



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(9): 1991-1995
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www.thepharmajournal.com
Received: 15-07-2022
Accepted: 24-08-2022

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Standardization of process technique for preparation of RTS blends from Karonda fruits and their storage behaviour

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Abstract

RTS blends of Karonda and grape, Karonda and pomegranate, Karonda and mango juice were prepared in the proportion of 75%:25%, 50%:50% and 25%:75% for each blend respectively and also 100% Karonda juice is prepared as RTS. These blends are evaluated for physico-chemical properties at 0, 30, 60 and 90 days after storage. It was also observed that the RTS prepared from blend of 25% Karonda juice + 75% mango juice (T₉) recorded the highest TSS (11.20°brix), ascorbic acid (19.35 mg/100mg), anthocyanins (1.36 mg/100 g), total phenols (247.40 mg/100 g). It was also observed that the RTS prepared from blend of 25% Karonda juice + 75% mango juice (T₉) recorded gradual increase in TSS from 0 to 90 days after storage, whereas the ascorbic acid content, anthocyanin content, total phenols decreased from 0 to 90 days after storage followed by RTS of 25% Karonda juice + 75% pomegranate juice (T₆).

Keywords: Karonda, grape, pomegranate, mango, TSS, ascorbic acid, anthocyanins, phenols

Introduction

Karonda (*Carissa carandas* L.) belongs to the family Apocyanaceae. It is an exotic, minor berry fruit crop which is commonly known as "Christ's thorn" which grows in wild as a bush (Bankar *et al.*, 1994) ^[1] with chromosome number 2n=22. The fruits are known by different names i.e., Kalivi, Chiru, Kila, Bengal currant and Natal plum. The details of area and production of karonda in India is not available as the shrubs grow wild and systematic cultivation is not undertaken (Singh *et al.*, 2014) ^[7].

Karonda is widely used as a substitute for cherry candy. It is used extensively by confectioners and bakers for decoration of cupcakes, desserts, cakes and puddings. The dried fruits may become a substitute for raisins. The ripe fruits emit gummy latex when it is cooked, but yields a rich clear red juice when it is cooled, so this is used as a refreshing cooling drink in hot weather. It is also sometimes substituted for apples to make an apple tart, with cloves and sugar to flavour the fruit.

Due to the high perishable nature and increasing in demand for soft drinks, there is considerable scope for developing naturally existing nutrient rich fruit juice beverages from Karonda. (Shaheel *et al.*, 2015) ^[12]. The present-day consumers demand natural products free from additives, with assured safety and better shelf life. Thus, fruit-based beverages can be used to replace the synthetic beverages, which are devoid of nutritional value.

The blending of fruit juices could be an economic requisite to utilize some varieties of fruits for processing, which may not otherwise have favourable characteristics 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) ^[3].

Hence, keeping in view of the limited period availability of these fruits, exotic nature and its enormous scope for popularization of value-added products, the present investigation was planned.

Material and Methods

This experiment was carried out in Dr. YSR Horticultural University, College of Horticulture Anantharajupeta during the year 2021-2022.

Juice Extraction

The karonda fruits of red variety, black grapes, pomegranate and mango were used for making RTS blends. Extraction of juices was done using Hurrom H-100 juicer.

Procedure

Karonda and grape juice were blended in the proportion of 75 ml + 25 ml, 50 ml + 50 ml and 25 ml + 75 ml. Ten ml of each of these blends are mixed with 10 g of sugar and 80 ml of water for the preparation of RTS blend treatment 1, 2 and 3 respectively.

Karonda and pomegranate juice were blended in the proportion of 75 ml + 25 ml, 50 ml + 50 ml and 25 ml + 75 ml. Ten ml of each of these blends are mixed with 10 g of sugar and 80 ml of water for the preparation of RTS blend treatment 4, 5 and 6 respectively.

