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Influence of Pretreatments and Varieties on Biochemical Quality during Aonla (*Emblica officinalis* G.) Murabba Preservation

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Abstract

Matured aonla fruits of three cultivars namely, Kanchan, Chakaiya and NA-7 were harvested and each variety was pretreated with water (control), salt 2%, alum 2% and salt+alum 2% so that a total of twelve different treatment combinations were made before processing in to murabba. Murabba was analyzed for quality during storage for six months. TSS and total sugars increased while ascorbic acid, titrable acidity and fiber content of the aonla murabba decreased during the storage period. For most of the biochemical parameters variety, NA-7 and pretreatment salt+alum 2% proved to be promising in retaining the quality.

Highlights

- Variety NA-7 was best among the cultivars taken for processing and pretreatment with salt+alum @ 2% helped in minimizing astringency and maintained ascorbic acid content.

Keywords : Aonla,murabba,ascorbic acid,fiber,total sugars

Aonla (*Emblica officinalis* Gaertn.) also known as Indian Gooseberry is a minor sub tropical deciduous medium size tree belonging to the family Euphorbiaceae. It can be grown successfully in dry and neglected regions outstanding its hardy nature, suitability to various kinds of wasteland. Aonla is grown in an area of about 50,000 ha with a production of around 2,00,000 metric ton in India (Goyal *et al*., 2008). It is rapidly spreading in semi-arid regions of Maharashtra, Gujrat, Rajasthan, Andhra Pradesh, Karnataka, Tamil Nadu and the Arawali regions in Haryana, Kandi area in Punjab and in Himachal Pradesh. In Madhya Pradesh, it is commercially cultivated in many districts viz. Mandsaur, Neemach, Ratlam, Jabalpur, Jhabua, Bhopal, Betual, Dewas, Hoshangabad, Chindwara, Sheopur, Tikamgarh, Rewa, etc.

Aonla fruit is highly nutritive with great medicinal values and the richest source of vitamin C. It contains 500-1500 mg of ascorbic acid per 100g of pulp (Chauhan *et al.*, 2005, Kore *et al.*, 2013). The fruit juice of aonla contains nearly 20 times as much vitamin C as in orange juice. Its other constituents are phenols, tannins, gallic acid, elegiac acid and glucose which prevent oxidation of vitamin C. A tablespoonful each of fresh aonla juice and honey mixed together forms a very valuable medicine for the treatment of several ailments like tuberculosis, asthma, bronchitis, diabetes, scurvy, anemia, weakness of memory, cancer, tension , influenza, cold, loss and grayness of hair etc. It is also used in both the Ayurvedic and the Unani treatment systems of medicine. It also possesses pronounced

expectorant, antiviral, cardiotonic, hypoglycemic and antioxidant activities (Daisy *et. al.*, 2007).

As aonla fruit is highly perishable in nature, its storage is very limited. Thus, researchers are paying attention towards processing aspect of aonla fruit to minimize losses after harvest. Due to its astringent nature, consumers are hesitant to eat it in raw form. So, the demand of aonla products was increasing among the consumers over a period of time. Attempts are being made to produce products which are not only nutritionally delicious but also acceptable among the consumers. The modern methods for preparation of different aonla products are hygienic, consume lesser time and provide maximum retention of nutrients. Hence, attention has been focused on the preparation of different value added products from aonla fruit aonla can be made into various products such as pickles, preserves (murabba), sauce, jam, jelly, tablets, etc. Aonla murabba has beneficial effect in reducing the cholesterol content of blood and in improving the eye sight. Keeping the above facts in view, a study to evaluate suitability of major varieties grown and different pretreatments to minimize astringency from fruits was conducted.

