

Effect Of Modified Atmosphere Package On Sensory Quality Of Pomegranate Fruits During Cold Storage.

Nasir Ahmad Sahel^{1*}, H. C. Krishna², Dinakara Adiga³, S. Bhuvaneshwari⁴, G. J. Suresh², B. Anjaneya Reddy⁵ and Ahmad Shafiq Foshanji¹

¹Department of Food Technology, College of Agriculture, Herat University, Herat, Afghanistan

²Department of Postharvest Technology, College of Horticulture, UHS Campus, GKVK, Bengaluru- 560 065, Karnataka, India

³Principal Scientist (Fruit Sciences) DCR-Puttur

⁴Senior Scientist Postharvest Technology and Agri. Engineering, IIHR, Bengaluru

⁵Department of Plant Pathology, University of Agriculture Science, GKVK campus, Bengaluru-560 065, Karnataka, India

*Corresponding Author E-mail: N.sahel@yahoo.com, krishnahc@gmail.com

Abstract: Pomegranate fruits are rich in vitamin-C, antioxidants and polyphenols hence considered good for health with anti-cancer properties. The aim of the study was to investigate the effect of different packaging material on sensory quality of pomegranate fruits during cold storage. Pomegranate fruits harvested from field washed with sodium hypochlorite, air dried, and graded based on uniformity. The fruits were packed with different plastic like 1) polyethylene; 2) polypropylene; 3) Xtend® bag 4) Silver nano bag. Pomegranates fruits without packaging served as controls. All pomegranates were stored at $7 \pm 2^\circ\text{C}$ and $90 \pm 5\%$ relative humidity upto 100 days. The result showed that sensory quality (Colour, texture, taste, aroma and overall acceptability) decreased in all treatment groups with prolonged storage, but the rate of decrease was highest in unpacked fruits. Overall, application of MAP maintained quality of pomegranate fruits up to 100 days compared to unpacked fruits at 40 days.

Keywords: Pomegranate, MAP, Sensory quality

1. INTRODUCTION

Pomegranate is one of the popular fruit in the world which are mainly consumed fresh (table purpose) and processed products such as juice, yoghurts, syrup, grenadine, anardana, anar-rub, jam, jelly, wine, carbonated beverage, etc. The separation of arils from peel is a little difficult, that is why direct consumption like grape, oranges and banana is not desirable for sum consumers (Pal and Gaikwad, 2014). Pomegranate is a non-climacteric fruit with low respiration rate which produces less amounts of ethylene (Caleb et al. 2012). Generally, pomegranate fruit can be store from 2 to 7 months, depending on the cultivar and storage conditions. Pomegranate cultivar 'Bhagwa' grown in India famous for its soft and deep red arils has good export potential and is exported to the UK, Holland, Malaysia and Singapore. The main problem in pomegranate exports is the weight loss, shrinkage, scald development, and microbial growth which limited the shelf life of pomegranate fruits during harvest and transportation. In order to meet the consumers present demand for natural, fresh, flavourish, convenient and high quality pomegranate fruits, various postharvest techniques have been developed among which, modified atmosphere packaging along with low temperature storage are being increasingly employed to extend the shelf life of pomegranate fruits by maintaining the quality with prolongation of storage. Modified atmosphere packaging (MAP) films modify the fruit's internal atmosphere and have the potential in extending the shelf-life for many fruit species (Kader et al., 1989; Arjona et al., 1994; Ben-Yehoshua, 1985). MAP is becoming increasingly popular in reducing weight loss and browning (Beaudry,

2000). The purpose of this study was to investigate the effect of modified atmosphere packaging on maintaining sensory quality of pomegranate cultivar 'Bhagwa' during storage.

Material and methods

The pomegranate fruits (cv. Bhagwa) were handpicked at ripe stage and brought to Department of Postharvest Technology, College of Horticulture, University of Horticultural Sciences Campus, GKVK (Post), Bengaluru, India during the academic year 2017-18 to carry out the experiment. After receiving the fruits in the laboratory were sorted out to remove misshaped, bruised, diseased and insect infested fruit. Pomegranate fruits were washed with sodium hypochlorite as sanitizer to make the fruits free from microbes and postharvest pathogens, later washed fruits were air dried. The fruits were packed with different plastic like T₁) Polyethylene; T₂) Polypropylene; T₃) Xtend® bag T₄) Silver nano bag; T₅) Control (without package) and stored at low temperature ($7 \pm 2^\circ\text{C}$).

Organoleptic evaluation of pomegranate fruits were conducted each 20 days interval on the basis of colour, texture, taste, aroma and overall acceptability by a panel of ten semi trained judges using a nine point Hedonic scale as laidout by Amerine et al. (1965). The chart used for evaluating the pomegranate is given below.

