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HORTICULTURE

Qualitative Assessment of Guava and Wood Apple Blended Jelly Cubes

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ABSTRACT

Wood Apple (*Limonia acidissima*) and Guava (*Psidium guajava* L.) are the most prominent fruit crops in India. An experiment, "Qualitative Assessment of Guava and Wood Apple Blended Jelly Cubes" conducted during the year 2021 visualized the effect of different and suitable pulp combinations of guava and wood apple juice for blended jelly preparation. The experiment was laid out in RBD with nine treatments. Jelly cubes were prepared using various proportions (100:0, 95:5, 90:10, 85:15, 80:20, 75:25, 70:30, 65:35, and 60:40) of wood apple and guava fruit juice and were evaluated for quality parameters. Significant variation was observed among different fruit juice combinations. Treatment T_6 [wood apple (75 %): guava (25 %)] recorded superiority in TSS, pH, moisture, acidity, ascorbic acid, and total sugars, while treatment T_2 [wood apple (95 %): guava (5 %)] showed minimum values. Sensory evaluation of jelly cubes from treatment T_6 [wood apple (75 %): guava (25 %)] achieved better organoleptic properties.

HIGHLIGHTS

- Blending different proportions of guava and wood apple fruit juice.
- Different combinations of blended guava and wood apple jelly cubes.
- Qualitative assessment and sensory evaluation of blended guava and wood apple jelly cubes.

Keywords: Quality parameters, Wood apple, Guava, Blended jelly, Organoleptic properties

Guava (*Psidium guajava* L.), one of the acing fruit crops widely cultivated all over India's tropics and sub-tropics, belongs to the family Myrtaceae. It originates from Peru and is commonly known as the apple of the tropics or poor man's apple. Guava fruits have low calorific value and contain several vital vitamins, minerals, antioxidants, polyphenols, and flavonoids with immune boosting and analgesic properties that play a predominant role in the prevention of cancer, diarrhea, gastroenteritis, and aging (Mondhe *et al*. 2018). Various processed products are prepared from guava viz. jam, jelly, canned fruit segments, ready-to-serve beverages, nectar, squash, candy, toffee, syrup, juice, and concentrate. Guava has great market demand due to its delicious taste, aroma, sweet flavor, and delicate balance of acid, sugar, and pectin. Jelly is one of the most essential confectionery products prepared from guava (Baramanray *et al.* 1985).

Wood apple (*Limonia acidissima L.*) a vital hardy dry land fruit crop grown primarily in the arid and semi-arid regions of the country, belongs to the family Rutaceae The tree is not majorly affected by any serious pests or diseases due to its hardy and resistant nature to both biotic and abiotic stresses It is an ideal tree which can be exploited for growing in waste and underutilized land (Kumar and Deen 2017).The wood apple fruit pulp is sour, sweet, aromatic, and refreshing with an excellent flavor

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and is the richest source of beta carotene. Fruits are of high medicinal value and can be utilized for the preparation of jelly; such fruit jelly naturally is very nutritious as they contain most of the constituents of the fruit from which they are prepared (Chavan and Vidhyapeeth 2018).

During harvesting season, a market glut occurs in wood apple and guava-producing areas. Due to the lack of marketing and storage facilities, huge quantities of fruits get spoiled. Around 30 - 50% of post-harvest losses occur because of high perishability; therefore, prevention of this seasonal surplus of fruits is done by processing and preservation techniques. However, very little work is done on blending wood apple and guava jelly as these fruits are a rich source of bioactive compounds and antioxidant properties. By considering the importance of wood apple and guava and with the motive of achieving the combination of flavor and nutritional value, there is enormous scope for future research and further pharmacological investigation in wood apple and guava jelly, and there is a need to utilize the nutritional potential of wood apple and guava to develop various new value-added products, which will also reduce the post-harvest losses of these perishable fruit crops.

The objective of our study was to assess various qualitative attributes from different combinations of wood apple and guava blended jelly cubes.

