International Journal of Processing and Post Harvest Technology
Volume 3 | Issue 2 | December, 2012 | 184-187
RESEARCH PAPER

Quality assessment of sweetened dehydrated aonla slices

■ K. CHANDAN, A.K. ROKHADE AND G.B. SRINIVASULU

SUMMARY : An investigation was conducted to prepare and assess the quality of dehydrated sweetened aonla slices. The organoleptically acceptable dehydrated sweetened aonla slices with better quality was obtained by blanching aonla fruits for five minutes and sliced pieces steeped in two per cent salt for two hours + steeping in 60^0B sugar syrup for 24 hours followed by drying under open sun. The dehydrated slices contain 2.87 per cent protein, 48.67 mg phosphorus, 96.53 mg calcium and 283 mg ascorbic acid per 100 g.

KEY **W**ORDS : Aonla fruits, Salt solution, Sugar syrup, Composition

How to cite this paper : Chandan, K., Rokhade, A.K. and Srinivasulu, G.B. (2012). Quality assessment of sweetened dehydrated aonla slices. *Internat. J. Proc. & Post Harvest Technol.,* **3** (2) : 184-187.

Research chronicle : Received : 27.04.2012; **Revised :** 20.07.2012; **Accepted :** 14.09.2012

Aonla (*Emblica officinalis* Gaerth.), is one of the important minor fruit crops rich in ascorbic acid. It is valued as an antiscorbutic, diuretic, laxative, alternative and antibiotic. Fresh aonla fruits are sour and astringent in taste. Hence, cannot be consumed as a table fruit. The excellent nutritive and therapeutic values of this fruit offer a great potential for processing into several value added products like murabba, candy, pickle, jam, sauce, etc. But the available information on preparation of dehydrated aonla slices is limited. Hence, there is a need to standardize a simple, economical and appropriate method for preparation of highly acceptable, good quality dehydrated aonla slices. With this view, the present investigation was under taken to standardize protocol for preparation of dehydrated aonla slices and to assess quality of the slices.

EXPERIMENTAL METHODS

Fresh aonla fruits cv. SUREBAN (local variety) procured from Lingadhal village, Belgaum district (Karnataka) were used to present investigation. The experiment was laid out in factorial completely randomised design with three replications. The experiment consisting of 15 treatments and two methods of drying. The treatments are as follows:

T_1 – Blanching for 5 minutes
T_2 – Blanching + 2% salt for 1 hour
T_3 – Blanching + 2% salt for 2 hour
T_4 – Blanching + 2% salt for 3 hour
T_5 – Blanching + 2% salt for 1 hour + 50^0B sugar syrup for 24 hours
T_6 – Blanching + 2% salt for 2 hour + 50^0B sugar syrup for 24 hours
T_7 – Blanching + 2% salt for 3 hour + 50^0B sugar syrup for 24 hours
T_8 – Blanching + 2% salt for 1 hour + 60^0B sugar syrup for 24 hours
T_9 – Blanching + 2% salt for 2 hour + 60^0B sugar syrup for 24 hours
T_{10} – Blanching + 2% salt for 3 hour + 60^0B sugar syrup for 24 hours
T_{11} – Blanching + 2% salt for 1 hour + 70^0B sugar syrup for 24 hours
T_{12} – Blanching + 2% salt for 2 hour + 70^0B sugar syrup for 24 hours
T_{13} – Blanching + 2% salt for 3 hour + 70^0B sugar syrup for 24 hours
T_{14} – Lye blanching + 60^0B sugar syrup for 24 hours

MEMBERS OF THE RESEARCH FORUM

Author for Correspondence :
K. CHANDAN, College of Horticulture, Sirsi, UTTAR KANNADA (KARNATAKA) INDIA

Coopted Authors:
A.K. ROKHADE, Division of Horticulture, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

G.B. SRINIVASULU, College of Horticulture, Sirsi, UTTAR KANNADA (KARNATAKA) INDIA

T_{15} – Lye blanching + 70^0B sugar syrup for 24 hours

The treated slices were dried under open sun and in solar cabinet drier and packed in 250 guage polythene bags and stored under ambient conditions of the laboratory.

