Plant Archives Vol. 15 No. 2, 2015 pp. 1083-1088 *ISSN 0972-5210*

UTILISATION OF JAMUN JUICE BY MAKING BLENDED RTS BEVERAGES

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Abstract

The present study was conducted during the year 2014-15 at HCRI, Venkataramannagudem. The juices used in the study were those obtained from mango, grapes and pineapple blended in different proportions with jamun juice. These juice blends were utilized for the preparation of RTS and were evaluated for their quality throughout the acceptable period of storage. Colour, TSS, acidity, pH, reducing sugars, non-reducing sugars total sugars and overall acceptability were observed throughout the storage period. The optical density of the beverages, acidity, reducing sugars and total sugars increased continuously during storage period, while pH, non-reducing sugars decreased during the storage period. The decrease in organoleptic acceptability was due to the change in the composition of these parameters. The RTS prepared from 75% of jamun juice blended with 25% grape juice had highest overall acceptability among all the combinations. However, all these RTS beverages were acceptable up to 90 days of storage period.

Key words: Jamun, RTS, colour, optical density, nutrition sectors.

Introduction

Recent researches in the food and nutrition sectors have called the attention of consumers towards the interest in fresh and processed foods that offer some additional benefits to health (Abdullah and Cheng, 2001). In order to meet these new standards of food demand, many native or introduced fruits, little explored economically, can be tested as raw material for domestic industrial use. Jamun (*Syzygium cumini* L.) is an evergreen tropical tree belonging to the family Myrtaceae which is native to India.

Jamun starts flowering in March- April and the fruits appear in May- June. The berry is oblong, ovoid and shining crimson black (rich in anthocyanin pigment and anti-oxidants) when fully ripe. Jamun fruits are universally accepted to be very good for medicinal purpose especially for curing diabetes because of its effect on pancreas (Joshi, 2001). The fruit, its juice and seed contain a metabolite called 'jamboline' which is believed to check the pathological conversion of starch into sugar in case of increased production of glucose. Besides, jamun fruit is an effective food remedy for bleeding piles and correcting liver disorders. Since the fruit is a very rich source of anthocyanin, it imparts anti-oxidant properties too.

In addition, the ripe berries form a good source for vitamins, minerals, pectin and ascorbic acid. It is used as an effective therapeutic medicine against diabetes, heart and liver trouble. However, jamun fruit is highly perishable; the short shelf-life of fruit has made it available only for short period, which makes its valuable properties unrealized by several people. Since, there has been an increasing demand for health promoting food products like those of jamun a clear necessity is felt to preserve the fruit in various forms.

Fruits, which are rich in nutrients but are not accepted 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 (Khan *et al*., 1988). Blending of the 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 (Kalra *et al.*, 1991). Once the acceptability is improved for any product, its demand increases and eventually fetches a good price in market. Viable or more acceptable blends of fruit juices can be further utilized in the preparation of corresponding beverages from them which will further widen the scope of their acceptable presentation in the market. The present study revealed that the blending improves the overall acceptability of RTS as the physico-chemical parameters showed

desirable values in different blends as compared to pure jamun juice.

Materials and Methods

In the present study, the fruits were collected from the local market. Well ripe fruits were collected and washed. Diseased, withered fruits were discarded. The fruit juice was extracted as per the procedure outlined by Srivastava and Kumar (1994).

Preparation of blends

The fruit juices thus prepared were blended in different proportions *viz*., 75:25, 50:50, 25:75 with jamun juice as per the respective treatment combinations and the observations were recorded for different blends. The stock preparations were made at different levels as per the treatments and they were further used in the preparation of RTS along with pure jamun juice.

Preparation of ready to serve (RTS) beverage

RTS was prepared by using the respective blends by addition of sugar syrup and permitted quantity of preservatives. The TSS was adjusted to 10 °B. Citric acid (0.3%) was added to maintain the acidity and Sodium benzoate (100ppm) was used as preservative.

