Plant Archives Vol. 25, No. 2, 2025 pp. 663-669 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.2.090

EVALUATE THE BEST PACKAGING MATERIALS FOR THE SHELF-LIFE EXTENSION OF GUAVA FRUIT (*PSIDIUM GUAJAVA* L.) VAR. ALLAHABAD SAFEDA

Ankit Singh Rajawat[1], Poonam[1]*, Sarika Mahore[2], Rahul Singh Sikarwar[3], Intjar Singh Dawar[1] and Sanjeev Singh Bhaghel[1]

[1]Department of Horticulture, School of Agriculture, ITM University, Gwalior - 474 001, India.

[2]Department of Agronomy, RVSKVV, College of Agriculture, Gwalior, M.P., India.

[3]Department of Agriculture Extension & Communication, RVSKVV, College of Agriculture, Gwalior, M.P., India.

*Corresponding author E-mail : poonambhadouriyahorti@gmail.com

(Date of Receiving-01-06-2025; Date of Acceptance-11-08-2025)

ABSTRACT

The present investigation was carried out at Post Graduate Laboratory of Department of Horticulture, School of Agriculture, ITM University Gwalior (M.P.) during the year 2023-2024. The present study was conducted to Evaluate the Best Packaging Materials for the Shelflife Extension of Guava Fruit (*Psidium guajava* L.) var. Allahabad Safeda *viz*. Open (control), black polythene, white polythene, brown paper, butter paper, tissue paper, newspaper, gunny bag, banana leaf, paddy straw, CFB boxes, open mud container and shield mud container at room temperature. Data pertaining to the studies on different types of packaging material to extend shelf life of guava at different days on bio-chemical changes of guava fruit. The maximum fruit weight was observed in T_{12} (shield mud container) and minimum was observed in T_0 (Control) on 16th days of trial, Maximum physiological loss in weight was found in T_0 (control) and minimum PLW was found in T_{12} (shield mud container). The bio-chemical parameters were taken for the experiments are TSS, Acidity and Ascorbic acid. The maximum TSS & ascorbic acid was found in T_{12} (shield mud container) and minimum was recorded in T0 (Control) at the 16th day of storage, while maximum acidity was found in T_7 (gunny bag) and minimum was found in T_{12} (shield mud container) at the 16th day of storage. After all the physical and bio-chemical analysis done from 0 to 16 days of experiment the result revealed that T_{12} (shield mud container) was found statistically best over all other packaging materials till the 16th day of shelf life.

Key words : Guava, Packaging material, TSS, Allahabad Safeda, Shelf-life.

Introduction

Guava (*Psidium guajava* L.), commonly known as Poor Man's Apple, belongs to the family Myrtaceae and is originated in the Southern part of Mexico and Central America, where from it was introduced to Asian countries in the 17th century. Guava is the most important, highly prolific, delicious and nutritious fruit of tropical and sub-tropical regions of Indo-Pak sub-continent. The fruit is an excellent source of vitamin C containing 2-5 times more than oranges and 10 times more than tomatoes. It is a good source of calcium, phosphorus and iron. However, being a fruit of perishable nature, it is most difficult to store for long periods (Sanjay, 2000). The common guava is a diploid (2n=22), but natural and artificial triploid (2n=33) and aneuploidy also exist in nature. The main factors depreciating post-harvest quality in guava are fast loss of green colour, excessive softening, high rot incidence and loss of turgidity.

Storage under low temperatures has been considered the most efficient method to maintain quality of most fruits due to its effects on reducing respiration rate, transpiration, ethylene production, ripening, senescence, and rot development. In climacteric fruits, like most guava varieties, the reduction of temperature delays the climacteric peak and consequently, ripening. The fruit become over ripe and loss its texture and quality within

3-4 days after harvest at room temperature (Singh and Pal, 2007; Mitra *et al*., 2012).

Maturity stage of guava at harvest is a critical factor for determining shelf life and quality (Azzolini *et al*., 2004; Cavalini *et al*., 2006). Skin colour is a measure of maturity and ripeness in guava. Fruit attaining maturity show signs of colour break stage from pale green to yellowish green (Asery *et al*., 2008). Guava is a perishable fruit and highly susceptible to bruising and mechanical injuries. It attributed that 18-20% post-harvest loss in guava. To reduce postharvest losses in guava by adopting proper packaging materials, proper harvesting, post-harvest handling to extend shelf life for keeping quality fruits and through treatments with biochemicals (post-harvest treatment), and storage technology (Mahajan *et al.*, 2004).

