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Effects of Aloevera Edible Coating on Quality and Postharvest Physiology of Ber (*Zizyphus mauritiana* Lamk.) under Ambient Storage Conditions

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ABSTRACT

The study was conducted to check the efficacy of aloevera gel as an edible coating so as to enhance shelf life of ber. The treatment combinations were T_1 = control, T_2= corn starch (1%) and T_3= Aloevera gel (2%). The physio-chemical properties, hardness and decay percentage of the fruits were observed upto 15th day of storage. The study revealed that the coating of aloevera gel was effective in retaining quality of Ber fruit over a storage period of at least 15 days. Aloevera gel coated fruits showed minimum physiological loss in weight, minimum shrinkage percentage, maximum colour retention, lesser loss in acid content as compared to uncoated ones. It was also found that aloevera gel subsequently helped in reducing the ripening rate of fruits which was found from the slower rate of total and reducing sugar development. Aloevera coating was very effective in reducing ascorbic acid loss and also helped to reduce the decay percentage. Both the starch and aloevera gel edible coating was found good enough to ensure hardness/firmness of the fruits during storage.

Key words: *shrinkage, colour retention, hardness.*

INTRODUCTION

Ber (*Zizyphus mauritiana* Lamk.) is one of the important minor fruit crop in arid and semi-arid regions belongs to the family Rhamnaceae. It is generally eaten as fresh fruit but some processed products can also be made from it. The richness of the pulp of Ber in nutritive compounds has been widely recognized and it is reported to contain a wide array of phytochemicals and minerals such as amino acids, carbohydrates, ascorbic acid, flavonoids, phenolic acids, vitamins A and C, phosphorus, calcium, and iron[1]. It is a climacteric fruit and ripening, senescence is triggered by ethylene, resulting a short storage life and prone to softening, browning and decay. Ber fruit is highly perishable and has poor shelf life (2-4 days) at ambient condition[2]. During its peak season, due to the surplus of fruits in the local market, a substantial quantity goes to waste, resulting in heavy postharvest losses[3].

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Several techniques such as refrigeration, modified atmosphere storage, chemical preservatives and packaging are being used to minimize deleterious effects[4]. All these are considerably more costly than edible coating[5]. Edible coatings have long been known to protect perishable food products from deterioration[6]. The edible films and coatings are the primary packaging which is prepared from edible materials[7]. Edible coatings provide a barrier against external elements and therefore increase shelf life by reducing gas exchange, loss of water, flavors and aroma and solute migration towards the cuticle. Edible coatings are known to retard moisture migration and the loss of volatile compounds, reduce the respiration rate and delay changes in textural properties. Edible coatings can provide an additional protective coating for fresh products and can also give the same effect as modified atmosphere storage in modifying internal gas composition[8]. A thin layer of edible material usually restricts loss of water, oxygen and other soluble material of food[9; 10]. Edible coatings and films can be consumed along with the food product which is considered as their main advantage over the synthetic packaging[11]. Edible coating is known to reduce browning reaction, loss of moisture and maintained the flavor of sliced apple. It can be used for coating of walnut, almond and bakery products[12; 13; 14]. Aloevera gel is an edible coating material for fruits and vegetables driven by its antifungal activity[15]. Aloevera commonly referred to as a "medicinal plant", is known for its wide range of therapeutic properties. The most common species are Aloe barbadensis and Aloe arborescens. This semi-tropical plant, Aloevera has a long and illustrious history dating from biblical times. It has been mentioned throughout recorded history and given a high ranking as an all-purpose herbal plant. The two major liquid components of *Aloe Vera* are a yellow latex (exudate) and clear gel (mucilage), which proceeds from the large leaf parenchymatic cells[16]. Edible coating using natural biomaterials is being explored as a safer alternative to extend the shelf life of perishable food crops. Aloevera gel has been identified as a novel coating agent with good antimicrobial properties[17; 18] found that Aloevera gel has inhibited the growth of both gram positive and gram negative bacteria. *Aloevera* gel showed good antibacterial activity against some food borne pathogenic microorganisms such as *Bacillus cereus, Salmonella typhimurium, Escherichia coli* and *Klebsialla pneumonia*[19]. Aloevera has found its place in the food industry as a source of functional foods in ice-cream, drinks and beverages[20], and due to antifungal activity of Aloevera gel, as an unique edible coating (plain or in combination with other components) to extend the post-harvest storage of arctic snow[21], apple slices[22], sweet cherry[23], papaya fruits[24] and table grape[25]. Literature search revealed absence of aloevera blended edible coating studies in ber. Hence, studies were carried out to evaluate the efficiency of *Aloevera* as an edible coating to extent the shelf life of ber.

