



EFFECT OF STORAGE PERIOD ON PHYSICAL AND ORGANOLEPTIC PROPERTIES OF RTS PREPARED FROM KARONDA (*CARISSA CARANDAS* L.) BLENDED JUICES

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Abstract

The karonda juice blended with guava, papaya and pineapple juices in different proportions and RTS drink was developed and evaluated for their physical and organoleptic properties at 15 days interval for 2 months storage period. The density was increased, while organoleptic quality was decreased with increasing in storage period, however the RTS prepared from 25% karonda juice + 75% pineapple juice recorded highest organoleptic score (7.91) and cost benefit ratio (1:2.68).

Key words : Karonda, guava, papaya, pineapple, blended juice and RTS.

Introduction

Karonda (*Carissa carandas* L.), which is an underutilized minor fruit crop of India and grows well in South Africa, Australia, India, Malaysia, Sri Lanka, Bangladesh and Myanmar. In India, karonda have been grown in Maharashtra, Bihar, West Bengal, Orissa, Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh (Sawant *et al.*, 2002) and is grown as stay cop in other parts of the country.

Karonda fruits are sour and astringent in taste and are a rich source of iron and an excellent source of vitamin A, C and B complex, fibre, carbohydrates and minerals such as calcium, phosphorous, potassium, sodium and sulphur (Peter, 2007). Ripe fruits are sub-acidic to sweet in taste with peculiar aroma. The fruits may be eaten as a dessert when ripe or used in the preparation of fruit products such as candies, jelly, squash and chutney. The storage life of karonda is very short because of its soft flesh and high moisture content. It may be stored for a week at 13°C and 95% relative humidity. Under the changing world trade scenario, the fruit can be exploited on a commercial scale in the processing industries.

It is a general assumption that juice from a single

variety of fruit is not often palatable in taste and aroma. It may be lack in one quality attribute or another. Blending is likely to compensate for certain characteristics by reuniting flavours and eliminating or diluting undesirable component of the juice thus maintaining a balance between the quality characters in the final product (Bhatia *et al.*, 1992). The blending of fruit juices could be an economic requisite to utilize some of fruits for processing, which may not otherwise have favourable characters such as colour, aroma, mouth feel including overall cost for the preparation of the processed products. It may also enhance the appearance, nutrition, flavour of the product and lead to new product development (Kalra *et al.*, 1991). Now-a-days the consumers are demanding products with no chemical preservatives, free from additives, naturals with assured safety and having good shelf life. Thus, fruit based beverages can be used to replace the synthetic beverages, which are devoid of nutritional value and hence the present investigation is carried out for the utilization of karonda fruit juice for the preparation of karonda RTS by blending with guava, pineapple and papaya juice for its quantitative and qualitative traits.

Materials and Methods

The present investigation was carried out at the Department of Post Harvest Technology, Horticultural

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Table 1 : Effect of storage period on colour and density of the RTS prepared from karonda blended juices.

Treatments	Colour						Density (Kg/m ³)					
	Days after storage											
	0	15	30	45	60	0	15	30	45	60	Mean	
T ₁ -75% karonda juice + 25% guava juice	Moderate purplish red	Strong pink	Deep red	Deep red	Vivid red	0.95	0.97	0.99	0.99	0.97	0.97	
T ₂ - 50% karonda juice + 50% guava juice	Moderate purplish red	Vivid reddish orange	Light yellowish pink	Light yellowish pink	Light yellowish pink	0.98	0.99	1.04	1.04	1.02	1.02	
T ₃ -25% karonda juice + 75% guava juice	Light pink	Moderate reddish orange	Light orange	Light orange	Light orange	1.05	1.10	1.12	1.11	1.09	1.09	
T ₄ -75% karonda juice + 25% papaya juice	Strong yellowish pink	Moderate red	Moderate red	Moderate red	Moderate red	0.97	1.04	1.08	1.05	1.03	1.03	
T ₅ -50% karonda juice + 50% papaya juice	Deep yellowish pink	Moderate orange	Moderate orange	Moderate orange	Moderate orange	0.91	0.95	0.98	0.97	0.95	0.95	
T ₆ -25% karonda juice + 75% papaya juice	Vivid reddish orange	Strong orange	Moderate orangish yellow	Moderate orangish yellow	Moderate orangish yellow	0.93	1.02	1.01	0.99	0.99	0.99	
T ₇ -75% karonda juice + 25% pineapple juice	Moderate pink	Vivid reddish orange	Vivid reddish orange	Moderate red	Vivid red	0.97	0.98	1.05	1.05	1.04	1.02	
T ₈ -50% karonda juice + 50% pineapple juice	Moderate yellowish pink	Strong yellowish pink	Strong yellowish pink	Strong yellowish pink	Strong yellowish pink	0.95	0.98	1.04	1.01	1.00	1.00	
T ₉ -25% karonda juice + 75% pineapple juice	Strong pink yellowish	Moderate yellow	Moderate yellow	Moderate yellow	Moderate yellow	1.01	1.05	1.09	1.06	1.07	1.05	
T ₁₀ -100% karonda juice	Vivid red	Strong red	Strong red	Strong red	Strong red	0.98	1.04	1.06	1.05	1.02	1.03	
Mean						0.97	1.01	1.05	1.03	1.02		

