

PROCESS TECHNOLOGY FOR PREPARATION OF JAMUN JAM AND SQUASH AND QUALITY EVALUATION

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Abstract: Jamun has a shelf life of 2-3 days only, it is harvested and marketed daily under unhygienic conditions which further reduces its self life. To make this jamun fruit available in off season we have to preserve it. The jamun jam was preserved by boiling fruit pulp with sugar to a consistency of 68-70% TSS. Jamun squash was prepared by adding sugar syrup of 45% TSS to the juice and the cooled. Jamun jam and squash was stored for a period of 4 weeks, then the variations in protein content, ascorbic acid content, carbohydrates, and total lipids of jamun jam and squash was observed. The quality parameters remained constant and these parameters was similar to that of fruit except that of carbohydrate content of jam which was 58% compared to 17% in the fruit.

Keywords: Jamun jam, Jamun squash, Preservation of Jamun jam, Squash

INTRODUCTION

Jamun (*Syzygium cumini* L) is an important underutilized fruit of Indian origin; it is an evergreen tropical tree which belongs to the flowering plant family of Myrtaceae. It is also known as jambu, jambula, jamboola(1).

Jamun trees start flowers from March to April. The flowers of jamun are fragrant and small, about 5 mm in diameter. The development of fruit takes place by May or June and resemble large berries. A jamun tree yields 80 to 100 kg of fruit. The fruit is oblong, ovoid, starts green and turns pink to shining crimson black as it matures. The fruit is harvested in June – July months. These are non cliometric fruits. The ripe fruits drop from the tree and are collected by spreading a blanket or canvas under a tree. Harvesting can also be done manually by hand-picking as well as by shaking the tree(2). The flower and fruit drop are main problems of jamun with only 12-15% of flowers reaching maturity.

The fruit has received more recognition in folk medicine and in pharmacy. Jamun is a healthy fruit with absolutely no trace of sucrose. It is therefore, the only fruit with minimum calories. Not only the fruit, but the seed and also the leaves and bark of the jamun tree are believed to have medicinal properties (3). The acidic, sour, sweet, and soothing fruit is used to treat diabetes, diarrhoea and ringworm. In fact, a mixture of equal quantities of jamun and mango juice is said to be an ideal drink for diabetics. The main problem with the fruit is the shelf life of jamun, it has a shelf life of 2-3 days only, and it is harvested and marketed daily under unhygienic conditions which further reduce its shelf life. Researchers reported that

pre-cooled jamun fruit in perforated polythene bags can be stored for 6 days at room temperatures, and or 21 days at low temperature of 9 °C and 85-90% relative humidity.

To make this jamun fruit available in off season we have to preserve it. The various preservation techniques can be used such as, modified atmospheric packaging, by preparation of jam, by preparation of jelly, by preparation of squash. The shelf life of jamun can be increased by one month by using modified atmospheric packaging and the advantage with this technique is we get the fruit with farm freshness. But by preparing jam, squash and jelly we can make available the fruit for more than one year. By preparation of jamun jam and squash we are adding value to the fruit and increasing the income of the farmer and also making the fruit with its medicinal properties available in the market throughout the year to diabetic patients and the people. The present study was undertaken to determine the self life of jamun products such as jamun jam and jamun squash by quality parameters.

MATERIAL AND METHOD

Preparation of jamun jam and squash

Jamun jam was prepared by cooking 560g of sugar with 560 g of jamun pulp. Where as jamun squash was prepared by 600g of sugar syrup with 600g jamun juice. For preparation of jamun jam and juice the fruit is first washed and then boiled in equal amounts of water to soften the pulp. The cooked jam was made into fine pulp by mashing and the seeds was removed, the pulp was made into fine pulp by using grinder. For the preparation of jam sugar was

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added to the pulp and cooked to the consistency of 68-70% TSS of jam. But for squash preparation 600g of sugar was dissolved in 1liter of water and it was boiled to get a consistency of 40-50% TSS. Finally

citric acid and sodium benzoate were added for jam and squash and filled hot in sterilized bottles. The sequential steps involved in preparation of jamun jam and squash are given below fig.

