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STORAGE STUDIES ON POMEGRANATE *CV.* BHAGWA ARILS AS INFLUENCED BY VARIOUS TREATMENTS

D. Ramesh Naik*, D. Manohar Prasad[1], Veena Joshi, A.S. Padmavathamma and C. Syamraj Naik[2]

*Department of Fruit Science, Dr.Y.S.R. Horticultural University, Hyderabad, India
[1]Post Harvest Technology Research Station, Rajendranagar, Hyderabad, India
[2]Department of Crop Physiology, Acharya N.G. Ranga Agricultural University, Hyderabad, India

Abstract

Pomegranate *cv.* Bhagwa arils washed with antioxidants (chlorinated water plus ascorbic acid and chlorinated water plus citric acid) and then packed in packaging material (80, 150 guage of Polypropylene bags) and stored at 5°C &, 15°C. Arils treated with chlorinated water 200 ppm plus ascorbic acid 5000 ppm and then packed in Polypropylene bags with 150 guage stored at 5°C recorded significantly lower PLW than unpacked arils. The highest Hunter color Lab values (L*, a* & b*), lowest spoilage and correspondingly increased the shelf life up to 14.39 days stored at 5°C, 4.54 days stored at 15°C were recorded in arils treated with 200 ppm plus ascorbic acid 5000 ppm, packed in Polypropylene bags with 80 guage stored at 5°C. Unpacked arils recorded a shelf life of 4.58 days stored at 5°C and 3.99 days stored at 15°C. Arils treated with chlorinated water 200 ppm plus ascorbic acid 5000 ppm then packed in Polypropylene bags with 80 guage stored at 5°C was found to be superior for organoleptic attributes.

Key words: arils, storage temperatures, shelf life, organoleptic evaluation

Introduction

In recent years minimally processed fruits and vegetables have received tremendous attention by the consumers. Such 'ready to use' crops consist of washed, peeled, sliced or shredded raw vegetables and usually they are packed in plastic bags and stored at low temperatures to prolong the shelf life. Minimally processed fruit and vegetables are perishable than fresh produce as a consequence of tissue damage resulting from processing operations, wounding in fact, leads to increases in respiration and ethylene production rates, alters metabolic activity, increases the rate of nutritional and sensory attributes breakdown and notably reduces shelf-life. In addition, mechanical damages may enhance susceptibility to decay and pathogenic infections that are toxic to consumers (Brecht, 1995).

In Pomegranate (*Punica granatum* L.) arils are the edible part of the fruit, Which constitutes 52 per cent of total fruit weight (w/w), comprising 78 per cent juice and 22 per cent arils (Kulkarni and Aradhya, 2005). Pomegranate arils are rich in vitamin C, vitamin K, antioxidants and polyphenols such as tannins, quercetin and anthocyanins which are good for heart and have anti-cancer properties (Seeram *et al*., 2006; Adams *et al*., 2006) and arils are recognised for their typical characteristics of reddish pigment due to the presence of anthocyanins, which are known to have important therapeutic properties to human health (Surh, 2003).

Pomegranate consumption is limited due to difficulty in peeling to obtain the arils. Presenting pomegranate arils in 'ready-to-eat' form would be a convenient and desirable alternative to encourage the consumption of fresh fruits and may also help to the demand for increase pomegranate cultivation. Minimally processed pomegranate arils have less post-harvest life and arils washed with antioxidants *viz.,* citric acid, ascorbic acid helps to prevent microbial development (Sepulveda *et al*., 2001). Lack of appropriate information regarding minimally processed pomegranate arils for quality exports led to the development of appropriate technologies to orient for export of arils from the state of Telangana.

***Author for correspondence :** E-mail : naik.ramesh766@gmail.com

However, little work has been done so far on washing of pomegranate arils, packaging and studies on storage temperatures. Therefore a collaberative study has been undertaken to find out the combined effect of washing treatments and packaging and storage temperatures on shelf life and organoleptic evaluation of minimally processed pomegranate aril cv. Bhagwa.

Materials and Methods

The present experiment was carried out at college of Horticulture in collaboration with Post Harvest Technology Research Station, SKLTSHU, Rajendranagar, Hyderabad. The experiment was conducted by washing the minimally processed pomegranate arils with antioxidants *viz.*, sodium hypochlorite (SH) 200 ppm, ascorbic acid (AA) and citric acid (CA) having treatments and then packed in polypropylene bags then stored at low temperatures 5^0C and 15^0C with the experimental design was complete randomized block design with factorial concept and replicated thrice.

