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## Studies on organoleptic qualities and colour ( $L^*a^*b^*$ ) values of Karonda (*Carissa carandas* L.) blended squash during storage

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**Abstract**

Presently, fruit juice consumption has increased considerably, undoubtedly due to public insight of fruit juices as a healthy natural source of nutrient. Blending of two or more fruit juices for the preparation of Squash appears to be a convenient and economical alternative for utilization of Karonda. Owing to such potential, an experiment was carried out during 2019-2020 in the Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi (UHS, Bagalkot), Karnataka. The karonda blended squash with guava, pineapple and red fleshed guava in different proportions were prepared and evaluated for organoleptic traits. Among various blended treatments, the combination of karonda and red fleshed guava (T10) in ratio of (50:50) obtained highest mean organoleptic score with respect to colour and appearance (8.30), Mouthfeel (8.09), flavour (7.90), taste (8.07) and overall acceptability (7.86) followed by combination of Karonda and pineapple (T3) in the ratio (60:40) during the storage period (90 days) at ambient condition. Whereas, the lowest score was registered in combination of karonda + pomegranate (70:30). The assessment of  $L^*$ ,  $a^*$ ,  $b^*$  values in karonda blended squash decreased from 79.46 to 79.07, 1.24 to 1.00 and 7.29 to 6.70 in their mean values respectively.

**Keywords:** Karonda, pineapple, guava, storage, blended squash, organoleptic score

**Introduction**

Karonda (*Carissa carandas* L.) is an underutilized minor fruit crop of India. It belongs to the family Apocynaceae. Karonda is an indigenous protective fruit used in high esteem in Indian dietary. It is popularly known as “Christ’s thorn”. In India, karonda have been grown in Maharashtra, Bihar, West Bengal, Orissa, Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh (Sawant *et al.*, 2002) [13] and is grown as stay crop in other parts of the country. Botanically the fruit of karonda is a berry, which is produced in clusters of 3-10 numbers. Flowering starts in the month of January – February. A fruit comes to mature in May-June and are harvested at both mature and ripe stage depending on their use.

The juice from ripe karonda is easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far superior to many synthetic and aerated drinks. Now a day, consumers demand the products with no chemical preservatives, free from additives, natural 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. It is a general assumption that juice from a single variety of fruit is not often palatable in taste and aroma which may be due to lack in one quality attribute or another. Hence blending is likely to compensate for certain characteristics by reuniting flavours and eliminating or diluting undesirable component of the juice. Maintenance of balance between the quality characters in the final product is achieved by blending (Bhatia *et al.*, 1992) [3].

The blending of fruit juices could be an economic requisite to utilize some of fruits for processing, which may not otherwise have good characters such as colour, aroma, mouth feel including overall cost incurred 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) [5]. Similarly, blending of two or more fruit juices with fruits like pineapple, guava, pomegranate for the preparation of squash appears to be a convenient and economic alternative for utilization of Karonda. In this context exploitation of karonda for the preparation of blended squash is planned in the present study.

**Materials and Methods**

An experiment was carried out during 2019-2020 in the Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi (UHS, Bagalkot), Karnataka.

For this experiment uniformly and fully ripened fruits of karonda were procured from the local farmer near Belgaum district and the fruits were sorted, 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 extracted juice was taken for imposing different treatments.

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. The pomegranate fruits were procured from the supermarket of Gokak, washed using tap water and were cut into four halves and arils were separated manually. The juice was extracted by squeezing the arils gently through two-fold muslin cloth into a stainless-steel container. The pink fleshed guava variety, Arka Rashmi were procured from local farmer orchards of Bangalore. The procured fruits were sorted for separating them from infected and bruised fruits washed them thoroughly, cut into halves and then put into blender with addition of water. The pulp was sieved using double fold 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<sub>1</sub>:** Control (Karonda 100)  
**T<sub>2</sub>:** Karonda + Pineapple (70:30)  
**T<sub>3</sub>:** Karonda + Pineapple (60:40)  
**T<sub>4</sub>:** Karonda + Pineapple (50:50)  
**T<sub>5</sub>:** Karonda + Pomegranate (70:30)  
**T<sub>6</sub>:** Karonda + Pomegranate (60:40)  
**T<sub>7</sub>:** Karonda + Pomegranate (50:50)  
**T<sub>8</sub>:** Karonda + Pink fleshed guava (70:30)  
**T<sub>9</sub>:** Karonda + Pink fleshed guava (60:40)  
**T<sub>10</sub>:** Karonda + Pink fleshed Guava (50:50)

In all treatments 25 per cent juice and 1 per cent acid were kept constant. The final TSS was adjusted to 50<sup>0</sup> B for all the treatments. Sodium benzoate at the concentration of 375 ppm was added as a preservative and to retain colour of the squash up to the end of the storage period.

