



## Physio chemical and sensory evaluation of papaya leather

Ankit Singh\*, Jaivir Singh, Neelash Chauhan and Vivak Baliyan

Dept. of Agricultural Engineering and Food Technology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

\*e-mail: rajivjaun@yahoo.com

(Received: August 04, 2015; Revised received: February 15, 2016; Accepted: February 19, 2016)

**Abstract:** Experiments were conducted to develop and evaluate the quality of jaggery based papaya leather. The citric acid levels of 0.5%, 0.75% and 1.0% were used for the preparation of papaya leather. After preparation of papaya leather, the finished products were packed in PET and glass jars. The study revealed that the moisture content increased while TSS and Vitamin-C decreased with increasing the level of citric acid from 0.5 to 1.0%. During storage there was a reduction in moisture content, pH and vitamin-C, where as TSS (total soluble solids) and optical density increased during storage. The organoleptic score of the leather samples in glass jars at 0.75% citric acid level was found to be higher followed by samples packed in PET jars.

**Key words:** acidity, leather, pH, papaya, processing, packaging material, TSS

### Introduction

Papaya (*Carica papaya* L.) is a tropical fruit. It is originated in Central America, Mexico and Northern South America. Papaya is spherical or pear shaped fruits that can be as long as 20 inches. During the year 2010-11, India's papaya production was 4196 metric tonnes (Indian Horticulture Database, 2011). The important papaya growing states are Andhra Pradesh, Tamil Nadu, Assam, Bihar, Maharashtra and Uttar Pradesh. The papaya fruits are rich source of vitamins, particularly ascorbic acid and  $\beta$ -carotene. Ready-to eat fruit bars are well established products and are being commercially prepared in our country. Fruit leathers from mango, papaya, pineapple, guava, juman and banana individually or in combination with different fruits (Mathur *et al.*, 1972, and Doreyappa Gowda *et al.*, 1995). Papaya has been described as an excellent source of pro vitamin A and ascorbic acid (Wenken and Miller; 1965). Because of its year-round availability, papaya is an important source of vitamins C in the diet of the rural population of tropical Latin America and Asia (De arriola *et al.* 1980). Papaya contains the digestive enzyme papain and therefore valuable for aiding digestion. Its unique protein- digesting enzymes; papain and chymopapain have been shown to help lower inflammation and to improve healing from burns in addition to helping in digestion of proteins. Fruit leather or bar is a ready to eat, semi-moist food with soft gel like texture obtained by dehydration of fruit purees into leathery sheets. These products are generally remaining shelf stable and can be stored safely for longer time at room temperature in PET jar, glass jar or in any type of flexible laminate pouches. In addition, it contains sufficient dissolved solutes to decreases water. Fruit leathers are prepared by drying fruit pulps after adjusting acidity and sugar concentration to a desired level. Development of fruit

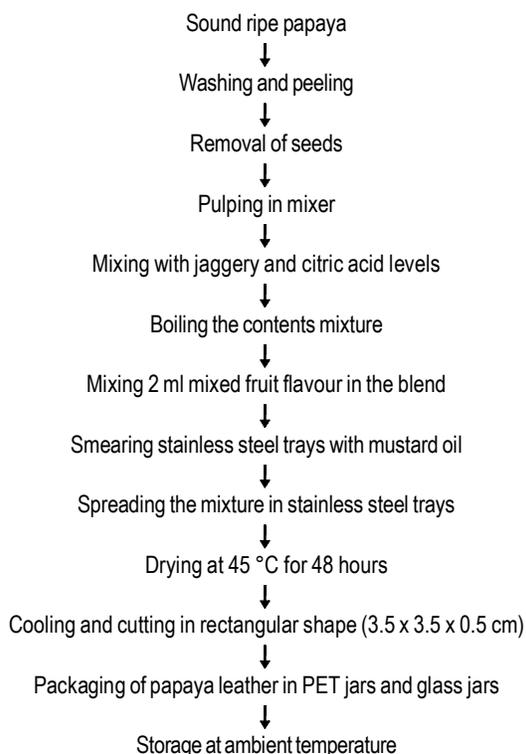
leathers offered tremendous advantages owing to simplicity and lower production cost besides better consumer appeal.

