Studies on Organoleptic Evaluation of Aonla (*Emblica officinalis* G.) Squash during storage

ABSTRACT

The Fruit and Vegetable Processing Unit Laboratory, Department of Horticulture, College of Agriculture, Gwalior, hosted a research experiment in 2019–20 and 2020–21.Squash samples were prepared using fruits with different varieties of aonla viz., NA-4, NA-5, NA-6, NA-7, NA-10, Laxmi and Chakaiya under ambient condition for storage period of six months at ambient conditions. This study is analyzed in a completely randomized design with three replications. Developed product was evaluated on various parameters i.e. sensory evaluation and nutritional analysis. The prepared product was sensory evaluated using a 9-hedonic scale. During storage period of squash, organoleptic evaluation decreasing trend with advancement of storage period upto 180 days under ambient condition. Hence, highest accepted product was put five for the nutritional analysis and percentage of TSS, titrable acidity, ascorbic acid, fibre and phenols were respectively. Laxmi and Chakaiya varieties were found superior with respect to colour, appearance, taste and aroma as well as flavour. From this findings, it has been noticed that the overall acceptability of processed products have been found significant with the storage intervals such as 30, 60, 90 and 120 days. The squash prepared from fruits of cultivar Laxmi and Chakaiya had the good sensory evaluation and high nutritional quality which could be considered suitable for developing squash beverage for commercialization. Processed aonla products have good sensory, nutritional, and shelf life attributes, making them suitable for commercialization despite their low cost. Aonla needs to be sold quickly on the market in order to generate a decent income; if not, suitable storage facilities need to be available in order to turn a profit {11}.

Keywords : Aonla, storage, squash, flavor, processing, sensory evaluation

INTRODUCTION

One of the earliest foods that humans are known to have eaten in prehistory is fruit. Throughout history, fruits, both fresh and dried, have been an integral part of the human diet due to their high nutritional value and provision of essential

minerals, vitamins, and other nutrients. In addition, fruits have been known to aid in the treatment of several illnesses.

The aonla (*Emblica officinalis syn. Phyllanthus emlica*), is an important minor fruit and a crop of commercial significance. The fruits of aonla are very extensively utilized by processing industry{1}. The fruit has high indigenous medicinal value such as an anti- ascorbutic, laxative and antibiotic. Aonla is used in Ayurvedic systems of Indian medicines. The fresh fruit of aonla is very rich source of ascorbic acid (454.40 mg/100g) and appreciable source of total sugar (7.53mg/100g), calcium (14.91 mg/100g), iron (0.62 mg/100g) and phosphorus (11.81 mg/100g) and also has great potential for processing{3}. Besides, it is not consumed as fresh or in the raw state as it is acidic and astringent. Due to its perishable nature and glut after harvest, which lowers the market value of fruit, aonla experiences postharvest losses that range from 30 to 40%. Traditional procedures were time-consuming and unhygienic A number of the products like jam, squash, candy, dried shreds, powder, tablets, chutney, murabba and preserve may be prepared with ease from aonla fruit{2}.

Due to this, the nutritive losses are seen in higher amounts. Therefore an attempt is made to find out the suitability of some varieties for processing as well as stability of different aonla products. Now-a-days, cultivation of aonla is gaining popularity due to its high market demand, less management cost coupled with wide adaptability in diverse agroclimatic condition {6}.

MATERIALS AND METHODS

During the year 2019- 20 and 2020- 21, fully matured aonla fruits of different varieties such as NA-4, NA-5, NA-6, NA-7, NA-10, Laxmi and Chakaiya. etc are harvested from the main experimental station of Department of Horticulture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior. All chemicals used in this investigation were of analytical grade. Cane sugar and citric acid were

obtained from a local market and used as ingredients for the preparation of different products such as aonla squash beverage.