MATERIALS AND METHODS

Sample collection

Fully matured, uniform size ber c.v. Umran were collected from a farmer's orchard at Coochbehar, West Bengal in 2017 fruiting period. It was ensured that the fruits harvested are of uniform maturity, free of blemishes and are immediately brought to the laboratory of the Department of Pomology and Post-harvest Technology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal for necessary treatments. The fruits were washed in running tap water, were dried in the shade for few minutes.

Treatment details and formulations

A set of 25 fruits were examined per replication. Each treatment had 3 sets of replications. Therefore for 3 replications 225 fruits were needed. Then the fruits were subjected to edible coating of following treatments: T_1 = control, T_2= corn starch (1%) and T_3= Aloevera gel (2%). Starch coating solution was prepared on the percentage of weight basis with distilled water. 1 g corn starch powder was mixed with 100 mL of

water for the preparation of 1% solutions. For preparation of 2% aloevera solution, 2ml aloevera gel was mixed with 100ml water. Each solutions were slightly heated in oven, cooled in air[30]. The both control and coated fruits were stored at ambient temperature (30±3ºC). Physico-chemical parameters, visual parameters and hardness were measured at 5, 10th and 15th day of the treatment.

Preparation of edible coating solution

Aloevera gel matrix was separated from the outer cortex of *Aloevera* leaf and this colorless *hydroparenchyma* was ground in a blender. The resulting mixture was filtered to remove the fibres. The liquid obtained constituted fresh *Aloevera* gel. The gel matrix was heated at 70^0C for 45 minutes. Immediately, it was cooled to an ambient temperature and ascorbic acid was added in the range of 1.9-2.0g per litre. This gel was cooled to about 23^0C in less than 15 minutes. Citric acid (4.5 – 4.6g/L) was added to this gel to maintain the pH at 4.

Application of the edible coating solutions: The fresh fruits were dipped in the coating solutions at room temperature for 5 min. At regular intervals, the fruits were rotated to increase the coating efficiency. They were allowed to drain for 2 min and then dried at room temperature under fan, to increase drying rate. Weights of the coated fruits were taken. One set of 10 fruits was taken for coating treatment. Another set of 10 uncoated fruits were used as control. The fruits were stored at room temperature (30 ± 3^0C) and at 70-755% RH. Similarly, a set of 2 other replications were done.

Physical analysis of coated fruits: The following physical analysis was carried out for the fruits to assess the effect of edible coating on the fruit quality:

Physiological loss in weight (PLW): The percentage of weight loss was calculated based on initial weight and weight at subsequent intervals. This was done as per the standard method of AOAC[28].

PLW/Water loss (%) = $(Wo-Wf)/Wo\times100$

where,

Wo is the initial weight of fruits (0 days)

W_f is the final weight of fruits. (5th, 10th and 15th day)

Shrinkage percentage: The length and breadth (millimeter scale) of ber fruits were measured as an index for shrinkage and it was measured by digital Vernier calipers at zero time of storage (beginning) and 5 days interval during the storage period.

Shrinkage percentage in terms of length = [(initial length – final length) / initial length] × 100

Shrinkage percentage in terms of breadth = [(initial breadth– final breadth) / initial length] × 100

Fruit Colour: The fruit colour was recorded with the help of Royal Horticulture Society mini colour chart (Fifth edition, 2007).

Chemical analysis of coated fruits: Total soluble solids (TSS) content of the fruits is determined using the hand refractometer. A drop of fruit juice is placed onto the plate surface of the refractometer and the reading is taken directly as ^{O} Brix. Total sugar and reducing sugar were estimated by the method described by Mazumdar and Majumder, 2003. The acidity and ascorbic acid were estimated by the method described by Rangana[27]. The pH of the ber fruit was determined as per the method of AOAC (1994). 1 g of fruit tissue was crushed in the motor-pastel with water and then this homogenized sample was analyzed. The pH was measured from the supernatant by pH meter.

