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Effects of Polypropylene Bag on Storage Properties of Litchi (*Litchi Chinensis* Sonn.)

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Abstract

The present study was run in the laboratory of the Department of Horticulture, Bangladesh Agricultural University, Mymensingh during the period of 15 May to September, 2016. The objectives of the study were to determine the effects of different postharvest treatments on the storage behaviour of litchi. Eight postharvest treatments viz., control, fruits stored in 50µ polypropylene bag at ambient temperature, fruits stored in 75µ polypropylene bag at ambient temperature, fruits stored in 100µ polypropylene bag at ambient temperature, fruits stored at 4ºC temperature, fruits stored in 50µ polypropylene bag at 4ºC temperature, fruits stored in 75µ polypropylene bag at 4ºC temperature, fruits stored in 100µ polypropylene bag at 4ºC temperature were assigned to the litchi fruits. The single factor experiment was laid out in a completely randomized design with three replications. 75µ polypropylene bag at low temperature (4ºC) caused minimal weight loss, whereas, the untreated fruits exhibited maximal weight loss. The pericarp turned brown within 4 days of storage in the untreated fruits, while polypropylene bags helped keep its bright red colour, but microbial decay was evident at the end of the storage period. Different postharvest treatments showed highly significant variation in the shelf life of litchi. Among the treated and untreated fruits, 75µ polypropylene bag at low temperature (4ºC) treatment exhibited better storage performance. The fruits kept in 75µ polypropylene bag at 4°C showed the highest shelf life (20.67 days) followed by 50µ polypropylene bag at 4°C (20.33 days), and it was the lowest in the untreated fruits (3 days).

Keywords: litchi, polypropylene bag, temperature, postharvest, shelf life

1. Introduction

Litchi (Litchi chinensis Sonn.) is called as one of the kings of sub-tropical fruits and famous for its excellent quality such as juiciness, slightly sour-sweet taste, characteristics pleasant flavor and for attractive colour. It is under the family Sapindaceae and subfamily Nepheleae. A white to cream coloured translucent pulp surrounding a glossy brown seed is its edible portion. The pulp is grape-like in texture, very succulent, aromatic and is characterized by sweet and acid tastes (Cavaletto, 1980). This fruit is originated in china, cultivated for 300 years and was introduced to Burma and India by the end of the 17th century (Goto, 1960; Liang, 1981). It was introduced into Australia, South Africa and Hawaii by the end of the 19th century (Menzel and Simpson, 1986). Other litchi growing countries of the world are Bangladesh, Pakistan, the Philippines, Thailand, Madagascar and Hong Kong.

Litchi fruit is so popular and major table fruit in Bangladesh. It is demanded by all classes of people. Litchi cultivating districts are Dinajpur, Rajshahi, Rangpur, Jessore, Pabna, Chittagong, Dhaka, Sylhet and Mymensingh. According to BBS (2006) Bangladesh produces 73000 mt of litchi per annum from 1619.43 hectares of land.

Litchi is known as a non-climacteric fruit (Wills *et al*., 2004) and it spoils its quality very quick after harvesting. The first and important visual sign of fruit quality deterioration is pericarp browning. It is considered the most important postharvest problem of litchi. Browning is normally caused by dehydration of the pericarp. When fruits loss a few percent of the harvested pericarp fresh weight it starts to brown. (Jiang and Fu 1999). The study mainly highlights on pericarp browning reduction of litchi and therefore, the biochemistry of browning needs to be clearly realized. The prominent colours of mature litchi fruits are largely due to a range of anthocyanins located in the mid to upper mesocarp (Underhill and Critchley, 1993).

