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Studies on physico-chemical properties of Aonla (*Emblca officinalis* Gaertn.) jam blended with leaf extract of lemon grass, Pudina and Tulsi

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Abstract

The present investigation entitled “Studies on Physico-Chemical Properties of Aonla (*Emblca officinalis* Gaertn.) Jam Blended with Leaf Extract of Lemon Grass, Pudina and Tulsi” was under taken at Post Harvest Technology Laboratory in Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, India during 2014-15. The experiment was laid out in (C.R.D.) completely randomized design with three replications and 10 treatments separately. The material used in the experiment was lemon grass, pudina and tulsi with three levels of each (0.5%, 1.0% and 1.5%). The products was stored for 100 days at ambient temperature. Ten treatment included in the trial are, T₀ (Control), T₁ (Lemon grass 0.5%), T₂ (Lemon grass 1.0%), T₃ (Lemon grass 1.5%), T₄ (Pudina 0.5%), T₅ (Pudina 1.0%), T₆ (Pudina 1.5%), T₇ (Tulsi 0.5%), T₈ (Tulsi 1.0%) and T₉ (Tulsi 1.5%) were tested in three replications. The treatment T₉ (Tulsi 1.5%) was found to be most suitable treatment in terms of physico-chemical properties.

Keywords: Aonla, jam, lemon grass, Pudina, Tulsi and extract

Introduction

Fruits are nature's gift to human being. They are not only delicious and refreshing but are also the chief source of vitamins, minerals and proteins. Aonla is one of the important non-traditional fruit of Indian origin having immense potentiality of cultivation on marginal lands. The major aonla producing states in India are Rajasthan, Uttar Pradesh, Gujarat, Tamil Nadu, Maharashtra, Andhra Pradesh, Karnataka and Bihar^[1]. It is more in India and in Uttar Pradesh it is commercially cultivated in areas comprising Agra, Azamgarh, Pratapgarh, Raibareilly, Jaunpur, Varanasi, Sultanpur, Kanpur, and Mathura. The vast tracts of USAR land widely spread in various parts of Sultanpur district of Uttar Pradesh offer ample scope for aonla cultivation. Aonla is known for exceptionally high amount of ascorbic acid and is regarded by the Indian scientist as “richest source of vitamin ‘C’ next to Barbados cherry”. It contains 500-600 mg of ascorbic acid per 100 g of pulp. This is much more than the vitamin C content of guava, tomato or citrus fruits. Aonla is a very good source of vitamin C containing chemical substances called lucoanthocyanin and polyphenols which retard the oxidation of vitamin C and presence of astringency^[2]. From a study it is reported that *E. officinalis* contains higher amount of vitamin C^[3]. Aonla fruit is valued as diuretic, laxative, alternatives, cooling, refrigerant, and antibiotic. The fruit has antiviral, cardiotoxic and hypoglycaemic activity^[4]. A number of cultivars are available in our country especially Uttar Pradesh. NA-4, NA-5, NA-6, NA-7, NA-9, NA-10 are important cultivars from Faizabad and cultivars Banarasi, Chakaiya, Pink tinged are important cultivars grown in district Pratapgarh. NA-7 is suitable for preparation jam, candy, squash and sauce^[5]. Lemon grass belongs to the genus *Cymbopogon*, in the family Poaceae. Lemon grass (*Cymbopogon flexuosus*) leaves contain aromatic oil, with a characteristic lemon like odour, containing 75-80% citral. Citral is a starting material for manufacturing of ionone's and vitamin A. It has medicinal properties and is used extensively in ayurvedic medicine. It is supposed to help with relieving cough and nasal congestion. Mints belong to the genus *Mentha*, in the family Lamiaceae. The four most commonly cultivated species are: Japanese Mint/Menthol Mint (*M. arvensis*), Peppermint (*M. piperita*), Spearmint (*M. spicata*) and Bergamot mint (*M. citrata*), out of which the Japanese Mint, yielding menthol is grown extensively in northern India. The oil has a bitter cooling taste, harsh odour and is the principal source of menthol.

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Tulsi belong to the genus *Ocimum*, in the family Lamiaceae. Tulsi has great medicinal value. Traditionally, Tulsi is taken in many forms as herbal tea, dried powder, fresh leaf, or mixed with ghee. It is very effective against indigestion, headache, hysteria, insomnia and cholera.

Materials and Methods

The present experiment "Studies on Physico-Chemical Properties of Aonla (*Emblica officinalis* Gaertn.) Jam Blended with Leaf Extract of Lemon Grass, Pudina and Tulsi" was conducted with the objective of assessing the chemical changes in aonla jam during a storage period of 100 days during 2014-15. Twenty kg healthy, uniform sized, fully ripened, mature, fresh and sound fruits, free from disease, pests and bruise was brought from the orchard of the Department of Horticulture, Sam Higginbottom University of Agriculture Technology & Sciences (Deemed-to-be-University) Allahabad. All other necessary requirements for experiment were available locally.

