EVALUATION OF AONLA (*PHYLLANTHUS EMBLICA* G.) SEGMENTS-IN-SYRUP PREPARED FROM STORED FRUITS

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***Abstract**: Aonla segments-in-syrup, an alternative to preserve, was prepared from fresh as well as stored fruits and quality was evaluated. Fruit of aonla cv. Chakaiya were packed in CFB boxes using newspaper as lining material and stored under ambient conditions (16-25^{0}C and 60-70% RH). The fruits were withdrawn at 0, 3, 6 and 9 days of storage for quality analysis and the product was prepared after each withdrawal by blanching the fruits in 2% alum solution for 10 minutes, separating the segments and dipping them overnight in successively increasing concentration of sugar syrup (55-75^{0}B) and packed in 72^{0}B sugar syrup. The physiological loss in weight, total soluble solids, titratable acidity and tannins increased while the content of ascorbic acid decreased in stored fruits. These losses were more pronounced in the fruits stored for 9 days. The product prepared from fresh and 3 days stored fruits have very little differences in nutritional attributes. The maximum ascorbic acid content (113mg/100g) and organoleptic quality (8.0) was observed in the product prepared from fresh fruits followed by the product prepared from 3 days stored fruits (103mg/100g and 7.6). It was concluded from the study that good quality product could only be prepared from fresh and 3 days stored fruits.*

***Key words:** Aonla, Phyllanthus emblica, Blanching, shelf-life, preserve*

INTRODUCTION

Aonla (*Emblica officinalis* G.) is one of the most important fruit of tropics and subtropics. It has played an important therapeutic role from time immemorial and is frequently recommended for its synergistic effects in both the ayurvedic and unani systems of medicine (JAIN et al., 1983). Being a very rich source of vitamin C and other nutrients like polyphenols, pectin, iron calcium and phosphorus (NATH et al., 1992; SINGH et al., 1993; KHOPDE et al., 2001), the fruit is a potent antioxidant, hypolipidemic, antibacterial, antiviral and antacid. However, like other tropical fruits, aonla has a short shelf life as fruit is sensitive to bruises, browning, desiccation and various post-harvest diseases. Moreover, the fresh aonla fruit is highly acidic and astringent; it is not as popular as table fruit. But, it has got great potential in processed forms (JAIN et al., 2007). A number of products such as murabba, pickle, candy, juice, squash, jam, jelly, powder, etc., are prepared from aonla fruits (TRIPATHI et al., 1988; NATH and SHARMA, 1998).

Though, preserve (murabba) is most popular, delicious and high valued product from aonla, its preparation is a cumbersome process involving exhaustive pricking of fruits resulting into loss of most of the nutrients (JAIN et al., 1983). Often, fruits break due to over pricking. There are reports that 25-93% losses occur in vitamin C and other nutrients during processing of aonla into preserve (SETHI and ANAND, 1983; KALRA et al., 1988; TANDON et al., 2003). Hence, it has been felt to have a product where pricking of fruit may not be required and most of the nutrients are retained. At the same time it should be easy to prepare and consume. In present investigation an attempt has been made to evaluate a product, aonla segments-in-syrup, alternative to preserve, prepared from stored fruits.

MATERIALS AND METHODS

Aonla fruits of cv. Chakaiya were procured from the experimental farm of Central Institute for Subtropical Horticulture, Lucknow, for present investigation. The fruits were washed, air dried, packed in CFB boxes using newspaper as lining material and stored under ambient conditions (16-25 ^{0}C and 60-70% RH). The fruits were analyzed at periodical interval of 0, 3, 6 and 9 days of storage and product prepared. Four replicates of fruits (1 kg each) were used for estimating physiological loss in weight and bio-chemical parameters. The product, aonla-segments-in-syrup, was prepared after each withdrawal by blanching in 2% alum solution for 10 minutes, separating the segments and dipping them in concentrations of sugar syrup of 55,65 and 75^0 B containing 500 ppm potassium metabisulphite (NAYAK, P. and TANDON, D.K., 2006). The segments were packed in 72^{0}B sugar syrup on sixth day in 500 g capacity air tight glass jars for quality evaluation. The biochemical parameters, *viz*. total soluble solids (TSS), titratable acidity, ascorbic acid, tannins, total sugars, reducing sugars, in fruits as well as in product and non-enzymatic browning, only in product were estimated (RANGANNA, 1997). The product was also assessed organoleptically on 9 point Hedonic scale as per method described in RANGANNA (1997). The data was analyzed statistically and reported at 5% significance level (PANSE and SUKHATME, 1961).