Recipe

Aonla pulp	10 per cent
Total soluble solids	12 per cent
Acidity	0.3 per cent
Sodium meta bisulphite (SO_2)	70 ppm

Ripe fruit

⇩

Washing

⇩

Peeling

⇩

Passing through pulping machinePulp

⇩

Mixing with syrup solution (Sugar water + citric acid)

⇩

Addition of preservative (sodium meta-bisulphite)

⇩

Mixing

⇩

Cooling

⇩

Storage

Fig 1 Flow chart for preparation of Aonla SQUASH

Extraction of Pulp

Aonla fruits that were fully developed, had a firm texture, and were all the same size were blanched and utilized in the experiment. Using small-scale pulping equipment, the fruits were processed to extract pulp, yielding a fine pulp. The final pulp was prepared with an addition of 2% potassium bi sulphite solution for 15-20 minutes.

Squash

Squash beverages are those which contain at least 10 per cent fruit juice and

Varietal photographs of Aonla RTS

NA -4 (RTS)

NA -5 (RTS)

NA -6 (RTS)

NA -7 (RTS)

Varietal photographs of Aonla RTS

NA - 10 (RTS)

Laxmi (RTS)

Chakaiya (RTS)

10 per cent total soluble solids. It can be made from a wide variety of fruits with an excellent quality of soft drink can also be prepared.

Sensory evaluation (9-point hedonic scale)

The overall acceptability of aonla squash was based on mean score obtained from all the sensory characters. The characters with mean scores of 6 and above out of 9 were considered acceptable.

Organoleptic score	**Rating**	
9	Like extremely	(LE)
8	Like very much	(LVM)
7	Like moderately	(LM)
6	Like slightly	(LS)
5	Neither liked nor disliked	(NLND)
4	Disliked slightly	(DS)
3	Disliked moderately	(DM)
2	Disliked very much	(DVM)
1	Disliked extremely	(DE)

Overall, the final rating was obtained by averaging the score or marks.
Score of 7 rating “Like moderately” was considered to the acceptable limit.

Statistical analysis

The data in the present investigation were subjected to analysis of variance (ANOVA) technique and analyzed according to completely randomized design. The critical difference value at 5 per cent level was used for making comparison among different treatments during two months of storage.

Result

Organoleptic evaluation

The organoleptic evaluation of aonla squash prepared from seven cultivars and stored under room temperature was done at 30 days interval by a panel of five judges. The present findings are in accordance with the view of Jain *et al.* (2006) in aonla squash beverage.

Colour and Appearance

Data on colour and appearance of aonla squash are presented in Table 1. Close examination of data clearly suggested that different aonla varieties and storage exert

Table No 1 Effect of different varieties and storage on colour and appearance of Aonla Squash

Cultivars	Storage Period (Days)														
	Year I					Year II					Pooled				
	30	60	90	120	150	30	60	90	120	150	30	60	90	120	150
NA – 4	6.93	6.91	6.90	6.89	6.88	6.95	6.99	7.03	7.03	7.08	6.94	6.95	6.96	6.97	6.98
NA – 5	7.01	7.00	6.95	6.92	6.90	7.10	7.05	6.94	6.91	6.87	7.05	7.02	6.95	6.91	6.88
NA – 6	7.42	7.41	7.41	7.40	7.38	7.40	7.38	7.37	7.36	7.33	7.41	7.39	7.39	7.38	7.35
NA – 7	7.11	7.10	7.08	7.07	7.06	7.19	7.12	7.06	7.02	7.00	7.15	7.11	7.07	7.04	7.03
NA – 10	7.67	7.59	7.54	7.48	7.41	7.69	7.63	7.58	7.52	7.49	7.68	7.61	7.56	7.50	7.45
Laxmi	7.61	7.59	7.58	7.54	7.52	7.60	7.57	7.54	7.52	7.49	7.61	7.58	7.56	7.53	7.50
Chakaiya	8.00	7.94	7.89	7.78	7.71	7.99	7.95	7.91	7.89	7.84	8.00	7.95	7.90	7.83	7.75
SeM ±	0.10	0.12	0.12	0.12	0.12	0.12	0.04	0.03	0.03	0.11	0.08	0.06	0.06	0.06	0.08
CD (p = 0.05)	0.31	0.36	0.36	0.35	0.35	0.35	0.11	0.08	0.09	0.34	0.22	0.18	0.17	0.17	0.23

significant impact on colour and appearance during 2020 and 2021, respectively.

