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STANDARDIZATION OF PROTOCOL FOR PREPARATION OF RTS BEVERAGE FROM JAMUN JUICE

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ABSTRACT
The investigation on standardization of protocol for preparation of ready to serve beverage from jamun juice was conducted in the Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 2014-16 to extract and clarify juice from jamun fruits and to standardize the process for preparation of RTS beverage.The juice cum pulp extracted by four different methods showed that maximum recovery was obtained from TM_3 (Screw type juice extractor) in jamun Cv. Bahadoli(55.20 %) and Cv. Local (48.40 %).Extracted juice cum pulp was clarified by using four clarification method and TC_4 (Pectinase enzyme 2 per cent and incubation at 30 ºC for 4 hours and centrifugation at 10000 rpm for 15 minutes) was found best for recovery of clear juice in jamun Cv. Bahadoli(90.42 %) and Cv. Local (89.12 %).Thus, it was found that the treatment T5 (Juice 15%+TSS14ºB +acidity 0.3 % + 50 ppm sodium benzoate)+ garlic 5ml + ginger 5ml (juice extract/lit RTS) recorded the highest sensory score of 8.1 in Konkan Bahadoli and 7.9 in local cultivar in respect of overall acceptability followed by treatment T1 (Juice 15% +TSS14º B + acidity 0.3% + 150 ppm sodium benzoate)which recorded the sensory score of 8.0 and 7.9, respectively.

INTRODUCTION

Jamun [*Syzygium cumini* (L.)Skeels] is an evergreen tropical tree in the flowering plant family Myrtaceae, native to India and Indonesia. The tree is tall, evergreen,also grown for shade and windbreak. It is gaining popularity among the consumers due to its high neutroclinical values, in rural as well as urban masses. Different parts of the tree such as bark, fruit and seed posses medicinal and therapeuticvalues (Kirtikar *et al*., 1990; Noomirio and Dahot, 1996). It is a good source of ironand pectin, apart from the usual contents, e.g., minerals, protein etc. It is also usedin making beverages, jellies, jam, squash, wine, vinegar and pickles. Jamun fruits are universally accepted to be very good for medicinal purposes especially forcuring diabetes because of its effect on the pancreas. The fruit juice and seed contain a biochemical called 'jamboline' which is believed to check the pathological conversion of starch into sugar in case of increased production of glucose. Thefruit is highly perishable and can be stored only upto 2-3 days under ambient temperature. However, in cold storage (3-4ºC and 85-90% RH) it can be stored foronly 12 days (Sharma, 2009).

India is a country, well-known for its tradition and culture. Syrup or Sharbet are offered to guests and is an important homemade soft drink. Similarly, fruit juice and beverages also hold an important position due to their richness in essential minerals,vitamins and other nutritive constituents. Synthetic drinks which are more popularcommercially are not so healthy or nutritive compared to natural once. Hence, if natural drinks could substitute synthetic drinks, it would provide numerous benefits to consumers as well as farmers. In view of the rising demands for natural andorganic products, fruit juice and other fruit-based beverages have great scope.

India is second largest producer of fruits and vegetables in the world after china,the present quantity of fruit and vegetable processing is very meager (around 2.2%)as compared to 80% in USA, 70% France, 80% Malaysia and 30% Thailand(Singh *et al*., 2014). Though, there is a maximum availability of raw material orjamun fruits harvested, it cannot be fully utilized, consumed or processed due tolack of processing techniques and technical know-how. Being highly perishable fruit and its short life, it deteriorates at a very faster rate if proper postharvest handling practices and processing techniques are not adopted. Hence, an attempt have been made in this study to utilize jamun juice for preparation of ready-to-serve beverage and to evaluate the overall acceptability.

MATERIALS AND METHODS

The present investigation on standardization of protocol for preparation of RTS beverage from jamun juice was conducted in the Department of Food Science and Technology and Post Harvest Technology Centre, Mahatma Phule Krishi Vidyapeeth, Rahuri. Fully matured fruits of jamun var. Konkan Bahadoli and Local were collected from the Horticulture Farm. The fruits were thoroughly washed with tap water to remove surface dirt and microbial flora if any. Jamun juice was extracted by four different methods of extraction as listed in Table1.

