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Effect of various post-harvest treatments on shelf life, physio-chemical characteristics and quality pomegranate fruit variety Phule arakta under different storage conditions

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ABSTRACT

The present investigation entitled, " Effect of various post harvest treatment on extending shelf life of pomegranate (*Punica granatum* L.) fruits cv. PHULE ARAKTA with three post harvest treatment and two storage conditions was conducted in the year 2005-06 with three replication in Factorial Completely Randomised Design (F.C.R.D.). The treated fruits of pomegranate cv. PHULE ARAKTA was stored at room temperature 22.17 to 24.36^{0}C, 52.0 to 82.0 % RH and in cool store (8^{0}C, 90.0 to 95.0 % RH). In all post harvest treatments, the treatment cool store and room temperature showed the trends of rise and falls in TSS, decrease in acidity and juice content with increasing physiological loss in weight, irrespective of storage conditions. The present study made it clear that pomegranate fruits coated with waxol + carbendazim (0.1 %) had great significance in retaining of physico-chemical characteristics and reducing the wastage during post harvest storage. The problem of fruit growers and handlers may be solved by adopting packaging material like CFB boxes along with simple post harvest treatment of wax coating and fungicides to fruit and use of cool store. The shelf life of pomegranate fruits was extended upto 50 days in case of variety Phule Arakta when treated with waxol + carbendazim (0.1 %) in cool store. The shelf life of pomegranate fruit was extended upto 24 days in case of Phule Arakta variety at room temperature storage when treated with waxol + carbendazim (0.1 %). To conclude, it may be stated that the storage of pomegranate fruit in cool store with dipping treatment of waxol + carbendazim 0.1 % should be recommended.

Key words : Pomegranate, Post harvest treatments, Shelf life, Physiochemical characters and quality

Pomegranate fruit has poor processing quality, therefore, mainly used for table purpose only. Under these circumstances, handling and marketing become important to sustain its increasing area and production for providing remunerative prices to farmers.

The post harvest losses in pomegranate occur due to lack of proper packing material and improper handling during long transport. Extension of shelf life can be possible by checking the rate of respiration, transpiration and microbial infection. No systematic studies have so far been carried out on extending the shelf life of pomegranate fruit by giving simple post harvest treatment like use of wax coating with fungicidal dip, packing in corrugated fibre board (CFB) boxes and storage in cool store.

MATERIALS AND METHODS

The experiment was conducted in AICRP on Arid Zone Fruits, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri in Ahmednagar District (M.S.) under APEDA project during the year 2004-05.

Experimental details :

The experiment was conducted in Factorial Completely Randomised Design (FCRD) with three post harvest treatments and two storage conditions and treatment were replicated three times.

Main treatment	Sub treatments
1. Wax-coating (W-0-9) (T_1)	1. Cool store (S_1)
2. W-O-9 + carbendazim 0.1 % (T_2)	2. Room temperature (S_2)
3. Control-T_3	

Treatment combination : 06

Wax coating :

Wax emulsion (9 %) solution was prepared in a plastic drum and the fruits were dipped in it for 40 to 60 seconds. Fungicidal treatment was given by dissolving the respective fungicide into wax emulsion. Wax emulsion does not leave only residue or import undesirable odour of flavour interfere with the natural appearance of fruit and its quality (Dalal *et al.*,1971).

Packaging :

The fruit were then packed in export quality

corrugated fibre board (CFB) boxes of size 15 x 11 x 4 inches. Effective use of CFB boxes for storage and transport has been reported by Waskar and Garande (1997) for pomegranate.

Juice per cent :

Juice percentage was calculated by following formula :

$$\text{Juice (\%)} = \frac{\text{Weight of juice extracted}}{\text{Weight of fruit}} \text{x100}$$

Acidity :

Acidity of juice was determined by as per method advocated by A.O.A.C. (1975).

Total soluble solids :

It was determined by temperature, correlation chart A.O.A.C. (1975).

Physiological loss in weight (PLW %) :

The fruits were weighted at 4 days interval at RT and 10 days interval in CS fruit and PLW was calculated by noting the difference between initial and subsequent weight and it was expressed as percentage.

$$\text{PLW (\%)} = \frac{\text{Initial weight – Final weight}}{\text{Initial weight}} \text{x 100}$$

Organoleptic evaluation :

The organoleptic evaluation for assessing the colour, flavour and texture was done by a panel or judges using a 9 point Hedonic scale (Amerine *et al.,* 1965).