Organoleptic evaluation of karonda blended squash was done at initial and monthly intervals up to three months of storage. It was carried out by semi-trained panel of judges consisting of teachers and Post-graduate students of Kittur Rani Channamma College of Horticulture, Arabhavi. The

organoleptic characteristics like Colour and appearance, Mouthfeel, Flavor, Taste and overall acceptability were evaluated on a nine-point hedonic scale using the score card mentioned below (Ranganna, 2003) [12].

Hedonic scale	Colour and appearance	Mouthfeel	Flavor	Taste	Overall acceptability
Like Extremely	9	9	9	9	9
Like very much	8	8	8	8	8
Like moderately	7	7	7	7	7
Like slightly	6	6	6	6	6
Neither like or dislike	5	5	5	5	5
Dislike slightly	4	4	4	4	4
Dislike moderately	3	3	3	3	3
Dislike very much	2	2	2	2	2
Dislike extremely	1	1	1	1	1

The colour of the karonda blended squash was measured by using a Lovibond colour meter (Lovibond RT300, Portable spectrophotometer, The Tintometer Limited, Salisbury, UK) fitted with 8mm aperture. The instrument was calibrated by using black and white tiles provided. Colour was expressed in Lovibond units L\* (lightness/darkness), a\* (redness/greenness) and b\* (yellow/blueness). In order to obtain these values, the lens of colour reader was placed over the squash taken in sample boxes. The colour difference between the treatments was observed, three measurements were performed and the values were averaged to get final value.

#### Statistical analysis

The data recorded on the organoleptic characteristics and Colour (L\*, a\*, b\*) values were subjected to statistical analysis in completely randomized block design. Analysis done using Web Agri. Stat. Package 2 developed by ICAR research complex, Goa. Examination of the data was determined in accordance with Panse and Sukhatme (1985) [10].

#### Results and Discussion

Organoleptic evaluation of products is a chief means for determining the consumer acceptability. Human element plays a significant role in assessment of sensory quality of a product. From the consumers point of view, the flavour, colour and organoleptic taste of fruit juice is very important because it determines the marketability of squash. Organoleptic quality like colour, mouth feel, flavour and taste of fruit products generally reduces with the increase in storage period (Table 1 and 2).

**Table 1:** Effect of treatments and storage period on colour and appearance, mouth feel, flavor of karonda blended squash

Treatments	Colour and appearance				Mouthfeel				Flavor			
	Months after storage				Months after storage				Months after storage			
	0	1	2	3	0	1	2	3	0	1	2	3
T1: Control (Karonda 100%)	8.76	8.61	8.56	8.32	8.90	8.65	8.12	7.80	8.67	8.49	7.96	7.38
T2: Karonda + Pineapple (70:30)	8.60	8.67	8.06	8.01	8.92	8.75	8.15	7.86	8.72	8.63	8.02	7.59
T3: Karonda + Pineapple (60:40)	8.32	8.21	7.95	7.88	8.96	8.80	8.23	8.04	8.84	8.69	8.20	7.86
T4: Karonda + Pineapple (50:50)	8.28	8.18	7.82	7.62	8.93	8.73	8.20	7.93	8.90	8.72	8.31	7.84
T5: Karonda + Pomegranate (70:30)	8.84	8.71	8.58	8.42	8.76	8.55	8.09	7.78	8.63	8.38	7.90	6.95
T6: Karonda + Pomegranate (60:40)	8.67	8.56	8.54	8.38	8.94	8.68	8.16	7.89	8.70	8.60	8.00	7.40
T7: Karonda + Pomegranate (50:50)	8.58	8.40	8.41	8.31	8.91	8.66	8.19	7.82	8.76	8.65	8.12	7.61
T8: Karonda + Pink fleshed guava (70:30)	8.82	8.70	8.53	8.39	8.88	8.70	8.13	7.79	8.79	8.67	8.08	7.75
T9: Karonda + Pink fleshed guava (60:40)	8.85	8.76	8.60	8.46	8.95	8.72	8.14	7.86	8.86	8.71	8.25	7.81
T10: Karonda + Pink fleshed guava (50:50)	8.73	8.63	8.55	8.30	8.97	8.84	8.31	8.09	8.92	8.79	8.37	7.90
Mean	8.64	8.54	8.36	7.21	8.91	8.71	8.17	7.89	8.78	8.63	8.12	7.61
S.Em	0.10	0.09	0.12	0.14	0.03	0.04	0.02	0.03	0.05	0.04	0.06	0.08
C. D. @ 1%	0.40	0.37	0.52	0.60	0.13	0.17	0.09	0.13	0.21	0.17	0.27	0.33

