

Effect of Preservation on Therapeutic Quality of Naturally Flavoured Papaya-Jackfruit Ready-to-Serve Beverage

Sindumathi G. * and M. R. Premalatha

Department of Food Science and Nutrition, Community Science College and Research Institute
Tamil Nadu Agricultural University, Madurai – 625 104

*Corresponding Author E-mail: sindhu276@gmail.com

Received: 7.02.2020 | Revised: 9.03.2020 | Accepted: 16.03.2020

ABSTRACT

Papaya and jackfruit are good source of protective nutrients needed by the human body. The present day customers demand products free from chemical preservatives and additives, with assured safety and better shelf life. Fruit based beverages can be an alternative to replace the synthetic beverages, which are devoid of nutritive value. The present study is an attempt to look at the prospect of effective utilization of papaya and jackfruit blend as a ready-to-Serve beverage with addition of natural flavour extracts. The blended RTS was prepared according to FSSAI specification using different combinations of papaya-Jackfruit as 80:20, 70:30, 60:40 and 50:50 and various proportion of flavouring extracts of ginger, cardamom, lime and mint. Among different blends the ratio 50:50 scored highest value with 8.9 for over all acceptability. Extracts of ginger and cardamom in the ratio of 1:1 was found to be more suitable for preparing papaya-jackfruit RTS beverage. The selected combination of papaya-jack fruit RTS beverage was filled in glass bottles and stored at room temperature. The nutrient content such as TSS, pH, acidity reducing sugar, total sugar β -carotene and ascorbic acid were analysed in the regular interval of 20 days. It was observed that the prepared naturally flavoured and blended RTS beverage could be successfully stored at room temperature for a period of 120 days without significant changes in chemical and sensory quality. Therefore blended fruit drinks with spice extract for the preparation of nutritive RTS beverage could be a suitable and profitable substitute for consumption of papaya and jackfruit.

Keywords: Papaya, Jack fruit, Ginger, Cardamom and Glass bottles.

INTRODUCTION

Fruits and vegetables embrace an essential standing between the health foods as they afford important sum of nutrients, particularly vitamins, minerals, fibers, sugars and antioxidants as well as it's energizing and

thirst quenching characteristics. However, due to extremely perishable nature and short shelf life, fruits and vegetables are in need of attention for processing into preserved products to avoid post-harvest losses (Panghal et al., 2017).

Cite this article: Sindumathi, G., & Premalatha, M. R. (2020). Effect of Preservation on Therapeutic Quality of Naturally Flavoured Papaya-Jackfruit Ready-to-Serve Beverage, *Ind. J. Pure App. Biosci.* 8(2), 69-75. doi: <http://dx.doi.org/10.18782/2582-2845.7990>

Fruits, which are rich in nutrients but not acceptable due to high acidity, poor taste and flavors, could be blended with other fruits to improve their acceptability and make use of available nutrients (Khan et al., 1988). Considering this, Papaya and Jackfruit was chosen for preparation of fruit drink due to its rational price, easy availability and high nutritive value. Papaya is also recognized as common man's fruit and belongs to Caricaceae family. Papaya hold attractive colour, delicious taste, wealthy supply of minerals like potassium and magnesium, nutrients such as carotenoids, vitamins C, E & flavonoids which acts as antioxidants; vitamins B, folate, pantothenic acid; and fiber (Nagarajan, 2002). Papaya can be blended with other fruits because of typical flavour of papaya juice after processing is not liked by few consumers. Therefore to improve their acceptability it can be blended with other fruits and make use of available nutrients.

Jackfruit loaded with vitamin-A and carotenes have been found to defend from chronic ailments, including lung and oral cavity cancers, cardiovascular diseases, and age-related macular degeneration. Hence, for the present study, papaya and jackfruit were preferred for preparation of functional fruit beverage.

