



Effect of packaging materials on physiological parameters of Ber (*Ziziphus mauritiana* Lamk.) cultivars Thai Apple and Gola

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ARTICLE INFO	ABSTRACT
<p>Original Research Article Received on April 12, 2025 Revised on April 18, 2025 Accepted on May 07, 2025 Published on May 13, 2025</p> <p>Article Authors Sushila, Surender Singh, Prince, Chitrlekha</p> <p>Corresponding Author Email prince@hau.ac.in</p>	<p>An experiment was conducted in Post-harvest Laboratory of the Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar to find the effect of packaging materials viz., corrugated fibre board boxes, sealed polyethylene bags, perforated polyethylene bags, polynet and control on physiological parameters of ber cultivars Thai Apple and Gola stored at room temperature during February month of 2018. The data were recorded on moisture content, physiological loss in weight, decay loss, fruit firmness and specific gravity during storage. The results reveal that the ber fruits of Thai Apple packed in sealed poly bags exhibited minimum physiological in weight, maximum specific gravity and retained maximum moisture %, while the fruits of Thai Apple cultivar packed in corrugated fiber board boxes retained more fruit firmness as compared to the fruits packed in other packaging materials and also to the fruits of Gola cultivar at the end of storage period. The fruits of Gola cultivar packed in corrugated fibre board boxes exhibited minimum decay loss than the fruits packed in other packaging materials and also to the fruits of Thai Apple cultivar at the end of storage period. The results of the present study conclude that the corrugated fiber board boxes were found best for reducing decay loss of Gola cultivar ber fruits up to eight days of storage under ambient room temperature conditions.</p>
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Indian Jujube (*Ziziphus mauritiana* Lamk.), popularly known as *ber*, belonging to the family Rhamnaceae is indigenous to India. The genus *Ziziphus* includes about fifty species, and among those, 18-20 species are native to India (Pareek, 1983). It is also considered as poor man's fruit due to its high nutritional and medicinal value and low cost (Gajbhiye *et al.*, 2003). It is mainly cultivated in India, central Asia, China and Taiwan. It is one of the most hardy fruit trees extensively grown in arid and semi-arid areas of India. The major ber growing states of India are Haryana, Punjab, Uttar Pradesh,

Rajasthan, Gujarat, Maharashtra, Madhya Pradesh and Bihar. The main areas of ber production in Haryana are Hisar, Mewat, Rewari, Mahendergarh, Gurugram, Sirsa, Fatehabad, Bhiwani, Rohtak and Jind. Fruits are highly perishable in nature and total losses in different fruits reach an extent of 20-40 percent. Ber is harvested at full ripening stage. Ripened fruits are highly perishable due to thin and delicate skin and high water content in pulp, which shortens its shelf life. Its storage life is very short at ambient room temperature, thus, it cannot be transported to distant market, which creates glut in the market.

It is desirable to extend the storage life of ber so that its fruits may be marketed for longer period. It is well established that the storage of fruits can be extended by checking the rate of respiration, transpiration and disease incidence (Banik *et al.*, 1998). In India, proper packaging is inadequate, which is the main reason of postharvest losses. Different types of packaging material alone or in combination with other biological materials, must be used without any adverse effect on human health and environment for increasing the shelf life of ber fruits. Role of different types of plastic like polyethylene, polypropylene bags and films (high density, low density, perforated or non-perforated) has been reported in enhancing the shelf life of commercially important fruits like in guava (Venkatesha and Reddy, 1994), banana (Nair *et al.*, 1995), Kinnow (Singh and Singh, 1996) and mango (Cao and Wang, 2000). Therefore, an experiment was planned to study the effect of packaging materials on physiological parameters of ber (*Ziziphus mauritiana* Lamk.) cultivars Thai Apple and Gola during storage.

Materials and Methods

The experiment was conducted during February month of 2018 in Post-harvest Laboratory of the Department of Horticulture, CCS Haryana Agricultural University, Hisar situated at 215.2 m above mean sea level with 29°10' N latitude and 75°46' E longitudes. The fruits of ber cv. Gola were obtained from university orchard and fruits of cultivar Thai Apple from the orchard of farmer at village Sheeshwal in district Hisar. Diseased, undesirable and damaged fruits were sorted out from the samples. Healthy fruits of uniform size were taken for conducting the experiment and packed in different packaging materials *viz.*, corrugated fibre board boxes, sealed polyethylene bags, perforated polyethylene bags, polynet and control each of 2 kg capacity. The treatments were laid out in Split split design with three replications and various physiological parameters were studied during experimentation. The moisture of the fruit was determined by using the method given in (A.O.A.C., 1965). A known weight of sample was oven dried at 70°C until a constant weight was recorded. From this, the dry weight and moisture content were computed.

