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Dehydration of karonda (*Carissa carandas* L.) fruits for culinary utilization

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Abstract

Karonda (*Carissa carandas L.*) is an underutilized fruit crop of hot arid and semi-arid region grown commonly as a protective hedge. The storage life of karonda is very short because of its soft flesh and high moisture content. Karonda remains unexploited commercially owing to lack of standardized post harvest and value addition technology. Unripe tender fruits (2.0 to 2.5 g) and mature unripe fruits (4.0 to 4.5 g) were subjected to treatments combination consist of control, blanching for 3 minute and blanching with preservatives treatments of potassium meta bisulphite, citric acid and sodium benzoate each at 0.1 and 0.2 % concentrations for five minutes and dried in sun. Among all the treatments, tender fruits blanched for 3 minute and treated with sodium benzoate 0.1 % were found superior for dehydration of karonda fruits for preparation of powder. Dehydrated karonda powder was found good in organoleptic taste for its tartness and as masala mixture for its typical sour taste. These dehydrated fruits can also be used as mouth freshener and for making chutney.

Key words: *Carissa carandas* L., dehydration, fruit powder, organoleptic quality

Introduction

Karonda (*Carissa carandas* L.) a thorny shrub belongs to family Apocynaceae. It is cultivated as hedges at farm boundary in the arid and semi-arid regions. After establishment, it hardly needs any care and gives yield (8-10 kg/plant) with minimum management. It is tolerant to biotic and abiotic stresses and ideal for growing in the adversity and drought prone areas (Mitra *et al.,* 2006). The fresh fruits of karonda are less popular due to their sour and astringent taste, however are one of the richest sources of iron (0.46-4.95 mg/100 g) and contain appreciable amount of vitamin C (1.6-17.90 mg/100 g), besides other minerals required for human health (Manivasagan *et al*., 2007 and Misra, 2011). Its unripe sour and astringent fruits are used for preparation of vegetable, chutney and pickle locally. Karonda is generally used as a condiment or additive to Indian pickles and spices (Maheshwari *et al.*, 2013). Karonda unripe fruit contains high amount of iron 0.83 mg, zinc 1.44 mg, ascorbic acid 17.00 mg, dietary fiber 2.07 g and total phenol 4.27 mg per 100 g of fruits (Hiregoudra, 2012). Karonda fruits are also used in making jelly, jam, squash, tarts and chutney which are of great demand in international market (Wani *et al*., 2013). It also helps to improve the sensorial, nutritional and organoleptic properties of foods (Khan, 2012). The unripe fruit harvested at maturity can be stored for 7 to 10 days at room temperature, but at ripe stage, it can be stored only for 2 to 3 days. Sometimes there is glut in the markets and farmers are not getting reasonable price. There is very meager information available on karonda post harvest and value addition technology particularly dehydration of fruits. The dehydrated fruit product can be stored for longer period. Blanching is used to arrest enzyme activity and associated changes before processing (Brewer *et al*., 1995). In hot arid and semi arid region plenty of sun light is available which can be utilized for dehydration of fruits. Besides, being acidic in nature karonda is not consumed as fresh and table fruit. 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 dried product not only retains nutritive value but also easy to handle, store and transport for long distances market. Therefore, the present investigation was undertaken to standardize the karonda dehydration technology for culinary utilization.

Materials and Methods

The experiment was conducted at the Post Harvest Laboratory of ICAR-Central Institute for Arid Horticulture for standardization of dehydration technology in karonda. The experiment conducted in factorial completely randomized design with three replications. Two type of fruits *i.e.* F_1-Tender fruits of small size (2.0 to 2.5 g with soft seed) and F_2- Unripe mature fruits of big size (4.0 to 4.5 g with hard seed) and three preservative potassium meta bisulphite (KMS), citric acid (CA) and sodium benzoate (SB) were used in the experiment. There were eight treatment combination namely T_1- Control (without any treatment), T_2- Blanching for 3 min., T_3- Blanching for 3 min.+ KMS 0.1 % for 5 min., T_4- Blanching for 3 min.+ KMS 0.2 % for 5 min., T_5- Blanching for 3 min.+ CA 0.1 % for 5 min., T_6- Blanching for 3 min.+ CA 0.2 % for 5 min., T_7- Blanching for 3 min.+ SB 0.1 % for 5 min. and T_8- Blanching for 3 min.+ SB 0.1 % for 5 minutes. Fresh, healthy tender and mature unripe fruits were harvested for the preparation of powder. After washing, the fruits were blanched