Combination of two or more fruits will build up new flavor and taste which help in consumer acceptance, adding flavor could be enhanced by extracts of ginger, cardamom, mint and lime. In present day customers insist natural products with no chemical preservatives, free from additives, and secured wellbeing and enhanced shelf life. Thus fruit based beverages can be used to substitute the synthetic beverages, which are devoid of nutritive value. With the above information in view, in the present study, naturally flavoured papaya-jackfruit Ready-to-Serve functional beverage was developed and its physicochemical characteristics, antioxidant potential, microbial quality, and sensory acceptability were evaluated.

MATERIALS AND METHODS

Uniformly ripened papaya and jackfruit was purchased from the local market of Madurai and food grade citric acid, sugar, salt, and other spices were procured market.

Papaya fruits were thoroughly washed under running tap water, peeled, and cut into small pieces. The pieces were finely blended to obtain papaya pulp, which was filtered through a muslin cloth. Whereas, from entirely matured jackfruits, and bulbs were alienated out cautiously. The seeds were detached by hand from the bulb and pulped by using the mixer grinder (Phillips HL1646 Model) and strained with muslin cloth and filtered juice was kept in the refrigeration temperature.

Preparation of flavouring extracts

The flavouring agents in the combination of ginger + cardamom, ginger + lime, mint + lime, mint + ginger, mint + cardamom are used in papaya and jack fruit blended RTS beverage. Fifty gram of fresh flavouring agent was mixed in 500ml of water, boiled for 20 minutes in a closed vessel and cooled. The extract of the flavouring agent was filtered and added in the ratio of 1:1 to the RTS beverage in varying proportions (2,4 and 6ml).

Standardization of therapeutic blended and flavored papaya-Jack fruit RTS beverage

Flavoured and blended RTS beverage was prepared according to FSSAI standard 15% of total soluble solids (TSS) and 0.3% of acidity and 10% of blended juices of different blending ratio of (A) 70% papaya juice + 30% jackfruit juice, (B) 60% papaya juice + 40 % jackfruit juice, (C) 50% papaya juice + 50 % jackfruit juice and (D) 80% papaya juice + 20% jackfruit juice. In the best blending ratio of papaya and jackfruit RTS beverage the extracts of flavouring agent was added in varying proportions. Best blended and flavoured RTS beverage was selected by organoleptic test which was conducted on 9 point Hedonic scale for appearance, colour, taste, flavor and overall acceptability by a panel of 25 semi trained judges having past experience of sensory evaluation of fruits and vegetable product.