Storage and proximate analysis

RTS beverages were stored in pet bottles at ambient conditions. The proximate analyses of jamun based beverages were done for different parameter. The samples were kept against a white piece of paper. Colour of the samples was ascertained by visual observation. Also the optical density (O.D.) of the samples was taken for greater accuracy by using colorimeter (Mazumdar and Mazumdar, 2003). The absorbance of the clear samples was obtained at 600 nm (Wave length of minimal absorbance) in colorimeter against distilled water blank. The total soluble solids were determined by using hand refractometer and expressed in ^{o}Brix as followed by Ranganna (1986).The titrable acidity was analysed by the procedure followed by Ranganna (1986). The pH of the RTS was recorded with the help of pH meter as followed by Covenin (1984). Total sugars and reducing sugars were determined following the method described by Lane and Eyon (Ranganna, 1986). The overall acceptability was recorded by using 9 point hedonic scale (Amerine *et al*., 1965).

Results and Discussion

Colour

The effect of treatments, storage period and their interactions showed significant difference in colour of the RTS beverages (table 1). There was a significant difference with respect to the optical density (OD) throughout the storage period. It was increased from the day of preparation (0.101) to 90 days of storage (0.107) but there was a non-significant difference in OD up to 60 days of storage.

Among the treatments the highest OD (0.109) was recorded in the RTS prepared from 75% jamun juice + 25% grape juice ($\mathbf{T_6}$) and 75% jamun juice + 25% mango ($\mathbf{T_3}$), which was on par with RTS beverages prepared from pure jamun juice (0.108) ($\mathbf{T_{10}}$) and RTS prepared from 50% jamun juice + 50% mango juice (0.107) ($\mathbf{T_2}$). The lowest OD (0.091) was observed in the RTS prepared from 25% jamun juice + 75% pineapple juice ($\mathbf{T_7}$).

Total soluble solids

Non-significant difference in TSS was found in the RTS beverages prepared from different juice blends with respect to the storage period and interactions among them (table 1). All the RTS beverages were maintained at 10°Brix without any change till 90 days of storage. Similar results were obtained by Jakhar *et al.* (2013).

Titrable acidity

The results obtained on titrable acidity (table 2) showed that there were significant differences among the treatments and the interaction between juice blends and storage intervals. The percentage of titrable acidity significantly increased from the day of preparation (0.276%) to 90 days of storage (0.299%).

The lowest titrable acidity (0.115%) was found in the RTS prepared from 25% jamun juice + 75% grape juice ($\mathbf{T_4}$) significantly preceded by the RTS from 50% jamun juice + 50% grape juice (0.239%) ($\mathbf{T_5}$). Titrable acidity was found to be at maximum (0.345%) in RTS prepared from pure jamun juice ($\mathbf{T_{10}}$).

The increase in titrable acidity might be due to the formation of organic acids by the degradation of ascorbic acid (Sharma *et al.*, 2009). However, in any particular treatment, the increase in titrable acidity was not significant. Sakhale *et al.* (2012) reported that the slight growth of micro-organisms in the beverages may leads to the increase in titrable acidity.

pH

There were significant differences with regard to pH among the treatments, storage intervals and their interactions (table 2). The average pH over all treatments was found to show significant decrease from 4.34 (initial day) to 3.51 (90 days of storage).

Among the treatments, the highest pH (4.32) was noticed in the RTS prepared from 25% jamun juice + 75% grape juice ($\mathbf{T_4}$) on par with the RTS prepared from

Table 1: Effect of jamun based blends and storage period on colour and Total Soluble Solids (°B) of RTS beverages

