

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 in the United States) or as a perennial in India and Africa (Lamont 1999). In the United States, 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). Other names include quingumbo, bhendi, bhindi, gumbo, gombo, quaio, and lady's finger.

In the United States, most fresh market okra is from California and the Southern United States and Mexico. 'Clemson Spineless' is the best-known fresh market cultivar; while low-mucilage, low-fiber, high-chlorophyll 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 ('Burgundy') pods. 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 (being used as a thickening agent).

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 (Ramaswamy and Rangana 1982).

Grades, Sizes, and Packaging

Okra is graded by size; absence of defects, decay, insects, and dirt; shape; and tenderness. Fancy pods are <9 cm (3.5 in); Choice are 9 to 11 cm (3.5 to 4.25 in); and Jumbo are >11 cm (4.25 in). Fresh okra is most commonly presented in 0.45-kg (1-lb) clamshell boxes or as bulk weight or volume-filled 11.4-kg (25-lb) bins.

Precooling 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 hydrocooling 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 (45 to 54 °F) in 4 to 10% CO₂ (Saltveit 1997). Other combinations have also shown some benefit, including 5 to 10% CO₂ at 5 to 8 °C (41 to 46 °F) and 3 to 5% O₂ and 0% CO₂ (Baxter and Waters 1986). Levels of CO₂ >20% can cause off flavors.

Retail Outlet Display Conditions

Okra should be kept dry, refrigerated, and humidified.

Chilling Sensitivity

Okra pods are highly sensitive to chilling, especially very young (more mucilaginous) pods. As little as 2 days at 2 °C (36 °F) can cause chilling injury. Chilling injury shows up within 24 h at 20 °C (68 °F) after pods have been held 7 days at 2 or 5 °C (36 to 68 °F). Symptoms include presence of water-soaked areas, exuding lesions, and 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 during storage: 0.5 µL kg⁻¹ h⁻¹ (Baxter and Waters 1986). Okra pods exposed to >1 µL L⁻¹ ethylene for 3 or more days show yellowing (Perkins-Veazie, 2002, 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 5
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

¹Data from 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 from Scholz et al. (1963).

To get mL CO₂ 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 ton⁻¹ day⁻¹ or by 61 to get kcal tonne⁻¹ day⁻¹.

Physiological Disorders

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

Postharvest Pathology

Cladosporium, gray mold (*Botrytis cinerea*), mildew, yeasts, *Rhizopus stolonifer*, *Rhizoctonia solani*, and *Pseudomonas* pv *syringae* (Snowdon 1992) can all be problematic in okra.

Quarantine Issues

There are no known quarantine issues.

Suitability as Fresh-Cut Product

Suitability is unknown. Okra is generally consumed after cooking.

Special Considerations

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

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