The dehydrated segments were analysed for physical and chemical parameters. Ascorbic acid was estimated as per AOAC method (Anonymous,1984). Acidity in fruit extract was estimated by titrating it against 0.1 N sodium hydroxide solution using phenolphthalein as indicator and reported in terms of citric acid. Reducing sugar was estimated as per the dinitrosalicylic acid method. Crude protein, starch, phosphorus and calcium were estimated as per the standard procedures.

The data were analysed statistically and reported at 1 per cent significance level (Panse and Sukhatme,1985).

EXPERIMENTAL FINDINGS AND ANALYSIS

The results obtained from the present investigation are summarized in Table 1, 2 and 3.

The objective of the investigation was to identify quality parameters of dehydrated sweetened aonla slices. During the investigation two methods of drying (sun and sloar) were selected.

The data reveals that, the treatments and drying methods differed significantly among themselves. The non-enzymatic browning for overall treatment and irrespective of drying methods was lowest in T_8 (0.101) and highest in T_1 (0.196). Among drying methods, it was found to be significantly higher in solar drying (0.143) as compared to sun drying (0.127). This may be due to higher drying temperature in the solar drier and presence of higher reducing sugar in solar dried slices which might have favoured the reactions between reducing sugar and acids present in the slices. Srivastava and Sanjeevkumar (1998) also reported that the development of brown pigmentation was due to the non-enzymatic browning stimulated by the higher temperature during dying of the produce. The interaction effect between treatments and methods of drying was also found to be significant. Significantly highest mean non-enzymatic browning was recorded in T_1(0.207) in solar drying whereas, the lowest value was recorded in T_8(0.083) in sun drying.

Significantly highest total titratable acidity was recorded

Table 1 : Effect of treatments and methods of drying on non-enzymatic browning, total sugar content, titratable acidity and ascorbic acid content of dehydrated aonla slices

Treatments	Non-enzymatic browning (OD at 440nm)			Total sugar content (%)			Titratable acidity (%)			Ascorbic acid (mg/100g)		
	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean
T_1	0.185	0.207	0.196	18.56	19.83	19.20	1.59	1.63	1.61	358.33	368.67	363.50
T_2	0.163	0.175	0.168	17.40	18.93	18.17	1.54	1.59	1.57	354.58	359.58	357.08
T_3	0.146	0.168	0.157	17.37	18.48	17.93	1.52	1.55	1.54	346.75	348.00	347.38
T_4	0.137	0.162	0.150	17.33	18.37	17.85	1.51	1.53	1.52	338.00	340.67	339.33
T_5	0.118	0.115	0.117	34.75	37.37	36.06	1.44	1.46	1.45	305.58	307.48	306.53
T_6	0.131	0.113	0.122	34.28	37.18	35.73	1.34	1.46	1.40	296.87	300.00	298.43
T_7	0.136	0.111	0.123	34.03	36.97	35.50	1.22	1.29	1.25	287.07	295.00	291.03
T_8	0.083	0.120	0.101	38.50	42.18	40.34	1.40	1.44	1.42	291.92	294.00	292.96
T_9	0.097	0.126	0.112	38.15	42.00	40.08	1.35	1.38	1.36	283.00	290.33	286.67
T_{10}	0.098	0.136	0.117	38.02	41.85	39.94	1.24	1.26	1.25	270.25	282.83	276.54
T_{11}	0.113	0.131	0.122	42.94	44.90	43.92	1.30	1.31	1.31	284.58	287.33	285.96
T_{12}	0.113	0.131	0.122	42.62	43.43	43.03	1.26	1.30	1.28	275.50	280.57	278.03
T_{13}	0.124	0.133	0.129	42.02	43.93	42.98	1.29	1.30	1.29	269.36	274.00	271.68
T_{14}	0.128	0.149	0.138	38.83	42.08	40.46	1.50	1.52	1.51	295.17	298.23	296.70
T_{15}	0.140	0.171	0.156	43.08	46.07	44.58	1.42	1.47	1.45	277.83	281.00	279.42
Mean	0.127	0.143	0.135	33.19	35.57	34.38	1.39	1.43	1.41	302.32	307.18	304.75
For comparing means of												
	S.E.±		C.D.(P=0.01)	S.E.±		C.D.(P=0.01)	S.E.±		C.D.(P=0.01)	S.E.±		C.D.(P=0.01)
Treatment (T)	0.0022		0.0081	0.0554		0.2030	0.0033		0.021	0.461		1.687
Drying method (D)	0.0008		0.0029	0.0202		0.0739	0.0012		0.0044	0.168		0.615
T x D	0.0031		0.0113	0.0783		0.2865	0.0047		NS	0.651		2.382

