Eggplant

Jorge H. Siller-Cepeda
Postharvest Physiology and Technology Laboratory, CIAD, Culiacán, Carretera a El Dorado, Culiacán, Sinaloa, Mexico

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. The color may be black and purple, yellow, white or striped. The main types include Standard (American), Japanese, Italian, Philippine, Thai, and Chinese. Eggplants are primarily grown in Mexico, Florida, New Jersey, Dominican Republic and Jamaica and are available year-round.

Quality Characteristics and Criteria: A high quality American eggplant is uniformly egg to globular shaped, has a fresh green calyx, firm flesh and a 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, light to dark purple; very perishable), White (small egg shaped to globular; thin skinned), Mini-Japanese (small elongate, striated purple; violet), Chinese (elongated, slender, light purple); and Thai (small, round striated dark green).

Horticultural Maturity Indices: Eggplant fruits are harvested at a range of developmental stages. Depending on cultivar and temperature, the time from flowering to harvest may be 10 to 40 days. Generally fruits are harvested immature before seeds begin to significantly enlarge and harden. Firmness and external glossiness are also indicators of a pre-maturity condition. Eggplant fruit become pithy and bitter as they reach an overmature condition.

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 appearances, and firmness. Sizes are defined as: Small, 32 fruit/box with fruit length 12 to 14 cm (4.75 to 5.5 in); Medium, 24 fruit/box with fruit length 19 to 21 cm (7.5 to 8.25 in); Large, 18 fruit/box with fruit length 21 to 24 cm (8.25 to 9.5 in); and Extra Large, 16 fruit/box with fruit length 24 to 26 cm (9.5 to 10.25 in) (Siller et al., 1995). Packages commonly are one-piece waxed fiberboard boxes or wire-bound crates, 0.39 m^3 containing 15 kg (33 lb). Fruit are individually wrapped with paper.

Pre-cooling 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). Hydro-cooling and forced-air cooling are most effective, but room-cooling after washing or hydro-cooling is common.

Optimum Storage Conditions: Fruit are stored at 10 to 12 °C (50 to 53.6 °F) with 90 to 95% RH (Ryall and Lipton, 1979). Storage of eggplant is generally less than 14 days as visual and sensory qualities deteriorate rapidly. Decay is likely to increase after storage > 2 weeks, especially after removal to typical retail conditions. Short-term storage or transit temperatures below this range 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 to eggplant quality maintenance. Low O_2 levels (3 to 5%) delay deterioration and the onset of decay only a few days. Eggplant tolerates up to 10% CO_2 but storage-life is not extended beyond that under reduced O_2. Wrapping fruits with plastic film to create modified atmosphere 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).

Wrapped eggplant fruit in high density polyethylene (HDPE) maintain a fresher flavor, firmness and quality for a longer period (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 like onions, is absorbed by eggplants. So, these products should not be placed in close proximity (Sargent, 1998).

Chilling Sensitivity: Eggplants will develop chilling injury after storage for 6 to 8 days at 5 °C (41 °F). 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 the time. Browning of the flesh and seeds are conspicuous internal symptoms 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, however, increased decay from *Botrytis* is a potential risk.

Temperature	**American**	**Japanese**	**Chinese**
	(days to visible chilling symptoms)		
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 μL kg^{-1} h^{-1} at 12.5 °C (54.5 °F). Eggplant fruit have a moderate to high sensitivity to exogenous ethylene. Calyx abscission and increased deterioration, particularly browning, may be a problem if eggplant are exposed to > 1 μL L^{-1} ethylene during distribution and short-term storage.

Respiration Rates:

Temperature	American	White egg	Japanese
		(mg CO_2 kg^{-1} h^{-1})	
12.5 °C	60 to 78	104 to 122	124 to 138

To get mL kg^{-1} h^{-1}, divide the mg kg^{-1} 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 mg kg^{-1} h^{-1} by 220 to get BTU per ton per day or by 61 to get kcal per metric ton per day. Data from Cantwell and Suslow, 1998.

Physiological Disorders: No significant disorders at this time.

Freezing Injury: Depending on the soluble solids content, fruit freeze at - 0.8 °C (30.6 °F). Symptoms include water-soaked pulp that becomes brown and desiccated over time.

Physical Injury: Harvesting should be done by cutting the calyx-stem free from the plant rather than by tearing. Cotton gloves are often used to protect the fruit. Bruising and compression injury is very common when attention to careful harvest and handling practices are not followed. Eggplant 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 *Phytophtora* (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 chemical solutions retarded calyx senescence (Temkin-Gorodeiski, et al., 1993; Muy et al., 1998).

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