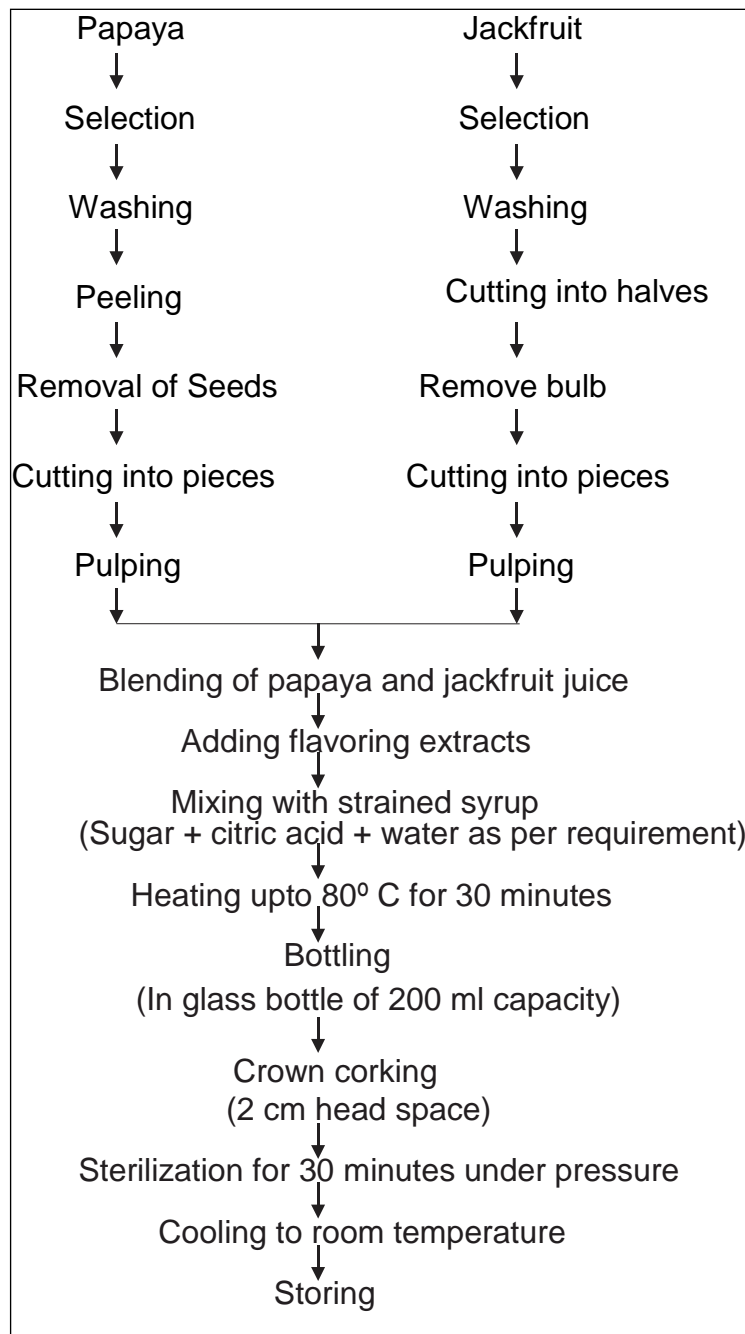


Fig. 1: Process flow chart for preparation of flavored papaya-jackfruit blended RTS beverage

Interval of analysis

The RTS beverage with finest mixture combination and their ratio (on the basis of sensorial evaluation) was filled in glass bottles and kept back at ambient temperature and changes were determined one time in twenty days up to four months. Physico-chemical parameters were measured by standard technique and overall acceptability was calculated on 9 point Hedonic Scale by 25 semi-trained panel members.

Physico- chemical parameters

The physico-chemical qualities of the prepared therapeutic RTS beverage samples were analyzed for total soluble solids by using a hand refractometer (Erma, Japan) and the values were expressed as °Brix. As per the procedure of Association of Official Analytical Chemists methods (AOAC, 2005) pH, titrable acidity, ascorbic acid content, total sugar and β -carotene of beverages was estimated.

Statistical analysis

The data generated during experimentation were recorded and statistically analyzed using standard procedure for analysis of completely randomized block design (CRD) as per the method suggested by the Panse and Sukhatme (1985). The standard errors (SE) and critical differences (CD) at 5% level of significance were worked out for comparison of treatments and presented in the tables.

Microbial examination of the products

The number of aerobic microorganisms present in the sample was determined by standard plate count using Plate Count Agar and the plates were incubated at 37°C for 48 hours (Cruik Shank et al., 1975).

RESULTS AND DISCUSSION

Standardization of papaya - Jackfruit RTS beverage

Table 1: Mean sensory scores for the papaya-jackfruit RTS beverage.

