

Nutritional and sensory qualities of jack fruit jam

S. JAYASHREE AND D.H. JAYASHEELA

The study aimed to develop jackfruit jam and to evaluate sensory and nutritional parameters. Jams were prepared with different variations in sugar content (T_1 , T_2 , T_3 , and T_4). Statistical analysis was done to find the significant difference in sensory parameters in different treatments. The results show that there is no significant difference at ($P>0.05$) between different jackfruit jam *i.e.* T_1 , T_2 , T_3 and T_4 for quality attributes of colour/appearance, texture and taste. However, significant difference ($P>0.05$) was found for overall acceptability. According to nutritional analysis TSS content varied from 65.56 ± 0.03 to 71.15 ± 0.05 . Titratable acidity of the products varied from 0.53 ± 0.01 to 0.63 ± 0.01 . The ascorbic acid content was 2.07 ± 0.03 in T_2 and 4.56 ± 0.20 in T_4 product. Total sugar content of developed products varied from 40.67 ± 0.09 to 54.44 ± 0.11 . Non reducing sugars (%) content was highest in T_1 (55.16 ± 0.21) and lowest in T_3 (37.7 ± 0.06). The results showed that the developed jackfruit jam of different combinations with respect to sugar is found to be acceptable by consumers with regard to overall acceptability.

Key Words : Jack fruit, Jam, Sensory evaluation, Nutritional evaluation

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INTRODUCTION

Jackfruit (*Artocarpus heterophyllus* Lam.) is the largest tree borne fruit in the world, reaching upto 50 kg in weight and 60-90 cm in length. It belongs to the family Moraceae. Jackfruit contains vitamin A, vitamin C, thiamin, riboflavin, calcium, potassium, iron, sodium, zinc, and niacin among many other nutrients. Jackfruit has a low caloric content where 100 g of jackfruit only contains 94 calories (Mukprasirt and Sajjaanantakul, 2004). The fruit is a rich source of potassium with 303 mg / 100 g of jackfruit. Studies show that food rich in potassium helps to lower blood pressure. Jackfruit is also a good source of vitamin C which is an antioxidant that protects the

body against free radicals, strengthens the immune system, and keeps the gums healthy (Umesh *et al.*, 2010).

The research on the utilization of jack fruits and jack fruits value added and jack fruits blended value added products are very scant. Keeping this in view, the present investigation was carried to develop jack fruit jam and analyze the nutritional and sensory qualities of jack fruit jam.

METHODOLOGY

Collection of fruits :

Well matured, ripened and sound fruits were used during this study. The fruits were procured from the local market of APMC, Shivamogga.

Methodology of preparing jam : (Fig. A)

Nutritional evaluation :

Total soluble solids (TSS) :

The TSS of jack fruit jam of different combinations were measured using Digital pocket Atago Hand

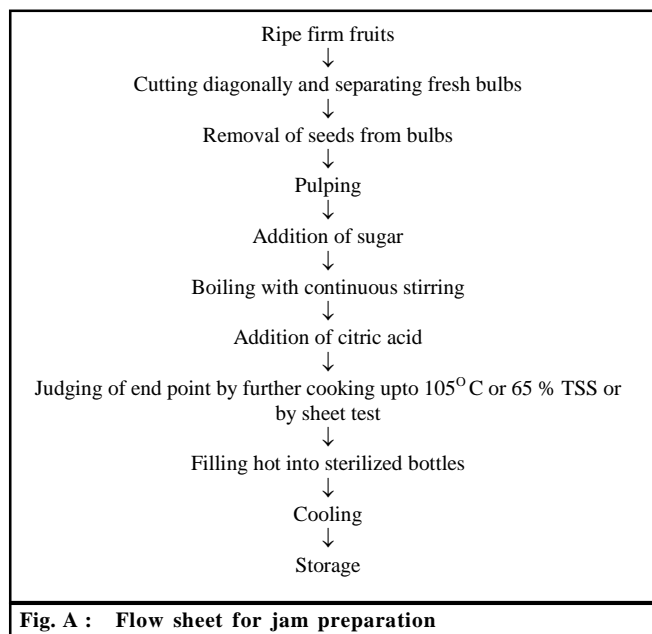
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Refractrometer (Model:PAL 3). and expressed as degree Brix (°B).

