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TANGERINE STORAGE

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INTRODUCTION

Florida is the only major tangerine-growing area in the United States, and there is only one important commercial variety, namely Dancy, which is characterized by a loose rind (*2*). A report from India states that varieties with loose rind have a short storage life of a few weeks while the variety Nagpur, with a tight rind, has a greater storage life of 3 months or more (*1*). Little has been published on the storage of tangerines. Because the variety Dancy has a storage life of only 2 to 4 weeks under ideal conditions of storage, it has been considered to be highly perishable (*10*). Most of the storage studies conducted on this fruit have been of short duration (*4*), and commonly were associated with railway transit conditions (*7, 9*).

In Hawaii, the commercial orchards of tangerines are mostly in the Puna area on the island of Hawaii, where the variety Dancy is grown. Most of the crop is marketed in Honolulu and is shipped there by air or by barge, usually without refrigeration. Therefore except for a period of overnight surface transportation, there is no extended storage period before the fruits are marketed.

The crop is harvested from late fall to midwinter and sold at good prices during a period when competition from mainland fruits on the local market is at a minimum. However, at times and especially during heavy crop years, the local market is unable to absorb all the fruit. Thus, there is a surplus of fruit which nevertheless must be harvested because of the short ripening season. The possibility that the surplus fruits may be saved and sold after the season, if properly stored, was explored in the investigations reported in this paper.

MATERIALS AND METHODS

Desiccation, storage decay, and loss of edible quality are the three most important factors in the deterioration of tangerines under usual conditions of storage. These factors were studied with the view of developing a method of prolonging the storage life of these fruits.

Most of the tangerines employed in these studies were obtained from Pahoa, Puna, Hawaii; others were obtained from Kona, Hawaii, and Honolulu, Oahu. Fruits from the 1961–1962, 1962–1963, 1963–1964, and 1964–1965 crops were harvested at the commercially ripe stage. Oahu fruits were used in experiments the same day they were harvested. Due to transit conditions, the Hawaii fruits were usually used 1 to 3 days after harvest. Fruits from Puna were shipped by air to Honolulu; those from Kona were shipped by barge under refrigeration. Ordinarily, fruits air-shipped from Hawaii were used on the day of arrival in Honolulu. When they were not used on the day of arrival, they were stored at 40° F at the airport until used in experiments. Matched fruits ranging in surface color from ½-yellow to full yellow were used in experiments. Detailed procedures for the experiments are described in appropriate places.

RESULTS

Desiccation Control

The effect of *relative humidity* on desiccation was first investigated. Fruits were stored under various relative humidities, maintained with differential concentrations of glycerol (5), and at different temperatures (3). Loss in weight of the fruits during storage was determined. Firmness of the fruit was determined with the Magness-Taylor fruit pressure tester, which was modified so that the plunger of the instrument was not allowed to puncture the rind. External condition in terms of degree of visible surface shrivelling and internal condition in terms of visible degree of pulp desiccation were also recorded for fruits in long-storage experiments.

The results of a test conducted at 77° F are compiled in Table 1; the results of a test at 45° F, in Table 2; and those of a test at 40° F, in Table 3.

Storage at relative humidities below 100 percent at 77° F for a short period resulted in weight loss (Table 1). At 45° F (Table 2), the percentage losses in weight were less than those at 77° F (Table 1) for similar relative humidities at both temperatures.

TABLE 1. Loss in weight of tangerines in storage at various relative humidities at 77° F for 5 days (12 fruits per treatment)

PERCENT RELATIVE HUMIDITY	AVERAGE PERCENT LOSS IN WEIGHT[1]
100	0
97	2.1
93	2.6
85	3.3

[1]Statistical significance ($P = 0.05$): $3.3 > 2.6 = 2.1 > 0$.

TABLE 2. Loss in weight of tangerines in storage at various relative humidities at 45° F for 7 days (40 fruits per treatment)

PERCENT RELATIVE HUMIDITY	AVERAGE PERCENT LOSS IN WEIGHT[1]
92	0
88	1.2
85	1.1
66	4.8

[1]Statistical significance ($P = 0.05$): $4.8 > 1.1 = 1.2 > 0$.