NS= Non-significant

Table 2 : Effect of treatments and methods of drying on crude protein (%), phosphorus (mg/100g), calcium (mg/100g) and starch content (%) of dehydrated aonla slices

Treatments	Crude protein (%)			Phosphorus content (mg/100g)			Calcium content (mg/100g)			Starch content (%)		
	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean
T_1	3.29	3.25	3.27	83.33	82.33	82.33	146.93	147.27	147.10	9.07	9.15	9.11
T_2	3.17	3.16	3.16	77.33	76.17	76.75	130.57	130.70	130.63	8.68	8.69	8.69
T_3	3.13	3.10	3.12	74.67	73.67	74.17	124.60	124.33	124.47	8.58	8.60	8.59
T_4	3.12	3.09	3.11	72.67	71.33	72.00	119.37	119.67	119.52	8.59	8.63	8.61
T_5	3.02	3.01	3.01	57.67	55.93	56.80	103.00	103.00	103.00	8.27	8.30	8.29
T_6	2.93	2.93	2.93	57.00	56.00	56.50	97.33	97.82	97.58	7.38	7.42	7.40
T_7	2.93	2.84	2.89	55.67	53.23	54.45	92.22	92.17	92.19	7.47	7.52	7.50
T_8	2.95	2.92	2.94	53.00	49.33	51.17	101.67	101.67	101.67	7.84	7.91	7.88
T_9	2.87	2.82	2.84	48.67	47.00	47.83	96.53	96.00	96.27	7.79	7.78	7.79
T_{10}	2.78	2.67	2.73	47.67	47.00	47.33	91.42	91.33	91.38	6.83	6.88	6.86
T_{11}	2.87	2.89	2.88	50.66	48.33	49.50	100.25	99.90	100.08	5.55	5.58	5.57
T_{12}	2.74	2.77	2.76	47.33	47.17	47.25	95.48	94.90	95.19	4.98	5.03	5.01
T_{13}	2.64	2.67	2.65	44.33	42.67	43.50	92.90	92.50	92.70	4.78	4.87	4.83
T_{14}	2.74	2.73	2.74	69.33	67.00	68.17	107.67	107.33	107.50	4.85	4.93	4.89
T_{15}	2.62	2.61	2.61	59.33	57.00	58.17	104.33	104.67	104.50	3.48	3.49	3.49
Mean	2.92	2.90	2.91	59.91	58.28	59.09	106.95	106.88	106.92	6.94	6.99	6.97
For comparing means of												
	S.E.±	C.D.(P=0.01)		S.E.±	C.D.(P=0.01)		S.E.±	C.D.(P=0.01)		S.E.±	C.D.(P=0.01)	
Treatment (T)	0.018	0.068		0.604	2.260		0.424	1.590		0.111	0.415	
Drying method (D)	0.006	NS		0.221	0.830		0.155	NS		0.041	NS	
T x D	0.026	0.096		0.855	NS		0.600	NS		0.025	NS	

NS = Non-significant

Table 3: Organoleptic evaluation of dehydrated aonla slices as influenced by treatments and methods of drying (scores out of 5.00)