and treated with preservative as per the treatments. The fruits were spread uniformly in aluminium trays and were dried in the sun. The dried fruits were grounded to form powder and sieved through mesh sieve to get uniform samples. Data were recorded on fruits morphological, physico-chemical parameter and fruit powder were evaluated for organoleptic parameters. The ascorbic acid was determined by using 2-6 dichlorophenol-indophenol dye. The acidity was analyzed by titrating with 0.1 N NaOH using phenolphthalein as an indicator Ranganna (1997). Sensory evaluation of the fruit powder was done by following the hedonic rating. Data on morphological and physico-chemical characteristics of fruits were presented in Table 1. Tender fruits had high acidity (3.84 %) as compared to mature unripe fruits (3.15%).

Results and Discussion

The effect of fruit type and preservative treatments on acidity and ascorbic acid content of fruit powder is presented in Table 2. Among fruit type, highest acidity was recorded in fruit powder prepared from tender fruits (4.17 %) which is significantly superior to mature unripe fruits (2.78 %). However, ascorbic acid content was recorded significantly highest in fruit powder prepared from mature unripe fruits (14.25 mg/100 g) as compared to tender fruit powder (12.41 mg/100 g). Similar results were also obtained by Saxena *et al*., (2016) in karonda. Among different treatments of preservatives, highest acidity was recorded in treatment blanching for 3 min.+ KMS 0.2 % for 5 min. (3.77 %) followed by blanching for 3 min.+ KMS 0.1 % for 5 min. (3.74 %) as against minimum in 3.13 in control. Ascorbic acid content (mg/100 g) was found highest in treatment blanching for 3 min.+ KMS 0.2 % for 5 min. (13.52) followed by blanching for 3 min.+ SB 0.1 % for 5 min. (13.44) as against minimum in 3.11 in control. Ascorbic acid was found high in chemically treated fruit powder as compared to control and blanching treatment alone, which are in accordance with results obtained by Gupta *et al*., (2008) in green leafy vegetables. Mulay *et al*., (1994) also reported that KMS

Table 1. Morphological and physico-chemical characteristic of fruits

Morphological characteristic			Physico-chemical characteristic		
Characteristic	Tender fruit	Mature unripe fruit	Characteristic	Tender fruit	Mature unripe fruit
Colour	Light green	Dark purple	TSS ^{0}Brix	6.25	7.69
Fresh weight (g)	2.30	4.12	Acidity (%)	3.84	3.15
Fruit length (cm)	1.80	2.50	Moisture (%)	80.12	78.18
Fruit diameter (cm)	1.30	2.31	Vita. C (mg/100 g)	14.03	17.50
No. of seeds	3.33	3.33	Total phenol (mg/100 g)	4.10	2.32

Table 2. Effect of fruit type and preservative on acidity and ascorbic acid of fruit powder

Treatments	Acidity (%)			Ascorbic acid (mg/100 g)		
	Tender fruit	Mature unripe fruit	Mean	Tender fruit	Mature unripe fruit	Mean
T_1	3.80	2.46	3.13	12.17	14.05	13.11
T_2	3.83	2.45	3.14	12.20	14.12	13.16
T_3	4.42	3.06	3.74	12.57	14.28	13.42
T_4	4.45	3.09	3.77	12.61	14.42	13.52
T_5	4.02	2.69	3.36	12.35	14.19	13.27
T_6	4.13	2.77	3.45	12.35	14.21	13.28
T_7	4.33	2.81	3.57	12.45	14.31	13.38
T_8	4.38	2.89	3.64	12.52	14.36	13.44
Mean	4.17	2.78		12.41	14.25	
SEm±	F=0.05 T=0.11 FxT=0.15			F=0.08 T=0.16 FxT=0.23		
CD at 5 %	F=0.16 T=0.32 FxT= NS			F=0.23 T=0. NS FxT= NS		

pretreatment to leafy vegetable can reduce loss of ascorbic acid. The interaction effect of fruit type and preservative treatments was found non significant and highest value (4.45 %) for acidity was recorded in treatment combination of tender fruit with blanching for 3 min.+ KMS 0.2 % for 5 minutes and lowest values for acidity were recorded in treatment combination of mature unripe fruits with blanching for 3 min. (2.45 %). and mature unripe fruits control (2.46 %) The ascorbic acid content was found highest (14.42 mg/100 g) in treatment combination mature unripe with blanching for 3 min. + KMS 0.2 % for 5 minutes.