TABLE 3. Effect of relative humidity on weight loss, external and internal condition, and firmness of tangerines stored at 40° F for 30 and 58 days (20 fruits per treatment)

PERCENT RELATIVE HUMIDITY	AVERAGE PERCENT LOSS IN WEIGHT		EXTERNAL CONDITION		INTERNAL CONDITION		AVERAGE PRESSURE (lb)[2]	
	30 days[1]	58 days[1]	30 days	58 days	30 days	58 days	30 days[1]	58 days[1]
100	0	0	normal	normal	normal	normal	24.9	23.0
98	0	2.4	normal	normal	normal	slightly desiccated	24.4	19.7
93	9.5	13.6	slightly shrivelled	moderately shrivelled	slightly desiccated	moderately desiccated	18.1	15.4

[1] Means connected by a line are not significantly different at P = 0.05.

[2] Measured with modified Magness-Taylor fruit pressure tester as a measure of firmness.

At a storage temperature of 40° F, relative humidities below 100 percent caused fruit weight losses after a prolonged storage period of 58 days (Table 3). After a storage period of 30 days, only fruits stored at 93 percent relative humidity lost weight (9.5 percent). Fruits stored under conditions of 100 percent relative humidity maintained their original turgidity and firmness as determined by the pressure test. With the decrease in the relative humidity, there was a corresponding increase in fruit weight loss, surface shrivelling, internal desiccation, and overall softening of the fruit.

Waxing is commonly used to reduce desiccation and improve appearance of various fruits. Local tangerines were waxed with various concentrations of commercial waxes and stored at various temperatures. Two commercial fruit waxes were used: Sta-Fresh 920D (Food Machinery and Chemical Corporation, Florida Division) and Prima Fresh (S. C. Johnson and Son, Inc., Racine, Wisconsin). The fruits were dipped in the wax preparations for a few seconds and then dried at room temperature before storing. At the time of storage and at intervals during storage, fruits were weighed. The results of an experiment are recorded in Table 4.

Results in Table 4 show that at 45° F and 87–98 percent relative humidity, waxing (full strength) affected weight loss only after an extended period of storage. In other tests, Sta-Fresh 920D was found to be much less effective at half strength and ineffective at lower concentrations.

Experiments with Prima Fresh wax indicated that, in general, concentrations less than 30 percent were ineffective for controlling weight loss. This is shown in the results of one of the tests conducted under an adverse storage condition (room temperature) (Table 5).

Waxing with both proprietary waxes at concentrations required to reduce fruit weight loss also slightly delayed surface coloring of partly colored fruits.

The effect of *liners,* which are commonly used in the commercial packaging of various fresh commodities, and of *polyethylene* bags on the prevention of fruit desiccation and weight loss was next investigated. The liners used

TABLE 4. Effect of waxing on weight loss of tangerines stored at 45° F and 87–98 percent relative humidity (12 fruits per treatment)

DAYS IN STORAGE	AVERAGE PERCENT LOSS IN WEIGHT (CUMULATIVE)			
	Lot 1		Lot 2	
	Control	Waxed[1]	Control	Waxed[1]
11	2.9	3.0	2.9	1.9
18	5.9	5.1	4.8	3.7
25	5.9	5.2	6.0	4.8
32	16.9	9.3	8.2	6.9
47	16.9	12.9	12.4	10.5
53	18.8	14.3	14.0	10.5
61	25.6[a]	17.4[a]	15.9[b]	13.6[b]

[1]Sta-Fresh 920D used full strength.
[a]Statistical significance ($P = 0.05$) : $25.6 > 17.4$.
[b]Statistical significance ($P = 0.05$) : $15.9 > 13.6$.

TABLE 5. Effect of waxing to control loss of weight in tangerines in storage at room temperature (68.5°–79.0° F, 52.5–86.5 percent relative humidity) (10 fruits per treatment)

TREATMENT	AVERAGE PERCENT LOSS IN WEIGHT IN 11 DAYS[1]
Wax* 25%	7.3
Wax* 30%	6.0
Wax* 35%	5.2
Control	7.3

*Prima Fresh.
[1] Statistical significance ($P = 0.05$): $7.3 = 7.3 > 6.0 = 5.2$.

in these tests were of plastic film (2 mils thick), and the film of the polyethylene bags was 1.5 mils in thickness. Perforated (pin holes about 1 inch apart) and nonperforated polyethylene bags were used. The fruits were placed in the bag which was then lightly twist-tied for storage. The liner was placed in the bottom of a corrugated paper carton into which the fruits were placed. Then the four sides of the top of the liner were folded over the fruits followed by the closing of the flaps of the carton without sealing. For a control lot, fruits were placed in a carton without the liner. Storage temperatures were 35°, 45°, and 55° F. At the time of storage and at intervals during storage, fruit weights were obtained. Typical results are recorded in Table 6 and similar data were obtained in other tests conducted at 35° and 55° F under similar storage conditions.

