e ISSN-2231-6426
Volume 5 | Issue 2 | December, 2014 | 136-140
■ Visit us: *www.researchjournal.co.in*
International Journal of Processing and Post Harvest Technology

RESEARCH PAPER
DOI: 10.15740/HAS/IJPPHT/5.2/136-140

Studies on preparation of karonda candy

■ RASHMI PATIL*, V.U. RAUT[1] AND R.S. WANKHADE
University Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA
(Email: patilrashu03@gmail.com)
[1]College of Agriculture, NAGPUR (M.S.) INDIA

*Author for Correspondence

Research chronicle : Received : 14.07.2014; **Revised :** 26.10.2014; **Accepted :** 12.11.2014

SUMMARY :

An experiment on the studies on preparation of karonda candy was carried out during the year 2012-2013 at Post Harvest Technology Laboratory, Department of Horticulture, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in Factorial Complete Ramdomized Design consisting of seven treatments and three replications with two drying methods (cabinet drying and solar drying). From the findings it was observed that, there was a gradual increase in TSS, titratable acidity, reducing sugars and total sugars content of the candy irrespective of drying methods and recipes used in experimentation. However, non-reducing sugars, ascorbic acid and moisture content of candy found to decreased with the advancement of storage period.

KEY WORDS : Karonda, Candy, Pectin, Vitamins

How to cite this paper : Patil, Rashmi, Raut, V.U. and Wankhade, R.S. (2014). Studies on preparation of karonda candy. *Internat. J. Proc. & Post Harvest Technol.,* **5** (2) : 136-140.

Karonda (*Carissa carandus* L.), among fruits popularly known as christs thorn. It is an indigenous fruit of India and belongs to the family apocynaceae. Karonda is usually valued for its important nutritional qualities and also recognised as richest source of carbohydrate, protein, fat, potassium and iron. Karonda fruit usually contains - 83.67 per cent moisture, 2.3 per cent protein, 1.77 g, fat - 76.26 per cent, carbohydrate - 4.7 per cent. The fruits are astringent and slightly acidic in taste, it also contain maximum amount of pectin, vitamins and minerals. Due to astringent in taste of fruit, no one can eat this fruit without processing. Ones the fruit processed, the availability of processed product is possible throughout the year. The value added products of karonda contain essential vitamins and minerals which are the essential part of the human diet.

The fresh karonda fruits are generally not consumed as it is due to highly acidic and astringent; therefore karonda is not a popular table fruit. But, it has got great potential in processed forms. Govt. of India as well as Maharashtra state is giving the due impetus for increasing the area under karonda plantation in Vidarbha region. “National Horticulture Mission” and ‘Employment guarantee scheme’ play an key role for its increasing cultivation. Considering the mass fruit production from this increasing plantation in coming future days, proper processing techniques for the preparation of different value added products need to be explored. Hence, the present investigation entitle “Studies on preparation of karonda candy” were conducted with the to prepare the candy with whole fruit, fruit pieces and fruit without seed by using cane sugar and Jaggery at different brix concentration and find out the best drying method for preparation of karonda candy.

EXPERIMENTAL METHODS

The experiment on the studies on preparation of karonda candy was conducted in Post Harvest Technology and Analytical Laboratory, at University Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during the academic year 2012-2013. Matured unripe and uniform sized of local variety of karonda fruits were procured from AICRP on Citrus, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Unripe, diseased, damaged and off type fruits were strictly discarded. The 100 g sample were used for each treatment. The selected fruits were thoroughly washed with clean tap water to remove dirt and dusts particles adhered to the pericarp of the fruit and then allowed to dry for removal of excess moisture from the fruit surface. Before preparation of candy fruits were estimated for physico-chemical composition. An experiment was laid out in factorial completely randomized design with seven treatments and three replications with 14 treatment combinations. The treatment details are given below.

Treatment details :

Factor A (Recipes) :

- T_1- Fruit pieces impregnated with cane sugar (TSS 60 °Brix) +0.5% citric acid.
- T_2- Whole fruit with seed impregnated with cane sugar (TSS 65°Brix)+0.6% citric acid.
- T_3- Whole fruit without seed impregnated with cane sugar (TSS 70°Brix) +0.7% citric acid.
- T_4- Fruit pieces impregnated with jaggery (TSS 60° Brix) + 0.5% citric acid.
- T_5- Whole fruit with seed impregnated with jaggery (TSS 65°Brix) + 0.6% citric acid.
- T_6- Whole fruit without seed impregnated with jaggery (TSS 70°Brix) + 0.7% citric acid.
- T_7- Control (Without citric acid).