Juice blends	Colour*					Total Soluble Solids (°B)				
	Storage period (days after preparation)					Storage period (days after preparation)				
	0	30	60	90	Mean	0	30	60	90	Mean
T_1: 25% Jamun + 75% Mango	Candy tuft pink (0.098)	Candy tuft pink (0.098)	Candy tuft pink (0.109)	Pink parafait (0.115)	**0.105**	10.00	10.00	10.00	10.00	**10.00**
T_2: 50% Jamun + 50% Mango	Pink parafait (0.099)	Pink parafait (0.099)	Pink parafait (0.112)	Clear pink (0.117)	**0.107**	10.00	10.00	10.00	10.00	**10.00**
T_3: 75% Jamun + 25% Mango	Straw berry pink (0.103)	Straw berry pink (0.104)	Straw berry pink (0.109)	Chocolate (0.119)	**0.109**	10.00	10.00	10.00	10.00	**10.00**
T_4: 25% Jamun + 75% Grapes	Camellia pink (0.098)	Camellia pink (0.099)	Camellia pink (0.100)	Brick red (0.113)	**0.102**	10.00	10.00	10.00	10.00	**10.00**
T_5: 50% Jamun + 50% Grapes	Casino pink (0.100)	Casino pink (0.101)	Casino pink (0.105)	Rust (0.115)	**0.105**	10.00	10.00	10.00	10.00	**10.00**
T_6: 75% Jamun + 25% Grapes	Summer punch pink(0.105)	Summer punch pink (0.105)	Summer punch pink (0.106)	Rose pink (0.118)	**0.109**	10.00	10.00	10.00	10.00	**10.00**
T_7: 25% Jamun + 75% Pineapple	Sunset snow (0.097)	Sunset snow (0.096)	Sunset snow (0.091)	Veranda blush pink (0.080)	**0.091**	10.00	10.00	10.00	10.00	**10.00**
T_8: 50% Jamun + 50% Pineapple	Venetian pink (0.098)	Venetian pink (0.098)	Venetian pink (0.093)	Shell pink (0.089)	**0.094**	10.00	10.00	10.00	10.00	**10.00**
T_9: 75% Jamun+ 25% Pineapple	Pomegranate pink (0.102)	Pomegranate pink (0.102)	Pomegranate pink (0.095)	Brown (0.090)	**0.097**	10.00	10.00	10.00	10.00	**10.00**
T_{10}: 100% Jamun	Roselle pink (0.106)	Roselle pink (0.107)	Roselle pink (0.107)	Caramine red (0.111)	**0.108**	10.00	10.00	10.00	10.00	**10.00**
Mean	**0.101**	**0.101**	**0.103**	**0.107**	**0.103**	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**
Factor	**SEm±**			**C.D. at 5%**		**SEm±**			**C.D. at 5%**	
T	0.001			0.002		-			-	
D	0.001			0.002		-			-	
T × D	0.001			0.003		-			-	

*Figures in parantheses indicate absorbance at 600 nm in terms of OD values.

Table 2: Effect of jamun based blends and storage period on Titrable acidity (%) and pH of RTS beverages

Juice blends	Titrable acidity (%)					pH				
	Storage period (days after preparation)					Storage period (days after preparation)				
	0	30	60	90	Mean	0	30	60	90	Mean
T_1: 25% Jamun + 75% Mango	0.230	0.237	0.245	0.249	**0.240**	4.51	4.23	4.07	3.90	**4.18**
T_2: 50% Jamun + 50% Mango	0.267	0.270	0.282	0.293	**0.278**	4.45	4.13	4.00	3.87	**4.11**
T_3: 75% Jamun + 25% Mango	0.297	0.300	0.312	0.319	**0.307**	4.38	4.03	3.47	3.40	**3.82**
T_4: 25% Jamun + 75% Grapes	0.100	0.110	0.120	0.128	**0.115**	4.61	4.32	4.24	4.12	**4.32**
T_5: 50% Jamun + 50% Grapes	0.230	0.233	0.240	0.254	**0.239**	4.45	4.24	3.93	3.89	**4.13**
T_6: 75% Jamun + 25% Grapes	0.327	0.330	0.335	0.338	**0.333**	4.36	4.13	3.79	3.68	**3.99**
T_7: 25% Jamun + 75% Pineapple	0.320	0.330	0.335	0.338	**0.331**	4.41	4.05	3.87	3.66	**4.00**
T_8: 50% Jamun + 50% Pineapple	0.325	0.340	0.347	0.353	**0.341**	4.35	4.01	3.63	3.47	**3.86**
T_9: 75% Jamun+ 25% Pineapple	0.330	0.340	0.349	0.356	**0.344**	4.27	3.90	3.61	3.51	**3.82**
T_{10}: 100% Jamun	0.333	0.340	0.348	0.359	**0.345**	4.31	3.96	3.59	3.40	**3.81**
Mean	**0.276**	**0.283**	**0.291**	**0.299**	**0.287**	**4.34**	**3.98**	**3.67**	**3.51**	**3.87**
Factor	**SEm ±**			**C.D. at 5%**		**SEm ±**			**C.D. at 5%**	
T	0.024			0.069		0.09			0.25	
D 0.001	0.003			0.04		0.10				
T × D	0.026			0.074		0.12			0.35	

Table 3: Effect of jamun based blends and storage period on reducing sugars (%) and non-reducing sugars (%) of RTS beverages.

