Plant Archives Vol. 15 No. 1, 2015 pp. 187-192 *ISSN 0972-5210*

EFFECT OF BLENDING OF KARONDA (*CARISSA CARANDAS* L.) JUICE WITH GUAVA, PAPAYA AND PINEAPPLE JUICES ON ITS QUALITY AND ORGANOLEPTIC EVALUATION

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Abstract

Fruits are important source of vitamins, minerals, fibre, carbohydrates, etc. Every fruit have it's own nutritional value, taste and flavor. Owing to such physico-chemical variation in quality, an experiment was conducted in the Laboratory of Department of Post Harvest Technology, Dr. Y. S. R. H. U., Horticultural College and Research Institute, Venkataramannagudem (A.P.), India during 2013-14. The karonda juice blended with guava, papaya and pineapple juices in different proportions and evaluated for their physico-chemical properties and organoleptic evaluation. The blend of 25% karonda juice + 75% pineapple juice recorded highest total sugars (10.35%), reducing sugars (6.96%) and organoleptic score (7.42) followed by 50% karonda juice + 50% guava juice ($\mathbf{T}_2$) of 7.18.

Key words : Karonda, guava, papaya, pineapple, TSS, acidity.

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 crop 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 consumers are demanding products with no chemical preservatives, free from additives, natural with assured safety and having good shelf life. Thus, fruit based beverages can be used to replace the synthetic beverages,

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which are devoid of nutritional value and hence the present investigation is carried out for the utilization of karonda fruit juice 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 College and Research Institute, Venkataramannagudem, West Godavari district of Andhra Pradesh (India) during the year 2013-14. For this experiment uniformly and fully riped 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:

$\mathbf{T_1}$: Blend of 75% karonda juice + 25% guava juice.

$\mathbf{T_2}$: Blend of 50% karonda juice + 50% guava juice.

$\mathbf{T_3}$: Blend of 25% karonda juice + 75% guava juice.

$\mathbf{T_4}$: Blend of 75% karonda juice +25% papaya juice.

$\mathbf{T_5}$: Blend of 50% karonda juice +50% papaya juice.

$\mathbf{T_6}$: Blend of 25% karonda juice +75% papaya juice.

$\mathbf{T_7}$: Blend of 75% karonda juice +25% pineapple juice.

$\mathbf{T_8}$: Blend of 50% karonda juice +50% pineapple juice.

$\mathbf{T_9}$: Blend of 25% karonda juice +75% pineapple juice.

$\mathbf{T_{10}}$: Control (100% karonda juice)

The physico-chemical parameters including pH of the blends were determined by using digital pH meter (ELICO LI-127). The TSS was determined by using hand refractometer (HRN-18) and expressed in ^{o}Brix. The colour was recorded through visual observation using standard RHS colour chart. The density was calculated by dividing mass with volume (Mass/Volume). The acidity was determined by AOAC (1984) method. The TSS/ Acid ratio was calculated by dividing the TSS value with the titrable acidity and expressed in ratio (Ranganna, 1986). The total sugars and reducing sugars were determined by the method of Lane and Eyon (AOAC, 1984). The non-reducing sugars determined by subtracting the per cent reducing sugars from per cent total sugars. The vitamin-C content of the blends was estimated by 2, 6-dichlorophenol indophenol dye visual titration method (AOAC, 1984). To asses consumer preference, organoleptic quality of the blended juice was tested by a panel of semi-trained judges, using the 9 point hedonic scale (Amerine *et al*., 1965). All the estimations were carried out in triplicate, determinations were made for each attribute and data on physico-chemical and sensory qualities were statistically analyzed using Completely Randomized Design (Panse and Sukhatme, 1985).

Results and Discussion

Colour

In the present investigation, karonda juice was in vivid purplish red colour, guava juice in yellowish white colour, papaya juice in vivid reddish orange colour and pineapple juice in vivid yellow colour. The blending of 75% karonda juice + 25% guava juice blend ($\mathbf{T_1}$), 50% karonda juice + 50% guava juice blend ($\mathbf{T_2}$), 25% karonda + 75% guava juice blend ($\mathbf{T_3}$) and 75% karonda juice + 25% papaya juice blend ($\mathbf{T_4}$) showed strong red colour, 50% karonda

Table 1: Physico-chemical properties of different fruit juices before blending with Karonda (*Carissa carandas* L.) juice

S. no.	Parameters	Karonda	Guava	Papaya	Pineapple
1.	Colour	Vivid purplish red	Yellowish white	Vivid reddish orange	Vivid yellow
2.	Density(kg/m^3)	1.03	0.99	0.96	0.91
3.	pH	3.12	3.41	4.96	3.98
4.	Total soluble solids (°Brix)	5.80	8.20	11.50	11.30
5.	Titrable acidity (%)	1.56	1.02	0.36	0.90
6.	TSS/Acid ratio	3.72	8.04	31.95	12.53
7.	Total sugars (%)	5.36	5.83	9.07	12.47
8.	Reducing sugars (%)	4.03	4.30	6.05	8.14
9.	Non-reducing sugars (%)	1.33	1.53	3.02	4.33
10.	Ascorbic acid (mg/100g)	14.25	191.30	50.33	21.62

juice + 50% papaya juice blend (T_5) showed deep yellowish pink colour, 25% karonda juice + 75% papaya juice blend (T_6) showed strong orangish pink colour, 75% karonda juice + 25% pineapple juice blend (T_7) and 50% karonda juice + 50% pineapple juice blend (T_8) showed moderate pink colour and 25% Karonda juice + 75% pineapple juice (T_9) showed strong yellowish pink colour. It might be due to variation in concentration and combination of guava, papaya and pineapple juices with karonda juice and the expression of colour as it is a pleiotropic effect (tables 1 and 2).