### Materials and Methods

**Preparation of papaya leather:** Papaya leather was prepared by adopting the procedure reported by Srivastava and Kumar (1994) with little modification in process. Papaya leather was prepared from evenly ripened fruit procured in bulk from local market. Papaya were washed to potable water and remove dust, dirty particles and some bacteria's. Peeling was done manually. Pulping of papaya was done in Electric Juicer mixer. The papaya fruit pulp (1.0 kg) was mixed with 450 g of jaggery, 7.25 g of citric acid for the preparation of papaya fruit leather with citric acid level of 0.5% after preparing papaya leather with citric acid level of 0.5% the same process was again done for the preparation of papaya leather with citric acid level of 0.75% and 1.0%. The mixture was heated with continuous stirring for 5 minutes. After cooking 2 ml of essence was added in the blend. This blend was spread in the thin layer on a tray smeared with mustard oil and dried in the hot air oven at 45<sup>o</sup> C. The dried layer was cut into rectangular leather pieces (3.5x3.5x0.5cm) and packed individually in PET and glass jars and then stored under ambient condition for further study.

**Physico-chemical changes:** The physico-chemical changes like moisture content (Hot air oven method), total soluble solids (TSS) (Hand refractometer), pH (pH meter), optical density (Digital spectrophotometer) and Vitamin-C (titrimetric method) for the fruit papaya leathers were determined using standard methods as fresh and after 15, 30, 45, 60, 75 and 90 days of storage period.

**Organoleptic evaluation:** The papaya leather samples were evaluated as fresh and after 30, 60 and 90 days of interval by ten judges using 9-1 hedonic scale rating. Sensory quality attributes



#### Process flow chart for preparation of jaggery based papaya leather

such as colour, flavour, taste, texture and overall acceptability of the product of papaya leather was evaluated as recommended by (Ranganna, 2001). Hedonic rating test method was used for the evaluation. This test measures the consumer acceptability. Detailed methodology is presented below. A panel consisting of members of different age groups having different eating habits was constituted to evaluate the quality through properly-planned experiment. The panelists were selected from the staff and student of the university.

Sample were served to the panelist and they were asked to rate the acceptability of the product through the sense of organs. Different attributes viz., colour, odour/flavor, taste and texture were rated on the basis of hedonic scale, ranging from 1 (extremely dislike/ most undesirable) to 9 (extremely like/ most desirable). A test proforma was also prepared and given to each panel member at the evaluation. An example of scale is given below-

Rating (s)	Score
Like extremely	09
Like very much	08
Like moderately	07
Like slightly	06
Neither like nor dislike	05
Dislike slightly	04
Dislike moderately	03
Dislike very much	02
Dislike extremely	01

#### Results and Discussion

The data on changes in physico-chemical constituents of papaya leather as influenced by different citric acid levels and

packaging materials is presented in Fig. 1 to 5. Moisture content of samples increased with increased in citric acid levels and moisture content of samples decreased with storage period, the reason for such trend may attributed to inversion of sucrose into monosaccharide by citric acid which is more in hygroscopic nature than the sucrose (Bhandari *et al.*, 1997), (Bhandari Howes, 1999) leading to relatively higher affinity for water molecules. Samples with higher level of citric acid undergone inversion of more sucrose and therefore, had higher final moisture content. From the table it is also shows that the moisture less decreases in glass jars as compared to the PET jars.

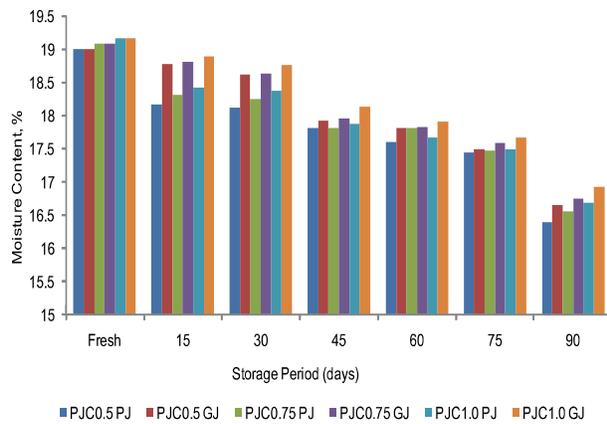
**Effect on total soluble solids:** TSS of leather samples decreased with increased in the levels of citric acid but the TSS of all leather samples prepared with different levels of citric acid increased with storage period. It is also showed that the TSS of samples packed in glass jars is higher as compared to the PET jars after storage of 90 days.

**Effect on total soluble pH:** pH of the leather samples decreased with increased in the levels of citric acid. From the table it is also showed that the pH of the samples prepared with different levels of citric acid decreased during storage similar pattern of decreasing trend was reported by (Sivakumar *et al.*, 2005) reason behind that the decreases pH is due to increases acidity. Among the packaging materials, the leather samples stored in PET jars had recorded higher pH followed by glass jars.