Pathological studies :

The fruits were observed daily for microbial infection. The infected material was isolated, cultured and organisms associated were identified.

Statistical analysis :

Analysis of variance for all the characters except organoleptic evaluation and physiological loss in weight was done as per the methods suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The results obtained from the present investigation have been discussed under following heads:

Juice content :

From data in Table 1. It was observed from statistical analysis that with the advancement of storage period, there was a significant decrease in juice content of pomegranate fruit of variety Phule Arakta. Juice content of control fruits decreased at faster rate than all treatments. At the beginning of storage, the juice content of pomegranate fruit was found to be 60.37 per cent.

At the end of 40th day in RT juice content was the lowest 47.83 % in control fruit T_3S_2, while highest 49.63 per cent in fruit treated with waxol + carbendazim (T_2S_2). The fruit treatment T_1S_2 and T_3S_2 had significantly low juice content as compared to T_2S_2. At the end of 60th day of storage period in CS, the juice content was found to be lowest 47.08 % in control fruits (T_3S_1) while the highest 48.50 % in fruit treated with waxol T_1S_1. The fruits of treatments T_1S_1 and T_2S_1 had significantly low juice content as compared to T_1S_1. Similar result were observed in pomegranate fruits by Salunkhe and Desai (1984) and Koksal (1989).

Acidity :

The data from Table 1 revealed that, acidity of pomegranate fruit was found to be highest at the time of storage and it decreased with advancement of storage period. It was also observed that with advancement of the storage period, the acidity content of control fruits decreased at faster rate than other treatments. Initially, acidity of pomegranate fruit was found to be 0.39 %.

At the end of 40th day of storage period in RT the acidity of pomegranate fruits was found to be lowest 0.203 % in control fruit T_3S_2 while highest 0.240 % of fruit treated with waxol + carbendaim T_2S_2. The fruit treatment T_1S_2 and T_3S_2 had significantly low acidity as compared to T_2S_2.

At the end of 60th day of storage period in CS the acidity of pomegranate fruits was found to be lowest 0.193 % in control fruit T_3S_1 while highest 0.227 % of fruit treated with waxol + carbendaim T_2S_1. The treatment T_1S_1 and T_3S_1 had significantly low acidity as compared to T_2S_1.

Koksal (1989) carried out research work on post harvest behaviours of pomegrantae (cv. GOK BACHE) under different conditions of storage and reported that, depending upon the temperature and duration the titrable acidity (1.44 %) decreased throughout the period of storage.

Total soluble solids (%) :

From Table 2 it was obvious that with advancement of storage period, there was a significant increase in TSS of pomegranate fruit till it reached the peak followed by a slight decline at the end of storage period. TSS of the control fruits increased at faster rate than fruits treated with waxol and carbendazim.

Table 1 : Effect of wax coating and fungicidal dip on changes in juice content (%) and acidity (%) of pomegranate fruit of Phule Arakta variety during in cool store (CS) and room temperature (RT)

		Juice content %							Acidity %						
Days after storage		10th	20th	30th	40th	50th	60th	Mean	10th	20th	30th	40th	50th	60th	Mean
Initial value		60.37	60.37	60.37	60.37	60.37	60.37	60.37	0.390	0.390	0.390	0.390	0.390	0.390	0.390
Cool store	T_1S_1	58.30	55.78	53.74	52.04	50.15	48.50	53.09	0.347	0.307	0.283	0.263	0.233	0.207	0.230
	T_2S_1	58.39	55.55	52.99	50.46	48.27	47.97	52.44	0.360	0.310	0.293	0.267	0.247	0.227	0.280
	T_3S_1	58.08	55.81	53.35	51.65	49.58	47.08	52.59	0.340	0.307	0.283	0.247	0.220	0.193	0.260
Room	T_1S_2	58.09	54.06	51.77	48.68	0.0	0.0	35.40	0.320	0.290	0.250	0.220	0.0	0.0	0.180
temperature	T_2S_2	58.41	55.43	52.32	49.63	0.0	0.0	35.97	0.337	0.300	0.283	0.240	0.0	0.0	0.190
	T_3S_2	58.07	54.19	51.66	47.83	0.0	0.0	35.29	0.313	0.277	0.240	0.203	0.0	0.0	0.170
	Mean	58.22	55.14	52.60	50.05	24.83	23.92		0.340	0.298	0.272	0.240	0.117	0.104	
						S.E. ±	C.D.(P=0.05)						S.E. ±	C.D.(P=0.05)	
	Storage period					0.140	0.393						0.205	0.575	
	Post harvest treatment					0.992	0.278						0.145	0.406	
	Storage condition					0.810	0.227						0.119	0.332	
	Storage period x post harvest					0.343	0.963						0.503	0.141	
	Treatment x storage condition														

