TOMATOES

facts for consumer education

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Human Nutrition and Home Economics
## Contents

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This is the first of a series of bulletins to provide source materials for persons who give consumers information on food: Workers in Extension, consumer education, and marketing services, teachers, dietitians, nutritionists, food editors, and others. Each publication will contain facts on a single commodity.

This publication was prepared by Irene H. Wolgamot, Bureau of Human Nutrition and Home Economics, with assistance from the Production and Marketing Administration, Bureau of Plant Industry, Soils, and Agricultural Engineering, and Bureau of Agricultural Economics, United States Department of Agriculture.

Washington, D. C. May 1951
Tomatoes... facts for consumer education

Origin

Tomatoes have been used as food by the Indians of Mexico since prehistoric times. The cultivated tomato was probably evolved from wild species growing on the slopes of the Andes mountains. The Italians, early in the sixteenth century, apparently were the first Europeans to eat tomatoes. Sometimes called "love apples," they were grown about 25 years later for ornament in the gardens of England, Spain, and mid-European countries. Perhaps because the plant is a member of the Nightshade family, tomatoes were for many years considered poisonous. In 1812, probably owing to French influence, tomatoes were used as food in New Orleans. Another 20 to 25 years elapsed before the northeastern colonists grew them for food, although records show that Thomas Jefferson grew them in Virginia as early as 1781.

Quantities used

Consumption of tomatoes per person during 1948 in the United States averaged 23 pounds or about 70 medium-size fresh tomatoes, eaten fresh and home canned. Consumption of commercially canned products averaged per person per year about 9 cups of canned tomatoes . . . 13 cups of soup and juice . . . 9 cups of pulp and puree, paste and sauce, catsup and chili sauce.

More fresh tomatoes are used during the peak of the season when the flavor is finest and the price is lowest. In Minneapolis-St. Paul and in Birmingham, according to food consumption surveys of city families in 1948-49 (3), five times as many tomatoes were bought at the peak of the season as in winter. More tomatoes were purchased in San Francisco than in Birmingham, Buffalo, or Minneapolis-St. Paul. Nation-wide, during the spring of 1948, over one-half of the families used fresh tomatoes.

The most frequently used canned vegetables were peas, tomatoes, and corn. A fourth of the families used canned tomatoes and tomato juice. Consumption of canned tomatoes, tomato puree, paste, and juice rose sharply with rising income with a threefold increase from the income levels less than $1,000 to the $4,000 to $5,000 level.

Canned tomato juice, according to a Nation-wide study (4) made October 1949 to March 1950, was purchased by a larger percent of families than was any other canned single-strength juice. About 44 percent of U. S. families bought tomato juice; 42 percent bought orange juice; 39 percent, pineapple juice; 30 percent, grapefruit juice; and 22 percent, blended orange-grapefruit juice. Purchases of canned tomato juice varied for the 6-month period from an average of 6.3 cans (46-ounce equivalent) in the highest income group to 4.8 cans in the lowest income group. The average frequency of purchases among buying families for this period was highest for tomato juice, although the average volume of purchases per buying family was highest for orange juice—5.8 cans (46-ounce equivalent), compared with 5.4 cans of tomato juice, 4.1 cans of grapefruit juice, 3.6 cans of pineapple juice, and 3.3 cans of blended orange-grapefruit juice.

The proportion of families buying canned tomato juice and the average volume of purchases per buying family were considerably greater in the Northwest and Pacific regions than in the North Central and South.

1 Numbers in parentheses refer to References Cited, p. 18.
A survey (5) shows that in 40 New York City retail stores of one chain system, fresh tomatoes ranked fourth in quantity of fresh vegetables sold during the prewar year 1938-39 and sixth during the war year 1941-42. Fresh tomatoes made up about 10 percent of the tonnage of fresh vegetables other than potatoes in 1938-39 and about 9 percent during 1941-42. They made up about 4 percent of the total vegetable tonnage. About three-fourths of the tomatoes were sold during the spring and summer months. They were stocked monthly by 91 percent of the stores. Fresh tomatoes ranked first among fresh vegetables other than potatoes for dollar sales and accounted for 11 cents of the consumer's dollar spent for fresh vegetables . . . for 16 cents of the dollar spent for fresh vegetables other than potatoes.

This same survey shows that of the fresh vegetables sold in three large stores in Syracuse, N. Y., during 1946-47, tomatoes ranked eighth in quantity and made up a little over 4 percent of the total vegetable tonnage in the three stores. They were second on the basis of dollar sales, accounting for over 10 cents of the consumer dollar spent in the stores for fresh vegetables.

Reports of the Production and Marketing Administration show that tomatoes ranked third among fresh vegetables in both 1948 and 1949 in number of carloads or equivalent unloaded in New York City.

- **Production** of tomatoes in 1949 was exceeded in tonnage only by potatoes among vegetables in the United States. About one-fourth were sold fresh and the remainder processed (6).

- **The 1949 packs** of canned tomatoes and tomato juice were both comparable in size to packs of corn, green peas, and snap beans. Each of these five packs greatly exceeded the packs of any other vegetable, except pickles. Lesser quantities of other tomato products were packed, such as tomato pulp, sauce, paste, and catsup (6).

### Nutritive value

- **Valued most for vitamin C** (ascorbic acid), tomatoes make an important contribution to the diet. Although not as rich in vitamin C as citrus fruits, they are an important source of this vitamin because of the quantities eaten. In 1948, tomatoes and tomato products provided almost 8 percent of the vitamin C in American diets. Since the body can't store much vitamin C, nutritionists recommend one or more servings a day of foods rich in this vitamin.