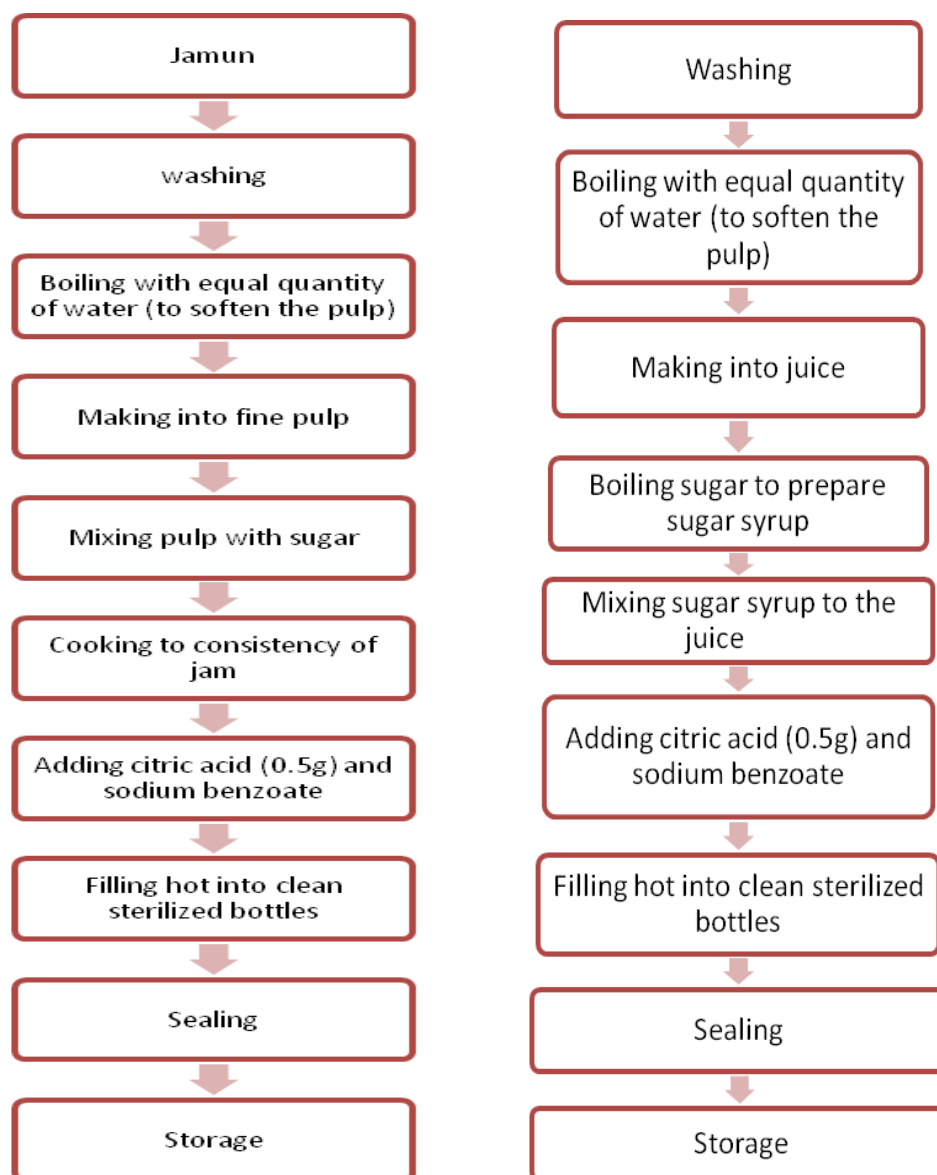


Fig: Flowchart for preparation of jamun jam and squash

Determination of proteins, carbohydrates, ascorbic acid, lipids

Estimation of total carbohydrates (phenol sulphuric acid method) Reagents required

1. Phenol 5%: redistilled (reagent grade) phenol (50g) dissolved in water and diluted to 1 liter.
2. Sulphuric acid (96%) reagent grade.
3. Standard stock: 100mg glucose in 100ml of water.
4. Working standard: 10ml of stock diluted to 100ml with distilled water.

METHODOLOGY

Sample weighing 1000 mg was taken in a boiling tube and it was hydrolyzed by keeping it in water bath for three hours with 5 ml of 2.5 N HCl and was cooled to room temperature. The solution was neutralized by adding sodium carbonate until the effervescence ceased. Now the neutralized solution was made to 100 ml using distilled water and solution was centrifuged at 5000 rpm for 5 minutes. 0.2 ml of centrifuged extract was pipetted in a test tube and made to 100 ml using distilled water. 1 ml of 5 % phenol reagent and 5 ml of sulphuric acid was added. Test tubes were put in water bath at 25-30 °C

for 20 min. the optical density at 490 nm was measured using a spectro-photometer. The amount of total carbohydrate present in the sample was calculated with the help of standard curve for carbohydrates.