Titration acidity :

Titration acidity of jackfruits and jam samples were determined by visual titration method (Ranganna, 1995).

Preparation of sample :

Ten g of sample was taken in a 100 ml beaker and a little quantity of distilled water was added to it. The pulp was boiled for 1 hour frequently replacing the water which was lost due to evaporation. The pulp was filtered using Whatman No. 4 filter paper and the filtrate was used for analysis.

Procedure :

Ten ml of filtrate was taken in a conical flask and titrated against 0.1N NaOH solution using 1 or 2 drops of phenolphthalein indicator. Formation of pink colour was recorded as the end point of filtration. Then, the acidity expressed as the percentage of anhydrous citric acid was

calculated as follows:

Calculation:

$$\text{Titration acidity \%} = \frac{\text{Titre value} \times N \text{ of NaOH} \times \text{Volume} \times \text{Equivalent Weight made up of citric acid}}{\text{Aliquot taken for titration} \times \text{Weight of sample}} \times 100$$

Ascorbic acid :

Ascorbic acid of jack fruit jam was determined by 2, 6-dichlorophenol indophenols visual titration method (Ranganna, 1995).

Preparation of 2, 6-dichlorophenol indophenols dye solution :

In a beaker, 52 mg of 2, 6-dichlorophenol indophenols dye and 42 mg of sodium bicarbonate were dissolved using 150 ml hot distilled water. Then, the volume was made upto 200 ml with distilled water.

Preparation of 4 per cent oxalic acid :

Fourty g of oxalic acid was dissolved in 900 ml distilled water. Then, the volume was made upto 100 ml with distilled water.

Standard ascorbic acid :

Fifty mg of L-ascorbic acid was dissolved in a small quantity of 4 per cent oxalic acid in a 50 ml volumetric flask and the volume is made upto 50 ml with 4 per cent oxalic acid. 10 ml of this stock solution was diluted to 100 ml using 4 per cent oxalic acid. Therefore, the standard ascorbic acid contained 0.1 mg of ascorbic per ml of solution.

Standardization of dye :

One ml of standard ascorbic acid solution and 5 ml of 4 per cent oxalic acid were taken in a conical flask and titrated against the dye solution. The end point was light pink colour which persisted for atleast 5-10 seconds. The dye factor was then calculated as:

$$\text{Dye factor} = 0.1 / \text{Titre value}$$

| Sr. No. | Ingredients | T ₁ | T ₂ | T ₃ | T ₄ |
|---------|---------------------|----------------|----------------|----------------|----------------|
| 1. | Jack fruit pulp (g) | 500 | 500 | 500 | 500 |
| 2. | Sugar (g) | 500 | 375 | 300 | 325 |
| 3. | Citric acid (g) | 2.5 | 2.5 | 2.5 | 2.5 |
| 4. | Sodium benzoate (g) | 1.2 | 1.2 | 1.2 | 1.2 |

Preparation of sample :

Ten g of sample was taken in a 100 ml volumetric flask and 50 ml of 4 per cent oxalic acid was added. The sample was thoroughly mixed and the volume was made up to the mark using 4 per cent oxalic acid. The solution was filtered using Whatman No. 4 filter paper and the filtrate was used for analysis.

Procedure :

Ten ml of ascorbic acid extract was taken in a conical flask and titrated against the standard dye solution. The end point was light pink colour that persisted for 5-10 seconds.

Calculation :

$$\text{Ascorbic acid, mg/100 g} = \frac{\text{Titre value} \times \text{Dye factor} \times \text{Volume made up}}{\text{Volume taken for titration} \times \text{Weight of the sample}} \times 100$$

Sugars :

Sugars present in jack fruit jam was estimated by following the method outlined by Lane and Eymon (1923).