Juice blends	Reducing sugars (%)					Non-reducing sugars (%)				
	Storage period (days after preparation)					Storage period (days after preparation)				
	0	30	60	90	Mean	0	30	60	90	Mean
T_1: 25% Jamun + 75% Mango	5.98	6.17	6.34	6.53	**6.26**	2.06	1.88	1.76	1.61	**1.83**
T_2: 50% Jamun + 50% Mango	5.41	5.60	5.78	5.87	**5.66**	1.85	1.70	1.60	1.57	**1.68**
T_3: 75% Jamun + 25% Mango	5.37	5.55	5.75	5.93	**5.65**	1.11	0.97	0.82	0.70	**0.90**
T_4: 25% Jamun + 75% Grapes	6.55	6.71	6.94	7.00	**6.80**	0.24	0.15	0.13	0.10	**0.16**
T_5: 50% Jamun + 50% Grapes	6.36	6.60	6.79	6.84	**6.65**	0.34	0.25	0.14	0.09	**0.20**
T_6: 75% Jamun + 25% Grapes	5.96	6.10	6.15	6.28	**6.07**	0.65	0.59	0.45	0.44	**0.53**
T_7: 25% Jamun + 75% Pineapple	4.14	4.32	4.51	4.64	**4.40**	1.98	1.87	1.65	1.64	**1.79**
T_8: 50% Jamun + 50% Pineapple	4.22	4.44	4.58	4.66	**4.48**	1.76	1.61	1.58	1.56	**1.63**
T_9: 75% Jamun+ 25% Pineapple	4.74	4.90	4.83	5.07	**4.82**	1.10	1.05	0.95	0.92	**1.00**
T_{10}: 100% Jamun	4.81	4.98	5.15	5.20	**5.03**	0.90	0.79	0.77	0.66	**0.78**
Mean	**5.35**	**5.54**	**5.68**	**5.80**	**5.59**	**1.20**	**1.09**	**0.98**	**0.93**	**1.05**
Factor	**SEm ±**			**C.D. at 5%**		**SEm ±**			**C.D. at 5%**	
T	0.22			0.63		0.22			0.63	
D	0.02			0.05		0.01			0.03	
T × D	0.32			0.89		0.23			0.66	

the 25% jamun juice + 75% mango juice (4.18) (T_1) . The lowest pH (3.81) was noticed in the RTS prepared from 100% jamun juice (T_{10}).

The pH of the particular treatment decreased with increase in the proportion of other juices (mango, grapes and pineapple) used while preparing the starter juice combinations for it. The increase in acidity of the drink

Table 4: Effect of jamun based blends and storage period on Total sugars (%) and Overall acceptability of RTS beverages

Juice blends	Total sugars (%)					Overall acceptability				
	Storage period (days after preparation)					Storage period (days after preparation)				
	0	30	60	90	Mean	0	30	60	90	Mean
T_1: 25% Jamun + 75% Mango	8.04	8.05	8.10	8.14	**8.08**	6.19	5.99	5.83	5.40	**5.85**
T_2: 50% Jamun + 50% Mango	7.26	7.30	7.38	7.43	**7.34**	4.30	4.19	3.98	3.60	**4.02**
T_3: 75% Jamun + 25% Mango	6.48	6.52	6.57	6.63	**6.55**	6.22	6.03	5.90	5.46	**5.90**
T_4: 25% Jamun + 75% Grapes	7.20	7.30	7.39	7.44	**7.33**	6.22	6.03	5.88	5.47	**5.90**
T_5: 50% Jamun + 50% Grapes	6.70	6.85	6.93	6.93	**6.85**	8.03	7.85	7.68	7.20	**7.69**
T_6: 75% Jamun + 25% Grapes	6.20	6.25	6.29	6.38	**6.28**	9.00	8.83	8.65	8.25	**8.68**
T_7: 25% Jamun + 75% Pineapple	6.12	6.20	6.17	6.28	**6.19**	6.18	5.99	5.83	5.40	**5.85**
T_8: 50% Jamun + 50% Pineapple	5.98	6.05	6.16	6.22	**6.10**	8.00	7.85	7.63	7.25	**7.68**
T_9: 75% Jamun+ 25% Pineapple	5.84	5.95	5.78	5.99	**5.89**	8.00	7.87	7.67	7.20	**7.69**
T_{10}: 100% Jamun	5.71	5.78	5.92	5.85	**5.81**	6.22	6.05	5.90	5.47	**5.91**
Mean	**6.55**	**6.62**	**6.67**	**6.73**	**6.64**	**6.84**	**6.67**	**6.49**	**6.07**	**6.52**
Factor	**SEm ±**			**C.D. at 5%**		**SEm ±**			**C.D. at 5%**	
T	0.26			0.72		0.47			1.31	
D	0.01			0.02		0.03			0.08	
T × D	0.28			0.78		0.51			1.44	