The physiological loss in weight (PLW) of the fruit was recorded using the formula given by (Srivastava and Tandon, 1968) based on initial weight of the fruit and loss in weight that occurred. The per cent decay loss was also calculated by using the formula suggested by (Srivastava and Tandon, 1968), which is weight of decayed fruits divided by initial weight of fruits. The fruit firmness was measured with the help of a penetrometer using 4 mm cylindrical plunger probe. The specific gravity of fruit was recorded by water displacement method. The data for the physiological parameters of ber fruits were recorded on alternate days. The data were tabulated in excel sheet and statistically analyzed with the procedures described by (Gomez and Gomez, 1984).

Results and Discussion

The moisture (%) in ber fruits decreased gradually and significantly with the advancement of storage period irrespective of packaging materials and cultivars (table 1). In the present study, a significantly higher level of moisture content was recorded in fruits of Thai Apple cultivar (78.05%) than the moisture content of Gola cultivar fruits (77.33%) irrespective of packaging materials and storage period. The moisture content was observed maximum in fruits packed in sealed polyethylene bags (79.16%) irrespective of storage period and cultivars. The maximum moisture content was recorded in fruits of Thai Apple cultivar packed in sealed polyethylene film bags (79.65%) irrespective of storage period. The maximum moisture content was recorded in fruits of Thai Apple cultivars packed in sealed polyethylene bags (76.12%) at the end of storage period.

The high moisture content in fruits of Thai Apple ber might be due to the hard and thick peel as compared to the peel thickness of Gola cultivar fruits and also due to high humid atmosphere inside the sealed polyethylene film bags. Similar results were obtained by (Abbas *et al.*, 1988) who observed a decrease in moisture content in fruits of *Ziziphus spina-christi* L. wild cv. Bambawi, Zaytoni and Mallasey during storage. The physiological loss in weight of fruits increased with increasing storage period irrespective of cultivars and packaging materials (table 2).

Table 1. Effect of cultivars and packaging materials on moisture content (%) of ber fruits during storage

Packaging Materials	Cultivars × Packaging Materials × Storage Period									
	Storage Period (Days)									
	0	2	4	6	8	Cultivars				
	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola
CFB	82.20	81.65	80.88	80.15	77.73	77.27	75.55	75.05	72.74	72.15
SP	82.20	81.65	81.30	80.45	80.35	78.41	78.28	77.37	76.12	75.47
PP	82.20	81.65	81.13	80.03	79.25	77.25	77.28	76.28	74.86	74.55
PN	82.20	81.65	80.10	79.60	76.93	76.43	74.50	74.47	71.59	70.95
Control	82.20	81.65	79.93	79.12	76.75	76.27	74.02	73.60	70.88	70.17
Mean	82.20	81.65	80.67	79.97	78.20	77.12	75.93	75.35	73.24	72.66
Packaging Material	Packaging Materials × Storage Period						Storage Period (Days)	Cultivars × Storage Period		
	Storage Period (Days)							Cultivars		
	0	2	4	6	8	Mean		T. Apple	Gola	Mean
CFB	81.92	80.52	77.50	75.30	72.45	77.54	0	82.20	81.65	81.92
SP	81.92	80.88	79.38	77.83	75.79	79.16	2	80.67	79.97	80.27
PP	81.92	80.58	78.25	76.78	74.70	78.45	4	78.20	77.12	77.66
PN	81.92	79.85	76.68	74.48	71.27	76.84	6	75.93	75.35	75.64
Control	81.92	79.52	76.51	73.81	70.52	76.46	8	73.24	72.66	72.95
Mean	81.92	80.27	77.66	75.64	72.95		Mean	78.05	77.33	
Packaging Material	Cultivars × Packaging Materials			CD at 5% Level of Significance						
	Cultivars									
	T. Apple	Gola	Mean							
CFB	77.82	77.25	77.54	Cultivars 0.47						
SP	79.65	78.67	79.16	Packaging materials 0.12						
PP	78.94	77.95	78.45	Storage period 0.11						
PN	77.07	76.62	76.84	Cultivars × Packaging materials 0.16						
Control	76.76	76.16	76.46	Cultivars × Storage period 0.16						
Mean	78.05	77.33		Packaging materials × Storage period 0.25						
				Cultivars × Packaging materials × Storage period 0.35						

