

## Physico-Chemical and Sensory Qualities of Different Value Added Products of Jack Fruit (*Artocarpus heterophyllus*) in Hill Zone

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Received 14 March 2018 ; Accepted 13 April 2018 ; Published on 30 April 2018

**Abstract** The study on value addition in jack fruit was conducted during the year 2008-2009. The different products prepared were Jam, Jelly, Candy, Crystalized, Glazed fruit and sweet chutney. After the six months of preservation and storage the organoleptic evaluation was carried out for each product. The physical characteristic like, weight, shape, taste, color, firmness, appearance, decay were evaluated and chemical compositions like total soluble solids, titratable acidity, ascorbic acid, moisture content, ash, total sugar were analyzed. Sensory attributes such as appearance, shape, taste, color, firmness and decay were evaluated by a panel of 10 experts. There were significant differences with different products. As per the observation, the different value added products were acceptable and maintained good in condition. Out of the different products prepared, crystallized and glazed fruit were having high organoleptic value (10.00 points) compared to all other products. The jam and jelly slightly decreased in their firmness as the period of storage increased.

**Keywords** Jam, Jelly, Chutney, Crystallized, Glazed.

### Introduction

The jack fruit tree (*Artocarpus heterophyllus*) belong to family Moraceae. It is native to part of South and South East Asia (Rahman et al. 1995) and is believed to have originated in the south western rain forest of India, in present day Kerala, Coastal Karnataka and Maharashtra. The jack fruit tree is widely cultivated and popular food item in tropical regions of India, Bangladesh, Nepal, Srilanka, Cambodia, Vietnam, Thailand, Malaysia, Indonesia and Philippines.

Jack fruit is known for having a distinct aroma due to different volatile compounds like esters and alcohols. It is reported to contain high levels of protein, starch, calcium and thiamine (Burkill 1997). It is also rich in energy, dietary fiber which makes it a good bulk laxative. The fiber content helps to protect the colon mucous membrane by decreasing exposure time and as well as binding to cancer causing chemicals in the colon (Morton 1987). Jack fruits are commonly used in South and South-East Asian countries. It can be eaten raw when ripe, but as the raw unripe fruit it is considered inedible.

Ripe jack fruit is naturally sweet with subtle flavoring. It can be used to make a variety of dishes including custards, cakes, halwa, ice cream. The matured and immatured jack fruit are used for the preparation of chutney, pickle, sambar, papad and palva in different parts of the world.

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**Table 1.** Physico-chemical characteristics of different value added products of jack fruit after six month of storage period.

| Products           | TSS (%) | Titra-<br>table<br>acid<br>(mg/<br>100 g) | Ascor-<br>bic<br>acid<br>(mg/<br>100 g) | Ash<br>(%) | Mois-<br>ture<br>(%) | Total<br>sugar<br>(mg/<br>100 g) | pH    |
|--------------------|---------|---|---|------------|----------------------|----------------------------------|-------|
| Fresh jack fruit   | 21.70   | 0.065                                     | 0.099                                   | 0.45       | 74.50                | 24.10                            | 5.58  |
| Jam                | 56.00   | 0.414                                     | 0.040                                   | 0.30       | 24.80                | 48.10                            | 3.38  |
| Jelly              | 30.00   | 0.321                                     | 0.038                                   | 0.27       | 26.40                | 38.40                            | 4.26  |
| Sweet chutney      | 42.00   | 1.842                                     | 0.088                                   | 0.40       | 28.40                | 22.10                            | 2.66  |
| Candy              | 65.00   | 0.246                                     | 0.066                                   | 0.50       | 16.40                | 58.10                            | 5.68  |
| Crystallized fruit | 65.00   | 0.226                                     | 0.044                                   | 0.44       | 13.40                | 60.10                            | 6.66  |
| Glazed fruit       | 66.00   | 0.227                                     | 0.038                                   | 0.44       | 13.40                | 62.10                            | 6.58  |
| F-test             | *       | *   | *                                       | NS         | *                    | *                                | *     |
| SEm±               | 5.23    | 0.051                                     | 0.005                                   | 0.391      | 1.421                | 3.881                            | 0.421 |
| CD @ 1%            | 13.08   | 0.131                                     | 0.013                                   | 0.980      | 3.421                | 10.091                           | 1.091 |