Fruits in the nonperforated polyethylene bag and those in the liner retained their original weight throughout the storage period (Table 6). The loss in weight of the fruits in the perforated polyethylene bag was

TABLE 6. Effect of packaging on retention of weight of tangerines stored at 45° F and 65–71 percent relative humidity (50 fruits per treatment)

DAYS IN STORAGE	AVERAGE PERCENT LOSS IN WEIGHT OF FRUITS (CUMULATIVE)[1]			
	Polyethylene bag (perforated)	Polyethylene bag (nonperforated)	Liner	Carton
7	0	0	0	1.7
14	1.8	0	0	2.7
21	1.8	0	0	3.7
35	1.8	0	0	6.0
51	1.8	0	0	9.0
64	1.8	0	0	12.6
85	1.8	0	0	21.3

[1] Statistical significance ($P = 0.05$): carton > polyethylene bag (perforated) > polyethylene bag (nonperforated) = liner.

TABLE 7. Effect of removal of the button on weight loss of tangerines in storage at 55° F and 85–94 percent relative humidity (39 fruits per treatment)

DAYS IN STORAGE	AVERAGE PERCENT LOSS IN WEIGHT (CUMULATIVE)	
	Buttons intact	Buttons removed
7	0	6.7
12	7.7	6.7
17	7.7	14.4
23	7.7	14.4
30	7.7	14.4
34	7.7[a]	14.4[a]

[a]Statistical significance (P = 0.05) : 14.4 > 7.7.

small compared with that of the fruits in the carton. Thus the ability of polyethylene bags and liners to prevent weight loss was demonstrated.

Removal of the *button* (calyx and attached fruit stem) prior to storage tended to hasten the loss in weight of the fruit at a relative humidity of 85–94 percent (Table 7). However, no weight loss in fruits with the buttons removed occurred in a polyethylene bag in which a higher relative humidity prevailed.

Storage Decay Control

Temperature and *relative humidity* are important in the control of decay caused by fungi in stored tangerines. Fruits were stored in unsealed corrugated paper cartons at different temperatures at varying relative humidities. At intervals during storage, decayed fruits were counted and removed. In Table 8 are combined the results of five tests at different storage temperatures.

The effect of temperature on decay incidence is evident from the data in Table 8. The fruits stored at room temperature had the highest decay percentage. Decay was absent for approximately 2 months at 35° or 45° F. However, at the latter temperature, other tests showed that in the presence of higher relative humidities (above 90 percent) some fruits decayed. Other experiments indicated that the higher the relative humidity, the greater was the incidence of decay at temperatures of 45° F and above.

The use of *chemical preparations* for storage decay control was tested under conditions favorable for the growth of decay organisms. Thus fruit was stored at room temperature in polyethylene bags, liners, or humidified atmosphere. For storage in humidified atmosphere, air was bubbled through a column of water, then led through the storage chamber (glass jar). The tangerines were dipped for a few seconds in the chemical preparations, dried at room temperature, and held in nonperforated, sealed polyethylene bags, in liners, or in jars supplied with humidified air. At intervals during storage, the decay percentage was determined. Commercial preparations employed included Orthocide 80 Wettable (California Spray Chemical Corp.), Sorbistat-K (Chas. Pfizer & Co., Inc.) (*6*), Dowicide A (Dow

TABLE 8. Effect of temperature and relative humidity on the incidence of decay in stored tangerines

DAYS IN STORAGE	PERCENT DECAYED FRUITS (CUMULATIVE)				
	Room temperature (76.5°–83.0° F), 51–69% relative humidity (20 fruits)	55° F, 85–94% relative humidity (40 fruits)	45° F, 65–71% relative humidity (50 fruits)	40° F, 69–81% relative humidity (30 fruits)	35° F, 72–86% relative humidity (30 fruits)
7	20	2.5	2	–	0
14	20	7.5	4	–	0
21	20	7.5	6	–	0
28	–	–	–	0	–
35	–	12.5	8	–	0
42	–	–	–	0	0
51	–	–	8	–	0
56	–	–	–	0	–
64	–	–	8	–	0
85	–	–	8	–	–

Chemical Co.), borax, Dreft (Proctor and Gamble detergent), DHA-S (Dow Chemical Co. dehydroacetic acid, sodium salt), and Purex (Purex Corp. sodium hypochlorite).

