



Effect of Storage Conditions and Benzoic Acid Concentrations on Quality and Shelf Life of Aonla Juice Cv. NA-10

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DOI: 10.5958/2455-7129.2019.00021.9 **ABSTRACT**

Key Words:

Ambient storage, Aonla, aonla juice, Benzoic acid, Cold storage.

The present study was conducted to study the effect of storage conditions and benzoic acid concentrations on quality and shelf life of aonla juice Cv. NA-10 in Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra with 4 concentrations of benzoic acid (0, 200, 400, 600 ppm) and 2 storage conditions (ambient and cold storage). Among different benzoic acid concentrations tried, treatment T₄ (600 ppm) and in case of storage conditions, cold storage (S₂) was found to be good. Hence, for better storage of aonla juice upto 6 months, interaction T₄S₂ (600 ppm benzoic acid and cold storage) was found to be good.

INTRODUCTION

Among the fruits, aonla commonly known as Indian Gooseberry (*Emblia officinalis* Gaertn.) finds a special place in India as it has got tremendous medicinal value. It belongs to the family Euphorbiaceae and comprises about 350 (Hooker, 1973) to 500 (Bailey 1917) species. Aonla is one of the richest sources of vitamin-C, pectin and tannin which is being used for preparation of various ayurvedic, unani system of medicine, cosmetic, pharmaceuticals and processing industry (Singh and Gaur 2002). Aonla has been cultivated in India since time immemorial (Singh et al. 2009). Now a days, world opinion has changed towards

nutritional as well as medicinal value rather than huge horticultural crops.

Improvement in the existing method of storage is an urgent need of the day. Use of post-harvest technology is very important concept in present context. General aim of it is to avoid loss of vitamin-C due to oxidation of ascorbic acid into dehydro-ascorbic acid in light and heat. The fresh aonla fruit is generally not consumed due to high astringency and thus fruit during their peak harvesting season go as waste due to limited usage. But it has great potential in processed form. The work on processed form of aonla in Konkan region is scanty. There is great demand for pure aonla juice as it has medicinal value.

MATERIALS AND METHODS

The present investigation was carried out in the Fruit and Vegetable Processing Unit Laboratory, at Department of Horticulture, College of Agriculture, Dapoli, Dist- Ratnagiri (M.S.) during 2013-2014. The aonla juice was stored at two different storage conditions *viz.* ambient temperature (S₁) and cold storage (S₂) for 6 months after adding different concentrations of benzoic acid *viz.* T₁- 0 ppm (control), T₂- 200 ppm, T₃- 400 ppm and T₄-600 ppm. The experiment was conducted following factorial completely randomized design. For this experimentation, fully ripe and uniform sized fruits of aonla were procured from the Regional Fruit Research Station, Vengurle, Taluka- Vengurle, Dist.- Sindhudurg. About 100 Kg of aonla fruits were brought to the laboratory. Unripe, diseased, damaged and off type fruits were strictly discarded. The selected fruits were thoroughly washed with clean tap water to remove dirt and dust particles adhered to the pericarp of the fruit and then washing was done with 30 ppm

minutes. Finally, fruits are wiped dry before juice extraction and extracted juice was stored in plastic cans (Fig.1).

Ascorbic acid was determined by 2, 6, dichlorophenol indophenol dye method of Johnson (1948) as described by Ranganna (1986). In sensory evaluation, colour and flavour of juice was observed at 2 months interval at 0, 2, 4 and 6 months storage. The sensory qualities in terms of colour and flavour were assessed by panel of 10 judges with 9 point Hedonic scale (Amerine and Singleton 1972). The overall quality score was obtained by averaging the score of colour and flavour. Shelf life of stored aonla juice was decided on the basis of sensory evaluation score (average score) of the aonla juice. The aonla juice which recorded sensory score below 5.5 in 9 point Hedonic scale was rated as unacceptable and shelf life of this juice was considered to be expired. However, the juice which recorded overall acceptability score (average score) above 5.5 was found to be considered.