  Summer field-grown tomatoes are richest in vitamin C . . . they contain about twice as much as winter and fall greenhouse fruit. Intensity of the light in which tomatoes are grown affects the vitamin C content; fresh tomatoes in winter contain less than those grown in summer sunshine. Some varieties of tomatoes are usually better sources of vitamin C than others, but light seems to make a greater difference than variety (7).

  Cooking, canning, and storing destroy some, but not much, of the vitamin C in tomatoes. In raw tomatoes, this vitamin holds up well at room or refrigeration temperatures as long as the tomatoes remain firm and sound. Canned tomatoes and juice hold vitamin C well at these temperatures too, but deterioration is rapid at temperatures as high as 110° F.

  Studies of canned tomato juice held at refrigeration temperatures or below show that nearly 90 percent of the vitamin C is retained after 12 months' storage. At room temperatures, approximately 80 percent is retained after 12 months . . . 70 percent after 24 months. At 110° F, only about 20 percent can be expected after a year's storage. After cans are opened, tomatoes and juice retain a good share of vitamin C for 24 hours in refrigerator or at room temperature (8).

- **Vitamin A** too is furnished in generous amounts by tomatoes. In 1948, tomatoes contributed carotene for 6 percent of the vitamin A in American diets.
• Other nutrients—niacin, thiamine, and iron—are provided in very small amounts. A natural for reducing diets, tomatoes are low in calories.

One medium-size raw tomato furnishes nearly half the amount of vitamin C, and sufficient carotene for a third of the amount of vitamin A, recommended by the National Research Council as the daily allowance for a physically active man. A half cup of canned or cooked tomatoes or juice furnishes smaller amounts of vitamins C and A. Other nutrients are provided too, as shown below.

**CONTRIBUTION OF A SERVING OF TOMATOES TO THE DIET**

1 medium-size raw tomato, 2 by 2½ inches (150 grams) provides:

- 47 percent of the vitamin C
- 33 percent of the vitamin A
- 8 percent of the iron
- 5 percent of the niacin
- 5 percent of the thiamine
- 1 percent of the calories

½ cup canned or cooked tomatoes or tomato juice (121 grams) provides:

- 27 percent of the vitamin C
- 23 percent of the vitamin A
- 7 percent of the iron
- 5 percent of the niacin
- 5 percent of the thiamine
- 1 percent of the calories

Recommended daily for a physically active man.

Source: Composition of Foods—Raw, Processed, Prepared (9).

**EQUIVALENTS IN VITAMIN C (38 MG.)**

**FRUITS AND JUICES**

- 1 cup canned tomato juice
- ¼ medium-size raw grapefruit
- ½ medium-size raw orange
- ½ cup fresh orange juice
- ½ cup (generous) canned orange juice
- ½ cup (scant) canned grapefruit juice
- 1½ (5 in. diam.) cantaloup
- 2 cups (scant) canned pineapple juice

**VEGETABLES**

- 1 medium-size raw tomato
- 1 cup (scant) canned or cooked tomatoes
- 1½ cup cooked broccoli
- ¾ cup cooked spinach
- ¾ cup cabbage, finely shredded raw, or cooked short time in small amount of water
- 2 cups canned peas
- 4 cups canned green snap beans
CHART 1

VITAMIN C (ASCORBIC ACID) IN A POUND OF SOME FOODS AS PURCHASED

Raw

<table>
<thead>
<tr>
<th>Food</th>
<th>Vitamin C (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabbage</td>
<td>200</td>
</tr>
<tr>
<td>Oranges</td>
<td>150</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>120</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>100</td>
</tr>
<tr>
<td>Pineapples</td>
<td>50</td>
</tr>
<tr>
<td>Bananas</td>
<td>20</td>
</tr>
<tr>
<td>Apples</td>
<td>10</td>
</tr>
<tr>
<td>Pears</td>
<td>5</td>
</tr>
</tbody>
</table>

Canned or Juice

<table>
<thead>
<tr>
<th>Food</th>
<th>Vitamin C (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange juice, fresh</td>
<td>200</td>
</tr>
<tr>
<td>Orange juice, canned</td>
<td>150</td>
</tr>
<tr>
<td>Grapefruit juice, canned</td>
<td>120</td>
</tr>
<tr>
<td>Tomatoes, canned</td>
<td>100</td>
</tr>
<tr>
<td>Tomato juice, canned</td>
<td>70</td>
</tr>
<tr>
<td>Pineapple juice, canned</td>
<td>50</td>
</tr>
<tr>
<td>Apple juice, fresh or canned (without added vitamin C)</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Composition of Foods - Raw, Processed, Prepared.
CHART 2

VITAMIN C (ASCORBIC ACID) IN SERVING PORTIONS
OF SOME COMMON FRUITS AND VEGETABLES

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Milligrams of Ascorbic Acid</th>
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<tbody>
<tr>
<td>Orange, raw, 1 medium</td>
<td></td>
</tr>
<tr>
<td>Grapefruit, raw, 1/2 medium</td>
<td></td>
</tr>
<tr>
<td>Orange juice, fresh, 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Sweetpotato, boiled and peeled, 1 medium</td>
<td></td>
</tr>
<tr>
<td>Tomato, raw, 1 medium</td>
<td></td>
</tr>
<tr>
<td>Spinach, cooked, 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Cabbage, 1/2 cup raw* or cooked**</td>
<td></td>
</tr>
<tr>
<td>Potato, boiled and peeled, 1 medium</td>
<td></td>
</tr>
<tr>
<td>Tomatoes, canned or cooked, 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Tomato juice, canned, 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Peas, green, canned, 1/2 cup</td>
<td></td>
</tr>
<tr>
<td>Corn, canned, 1/2 cup</td>
<td></td>
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<tr>
<td>Snap beans, green, canned, 1/2 cup</td>
<td></td>
</tr>
</tbody>
</table>

*Finely shredded. **Cooked short time in small amount of water. ***Solids and liquid.