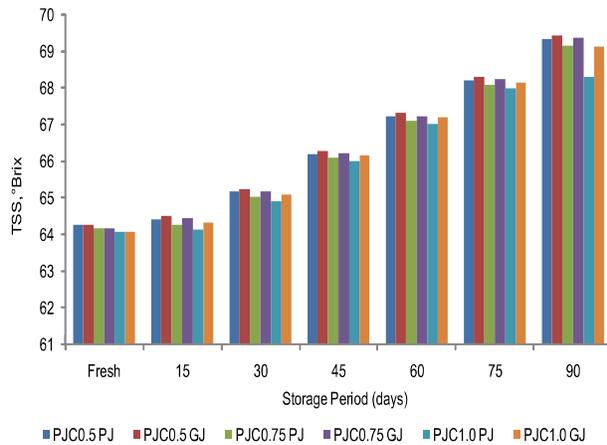
**Effect on total optical density:** Optical density of the leather samples decreased with increased in the levels of citric acid. From the table it is also showed that the optical density of the samples prepared with different levels of citric acid increased during storage. This increase in non- enzymatic browning might be due to decrease in sulphur dioxide (Swaminathan 1987; Mir and Nath 1993), higher temperature (Meyer 1966), as expected from Arrhenius equation (Mir and Nath 1993) and concomitant with heat and loss of sulphur dioxide content of the product (Rao and Roy 1980 b). This might be due to reaction of sulphur dioxide with food constituents (sugars, pectin's, proteins and lipids), oxidation or due to volatilisation (Bolin and Boyle 1972; Echkoff and Okos 1986).

**Effect on total vitamin-C:** Vitamin-C of the leather samples decreased with increased in the levels of citric acid. From the table it is also showed that the Vitamin-C content of the samples prepared with different levels of citric acid decreased after 90 days of storage. The reason behind this is the ascorbic acid content decreased during storage due to oxidation of ascorbic acid to dehydroascorbic acid. This is due to oxidation or exposure of atmosphere oxygen while preparing the fruit leather (Fennema, 1977). The loss of Vitamin-C is more in samples packed in PET jars as compared to glass jars.

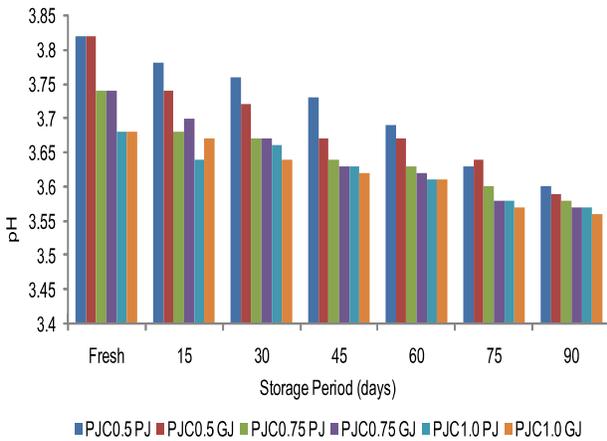
**Overall acceptability:** Fig. 2 shows the organoleptic score values for leather samples during storage. Results of sensory evaluation showed that the sensory attributes like colour, flavour, texture and taste of samples prepared with different levels of citric acid in glass jars were most acceptable up to 90 days of storage at room temperature. The results also indicated that samples



**Fig. 1:** Effect of citric acid levels and packaging materials on moisture content of papaya leather



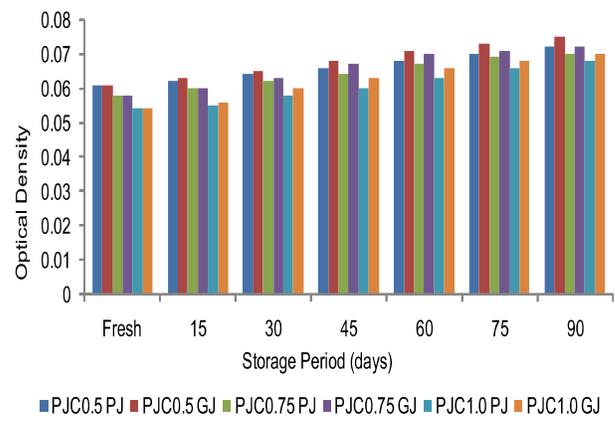
**Fig. 2:** Effect of citric acid levels and packaging materials on total soluble solids of papaya leather



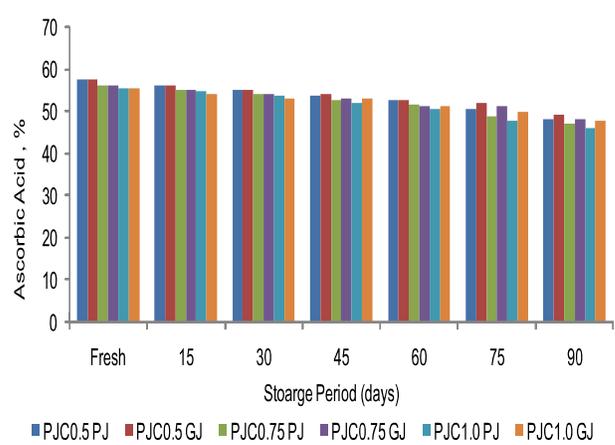
**Fig. 3:** Effect of citric acid levels and packaging material on pH of papaya leather

prepared with citric acid level of 0.75% ranked high followed by 0.5% and 1.0% citric acid levels.

