

Organoleptic Evaluation of Aonla (*Emblica officinalis* G.) Ready-To-Serve during storage

ABSTRACT

To overcome current national and international limitations to the use of chemical food additives in food processing and preservation, research into biological and plant-derived food additives has risen significantly {1}. A research experiment was conducted during the year 2019-20 and 2020-21 in the Fruit and Vegetable Processing Unit Laboratory, Department of Horticulture, College of Agriculture, Gwalior with seven different varieties of aonla viz., NA-4, NA-5, NA-6, NA-7, NA-10, Laxmi and Chakaiya. Value added products make the fruit available throughout the year and helps to promote the use of aonla among the public. Hence an attempt was made to standardized non-alcoholic based products viz., ready-to-serve with different varieties. Three replicates were used in a completely randomized design to analyze observations that were recorded up to a storage period of six months in ambient conditions. Sensory evaluation and nutritional analysis were among the parameters used to evaluate the developed product along with 9 hedonic scale, out of there. Analyzing and measuring human responses to food composition, such as color, appearance, taste, flavor, aroma, and overall acceptability {4}. From the findings, Laxmi and Chakaiya varieties were found superior with respect to colour, appearance, taste and aroma as well as flavor. The overall acceptability of processed items has been found to be significantly higher with storage periods of 30, 60, 90, and 120 days. With respect to the sensory evaluation of different aonla products was concerned, the Laxmi and Chakaiya varieties are found to be superior for the purpose of the processing industry.

Keywords : Aonla, analyzing , aroma, flavor, ready-to-serve, , processing, sensory evaluation, storage

INTRODUCTION

Aonla, or Indian gooseberry (*Emblica officinalis*) is an indigenous fruit of the Indian subcontinent. It is one of the oldest Indian fruits and considered as “wonder fruit for health” because of its unique qualities {2}. It is one of the oldest minor fruit and considered to be a wonder for human health. India ranks 1st in aonla area and production

all over the world. It belongs to the family Euphorbiaceae. The fruit has high indigenous medicinal value such as an anti- ascorbutic, laxative and antibiotic. Aonla is used in Ayurvedic systems of Indian medicines. 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. Processed aonla finds use in various forms such as chutney, candy, preserves, sauce, dried chips, tablets, jellies, and pickles{5}. Like many other fruits, Aonla is highly perishable and is responsible for postharvest losses in handling, transportation and storage, resulting in economic losses. 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}. Aonla prices become very low during main season and sometimes farmers have to pay to throw away their produces because of higher perishable nature of the produce. Fresh Aonla has 92 to 94% moisture and it can be stored for 2 to 4 weeks at 0°C {7}. Problem of food preservation has grown more complex task become today and because new products launched in market requiring longer shelf life and greater assurance of protection from microbial spoilage. The development of many functional compounds helpful to human health is manufactured by processing of meat and meat products{3}.

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 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, skimmed milk powder, glucose, butter, citric acid, hot spices, vegetables and salt were obtained from a local market and used as ingredients for the preparation of different products such as aonla ready-to-serve beverage.

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.

RTS

Ready-to-serve beverages are those which contain at least 10 per cent fruit juice and 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.

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)

Recipe

Aonla pulp	10percent
Totalsolublesolids	12percent
Acidity	0.3percent

Sodium meta bisulphite 70ppm
(SO₂)