Two washing treatments were tested including distilled water, SH and solutions of AA and CA. After peeling, seeds were divided into uniform groups (120 g) and each were dipped in 5 L of appropriate solution. Washing treatments were carried out at 23^0C. Arils were dipped in sodium hypochlorite 200 ppm for 5 min followed by dipping for 30 sec. in a solution of AA 5000 ppm and CA 5000 ppm and then arils were air dried for 30 min at 23^0C to remove residual water and then they were packed in polypropylene bags before analysis. The following parameters were analysed.

Physiological loss in weight (%):

Physiological loss in weight of the arils was recorded on every 3 days and subtracted from the initial weight. The mean loss of weight in grams in relation to initial weight was calculated and expressed as percentage. The number of fruit arils spoiled in each replication were counted and expressed in percentage.

Spoilage (%):

The spoilage was determined based shrivelling and fungal infection and subsequent rotting of the arils.

Shelf Life:

The shelf life of arils was determined by recording the number of days the arils remained in good condition in storage. The stage wherein more than 5 per cent of the stored arils became unfit for consumption was considered as end of shelf life in that particular treatment and expressed as mean number of days.

Colour of arils:

The colour of the arils in each replication were instrumentally determined by using a colorometric spectrophotometer (Model: colorflex, Hunter lab, West Virginia, USA) and expressed in Hunter scale (L*, a* and b*).

Organoleptic evaluation:

Sensory evaluation was done by panel of 15 personnel of both the genders at College of Horticulture and Post Harvest Technology Research Station for standard organoleptic attributes using the 5 point hedonic scale (Adsule and Banerjee, 2003). Score card contains various aril quality attributes viz., color, appearance and overall acceptability.

The data obtained was subjected to statistical analysis as per the procedure outlined by Panse and Sukhatme (1985).

Results and Discusion

Physiological loss in weight (%): Physiological loss in weight (PLW) indicates the total moisture lost during storage and ripening, which results in desiccation and shrivelled appearance of the arils (table 1). Significantly minimum PLW was recorded in C_2 (0.19) arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^0C and, whereas maximum PLW was noticed in arils stored at 15 ± 1^0C without washing and packaging C_{10} (6.11). With respect to storage period, minimum and maximum PLW was observed on 3rd day (1.27) over 6th day (1.86).

Treatments like C_1, C_2, C_3 and C_4 were continued from day 9 to day 15 and among them, minimum PLW was seen in C_2 (0.95) arils washed with chlorinated water 200 ppm + ascorbic acid then packed Polypropylene 150 guage bags and stored at 5 ± 1^0C and whereas, C_3 (1.45) arils washed with chlorinated water 200 ppm + citric acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C recorded maximum PLW. Minimum and maximum PLW was observed on 9th day (0.95) over 15th day (1.50). The lower PLW values in cold storage can be attributed to the low moisture loss due to prevailing low temperature. These results are similar to those reported by earlier researchers *i.e.*, Raja Krishna Reddy *et al*. (1999), Baviskar *et al.* (1995) and Garg *et al*. (1976).

Minimum weight loss at low temperature occurs due to retardation of process of transpiration and respiration. The Polypropylene packed arils had less PLW than control, storage of arils in Polypropylene bags, generally

Table 1: Combined effect of washing, packaging and storage temperature on physiological loss in weight (%) and spoilage (%) of pomegranate arils *cv.* Bhagwa