The jamun fruits were thoroughly washed with tap water and the seeds were separated with the help of hand. The pulp was extracted by heating at 60°C for 15 min**(TM_1)**.The weighed jamun were filled separately in sterilized nylon net bags and

pressed in with the help of hydraulic basket press for five minutes. Hydraulic pressure (≤100 psi) was applied to avoid crushing of seeds. The juices obtained were strained out and used for further investigation(TM_2).The juice from jamun was extracted with the help screw type juice extractor. Juice was collected in stainless steel utensils and stored in refrigerated condition till used in further studies(TM_3).The juice of jamun were extracted with the help Brush of type juice extractor. The juice extraction was performed in specially designed plastic brush for kneading to minimize the crushing of seeds(TM_4).

Juice recovery and clarification

The juice obtained from different extraction methods were evaluated for quality and best quality fruit juices samples obtained from one of the methods were used for further improvement of juice clarification by using different treatments as referred in Table 2**.**

The juice recovery and clarification of fruit juices were performed as per the method suggested by Kotecha, *et. al* (1995).The juice was mixed with pectinase enzyme at 0.2% concentration .The mixture was then kept for incubation at 30ºC for 4 h and centrifuged at 10000 rpm for 5, 10 and15 minutes in Remi make laboratory type centrifuge machine. The clarified juice samples in the form of supernatant were passed through muslin cloth and were used for further analysis of RTS beverage. The TC_1 treatment was used as a control.

Standardization of RTS ingredients level

The levels of juice, TSS and acidity in the RTS beverage were standardized by conducting preliminary trials by using different levels of juice like 15 and 20 per cent, Total soluble solids14, 16°Band 0.30 per cent acidity. The treatments used for preparation of RTS beverage are given in Table 3.

The prepared RTS with different recipes as given in Table 3 was pasteurized at 60 C for 30 minutes and hot filled in 200 ml bottles by leaving 2 cm head space and sealed and again pasteurized. The pet bottles and pouches were cooled ,labelled and stored at ambient (30 + 5 C and cold storage (5 C). Observations were taken just after the preparation of the product.

Biochemical analysis

The total soluble solids (TSS, as expressed in °B) and pH of extracted juice and RTS were determined using hand refractometer and digital pH meter, respectively. The titratable acidity was determined by the procedure as reported by Ranganna (2005). Sugars was estimated in terms of reducing and total sugars (Ranganna, 1986). The total anthocyanin content was determined by the method reported by Fuleki and Francis (1968) with slight modification as suggested by Khurdiya and Roy (1984). The tannin content of juice was determined by calorimetric method using Folin-Denis reagent (A.O.A.C., 2005). The antioxidant activity potential of juice was determined on the basis of scavenging activity of the stable 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical as described by Sadhu *et al*. (2003) and Bhalodia *et al*(2011). Zn, Cu, Fe and Mn were determined by Lindsay and Norvell (1978) using Atomic Absorption Spectrophotometer.

Fruits
↓
Washing
↓
Peeling & removal of skin
↓
Extraction of pulp/juices
↓
Pectinase treatment 0.2 per cent for 4h and centrifugation10000 RPM for 15 min.
↓
Juice
↓
Adjust brix & acidity
↓
Pasteurization (at 60 ^{0}c for 30 min)
↓
Hot filling
Addition of sodium benzoate, garlic and ginger extract
↓
Filling in PET bottles and pouches
↓
Sealing
Cooling
↓
Labeling
↓
Storage (Ambient (30 ± 5°C) and Cold storage at 5°C)

Statistical analysis

The analysis of variance of the data was done by using completely randomized design (CRD) for different treatments as per the methods given by Gomez and Gomez (1985).

RESULTS AND DISCUSSION

The jamun fruits of Cv. Konkan Bahadoli were dark purple in colour and that of Cv. Local were red purple. Garande (1992) and Anonymous (2014) studied the physical parameters ofjamun fruits and reported that the colour of berries was light dark purple and deep purple. The shape of both the cultivars was oblong. The weight and colour of the fruits is one of the key indices that can be employed for judging the fruit maturity. The average weight of jamun fruits of Cv. KonkanBahadoli was 21.84 g while that of Cv. Local was 20.25 g. Patil *et al*. (2012) have reported the average weight of jamun fruits, which is indeed in accordance with the present investigation. The average length and breadth of jamun fruits of Cv. KonkanBahadoli was measured to 2.97 cm and 2.15 cm while that of Cv. Local was 2.85 cm and 2.10 cm, respectively, consistent to the findings reported by Garande (1992) and Patil *et al*. (2012). The pomace, seed and pulp cum juice recovery from jamun fruits of Cv. KonkanBahadoli was 18.60, 30.20 and 51.20 per cent whereas that of Cv. Local was 18.80, 32.10 and 49.10, respectively (Table 4). The current data is analogous to the results reported by Patil *et al*. (2012); Pimpale (2013)and Anonymous (2014).