Factor B (Method of drying) :

D_1 - Cabinet drying

D_2- Solar drying .

The prepared slices as well as whole fruit of karonda then blanched in 500 ppm potassium metabisulphite with hot water treatment to become the slices and whole fruit soft. Then these prepared slices and fruit were steeped in syrup of 60, 65, 70 ^{o}Brix with the addition of citric acid containing cane sugar and jaggery at different concentration. The sugar and jaggery solution initially prepared at concentration of 60 ^{0}Brix. After 24 hours of steeping in each treatment, the syrups were drained and their concentrations were increased by adding sugar and jaggery proportionately. Then slightly heating was done to dissolve the sugar and jaggery. The required quantity of sugar and jaggery were added subsequently to obtain the required 70 ^{0}Brix strength of syrup. The syrup concentration was increased by 5 ^{o}Brix every time until the concentration reached up to 70 ^{0}Brix. Finally the slices and whole fruit was kept in 60, 65, 70 ^{0}Brix syrup solution of sugar and jaggery according to the treatment for a period until the equilibrium was reached between slices and the syrup concentration. Finally, the slices and whole fruit as per treatment impregnated in each treatment was drained free of syrup and rinse immediately with the tap water and dried in shade for 24 hrs. After drying, the candy was packed in 250 guage polythene bags and stored under ambient condition. The chemical observations were recorded at every 30 days interval until the candy remains acceptable and record maximum consumer acceptability. The chemical parameters like total soluble solids (°Brix), acidity (%), ascorbic acid (mg/100g), reducing sugars (%), non-reducing sugars (%) total sugars (%), moisture (%) and mould (x10^1 cfu/g) were determined by adopting the proper analytical methods. The prepared karonda candy was stored at ambient temperature. The data obtained was analysed for the statistical significant according to the procedure given by Panse and Sukhantme (1967).

EXPERIMENTAL FINDINGS AND ANALYSIS

The changes in total soluble solids (°Brix), acidity (%), ascorbic acid (mg/100g), reducing sugars (%), non-reducing sugars (%), total sugars (%), moisture (%) and mould (x10^1 cfu/g) at 120 days of storage as influenced by different recipe and drying methods at ambient storage is presented in Table 1 and their interaction effect in Table 2.

Total soluble solids (°Brix) :

Effect of recipe :

At 120 days T_6 recorded maximum TSS (75.68 ^{0}Brix) but at par with T_1 (75.66 ^{0}Brix), T_2 (75.65 ^{0}Brix) and T_7 (75.64 ^{0}Brix).

Effect of drying methods :

The data presented in Table 1 in respect of total soluble solids as influenced by the different drying methods showed significant difference at 120 days. At 120 days cabinet drying showed maximum TSS than solar drying.

Interaction effects :

An interaction effect of recipes and drying methods on total soluble solids content of karonda candy was found significant at 0 to 120 days. At 120 days maximum TSS was recorded by T_1D_1 (75.74%) and was found significantly higher than all other treatments but at par with T_6D_1 (75.69%).

This might be due to conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture content of the product with the advancement of storage. Increase in TSS with storage was also reported by Tripathi *et al.* (1988) in aonla products, Manivasagan *et al.* (2006) in karonda candy and Rani and Bhatia (1985) in pear candy.

Titratable acidity content of karonda candy :

Effect of recipes :

The acidity was found increases gradually with advancement of storage period. The effect of treatment on acidity per cent at 0 to 120 days storage was found significant at 5 per cent level of significant. At 120 days maximum acidity was found in T_5 (1.59%) but at par with T_2 (1.43%) while minimum acidity was recorded by T_7 (0.78%).

Effect of drying methods :

The data presented in Table 1 in respect of acidity as influenced by the different drying methods showed non significant difference at 120 days.

