Peppers (greenhouse)

Bell peppers are among the many common household varieties of *capsicum annuum*, an annual shrub belonging to the nightshade family. Colors of bell peppers might be green, red, yellow, orange, purple, or brown. Sugar content in peppers increases as they ripen. Botanically speaking, the pepper is a fruit because it has seeds.

As demand for fresh bell peppers continues to climb, U.S. supply has been increasingly augmented by international greenhouse production. Though the majority of peppers are imported from Canada and Mexico, as well as the Netherlands, Spain, and Israel, U.S. production is rapidly expanding with new greenhouses popping up across the country.

Even within a protected environment, pepper yields will vary by location, season, plant density, trellis system, cultivar, irrigation, and fertilizer management.

*References: Agricultural Marketing Resource Center, Foodland Ontario, Pennsylvania State University, Purdue University, University of Florida.*

**TYPES, VARIETIES & CUTS**

The most common greenhouse peppers are sweet bell varieties—red, green, orange, and yellow. Cultivars are generally hybrids selected for marketability, pest and disease resistance or tolerance, and overall yield and quality. Among the popular varieties are Parker, Triple 4, Cubico, and Lorca for red; Kelvin for yellow; and Neibla and Emily for orange. New cultivars for greenhouse production are regularly introduced by seed companies.

Cultivars can be distinctly different, enough to require varying growing environments for maximum yield. Some greenhouse growers are also experimenting with field-grown varieties.

*References: Agriculture & Agri-Food Canada, Cornell University, Foodland Ontario, Purdue University, UC Davis Postharvest Technology website, University of Florida, USDA.*
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**GROWING**

Peppers are generally grown in a soil-less culture. Nursery pots (3 and 4 gallon) with one plant per pot or flat polyethylene bags (5 gallon) with 3 to 4 plants per bag are used. Containers are filled with media such as perlite, pine bark, peat mixes, or sawdust. At the time of transplanting, seedlings can be irrigated up to 10 times per day, increased watering during higher light levels and longer days. Night irrigation may be considered during warmer weather.

Ventilation provides a more uniform climate, helps distribute heat, and can't dehumidify the greenhouse environment. Temperature is regulated, depending on the stage of development and cultivar grown. Generally, temperatures should not exceed 70 to 79°F, with an optimum temperature range of 70 to 73°F.

Plants generally grow up to 6 feet tall during a season, and require vertical support. Peppers are often trellised with the “V” system or in a double row trellis via the “Spanish” system. In the Spanish method, the plant is allowed to grow without pruning.

When pruning is required, plants are generally managed with two main stems per plant and pruned every two weeks. It is important when pruning to ensure the main stem or growing point remains intact.

*References: Agriculture and Agri-Food Canada, Alberta Agriculture and Rural Development, Foodland Ontario, USDA National Agricultural Library, University of Florida.*

**PESTS & DISEASE**

*Yellow spots* can occur from environmental stresses such as cool temperatures or poor ventilation. This disorder can be minimized by selecting a cultivar with less susceptibility to stress.

*Fruit cracking* results when pepper plants receive too much water or humidity is too high. Pepper cultivars with thick-walled fruit (greater than 8 mm) are more susceptible to cracking than thinner walled fruit. Flat or misshapen fruit is caused by low temperatures, usually over the course of several days.

*Blossom-end rot* can be caused by reduced calcium absorption.

*Sunscald* can occur under high solar radiation from direct exposure to sunlight. Symptoms of sun scald appear similar to blossom-end rot, adequate leaf cover to shade the fruit from direct sunlight is recommended.

Pests are reduced but not eliminated in greenhouse growing. Transplants should be free of pests and weeds when brought into the structure. Major pests include *aphids* (green peach and cotton/melon), *fungus gnats, mites* (broad and two-spotted spider) *thrips* (Western flower, melon and onion), *whiteflies* and *pepper weevils*.

Common fungal diseases are *powdery mildew* and *fusarium stem rot*. *Powdery mildew* causes reduced plant vigor and exposes fruit to sunscald. Symptoms include white to grey spots on the underside of mature leaves. Lesions appear yellow or as raised, pimply areas on the upper leaf surface causing leaves to curl and drop. *Fusarium stem rot* symptoms include dark brown or black lesions on stems, petioles, or fruit. Lesions typically develop at the base of where the two main stems divide.

*References: Agriculture and Agri-Food Canada, Alberta Agriculture and Rural Development, Foodland Ontario, USDA National Agricultural Library, University of Florida.*

**U.S. GRADES**

Peppers can be graded according to USDA standards or based on classifications by diameter ranges, similar to greenhouse peppers imported from Holland (extra-large diameter is greater than 3.3 inches; large diameter is 3.0 to 3.2 inches; medium is 2.5 to 2.9 inches; and small is 2.2 to 2.4 inches).

*References: PACA, University of Florida, USDA.*
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GOOD ARRIVAL GUIDELINES

Generally speaking, the percentage of defects shown on a timely government inspection certificate should not exceed the percentage of allowable defects, provided: (1) transportation conditions were normal; (2) the U.S. Department of Agriculture (USDA) or Canadian Food Inspection Agency (CFIA) inspection was timely; and (3) the entire lot was inspected.

There are no good arrival guidelines for this commodity specific to Canada; U.S. guidelines apply to shipments unless otherwise agreed by contract.

References: DRC, PACA, USDA.

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*includes Baja California and Baja California Sur.

References: Agriculture and Agri-Food Canada; Asociación Mexicana de Horticultura Protegida (AMHPAC); Alberta Agriculture and Rural Development; Foodland Ontario; Gary Hickman, Cuesta Roble Consulting; University of Florida; USDA National Agricultural Library.