Materials and Methods

The present investigation was conducted in the laboratory of Department of Horticulture, School of Agriculture, ITM University, Gwalior - 475 001 (M.P.), India.

The following headings provide descriptions of the specific materials and methods used to conduct the investigation:

Experimental Sites : The trial was conducted at the School of Agriculture, Department of Horticulture, ITM University, Gwalior (M.P.) India. Sithouli is located at 26.146° N, latitude and 78.187°E longitudes at an altitude of 227 m Mean Sea Level. The laboratory is situated in the campus of college. The campus of college is located on the NH-75, opp. Sithouli Railway Station, Sithouli, Gwalior, Madhya Pradesh 475001, India.

Climatic conditions : The subtropical climate in Gwalior has both Summer, Rainy and Winter seasons. It can get as hot as 46^0C in the Summer and as cold as 3^0C to 7^0C in the Winter. The meteorological observatory at the Sithouli Farm, School of Agriculture, Gwalior, recorded the mean of weekly values of weather parameters during the investigation period.

Experimental materials : The mature and uniform size of guava fruit were collected from the KVK Orchard, and different types of packaging materials like; Open (Control), Black polythene, White polythene, Brown paper, Butter paper, Tissue paper, Newspaper, Gunny bag, Banana leaf, Paddy straw, CFB boxes, Open mud container and Shield mud container were carried out as per treatments to Department of Horticulture, School of Agriculture, ITM University, Gwalior for completing the experiments

Physical parameters

Fruit weight (g) : Three fruits per treatment weighed on an electronic balance and average weight (g) was obtained by dividing the total weight of the fruits with the number of fruits.

Average fruit weight = Total weight of fruits (g)/ Number of fruits.

Fruit volume (cm^3) : Using a measuring cylinder and the water displacement method, the fruit's volume was calculated and expressed in cm^3.

Physiological Loss in Weight (PLW) : To determine (PLW %), 9 fruits each replication were noticeable and labelled. The recognizable and labelled fruits were weighed before storage under each treatment. Their weight was determined on 0 (initial), 4^{th}, 8^{th}, 12^{th} and 16^{th} of storage days. PLW in weight was conveyed based on original weight of fruit suggested by Srivastava and Tandon (1968).

$$\text{PLW (\%)} = \frac{\text{Initial Weight-Final Weight}}{\text{Initial Weight}} \times 100$$

Bio-chemical parameters

Total Soluble Solids (^{0}Brix) : Total soluble solids (TSS) (°Brix) of the juice of fresh pulp was determined by using hand refractometer.

Ascorbic acid, titratable acidity : Ascorbic acid (vitamin-C) content of the sample was analyzed by using 2, 6- dichlorophenol indophenol dye method as described by Ranganna (2000) and expressed in mg per 100 g.

$$\text{Ascorbic acid(mg/100g)} = \frac{\text{Titrate value} \times \text{Dye factor} \times \text{Volume made up}}{\text{Aliquot taken} \times \text{Weight of the sample taken}} \times 100$$

Titratable acidity (%) of guava powder samples was measured by AOAC (2005) method by boiling the sample for 1 h in water and making up the volume up to 100 ml and then titrating it against 0.1 N sodium hydroxide solution using phenolphthalein indicator.

$$\text{Acidity (\%)} = \frac{\text{Titre value} \times \text{Normality} \times \text{Volume made up} \times \text{Eq. wt. of acid of NaoH}}{\text{Volume of sample taken for estimation} \times \text{Wt. of sample taken} \times 100} \times 100$$

Statistical analysis

The data obtained from set of observation for each character were subjected to "Analysis of Variance" as advocated by Panse and Sukhatme (1985). The skeleton of ANOVA as per design.

Results and Discussion

The data recorded on physical and bio-chemical parameters of guava fruit were statistically analysed and presented under the following appropriate headings. Data pertaining to the studies on deferent types of packaging material to extend shelf life of guava at *i.e.*, 0, 4, 8, 12 and 16 days on physico-bio-chemical changes of guava are presented in this chapter.

Physical parameters of fruits

Fruit weight (gm)

Observations recorded on Fruit weight exhibited significant differences among the treatments in 0, 4, 8, 12 and 16 days after storage of guava fruits (Table 1). Among the packaging treatments, the fruits under the treatments T_{12} retained maximum fruit weight (178.27 gm), which were on at par with each other including T_{11} (164.92 gm) at 0 days after storage.

