

Organoleptic Evaluation of Aonla (*Emblica officinalis* G.) nectar during storage

ABSTRACT

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 for preparation of aonla nectar. This study is analyzed was carried out in a completely randomized design with three replications. ~~It was studied about the preparation of various value added products such as aonla aonla nectar.~~ From the finding it was observed that, the increase in the percentage of acidity, moisture, phenols and ~~fibrefiber~~ content of ~~aonla aonla~~ nectar while total soluble solids and total sugars content was decreased. There was gradual increase in moisture content of aonla nectar prepared with different pulp combination of aonla fruits during storage period. However, total soluble solids, ascorbic acid content ~~of aonla nectar~~ decreased with advancement of storage period. Observations were recorded up to storage period of six months at ambient conditions. ~~This study is analyzed in a completely randomized design with three replications.~~ Laxmi and Chakaiya varieties were found superior with respect to colour, appearance, taste and aroma as well as flavour. As per the organoleptic evaluation It has been noticed that the overall acceptability of ~~processed products~~ aonla nectar ~~have been~~ was found significant with the storage intervals ~~such as of~~ 30, 60, 90 and 120 days. ~~As far as 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; processing industry; storage; value addition; overall acceptability.

INTRODUCTION

“Aonla (*Emblica officinalis*) 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

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medicinal value such as ~~an~~ anti- ascorbutic, laxative and antibiotic. Aonla is used in Ayurvedic systems of Indian medicines. 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. 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.

MATERIALS AND METHODS

Fully matured aonla fruits of different varieties such as NA-4, NA-5, NA-6, NA-7, NA-10, Laxmi and Chakaiya. ~~Etc etc.~~ are harvested from the main experimental station of Department of Horticulture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior during the year 2019- 20 and 2020- 21. 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~~ aonla nectar, nectar and squash.

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Extraction of Pulp

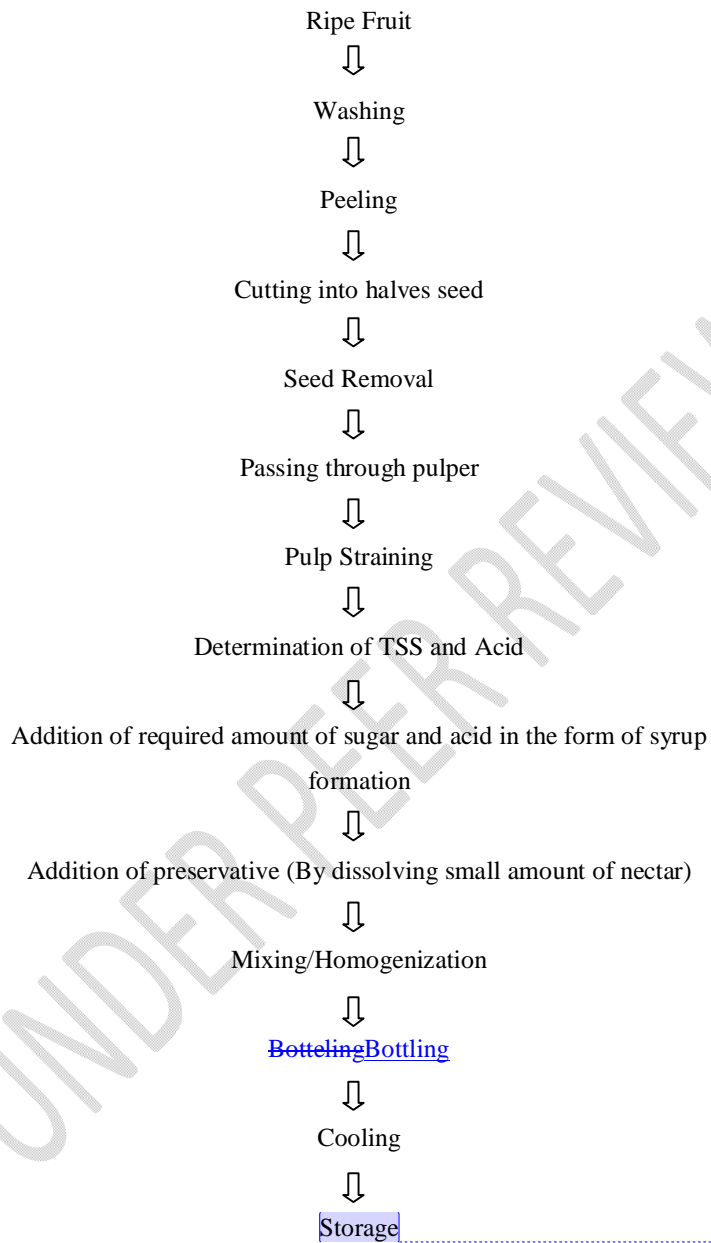
Aonla fruits that were fully developed, had a firm texture, and ~~were all the of~~ same size were blanched and utilized in the experiment. Using small-scale pulping equipment, the fruits were processed to extract pulp, yielding a fine pulp. The final pulp was prepared with an addition of 2% potassium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

