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Post harvest physiological studies in aonla

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Abstract

The experiment was laid in a Factorial Completely Randomized Design with six replications. The plots had four treatments viz., T₁- 0 day, T₂- 4 days, T₃- 8 days, T₄-12 days, T₅-16 days. The varieties BSR 1, NA7, Kanchan and Chakaiya were used as experimental material with all normal cultural practices followed for aonla cultivation during 2023-2024. The post-harvest physiological studies like., TSS (°Brix) acidity (pH) ascorbic acid content (mg/100 g pulp) physiological loss in weight (%) and percentage in decay loss were recorded. The Aonla variety BSR 1 registered highest mean TSS (12.33°Brix), Acidity (3.33%), Ascorbic acid (561.13 mg/100 g), lowest mean Physiological loss in weight (5.29%) at 16 days storage period and lesser percent decay loss (19.85%).

Keywords: TSS, acidity, PWL, post-harvest studies, physiological parameters, aonla

Introduction

The Indian gooseberry (*Emblica officinalis* Gaertn. Syn. *Phyllanthus emblica*) is a member of the Euphorbiaceae family and is known as Aonla in India. It is rich source of vitamin C and its ascorbic acid level is second only to the Barbados cherry (Chadha, 2002) [9]. Due to its highly acidic and astringent nature, consumers do not prefer this fruit in its natural state, thus it is usually eaten in processed forms such as jam, jelly, murabba, candy, pickles, herbal jam, sauce, and so forth (Singh, 2014) [3]. It is commercially utilised to make ayurveda tonics such as Chavyanprash and triphala (Goyal *et al.*, 2007 and Singh *et al.*, 2012) [8, 10]. Aonla fruits are highly perishable and difficult to store or transport across long distances. As a result, it requires quick marketing and utilization. It becomes necessary to keep the fruits for a long time in order to get a decent return and avoid market glut. The shelf life of aonla fruits could be extended by reducing the respiration rate, water loss through transpiration (Dhumel *et al.*, 2008) [2] and limiting various post-harvest diseases mainly blue mould (*Penicillium citrinum*) and other diseases caused by Rhizopus, Aspergillus and *Syncephalastrum racemosum* (Singh *et al.*, 2005) [5]. Plant growth regulators and certain chemicals play a vital role for short period storage. (Dhumel *et al.*, 2008) [2]. To combat post-harvest losses in perishable commodities such as aonla, the current study looked into the post harvest studies on the physiological parameters of aonla fruits during different days after storage period.

Materials and Methods

Site of study: Fresh fruits of aonla cv. BSR1, NA7, Kanchan and Chakaiya of uniform shape, size, colour and free from bruises were harvested from regional research Station, Aruppukottai research field trial (Field Number B1) at the physiological mature stage during the morning hours and brought to the laboratory immediately and further investigation was carried out in Laboratory, Regional research Station, Aruppukottai during 2022 to 2024.

Treatments and methods of analysis: The selected fruits were stored in the room temperature. The experiment was laid in a Factorial Completely Randomized Design with six replications. The plots had five treatments viz., T₁- 0 day, T₂- 4 days, T₃- 8 days, T₄-12 days, T₅-16 days. All the parameters were analysed at an intervals of 0 days up to 16 days. The physiological loss in weight was calculated by the following formula.

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$$PLW (\%) = \frac{\text{Initial weight (g)} - \text{final weight (g)}}{\text{Initial weight (g)}} \times 100$$

Decay loss (%) of fruits was evaluated on the basis of visual observations by counting the number of spoiled fruits displaying fungal infection and subsequent rotting in a replication and expressed in percentage. The change in colour during the storage period was determined on visual basis.

Statistical analysis: The experiment was carried out in Factorial Completely Randomized Design with six replications for

analysis of variance (ANOVA). The data were analysed with the help of OPSTAT statistical software.

Results and Discussion

The data on TSS ($^{\circ}$ Brix) were recorded in four varieties in different days interval at ambient temperature. Comparing the four varieties, BSR1 had higher TSS mean values 12.33° Brix, which was followed by NA7 10.45° Brix than the other Aonla varieties. The Lowest TSS mean values registered in Kanchan 8.29° Brix.