Factors	Density		
	A (Treatments)	B (Days)	A×B
S.Em ±	0.006	0.004	0.013
CD at 5%	0.02	0.01	N.S

Table 2 : Effect of storage period on organoleptic score for colour, taste and overall acceptability of RTS prepared from karonda blended juices.

Treatments	Organoleptic score (Colour)					Organoleptic score (Taste)					Organoleptic score (Overall acceptability)							
	Days after storage																	
	0	15	30	45	60	Mean	0	15	30	45	60	Mean	0	15	30	45	60	Mean
T ₁ -75% karonda juice + 25% guava juice	7.25	7.40	7.00	6.40	6.20	6.85	6.40	6.33	6.07	6.10	5.70	6.12	6.82	6.86	6.53	6.25	5.94	6.48
T ₂ -50% karonda juice + 50% guava juice	7.91	7.93	7.90	7.70	7.50	7.79	7.83	7.43	7.33	7.03	6.60	7.25	7.87	7.68	7.62	7.37	7.05	7.52
T ₃ -25% karonda juice + 75% guava juice	7.40	7.55	7.10	6.75	6.25	7.01	6.90	6.47	6.23	5.80	5.70	6.22	7.15	7.01	6.66	6.27	5.97	6.61
T ₄ -75% Karonda juice + 25% papaya juice	6.40	6.20	5.90	5.90	5.63	6.01	5.93	5.83	5.43	4.97	4.63	5.36	6.17	6.02	5.67	5.43	5.13	5.68
T ₅ -50% karonda juice + 50% papaya juice	6.53	6.70	6.33	6.30	6.10	6.39	6.23	5.90	5.57	5.30	5.00	5.60	6.38	6.30	5.95	5.80	5.55	6.00
T ₆ -25% Karonda juice + 75% papaya juice	7.63	7.60	7.40	7.50	6.70	7.37	6.40	6.10	6.10	5.90	5.40	5.98	7.02	6.85	6.75	6.70	6.05	6.67
T ₇ -75% karonda juice + 25% pineapple juice	7.90	7.90	7.83	7.63	7.13	7.68	6.60	6.40	6.17	5.87	5.73	6.15	7.25	7.15	7.00	6.75	6.43	6.92
T ₈ -50% karonda juice + 50% pineapple juice	7.33	7.40	7.20	7.03	6.80	7.15	7.23	7.23	7.03	6.50	6.20	6.84	7.28	7.32	7.12	6.77	6.50	7.00
T ₉ -25% karonda juice + 75% pineapple juice	8.20	8.10	8.10	8.03	7.63	8.01	8.23	8.20	7.83	7.23	7.10	7.72	8.22	8.15	7.97	7.63	7.57	7.91
T ₁₀ -100% karonda juice	7.20	7.40	7.73	7.63	7.62	7.52	4.30	4.47	4.27	4.03	3.83	4.18	5.75	5.93	6.00	5.83	5.73	5.85
Mean	7.37	7.42	7.25	7.10	6.76		6.61	6.44	6.20	5.87	5.59		6.99	6.93	6.73	6.48	6.19	

Factors	Organoleptic score (Colour)					Organoleptic score (Taste)					Organoleptic score (Overall acceptability)				
	A (Treatments)	B (Days)	A×B	A (Treatments)	B (Days)	A×B	A (Treatments)	B (Days)	A×B	A (Treatments)	B (Days)	A×B	A (Treatments)	B (Days)	A×B
S.Em ±	0.06	0.04	0.14	0.06	0.04	0.14	0.06	0.05	0.03	0.10					
CD at 5%	0.18	0.13	0.40	0.18	0.13	N.S	0.13	0.13	0.09	0.28					

Note : Hedonic rating scale	Like extremely – 9	Like very much – 8	Like moderately – 7
Like slightly – 6	Neither like nor dislike – 5	Dislike slightly – 4	Dislike moderately – 3
Dislike very much – 2	Dislike extremely – 1		

College and Research Institute, Venkataramannagudem, West Godavari district of Andhra Pradesh during the year 2013-14. For this experiment uniformly and fully ripened fruits of karonda were procured from the forest area besides Horticultural College and Research Institute, Venkataramannagudem, West Godavari District of Andhra Pradesh and the fruits were washed under running water and after cleaning put into blender and extracted the juice. The juice obtained was strained through double layered muslin cloth to remove bigger pulp particles into a stainless steel container.