The Cv. Konkan Bahadoli of jamun fruit contain 15.20 °B, 3.05, 0.82, 10.77 and 12.62 per cent of TSS, pH, acidity, reducing sugars and total sugars, respectively whereas total tannins, anthocyanin contents and antioxidant activity were 162.00 and 182.00 mg/100 ml and 80.40 per cent, respectively. The Mg, Fe, Cu and Zn contents of Cv. KonkanBahadoliwere 1.18, 1.45, 1.78 and 1.93 mg per 100 ml, respectively. The Cv. Local contains 14.10 °B TSS, 3.25 pH, 0.91 per cent acidity, 9.33 per cent reducing sugars and

Table 1 : Treatment details for pulp extraction

Treatment Symbol	Methods of pulp extraction
TM_1	Manual separation
TM_2	Hydraulic basket press separator
TM_3	Screw type juice extractor
TM_4	Brush type juice extractor

Table 2 : Treatment details for juice recovery and clarification

Treatment Symbol	Treatments of juice recovery and clarification
TC_1	Pectinase enzyme (0.2%) and incubation at 30ºC for 4 h and Centrifugation at 5000 rpm for 20 minutes.
TC_2	Pectinase enzyme (0.2%) and incubation at 30ºC for 4 h and Centrifugation at 10000 rpm for 5 minutes.
TC_3	Pectinase enzyme (0.2%) and incubation at 30ºC for 4 h and Centrifugation at 10000 rpm for 10 minutes.
TC_4	Pectinase enzyme (0.2%) and incubation at 30ºC for 4 h and Centrifugation at 10000 rpm for 15 minutes.

Table 3 : Treatment details of RTS samples

Treatments	Treatment Combinations
T_0	Control (Juice 15% +TSS 12°B + acidity 0.3% + 150 ppm sodium benzoate
A)	Use of Chemical preservative
T_1	Juice 15% +TSS14 °B + acidity 0.3% + 150 ppm sodium benzoate
T_2	Juice 20% +TSS 14°B + acidity 0.3% + 150 ppm sodium benzoate
T_3	Juice 15% +TSS 16°B + acidity 0.3 % + 150 ppm sodium benzoate
T_4	Juice 20% +TSS 16°B + acidity 0.3 % + 150 ppm sodium benzoate
B)	Use of chemical and Natural preservative
T_5	Juice 15%+TSS14°B +acidity 0.3 % + 50 ppm sodium benzoate)+ garlic 5ml + ginger 5ml (juice extract/lit RTS)
T_6	Juice 20%+TSS 14°B +acidity 0.3% + 50 ppm sodium benzoate + garlic 5ml + ginger 5ml (juice extract / lit RTS)
T_7	Juice 15%+TSS 16°B +acidity 0.3% + 50 ppm sodium benzoate + garlic 5ml + ginger 5ml (juice extract / lit RTS)
T_8	Juice 20%+TSS 16°B +acidity 0.3% + 50 ppm sodium benzoate + garlic 5ml + ginger 5ml (juice extract/ lit RTS)

Table 4 : Physical characteristics of jamun fruit

Sr.No.	Parameters	Jamun fruit	
		Cv. Konkan Bahadoli	Cv. Local
1	Rind colour of the fruits	Dark purple	Red purple
2	Shape of the fruits	Oblong	Oblong
3	Average wt. of fruit (g)	21.84	20.25
4	Av.fruitlength (cm)	2.97	2.85
5	Av.fruitbreadth(cm)	2.15	2.10
6	Rind/Peel/pomace (%)	18.60	18.80
7	Seed (%)	30.20	32.10
8	Pulp cum juice recovery (%)	51.20	49.10

