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

UNDER PEER REVIEW

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

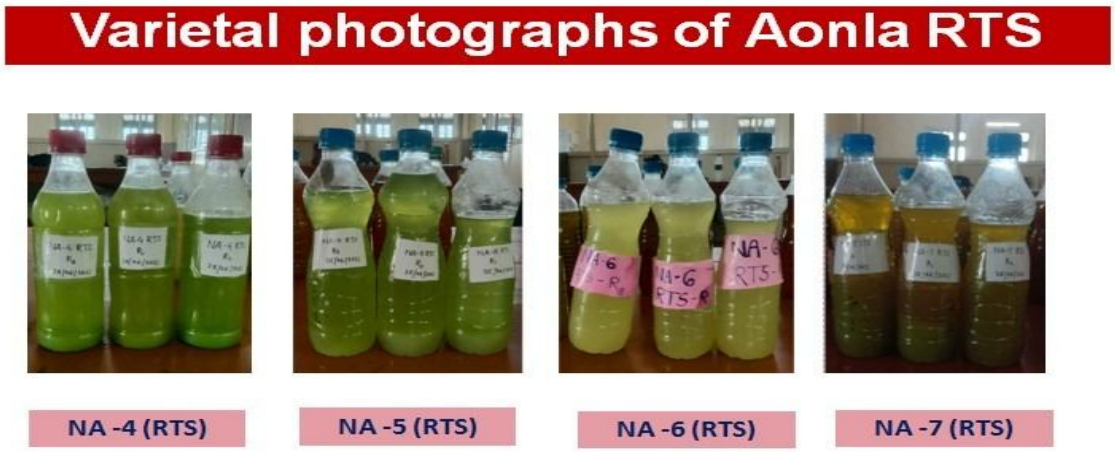
Aonla fruits that were fully developed, had a firm texture, and were all the same size were blanched and utilized in the experiment. Using small-scale pulping

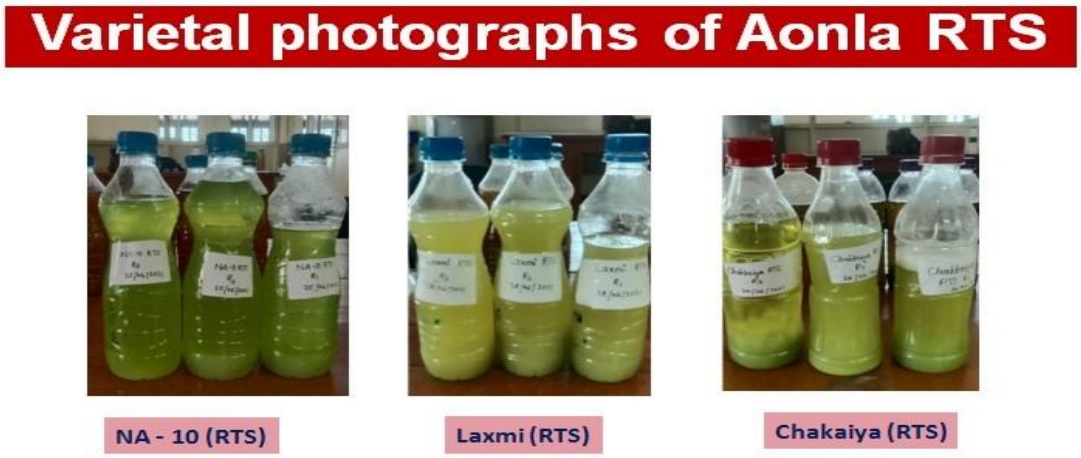
UNDER PEER REVIEW

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 centfruit juice and 10 per cent total soluble solids. It can be made from a widevarietyoffruitswithanexcellentqualityofsoft drinkcanalsobeprepared.





Recipe

Aonla pulp	10percent
Totalsolublesolids	12percent
Acidity	0.3percent

Sodium meta bisulphite (SO_2) 70ppm

Ripe fruit

⇩

Washing

⇩

Peeling

⇩

Passing through pulping machinePulp

⇩

Mixingwith syrup solution(Sugar +water+ citric acid)

⇩

Addition of preservative (sodium meta-bisulphite)

⇩

Mixing

⇩

Cooling

⇩

Storage

Fig 1. Flow chartforpreparationofAonlaRTS

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}.

Sensoryevaluation(9-point hedonicscale)

Value added aonla products such RTSwas 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

UNDER PEER REVIEW

hedonicscale(Ranganna,1986).Theseproductswereassessedforcolourandappearance,taste ,aroma,flavourandoverallacceptability.The overall acceptability of aonla RTS was basedon mean score obtained from all the sensory characters. The characters withmeanscores of6andaboveoutof9wereconsideredacceptable.

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 Henrye Garrett {1}.