Amount of carbohydrate present in 100 mg of the sample =

$$\frac{\text{mg of glucose}}{\text{volume of test sample}} \times 100$$

Estimation of protein (Lowry's method 1951)

Reagents required

1. Reagent A: 2% sodium carbonate in 0.1N sodium hydroxide.
2. Reagent B: 0.5% copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in 1% potassium sodium tartarate (Rachelle salt).
3. Reagent C: Alkaline copper solution: Mix 50 ml of reagent A and 1 ml of reagent B prior to use.
4. Reagent D: Folin and Ciocalteu (2N) phenol reagent. (Readily available).
5. Solution A: Protein solution (Stock standard)
6. Solution B: Working standard

METHODOLOGY

Extraction of protein from sample

Protein was extracted from the sample using buffer solution. 500 mg of sample was weighed and was ground well in mortar and pestle in 10 ml of buffer solution. The extract was centrifuged and supernatant was used for protein estimation.

Estimation of protein

0.1 ml of centrifuged extract was taken into test tube and volume was made to 1 ml by adding 0.9 ml of distilled water. 5 ml of reagent C was added to test tube and allowed to stand for 10 minutes. 0.5 ml of reagent D was added to the test tube and was allowed to incubate in dark for 30 minutes. Optical density readings were taken at 660 nm. The protein was calculated using standard curve for protein.

Estimation of ascorbic acid

Reagents Required

1. Oxalic acid (4%).
2. Dye solution: 2, 6 Dichloro phenol indophenol dye solution: - Weigh 42mg of sodium bicarbonate. Add 52mg of dye to dissolved solution. Make up the volume to 200ml with distilled water.
3. Stock standard solution: Dissolve 100mg pure ascorbic acid in 100ml of 4% oxalic acid.
4. Working standard: Dilute 10ml of the stock solution to 100ml with 4% oxalic acid. The concentration of working standard is 100µg/ml.

METHODOLOGY

500 mg of sample was weighed and homogenized in 5 ml of 4% oxalic acid and centrifuged in a

centrifuge and the supernatant was collected in a beaker and it was made up to 100 ml using 4 % oxalic acid. Charcoal was added to decolorize the solution. 5 ml of the supernatant solution was taken in a porcelain basin and 10 ml of oxalic acid was added to it. The contents in porcelain basin were titrated against the dye until the end point of light pink color appeared. The amount of dye was noted down.

Estimation of lipids (Bligh and Dryer method)

Reagents required: Solvent mixture: chloroform and methanol (2:1) (v/v).

METHODOLOGY

In Bligh and Dryer method, a mixture of chloroform and methanol (2:1 v/v) was used. The sample about 1 g weight was first ground in a pestle and mortar with about 10ml distilled water. The pulp was transferred to conical flask (250 ml capacity) and 30ml of chloroform-methanol mixture was added and mixed well. For complete extraction, it was kept overnight at room temperature, in the dark. At the end of this period, 20ml chloroform and 20ml water was added. The resulting solution was centrifuged, 3 layers were seen. A clear lower layer of chloroform containing all the lipids, a colored aqueous layer of methanol with all water soluble material and a thick pasty interface were seen.

The methanol layer was discarded and the lower layer was carefully collected free of interphase either by sucking out with a fine capillary or by filtration through glass wool. The organic layer from either of the extraction method was taken in a pre-weighed or vial and carefully evaporated. Sample was covered with a dark paper to protect from light. This was done because some lipids get polymerized or decomposed on exposure to light, heat and oxygen.

When the solution was free of organic solvents, the weight was determined again. The difference in weight gave the weight of the lipids. The results are expressed in terms of weight in milligrams of total lipid per gram of fresh sample.

RESULT AND DISCUSSION

In this chapter the effect of shelf life on protein content, carbohydrates, ascorbic acid and total lipids of jamun jam and squash are discussed. And also these parameters are determined for fruit pulp and compared with value added products of jamun i.e. jam and squash.