The minimum fruit weight was recorded in control (127.34 gm). In treatments T_{12} retained maximum Fruit weight (176.17 gm), which were at par with each other including T_{11} (160.88 gm) at 4 days after storage. The minimum fruit weight was recorded in control (109.30 gm). In treatments T_{12} retained maximum fruit weight (174.47 Results 30 gm), which were on par with each other including T_{11} (158.54 gm) at 8 days after storage. The minimum fruit weight was recorded in control (102.56 gm). In treatments T_{12} retained maximum Fruit weight (170.69 gm), which were on par with each other including T_{11} (152.42 gm) at 12 days after storage. The minimum fruit weight was recorded in control (95.48 gm). At 16 days after storage, the observations among various packaging treatments revealed that the fruits under treatment T_{12} retained maximum fruit weight (166.22 gm) followed by T_{11} (147.90 gm). The minimum fruit weight was recorded in T_0 (86.92 gm).

Fruit volume (cm^3)

Observations recorded on fruit volume exhibited significant differences among the treatments in 0, 4, 8, 12 and 16 days after storage of guava fruits (Fig. 1). Among the packaging treatments, the fruits under the treatments T_{12} retained maximum fruit volume (162.32 cm 3), which were at par with each other including T_{11} (150.30 cm^3) at 0 days after storage. The minimum fruit volume was recorded in control (121.33 cm^3). In treatments T_{12} retained maximum fruit volume (170.93 cm^3), which were at par with each other including T_{11} (155.60 cm^3) at 4 days after storage. The minimum fruit volume was recorded in control (104.82 cm^3). In treatments T_{12} retained maximum fruit volume (164.60 cm3), which were at par with each other including T_{11} (152.83 cm^3) at 8 days after storage. The minimum fruit volume was recorded in control (96.22 cm^3). In treatments T_{12} retained maximum fruit volume (162.05 cm^3), which were on par with each other including T_{11} (147.56 cm^3) at 12 days after storage. The minimum fruit volume was recorded in control (91.34 cm^3). At 16 days after storage, the observations among various packaging treatments revealed that the fruits under treatment T_{12} retained maximum fruit volume (159.82 cm^3) followed by T_{11} (143.62 cm^3). The minimum fruit volume was recorded in T_0 (79.39 cm^3).

Table 1 : Effect of various packaging material on fruit weight (gm) at 0, 4, 8, 12 and 16 days in guava fruit.

Treatments	At 0 days	At 4 days	At 8 days	At 12 days	At 16 days
Control **(T_0)**	127.34	109.30	102.56	95.48	86.92
Black polythene **(T_1)**	146.26	136.76	130.80	125.98	121.62
White polythene **(T_2)**	144.26	133.28	127.37	120.59	116.94
Brown paper **(T_3)**	135.07	120.87	110.53	106.84	100.61
Butter paper **(T_4)**	143.50	132.12	124.35	119.18	113.86
Tissue paper **(T_5)**	131.76	116.40	105.29	100.51	95.36
News paper **(T_6)**	145.30	135.10	128.50	124.29	120.25
Gunny bag **(T_7)**	140.10	126.55	116.14	110.76	106.33
Banana leaf **(T_8)**	152.54	144.22	136.82	133.91	129.56
Rice husk **(T_9)**	149.16	140.30	134.71	131.12	126.73
CFB boxes **(T_{10})**	160.79	153.86	146.92	143.47	139.95
Open mud container **(T_{11})**	164.92	160.88	158.54	152.42	147.90
Shield mud container **(T_{12})**	178.27	176.17	174.47	170.69	166.22
C.D.	**4.81**	**4.28**	**3.40**	**2.99**	**3.07**
SE(m)	**1.64**	**1.46**	**1.16**	**1.02**	**1.05**
C.V.	**1.93**	**1.85**	**1.54**	**1.41**	**1.50**

Table 2 : Effect of various packaging material on Physiological loss in weight (%) at 0, 4, 8, 12 and 16 days in guava fruit.