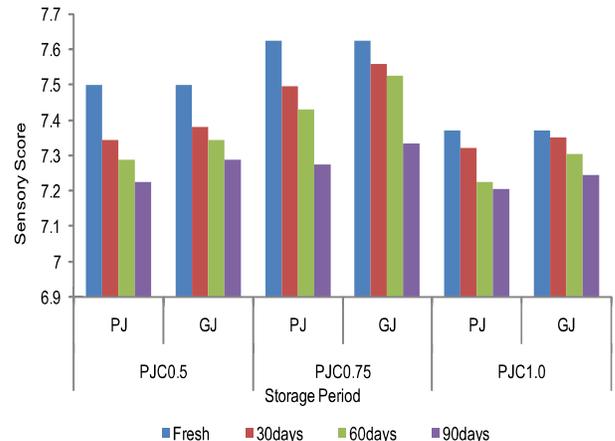
Physio-chemical, organoleptic changes were studied in papaya leather during storage at room temperature. Significant



**Fig. 4:** Effect of citric acid levels and packaging materials on optical density of papaya leather



**Fig. 5:** Effect of citric acid levels and packaging materials on ascorbic acid content of papaya leather



**Fig. 2** Effect of citric acid levels and packaging materials on overall acceptability of fresh and stored papaya leather

changes were noticed in moisture content, TSS, pH, optical density and Vitamin-C. The result indicated that the samples prepared with citric acid level of 0.75% ranked high followed by 0.5% and 1.0% citric acid levels. Among the packaging materials the samples packed

in glass jars showed minimum nutrient loss and also retained maximum consumer acceptability scores.

### References

- Bhandari, B.R., Howes, T.: Implementation of glass transition for the drying and stability of dried foods. *J. Food Engg.*, **40**: 71-79 (1999).
- Bhandari, B.R., Datta, N., Howes, T.: Problem associated with spray drying of sugar rich foods. *Drying Technol.*, **12**: 671-684 (1997).
- Bolin, H.R., Boyle, F.P.: Effect of storage and processing on sulphur dioxide in preserved fruit, *Food Product Development*, **7**: 82-86 (1972).
- De arriola, M.C., Calzada, J.F., Menchu, J.E., Rolz, C., Gracia, R., and de Cabrera, S.: Papaya. In tropical and subtropical fruits: composition nutritive values, properties, and uses Westport conn., p. 316-340 (1980).
- Doreyappa, Gowda IN, Amba Dan and Ramanjaneya, K.H.: Studies on mango fruit bar preparation. *Ind. Fd. Packer*, **49**: 17-24 (1995).
- Echhoff, S.R., Okos, M.R.: Kinetics of sulphite reaction in corn grain. *J Agri. Food Chem.*, **34**: 239-245 (1986).
- Fennema, O.: Loss of vitamins in fresh and frozen food. *J. food Sci. Technol.*, **31**: 32-35 (1977).
- Mathur, N.K., Anthony Dos, S., Jayaraman, K.S. and Bhatia, B.S.: Preparation of fruit bars used in combat rations, *Ind. Fd. Packer*, March- April, p. 33-35 (1972).
- Meyer, L.H.: Food Chemistry, Reinhold Publishing Corporation, New York (1966).
- Mir, M.A., Nath, N.: Storage changes in fortified mango bars. *J Food Sci. Technol.*, **30**: 279-282 (1993).
- Ranganna, S.: Hand book of analysis and quality control of fruit and vegetable products. Published by Tata McGraw Hill Pub. Comp. Ltd., New Delhi (2001).
- Rao, V.S., Roy, S.K.: Studies on dehydration of mango pulp II. Storage studies on dehydration of mango sheet leather. *Indian Food Packer*, **34**: 72-79 (1980).
- Sivakumar, P.K., Malathi, D., Nallakurumban, B., Kalaiselvan, A.: Studies on storage stability of guava bar in different packaging materials. *Beverage and food world* Nov. p 80-81 (2005).
- Swaminathan, M.: Food Science, Chemistry and Experimental Foods. The Bangalore Printing and Publishing Co. Ltd., Bangalore (1987).
- Wenkam, N.S., and Miller, C.D.: Composition of hawaii fruits. Bulletin 135. Honolulu, Hawaii, Hawaii Agric. Exp. Sta. (1965).