Table 1: Experimental Details

Place	Post Harvest Lab, Department of Horticulture, Shuats, Allahabad, U.P
Crop	Aonla
Cultivar	Narendra Aonla (NA-7)
Herbal Extracts Used for Value Addition	Lemon grass, Pudina, Tulsi
Design	Completely Randomized Design (C.R.D.)
Product	Aonla Jam
No. of Treatment	10
No. of Replication	3

Table 2: Treatment Details with Storage Period

Jam	Storage period (days)				
	0	25	50	75	100
T ₀ (Control)	0	25	50	75	100
T ₁ Extract of Lemon grass (0.5%)	0	25	50	75	100
T ₂ Extract of Lemon grass (1.0%)	0	25	50	75	100
T ₃ Extract of Lemon grass (1.5%)	0	25	50	75	100
T ₄ Extract of Pudina (0.5%)	0	25	50	75	100
T ₅ Extract of Pudina (1.0%)	0	25	50	75	100
T ₆ Extract of Pudina (1.5%)	0	25	50	75	100
T ₇ Extract of Tulsi (0.5%)	0	25	50	75	100
T ₈ Extract of Tulsi (1.0%)	0	25	50	75	100
T ₉ Extract of Tulsi (1.5%)	0	25	50	75	100

Observations to be recorded

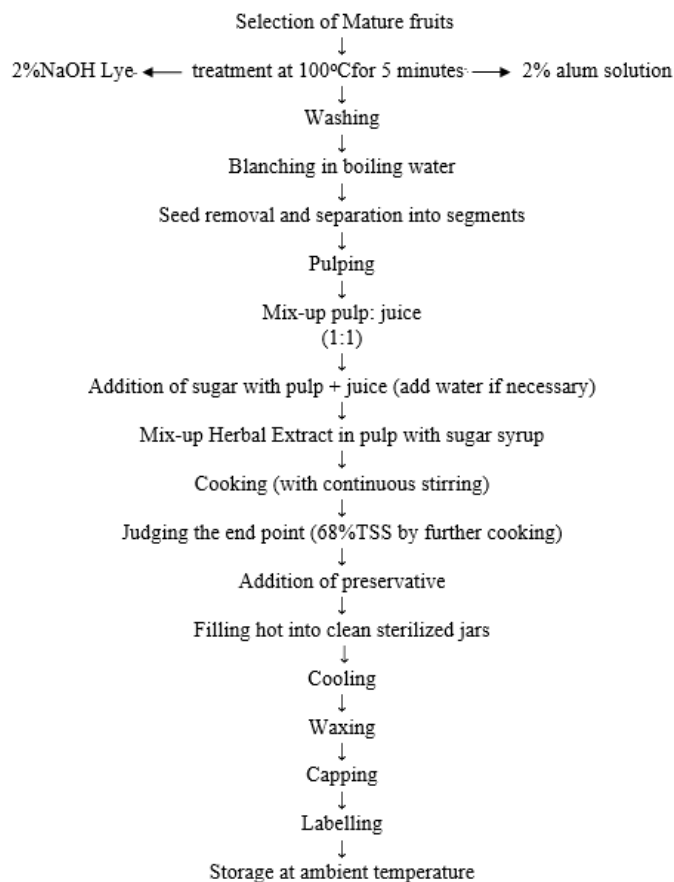
Quality parameters

1. TSS
2. Acidity
3. Vitamin C (mg/100g.)
4. pH
5. Browning (OD)

Statistical Analysis

Experiments were conducted in simple Completely Randomized Design (C.R.D.). The data recorded during the course of investigation on quality parameters of fresh product during storage were statistically analyzed by adopting Analysis Of Variance (ANOVA) techniques as described by Panse and Shukhatme^[6]. The treatment difference was tested by 'F' test of significance on the basis of null hypothesis. The appropriate standard error (S.Em.±) was calculated in each case. The critical difference (C.D.) at 5 percent level of probability was worked out.

Flow Chart for the Process of Aonla Jam Preparation



Results and Discussion

In present study changes in total soluble solids (TSS), acidity, vitamin C, pH and browning in aonla jam blended with lemon grass, pudina and tulsi during 100 days storage period have been presented in Tables 3 and 4.

