Persimmon

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Postharvest Quality Maintenance Guidelines

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Scientific Name and Introduction

Persimmon is usually the fruit of the species *Diospyros kaki*, a tree belonging to the family Ebenaceae and native to the Far East. It was originally cultivated in China and Japan, and it is therefore also known as the CHINESE DATE PLUM. Today persimmon is cultivated throughout the warmer parts of the world, e.g., in the South of France and other Mediterranean countries, as well as in the USA.

The fruit is a berry resembling a tomato in color, shape and size, but the seeds are large, almond-shaped and few in number. The epidermis is thin, as in the tomato, and an enlarged calyx adheres to the base of the fruit. Persimmon has a delicious flavor and may be eaten as a dessert fruit, or it may be consumed dried or candied. In the USA a native species, *Diospyros virginiana*, occurs, but its fruit is very inferior to *D. kaki*. Another well known species is *D. lotus*, yielding DATE PLUMS and cultivated in the Orient and Italy.

Quality Characteristics and Criteria

Skin color from yellow to orange color with medium to large in size. Fruit should be firm (penetration force, using an 8-mm tip). It is suggested above 5 lb-force for 'Fuyu' and similar cultivars. Fruit should be freedom from growth cracks, mechanical injuries and decay. Soluble solids of 21-23% in 'Hachiya' and 18-20% in 'Fuyu' and similar non-astringent cultivars are recommended with no astringency (tannin content). Fruit is a good source of carotenoids, vitamin A, vitamin C, and dietary fiber.

Horticultural Maturity Indices

Minimum maturity is based on skin color change from green to orange, or reddish-orange ('Hachiya') or to yellowish-green or yellow ('Fuyu,' 'California Fuyu,' 'Jiro'). 'Hachiya'**:** Blossom end's color is orange or reddish color equal to or darker than Munsell color chart 6.7 YR-5.93/12.7 on at least 1/3 of the fruit's length with the remaining 2/3 a green color equal to or lighter than Munsell color 2.5 GY-5/6. Other varieties**:** Attained a yellowish-green color equal to or lighter than Munsell color chart 10Y-6/6.

Grades, Sizes and Packaging

The best method of harvesting the fruit is to clip it with small secateurs from the tree, leaving the calyx attached to the fruit. It is possible to snap the fruit from the tree but this practice is not recommended, as it may injure the fruit and adjoining shoot. The fruit must be handled very carefully to avoid bruising, likely to result in marking which becomes unsightly as the fruit ripens. Two to three picks are usually required, depending on fruit size and color, to harvest the crop. Size is especially important if fruit is to be exported to Japan, where large variations in price occur between fruit of different sizes. A desirable size for 'Fuyu' is 230-250 g; and 200 g is a minimum marketable size for this cultivar.

Optimum Storage Conditions

Chilling injury: 'Fuyu' and similar non-astringent cultivars are chilling-sensitive at temperatures between 5^{O}C and 15^{O}C (41^{O}F and 59^{O}F) and will exhibit flesh browning and softening. Exposure to ethylene aggravates chilling injury at these temperatures.

Optimum Temperature

$0^{o}C \pm 1^{o}C$ ($32 \pm 2^{o}F$). Freezing point: $-2^{o}C$ ($28^{o}F$); may vary depending on soluble solids content.

Relative humidity

Humidity 90-95% R.H.

Rates of Respiration

2-4 ml CO_2 / kg•hr 0ºC (32ºF)
10-12 ml CO_2 / kg•hr 20ºC (68ºF)

To calculate heat production multiply ml CO_2/kg•hr by 440 to get Btu/ton/day or by 122 to get kcal/metric ton/day.

Controlled Atmosphere (CA) Considerations

Low oxygen (3-5%) delays ripening.

Carbon dioxide at 5-8% helps retain firmness and can reduce chilling injury symptoms on 'Fuyu' and similar cultivars.