Degree and rate of fruit spoilage: The differently coated fruits were visually observed for fungal Spoilage and fruit rots. The number of fruits affected or spoiled were recorded periodically to assess the effect of the different coating on fruit spoilage and reported in percentage as total fruit decay.

Instrumental texture or hardness determination: Instrumental texture analyzer (Stable Microsystem; Model: TA.XT.Plus) in CIC laboratory, UBKV was used for this experiment. A 2 mm probe was used in this experiment. The test speed was set at 2 mm/second and trigger force at 5 g. The sample was kept on the tray and the probe was allowed to penetrate the sample. A graph was obtained on the screen. The force in gram (g) values corresponding to the highest peak was noted. Penetration force was presented as hardness in N (newton).

Statistical tool: The study consists of a Randomized Block Design, with three replicates. The data presented in this paper was statistically analysed by SPSS 17 software and

the mean and standard deviation (SD) were calculated. The statistical significance of the data was assessed by one way Analysis of variance and LSD test. Mean comparisons were performed using HSD of Tukey's test to examine if differences between treatments and storage time were significant at $P < 0.05$. The overall least significance difference (LSD; $p \leq 0.05$) was calculated and used it to detect significant differences among all the treatments and control set. Relationships among measurement variables were studied by using the correlation coefficient[34].

RESULTS AND DISCUSSION

Physiological loss in weight (PLW): Loss in weight increased in all the treatments as the storage period progressed (Table 1). The physiological loss in weight is maximum in case of the control samples whereas T_3 (aloevera gel) showed minimum physiological loss in weight followed by T_2. The weight loss of the fruit is mainly associated with respiration and moisture evaporation through their skin. The rate at which water is lost depends on the water pressure gradient between the fruit tissue and the surrounding atmosphere, and the storage temperature[29]. The basic mechanism of weight loss from fresh fruit and vegetables is by vapour pressure at different locations[30], although respiration also causes a weight reduction. The reduction in weight loss was probably due to the effects of these coatings as a semi permeable barrier against oxygen, carbon dioxide, moisture and solute movement, thereby reducing respiration, water loss and oxidation reaction rates[31]. The physiological loss of weight of ber fruits were recorded in this present experiment. Similar observation was reported by Kaur et al., 2014 in guava fruits during the storage period.

Table 1: Effects of edible coatings on Physiological loss in weight (%) during storage period

Treatment	Days after storage		
	5^{th} day	10^{th} day	15^{th} day
T_1 (Control)	15.22733	25.17233	22.65
T_2 (corn starch)	13.16867	12.02267	11.49
T_3 (aloevera gel)	10.43967	9.099	9.75
S.Em. (±)	0.77	0.47	0.67
C.D. at 5%	3.11	1.86	2.69

Shrinkage percentage: Table 2 represents the shrinkage percentage of the treated and untreated ber fruits in terms of length and breadth. Clearly it can be observed that the change in length is maximum in T_1 (control) which is 21.2mm at day 0 and 11.19 mm at 15^{th} day of storage. Similarly, change in the breadth was also observed maximum in control from 12.59mm at 0 day to 7.64mm at 15^{th} day of storage. T_3 shows minimum change in length and breadth (mm) followed by T_2.

Table 2: Effects of edible coatings on length and breadth (in mm) of fruits during storage period

Treatment	Days after treatment							
	0 day		5^{th} day		10^{th} day		15^{th} day	
	Length	Breadth	Length	Breadth	Length	Breadth	Length	Breadth
T_1 (Control)	21.20	12.59	18.28	10.36	14.57	8.73	11.19	7.64
T_2 (corn starch)	20.21	14.14	17.07	11.93	14.85	10.38	11.24	9.03
T_3 (aloevera gel)	20.6	13.79	18.73	12.32	15.89	10.91	13.20	9.75
S.Em. (±)	0.360	0.55	0.279	0.38	0.258	0.41	0.099	0.48
C.D. at 5%	N/S	N/S	1.125	1.525	1.038	1.661	0.400	N/S

From table-3 it can be clearly observed that the shrinkage percentage in length is maximum in case of T_1 (47.23) and minimum in T_3 (35.9), while T_2 shows a average shrinkage percentage of 44.41. Shrinkage percentage in breadth showed a similar pattern, T_1 showed a maximum shrinkage percentage (39.32) followed by T_2 and T_3 which are 36.16 and 29.25 respectively.

