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Short communication

Studies on stability and quality of *jamun*-mango blended ready-to-serve beverage

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ABSTRACT

***Jamun* fruits are sweet and sour which are rich in nutrients but not acceptable due to high acidity or poor taste and flavour. However, its juice can be blended with other fruits to improve the acceptability and make use of available nutrients. Hence, an experiment was carried out to study blended *jamun*-mango juice for the preparation of *jamun*-mango blended ready-to-serve (RTS) beverages with 15% juice, 15°Brix total soluble solids and 0.2% acidity. *Jamun* and mango juices were blended in the ratio of 100% *jamun* juice as control and in the ratio of 90:10, 80:20, 70:30 and 60:40. During six months of storage, total soluble solids increased, whereas acidity decreased slightly. Anthocyanin content decreased throughout the storage period. The results of ready-to-serve beverage reveled that maximum iron (0.16 mg/100 g) was found in T_1 treatment (100% *jamun* juice). After six months of storage, sensory evaluation revealed that the treatment T_3 (80:20, *jamun*: mango) recorded the highest score for flavour (7.24), body (8.70) and for overall acceptability (7.66). The same combination retained the maximum anthocyanin content of 31.16 mg/100 g after 6 months of storage and was judged as the best.**

Key words: *Jamun*, mango, ready-to-serve beverage, storage.

India produced 88,977 metric tonnes of fruits and 1,62,897 metric tonnes of vegetables (Anon, 1). In fruit production, it ranks next to China. Unfortunately, a big chunk (20-30%) of this hard earned valuable produce goes waste due to inadequate post harvest infrastructure and poor utilization (1.8%) by processing industries (Verma and Joshi, 13). The demand for fruit beverages is increasing in India as well as in other countries due to increasing trend towards fast food. Fruit beverages have higher nutritional and medicinal values compared to synthetic beverages and these can be improved further by blending juice of two or more juices having nutritive and therapeutic values. Tiwari (12) standardized papaya and guava pulp for making ready-to-serve beverage. Similarly, Sharma *et al.* (10) also worked on the blending of juices of different mango varieties. Blending of fruit juices helps in improving nutrient elements, reducing cost of production by using cheaper fruits in the blends and also leads to new product development. Moreover, fruits which are rich in nutrients but not acceptable due to high acidity or poor taste and flavour can be blended with other fruits to improve their acceptability and make use of available nutrients. Some consumer avoid taking *jamun* fruit because of astringent taste but prefer it if suitable fruit products are prepared from this fruit. Hence, the study was conducted with the objective to develop value-added products from *jamun*-mango blends and to study storability of the finished product.

Mature fruits of *jamun* (*Syzigium cumini* Linn.) were obtained from the avenue trees of the R.S. Pura orchard and mango cv. Dashehari fruits were purchased from Fruit Trans-Shipment Centre (FTC) Narwal, Jammu. Both *jamun* and mango fruits were transported to the pilot plant of the Division of Post-Harvest Technology, SKUAST, Udheywalla, Jammu or further processing. The defective and injured fruits of *jamun* and mango were sorted out and healthy ones were retained for juice extraction after washing with water. The juice so obtained was passed through stainless steel strainer, homogenized followed by heating at 85°C for 30 sec. and filling in pre-sterilized glass bottles. Bottles were crown corked and pasteurized for 20 min. in boiling water, cooled, labeled and stored at ambient temperature for further use. The juice so obtained was also analyzed for physico-chemical and organoleptic characters. The *jamun* and mango juices were blended with each other in different ratio such as 100:00; 90:10; 80:20; 70:30 and 60:40, respectively for developing ready-to-serve beverage. The prepared blends were heated at 85 ± 5°C for 2 min., hot packed in pre-sterilized glass bottles followed by 20 min. processing in boiling water, cooling and labeling. RTS beverages were prepared using 15 per cent of juice from the blended ratios,

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viz., T_1 (15% juice of 100:00 *jamun*-mango blend), T_2 (15% juice of 90:10 *jamun*-mango blend), T_3 (15% juice of 80:20 *jamun*-mango blend), T_4 (15% juice of 70:30 *jamun*-mango blend) and T_5 (15% juice of 60:40 *jamun*-mango blend). Total soluble solids (15°Brix) and acidity (0.3%) of the beverage was adjusted using sugar and citric acid. The beverage was heat processed at 85°C for 30 sec. filled in pre-sterilized glass bottles of 200 ml capacity, crown corked and pasteurized for 30 min. in boiling water followed by immediate cooling, labeling and storing. The beverage was preserved with 200 ppm sodium benzoate. The ready-to-serve beverages prepared were stored at room temperature (30-42°C) for periodical physico-chemical analysis and organoleptic evaluation after 0, 2, 4 and 6 months (Ranganna, 9). Sensory appeal was determined by appearance, texture and flavour (Bourne, 3). Anthocyanins content were determine as per the method suggested by Swain and Hillis (11) and iron estimation was done as per the standard procedures described by AOAC (2). The samples were evaluated on the basis of colour, body, flavour and overall acceptability by semi-trained taste panels of 6-7 judges using 9 point hedonic scale. A score of 5.5 and above was considered acceptable (Bourne, 3). The experiment was carried out in completely randomized design and completely randomized design with factorial concept for interpretation of results through analysis of variance (Gomez and Gomez, 5).