Materials and Methods

The present study was conducted at the Department of Post Harvest Management, College of Horticulture, Mandsaur (M.P.) during the year 2011-2012. Aonla murabba was prepared by processing of freshly harvested matured aonla fruits. The aonla fruits of three cultivars namely, Kanchan (V_1), Chakaiya (V_2) and NA-7 (V_3) were harvested from the Research Farm of College of Horticulture, Mandsaur. Pretreatments viz., with water (control), salt 2%, alum 2% and salt+alum 2% were done for each variety and it was replicated thrice. For three replications a total of 18 kg aonla (6 kg of each variety) was taken for the experiment. Thus, a total 12 treatment combinations were prepared and stored in the room temperature for six months storage period. For the packing of aonla murabba rigid glass jars were used. Method used for preparation of aonla murabba given in flow chart (Plate 1). Observations were taken at three month interval and one at immediately after preparation. The analysis for different parameters such as TSS, titrable acidity, ascorbic acid, total sugars and fiber content was done according to the methods suggested by Ranganna (1978). To test the significance of variation in the data obtained, the analysis of variance technique was adopted for Completely Randomized Design. Significance of the difference in the treatment effect was tested through "F" test.

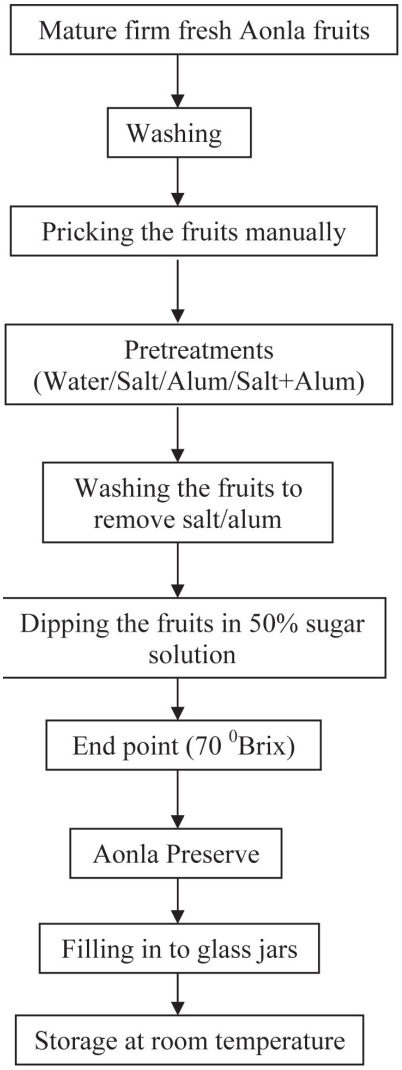

Plate 1: Flowchart for preparation of aonla murabba

Results and Discussion

TSS of aonla murabba as affected by different aonla varieties, pre-treatments and their interaction during storage has been presented in Table 1. The data revealed that the TSS of different treatments and their treatment combinations was found to be statistically significant at 0 days, 90 days and 180 days of storage with respect to the aonla murabba. The TSS of varieties and pretreatments followed the pattern $V_3>V_2>V_1$ and $T_4>T_2>T_3>T_1$ respectively. The maximum TSS was found in V_3T_4 (55.68 ^{0}Brix) and minimum TSS was in V_2T_1 (53.51 ^{0}Brix) immediately after preparation. At the end of storage the maximum TSS was found in V_3T_4 (57.81 ^{0}Brix) and minimum TSS was in V_1T_1 (56.40 ^{0}Brix). TSS was found

to increase more rapid in the initial stages but became very slow in the later stages with the increase in storage period. This might be due to conversion of polysaccharides into soluble sugars and the reduction in moisture content of the product with storage. Similar results were also reported by Kumar and Singh (2001) in aonla product, Daisy and Singh (2007) in aonla preserve, Goyal *et al*., (2007) in aonla candy, Ram *et al.*, (2011) in aonla blended RTS beverage and Choudary *et al.*, (2012) in aonla nectar.

Ascorbic acid is very important qualitative parameter of aonla murabba. It was found to decrease with advancement of storage period (Table 1). The decrease in ascorbic acid content of aonla murabba was found to be significant in different treatments and their combinations during the storage. The minimum ascorbic acid content was observed in V_1T_2 (85.47mg/100g) aonla murabba on 180 days of storage, however it was maximum in V_3T_4 (166.46 mg/100g). The ascorbic acid was found to decrease more rapid in the initial stages but became very slow in the later stages with the increase in storage period. The ascorbic acid content of the product decrease continuously during storage. This loss of ascorbic acid could be attributed to oxidation of ascorbic acid to dehydro-ascorbic acid with passage of time and also due to leaching loss of ascorbic acid. Similar findings have been confirmed by Kumar and Singh (2001) in aonla product, Damame *et al*., (2002) in aonla product, Tandon *et al*., (2003) in aonla candy, Choudary *et al.* (2012) in aonla syrup and Vikram *et al.*, (2012) in aonla herbal jam. However, various pretreatments used in the present study helped in reducing the loss of vitamin-C during storage periods.