Note: T. Apple= Thai Apple, CFB= Corrugated Fibre Board Boxes, SP= Sealed Polyethylene, PP= Perforated polyethylene, PN= Poly net

In the current experiment, the physiological loss in weight was significantly lesser in fruits of Thai Apple cultivar (4.14%) than fruits of Gola cultivar (4.32%) irrespective of packaging materials and storage period. The minimum physiological loss in weight was observed in fruits packed in sealed polyethylene bags (2.76%) irrespective of cultivars and storage period, which might be due to the development of high humid atmosphere inside the package, which reduced the rate of transpiration. Panda *et al.* (2017) also reported a positive effect of packaging film on the maintenance of high humidity inside the package and reduction in water loss from the produce. The minimum physiological loss in weight was recorded in fruits of Thai Apple cultivar packed in sealed polyethylene film bags (2.55%) irrespective of storage period. At the end of storage, the minimum physiological loss in weight was recorded in fruits of Thai Apple cultivar packed in

sealed polyethylene bags (6.08%), which was statistically at par with the physiological loss in weight of fruits of Gola cultivar packed in sealed polyethylene bags (6.18%). This might be due to the fact that the sealed polyethylene bags acted as a barrier against transpiration loss during storage, thus, maintained high humid atmosphere inside the package. These results are in close conformity with the findings of (Ding *et al.*, 1998) who recorded minimum (8.3%) physiological loss in weight of ripe loquat fruit packed in perforated polythene film bags with 0.15% perforation, these results might also be due to the reduction in metabolic rate, reducing the moisture loss from the mandarin fruits (Bhardwaj and Sen, 2003). Ingawale *et al.* (2001) who stated that the fruits of apple packed in 100 gauge polythene bags with 2% vent showed less physiological loss in weight as compared to unpacked fruits (29.8%).

Kaur *et al.* (2014) who recorded minimum physiological loss in weight (0.67%) of guava fruits packed in non-perforated polythene film bags and (Mahajan *et al.*, 2015) who found an increase in physiological loss in weight of peaches with the advancement of storage period and they also observed lowest physiological loss in weight of peaches packed in shrink film as compared to the fruits packed in other packaging materials. The decay loss (%) of ber fruits increased with the increase in period of storage irrespective of cultivars and packaging materials (table 3). During storage, the pectic substances are broken down, which resulted in decreased fruit firmness leading to softening of fruits and ultimately made them susceptible for the attack of microorganisms. This increasing decay loss might be due to the spoilage of fruits caused by fungal infection like stem end rot

during storage (Eckert *et al.*, 1996). Due to the attack of microorganisms on fruit stem end, spoilage or decay loss occurred, which resulted in biochemical changes in fruits (Jain and Chauhan, 1994). In this experiment, the decay loss was recorded significantly lower in fruits of Gola cultivar (6.77%) than fruits of Thai Apple cultivar (8.80%) irrespective of packaging materials and storage period. The minimum decay loss was recorded in fruits packed in corrugated fiber board boxes (5.79%) irrespective of cultivars and storage period. The minimum decay loss was recorded in fruits of Gola cultivar packed in corrugated fiber board boxes (5.06%) irrespective of storage period. The interaction between cultivars, packaging materials and storage period was found non-significant in respect of decay loss.

Table 2. Effect of cultivars and packaging materials on physiological loss in weight (%) of ber fruits during storage