Interaction effects :

Significant results were obtained at 120 days. At 120 days maximum acidity per cent was recorded by T_5D_2 (1.61%) and was found significant higher than all other treatment but at par with T_5D_1 (1.58%).

Pectic acid have been reported to increase the acidity in fruit products, hence, degradation of pectic substances into soluble solids might have contributed towards an increase in the acidity of karonda candy. An increase in acidity with storage period has also been observed in aonla preserve. Similar findings were also reported by Sethi (1980) and Kumar and Singh (2001) in aonla products. These results were in confirmation to the results obtained by Manivasagan *et al.* (2006) in karonda candy and Mehta and Rathore (1976) in amla juice, in which the acidity increased throughout the storage.

Ascorbic acid of karonda candy :

Effect of recipes :

At 120 days of storage showed the treatment T_1 (2.12%) gave maximum ascorbic acid and was found significantly superior to all other treatment.

Effect of drying methods :

The data presented in Table 1 in respect of ascorbic acid content as influenced by the different drying methods showed significant differences at 120 days. At 120 days D_1 (3.22%) treatment gave maximum ascorbic acid and was found significantly superior over D_2(3.21%).

Interaction effects :

An interaction effect of recipes and drying methods on ascorbic acid content of karonda candy at 120 days T_1D_1 (2.13%) recorded maximum ascorbic acid but at par with T_1D_2 (2.1%) T_3D_1 (2.1%) and T_6D_1 (2.1%).

Reduction in vitamin 'C' might be due to oxidation trapped by oxygen in the polythene pouch which results in to formation of dehydro ascorbic acid. Loss in ascorbic acid content was also observed by Sethi (1980) in aonla preserve, Tripathi *et al.* (1988) in aonla products, Rani and Bhatia (1985) in pear candy and Kumar and Singh (2001) in different aonla products.

Reducing sugars of karonda candy :

Effect of recipes :

In general there was an increase in reducing sugars during the storage. At 120 days treatment T_1 was found significantly superior over to other treatments.

Effect of drying methods :

Maximum reducing sugars was recorded by D_1 and also found significantly higher than D_2.

Table 1 : Changes in total soluble solids (°Brix), acidity (%), ascorbic acid (mg/100g), reducing sugars (%), non-reducing sugars (%) total sugars (%), moisture (%) and mould (x10^1 cfu/g) at 120 days of storage as influenced by different recipe and drying methods at ambient storage

Treatments	TSS (^{O}Brix)	Acidity (%)	Ascorbic acid (mg/100 g)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)	Moisture (%)	Mould (x 10^1 cfu/g)
T_1	75.66	0.91	2.12	41.53	27.86	69.39	15.78	3.95 (2.11)
T_2	75.65	1.43	2.05	28.36	25.82	54.18	15.79	*
T_3	75.55	0.88	2.08	35.25	25.38	60.63	15.91	4.27 (2.18)
T_4	75.59	0.98	2.05	32.64	26.77	59.41	15.88	4.52 (2.24)
T_5	75.60	1.59	2.05	32.21	26.47	58.68	15.84	*
T_6	75.68	0.99	2.08	37.08	25.15	62.23	15.84	4.67 (2.27)
T_7	75.64	0.78	2.05	37.13	24.45	61.58	15.96	5.18 (2.38)
'F' test	Sig.	Sig.	Sig.	Sig	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.02	0.01	0.008	0.06	0.004	0.05	0.02	0.01
C.D. (P=0.05)	0.06	0.03	0.024	0.18	0.013	0.15	0.07	0.05
D_1	75.64	1.07	2.08	34.96	25.93	60.94	15.83	3.03 (1.76)
D_2	75.60	1.08	2.06	34.80	25.99	60.80	15.89	3.42 (1.85)
'F' test	Sig.	NS	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.01	0.005	0.004	0.03	0.002	0.03	0.01	0.04
C.D. (P=0.05)	0.03	–	0.012	0.09	0.007	0.08	0.04	0.13

Value in parenthesis indicates square root transformation *Sample rotten due to mould growth - No growth NS=Non-significant

Interaction effects :

An interaction effect of recipes and drying methods on reducing sugars per cent of karonda candy was found significant differences 120 days of storage. At 120 days T_1D_1 (42.04%) recorded maximum reducing sugars per cent and was found significantly superior to all other treatments.

