



## Passion Fruit: Postharvest Quality-Maintenance Guidelines

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Purple passion fruit (*Pasiflora edulis* Sim.) and yellow passion fruit (*P. edulis* f. *flavicarpa* Deg.) should more correctly be referred to as “passionflower fruit,” but the trade more commonly uses “passion fruit.” Passion fruit is often referred to as “lilikoi” in Hawai'i. Hybrids of the two subspecies freely form, showing characteristics that combine those of the two parents. A tough outer skin surrounds a fleshy, acidic yellow pericarp and aril surrounding small, edible black seeds (Pruthi 1963, Anon. 2004, Paull and Duarte 2012).



Passion fruit

should have changed from green to  $\geq 75\%$  yellow or purple (Chan 1980). Purple passion fruit at the light-purple stage are more suitable for long-distance transport. Normally, the respiratory climacteric occurs on the vine. Fruit harvested earlier have an unripe flavor, with low aroma and higher acidity (Campbell and Knight 1983). In some cases, full-colored fruit are allowed to abscise and fall, and are then picked up from the ground. However, fruit picked from the ground may have impact injury

and scarring damage that will lead to more rapid water loss and greater chance of disease.

### Quality Characteristics and Criteria

Size, shape, skin color, acidity, and SSC are the major criteria used to evaluate quality. The yellow egg-shaped passion fruit is 6 to 8 cm (2.5 to 3 in) wide by 7 cm (2.7 in) long and weighs from 50 to 150 g (1.8 to 5.3 oz). The smaller purple fruit weighs from 25 to 50 g (1 to 2 oz). Fruit should be blemish free. SSC is 10 to 18% in yellow and 10 to 20% in purple, with the yellow type having a more acidic flavor (Schotsmans and Fischer 2011).

### Horticultural Maturity Indices

Fruit are harvested by cutting or clipping from the vine, leaving a short piece of stem (2 cm, 1 inch). The skin

### Grades, Sizes, and Packaging

Fruit should have a diameter of 5 to 8 cm (2 to 3 in) for purple and 6 to 8 cm (2.5 to 3 in) for yellow. Smaller fruit are normally placed in a lower grade. Skin color should be full yellow or purple, unless a hybrid. The fruit should be cleaned to remove dirt; surface stains; and adhering calyx, leaf, or other tissue. The dried calyx should be removed, as it is a source of decay. Fruit are packed in 6 (13.2 lb) and 4.5 kg (9.9 lb) fiberboard cartons, sometimes in one- or two-layer trays or cell packs. If the stem is attached, care is needed in packing to avoid the stem rubbing against the skin of other fruit in the carton.



Passion flower. Photo by Ken Love.

### Pre-Cooling Conditions

Room or forced-air cool to 10°C (50°F).

### Optimum Storage Conditions

Yellow passion fruit should be stored at 7 to 10°C (45 to 50°F) with 90 to 95% RH. They will have a potential storage-life of 2 weeks (Arjona et al. 1992). Purple passion fruit are chilling tolerant and can be stored at 3 to 5°C (37 to 41°F) for 3 to 5 weeks.

### Controlled Atmospheres (CA) Consideration

Modified atmospheres (MA) have been tested on yellow passion fruit, with a fungicide treatment applied before storage is desirable. Fruit held at 6 to 10°C (43 to 50°F) for 3 to 4 weeks had less shrivel (Campbell and Knight 1983). Film-bagging and various coatings reduce water loss in yellow and purple passion fruit (Mohammed 1993, Arjona et al. 1992). Response to film bagging may be associated with control of water loss, rather than MA effects. A carnauba- or paraffin-based coating or wax is sometimes applied before packing of purple passion fruit to increase fruit gloss, reduce water loss, and extend postharvest life. The wax is applied by spraying, with brushes, or by rubbing.

### Retail Outlet Display Considerations

Display at ambient temperature; do not mist or ice.

### Chilling Sensitivity

Symptoms of chilling injury on yellow passion fruit are skin discoloration, pitting, water-soaked areas, uneven ripening, and increased decay. Discoloration can penetrate skin into the exocarp.

Table 1. Respiration Rates for Passion Fruit

Temperature	mg CO <sub>2</sub> /kg <sup>-1</sup> h <sup>-1</sup>
5°C	29 to 58
10°C	39 to 78
20°C	87 to 194
25°C	175 to 349

### Ethylene Production and Sensitivity

Passion fruit produce very high levels of ethylene, 160 to 400  $\mu\text{L kg}^{-1} \text{h}^{-1}$  at 20°C (68°F) at their climacteric peak (Shiomi et al. 1996). Exposure to 100  $\mu\text{L L}^{-1}$  ethylene for 24 h accelerates ripening (Arjona and Matta 1991, Akamine et al. 1957). Methylcyclopropene (1-MCP), when applied to green and yellowish-green fruit, delays ripening, decreases respiration, and maintains fruit quality. No significant response occurs when 1-MCP is applied to fruit with >50% colour (Schotsmans et al. 2008)

### Respiration Rates

See Table 1. The climacteric of this fruit normally occurs on the vine (Biale 1975, Schotsmans et al. 2008). To get  $\text{mL kg}^{-1} \text{h}^{-1}$ , divide the  $\text{mg kg}^{-1} \text{h}^{-1}$  rate by 2.0 at 0°C (32°F), 1.9 at 10°C (50°F), and 1.8 at 20°C (68°F). To calculate heat production, multiply  $\text{mg kg}^{-1} \text{h}^{-1}$  by 220 to get BTU per ton per day or by 61 to get kcal per metric ton per day.

### Physiological Disorders

Shrivel, pulp fermentation, and fungal attack are the major postharvest problems (Pruthi 1963). Shrivel is due to moisture loss and does not initially significantly affect pulp quality. Insect stings cause small round, sunken depressions in the skin.

### Postharvest Pathology

This is normally a minor problem though the fruit is susceptible to a number of disease of preharvest origin. Most common is brown spot (*Alternaria passiflorae*), whose symptoms include circular, sunken, light-brown spots on ripening fruit (Inch 1978). This disease is most severe following warm, wet periods in the field. Septoria

spot (*Septoria passiflorae*) infects fruit in the field and leads to uneven ripening of the skin. Phytophthora fruit rot (*Phytophthora* spp.) causes water-soaked dark green patches that dry up on the skin. Orchard sanitation, reduction in high RH by pruning to open the canopy, and the application of fungicides can minimize these diseases.

### Quarantine Issues

Fruit are a fruit fly host and may require treatment. Irradiation has been successful.

### Suitability as Fresh-Cut Product

No current potential.

### Special Considerations

None.

*An earlier version of this article was originally published at the USDA website: [www.ba.ars.usda.gov/hb66/contents.html](http://www.ba.ars.usda.gov/hb66/contents.html)*

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