

Eggplant

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Scientific Name and Introduction

The eggplant (*Solanum melongena* L.) is an annual plant of the Solanaceae or nightshade family. The edible portion is the immature fleshy pulp of the fruit. The fruit may be oval, round, long or pear-shaped. The skin is smooth and shiny, and the color may be black and purple, yellow, white, or striped. The main types include Standard (American), Japanese, Italian, Philippine, Thai, and Chinese. Available year-round, eggplants are grown primarily in Mexico, the United States (mostly in Florida and New Jersey), the Dominican Republic, and Jamaica.

Quality Characteristics and Criteria

A high-quality American eggplant is uniformly egg-shaped or globular and has a fresh green calyx, firm flesh, and dark purple skin. Additional quality indices are size, freedom from growth or handling defects, and decay. Characteristics of other eggplant types include Japanese (elongated, slender, and light to dark purple), White (small, egg-shaped to globular, and thin-skinned), Mini-Japanese (small, elongated, striated purple and violet), Chinese (elongated, slender, and light purple), and Thai (small, round, and striated dark green).

Horticultural Maturity Indices

Eggplant fruit are harvested at a range of developmental stages. The time from flowering to harvest depends on cultivar and temperature and may be 10 to 40 days. Fruit are harvested immature before seeds begin to significantly enlarge and harden. Firmness and external glossiness are also used as harvest indicators. Overmature fruit become pithy and bitter.

Grades, Sizes, and Packing

Grades include Fancy, U.S. No. 1, U.S. No. 2, and Unclassified. Distinction among grades is based solely on size, external appearance, and firmness. Size is classified as “small”—32 fruit per box with fruit length 12 to 14 cm (4.75 to 5.5 in), “medium”—24 fruit per box with fruit length 19 to 21 cm (7.5 to 8.25 in), “large”—18 fruit per box with fruit length 21 to 24 cm (8.25 to 9.5 in), and “extra large”—16 fruit per box with fruit length 24 to 26 cm (9.5 to 10.25 in) (Siller et al. 1995). One-piece waxed fiberboard boxes and wire-bound crates that can hold up to 15 kg (33 lb) are commonly used. Fruit are individually wrapped with paper to reduce desiccation and mechanical injury.

Precooling Conditions

Rapid cooling to 10 °C (50 °F) immediately after harvest is necessary to retard discoloration, weight loss, drying of calyx, and decay (Ryall and Lipton 1979). Hydrocooling and forced-air cooling are most effective, but room cooling after washing or hydrocooling is common.

Optimum Storage Conditions

Fruit are stored at 10 to 12 °C (50 to 54 °F) with 90 to 95% RH because they are chilling sensitive (Ryall and Lipton 1979). Visual and sensory qualities deteriorate rapidly after 14 days of storage, especially if chilled during storage. Short-term storage or transit temperatures below 10 °C (50 °F) are often used to reduce weight loss but result in chilling injury after transfer to retail conditions.

Controlled Atmosphere (CA) Considerations

CA storage or shipping offers little benefit. Low O₂ levels (3 to 5%) delay deterioration and the onset of decay by only a few days. Eggplant tolerates up to 10% CO₂, but storage life is not extended beyond that under reduced O₂. Wrapping fruit with plastic film to create modified atmosphere (MA) reduces weight loss and maintains firmness due to the high RH, especially on Japanese eggplant types, which have a high transpiration rate (Díaz Pérez 1998a). Eggplant fruit wrapped in high-density polyethylene (HDPE) films maintain a fresher flavor, firmness, and quality for a longer period than nonwrapped fruit (Ben-Yehoshua et al. 1985, Díaz Pérez 1998b).

Retail Outlet Display Considerations

Eggplants should never be held in contact with ice. Odor from ginger, and possibly other odor-producing commodities such as onions, can be absorbed by eggplants. Thus, these products should not be placed in close proximity to eggplants (Cantwell and Suslow 2006).

Chilling Sensitivity

Eggplants will develop chilling injury after storage for 6 to 8 days at 5 °C (41 °F) (table 1). Surface pitting and scald are definite external symptoms (McColloch 1966). Scald refers to brown spots or areas that are first flush with the surface but may become sunken with time. Browning of the flesh and seeds is a conspicuous internal symptom of chilling injury, almost invariably followed by decay caused by *Alternaria* sp. (Ryan and Lipton 1979). Chilling injury is cumulative and may be initiated in the field prior to harvest. Symptom development can be reduced by storage in polyethylene bags or polymeric film overwraps that retard water loss; however, increased decay from *Botrytis* is a potential risk.

Table 1. Chilling susceptability of eggplant by type

Temperature	Days to visible chilling symptoms		
	American eggplant	Japanese eggplant	Chinese eggplant
0.0 °C	1 to 2	2 to 3	—

2.5 °C	4 to 5	5 to 6	5 to 6
5.0 °C	6 to 7	8 to 9	10 to 12
7.5 °C	12	12 to 14	15 to 16

Ethylene Production and Sensitivity

Rates of ethylene production vary from 0.1 to 0.7 $\mu\text{L kg}^{-1} \text{h}^{-1}$ at 12.5 °C (55 °F). Eggplant fruit have a moderate to high sensitivity to ethylene exposure. Calyx abscission and increased deterioration, particularly browning, may be a problem if eggplant fruit are exposed to greater than 1 $\mu\text{L L}^{-1}$ ethylene during distribution and short-term storage.

Respiration Rates

Temperature	American eggplant	White eggplant	Japanese eggplant
	-----($\text{mg CO}_2 \text{ kg}^{-1} \text{ h}^{-1}$)-----		
12.5 °C	60 to 78	104 to 122	124 to 138

Data from Cantwell and Suslow (1998).

To get $\text{mL CO}_2 \text{ kg}^{-1} \text{ h}^{-1}$, 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 tonne per day.

Freezing Injury

Eggplant fruit freeze at -0.8 °C (30.6 °F). Symptoms include water-soaked pulp that becomes brown and desiccated over time.

Physiological Disorders

Harvesting should be done by cutting the calyx-stem free from the plant rather than by tearing. Cotton gloves are often worn to protect the fruit. Bruising and compression injury is very common when not enough attention is paid to careful harvest and handling practices. Eggplant fruit cannot withstand stacking in bulk containers.

Postharvest Pathology

Postharvest diseases often occur in combination with chilling stress. Common fungal pathogens are *Alternaria* (black mold rot), *Botrytis* (gray mold rot), *Rhizopus* (hairy rot), *Phomopsis* rot, and *Phytophthora* (soft rot).

Quarantine Issues

None.

Suitability as Fresh-Cut Product

No current potential.

Special Considerations

Moistened paper or waxed cartons are often used to reduce water loss. Japanese eggplants lose water three times more rapidly than American types. Visible signs of water loss are reduction of surface sheen, skin wrinkling, spongy flesh, and browning of the calyx. Dipping the calyx or the whole fruit in dilute aqueous solutions of 1-naphthalene acetic acid and prochloraz retarded calyx senescence (Temkin-Gorodeiski et al. 1993, Muy et al. 1998).

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