attributed to the increase in release of hydrogen ions during the storage. Therefore the corresponding decrease was noticed in pH (Akhtar *et al.*, 2013)

Reducing sugars

The data (table 3) revealed that there were significant differences among the treatments, storage intervals and their interactions. Among the treatments, the highest amount of reducing sugars (6.8%) was observed in the RTS prepared from 25% jamun juice + 75% grape juice (T_4) which was on par RTS from 50% jamun juice + 50% grape juice (6.65%) (T_5) and also with RTS from 25% jamun juice + 75% mango juice (6.26%) (T_1).

The analysis revealed that the reducing sugars increased steadily and significantly from the minimum (5.35%) on the day of preparation to the maximum (5.80%) at 90 days of storage.

Sakhale *et al.* (2012) reported that the increase in reducing sugars might be due to the conversion of non-reducing sugars into reducing sugars in presence of citric acid.

Non-reducing sugars

The effect of treatments on percentage of non-reducing sugars was found to be significant (table 3). The non-reducing sugars were found to decline significantly from the day of preparation (1.20%) to 90 days of storage (0.93%). This decline was due to their conversion into reducing sugars.

The highest percentage of non-reducing sugars (1.83%) was observed in RTS prepared from 25% jamun juice + 75% mango juice (T_1) which was on par with RTS beverages prepared from 25% jamun juice + 75% pineapple juice (1.79%), 50% jamun juice + 50% mango juice (1.68%) and 50% jamun juice + 50% pineapple juice (1.63%). The lowest percentage of non-reducing sugars (0.16%) was found in the RTS from 25% jamun + 75% grape juice (T_4).

Total sugars (%)

There were significant differences among the treatments, storage intervals and their interactions (table 4). Among different RTS beverages, the highest value of total sugars (8.08%) was found in the RTS prepared from 25% jamun juice + 75% mango juice (T_1) followed by the RTS from 50% jamun juice + 50% mango juice (7.34%) (T_2). The RTS prepared from the jamun juice 100% (T_{10}) was found to have the least quantity of total sugars (5.81%). The percentage of total sugars increased significantly from the day of preparation (6.55%) to 90 days after storage (6.73%). However, the increasing trend in total sugars was observed by earlier workers and was ascribed due to inversion of sugars and hydrolysis of polysaccharides into simple sugars (Sonia *et al.,* 2010).

Overall acceptability

The organoleptic score presented in Table 4 revealed significant differences with respect to overall acceptability due to the treatments and storage intervals as well as their interactions. Significant decreases were found to occur in overall acceptability throughout the storage period from the day of preparation (6.84) to 90 days of storage (6.07).

The maximum overall acceptability (8.68) was obtained by the RTS prepared from 75% jamun juice + 25% grape juice ($\mathbf{T_6}$). It was on par with RTS beverages prepared from 50% jamun + 50 grape juice (7.69) ($\mathbf{T_5}$), 75% jamun + 25% pineapple (7.69) ($\mathbf{T_9}$) and 50% jamun + 50 pineapple juice (7.69) ($\mathbf{T_8}$) but superior from the control (5.91) ($\mathbf{T_{10}}$) with a significant difference. The minimum score (4.02) was obtained by the RTS prepared from 50% jamun juice + 50% mango juice ($\mathbf{T_2}$).

Overall acceptability decreased from RTS beverages made out of grape juice combinations to those made from mango juice combinations. Pineapple juice blends with jamun gave intermediately acceptable RTS beverages as compared to grapes and mango. The superiority of RTS prepared from grape juice combinations in general and 75% jamun + 25% grapes ($\mathbf{T_6}$) in particular might be due to several reasons as evident from the results of the present study.

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