Table 3: Effects of edible coatings on Shrinkage percentage during storage period

Treatment	Shrinkage percent (%)	
	Length	Breadth
T_1 (Control)	47.23	39.32
T_2 (corn starch)	44.41	36.16
T_3 (aloevera gel)	35.9	29.25

It might be due to the anti-senescent action of coatings which had an inhibitory effect on ethylene biosynthesis and retard the activity of enzymes responsible for ripening, cell degradation was prevented which in turn facilitated reduced moisture loss and lesser respiratory gas exchange, hence delay in senescence and lower the shrinkage percentage.

Colour: Table 4 shows the change in colour of the coated and uncoated fruits. At the time of harvesting, the fruits were yellowish green (YGG150B) in colour, which is ultimately changed in to brown (BG200D) in T_1; grayish brown (GBG199C) in T_2 and yellow green (YGG145B) in T_3. A quicker senescence was observed in fruits under control from 10th day of storage. Coated fruits showed a lesser loss in chlorophyll, lesser development of xanthophyll and reduced rate of ripening. It was probably due to an increase in CO_2 and decrease in O_2 levels, which decrease ethylene synthesis followed by delay in colour changes[33]. Castricini et al., (2012) observed that papaya coated with cassava starch and carboxymethyl starch helped to maintain the colour during storage.

Table 4: Effects of edible coatings on colour of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	YGG150B	YGG144D	GBGN199B	BG200D
T_2 (corn starch)	YGG150B	YGGN144C	GBGN199B	GBGN199C
T_3 (aloevera gel)	YGG150B	YGG144B	YGG144B	YGG145B

GBG- GREY BROWN GROUP, YGG- YELLOW GREEN GROUP, BG- BROWN GROUP

pH value: Table 5 shows that pH of both coated and uncoated Ber fruits increased gradually over storage time. However the change in pH is not significant at 5% level. The value of pH increased from 5.15 (at 0 day) to the highest 5.53 at the end of the storage (15th day). However, lesser pH values were observed in the coated fruit than that of the control fruit. Coating reduces respiratory and metabolic rates, and thereby the lesser utilization of organic acids, reported by Baraiya *et al*[35].

Table 5: Effects of edible coatings on pH of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	5.12	5.31	5.62	5.83
T_2 (corn starch)	5.13	5.28	5.41	5.5
T_3 (aloevera gel)	5.15	5.28	5.41	5.53
S.Em. (±)	0.020	0.037	0.057	0.095
C.D. at 5%	N/S	N/S	N/S	N/S

Titratable acidity: Table 6 shows that the titratable acidity of the fruits gradually falls during the storage. The fall in titratable acidity is highest in case of control which is 11.37 at 0 day to 3.92 at 15th day of storage. However the reduction in acid content was lowest in case of coated fruit samples. Aloevera gel treated (T_3) showed minimum fall in the titratable acidity (11.48 to 7.21) followed by T_2 (11.64 to 6.37) Titratable acidity in T_2 and T_3 was at par at 10th and 15th day of storage.

Table 6: Effects of edible coatings on titratable acidity of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	11.37	8.96	6.75	3.92
T_2 (corn starch)	11.64	9.46	7.79	6.37
T_3 (aloevera gel)	11.48	9.63	8.05	7.21
S.Em. (±)	0.454	0.367	0.240	0.213
C.D. at 5%	N/A	N/A	0.968	0.860

A gradual decrease in titratable acidity occurred in Ber fruit throughout the storage period. The probable reason for decline in the acidity may be the utilization of organic acids in the respiration and metabolic processes of the fruit. Srinivasa *et al.*[36], also suggested that the decrease in acidity has been attributed towards the conversion of organic acids into sugars and their further utilization in the metabolic process of the fruit. According to Vyas et al.[37], the titratable acidity values in both coated and uncoated fruit had decreased with the passage of storage time. However, the results of the present study suggest that the acidity values in the control fruits were significantly lower as compared to that of starch and aloevera gel coated fruits. At 10th and 15th day of storage, the higher values of the titratable acidity were observed in the fruits coated with aloevera gel coating. The results from this study are in agreement with those of Debeaufort[38] who used edible coating to preserve strawberry and found that the edible coating could reduce the transpiration rate due to declining of availability of organic acids for enzymatic reaction of respiration. It is also considered that coatings reduce the rate of respiration and may therefore delay the utilization of organic acids[39].