Ivi and Banik (2003) conducted an experiment on the effect of sulfur treatment followed by HCl dipping on the retention of litchi pericarp colour and fruit quality- by storing in polyethylene bag and polypropylene packaging. They reported that physiological loss in weight was lower in fruits in polyethylene bag than in polypropylene packaging. Chaiprasart (2005) ran an experiment with litchi fruit packed in tray and wrapped in polyethylene and polyvinyl chloride films and fruits were stored at 5°C. He found that fruits wrapped in polyethylene showed slight changes in weight loss and the peal was brighter than polyvinyl chloride during 12 days of storage. Roy (2002) studied the postharvest behaviors of litchi cv. 'Bombai' and 'Bedana'. He noticed that fruits preserved in unperforated polyethylene bag without litchi leaves at low temperature (7-8 °c) showed minimal weight loss and gave the longest shelf life (21.50days) than the fruits kept in unperforated polyethylene bag with or without litchi leaves, oil coated fruits kept in unperforated polyethylene bag without litchi leaves. Kamleshwar (2001) reported that litchi fruits covered with shisam (*Dalbergia sisso*)leaves, litchi leaves, polyethylene bag, paper cuttings and perforated polyethylene bags and kept in a basket for storage, the treatments shisam leaves, litchi leaves, polyethylene bags deteriorated and become inedible on the 5th day. The fruits of the treatment last perforated plastic bags were fairly to maintain acceptable quality until the 7th days of storage where the rest of the treatments did not perform well.

Fontes *et al*. (1999) investigated the influence of low density polyethylene, PVC and temperature (27 or 5^0C) on litchi cv. 'Brewster' during storage. Regardless of temperature low density polyethylene (LDP) film (non perforated) had the lowest water loss throughout the storage period and at 27°C LDP were able to reduce the rate of browning until 8th day after harvest. Liang *et al*. (1948) conducted an experiment to study the effect of 3 types of packaging materials on litchi fruit. They found that at room temperature weight loss was reduced by 10.4% and proportion of good fruits were 96.2% and 71.4% after 3 and 5 days of storage when fruits were packed in *Litchi chinensis* leaves inside plastic boxes. Mitra *et al. (1996)* studied the effect of polyethylene at low temperature on litchi cv. 'Bombai' during storage. Ripe litchi fruits were harvested and placed in perforated polyethylene bags and stored at 0°C, 4°C and at ambient temperature. The control fruits were dipped in water and stored at ambient temperature. Results showed that wrapping fruits in polyethylene bags gave the longest life with better quality at 4°C than at 0°C (up to 18 and 16 days, respectively). Bluller *et al*. (1983) stated that it was possible to store fully ripe litchi fruits in perforated polyethylene bags for up to 35 days at 3.3°C.

Sing *et al*. (2004) reported that polythene wrappers having 20% vent+Ca $(NO_3)_2$ at 1.0, 1.5 and 2% recorded minimum spoilage percentage (20.50, 20.50 and 20.00) in Purbi and 19.17, 20.50 and 20.33 in 'manaraji' cultivars, respectively on the thirteenth day of storage. A maximum economic life of 11 days was also observed using the same treatments in both cultivars. According to Techavuthiporn *et al*. (2006) fruit shelf life increased from 20 days in 21% O_2 (air) to 32 days in 3-8% O_2. Rajak *et al*. (2004) conducted an experiment with litchi cv. 'Shahi' fruit by sulphur fumigation and packed in different packaging materials. They observed 21 days (longest) shelf life in sulfur fumigated fruit in polythene bags at 14ºC and 2 days (shortest) in untreated fruits at 31ºC. Ramma (2004) observed that litchi fruit treated with sulfur fume and dipped in 3% HCl extended the storage life to 5 weeks under storage at 2°C and 90-95% RH. compared to 2 weeks for sulfur treated fruits that were not acid treated.

Semeerbabu *et al.* (2007) found that the shelf life of litchi fruits were 21 days which were treated with SO_2 fume followed by 4% HCl dip and packed in LDPE film pouches at 2±1°C. Mitra and Kar (2001) obtained the best results under the treatments on fruits using litchi perforated polyethylene at 0 and 4ºC, where minimum physiological loss in weight up to 8 days of storage was observed and storage life was extended up to 14 and 18 days, respectively. According to Lin *et al*. (2003) the postharvest life of fruit at ambient temperature is less than 3days. Lin (1999) conducted an experiment with litchi fruits cv. 'Huoli' and 'Heiyell'. He noticed that fruit treated with polysaccharide solution in combination with various disinfectants and stored in plastic bag at room temperature give the best results with 84.2-89.2% sound fruits after 12 days for storage, whereas the controls had only 4% sound fruit after 4 days of storage.

The need to increase the shelf life and reduce postharvest browning of litchi is of paramount importance. So, the present study has been undertaken to find out suitable postharvest treatment to reduce pericarp browning & extend shelf life of litchi.