Sorbistat-K in concentrations from 0.36–5.70 percent, Orthocide 80 Wettable (0.04–0.60 percent), borax (0.4–3.2 percent), Purex (62.5–1,000 ppm of sodium hypochlorite), and Dreft (½ to 2 tablespoons/quart water) had no practical effect on decay control under high humidity conditions at room temperature. Dowicide A, when used at the rate of 1 pound/5 gallons water, effectively controlled storage decay (Table 9).

TABLE 9. Chemical control of storage decay in tangerines under high humidity conditions (polyethylene bag) at room temperature (76.5°–82.5° F) (20 fruits per treatment)

TREATMENT	PERCENT DECAYED FRUITS (CUMULATIVE)		
	7 days	13 days	18 days
Dowicide A (1 lb/5 gal)	0	0	0
" " (½ lb/5 gal)	0	20	30
" " (¼ lb/5 gal)	0	20	40
" " (⅛ lb/5 gal)	0	10	30
Control	0	10	40

DHA-S, especially 2 percent solution, was also found to be effective for controlling decay in tangerines stored under high humidity conditions at room temperature (Table 10).

TABLE 10. Control of storage decay in tangerines under high humidity conditions (plastic liner) at room temperature (74°–81° F) (20 fruits per treatment)

TREATMENT	PERCENT DECAYED FRUITS (CUMULATIVE)	
	6 days	11 days
DHA-S 2%	0	0
DHA-S 1%	0	20
Control	30	50

During storage at 40° F, the use of Dowicide A and DHA-S was of doubtful advantage because at this temperature there was little decay. However, an application of Dowicide A prior to cold storage was found, in another experiment, to protect against decay for at least 3 days after the fruits were removed from cold storage to room temperature.

In the next series of experiments, the role of the *button* on decay control was investigated. The buttons were removed before storing the fruits under various conditions, and at intervals during the storage period the degree of decay was ascertained. Regardless of temperature and humidity conditions, fruits without buttons showed decay sooner than corresponding ones with intact buttons. The area exposed by the removal of the button became an additional point of infection by decay organisms. The results of an experiment are shown in Table 11.

TABLE 11. Effect of removal of the button on decay incidence in tangerines stored at 55° F and 85–94 percent relative humidity (39 fruits per treatment)

DAYS IN STORAGE	PERCENT DECAYED FRUITS (CUMULATIVE)	
	Buttons intact	Buttons removed
7	2.6	5.1
12	2.6	15.4
17	2.6	28.2
23	5.1	38.5
30	23.1	64.1
34	38.5	72.2

In preliminary tests, there was no indication of decay control by *curing* (exposure to air) the fruits for 1 to 4 days at room temperature just prior to storing under various conditions.

Regardless of storage conditions, *waxing* had no advantages for decay control in tangerines.

The effect of a *modified atmosphere* on decay control in tangerines was determined in one experiment. By proportionate mixing of air with nitrogen, an air stream containing 5.25 percent oxygen was obtained. This air stream was bubbled through a column of water for humidification, then passed through a chamber in which 55 fruits were stored. A control lot in which fruits were subjected to normal humidified air was included in the experiment which was conducted at room temperature. After 6 days of storage, the decay percentages in the modified atmosphere and normal atmosphere were 25.4 and 40, respectively. Whereas undecayed fruits in the normal atmosphere were normal in flavor, those in the modified atmosphere were off-flavor as determined organoleptically.

Some tests were conducted on the effect of *fumigation* on the control of decay in stored tangerines. Commercial fumigants (methyl bromide and ethylene dibromide) were used at dosages required for disinfestation of fresh Hawaiian commodities for the export trade. Methyl bromide was applied at the rate of 2 pounds per 1,000 cubic feet of air space in a fumigation chamber, and ethylene dibromide was applied at the rate of ½ pound per 1,000 cubic feet. These treatments proved ineffective for decay control.

Gamma irradiation at dosages of 20 to 40 krad resulted in no control of decay in fruits stored under conditions favorable for decay incidence.

Control of Loss of Edible Quality

Temperature is a very important factor in the maintenance of edible quality in any fruit stored for any extended period. For tangerines, this effect of temperature was influenced by *relative humidity*. Fruits stored at various temperatures were sampled periodically during storage periods for organoleptic flavor evaluation. Tests indicated that at storage temperatures below 45° F, off-flavor, usually accompanied by off-aroma, developed in prolonged storage. The data in Tables 12 and 13 are representative of the results obtained in storage tests conducted at 35° and 40° F.