Nectar

Nectar is a type of fruit beverage, which contains at least 20 per cent fruit pulp and 15 per cent total soluble solids. Experiences, however show that nectar prepared with 15 per cent sugar is very sweet. It has normally 0.3 per cent acidity. Dilution is not required before serving.

Recipe:

- Aonla pulp 20 percent
- Total soluble solids 15 percent
- Acidity 0.3 percent
- SO₂ 70 ppm



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Fig1 .Flowchart forpreparation ofAonla Nectar

3.1 Sensoryevaluation(9-point hedonicscale)

Aonla Nectar was subjected to evaluation soon after preparation and after one, two, threeand 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, flavor and overall acceptability.

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Image 1: Photographs of sensory evaluation

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The overall acceptability of squash, nectar, RTS, sauce and toffee 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.

List 1: Organoleptic score calculation

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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.

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Result

Colour and Appearance

Data on colour and appearance of faonlanectar are represented in Table 1. Among different varieties, significantly higher colour and appearance were recorded with Chakaiya

(7.55, 7.42, 7.32, 7.19 and 7.05) in the pooled data. However, it was remained statistically at par with the Laxmi and NA-7. NA-4 variety recorded least values (6.87, 6.76, 6.64, 6.52 and 6.38) in colour and appearance of aonla nectar.

For the preparation of aonla nectar, dull colour was observed in aonla nectar (6.00) in NA-5 variety, respectively. The bright colour and appearance was observed on the visual basis. For organoleptic evaluation, significantly maximum response was recorded in aonla nectar (6.79) in NA-5 variety.

Table No-1. Effect of different varieties and storage on colour and appearance of Aonla Nectar

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Cultivars	Storage Period (Days)				
	30	60	90	120	150
NA-4	6.87	6.76	6.64	6.52	6.38
NA-5	7.03	6.79	6.66	6.43	6.28
NA-6	7.21	7.07	6.94	6.86	6.76
NA-7	7.26	7.09	6.99	6.90	6.81
NA-10	6.69	7.04	6.93	6.83	6.76
Laxmi	7.41	7.32	7.25	7.16	7.07
Chakaiya	7.55	7.42	7.32	7.19	7.05
SeM±	0.01	0.01	0.01	0.01	0.01
CD (p=0.05)	0.04	0.04	0.05	0.03	0.04

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

Cultivars	Storage Period (Days)				
	30	60	90	120	150
NA-4	8.54	8.41	8.36	8.30	8.23
NA-5	8.65	8.58	8.50	8.39	8.32
NA-6	8.55	8.41	8.30	8.17	8.11
NA-7	8.56	8.51	8.46	8.37	8.30
NA-10	8.75	8.68	8.60	8.53	8.45
Laxmi	8.58	8.49	8.32	8.20	8.12
Chakaiya	8.65	8.54	8.46	8.36	8.51
SeM±	0.02	0.02	0.02	0.02	0.02
CD (p=0.05)	0.06	0.05	0.07	0.06	0.06

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Taste

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

A significant effect of different aonla varieties and their storability with respect to the taste of aonla nectar found between the varieties examined for both the year. Critical probing of pooled data, it was revealed that there is a decreasing noticeable taste significantly in the aonla nectar was thereafter significantly noticed. In NA-4 the in decent raunchy

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taste was observed in raunchy taste of aonla nectar (8.11), in NA-4, respectively.