Table 2 : Effect of wax coating and fungicidal dip on changes in total soluble solids (%) and physiological loss in weight (%) of pomegranate fruit of Phule Arakta variety

		Total soluble solids %							Physiological loss in weight %							
Days after storage		10th	20th	30th	40th	50th	60th	Mean	10th	20th	30th	40th	50th	60th	70th	80th
Initial value		13.31	13.31	13.31	13.31	13.31	13.31	13.31								
	T_1S_1	13.80	14.27	14.83	15.30	14.70	14.17	14.51	6.0	6.5	6.9	7.0	7.5	8.0	8.5	9.4
Cool	T_2S_1	14.10	14.63	15.0	15.47	14.97	14.40	14.76	6.0	6.0	6.3	6.5	6.6	7.4	8.0	8.9
store	T_3S_1	13.32	13.57	14.30	15.10	14.60	13.90	14.13	6.3	6.3	6.5	6.8	6.9	7.8	8.3	9.0
Days after storage									4th	8th	12th	16th	20th	24th	28th	
Room	T_1S_2	13.83	14.63	14.0	13.43	0.0	0.0	9.32	4.5	4.8	6.0	6.5	6.8	7.4	7.5	
temper	T_2S_2	14.40	15.03	14.50	13.97	0.0	0.0	9.65	3.5	4.3	4.8	6.2	6.5	6.9	7.0	
ature	T_3S_2	13.33	14.27	13.83	13.37	0.0	0.0	9.13	4.5	4.9	4.2	6.0	6.0	6.9	7.9	
	Mean	13.80	14.40	14.41	14.44	7.38	4.08									
					S.E. ±	C.D. (P=0.05)										
	Storage period				0.361	0.101										
	Post harvest treatment				0.255	0.716										
	Storage condition				0.209	0.584										
	Storage period x post harvest				0.885	0.248										
	Treatment x storage condition															

At the beginning of the storage, the TSS of pomegranate fruit was found to be 13.31 per cent. In case of CS and RT the TSS was increasing upto 40th days and 20th days, respectively after that it started again decreasing in both store condition.

At the end of 40th day in R. T. TSS was found lowest 13.37 % in control T_3S_2 and highest 13.97 % when fruit treated with Waxol + carbendazim 0.1 %. At the end of 60th day in CS lowest TSS is 13.90 % was found in control T_3S_1 and highest 14.40 % in fruits treated with Waxol + carbendazim 0.1 %. The fruits of treatment T_1S_1 and T_3S_1 had significantly low TSS as compared to T_2S_1. Similar reports also given by Baviskar (1993), Padule and Keskar (1989).

Physiological loss in weight (%) :

It is clear from the figures in Table 2 that with advancement of storage period during RT and CS, the per cent physiological loss in weight of pomegranate fruits increased at both storage conditions. In RT conditions

physiological loss in weight in control fruit T_3S_2 was highest (7.9 %) and lowest 7.0 % when fruits treated with waxol + carbendazim 0.1 % T_2S_2. The T_2S_2 treatment proved to be superior over fruits treated with waxol (T_1S_2).

It is also clear from data that in case of CS physiological loss in weight in waxol treated fruits was highest 9.4 % T_1S_1 and lowest 8.9 in fruit treatment with waxol + carbendazim 0.1 %.

From the data of post harvest treatments and stoage conditions both had significant effect on per cent loss of pomegranate fruits throughout the storage period, but the rate of loss of weight of pomegranate fruits was found to be faster at RT then in CS storage conditions.

The interaction between post harvest treatment and storage condition was also found to be significant for per cent physiological loss in weight of pomegranate fruit. Koksal (1989) reported the same result that there was continuous decrease in weight of pomegranate fruit.