Sensory Characteristics	Various proportions of papaya-jackfruit RTS beverage			
	80:20	70:30	60:40	50:50
Colour	9.5	9.5	9.5	9.5
Appearance	9.2	8.1	7.5	8.3
Flavor	7.8	8.4	7.9	8.5
Taste	7.6	7.8	8.5	9.0
Overall acceptability	8.0	8.2	8.4	9.5

The data on sensory scores of papaya-jackfruit RTS beverage is presented in Table 1. The data on effects of combination on overall acceptability suggested that the beverage prepared by 50:50 proportion of papaya and jackfruit was liked by the panel on the basis of maximum score recorded for almost all the sensory parameters as compared to the rest of combinations (80:20, 70:30 and 60:40). This might be associated with increasing concentration of papaya flavour did not like by the members. The proportion of 50:50

specified by equal contribution of both papaya and jackfruit recorded better results with respect to the various sensory characteristics. Hossain et al. 2017 prepared the functional ready-to-serve (RTS) beverage from jackfruit and aloe vera juice with various combinations T0 (100:00), T1 (90:10), T2 (80:20), T3 (70:30) and T4 (60:40). Among the mixed samples the highest sensory score was obtained for overall acceptability in the T3 sample which has mixed ratio of (70:30).

Table 2: Mean scores obtained for the flavoring extracts in the papaya-jackfruit RTS beverage

Blended flavoring extracts used in 200 ml of papaya-jackfruit blended RTS beverage	Mean scores obtained for the various sensory parameter				
	Colour	Taste	Flavour	Consistency	Overall acceptability
Ginger + cardamom (1:1)					
2 ml	9.3	9.5	9.6	9.5	9.5
4 ml	9.0	8.5	7.6	7.8	7.5
6 ml	8.3	7.4	7.4	7.7	7.4
Ginger + lime (1:1)					
2 ml	9.0	8.8	9.0	9.2	8.5
4 ml	9.2	8.5	8.9	9.5	8.7
6 ml	8.9	8.0	8.5	8.0	8.2
Mint + lime (1:1)					
2 ml	7.5	8.2	8.5	8.9	8.2

4 ml	7.5	7.5	8.0	8.5	8.5
6 ml	8.8	8.5	8.9	8.8	8.7
Mint + ginger(1:1)					
2 ml	8.5	8.8	8.3	9.2	8.5
4 ml	8.6	8.5	8.8	9.5	8.6
6 ml	8.8	8.2	8.0	9.4	8.4
Mint + cardamom(1:1)					
2 ml	8.5	8.4	8.7	9.5	8.4
4 ml	8.7	8.5	8.2	9.2	9.2
6 ml	8.6	8.9	8.5	9.3	8.4

Data presented in Table 2 shows sensory scores of different flavoring extracts used in the preparation of papaya-jackfruit (50:50) RTS beverage. The maximum organoleptic score for colour, taste, flavor, consistency and overall acceptability of ginger and cardamom was recorded in treatment (2ml ginger: 2 ml cardamom). The organoleptic score for all sensory attributes showed decreasing trend especially in mint extract combination with lime, ginger and cardamom in different proportion which might be due to dark and unpleasant colour of mint leaves. Bhardwaj

and Mukherjee (2005) also observed that the juice blended with kinnow juice (87.0%) + pomegranate juice (10.0%) + ginger juice (3%) and kinnow juice (92.0%) + aonla juice (5.0%) + ginger juice (3.0%) had minimum changes in the physico-chemical and sensory score with minimum increases in microbial population up to six months of storage. All these spices have appetizing properties also hold healing and curative values, which have a intense result on human health and influence several functional processes.

Table 3: Changes of nutrient content in therapeutic flavoured and blended papaya-jackfruit RTS beverage during storage

Nutrients	Storage days			SED	CD 0.05
	0 day	60 days	120 days		
pH	4.32	4.24	4.13	0.0079	0.0250**
Acidity (%)	0.2560	0.2582	0.2598	0.0112	0.0217**
TSS (°brix)	15.00	17.00	19.00	0.0129	0.0495**
Reducing sugar (g/100g)	3.95	4.18	4.27	0.0062	0.0174**
Total sugar (g/100g)	12.00	13.05	13.85	0.0154	0.0352**
Ascorbic acid (mg/100g)	8.20	7.25	6.86	0.0065	0.0242**
β-carotene (µg/100g)	512.00	494.00	475.00	0.0042	0.0184**

