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NOTE

EFFECT OF STORAGE TEMPERATURE AND CONTAINER TYPE ON STORAGE AND SHELF LIFE OF PERSIMMON FRUITS[1]

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Abstract – Fruits of persimmon (*Diospyros Kaki* L.) were harvested from a commercial cultivar at turning stage of maturity. The selected fruits were either placed in open containers or sealed polyethylene bags and were kept in germinators at 0, 5, 10 and 15°C for varying lengths of time. The results indicated that regardless of container type, both astringency and firmness were increasingly reduced by increased storage temperature and duration. After 28 days, fruits kept in open containers were softer and riper than comparable fruits stored in poly bags. After one week at room temperature, fruits originally kept in bags at 5°C were superior in their eating and marketing qualities to all other treatments.

INTRODUCTION

The ripening processes do not always terminate by detachment of fruits from mother plants, and most fruits ripen further in storage [5]. The effects of storage temperature and duration and also container type on storage life and physiology of many fruits are established [2, 3, 6, 7]. However, few data are available on post-storage life and marketing quality of persimmon (*Diospyros Kaki* L.) as affected by different storage conditions.

The purpose of the present investigation was to study the effect of storage temperature and container type on ripening and post storage quality of green ripe persimmon fruits.

MATERIALS AND METHODS

Fruits of a local persimmon cultivar were harvested on 19 October 1976 at the turning stage [1] from the periphery of uniform trees and were surface sterilized in a 3% w/v solution of Na_2CO_3 for 5 min. Samples of 4 fruits were selected at random and placed either in polyethylene bags (0.1 mm thickness) or on plastic plates (to represent open shelf storage). The bags were sealed and the samples were placed in 0, 5, 10 and 15°C

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Memmert germinators.

A completely randomized design with four replications of 4 fruits each repeated over 4 temperatures was used. Within each temperature, treatments were arranged in a 2 X 5 factorial consisting of 2 types of containers and 5 storage periods of 0, 8, 15, 21 and 28 days. At the end of each storage period, 4 bags and 4 plates were randomly removed from each germinator for measurement of fruit firmness and astringency. Firmness was measured by means of a Chatillon pressure tester equipped with a 1/32 in. dia plunger. Astringency was measured on a relative basis, using 1% w/v solution of $FeCl_3$ on fruit halves and assigning numbers from 0 (no color development indicating no astringency) to 5 (dark brown color indicating full astringency) to them.

In addition to the fruits required for analyses, four additional bags and plates were placed at each temperature. These fruits were taken out at the end of the experiment (28 days) and placed at room temperature for observation of their shelf lives after one week.

The data were subjected to analyses of variance and means were compared by Duncan's multiple range test.

RESULTS AND DISCUSSION

Effects of treatments on the astringency of fruits is shown in Table 1. The astringency was increasingly removed with increased temperatures and storage periods. Placing the fruits in sealed polyethylene bags reduced the effect of higher temperatures, especially at longer storage periods. It is established that in sealed containers of fruits and vegetables CO_2, produced by respiration, accumulates to concentrations greater than atmospheric levels. Wankier *et al.* [8] reported that firmness, total pectins and tannins of peach and apricot fruits decreased with increased storage duration and that higher CO_2 levels of the storage atmosphere reduced the rate of this decrease. The higher astringency of bagged fruits in our experiment can, therefore, be explained on the basis of higher CO_2 concentrations in the bags than the surrounding atmosphere. Nakayma and Chichester [4] reported the astringency of persimmon fruits to be due to presence of soluble anthocyanogens which they were able to precipitate during a 6-hr treatment at 40°C. In our experiment, due to the much lower temperatures used, the rate of astringency removal was much less but the quality of the treated fruits was much higher than would be expected from fruits treated at temperatures as high as 40°C.

Fruits kept in bags were firmer at the end of each storage period than those placed on plates (Table 1). Higher temperatures and longer storage periods resulted in increased softening of fruits. But fruits stored at 0°C remained very firm and were also highly astringent throughout the experimental period. Softening of fruits is achieved by solubilization of pectic materials and loosening of the middle lamellae. It is well established that both temperature and time significantly affect this process as is also shown by our data.