**Table 2:** Effect of treatments and storage period on taste and overall acceptability of karonda blended squash

Treatments	Taste				Overall acceptability			
	Months after storage				Months after storage			
	0	1	2	3	0	1	2	3
T1: Control (Karonda 100%)	8.88	8.63	8.10	7.78	8.63	8.45	7.92	7.34
T2: Karonda + Pineapple (70:30)	8.90	8.73	8.13	7.84	8.68	8.59	7.98	7.55
T3: Karonda + Pineapple (60:40)	8.94	8.78	8.21	8.02	8.80	8.65	8.16	7.82
T4: Karonda + Pineapple (50:50)	8.91	8.71	8.18	7.91	8.86	8.68	8.27	7.80
T5: Karonda + Pomegranate (70:30)	8.74	8.53	8.07	7.76	8.59	8.34	7.86	6.91
T6: Karonda + Pomegranate (60:40)	8.92	8.66	8.14	7.87	8.66	8.56	7.96	7.36
T7: Karonda + Pomegranate (50:50)	8.89	8.64	8.17	7.80	8.72	8.61	8.08	7.57
T8: Karonda + Pink fleshed guava (70:30)	8.86	8.68	8.11	7.77	8.75	8.63	8.04	7.71
T9: Karonda + Pink fleshed guava (60:40)	8.93	8.70	8.12	7.84	8.82	8.67	8.21	7.77
T10: Karonda + Pink fleshed guava (50:50)	8.95	8.82	8.29	8.07	8.88	8.72	8.33	7.86
Mean	8.89	8.69	8.15	7.87	8.74	8.59	8.08	7.57
S.Em	0.03	0.04	0.02	0.03	0.03	0.04	0.06	0.08
C. D. @ 1%	0.12	0.17	0.09	0.13	0.15	0.19	0.27	0.33

In the present experiment gradual decrease in appearance and colour, mouth feel, flavour, taste and overall acceptability of karonda blended squash during the storage were observed. Reduction in the mean value for colour and appearance was initially from 8.64 to 7.21 at the end of storage. Supreme score (8.46) was stated for the treatment T9 - Karonda + Pink fleshed guava (60:40) followed by T5 (8.42) and minimum score (7.62) was recorded in T4 - Karonda + Pineapple (50:50). This change may be due to deterioration of pigments in karonda blended squash.

Scores for flavour and mouth feel showed analogous decreasing trend as colour and appearance, here treatment T10 - Karonda + Pink fleshed guava (50:50) recorded highest score followed by T3 and minimum value was recorded in T5 - Karonda + Pomegranate (70:30). A gradual decrease in flavour during storage might be due to heat treatment applied during processing. The loss of flavour and taste might be due to the degradation of ascorbic acid and furfural production (Kausar *et al.*, 2012) [6].

Significant decrease was recorded in organoleptic score with respect to the taste of different squashes. The mean value for taste was also decreased throughout the storage period, but the maximum score (8.07) was recorded by the treatment T4 - Karonda + Pink fleshed guava (50:50) followed by T3 (8.03) and minimum scores (7.76) was documented in T5 - Karonda + Pomegranate (70:30). This might be due to change in the acidity content during the storage. Similar reduction in taste during storage has been reported in tamarind pulp blending with mango squash (Kiranmai *et al.*, 2015) [8].

The mean score for overall acceptability of karonda blended squash varies from 8.74 in fresh to 7.57 at the end of 3

months of storage period signifying reduction in performance over the time. The highest score (7.86) was recorded in T10 - Karonda + Pink fleshed guava (50:50) followed by T3 (7.82) at the end of storage period whereas least score (6.91) was documented in T5 - Karonda + Pomegranate (70:30). The results were in accordance with Awis Jan and Docus Masih (2012) in pineapple, carrot and orange juice blends.

However, there was a substantial decrease in organoleptic mean score for colour and appearance, mouth feel, taste, flavour and overall acceptability during storage. The sensory mean score for each trait was uppermost on the day of preparation, which decreased with increasing period of storage. There are many extrinsic factors which determines the storage stability of products and temperature plays an important role among them.

Biochemical changes occurring during the storage might have led to the formation of undesirable colours, flavours and taste, which might have affected the poor acceptability of the products which can further lead to a reduction of the organoleptic score of the product (Dwivedi *et al.*, 2011) [4]. Similar results were also reported by Bhardwaj and Mukharjee (2012) in kinnow, aonla and ginger blended juices and Thirukkumar *et al.*, (2018) [14] in noni fruit juice blended squashes.

#### Colour (L\*a\*b\*) values: L\* value

L - Value measures the lightness of the sample thus it specifies the lightness of the karonda blended squash with different treatments. Amongst the treatments the mean value of lightness of karonda blended squash declined from 79.46 – 79.07 during storage (Table 3).