MATERIALS AND METHODS

Sample and materials collection

Study was undertaken at the Post-harvest Technology and Analytical Laboratory, Department of Fruit Science, Faculty of Horticulture, Dr. PDKV, Akola. Matured and medium-ripe fruits of wood apple (*Limonia acidisimma*) and guava (*Psidium guajava*) were obtained from Dr. PDKV, Akola. Chemicals and other required reagents used for the study were analytical reagent grade.

Sample preparation

The experiment comprised 9 treatments with different wood apple and guava juice combinations (100:0, 95:5, 90:10, 85:15, 80:20, 75:25, 70:30, 65:35, and 60:40). Trial was conducted in Randomized Block Design for preparation of guava blended wood apple jelly cubes and were wrapped in gelatin papers and stored in plastic boxes.

Procedure for preparation guava blended wood apple jelly cubes

1. Selection of suitable wood apple and guava fruits
2. Sorting and grading
3. Washing
4. Extraction of juice by boiling pulp with water
5. Blending of juices in different proportions as per the treatments
6. Pectin test
7. Heating the mixture for attaining 60 ^{o}B
8. Addition of sugar in 3:4 proportion
9. Further boiling of mixture till 65 ^{o}B is attained
10. Addition of 0.5% citric acid
11. Boiling the mixture up to 68 ^{o}B
12. Judging the end point by further cooking upto 105 ^{o}B
13. Pouring hot mixture in aluminum trays
14. Setting of jelly
15. Cooling till room temperature is reached
16. Jelly is cut into uniform sized cubes
17. Guava blended wood apple jelly cubes is obtained
18. Packaging
19. Storing at refrigerated conditions

METHODOLOGY

Extraction of pulp and juice

The best quality fruits with firm textures were selected for Juice extraction from the pulp. The pulp of wood apple and guava fruits were boiled separately with water for about 20-30 minutes to extract the juice, and clear pectin-containing juices of both fruits were obtained by straining. The fruit juice was used immediately after separation to avoid browning.

Standardization of jelly recipe

Guava blended wood apple jelly cubes were first prepared by using 9 treatments of different wood apple and guava juice combinations with different

proportions. Other ingredients such as citric acid 5 g/kg, Sugar 750 g/kg juice were taken, and the best treatment was selected by organoleptic test.

Addition of sugar

One liter of blended juice of wood apple and guava was used in each treatment to prepare jelly. The sugar was added in 3:4 proportion to the juice.

Addition of citric acid

At TSS of 65°B, the citric acid was added @ 0.5 percent to prevent sucrose crystallization in the end product and establish the optimum gel formation. The citric acid was added at the end of cooking for proper sugar inversion.

Judging the end point

Heating was discontinued when TSS reached 65 - 68 °Brix and at desired consistency when the boiling point reached 105°C as suggested by Saxena and Umar, 2015.

Filling

After reaching the endpoint, the heated mass was transferred into an aluminum tray, and the product was spread onto a thin sheet of 1 - 2 cm thickness. This was allowed to cool at room temperature.

Wrapping

Jelly cubes were cut into -size thicknesses of 1.5 - 2.5 cm with a stainless steel knife and wrapped in plastic wrapping paper for storage (Parpia, 1967).

Storage

The wrapped guava blended wood apple jelly cubes were stored in plastic boxes per treatments at ambient temperature for 90 days for further evaluation.

Physico-chemical analysis of guava blended wood apple jelly cubes

The pulp and juice extracted from wood apple and guava fruits were initially analyzed for physical and chemical parameters and the procedures for analysis of various parameters are given below.

Preparation of sample

Analysis of fruit jelly cubes for the various properties as done using an aqueous sample solution. 2g sample was weighed and dissolved in 10 ml of distilled water by crushing in a pestle and mortar. The aqueous solution was filtered and used for analysis.

pH

pH of fruit jelly cubes was recorded by using Perkins Elmer pH meter at 30 °C temperature.

Total Soluble Solids (° Brix)

The juice was extracted from fruits, and Total Soluble Solids (TSS) were determined using a digital refractometer. A drop of juice was extracted and placed on the refractometer's clean prism, and the lid was closed. Reading was taken directly from the scale at 20 °C temperature and recorded as total solids in °Brix.

