The origins of the lemon (*Citrus limon*) are unknown, though its history dates back as far as 200 A.D. when the fruit is believed to have been brought from India to southern Italy. Reports of lemon cultivation appear in Iraq and Egypt around 700 A.D. as well as in Sicily and China around the same period. Lemons were valued for their medicinal qualities after Arabs introduced them throughout the Mediterranean.

An oval-shaped fruit with a nipple-like bulge at one end, lemons usually have a peel around a quarter-inch thick. Peels are usually light-yellow and pocked with oil glands, though some have green, yellow, or white stripes running lengthwise along the fruit. Pulp is pale-yellow and acidic with a distinctive sour taste. The fruit is divided into several segments with few or no seeds.

Lemons arrived in the New World in the mid-1700s where they were initially grown in California. Cultivation spread to Florida by 1839, leading to commercial production in both states by 1870. Today, California is the nation’s top grower, accounting for over 92% of production in the United States. Globally, Mexico is the largest producer with Argentina and the European Union coming in second and third.

Lemons typically garner the highest price per box of all citrus fruits. While most lemons are used as juice, garnish, or as a cooking ingredient, per-person consumption of fresh lemons has reached more than 3.5 pounds annually. The highest demand for lemons is in the summer months with the popularity of lemonade and other juice-based drinks.

References: Agricultural Marketing Resource Center, Purdue University Center for New Crops & Plant Products.

### SEASONAL AVAILABILITY

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<th>LOCATION</th>
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</table>

References: Agricultural Marketing Resource Center, Chilean Fresh Fruit Association, University of Florida/IFAS Extension, USDA, Western Growers Association.
**CULTIVATION, STORAGE & PACKAGING**

**Preharvest:**
Lemon trees grow from 10 to 20 feet in height with sharp thorny branches. Flowers are single or bunched two or more together in leaf axils. Less than 1% of pollinated buds will produce fruit. Trees usually achieve full fruit production by the eighth year of growth.

Lemon trees are less sensitive to cold than lime trees, but since they both grow continuously, they are more susceptible to cold damage than orange trees and less capable of recovery. Climate is more limited for lemons than for other citrus as trees produce the best fruit in coastal areas with cooler summer temperatures, but cold snaps can be devastating. Lemon trees can thrive in either humid or dry conditions and tolerate rainfall between 25 and 125 cm per year although irrigation is necessary for drought conditions.

Temperatures below 29°F will kill flowers and new fruit and just one degree colder can severely damage mature fruit. The 24 to 22°F temperature range will defoliate the tree, while below 20°F can damage wood.

Many different types of soil are acceptable, which can even grow on sand or silty clay loam, but pH levels should be between 5.5 and 6.5. Rough lemons can be grown from seed, though Meyer lemons are generally grown via rooting cuttings for transplant. Trees should be placed 25 feet apart each way and must be protected from wind, which will scar both fruit and tree.

**Postharvest:**
Lemons are hand-picked at different stages for varying marketability. California and Arizona producers pick lemons any time after they have attained 25% juice content. Some, such as Italian lemons, are picked early and cured. Others are harvested at maturity.

Fruit is packed into bins in the field and transported to packinghouses for cleaning, grading, sizing and final packing. Lemons are coated with a fungicide and thin wax layer before curing in storage and later shipping. Some growers cure loose fruit before moving on to the grading stage and another round of curing. Early-picked lemons require about three weeks to attain best color but green lemons may be kept for four months or longer. More mature lemons may need less than a week to cure.

Degreening can be expedited by exposure to ethylene gas, ethephon, or silane, but care must be taken as this can also promote decay. Packing lemons in 10 micrometer-thick, high-density polyethylene may minimize decay and allow storage for up to six months. Lemons can generally be kept for up to six months between 54 and 57°F with 90 to 95% relative humidity.

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**TYPES, VARIETIES & CUTS**

Lemons can be separated into two categories: ‘true’ lemons and ‘rough’ lemons. True lemons are the original fruit thought to originate in India. Rough lemons are similar, but less acidic and larger than true lemons with a bumpier peel and more seeds. Other fruits that are sometimes referred to as lemons are Meyer or Ponderosa lemons. Neither are true lemons, but Meyer lemons are often used as lemon substitutes although they are much less acidic and bear some resemblance to yellowish oranges. Buddha’s hand lemons are gaining popularity with chefs as a zest. There are both edible and ornamental types of Buddha’s hand lemons.

Popular lemon varieties include Armstrong, Avon, Bearss, Berna, Eureka, Femminello Ovale, Genoa, Harvey, Interdonato, Lisbon, Monachello, Nepali Oblong, Nepali Round, Rosenberger, Santa Teresa, and Villafranca. Roughly 80% of U.S. lemons are destined for the fresh market; the remaining 20% are processed for juices or discarded as unsaleable.

*References: Purdue University Center for New Crops & Plants Products, Texas A&M University Horticultural Sciences Department.*

**PESTS & DISEASE**

Common diseases that affect lemons include *citrus greening, citrus canker, mold, altenaria rot, scab, anthracnose, greasy spot, stem-end rot, damping-off, leaf spot, felt fungus, various types of root rot and wood rot*, as well as *the crinkly leaf and exocortis viruses*.

Pests of concern are the *Asian citrus psyllid, California red scale and purple scale, phytophthora, nematodes, and rust and red mites*.

*References: Agricultural Marketing Resource Center, Purdue University, UC Davis Postharvest Technology website, University of California Cooperative Extension.*

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Know Your Commodity Guide
CULTIVATION, STORAGE & PACKAGING—CONTINUED

Tree yield varies by cultivar and location and is usually measured in 900-pound field bins per acre. Lemons are sold in packed 40-pound cartons and a 900-pound bin consists of 23 or 24 cartons. Lemons exported from Florida to Hawaii and Arizona are fumigated with methyl bromide to prevent Caribbean fruit fly infestations.

References: Agricultural Marketing Resource Center, Purdue University, UC Davis Postharvest Technology website, University of California Cooperative Extension.

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. Note that the percentage of allowable defects increases based on the number of days in transit, with five days for coast-to-coast transport by motor carrier considered normal.

<table>
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<tr>
<th>U.S. Grade Standards</th>
<th>Days Since Shipment</th>
<th>% of Defects Allowed</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.

LEMONS: WEEKLY MOVEMENTS & PRICES, USA

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

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Know Your Commodity Guide
**INSPECTOR’S INSIGHTS**

The following defects are unique to lemons only:
- Any amount of mold from a decayed lemon affecting a sound lemon is scored as a defect, serious damage by contact spot
- Lemons are prone to an internal defect and decline, usually found starting at the stylar end; any amount is scored as a serious damage defect
- *Peteca* is a deep, sharply defined pitting or sinking of the surface of the rind and is scored as a defect when more than two spots, or aggregating more than ¼-inch in diameter.