Packaging Materials	Cultivars × Packaging Materials × Storage Period									
	Storage Period (Days)									
	0		2		4		6		8	
	Cultivars									
	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola
CFB	0.00	0.00	1.32	1.50	4.47	4.38	6.65	6.60	9.46	9.50
SP	0.00	0.00	0.90	1.20	1.85	3.24	3.92	4.28	6.08	6.18
PP	0.00	0.00	1.07	1.62	2.95	4.40	4.92	5.37	7.01	7.10
PN	0.00	0.00	2.10	2.05	5.27	5.22	7.70	7.18	10.61	10.70
Control	0.00	0.00	2.27	2.53	5.45	5.38	8.18	8.05	11.32	11.48
Mean	0.00	0.00	1.53	1.78	3.99	4.52	6.27	6.30	8.90	8.99
Packaging Material	Packaging Materials × Storage Period						Storage Period (Days)	Cultivars × Storage Period		
	Storage Period (Days)							Cultivars		
	0	2	4	6	8	Mean		T. Apple	Gola	Mean
CFB	0.00	1.41	4.43	6.62	9.48	4.39	0	0.00	0.00	0.00
SP	0.00	1.05	2.55	4.10	6.13	2.76	2	1.53	1.78	1.65
PP	0.00	1.34	3.67	5.14	7.06	3.44	4	3.99	4.52	4.26
PN	0.00	2.07	5.24	7.44	10.65	5.08	6	6.27	6.30	6.28
Control	0.00	2.40	5.42	8.12	11.40	5.47	8	8.90	8.99	8.94
Mean	0.00	1.65	4.26	6.28	8.94		Mean	4.14	4.32	
Packaging Material	Cultivars × Packaging Materials			CD at 5% Level of Significance						
	Cultivars									
	T. Apple	Gola	Mean							
CFB	4.38	4.40	4.39	Cultivars 0.06						
SP	2.55	2.98	2.76	Packaging materials 0.12						
PP	3.19	3.69	3.44	Storage period 0.10						
PN	5.13	5.03	5.08	Cultivars × Packaging materials 0.17						
Control	5.45	5.49	5.47	Cultivars × Storage period 0.14						
Mean	4.14	4.32		Packaging materials × Storage period 0.23						
				Cultivars × Packaging materials × Storage period 0.32						

Note: T. Apple= Thai Apple, CFB= Corrugated Fibre Board Boxes, SP= Sealed Polyethylene, PP= Perforated polyethylene, PN= Polynet

Table 3. Effect of cultivars and packaging materials on decay loss (%) of ber fruits during storage

Packaging Materials	Cultivars × Packaging Materials × Storage Period									
	Storage Period (Days)									
	0		2		4		6		8	
	Cultivars									
	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola
CFB	0.00	0.00	1.88	1.09	6.35	4.63	9.14	8.18	15.25	11.42
SP	0.00	0.00	2.56	2.62	9.18	7.89	16.04	13.14	22.76	19.40
PP	0.00	0.00	2.42	1.58	8.70	5.22	15.90	10.74	21.90	16.38
PN	0.00	0.00	2.06	1.12	8.27	4.88	14.27	10.56	18.77	16.07
Control	0.00	0.00	2.16	1.29	8.27	5.05	14.61	10.61	19.51	17.43
Mean	0.00	0.00	2.22	1.54	8.15	5.53	13.99	10.64	19.64	16.14
Packaging Material	Packaging Materials × Storage Period						Storage Period (Days)	Cultivars × Storage Period		
	Storage Period (Days)							Cultivars		
	0	2	4	6	8	Mean		T. Apple	Gola	Mean
CFB	0.00	1.49	5.49	8.66	13.33	5.79	0	0.00	0.00	0.00
SP	0.00	2.59	8.53	14.59	21.08	9.36	2	2.22	1.54	1.88
PP	0.00	2.00	6.96	13.32	19.14	8.28	4	8.15	5.53	6.84
PN	0.00	1.59	6.58	12.41	17.42	7.60	6	13.99	10.64	12.32
Control	0.00	1.73	6.66	12.61	18.47	7.89	8	19.64	16.14	17.89
Mean	0.00	1.88	6.84	12.32	17.89		Mean	8.80	6.77	
Packaging Material	Cultivars × Packaging Materials			CD at 5% Level of Significance						
	Cultivars									
	T. Apple	Gola	Mean							
CFB	6.52	5.06	5.79	Cultivars 0.41						
SP	10.11	8.61	9.36	Packaging materials 0.62						
PP	9.78	6.78	8.28	Storage period 0.52						
PN	8.67	6.53	7.60	Cultivars × Packaging materials NS						
Control	8.91	6.88	7.89	Cultivars × Storage period 0.73						
Mean	8.80	6.77		Packaging materials × Storage period 1.16						
				Cultivars × Packaging materials × Storage period NS						

Note: T. Apple= Thai Apple, CFB= Corrugated Fibre Board Boxes, SP= Sealed Polyethylene, PP= Perforated polyethylene, PN= Polynet