Treatments	At 0 days	At 4 days	At 8 days	At 12 days	At 16 days
Control **(T_0)**	11.71	14.17	19.46	25.02	31.74
Black polythene **(T_1)**	7.50	6.50	10.57	13.87	16.85
White polythene **(T_2)**	7.61	7.61	11.71	16.41	18.94
Brown paper **(T_3)**	9.51	10.51	18.17	20.90	25.51
Butter paper **(T_4)**	6.93	7.93	13.34	16.95	20.66
Tissue paper **(T_5)**	9.99	11.66	20.09	23.72	27.63
News paper **(T_6)**	7.35	7.02	11.56	14.46	17.24
Gunny bag **(T_7)**	8.67	9.67	17.10	20.94	24.10
Banana leaf **(T_8)**	6.46	5.46	10.31	12.22	15.07
Rice husk **(T_9)**	6.27	5.94	9.69	12.09	15.04
CFB boxes **(T_{10})**	5.64	4.31	8.63	10.77	12.96
Open mud container **(T_{11})**	4.12	2.45	3.87	7.58	10.32
Shield mud container **(T_{12})**	1.51	1.18	2.13	4.25	6.76
C.D.	**1.23**	**1.21**	**1.21**	**1.21**	**1.21**
SE(m)	**0.43**	**0.42**	**0.42**	**0.42**	**0.42**
C.V.	**10.18**	**9.89**	**5.96**	**4.69**	**3.85**

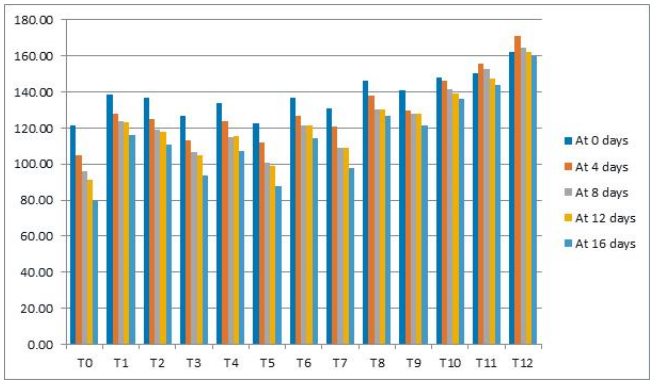

Fig. 1 : Effect of various packaging material on fruit volume (cm^3) at 0, 4, 8, 12 and 16 days in guava fruit.

Physiological loss in weight (%)

Observations recorded on physiological loss in weight exhibited significant differences among the treatments in 0, 4, 8, 12 and 16 days after storage of guava fruits (Table 2). Among the packaging treatments, the fruits under the treatments T_0 retained maximum physiological loss in weight (11.71 %), which were at par with each other including T_5 (9.99 %) at 0 days after storage. The minimum physiological loss in weight was recorded in T_{12} (1.51 %) followed by T_{11} (4.12 %).

In treatments T_0 (control) retained maximum physiological loss in weight (14.17 %), which were at par with each other including T_5 (11.66 %) at 4 days after storage. The minimum physiological loss in weight was recorded in T_{12} (1.18 %) followed by T_{11} (2.45 %). In treatments T_5 retained maximum physiological loss in weight (20.09%), which were on par with each other including T_0 (control) (19.46%) at 8 days after storage. The minimum physiological loss in weight was recorded in T_{12} (2.13%) followed by T_{11} (3.87%). In treatments T_0 (control) retained maximum physiological loss in weight (25.02%), which were at par with each other including T_5 (23.72%) at 12 days after storage. The minimum physiological loss in weight was recorded in T_{12} (4.25%) followed by T_{11} (7.58%). At 16 days after storage, the observations among various packaging treatments revealed that the fruits under treatment T_0 (control) retained maximum physiological loss in weight (31.74%) followed by T_5 (27.63 Results 40%). The minimum physiological loss in weight was recorded in T_{12} (6.76%) followed by T_{11} (10.32%).

