

Original Research Article

Effect of Postharvest Practices on Moisture Loss in Shahi Litchi

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ABSTRACT

Shahi litchi, a speciality of Bihar state, is prized for its excellent quality characteristics, pleasant flavour and fascinating colour. But, Shahi litchi is highly perishable, so have a very short life and particularly prone to water loss (physiological loss). Most of the initial water lost from the pericarp, causing it to lose colour and turn dull brown. Consequently that limits its marketability and demand. Many Postharvest technologies have been developed to reduce these loss (moisture loss). These technologies involve, use of various packages and packaging materials and the application of chemicals treatments. Therefore, a study was conducted through the use of packaging materials and different chemicals treatments for the achievement of highly coloured litchi fruit with longer storage life. Shahi variety of Litchi was chosen as sample for the study of moisture loss after harvesting it, which was specialty of that particular zone i.e. Muzzafarpur and Samastipur district belonging to northern region of Bihar state. A survey was conducted for the study of existing methods of harvesting, packaging and processing of litchi fruits. The information regarding these were collected from litchi growers and person engaged in this field. It was studied that litchi growers did not use any kind of new postharvest technologies. At first, the litchi were graded and treated with sulphur fumigation, borex and bavistin and packed in polythene bag, plastic box, paper cartoon, wooden box and bamboo basket and stored at room temperature (32 C). It was found that the storage period of untreated litchi, borex and bavistin treated litchi was less than sulphitation treated litchi at room temperature. It was also revealed that moisture loss was increasing as the storage period increases at room temperature. It was also found that the moisture loss was minimum in sulphitation treated litchi stored in polythene bag and followed by plastic box, paper cartoon, wooden box and bamboo basket respectively. So, it is concluded from the present study that the storage life of litchi was found highest in sulphitation treated litchi stored in polythene bag.

Keywords

Litchi, Storage period, Packaging materials, Chemical treatment, Moisture loss

Introduction

Litchi is a valuable international fruit and is highly prized for its flavour, colour, taste and attractive red skin. Among various fruits grown in India, litchi occupies a special position because of its high nutritive value, good taste and pleasant flavor (Gaur and Bajpai, 1978). It is most important subtropical evergreen fruit belonging to

Sapindaceae family. India ranks second in the world next only to China both in respect of area as well as the production of litchi. In India, litchi is grown extensively in northern Bihar region (e.g. Muzaffarpur and Samastipur and other nearby districts) and our country accounts for 20 per cent of world's quality litchi production (Mahajan

and Goswami, 2004). Litchi fruit plays a vital role in the earning of north Bihar region's farmers. It is one of the most important commercial fruit of Bihar state, contributing significantly to the state economy. Bihar is the leading state in litchi production (227.0 thousand tons) followed by West Bengal (85.1 thousand tons) and Assam (40.50 thousand tons) in 2010 respectively.

But, it is highly perishable fruit. A huge quantity of highly nutritious fruit became waste due to lack of use of proper postharvest operations. However marketing in fresh form is restricted because of its high perishable nature of the fruit.(Revathy and Narasimham,1997) In monetary term if only Bihar state is considered approximately there is a loss of Rs.100 crores annually. With the advancement of science and technology, agricultural processing process has achieved a better position today than the process used in the past to extend the storage life of such internationally valuable fruit. These new postharvest technologies not only improves the quality of the agricultural produce but also improves its market values, durability and minimizes various kinds of postharvest loses. Therefore, a study was conducted as an effort to reduce postharvest loss(moisture loss) in Shahi litchi through the use of easily available different packaging materials and chemical treatments.

Materials and Methods

A series of activity was carried out in the methodology of the present study. It was consisted of sample collection, laboratory studies, use of packaging materials and chemical treatments and measurement of storage period and moisture loss of litchi after harvesting it. For this purpose, different orchards of R.A.U., pusa, Samastipur and

Muzaffarpur districts of Bihar state were visited.A survey was conducted for the study of existing methods of harvesting, processing and packaging of litchi fruits. The information regarding these were collected from litchi growers and person engaged in this field.

Harvesting: Litchi was harvested from last week of May to third week June in every year in Muzaffarpur, and Samastipur districts of Bihar state. Shahi variety was chosen for experiment which was specialty of the study region.