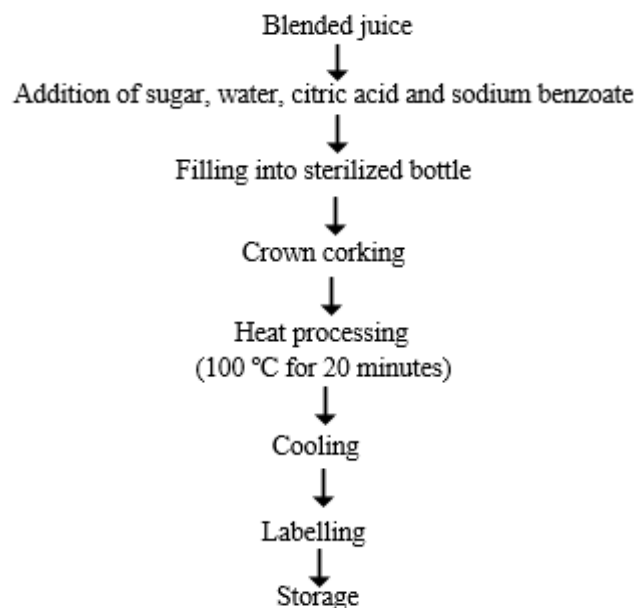
Karonda and mango juice were blended in the proportion of 75 ml + 25 ml, 50 ml + 50 ml and 25 ml + 75 ml. Ten ml of each of these blends are mixed with 10 g of sugar and 80 ml of water for the preparation of RTS blend treatment 7, 8 and 9 respectively.

Ten ml of karonda juice alone was mixed with 10 g of sugar and 80 ml of water for the preparation of RTS blend used for preparation of treatment 10.

RTS blends were mixed with 0.3% citric acid and 120 ppm sodium benzoate and filled into the sterilized glass bottles. These bottled RTS blends were crown corked and heat processed for 20 minutes at 100 °C followed by cooling and storage for further storage and evaluation.

Treatments

- T₁: RTS prepared from blend of 75% karonda juice + 25% grape juice
 T₂: RTS prepared from blend of 50% karonda juice + 50% grape juice
 T₃: RTS prepared from blend of 25% karonda juice + 75% grape juice
 T₄: RTS prepared from blend of 75% karonda juice + 25% pomegranate juice
 T₅: RTS prepared from blend of 50% karonda juice + 50% pomegranate juice
 T₆: RTS prepared from blend of 25% karonda juice + 75% pomegranate juice
 T₇: RTS prepared from blend of 75% karonda juice + 25% mango juice
 T₈: RTS prepared from blend of 50% karonda juice + 50% mango juice
 T₉: RTS prepared from blend of 25% karonda juice + 75% mango juice
 T₁₀: RTS prepared from 100% karonda juice



Flow sheet for preparation of RTS beverage

Physico-chemical properties of the Karonda RTS prepared from different blends during storage

Total Soluble Solids (°Brix)

The total soluble solids are measured as described by Ranganna (1986) [10] by using Atago RX1000 digital refractometer (HRN-18) and expressed in °Brix.

Total phenols (mg/100 g)

In a test tube 0.5 g of methanolic extract (1ml sample was made upto 50 ml using 80% methanol) was taken. To that 0.5 ml of 80% methanol was added and made the volume upto 1ml. After that 5 ml of Folin-Ciocalteu Phenol reagent was added and shaken thoroughly. Then 4 ml of saturated solution of sodium carbonate was added, after the gap of 5 minutes. The mixture was incubated in dark at room temperature for about 2 hours. Absorbance was measured at 750 nm against a blank. Blank was prepared using only distilled water and reagents. The concentration of total phenols was read from the standard curve which was prepared by using gallic acid at the concentration ranging between 20-100 µgram/ml.

Ascorbic acid (mg/100 ml)

Ten ml sample was taken and the volume was made up to 100 ml with 3 percent metaphosphoric acid.

10 ml of the aliquot was taken and titrated against standard dye solution (2, 6-dichlorophenol indophenol dye) till the light pink colour persisted for at least 15 seconds (Sadasivam and Manickam, 1992) [10]. The ascorbic acid content was estimated using the given formula and expressed as mg/100ml.

$$\text{Ascorbic acid (mg/100ml)} = \frac{\text{Titre value} \times \text{dye factor} \times \text{volume made up}}{\text{Aliquot taken} \times \text{weight of the sample}}$$

Anthocyanins (mg/100g)

Ten grams of juice was diluted to 50 ml with 0.1N Hydrochloric acid and allowed to equilibrate in the dark for one hour. The absorbance (OD) at 510 nm was recorded using spectrophotometer. (Srivastava and Sanjeev Kumar, 2002) [6].

Results and Discussion**Total Soluble Solids (°Brix)**

In initial day of storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest TSS of 11.20°brix followed by 10.90°brix in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest TSS of 6.50°brix was observed in 100% karonda juice (T₁₀).

Among different treatments after 30 days of storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest of 11.70°brix followed by 25% karonda juice + 75% pomegranate juice blend (T₆) of 11.40°brix and the lowest of 7.00°brix in 100% karonda juice (T₁₀) was observed.

