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EFFECT OF STORAGE ENVIRONMENT ON SHELF LIFE OF AONLA CV. NA-7

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ABSTRACT: For combating the glut at peak harvest it is imperative to improve the storage life of aonla fruit. The object of the present study was to evaluate the effect of packaging and storage environment at ambient temperature as well as under refrigeration for conservation of aonla fruits cv.NA-7. The treatment comprised thermocol bowls, perforated polythene bags, cardboard, wooden boxes, perforated plastic crates, earthen pots, gunny bags, refrigerator and control. Storage under refrigerator was found most effective in retaining relatively superior skin colour, minimizing PLW and pathological losses and conserving Vitamin 'C' and acidity contents in aonla fruits. Reduction was noticed in the metabolital status i.e. TSS and sugars when compared with the storage under rest of the packaging and environmental conditions obviously due to moisture loss at ambient temperature. The higher spoilage occurred mainly due to black mould.

Keywords: *Aonla, storage conditions, shelf life.*

Aonla is very important fruit in tropical and subtropical regions of India. It has a high adaptability to extreme climatic conditions and salt tolerance. The unique characteristics has made it the choice tree for wasteland which spreads into thousand of hectares. It is also an important ingredient of *Triphla*, *Chawanprash, Amritkalash*, Netutrale etc. Fruits are commonly used for preserve, pickle, candy, jelly, dried chips etc and richest source of vitamin 'C'. Dalal *et al*. (4) pointed out that fermented liquor prepared from fruits is used in dyspepsia and cough. With a little care aonla tree gives a good crop and after harvest there is a glut in the market and serious losses occur if the fruits are stored.

Losses in fruit weight, decay and nutritional quality during storage are some major hurdles of aonla industry. Besides, pathological losses in fruits start after harvesting and spoilage mainly occur due to moulds (Setty, 9). Therefore, a systematic study on shelf life and storage stability of aonla fruits become imperative.

MATERIALS AND METHODS

Healthy, firm, mature and uniform fruits of aonla cv NA-7 were procured from the Horticulture Garden of College of Horticulture, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur on December 8, 2012. Physico-chemical analysis was carried out at the Post Harvest Laboratory of Fruit Science. Selected fruits were cleaned removing dust and surface moisture and stored under different packaging and storage conditions. Thus, there were 9 treatments viz., thermocol bowls, perforated plastic crates, card board, wooden boxes, perforated polythene bags, earthen pots, gunny bags, refrigerator and control. The trial was conducted in a complete Randomized Block Design replicating thrice.

Out of 2 kg fruits under each treatment, 5 fruits were drawn from each treatment on the time of storage and subsequently at 1,2,3 and 4 week interval for physio-chemical examination. The fruits were evaluated for PLW, TSS, reducing sugar, ascorbic acid, acidity contents and pathological losses. TSS was recorded with the help of a hand refractometer and sugars were estimated as per Ranganna (8) and acidity and ascorbic acid as per AOAC (1).

RESULTS AND DISCUSSION

Data depicted in Table 1 clearly indicated that storage environments had significant effect on PLW, reducing and non reducing sugar, acidity, ascorbic acid, TSS contents and pathological losses in aonla fruits during storage. Fruit weight under refrigerator was less affected and expressed 32.76 g weight of individual fruit against 33.12 g recorded for fresh ones. Four weeks after storage refrigerator showed 1.05% loss followed by storage under gunny begs (2.14%) and perforated plastic crates (2.29%). Storage under thermocol bowls exhibited the maximum PLW (7.40%). Physiological loss in aonla fruits stored under different packing and environmental condition gradually increased 2

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Table 1 : Physiological and pathological losses during storage of aonla cv. NA-7.

Weeks after storage	Control	Thermocol bowls	Perforated polythene bags	Card board	Wooden boxes	Perforated plastic crafts	Earthen Pots	Gunny bags	Refrigerator	CD (P= 0.05)
Physiological loss of weight (%)										
2	3.62	4.68	1.20	1.70	1.50	1.08	3.92	0.99	0.51	0.029
3	4.07	5.74	2.53	3.17	2.95	2.17	4.53	1.75	0.78	
4	5.40	7.40	3.25	4.04	3.32	2.29	7.39	2.14	1.08	
TSS content (^{0}Brix)										
2	6.58	6.85	6.43	6.60	6.50	6.35	6.80	6.20	6.10	0.031
3	7.13	7.60	6.68	6.95	6.80	6.55	7.50	6.35	6.20	
4	7.53	8.00	6.83	7.45	7.00	6.70	7.80	6.55	6.30	
Reducing sugar (%)										
2	0.22	0.26	0.15	0.20	0.17	0.06	0.24	0.03	0..01	0.018
3	0.67	0.71	0.30	0.50	0.35	0.17	0.69	0.08	0.03	
4	1.03	1.05	0.43	0.81	0.61	0.28	1.04	0.15	0.05	
Non- reducing sugar (%)										
2	0.16	0.25	0.06	0.13	0.07	0.02	0.20	0.01	0.01	0.020
3	0.23	0.32	0.12	0.22	0.15	0.05	0.27	0.03	0.02	
4	0.4	0.47	0.17	0.29	0.23	0.10	0.45	0.05	0.03	
Ascorbic acid (mg/100 mg)										
2	517.2	500.2	540.5	530.4	539.7	518.9	515.7	523.7	538.1	1.282
3	505.4	480.7	520.5	515.4	529.5	515.5	495.6	520.0	534.8	
4	480.4	470.1	505.5	490.9	500.3	510.3	482.3	515.4	530.2	
Acidity content (%)										
2	1.47	1.46	1.47	1.47	1.48	1.48	1.47	1.49	1.49	0.167
3	1.45	1.43	1.46	1.45	1.46	1.47	1.45	1.48	1.49	
4	1.43	1.41	1.45	1.43	1.44	1.46	1.42	1.47	1.48	
Pathological losses (%)										
2	2.35	7.10	0.0	3.15	2.47	0.0	2.90	0.0	0.0	0.043
3	5.71	9.81	3.52	4.28	3.42	2.35	6.35	2.15	1.20	
4	12.25	13.10	5.35	6.25	5.90	5.15	12.71	3.40	2.15	