Many products could be made from ripe jack fruit like nectar, jam, chips and canning. When ripe, jack fruit contains about 7–15% weight sucrose with a very specific aroma and taste. This aromatic fruit is usually consumed fresh. Unfortunately the shelf-life of the ripe jack fruit pulp is only about two days under room condition and the pulp will start to wither and rot thereafter. Being aware to this fact local people has transformed the fruit pulp into various food products to improve its economic values. Being highly seasonal, there is a glut of these fruits in the market during peak season resulting in reduced price and leading to losses to the growers. Preservation of these jack fruits can prevent huge wastage as well as make them available in the lean season at remunerative prices.

Preparation of value added products is one of the methods of preservation of jack fruit which create an avenue for marketing of the produce by reducing the volume in bulk or glut, easy to transport and adds value in terms of nutritional benefit and economic advantages reduce wastage, labors and storage spaces. Preparation of value added products have longer shelf life than fresh jack fruits. In order to enhance shelf life of jack fruit to augment the availability throughout the year and to create convenience to the users, study has been carried out with an objective to exploring the value added products from jack fruit with physico-chemical and seasonal qualities after storage life.

## Materials and Methods

The raw jack fruits were procured from local market as well as from regional research station, Mudigere. The fully matured ripe fruits selected and cut opened flesh is removed. The different products were prepared using following recipes.

| Pro-<br>ducts              | TSS<br>(°B) | Pulp<br>(%) | Su-<br>gar<br>(kg) | Cit-<br>ric<br>acid<br>(g) | Wa-<br>ter<br>(ml) |
|----------------------------|-------------|-------------|--------------------|----------------------------|--------------------|
| Jam                        | 68          | 1.0kg       | 0.750              | 2.50                       | 250 ml             |
| Jelly                      | 65          | 1.0kg       | 0.750              | 2.50                       | 250 ml             |
| Candy                      | 70          | 40%         | 1.00               | 2.50                       | 250 ml             |
| Crysta-<br>llized<br>fruit | 70          | 35%         | 1.00               | 2.50                       | 250 ml             |
| Glazed<br>fruit            | 70          | 35%         | 1.00               | 2.50                       | 250 ml             |
| Chut-<br>ney               | 50          | 40%         | 0.750              | 2.50                       | 250 ml             |

The procedure for preparation of Jam, Jelly, Chutney, Candy, Crystallized fruit and Glazed fruit were prepared using the procedure as suggested earlier. After the preparation of the different products of jack fruit, 100 ppm KMS added as preservative and kept for storage in the laboratory condition for 6 months. Storage samples were drawn for testing the physico-chemical parameters.

Moisture content and ash was determined (AOAC 1990). Total soluble solids (°Brix) was deter-

**Table 2.** Organoleptic evaluation (score 1–10) of value added products of jack fruit after six months of storage period.