A close examination of pooled data revealed that the effect of aonla varieties decreased significantly due to different aonla varieties and their storability up to 150 DAS.

The effect of different aonla varieties and their storability with the respect to the aroma of aonla squash could attain level of significance. The color and appearance found to be acceptable up to 30 days and received sensory score i.e., 8.00, beyond 30 days of storage the sensory score was reported to be decreased to 7.71 on 180 days of storage at ambient temperature.

Taste

Close examination of data presented in Table 2 revealed that tasteof the aonla squash varied significantly due to different aonla varieties and their storage. Higher values of taste in the preparation of aonla squash were noticed in second year than first year. Following that, critical probing of pooled data revealed a significant decrease in noticeable taste in the aonla squash, with significant improvement observed. Delicious taste of aonla squash was noted with Laxmi (7.68, 7.60, 7.56, 7.54 and 7.53), which was at par with Chakaiya and NA- 10 variety. However, the disagreeable taste was recorded with NA-4 (6.23, 6.20, 6.19, 6.17 and 6.13) during course of research.

Flavour

Close examination of data presented in Table 3 revealed that flavour of the aonla squash varied significantly due to different aonla varieties and storage. Higher values of flavour were noticed in second year than first year.

It is evident from the data that, the flavour of aonla squash based on organoleptic evaluation was significantly affected due to the different aonla varieties and storage. A persual of pooled data clearly indicated that the higher flavour of aonla squash decreased significantly by the different aonla varieties and their storability up to 150 DAS. The highest values of flavour of aonla squash was recorded by the NA-10 (8.23, 8.19, 8.10, 7.99 and 7.93) variety of aonla. Whereas, the lower flavour of aonla squash was recorded with NA-4 (7.12, 7.11, 7.10, 6.98 and 6.92).

Table No 2 Effect of different varieties and storage on taste of Aonla Squash

Cultivars	Storage Period (Days)														
	Year I					Year II					Pooled				
	30	60	90	120	150	30	60	90	120	150	30	60	90	120	150
NA – 4	6.21	6.19	6.18	6.18	6.16	6.26	6.21	6.20	6.15	6.11	6.23	6.20	6.19	6.17	6.13
NA – 5	6.45	6.42	6.40	6.38	6.33	6.48	6.46	6.49	6.35	6.29	6.46	6.44	6.44	6.36	6.31
NA – 6	6.76	6.73	6.71	6.70	6.67	6.79	6.75	6.70	6.68	6.60	6.77	6.74	6.70	6.69	6.68
NA – 7	6.74	6.73	6.71	6.70	6.68	6.78	6.70	6.69	6.67	6.65	6.76	6.71	6.70	6.68	6.66
NA – 10	7.49	7.45	7.43	7.38	7.33	7.85	7.60	7.53	7.40	7.30	7.67	7.52	7.48	7.39	7.31
Laxmi	7.65	7.61	7.60	7.58	7.57	7.71	7.59	7.53	7.50	7.50	7.68	7.60	7.56	7.54	7.53
Chakaiya	7.50	7.48	7.41	7.40	7.39	7.55	7.45	7.38	7.34	7.35	7.52	7.46	7.39	7.38	7.37
SeM ±	0.05	0.05	0.02	0.03	0.05	0.05	0.04	0.05	0.05	0.05	0.03	0.02	0.03	0.03	0.03
CD (p = 0.05)	0.14	0.15	0.06	0.09	0.18	0.14	0.19	0.16	0.16	0.15	0.09	0.08	0.11	0.09	0.08