Total Soluble Solids (TSS)

Data regarding the changes in TSS content of aonla jam blended with leaf extract of lemon grass, pudina and tulsi was influenced by various treatments during 100 days storage period have been presented in Table 3. The data clearly revealed that there is a gradual increase in TSS with increase in storage period. After 100 days of storage maximum TSS was recorded in T₉ (Tulsi 1.5%) 68.47 followed by T₈ (Tulsi 1.0%) 68.37 and minimum TSS was found in T₀ (Control) 68.12. This might be due to hydrolysis of polysaccharides into monosaccharide and oligosaccharides. This finding agreed with the findings of Alvarez *et al.*^[7] in effect of temperature on rheological properties of different jams and Manivasagan *et al.*^[8] in Qualitative changes in Karonda (*Carissa carandas* Linn.) candy during storage at room temperature.

Ascorbic Acid

Data regarding the changes in Ascorbic acid content of aonla jam blended with leaf extract of lemon grass, pudina and tulsi was influenced by various treatments during 100 days storage period have been presented in Table 3. The data shows that, with advancement of storage period, ascorbic acid content shows a decline trend. This may be caused by oxidation of ascorbic acid which gets converted to dehydro-ascorbic acid with passage of time. The maximum ascorbic acid content was noted in T₉ (Tulsi 1.5%) 111.96 followed by T₃ (Lemon

grass 1.5%) 111.36 and minimum ascorbic acid content was noted in T₀ (Control) 110.03. Similar results were reported by Choudhary *et al.*^[9] in aonla nectar stored at room temperature for 240 days and Vikram *et al.*^[10] in aonla herbal jam stored for eight months at ambient temperature.

Acidity

Data regarding the changes in Acidity content of aonla jam blended with leaf extract of lemon grass, pudina and tulsi was influenced by various treatments during 100 days storage period have been presented in Table 3. The data shows that, there was a significant increase in acidity content during storage. Highest acidity was recorded in T₀ (Control) 0.576 while lowest was observed in T₉ (Tulsi 1.5%) 0.542. Degradation of pectin substances into soluble solids might have contributed towards an increase the acidity of the product. Similar results were reported by Castello *et al.*^[11] in changes in respiration rate and physical properties of strawberries due to osmotic dehydration and storage and Nath *et al.*^[12] evaluation of aonla cultivars for their shelf life at ambient temperature.

pH

Data regarding the changes in pH of aonla jam blended with leaf extract of lemon grass, pudina and tulsi was influenced

by various treatments during 100 days storage period have been presented in Table 4. It was noticed that there was declining trend in pH values of the product which might be due to increase in acidity content. After 100 days of storage, highest pH value in T₉ (Tulsi 1.5%) 3.59 and lowest pH value in T₀ (Control) 3.43 was recorded. The data recorded on pH value in present study is in close conformity to the findings of Dervisi *et al.*^[13] in high pressure processing in jam manufacture effects on textural and colour properties.

Browning

Data regarding the changes in browning of aonla jam blended with leaf extract of lemon grass, pudina and tulsi was influenced by various treatments during 100 days storage period have been presented in Table 4. The data shows that, there was a significant increase in browning with the advancement in storage duration. Maximum browning was noted in T₄- (pudina 1.5%) 0.31 and minimum browning was noted in T₉ (Tulsi 1.5%) 0.25. This might be due to condensation of tannins to brown pigments. Similar findings have been confirmed by Damame *et al.*^[14] in aonla preserve stored at room temperature; Nayak *et al.*^[15] evaluated aonla segments-in-syrup prepared from stored fruits and Tandon *et al.*^[16] in aonla candy stored for nine months under ambient temperature.

Table 3: Effect of treatments on physicochemical properties (TSS, Ascorbic acid and Acidity) of Aonla Jam (2014-15)