Density

The density of pure juices of karonda (1.03), guava (0.99), papaya (0.96), pineapple (0.91) and on blending these with different percentages, the highest density of 1.04 in 50% karonda juice + 50% guava juice blend (T_2) followed by 1.03 in 100% karonda juice (T_{10}) and the lowest of 0.90 in 25% karonda juice + 75 % pineapple juice blend (T_9) was recorded. It might be due to variation in concentration and combination of guava and pineapple juices with karonda juice in T_2, T_{10} and T_9 (tables 1 and 2).

pH

The pH of pure juices of karonda (3.12), guava (3.41), papaya (4.96), pineapple (3.98) and on blending these with different percentages, the highest pH of 4.48 in 25% karonda juice + 75% papaya juice blend (T_6) followed by 4.01 in 50% karonda juice + 50% papaya juice blend (T_5) and the lowest of 3.03 in 100% karonda juice (T_{10}) was recorded (tables 1 & 2). It might be due to variation in concentration of karonda juice on blending with papaya juice or might be due to decrease in titrable acidity. As reported by Aswi Jan and Dorcus Masih (2012) in pineapple, carrot and orange blended juices, the acidity and pH are inversely proportional to each other.

Total soluble solids

The total soluble solids (°Brix) of pure juices of karonda (5.80°Brix), guava (8.20°Brix), papaya (11.50°Brix), pineapple (11.30°Brix) and on blending these with different percentages, the highest total soluble solids of 10.15 °Brix in 25% karonda juice + 75% papaya juice blend (T_6) followed by 9.87 °Brix in 25% karonda juice + 75% pineapple juice blend (T_9) and the lowest of 5.80°Brix in 100% karonda juice (T_{10}) was recorded (tables 1 & 2). It might be due to variation in concentration of karonda juice on blending with papaya and pineapple juices. Similarly, Bhardwaj and Mukherjee (2012) in kinnow, aonla and ginger blended juice and Aswi Jan and Dorcus Masih (2012) in pineapple, carrot and orange blend juices were reported.

Titrable acidity

The titrable acidity of pure juices of karonda (1.56%), guava (1.02%), papaya (0.36%), pineapple (0.90%) and on blending these with different percentages, the highest titrable acidity of 1.58% in 100% karonda juice (T_{10}) followed by 1.46% in 75% karonda juice + 25% guava juice blend (T_1) and the lowest of 0.70% in 25% karonda juice + 75% papaya juice blend (T_6) was recorded (tables 1 & 2). This might be due to variation in concentration of karonda juice with guava increased the acidity content or due to concentration of organic acids present in the juices of guava and papaya and also the same was confirmed by Deka (2000) in lime-aonla, mango-pineapple and guava-mango blended juices.

TSS/Acid ratio

The TSS/Acid ratio of pure juices of karonda (3.72), guava (8.04), papaya (31.95), pineapple (12.53) and on blending these with different percentages, the highest TSS/Acid ratio of 14.30 in 25% karonda juice + 75% papaya juice blend (T_6) followed by 8.94 in 50% karonda juice + 50% papaya juice blend and the lowest (3.67) in

Table 2: Effect of blending on physico-chemical properties and organoleptic score of karonda (*Carissa carandas* L.) with guava, papaya and pineapple juices