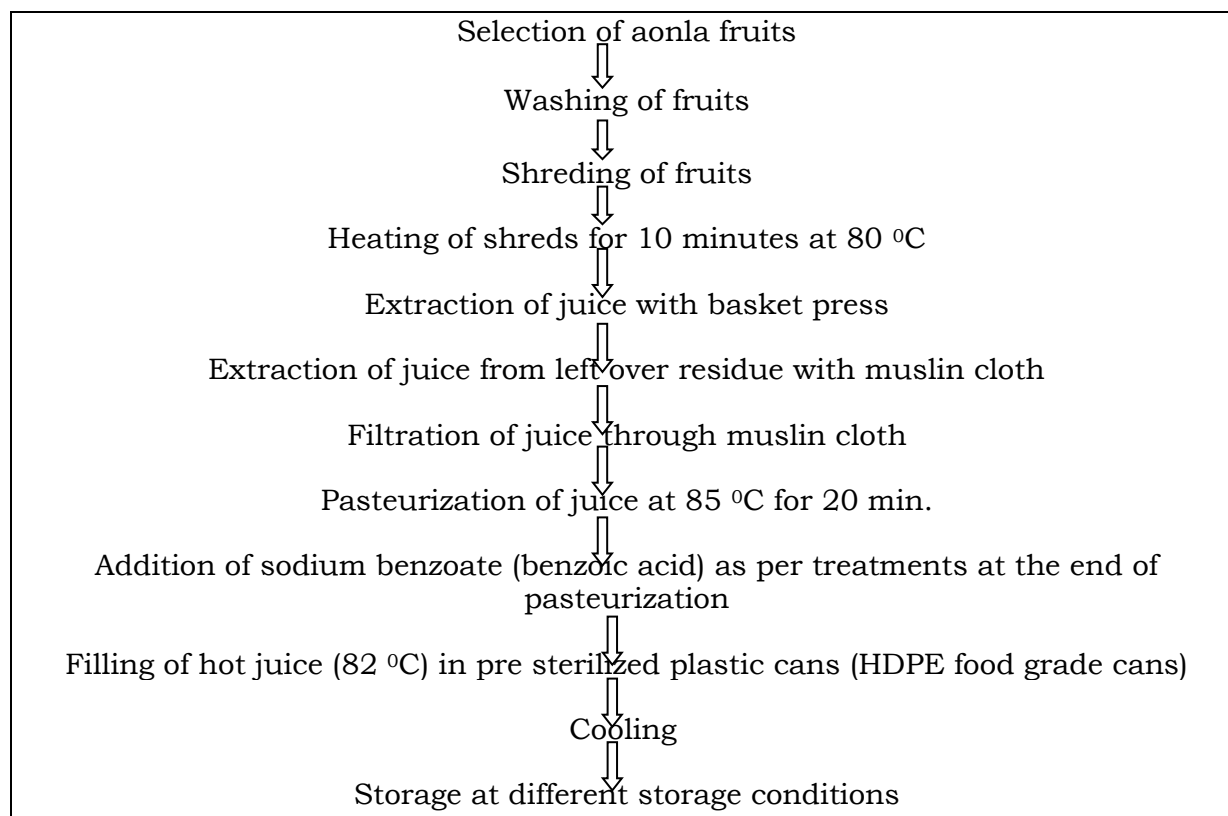


Fig. 1. Flow chart for extraction of juice from aonla fruits

RESULTS AND DISCUSSION

Results of the sensory evaluation and shelf life of aonla juice are presented in Table 1 to 5. There was decrease in ascorbic acid content of aonla juice throughout the storage both at ambient and cold storage conditions. Reduction in ascorbic acid may be due to oxidation of ascorbic acid. The ascorbic acid content was found to be increased with increase in benzoic acid concentrations from T₁ to T₄. This may be due to increase in interference of benzoic acid in enzyme activity with increase in concentration, which ultimately affects oxidation process of ascorbic acid and hence less reduction in ascorbic acid (Srivastava and Kumar 2003). The interaction effect showed that interaction T₄S₂ recorded highest ascorbic acid content and it was significantly superior over rest of the interactions. Hence, interaction T₄S₂ was found to be good as far as ascorbic acid content of stored aonla juice is concerned. Similar results were also reported by Bagkar (2013) in jamun juice.

