International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(5): 1755-1758

Received: 10-07-2019
Accepted: 12-08-2019

Rekha EDA
Assistant Professor (Hort.), College of Horticulture, Parvathipuram, Dr. Y.S.R. Horticultural University, Andhra Pradesh, India

Swami DV
Principal Scientist & Head, PHTRS, Dr. Y.S.R.H.U, Andhra Pradesh, India

Prasanna Kumar B
Associate Dean, College of Horticulture, Parvathipuram, Andhra Pradesh, India

Salomi Suneetha
Technical Officer to Dean of Horticulture, Dr. Y.S.R.H.U, Andhra Pradesh, India

Dr. Kiran Patro TSKK
Associate Professor, Dept. of Biochemistry, COH, V.R. Gudem, Dr. Y.S.R.H.U, Andhra Pradesh, India

Correspondence
Rekha EDA
Assistant Professor (Hort.), College of Horticulture, Parvathipuram, Dr. Y.S.R. Horticultural University, Andhra Pradesh, India

Studies on storage of jam prepared from organically grown papaya cv. Arka Prabhat

Rekha EDA, Swami DV, Prasanna Kumar B, Salomi Suneetha and Dr. Kiran Patro TSKK

Abstract
An experiment was conducted to study the quality and shelf life of jam prepared from organically grown papaya cv. Arka prabhat. The maximum TSS was observed in the papaya jam prepared from fruits of plants applied with sheep manure 100% RDN (73.21 ºBrix) during storage. The maximum titratable acidity was observed in papaya jam prepared from fruits of plants applied with FYM 50% RDN + vermicompost 50% RDN (0.74%). The maximum moisture content (22.98%) was observed in papaya jam prepared from fruits of plants applied with vermicompost 100%. The microbial spoilage was not observed upto 75 days of storage in all the treatments. The jam prepared from FYM 100% RDN, sheep manure 100% RDN and FYM 50% RDN + vermicompost 50% RDN had recorded no spoilage and maximum of 1×10^4 cfu in 100% RDF on 90th day of storage. The jam prepared from papaya can be stored upto 90 days under ambient conditions without any considerable loss in quality.

Keywords: Storage, jam prepared, organically grown, papaya cv. Arka Prabhat

Introduction
Papaya (*Carica papaya* L.) belongs to the family Caricaceae and is one of the important fruit crops of tropical and subtropical regions of the world. Papaya fruit is rapidly becoming an important commodity worldwide, both as fresh fruit and as processed product [1]. It is a cheap source of vitamins (A, C and E) and minerals (Mg and K). Unripe fruit is a rich source of papain a proteolytic enzyme, which is very helpful in digestion of protein, used as meat tenderizer and also used for medicinal and industrial purposes. The mature fruits being utilized in the preparation of candy and tuti fruity. Ripe fruits are also used in the preparation of ready-to-serve papaya juice, jam and for table purpose.
Various products such as canned fruits, frozen slices, beverages, fruit leather, fruit bar, fruit jam are developed from fruits for value addition which are inherently perishable in nature. The ripe fruits exhibit lesser shelf life. Hence, processing of these fruits into value added products with increased shelf life is important. There is a need to reduce the post harvest losses and improve the availability through the recommended pre and post harvest treatments and storage to improve the marketing efficiency in papaya.

Materials & Methods
The present investigation was conducted in the college farm and Department of Fruit Science at College of Horticulture, Venkataramannagudem, Andhra Pradesh during the year 2014-15. The design for the experiment was Randomized Block Design (RBD) having 8 treatments replicated thrice. Treatments were randomly allocated in each replication. The seeds of papaya cv. Arka Prabhat hybrid were procured from Indian Institute of Horticultural Research, Bangalore. The treatments were comprised of T_1 - FYM 100% RDN, T_2- Vermicompost 100% RDN, T_3 - Neem cake 100% RDN, T_4 - Sheep manure 100% RDN, T_5- FYM 50% RDN + Vermicompost 50% RDN, T_6- FYM 50% RDN + Neem cake 50% RDN, T_7- FYM 50% RDN + Sheep manure 50% RDN and T_8- 100% RDF. The fully ripe papaya fruits were selected for preparation of papaya jam. The fruits were washed with clean water and peeled with a peeler. The fruits were cut longitudinally and the seeds were removed. The pulp was homogenised in a mixer. The pulp was cooked after addition of sugar at the rate of 750g of sugar per 1kg of pulp and added 0.2 per cent of citric acid to the pulp. The pulp was cooked by continous stirring till the end point (68ºBrix through refractometer) was reached. Then, it was allowed to cool and stored in sterilized glass bottles for storage studies.

The total soluble solids was determined by using ERMA hand refractrometer by placing a drop of filtered juice on the prism of the refractrometer. The titratable acidity was calculated as per the procedure laid out by Ranganna and expressed in percentage [2].