2. Materials and Methods

The experiments were carried out at the laboratory of the Departments of Horticulture, Bangladesh Agricultural University, Mymensingh during the period from 15 May to 15 September, 2016. The litchi variety, namely 'Bombai' was chosen as experimental materials for the current investigation of the experiment. The experimental litchies were collected from the local growers of Ishwardi, Pabna. The maturity of the fruits was determined by the flatness of tubercles and comparative smoothness of epicarp. The commercially important litchi variety namely

'Bombai' was used for the present experiment. The single factor experiment consists of Eight (8) treatments as T_0= control (Fruits under ordinary conditions without wrapping), T_1= Fruits wrapped in 50μ polypropylene bag at ambient temperature, T_2= Fruits wrapped in 75μ polypropylene bag at ambient temperature, T_3= Fruits wrapped in 100μ polypropylene bag at ambient temperature, T_4= Fruits stored at 4°C temperature, T_5= Fruits wrapped in 50μ polypropylene bag at 4°C temperature, T_6= Fruits wrapped in 75μ polypropylene bag at 4°C temperature and T_7= Fruits wrapped in 100μ polypropylene bag at 4°C temperature. The single factor experiment was laid out in completely randomized design with three replications of 8 fruits. A total of 192 fruits of more or less similar shape and size and free of visible disease symptoms were randomly selected from the harvested fruits. Among 8 fruits in each replication of each treatment 4 fruits were marked to investigate colour, pericarp browning, total weight loss, disease incidence, disease severity, isolation and identification of causal pathogens, shelf life and the remaining 4 fruits were kept unmarked conditions for destructive sampling to examine moisture content, dry matter content, TSS, pulp to peel ratio, vitamin C and pulp pH. All the marked and unmarked fruits were then subjected to the following treatments as per the experimental design: Thirty-six fruits were randomly selected from the lot and kept on brown paper placed on the laboratory floor at ambient conditions without imposing any treatment. Polypropylene bag with the thickness of 50μ, 75μ and 100μ (35X24 cm) were used for this treatment. Twelve fruits were kept the Polypropylene bag for each replication. The top of the bag was tied by using thread and then placed on brown paper for observation at ambient condition. Fruits were kept in low temperature (4ºC). Twelve fruits were taken in a petridish and then placed on brown paper for observation at low temperature condition.

The fruits into polypropylene bag were kept into refrigerator at temperature of 4°C. Polypropylene bag with the thickness of 50μ,75μ and 100μ (35X24 cm) were used for this treatment. Twelve fruits were kept the Polypropylene bag for each replication. The top of the bag was tied by using thread and then placed on brown paper for observation at low temperature (4°C) condition. The parameters studied include: colour, browning, pulp to peel ratio, total weight loss, moisture content, dry matter content and shelf life. The above parameters were studied as per the following methods. Among 12 fruits in each replication 6 fruits were used for destructive sampling at 2 days interval to investigate several parameters including moisture content, dry matter content, pulp to peel ratio. The remaining 6 fruits were used to investigate colour, browning, total weight loss and shelf life.

2.1 Colour

Days required to reach different stages of colour during storage and ripening were determined objectively using numerical rating scale of 1-6, where 1 = 'green', 2= 'breaker' or 10-<30% coloured, 3 = 30-<50% coloured, 4 = 50-<70% coloured, 5 =70-<90% coloured and 6 = fully coloured. Similar rating scale was used by Hassan, (2006) for mango.

2.2 Pericarp Browning

Days required to reach different stages of browning during storage and ripening were determined using numerical rating scale of 1-5, where, 1 = 10-<30% brown, 2 = 30-<50% brown, 3 = 50-<75% brown, 4 =75-<90% brown and 5 = 90-<100% brown.

2.3 Pulp to peel ratio

The fruits were peeled at the 3rd, 6th and the 9th day's storage. After separating, the peel and pulp weights were taken separately by using an electric balance and then the pulp to peel ratio was calculated. The pulp was then used for other chemical analyses.