Initial values of protein content, carbohydrates, ascorbic acid, total lipids and pH of the fresh jamun fruit, jam and squash

It was observed that the ascorbic acid decreased in jam and squash than in fresh fruit, this deterioration may be because ascorbic acid deteriorates by application of heat. As the jam is boiled ascorbic acid

content is less than fresh fruit and as jam is more concentrated than squash, the ascorbic content in jam is more than squash. From the results it was observed that there is little decrease in protein content in jam and squash than in fresh fruit. As the jam is more concentrated than squash, the protein content is more than squash. There is negligible change in protein content due to processing of fruit. The carbohydrate content is very high in jam than in fresh fruit because of addition of sugar in preparation of jam. In squash the carbohydrate content is less than fruit and jam, this may be because the sugar added is in diluted form and it is not as concentrated as jam. The jam

contained 58.11 % of carbohydrates compared to 15.89% and 5.60 % of fruit and squash respectively. As it is well known that total lipids or fat content in the fruit is very less, the products of the fruit showed similar results. Total lipids decreased in the processed products than in fruit. The pH of the fruit and its products showed that the fruit and its products were acidic in nature. The pH of fruit was 3.71 while that for jam and squash was 4.01 and 3.19. Squash showed more acidity than jam and fruit.

The initial values of protein content, carbohydrates, ascorbic acid, total lipids and pH of the fresh jamun fruit, jam and squash are presented in Table 1.

Table 1. Ascorbic acid, protein, carbohydrate, lipids and pH of the fruit and its products

PRODUCTS	Ascorbic acid (mg/100g)	Protein (%)	Carbohydrates (%)	Lipids (%)	pH
Fruit	19.16	1.19	15.89	0.253	3.71
Jam	8.86	1.04	58.11	0.1535	4.01
Squash	4.46	0.991	5.60	0.083	3.19

Effect of shelf life on ascorbic acid content of jam and squash

The effect of shelf life on ascorbic acid content of jam and squash is shown in fig. The ascorbic acid content decreased from 8.86 mg/100 g of fresh jam to 8 mg/100 g of jam stored for 4 weeks. While the

ascorbic acid content of squash decreased from 4.46 mg/100 g of fresh squash to 4.28 mg/100 g for squash stored for 4 weeks. The decrease in ascorbic content is because the ascorbic acid deteriorates on storage.

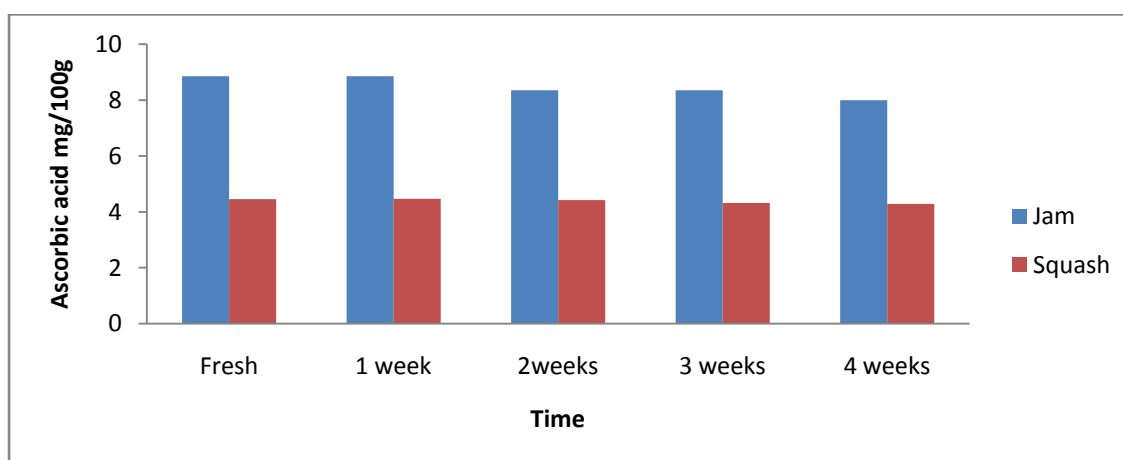


Fig. Effect of shelf life on ascorbic acid content of jam and squash

Effect of shelf life on protein content of jam and squash

The effect of shelf life on protein content of jam and squash is shown in fig.. The protein content did not

change during a storage period of 4 weeks. The protein content of jam remained constant at 1.04% during the storage period of 4 weeks while for squash it decreased from 0.99% to 0.92%.