Packaging: Generally wooden boxes and bamboo baskets were used for packaging of fresh fruits to bring the litchi from orchard to local market.

Storage: There was no any good facility available for storage.Very few cold storage was available. So litchi growers. harvest the fruits and pack in wooden box or bamboo basket and transport to other cities and states.

Processing: Generally, no any modern processing methods were adopted by litchi growers. But, in the present study following processing methods were used which are given below.

Grading: Harvested litchi was graded first on the basis of their size and appearance of fruits.

Moisture content

Moisture content of the fruits were determined by oven dry methods calculated by formula.

$$\text{Moisture content (\%)} = \frac{W_w - W_d}{W_d} \times 100$$

Where ,

W_w = weight of fresh fruits

W_d = weight of oven dried fruit

Chemical Treatments

Litchi were treated by different type of chemicals to preserve it for longer time and maintain its qualities.

Sulphitation: For sulphitation, litchi fruits were placed in a closed chamber and 300 - 600 g/tonnes of sulphur was burnt in the closed space for 10 minutes. Total time taken for one pass was 45 minutes.

Borex and bavistin: For this treatment 0.1 g/ litre borex and 0.1 g / litre bavistin solution were prepared in water and litchi fruits dropped in it for 2 minutes and then taken out. After drying its wetted surface , both treated and untreated litchi were packed in different packaging materials i.e., polythene bag, plastic box, paper cartoon, wooden box and bamboo basket. For obtaining experimental objective different types of quality and parameters of litchi fruits were measured. The storage period and moisture loss of litchi fruits were recorded. In order to find out the effect of various parameters, used during the experimentation, all the important data were subjected to statistical analysis. Various models were tried to correlate moisture loss and storage period. The models used were as follows :-

- 1) $Y = a + bx$
- 2) $Y = a.e^{bX}$
- 3) $Y = a + blnx$
- 4) $Y = a \times b$
- 5) $Y = a + bx + cx^2$

Putting the value of storage period in X axis and corresponding moisture loss on Y – axis in the different equations, the values of goodness of fit for different equations were

determined and the best fit equation was chosen on the basis of highest value of goodness of fit (r^2).

Results and Discussion

In Bihar state, litchi is mainly grown on large scale in some of the districts of north Bihar like Muzaffarpur and Samastipur districts. Shahi variety of Litchi was chosen for experiment which was specialty of the study region Litchi was harvested from last week of May to third week June every year.

A survey was conducted for the study of existing methods of harvesting , packaging and processing of litchi fruits with the help of the litchi growers and person engaged in this field. There was no any good facility for storage of litchi fruits. So litchi growers harvested the fruits and packed in wooden box or bamboo basket and transported to other cities and states. Generally, there were no any processing methods were adopted by litchi growers.

Litchi fruit is highly perishable and consequently have a short life that limits its marketability. After harvest litchi can be stored only for 1 or 2 days at ambient temperature.

The limited storage life at ambient condition, due to decay is leading problem towards losses of almost 25 30 per cent of total produce. Litchi fruits is negligibly exploited at post harvest level for processing particularly in India. It seriously reduces its commercial value. Post harvest technologies have been developed to minimize these losses. So a study was conducted through the use of various packages and packaging materials and application of chemicat materials with an effort to reduce moisture loss in litchi.

Study of storage life of litchi fruits in different packaging materials

Harvested litchi (Shahi variety) fruits were graded first. The graded fruits were treated with different chemical treatments i.e. sulphitation, borex and bavistin. Packaging of litchi fruits both (chemical treated and untreated) was done using different types of packaging materials like polythene bag, plastic box, paper cartoon, wooden box and bamboo basket. The combined effect of the chemical treatments and packaging materials on storing period of litchi fruit is given in table.no.1.

