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Short Communication

Standardization of processing techniques for karonda (*Carissa carandas*) products for commercial utilizatoin

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Karonda (*Carissa carandas* L.) is an underutilized indigenous fruit crop of India. It bears wider adaptibility and thrives well throughout arid and semi-arid areas of the country. Being astringent in taste, it is not popular as dessert fruit but it is rich source of essential vitamins and minerals required for adequate human health. The ripe fruit have antioxidant properties and reported to be useful in curing certain diseases like bilious (Watt, 1972) and intestinal worming (Vasu, 1986).

Besides, the karonda fruit also has good potential of processing and has potential for export as fresh fruits and processed products such as preserve, jam, candy, juices, pickles etc (Chandra and Jindal, 2001). Further, huge harvest of the produce during peak harvesting season creates glut and the growers are compelled to sale their produce at low prices which reduces the markets value of the fruit. The post harvest losses in karonda vary from 30-40%. Besides, being acidic in nature karonda is not consumed as fresh and not popular as table fruit. Hence, value addition through processing would be the only effective tool for economic utilization of karonda. Since, karonda is a seasonal fruit, its preservation in different products is necessary to avoid its spoilage and to make its availability round the year (Parvathi and Anby, 1997).

The storage of fresh karonda fruits for longer time is not quite feasible; therefore, its processing into different products is essential. Also, longer shelf life of value added products of karonda is important from consumers and marketing point of view. Very little attempts have been made to study the standardization of processing techniques of karonda in to various products. Keeping these points in view, the present investigation was undertaken to study the standardization of processing techniques for karonda products (candy, squash, jelly and jam) for ensuring the longer storage life and better organoleptic acceptibility.

The present investigation was carried out at the Post-harvest Technology Laboratory, Department of Horticulture and Food Processing, Uttar Pradesh, Saharanpur, India, during June to November, 2007 and 2008 to standardize the processing techniques for karonda products for commercial processing. Healthy and matured karonda fruits of 'Green with Purple blush' genotype were used for the experimentation. Four products *viz.*, candy, squash, jelly and jam were made from karonda. The five recipes each of candy and squash; and six recipes each of jelly and jam were prepared (Table 1-4). The method of preparation of various products was common for all recipes. Different recipes of the products were taken for estimating biochemical parameters like total soluble solids (TSS °Brix) and acidity (%) by hand refractometer and standard solutions of *p*H 4.0 and 7.0, respectively. Organoleptic analysis of different recipes of karonda products was done by the panel of 9 judges on a 9 point hedonic scale to assess the acceptability of the products based on the various sensory attributes like colour and appearance, texture, flavour, taste, after taste and overall acceptability. The data of the various recipes' of karonda products were analyzed statistically in Completely Randomized Design with three replications.

Table 1. Different recipes of candy prepared from karonda fruits

Recipe No.	Contents	Fruit: sugar ratio	Additives
1.	Fruits blanched with water i.e. (*control*)	1 : 1.5	-
2.	Whole fruit without pectin coating	1 : 1.5	Citric acid
3.	Segmented fruit without pectin coating	1 : 1.5	Citric acid
4.	Whole fruit with pectin coating	1 : 1.5	Pectin
5.	Segmented fruits with pectin coating	1 : 1.5	Pectin

Table 2. Different recipes of squash prepared from karonda fruits

Recipe No.	Juice : sugar ratio	Acidity (%)
1	1 : 1.0	1.01
2	1 : 1.2	1.21
3	1 : 1.5	1.00
4	1 : 1.6	1.21
5	1 : 1.7	1.01

Table 3. Different recipes of jelly prepared from karonda fruits

Recipe No.	Juice extract : sugar ratio	*p*H
1	1 : 1.0	3.0
2	1 : 1.1	3.2
3	1 : 1.2	3.4
4	1 : 1.3	3.0
5	1 : 1.4	3.2
6	1 : 1.5	3.4

Table 4. Different recipes of jam prepared of karonda fruits

Recipe No.	Pulp : sugar ratio
1	1 : 1.0
2	1 : 1.4
3	1 : 1.5
4	1 : 1.6
5	1 : 1.7
6	1 : 1.8

Candy

Data reveals that karonda candy prepared of 'whole fruit with pectin coating' having TSS of 78.8 ^{0}Brix and 0.42% acidity scored significantly highest for organoleptic quality (Table 5). Organoleptic score (7.57) of this recipe was differed significantly with all other recipes. All the recipes were with acceptable organoleptic score i.e. like moderately. Kumar (1990) and Deen (1992) were also supported this contention for candy preparation.

Squash

Results indicate that a composition of juice and sugar in the ratio of 1:1.5 containing 51.8 ^{0}Brix TSS and 0.23% acidity was found suitable for preparation of quality squash of karonda (Table 6). Organoleptic score (7.74) of this recipe was differed significantly with all other recipes. All the recipes were with acceptable organoleptic score i.e. like moderately. The increase or decrease in acidity and TSS beyond this level reduced the organoleptic quality of karonda squash. Similarly, Ashraf (1987) suggested ideal recipe of jamun squash containing 40% juice, 50% TSS and 1.2% acidity whereas, Waskar and Khurdiya, (1987) reported that S35% juice, 40 ^{0}Brix TSS is ideal composition for phalsa squash.

