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# IMPACT OF EDIBLE COATINGS AND PACKAGING ON THE SHELF LIFE OF PEAR (*Pyrus communis*)

**NANCY SABHARWAL, NAVDEEP GANDHI, KARAMPAL SINGH AND JYOTMANINDER SINGH**

**Department of Agriculture, D.A.V. College, Abohar, Fazilka**

***ABSTRACT***

***A study was conducted to investigate the impact of edible coatings and packaging on physical properties, chemical properties and shelf life of Pear at Agriculture Lab, D.A.V. College, Abohar during year 2015. The fruits were coated with jojoba oil, almond oil and packed in polythene. They were stored at ambient room temperature. The samples were analyzed for physical properties, chemical properties and for shelf life of the pear. Coated pears and polythene packed fruits extended and improved their shelf life quality due to the minimization of the physico-chemical changes and sensorial properties. Therefore, the results indicated that the edible coating and polythene packaging has potential to extend the shelf life and maintain quality of pears. Edible coating and packaging application represents a good alternative to keep pears freshness for longer periods.***

***Keywords:*** ***Pear, jojoba oil, almond oil, polythene packaging, storage, physical and chemical characters, and shelf life.***

## INTRODUCTION

The pear (*Pyrus communis*) is one of the most commonly grown fruits in temperate region of India. Due to its wider adaptability under different agro-climatic conditions, it is grown in different parts of the world. All pear cultivars belong to kingdom Plantae. These are Angiosperms which belongs to order Rosales having family Rosaceae and sub-family Amygdaloideae. Its tribe is *Maleae* and having genus *Pyrus*. There are about 30 species of the pear. Several species of pear is valued for their edible fruit, while other are cultivated as ornamental trees. Its chromosome number varies from variety to variety (2n=34, 2n=51, 2n=68). China is the maximum producer country in total pear production of about 17,325,831 metric tonnes (2013-14). In India, pear occupies the second place among temperate fruits both in area and production. The area under production in India is 44,000 hectares

with its annual production of 3, 20,000 million tonnes (NHB 2013-14). Due to its higher adaptability, it is commercially cultivated in regions of Jammu and Kashmir, Himachal Pradesh, Tarai regions of Uttar Pradesh, Punjab, Uttarakhand, Haryana, Arunachal Pradesh, Assam and South India. Pear is fruit whose ripening is regulated by ethylene, exhibiting a relatively short shelf life. During ripening of pears, some changes are observed in firmness, colour, acidity, sugar content, and development of aroma. The optimum quality for eating pears is characterized by a buttery texture, appropriate colour change, characteristic flavour associated with the content of sugars, acids, and volatile compounds. The producers of the countries are facing problems in not achieving the integration of horticultural products to national and international markets with quality products. For this reason in the last years, growers and packers are developing orchard management techniques, packing and shipping practices in order to export their fruit and vegetable products. Some recent studies have been reported to prolong the shelf life of pears using edible coatings that are used to improve the mechanical integrity or handling characteristics of the fruits, reporting the ability of this technological strategy to retard changes in moisture, oxygen, aromas, and solute transport and the function of edible coating can be improved by including additives such as antioxidants, antimicrobials, colorants, flavours, fortifying nutrients, and spices in film formulation. Besides, incorporation of antioxidants agents into packaging materials has also become very popular.

## MATERIALS AND METHODS

The experiment was conducted at Agriculture Lab-II, D.A.V College, Abohar. In the laboratory, the fruits were washed with chlorinated water and categorised in four lots. First lot was coated with almond oil containing 10 fruits numbered as $A_1$ to $A_{10}$, second lot was coated with jojoba oil containing 10 fruits numbered as $J_1$ to$J_{10}$,and third lot was packed into polythene an numbered as $P_1$ to $P_{10}$ and fourth lot was remain uncoated as control treatment containing 10 fruits numbered as $C_1$ to $C_{10}$. The treated fruits were stored and analysed for various physical and chemical characteristics at an interval of four days

**Physical characters**.

**Juice (%)**

The juice per cent defines the total amount of juice in the fruit which varies from fruit to fruit. The fruit was peeled and crushed, after that the juice was collected either by the use of juicer or muslin cloth. Juice % is measured by the following formula:

$$\text{Juice (\%)} = \frac{\text{Juice weight}}{Fruit\ weig\ ht} \times 100$$

**Pulp (%)**

The pulp per cent defines the total amount of pulp in the fruit which varies from fruit to fruit. It is measured by the following formula:

$$\text{Pulp (\%)} = \frac{\text{Pulp weight}}{Fruit\ weight} \times 100$$

**Physiological loss in weight (PLW %)**

The weight of fruit was measured with the help of weighing machine. The weight of fruit was according to their size. The loss in weight was measured after the fixed intervals of the experiment by using the following formula:

$$\text{PLW\%} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

**Spoilage (%)**

Spoilage is the process in which food deteriorates to the point in which it is not edible to humans or its quality of edibility reduced. The total spoilage % was calculated by the following formula:

$$\text{Spoilage (\%)} = \frac{Number\ of\ spoiled\ fruits}{Total\ number\ of\ fruits} \times 100$$

