



A METHOD OF ENHANCING SHELF-LIFE OF PERSIMMONS BY FILM PACKAGING

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PREFACE

Persimmon is abundantly grown in Peshawar and Swat vallies of North West Frontier Province of Pakistan. Its production has greatly increased during the past decade. However, sizeable portion of the produce is wasted due to perishable nature of the fruit and inadequate processing and storage facilities. In view of export potential of this fruit, studies on enhancing its shelf life through proper packaging were conducted at this Institute. This brochure provides information on the improvement of quality and enhancement of shelf life of persimmon by bulk or unipackaging in polyethylene. I hope the information given in this brochure will be beneficial for the researchers, fruit growers, exporters and general public.

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SHELF LIFE EXTENSION OF FRESH PERSIMMON

Among foods of plant origin, fruits are more susceptible to deteriorate changes and spoilage during post-harvest storage. Apart from some physiological and pathological disorders, surface evaporation is mainly responsible for deterioration of fresh fruits. Excessive weight loss due to respiration/transpiration can result in shriveling and loss of gloss. Keeping in view the importance of persimmon and its perishable nature, studies were undertaken to extend the shelf life of this fruit.

Since its introduction in 1940, persimmon (*Diospyros kaki*) has been widely grown in Peshawar, Swat and Dir valleys and to a lesser extent in several other areas of Pakistan. Its cultivated areas is increasing every year. This fruit is very nutritious and delicious with appreciable quantities of ascorbic acid, carotenoids and sugars in the form of glucose and fructose. Post-harvest quality of this fruit is affected by astringency due to the presence of polyphenols especially water-soluble tannins, and its highly perishable nature. If properly handled during and after harvest, the fruit can be a source of considerable profit for the growers and could be exported to earn valuable foreign exchange. Experiments were undertaken to extend the post-harvest life of this fruit by different means including film packaging.

Plastic film packaging (mostly polyethylene-common plastic costing about Rs.25/- per pound) is being successfully used for post-harvest storage of many fruits and vegetables in several countries of the world. In Pakistan, the common practice is to wrap the fruits in newspaper which itself could be a source of contamination. Hence series of experiments were conducted to investigate the effect of different types of packages. Orchard picked mature but unripe fruits were packaged in newspaper (0.093 mm), cellophane (0.30 mm), polyethylene (0.030 mm) and wax-paper (0.0245 mm) for subsequent storage at room temperature for 6 weeks. The results showed maximum weight loss (16%) in newspaper lined and minimum (2%) in polyethylene (PE) wrapped samples (4 kg force) were the highest for cellophane (3 kg force) followed by wax-paper (2kg force) and newspaper (2 kg force) wrapped fruits. The mean values for vitamin C for PE, cellophane, wax-paper and newspaper wrapped fruits were 36.0, 33, 32 and 31 mg/100g, respectively. The vitamin C content of fruits under all the treatments decreased as a result of storage period. The packed samples were also evaluated for colour, flavour, taste and general acceptability by the experienced judges. The overall scores ranged between 5 and 8 (highest for the PE packaged) at the end of entire storage period. The shelf life of PE lined fruits was found to be 40 days compared to 33 days for cellophane, 25 days for wax-paper and 20 days for newspaper. From these studies it is concluded that polyethylene is a better packaging material than others for retaining weight and texture of persimmon fruits during storage (Table 1).

The polyethylene thickness can affect post-harvest quality of persimmons, hence the influence of different thicknesses of PE on the quality of persimmon was studied. The mature but unripe samples were sorted, washed and packaged in PE of 4 thicknesses (0.03, 0.013, 0.025, 0.035 and 0.043 mm) alongwith newspaper packaged samples. The mean values for weight loss (%) for newspaper, PE-I, PE-II, PE-III and PE-IV were 17,2,2,2,1.5, respectively, whereas firmness values for these samples ranged between 2.5 to 3.0 kg force. The differences in