Total Soluble Solids (TSS)						Ascorbic Acid						Acidity								
Treatments	Storage Period (Days)					Mean	Treatments	Storage Period (Days)					Mean	Treatments	Storage Period (Days)					Mean
	0	25	50	75	100			0	25	50	75	100			0	25	50	75	100	
T ₀	67.383	68.120	68.250	68.320	68.483	68.12	T ₀	119.103	113.573	110.340	106.573	100.597	110.03	T ₀	0.564	0.571	0.577	0.580	0.586	0.576
T ₁	67.390	68.160	68.320	68.347	68.520	68.14	T ₁	119.253	115.207	111.360	106.337	100.633	110.56	T ₁	0.549	0.556	0.558	0.565	0.571	0.559
T ₂	67.717	68.210	68.350	68.367	68.553	68.24	T ₂	119.640	115.273	111.413	106.397	101.180	110.78	T ₂	0.538	0.545	0.550	0.558	0.567	0.552
T ₃	67.380	68.230	68.490	68.343	68.563	68.20	T ₃	119.737	116.393	112.453	106.437	101.797	111.36	T ₃	0.554	0.565	0.571	0.577	0.582	0.569
T ₄	68.020	68.140	67.920	68.447	68.593	68.22	T ₄	119.580	114.413	111.580	107.273	101.260	110.82	T ₄	0.557	0.561	0.566	0.570	0.575	0.566
T ₅	68.013	68.150	68.280	68.513	68.687	68.33	T ₅	119.310	114.193	111.437	106.220	101.393	110.51	T ₅	0.549	0.555	0.558	0.563	0.571	0.559
T ₆	68.040	68.190	68.340	68.427	68.637	68.33	T ₆	119.293	115.227	111.387	106.467	101.267	110.72	T ₆	0.545	0.549	0.553	0.558	0.566	0.554
T ₇	68.020	68.170	68.320	68.440	68.593	68.30	T ₇	119.340	115.087	112.240	107.163	101.700	111.10	T ₇	0.543	0.548	0.553	0.556	0.567	0.553
T ₈	68.033	68.210	68.420	68.553	68.647	68.37	T ₈	119.573	115.240	112.387	107.393	101.747	111.27	T ₈	0.538	0.542	0.549	0.552	0.540	0.544
T ₉	68.060	68.250	68.540	68.653	68.893	68.47	T ₉	120.453	116.773	112.623	107.627	102.320	111.96	T ₉	0.534	0.538	0.542	0.547	0.550	0.542
Mean	67.81	68.183	68.323	68.441	68.62		Mean	119.53	115.14	111.72	106.79	101.39		Mean	0.547	0.553	0.557	0.562	0.567	
F-test	S	S	S	S	S		F-test	S	S	S	S	S		F-test	S	S	S	S	S	
S.Ed (±)	0.535	0.016	0.020	0.067	0.078		S.Ed (±)	0.016	0.029	0.009	0.010	0.014		S.Ed (±)	0.005	0.004	0.005	0.006	0.020	
C.D. at 5%	0.255	0.034	0.042	0.032	0.037		C.D. at 5%	0.018	0.056	0.017	0.024	0.026		C.D. at 5%	0.002	0.003	0.003	0.003	0.009	

Table 4: Effect of treatments on physicochemical properties (pH and Browning) of Aonla Jam (2014-15)

pH						Browning							
Treatments	Storage Period (Days)					MEAN	Treatments	Storage Period (Days)					MEAN
	0	25	50	75	100			0	25	50	75	100	
T ₀	3.450	3.440	3.430	3.420	3.390	3.43	T ₀	0.220	0.230	0.250	0.280	0.320	0.26
T ₁	3.510	3.510	3.500	3.480	3.480	3.49	T ₁	0.260	0.270	0.270	0.300	0.330	0.29
T ₂	3.560	3.560	3.550	3.540	3.530	3.55	T ₂	0.250	0.260	0.260	0.280	0.300	0.27
T ₃	3.590	3.590	3.580	3.570	3.560	3.58	T ₃	0.240	0.250	0.240	0.260	0.280	0.25
T ₄	3.500	3.500	3.490	3.470	3.470	3.48	T ₄	0.270	0.280	0.310	0.340	0.370	0.31
T ₅	3.520	3.510	3.500	3.490	3.490	3.50	T ₅	0.250	0.260	0.280	0.310	0.350	0.29
T ₆	3.540	3.540	3.530	3.510	3.460	3.52	T ₆	0.250	0.260	0.270	0.290	0.330	0.28
T ₇	3.530	3.530	3.520	3.510	3.480	3.51	T ₇	0.240	0.250	0.290	0.310	0.340	0.29
T ₈	3.580	3.570	3.560	3.550	3.540	3.56	T ₈	0.240	0.250	0.263	0.290	0.320	0.27
T ₉	3.600	3.600	3.590	3.580	3.570	3.59	T ₉	0.230	0.230	0.260	0.280	0.310	0.25
Mean	3.54	3.54	3.53	3.51	3.49		Mean	0.245	0.25	0.27	0.25	0.33	
F-test	S	S	S	S	S		F-test	S	S	S	S	S	
S.Ed (±)	0.25	0.30	0.34	0.43	0.46		S.Ed (±)	0.003	0.005	0.016	0.018	0.024	
C.D. at 5%	0.52	0.60	0.75	0.86	0.97		C.D. at 5%	0.005	0.010	0.036	0.024	0.053	

Conclusion

On the basis of results obtained from this study it may be concluded that T₉ (Tulsi 1.5%) was most suitable treatment in terms of their chemical properties and can be used in commercialization of Aonla jam.

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