Preparation of sample :

Ten g of sample was blended with 80 ml distilled water in a 100 ml volumetric flask and the sample was neutralized with 1N NaOH using phenolphthalein indicators. This solution was boiled gently for 1 hour with occasional stirring. Boiling water was added to maintain the original level. It was cooled and transferred to 100 ml volumetric flask, volume was made up using distilled water and was also filtered through Whatman No.4 filter paper. From this solution, 50 ml was pipetted out in to a 250 ml volumetric flask, 100 ml water and 2 ml lead acetate was added and was allowed to stand for 10 minutes. Then the excess lead was precipitated by adding 1.8 ml potassium oxalate solution. It was made upto mark with distilled water and filtered through Whatman No. 4 filter paper and the filtrate was used for analysis.

Procedure :

Ten ml of Fehling's solution (Fehling's No. 1 (25 ml) + Fehling's No. 2 (25 ml) with 25 to 50 ml of distilled water was taken in a conical flask, heated to boil and titrated against the filtrate sample using methylene blue as an indicator. The end point of titration was brick red colour. The reducing sugar was calculated using equation.

Calculation :

$$\text{Reducing sugar (\%)} = \frac{0.05 \times \text{Volume made up}}{\text{Titre value} \times \text{Weight of sample}} \times 100$$

Total sugars :

Fifty ml of the filtrate (prepared for reducing sugar estimation) was hydrolyzed with 10 ml of 6 N HCl at room temperature for 24 hours in 250 ml volumetric flask. Add 4 drops of phenolphthalein indicator to hydrolyzed sample and was neutralized with 10 per cent NaOH and the volume was made up to 250 ml with distilled water. Since all the sugars present in the sample were now converted to reducing sugars, estimation of reducing sugars in the aliquot as explained in the previous section gave the total sugar present.

Calculation :

$$\text{Total sugar (\%)} = \frac{0.05 \times \text{Volume made up} \times 100}{\text{Titre value} \times 25 \times \text{Weight of sample}} \times 100$$

Non-reducing sugars :

The non-reducing sugar contents of the jack fruit jam samples were determined by method of difference as:

$$\text{Non-reducing sugars} = \text{Total sugars} - \text{Reducing sugars}$$

Sensory evaluation of jack fruit jam :

Prepared jack fruit jams of different combinations (4 products using different sugar concentration) were evaluated by a panel of 10 judges for sensory attributes such as colour/appearance, texture, taste (aroma and sweetness) and overall acceptability in order to identify best one sample. Numerical scoring method with maximum 9 point hedonic scale (Lim, 2011) was adopted for evaluating the products and the samples were ranked for quality parameters from higher to lower in descending order of acceptability.

Statistical analysis :

The experimental data were analyzed as per the statistical design using the ARIS computer facility of College of Agriculture, Shivamogga to study the main treatment effects (Sundaraja *et al.*, 1972). The limit of probability fixed for the test of significance was $P = 0.05$.

OBSERVATIONS AND ASSESSMENT

Table 1 shows the average score obtained by the four jam products for colour/appearance, texture, taste and overall acceptability.

The product T₁ was found to be superior in all quality parameters that is colour/appearance, texture, taste and over all acceptability. However the overall acceptability score of developed products varied from 7.2 to 8.00. All the products were acceptable. T₁ was highly acceptable followed by T₄. The product T₄ had higher score for texture and taste as compared to other products.

The results also show that there is no significant difference at (P>0.05) between different jackfruit jam *i.e.* T₁, T₂, T₃ and T₄ for quality attributes of colour/appearance, texture and taste.

However, significant difference (P>0.05) was found for overall acceptability stating that there is a difference between the products for overall acceptability.