Treatments	Storage period (days)													
	Physiological loss in weight (%)							Spoilage (%)						
	Day 3	Day 6	Mean	Day 9	Day 12	Day 15	Mean	Day 3	Day 6	Mean	Day 9	Day 12	Day 15	Mean
C_1	0.11	0.72	0.42^{ab}	1.05	1.32	1.60	1.32^{bc}	1.13	2.04	1.59^{a}	3.39	4.29	5.18	4.27^{a}
C_2	0.03	0.35	0.19^{a}	0.68	0.95	1.23	0.95^{a}	1.66	2.82	2.24^{a}	3.72	4.62	6.54	5.00^{ab}
C_3	0.13	0.85	0.49^{abc}	1.18	1.45	1.73	1.45^{c}	1.36	2.49	1.93^{a}	3.62	4.52	5.55	4.59^{a}
C_4	0.06	0.54	0.30^{ab}	0.87	1.14	1.42	1.14^{ab}	1.81	3.17	2.49^{a}	4.07	4.75	6.67	5.21^{b}
C_5	5.41	5.82	5.62^{d}	-	-	-		3.51	6.33	4.92^{b}	-	-	-	
C_6	0.26	1.04	0.65^{c}	-	-	-		2.72	5.76	4.24^{b}	-	-	-	
C_7	0.16	0.94	0.55^{bc}	-	-	-		3.39	6.93	5.16^{b}	-	-	-	
C_8	0.35	1.13	0.74^{c}	-	-	-		3.18	6.72	4.95^{b}	-	-	-	
C_9	0.19	0.97	0.58^{bc}	-	-	-		3.41	6.95	5.18^{b}	-	-	-	
C_{10}	5.98	6.23	6.11^{e}	–	-		3.89	7.24	5.57^{b}	-	-	-		
Mean	1.27^{a}	1.86^{b}		0.95^{a}	1.22^{b}	1.50^{c}		2.61^{a}	5.05^{b}		3.70^{a}	4.55^{b}	5.92^{c}	
	S.Em±	CD at 5%		S.Em±		CD at 5%		S.Em±	CD at 5%		S.Em±		CD at 5%	
Treatments (T)	0.11	0.30		0.09		0.27		0.52	1.49		0.17		0.49	
Days (D)	0.05	0.14		0.08		0.23		0.23	0.67		0.15		0.43	
T x D	0.15	NS		0.16		NS		0.73	NS		0.29		NS	

Figure with same alphabets did not differ significantly; NS–Not significant. (-) indicates spoilage of aril on particular day.

C_1 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C

C_2 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C

C_3 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C

C_4 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C

C_5 – Arils stored at 5 ± 1^{o}C without washing and packaging

C_6 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^{0}C

C_7 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^{0}C

C_8 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^{0}C

C_9 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^{0}C

C_{10} – Arils stored at 15 ± 1^{0}C without washing and packaging

Table 2: Combined effect of washing, packaging and storage temperature on Hunter color L* (lightness) and Hunter color a* of pomegranate arils *cv.* Bhagwa.

Treatments	Storage period (days)															
	Hunter color L* (lightness)								Hunter color a*							
	Day 0	Day 3	Day 6	Mean	Day 9	Day 12	Day 15	Mean	Day 0	Day 3	Day 6	Mean	Day 9	Day 12	Day 15	Mean
C_1	24.56	23.78	23.49	23.94^{a}	23.21	22.92	22.63	22.92^{a}	20.06	19.96	19.78	19.93^{a}	19.66	19.54	19.42	19.54^{a}
C_2	24.56	23.09	22.86	23.50^{abc}	22.63	22.41	22.18	22.41^{b}	20.06	19.48	19.29	19.61^{bc}	19.21	19.08	18.95	19.08^{c}
C_3	24.56	23.37	23.16	23.70^{ab}	22.95	22.74	22.53	22.74^{a}	20.06	19.68	19.58	19.77^{ab}	19.51	19.43	19.35	19.43^{b}
C_4	24.56	22.87	22.61	23.35^{abc}	22.35	22.09	21.83	22.09^{c}	20.06	19.26	19.21	19.51^{cd}	19.12	18.96	18.74	18.94^{d}
C_5	24.56	19.83	19.24	21.21^{c}	-	-	-		20.06	18.74	17.58	18.79^{g}	-	-	-	
C_6	24.56	21.67	19.84	22.02^{abc}	-	-	-		20.06	19.27	18.97	19.43^{cde}	-	-	-	
C_7	24.56	21.08	19.65	21.76^{c}	-	-	-		20.06	19.02	18.66	19.24^{ef}	-	-	-	
C_8	24.56	21.13	19.78	21.82^{bc}	-	-	-		20.06	19.09	18.76	19.30^{def}	-	-	-	
C_9	24.56	20.96	19.46	21.66^{c}	-	-	-		20.06	18.92	18.58	19.18^{f}	-	-	-	
C_{10}	24.56	19.56	18.89	21.00^{c}	-	-	-		20.06	18.28	17.31	18.55^{h}	-	-	-	
Mean	24.56^{a}	21.74^{b}	20.90^{b}		22.79^{a}	22.54^{ab}	22.29^{b}		20.06^{a}	19.17^{b}	18.77^{c}		19.38^{a}	19.25^{b}	19.12^{c}	
	S.Em±		CD at 5%		S.Em±		CD at 5%		S.Em±		CD at 5%		S.Em±		CD at 5%	
Treatments (T)	0.74		2.09		0.11		0.31		0.23		0.64		0.03		0.10	
Days (D)	0.40		1.14		0.09		0.27		0.12		0.35		0.03		0.08	
T x D	1.28		NS		0.19		NS		0.39		NS		0.06		NS	

Figure with same alphabets did not differ significantly; NS–Not significant. (-) indicates spoilage of aril on particular day.