Organoleptic evaluation and microbial count :

From Table 3, it is clear from data, that the shelf life of the fruits stored in CS was better than at RT store fruits. At RT, the shelf life of pomegranate fruits of Phule Arakta could be extended upto 24 days with application of wax coating along with carbendazim (0.1 %). In case of CS the shelf life of pomegranate fruits could be extended upto 50 days in CS storage when coated with Waxol + carbendazim T_2S_2.

The organoleptic rating of the fruits in terms of colour, flavour and texture was maximum in fruits coated with waxol + carbendazim 0.1 % T_2S_1 and T_2S_2 at the termination of storage period.

At the end of storage period of 24 days at RT, the highest score 6.32 was obtained by fruit coated with waxol + carbendazim T_2S_2 followed by 5.85 and 5.34 under T_1S_2 and T_2S_2 treatment, respectively.

Similarly, at the end of storage period of 50 days in CS, the highest score 7.50 was obtained by fruits treated with Waxol + carbendazim followed by 7.18 and 6.75 under T_1S_2 and T_3S_2 treatments, respectively. The storage life of fruits treated with waxol + carbendazim 0.1 % was found to be maximum and fruits remains fresh, acceptable and disease free under both storage condition.

The highest percentage of pathogen were found in control fruits T_3S_1 and T_3S_2 followed by fruit treated with waxol T_1S_1, T_1S_2 and T_2S_1, T_2S_2, respectively.

The pathogen responsible for spoilage at RT were *Aspergillus niger* and while in CS *Aspergillus niger* and *Penicillium* spp.

It is also found that fruits treated with Waxol + Carbendazim 0.1 % controlled the attack of these microorganisms completely.

The results obtained in present study of storage of pomegranate fruit were in conformity with the observation of Elyatem and Kader (1984).

Table 3 : Effect of post harvest treatments on shelf life and organoleptic evaluation of pomegranate fruit of Phule Arakta at cool store (CS) and in room temperature (RT)

Treatments		Shelf life days	Organoleptic score			
			Colour	Flavour	Texture	Overall
CS	T_1S_1	40	6.80	7.55	7.20	7.18
	T_2S_1	50	7.40	7.65	7.45	7.50
	T_3S_1	28	6.30	7.20	6.75	6.75
RT	T_1S_2	20	5.77	5.82	5.97	5.85
	T_2S_2	24	6.35	6.28	6.32	6.32
	T_3S_2	15	5.27	5.20	5.56	5.34

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REFERENCES

A.O.A.C. (1975). *Official Methods Of Analysis*. Association of Agricultural Chemists. 12th Ed., Washington, D. C. 20044.

Amerine, M.S., Pangborn, R.M. and Rossler, E.A. (1965). *Principle of sensory evaluation of food*. Academic Press, New York and London.

Baviskar, M.R. (1993). Studies on extending the shelf life of ber (*Zizyphus mauritiana* L.). M. Sc. (Ag.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.).

Dalal, V. B., Eipeson, W. E. and Singh, S. N. (1971). Wax emulsion for fresh fruits and vegetables to extend their storage life. *Indian Food Packer*, **25** (5) : 9-16.

Elyatem, S.N. and Kader, A. (1984). Post harvest physiology and storage behaviour of pomegranate fruit. *Scientia Hort.,* **24** : 287-298.

Gomez, K.A. and Gomez, A. A. (1984). *Statistical Procedure For Agricultural Research*, 2nd Ed. 1984. International Rice Research Institute Book. Willey Inter Science Pub., New York, pp. 306-308.

Koksal, A.I. (1989). Research on the storage of pomegranate (cv. GOK BAHCE) under different conditions. *Acta Hort.,* **258** : 295-302.

Padule, D.N. and Keskar, B. G. (1989). Studies on postharvest treatments for increasing shelf life of pomegranate fruits. *Maharashtra J. Hort.*, **4** (2) : 73-76.

Salunkhe, D.K. and Desai, B.B. (1984). *Post harvest Biotechnology of fruits*. Vol. **1** & **2**. Boca Raton.

Waskar, D.P. and Garande, V.K. (1997). Post harvest management of pomegranate in Maharashtra. *Beverage & Food World*, **24** (3) : 26-28.

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