Total Soluble Solids (^{O} Brix): As shown in table 7, the TSS of the fruit sample falls sharply with storage. In T_1 the TSS falls from 13.08 at 0 day to 3.8 at 15th day of storage. Similar results can also be observed in case of T_2 and T_3. But the rate of fall in TSS of the treated fruit is lower as compared to that of the uncoated ones. This can be due to the fact the untreated fruits were having a higher rate of respiration and thus a much higher substrate utilization. The fall in TSS is mainly due to the fact that climacteric fruit like ber also uses the sugar formed as well. Aloevera gel coated fruits shows a least decline in TSS. Corn starch shows lesser decline in TSS as compared to that of the aloevera.

Table 7: Effects of edible coatings on TSS (^{O} Brix) of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	13.08	8.94	5.71	3.80
T_2 (corn starch)	12.74	8.71	6.65	5.34
T_3 (aloevera gel)	12.62	8.45	7.55	6.09
S.Em. (±)	0.377	0.217	0.044	0.167
C.D. at 5%	N/A	N/A	0.179	0.673

Total sugar and reducing sugar (%): Table-8 shows the increase in total sugar content of the fruits during the storage period. The total sugar content in untreated fruits shows an increase from 8.17 at 0 day to 12.93 at 15th day of storage. In T_2 (corn starch) the increase in total sugar content during storage was 8.50 at 0 day to 11.93 at 15th day of storage. In T_3 (aloevera gel), there was a significant increase in total sugar at 15th day. The total sugar content was 8.65 at 0 day to 11.29 at 15th day of storage. The increase in storage can be attributed to the fact that starch gets converted to sugar during storage period. The remarkable increase in total sugars during their storage is attributed to the increase in the activity of

enzymes responsible for starch hydrolysis and for the decline in the rate of sugar breakdown by respiration. Campestre et al., (2002) also gave an appropriate explanation for such trend as the polysaccharides get converted into soluble sugar through the hydrolytic conversion process. There is significant increase in total sugar content of fruits at 15th day of storage. The reasons for this significant increase may be attributed to the fact that in the beginning of the experiment Ber fruit was in mature stage and during this stage the rate of metabolic activities remain considerably slow. As the storage period increases and ripening begins which intern causes increase in the levels of sugars. Thus lower levels of sugars were observed during initial stages of ripening, whereas the sugar content had increased gradually and significantly as the storage period advanced.

Table 8: Effects of edible coatings on total sugar content of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	8.17	9.11	10.11	12.93
T_2 (corn starch)	8.50	9.36	10.25	11.93
T_3 (aloevera gel)	8.65	9.91	10.54	11.29
S.Em. (±)	0.2	0.21	0.14	0.11
C.D. at 5%	N/S	N/S	N/S	0.43

Table 9 shows the increment in the reducing sugar content of both the treated and untreated fruits. Similar to the trend of total sugar content, the reducing sugar also showed an increase. At the 15th day of storage, control (T_1) was having highest amount of reducing sugar as compared to the treated ones. This is due to enhanced rate of ripening in untreated fruits and more starch dissolution.

Table 9: Effects of edible coatings on reducing sugar content of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	1.75	3.32	4.08	6.30
T_2 (corn starch)	2.09	3.31	3.85	5.83
T_3 (aloevera gel)	2.80	3.61	3.92	5.23
S.Em. (±)	0.132	0.153	0.138	0.082
C.D. at 5%	0.53	N/S	N/S	0.33