At 35° F, the percentage of off-flavor fruits was similar in both the polyethylene bags (perforated as well as nonperforated) and the liner (Table 12). After 42 days of storage in these containers, all fruits developed off-flavor. In the carton, the occurrence of off-flavor fruits was delayed; an

TABLE 12. Development of off-flavor in tangerines stored at 35° F and 72–86 percent relative humidity (210 fruits per treatment)

DAYS IN STORAGE	PERCENT OFF-FLAVOR FRUITS (CUMULATIVE)			
	Polyethylene bag (perforated)	Polyethylene bag (nonperforated)	Liner	Carton
7	0	0	0	0
14	0	0	0	0
21	0	0	0	0
35	6.7	6.7	3.3	0
42	100.0	100.0	100.0	6.7
51	–	–	–	23.3
64	–	–	–	100.0

TABLE 13. Development of off-flavor in tangerines stored at 40° F and 69–81 percent relative humidity

DAYS IN STORAGE	PERCENT OFF-FLAVOR FRUITS (CUMULATIVE)	
	Liner (350 fruits)	Carton (175 fruits)
14	0	–
28	0	0
42	20.1	–
56	35.1	20
70	41.1	–
84	53.1	28
98	100.0	–

additional 22 days of storage in this container were required for all fruits to develop off-flavor. At 40° F, the occurrence of off-flavor fruits in the carton was also delayed as compared with its onset in the liner (Table 13). Furthermore, the final percentage of off-flavor fruits in the carton was much less than in the liner. Off-flavor in fruits occurred earlier at the lower than at the higher temperature; for example, whereas all fruits in the liner were off-flavor after 42 days at 35° F, only 20 percent were off-flavor after 42 days at 40° F (Tables 12 and 13).

At 35° and 40° F (Tables 12 and 13), off-flavor developed more readily in fruits stored in polyethylene bags or liners than in those stored in the cartons. This suggested that relative humidity may affect the incidence of off-flavor (the relative humidity in both the polyethylene bag and the liner being much higher than in the carton). This possibility was explored by storing under a range of relative humidities at 40° F. The results of periodic flavor evaluations conducted during storage indicated that off-flavor developed readily at relative humidities of 98 and 100 percent but not at 93 percent (Table 14).

As previously stated, a reduction in oxygen concentration in the storage atmosphere to approximately 5 percent caused off-flavor to develop in one test. Therefore, the atmosphere around fruits in a liner was analyzed for carbon dioxide and oxygen with an Orsat Gas Analyzer. In three tests conducted at 40° F, there was no evidence of a significant reduction in the normal atmospheric oxygen concentration or any accumulation of carbon dioxide within the liner.

Storage at temperatures above 40° F did not cause any off-flavor to develop, but signs of aging or physiological deterioration were evident.

TABLE 14. Effect of relative humidity on the development of off-flavor in tangerines stored at 40° F (80 fruits per treatment)

DAYS IN STORAGE	PERCENT OFF-FLAVOR FRUITS (CUMULATIVE)		
	100% relative humidity	98% relative humidity	93% relative humidity
30	18.8	18.8	0
44	60.0	55.0	10
58	100.0	100.0	10
86	–	–	20

TABLE 15. Effect of packaging method on flavor of tangerines stored at 45° F and 65–71 percent relative humidity (100 fruits per treatment)

DAYS IN STORAGE	PERCENT "FLAT"-FLAVOR FRUITS			
	Polyethylene bag (perforated)[1]	Polyethylene bag (nonperforated)[1]	Liner[1]	Carton
21	0	0	0	0
35	0	0	0	0
51	35	80	30	0
85	57	80	52	0

[1]Relative humidity probably approaching 100 percent.

With prolonged storage, fruits developed "flat" flavor due to loss in the normal tangerine flavor. The results of flavor samplings on fruit stored at 45° F are recorded in Table 15.

Tangerines stored both in polyethylene bags (perforated or nonperforated) and liners at 45° F began to lose flavor between the 36th and the 51st day of storage (Table 15). The percentage of "flat"-flavor fruits was higher in fruits stored in nonperforated polyethylene bags than in those stored in perforated polyethylene bags or liners. The fruits in the cartons retained their flavor for at least 85 days.

A similar experiment was conducted at 55° F and 85–94 percent relative humidity. The flavor of all fruits in all containers was "flat" only 35 days after storage.