mean value of control and treated samples were highly significant, however, the differences among various thicknesses of PE were not significant. The weight loss increased significantly and texture values decreased as expected as a result of 6 weeks ambient storage. The vitamin C content also decreased during storage and maximum decrease was found in the control (unpacked) and newspaper lined samples indicating that fruits in these treatments had ripened earlier as compared to PE-lined samples. The differences in ascorbic acid content of various PE-lined samples were non-significant. Sensory testing by the judges for overall acceptability and individual parameter such as colour, flavour and taste revealed that the control and newspaper lined fruits obtained minimum ratings compared to PE wrapped ones. The differences among PE-lined samples were not marked and the samples were relatively firmer. The control and newspaper lined fruits were found to be overripe and deformed compared to the PE-lined ones. It was concluded from these studies that polyethylene thicknesses did not influence the post-harvest changes in quality of persimmons significantly but extended their storage life up to 45 days as compared to 23 days for the samples kept in newspaper.

The packaging of fruits and vegetables in bulk (bulk packaging) is most common but unipackaging (wrapping each fruit individually) has not been practiced in Pakistan. A study was conducted to compare unipackaging with bulk packaging. Like previous experiments, mature but unripe green fruits were sorted, washed and divided into 3 portions. One of the lots was kept in a fiber-board carton as unlined control, the second lot in a similar carton lined with polyethylene (0.03 mm thick) and in the 3rd lot the fruits were sealed individually in PE (0.03 mm thick) pouches and stored in similar cartons at room temperature (10-30°C). It was observed that both unipackaging and bulk packaging of persimmons exhibited significantly lesser weight loss (2 and 3% respectively) than control (13%), and unipackaging in turn resulted in lesser weight loss than bulk wrapping. Similar results were obtained regarding firmness after 6 weeks of storage (Table 2). The correlation between weight loss and firmness (texture) values was negative but significant ($r = -0.996$). The vitamin C level was lower in control (39/100g) than unipackaged (42/100g) or bulk packaged (41/100g) samples showing faster ripening in the former. The vitamin C contents decreased during storage, however, maximum loss of this vitamin occurred in control followed by bulk packaged and unipackaged samples. The Sensoric evaluation was carried out, the values for appearance, flavour and overall acceptability were higher for PE-packaged than the control samples (Table 3).

From results of these studies, it was concluded that bulk PE-wrapping and unipackaging extended the shelf life of persimmon to 40 and 45 days respectively as compared to 20 days in control during room temperature storage for 6 weeks. This was evidenced by maintenance of weight, firmness and Sensoric quality. Unipackaging, although costly, has many advantages over bulk packaging regarding reduction in weight loss and deformation, maintenance of fruit firmness etc. It modifies the internal atmosphere of the pouch as well as allows restricted and balanced metabolism of fruits during storage. Furthermore a single infected fruit spoils the whole lot in bulk packaging, but this type of damage is not possible in unipackaging.

Table 1: EFFECT OF PACKAGES ON POST-HARVEST CHANGES IN PERSIMMON.

Packages	Weight loss(%)	Texture (kg - force)	Vitamin C (mg/100g)	Sensory scores (1 - 9)	Shelf-life (days)
Polyethylene (PE)	2	4	36	8.0	40
Cellophane	12	3	33	8.0	33
Wax-paper	14	2	32	5.0	20

Storage time: 4 weeks at ambient temperature.

Scoring scale: 1 disliked extremely, 9= liked extremely.

Table 2: PHYSICO-CHEMICAL CHARACTERISTICS OF BULK AND UNPACKAGED PERSIMMON.

	Packages		
	Control newspaper	Bulk packaged (PE)	Unpackaged-PE
Weight loss (%)	13	3	2
Firmness (kg-force)	3	4	4
Vitamin C (mg/100g)	39	41	42
Shelf life (days)	20	40	45

Initial value for hardness: 4.43, Vitamin C: 49.46 mg/100g.

Table 3: EFFECT OF BULK AND UNPACKAGING ON SENSORY SCORES OF PERSIMMON.

Treatments	Sensory score			Mean acceptability.
	Appearance	Firmness	Flavour	
Control	3	3	7	5
Bulk-PE-packaged	7	7	8	7
Unpackaged	7	8	8	8
Mean	6	6	7	

Storage time: 6 weeks at ambient temperature.