9-Excellent 8-Extremely good 7-Very good 6-Moderately good
5-Good
4-Very fair 3- Fair 2-Poor 1-Very poor

Result and discussion

The colour of pomegranate fruits decreased with prolonging of storage maximum (9.00) score for colour was recorded in D0 when fruits were fresh. Later maximum (8.50) score was

noticed in Silver nano bag and least score (5.75) was recorded in unpacked fruits at 40 days after storage, unpacked fruits discarded due to scold development, shrinkage and spoilage after 40 days of storage. Whereas, at 100 days after storage maximum (7.50) and minimum (6.50) score was recorded in treatments that pomegranate fruits were packed in Silver nano bag (T₄) and Xtend[®] bag (T₃) respectively (Fig. 1).

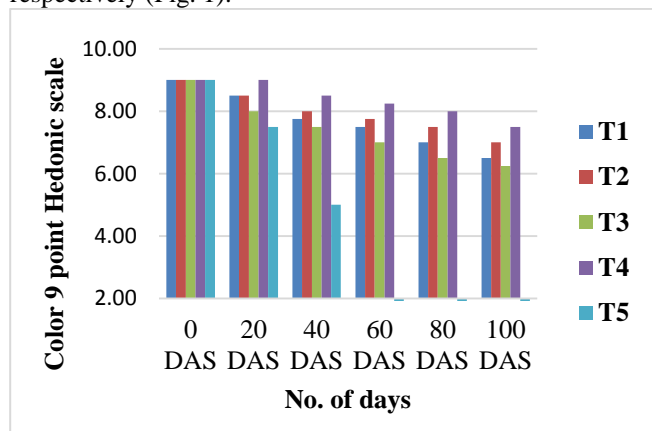


Fig. 1: Effect of modified atmosphere package on sensory quality (Colour) of pomegranate fruits under low temperature storage (7±2°C)

The texture of pomegranate fruit were decreased with respect to packing material and storage period (Fig. 2) maximum score (8.50) score for texture was recorded in D0 when fruits were fresh. Later maximum (8.12) score was noticed in Silver nano bag and least score (6.10) was recorded in unpacked fruits at 40 days after storage. Whereas, at 100 days after storage maximum (7.25) and minimum (6.10) score were recorded in treatments that pomegranate fruits were packed in Silver nano bag (T₄) and Xtend[®] bag (T₃) respectively.

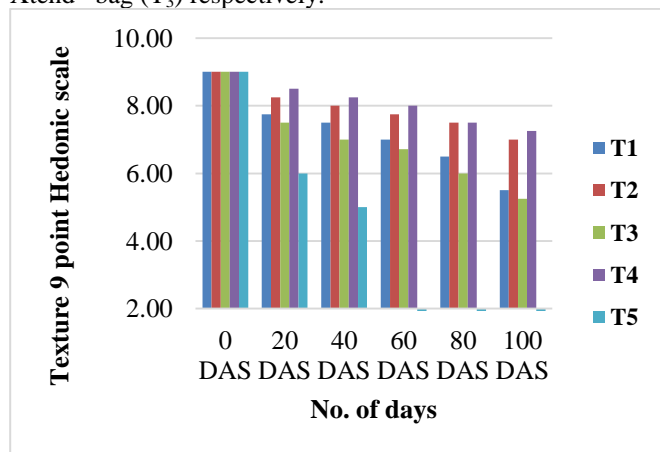


Fig. 2: Effect of modified atmosphere package on sensory quality (Texture) of pomegranate fruits under low temperature storage (7±2°C)

The taste of pomegranate fruit were differed with respect to packing material and storage period (Fig.3) The taste rating decreased with prolonged storage. All the packaged fruits T₄, T₂, T₁, T₃ had better rating taste (8.50, 8.00, 7.50 and 7.50) respectively when compare to control (5.00) on day 40.

After that control terminated due to spoilage and other treatment continued storage life up to 100 days. Taste rating decreased with prolonged storage, Among the treatment maximum taste rating was recorded by T₄ (6.00) while lower sore recorded in T₃ (5.00) after 100 days of storage.

