Okra

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Scientific Name and Introduction: Okra [*Abelmoschus esculentus* (L.) Moench], also known as *Hibiscus esculentus* L. is a member of the mallow (Malvaceae) family and can be found as an annual (primarily the U.S.) or as a perennial in India and Africa (Lamont, 1999). In the U.S., Mexico and Japan, the young fruiting pods are the edible portion, while young leaves and mature seeds may be consumed in other countries (Duzyaman, 1997). In the U.S., most fresh market okra is from California and the southern U.S. and Mexico. 'Clemson Spineless' is the most well-known fresh market cultivar, while low mucilage, low fiber, high chlorophyll content types such as 'Emerald' and 'Louisiana Green Velvet' are grown for processing. A few fresh market hybrids, 'Annie Oakley', 'North and South' and 'Cajun Delight' are now available. Most okra cultivars produce green pods, but a few varieties produce yellow ('Blondy') or dark red pods ('Burgundy'). Usually, pods have 4 to 10 distinct ribs or ridges ('Emerald' is completely round, with no ribs). Pods are prized for their unique flavor and high mucilaginous content (use as a thickening agent). Other names include quingumbo, bhendi, bhindi, gumbo, gombo, quaio, and lady's finger.

Quality Characteristics and Criteria: High quality pods are 5 to 15 cm (2 to 6 in) long, flexible, bright-green and turgid. Seeds should not be protruding through the epidermis, and ridges should be free of blackening and bruising.

Horticultural Maturity Indices: Okra pods are harvested when immature and high in mucilage, but before becoming highly fibrous; generally within 2 to 6 weeks after flowering.

Grades, Sizes and Packaging: Okra is graded by size and absence of defects, decay, insects and dirt, shape, and tenderness. Fancy pods are < 9 cm (3.5 in); Choice 9 to 11 cm (3.5 to 4.25 in); and Jumbo > 11 cm (4.25 in). Fresh okra is most commonly presented in 0.45 kg (l lb) clamshell boxes or as bulk weight or volume-filled 11.4 kg (25 lb) bins.

Pre-cooling Conditions: Okra should be marketed within 36 h of harvest and shipped under refrigeration. Storage in unventilated containers without refrigeration can cause degradation of color. Some growers use hydro-cooling or forced-air cooling.

Optimum Storage Conditions: Okra pods lose weight readily and are chilling-sensitive. Pods can be stored for 7 to 14 days at 7 to 10 °C (45 to 50 °F) with > 90% RH.

Controlled Atmosphere (CA) Considerations: There is a slight benefit from storage at 7 to 12 °C (44.6 to 53.6 °F) in air with 4 to 10% CO_2 (Saltveit, 1997). Other combinations have also shown some benefit, including 5 to 10% CO_2 at 5 to 8 °C (41 to 46 °F) and 3 to 5% O_2 + 0% CO_2 (Baxter and Waters, 1986). Levels of CO_2 > 20% can cause off-flavors.

Retail Outlet Display Conditions: Keep dry, refrigerate and humidify.

Chilling Sensitivity: Okra pods are highly sensitive to chilling, especially very young (more mucilaginous) pods. As little as 2 days at 2 °C (35.6 °F) can cause chilling injury. Chilling injury shows up within 24 h at 20 °C (68 °F) after pods are held 7 days at 2 or 5 °C (35.6 to 68 °F). Symptoms can be expressed as water-soaked or exuding lesions, appearance of mold or mildew, especially if held at 5 °C (41

°F) (Perkins-Veazie and Collins, 1992). Green pods turn a brown-olive green, yellow varieties turn brown, and burgundy varieties become a dull brown-red.

Ethylene Production and Sensitivity: Okra produce small amounts of ethylene at 0.5 μL kg^{-1} h^{-1} during storage (Baxter and Waters, 1986). Okra pods exposed to > 1 μL L^{-1} ethylene for 3 or more days show yellowing (Perkins-Veazie, unpublished).

Respiration Rates:

Temperature	mg CO_2 kg^{-1} h^{-1}
2 to 3 °C	10 to 32[1]
4 to 5 °C	21[1] to 59
10 °C	86 to 95
15 to 16 °C	138 to 153
20 to 21 °C	248 to 274
25 to 27 °C	328 to 362

[1]Perkins-Veazie, 2002 (unpublished) for 'Annie Oakley,' 'Blondy,' and 'Clemson Spineless 80' pods 4 to 12 cm (1.5 to 4.75 in) long; other data are from Scholz et al. (1963). 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.

Physiological Disorders: Pods are susceptible to chilling injury, yellowing, shrivel from weight loss, warty pods (nitrogen deficiency).

Postharvest Pathology: Chladosporium, gray mold (*Botrytis cinerea*), mildew, yeasts, *Rhizopus stolonifer*, *Rhizoctonia solani*, *Psuedomonas* pv *syringae* (Snowdon, 1992).

Quarantine Issues: None known.

Suitability as Fresh-cut Product: Unknown.

Special Considerations: The ridges on okra pods damage easily. Avoid storing with melons, onions, and potatoes, since pods will trap their odors and develop off-flavors.

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