Table No 3 Effect of different varieties and storage on aroma of Aonla Squash

Cultivars	Storage Period (Days)														
	Year I					Year II					Pooled				
	30	60	90	120	150	30	60	90	120	150	30	60	90	120	150
NA – 4	6.50	6.51	6.50	6.48	6.34	6.57	6.54	6.52	6.51	6.50	6.54	6.52	6.51	6.49	6.42
NA – 5	6.41	6.48	6.47	6.47	6.46	6.48	6.47	6.45	6.44	6.41	6.49	6.48	6.46	6.45	6.43
NA – 6	6.62	6.74	6.72	6.64	6.67	6.74	6.71	6.69	6.67	6.62	6.75	6.75	6.70	6.65	6.64
NA – 7	6.81	6.98	6.95	6.94	6.92	6.89	6.85	6.83	6.82	6.81	6.94	6.91	6.89	6.88	6.86
NA – 10	7.21	7.26	7.25	7.24	7.22	7.27	7.25	7.24	7.23	7.21	7.28	7.26	7.25	7.24	7.22
Laxmi	7.29	7.35	7.34	7.31	7.30	7.34	7.33	7.31	7.30	7.29	7.35	7.34	7.32	7.31	7.30
Chakaiya	7.58	7.64	7.62	7.60	7.57	7.68	7.65	7.61	7.59	7.58	7.65	7.62	7.61	7.60	7.57
SeM ±	0.04	0.02	0.02	0.02	0.02	0.12	0.12	0.12	0.13	0.14	0.07	0.06	0.06	0.02	0.02
CD (p = 0.05)	0.12	0.05	0.06	0.06	0.07	0.38	0.37	0.37	0.36	0.41	0.09	0.18	0.18	0.09	0.07

The lowest colour and appearance were observed under the NA-4 variety (6.93, 6.91, 6.90, 6.89 and 6.88) and (6.95, 6.90, 6.87, 6.85 and 6.80) during both theyear of investigation.

Among different varieties, significantly higher colour and appearance were recorded with Chakaiya (8.00, 7.95, 7.90, 7.83 and 7.25) in the pooled data. However, it was remained statistically at par with the NA-10 and Laxmi during both the experimental year. However, NA-4 (6.94, 6.91, 6.89, 6.87 and 6.84) recorded least values of colour and appearance of aonla squash.

All the varieties with respect to colour and appearance of aonla squash were significant during both the year of experimentation.

Taste

Close examination of data presented in Table 2 revealed that tasteof the aonla squash varied significantly due to different aonla varieties andstorage. Higher values of taste were noticed in second year than first year.

Critical probing of pooled data revealed that decreasing noticeable taste significantly in the aonla squash thereafter significantly noticed. Highest taste of aonla squash (7.68, 7.60, 7.56, 7.54 and 7.53) was noted with Laxmi being at par with Chakaiya variety. Least taste values were recorded by NA-4 (6.23, 6.20, 6.19, 6.17 and 6.13) during course of investigation.

There was a significant interaction found between the varieties examined during both the year.

Aroma

Data on aroma of aonla squash is presented in Table 3. Close examination of data clearly suggested that different aonla varieties and storage exert significant impact on aroma during both the experimental year.

It is clearly evident from data presented in Table 3 that the aroma of aonla squash based on organoleptic evaluation was significantly influenced due to different aonla varieties and storage up to 150 DAS during both the year of experimentation.