Titrable acidity was found minimum in V_1T_4 (0.616%) and maximum in V_3T_1 (0.659%) after 180 days of storage. Titrable acidity content of aonla murabba decreased with

Table 1: Effect of aonla varieties, pre-treatments and their interaction on TSS, ascorbic acid, titrable acidity of aonla murabba during storage

Treatments	TSS (^{0}Brix)			Ascorbic acid (mg/100g)			Titrable Acidity (%)		
	0 days	90 days	180 days	0 days	90 days	180 days	0 days	90 days	180 days
Varieties (V)									
Kanchan (V_1)	54.05	55.78	56.65	103.40	99.07	95.06	0.754	0.712	0.621
Chakaiya (V_2)	54.35	55.82	56.71	123.30	119.24	114.68	0.769	0.713	0.641
NA-7 (V_3)	55.19	56.24	57.48	160.00	155.82	151.09	0.781	0.714	0.649
S.Em. ±	0.079	0.025	0.029	0.013	0.022	0.015	0.001	NS	0.002
CD at 5%	0.230	0.074	0.085	0.040	0.064	0.045	0.003	NS	0.006
Pre-treatments (T)									
Water (control) (T_1)	53.86	55.79	56.72	117.30	115.42	113.62	0.770	0.718	0.643
Salt (T_2)	54.76	56.03	57.04	123.34	117.32	111.07	0.768	0.711	0.640
Alum (T_3)	54.48	55.80	56.78	132.37	127.30	122.32	0.770	0.714	0.632
Salt + alum (T_4)	55.02	56.17	57.26	142.68	138.79	134.11	0.763	0.709	0.632
S.Em. ±	0.091	0.029	0.034	0.016	0.025	0.018	0.001	0.001	0.002
CD at 5%	0.266	0.085	0.099	0.047	0.074	0.052	0.004	0.004	0.007
Treatment combination									
V_1T_1	53.76	55.50	56.4	92.36	90.22	89.26	0.763	0.717	0.625
V_1T_2	54.07	56.02	56.82	97.41	91.34	85.47	0.751	0.710	0.621
V_1T_3	53.86	55.57	56.45	107.56	102.34	109.42	0.752	0.716	0.622
V_1T_4	54.51	56.04	56.94	116.26	112.38	112.00	0.750	0.707	0.616
V_2T_1	53.51	55.53	56.49	113.3	111.45	109.30	0.765	0.714	0.646
V_2T_2	54.83	56.03	56.86	118.28	112.32	106.50	0.773	0.712	0.641
V_2T_3	54.20	55.69	56.48	125.27	120.35	115.29	0.774	0.716	0.643
V_2T_4	54.87	56.02	57.03	136.37	132.83	127.62	0.764	0.710	0.634
V_3T_1	54.32	56.33	57.27	146.25	144.59	142.29	0.783	0.723	0.659
V_3T_2	55.39	56.04	57.44	154.33	148.31	141.25	0.782	0.711	0.658
V_3T_3	55.38	56.12	57.40	164.28	159.20	154.37	0.785	0.711	0.632
V_3T_4	55.68	56.45	57.81	175.41	171.16	166.46	0.777	0.710	0.645
S.Em. ±	0.158	0.051	0.058	0.027	0.044	0.031	0.002	NS	0.004
CD at 5%	0.461	0.148	0.171	0.081	0.128	0.091	0.007	NS	0.013

NS – Non Significant

the increase in storage period. Decrease in acidity might be because of acid base reactions. Similar findings were reported by Geetha *et al., (*2006) in aonla product, Ram *et al.,* (2011) in aonla blended RTS beverage and Choudary *et al.,* (2012) in aonla nectar.