All the treatments showed a significant increase in total soluble solids of *jamun*-mango blended ready to serve beverage during storage (Table 1). The increase in total soluble solid during storage

Table 1. Changes in chemical composition of *jamun*-mango blended ready-to-serve (RTS) beverage during storage.

Treatment	Storage period (months)					$CD_{0.05}$
	0	2	4	6	Mean	
Total soluble solids (°Brix)						
T_1	15.0	16.34	17.05	17.71	16.52	Treatment (T) = 0.04
T_2	15.0	16.45	17.14	17.86	16.62	Storage (S) = 0.03
T_3	15.0	16.52	17.35	17.43	16.58	T × S = 0.07
T_4	15.0	16.66	17.46	17.95	16.77	
T_5	15.0	16.81	17.62	18.02	16.87	
Mean	15.0	16.56	17.33	17.79		
Titratable acidity (%)						
T_1	0.3	0.27	0.26	0.22	0.26	Treatment (T) = NS
T_2	0.3	0.28	0.25	0.23	0.27	Storage (S) = 0.03
T_3	0.3	0.27	0.26	0.23	0.27	T × S = NS
T_4	0.3	0.26	0.24	0.20	0.25	
T_5	0.3	0.28	0.26	0.23	0.27	
Mean	0.3	0.27	0.25	0.22		
Anthocyanins (mg/100 g)						
T_1	34.7	31.16	28.10	26.60	30.14	Treatment (T) = 1.52
T_2	34.2	33.30	28.50	25.60	30.39	Storage (S) = 1.36
T_3	33.7	33.20	32.40	31.16	32.62	T × S = NS
T_4	31.3	28.50	26.60	24.60	27.75	
T_5	28.8	26.50	24.70	21.60	25.40	
Mean	32.5	30.53	28.06	25.91		
Iron (mg/100 g)						
T_1	0.18	0.16	0.15	0.14	0.16	Treatment (T) = 0.02
T_2	0.16	0.15	0.14	0.13	0.15	Storage (S) = 0.02
T_3	0.15	0.14	0.14	0.130	0.14	T × S = NS
T_4	0.14	0.12	0.11	0.10	0.12	
T_5	0.13	0.11	0.10	0.09	0.11	
Mean	0.15	0.14	0.13	0.12		

T_1 (100:0), T_2 (90:10), T_3 (80:20), T_4 (70:30), T_5 (60:40)

was also reported by Pandey and Singh (8) in guava ready-to-serve drink. The possible reason for the increase in total soluble solids might be due to partial hydrolysis of complex carbohydrates. After six months of storage, the maximum per cent of titratable acidity was recorded as 0.23 per cent in T_2 (90:10), T_3 (80:20) and in T_5 (60:40) and minimum of 0.22 per cent in T_4 (70:30). During storage, acidity of ready-to-serve decreased, which was in conformity with the findings of Kannan and Thirumaran (6), while working on *jamun* fruit products. Decrease in acidity during storage might be due to co-polymerization of organic acids with sugars and amino acids and loss of volatile acids during storage.

Highest anthocyanin recovery (31.16 mg/100 g) was recorded in T_3 (80:20) treatment with the advancement of storage period. This might be due to hydrolysis of protective 3-gycoside linkage to give unsuitable anthocyanin. These results were supported by Kannan and Thirumaran (6) in *jamun* products. The iron content of the ready-to-serve beverage decreased during storage. The treatment T_1 (100:00) recorded the highest iron content (0.14 mg/100 g) and the lowest iron content (0.09 mg/100 g) was in T_5 (60:40) and the possible reason for the decrease might be due to its heat sensitivity even at the ambient temperature, which causes the destruction of minerals during storage.