Ripe fruit

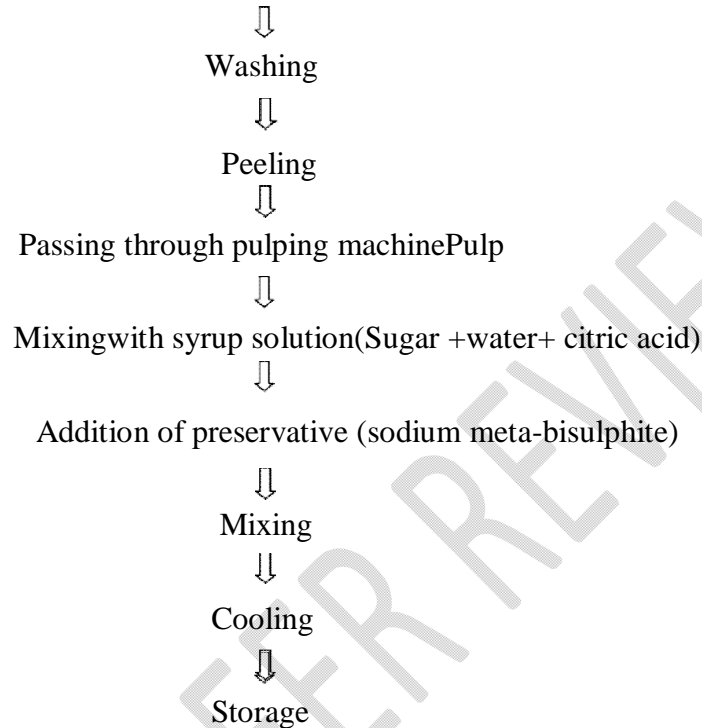


Fig 1. Flow chart for preparation of Aonla RTS

Storage Study

The storage studies of prepared squash was analysis by noting the changes in the bioactive components and sensory evaluation at regular intervals before and during storage {9}.

Sensory evaluation (9-point hedonic scale)

Value added aonla products such RTS was subjected to evaluation soon after preparation and after one, two, three and four months of storage by a panel of ten judges following

9-point

hedonic scale (Ranganna, 1986). These products were assessed for colour and appearance, taste, aroma, flavour and overall acceptability. The overall acceptability of aonla RTS 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.

Statistically analyzing the data obtained during this investigation, the methods to determine the significance of the difference between means of scores were followed as suggested by Henry Garrett [1].

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 be the acceptable limit.

Result

The data on colour, appearance, flavor, texture as well as overall acceptability was determined by sensory evaluation card. Sensory evaluation by judges observed colour,

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

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	6.90	6.87	6.85	6.80	6.94	6.91	6.89	6.87	6.84
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±	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.05	0.05	0.05	0.05	0.05
CD (p= 0.05)	0.24	0.23	0.21	0.23	0.24	0.23	0.23	0.25	0.25	0.24	0.16	0.13	0.11	0.15	0.16

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

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	7.76	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±	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.05	0.05	0.05	0.05	0.05
CD (p=0.05)	0.24	0.23	0.21	0.23	0.24	0.23	0.23	0.25	0.25	0.24	0.16	0.13	0.11	0.15	0.16

appearance, flavor, texture of sample 1 and 3 are concerned, there was a significant difference between the mean of these parameters using 9 point Hedonic scale.

1.1 Colour and Appearance

Data on colour and appearance of aonla RTS are presented in Table 1. 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 RTS.

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

1.2. Taste

Close examination of data presented in Table 2 revealed that taste of the aonla RTS varied significantly due to different aonla varieties and storage. Critical probing of pooled data revealed that decrease in noticeable taste significantly in the aonla RTS thereafter significantly noticed. Highest taste of aonla RTS (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.

1.3. Aroma

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

A close examination of data revealed that aroma of aonla RTS decreased significantly due to the different aonla varieties and their storability up to 150 DAS. Highest values of aroma of aonla RTS (7.65, 7.62, 7.61, 7.60 and 7.57) was recorded in Chakaiya being statistically at par with Laxmi and NA-10. Whereas, lower aroma of aonla RTS (6.54, 6.52, 6.51, 6.49 and 6.42) was achieved by control during course of investigation.

The effect of different aonla varieties with respect to aroma of aonla RTS could attain level of significance

TableNo3 Effectof differentvarietiesandstorageonaromaofAonlaRTS

Cultivars	StoragePeriod(Days)														
	YearI					YearII					Pooled				
	30	60	90	120	150	30	60	90	120	150	30	60	90	120	150
NA-4	6.52	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	6.49	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	6.77	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	6.99	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	7.28	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	7.36	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	7.65	7.64	7.62	7.60	7.57	7.68	7.65	7.61	7.65	7.58	7.65	7.62	7.61	7.60	7.57
SeM±	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CD (p =0.05)	0.05	0.05	0.06	0.06	0.05	0.07	0.05	0.07	0.06	0.06	0.04	0.03	0.05	0.03	0.03

TableNo4Effectof differentvarieties andstorage onflavourofAonlaRTS

Cultivars	StoragePeriod(Days)														
	YearI					YearII					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	0.12	0.12	0.12	0.12	0.12	0.06	0.06	0.06	0.06	0.06
CD (p=0.05)	0.06	0.07	0.06	0.07	0.06	0.37	0.32	0.35	0.36	0.37	0.18	0.21	0.22	0.19	0.20

1.4 Flavour

It is evident from the data presented in Table 4 that flavour of aonla varieties and storage.