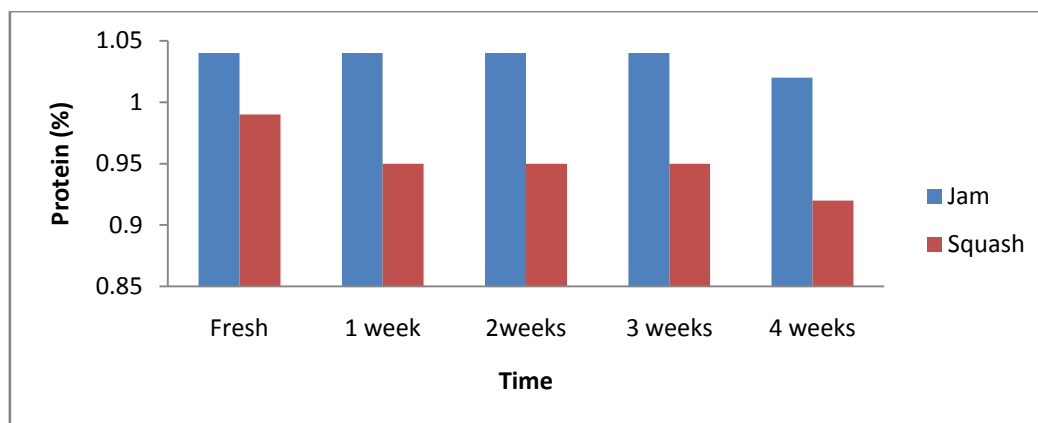


Fig. Effect of shelf life on protein content of jam and squash

Effect of shelf life on carbohydrates of jam and squash

The effect of shelf life on carbohydrates of jam and squash is shown in fig. The carbohydrates did not change during a storage period of 4 weeks for jam,

but it decreased for squash. The carbohydrates of jam remained constant at 58.11% during the storage period of 4 weeks while for squash it decreased from 5.60% to 4.7%.

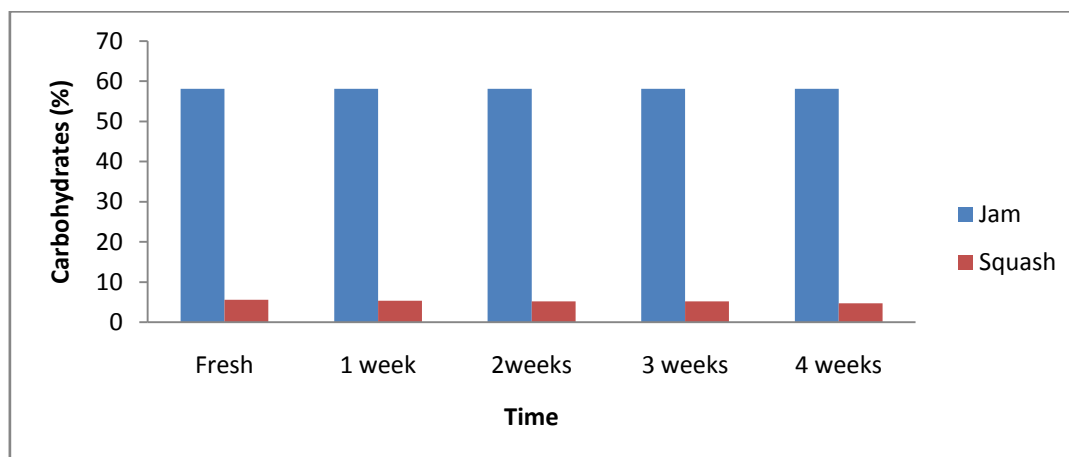


Fig. Effect of shelf life on carbohydrates content of jam and squash

Effect of shelf life on total lipids of jam and squash:

The effect of shelf life on total lipids of jam and squash is shown in fig. The total lipids remained

constant during a storage period of 4 weeks for jam and squash. The total lipids of jam remained constant at 0.1535% during the storage period of 4 weeks while for squash it was at 0.083%.