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A significant effect of different aonla varieties and their storability with respect to the taste of aonla nectar found between the varieties examined during of both the year.

Aroma

It is clearly evident from data presented in Table 3 that the aroma of aonla nectar based on organoleptic evaluation was significantly influenced due to the different aonla varieties and storage 30 to 150 days after storage (DAS) during for both the year of experiment.

The effect of different aonla varieties and their storability with respect to the aroma could attain level of significance. The products wise given started as smelling bad smell after 90

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days of storage, fusty aroma of aonla nectar (6.26) in NA-4 variety, respectively. With respect to the sweet-smelling, significantly maximum response to fragrant aroma was

Cultivars	Storage Period (Days)				
	30	60	90	120	150
NA-4	6.52	6.46	6.34	6.60	6.26
NA-5	6.61	6.56	6.54	6.47	6.40
NA-6	6.68	6.62	6.57	6.51	6.47
NA-7	6.98	6.93	6.87	6.83	6.79
NA-10	7.05	6.98	6.95	6.92	6.83

for aonla nectar in Chakaiya variety (7.44) for the preparation which was significantly highly suitable till 90 days of storage.

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Table No.3. Effect of different varieties and storage on aroma of Aonla Nectar aonla nectar

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Laxmi	7.47	7.41	7.37	7.32	7.28
Chakaiya	7.62	7.59	7.53	7.48	7.44
SeM±	0.02	0.02	0.02	0.02	0.02
CD (p=0.05)	0.04	0.04	0.05	0.05	0.07

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Flavour

The unappetizing flavour was observed in NA-4 variety aonla nectar (6.22) in NA-4 variety. However, the palatable flavour was recorded in aonla nectar Chakaiya variety (6.87) in Chakaiya variety. Whereas, the delicious taste was observed in Chakaiya (8.51) for aonla nectar along with the guidelines of Hedonic scale by the acceptance.

Overall acceptability

The disagreeable acceptability was observed in NA-4 aonla nectar (6.53) in NA-4. Whereas, significantly maximum response to less than excellent was recorded in Chakaiya variety (7.03) in aonla nectar for the preparation which was significantly highly suitable during 2020 and 2021, respectively.

The effect of different aonla varieties and their storability upto 150 DAS with respect to the overall acceptability of aonla nectar could attain level of significance.

Table No.4 Effect of different varieties and storage on flavour- Table.4. Effect of different varieties and storage on flavour of Aonla Nectar

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Cultivars	StoragePeriod(Days)				
	30	60	90	120	150
NA-4	6.57	6.46	6.41	6.30	6.22
NA-5	6.76	6.71	6.63	6.58	6.54
NA-6	6.81	6.76	6.69	6.62	6.65
NA-7	6.88	6.84	6.80	6.76	6.72
NA-10	6.91	6.86	6.82	6.76	6.73
Laxmi	7.03	6.95	6.87	6.84	6.82
Chakaiya	7.08	7.06	6.97	6.91	6.87
SeM±	0.04	0.04	0.04	0.04	0.04
CD (p=0.05)	0.12	0.13	0.12	0.12	0.11

Table 5. Effect of different varieties and storage on overall acceptability of Anonla Nectar.