The results of visual evaluation of treated fruits at the end of the experiment and after one week of shelf life at room temperature are reported in Table 2. Upon removal from storage, fruits stored on plates were riper than bagged fruits and those stored at 5 and 10°C were in better marketable conditions than those at other temperatures. Furthermore, the bagged fruits stored at 0°C showed some chilling damage near the pedicel while those kept in plates were not affected. This can be explained on the basis of

Table 1. Effect of storage temperature and duration, and container type on astringency and firmness of persimmon fruits

	Storage period days	Open plate 0	Open plate 5	Open plate 10	Open plate 15	Temperature (°C) Mean	Poly bag 0	Poly bag 5	Poly bag 10	Poly bag 15	Mean
Astringency *	0	4.5	4.5	4.5	4.5	4.5a	4.5	4.5	4.5	4.5	4.5a
	8	3.5	3.9	1.8	2.0	2.8b	3.8	3.3	3.4	3.2	3.4b
	15	3.6	2.8	1.5	0.5	2.1c	3.4	3.4	2.3	2.5	2.9c
	21	2.9	2.2	1.7	0.7	1.9c	3.4	2.4	2.5	3.1	2.8c
	28	2.6	1.3	0.7	0.2	1.2d	2.8	2.5	1.7	1.0	1.8d
	Mean	3.4a†	2.9b	2.1c	1.6d		3.6a	3.2ab	2.9b	2.9b	
Firmness g	0	369	369	369	369	369a	369	369	369	369	369a
	8	346	327	215	171	265b	376	376	314	269	334b
	15	382	268	181	84	229c	366	327	202	168	266c
	21	410	222	158	50	210c	400	257	156	178	248c
	28	352	117	84	37	147d	401	188	176	66	208d
	Mean	372a	261b	202c	142d		382a	304b	243c	210d	

* 0 = non-astringent, 5 = fully astringent, and 1–4 = intermediate levels of astringency.
† Means in each group, followed by same letter, are not significantly different at 1% level of probability (Duncan's multiple range test).

Table 2. Visual evaluation of persimmon fruits upon removal from 28 days of storage (26 November 1976) and after one week (2 December 1976) of storage at room temperature of 23 ± 2°C

Date	Temperature (°C)	Open plate	Poly bag
26 November 1976	0	Healthy, firm, non-edible	Healthy, non-edible, a few freeze damaged at peduncle end
	5	Half-ripe, edible, healthy	Half-ripe, edible, healthy
	10	Ripe, edible, healthy	Half-ripe, edible, healthy
	15	Over ripe decaying, non-edible	Ripe, edible, 25% rotten
2 December 1976	0	Ripe, fully marketable	Freezing damage showing on most fruits
	5	Fully ripe, somewhat shrivelled	Fully ripe, turgid, some rotting
	10	Over ripe, very shrivelled non-marketable	Over ripe, some shrivelling and rotting
	15	Severe rotting and shrivelling non-marketable	Over-ripe, some shrivelling and rotting

the fact that after 28 days of storage at 0°C, fruits stored on plates had lost about 16% of their fresh weight while those stored in bags had a weight loss of 0.3% (Table 3). As a result of this differential loss of water, fruits stored on plates had thicker saps and were more tolerant to chilling. After 1 week of shelf life, the bagged fruits were in better condition than fruits similarly treated on plates. The only problem with bagged fruits was some degree of molding which most probably was due to inadequate original surface sterilization and/or recontamination. In general, the results indicated that placing persimmon fruits in sealed bags and keeping them at 5°C prolonged the storage and shelf life more effectively than other treatments.

Table 3. Effect of container type and temperature on % weight loss of persimmon fruits after 28 days of storage

Container type	Storage temperature (°C) 0	5	10	15	Mean container
Open plate	16.66	25.80	34.71	43.67	30.21a
Poly bag	0.30	0.37	1.46	1.57	0.93b
Mean temperature	8.48d	13.09c	18.09b	22.62a	

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