Table 1: Varietal variation in TSS ($^{\circ}$ Brix) of aonla fruits at ambient temperature

Varieties	0 days	4 days	8 days	12 days	16 days	Mean
BSR 1	11.85	12.09	12.33	12.57	12.83	12.33
NA 7	10.04	10.24	10.44	10.65	10.86	10.45
KANCHAN	7.97	8.13	8.29	8.46	8.63	8.29
CHAKAIYA	8.77	8.94	9.12	9.30	9.49	9.13
Mean	9.66	9.85	10.05	10.25	10.45	
SEd			CD (0.05)			
V	0.09812		V		0.19831	
D	0.10970		D		0.22171	
V x D	0.21940		VxD		0.44343	

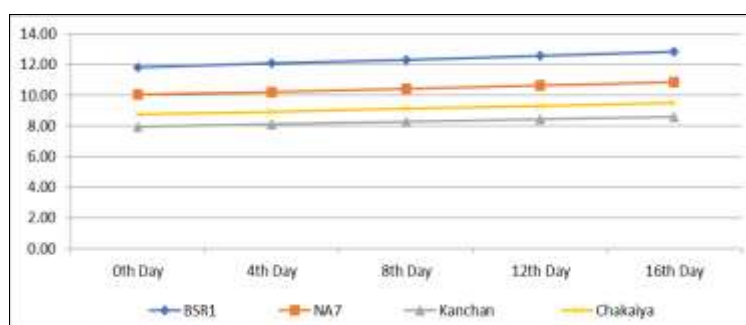


Fig 1: Varietal variation in TSS ($^{\circ}$ Brix) of aonla fruits at ambient temperature

Table 2: Varietal variations in acidity (pH) of aonla fruits at ambient temperature

Varieties	0 days	4 days	8 days	12 days	16 days	Mean
BSR 1	3.20	3.26	3.33	3.39	3.47	3.33
NA 7	2.71	2.76	2.82	2.87	2.94	2.82
KANCHAN	2.15	2.20	2.24	2.28	2.34	2.24
CHAKAIYA	2.36	2.42	2.46	2.51	2.56	2.46
Mean	2.61	2.66	2.71	2.76	2.83	
SEd			CD (0.05)			
V	0.02434		V		0.04919	
D	0.02721		D		0.05499	
V x D	0.05442		V x D		0.10998	

The result on acidity was recorded in four varieties in different days interval at ambient temperature. Among the different aonla varieties BSR1 maintained its superiority in acidity (pH) 3.47

followed by NA7 2.94 at 16 days storage period. The Lowest acidity values registered in chakaiya 2.34 at 16 days storage period.

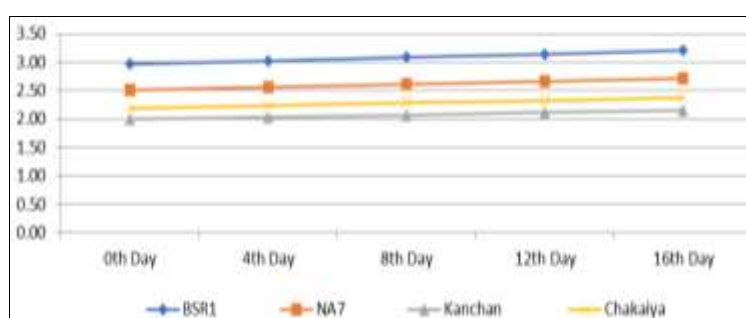


Fig 2: Varietal variations in acidity (pH) of aonla fruits at ambient temperature

Table 3: Varietal variations in ascorbic acid content (mg/100 g pulp) of aonla fruits at ambient temperature