Treatments	Colour and appearance			Texture			Taste			Overall acceptability		
	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean	Sun drying	Solar drying	Mean
T_1	1.17	1.17	1.17	1.16	1.00	1.08	1.17	1.17	1.17	1.16	1.16	1.16
T_2	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.66	1.16	1.42
T_3	1.17	1.17	1.17	1.17	1.16	1.16	2.17	1.67	1.92	1.17	1.16	1.16
T_4	1.17	1.17	1.17	1.17	1.17	1.17	2.17	1.17	1.67	1.42	1.16	1.29
T_5	2.17	1.18	1.92	2.17	1.17	1.92	2.67	2.17	2.42	2.67	2.17	2.42
T_6	2.67	2.57	2.62	2.17	2.16	2.17	2.16	2.17	2.17	2.77	2.67	2.72
T_7	2.17	2.87	2.52	2.67	2.67	2.67	2.66	2.16	2.42	2.57	2.17	2.37
T_8	4.17	3.17	3.67	3.67	3.47	3.57	2.66	3.66	3.17	3.17	3.67	3.42
T_9	4.67	3.67	4.17	4.50	3.67	4.08	4.17	4.17	4.17	4.37	4.17	4.27
T_{10}	4.17	3.77	3.97	3.83	3.66	3.75	3.83	3.87	3.85	4.17	3.92	4.04
T_{11}	3.67	3.67	3.67	3.83	3.66	3.75	4.00	3.77	3.88	3.73	3.67	3.70
T_{12}	4.00	3.67	3.83	4.17	3.92	4.04	4.20	3.87	4.03	4.37	4.07	4.22
T_{13}	4.10	3.67	3.88	4.17	3.92	4.04	3.67	3.87	3.77	4.17	4.07	4.12
T_{14}	3.27	2.67	2.97	3.16	3.17	3.17	2.50	3.42	2.96	2.67	3.66	3.16
T_{15}	3.17	2.87	3.02	3.16	3.17	3.17	3.67	3.67	3.67	3.66	3.66	3.66
Mean	2.86	2.59	2.73	2.81	2.64	2.73	2.86	2.80	2.83	2.91	2.84	2.88
For comparing means of												
	S.E.±	C.D.(P=0.01)		S.E.±	C.D.(P=0.01)		S.E.±	C.D.(P=0.01)		S.E.±	C.D.(P=0.01)	
Treatment (T)	0.110	0.411		0.118	o.441		0.118	0.441		0.106	0.396	
Drying method (D)	0.040	0.149		0.043	0.161		0.043	NS		0.039	NS	
T x D	0.156	0.583		0.167	NS		0.167	0.624		0.151	0.565	

NS = Non-significant

in control (1.61%) whereas, slices steeped in sugar syrup showed minimum acidity as compared to untreated control the brine treated slices. It may be due to transfer of sugar molecule to slices. Similar results of decreased acidity level in sugar syrup treated slices were observed by Kannan and Susheela (2001) in guava and Keshatti (2003) in aonla. The lower level of acidity (1.39%) was found in sundried slices as compared to solar dries slices (1.43%) (Table 1).

Significantly maximum ascorbic acid was observed in control (363.50mg/100g), whereas, minimum ascorbic acid (271.68mg/100g) was observed in blanched slices steeped in two per cent salt for three hours + steeping in 70^0B sugar syrup for 24 hours (Table 1). This might be due to loss of ascorbic acid during blanching and syruping treatments. Significantly higher level of ascorbic acid was recorded in solar dried slices (307.18mg/100g) as compared to sun dried slices (302.32mg/100g). Higher retention of ascorbic acid in solar dried slices may be due to lesser time of exposure to drying temperature as compared to sun drying. Similar results of higher levels of ascorbic acid in solar dried slices were observed by Balasaheb (1995) in fig and Keshatti (2003) in aonla.

