



EFFECT OF COATINGS ON STORAGE QUALITY OF PEAR

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ABSTRACT

Punjab Beauty is the leading cultivar of semi-soft pears grown in Punjab. Pear fruits have short shelf-life at ambient conditions of sub-tropics. To extend the storage life fruits of 'Punjab beauty' were subjected to various post harvest treatments viz; Carboxymethyl cellulose (CMC) @ 0.25%, Alovera gel (AVG) @ 0.25 %, Chitosan @ 0.25% and control (untreated). Treated fruits were packed in CFB boxes before storage at 0-1°C and 90-95% RH. Stored fruits were analyzed for fruit firmness, total sugars, total phenolics and juice pH after 30, 45, 60, 67 and 74 days of storage. Results revealed that fruits treated with Carboxymethyl cellulose (CMC) @ 0.25% maintained the acceptable fruit quality up to 67 days of storage with maximum fruit firmness, juice pH and total sugars as compared to other treatments. Fruit browning was not found in Carboxymethyl cellulose (CMC) @ 0.25% coated fruits up to 67 days of storage, whereas in all other treatments it was recorded.

KEY WORDS: Pear, storage, Carboxymethyl cellulose, Alovera gel and Chitosan.

INTRODUCTION

Under sub-tropical conditions of Punjab, low chill cultivars of pear are performing quite well. In state, Punjab Beauty is the leading cultivar of pear. Fruits of this cultivar mature during the summer months, when temperature is very high and is unfavorable for ambient storage which leads to heavy post harvest losses. To avoid losses, scientific information on physico-chemical characteristics associated with fruit maturity and standard storage method is therefore needed. Many storage techniques have been developed over the years to extend the postharvest life of fruits. Some extension of shelf-life has been demonstrated using controlled atmosphere storage. However, carbon dioxide injury, increased ethanol production and off-flavor problems due to anaerobic respiration have been reported. Semi-permeable coatings can create a modified atmosphere similar to CA storage, with less expense incurred. Edible coatings are traditionally used to improve food appearance and conservation due to their environmentally friendly nature (Petersen *et al.*, 1999). They act as barrier to moisture and oxygen during handling and storage and do not solely retard food deterioration but also enhance its safety due to incorporation of antimicrobial properties. Serrano *et al* (2004) stated that fruit shelf life can be extended by optimization of environmental conditions, minimization of mechanical damage, application of food additives, edible coatings and by ionizing radiations. The high level of water loss, rapid transpiration and mechanical damage degrade the physico-chemical quality of produce and lower its market value. Keeping it in view a study was planned to extend the storage life of pear *cv.* Punjab beauty with edible coatings under low temperature conditions.

MATERIALS & METHODS

Experiment was conducted in the Post Harvest Laboratory,

Department of Fruit Science, Punjab Agricultural University, Ludhiana during the year 2013. For storage studies fruits of pear *cv.* Punjab Beauty were hand harvested from all the four directions of the tree at physiological mature stage in the early hours. The harvested fruits were then immediately transported in plastic crates to Post Harvest Laboratory of the Department. The bruised and diseased fruits were sorted out and only healthy fruits were selected for the experiment. Fruits were washed and air dried and subjected to various treatments viz; Carboxymethyl cellulose (CMC) @ 0.25%, Alovera gel (AVG) @ 0.25 %, Chitosan @ 0.25% and control (water dip). Treated fruits were packed in CFB boxes before storage at 0-1°C and 90-95% RH in cold chambers. Stored fruits were analysed for fruit firmness, total sugars, total phenolics and juice pH after 30, 45, 60, 67 and 74 days of storage. Firmness of randomly selected fruits was measured with the help of fruit pressure tester (Model FT- 327, USA). About 1 square centimeter of the skin in each fruit from the shoulder end on both sides was removed with the help of peeler and firmness of pulp was recorded and expressed in terms of lb force. pH of juice was estimated by using the pH meter from the freshly extracted juice. For estimation of total sugars a sample of 10 ml fruit juice was taken and extraneous material was precipitated with the help of lead acetate. Excess of lead acetate was removed with potassium oxalate. Thereafter, solution was filtered and volume was made 100 ml with distilled water. This filtrate (aliquot) was kept for the estimation of total sugars. Total sugars were estimated by taking 25 ml of above aliquot in 100 ml volumetric flask. To this solution 5 ml 60 per cent HCl and 25 ml distilled water was added. It was allowed to stand overnight for hydrolysis. The excess HCl was neutralized with saturated NaOH solution and volume was made 100 ml with distilled water. Total sugars were then estimated by titrating the hydrolyzed aliquot against the