Source: Composition of Foods - Raw, Processed, Prepared.
Market information

Fresh tomatoes—seasonal supplies and sources

- **Urban markets** offer home-grown tomatoes in season and shipped tomatoes throughout the year. The retail price is affected both by market supplies and shipping distance.

- **Supplies of fresh tomatoes shipped into one city**, month by month, are shown in chart 3, developed from records of carlot unloads of tomatoes in Washington, D.C. Supplies of home-grown tomatoes bring up total market supplies in August and September. Information on carlot unloads for many of the principal cities can be obtained from the Production and Marketing Administration.

- **Total supplies of tomatoes** are greatest in summer and early fall. At this time, on most markets, they are either locally grown or shipped from nearby growing areas in the pink or “turning” stage. Winter and spring tomatoes are shipped in the mature-green stage (called green wraps) from warm areas. The tomatoes are ripened for retailing in special rooms with controlled temperature and humidity before being sorted and packed in consumer-size trays or cartons. These tomatoes often require some ripening after the consumer buys them. Proper handling and ripening in the home as well as while in commercial channels is necessary for good flavor. (See p. 16 for information on storing and ripening at home.)

Some of the fresh tomatoes in winter are supplied also by greenhouses in the East North Central, Middle Atlantic, and southern New

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**CHART 3**

RAIL AND TRUCK RECEIPTS OF FRESH TOMATOES IN WASHINGTON, D.C. MARKETS, 1949

Source: Annual Summary of Carlot Unloads of Fresh Fruits and Vegetables at Washington, D.C. for 1949. PMA, USDA
## United States Sources of Fresh Tomatoes for Market

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Early</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Florida</em></td>
<td><em>California</em></td>
<td><em>Florida</em></td>
<td><em>California</em></td>
</tr>
<tr>
<td><em>Texas</em></td>
<td><em>Arkansas</em></td>
<td>Delaware</td>
<td><em>North Carolina</em></td>
</tr>
<tr>
<td><em>Texas</em></td>
<td></td>
<td>Illinois</td>
<td>Ohio</td>
</tr>
<tr>
<td>LATE</td>
<td>Alabama</td>
<td>Kentucky</td>
<td>Tennessee</td>
</tr>
<tr>
<td></td>
<td>Georgia</td>
<td>*Maryland</td>
<td>Virginia</td>
</tr>
<tr>
<td></td>
<td>Louisiana</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mississippi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>South Carolina</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Texas</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Late</strong></td>
<td>Alabama</td>
<td><em>New York</em></td>
<td><em>Florida</em></td>
</tr>
<tr>
<td></td>
<td>Georgia</td>
<td></td>
<td><em>Texas</em></td>
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<tr>
<td></td>
<td>Louisiana</td>
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</tr>
<tr>
<td></td>
<td>Mississippi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>South Carolina</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Texas</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* States producing most tomatoes.

Source: Agricultural Statistics 1950, table 352 (6).

England States. These tomatoes are ripened on the vine and are of good red color when offered in the market.

- **United States sources** of fresh tomatoes are shown above. Tomatoes are shipped to United States markets also from Mexico and from Cuba, Puerto Rico, Jamaica, and other West Indies Islands in winter, early spring, and late fall. A large share of our winter tomatoes come from Mexico.

### Food Value for Money Spent

One measure of food value received for money spent for tomatoes is the comparison of the cost of vitamin C in tomatoes with its cost in other foods. Information for such comparisons is given in chart 1 (p. 4), chart 2 (p. 5), and chart 4 (p. 8).

Comparative cost of vitamin C per serving, of interest to school lunch and other institutional food services, can be determined by considering vitamin C values per serving portion given in chart 2 in relation to cost per serving for the different foods.

Another type of comparison can be made by considering the vitamin C values per pound shown in chart 1 in relation to retail prices per pound. At present-day prices, both fresh and canned tomatoes are more expensive by the pound for vitamin C than citrus fruits and cabbage but less expensive than the fruits and fruit juices other than citrus.

Chart 4 shows the price per pound at which tomatoes cost the same for vitamin C content as oranges, grapefruit, and cabbage. Values are for raw foods with average vitamin C content. To use the chart, find price per pound of tomatoes and follow vertical line until it crosses the line for the other food. Follow horizontal line across to price per pound of the other food. The example given, using dotted lines, shows that when tomatoes are 10 cents a pound, equally economical sources of vitamin C are cabbage and oranges at 17 cents a pound ($1.02 a dozen for medium-size oranges, No. 200) and grapefruit at 13 cents a pound.

To be comparable in cost for vitamin C, canned tomatoes or juice (without added vitamin C) would have to sell for 8 cents a pound or around 9 or 10 cents for a No. 2 can.
CHART 4
COST COMPARISON OF VITAMIN C IN FOODS

*Quantities in a pound:
- 3 medium-size tomatoes
- 1 small-size grapefruit
- 2 medium-size oranges
- 1 small head cabbage
Fresh tomatoes in season, eaten in generous quantities, can make worthwhile contributions of vitamins C and A; they also provide some niacin, thiamine, and iron. A recent survey shows that families spent 1 percent of their food dollar for tomatoes in the fall (when tomatoes were 8 cents a pound) and received almost 20 percent of the vitamin C content of their diets...over 12 percent of the vitamin A (chart 5). Of the families surveyed, 85 percent had diets which met National Research Council allowances in vitamin C and 92 percent met allowances in vitamin A.