The results (Table 2, 3) evinced that, colour and flavour of juice decreased with increase in storage period. Decrease in colour was may be due to slight oxidative browning and decrease in flavour may be due to increase in micro fermentation. Similar findings have been reported by Bhandari (2004) and Bagkar (2013) in jamun juice. The score for colour decreased with increase in benzoic acid concentrations due to more darkening of colour during storage with increase in benzoic acid concentration. In the long run benzoic acid may darken the product

(Srivastava and Kumar 2003). The score for flavour of aonla juice was found to be increased with increased in benzoic acid concentrations. It may be due to higher level of benzoic acid restricted the biochemical changes in juice during storage. In case of colour, interaction T₁S₂ recorded highest score for colour at 4 (7.10) and 6 (6.90) months storage. In case of flavour, interaction T₄S₂ recorded highest (7.50 and 7.30) score and it was at par with T₃S₂ at both at 4 and 6 months storage.

As storage period advances there was continuous decrease in overall acceptability score (Table 4). This decrease may be due to degradation of colour and changes in flavour of stored juice. Similar findings have been reported by Patil (2001) in jamun juice, Shakoor et al. (2013) in strawberry juice, Dev Raj et al. 2017 in Aloe vera juice. In case of the interactions, T₄S₂ recorded significantly highest score (7.00) at 6 months storage and it was at par with interaction T₃S₂ (6.90) and significantly superior over all remaining treatment combination. From data in table 5 it is seen that, the aonla juice prepared with different benzoic acid concentrations and storage at cold storage (S₂) recorded 6 months shelf life. However, juice stored at ambient temperature (S₁) recorded only 2 months shelf life.

CONCLUSION

The present findings conclude that, for storage of aonla juice, 600 ppm benzoic acid and cold storage condition was found good followed by 400 ppm benzoic acid and cold storage condition.

Table 1. Effect of benzoic acid concentrations and storage conditions on ascorbic acid (mg/100g) content of aonla juice

Benzoic acid concentrations (T)	Storage Period (Months)											
	Initial (0 months)			2 months			4 months			6 months		
	Storage conditions (S)			Storage conditions (S)			Storage conditions (S)			Storage conditions (S)		
	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean
T ₁	465.00	465.00	465.00	217.00	268.60	242.80	99.80	165.20	132.50	53.60	97.40	75.50
T ₂	465.00	465.00	465.00	217.00	273.80	245.40	123.20	194.60	158.90	55.40	138.80	97.10
T ₃	465.00	465.00	465.00	232.60	279.00	255.80	145.40	213.20	179.30	81.00	148.20	114.60
T ₄	465.00	465.00	465.00	237.80	289.20	263.50	147.20	226.20	186.70	88.20	155.40	121.80
Mean	465.00	465.00	465.00	226.10	277.65	251.88	128.90	199.80	164.35	69.55	134.95	102.25
	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%
Benzoic acid concentrations (T)	2.656		NS	0.163		0.687	0.103		0.435	0.151		0.636
Storage conditions (S)	5.634		NS	0.346		1.458	0.219		0.923	0.321		1.350
Interactions (T×S)	3.756		NS	0.231		0.972	0.146		0.615	0.214		0.900

T₁- control, T₂- benzoic acid 200 ppm, T₃- benzoic acid 400 ppm, T₄- benzoic acid 600 ppm, S₁-ambient temperature, S₂-cold storage

Table 2. Effect of benzoic acid concentrations and storage conditions on colour of aonla juice

Benzoic acid concentrations (T)	Storage Period (Months)											
	Initial (0 months)			2 months			4 months			6 months		
	Storage conditions (S)			Storage conditions (S)			Storage conditions (S)			Storage conditions (S)		
	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean
T ₁	8.50	8.50	8.50	6.90	8.00	7.50	4.50	7.10	5.80	3.90	6.90	5.40
T ₂	8.50	8.50	8.50	6.50	8.00	7.30	4.50	7.00	5.80	4.00	6.70	5.40
T ₃	8.50	8.50	8.50	5.80	7.50	6.70	4.60	6.90	5.80	3.70	6.80	5.30
T ₄	8.50	8.50	8.50	5.60	7.40	6.50	4.50	6.90	5.70	3.60	6.60	5.10
Mean	8.50	8.50	8.50	6.20	7.73	7.00	4.53	6.95	5.83	3.80	6.75	5.30
	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%
Benzoic acid concentrations (T)	0.035		NS	0.188		0.497	0.077		NS	0.062		NS
Storage conditions (S)	0.075		NS	0.25		1.053	0.163		0.687	0.132		0.558
Interactions (T×S)	0.050		NS	0.167		NS	0.109		NS	0.088		NS