RESULTS AND DISCUSSIONS

The physiological loss in weight (PLW) of fruits increased gradually with the advancement of storage period (Table 1). It was significantly high in the fruits stored for 9 days (9.32%) as compared to 3 days stored fruits (3.77%). Increase in PLW of fruits might be due to the loss of moisture through evapo-transpiration and respiration. The fruits were spoiled after 9 days of storage due to blue mould and were not found fit for further storage. SINGH et al. (2005) and PATHAK et al. (2009) have also reported that physiological loss in weight increased gradually when aonla fruits were stored up to 15 days under ambient conditions. The total soluble solids (TSS) content increased from 9.7 to 10.5 ^{0}B during storage of fruits (Table 1). KUMAR et al. (2005) and HIWALE and SINGH (2006) have also recorded an increase in TSS of aonla fruits during storage The minimum titratable acidity was recorded in fresh and 6 days stored fruits, while maximum on 3 and 9 days of storage. Similar results have been reported by Gupta and MUKHERJEE (1981), NEERAJ et al. (2002) and SINGH et al. (2005) in aonla fruits. Its content of ascorbic acid in fruits decreased significantly as the storage period advanced of storage period. The content decreased from an initial value of 309 to 252 mg/100g during storage. KUMAR et al. (2005) and SINGH et al. (2005) reported that the ascorbic acid content of aonla fruits decrease continuously during storage under ambient conditions. This reduction in ascorbic acid content was due to its oxidation into dehydro-ascorbic acid by oxidase enzyme. An increase in tannins content was observed during successive stages of storage. Maximum tannins content was found in fruits stored for 9 days (1.73%), while minimum was in fresh fruits (1.60%). Similar results have been reported by SINGH et al., (2005). The increase in tannins content during storage might be due to dehydration of fruits and reduced activity of polyphenol oxidase. The data revealed that the total sugars and reducing sugars of fruits stored for different period were statistically non-significant with storage period, though a slight increase was found with an increase in storage period. The fruits stored for longer period register higher losses in fruit weight, decay and ascorbic acid content. These losses were more pronounced in the fruits stored for 9 days.

The biochemical parameters analyzed in product (segments as well as in syrup) are reported in Table 2 and Fig 1 and 2. The data revealed that the TSS in segments and syrup of the product were statistically non-significant as the TSS was maintained at 72^{0}B. A very little difference in titratable acidity was found in both segments and syrup of the product. The

ascorbic acid content in segments decreased significantly. The maximum ascorbic acid content of 113 mg/100 g and 108 mg/100g were recorded in the segments as well as in syrup prepared from fresh fruits followed by the product prepared from 3 day stored fruit, while segments-in-syrup prepared from 9 days stored fruits recorded minimum ascorbic acid content (92 and 78 mg/100g in segments and syrup, respectively). The data indicated that as the storage period of aonla fruit prolonged, the ascorbic acid content decreased in the product thereby decreasing the quality of the product. The intake of even 25 g of segments along with syrup will cater to the needs or daily requirement of vitamin-C. Besides, it is also a very rich source of energy as 100g segments-in-syrup contains 300 calories of energy. The tannins content in segments was maximum (0.97%) in the product prepared from fresh fruits followed by the segments (0.85%) prepared from 3 days stored fruits. The minimum content of tannins (0.75%) was found in product prepared from 9 days stored aonla fruits. The total sugars content in segments was maximum (48.7%) in the product prepared from 9 days stored fruits. The minimum content of total sugars (47.3%) was recorded in product prepared from fresh fruits. The maximum reducing sugars content of 19.9% was found in the product prepared from fresh fruits, while product prepared from 9 days stored fruits recorded minimum reducing sugars content (17.8%). The non-enzymatic browning in aonla segments as well as in syrup were found statistically significant. The non-enzymatic browning in segments was minimum (0.054 OD) in the product prepared from fresh fruits followed by segments (0.056 OD) prepared from 3 days stored fruits. The maximum non-enzymatic browning (0.069 OD) was found in the product prepared from 9 days stored fruits.

The data on organoleptic quality of the product (segments as well as syrup) are depicted in Table 3. The organoleptic acceptability of the product was found to decrease with the increase in storage period of fruits. The maximum (8.0) organoleptic score was found in product prepared from fresh fruits followed by the product prepared from 3 days stored fruits (7.6), while minimum score (4.7) in the product was noted when it was prepared from 9 days stored fruits. The product prepared from 6 and 9 days stored fruits were low in quality.

CONCLUSION

The physiological loss in weight, TSS and tannins increased, while ascorbic acid content decreased on prolonging the storage period of fruits under ambient conditions. The maximum amount of ascorbic acid (295 mg/100g) was recorded in 3 days stored fruits. The product prepared from fresh and 3 days stored fruits have very little differences in nutritional attributes. The maximum ascorbic acid content (113 mg/100g) and organoleptic quality (8.0) was observed in segments of the product prepared from fresh fruits followed by 3 days stored fruits (103 mg/100g and 7.6) of the product. Hence, the preparation of product from aonla fruits stored up to 3 days is suggested.