The ripened and blemish free guava fruits were first washed under running tap water, lye peeled in 2% NaOH solution (boiling) for 1.5 minutes, cooled by dipping in cold water and then thoroughly washed in running water to remove sodium hydroxide solution then peeled fruits were cut into small pieces, put into blender and added ascorbic acid @ 1000 mg/ kg of fruits to prevent browning, passed through a stainless steel sieve of 30 mm mesh and removed seeds and fruit pieces and the juice was strained through double layered muslin cloth and collected the juice into a stainless steel container.

The well matured, firm and ripened papaya fruits were selected, washed, cleaned and hand peeled with the help of stainless steel knife and the outer skin was removed. The fruit is cut into two halves and seeds were removed. The fruit was chopped into small pieces and put into juice blender and obtained the pulp and the pulp was squeezed through a double layered muslin cloth and collected the juice into a stainless steel container.

The well matured ripened pineapple fruits were selected, hand peeled with the help of stainless steel knife and the crown, rind, eyes and core was removed. Then the fruit was cut into small pieces and fed into blender for extraction of the juice. The juice was strained through a double layered muslin cloth into a stainless steel container.

After extraction of juices, the guava, papaya and pineapple juices were blended with karonda juice on volume basis in different ratios as:

- T_1 : Blend of 75% karonda juice + 25% guava juice.
 T_2 : Blend of 50% karonda juice + 50% guava juice.
 T_3 : Blend of 25% karonda juice + 75% guava juice.
 T_4 : Blend of 75% karonda juice + 25% papaya juice.
 T_5 : Blend of 50% karonda juice + 50% papaya juice.
 T_6 : Blend of 25% karonda juice + 75% papaya juice.
 T_7 : Blend of 75% karonda juice + 25% pineapple juice.

T_8 : Blend of 50% karonda juice + 50% pineapple juice.

T_9 : Blend of 25% karonda juice + 75% pineapple juice.

T_{10} : Control (100% karonda juice).

The RTS was prepared with 10% blended juice, 10% sugar, 0.20% citric acid and 250 mg sodium benzoate per liter of RTS. The prepared RTS beverages were filled in 200 ml glass bottles when they are hot and pasteurized at 65°C for 30 minutes then cooled, labelled and stored at ambient temperature for storage studies.

The colour was recorded through visual observation using standard RHS colour chart. The density was calculated by dividing mass with volume (Mass/Volume). To assess consumer preference, organoleptic quality of the juice was tested by a panel of semi-trained judges, using the 9 point hedonic scale (Amerine *et al.*, 1965). The data on density and organoleptic properties were statistically analyzed using factorial Completely Randomized Design (Panse and Sukhatme, 1985).

Results and Discussion

Colour

The RTS showed strong yellowish pink colour at 0 day of storage in 25% karonda juice + 75% pineapple juice blend (T_9), later it was changed to moderate yellow colour at 15, 30, 45 and 60 days after storage (table 1). The gradual change in colour was observed in all the treatments during storage and this might be due to non-enzymatic reaction between organic acids and sugar or oxidation of the phenols as reported by Deka *et al.* (2005) in mango-pineapple beverage.

Density

Among different treatments, 50% karonda juice + 50% papaya juice blend (T_5) recorded significantly the

Table 3 : Cost of production of 100ml of different fruit juices.

Fruits	Weight of fruits (g)	Labour charges (₹)	Cost of fruits (₹)	Total cost (₹)
Karonda	220.00	0.30	4.50	4.80
Guava	140.00	0.30	2.25	2.55
Papaya	130.00	0.30	2.50	2.80
Pineapple	160.00	0.30	5.50	5.80

*The price was estimated based on the price prevailing in the local market of the respective RTS as rated below.

- 1 liter karonda RTS costs - ₹ 40/- (Assumed)
- 1 liter guava RTS costs - ₹ 58/-
- 1 liter papaya RTS costs - ₹ 58/-
- 1 liter pineapple RTS costs - ₹ 70/-

Table 4 : Cost benefit ratio obtained for 1000ml RTS prepared from different karonda blended juice.