2.4 Total weight loss

6 fruits of each replication of each treatment were weighed by using an electric balance at the first day of storage and at every 2-day intervals. Weight loss of fruit was estimated during storage by using the following formula:

$$\text{Weight loss (\%)} = \frac{IW - FW}{IW} \times 100$$

Where,

IW = Initial weight of fruits (g)

FW = Final weight of fruits (g)

2.5 Moisture Content

Ten grams of fruit pulp was taken in a Petridish from each treatment and replication. The Petridish was placed in an electric oven preset at 80°C for 72 hours until constant weight attained. It was then cooled in desiccators and weighed again. Percent moisture content was calculated according to the following formula:

$$\text{Moisture content (\%)} = \frac{\text{IW - FW}}{\text{IW}} \times 100$$

Where,

IW = Initial weight of pulp (g)

FW= Final weight of oven dried pulp (g)

2.6 Dry Matter Content

Percent dry matter content of the pulp was calculated from the data obtained during moisture estimation using the following formula;

Dry matter (%) = (100%-% moisture content)

2.7 Shelf Life

Shelf life of litchi fruits as influenced by different varieties was calculated by counting the days required to ripe fully as to retaining optimum marketing and eating qualities.

2.8 Observation

Fruits used in the experiment were observed everyday. Data were collected on weight loss, physical and chemical changes and rottening of the fruits during storage as influence by different postharvest treatments.

2.9 Statistical Analysis

For the experiment, the collected data were statistically analyzed by Analysis of Variance (ANOVA) test. The means of different parameters were compared by least significant difference (LSD) as described by Gomez and Gomez (1984). For percentage data arcsine transformations were carried out to satisfy the assumption of ANOVA.

3. Results and Discussion

3.1 Colour

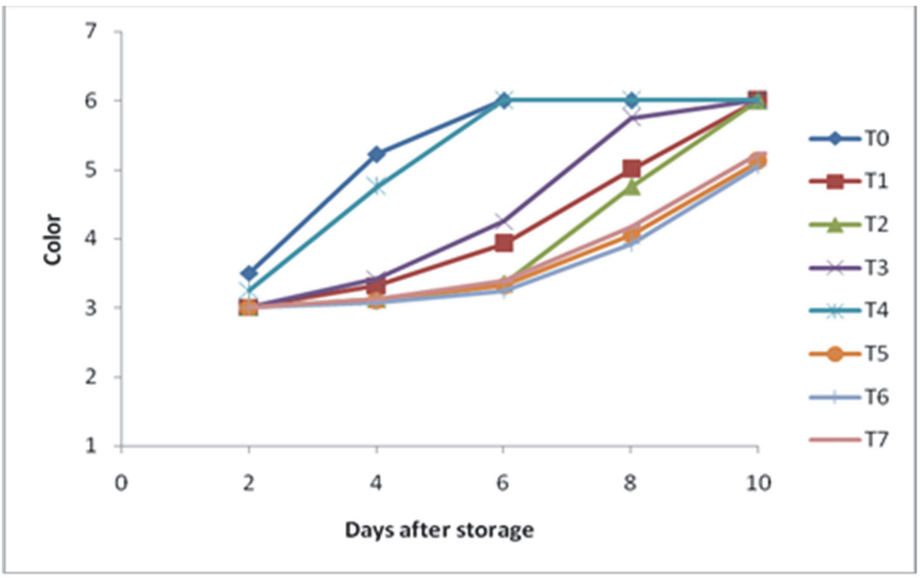

Figure 1. Effect of different postharvest treatments in colour change of litchi during storage. a = colour scale (1 = ‘green’, 2 = 10-<30% colour, 3 = 30-<50% colour, 4 = 50-<70% colour, S = 70-<90% colour, 6 = 90-100% colour).The vertical bar represents LSD at 5% level of probability. T0= control, T1= 50μ polypropylene bag at ambient temp, T2= 75μ polypropylene bag at ambient temp, T3= 100μ polypropylene bag at ambient temp, T4= Low temperature (4°C) treatment, T5= 50μ polypropylene bag at 4°C temp, T6= 75μ polypropylene bag at 4°C temp, T7= 100μ polypropylene bag at 4°C temp

The influence of different postharvest treatments in respect of reduction of postharvest browning and extension of shelf life of litchi was studied. The experiment was carried out to achieve the objective of the study. The results obtained from the present investigation are presented and interpreted in the following:

Different storage treatments used in the present investigation had pronounced effects on colour changes of litchi fruits. The variations among the treatments were significant in respect of colour change. A sharped changed was observed in colour change among all the treatments. However, the fruits kept in 75µpolypropylene bag at 4ºC temperature (T_6) were good until the 10th days of storage, whereas the fruits kept in 50µ polypropylene bag at ambient temperature (T_1), 75µ polypropylene bag at ambient temperature (T_2), 100µ polypropylene bag at ambient temperature (T_3) attained full colour at the 10th day of storage (Fig. 6). It was also observed that control fruits(T_0) lost its colour very fastly followed by fruits kept in 4ºC temperature (T_4).

3.2 Pericarp Browning

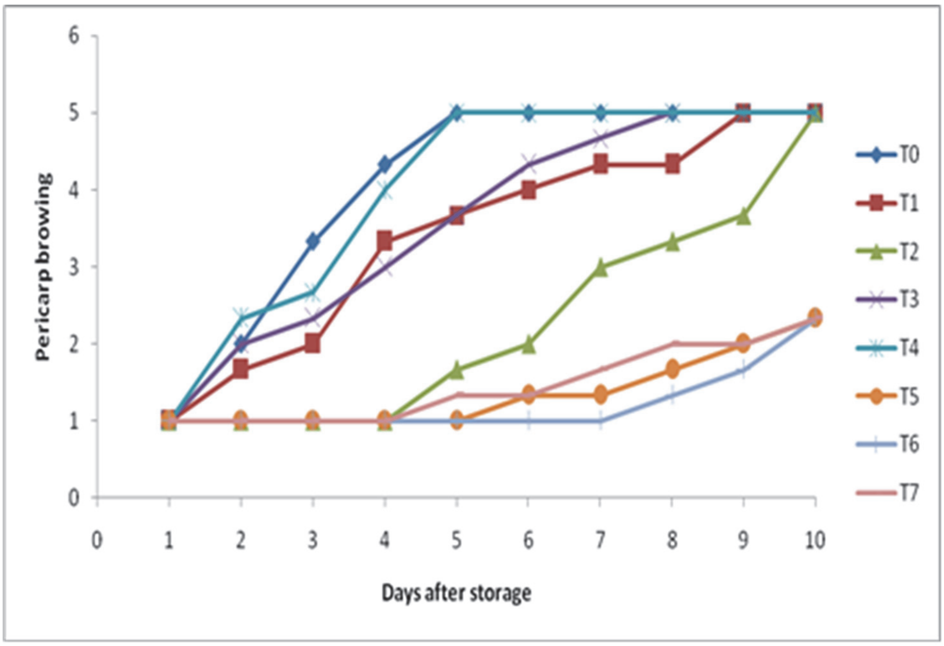

Figure 2. Effect of different postharvest treatments on pericarp browning of litchi during storage. Browning scale, b=(1= 10-<30%brown, 2= 30-<SO% brown, 3= 50-<70% brown, 4= 70<90% brown and 5= 90-100% brown). The vertical bar represents LSD at 5% level of probability.T_0= control, T_1= 50µ polypropylene bag at ambient temp, T_2= 75µ polypropylene bag at ambient temp, T_3= 100µ polypropylene bag at ambient temp, T_4= Low temperature (4°C) treatment, T_5= 50µ polypropylene bag at 4°C temp, T_6= 75µ polypropylene bag at 4°C temp, T_7= 100µ polypropylene bag at 4°C temp

Various postharvest treatments used in the present study showed highly significant variation in respect of pericarp browning during storage. Browning score showed an increasing trend with the storage period. However, the change was very sharp in the untreated fruits (T0). The browning scores in that fruits were 2.0, 4.33 and 5.00 at the 2nd, 4th and 6th day of storage, respectively (Fig. 7). On the other hand, at ambient temperature the scores were very lower in the fruits kept in 75µ polypropylene bag (T2). At the 5th day of storage when control fruits reached at the highest score (5.00) then the fruits kept in 75µ polypropylene bag (T2) treated fruits score were 1.67. Besides T2 fruits, T1 (fruits kept in 50µ polypropylene bag) treated fruits also showed slower rate of browning changes than that of T3 (fruits kept in 100µ polypropylene bag) and T0 (control) treated fruits respectively. This was one of the striking results of the present experiment where fruits kept in polypropylene bag at low temperature e.g. 4°C (T5, T6, T7) greatly maintained pericarp browning lower as compared with those of other treatments. Among all the treatments T6 (fruits kept in 75µ polypropylene bag at 4°C) performs best and it had no browning upto 7th days. 75µ Polypropylene bag at ambient temperature (T2) was effective at the early part of storage.