Bio-chemical parameters

Total Soluble Solids (^{o}Brix) : Observations recorded on Total Soluble Solids exhibited significant differences among the treatments in 0, 4, 8, 12 and 16 days after storage of guava fruit (Fig. 2). Among the packaging treatments, the fruits under the treatment T_3 retained maximum Total Soluble Solids (10.05^{0}B) at 0 days after storage. The minimum Total Soluble Solids was recorded in T_{10} (7.10^{0}B). In treatment T_7 retained maximum Total Soluble Solids (9.39^{0}B) followed by T_6 (9.17^{0}B) at 4 days after storage. The minimum Total Soluble Solids was recorded in T_4 (6.60^{0}B) followed by T_8 (7.02^{0}B). In treatment T_1 retained maximum Total Soluble Solids (14.14^{0}B) followed by T_{12} (13.54^{0}B) at 8 days after storage. The minimum Total Soluble Solids was recorded in T_4 (10.56^{0}B) followed by T_0 (10.88^{0}B). In treatment T_5 retained maximum Total Soluble Solids (13.38^{0}B) followed by T_{12} (13.31^{0}B) at 12 days after

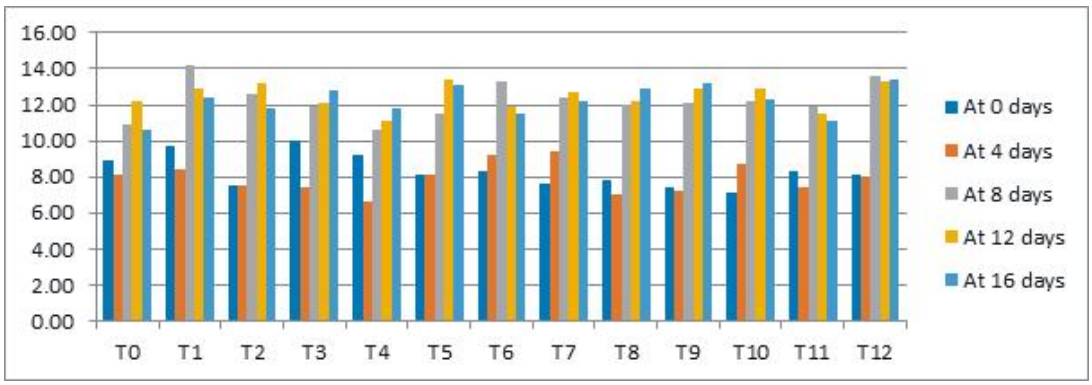

Fig. 2 : Effect of various packaging material on TSS (° Brix) at 0, 4, 8, 12 and 16 days in guava fruit.

Table 3 : Effect of various packaging material on titratable acidity (%) at 0, 4, 8, 12 and 16 days in guava fruit.

Treatments	At 0 days	At 4 days	At 8 days	At 12 days	At 16 days
Control **(T_0)**	0.51	0.46	0.42	0.40	0.37
Black polythene **(T_1)**	0.44	0.40	0.37	0.35	0.31
White polythene **(T_2)**	0.42	0.38	0.36	0.35	0.32
Brown paper **(T_3)**	0.46	0.42	0.40	0.38	0.36
Butter paper **(T_4)**	0.44	0.41	0.39	0.36	0.33
Tissue paper **(T_5)**	0.48	0.46	0.41	0.39	0.35
News paper **(T_6)**	0.44	0.42	0.38	0.36	0.32
Gunny bag **(T_7)**	0.46	0.43	0.40	0.39	0.37
Banana leaf **(T_8)**	0.41	0.38	0.36	0.35	0.31
Rice husk **(T_9)**	0.43	0.42	0.39	0.37	0.35
CFB boxes **(T_{10})**	0.36	0.34	0.31	0.29	0.27
Open mud container **(T_{11})**	0.35	0.35	0.33	0.31	0.27
Shield mud container **(T_{12})**	0.34	0.32	0.30	0.27	0.24
C.D.	**0.04**	**0.02**	**0.02**	**0.02**	**0.02**
SE(m)	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
C.V.	**4.86**	**3.25**	**3.64**	**3.59**	**3.70**

storage. The minimum Total Soluble Solids was recorded in T_4 (11.12^{0}B) followed by T_{11} (11.46^{0}B). At 16 days after storage, the observations among various packaging treatments revealed that the fruits under treatment T_{12} retained maximum Total Soluble Solids (13.36^{0}B) followed by T_9 (13.20^{0}B). The minimum Total Soluble Solids was recorded in T_0 (Control) (10.56^{0}B) followed by T_{11} (11.06^{0}B).

Titratable acidity (%) : Observations recorded on Titratable acidity exhibited significant differences among the treatments in 0, 4, 8, 12 and 16 days after storage of guava fruit (Table 3). Among the packaging treatments, the fruits under the treatment T_0 (Control) retained maximum Titratable acidity (0.51%) at 0 days after storage. The minimum Titratable acidity was recorded in T_{12} (0.34%).