**Chemical characters**

**TitratableAcidity %**

Tritratable acidity was measured by titrating freshly prepared juice with 0.1NaOH and Phenolphthalein indicator.

$$\text{Titratable acidity (\%)} = \frac{Volume\ of\ NaOH\ used \times 0.0067}{Volume\ of\ juice\ taken} \times 100$$

**TSS: acid ratio**

The TSS/acid ratio is a key characteristic determining the taste, texture and feel of fruit segments. It is the sugar/acid ratio which contributes towards giving many fruits their characteristics flavour. It is also an indicator of commercial and sensory ripeness. The TSS/acid ratio is determined by simple division of ˚Brix value to the total acid value, as the value of this ratio depends on the value of TSS and acid per cent.

## RESULTS AND DISCUSSION

### Physical characters

### Juice %

The data of table 1 shows the juice % of the Pear. The maximum juice % was observed in almond oil coated fruits (53.03%) and minimum juice % was found in uncoated control fruits (46.99%). The juice % was more at the beginning of the storage and was decreasing during the advanced days of the storage.

**Table 1. Effect of edible coatings and polyethylene packaging on juice % of Semi- Soft Pear fruits at ambient conditions.**

| Treatments | Days after storage | | | |
|---|---|---|---|---|
| | 0 | 4 | 8 | 12 |
| **Almond oil** | 47.60 | 51.80 | 53.80 | 53.03 |
| **Jojoba oil** | 46.65 | 52.53 | 52.60 | 52.20 |
| **Polyethylene packaging** | 47.75 | 51.80 | 52.00 | 48.34 |
| **Control** | 46.60 | 49.54 | 47.52 | 46.99 |

Similarly, Youssef *et al* (2015) studied effect of edible coating on storage life of navel oranges fruit during cold storage. Result indicate that chitosan coating at 1% and mango leaf extract with gelatin at 2% was more effective in keeping fruit firm with increased fruit juice percent up to 30 days of cold storage and then decrease was observed at the end of storage period. Coating treatment gave effective result by maintaining higher juice percent over control fruits.

**Pulp %**

The data presented in the table 2 shows that the pulp% of different treatments at the different days of storage. There was maximum pulp% (33.40%) of almond oil coated fruits, followed by jojoba oil coated fruits (30.26%), polythene packed fruits (30.24%) and control (28.20%). The pulp % basically depends on the weight and the juice content of the fruit. There was less pulp% (19.30%) at 0 day in the fruits of all treatments as compared to the 30$^{th}$ day of the storage.

**Table 2. Effect of edible coatings and polyethylene packaging on pulp % of Semi-Soft Pear fruits at ambient conditions.**

| Treatments | Days after storage | | | |
|---|---|---|---|---|
| | **0** | **4** | **8** | **12** |
| **Almond oil** | 19.30 | 24.10 | 30.30 | 33.40 |
| **Jojoba oil** | 19.30 | 23.20 | 28.90 | 30.26 |
| **Polyethylene packaging** | 19.30 | 22.24 | 26.95 | 30.24 |
| **Control** | 19.30 | 22.10 | 27.50 | 28.20 |

Similarly, Durrani *et al* (2010) studied the physicochemical response of apple pulp to chemical preservatives and antioxidant during storage. He observed that storage intervals and treatments had a significant effect on physicochemical and sensory analysis of apple pulp.

**Physiological loss in weight**

**Table 3 Effect of edible coatings and polyethylene packaging on the physiological loss in weight (PLW %) on Semi-Soft Pear fruits at ambient conditions.**

| Treatments | Days after storage | | | |
|---|---|---|---|---|
| | 0 | 4 | 8 | 12 |
| **Almond oil** | 0.00 | 4.13 | 7.45 | 15.49 |
| **Jojoba oil** | 0.00 | 4.15 | 5.11 | 14.21 |
| **Poly. packaging** | 0.00 | 4.07 | 4.27 | 11.60 |
| **Control** | 0.00 | 4.21 | 11.30 | 18.24 |

The data presented in the table 3 represents that PLW increases with the advancement of storage period rather slowly in the beginning but at a faster rate as the storage period advanced. There was no any loss in weight at 0 day treatment. The treatment shows the significant difference among themselves with regard to PLW. The maximum loss in weight (18.24%) was observed in uncoated control fruits followed by almond oil (15.49%), jojoba oil (14.21%) and polyethylene packed (11.6%) fruits. . Similarly, Bisen *et al* (2012) also found loss in weight of kagzi lime fruits when coated with mustard oil. Kaur *et al* (2013) observed the increase in PLW% during the storage of pear fruits.