boiling mixture containing 5 ml of each of Fehling's solution A and B using methylene blue as an indicator. The adding of titre was stopped on the appearance of brick red colour. The values were expressed in per cent on fresh juice basis (AOAC 1990). The experiment was laid out in a Completely Randomised Block Design (Factorial). An analysis of variance was conducted using SAS software version 9.3 (SAS Institute Inc., Cary, NC, USA). The

means were compared using Tukey's HSD test at significance level of 0.05.

RESULTS & DISCUSSION

Fruit firmness is an important factor which highly effects the fruit quality. Various fruit coatings significantly affected the fruit firmness as compared to control.

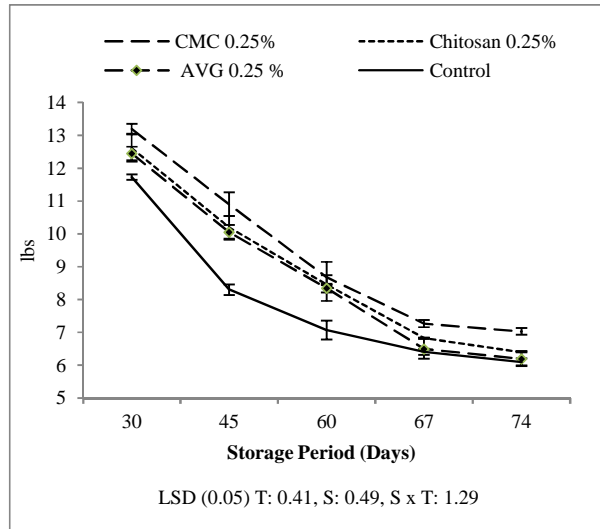


FIGURE 1: Effect of post-harvest treatments on firmness (lbs) of pear fruits during cold storage

Results revealed that fruit firmness was decreased in all the treatments with the advancement of storage period, but at the end of storage period maximum fruit firmness was retained by the fruits coated with Carboxymethyl cellulose @ 0.25%. Whereas minimum fruit firmness was recorded in the control (untreated) fruits (Fig.1). The decrease in fruit firmness during prolonged storage may be attributed to increased rate of respiration and consequently enhanced fruit ripening. However, rapid loss in firmness during storage might be associated with the increased activity of polygalacturonase (PG), pectin methyl esterase (PME) as

well as depolymerization of cell wall pectins (Bartley *et al.*, 1982). The effect of coatings to retard the firmness loss is due to its role in checking the activity of cell wall enzymes. It might also be attributed to change in the turgor of the cells and changes in the composition of cell wall pectin and lipo protein membrane bordering the cells (Chen *et al.*, 1991). Juice pH determines the acid content of fruit juice and attributes to the juice quality. Juice pH showed the inconsistency during storage. All the fruit coatings significantly effected the change in juice pH.

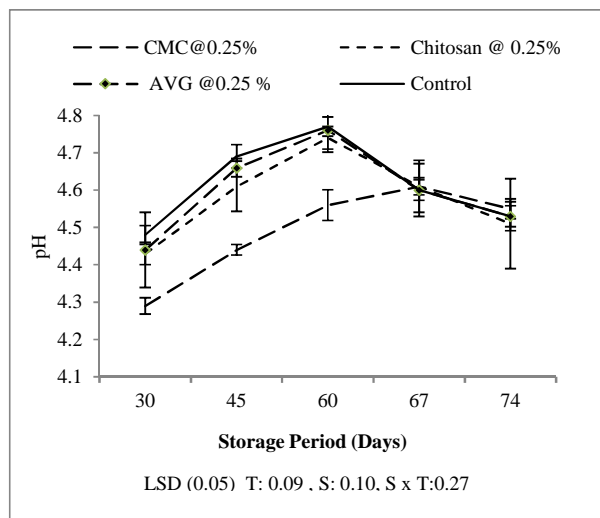


FIGURE 2. Effect of post-harvest treatments on Juice pH of pear fruits during cold storage