In treatment T_0 (Control) and T_5 retained maximum Titratable acidity (0.46%) followed by T_7 (0.43%) at 4 days after storage. The minimum Titratable acidity was recorded in T_{12} (0.32%) followed by T_{10} (0.34%). In treatment T_0-Control retained maximum Titratable acidity (0.42%) followed by T_5 (0.41%) at 8 days after storage. The minimum Titratable acidity was recorded in T_{12} (0.30%) followed by T_{10} (0.31%). In treatment T_0-Control retained maximum Titratable acidity (0.40%) followed by T_5 and T_7 (0.39%) at 12 days after storage. The minimum Titratable acidity was recorded in T_{12} (0.27%) followed by T_{10} (0.29%). At 16 days after storage, the observations among various packaging treatments revealed that the fruits under treatment T_0-Control and T_7 retained maximum Titratable acidity (0.37%) followed by T_3 (0.36%). The minimum Titratable acidity was recorded in T_{12} (0.24%) followed by T_{10} and T_{11} (0.27%).

Ascorbic acid (mg/100 gm) : Observations recorded on "Ascorbic acid" exhibited significant differences among the treatments in 0, 4, 8, 12 and 16 days after storage of guava fruit (Table 4). Among the

Table 4 : Effect of various packaging material on ascorbic acid (mg/100 gm) at 0, 4, 8, 12 and 16 days in guava fruit.

Treatments	At 0 days	At 4 days	At 8 days	At 12 days	At 16 days
Control **(T_0)**	185.72	178.91	175.21	172.12	171.05
Black polythene **(T_1)**	194.85	192.25	190.32	187.61	184.28
White polythene **(T_2)**	194.38	191.57	188.28	185.92	182.92
Brown paper **(T_3)**	187.87	184.68	181.33	178.86	175.71
Butter paper **(T_4)**	192.08	186.38	184.07	181.45	180.32
Tissue paper **(T_5)**	187.08	183.58	180.40	177.14	174.07
News paper **(T_6)**	192.79	186.81	185.25	184.33	182.17
Gunny bag **(T_7)**	190.65	187.00	182.52	180.28	178.44
Banana leaf **(T_8)**	197.35	193.31	192.80	190.60	187.23
Rice husk **(T_9)**	195.69	191.68	190.77	187.73	182.34
CFB boxes **(T_{10})**	201.17	198.73	195.30	192.05	190.70
Open mud container **(T_{11})**	203.68	200.18	198.75	197.18	195.25
Shield mud container **(T_{12})**	206.17	202.97	201.48	199.78	198.07
C.D.	**1.57**	**1.71**	**1.64**	**2.21**	**2.06**
SE(m)	**0.54**	**0.59**	**0.56**	**0.76**	**0.70**
C.V.	**0.48**	**0.53**	**0.52**	**0.71**	**0.67**

packaging treatments, the fruits under the treatment T_{12} retained maximum Ascorbic acid (206.17 mg/100 gm), which were on par with each other including T_{11} (203.68 mg/100 gm) at 0 days after storage. The minimum Ascorbic acid was recorded in T_0 Control (185.72 mg/100 gm). It was found to be on par with T_5 (187.08 mg/100 gm).

In treatment T_{12} retained maximum Ascorbic acid (202.97 mg/100 gm) followed by T_{11} (200.18 mg/100 gm) at 4 days after storage. The minimum Ascorbic acid was recorded in T_0 Control (178.91 mg/100 gm) followed by T_5 (183.58 mg/100 gm). In treatment T_{12} retained maximum Ascorbic acid (201.48 mg/100 gm) followed by T_{11} (198.75 mg/100 gm) at 8 days after storage. The minimum Ascorbic acid was recorded in T0-Control (175.21 mg/100 gm) followed by T_5 (180.40 mg/100 gm). In treatment T_{12} retained maximum Ascorbic acid (199.78 mg/100 gm) followed by T_{11} (195.25 mg/100 gm) at 12 days after storage. The minimum Ascorbic acid was recorded in T_0 Control (172.12 mg/100 gm) followed by T_5 (177.14 mg/100 gm). At 16 days after storage, the observations among various packaging treatments revealed that the fruits under treatment T_{12} retained maximum Ascorbic acid (198.07 mg/100 gm) followed by T_{11} (195.25 mg/100 gm). The minimum Ascorbic acid was recorded in T_0 Control (171.05 mg/100 gm) followed by T_5 (174.07 mg/100 gm).

