

# GARLIC

## Safe Methods to Store, Preserve, and Enjoy

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### WHAT IS GARLIC?

Garlic (*Allium sativum*) is a member of the Amaryllis family (Amaryllidaceae), which also includes leeks, onions, and shallots. It is a perennial with an underground bulb (head) composed of pungent bulblets commonly called cloves.

Approximately 90 percent of the garlic grown in the United States is grown in California. California Early and California Late are the two major commercial varieties. California Early has white skins and is planted in November for harvest in June. California Late has light purple skins and is planted in December for harvest in July and August. The largest garlic variety, Elephant Garlic, has a very mild-flavored clove and is a close relative of the leek.

The pungent flavor of garlic is caused by a chemical reaction that occurs when the garlic cells are broken. The flavor is most intense shortly after cutting or chopping. This chemical reaction cannot occur after garlic is cooked, which is why roasted garlic is sweet rather than pungent.

### BOTULISM WARNING

Regardless of its flavor potency, garlic is a low-acid vegetable. The pH of a clove of garlic typically ranges from 5.3 to 6.3. As with all low-acid vegetables, garlic will support the growth and subsequent toxin production of the bacterium *Clostridium botulinum* when given the right conditions. These conditions include improper home canning and improper preparation and storage of fresh herb and garlic-in-oil mixtures. Moisture, room temperature, lack of oxygen, and low-acid conditions all favor the growth of *Clostridium botulinum*. When growing, this bacterium produces an extremely potent toxin that causes the illness botulism. If untreated, death can result within a few days of consuming the toxic food. It is important to follow the directions in this publication carefully to make sure your preserved garlic is safe.

### BUYING GARLIC

Select garlic heads that are firm and tight-skinned.

### HARVESTING GARLIC

If you grow your own garlic, it is important to let it mature after harvest. Spread the harvested garlic heads or bulbs on newspapers or wire racks out of direct sunlight in a well-ventilated place to cure for 2 to 3 weeks or until skins are papery.

### STORING GARLIC

Commercially, garlic is stored near 32°F (0°C). However, most home refrigerators are too warm for ideal long-term storage of garlic. Instead, store it in a cool, dry, well-ventilated place in well-ventilated containers such as mesh bags. Storage life is 3 to 5 months under cool (60°F/16°C), dry, dark conditions.

### PEELING GARLIC CLOVES

Peeling whole cloves requires that the papery skin be removed without cutting into the clove. If the garlic is going to be chopped or sliced, the skin can be removed by pressing the clove with the flat side of a knife until the clove and skin crack. The skin can then be easily removed.

### ROASTING GARLIC

Roasted garlic, which has become popular in recent years, is sweet to the taste and is delicious on bread or crackers as an appetizer or served as a vegetable side dish. To prepare roasted garlic, leave the head whole and cut off the tip of the head, exposing the cloves. Allow one-half to one head per person. Put the head (or heads) in a baking dish or wrap them in aluminum foil, sprinkle with olive oil or pat with butter, and season with a little salt and pepper and some fresh or dried thyme if desired. Bake at 350°F (176°C) until very soft and tender (about 45 minutes to 1 hour). The roasted garlic cloves can be easily squeezed from their skins and spread with a knife.

## FREEZING GARLIC

Garlic can be frozen in a number of ways.

1. Chop the garlic, wrap it tightly in a plastic freezer bag or in plastic wrap, and freeze. To use, grate or break off the amount needed.

2. Freeze the garlic unpeeled and remove cloves as needed.

3. Peel the cloves and puree them with oil in a blender or food processor using 2 parts oil to 1 part garlic. The puree will stay soft enough in the freezer to scrape out parts to use in sautéing. Freeze this mixture immediately—**do not store it at room temperature**. The combination of the low-acid garlic, the exclusion of air (by mixing with oil), and room-temperature storage can support the growth of *Clostridium botulinum*.

## DRYING GARLIC

Dry only fresh, firm garlic cloves with no bruises. To prepare, separate and peel the cloves. Cut in half lengthwise. No additional predrying treatment is necessary. Dry at 140°F (60°C) for 2 hours, then reduce heat to 130°F (54°C) until completely dry or crisp.

If desired, garlic salt may be made from dried garlic. Powder dried garlic by processing in a blender or food processor until fine. Add 4 parts salt to 1 part garlic powder and blend 1 to 2 seconds. If blended longer, the salt will become too fine and cake together in clumps.

## CANNING GARLIC

Canning of garlic is not recommended. Garlic is a low-acid vegetable that requires a pressure canner to be properly processed. Garlic loses most of its flavor when heated in this way. For this reason, adequate processing times have not been determined for canning garlic.

## STORING GARLIC IN WINE OR VINEGAR

Peeled cloves may be submerged in wine or vinegar and stored in the refrigerator. A dry white or red wine is suggested; white or wine vinegars also work well. The garlic/liquid mixture should keep for about 4 months in the refrigerator. Discard both the cloves and the liquid if there are signs of mold or yeast growth on the surface of

the wine or vinegar. The garlic-flavored liquid and the garlic cloves may be used to flavor dishes. Do not store the garlic/liquid mixture at room temperature because it will rapidly develop mold growth.

## STORING GARLIC IN OIL

Extreme care must be taken when preparing flavored oils with garlic or when storing garlic in oil. Peeled garlic cloves may be submerged in oil and stored in the freezer for several months. **Do not store garlic in oil at room temperature**. Garlic-in-oil mixtures stored at room temperature provide perfect conditions for producing botulism toxin (low acidity, no free oxygen in the oil, and warm temperatures). The same hazard exists for roasted garlic stored in oil. At least three outbreaks of botulism associated with garlic-in-oil mixtures have been reported in North America.

By law, commercially prepared garlic in oil has been prepared using strict guidelines and must contain citric or phosphoric acid to increase the acidity. Unfortunately, there is no easy or reliable method to acidify garlic in the home. Acidifying garlic in vinegar is a lengthy and highly variable process; a whole clove of garlic covered with vinegar can take from 3 days to more than 1 week to sufficiently acidify. As an alternative, properly prepared dried garlic cloves may be safely added to flavor oils.

**Question:** Why did my garlic turn blue?

**Answer:** Garlic contains anthocyanins, water-soluble pigments that can turn blue or purple under acidic conditions. This is a variable phenomenon that is more pronounced for immature garlic but can differ among cloves within a single head of garlic. If you grow your own garlic, be sure to mature it at room temperature for a couple of weeks before using it.

**Note:** Research on food preservation is ongoing—recommendations may change. Make sure your food preservation information is always current. Always follow up-to-date, tested guidelines and recipes from reliable sources.

Special thanks to Lora Tanumihardja for her assistance in collecting materials. The Department of Food Science Home Page can be found at <http://www-foodsci.ucdavis.edu/>. Portions of this publication were adapted from *Food Safety Advisor 1995 Volunteer Handbook* by Virginia Hiller (Pullman: Washington State University, 1995). The University of California, in accordance with applicable Federal and State law and University policy, does not discriminate on the basis of race, color, national origin, religion, sex, disability, age, medical condition (cancer-related), ancestry, marital status, citizenship, sexual orientation, or status as a Vietnam-era veteran or special disabled veteran. The University also prohibits sexual harassment. Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action Director, University of California, Agriculture and Natural Resources, 300 Lakeside Drive, 6th Floor, Oakland, CA 94612-3560 (510) 987-0096.