3.3 Pulp to Peel Ratio

Table 1. Effects of different postharvest treatments on pulp to peel ratio of litchi

Postharvest treatments	Pulp to peel ratio at different DAS		
	3	**6**	**9**
T_0	7.31	8.80	7.08
T_1	4.55	4.58	4.43
T_2	4.54	4.56	4.41
T_3	4.58	4.60	4.39
T_4	4.45	4.72	4.38
T_5	4.49	4.85	4.54
T_6	4.52	4.96	4.69
T_7	4.46	4.78	4.52
$LSD_{0.05}$	0.232	0.173	1.29
$LSD_{0.01}$	0.320	0.238	1.77
Level of significance	2.940**	6.297**	2.603**

** = Significant at 1% level of probability

The postharvest treatments used in the present study showed significant variation in respect of pulp to peel ratio during the entire storage period The pulp to peel ratio showed an increasing rate up to the 6th day of storage and decreased thereafter (Tab1e.1). At the 3rd day of storage, the highest (7.31) pulp to peel ratio was obtained in control (T0) treatments whereas the lowest (4.45) was observed in T4 (litchi fruits kept at 4°C temperature) treatment. At the 6th day of storage, higher pulp to peel ratio was found in control (T0) fruits (8.80) and the lower pulp to peel ratio (4.56) was observed in T2 (fruits kept in 75µ polypropylene bag at ambient temperature) treatments. Similarly at 9th day of storage the higher pulp to peel ratio was found in T0 (7.08) and the lower in T2 (4.38) treatments.

3.4 Total Weight Loss

Table 2. Effects of different postharvest treatments on total weight loss of litchi during storage

Postharvest treatments	Total weight loss (%) at different days after storage (DAS)				
	2	**4**	**6**	**8**	**10**
T_0	6.77	16.25	21.70	27.50	33.15
T_1	1.74	2.63	4.72	7.02	9.16
T_2	0.98	1.60	2.81	3.76	5.38
T_3	2.51	3.51	5.67	9.74	12.10
T_4	1.92	3.87	7.92	10.56	14.20
T_5	0.57	1.58	2.46	3.40	5.08
T_6	0.51	1.48	2.23	3.75	4.89
T_7	0.63	1.62	2.59	3.66	5.73
$LSD_{0.05}$	0.69	0.85	1.44	1.88	1.94
$LSD_{0.01}$	0.95	1.17	1.98	2.59	2.68
Level of significance	12.965**	75.339**	128.538**	198.512**	272.930**

** = Significant at 1% level of probability

Different storage treatments used in the present investigation had pronounced effects on total weight loss. The variations among the treatments were highly significant in respect of total weight loss. The highest (33.15%) weight loss was found in T0 (control) fruits at the 10 day of storage, whereas the lowest (0.51%) was recorded in T6 (75µ polypropylene bag containing fruits at 4°C temperature) at the 2nd days of storage. Similar results were also reported by Liang (1998). From the 2nd day to 10th day of storage, sharp increase of total weight loss was observed in control fruits (6.77% to 33.15%) whereas it was slower in low temperature (4°C) treated fruits (1.92% to 14.20), 100µ polypropylene bag at ambient temperature (2.51% to 12.10%), 50µ polypropylene bag at ambient temperature (1.74% to 9.16%),100µ polypropylene bag at 4°C temperature (0.63% to 5.73%), 75µ polypropylene bag at ambient temperature (0.98% to 5.38%),50µ polypropylene bag at 4°C temperature (0.57% to 5.08%), 75µ polypropylene bag at 4°C temperature (0.51% to 4.89%), respectively (Table. 2). Higher percentage of weight loss in controlled fruits can be explained by the fact that, transpiration, respiration dehydration and evaporation rate was higher in those fruit but due to the presence of polypropylene bag and low temperature the rate was slower in T6 and T5fruits.