The findings of present experiment are in line with the findings of (Joshi and Roy, 1986) who reported corrugated fiberboard boxes as an effective packaging material for the transportation and storage of mango cv. Alphonso as compared to other packaging materials, as they found lesser decay loss of fruits stored in corrugated fiberboard boxes with three partitions, (Lal and Fageria, 2004) who reported that the performance of ber fruits packed in corrugated cardboard boxes was best during storage and the fruits packed in corrugated cardboard boxes exhibited minimum decay loss at the end of storage period (Yadav *et al.*, 2005) who reported that the decay loss in ber fruits of cv. Gola and Kaithali were found minimum in fruits packed in corrugated fiberboard boxes with paper cutting as cushioning material and (Raddar *et al.*, 2007) who observed that the performance of Umran ber fruits packed in corrugated fiberboard boxes was better in respect of

decay loss as compared to the fruits packed in other packaging materials and (Rokaya *et al.*, 2015) who also observed that the decay loss increased significantly with the increase in storage period and found the decay loss minimum (3.83%) after four weeks of storage in mandarin when packed in corrugated fiberboard boxes at 16±2°C temperature. The fruit firmness (lb-f) continuously decreased with the advancement of storage period irrespective of different cultivars and packaging materials (table 4). The decrease in fruit firmness during storage might be due to the conversion of proto-pectin to soluble pectin caused by the increased activity of pectin esterase enzyme in cell wall and middle lamella at maturity. Thakur *et al.* (2005) also reported that along the post-harvest handling and distribution channels, the fruit firmness decreased due to increased metabolic activities.

In the present experiment, the fruits of Thai Apple cultivar were significantly more firm (26.79 lbf) than the fruits of Gola cultivar (24.96 lbf) irrespective of packaging materials and storage period. The fruits packed in corrugated fiber board boxes had maximum firmness (27.12 lbf) irrespective of cultivars and storage period. The interaction between cultivars and packaging materials used was non-significant. At the end of storage period, the maximum firmness was recorded in fruits of Thai Apple cultivar packed in corrugated fiber board boxes (24.48 lbf). The results of present study are in agreement with the findings of (Goutam *et al.*, 2010) who observed maximum fruit firmness in winter guava packaged in corrugated fiberboard boxes lined with newspaper after treating with 1.5% $\text{Ca}(\text{NO}_3)_2$ and stored at 6-8°C temperature and 90-95% relative humidity and (Rokaya *et al.*, 2015) who observed maximum firmness in fruits of

mandarin packed in corrugated fiberboard boxes after four weeks of storage at ambient room temperature. The specific gravity decreased continuously with the advancement of storage period irrespective of cultivars and packaging materials (table 5). During storage, fruits show reduction in weight because of increased rate of respiration and transpiration, which is the main cause for the reduction of specific gravity. Similar results were obtained by (Ramkishan and Godara, 1993) and (Kannan and Thirumaran, 2003) in ber. In the current experiment, specific gravity was significantly higher of Thai Apple fruits (0.978) than the fruits of Gola cultivar (0.967) irrespective of packaging materials and storage period. The specific gravity was recorded maximum of fruits packed in sealed polyethylene bags (0.979) irrespective of cultivars and storage period.

Table 4. Effect of cultivars and packaging materials on firmness (lb-f) of ber fruits during storage

Packaging Materials	Cultivars × Packaging Materials × Storage Period									
	Storage Period (Days)									
	0		2		4		6		8	
Packaging Materials	Cultivars									
	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola
CFB	30.70	28.96	30.15	27.72	28.75	26.44	25.75	24.58	24.48	23.62
SP	30.70	28.96	29.83	26.83	26.70	25.04	24.37	22.37	22.35	20.99
PP	30.70	28.96	30.03	27.13	27.43	25.68	25.05	22.92	22.70	21.67
PN	30.70	28.96	29.31	26.31	25.80	24.33	23.85	21.99	21.83	20.56
Control	30.70	28.96	28.97	25.78	25.27	23.83	23.35	21.48	20.27	20.09
Mean	30.70	28.96	29.66	26.76	26.79	25.06	24.47	22.67	22.33	21.39
Packaging Material	Packaging Materials × Storage Period						Storage Period (Days)	Cultivars × Storage Period		
	Storage Period (Days)							Cultivars		
	0	2	4	6	8	Mean		T. Apple	Gola	Mean
CFB	29.83	28.94	27.59	25.16	24.05	27.12	0	30.70	28.96	29.83
SP	29.83	28.33	25.87	23.37	21.67	25.81	2	29.66	26.76	28.21
PP	29.83	28.58	26.55	23.99	22.18	26.22	4	26.79	25.06	25.92
PN	29.83	27.81	25.06	22.92	21.19	25.36	6	24.47	22.67	23.57
Control	29.83	27.38	24.55	22.41	20.18	24.87	8	22.33	21.39	21.86
Mean	29.83	28.21	25.92	23.57	21.86		Mean	26.79	24.96	
Packaging Material	Cultivars × Packaging Materials			CD At 5% Level of Significance						
	Cultivars									
	T. Apple	Gola	Mean							
CFB	27.97	26.26	27.01	Cultivars 0.18						
SP	26.79	24.84	25.81	Packaging materials 0.12						
PP	27.18	25.27	26.22	Storage period 0.08						
PN	26.30	24.43	25.36	Cultivars × Packaging materials NS						
Control	25.71	24.03	24.87	Cultivars × Storage period 0.12						
Mean	26.79	24.96		Packaging materials × Storage period 0.19						
				Cultivars × Packaging materials × Storage period 0.26						