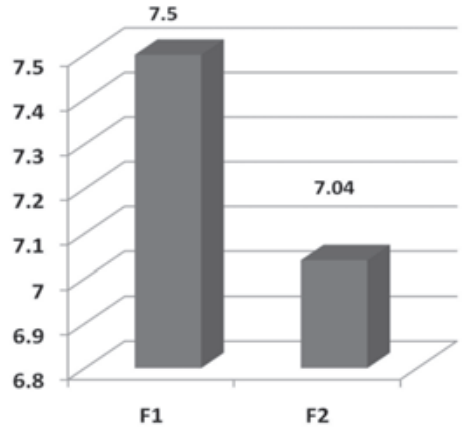
Fruit powder was also subjected to sensory evaluation. Data presented in Table 3 divulged that there was significant effect of fruit type and preservative treatments on organoleptic qualities of karonda fruit powder. Based on score, amongst fruit type, tender fruits was found more acceptable (7.23 and 7.10) as compared to mature fruits (6.93 and 6.86) for colour and texture, respectively. Similar trends for texture were also obtained by Saxena *et al*., (2016) in Pant Sudarshan variety of karonda. The colour of dehydrated mature unripe fruits in the control was brownish black which may be due to changes in phenolic contents affected by non enzymatic browning (Mayer and Harel, 1979). Among different treatments of preservatives, chemical preserves improves colour and texture of fruit powder, highest colour acceptability (7.96) was obtained in treatment blanching for 3 min.+ SB 0.2 % for 5 min. while value for texture was highest (7.70) in blanching for 3 min.+ KMS 0.2 % for 5 min. treatment.

Among interaction effects of fruit type and preservative treatments, highest acceptability for colour with 8.26 score was observed in treatment combination of tender fruit with blanching for 3 min.+ SB 0.1 % for 5 minutes whereas, highest score of texture (7.83) was observed in treatment combination of tender fruit with blanching for 3 min.+ KMS 0.2 % for 5 minutes.

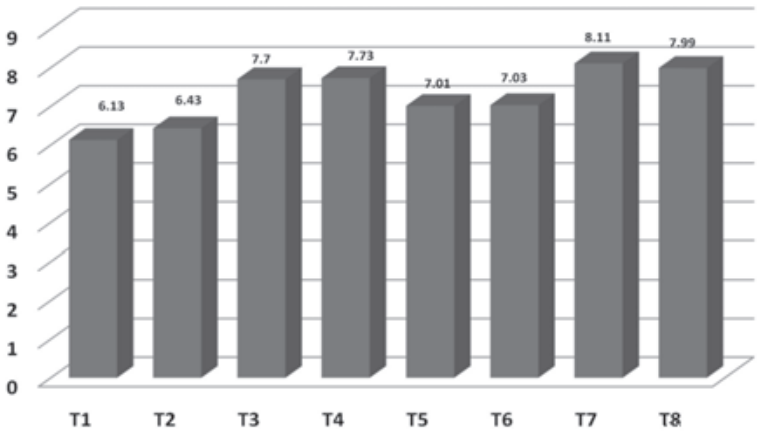
Based on organoleptic evaluation (Fig.1), amongst all fruit types highest acceptability was recorded in powder prepared from tender fruits (7.5) while in preservative treatments blanching for 3 min.+ SB 0.1 % for 5 min. was found more acceptable with highest rating (8.11). Amongst combined effect of fruit type and preservative treatments, highest overall acceptability (8.53) was observed in treatment combination of tender fruit with blanching for 3 min.+ SB 0.1 % for 5 minutes. Similar findings were reported by Saxena *et al*. (2016) with highest acceptability of karonda fruit powder prepared from fruits picked at 70 days after fruit set. It can be concluded that powder prepared from tender karonda fruits treated with blanching for 3 minutes + SB 0.1 % for 5 minutes (Fig.2) was better in terms of colour, overall acceptability and with higher acidity. Dehydrated karonda powder was found mot suitable in organoleptic taste for its tartness and for masala mixture owing to its typical sour taste. These dehydrated fruits can also be utilized as mouth freshener and chutney preparation.