The increase in reducing sugars with advancement of storage might be because of increased degree of inversion of sugars. These results are in conformity with the results reported by Rani and Bhatia (1985) in pear candy, Mehta *et al.* (2005) in galgal peel candy and Sagar and Khurdiya (1999) in dehydrated mango slices.

Non reducing sugars of karonda candy :

Effect of recipes :

In general there was a decrease in non-reducing sugars during storage. At 120 days treatment T_1 was found significantly superior as compared to other treatment under study.

Effect of drying methods :

Maximum non-reducing sugars was recorded by D_1 at all storage period and also found significantly higher than D_2.

Interaction effects :

At 120 days maximum non reducing sugars was recorded in T_1D_2 (27.87%) followed by T_1D_1 (27.85%) and was found at par with each other.

The decreased in non-reducing sugars during the entire storage. These results were in conformity with the results obtained by Nayak *et al.* (2012).

Total sugars of karonda candy :

Effect of recipes :

In general there was an increase in total sugars during storage. At 120 days, treatment T_1 was found significantly superior as compared to other treatments.

Effect of drying methods :

The data presented in Table 1 in respect of total sugars as influenced by the different drying methods showed significant differences at 120 days. Maximum total sugars were recorded in the candy dried by cabinet drier and also found significantly higher than D_2.

Interaction effects :

At 120 days T_1D_1 (69.87%) recorded maximum total sugars % and was found significantly superior to all other treatment.

Increase in total sugars throughout the storage might be because of increased degree of inversion of sugars. These results are in conformity with the results reported by Rani and Bhatia (1985) in pear candy, Mehta *el al.* (2005) in galgal peel candy and Sagar and Khurdiya (1999) in dehydrated mango slices.

Moisture per cent of karonda candy :

Effect of recipes :

Minimum moisture per cent was found in T_1 at 120 days

Table 2 : Interaction effect of different recipe and drying methods on total soluble solids (°Brix), acidity (%), ascorbic acid (mg/100g), reducing sugars (%), non-reducing sugars (%) total sugars (%), moisture (%) and mould (x101 cfu/g) at 120 days of storage of karonda candy

Treatments	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100 g)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)	Moisture (%)	Mould (x 10^1 cfu/g)
T_1D_1	75.74	0.90	2.13	42.04	27.85	69.87	15.75	3.7 (2.04)
T_1D_2	75.58	0.92	2.1	41.02	27.87	68.90	15.81	4.20 (2.17)
T_2D_1	75.71	1.39	2.04	28.39	25.80	54.19	15.77	*
T_2D_2	75.58	1.46	2.07	28.33	25.84	54.17	15.82	*
T_3D_1	75.57	0.86	2.1	35.28	25.36	60.62	15.87	3.97 (2.11)
T_3D_2	75.54	0.90	2.05	35.22	25.40	60.64	15.95	4.57 (2.25)
T_4D_1	75.62	0.97	2.06	32.65	26.76	59.44	15.85	4.27 (2.18)
T_4D_2	75.54	0.99	2.04	32.63	26.78	59.38	15.91	4.77 (2.29)
T_5D_1	75.61	1.58	2.06	32.19	26.44	58.69	15.82	*
T_5D_2	75.58	1.61	2.04	32.23	26.5	58.67	15.87	*
T_6D_1	75.69	1.03	2.1	37.1	25.12	62.19	15.82	4.4 (2.21)
T_6D_2	75.66	0.95	2.05	37.06	25.18	62.27	15.85	4.93 (2.33)
T_7D_1	75.65	0.76	2.04	37.11	24.48	61.60	15.93	*
T_7D_2	75.62	0.81	2.05	37.15	24.42	61.56	15.98	*
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.E.±	0.02	0.01	0.01	0.08	0.006	0.07	0.04	0.02
C.D. (P=0.05)	0.07	0.04	0.03	0.26	0.019	0.21	0.10	0.07

Value in parenthesis indicates square root transformation

(15.05%).

Effect of drying methods :

At 120 days maximum moisture per cent was recorded by D_1 (16.13%) but it was statistically at par with each other.