Moisture

The moisture was recorded using a hot air oven at 66°C. The percent moisture was calculated by using the equation.

$$\text{Moisture (\%)} = \frac{W_1 - W_2}{W_1} \times 100$$

Where W_1= weight of wet sample (g)

W_2= weight of dry sample (g)

Titratable acidity (%)

The acidity of the jelly was determined by diluting an aliquot of the sample with distilled water and titrating it with 0.1N NaOH using phenolphthalein as an indicator. The calculated acidity was expressed as percent anhydrous citric acid (AOAC.1995).

$$\text{Titratable acidity (\%)} = \frac{t \times n \times e}{V \times 1000} \times 100$$

Where,

t = Titrate

n = Normality of alkali

e = equivalent weight of acid

v = Volume of Sample taken for estimation

Ascorbic acid

Ascorbic acid content was estimated using 2,6-dichloro- phenol indophenols dye as reported by Ranganna. (1986)

$$\text{Ascorbic acid (mg/100 ml)} = \frac{\text{Titre} \times \text{Dye equivalent} \times \text{Volume made up}}{\text{Aliquot taken for sample} \times \text{Weight of sample}}$$

Total sugars (%)

The total sugars were estimated using the spectrophotometer method that Sadasivam and Manickam (1997) reported. Preparation of Phenol Sulphuric acid (SFA) for estimation of total sugars.

$$\text{Total sugars (\%)} = \frac{\text{Absorbance of sample} \times \text{K value} \times \text{Dilution factor}}{\text{Weight of Fresh Tissue}}$$

Sensory evaluation

Each attribute was given a separate score of 9 points scale according to the method reported by Amerine *et al*. (1965). Sensory panel consisted of 3 trained panelists who evaluated the experimental samples as per the hedonic scale. The mean values of the score for sensory evaluation was calculated and reported.

STATISTICAL ANALYSIS

The data collected on various observations duringthe investigation were analyzed statistically by Randomized Block Design by Panase and Sukhatme. Critical difference for treatment means and for their significance was calculated at 5% level of significance.

RESULTS AND DISCUSSION

The results of the following experiments shown in Table 1 below clearly show the significant difference between different treatment combinations of guava and wood apple jelly cubes. It was observed that maximum TSS (Fig. 1) (69.15), acidity (0.65), moisture (24.66), ascorbic acid (59.92), sugars (7.77) and pH (2.92), whereas minimum results were obtained in T_2 treatment combination. Similar results were also reported by Kumar and Deen (2017), who stated that the increasing trend in the TSS content is due to the conversion of polysaccharides into sugars in the presence of organic acids. Decreased titratable acidity is due to acid hydrolysis of polysaccharides and non-reducing sugars to their simpler components, where the acid is utilized for converting them to hexose sugars or complexes in the presence of metal ions (Archana and Laxman, 2015). Deokar *et al.* (2018) reported significant changes in moisture from 24.85 to 30.57 percent in blended sapota and tamarind jelly cubes. Mondhe *et al.* (2018) revealed an increase in pH of guava

Table 1: Effect of different proportions of wood apple and guava juices on TSS, acidity, ascorbic acid, sugars, moisture and pH content of jelly cubes during storage

Treatment	Observations recorded					
	Total Soluble Solids (°Brix)	Acidity (%)	Total sugars (%)	Ascorbic acid (mg/100g)	Moisture (%)	pH
T_1	67.50	0.52 (1.236)	50.36	7.72	22.91 (4.889)	2.68
T_2	65.96	0.43 (1.194)	49.94	7.39	22.74 (4.872)	2.22
T_3	68.17	0.57 (1.246)	50.35	7.68	23.81 (4.980)	2.84
T_4	68.95	0.62 (1.276)	50.10	7.58	23.83 (4.982)	2.70
T_5	68.90	0.59 (1.261)	50.64	7.68	23.86 (4.985)	2.68
T_6	69.15	0.65 (1.283)	52.92	7.77	24.66 (5.065))	2.92
T_7	68.96	0.59 (1.261)	50.02	7.51	24.34 (5.034)	2.60
T_8	68.98	0.64 (1.280)	51.02	7.74	24.63 (5.062)	2.85
T_9	68.86	0.56 (1.242)	50.08	7.54	24.01 (5.088)	2.56
F- Test	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.260	0.040	0.43	0.041	0.39	2.60
CD at 5 %	0.783	0.118	1.30	0.12	1.18	2.85

blended with pomegranate jelly during storage. Results conform with Kumar and Deen (2017) in wood apple jelly, and Raut (2015) in pomegranate and sapota mixed fruit jelly.