Table 3. Organoleptic evaluation of karonda fruit powder

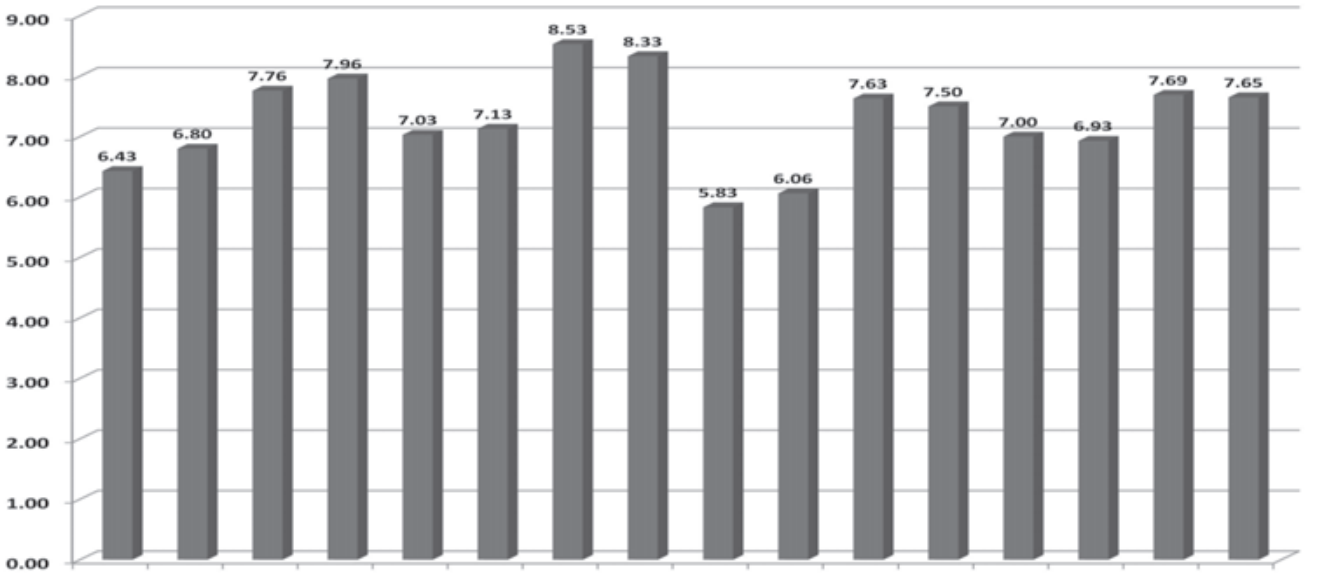
Treatments	Colour			Texture		
	Tender fruit	Mature unripe fruit	Mean	Tender fruit	Mature unripe fruit	Mean
T_1	6.13	5.60	5.86	6.26	5.73	6.00
T_2	6.57	5.80	6.18	6.70	5.93	6.32
T_3	7.47	7.46	7.47	7.60	7.60	7.60
T_4	7.70	7.43	7.57	7.83	7.57	7.70
T_5	6.73	6.70	6.72	6.86	6.83	6.85
T_6	6.83	6.66	6.75	6.96	6.80	6.88
T_7	8.26	7.90	8.08	7.40	7.20	7.30
T_8	8.10	7.83	7.96	7.23	7.26	7.25
Mean	7.23	6.93		7.10	6.86	
SEm±	F=0.019 T=0.039 F xT=0.055			F=0.029 T=0.058 F xT=0.082		
CD at 5 %	F=0.056 T=0.112 F xT= 0.158			F=0.084 T=0.168 F xT= 0.237		