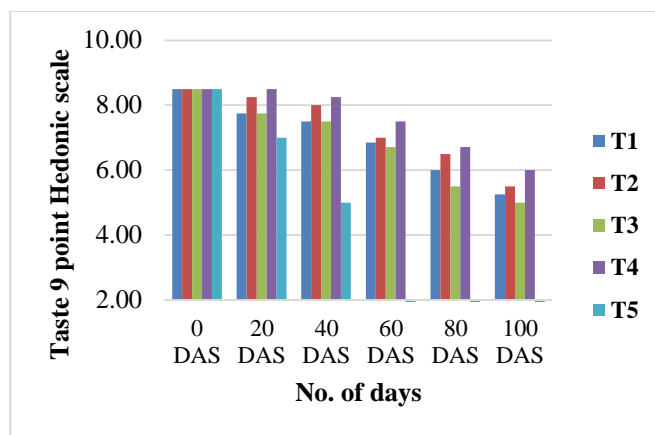
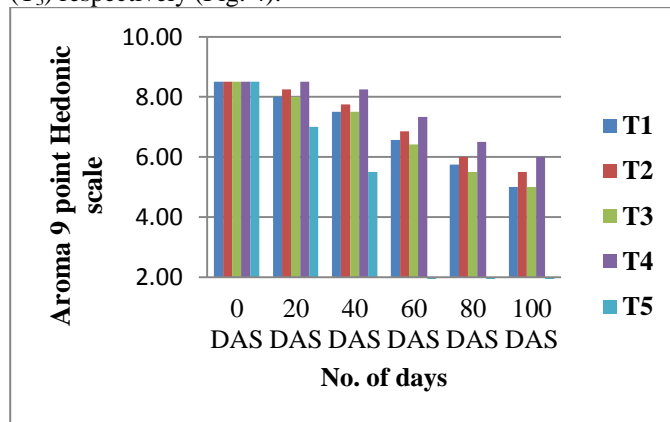


Fig. 3: Effect of modified atmosphere package on sensory quality (Taste) of pomegranate fruits under low temperature storage (7±2°C)

The maximum (8.50) score for aroma was recorded in D0 when fruits were fresh. Later maximum (8.25) score was noticed in Silver nano bag and least score (5.50) was recorded in unpacked fruits at 40 days after storage. Whereas at 100 days after storage maximum (6.15) and minimum (5.15) score were recorded in treatments that pomegranate fruits were packed in Silver nano bag (T₄) and Xtend[®] bag (T₃) respectively (Fig. 4).



Note: DAS= days after storage
Fig. 4: Effect of modified atmosphere package on sensory quality (Aroma) of pomegranate fruits under low temperature storage (7±2°C)

It is evident from the data presented in figure 5 that the overall acceptability of pomegranate fruits varied between treatments. The combined qualities of colour, texture, taste and aroma were pooled and represent the overall acceptability and similar trend followed. Out of 9 score recorded for fresh fruits, minimum score (5.25) was recorded in unpacked fruits and maximum score (8.50) in Silver nano bag recorded after 40 DAS. Whereas at 100 days after storage the fruits which were packed in Silver nano bag obtained highest (6.50) score and least (5.25) overall acceptability score was recorded in Xtend® bag (T₃).

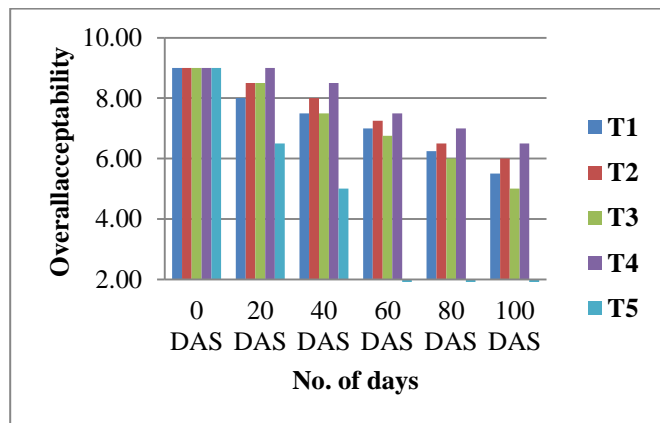


Fig. 5: Effect of modified atmosphere package on sensory quality (Overall acceptability) of pomegranate fruits under low temperature storage ($7\pm 2^{\circ}\text{C}$)

Maintaining of better quality in pomegranate fruits packed by MAP bags might be due to the greater protection of visual appearances by minimizing moisture loss and scald development, minimized softening by delaying senescence and shrinkage during storage, minimizing fluctuations in acids, pH and sugar/acid ratio. Similar observation to this finding was also reported by Nanda *et al.* (2001) in pomegranate when fruits were packed in shrink film. During the storage period, there was a decreasing trend in organoleptic score for taste of arils of pomegranate cultivars, Ganesh and Bhagwa due to fluctuations in acids, pH and sugar/acid ratio as reported by Malundo *et al.* (1991) in mango. Similar observations were reported by Rathod *et al.* (2011) in carambola fruits. Maintaining the nutritional and organoleptic quality of pomegranate arils is a major challenge, because extracted arils deteriorate in colour, taste, flavour and overall acceptability and a reduction in shelf-life (Gil *et al.* 1996). This is due to active metabolic processes by endogenous enzymatic activity and enhanced respiration rate as opined by Rolle and Chism (1987) in fruits and vegetables.

Conclusion

The result of this study showed that application of modified atmosphere packaging (MAP) was the best technique for maintaining quality of fresh produce by providing of microenvironment around the commodity inside the package which reduced metabolic activity and increased the storage life of pomegranate fruits upto 100 days compared to 40 days of unpacked fruits.

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