The fruit moisture content was estimated by using infrared moisture balance. It works based on weight of the sample and drying the sample by evaporating moisture, with heating system of infrared bulb. A thermometer was provided for sensing temperature and heat control is provided to adjust the bulb heat.

Plug the balance socket in A.C mains, put on the toggle switches, rotated the control nob in clockwise direction. Heated for some time to evaporate the moisture in pan and then off the infrared bulb. Then rotated the right hand knob (A) and brought the needle (pointer) and the scale to coincide with the per cent symbol. If the needle is not coincided, rotated the left hand knob (B) to brought the pointer to coincide. Lifted the window of oven and brought the scale to zero position by rotating right hand knob. Placed the sample of about 5 to 7 g to be tested in the pan so that the pointer also projected to the zero. Now shut the window and switch on the bulb again and heated at 120 ^{0}C for 10-15 minutes. The needle gets lifted upward. Again rotated the right hand knob (A) to brought the needle and the scale to coincide. The reading on scale gives the percentage of the sample moisture.

Microbiological examination of the product

The yeast and mould populations in different sample products were estimated by using dilution plate method [3]. One gram of test sample was taken and thoroughly mixed in nine milliliter of sterile saline water. One milliliter of sample was transferred through a sterile pipette to a screw cap test tube containing nine milliliter of sterile saline water. This gave dilution of 10^{-1}. Similarly serial dilutions were made upto 10^{-10}. One millitre of serially diluted sample was placed in sterile petri-dish to which 5ml of potato dextrose agar medium was added and mixed thoroughly with the suspension and then allowed to set and then incubated at 30 ^{O}C for 48 hours. Individual colonies were counted and multiplied with the dilution factor to get the microbial population in one gram of sample. Yeast is the fungi which are non-filamentous but unicellular and moulds are fuzzy or cottony in appearance which commonly appears as white but may be coloured or dark or smoky.

$$\text{cfu/ml} = \frac{\text{(No. of colonies} \times \text{sample weight)}}{\text{(Milliliter plated} \times \text{dilution factor)}}$$

Result

Total soluble solids (°Brix)

The data pertaining to total soluble solids (table 1) of papaya jam revealed significant differences between the product prepared from the fruits of plants as affected by the application of different organic manures and days of storage.

The maximum TSS of 73.21 °Brix was recorded in the papaya jam prepared from fruits of plants applied with sheep manure 100% RDN followed by vermicompost 100% RDN (71.50 °Brix) and FYM 50% RDN + neem cake 50% RDN (70.68 °Brix) whereas minimum TSS of 69.40 °Brix in FYM 100% RDN. The highest TSS of 72.76 °Brix was recorded on 90th day of storage followed by 75th day of storage (72.24 °Brix) and minimum of 68.67 °Brix on 1st day of storage.

Titrable acidity (%)

The data pertaining to titrable acidity of papaya jam revealed significant differences between the product prepared from the fruits of plants as affected by different organic manures and days of storage was presented in table 1.

The maximum titrable acidity of 0.74% was recorded in papaya jam prepared from fruits of plants applied with FYM 50% RDN + vermicompost 50% RDN and in fruits of plants applied with neem cake 100% RDN (0.74%) where as the minimum of 0.55% was recorded in 100% RDF. The highest titrable acidity of 0.78% was recorded on 1st day of storage and minimum of 0.57% on 90th day of storage. The interaction effects were found to be non significant.

Moisture content (%)

The data pertaining to moisture content (table 2) of papaya jam revealed significant differences between the product prepared from the fruits of plants as affected by different organic manures and days of storage.

The maximum moisture content of 22.98% was recorded in papaya jam prepared from fruits of plants applied with vermicompost 100% RDN which was on par with FYM 100% RDN (22.44%) and sheep manure 100% RDN (22.41%) whereas minimum of 20.80% in FYM 50% RDN + sheep manure 50% RDN. The highest moisture content of 24.49% was recorded on 30th day of storage and the lowest of 19.62% on 90th day of storage. The interaction effects were found to be non significant.

Spoilage (cfu)

The spoilage was calculated based on the microbial count in stored samples (table 2).The data revealed that microbial load was not recorded upto 75 days of storage which appeared thereafter during storage. The jam prepared from FYM 100% RDN, sheep manure 100% RDN and FYM 50% RDN + vermicompost 50% RDN had recorded no spoilage and maximum of 1×10^{4} cfu in 100% RDF on 90th day of storage.

Shelf life (days)

The data pertaining to shelf life of papaya jam revealed that significant differences between the jam prepared from the fruits of plants as affected by different organic manures was presented in table 3.