Total sugar content of aonla murabba increased slightly with increase in storage period. The interaction effect of varieties and pre-treatments on total sugars content was found to be significant on 180 days of storage. The maximum total sugars content was observed in V_1T_4 (56.17%) aonla murabba on 180 days of storage, however it was minimum in V_3T_1 (52.14%). The increase in total sugar with storage might be because of increased degree of inversion of sugars. These results were in conformity with the results obtained by Sagar and Khurdiya (1999) Geetha et al. (2006) in aonla preserve, Ram *et al.,* (2011) in aonla blended RTS beverage, Choudary *et al.,* (2012) in aonla nectar, Choudary *et al.,* (2012) in aonla syrup and Gaikwad *et al.,* (2013) in aonla ginger RTS beverage.

Fiber content of aonla murabba decreased slightly with increase in storage period (Table 2). However, this increase is non significant. Immediately after processing maximum fiber content was found in V_2T_1 (1.73%) and minimum in V_3T_4 (1.02%). At the end of storage period the maximum fiber content was found in V_2T_1 (1.54%) and minimum in V_3T_4 (0.91%). Research was scanty in the area of fiber content of procesed products like murabba, therefore; further research investigations to be required for confirmation of present findings.

Conclusion

Processing of aonla fruits in to murabba was proved to be beneficial in minimizing postharvest losses in case of glut as it can be stored for six months. Sugar syrup helped in

Table 2: Effect of aonla varieties, pre-treatments and their interaction on total sugars (%) and fiber content of aonla murabba during storage

Treatments	Total sugars (%)			Fiber content (%)		
	0 days	90 days	180 days	0 days	90 days	180 days
Varieties (V)						
Kanchan (V_1)	52.58	53.24	55.72	1.22	1.11	1.05
Chakaiya (V_2)	52.17	53.03	54.78	1.67	1.44	1.37
NA-7 (V_3)	49.94	50.92	52.80	1.08	0.98	0.95
S.Em. $\pm$	0.102	0.171	0.151	0.015	0.450	0.028
CD at 5%	0.300	0.501	0.441	0.040	0.131	0.084
Pre-treatments (T)						
Water (control) (T_1)	51.05	51.85	53.57	1.40	1.25	1.20
Salt (T_2)	51.52	52.37	54.59	1.30	1.48	1.09
Alum (T_3)	51.74	52.49	54.62	1.33	1.24	1.18
Salt + alum (T_4)	51.95	52.88	54.95	1.26	1.06	1.02
S.Em. $\pm$	0.118	0.198	0.174	0.028	0.052	0.033
CD at 5%	0.346	0.579	0.510	0.084	0.151	0.097
Treatment combinations						
V_1T_1	52.10	52.72	55.57	1.29	1.17	1.07
V_1T_2	52.21	53.14	55.57	1.23	1.11	1.04
V_1T_3	52.76	53.34	55.58	1.23	1.12	1.12
V_1T_4	53.27	53.76	56.17	1.14	1.02	0.98
V_2T_1	52.02	52.16	53.02	1.73	1.51	1.54
V_2T_2	52.07	53.26	55.34	1.66	1.36	1.26
V_2T_3	52.18	53.31	55.37	1.68	1.65	1.50
V_2T_4	52.41	53.41	55.40	1.62	1.25	1.19
V_3T_1	49.03	50.69	52.14	1.20	1.07	1.00
V_3T_2	50.26	50.73	52.86	1.03	0.96	0.98
V_3T_3	50.29	50.82	52.93	1.08	0.97	0.93
V_3T_4	50.18	51.46	53.26	1.02	0.92	0.91
S.Em. $\pm$	0.205	NS	0.302	NS	NS	NS
CD at 5%	0.600	NS	0.883	NS	NS	NS

NS - Non Significant

maintaining the quality of the murabba. The astringency of the fruits was minimized by the help of pretreatments. Maximum TSS (55.68 ^{0}Brix) and ascorbic acid content (175.41 mg/100g) was observed in V_3T_4 immediately after processing in to murabba. Titrable acidity was found highest in V_3T_3 (0.785 %), fiber content in V_2T_1 (1.73 %) and total sugars in V_1T_4 (53.27%) after murabba preparation. Variety NA-7 was proved to be best suitable for processing in to murabba as it retained most of the parameters. Salt + alum @ 2% was proved to be best among the pretreatments as it helped in minimizing astringency and maintained ascorbic acid content.

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