Organoleptic score	**Rating**	
9	Likeextremely	(LE)
8	Likevery much	(LVM)
7	Likemoderately	(LM)
6	Likeslightly	(LS)
5	Neither likednordisliked	(NLND)
4	Disliked slightly	(DS)
3	Dislikedmoderately	(DM)
2	Dislikedverymuch	(DVM)
1	Dislikedextremely	(DE)

Overall,thefinalratingwasobtainedbyaveragingthescoreormarks.
Score of 7rating“Like moderately”was consideredtothe 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 observecolour,

UNDER PEER REVIEW

TableNo 1 Effectofdifferentvarietiesand storageoncolour andappearanceofAonla RTS

Cultivars	StoragePeriod(Days)														
	YearI					YearII					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

UNDER PEER REVIEW

TableNo 2Effectofdifferentvarieties and storageon tasteofAonlaRTS

Cultivars	StoragePeriod(Days)														
	YearI					YearII					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

UNDER PEER REVIEW

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 Colourand Appearance

DataoncolourandappearanceofaonlaRTSarepresentedinTable 1.Among different varieties, significantly higher colour and appearancewere recorded with Chakaiya (8.00, 7.95, 7.90, 7.83 and 7.25) in the pooleddata. However, it was remained statistically at par with the NA-10 and Laxmiduring both the experimental year. However, NA-4 (6.94, 6.91, 6.89, 6.87 and6.84)recordedleastvaluesofcolourandappearanceofaonlaRTS.

All the varieties with respect to colour and appearance of aonla RTSweresignificantduringboth theyearofexperimentation.

1.**2. Taste**

CloseexaminationofdatapresentedinTable2revealedthattasteoftheaonlaRTSvariedsignificantlyduetodifferentaonlavarietiesandstorage.Criticalprobingofpooleddatarevealedthatdecreasingnoticeabletaste significantly in the aonla RTS thereafter significantly noticed. Highesttaste of aonla RTS (7.68, 7.60, 7.56, 7.54 and 7.53) was noted with Laxmibeing at par with Chakaiya variety. Least taste values were recorded by NA-4(6.23, 6.20,6.19,6.17 and6.13)duringcourseofinvestigation.

Therewasasignificantinteractionfoundbetweenthevarietiesexamined duringboththeyear.

1.3. Aroma

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

AcloseexaminationofdatarevealedthataromaofaonlaRTSdecreased significantly due to the different aonla varieties and their storabilityup to 150 DAS. Highest values of aroma of aonla RTS (7.65, 7.62, 7.61, 7.60and 7.57) was recorded in Chakaiya being statistically at par with Laxmi andNA-10. Whereas, lower aroma of aonla RTS (6.54, 6.52, 6.51, 6.49 and 6.42)wasachievedbycontrolduringcourse ofinvestigation.

The effect of different aonla varieties with respect to aroma of aonlaRTScouldattainlevelofsignificance

UNDER PEER REVIEW

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

UNDER PEER REVIEW

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

UNDER PEER REVIEW

1.4 Flavour

It is evident from the data presented in Table 4that flavour of aonlavarietiesandstorage.

A persual of pooled data clearly indicated that the higher flavour ofaonla RTS decreased significantly by the different aonla varieties and theirstorability up to 150 DAS with NA-10 variety. Highest values of flavour of aonlaRTS(8.23,8.19,8.10,7.99and7.93)recordedbytheNA-10varietyofaonla.

Whereas,lowerflavourofaonlaRTS(7.12,7.11,7.10,6.98and6.92)achievedby NA-4.The interaction between different aonla varieties and their storability upto150DAScouldreachtothelevelofsignificance.

1.5 Overallacceptability

Persual of results presented in Table 5 revealed that the overallacceptability of aonla RTS based on organoleptic evaluation was significantlyaffected due to different aonla varieties and their storability up to 150 DAS toexertany significantchangeduring boththeexperimentalyear.

Close examination of data revealed that significantly higher values ofoverallacceptabilityofaonlaRTSonorganolepticevaluation(8.22,7.58,7.49, 7.45and7.33) and(8.17,8.09,7.83,7.61and 7.40)wererecordedunder Chakaiya during 2020 and 2021, respectively. It was followed by theLaxmiandNA-10variety.

Theleastvalues(7.14,7.06,7.91,6.83and6.67)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,basedontheorganolepticevaluationandchemicalparameters, it can be concluded that a best quality ofaonla RTS can bepreparedbytheLaxmiwhichwasfollowedbyNA-10varietywithrespecttothe attributes such as colour and appearance, taste, flavour, aroma and itsoverallacceptability.

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

UNDER PEER REVIEW

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

UNDER PEER REVIEW

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},ShashiKumar*et.al*{13},BalajiandSikarwar*etal.* {13},Khushboo*etal.*{14},Kumar*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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UNDER PEER REVIEW

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