Postharvest life under optimum temperature and relative humidity in ethylene-free air can be up to 3 months vs. 5 months in optimum, ethylene-free CA (3-5% O_2 + 5-8% CO_2) conditions.

Retail Outlet Display Considerations

Cold table display.

Chilling Sensitivity

It varies according to cultivars. 'Fuyu' is chilling sensitive.

Rates of Ethylene Production and Sensitivity

>0.1 :l/kg•hr at 0ºC (32ºF)
0.1-0.5 :l/kg•hr at 20ºC (68ºF)

Persimmons are very sensitive to ethylene action. Exposure to 1 ppm and 10 ppm ethylene at 20ºC (68ºF) accelerates softening to less than 4 lb – force (limit of marketability) after 6 and 2 days, respectively. Thus, ethylene removal and/or exclusion from transport and storage facilities is highly recommended.

Physiological Disorders

Chilling Injury

Occurrence: The incidence and severity of chilling injury depend upon the cultivar ('Fuyu' is chilling-sensitive while 'Hachiya' is not chilling-sensitive), storage temperature and duration.

Symptoms: Chilling injury can be a major cause of deterioration of 'Fuyu' persimmons during marketing after exposure to temperatures 15ºC (59ºF). Symptom development is fastest at 5-7ºC (41-45ºF) and slowest at 0ºC (32ºF), which is the recommended storage and transport temperature for persimmons.

Physiology: 'Fuyu' persimmons exhibit chilling injury symptoms if kept at temperatures between 2ºC (36ºF) and 15ºC (59ºF). Upon transfer to higher temperatures the severity of the symptoms (flesh softening, browning, and water-soaked appearance) increases an renders the fruits unmarketable. Respiration and ethylene production rates of chilled 'Fuyu' persimmons are higher than those of nonchilled fruits. Exposure to ethylene at 1 ppm or higher aggravates chilling symptoms of 'Fuyu' persimmons, while controlled atmospheres ameliorate these symptoms.

Control: Avoid exposure of 'Fuyu' persimmons to temperatures between 2ºC (36ºF) and 15ºC (59ºF). Optimum storage and transport temperature is 0ºC (32ºF). Avoid exposure to ethylene above 1ppm throughout postharvest handling of 'Fuyu' persimmons. Use of controlled atmosphere of 3-5% O_2 + 5-8% CO_2 at temperatures below 5ºC (41ºF) reduced chilling injury.

Disorders induced by low O_2 and/or high CO_2:

Exposure to oxygen levels below 3% during storage for longer than one month can result in failure of persimmons to ripen and off flavors. Exposure to carbon dioxide levels above 10% during storage for longer than one month can cause brown discoloration of the flesh and off-flavors.

Postharvest Pathology

Alternaria rot is caused by *Alternaria alternata* which attacks developing fruits. Infections remain quiescent until after harvest, and black spots become apparent as the fruits ripen in store. Wound infection results in earlier appearnace of symtoms.

Other causes of decay in persimmons include species of *Botrytis, Cladosporium, Colletotrichum, Mucor, Penicillium, Phoma* and *Rhizopus.*

Calyx Separation is a physiological disorder which may affect certain cultivars; it has caused losses in New Zealand. Growing conditions are all-important, and excessive nitrogen fertilization should be avoided. If the plants are thinned early in the season, this will enhance calyx growth and help to prevent the disorder.

Special Considerations

Removal of Astringency from 'Hachiya' Persimmons: Ethylene (10 ppm) at 20ºC (68ºF) can be used to remove astringency but the excessive softening that results would make it very difficult to market the persimmons. Exposure to air enriched with 80% CO_2 for 24 hours at 20ºC (68ºF) is effective in removing astringency while maintaining firmness.

Although persimmons are mainly consumed fresh they can also be frozen, cooked and made into jam or jelly.

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Acknowledgments

Some of the information included was from the University of California - Davis website on “Fresh Produce Facts” at http://postharvest.ucdavis.edu/produce/producefacts/