Ascorbic acid (mg/100g): Table 10 shows the ascorbic acid content of the coated and uncoated fruit samples during storage. It was observed that there was a slow decline in the ascorbic acid content of both the coated and the uncoated fruits. However, the decline in ascorbic acid content of the fruits were more in case of T_1 (control) as compared to T_2 (corn starch) and T_3 (aloevera gel). T_1 showed a decline in ascorbic acid content from 89.37 at 0 day to 75.87 at 15th day of storage. Similar decline was observed in T_2 and T_3 which showed a decline of 90.33 to 78.81 and 89.89 to 79.96 respectively. The lesser decline in rate of ascorbic acid content in treated samples as compared to untreated ones can be due to the fact that oxygen could not penetrate deep inside the fruit tissue so as to bring oxidative breakdown of organic acids like ascorbic acid. Togrul *et al.*[41] stated that the coatings serve as a protective layer and control the permeability of O_2 and CO_2, thus decreasing the autoxidation potential of the fruit. Zhu et al. (2008) reported a similar finding that the use of edible coatings of different types of polysaccharides significantly reduced the loss of vitamin C in mango. Ascorbic acid is lost at later stage due to the activities of phenol oxidase and ascorbic acid oxidase enzymes during storage[43].

Table 10: Effects of edible coatings on ascorbic acid content (mg/100g) of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	89.37	86.77	81.07	75.87
T_2 (corn starch)	90.33	87.57	83.49	78.81
T_3 (aloevera gel)	89.89	87.04	83.12	79.96
S.Em. (±)	1.268	0.873	0.570	0.757
C.D. at 5%	N/A	N/A	N/A	3.050

Firmness or hardness (Newton 'N'): Table 11 shows the firmness or hardness of the coated and uncoated fruit samples during their storage period. The hardness showed a decline from 794.77 N at 0 day to 291.6 N in T_1; 808.86 N at 0 day to 445.22 N in T_2; 767.20 N at day 0 to 462.74 N at 15th day. It can clearly be observed that the uncoated fruit samples showed a poor hardness at 15th day of storage as compared to the coated ones. Both the starch based coating and aloevera gel coating showed a higher hardness which is at par at 15th day of storage. The higher hardness of the coated fruits can be attributed to the fact that as respiration rate is reduced also reduced is the degradation of water insoluble calcium pectate (Ca-pectate) or calcium bridge that renders strength to the fruit skin.

Table 11: Effects of edible coatings on firmness/hardness of fruits during storage

Treatment	Days after storage			
	0 day	5th day	10th day	15th day
T_1 (Control)	794.77	592.32	390.72	291.60
T_2 (corn starch)	808.86	591.10	495.58	445.22
T_3 (aloevera gel)	767.20	624.62	495.13	462.74
S.Em. (±)	22.39	31.14	27.22	18.89
C.D. at 5%	N/A	N/A	N/A	76.160

Decay or spoilage percentage: Table 12 shows that T_1 (control) is having maximum decay percentage at 5th, 10th and 15th day of storage. T_2 and T_3 have a less and least decay percentage upto 15th day of storage. Only 25% fruits were found decayed in T_3 (aloevera gel) which is a remarkable achievement. This is because aloevera gel is not only capable of reducing the rate of respiration and ripening process but it can significantly retard the growth of bacteria, fungi and molds that is known to cause rotting in fruits. Aloevera is known to induce a strong defense system in coated fruits. A similar observation was done by Jawandha *et al.*[44], who reported that percent spoilage of Baramasi lemon fruits was increased with the extension in storage period due to the weakening of the defense system against fungal attack.

Table 12: Effect of edible coating on the decay or spoilage percentage of fruits during storage

Treatment	Days after storage		
	5th day	10th day	15th day
T_1 (Control)	10.00	53.33	98.33
T_2 (corn starch)	6.67	41.67	68.33
T_3 (aloevera gel)	0.00	5.00	25.00
S.Em. (±)	1.52	3.33	3.04
C.D. at 5%	6.134	13.439	12.268

CONCLUSION

The current study revealed that the coating of aloevera gel was effective in retaining quality of Ber fruit over a storage period of at least 15 days. Aloevera gel coated fruits showed minimum physiological loss in weight, minimum shrinkage percentage, maximum colour retention, lesser loss in acid content as compared to uncoated ones. It was also found that aloevera gel subsequently helped in reducing the ripening rate of fruits which was found from the slower rate of total and reducing sugar development. Aloevera coating was very effective in reducing ascorbic acid loss and also helped to reduce the decay percentage. Both the starch (T_2) and aloevera gel (T_3) edible coating was found good enough to ensure hardness/firmness of the fruits during storage.

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