**Spoilage(%)**

**Table 4 Effect of edible coatings and polyethylene packaging on spoilage % of Semi-Soft Pear fruits at ambient conditions.**

| Treatments | Days after storage | | | |
|---|---|---|---|---|
| | 0 | 4 | 8 | 12 |
| **Almond oil** | 0.00 | 20.35 | 25.00 | 66.67 |
| **Jojoba oil** | 0.00 | 10.32 | 22.26 | 42.85 |

| | | | | |
|---|---|---|---|---|
| **Polyethylene packaging** | 0.00 | 10.00 | 11.11 | 25.00 |
| **Control** | 0.00 | 25.00 | 37.50 | 80.23 |

The data presented in table 4 shows the spoilage per cent of fruits of different treatments. The data shows the difference among themselves with regard to spoilage. The spoilage per cent generally increased with the advancement of storage period rather slowly in the beginning but at a faster rate as the storage period increases. There was no spoilage at 0 day. The maximum spoilage was observed in control fruits at $12^{th}$ day of storage is 80.23% and the minimum spoilage was observed in polyethylene packaging i.e. 25%. Similarly, Kamel (2014) studied the impact of garlic oil, seaweed extract and imazalil on keeping quality of Valencia orange fruits during cold storage. The obtained results revealed that spoilage %, significantly increased as storage period prolonged.

**Chemical characters**

**Titratable Acidity %**

**Table 5 Effect of edible coatings and polyethylene packaging on titratable acidity % of Semi-Soft Pear fruits at ambient conditions.**

| **Treatments** | **Days after storage** | | | |
|---|---|---|---|---|
| | **0** | **4** | **8** | **12** |
| **Almond oil** | 0.28 | 0.33 | 0.30 | 0.27 |
| **Jojoba oil** | 0.28 | 0.35 | 0.32 | 0.28 |
| **Polyethylene packaging** | 0.28 | 0.36 | 0.33 | 0.29 |
| **Control** | 0.28 | 0.32 | 0.27 | 0.24 |

The table 5 shows that the titratable acidity % of the different treatments. It was found that titratable acidity decreases with the increase in storage days. There was maximum acidity (0.29%) in polythene packed fruits followed by jojoba oil coated fruits (0.28%), almond oil coated fruits (0.27%) and minimum in control fruits

(0.24%). Similarly, Mohamed *et al* (2013) studied the utilization of edible coating in extending the shelf life of processed prickly pear they observed a slow decrease in titratable acidity.

**TSS: acid ratio**

The table 6 shows the TSS: acid ratio of different treatments at different intervals of days.

**Table 6. Effect of edible coatings and polyethylene packaging on TSS: acid ratio of Semi-Soft Pear fruits at ambient conditions.**

| Treatments | Days after storage | | | |
|---|---|---|---|---|
| | 0 | 4 | 8 | 12 |
| **Almond oil** | 64.49 | 44.24 | 46.06 | 57.78 |
| **Jojoba oil** | 64.49 | 42.28 | 46.65 | 54.82 |
| **Polyethylene packaging** | 64.49 | 41.43 | 46.32 | 52.03 |
| **Control** | 64.49 | 47.18 | 57.03 | 68.34 |

The maximum TSS: acid ratio was found in control fruits (68.34) followed by almond oil coated fruits (57.78), jojoba oil coated fruits (54.82) and polyethylene packed fruits (52.03). Similarly, Kaur *et al* (2013) studied the effect of different packaging materials and storage intervals on physical and biochemical characteristics of pear. It has been observed that TSS: acid ratio was increased during storage.

## CONCLUSIONS

Results conclude that there was minimum loss in weight in polythene packed fruits (11.60%) and maximum loss in weight under control untreated fruits (18.24%) after 12 days of storage. The minimum juice % was observed in uncoated control fruits (46.99%) whereas maximum juice % observed in almond oil coated fruits (53.03%) after 12 days of storage. The maximum pulp % (33.40%) was found in almond oil coated fruits and minimum pulp % (28.20%) was found in uncoated control fruits. Results conclude that there was minimum spoilage in polythene

packed fruits (25%) whereas maximum spoilage was observed in control untreated fruits (80.23%) after 12 days of storage. The maximum acidity was recorded in polyethylene packed fruits (0.29%) and minimum in uncoated control fruits (0.24%). The maximum TSS: acid ratio was found in uncoated control fruits and minimum TSS: acid ratio was found in polyethylene packed fruits. Results conclude that fruits packed in polythene have maximum shelf life followed by jojoba oil coated fruits.

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