Table 5 : Chemical parameters of jamun fruit juice

Sr. No.	Parameters	Jamun Cv. Konkan Bahadoli	Cv. local
1	TSS (° Brix)	15.2	14.1
2	pH	3.05	3.25
3	Acidity (%)	0.82	0.91
4	Reducing sugars (%)	10.77	9.33
5	Total sugars (%)	12.62	12.02
6	Tannins(mg/100ml)	162	144.23
7	Total anthocyanin content (mg/100ml)	182	173.28
8	Manganese(mg/100ml)	1.18	1.17
9	Iron (mg/100ml)	1.45	1.43
10	Copper (mg/100ml)	1.78	1.76
11	Zinc (mg/100ml)	1.93	1.95
12	Antioxidant activity (%)	80.4	70.37

12.02 per cent total sugars. The total tannins, anthocyanin content and antioxidant activity of Cv. Local were 144.23, 173.28 mg/100 ml and 70.37 per cent, respectively. The minerals such as Mg, Fe, Cu and Zn content in local cultivar were 1.17, 1.43, 1.76 and 1.95 mg/100 ml, respectively (Table 5). Similar results were also reported by ApurwaKesharwani *et al*. (2015).

Standardization of ingredients levels for jamun RTS beverage

The jamun fruits are good source of iron and are used as an effective medicine against diabetes, heart and liver troubles. Due to high therapeutic and neutraceutical value of jamun it is highly acceptable by all the groups of the society. Jamun juice is astringent in taste. The outcomes of organoleptic evaluation of RTS beverage by using various levels of jamun juice and TSS are summarized in Table 6, which indicated that the sensory evaluation of fresh beverage prepared from 15 % juice, 16 °B and chemical preservatives exhibit higher score. The sensory evaluation data for jamun juice having similar juice levels and TSS containing either chemical or natural preservative, shows the superiority of treatments T_1 and T_5 with higher scores 8.0 and 8.1 for Cv. Konkan Bahadoli and 7.9 and 7.9 for Cv. Local, respectively; as compared to control in terms of various parameters like colour, appearance,

Table 6 : Sensory evaluation of fresh beverage of jamum juice

Sr. No.	Treatments	Colour and appearance		Flavour		Taste		Overall acceptability	
		CB	CL	CB	CL	CB	CL	CB	CL
1	T_0	7.5	7.3	7.3	7	7.5	7.3	7.4	7.2
2	T_1	8	7.9	7.9	7.8	8	7.9	8	7.9
3	T_2	7.6	7.4	7.1	7.1	7.5	7.3	7.4	7.3
4	T_3	7.8	7.5	7.8	7.8	7.9	7.6	7.8	7.6
5	T_4	7.9	7.6	7.8	7.7	7.8	7.4	7.8	7.5
6	T_5	8	7.9	8.1	8	8.1	7.9	8.1	7.9
7	T_6	7.9	7.6	7.5	7.6	7.9	7.5	7.8	7.6
8	T_7	7.6	7.6	7.8	7.5	7.5	7.3	7.6	7.5
9	T_8	7.7	7.5	7.8	7.5	7.5	7.5	7.7	7.5
	SE +	0.062	0.068	0.105	0.109	0.082	0.08	0.08	0.078
	CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS

CB-Cv. KonkanBahadoli;CL- Cv. Local;NS – Non- significant

taste and flavour. The data obtained for samples containing similar juice level, TSS °B of jamun juice and either chemical or natural preservative showed the superiority based on sensory evaluation by panel of semi trained judges. The optimum level of juice, TSS and acidity were found to be 15 per cent, 14 °B and 0.30 per cent, respectively for the juice with higher acceptable quality. Thus, it was found that the treatment T5 (Juice 15% + TSS14°B + acidity 0.3 % + 50 ppm sodium benzoate) + garlic 5ml + ginger 5ml (juice extract/lit RTS) recorded the highest sensory score of 8.1 in KonkanBahadoli and 7.9 in local cultivar in respect of overall acceptability followed by treatment T1 (Juice 15% + TSS14 °B + acidity 0.3% + 150 ppm sodium benzoate)which recorded the sensory score of 8.0 and 7.9, respectively and Roy (1985) and Waskar and Garande (2000) have successfully utilized jamun juice for preparation of RTS beverages.

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