| Jack fruit products | Appearance | Shape | Taste | Color | Firmness | Decay | Weight | Shrivelled | Total score |
|---------------------|------------|-------|-------|-------|----------|-------|--------|------------|-------------|
| Jam                 | 9.00       | 8.00  | 9.00  | 8.00  | 8.00     | 8.00  | 8.00   | 8.00       | 8.25        |
| Jelly               | 9.00       | 8.00  | 9.00  | 8.00  | 8.00     | 7.00  | 9.00   | 7.00       | 8.13        |
| Sweet chutney       | 8.00       | 9.00  | 8.00  | 8.00  | 8.00     | 8.00  | 8.00   | 8.00       | 8.12        |
| Candy               | 10.00      | 10.00 | 9.00  | 10.00 | 10.00    | 9.00  | 9.00   | 9.00       | 9.50        |
| Crystallized fruit  | 10.00      | 10.00 | 10.00 | 10.00 | 10.00    | 10.00 | 10.00  | 10.00      | 10.00       |
| Glazed fruit        | 10.00      | 10.00 | 10.00 | 10.00 | 10.00    | 10.00 | 10.00  | 10.00      | 10.00       |
| F-test              | *          | *     | *     | *     | *        | *     | **     | **         | **          |
| SEm±                | 0.842      | 0.912 | 0.920 | 0.892 | 0.848    | 0.797 | 0.880  | 0.799      | 0.892       |
| CD @ 1%             | 2.112      | 2.280 | 2.300 | 2.110 | 2.470    | 2.107 | 2.421  | 2.112      | 2.230       |

mined using a hand refractometer, pH was determined using a digital pH meter (Model MKVI). Total Titratable Acidity (TTA) was determined by standard method (Table 1). The sensory evaluation was done using a 10 points hedonic scale to rate for color, taste, texture, appearance, aroma, spreadability and overall acceptability as described by Larmond (1977). The products were ranked for quality parameters, from higher to lower descending order of acceptability. Color, flavor, taste, decay, gloss, firmness, uniformity of shape, shrivels and overall acceptability of the fruit was determined by visual assessment.

The data pertaining to physiological and biochemical parameters of the fruits were subjected to statistical analysis of FCRD using analysis of variance (ANOVA). The level of significance used in F test and t test was  $p \leq 0.05$ . Critical difference values were calculated wherever the F test was found significant.

## Results and Discussion

Among the value added products of jack fruit, glazed fruits had highest TSS (66.00%), on par with crystallized fruits (65.00%), candy (65.00%) and jam (56.00). Whereas, fresh jack fruit had lowest TSS (21.70%). Titratable acid was ranging from 0.065 mg/100g in fresh jackfruit to 1.842 mg/100 g in sweet chutney. Highest ascorbic acid was found in fresh jack fruit (0.099 mg/100 g) and it was on par with sweet chutney (0.088 mg/100 g) and the lowest was in jelly and glazed fruit (0.038 mg/100 g).

Ash content was highest in candy (0.50%) and was lowest in jelly (0.27%). Lowest moisture content was found in crystallized and glazed fruits (13.40%), whereas fresh jack fruit had highest moisture content (74.50%). The difference in the moisture content between processed and unprocessed jack fruit is because of the heating process involved in the processed jack fruit products. Moisture content has a great impact on the shelf life of the products (Eke-Ejiofor and Owuno 2013). Total sugar was found highest in glazed fruits (62.10 mg/100 g) on par with crystallized fruit (60.10 mg/100 g) and candy (58.10 mg/100 g). Whereas, sweet chutney had lowest (22.10 mg/100 g). pH was highest in crystallized fruit (6.66) on par with glazed fruit (6.58) and candy (5.68). Whereas lowest was found in sweet chutney (2.66). The pH of the product is import factor to obtain optimum gel condition in jam and jelly (Imtiaz and Iftikhar 2010).

The organoleptic evaluation of the value added product showed that, appearance, shape, taste, color, firmness and weight were found to be good, after six month of storage (Table 2). The product like crystallized and glazed fruit had higher organoleptic value (10.00 points) followed by candy (9.50 points). The percentage of decay and shrivelling is less in all the products. Slight decrease in color, firmness, weight and shrinking in jam, jelly and sweet chutney was observed as they are semi solid in condition.

## Conclusion

The result of the present study have shown that, jack

fruit and its products have a good content of sugar, total soluble solid, ash, total acidity and products ability to store for a longer time. Therefore, the value added products of jack fruit reduces postharvest losses due to its perishability. Suitable longer preservation of the product is possible if candy, crystallized fruit and glazed fruit are prepared from ripe jack fruit.

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