3.5 Moisture Content

Table 3. Effects of different postharvest treatments on moisture content of litchi

Postharvest treatments	moisture content (%) at different days after storage		
	3	**6**	**9**
T_0	81.01	78.65	76.43
T_1	81.79	79.97	78.75
T_2	82.42	80.17	79.80
T_3	81.46	79.53	78.28
T_4	82.23	80.93	79.00
T_5	83.62	82.03	80.18
T_6	83.85	82.20	80.76
T_7	83.48	82.17	80.10
$LSD_{0.05}$	1.47	1.92	0.91
$LSD_{0.01}$	2.02	2.65	1.25
Level of significance	4.402**	5.408**	5.706**

** = Significant at 1% level of probability

Statistically significant variation was observed among the postharvest treatments used in the present study. he maximum (83.85%) moisture content was recorded in the fruits kept in polypropylene bag at 4ºC temperature (T_6) at 3rd day of storage and the minimum (76.43%) moisture content at the 9th day of storage was observed in control (T_0) fruits. Moisture content decreases with the increase of storage period. At the 3rd day of storage the moisture content was 81.01%, 81.46%, 81.79%, 82.23%, 82.42%, 83.48%, 83.62% and 83.85% in T_0 (control), T_3 (100µ polypropylene bag), T_1 (50µ polypropylene bag), T_4 (low temperature treatment), T_2 (75µ polypropylene bag), T_7 (100µ polypropylene bag at 4ºC temperature), T_5 (50µ polypropylene bag at 4ºC temperature), T_7 (75µ polypropylene bag at 4ºC temperature) treatments, respectively. But at the 9th day they decrease sharply and it were 76.43%, 78.28%, 78.75%, 79.00%, 79.80%, 80.10%, 80.18% and 80.76% in T_0, T_3, T_1, T_4, T_2, T_7, T_5 and T_6 treatments respectively (Table. 3). These decreasing trends were also supported by Gaur and Singh (1987) and by Joshi and Roy (1988).

3.6 Dry Matter Content

Table 4. Effects of different postharvest treatments dry matter content of litchi

Postharvest treatments	Dry matter content (%) at different days after storage		
	3	**6**	**9**
T_0	18.99	21.35	23.57
T_1	18.21	20.03	21.25
T_2	17.58	19.83	20.20
T_3	18.54	20.47	21.72
T_4	17.77	19.07	21.00
T_5	16.38	17.97	19.82

T_6	16.15	17.80	19.24
T_7	16.52	17.83	19.90
$LSD_{0.05}$	1.42	2.00	1.38
$LSD_{0.01}$	1.96	2.76	1.91
Level of significance	3.394**	5.408**	5.706**

** = Significant at 1% level of probability

Different storage treatments used in the present investigation had pronounced effects on dry matter content. The variations among the treatments were significant in respect of dry matter content. At the 3rd day of storage, the highest (18.99%) dry matter content was in control (T0) fruits, where as it was lowest (16.15%) in T6 (75µ polypropylene bag at 4ºC temperature) treated fruits (Table 4). Similar trend was always observed during the entire storage period. Dry matter content increased proportionally with the storage period. However, during the entire storage period the highest dry matter content (23.57%) was recorded in T0 (control) fruits at the 9th day of storage. At the 9th day of storage, the lowest dry matter content (19.24%) was recorded in T6 (75µ polypropylene bag at 4ºC temperature) fruits. This phenomenon could be due to the presence of physical barrier (polypropylene bag) in case of water loss in T5, T6, T7 treated fruits.