DISCUSSION

The results presented above show that fresh tangerines require relative humidities of 98–100 percent for the control of desiccation in prolonged storage. These conditions are adequately supplied when polyethylene bags or liners are used. Waxing is not as effective in this respect as the bags or liners. Waxing also tends to delay coloring in partly colored fruits, which is an undesirable feature. Under low humidity conditions, the presence of the button on the fruit reduces weight loss due to desiccation.

The main storage disease in tangerines is caused by a green mold (*Penicillium* sp.) (*8, 9*). The growth of the mold on the fruit is dependent on the temperature and relative humidity of the storage medium. Thus at 35° F, excellent control of the decay is obtained regardless of the humidity, but at 40° F, some decay occurs at relative humidities of 90 percent and above. In Florida, an effective control of decay was obtained at 38° F (*9*). At temperatures of 45° F and above, the higher the relative humidity, the greater is the decay percentage. During low temperature storage, use of Dowicide A and DHA-S is of doubtful advantage, but when fruits treated with Dowicide A are removed from cold storage to room temperature, decay incidence is suppressed for a few days. The intact button prevents invasion of disease through an exposed area on the fruit. The use of modified atmosphere (5.25 percent oxygen) during storage may result in the development of off-flavor. Curing, waxing, fumigation, and irradiation, as applied in these studies, are ineffective for controlling decay in tangerines.

The temperature and relative humidity used in storage also affect the edible quality of the fruit. At 35° and 40° F, off-flavor develops, and at 45° and 55° F, "flat" flavor develops in prolonged storage. Off-flavor develops more rapidly at 35° than at 40° F and the onset of off-flavor is earlier in polyethylene bags (perforated and nonperforated) and liners than in the cartons. Relative humidities approaching 100 percent are conducive to off-flavor development which could explain why storage in polyethylene bags and liners induces off-flavor in tangerines during prolonged storage. A change in oxygen and carbon dioxide concentration could contribute to the development of off-flavor but no such change was detected. At 45° F, "flat" flavor is found in fruits after approximately 7 weeks of storage in polyethylene bags (perforated and nonperforated) or liners but not in fruits in the cartons. At 55° F, all stored fruits develop "flat" flavor in 5 weeks.

The present results indicate that the best conditions for storage differ according to the desired length of storage period. Ideal conditions for storage of fresh Hawaiian tangerines for periods greater than a month require a temperature between 40° and 45° F and a relative humidity of 93 percent. Under these conditions, tangerines may be expected to remain in an edible condition for about 2 months. Longer storage periods will result in the development of off-flavor. Furthermore, under these conditions, no "flat" flavor develops and decay control is effective. However, the loss in weight due to desiccation may be as much as 14 percent during the 2-month storage period resulting in fruits with shrivelled surface and desiccated pulp. If the storage period is 1 month, loss in weight of about 10 percent accompanied by slight surface shrivelling and slight pulp desiccation can be expected. However, for a storage period of 1 month, 35° F at a relative humidity of 93 percent is safe and in fact slightly more effective than 40° F for maintaining the quality of stored tangerines. These are essentially the conditions recommended (31°–38° F, 90–95 percent relative humidity) for the storage of tangerines for a period of about 1 month (*10*).

PRACTICAL ASPECTS

In view of the above findings, the following points are pertinent to proper storage practice for fresh Hawaiian tangerines:

1. At harvest, the button should be left intact with the fruit stem cut off short enough to prevent the stump from injuring other fruits during handling.
2. At present the use of Dowicide A on tangerines is not specifically cleared by the United States Food and Drug Administration. When it is cleared, fruits should be dipped in this preparation (1 lb/5 gal water) for a few seconds and then dried in the shade.
3. Fruits should be placed in corrugated paper cartons with flaps closed but not sealed. Polyethylene bags, plastic liners, and other materials that maintain high humidities should not be used.

4. Cartons should be stored in a refrigerated room maintained at a temperature of 35° F and 93 percent relative humidity. Under these conditions, fruits will remain in a marketable state for approximately 1 month.
5. If periods of storage up to about 2 months are desired, the fruits should be stored at 40° F and 93 percent relative humidity. Under these conditions, although the fruits will retain their flavor and aroma, they will have a shrivelled surface, desiccated pulp, and reduced weight, and therefore may not be salable.
6. In all handling operations, from harvesting to packing, tangerines should be handled very carefully. Any break in the rind surface, due to cutting or bruising, is a potential infection point where decay organisms may become established.
7. In summary, during periods of oversupply, tangerines may be kept in a marketable condition for at least 1 month under proper storage conditions.

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