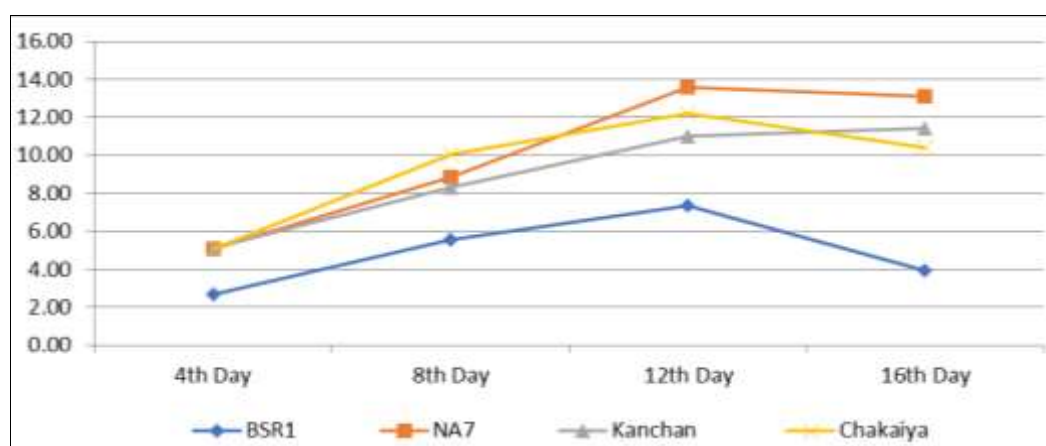
Varieties	0 days	4 days	8 days	12 days	16 days	Mean
BSR 1	601.47	589.47	571.74	543.20	499.75	561.13
NA 7	512.57	502.31	487.19	462.89	425.84	478.16
KANCHAN	469.80	460.50	446.65	424.25	390.39	438.32
CHAKAIYA	508.42	498.28	483.28	459.11	422.43	474.3
Mean	523.07	512.64	497.22	472.36	434.6	
SEd			CD (0.05)			
V	4.50735			V	9.10989	
D	5.03937			D	10.18517	
VxD	10.07875			VxD	20.37034	

The result on ascorbic acid content (mg/100 g pulp) was recorded in four varieties in different days interval at ambient temperature. Comparing the four varieties BSR1 registered higher Ascorbic acid content 499.75 mg / 100 g pulp, which was

followed by NA7 (425.84 mg / 100 +g of pulp) at 16 days storage period. The Lowest ascorbic acid content registered in Kanchan 390.39 mg / 100 g of Pulp at 16 days storage period.

Table 4: Varietal variation in physiological loss in weight (%) of aonla fruits at ambient temperature

Varieties	0-4 days	5-8 days	9-12 days	13-16 days	Mean
BSR 1	2.90	6.03	7.95	4.26	5.29
NA 7	5.46	9.58	14.67	14.15	10.97
KANCHAN	5.58	8.99	11.91	12.33	9.7
CHAKAIYA	5.46	10.82	13.16	11.20	10.16
Mean	4.85	8.86	11.92	10.49	
SEd			CD (0.05)		
V	0.13109		V	0.26702	
D	0.13109		D	0.26702	
V x D	0.26217		VxD	0.53404	

**Fig 3:** Varietal variation in physiological loss in weight (%) of aonla fruits at ambient temperature

The post harvest studies on physiological loss in weight (%) were recorded in four aonla varieties. Among the different aonla varieties BSR1 registered less mean physiological loss in weight (4.26) than other aonla varieties at 16 days storage period. These results were in accordance with the report of Singh *et al.*, 2014^[3] and Neeraj *et al.*, 2002 stated that, the increased physiological weight loss in fruits must be due to various physiological

mechanisms such as upsurged respiration and transpiration rate. Among the different aonla varieties BSR1 registered less mean physiological loss in weight (4.26) which might be due to characteristics by limiting the disintegration of cytoplasmic membranes, mitochondria and endoplasmic reticulum, which results into enhancement of shelf life of aonla (Dhumal *et al.*, 2008)^[7].

Table 5: Varietal variation (%) in decay loss of aonla fruits at ambient temperature

Varieties	1-4 days	1-8 days	1-12 days	1-16 days
BSR 1	0.00	8.86	19.85	100
NA 7	0.00	17.06	34.99	100
KANCHAN	0.00	17.74	34.08	100
CHAKAIYA	0.00	9.93	20.76	100
Mean	0.00	13.4	27.42	100
SEd		CD (0.05)		
V	0.66425		V	1.35307
D	0.66425		D	1.35307
V x D	1.32850		VxD	2.70615

Among the Aonla varieties NA7 registered higher percent decay loss (34.99%) than other Aonla varieties at 12 days storage period. The Lowest percent decay loss registered in BSR 1 (19.85%). This is because BSR1 variety resistance against pathogens like fungi which are causative factors for rotting of fruits and in maintaining the cell wall integrity and maintain the shelf life of fruits for longer period (Lodhi and Tiwari, 2017) ^[1].

Conclusion

From the present investigation, it can be concluded that, the Aonla variety BSR 1 registered highest mean TSS (12.33°Brix), Acidity (3.33%), Ascorbic acid (561.13 mg/100 g), lowest mean Physiological loss in weight (5.29%) at 16 days storage period and lesser percent decay loss (19.85%).

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