(a) Main effect of fruit type



(b) Main effect of preservatives



(c) Interation effect of fruit type and preservatives

Fig 1. Overall acceptability of karonda fruit powder

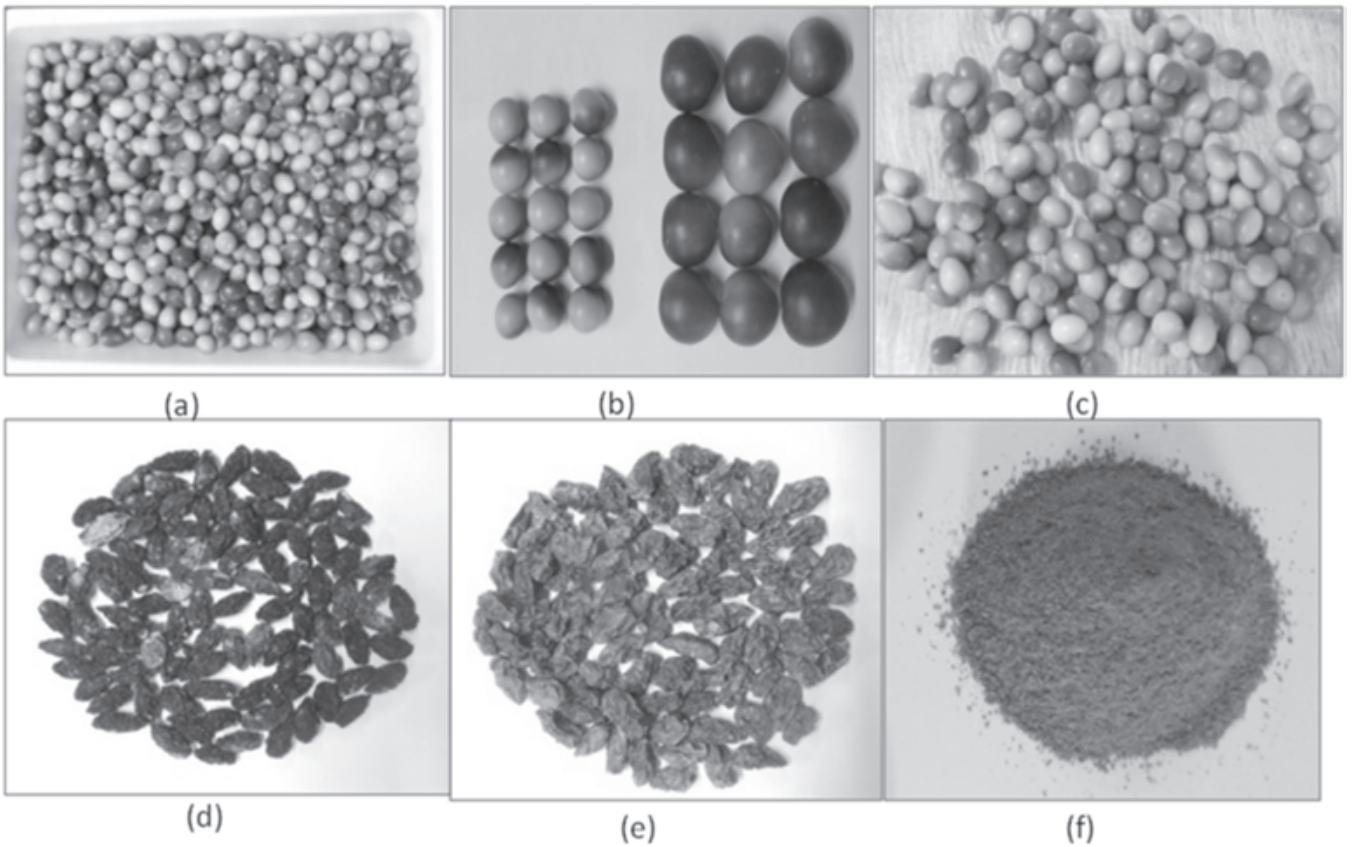


Fig 2. Dehydration of karonda fruits for value addition
(a) Fresh fruits, (b) Tender and mature unripe fruits, (c) Treated fruits, (d) Dehydrated mature unripe fruit (control), (e) Dehydrated tender fruit (blanching for 3 minutes + SB 0.1 % for 5 min.) and (f) Fruits powder

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