g)

Determination of ascorbic acid was done by 2, 6 – dichlorophenolindophenols dye method as described by Ranganna (1997). A known quantity of sample was blended with 3 per cent metaphosphoric acid (HPO3) to make the final volume of 100 ml and then filtered. A known quantity of aliquot was titrated against 0.025 per cent 2, 6 - dichlorophenol indophenols dye to a pink colour end point. The ascorbic acid content of the sample was calculated taking into consideration the dye factor and expressed as mg Ascorbic acid per 100g.

Organoleptic evaluation

To assess the consumer preference, sensory evaluation of the experimental sample was conducted at different intervals by panel of 7-8 judges. The sample were evaluated for color and appearance, taste, aroma and overall acceptability.

RESULTS AND DISCUSSION

Titrable Acidity (%)

During the storage term (12 days) at ambient room temperature, the increase in acidity of nectar during storage might be due to formation of organic acids by ascorbic acid degradation as well as progressive decrease in the pectin content. It is also due to formation of acids from sugar. the significant highest titrable acidity (0.59%) was noticed under the treatment T_9 (0% Guava juice: 100% Papaya juice.While, minimum (0.35%) acidity was observed with T_4 (60% Guava juice: 40% Papaya juice). The results are also in conformity with the findings of Bal *et al*. (2014), who reported a significant increase in acidity of guava nectar during storage.

pH

It is evident from the data that the pH value in blended guava and papaya nectar showed a decreasing trend with increasing period of storage (0-12 days). The increased acidity and TSS under all the recipe treatments during storage had a corresponding decrease in pH. During the storage, maximum pH value was observed (4.81) with the T_6 (45% Guava juice: 55% Papaya juice). While, minimum pH was observed (4.07) with the treatment T_9 (0% Guava juice: 100% Papaya juice). The present findings are in agreement with Sasikumar (2015), who observed significant decrease in pH during storage of functional beverages from Aloe-vera juice blended with bael fruit juice.

Total Soluble Solids

This gradual increase in total soluble solids during the storage period (12 days) might be due to conversion of polysaccharides into sugars during hydrolysis process. The total soluble solids content was found to be maximum (18.45%) with the treatment T_4 (60% Guava juice: 40% Papaya juice). While, minimum TSS content was recorded (15.73%) with the treatment T_7 (40% Guava juice: 60% Papaya juice). Similar findings were also reported by Deka *et al.* (2004), who observed that total soluble solids showed an increasing trend throughout the storage period.

Ascorbic Acid

This gradual reduction in ascorbic acid during the storage period (12 days) might be due to oxidation by trapped oxygen in packaging container, which results in formation of dehydroascorbic acid. The maximum ascorbic acid was recorded (33.70mg/100ml) with the treatment T_4 (60% Guava juice: 40% Papaya juice) followed by T_3 (75% Guava juice: 25% Papaya juice). While the minimum ascorbic acid (31.24mg/100ml) was recorded under treatment T_0 (100%Guava juice: 0% Papaya juice). Similar results were also noted by Mall and Tondon (2007), in guava-aonla blended beverage, Sharma et al. (2008), in guava-papaya RTS beverage.

Organoleptic evaluation

In the organoleptic evaluation such as color and appearance, taste, aroma and overall acceptability. Sensory scores for treatment T_4 (60% Guava juice: 40% Papaya juice) were found to be highest in all parameters of organoleptic attributes. The highest overall acceptability score (7.03) indicated that it was well received by the judges.

Shelf life of guava-papaya nectar

From the shelf life point of view during the storage period, the highest was recorded in T_4 (60% Guava juice: 40% Papaya juice) 11.23. While minimum was recorded in T_9 (0% guava juice: 100% papaya juice) 8.20.

Table 1: Changes in acidity, pH, and TSS in the guava-papaya nectar during storage.

Treatments	Acidity (%)				pH				TSS (ºBx)			
	Storage period (days)				Storage period (days)				Storage period (days)			
	0	4	8	12	0	4	8	12	0	4	8	12
T_0	0.33	0.34	0.39	0.43	5.03	4.92	4.69	4.66	17.37	17.39	17.42	17.46
T_1	0.34	0.35	0.41	0.42	4.65	4.59	4.57	4.54	18.26	18.29	18.31	18.33
T_2	0.33	0.36	0.40	0.44	4.81	4.71	4.62	4.59	17.67	17.71	17.73	17.76
T_3	0.37	0.38	0.42	0.46	4.76	4.72	4.66	4.63	16.22	16.26	16.28	16.31
T_4	0.28	0.31	0.33	0.35	4.87	4.77	4.57	4.53	18.39	18.41	18.43	18.45
T_5	0.32	0.33	0.38	0.41	5.11	4.85	4.72	4.69	17.02	17.05	17.07	17.10
T_6	0.31	0.32	0.35	0.38	5.18	5.11	4.84	4.81	18.29	18.31	18.33	18.35
T_7	0.35	0.36	0.40	0.47	4.79	4.77	4.27	4.24	15.65	15.67	15.70	15.73
T_8	0.36	0.37	0.41	0.49	5.08	5.07	4.55	4.52	16.37	16.40	16.44	16.48
T_9	0.35	0.36	0.43	0.51	5.3	4.32	4.11	4.07	16.79	16.84	16.88	16.90
F-test	**NS**	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**NS**	**S**	**S**	**S**
S.Ed(±)	**0.006**	**0.01**	**0.18**	**0.13**	**0.1**	**0.11**	**0.09**	**0.1**	**0.28**	**0.28**	**0.28**	**0.27**
CD @ 5%	**NS**	**NS**	**0.43**	**0.32**	**0.25**	**0.27**	**0.23**	**0.24**	**NS**	**0.68**	**0.67**	**0.64**