Nutritional qualities of developed products are presented in Table 2. The TSS content varied from 65.56 ± 0.03 to 71.15 ± 0.05. According to Indian Standards, the TSS of jam should not be less than 68.0 % (BIS 5861, 1993). Further, as per the Food Safety and Standards Regulation, 2010, the TSS of jam should not be less than

65.0%. Taking these standards in to consideration, the developed T₁, T₃ and T₄ had appreciable TSS levels in the present study.

Titrateable acidity of the products varied from 0.53±0.01 to 0.63±0.01. However, Eke-Ejiofor and Owuno (2013) has reported the titrateable acidity of jackfruit jam to be 0.31/100g. Goswami *et al.* (2011) found the value of total acidity of five different varieties of fresh jackfruit to be high ranging from 0.04-0.91%. The importance of high acidity in developed food products shows it can be stored for some time. The higher acidity in the study sample may be due to higher acidity of the fresh jackfruit used. However, the Ascorbic acid content was 2.07±0.03 in T₂ and 4.56±0.20 in T₄ product. Sharma *et al.* (2011) has reported ascorbic acid of quince jam as 11.20mg/100g. Vitamin C is an antioxidant that protects the body against free radicals, strengthens immune system and keeps gums healthy (Umesh *et al.*, 2010). Frequent consumption of jackfruit and jackfruit jam will help the body develop resistance against infectious agents and scavenge harmful free radicals.

Total sugar content of developed samples varied from 40.67±0.09 to 54.44±0.11. Non reducing sugars (%) content was highest in T₁ (55.16±0.21) and lowest in T₃

Table 1 : Organoleptic scores of jackfruit jam for various sensory attributes

| Treatments | Quality parameters | | | |
|----------------|--------------------|---------|-------|-----------------------|
| | Colour | Texture | Taste | Overall acceptability |
| T ₁ | 8.3 | 8 | 8.2 | 8 |
| T ₂ | 7.4 | 7.1 | 7.1 | 7.2 |
| T ₃ | 7.6 | 7.3 | 7.1 | 7.4 |
| T ₄ | 7.2 | 7.6 | 7.8 | 7.5 |
| Mean | 7.6 | 7.5 | 7.6 | 7.5 |
| F value | 2.39 | 1.55 | 2.88 | 1.20 |
| C.D. (P=0.05) | 0.88 | 0.89 | 1.01 | 0.88 |
| P value | 0.24 | 0.08 | 0.16 | 0.05 |
| S.E.± | 0.31 | 0.31 | 0.32 | 0.31 |

Table 2 : Nutritional qualities of jack fruit jam

| Constituents | Treatments | | | |
|-------------------------|----------------|----------------|----------------|----------------|
| | T ₁ | T ₂ | T ₃ | T ₄ |
| TSS (°B) | 71.15 ± 0.05 | 61.6 ± 0.10 | 66.1 ± 0.45 | 65.56 ± 0.15 |
| Titrateable acidity (%) | 0.53 ± 0.01 | 0.56 ± 0.01 | 0.63 ± 0.01 | 0.56 ± 0.01 |
| Ascorbic acid (mg/100g) | 3.60 ± 0.10 | 2.07 ± 0.03 | 3.60 ± 0.10 | 4.56 ± 0.20 |
| Total sugar (%) | 58.44 ± 0.11 | 53.72 ± 0.98 | 40.67 ± 0.09 | 43.85 ± 0.11 |
| Reducing sugar (%) | 3.28 ± 0.12 | 2.70 ± 0.20 | 2.93 ± 0.05 | 9.66 ± 0.05 |
| Non reducing sugar (%) | 55.16 ± 0.21 | 51.02 ± 0.89 | 37.7 ± 0.06 | 40.59 ± 0.07 |

Values are Mean ± SD.

(37.7±0.06).

Conclusion:

The developed jackfruit jam of different combination with respect to sugar is found to be accepted by consumers with regard to overall acceptability. There was significant difference stating there is a difference in different combination of sugars in development of jam for overall acceptability.

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