Significantly highest total sugar content was recorded in lye treated slices steeped in 70^0B sugar syrup for 24 hours (44.58%). The lye treated slices steeped in 70^0B sugar syrup for 24 hours followed by drying in solar drier had recorded highest total sugars (46.07%)(Table 1).

The results of per cent crude protein content of dehydrated aonla slices showed significant differences between the different treatments. Significantly highest crude protein content was observed in control (3.27%) followed by T_2 (3.16%) (Table 2). The level of crude protein was significantly lower in slices steeped in sugar syrup as compared to ones subjected to only blanching due to solubility of protein and hydrolysis of protein to free amino acids lead to leaching of protein in to syrup from slices. Similar result of leaching of protein in to sugar syrup was observed by Kalra (1988) in aonla preserve.

The phosphorus content of treated slices irrespective of methods of drying revealed that, T_1 (control) retained significantly highest phosphorus (82.33mg/100g), while the least phosphorus (43.50mg/100g) was retained in $T_{13.}$ Among methods of drying, sun dried slices retained highest phosphorus (59.91mg/100g) as compared to solar drying (58.28mg /100g). The calcium content of treated slices irrespective of methods of drying revealed that, T_1 (control) retained significantly highest calcium (147.10mg/100g) followed by T_2 (130.63mg/100g) , while the least calcium (91.38mg/100g) was retained in T_{10} (Table 2). Lower retention of phosphorus and calcium in slices steeped in either salt solution or sugar syrup due to leaching of these in to blanching water or the steeping solutions like brine and syrup was reported by Gothwal *et al.* (1998) in mango, pineapple, carrot and drumstick.

The mean starch content of treated slices irrespective of methods of drying revealed that, T_1 (control) had significantly highest starch (9.11%) followed by T_2 (8.69%), which was at par with T_4 (8.61%) and T_3 (8.59%), whereas the lowest starch content was observed in T_{15} (3.49%) (Table 2). Starch content higher in control as compared to slices steeped in either salt solution or sugar syrup due to hydrolysis of starch.

The dehydrated sweetened aonla slices prepared by steeping the slices in two per cent salt for two hours followed by steeping in 60^0B sugar syrup containing for 24 hours and drying under open sun had highest scores (out of 5.00) for colour and appearance (4.17) (Table 3). The sun dried slices had significantly higher scores for colour and appearance (2.86), texture (2.81), taste (2.86) and overall acceptability (2.91) as compared to solar dried slices.

Conclusion :

Keeping in view of the above discussion, it can be concluded that, the sun dried sweetened aonla slices had highest biochemical composition with better organoleptic quality as compared to solar dried slices.

LITERATURE CITED

Anonymous (1984). *Official methods of analysis*. Ed. Sineway, W., Association Official Analytical, Virginia, pp.423-462.

Balasaheb (1995). Effect of methods of preparation and storage on quality of dried figs. M.Sc.(Hort.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, M.S. (INDIA).

Gothwal, P.P., Setty, G.R. and Mookerj, K.K. (1998). Effect of processing steps for dehydration of mango, pineapple, carrot and drumstick on the retention of nutrients. *Beverage & Food World*, **25**(7):31-35.

Kalra, L.L. (1988). The chemistry and technology of amla (*Phyllanthus emblica* L.). A Resume. *Indian Food Packer*, **42**(4):67-83.

Kannan, S. and Susheela, T.A. (2001). Effect of osmotic dehydration of guava. *Beverage & Food World*, **28**(12):25-26.

Keshatti, G.I. (2003). Dehydration of aonla (*Emblica officinalis* Gaerth.) fruits. M.Sc. (Hort.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Panse, V.G. and Sukhatme, P.V.(1985). *Statistical methods for agricultural workers*, ICAR, NEW DELHI, INDIA pp.152-155.

Srivastava,R.P. and Kumar, Sanjeev (1998). *Fruit and vegetable preservation principles and practices*. International Book Distributing co., Lucknow, pp.64-98.

● ● ● ● ●