Treatments	Blended percent-ages	Cost of fruit juice (1) Karonda juice	Cost of other fruit juice (2), guava, papaya, Pineapple	Cost of blended juice (₹)	Cost of preservative (₹)	Cost of bottle (₹)	Cost of labour (₹)	Cost of sugar (₹)	Miscellaneous (₹)	Cost incurred for 1000ml RTS (₹)	Estimated price for 1000ml RTS (₹)	Net-benefit (₹)	Cost benefit ratio
T ₁ -75% Karonda juice + 25% Guava juice	75:25	3.60	0.56	4.16	1.40	4.50	3.00	3.70	5.20	21.96	44.50	22.54	1:2.03
T ₂ -50% Karonda juice + 50% Guava juice	50:50	2.40	1.12	3.52	1.40	4.50	3.00	3.70	5.20	21.32	49.00	27.68	1:2.30
T ₃ -25% Karonda juice + 75% Guava juice	25:75	1.20	1.68	2.88	1.40	4.50	3.00	3.70	5.20	20.68	53.50	32.82	1:2.59
T ₄ -75% Karonda juice + 25% Papaya juice	75:25	3.60	0.62	4.22	1.40	4.50	3.00	3.70	5.20	22.02	44.50	22.48	1:2.02
T ₅ -50% Karonda juice + 50% Papaya juice	50:50	2.40	1.25	3.65	1.40	4.50	3.00	3.70	5.20	21.45	49.00	27.55	1:2.28
T ₆ -25% Karonda juice + 75% Papaya juice	25:75	1.20	1.87	3.07	1.40	4.50	3.00	3.70	5.20	20.87	53.50	32.63	1:2.56
T ₇ -75% Karonda juice + 25% Pineapple juice	75:25	3.60	1.45	5.05	1.40	4.50	3.00	3.70	5.20	22.85	47.50	24.65	1:2.08
T ₈ -50% Karonda juice + 50% Pineapple juice	50:50	2.40	2.90	5.30	1.40	4.50	3.00	3.70	5.20	23.10	55.00	31.90	1:2.38
T ₉ -25% Karonda juice + 75% Pineapple juice	25:75	1.20	4.35	5.55	1.40	4.50	3.00	3.70	5.20	23.35	62.50	39.15	1:2.68
T ₁₀ -100% Karonda juice	100	4.80	0.00	4.80	1.40	4.50	3.00	3.70	5.20	22.60	40.00	17.40	1:1.77

lowest of 0.95 kg/m³ density followed by 75% karonda juice +25% guava juice (**T₁**) of 0.97 kg/m³ density (table 1). There was a significant increase in density during storage period in all the treatments. The similar results were also found by Roy *et al.* (2014) in cashew apple RTS.

Organoleptic evaluation

Among different treatments, 25% karonda juice + 75% pineapple juice blend (**T₉**) recorded significantly the highest organoleptic score for colour (8.01), taste (7.72) and overall acceptability (7.91) followed by 50% karonda juice + 50% guava juice blend (**T₃**) in colour (7.79), taste (7.25) and overall acceptability (7.52). In present findings, there was a gradual decrease in organoleptic score of blended RTS beverage during the storage period in all the treatments (table 2). The possible reasons could be the loss of volatile aromatic substances responsible for flavour and taste which decreased acceptability in storage period due to certain bio-chemical changes in the product and discoloration, the original flavour of the product was masked. The similar findings on reduction in organoleptic quality during storage of RTS was also reported by Sharma *et al.* (2008) and Tiwari (2000) in guava-papaya RTS and Deka *et al.* (2005) in mango-pineapple RTS.

Cost benefit ratio

Cost benefit ratio over karonda RTS as per the prevailing price of local market for pineapple RTS cost of ₹ 70 per litre, guava RTS cost of ₹ 58 per litre, papaya RTS cost of ₹ 58 per litre and karonda RTS cost of ₹ 40 per litre (assumed) were taken into consideration and the price was estimated for calculation of cost benefit and the highest cost benefit of 1:2.68 was found in 25% karonda juice + 75% pineapple juice blend (**T₉**) followed by 1:2.59 in 25% karonda juice + 75% guava juice blend (**T₃**) and the lowest cost benefit ratio (1:1.77) recorded in 100% karonda juice (**T₁₀**). The similar results were also reported by Bhuvanewari and Tiwari (2007) in guava RTS (tables 3 and 4).

Conclusion

The RTS prepared from 25% karonda juice + 75% pineapple juice blend (**T₉**) was found the best in physical qualities, acceptability and economically beneficial when compared to other blended juices, so the investigation may be taken in to commerce.

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