Treatments	Colour	Density (kg/m^3)	pH	TSS (°Brix)	Titrable acidity (%)	TSS/ Acid ratio	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)	Ascorbic acid (mg/ 100g)	Organoleptic score		
											Colour	Taste	Overall acceptability
T_1 -75% karonda juice + 25% guava juice	Strong red	0.99	3.06	6.30	1.46	4.30	5.26	4.00	1.26	56.34	6.07	6.30	6.18
T_2 -50% karonda juice + 50% guava juice	Strong red	1.04	3.08	7.23	1.32	5.48	5.46	4.09	1.37	98.75	7.03	7.33	7.18
T_3 -25% karonda juice + 75% guava juice	Strong red	1.01	3.23	7.40	1.12	6.64	5.47	4.17	1.30	142.50	6.00	6.40	6.20
T_4 -75% karonda juice + 25% papaya juice	Strong red	0.98	3.50	7.10	1.27	5.59	5.72	4.14	1.58	26.40	5.93	6.13	6.03
T_5 -50% karonda juice + 50% papaya juice	Deep yellowish pink	0.99	4.01	8.67	0.97	8.94	6.47	4.21	2.25	35.51	6.20	6.37	6.28
T_6 -25% karonda juice + 75% papaya juice	Strong orengish pink	1.02	4.48	10.15	0.70	14.30	6.61	4.25	2.36	43.89	6.03	6.10	6.07
T_7 -75% karonda juice + 25% pineapple juice	Moderate pink	0.95	3.24	7.17	1.39	5.17	6.75	4.86	1.90	18.88	6.20	5.93	6.07
T_8 -50% karonda juice + 50% pineapple juice	Moderate pink	0.91	3.53	8.53	1.27	6.72	8.84	5.90	2.94	19.58	6.50	6.90	6.70
T_9 -25% karonda juice + 75% pineapple juice	Strong yellowish pink	0.90	3.75	9.87	1.11	8.86	10.35	6.96	3.39	23.07	7.20	7.63	7.42
T_{10} -100% karonda juice	Vivid red	1.03	3.03	5.80	1.58	3.67	5.19	3.97	1.22	14.25	8.03	2.30	5.17
S. Em. ±		0.02	0.04	0.07	0.02	0.14	0.04	0.03	0.03	0.93	0.18	0.13	0.13
CD at 5%		0.06	0.11	0.21	0.07	0.41	0.12	0.08	0.10	2.76	0.52	0.40	0.39

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

100% karonda juice (T_{10}) was recorded. This might be due to variation in concentration of karonda juice with the papaya juice and guava juice increased further of TSS/Acid ratio that can be attributed due to reduced level of acidity and increased level of sugar in papaya when compared to karonda juice blends of other juices as reported by Hiremath and Rokhade (2012) in sapota (tables 1 & 2).

Total sugars (%)

The total sugars of pure juices of karonda (5.36%), guava (5.83%), papaya (9.07%), pineapple (12.47%) and on blending these with different percentages, the maximum total sugars of 10.35% in 25% karonda juice + 75% pineapple juice blend (T_9) followed by 8.84% in 50% karonda juice + 50% pineapple juice blend (T_8) and the minimum of 5.19% in 100% karonda juice (T_{10}) was recorded (tables 1 & 2). This might be due to variation in concentration of karonda juice blending with pineapple juice as reported by Bhardwaj and Mukherjee (2012) in kinnow, aonla and ginger blended juices.

Reducing sugars (%)

The reducing sugars of pure juices of karonda (4.03%), guava (4.30%), papaya (6.05%), pineapple (8.14%) and on blending these with different percentages, the highest reducing sugars of 6.96% in 25% karonda juice + 75% pineapple juice blend (T_9) followed by 5.90% in 50% karonda juice + 50% pineapple juice blend (T_8) and the lowest of 3.97% in 100% karonda juice (T_{10}) was recorded (tables 1 & 2). This might be due to variation in concentration of karonda juice blended with pineapple juice having highest TSS as reported by Sakhale (2012) in mango and whey.

Non-reducing sugars (%)

The non-reducing sugars of pure juices of karonda (1.33%), guava (1.53%), papaya (3.02%), pineapple (5.36%) and on blending these with different percentages, the maximum non-reducing sugars of 3.39% was recorded in 25% karonda juice + 75% pineapple juice blend (T_9) followed by 2.94% in 50% karonda juice + 50% pineapple juice blend (T_8) and the minimum of 1.22% in 100% karonda juice (T_{10}) was recorded (tables 1 & 2). It might be due to variation in concentration and combination of karonda and pineapple juices or due to higher level sugars in fruits as reported by Sakhale (2012) in mango and whey.

Ascorbic acid

The ascorbic acid (mg/100 g) of pure juices of karonda (14.25 mg/100 g), guava (191.30 mg/100 g), papaya (50.33 mg/100 g), pineapple (21.62 mg/100 g) and on blending these with different percentages, the highest ascorbic acid of 142.50 mg/100 g in 25% karonda juice + 75% guava juice blend (T_3) followed by 98.75 mg/100 g in 50% karonda juice + 50% guava juice blend (T_2) and the lowest of 14.25 mg/100 g in 100% karonda juice (T_{10}) was recorded (tables 1 & 2). It might be due to the higher concentration of guava and papaya juice on blending with karonda juice increased the ascorbic acid in the combination as reported by Bhardwaj and Mukherjee (2012) in kinnow, aonla and ginger blended juices.

Organoleptic evaluation

The highest acceptability score in pineapple juice followed by papaya and guava juice over only karonda juice but on blending of juices at different percentages the highest acceptability in relation to colour and taste was found in 25% karonda juice + 75% pineapple juice blend (T_9) followed by 50% karonda juice + 50% guava juice blend (T_2) and the lowest acceptability in 100% karonda juice (table 2). Similar results were also reported by Bhardwaj and Mukharjee (2012) in kinnow, aonla and ginger blended juices and Awis Jan and Docus Masih (2012) in pineapple, carrot and orange juice blends.

Conclusion

Among the different blended juices the combination of karonda juice with pineapple juice showed best in physico-chemical properties and organoleptic evaluation.

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