Although broccoli (*Brassica oleracea*) is native to the Mediterranean, it was brought to England in the early 1700s and to America in the early 1920s. Broccoli is a cruciferous vegetable and closely related to and often confused with cauliflower, cabbage, and Brussels sprouts. Eaten year-round either raw or cooked, broccoli is a cool-weather crop that will not thrive in high temperatures.

Broccoli began gaining popularity after World War II and has steadily increased its market share in the decades since. The United States is the largest producer of broccoli in the world; almost every state can grow broccoli, but California grows it year-round and accounts for most of the commercial crop, with Arizona coming in a distant second. East Coast growers have begun cultivating broccoli to save on shipping costs, and have met with initial success. The bulk of California’s broccoli is for the fresh market, though about 20% is shipped to international receivers.

References: Agricultural Marketing Resource Center, Penn State Extension, University of Kentucky College of Agriculture, Food, and Environment.
TYPES, VARIETIES & CUTS
While there are many different types of broccoli, they do not have significantly different flavor profiles and use is generally tied to growing region and planting schedule. Common California varieties include Avenger, Belstar, Concord, Destiny, Green Magic, Imperial, Legacy, Marathon, Patriot, Patron, and Tahoe; Northeastern varieties include hybrids (Captain, Everest, Gypsy, Pinnacle, Diplomat, and Windsor) and nonhybrids (Imperial, Emerald Pride, Packman, and Premium Crop).

References: Agricultural Marketing Resource Center, Penn State Extension, UC Davis Postharvest Technology website.

PESTS & DISEASE
Common diseases affecting broccoli are hollow stem, floret yellowing, and brown floret. Rough handling or the forceful application of cooling substances during harvest can increase the likelihood of bacterial decay. Fungal and bacterial pathogens are more common in rainy, cooler growing environments and include black rot, blackleg, bacterial head rot, downy mildew, and alternaria. These can often be prevented with good crop rotation and the introduction of disease-resistant varieties.

Common pests that attack broccoli roots are cabbage and seedcorn maggots, while flea beetles, wireworms, cutworms, and aphids attack seedlings. Mature broccoli plants can fall victim to loopers, beet armyworms, diamondback moths, silverleaf whiteflies, and cabbage worms. Nematodes can interfere with growth if soil is infested.

References: PennState Extension, UC Davis Postharvest Technology website, University of Illinois Extension.

CULTIVATION, STORAGE & PACKAGING
Preharvest:
Broccoli can be directly seeded or transplanted. Either method generally uses double-row raised beds from 38 to 42 inches wide. Single row planting can also be used on 30 inch beds, spacing plants 5 to 6 inches apart. One acre of broccoli usually holds about 40,000 plants. Seeded acres can require up to 15 pounds of seed; recommended depth is about ½ inch. Ideal soil is well-drained with a variety of textures and low salination, as higher salinity levels will affect yield. Newer varieties have been bred to resist various pests and diseases or thrive at differing climates and moisture levels. Irrigation is particularly important during flower head formation. Overwatering causes loose heads or hollow stems, putting plants at risk for root diseases. Sprinkler irrigation is commonly used through seed emergence or after transplanting; thereafter, furrow or drip irrigation is effective for the life of the crop. Fertilization is crucial to meet the nutrient demands of this heavy-feeding crop, though increases runoff of nitrate-nitrogen and phosphates, particularly in central and south coastal regions of California.

Postharvest:
Broccoli is ready for harvest between 60 to 100 days after initial planting. Good quality plants have dark or bright green closed beads. Heads should be compact, approximately 3 to 8 inches in diameter, with cleanly-cut stalks or snapped at 8 inches. At harvest, crews bunch two to four heads together with a rubber band and cut the stems uniformly to about 7 inches. Packed waxed cartons (to withstand icing) contain 14 to 18 bunches.

Crown-cut broccoli is cut from the stem at 5 inches with a top dome 5 to 5.5 inches in diameter. Packed cartons contain 34 to 38 bulk-packed crowns. Broccoli florets are loosely packed in bags and stored in cardboard cartons of 9 to 18 pounds containing 3 to 4 bags apiece. Broccoli to be processed or frozen is cut at about 6 inches at the stem and collected in bulk bins for delivery to the processor.

Broccoli heads must be cooled immediately after harvest to prevent dehydraion and floret yellowing. Optimal shelf life, when stored at 32°F and 95% relative humidity or above, is between 21 to 28 days (but can vary depending on cultivar). Exposure to ethylene is particularly damaging and can reduce shelf-life by half. Broccoli has a very high respiration rate at 40°F; heads have higher respiration rates than separated florets.

References: UC Davis Postharvest Technology website, University of Kentucky College of Agriculture, Food and Environment.
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.

<table>
<thead>
<tr>
<th>U.S. Grade Standards</th>
<th>Days Since Shipment</th>
<th>% of Defects Allowed</th>
<th>Optimum Transit Temp. (°F)</th>
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</table>

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.

INSPECTOR’S INSIGHTS

• Some varieties of broccoli often have a purplish to blue color of the bud clusters. This is a varietal characteristic and these colors would not be considered a defect
• ‘Hollow stems’ is a defect when discolored or when the opening extends more than 3 inches up into the stem
• Bunches would be considered damaged by “flowering bud clusters” when more than three buds are obviously open
• A bunch is considered damaged when more than 5 insects are present or when more than 1 worm is present.


BROCCOLI: WEEKLY MOVEMENTS & PRICES, USA

Source: Chart by Gallo Torrez Agricultural Price Trends (GTAPT), mgallo@markfinstrat.com, compiled from USDA data.