Retail prices of canned tomatoes

Retail prices vary, depending on the general level of prices, the locality and type of retail store, the season, quality, and other conditions. Canned tomato prices are more stable than those of fresh. The size and cost of the new year's pack, which depends on season, carry-over from previous year, and other factors, affect the retail price of both the new and old pack.

Table 1, which gives monthly retail prices of canned tomatoes in one city over a 3-year period, shows gradual price changes but no marked seasonal pattern.

<table>
<thead>
<tr>
<th>Month</th>
<th>1950</th>
<th>1949</th>
<th>1948</th>
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</thead>
<tbody>
<tr>
<td>January</td>
<td>13.9</td>
<td>15.2</td>
<td>15.2</td>
</tr>
<tr>
<td>February</td>
<td>12.8</td>
<td>15.1</td>
<td>15.3</td>
</tr>
<tr>
<td>March</td>
<td>13.0</td>
<td>14.8</td>
<td>15.2</td>
</tr>
<tr>
<td>April</td>
<td>13.3</td>
<td>14.8</td>
<td>15.2</td>
</tr>
<tr>
<td>May</td>
<td>13.6</td>
<td>14.7</td>
<td>15.1</td>
</tr>
<tr>
<td>June</td>
<td>14.2</td>
<td>14.4</td>
<td>15.5</td>
</tr>
<tr>
<td>July</td>
<td>13.8</td>
<td>14.6</td>
<td>15.5</td>
</tr>
<tr>
<td>August</td>
<td>14.3</td>
<td>13.4</td>
<td>15.1</td>
</tr>
<tr>
<td>September</td>
<td>14.9</td>
<td>13.4</td>
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<tr>
<td>October</td>
<td>14.4</td>
<td>13.2</td>
<td>15.5</td>
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<tr>
<td>November</td>
<td>14.8</td>
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<td>15.3</td>
</tr>
<tr>
<td>December</td>
<td>15.0</td>
<td>13.0</td>
<td>15.4</td>
</tr>
</tbody>
</table>


CHART 5
PERCENT OF FOOD DOLLAR SPENT FOR TOMATOES
AND PERCENT OF NUTRIENTS CONTRIBUTED IN DIETS

(Estimated average losses in cooking have been deducted)

United States yearly average retail prices from the U. S. Bureau of Labor Statistics for a No. 2 can of tomatoes are listed below for 1942 to 1950. They show the same trend as canned fruit and vegetable prices in general for this period.

<table>
<thead>
<tr>
<th>Year</th>
<th>Price (cents)</th>
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<tbody>
<tr>
<td>1942</td>
<td>11.7</td>
</tr>
<tr>
<td>1943</td>
<td>12.6</td>
</tr>
<tr>
<td>1944</td>
<td>12.0</td>
</tr>
<tr>
<td>1945</td>
<td>12.2</td>
</tr>
<tr>
<td>1946</td>
<td>15.0</td>
</tr>
<tr>
<td>1947</td>
<td>19.3</td>
</tr>
<tr>
<td>1948</td>
<td>16.5</td>
</tr>
<tr>
<td>1949</td>
<td>15.2</td>
</tr>
<tr>
<td>1950</td>
<td>14.7</td>
</tr>
</tbody>
</table>

The tomato dollar—where it goes

- The consumer dollar spent for tomatoes is spread over more operations between farmer and consumer for shipped tomatoes than for those that are home grown. Usually packed in cellophane-wrapped trays at the wholesale terminal, the trays of 3 or 4 tomatoes each are packed 10 to a carton for delivery to retail stores. The handling loss from spoilage between farm and retail market amounts to about 25 percent (10).

A study made in 1948 of the distribution of the consumer’s dollar spent in New York City for South Carolina tomatoes showed that 31 cents went to the producer for growing, picking, and delivering the tomatoes to the packing house; 12 cents went for grading, packing, and loading; 9 cents for transportation; 8 cents for costs of first sale (commission, cartage, inspection, etc.) and about 40 cents for wholesaling and retailing (11).

Another study made in 1950 of tomatoes grown in South Carolina and retailed in Florida showed that sorting, discarding, and other factors resulted in a shrinkage of approximately 43 percent in the weight of the tomatoes between time of harvest and when sold by the retailer. The higher quality tomatoes (predominantly No. 1’s) returned 53.3 cents of the consumer’s dollar to the grower, while 46.7 cents was used for the various functions of wholesaling and retailing. The average retail price was 21.8 cents per pound. The lower qualities of tomatoes (predominantly No. 2’s) brought the grower 26.5 cents of the consumer’s dollar; 73.5 cents was used for wholesaling and retailing. Consumers paid an average price of 15.6 cents per pound for these tomatoes (12).

- Canned tomatoes must be grown, transported, canned, stored, and made available to the consumer. A study of marketing charges for canned tomatoes based on price data collected in 22 cities indicates that during the 1949–50 season, the consumer’s dollar for canned tomatoes was divided as follows: 73 percent cannery price, 5 percent freight costs, 3 percent wholesalers’ margin, and 19 percent retailers’ margin (13). The 1948 average retail price of a No. 2 can of tomatoes was 16.7 cents, of which 3.4 cents represented farm value and 13.3 cents marketing charges (14).