When untreated litchi were stored at room temperature 32⁰C, its storage period was of 2 days in packages made up of paper cartoon, wooden box and bamboo basket and 3 days in plastic box and polythene bag respectively. When litchi fruits treated with sulphur fumigation and stored at room temperature 32⁰C, its storage period extended upto 6 days in packages made up of paper cartoon, wooden box and bamboo basket and upto 5 days in plastic box and polythene bag. When litchi fruits treated with borex and stored at room temperature 32⁰C, its storing period enhanced upto 3 days in packages made up of paper cartoon, wooden box and bamboo basket and 4 days in plastic box and polythene bag based packages and in case of bavistin treated litchi its storage period last for 3 days in packages made up of paper cartoon, wooden box and bamboo basket and 4 days in plastic box and polythene bag based packages. So, it is very clear from the above findings given in table 1 that as compared to untreated litchi, borex and bavistin treated litchi, sulphitation treated litchi stored in polythene bags had longer storing period and litchi stored in paper cartoon, wooden box and bamboo basket followed next in order. In a study conducted by Mahajan and Hoswami, (2004) it was revealed that

fumigation with sulphur dioxide (75-125ml/kg) is used to control postharvest browning in litchi.

Study of moisture loss in litchi fruits

The litchi was treated with sulphur fumigation (Table.No.2.) and stored at different packaging materials (i.e. polythene bag, plastic box, paper cartoon and bamboo basket at room temperature and it was found that moisture loss in polythene was lowest (5.02 per cent) followed by plastic box (6.88 per cent), paper cartoon, (9.05 per cent) wooden box (10.15 per cent) and highest in bamboo basket (11.91 per cent) for period of 5 days. In a study conducted by Ray, 1998 it was found that low temperature (0-2C) and high relative humidity (90-95%) coupled with various physical and chemical treatments, are reported to be effective in extending the storage life of litchi fruit to around 3-4 weeks (Revathy and Narasimham, 1997).

As per data given in Table.no.3.the litchi was treated with borex and stored in different packaging materials (i.e. polythene bag, plastic box, paper cartoon, wooden box and bamboo basket) and it was found that the moisture loss in polythene bag was lowest (2.21 per cent), followed by plastic box (6.89 per cent), paper cartoon (5.08 per cent), wooden box (10.31 per cent) and bamboo basket (11.98 per cent) respectively.

Litchi was treated with bavistin and stored in different packaging materials (i.e. polythene bag, plastic box, paper cartoon, wooden box and bamboo basket) at room temperature (32⁰C) and data is mentioned in Table.no.4. It was found that the moisture loss was lowest (5.20 per cent) in polythene bag followed by plastic box (6.91 per cent), paper cartoon (9.18 per cent), wooden box (10.43 per cent) and bamboo basket (12.14 per cent) respectively.

Table.1 Comparative assessment of storage life of litchi (Shahi Variety) at room temperate 32⁰ C

Packaging Materials	Storage life in days at room temperate 32 ⁰ C			
	SO ₂	Borex	Bavistin	Untreated
Polythene Bag	5	4	4	3
Plastic Box	5	4	4	3
Paper Cartoon	6	3	3	2
Wooden Box	6	3	3	2
Bamboo Basket	6	3	3	2

Table.2 Comparative assessment of moisture loss (by weight) of Sulphur fumigation (SO₂) treated litchi during storage at room temperature 32⁰ C

Packaging Materials	Storage period in days	
	3 days	5days
Polythene Bag	3.56	5.02
Plastic Box	4.06	6.88
Paper Cartoon	4.83	9.05
Wooden Box	5.78	10.15
Bamboo Basket	6.50	11.91

Table.3 Comparative assessment of moisture loss (by weight) of borex treated litchi during storage at room temperature