Table 1

Changes in physico-biochemical characters of aonla fruits stored under ambient conditions

Characters	Storage period (days)				CD at 5%
	0	3	6	9	
PLW (%)	_	3.97	7.03	9.32	0.02
TSS (^{0}B)	9.7	9.7	9.8	10.4	NS
Titratable acidity (%)	1.6	1.8	1.6	1.8	NS
Ascorbic acid (mg/100 g)	309	295	267	252	1.9
Tannins (%)	1.60	1.65	1.70	1.73	NS
Total sugars (%)	7.4	7.5	7.5	7.6	NS
Reducing sugars (%)	1.5	1.5	1.6	1.6	NS

Table 2

Changes in biochemical composition of the product prepared from aonla fruits stored under ambient conditions

Characters	0 day stored		3 days stored		6 days stored		9 days stored		C.D. at 5%
	Segment	Syrup	Segment	Syrup	Segment	Syrup	Segment	Syrup	
TSS (^{0}B)	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	NS* NS$^\#$
Titratable acidity (%)	1.1	1.0	1.1	1.0	1.0	0.9	0.9	0.8	NS* NS$^\#$
Tannins (%)	0.97	0.51	0.85	0.45	0.80	0.41	0.75	0.39	0.019* 0.019$^\#$
Total Sugars (%)	47.3	47.4	48.8	49.5	48.2	49.3	48.7	49.6	0.19* 0.19$^\#$
Reducing Sugars (%)	19.9	20.3	18.8	19.2	19.0	19.2	17.8	19.0	0.19* 0.19$^\#$
NEB (OD at 440 nm)	0.054	0.045	0.056	0.049	0.064	0.055	0.069	0.064	0.002*

Segments:
Syrup: #

Table 3

Organoleptic quality of segments-in-syrup prepared from aonla fruits stored for different periods

Storage period (Days)	Colour	Appearance	Texture	Taste	Overall average (Out of 9)
0	8.0	8.0	8.0	8.1	8.0
3	7.6	7.6	7.6	7.8	7.6
6	5.1	5.0	5.0	4.8	4.9
9	4.8	4.6	4.8	4.6	4.7
CD at 5% 0.105					

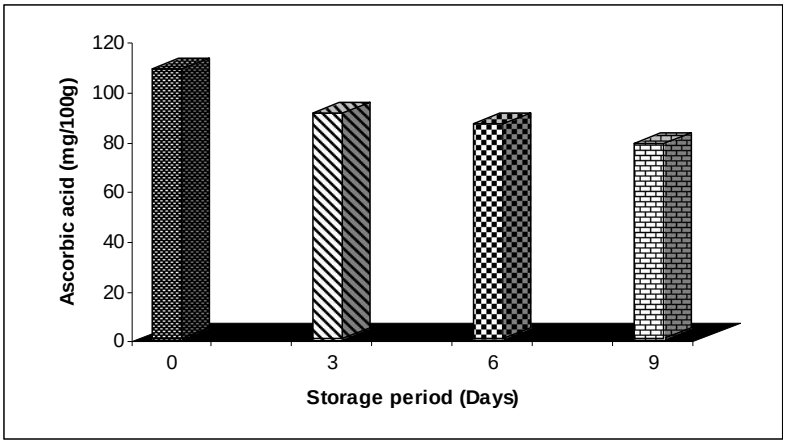

Figure 1. - Changes in ascorbic acid content of segments prepared from stored fruits

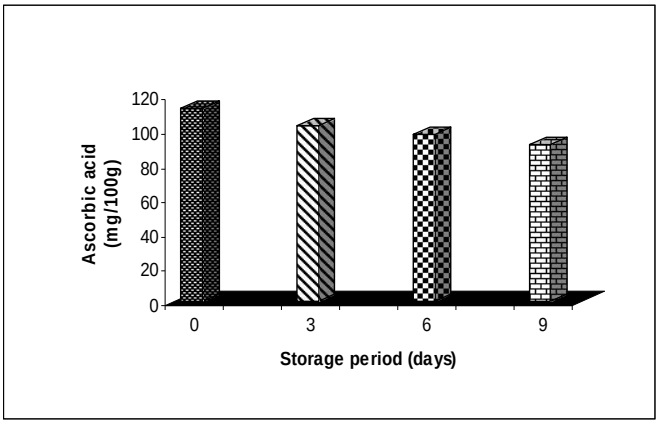

Figure 2. Changes in ascorbic acid content of syrup prepared from stored fruits

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