The physico-chemical properties flavoured and blended papaya-jackfruit RTS beverage during storage was analyzed and results are noted in the Table 3. From the results, the pH of flavoured and blended papaya-jackfruit RTS beverage found to decrease from 4.32 to 4.13 during storage as reported by the investigators (Boghani et al., 2012). The pH of the RTS beverage is directly dependent on the inherent total organic acids of fruit and indirectly

proportionate to the added organic acid content during the product's preparation. The acidity of flavoured and blended papaya-jackfruit RTS beverage was gradually increased from 0.2560% to 0.2598 % after 120 days of storage. The same result was also observed with the finding of Panghal et al. (2009). These changes in the decrease of acidity might be due to the acidic hydrolysis of the polysaccharides, where the acid is utilized for

converting non reducing sugar into reducing sugar. The sample exhibits the changes in the total soluble solids (TSS) and significantly increased from 15.00°B to 19.00 °B stored under room condition and similar findings was also reported by Yadav et al. (2010). The total soluble solids content in the juice increased actually during storage, which might be due to hydrolysis of polysaccharides into monosaccharides and increase in concentration of juice due to dehydration. The values of reducing sugar and total sugars were also found to increase significantly due to storage. This could be due to inversion of non reducing sugars to reducing sugars. Similar findings were reported in lime-aonla spiced beverage (Deka et al., 2004). Ascorbic acid content of flavoured and blended papaya-jackfruit RTS

beverage decreased with the values from 8.20 mg/100g to 6.86 mg/100g. It showed a continuous decline with the advancement of storage period which might be due to its degradation to dehydro-ascorbic acid by oxidative enzymes and application of heat. Similar decline has been reported in Jackfruit-Aloe Vera Blended Ready to Serve (RTS) Functional Beverage (Hossain et al., 2017). β -carotene content of the developed beverage from 0 day (512 $\mu\text{g}/100\text{g}$) to 120th day (475 $\mu\text{g}/100\text{g}$) decreased significantly due to effect of storage temperature and catalytic activity of fructose in the catabolization of vitamin C. The present results agreed with the finding in bael and citrus fruit blended RTS beverage (Nagpal & Rajyalakhmi, 2009).

Table 4: Organoleptic characteristics of therapeutic flavored and blended papaya-jackfruit RTS beverages during storage

Storage days	Sensory attributes				
	Colour	taste	flavour	Consistency	Overall acceptability
0 day	9.7	9.5	9.6	9.8	9.8
60 th day	8.7	8.2	8.4	8.5	8.6
120 day	8.3	8.5	8.2	8.5	8.4

Organoleptic traits of blended papaya-jackfruit RTS beverages were evaluated at regular intervals based on 9 Points Hedonic Scale and depicted in Table 4. From the result, it is observed that all the sensory characteristics i.e. colour, taste, flavor, consistency and overall acceptability was in decreasing trend. The developed RTS beverage scored good (>8) in organoleptic evaluation after 120 days of storage period. This might be due to changes during storage of beverage. Similar findings were reported in other studies (Sasi et al., 2013).

Enumeration of microbial load in therapeutic flavoured and blended papaya-Jackfruit RTS beverage during storage

The results obtained for microbial load in therapeutic flavored and blended papaya-jack fruit during storage. In the beginning there was rejection bacterial count in flavored and blended papaya-jackfruit during storage. It had increased to 2.00×10^{-6} after 120 days of

storage. No fungal growth was noticed in flavored and blended papaya-jackfruit RTS beverage in the entire period of storage. Lowest increase in the microbial population was observed when juice was blended with spices like ginger and cardamom. Spices had the inhibitory effect with respect to micro-organisms. Similar results have been reported by (Sakhale et al., 2012) for whey-based RTS from mango.