Interaction effects :

The data revealed that, the interaction effect of recipes and drying methods was statistically non-significant. The moisture per cent was found to decrease with increase in storage period. At 120 days minimum per cent was found in T_1D_1 (15.75%) but found at par with T_1D_2, T_2D_2, T_6D_1, T_5D_1.

The decrease in moisture content in karonda candy with an increase in storage period might be due to the evaporation of moisture from the stored candy. Decrease in moisture content of candy during storage was also reported by Tripathi *et al.* (1988) in aonla candy, Mehta *et al.* (2005) in galgal peel candy, Rani and Bhatia (1985) in pear candy and Lathar *et al.* (2007) in aonla.

Microbial count :

Effect of recipes :

At 120 days the occurrence of mould was maximum in T_7 5.18 (2.28)x10^1 cfu/g and was found significantly superior rest of the treatments, sample was fermented in T_2 and T_5 hence count can not be taken.

Effect of drying methods :

At 120 days maximum occurrence of mould was recorded by D_2 found significantly superior over cabinet drying method at all storage periods.

Interaction effects :

At 120 days maximum mould occurrence was observed in T_6D_2 4.93(2.33) x10^1 but at par with T_4D_2 and minimum mould occurrence was observed in T_1D_1 3.7(2.04) x10^1. At 120 days sample was fermented in T_2D_1, T_2D_2, T_5D_1, T_5D_2, T_7D_1 and T_7D_2 hence count can not be taken.

The results were in conformity with the earlier finding in which increased bacterial count in aonla preserves was noticed during storage (Sethi and Anand, 1982).

Conclusion :

There was a gradual increase in TSS, titratable acidity, reducing sugars, and total sugars content of the candy irrespective of drying methods and recipes used in experimentation. However, non-reducing sugars, ascorbic acid and moisture content of candy found to decreased with the advancement of storage period.

LITERATURE CITED

Kumar, Sanjeev and Singh, I.S. (2001). Storage studies of aonla fruit products at ambient temperature. *Prog. Hort.,* **33**(2): 169-173.

Lathar, R., Godara, A.K., Sehrawat, S.K. and Saran, P.L. (2007). Standardization of drying techniques for aonla (*Emblica officinalis*) fruit. *Haryana J. Hort. Sci.,* **36**(1&2) : 31-33.

Manivasagan, S., Rana, G.S., Kumar, Surinder and Joon, M.S. (2006). Qualitative changes in karonda (*Carissa carandas* Linn.) candy during storage at room temperature. *Haryana J. Hort. Sci.,* **35**(1&2) : 19-21.

Mehta, Anjali, Ranote, P.S. and Bawa, A.S. (2005). Processing of kandi lemon (Galga) peel waste for candy making. *Indian Fd. Pack.,* **54** : 67-74.

Mehta, Urmil and Rathore, Harminder (1976). Storage studies of pressed juice from amla (*Phyllanthus emblica*). *Indian Fd. Pack.,* **30** : 9-12.

Nayak, P., Tandon, D.K. and Bhatt, D.K. (2012). Study on changes of nutritional and organoleptic quality of flavored candy prepared from aonla (*Emblica officinalis* G.) during storage. *Internat. J. Nutrition & Metabolism,* **4**(7) : 100-106.

Panse, V.G. and Sukhatme, P.V. (1967). *Statistical methods for agricultural workers*. Indian Counsil of Agricultural Research, NEW DELHI (INDIA).

Rani, Upasana and Bhatia, B.S. (1985). Studies on pear candy processing. *Indian Fd. Pack.,* **29** : 40-46.

Sagar, V.S. and Khurdiya, D.S. (1999). Studies on dehydration of dashehari mango slices. *Indian Fd. Pack.,* **53** : 5-9.

Sethi V. (1980). Studies on preparation and storage of some semi-dry preserves (Murrabba). Ph.D. Thesis, Indian Agricultural Research Institute, NEW DELHI (INDIA).

Sethi, V. and Anand, J.C. (1982). Physico-chemical and microbial quality of carrot and aonla preserve. *Indian Fd. Pack.,* **24**(6): 38-42.

Tripathi, V.K., Singh, M.B. and Singh, Surjit (1988). Studies on comparative compositional changes in different preserved products of amla (*Emblica officinalis* Gaertn.) var. Banarasi. *Indian Fd. Pack.,* **42**(4) : 60 - 66.