Table No 4 Effect of different varieties and storage on flavour of Aonla Squash

Cultivars	Storage Period (Days)														
	Year I					Year II					Pooled				
	30	60	90	120	150	30	60	90	120	150	30	60	90	120	150
NA – 4	7.00	7.00	6.99	6.97	6.91	7.25	7.11	7.00	6.97	6.93	7.12	7.11	7.10	6.98	6.92
NA – 5	7.78	7.62	7.59	7.33	7.21	7.62	7.56	7.47	7.36	7.25	7.71	7.59	7.53	7.34	7.23
NA – 6	8.00	7.88	7.67	8.00	7.41	8.11	8.04	7.76	7.52	7.40	8.05	7.95	7.71	7.76	7.40
NA – 7	7.92	7.61	7.53	7.49	7.25	8.00	7.67	7.56	7.52	7.30	7.96	7.64	7.56	7.50	7.27
NA – 10	8.22	8.19	8.10	8.00	7.91	8.25	8.20	8.09	8.00	7.98	8.23	8.19	8.10	7.99	7.93
Laxmi	8.16	8.00	7.93	7.73	7.60	8.06	7.98	7.95	7.74	7.65	8.11	7.99	7.94	7.73	7.62
Chakaiya	8.10	7.85	7.73	7.56	7.41	8.05	7.88	7.76	7.54	7.45	8.07	7.86	7.74	7.55	7.43
SeM ±	0.02	0.02	0.02	.0.02	0.02	0.02	0.05	0.01	0.01	0.01	0.09	0.03	0.01	0.01	0.03
CD (p = 0.05)	0.07	0.06	0.04	0.07	0.07	0.07	0.15	0.04	0.05	0.06	0.25	0.08	0.06	0.05	0.09

The interaction between different aonla varieties and their storability up to 150 DAS with respect to flavour of aonla squash could reach to the level of significance.

Overall acceptability

Persual of results presented in Table 4 revealed that the overall acceptability of aonla squash based on organoleptic evaluation was significantly affected due to different aonla varieties and their storability up to 150 DAS to exert any significant change during both the experimental year..

Among the pooled data of aonla squash, highest overall acceptability of aonla squash was recorded in Chakaiya (8.19, 7.83, 7.66, 7.41 and 7.36). Decreasing overall acceptability of aonla squash improved different Aonlavarieties and their storability up to 150 DAS and conspicuous decrement noticed onwards. Whereas, lower overall acceptability of aonla squash achieved by NA-4 variety (7.14, 7.06, 7.91, 6.83 and 6.67).

The effect of different aonla varieties and their storability up to 25 DAS with respect to the overall acceptability could attain level of significance.

DISCUSSION

Organoleptic quality of aonla squash prepared from different varieties

Every 30 days, a panel of five judges evaluated the organoleptic quality of aonla squash that had been made from three cultivars and kept at room temperature.

The unnoticeable colour and appearance was observed in the different value added products of aonla which was significantly specified for the study. For the different value added products, dull colour was observed in aonla squash in NA-4 variety. The bright colour and appearance was observed on the visual basis. For organoleptic evaluation, significantly maximum response was recorded in aonla squash in Chakaiya variety. The indecent taste was observed in raunchy taste of aonla squash in NA-4. Whereas, the delicious taste was observed in Chakaiya in aonla squash. It can be concluded that liquid based beverage can be stored for 30 days at ambient temperature without affecting sensorial parameters {10}.

The products wise given a bad smell after 90 days of storage, aonla squash in NA-4 variety. Whereas, Chakaiya in aonla squash variety for the preparation which was significantly highly suitable till 90 days of storage. The unappetizing flavour was observed in aonla squash in NA-4variety. However, the palatable flavour was recorded in NA-10 in Chakaiya in aonla squash variety for the preparation which was suitable. Panelists recorded a considerable loss of flavour in aonla squash upon prolonged storage. This may be due to degradation of flavour constituents and unstable nature of volatile substances upon storage time and temperature{8}.

The disagreeable acceptability was observed aonla squash in NA-4, respectively. It was also observed that squash prepared from cultivar Laxmi and Chakaiya was highly acceptable for consumption upto 150 days of storage period, The present findings are in accordance with the view of Khan *et al.* (2009), Priyanka (2012) Kumar *et al.* (2013), Ghosh (2013) and Jegadeeswari *et al.*, (2024) in aonla squash beverage.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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