Conclusion

Result concluded that the different packing material *viz.*, Open (Control), Black polythene, White polythene, Brown paper, Butter paper, Tissue paper, Newspaper, Gunny bag, Banana leaf, Paddy straw, CFB boxes, Open mud container and Shield mud container were used for induced the shelf life of guava were significantly influenced the different physical and bio-chemical parameters of guava. It was recorded that the treatment Shield mud container (T_{12}) is best for the fruit weight (g), physiological loss in weight (%), fruit volume (cm^3). bio-chemical parameters (*viz.*, Total soluble solids (^{o}Brix), acidity (%) and Ascorbic acid (mg/100g) reported best for storage of guava to extent shelf life up to 16th day of storage.

Acknowledgements

The author is thankful to Dr. Poonam (Assistant Professor, Department of Horticulture) for his guidance and generous support. This research was conducted at ITM University, School of Agriculture, Gwalior (M.P.), India.

References

AOAC (2005). *Official methods of analysis*. 18th edn. Association of official Analytical Chemists, Washington DC; 2005.

Asery, R., Patel V.B., Singh S.K. and Sagar V.R. (2008). Factors affecting fruit maturity and maturity standards : A review. *J. Food Sci. Technol. Mysore*, **45(5)**, 381-390.

Azzolini, M., Jacomino A.P. and Spoto M.H.F. (2004). Maturation stage and postharvest quality of 'Pedro Sato' guavas. *Revista Brasileira de Fruticulture*, **26**, 29-31.

Cavalini, F.C., Jacomino A.P., Lochoski M.A., Kluge R.A. and Ortega E.M.M. (2006). Maturity indexes for Kumagai and Paluma guavas. *Revista Brasileira de Fruticulture*, **28**, 176-179.

Chouksey, S., Singh A., Thakur R.S. and Deshmukh R. (2013). Influence of gamma irradiation and benzyl adenine on keeping quality of custard apple fruits during storage. *J. Food Sci. Technol*., **50**, 934- 941.

Faasema, J., Abu J.O. and Alakali J.S. (2011). Effect of packaging and storage condition on the quality of sweet orange (*Citrus cinesis*). *J. Agricult. Technol.*, **7(3)**, 797-804.

Fageria, M.S., Lal G., Dhaka R.S. and Choudhary M.R. (2006). Studies on post-harvest management of ber cv. Umran. *Indian J. Horticult.*, **64**, 469-471.

Fassema, J., Abu J.O. and Alakali J.S. (2011). Effect of packaging and storage condition on the quality of sweet orange (*Citrus sinensis*). *J. Agricult. Technol.*, **7(3)**, 797-804.

Gonzaga Neto, L., Cristo A.S. and Choudhury M.M. (1999). Conservaçaopos-colheita de frutos de goiabeira, variedade Paluma. *Pesquisa Agropecuária Brasileira, Brasília*, **34(1)**, 1-6.

Kader, A.A. (1992). *Postharvest technology of horticultural crops*. The University of California, Division of Agriculture and Natural Resources, (quality and safety factors, definition and evaluation for fresh horticultural crops) second edition, publication No 3311, 228-345.

Mahajan, B.V.C., Dhatt A.S. and Dhillon W.S. (2004). Effect of pre-storage treatments on the quality and storage life of Asian pear. *Indian J. Horticult.*, **61(4)**, 342-344.

Mitra, S.K., Devi H.L., Chakraborty I. and Pathak P.K. (2012). Recent development in postharvest physiology and storage of guava. In : *III International Symposium on guava and other Myrtaceae*, **959**, 89-95.

Pance, V.G. and Sukhatme P.V. (1985). *Statistical method for agriculture workers*. Indian Council of Agriculture Research Publication, 3rd rev. ed.

Ranganna S. (2000). *Handbook of analysis and quality control for fruit and vegetable products*. 2nd edn. Tata McGraw-Hill Publ Co. Ltd,New Delhi; 2000.

Sanjay, S. (2000). Effect of season on the vegetative and reproductive attributes of Sardar guava (*Psidium guajava*). *Orissa J. Horticult. India*, **28 (2)**, 77-80.

Singh, S.P. and Pal R.K. (2007). Postharvest fruit fly disinfestation strategies in rainy season guava crop. *Acta Horticulture*, **735**, 591-596.