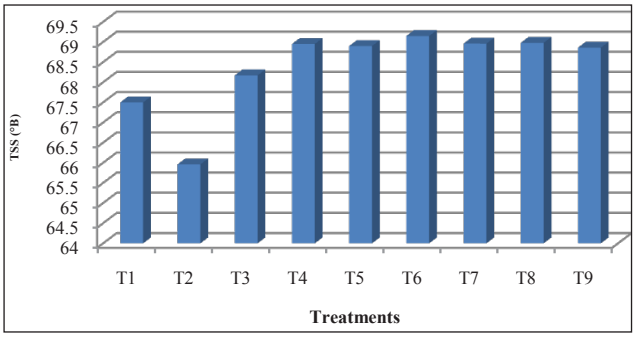

Fig. 1: Variation of Total Soluble Solids in different combinations of guava and wood apple blended combinations

As per Table 2 given below, enhanced attributes such as color (8.8), flavor (8.8), taste (7.8), texture (8.8), and overall acceptability (8.6) was found superior in treatment T_6 followed treatment T_8, T_9, T_7, T_1, etc. and least in treatment combination T_3 (7.1, 7.8, 7.0, 8.0, 8.0). Singh and Chandra (2012) reported that the color score decreased from 7.10 to 6.12 in guava-carrot jelly. Gaikwad (2016) noticed the color change in sapota and beetroot blended jelly. Panchal *et al*. (2018) reported that the score for the color of samples decreased from 8.89 to 8.48 in dragon fruit. The above results conform with Singh and Chandra (2012) where the taste score decreased from 8.66 to 7.81 in karonda jelly. Deokar *et al*. (2018) observed mean score for texture of the sapota and tamarind blended jelly gradually decreased from 7.93 to 7.68; 7.70 to 5.40 in sapota and beetroot blended jelly (Gaikwad, 2016) and 7.34 to 6.14 in guava and carrot jelly (Singh and Chandra, 2012) were also reported.

CONCLUSION

The blended jelly cubes prepared from a different proportion of wood apple and guava juice recorded enhanced parameters in treatment T_6 [wood apple (75%): guava (25%)] with TSS (65.96 to 69.96^{0}B) pH (2.22 to 3.17), Titratable Acidity (0.33 to 0.65 %), moisture (22.74 to 25.73 %), Total Sugars (49.94 to 53.30 %) and Ascorbic Acid (7.77 to 4.20 mg/100g), whereas, sensory attributes of jelly cubes prepared with treatment T_6 [wood apple (75 %): guava (25 %)] showed better organoleptic properties. The above study suggests that under-exploited fruit crops such as wood apple and enhancing their value through Post-harvest management, value addition, and marketing for improving nutritional and livelihood security has garnered more considerable limelight to it. Considering the high rising global demand for processed food and India's conductive geo-climatic conditions, improved technology of wood apple and guava fruit production is of more excellent value given for the Indian farmers which in turn fetches foreign currency to India as well as it will help in prospering our domestic economy and livelihood of farmers. Hence we can draw that blending guava and wood apple jelly cubes on a large scale will prove to be essential and beneficial.

Table 2: Effect of different proportions of wood apple and guava juices on the organoleptic characters of jelly cubes

Treatment	Observations				
	Colour	Flavour	Taste	Texture	Overall acceptability
T_1	8.3	8.1	7.2	8.5	8.1
T_2	8.1	8.6	7.7	8.6	8.6
T_3	7.1	7.8	7.0	8.0	8.0
T_4	8.2	8.2	7.2	8.2	8.2
T_5	8	8.2	7.2	8.1	8.2
T_6	8.8	8.8	7.8	8.8	8.8
T_7	8.4	8.4	7.4	8.3	8.4
T_8	8.6	8.1	7.1	8.2	8.2
T_9	8.5	8.0	7.5	7.9	8.5

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