**OPERATIONS IN MARKETING SHIPPED TOMATOES**

**PRODUCTION** → **ASSEMBLING** → **SHIPPING** → **WHOLESALING** → **RETAILING**

Growing → Sizing → Transporting from packing-house to wholesale terminal or food chain warehouse
Picking → Grading
Packing → Packing
Delivering to packing-house → Loading on RR-car or truck → Unloading

**TRANSPORTATION**
- Perhaps trucking
- Resorting
- Ripening
- Storing
- Resorting
- Repacking
- Delivering to retail store

**DISPLAY AND SALE**
- Storing
- Displaying
- Selling to consumer

**STORAGE**
- Storing

** Ripening**
- Storing
- Resorting
- Repacking
- Delivering to retail store
**Selection**

**How to buy fresh tomatoes**

- **Good-quality tomatoes** are fairly well shaped, plump, smooth, firm, of good red color, and free from blemishes. Shrunken and bruised tomatoes are poor in quality. Serious bruising increases chance of decay, and decayed or watery tomatoes develop undesirable flavors. There is considerable waste in peeling and serving tomatoes that are of irregular shape or have large tough cores or scars around the stem end. The importance of the size and shape depends on the way the tomatoes are to be used. Uniform, well-shaped, medium-size tomatoes are best for slicing, for stuffed tomato salad, or broiled halves. For a casserole dish, size and shape are less important.

The consumer can best select tomatoes, without damaging them, from single layers of bulk tomatoes. Judging quality is more difficult in the cellophane-wrapped cardboard trays or cartons, particularly since the tomatoes are packed with the stem end down. Badly bruised or spoiled tomatoes are usually evidenced by moisture on the bottom of the tray. There should be perforations in the cellophane on tomatoes packed before ripe in order to allow for the air circulation necessary for normal ripening. Some consumer packages contain a pound of tomatoes, some less than a pound. Where net weight is not required, packages are often marked only with the number of tomatoes.

- **U. S. Grades**, both shipping grades and consumer standards, have been established for fresh tomatoes and for canned tomatoes and tomato products. Use of these grades is optional.

  **U. S. shipping grades** are customarily used as a basis for quality standards in buying and selling shipments of field-grown tomatoes and include U. S. No. 1, U. S. No. 2, and U. S. Combination (17). **U. S. No. 1** grade requires that tomatoes have similar varietal characteristics and that they be: Mature but not overripe or soft; well developed; fairly well formed; fairly smooth; free from decay and freezing injury and from damage caused by dirt, bruises, cuts, sunscald, sunburn, puffiness, catfaces, growth cracks, scars, disease, insects, and hail, or by mechanical or other means. **Requirements for U. S. No. 2** grade allow wider tolerances for shape, smoothness, and damage factors. **U. S. Combination grade** is a combination of U. S. No. 1 and U. S. No. 2 with at least 60 percent of the tomatoes by count meeting requirements of U. S. No. 1 grade.

- **Consumer standards** for fresh tomatoes include **U. S. Grades A and B**—similar to shipping grades U. S. No. 1 and 2 but with smaller tolerances for defective tomatoes. Developed in 1948, these standards are being used by some prepackagers and there is increasing interest in their adoption (18). Consumers will not ordinarily find graded tomatoes in today's market, but they can look for the quality characteristics used in grading.

- **On the retail market**, shipped tomatoes are sold by the carton of three or four tomatoes weighing a pound or a little less . . . in bulk by the pound . . . and by the lug box (about 30 pounds). Home-grown tomatoes are sold by the pound in bulk, in small baskets of varying sizes, and by the bushel (about 50 pounds) or hamper (about 30 pounds). Legal weights vary in different States (19).

- **When buying in wholesale quantity**, it is a good practice to specify grade. In late summer and fall, it may be more economic to buy ungraded local crops by the bushel, box, or basket and sort them.

- **Quantities to buy** for different purposes can be easily calculated. The information in table 2 may serve as a guide to quantities needed.

**Table 2.—Yield from a purchase unit of fresh tomatoes**

<table>
<thead>
<tr>
<th>Unit of purchase</th>
<th>Quantity</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pound . . .</td>
<td>3 medium or 4 small</td>
<td>4 servings.</td>
</tr>
<tr>
<td>1 bushel . . .</td>
<td>About 50 pounds</td>
<td>200 servings or 15 to 20 quarts tomatoes or juice.</td>
</tr>
<tr>
<td>1 lug box or hamper</td>
<td>About 30 pounds</td>
<td>120 servings.</td>
</tr>
</tbody>
</table>
• In wholesale price quotations, size of tomatoes (except for lugs packed with tomatoes arranged diagonally) is designated by the number of rows of tomatoes running both ways of the lug in the top layer. For example, the top layer of a lug packed with 5 rows of medium tomatoes lengthwise and 6 rows crosswise will be designated as a 5 x 6 pack. The diagonal-pack size is designated by two figures to show number of tomatoes in rows crosswise of lug and a third figure to indicate total number of crosswise rows in the layer. A box with 9 crosswise rows containing alternately 4 and 5 tomatoes each is designated as 4-5 x 9 (10). The U. S. Standard Pack, which applies only to tomatoes packed in Los Angeles lugs, requires that the net weight of tomatoes in the lug shall be not less than 30 pounds (17).

How to buy canned tomatoes and tomato products

• Quality standards established by the U. S. Department of Agriculture are used as a basis for grading canned tomatoes and tomato products. Canned tomatoes are scored according to percent of whole tomatoes, drained weight, color, absence of defects, and flavor. U. S. official grading is not required but is used to considerable extent by packers, distributors, and buyers as a guide to quality (20, 21, 22).