Cultivars	StoragePeriod(Days)				
	30	60	90	120	150
NA-4	6.85	6.69	6.62	6.58	6.53
NA-5	6.86	6.77	6.72	6.67	6.61
NA-6	6.95	6.89	6.84	6.50	6.76
NA-7	7.04	6.99	6.90	6.84	6.78
NA-10	7.17	7.15	7.08	6.99	6.90
Laxmi	7.30	7.20	7.14	7.05	7.00
Chakaiya	7.00	6.92	6.85	6.80	7.03
SeM ±	0.07	0.07	0.07	0.07	0.07
CD (p= 0.05)	0.21	0.22	0.22	0.20	0.19

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Discussion

An unfermented beverage of aonla pulp based nectar was prepared by muddling of fresh fruits, but it does not include 100 % pure fruit. Based on the organoleptic evaluation and chemical parameters, it can be confessed that a best quality of aonla nectar can be prepared by the Chakaiya which was followed by Laxmi variety with reference to the attributes such as colour and appearance, taste, flavour, aroma and its overall acceptability.

There was sharp decrease in the organoleptic scores for taste in various treatments during the storage period at ambient condition; this might be due to the production of off taste in nectar as a result of certain bio-chemical changes taking place under high temperature. Thus, based on the above observations, it is concluded that Chakaiya recorded maximum organoleptic score at 30, 60, 90, 120 and 150 days after color/appearance treatment. However, a downward trend was observed in the scores, this can be due to the oxidation of phenols that causes dye degradation or organic non-enzymatic reaction sour with sugar.

The present findings were in the reference of Mandal *et al.* (2013) and Shekhawat *et al.* (2014) with regards to aonla nectar.

References

AOAC (1984) Methods of analysis of the association of official analytical chemists: 15th edition Washington DC.

Athawale G.H. and Dr. S.H. Akabari. 2017. Amla and its processing – A review. *International Journal of Green and Herbal Chemistry. Sec B*, **6** (3): 62-73.

Balaji, Vikram and Prasad V.M. 2014. Studies on value kinnow-aonla blended ready-to-serve beverage. *Journal of Food Processing Technology*. **5**: 288.

Balaji, Vikram and Purnima Singh Sikarwar. 2017. Studies on preparation of value added herbal kinnow-aonla beverages (RTS and Squash) during storage. *Indian Journal of Pure & Applied Biosciences*. **6** (1): 758-765.

Bhattacharjee, A.K., Dikshit, Abhay, Kumar, Sanjay and Tandon, D.K. 2012. Quality of aonla candy and segments-in-syrup prepared from steep

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preserved fruits in water. *Indian Journal of Natural Products and Resources*. **4** (1): 119-122.

Bhawna Panda, H.G. Sharma, Abhay Bisen and Krishnakant Rajak. 2019. Microbial and economical studies of jamun beverages prepared by alternative sweeteners. *International Journal of Current Microbiology and Applied Sciences*. **8**(12): 187-195.

Devra, Naval Singh, Kaushik R.A. and Meena H.R. 2017. Standardization and storage study of aonla (*Emblica officinalis* Gaertn.) based blended Ready-To-Serve beverages. *International Journal of Current Microbiology and Applied Sciences*. **6** (5): 1275-1284.

Fruit Products Order, <https://www.india.gov.in/fruit-products-order-1955>

Goyal, Madhu, Sharma, Kavita and Kiradoo Vrinda. 2024. New Vistas of Value Addition to Utilize Amla (*Emblica Officinalis*) and Ber (*Ziziphus Mauritiana*) Fruits. *Asian Journal of Dairy and Food Research*. **27** (2): 145-147.

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Mandal, Purandar, Sahoo, Vibhuti Bhushan, Das, Bhaskar Chandra and Katiyar, Dharendra. 2013. Studies on processing and storage stability of aonla (*Emblica officinalis* Gaertn.) Nectar. *Hortflora Research Spectrum*. **2** (3): 259-161.

Thakur, N.S., Thakur, Nancy, Thakur, Abhimanyu, Kumar, Pradeep and Hamid. 2018. Physico-chemical characteristics and standardization of juice extraction method from wild aonla (*Phyllanthus emblica* L.) fruits of Himachal Pradesh. *International Journal of Current Microbiology and Applied Sciences*. **7** (02): 731-737.

Yadav, Prem Kant, Vishwakarma, Govind and Yadav, D.K. 2015. Studies on determination of storage stability of aonla products. *Research in Environment and Life Sciences*. **8** (3): 425-430.

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