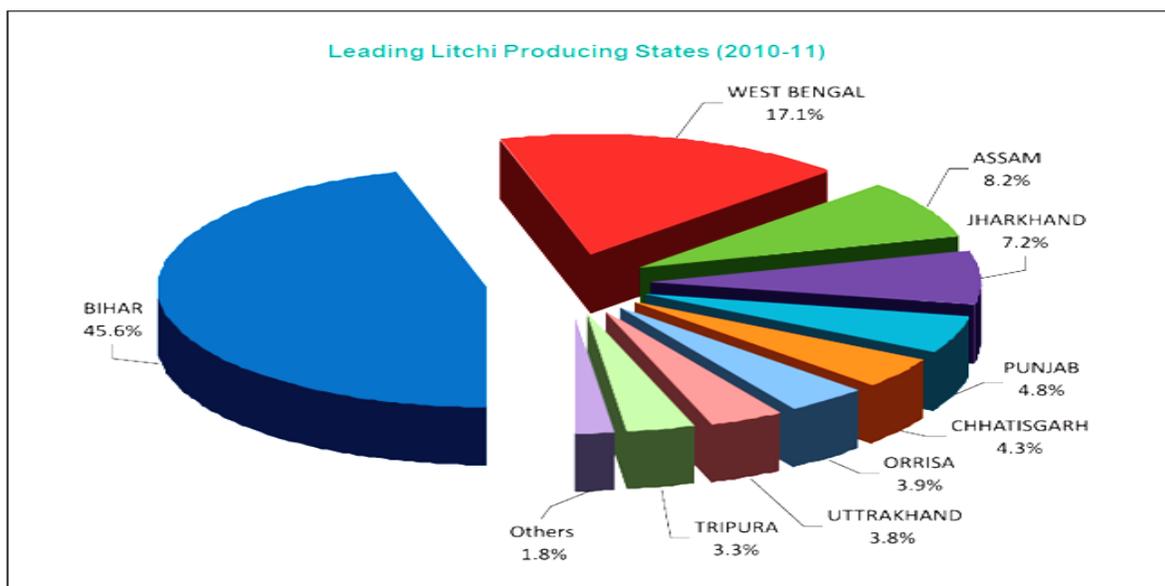
Packaging Materials	Storage period in days	
	3 rd days	5 th days
Polythene Bag	3.60	5.21
Plastic Box	4.15	6.89
Paper Cartoon	4.99	9.08
Wooden Box	5.93	10.31
Bamboo Basket	6.56	11.98

Table.4 Comparative assessment of moisture loss (by weight) of bavistin treated litchi during storage at room temperature (32⁰ C)

Packaging Materials	Storage period in days	
	3 rd days	5 th days
Polythene Bag	3.62	5.20
Plastic Box	4.19	6.91
Paper Cartoon	5.00	9.18
Wooden Box	5.97	10.43
Bamboo Basket	6.60	12.14

Table.5 Comparative assessment of moisture loss (by weight) of untreated litchi during storage at room temperature (32⁰C)

Packaging Materials	Storage period in days	
	3 rd days	5 th days
Polythene Bag	3.65	5.30
Plastic Box	4.26	6.81
Paper Cartoon	5.00	9.16
Wooden Box	5.90	10.45
Bamboo Basket	6.60	12.01



Source: Apeda, 2011(www.agriexchange.apeda.gov.in.cited 11/11/2017)

In all the three chemical treated litchi (Table.no2,3 and 4) that sulphitation treated litchi fruits stored in polythene bags had lowest moisture loss and could be stored for longer time in comparison to other packages e.g. plastic box , paper cartoon , wooden box and bamboo basket respectively.

As per given information in table no.5 the untreated litchi was stored in different packaging materials (i.e. polythene bag, plastic box, paper cartoon, wooden box and bamboo basket) at room temperature (32⁰C) and it was found that the moisture loss was lowest (5.30 per cent) in polythene bag

followed by plastic box (6.81 per cent) , paper cartoon (9.16 per cent) , wooden box (10.45 per cent) and bamboo basket (12.01 per cent) at the 5th days of storage period even at the 3rd days of storage life it was found that moisture loss was minimum in polythene bags at room temperature. So, it is very clear that litchi is best stored in polythene bags as compared to other packaging materials. In a study conducted by Mahajan and Goswami (2004) it was found that fruits packed in polythene bags and stored at 22⁰ C reduced browning.

In conclusion, litchi is prized for its

excellent quality characteristics, pleasant flavour and fascinating colour. Litchi fruit plays a vital role in the earning of the farmers of north Bihar region. In monetary term if only Bihar state is considered approximately there is a loss of Rs.100 crores annually due to postharvest loss of litchi.. Postharvest technologies have been used to reduce these loss. These technologies involve, use of various packages and packaging materials and the application of chemicals. The storage period of untreated, borex and bavistin treated litchi was less than sulphitation treated litchi at room temperature. It was found that moisture loss was increasing as the storage period increases at room temperature. The storage life of litchi was found highest in sulphitation treated litchi. Litchi fruits stored in polythene bags had lowest moisture loss and could be stored for longer time in comparison to other packages e.g. plastic box , paper cartoon , wooden box and bamboo basket.

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