• U. S. grades for canned tomatoes are A, B, C, and D. The B, C, and D grades lack the color, size, and shape of the A grade but are nutritious and cost less. Grade D tomatoes are substandard and are not normally found in

<table>
<thead>
<tr>
<th>U. S. Grades for Canned Tomatoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADE</td>
</tr>
<tr>
<td>U. S. Grade A (Fancy)....</td>
</tr>
<tr>
<td>U. S. Grade A Whole (Fancy whole).</td>
</tr>
<tr>
<td>U. S. Grade B (Extra Standard).</td>
</tr>
<tr>
<td>U. S. Grade (Standard)....</td>
</tr>
<tr>
<td>U. S. Grade D (Sub-standard).</td>
</tr>
</tbody>
</table>

Source: U. S. Production and Marketing Administration, United States Standards for Grades of Canned Tomatoes (Effective August 1, 1946) (21).
retail stores; they have the same uses as Grade C. It is economical to buy the grade of canned tomatoes suited to the use intended.

• Tomato juice, catsup, paste, and puree are graded by U. S. Standards as U. S. Grade A (Fancy), U. S. Grade C (Standard), or Substandard. Standards for tomato sauces have not been completed at this time.

• Continuous U. S. plant inspection means that the product was prepared and packed under USDA inspection with strict requirements for cleanliness. This may be indicated by a shield or statement on the label (22).

The Federal Food, Drug, and Cosmetic Act of 1938 provides legal penalties covering interstate shipment of food products prepared under unsanitary and filthy conditions (23). Some States have laws regarding sanitation in canneries. Information on State and local regulations can be obtained from State health authorities.

• Reading the label is a good buying practice. All labels must show net weight of contents, list of ingredients (if two or more, and the food is not standardized), and name and address of manufacturer, packer, or distributor. In addition, some labels offer helpful information such as can size, number of cups, number of servings, and directions for use, including recipes. Some descriptive terms on labels are useful to the consumer. Information on color and wholeness of tomatoes which might read, for example, "uniformly red" and "whole" tell the consumer something about the tomatoes in the can which he may want to know. Other descriptive terms sometimes given such as "selected" or "fine" have no uniform meaning and are of little value as a basis for selection. Some canned tomatoes are graded by U. S. standards but marked with label names instead of A, B, and C to indicate quality.

• Comparisons of quality of canned tomatoes can be made by a group of interested consumers, by evaluating the tomatoes sold under label names common in their market. The cans may be opened and their contents compared for proportion of tomatoes to juice, for color, flavor and odor, wholeness, number and kind of defects, and prices paid. "Best buys" for different uses can be determined.

• Cost comparisons for cans of different sizes can be made by figuring the cost per pound or per ounce. For example, tomatoes at 16 cents for a No. 2 can (19 ounces) cost 0.84 cent per ounce. At 20 cents for a No. 2½ can (28 ounces) the cost is 0.71 cent per ounce, showing that the No. 2½ can is the more economical.

Equivalent money values per pound of net weight of contents, assuming comparable qualities, are given in table 3 for cans of tomatoes of three different sizes.

• When buying in quantity, specifications, according to use, should be given by the purchaser for tomatoes and tomato products. Suggestions for points to include in the specifications are listed below.

<table>
<thead>
<tr>
<th>Product</th>
<th>Specifications should include—</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomatoes</td>
<td>Grade; size and kind of container.</td>
</tr>
<tr>
<td>Tomato juice</td>
<td>Grade; size and kind of container.</td>
</tr>
<tr>
<td>Tomato catsup</td>
<td>Grade; specific gravity or solids; size and kind of container.</td>
</tr>
<tr>
<td>Tomato paste</td>
<td>Grade; concentration (heavy, medium, light); texture (fine, coarse); size and kind of container.</td>
</tr>
<tr>
<td>Tomato puree</td>
<td>Grade; concentration (heavy, medium, light); size and kind of container.</td>
</tr>
</tbody>
</table>

The needs of institutions are usually met with U. S. Grade B or U. S. Grade C canned tomatoes and with U. S. Grade A tomato juice, catsup, and paste (24).

<table>
<thead>
<tr>
<th>Can size</th>
<th>Equivalent price per can, in cents</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 2 (19 oz.)</td>
<td>10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</td>
</tr>
<tr>
<td>No. 2½ (28 oz.)</td>
<td>15 16 18 19 20 22 24 25 26 28 29 31 32 34 35 37</td>
</tr>
<tr>
<td>No. 10 (102 oz.)</td>
<td>54 59 64 70 75 80 85 91 97 102 107 113 118 123 129 134</td>
</tr>
</tbody>
</table>

Table 3.—Equivalent prices for different sized cans of tomatoes of similar quality
Table 4 gives information for determining size and number of cans of tomatoes and tomato juice to buy.

**Fresh or canned tomatoes—the better buy?**

In late summer and fall when tomatoes are most abundant, they are also cheapest, have the best flavor, and the highest vitamin content. Then the retail price of fresh tomatoes may fall below that of canned tomatoes, particularly if bought in quantity. On a year-round basis, however, canned tomatoes ordinarily cost less per pound than fresh ones.

- **A year’s retail prices** in one locality are shown in chart 6, month by month, for fresh tomatoes in cartons, fresh tomatoes in bulk, and canned tomatoes. While the price of canned tomatoes remained comparatively steady, fresh tomatoes showed definite seasonal variations. Canned tomatoes remained cheaper throughout the year than fresh tomatoes. Home-grown tomatoes in bulk cost less, when available, than shipped tomatoes in cartons.