**Table 3:** Effect of treatments and storage period on colour (L\*, a\*, b\*) of karonda blended squash

Treatments	L* value				a* value				b* value			
	Months after storage				Months after storage				Months after storage			
	0	1	2	3	0	1	2	3	0	1	2	3
T1: Control (Karonda 100%)	78.56	78.35	78.30	78.18	1.45	1.38	1.27	1.13	6.78	6.62	6.46	6.05
T2: Karonda + Pineapple (70:30)	79.95	79.74	79.69	79.56	1.18	1.13	1.04	0.92	7.19	7.09	6.92	6.36
T3: Karonda + Pineapple (60:40)	80.13	79.91	79.85	79.71	1.14	1.10	0.98	0.89	7.30	7.21	7.03	6.87
T4: Karonda + Pineapple (50:50)	80.37	80.09	80.04	79.89	1.07	1.03	0.93	0.81	7.45	7.36	7.13	6.91
T5: Karonda + Pomegranate (70:30)	79.27	79.04	78.98	78.86	1.28	1.21	1.17	1.08	6.58	6.42	6.33	6.01
T6: Karonda + Pomegranate (60:40)	79.51	79.28	79.07	78.92	1.22	1.16	1.11	1.01	7.55	7.45	7.31	7.12
T7: Karonda + Pomegranate (50:50)	79.78	79.57	79.51	79.39	1.19	1.12	1.08	0.94	7.88	7.78	7.54	7.20
T8: Karonda + Pink fleshed guava (70:30)	78.79	78.48	78.43	78.20	1.37	1.28	1.20	1.12	6.68	6.55	6.49	6.09
T9: Karonda + Pink fleshed guava (60:40)	79.04	78.86	78.80	78.67	1.29	1.22	1.15	1.07	7.43	7.32	6.85	7.14
T10: Karonda + Pink fleshed guava (50:50)	79.21	79.48	79.48	79.37	1.23	1.18	1.10	0.98	8.01	7.92	7.35	7.29
Mean	79.46	79.28	79.22	79.07	1.24	1.18	1.10	1.00	7.29	7.17	6.94	6.70
S.Em	0.18	0.19	0.21	0.18	0.02	0.01	0.03	0.02	0.18	0.10	0.12	0.18
C. D. @ 1%	0.75	0.78	0.86	0.74	0.10	0.05	0.12	0.09	0.73	0.42	0.50	0.74

Significantly maximum L\* value (79.89) was reported in treatment T4 - Karonda + Pineapple (50: 50) at 90 days after storage. While minimum L\* value (78.18) was reported in treatment T1- Karonda (100%) at 90 days after storage. Mall and Tandon (2007) <sup>[5, 9]</sup> in Guava-Aonla blended beverage reported decrease in L\* value in blended treatments during storage period of 3 months.

#### a\* value

a\* Value measures the redness of the karonda blended squash with different treatments. Amongst all the treatments the mean value of redness of karonda blended squash juice decreased from 1.24 – 1.00 during storage (Table 3).

Significantly maximum a\*value (1.13) was reported in treatment T1- Control (Karonda 100%) followed by T8 (1.12) at 90 days after storage. While minimum a\* value (0.81) was reported in treatment T4 - Karonda + Pineapple (50: 50) at 90 days after storage. Similar results were also reported by Kilima *et al.*, 2014 <sup>[7]</sup> in roselle juice blends.

#### b\* value

b\* value measures the yellowness of the karonda blended squash. In present study it showed that all the b\* values are located in positive quadrant. Storage period tend to decrease the b\* value from 7.29 at initial to 6.70 at the end of the storage (Table 3).

Among all the treatments highest value (7.29) for yellowness was registered in T10-Karonda + Pink fleshed guava (50:50), while minimum value (6.01) was recorded in T5- Karonda + Pomegranate (70:30) at the final month of storage period in karonda blended squash. Pushpa *et al.*, (2016) <sup>[11]</sup> in aloe vera based blended squash stated that mean value for yellowness (b\*) decreased with increasing storage period.

#### Conclusion

The mean value of sensory evaluation of karonda blended squash scores decreased from an initial value of 8.64 to 7.21, 8.91 to 7.89, 8.78 to 7.61, 8.89 to 7.87 and 8.74 to 7.57 for colour and appearance, mouth feel, flavour, taste and overall acceptability respectively, during three months of storage. Among the treatments, the combination of karonda and pink fleshed guava (T10) in ratio of (50:50) was showed best in organoleptic evaluation.

The mean value of colour parameters of karonda blended squash also decreased from 79.46 to 79.07, 1.24 to 1.00 and 7.29 to 6.70 with respect to L\*, a\*, b\* values respectively. Significantly maximum L\* value (79.89) was reported in treatment T4, while highest a\* value was found in T4 whereas, highest b\* value was noticed in treatment T10 at 3 months after storage.

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