A persual of pooled data clearly indicated that the higher flavour of aonla RTS decreased significantly by the different aonla varieties and their storability up to 150 DAS with NA-10 variety. Highest values of flavour of aonla RTS (8.23, 8.19, 8.10, 7.99 and 7.93) recorded by the NA-10 variety of aonla.

Whereas, lower flavour of aonla RTS (7.12, 7.11, 7.10, 6.98 and 6.92) achieved by NA-4. The interaction between different aonla varieties and their storability up to 150 DAS could reach to the level of significance.

1.5 Overall acceptability

Persual of results presented in Table 5 revealed that the overall acceptability of aonla RTS 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.

Close examination of data revealed that significantly higher values of overall acceptability of aonla RTS on organoleptic evaluation (8.22, 7.58, 7.49, 7.45 and 7.33) and (8.17, 8.09, 7.83, 7.61 and 7.40) were recorded under Chakaiya during 2020 and 2021, respectively. It was followed by the Laxmi and NA-10 variety.

The least values (7.14, 7.06, 7.91, 6.83 and 6.67) and (7.21, 7.11, 7.00, 6.90 and 6.71) were noticed in NA-4 variety during 2020 and 2021, respectively.

Discussion

Similarly, based on the organoleptic evaluation and chemical parameters, it can be concluded that a best quality of aonla RTS can be prepared by the Laxmi which was followed by NA-10 variety with respect to the attributes such as colour and appearance, taste, flavour, aroma and its overall acceptability.

The colour and appearance is affected by the storage period. As the storage period increased, a slight decline in colour and appearance. Also, gradual loss in flavour and taste due to changes in volatile compounds of aonla RTS. The flavour and

TableNo 5. Effectofdifferentvarieties and storageon overallacceptabilityofAonlaRTS

Cultivars	StoragePeriod(Days)														
	YearI					YearII					Pooled				
	30	60	90	120	150	30	60	90	120	150	30	60	90	120	150
NA-4	7.14	7.06	7.91	6.83	6.67	7.21	7.11	7.00	6.90	6.71	7.17	7.08	6.95	6.86	6.69
NA-5	7.29	7.13	6.96	6.89	6.70	7.17	7.04	6.91	6.84	6.77	7.23	7.08	6.93	6.86	6.73
NA-6	7.55	7.32	7.24	7.05	6.83	7.50	7.40	7.31	7.10	6.91	7.52	7.36	7.27	7.07	6.87
NA-7	7.78	7.58	7.49	7.22	6.92	7.63	7.48	7.26	7.11	6.95	7.70	7.53	7.37	7.16	6.93
NA-10	7.95	7.64	7.42	7.25	7.10	8.00	7.84	7.62	7.40	7.16	7.97	7.74	7.52	7.32	7.13
Laxmi	8.08	7.83	7.65	7.43	7.25	8.18	7.89	7.66	7.40	7.29	8.13	7.86	7.65	7.41	7.27
Chakaiya	8.22	7.58	7.49	7.45	7.33	8.17	8.09	7.83	7.61	7.40	8.20	7.84	7.66	7.53	7.37
SeM±	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
CD (p =0.05)	0.07	0.05	0.07	0.08	0.06	0.08	0.09	0.08	0.08	0.08	0.05	0.05	0.05	0.06	0.05

taste loss might be due to time, temperature and duration of storage.

Similar findings were observed in the confirmation of Kore *et al.* {10}, BalajiandPrasad*et.al.*{11},Singh*etal* {12},ShashiKumare*et.al*{13},BalajiandSikarware*etal.* {13},Khushboo*etal.*{14},Kumare*et.* *al.* {15}andRajendraKumar{16} forthepreparationof aonlaRTS.

CONCLUSION

The data was analyzed using test analysis of variance (ANOVA) and sampled multiple times. To achieve the goal, multiple trials were conducted before selecting three samples. Sensory evaluation determines final product selection {8}. It can be concluded that aonla squash is highly nutritious and medicinal properties, the shelf life of aonla squash was found to be highly acceptable at ambient conditions.

FUTURE SCOPE

The several investigations were made on nutraceuticals properties of aonla have to be retaining for curing of different diseases. There is a possibility that it will lead to the development of new food based drugs for control of disease management for humans in the future{9}.

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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