After 60 days of storage, treatment 25% karonda juice + 75% mango juice blend (T₉) shown the highest TSS of 12.20°brix followed by 11.90°brix in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest TSS of 7.20°brix was observed in 100% karonda juice (T₁₀).

The highest TSS was observed in 25% karonda juice + 75% mango juice blend (12.80°brix) treatment (T₉) and it is followed by 12.40°brix in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest TSS of 7.50°brix was observed in 100% karonda juice (T₁₀) during 90 days after storage.

All the treatments showed increased trend from 0 day to 90 days of storage. Increase in total soluble solids might be due to conversion of insoluble polysaccharides and organic acids into sugars. Similar results were also reported by Sharma *et al.* (2008) [13] in guava-papaya RTS.

Total phenols (mg/100 g)

Among different treatments, on initial day of storage, 25% karonda juice + 75% mango juice blend recorded the highest total phenolic content of 247.40 mg/100g followed by 245.60 mg/100g in 25% karonda juice + 75% pomegranate juice blend and the lowest of 238.30 mg/100g was observed in 100% karonda juice.

At 30 days after storage the highest total phenols content was observed in treatment of 25% karonda juice + 75% mango juice blend (240.40 mg/100 g) followed by 238.50 mg/100 g was recorded in 25% karonda juice + 75% pomegranate juice blend and the lowest (231.20 mg/100g) was shown in 100% karonda juice.

Treatment with 25% karonda juice + 75% mango juice blend recorded the highest total phenolic content of 233.40 mg/100 g during 60 days after storage followed by 231.60 mg/100 g in 25% karonda juice + 75% pomegranate juice blend and the lowest of 224.40 mg/100g was observed in 100% karonda juice.

The total phenols content was recorded maximum (229.40 mg/100 g) in 25% karonda juice + 75% mango juice blend treatment and it is followed by 25% karonda juice + 75% pomegranate juice blend (227.53 mg/100 g) and the lowest of 221.50 mg/100 g was observed in 100% karonda juice during 90 days after storage.

All the treatments showed decreased trend from 0 day to 90 days of storage. A gradual loss of total phenols during storage might be due to their condensation into brown pigments

(Karpagavalli and Amrutha (2015) [5], Sharma *et al.* (2012) [14], Kannan and Thirumaran (2001) [4]. Similar results were reported by Krishna *et al.* (2016) [6] in bayberry and yellow Himalayan raspberry-based health beverages.

Ascorbic acid (mg/100ml)

The ascorbic acid content was recorded highest (19.35 mg/100 ml) in 25% karonda juice + 75% mango juice blend treatment during initial day of storage and it was followed by 15.70 mg/100 ml in 50% karonda juice + 50% mango juice blend and the lowest (4.29 mg/100 ml) was observed in 100% karonda juice.

Among different treatments after 30 days of storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest ascorbic acid content of 18.64 mg/100 ml followed by 15.03mg/100 ml in 50% karonda juice + 50% mango juice blend (T₈) and the lowest of 4.08 mg/100 ml was observed in 100% karonda juice (T₁₀).

Treatment of 25% karonda juice + 75% mango juice blend (T₉) recorded the highest ascorbic acid content of 18.14 mg/100 ml followed by 14.50 mg/100 ml in 50% karonda juice + 50% mango juice blend (T₈) and the lowest of 3.75mg/100 ml was observed in 100% karonda juice (T₁₀) during 60 days after storage.

Out of all other treatments after 90 days of storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest ascorbic acid content of 17.19 mg/100 ml followed by 13.15 mg/100 ml in 50% karonda juice + 50% mango juice blend (T₈) and the lowest of 3.35mg/100 ml was observed in 100% karonda juice (T₁₀).

All the treatments showed decreased trend from 0 day to 90 days of storage. This is due to the destruction of ascorbic acid by oxidation, especially at high temperatures and the vitamin is easily lost during food processing and storage (Potter and Hotchkiss, 1995) [9]. Similar results were also reported by Deka *et al.* (2005) [2] in mango-pineapple RTS.

Anthocyanins (mg/100g)

Among different treatments on the initial day of storage 25% karonda juice + 75% mango juice blend (T₉) recorded the highest anthocyanin content of 1.36 mg/100 g followed by 1.25 mg/100 g in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest of 0.63 mg/100g was observed in 100% karonda juice (T₁₀).

Among different treatments after 30 days of storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest anthocyanin content of 0.86mg/100g followed by 0.74 mg/100 g in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest of 0.23mg/100g was observed in 100% karonda juice (T₁₀).

Among different treatments after 60 days after storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest anthocyanin content of 0.75 mg/100 g followed by 0.65 mg/100 g in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest of 0.13mg/100g was observed in 100% karonda juice (T₁₀).