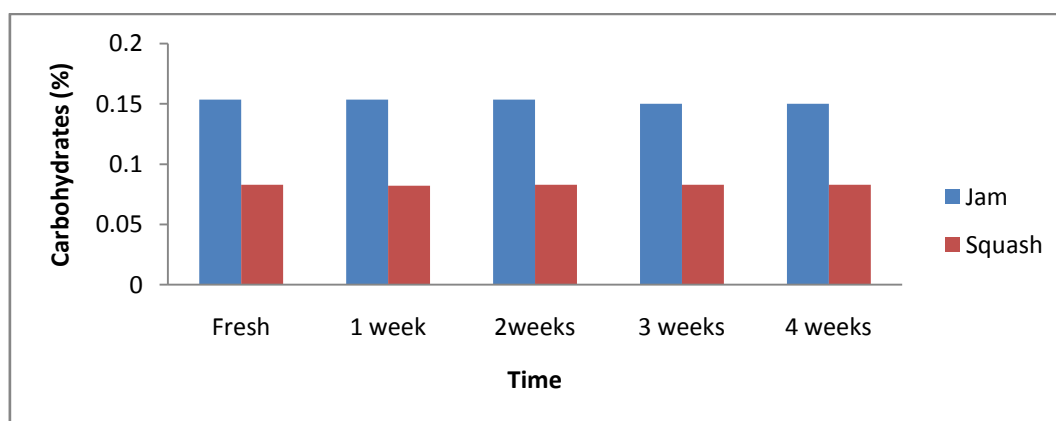


Fig. Effect of shelf life on total lipids of jam and squash

SUMMARY AND CONCLUSION

The jamun jam was prepared by boiling the jamun fruit pulp with sugar to a consistency of 68 – 70 % TSS. Jamun squash was prepared by adding sugar syrup of 45% TSS was added to sugar and then cooled. The data was analyzed for determining the protein content, ascorbic acid content, carbohydrates, total lipids, pH and sensory score of jamun jam and squash.

Based on the results from the present study it can be concluded that jamun squash and jam prepared from jamun fruit showed significantly high acceptability. Utilization of jamun jam and squash can serve as healthy product for diabetic products as it contains an alkaloid, jambosine and glycoside jambolin or antimellin which halts the conversion of starch into sugar.

Therefore it was suggested that jamun fruit up to 100% can be incorporated for preparation of nutritious and acceptable jam and squash. The estimated fruit waste in jamun fruit is around 2 kilo and hence the utilization of jamun seed in the preparation of seed powder will result in fruit waste utilization and also increase value addition of fruit.

REFERENCES

- Pranay, J. and Priyanka, S.** (2015). Antagonistic Activity of Entophytic Fungi Isolated from syzygium cumini skeels. *International journal of Life Sciences Research* vol3, Issue 2, PP: (59-63).
- Tanmay, K., Kalyan, B. and Ram, A.** (2011). Nutracutical Properties of Jamun and its processed products. *Indian Food Industry* 30(3)
- Shahnawaz, M., Sheikh, S.A. and Nizamani, S.M.** (2009). Determination of nutritive values of jamun fruit (eugenia jambolana) products. *Pakistan Journal of Nutrition*. 8 (8): 1275-1280
- Ajenifujah-Solebo So and Jo Aina.** (2011). Physico-Chemical properties and sensory evaluation of jam made from black plum fruit. *African Journal of Food, Agriculture, Nutrition And Development*. 11(3): 34-37.
- Das, J.N.** (2009). Studies on storage stability of jamun beverages. *Indian Journal of Horticulture*. 66(4): 200-203.
- Kannan, S and Susheela Thirumaran, A.** (2004). Studies on storage life of jamun (*Syzygium Cumini Rom*) fruit products. *J. Food Sci and Technol*. 41(2): 186-188.
- Khurdiya, D.S. and Susanta, K. Roy.** (1985a). Processing of jamun (*Syzygium Cuminilinn*) fruit in to a Ready to Serve beverage. *J. Food Sci and Technol*. 22(6): 27-30.
- Khurdiya, D.S and Susanta, K.Roy.** (1985b). Storage studies on jamun (*Syzygium Cuminilinn*) juice and squash. *J. Food Sci and Technol*. 22(6): 217-220.
- Parihar, P., Mandhyan, B. L. and Agarwal, R.** (2000). Studies on the development of process for guava squash. *J. Food Sci and Technol*. 37(6): 636-638.
- Ranganna, S.,** (1997). *Handbook of analysis and quality control of Fruit and vegetable products*, 2nd Edition, Tata Mc-Graw-Hill Publication co., New Delhi
- Shahnawaz, M. and Sheikh, S.A.** (2008a). Study on shelf life of stored jamun fruit products by monitoring microbial growth and sensory excellence. *Journal of Agricultural Research*. 46(4): 520-530.
- Shahnawaz, M. and Sheikh, S.A.** (2011). Analysis of viscosity of jamun fruit juice, squash and jam at different compositions to ensure the suitability of processing applications. *International Journal of Plant Physiology And Biochemistry*. 3(5): 89-94.
- Shahnawaz, M. and Sheikh, S.A.** (2008b). Study on off coloring of jamun fruit. *Journal Of Agricultural Research*. 46(1):23-27.
- Sood, P., Modgil, R. and Sood, M.** (2011). Development and nutritional quality evaluation of wild jamun spinach rts. *Beverage and Food World*: 46-47.
- Srivastava, R.P.,** (2002). *Fruit and Vegetable Preservation*, 3rd edition, International Book Distributing Company., Lucknow.