The tomato, *Lycopersicon esculentum*, is a part of the nightshade family. It is a warm-season crop that originated in the Americas and was taken to Europe by Spanish conquistadors in the sixteenth century. Some believe the fruit might have been taken to Europe by Christopher Columbus himself as early as the fifteenth century. Botanically speaking, the tomato is a fruit but was deemed a vegetable in 1893 by the U.S. Supreme Court to clear up a tariff dispute.

Both field- and greenhouse-grown tomatoes for the fresh market are hand-picked, while most bound for processing are harvested by machine.

The world’s top producer of tomatoes is China, in both field-grown and greenhouse varieties. In North America, Canada rules the greenhouse market, followed by Mexico and the United States.

References: Agricultural Marketing Resource Center, Statistics Canada, USDA.

<table>
<thead>
<tr>
<th>CANADA</th>
<th>MEXICO</th>
<th>UNITED STATES</th>
<th>OTHER INTERNATIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>Baja*</td>
<td>Arizona</td>
<td>Belgium</td>
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<tr>
<td>British Columbia</td>
<td>Jalisco</td>
<td>California</td>
<td>France</td>
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<tr>
<td>Ontario</td>
<td>Sinaloa</td>
<td>Colorado</td>
<td>Israel</td>
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<tr>
<td>Quebec</td>
<td>Sonora</td>
<td>Florida</td>
<td>Netherlands</td>
</tr>
</tbody>
</table>

*includes Baja California and Baja California Sur.

References: Asociación Mexicana de Horticultura Protegida (AMHPAC); Gary Hickman, Cuesta Roble Consulting; Roberta Cook (formerly of University of California, Davis), Statistics Canada, USDA.
TYPES, VARIETIES & CUTS

Tomatoes can be classified several ways but usually fall into determinate and indeterminate varieties. Determinate varieties grow to a certain height and produce fruit for one cycle; indeterminate varieties require staking and grow throughout the season. Commercially, both determinate and indeterminate varieties are used.

Cultivars for greenhouse use tend to be specifically bred and of a heartier nature for indoor growth, due to reductions (15 to 20%) in light from outdoor counterparts, with some seeds tailored to geographic locations given seasonal light availability. Higher-tech greenhouses regulate light for optimal growing conditions. Target harvests can range from 25 to 45 pounds of fruit per plant during a 10- to 12-month growing season.

Greenhouse-grown, like open-field tomatoes, come in several shapes, sizes, and colors. Standard sizes include the most common, the round or globe, as well as grape, cherry, grape/plum, or pear/teardrop. Cherry tomatoes are small and range in size from one to two inches in diameter; beefsteak tomatoes are large, wide, and somewhat flat-looking. Grape, plum, or pear tomatoes have smooth skin and are shaped as their names imply. Colors are no longer limited to traditional red, there are also white, yellow/orange, green, brown, pink, and even purple/black.

The USDA categorizes tomatoes as greenhouse, fresh, cherry, or on-the-vine.

References: Mississippi State University Extension, USDA, University of Kentucky.

PESTS & DISEASE

Pests and diseases are controlled through chemical or biological means, with special consideration given to organic production. For the latter, some growers employ a hot water wash rather than pesticide applications; but most greenhouse growers utilize a biologic or integrated pest management program.

Common Diseases:
A number of diseases thrive in damp, humid conditions including Botrytis gray mold (which turns leaves brown causes molding of the stem and foliage), Fusarium and verticillium wilt cause foliage to yellow and wilt. Blossom-end rot will appear dark, flattened, or sunken on the blossom end of the fruit. Other diseases include bacterial canker, ghost spot, blight, powdery mildew, and mosaic viruses.

Other problems and/or disorders can be caused by nutritional deficiencies or environmental fluctuations in temperature, humidity, light, water, etc. Among the more common are cracking, splitting, catfacing (a malformation of the blossom end), scarring, blotchy ripening, green shoulder (greening near the top that never turns red), and sunscald or solar yellowing.

Common Pests:
A number of insects pose a threat to greenhouse operations including aphids feeding on leaves, making them curl and become distorted; loopers, which also feed on leaves leaving ragged holes; and various whitefly species that feed on the underside of leaves turning them black. Cutworms, hornworms, pinworms, leafminers, slugs, thrips, gnats, and moths can cause damage as well—though most are controlled by integrated pest management—using mites, wasps, midges, beetles, and nematodes as biologic control agents.

References: Agricultural Marketing Resource Center, Mississippi State University Extension, North Carolina State University, Oregon State University, USDA.

CULTIVATION, STORAGE & PACKAGING

Preharvest:
Most greenhouse tomatoes are grown in one- or two-season crop cycles, often depending on location. Growers in the South often avoid July and August, when sunlight and high temperatures make it cost-prohibitive to cool greenhouses. The opposite occurs in Canada during the harshest winter months (generally December to February), when it is difficult to maintain adequate light and heat.
CULTIVATION, STORAGE & PACKAGING — CONTINUED

Greenhouse tomatoes need at least four square feet per plant or about 10,000 plants per acre, as higher density—and the resultant loss of sunlight—can cause a drop in yields and promote disease when pest treatments cannot reach all foliage.

Plants can be grown in a variety of media, including soil-less (hydroponic or aeroponic), sand, bark, peat, perlite, rock wool, and straw to name a few. Structures range from bags and nutrient film to plastic piping and trellises or troughs.

Postharvest:
Greenhouse tomatoes are collected by hand throughout the harvesting period. Pink to firmly red fruit can be stored at temperatures of 50 to 55°F, while less mature tomatoes should be ripened at 70°F. For marketing, tomatoes are segregated by grade, color, and variety. Greenhouse tomatoes are classed into U.S. No. 1 and U.S. No. 2 only (though most buyers will only buy U.S. No. 1 quality or better).

Tomatoes are subject to chilling injury and high humidity may encourage the growth of surface molds due to condensation. Ripening tomatoes do produce ethylene at a moderate rate, so storage or shipping with ethylene-sensitive commodities should be avoided.

References: Oregon State University, Texas A&M AgriLife Extension Service, USDA, University of Kentucky.

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>
</tr>
</thead>
<tbody>
<tr>
<td>10-5-1</td>
<td>5</td>
<td>15-8-3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>14-8-3</td>
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<td></td>
<td>2</td>
<td>11-6-1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>10-5-1</td>
</tr>
</tbody>
</table>

Canadian good arrival guidelines (unless otherwise noted) are broken down into five parts as follows: maximum percentage of defects, maximum percentage of permanent defects, maximum percentage for any single permanent defect, maximum percentage for any single condition defect, and maximum for decay. Canadian destination guidelines are 10-5-5-10-3.

References: DRC, PACA, USDA.

INSPECTOR’S INSIGHTS

- The tolerance for soft and decay tomatoes is only 1%
- Puffiness is scored as a defect when the open space in one or more locules materially detracts from the appearance of the tomato
- Any unhealed skin break or cut is scored as a defect, against the 5% tolerance for serious damage
- Mold on the stems is scored as a defect, as damage, or as serious damage, depending on the severity.


HEALTH & NUTRITION

Tomatoes are high in Vitamins A, C, E, and K, are a good source of potassium, and contain lycopene, an antioxidant with cancer fighting abilities. They are naturally fat and cholesterol free, low in calories, and have very low sodium.

References: Produce for Better Health Foundation, Western Growers Association.