CONCLUSION

It could be concluded that a flavored and blended papaya-jackfruit RTS beverage can be developed effectively with the inclusion of 2% ginger and cardamom extracts stored at ambient circumstance in sterilized bottles for 120 days without observing any symptoms of microbial spoilage. Therefore, it is concluded that when compare to synthetic drinks, flavored and blended papaya-jackfruit RTS beverage afford nutrients like ascorbic acid

and β -carotene which are also antioxidant vital to support health. Papaya, jackfruit, ginger and cardamom known for their dietary and healing properties as well recognized by Indian Ayurveda also can be subjugated to develop nutritious health drinks with natural therapeutic properties. Combination of fruit juices help in getting better nutritional and sensory quality and ease cost of production by using seasonal low cost fruits leading to new product development. Commercialization of these products helps in utilizing a mixture of perishable seasonal fruits into nutrient loaded value added products, which in roll balances the profitable aspects.

REFERENCES

- AOAC. (2005). Official methods of analysis (16th edition), association of Official Analytical Chemists, Washington, USA.
- Bhardwaj, R.L., & Mukherjee, S. (2005). Studies on preservation of kinnow mandarin juice and its blends. Ph.D. Dissertation. Department of Horticulture. SKN. College of Agriculture. Jobner, RAU-Bikaner.
- Boghani., A.H., Raheem, A., & Hasmi, S.I. (2012). Development and storage studies of blended papaya-aloe vera ready to serve (RTS) beverage, *Food Processing & Technology*, 3(10), 13-17.
- Cruickshank, R., Duguid, J.P., Marmion, B.P., & Surain, R.H.A. (1975). Medical microbiology. The practice of medical microbiology. Churchill Livingstone, Edinbargh, London and Newyork p.306.
- Deka, B.C., Dethi, V., & Saikia, A. (2005). Changes in quality of mango-pineapple spicd beverage during storage. *Indian Journal of Horticulture*. 62, 71-75.
- Hossain., Ram, L., Ngumani, P.S., & Bepary, R.H. (2017). Development of Jackfruit-Aloe Vera blended Ready-To-Serve (RTS) functional beverage at refrigerated condition. *International journal of Agriculture Innovations and Research*. 6(2), 227-230.
- Khan, A., Singh, H., Krishna, B.R., & Bhatia, A.K. (1988). Carotene enriched beverage. *Indian Food Packer* 42, 27–29.
- Nagarajan, B Nutrient importance of papaya. *Kissan world*. 28(1), 41 (2002).
- Nagpal & Rajyalakshmi, P. (2009). Quality and storage of RTS beverage from Bael and citrus fruit blends. *Beverage and food world*. 45(12), 24- 26.
- Panghal, A., Kumar, V., Dhull, S.b., Gat, Y., & Chhikara, V. (2017). Utilization of dairy industry waste-whey in formulation of papay RTS beverage. *Current research in nutrition and food science*. 5(2), 168-174.
- Panse, V.G., & Sukhatme, P.V. (1985). Statistical method for agricultural workers. Indian Council of Agricultural Research, New Delhi.
- Panghal, A., Navnidhi, N.D., & Khatkar, B.S. (2009). Whey Based Strawberry Ready to Serve (RTS) Beverage, *Beverage and Food World*, 36(4), 28-30.
- Sakhale, B.K., Pawar, V.N., & Ranveer, R.C., (2012). Studies on the development and storage of whey based RTS beverage from Mango cv. Kesar. *Food Processing and Technology*. 3(3), 13-18.
- Sasi, K.R., Ray, Paul, P.K., & Suresh, C.P. (2013). Development and storage studies of therapeutic ready to serve (RTS) made from blend of aloevera, aonla and ginger, *Food Processing & Technology*, 4(6), 1-5.
- Yadav R.B., Yadav B.S., & Kaila. N., (2010). Development and storage studies on whey-based banana herbal (Mentha arvensis) beverage. *America Journal of Food Technology*. 5, 121-129.