- **For price comparisons** chart 7 can be used. The price per pound of canned tomatoes can be compared with the price per pound of fresh tomatoes. Comparisons can also be made between prices per pound of tomatoes in cans of different size. Differences in quality, grade, and drained weight should of course be considered in comparing prices of canned products. To use the chart, find price per can at bottom and follow vertical line until it crosses line for can size. Follow horizontal line across to price per pound.

**Use in family meals**

- **Tomatoes are popular** for flavor, color, and food value. They are eaten the year around. Retail stores offer them fresh and canned . . . in the form of juice, sauce, puree, paste, and catsup . . . in chili sauce and relishes. New on the market is frozen tomato juice concentrate with added vitamin C.

Tomatoes can be used in a variety of ways as shown below.

- Fresh whole . . . . For eating out of hand at home, for picnics, for the packed lunch.
- Salad . . . . . Slices or wedges, whole stuffed, jellied.
- Cooked . . . . Stewed, fried, baked, broiled.
- Soups . . . . . . Hot or cold . . . with milk . . . with vegetables and meat . . . clear, spiced.
- Main dishes . . . In fish or meat loaf . . . with Swiss steak . . . in meat or fish stews . . . in casserole mixtures.
- Sauces . . . . . For fish, poultry, meat, vegetables, cheese, spaghetti, or egg dishes.
- Juice . . . . . . For any meal and between-meal pick-ups . . . party snacks.
- Relishes . . . . . Chili sauce . . . chow chow . . . catsup . . . green and ripe tomato relishes.

A list of recipes from publications of the Bureau of Human Nutrition and Home Economics (28, 29, 30) is given on page 17.

### Table 4—Quantities of tomatoes and tomato juice in commercial cans

<table>
<thead>
<tr>
<th>Product</th>
<th>Can size No.</th>
<th>Net weight of contents</th>
<th>Cups per can</th>
<th>Half-cup servings per can</th>
<th>Cans per case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomatoes</td>
<td>303</td>
<td>1 lb</td>
<td>2</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>1 lb. 3 oz</td>
<td>2½</td>
<td>2½</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>1 lb. 12 ozs</td>
<td>1½</td>
<td>3½</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>6 lb. 6 oz</td>
<td>12</td>
<td>23</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>12 fl. oz</td>
<td>1½</td>
<td>2½</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>13½ fl. oz</td>
<td>1½</td>
<td>3½</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>2 cylinder</td>
<td>1 pt. 2 fl. oz</td>
<td>3½</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>1 pt. 7 fl. oz</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>1 qt. 14 fl. oz</td>
<td>5½</td>
<td>11½</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>2 cups</td>
<td>3</td>
<td>24</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>3 cups</td>
<td>3</td>
<td>24</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>4 cups</td>
<td>4</td>
<td>24</td>
<td>6</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: National Canners Association, Net Contents Statements for Canned Food Labels (25) and Canned Food Tables (26); Bureau of Human Nutrition and Home Economics, Planning Food for Institutions (27).
CHART 6
RETAIL PRICES* OF FRESH AND CANNED TOMATOES
DURING THE YEAR IN ONE LOCALITY

*Source: 1949 monthly average prices of one food chain in Washington, D.C.

CHART 7
COMPARISON OF TOMATO PRICES

15
To store

Canned tomatoes should be stored in a dry, cool place. After opening, they should be covered and stored in the refrigerator.

Fresh tomatoes should be sorted and the ripest ones used first; the remainder spread out at temperature to suit the stage of ripeness. If completely ripe, they can be held a day or two in the refrigerator; otherwise they will require ripening before using.

To ripen

Between 60° and 70° F. is right for ripening tomatoes. Most basements are about right the year around. Light is unnecessary to produce good red color in tomatoes after they are picked. Ripening summer tomatoes on a sunny window sill is a poor practice, because excessive sunlight prevents normal color development or makes the color splotchy. Temperatures as high as 80° are also unfavorable to normal ripening. Placing underripe tomatoes in the refrigerator stops the ripening process and makes the tomatoes watery.

To peel

There are three easy ways to loosen tomato skins. If a quantity of tomatoes are to be peeled, as in home canning, they are usually dipped in hot water a minute or two, then in cold water. For one or two tomatoes, the skin can be stroked with the back of a knife, or the tomato rotated on the end of a fork over a flame until the skin wrinkles slightly.

To serve

In order to retain the most vitamin C, tomatoes should be served with the peel on, or peeled and cut just before serving.

Home canning

To can or not to can

Some things to consider are the quality and cost of fresh tomatoes, the tastes of the family, and the time, energy, and interest of the person who would do the canning. Consideration should be given to equipment on hand, including jars, to storage facilities, and to the comparative palatability and nutritive values of home canned and commercially canned tomatoes.

* Easy to can, tomatoes and tomato juice—like fruits—can be processed safely in the boiling water bath (31). They can be put up in glass jars or tin cans. Sometimes, the juice is bottled. Fully ripe tomatoes canned by recommended procedures retain much of the vitamin C. A recent study (32) shows that home canned tomatoes retain good quality during storage. In 1 year color and odor were not impaired; texture deteriorated gradually. Flavor was stable through 8 months' storage and affected only a little by the end of a year.

* Home gardens yield about a bushel of tomatoes during the season for every 9 or 10 tomato plants—enough for 15 to 20 quarts of tomatoes or juice.

Home vs. commercially canned tomatoes

In a study comparing home and commercially canned tomatoes, high-grade commercially canned tomatoes—put up at the peak of the season—tended to score higher for flavor and uniformity. Home canned tomatoes rated higher for solids content and percent of whole tomatoes. Underripe tomatoes caused lower flavor scores in some home canned products; in others, lower scores were due to overcrowding (33).