Jelly

Data indicates that jelly prepared of using juice extracts and sugar ratio of 1:1.3 with 70.8 ^{0}Brix TSS and 0.31% acidity was recorded significantly highest organoleptic score (8.09) (Table 7). Though, it was found at par with recipie containing juice extracts and sugar ratio of 1:1.4 with organoleptic score of 8.02. All the recipes were with acceptable organoleptic score i.e. like moderately and like very much. A good quality jelly can be prepared from karonda fruits because its' juice is rich in both pectin and acidity. Juice and sugar ratio of 1:1.3 with 70.8 ^{0}Brix TSS and 0.31% acidity were found suitable for making an excellent quality of jelly. Since, only a particular proportion of sugar for particular fruit juice containing pectin can produce best jelly. Sugar aids in forming hydrogen bonds between pectin molecules (Speiser *et al.*, 1947) hence, these bonds facilitates the ideal setting of jelly. The rate of jelly setting is also modified by hydrogen ion concentration. The present result is supported by the findings of Ashraf (1987).

Jam

Jam prepared of using karonda pulp and sugar ratio of 1:1.6 with 75.2 ^{0}Brix TSS and 0.23% acidity was recorded significantly highest organoleptic score (8.01) followed by and considered as an ideal recipe for making jam from karonda fruits (Table 8). All the recipes were with acceptable organoleptic score i.e. like moderately. Many workers pointed out that higher the sugar concentration higher is the jam strength.

The present investigation suggests that karonda candy prepared of 'whole fruit with pectin coating' having TSS of 78.8 ^{0}Brix in fruit to sugar ratio of 1:1.5 scored significantly highest for organoleptic quality. A composition of juice and sugar in the ratio of 1:1.5 containing 51.8 ^{0}Brix TSS was found suitable for preparation of karonda squash. It can also be concluded that jelly prepared of using juice extracts and sugar ratio of 1:1.3 with 70.8 ^{0}Brix TSS and Jam prepared of using karonda pulp and sugar ratio of 1:1.6 with 75.2 ^{0}Brix TSS were recorded significantly highest organoleptic score of 8.09 and 8.01, respectively.

Table 5. Biochemical and organoleptic analysis of different recipes of karonda candy (mean of 2 years)

Recipe No.	Recipe	TSS (^{0}Brix)	Acidity (%)	Organoleptic quality	
				Score	Rating
1.	Fruits blanched with water	72.8	0.41	7.23	Like moderately
2.	Whole fruit without pectin coating	74.2	0.41	7.45	Like moderately
3.	Segmented fruit without pectin coating	75.7	0.41	7.36	Like moderately
4.	Whole fruit with pectin coating	78.8	0.42	7.57	Like moderately
5.	Segmented fruit with pectin coating	77.6	0.42	7.21	Like moderately
S.Ed.		1.17	0.04	0.034	
CD at 5%		2.6	NS	0.07	

Table 6. Biochemical and organoleptic analysis of different recipes of karonda squash (mean of 2 years)

Recipe No.	Juice : sugar Ratio	TSS (°Brix)	Acidity (%)	Organoleptic quality	
				Score	Rating
1.	1 : 1.0	45.8	0.24	7.51	Like moderately
2.	1 : 1.2	51.2	0.24	7.54	Like moderately
3.	1 : 1.5	51.8	0.23	7.74	Like moderately
4.	1 : 1.6	53.8	0.24	7.47	Like moderately
5.	1 : 1.7	56.1	0.24	7.46	Like moderately
S.Ed.		0.77	0.03	0.093	
CD at 5%		1.7	NS	0.21	

Table 7. Biochemical and organoleptic analysis of different recipes of karonda jelly (mean of 2 years)

Recipe No.	Juice : sugar ratio	TSS (°Brix)	Acidity (%)	Organoleptic quality	
				Score	Rating
1.	1:1.0	66.88	0.29	7.26	Like moderately
2.	1:1.1	67.29	0.29	7.11	Like moderately
3.	1:1.2	67.72	0.31	7.13	Like moderately
4.	1:1.3	70.83	0.31	8.09	Like very much
5.	1:1.4	69.88	0.32	8.02	Like very much
6.	1:1.5	68.86	0.32	7.27	Like moderately
S.Ed.		1.102	0.03	0.171	
CD at 5%		2.38	NS	0.37	

Table 8. Biochemical and organoleptic analysis of different recipes of karonda jam (mean of 2 years)

Recipe No.	Pulp : sugar ratio	TSS (°Brix)	Acidity (%)	Organoleptic quality	
				Score	Rating
1.	1:1.0	74.26	0.23	7.46	Like moderately
2.	1:1.4	74.29	0.24	7.59	Like moderately
3.	1:1.5	75.28	0.24	7.82	Like moderately
4.	1:1.6	75.23	0.23	8.01	Like moderately
5.	1:1.7	77.21	0.23	7.67	Like moderately
6.	1:1.8	81.22	0.25	7.88	Like moderately
S.Ed.		1.121	0.04	0.092	
CD at 5%		2.42	NS	0.20	

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