A decreasing trend in the sensory evaluation was noticed throughout the storage period in the developed samples. After six months of storage, treatment T_3 (80:20) received the highest score of 7.24 for flavour and 7.66 for overall acceptability (Table 2). The possible reason for decrease in flavour was due to the loss of volatile aromatic substances in storage at ambient conditions. In general, decrease in sensory score of different characteristics of *jamun*-mango blended ready-to-serve beverage, irrespective of treatments, during storage might be attributed colour changes occurring in appearance and taste of the product. Pandey and Singh (8) in guava beverage, Dwivedi *et al.* (4) in seabuckthorn beverage and Kannan and Thirumaran (6), while working on *jamun* product also reported that the organoleptic score of the products declined during storage due to formation of off-flavour, browning thus masking the original flavour/ taste. Kumar and Manimegalai (7) also reported similar findings with respect to organoleptic score in mixed fruit ready-to-serve beverages. All the samples were found to be free from microbial count upto four months of storage. However, after six months of storage only treatments T_4 (70:30) and T_5 (60:40) showed a negligible count of 1×10^6 (CFU/ml), which might have occurred during handling etc. and was in safe zone. Storability of ready-to-serve beverage showed that T_3 (80:20, *jamun*: mango) was adjudged the best by way of retaining the maximum anthocyanin content after 6 months of storage. The same treatment scored maximum points for flavour, body, colour and overall acceptability after 6 months of storage (Fig. 1).

Table 2. Changes in sensory quality of *jamun*-mango blended ready-to-serve (RTS) beverage during storage.

Treatment	Storage period (months)					$CD_{0.05}$
	0	2	4	6	Mean	
Flavour						
T_1	7.44	7.34	7.04	6.26	7.02	Treatment (T) = 0.02
T_2	7.44	7.34	7.24	6.15	7.04	Storage (S) = 0.02
T_3	8.76	7.54	7.34	7.24	7.72	T × S = 0.03
T_4	7.54	7.42	7.34	6.25	7.14	
T_5	7.54	7.56	7.44	6.34	7.22	
Mean	7.74	7.44	7.28	6.45		
Overall acceptability						
T_1	8.04	7.84	7.72	7.64	7.81	Treatment (T) = 0.02
T_2	7.96	6.75	7.64	7.56	7.48	Storage (S) = 0.01
T_3	8.64	8.34	7.84	7.66	8.12	T × S = 0.03
T_4	7.84	7.62	7.54	7.42	7.61	
T_5	7.82	7.66	7.54	7.46	7.62	
Mean	8.06	7.64	7.66	7.55		

T_1 (100:0), T_2 (90:10), T_3 (80:20), T_4 (70:30), T_5 (60:40)

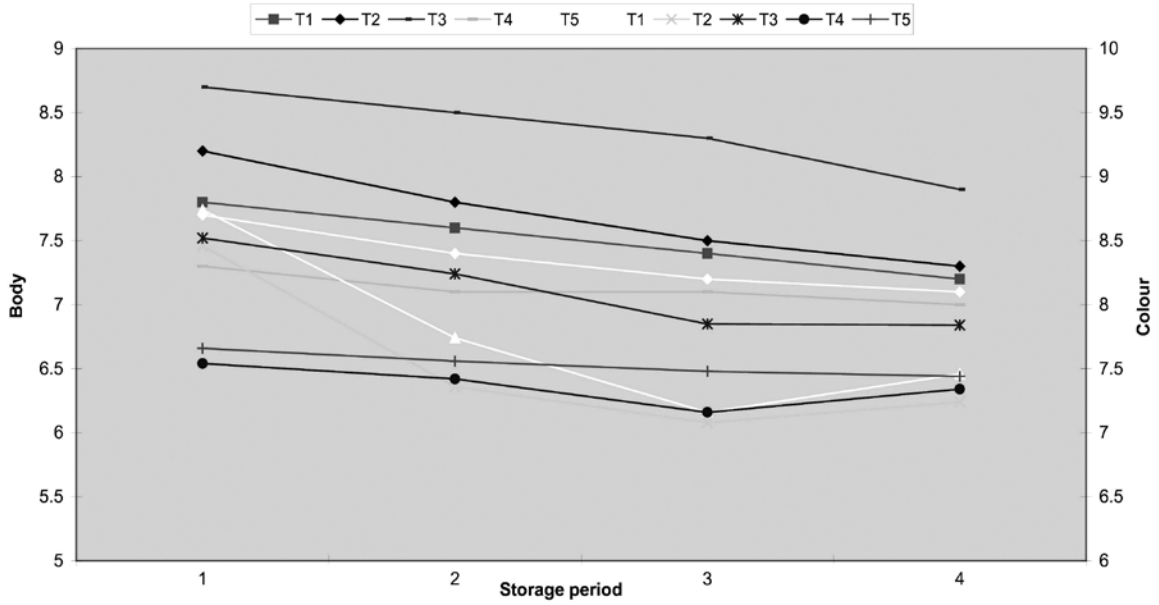

Fig. 1. Effect of treatments and storage period on mean score evaluation of body and colour of *jamun*-mango blended ready-to-serve (RTS) beverage.

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