This same study shows that when tomatoes cost 50 to 60 cents per bushel, the money cost for raw tomatoes, salt, jars, fuel, processing equipment, and spoilage averaged 5.3 cents per quart . . . time spent per quart averaged 11.4 minutes.

Vitamin C values in home and commercially canned tomatoes depend largely on the vitamin C content of the raw tomatoes and on the canning methods. Vitamin C is affected also by the type of container.

One study shows that with commercial containers, the most vitamin C was retained in tomato juice in plain tin cans, in jars or bottles with plain tin vacuum seal caps, or in bottles with crown caps and tin foil facing. With home canning type glass jars, those with metal lids, or with minimum headspace to hold entrapped air, gave best results. With recommended types of containers and approved canning methods, there was little difference between home and commercially canned tomato juice in retention of vitamin C (34).
**Questions from homemakers**

**Question:** Do tomatoes form acid in the body?

**Answer:** Tomatoes are acid as eaten but in the processes of digestion and metabolism in the body, they ultimately have an alkaline reaction.

**Question:** Is it safe to leave tomatoes in the tin can after opening?

**Answer:** Yes, if they are kept cold and covered. A slight metallic flavor may develop but it is harmless.

**Question:** Is tomato juice spoiled when it separates?

**Answer:** No. Just before using, the jar should be shaken or the contents stirred vigorously.

**Question:** Why do home-canned tomatoes sometimes float in the jar?

**Answer:** The pack may be too loose, or air in the tissues of the tomatoes has not all been forced out during heating and processing.

**Question:** Is it safe to cook tomatoes and heat them for canning in aluminum containers?

**Answer:** Yes. There is no evidence that the small amount of aluminum dissolved by tomatoes heated in aluminum pans is harmful.

**References on tomato recipes**

Recipes listed below are taken from the following U. S. Department of Agriculture publications: Family Fare. Food Management and Recipes (28); Money-saving Main Dishes (29); Tomatoes on Your Table (30).

**SALADS**

Jellied tomato salad (30), p. 10.
Tomato salad suggestions (30), p. 11.

**SAUCES**

Spanish sauce (30), p. 12.

**SOUPS**

Clear tomato soup (30), p. 12.

**MAIN DISHES**

Baked chili beans and hamburger (29), p. 33.
Beef, tomato, and cabbage scallop (30), p. 7.
Chicken creole (30), p. 7.
Curry of meat with green tomatoes (30), p. 5.
Eggs creole (28), p. 49.
Fish-tomato stew (30), p. 7.
Puffy Spanish omelet (29), p. 28.
Savory bean stew (29), p. 35.
Spanish liver (30), p. 6.
Spanish steak (29), p. 12.
Swiss steak (29), p. 12.
Tomato rabbit (28), p. 50.

**COOKED—AS VEGETABLE**

Baked tomatoes (28), p. 61.
Broiled tomatoes (30), p. 4.
Fried tomatoes (30), p. 3.
Savory rice with tomatoes (30), p. 9.
Scalloped tomatoes (30), p. 4.
Spanish snap beans (28), p. 58.
Stewed tomatoes (30), p. 3.

**JUICE**

Tomato juice cocktail (30), p. 11.

**RELISHES**

Catsup (30), p. 17.
Chili sauce (30), p. 18.
Green tomato relish (30), p. 17.
Uncooked green tomato chow chow (30), p. 16.
Uncooked ripe tomato relish (30), p. 16.

**MARMALADES, DESSERTS**

Green tomato marmalade (30), p. 15.
Green tomato mincemeat (30), p. 18.
Green tomato pie (30), p. 20.
Tomato-apple butter (30), p. 15.
Yellow tomato preserves (30), p. 16.
References Cited

Origin


Quantities used


Nutritive value


Market information


Selection


Use in family meals


Home canning


Other Sources of Information

Digests on tomatoes


U. S. Government sources of marketing information

DEPARTMENT OF AGRICULTURE

Bureau of Agricultural Economics

The Agricultural Situation, issued monthly.
The Marketing and Transportation Situation, issued monthly.
The National Food Situation, issued quarterly.

For others, see list and description of publications in "Agricultural Economic and Statistical Publications." Write Information Branch, Bureau of Agricultural Economics, United States Department of Agriculture, Washington 25, D. C.

Production and Marketing Administration

Marketing Activities, issued from Washington monthly.
Plentiful Foods reports, issued from the regional offices.

For others, see list and description of reports issued both from Washington and from the field offices in "Periodic Market Reports." Write Information Branch, Production and Marketing Administration, United States Department of Agriculture, Washington 25, D. C.

DEPARTMENT OF LABOR

Bureau of Labor Statistics

Retail Prices and Consumer Price Index, issued monthly.
Retail Food Prices, issued monthly.

Write Information Branch, United States Department of Labor, Washington 25, D. C.

DEPARTMENT OF COMMERCE

Facts for Industry Publications on Foods.
Industry and State Pamphlets on Foods.

Lists of pamphlets available from Information Branch, United States Department of Commerce, Washington 25, D. C.
Materials for Use With Consumer Groups

Canning Fruits and Tomatoes. 35 mm. slide film No. C80, 49 frames, double. June 1945. Part 2 shows how to can tomatoes according to methods recommended by Bureau of Human Nutrition and Home Economics. Available through State Extension Service or may be purchased from Photo Lab., Inc., 3325 Georgia Ave. NW, Washington 11, D. C., for $1.