The maximum shelf life of 79.53 days was recorded in papaya jam prepared from fruits of plants applied with FYM 100% RDN and minimum of 74.25 days in 100% RDF. The shelf life was determined based on the overall acceptability of the product.

Table 1: Effect of organic manures on total soluble solids (°Brix) and titrable acidity (%) of papaya (*Carica papaya* L.) jam during storage under ambient condition

Treatments	Number of days of storage															
	Total soluble solids (°Brix)								Titrable acidity (%)							
	1	15	30	45	60	75	90	Mean	1	15	30	45	60	75	90	Mean
M_1	67.65	67.79	68.32	68.32	70.50	70.99	71.37	69.40	0.77	0.74	0.70	0.67	0.60	0.57	0.53	0.63
M_2	68.90	69.15	70.83	70.83	72.83	73.43	73.75	71.50	0.74	0.70	0.68	0.65	0.60	0.58	0.56	0.63
M_3	68.15	68.30	69.66	69.66	71.40	71.94	72.18	70.35	0.87	0.82	0.80	0.77	0.72	0.69	0.66	0.74
M_4	71.90	72.11	72.54	72.54	73.86	74.32	74.44	73.21	0.77	0.74	0.71	0.67	0.65	0.62	0.66	0.66
M_5	68.15	68.33	69.10	69.10	70.43	71.65	72.41	69.99	0.89	0.83	0.80	0.76	0.73	0.70	0.65	0.74
M_6	68.35	68.54	69.65	69.65	71.94	72.20	73.21	70.68	0.76	0.71	0.69	0.66	0.63	0.60	0.59	0.64
M_7	67.90	68.16	69.15	69.15	71.16	72.10	73.04	70.28	0.73	0.69	0.66	0.64	0.61	0.59	0.56	0.62
M_8	68.40	68.60	69.16	69.16	70.85	71.34	71.69	70.03	0.70	0.66	0.60	0.58	0.53	0.49	0.46	0.55
Mean	68.67	68.87	69.80	70.78	71.62	72.24	72.76		0.78	0.73	0.70	0.67	0.63	0.60	0.57	

Factor	Total soluble solids (°Brix)			Titrable acidity (%)		
	M	D	M*D	M	D	M*D
S.Em±	0.13	0.12	0.35	0.05	0.05	0.01
C.D (0.05)	0.38	035	N.S	0.01	0.01	N.S

- M_1- FYM 100% RDN
- M_2- Vermicompost 100% RDN
- M_3- Neem cake 100% RDN
- M_4- Sheep manure 100% RDN
- M_5- FYM 50% RDN + Vermicompost 50% RDN
- M_6- FYM 50% RDN + Neem cake 50% RDN
- M_7- FYM 50% RDN + Sheep manure 50% RDN
- M_8- 100% RDF
- M- Manures
- D- Days of storage
- RDN- Recommended dose of Nitrogen
- RDF- Recommended dose of fertilizer

Table 2: Effect of organic manures on moisture content (%) and spoilage (cfu) of papaya(*Carica papaya* L.) jam during storage under ambient condition

Treatments	Number of days of storage														
	Moisture content (%)								Spoilage (cfu)						
	1	15	30	45	60	75	90	Mean	1	15	30	45	60	75	90
M_1	22.85	22.97	22.73	22.49	21.50	21.33	22.37	22.44	0	0	0	0	0	0	0
M_2	24.35	23.83	23.16	22.77	22.08	20.50	22.75	22.98	0	0	0	0	0	0	$1x10^2$
M_3	22.40	21.81	21.33	20.83	20.33	19.66	21.03	21.22	0	0	0	0	0	0	$1x10^2$
M_4	23.30	22.99	22.50	22.21	21.50	21.06	22.26	22.41	0	0	0	0	0	0	0
M_5	22.55	21.82	21.22	20.66	20.17	19.83	21.00	21.22	0	0	0	0	0	0	0
M_6	22.65	22.06	21.83	21.00	20.50	20.16	21.33	21.52	0	0	0	0	0	0	$1x10^2$
M_7	22.75	22.17	21.83	21.11	20.50	14.86	20.48	20.80	0	0	0	0	0	0	$1x10^2$
M_8	23.30	22.32	21.00	20.25	19.83	19.61	21.00	21.33	0	0	0	0	0	0	$1x10^4$
Mean	23.01	22.88	24.49	21.95	21.41	20.80	19.62								

Factor	Moisture content (%)		
	M	D	M*D
S.Em±	0.23	0.22	0.63
C.D (0.05)	0.67	0.63	N.S