Table 2: Effect of storage conditions on the pathological losses and infestation due to different fungus on aonla cv. NA-7 at subsequent stages of storage.

Treatment	Fruits spoiled (%)			Extent of loss due to		
	2 WAS	3 WAS	4 WAS	*Penicilium inlandicum* (%)	*Aspergillus niger* (%)	*Glomerella cingulata* (%)
Control	2.35	5.71	12.25	8.57	2.45	1.23
Thermocol bowls	7.10	9.81	13.10	8.78	2.62	1.7
Perforated Polythene bags	-	3.52	5.35	3.64	1.35	0.37
Card board	3.15	4.28	6.25	5.31	0.56	0.38
Wooden boxes with rice straw	2.47	3.42	5.90	4.72	0.71	0.47
Perforated plastic crates	-	2.35	5.15	4.48	0.41	0.26
Earthen pots	2.90	6.35	12.71	11.18	0.89	0.64
Gunny bags	-	2.15	3.40	2.79	0.34	0.27
Refrigerator	-	1.20	2.15	1.72	0.28	0.15
CD (P=0.05)	0.043					

*WAS–Weeks after storage.

weeks after storage and prior to it there was practically no loss in this respect. Loss in PLW may be attributed to the shrinkage of fruit due to moisture loss owing to respiration and evaporation particularly at ambient temperature. Similar observations have been reported by Chandra *et al*. (3) and Kumar *et al*. (5) in guava. The normal change in fruits cannot be stopped during storage and fruit deteriorate until loss in quality is perceptible. Dalal *et al.* (4) considered 10% weight

loss as a parameter for economic storage life of fruits.

In the present investigation, there was no any change in the TSS content of aonla fruits irrespective of the treatments upto first week of storage but there after gradual change occurred. Storage under thermocol bowls maximized the TSS content showing 8.0^0 Brix against 6.10^0B noted in fresh fruits. There was, thus, a total increase of 1.90^0B at the expiry of the investigation. Other storage conditions i.e., earthen pots and control also enhanced the metabolic activities causing increase to the tune of 1.70 and 1.50^0B. These variations are obviously due to relatively greater loss in the moisture content. Storage under refrigerator, however, did not being considerable variation showing an increase of 0.30^0Brix. Gradual increase in TSS in the present studies might be ascribed to slow PLW. However, the improvement in metabolital status during storage may be attributed to conversion of starch and polysaccharides into soluble sugar. The findings are in accordance with the reports of Kumar *et al.* (5) in guava and Neeraj *et al*. (7) in aonla.

Ascorbic acid as well as acidity contents of aonla fruit deteriorated gradually with advancing period of storage. The maximum decrease recorded under thermocol bowls, earthen pots and control. These reductions might be associated with the conversion of organic acids into sugar and their derivatives and their utilization in respiration which usually happen with high respiration rate of fruits. Similarly the decrease in ascorbic acid may be attributed to the oxidation of Vitamin 'C' during storage. The loss in ascorbic acid has also been reported by Singh *et al.* (10) in anola and Attri and Singh (2) in guava.

Pathological losses in the present studies were observed from the second week of storage under some of the materials after 3 weeks of storage, however, fungal infestation were noticed under all the treatments (Table 2). It increased further with varying degree of infestation under all the packing and storage environments at the final observation i.e. 4 weeks after storage. Thermocol bowls, earthen pots and control expressed the poor storability showing greater severity of infestation, whereas, minimum pathological loss to the tune of 2.15% occurred under refrigeration followed by gunny bags (3.40%). When the exten of pathological losses were examined, it was due to P*enicillium-islandicam*, *Aspergillus niger* and *Glomerella cingulata* and the extent of damage due to these fungus ranged from 1.7-8.78%, 0.28-2.62% and 0.15-1.7%, respectively. Thus the spoilage was mainly due to black mould (P*enicillium-islandicam)* followed by Black mould *Aspergillus niger* and G*lomerella cingulata*. The findings of the present investigation are in agreement with the reports of Neeraj *et al*. (7) and Meena *et al.* (6) in aonla.

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