T₁- control, T₂- benzoic acid 200 ppm, T₃- benzoic acid 400 ppm, T₄- benzoic acid 600 ppm, S₁-ambient temperature, S₂-cold storage

Table 3. Effect of benzoic acid concentrations and storage conditions on flavour of aonla juice

Benzoic acid concentrations (T)	Storage Period (Months)											
	Initial (0 months)			2 months			4 months			6 months		
	Storage conditions (S)			Storage conditions (S)			Storage conditions (S)			Storage conditions (S)		
	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean
T ₁	7.80	7.80	7.80	6.10	7.20	6.70	4.40	5.30	4.90	1.50	4.80	3.10
T ₂	7.80	7.80	7.80	6.50	7.40	7.00	5.10	6.70	5.90	2.60	5.30	4.00
T ₃	7.80	7.80	7.80	6.40	7.70	7.10	5.20	7.30	6.30	4.20	7.00	5.60
T ₄	7.80	7.80	7.80	6.80	7.80	7.30	6.30	7.50	6.90	5.80	7.30	6.60
Mean	7.80	7.80	7.80	6.45	7.53	7.02	5.25	6.70	6.00	3.53	6.10	4.83
	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%
Benzoic acid concentrations (T)	0.035		NS	0.101		0.426	0.042		0.178	0.069		0.291
Storage conditions (S)	0.074		NS	0.215		0.904	0.089		0.377	0.146		0.616
Interactions (T×S)	0.049		NS	0.143		NS	0.059		0.252	0.098		0.411

T₁- control, T₂- benzoic acid 200 ppm, T₃- benzoic acid 400 ppm, T₄- benzoic acid 600 ppm, S₁-ambient temperature, S₂-cold storage

Table 4. Effect of benzoic acid concentrations and storage conditions on overall acceptability of aonla juice

Benzoic acid concentrations (T)	Storage Period (Months)											
	Initial (0 months)			2 months			4 months			6 months		
	Storage conditions (S)			Storage conditions (S)			Storage conditions (S)			Storage conditions (S)		
	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean	S ₁	S ₂	Mean
T ₁	8.20	8.20	8.20	6.50	7.60	7.10	4.50	6.20	5.40	2.70	5.90	4.30
T ₂	8.20	8.20	8.20	6.50	7.70	7.10	4.80	6.90	5.90	3.30	6.00	4.70
T ₃	8.20	8.20	8.20	6.10	7.60	6.90	4.90	7.10	6.00	4.00	6.90	5.50
T ₄	8.20	8.20	8.20	6.20	7.60	6.90	5.40	7.20	6.30	4.70	7.00	5.90
Mean	8.20	8.20	8.20	6.33	7.63	7.00	4.90	6.85	5.90	3.68	6.45	5.10
	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%	SEm±		CD at 1%
Benzoic acid concentrations (T)	0.041		NS	0.075		NS	0.068		0.287	0.074		0.310
Storage conditions (S)	0.087		NS	0.158		0.668	0.145		0.609	0.157		0.659
Interactions (T×S)	0.058		NS	0.106		NS	0.096		NS	0.104		0.439

T₁- control, T₂- benzoic acid 200 ppm, T₃- benzoic acid 400 ppm, T₄- benzoic acid 600 ppm, S₁-ambient temperature, S₂-cold storage

Table 5. Shelf life of aonla juice

Interaction	Shelf life (months)
T ₁ S ₁	2
T ₁ S ₂	6
T ₂ S ₁	2
T ₂ S ₂	6
T ₃ S ₁	2
T ₃ S ₂	6
T ₄ S ₁	2
T ₄ S ₂	6

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