- M_1- FYM 100% RDN
- M_2- Vermicompost 100% RDN
- M_3- Neem cake 100% RDN
- M_4- Sheep manure 100% RDN
- M_5- FYM 50% RDN + Vermicompost 50% RDN
- M_6- FYM 50% RDN + Neem cake 50% RDN
- M_7- FYM 50% RDN + Sheep manure 50% RDN
- M_8- 100% RDF
- M- Manures
- D- Days of storage
- RDN- Recommended dose of Nitrogen
- RDF- Recommended dose of fertilizer

Table 3: Effect of organic manures on shelf life (days) of papaya (*Carica papaya* L.) jam during storage under ambient condition

Treatments	Shelf life (days)
M_1 FYM 100% RDN	79.53
M_2 Vermicompost 100% RDN	74.50
M_3 Neem cake 100% RDN	75.70
M_4 Sheep manure 100% RDN	77.50
M_5 FYM 50%RDN + Vermicompost 50% RDN	77.25
M_6 FYM 50%RDN + Neem cake 50% RDN	77.25
M_7 FYM 50%RDN + Sheep manure 50% RDN	78.08
M_8 100% RDF	74.25
C.D (0.05)	1.03
S.Em±	0.31

RDN- Recommended dose of Nitrogen, RDF- Recommended dose of fertilizer

Discussion

The TSS is an important chemical constituent which indicates the sugar content in the product and is considered as one of the important criteria for dessert quality of product. There was a gradual increase in TSS of papaya jam throughout the storage period. The increase in the TSS might be due to loss of moisture during storage resulting in the concentration of the product [4]. These results were in close conformity with results of in persimmon [5] and in papaya [6].

These results revealed that, there was a gradual decrease in titrable acidity of papaya jam throughout the storage period irrespective of the treatment. The acidity of jam decreased during the storage period might be due to neutralization of acid during storage and probable interaction with the natural chemical constituents of the jam. Similar results were reported in papaya [6] and in mango [7].

The loss in moisture content in jam might be due to loss of residual moisture from the surface by the evaporation. Similar reports of decrease in moisture content with storage were also reported in apple and in persimmon [5].

The microbial food safety is an essential component of food quality. Quality is a combination of characteristics that have significance in determining the degree of acceptability of the product by the consumer. The less microbial count of the jam might be due to higher sugar concentration of the jam. The increase in microbial count after 90 days might be due to secondary contamination of the jam. Similar findings were also reported in amla [8] and in apple [9] and pear mixed fruit jam. The jam remained accepted for 90 days of storage at ambient condition. These findings were in accordance with the reports of in mixed fruit jam [10] and in ber jam [11].

Conclusion

The jam prepared from papaya can be stored upto 90 days under ambient conditions without any considerable loss in quality in terms of TSS, Titrable acidity, moisture content, microbial spoilage and Shelf life.

References:

1. Sankat CK, Maharaj RP. In: Mitra, S.K, editor. Post-harvest physiology and storage of tropical and subtropical foods. New York, 1997, 167-89.
2. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. Tata Mc. Graw hill Publishing Company Ltd., New Delhi, 1986.
3. Food and Agricultural Organization (FAO). Food quality and safety system: A training manual on food hygiene and the Hazard Analysis and Critical Control Point (HACCP) System. Publishing Management Group, FAO Information Division, Rome, 1998.
4. Shere DM, Pawar VS, Shere PD. Process standardization and storage studies of Jamun-mango bar. Internat. J Proc. & Post Harvest Technology. 2014; 5(2):141-44.
5. Riat P. Suitability and self-stability studies on the persimmon cultivars of different product development based intermediate moisture technologies. M.Sc. thesis, CSKHPKV, Palampur, 2003.
6. Saravanan K, Godara RK, Goyal RK, Sharma RK. Studies on the storage behaviour of papaya jam. Haryana Journal of Horticulture Sciences. 2004; 33(3-4):218-220.
7. Kumari A. Nutritional quality evaluation of the products prepared from locally available mango (*Mangifera indica*) supplemented with whey. M.Sc. thesis CSKHPKV, Palampur, 2007.
8. Garg N, Sonkar P, Bhriguvashi SR. Nutritional and microbiological quality evaluation of the commercial samples of amla chavanprash and amla preserve and amla juice. Journal of Food Science and Technology. 2008; 45(2):193-195.
9. Shakir I, Hussain I, Alam zeb, Yasser D. Sensory evaluation and microbial analysis of apple and pear mixed fruit jam prepared from varieties grown in azad Jammu and Kashmir. World Journal of Dairy and Food Sciences. 2009; 4(2):201-204.
10. Prasad RN, Mali PC. Changes in physico-chemical characteristics of ber jam during storage. Indian J Hort. 2006; 63(1):86-87.
11. Jagmohan Singh, Kamaljeet S, Manmeet K. Sensory Evaluation of jam prepared from various cultivars of mango and mango-papaya blends. Annals of Horticulture. 2013; 6(1):133-138.