C_1 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C

C_2 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C

C_3 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C

C_4 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C

C_5 – Arils stored at 5 ± 1^{o}C without washing and packaging

C_6 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^{0}C

C_7 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^{0}C

C_8 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^{0}C

C_9 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^{0}C

C_{10} – Arils stored at 15 ± 1^{0}C without washing and packaging

Table 3: Combined effect of washing, packaging and storage temperature Hunter color b* of pomegranate arils *cv.* Bhagwa.

Treatments	Storage period (days)							
	Hunter color b *							
	Day 0	Day 3	Day 6	Mean	Day 9	Day 12	Day 15	Mean
C_1	6.78	6.55	6.52	6.65[a]	6.47	6.36	6.25	6.36[a]
C_2	6.78	6.41	6.37	6.52[ab]	6.29	6.21	6.13	6.29[a]
C_3	6.78	6.59	6.46	6.61[ab]	6.29	6.25	6.21	6.25[a]
C_4	6.78	6.28	6.18	6.41[abc]	6.09	6.01	5.93	6.01[b]
C_5	6.78	5.81	5.64	6.08[c]	-	-	-	
C_6	6.78	6.16	5.97	6.30[abc]	-	-	-	
C_7	6.78	5.92	5.78	6.16[c]	-	-	-	
C_8	6.78	6.03	5.86	6.22[bc]	-	-	-	
C_9	6.78	5.87	5.71	6.12[c]	-	-	-	
C_{10}	6.78	5.73	5.51	6.01[c]	-	-	-	
Mean	6.78[a]	6.15[b]	6.00[c]		6.29[a]	6.21[ab]	6.13[b]	
	S.Em±		CD at 5%		S.Em±		CD at 5%	
Treatments (T)	0.15		0.41		0.05		0.13	
Days (D)	0.08		0.23		0.04		0.11	
T x D	0.25		NS		0.08		NS	

Figure with same alphabets did not differ significantly; NS–Not significant. (-) indicates spoilage of aril on particular day.

C_1 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C

C_2 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C

C_3 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C

C_4 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C

C_5 – Arils stored at 5 ± 1^{o}C without washing and packaging

C_6 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^{0}C

C_7 – Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^{0}C

C_8 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^{0}C

C_9 – Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^{0}C

C_{10} – Arils stored at 15 ± 1^{0}C without washing and packaging

reduced respiration rate due to feed back inhibition and thus causing reduction in PLW and arils packed in 150 guage Polypropylene bags exhibited minimum reduction in PLW. This might probably due to decreased thickness of the polythene bags, resulting in increased ventilation thus exerting lower percentage of PLW leading to the increase in shelf life (Sepulveda *et al*., 2001). An increase in the permeability of the bags was associated with a reduction in the permeability of the bags to the loss of moisture as well as respiration of the produce as reported by Bhuller and Farmohan., 1980. Unpacked arils had maximum weight loss compare to polypropylene packed arils, which might be due to effective increase in the rate of respiration and transpiration (Ghatge *et al*., 2005).

Spoilage (%): The storage life and spoilage of arils are directly related to the rate of respiration. The data in the table-1 depicts that browning and shriveling of arils and significantly lowest spoilage percentage was recorded in C_1 (1.59) *i.e.* arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C whereas highest spoilage was noticed in C_{10} (5.57) *i.e.* arils stored at 15 ± 1^{0}C without washing and packaging, with respect to storage period, minimum and maximum spoilage was observed on 3rd day (2.61) over 6th day (5.05). Treatments like C_1, C_2, C_3 and T_4 were continued from day 9 to day 15 and Minimum spoilage was observed on 9th day (3.70) and maximum on 15th day (5.92). Among the treatments, minimum spoilage was seen in C_1 (4.27) arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C and C_4 (5.21) while arils washed with chlorinated water 200 ppm + citric acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^{0}C recorded maximum spoilage.

Minimally processed pomegranate aril show a browning produced by the oxidation of the phenolic compounds during storage, indicating that the stabilization

Table 4 Combined effect of washing, packaging and storage temperature on shelf life (days) and Organoleptic evaluation of pomegranate arils cv. Bhagwa.