Note: T. Apple= Thai Apple, CFB= Corrugated Fibre Board Boxes, SP= Sealed Polyethylene, PP= Perforated polyethylene, PN= Polynet

Table 5. Effect of cultivars and packaging materials on specific gravity of ber fruits during storage

Packaging Materials	Cultivars × Packaging Materials × Storage Period										
	Storage Period (Days)										
	0		2		4		6		8		
	Cultivars										
	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	T. Apple	Gola	
CFB	1.037	1.030	1.017	1.008	0.977	0.978	0.938	0.925	0.914	0.898	
SP	1.037	1.030	1.027	1.016	0.987	0.983	0.943	0.936	0.925	0.906	
PP	1.037	1.030	1.019	1.011	0.985	0.979	0.944	0.930	0.921	0.900	
PN	1.037	1.030	1.016	1.010	0.981	0.970	0.933	0.917	0.910	0.891	
Control	1.037	1.030	1.013	1.004	0.979	0.962	0.938	0.907	0.906	0.886	
Mean	1.037	1.030	1.018	1.010	0.982	0.974	0.939	0.923	0.915	0.896	
Packaging Material	Packaging Materials × Storage Period						Storage Period (Days)	Cultivars × Storage Period			
	Storage Period (Days)							Cultivars			
	0	2	4	6	8	Mean		T. Apple	Gola	Mean	
CFB	1.034	1.013	0.978	0.931	0.906	0.972	0	1.037	1.030	1.034	
SP	1.034	1.022	0.985	0.940	0.915	0.979	2	1.018	1.010	1.014	
PP	1.034	1.015	0.982	0.937	0.910	0.976	4	0.982	0.974	0.978	
PN	1.034	1.013	0.976	0.925	0.901	0.970	6	0.939	0.923	0.931	
Control	1.034	1.009	0.971	0.922	0.896	0.966	8	0.915	0.896	0.906	
Mean	1.034	1.014	0.978	0.931	0.906		Mean	0.978	0.967		
Packaging Material	Cultivars × Packaging Materials			CD at 5% Level of Significance							
	Cultivars										
	T. Apple	Gola	Mean								
CFB	0.977	0.968	0.972	Cultivars							0.005
SP	0.984	0.974	0.979	Packaging materials							0.001
PP	0.981	0.970	0.976	Storage period							0.001
PN	0.975	0.964	0.970	Cultivars × Packaging materials							0.001
Control	0.974	0.958	0.966	Cultivars × Storage period							0.001
Mean	0.978	0.967		Packaging materials × Storage period							0.002
				Cultivars × Packaging materials × Storage period							0.003

Note: T. Apple= Thai Apple, CFB= Corrugated Fibre Board Boxes, SP= Sealed Polyethylene, PP= Perforated polyethylene, PN= Polynet

The maximum specific gravity was recorded of Thai Apple fruits packed in sealed polybags (0.984) irrespective of storage period. At the end of experiment, the maximum specific gravity was recorded of Thai Apple fruits packed in sealed polyethylene bags (0.925). The findings of current experiment are in conformity with the findings of (Bisen *et al.*, 2014) who reported a gradual decrease in specific gravity of calcium treated guava fruits during both years and (Pratap *et al.*, 2017) who observed a continuous decreasing trend in specific gravity of sapota fruits and recorded maximum retention of specific gravity in fruits packed in LDPE (25 μ).

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