Table 2: Changes in ascorbic acid, colour and appearance and taste in the aonla candy during storage.

Treatments	Ascorbic acid (mg/100g)				Colour and appearance				Taste			
	Storage period (days)				Storage period (days)				Storage period (days)			
	0	4	8	12	0	4	8	12	0	4	8	12
T_0	31.33	31.30	31.27	31.24	4.61	4.52	4.14	4.05	5.61	5.22	5.12	4.91
T_1	31.71	31.69	31.67	31.64	5.48	5.38	5.08	4.42	5.82	5.62	5.22	5.11
T_2	32.50	32.48	32.46	32.44	5.43	5.33	5.13	4.66	5.76	5.56	5.16	5.08
T_3	32.82	32.80	32.78	32.75	5.90	5.80	5.13	5.03	7.08	7.01	6.79	6.66
T_4	33.77	33.75	33.73	33.70	7.78	7.68	7.34	7.11	7.14	7.11	7.01	6.95
T_5	31.71	31.69	31.66	31.63	7.12	7.02	6.69	6.35	5.79	5.45	5.28	5.04
T_6	32.64	32.62	32.60	32.57	6.11	6.09	6.08	6.07	7.11	7.08	6.86	6.73
T_7	32.58	32.57	32.55	32.53	6.22	6.12	6.04	5.97	6.12	6.08	5.95	5.75
T_8	32.66	32.64	32.60	32.57	5.52	5.42	5.42	5.29	5.52	5.39	5.22	5.12
T_9	32.60	32.58	32.56	32.53	9.08	9.01	8.81	8.48	5.43	5.36	5.26	5.19
F-test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
S.Ed(±)	**0.23**	**0.24**	**0.24**	**0.25**	**0.30**	**0.30**	**0.29**	**0.37**	**0.43**	**0.22**	**0.14**	**0.14**
CD @ 5%	**0.57**	**0.57**	**0.58**	**0.61**	**0.71**	**0.71**	**0.71**	**0.89**	**1.02**	**0.52**	**0.34**	**0.33**

Table3: Changes in aroma, overall acceptability and shelf life in the guava-papaya during storage.

Treatments	Aroma				Overall acceptability				Shelf life
	Storage period (days)				Storage period (days)				Storage period (days)
	0	4	8	12	0	4	8	12	12
T_0	6.21	6.17	6.00	5.91	6.07	6.01	5.95	5.75	8.21
T_1	5.27	5.23	5.12	5.08	5.08	5.01	4.91	4.78	9.43
T_2	5.19	5.15	5.10	5.03	5.04	4.99	4.99	4.75	8.50
T_3	5.20	5.17	4.99	4.65	5.15	5.08	5.08	4.86	9.50
T_4	7.17	7.15	7.13	7.11	7.03	6.98	6.98	6.77	11.23
T_5	7.10	7.08	7.03	6.90	6.20	6.16	6.07	6.00	10.43
T_6	6.62	6.58	6.49	6.26	6.23	6.19	6.10	6.02	10.90
T_7	5.56	5.51	5.48	5.36	5.06	4.97	4.88	4.82	9.70
T_8	5.16	5.12	4.98	4.81	5.01	4.96	4.87	4.80	8.79
T_9	5.25	5.23	5.13	4.87	4.99	4.93	4.84	4.79	8.20
F-test	S	S	S	S	S	S	S	S	S
S.Ed(±)	0.12	0.12	0.20	0.18	0.20	0.17	0.17	0.13	0.30
CD @ 5%	0.29	0.30	0.48	0.42	0.48	0.41	0.40	0.36	0.71

CONCLUSION

The nectar prepared from the recipe T_4 (60% Guava : 40% Papaya juice) contained most acceptable ascorbic acid with 33.70mg/100g, pH with 4.53, TSS with 18.45 °Brix, acidity 0.35% and also in organoleptic score as compared to other recipes during storage. The highest net return (3154.00) and benefit: cost ratio (2.34) was recorded in the treatment T_4 of (60% Guava: 40% papaya) with low cost of production. The study concludes that 60:40 ratio for blending of guava and papaya was most acceptable for preparation of nectar with TSS, acidity, pH, ascorbic acid and in economics also followed by 45:55 ratio of guava papaya blending.

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