Treatments	Shelf life (days)	Organoleptic evaluation
C_1	14.39[a]	3.93[a]
C_2	12.59[c]	3.79[ab]
C_3	13.40[b]	3.90[a]
C_4	12.39[c]	3.55[bc]
C_5	4.58[d]	3.03[de]
C_6	2.25[f]	3.43[c]
C_7	4.39[de]	3.29[cd]
C_8	4.54[d]	3.40[c]
C_9	4.36[de]	3.05[d]
C_{10}	3.99[e]	2.88[e]
	S.Em±	S.Em±
	0.41	0.10
	CD at 5%	CD at 5%
	1.19	0.29

Figure with same alphabets did not differ significantly

C_1- Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C

C_2- Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^0C

C_3- Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C

C_4- Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^0C

C_5- Arils stored at 5 ± 1^oC without washing and packaging

C_6- Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^0C

C_7- Arils washed with chlorinated water 200 ppm + Ascorbic acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^0C

C_8- Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 80 guage bags and stored at 15 ± 1^0C

C_9- Arils washed with chlorinated water 200 ppm + Citric acid then packed in Polypropylene 150 guage bags and stored at 15 ± 1^0C

C_{10}- Arils stored at 15 ± 1^0C without washing and packaging

of anthocyanin pigments is essential in order to achieve a good quality (Gill *et al*., 1996 and Ayhan and Esturk, 2009).

Hunter color (L*, a* & b*): The red color of pomegranate fruit aril may be due to anthocyanin pigments. There was significant difference observed among treatments on Hunter color (L*, a* & b*) values of minimally processed pomegranate arils (table-2&3).

The Hunter color (L*, a* & b*) values of aril was gradually decreased with each successive storage period and significantly maximum value was recorded in C_1 (23.94, 19.93 & 6.65) *i.e.* arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C and whereas minimum Hunter color (L*, a* & b*) was noticed in C_{10} (21.00, 18.85 & 6.01) i.e. arils stored at 15 ± 1^0C without washing and packaging.

With respect to storage period, maximum and minimum Hunter color (L*, a* & b*) values was observed on day 0 (24.56) over 6th day (20.90). Treatments like C_1, C_2, C_3 and C_4 were continued from day 9 to day 15 and among them maximum Hunter color (L*, a* & b*) was seen in C_1 (22.92, 19.54 & 6.36) *i.e.* arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C while C_4 (22.09, 18.94 & 6.01) *i.e.* arils washed with chlorinated water 200 ppm + citric acid then packed in Polypropylene 150 guage bags and stored at 5 ± 1^0C recorded minimum Hunter color L*. Maximum and minimum Hunter color L* was observed on 9th day (22.79) and 15th day (22.29).

Hunter color L*, a* & b* parameter was a good indicator of changes in the aril brightness, redness & yellowness. During successive storage period the Lab* value of aril decreased, showing a decrease in brightness, redness & yellowness (Gill *et al*., 1996).

Shelf Life (days): Pomegranate arils are highly perishable and have a short shelf life (table 4). with respect to treatments C_1 (arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C) recorded maximum shelf life (14.39) and C_{10} (arils stored at 15 ± 1^0C without washing and packaging) recorded minimum(3.99). The increase in shelf life was due to packaging which was attributed to reduction in gaseous exchange and increase in CO_2 concentration inside the package, and consequently further bringing down the rate of respiration (Kariyanna *et al.* 1990). Dorairaj (1985) and Kumbhar and Desai (1986) were also reported similar results in sapota.

The shelf life of pomegranate arils was 4 days without packing material under cold temperature. Control arils had minimum shelf life compare to polythene packed arils. This might be due to effective increase in the rate of respiration and transpiration (Ghatge *et al*., 2005).

Organoleptic evaluation (5 point scale): With respect to treatments on organoleptic evaluation as shown in table-4, highest score was recorded in C_1 (arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^0C)

(3.93) and lowest was recorded in C_{10} arils stored at 15 ± 1^{0}C without washing and packaging (2.88). The score for organoleptic evaluation decreased with decrease in storage period. This might be due to the breakdown of ascorbic acid during storage of products (Nanda *et al*., 2001). The arils stored without packing material showed lower organoleptic score which might be the respiratory rate is markedly reduced at low temperature. Similar results were also reported by sepulveda *et al*., 2001 in pomegranate.

Conclusion

Arils washed with chlorinated water 200 ppm + ascorbic acid then packed in Polypropylene 80 guage bags and stored at 5 ± 1^{0}C recorded highest shelf life of 14.39 days and was also found to be superior in organoleptic evaluation.

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