Among different treatments after 90 days after storage, 25% karonda juice + 75% mango juice blend (T₉) recorded the highest anthocyanin content of 0.71 mg/100 g followed by 0.62 mg/100 g in 25% karonda juice + 75% pomegranate juice blend (T₆) and the lowest of 0.09mg/100g was observed in 100% karonda juice (T₁₀).

All the treatments showed decreased trend from 0 day to 90

days of storage. It is reported that anthocyanin pigments of fruit juices are destroyed at high storage temperature and the refrigerated temperature has stabilising effect on anthocyanins

(Ponting *et al.*, 1952) [8]. Similar results have been reported in phalsa beverages (Waskar and Khurdiya, 1987) [15].

Table 1: Effect of storage period on TSS and total phenols of karonda RTS blends

Treatments	Total soluble solids (°Brix)				Total phenols (mg/100g)			
	Days after storage							
	0 Day	30 Days	60 Days	90 Days	0 Day	30 Days	60 Days	90 Days
T1- 75% karonda juice +25% grape juice	6.90	7.40	7.60	7.90	238.80	231.80	224.70	221.80
T2- 50% karonda juice + 50% grape juice	7.00	7.40	7.80	8.00	241.20	234.10	227.20	224.10
T3- 25% karonda juice +75% grape juice	7.40	7.90	8.40	8.90	243.60	236.50	229.60	225.50
T4- 75% karonda juice +25% pomegranate juice	10.40	10.90	11.10	11.40	239.20	232.10	225.20	221.10
T5- 50% karonda juice + 50% pomegranate juice	10.50	11.20	11.30	11.50	243.30	236.40	229.30	225.30
T6-25% karonda juice +75% pomegranate juice	10.90	11.40	11.90	12.40	245.60	238.50	231.60	227.53
T7-75% karonda juice + 25% mango juice	10.70	11.20	11.40	11.70	240.50	233.80	226.50	222.80
T8- 50% karonda juice + 50% mango juice	10.80	11.30	11.60	11.80	245.50	238.43	231.50	227.47
T9-25% karonda juice +75% mango juice	11.20	11.70	12.20	12.80	247.40	240.40	233.40	229.40
T10- 100% karonda juice	6.50	7.00	7.20	7.50	238.30	231.20	224.40	221.50
S.E (m) ±	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
CD at 5%	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.19

Table 2: Effect of storage period on ascorbic acid content and anthocyanin content of karonda RTS blends

Treatments	Ascorbic acid (mg/100 ml)				Anthocyanins (mg/100g)			
	Days after storage							
	0 Day	30 Days	60 Days	90 Days	0 Day	30 Days	60 Days	90 Days
T1- 75% karonda juice +25% grape juice	8.85	8.15	7.65	6.65	0.78	0.28	0.17	0.13
T2- 50% karonda juice + 50% grape juice	9.75	9.05	8.55	7.55	0.95	0.44	0.35	0.30
T3- 25% karonda juice +75% grape juice	10.19	9.49	9.03	7.90	1.16	0.66	0.54	0.50
T4- 75% karonda juice +25% pomegranate juice	11.03	10.30	9.80	8.80	0.85	0.36	0.25	0.20
T5- 50% karonda juice + 50% pomegranate juice	11.90	11.20	10.70	9.70	1.06	0.55	0.45	0.41
T6-25% karonda juice +75% pomegranate juice	12.35	11.64	11.15	10.19	1.25	0.74	0.65	0.62
T7-75% karonda juice + 25% mango juice	13.05	12.35	11.85	10.90	0.96	0.45	0.34	0.29
T8- 50% karonda juice + 50% mango juice	15.70	15.03	14.50	13.50	1.15	0.64	0.55	0.50
T9-25% karonda juice +75% mango juice	19.35	18.64	18.14	17.19	1.36	0.86	0.75	0.71
T10- 100% karonda juice	4.29	4.08	3.75	3.35	0.63	0.23	0.13	0.09
S.E (m) ±	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01
CD at 5%	0.04	0.04	0.04	0.09	0.03	0.03	0.03	0.03

Conclusion

From the results obtained during present investigation it is concluded that, treatment of RTS blend prepared from 25% karonda juice +75% mango juice blend have shown the better results with highest TSS, ascorbic acid, anthocyanins, total phenols. It was observed that all the treatments recorded gradual increase in TSS from 0 to 90 days after storage, whereas, ascorbic acid content, anthocyanin content and total phenols decreased from 0 to 90 days after storage.

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