3.7 Shelf Life

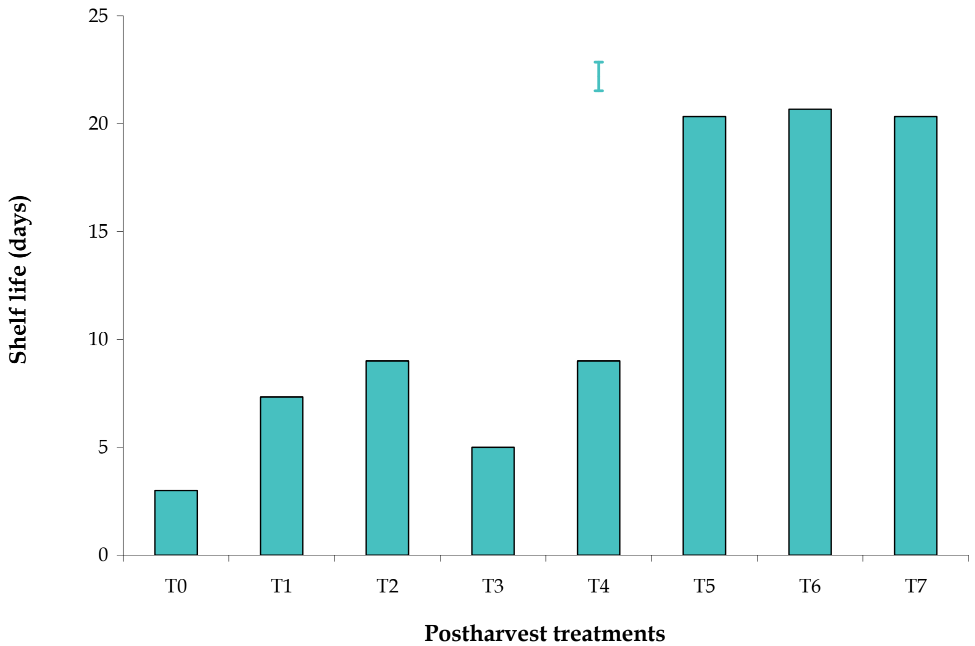

Figure 3. Effect of different postharvest treatments on shelf life of litchi during storage. The vertical bar represents LSD at 5% level of probability.T0= control, T1= 50µ polypropylene bag at ambient temp, T2= 75µ polypropylene bag at ambient temp, T3= 100µ polypropylene bag at ambient temp, T4= Low temperature (4°C) treatment, T5= 50µ polypropylene bag at 4°C temp, T6= 75µ polypropylene bag at 4°C temp, T7= 100µ polypropylene bag at 4°C temp. ** = significant at 1 % level of probability

The effect of different postharvest treatments used in the present investigation was highly significant in extending the shelf life of litchi fruits. The longest shelf life (20.67 days) was observed in fruits kept in 75µ polypropylene bag at 4°C temperature (T_6) followed by 20.33 days both in 50 and 100µ polypropylene bag at 4°C temperature (T_5& T_7). The shortest shelf life *(3* days) was recorded in control (T_0) fruits. Fruits kept in 75µ polypropylene bag at ambient temperature treatments (T_2) significantly better than control (T_0) but was not as much effective as those of fruits kept in 75µ polyethylene bag at 4º C.

4. Summary and Conclusion

The postharvest treatments showed significant influence in respect of changes in peel colour and pericarp browning of 'Bombai' variety. Among the treatments fruits kept in 75µ polypropylene bag at 4ºC were found best to retain peel colour and to reduce pericarp browning. Peel colour and pericarp browning increased with the increase of storage period. Significant variation was observed among the treatments in relation to weight loss. Weight loss showed an increasing trend with storage period. Similar trend was also observed in dry matter content. Except the control fruit maximum (23.57%) dry matter was recorded in the fruits kept in 100µ polypropylene bag at ambient temperature (21.72%) at the 9th day of storage, while it was minimum (16.15%) in fruits kept in 75µ polypropylene bag at 4ºC temperature. There was significant variation in moisture content among the treatments during storage. Moisture content was found to be decreased with increase in storage period. The findings of the present investigation indicated that peel colour, browning, weight loss, dry mater content increased throughout the storage period. From the above discussion it may be concluded that keeping litchi in 75µ polypropylene bag and stored in low temperature (4ºC) is the best to extend its shelf life without affecting the quality. For short-term storage of litchi fruits 75µ polypropylene bag at ambient temperature would be recommended.

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Conflict of interest

The authors have no conflict of interest to report.

Authors' Contributions

Fakhar Uddin Talukder conducted the experiment and analyzed the data. Md. Sohanur Rahman contributed in data presentation, analysing data, searching journal for publication and finally manuscript processing & writing of this article. Md. Kamrul Hassan provided help for the experimental design and supervised in the whole experiment. This article was read and approved by all authors for final Publication.

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