Juice pH increased in all the fruits up to 60 days of storage except fruits coated with Carboxymethyl cellulose @ 0.25% where this increase was registered up to 67 days of storage after that a decline was recorded (Fig. 2). An increase in juice pH indicates the decline in juice acidity with storage and a decline in pH at the end of storage showed an increase in acidity. An increase in juice pH with the advancement of storage period could be attributed to use of organic acids in the respiratory process and due to the hydrolysis of starch in to sugars. A slow increase in juice pH in coated fruits as compared to control fruits might be due to low respiration rate in coated fruits. At the end of storage fruits coated with Carboxymethyl cellulose @ 0.25% maintained the higher juice pH as compared to other treatments. Decline in juice pH at the end of storage might be due the increase in acid content of juice due to the fermentation which indicates the deterioration of fruit quality. Total sugars of the fruit directly influence the consumer acceptability. The coatings affected the

conversion of starch in to sugars during storage. Fruits coated with various coatings showed a slow increase in total sugars as compared to uncoated (control) fruits (Fig.-3). All the treatments showed an increase in total sugars with the increase in storage period. Maximum increase in total sugars was recorded in control fruits, but this increase was only up to 45 days of storage after that a decline was recorded. Fruits coated with chitosan and alovera gel showed an increase in total sugars up to 60 days of storage, whereas fruits treated with Carboxymethyl cellulose (CMC) @ 0.25% showed this increase up to 67 days of storage. The increase in total sugars during storage might be due to water loss and fast hydrolysis of acids, starch and polysaccharides to soluble form of sugars. Similarly Dhillon *et al.* (1981) reported the increase in total sugars with the advancement of storage period in pear fruits. Singh (2004) also reported a slow increase in sugars in wax coated pear fruits as compared to control.

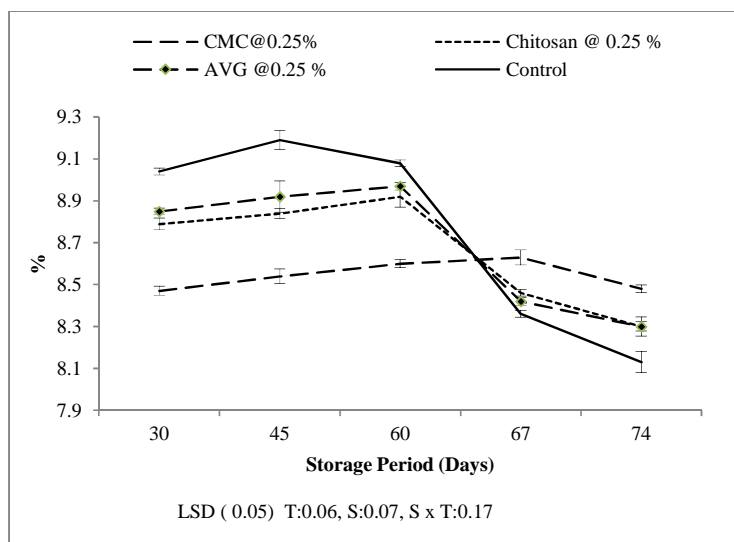


FIGURE 3. Effect of post-harvest treatments on Total sugars (%) of pear fruits during cold storage

Internal browning is the discoloration of fruit pulp tissue is a limiting factor in post harvest handling of pear. During the initial period (60 days) of storage browning was not

observed in any treatment, but after 67 days of storage browning was observed in all the treatments except Carboxymethyl cellulose @ 0.25% treated fruits (Table1).

TABLE: 1. Effect of post-harvest treatments on Internal Browning of pear fruits during cold storage

Treatment	Internal Browning (%)					Mean
	Storage period (days)					
	30	45	60	67	74	
T ₁ : CMC@0.25%	0.0	0.0	0.0	0.0	44.5	8.9
T ₂ : Chitosan @ 0.25 %	0.0	0.0	0.0	21.5	80.0	20.3
T ₃ : AVG @0.25 %	0.0	0.0	0.0	20.5	82.5	20.6
T ₄ : Control	0.0	0.0	0.0	20.0	80.0	20.0
Mean	0.0	0.0	0.0	15.5	71.8	

At the end of storage browning was recorded in all the treatments, but minimum browning was recorded in Carboxymethyl cellulose @ 0.25% treated fruits. An increase in acidity with the advancement of storage period might be due to the oxidation of phenols. A slow increase in Carboxymethyl cellulose @ 0.25% treated fruits might be due low respiration rate and oxidation of phenols. Similar results in different pear cultivars were also

reported by Xuzn *et al* (2001) and Meheruik (1989).

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