Canning Foods at Home: General Guidelines

Mohak Koirala
Graduate Research Assistant

Dr. Sujan Acharya
Assistant Professor of Food Science

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What is Canning?

Canning is a method of food preservation in which items are placed in mason jars and heated to a preset temperature for a set amount of time. The procedure uses heat to kill microorganisms that cause food spoilage and to inactivate enzymes in foods, preventing the food from changing color when stored for an extended period. The approach is adaptable to both high and low-acid foods.

Before canning

Gathering produce early, while it is at its best quality, is the best practice for canning. Avoid overripe products. To prevent bacteria from growing during the canning process, the items must be washed thoroughly. To minimize flavor and nutrient loss, avoid soaking the food.

The enzymes present in the food may continue to function after the fruit or vegetable is picked, thereby altering its color, texture, flavor and nutritional value. Adding 3 grams of ascorbic acid to 1 gallon of holding water reduces color changes. Enzymes are inactivated when heated between 170 and 190°F (77 and 88°C). Heat-process foods as soon as possible after they have been prepared for canning to inactivate enzymes.

Mason jars are better suited to canning than single-use jars because they can withstand higher temperatures; however, they should not be used in ovens, as the dry heat can crack and shatter them.

Canning Methods

Boiling water method: This is the most widely used method for fruits, tomatoes and pickles, as well as jams, jellies and other fruit preserves. Jars of food are heated while covered with boiling water (212°F [100°C] at sea level).

Pressure canning method: This is widely used for vegetables, meats, poultry and seafood. Jars of food are placed in 2 to 3 inches of water in a pressure canner, which is heated to a temperature of at least 240°F (116°C), a temperature only reachable in a pressure canner.

Low and High-Acid Foods

Low-acid foods: Low-acid foods lack the acidity required to stop the growth of bacteria and spores that can withstand boiling water. *Clostridium botulinum,* which causes botulism (food poisoning), is the primary problem, as it thrives in the absence of air, in the presence of moisture, at low acidity and at room temperature. Spores of microorganisms may survive a water bath but are destroyed in a pressure canner where the temperature reaches 240°F (116°C) or higher.

High-acid foods: Most fruits are naturally acidic. Tomatoes, on the other hand, are on the border between high and low acidity, necessitating the addition of bottled lemon juice, citric acid or vinegar (5% acidity) for safe processing. Fermented foods and foods with a substantial amount of vinegar are also classified as high-acid foods. Foods with high acidity can be safely prepared in boiling water or atmospheric steam.

Low and High-Acid Foods

Low-Acid Foods	**High-Acid Foods**
Pressure Canning	Boiling Water bath canning or Atmospheric steam canning
Most Vegetables	**Most Fruits**
Asparagus	Apples and applesauce
Beets	Apricots
Carrots	Berries
Green and dried beans	Cherries
Okra	Grapes
Peas	Jams and jellies (fruit only)
Peppers	Pears
Pumpkin cubes (pumpkin puree cannot be safely canned at home)	Pie fillings (fruit only)
Sweet corn	Plums
Meats	**Acidified and Fermented Foods**
Beef and Poultry	Chutneys
Mincemeat pie filling	Pickled vegetables
Seafood	Pickles (cucumbers)
Wild game	Relishes
Combination foods	Salsa
Meat sauces	Sauerkraut
Soups and stews	Tomatoes (acidified)

Raw Packing and Hot Packing

Raw packing is the process of filling jars with freshly prepared but unheated foods. It's more suited for vegetables processed in a pressure canner.

Hot packing is heating fresh food to boiling, simmering it for 2-5 minutes and promptly filling jars loosely with the food. It's more suited for a boiling-water canner. Both the color and flavor of hot-packed foods are superior to those of raw-packed foods.

General canning guidelines

- Only use tested recipes from university Extension websites containing research-based recipes. Do not use recipes from before 1994, as they may not have adequate processing times or pressure for safety.
- Preheat mason jars in the dishwasher or simmering water before filling them.
- Too much headspace (the space between the food and the lid) results in a reduced vacuum and a weak seal, whereas too little leads to siphoning or to the lid breaking due to excessive pressure beneath it.

Headspace	Food product
¼ inch	Juices, jams and jellies
½ inch	Fruits, tomatoes and pickles
1 to 1½ inch	Meat and vegetables

- Remove air bubbles with a plastic utensil.
- Wipe the edge of the jar with a damp paper towel or cloth to provide a clean sealing surface.
- Use two-piece lids (a new flat disk and a screw band) and tighten them fingertip-tight.
- Use a jar lifter to place jars into the canner and avoid tilting the jars during removal.
- Process by boiling-water bath, atmospheric steam canning or pressure canning.
- Adjust process times or pressure for altitudes 1,001 feet or more above sea level. Boil an additional minute for every 1000 feet of additional altitude. (See table on page 6)
- After processing, set jars at least 2 inches apart to cool on a wooden cutting board or towel-lined surface.
- Don't retighten bands or turn jars upside down.

Boiling Water Bath Procedures

- Follow the general canning guidelines.
- Fill the canner with water until half full.
- Preheat water to 140°F (60°C) for raw-packed foods and 180°F (82°C) for hot-packed foods.
- Place jars on a rack in the canner.
- If necessary, add more hot water to cover the jars by at least 1 inch.
- Place the lid on the canner and keep it covered during processing.
- Turn the heat to the highest position until the water boils vigorously; then lower it to maintain a gentle boil while processing.
- Add more boiling water during the process if needed to cover the jars with at least 1 inch of water.
- If water stops boiling at any time during the process, return to a boil and redo the process.
- After processing for the specified time, turn off the heat and burner, remove the lid and allow the jars to rest in the canner for 5 minutes before removing them to reduce liquid loss.

Atmospheric Steam Canning Procedures

- Follow the general canning guidelines.
- Fill the base of the canner with the amount of water indicated in the canner's instruction manual (usually 2 quarts).
- Set the rack in the base of the canner.
- Heat water in the base of the canner to 140°F (60°C) for raw-packed foods and 180°F (82°C) for hot-packed foods.
- Place jars on a rack in the canner.
- Place the lid on the canner and keep it covered during processing.
- Bring to a boil over medium to medium-high heat until a steady column of steam at least 6 inches long escapes from the vent hole(s).
- Start the processing time.
- Slowly adjust the heat to maintain a steady column of steam.
- After processing, turn off the heat and allow the jars to rest in the canner for 5 minutes before removing them to prevent liquid loss.

Pressure Canning Procedures

- Follow the general canning guidelines.
- Put 2 to 3 inches of water in the bottom of the pressure canner.
- Place filled jars on a rack at the bottom of the canner.
- Heat to a boil to exhaust steam from the canner for 10 minutes before adding the weight or closing the petcock (a small valve used to release pressure).
- Add a weight or pressure regulator.
- Allow the pressure to rise while adjusting the heat to retain the level specified in the tested recipe. If pressure falls below the required level at any point during processing, reset the timer and repeat the process.
- After processing, remove the canner from the heat and let it cool naturally to 0 pounds of pressure. Wait two minutes before removing the weighted gauge or pressure regulator. Wait ten more minutes before removing the lid to minimize liquid loss from the jar.
- Pressure canner dial gauges should be tested for accuracy each year. The local Extension office can determine testing locations and times at no charge.

Important Tips

Process adjustment for higher altitudes

Processing times for home canning are not the same for everyone. Water boils at a lower temperature as altitude increases, which reduces the effectiveness of heat in destroying microorganisms. Increasing processing time or canner pressure compensates for a lower boiling temperature.

The boiling temperature of water decreases gradually as altitude increases:

Altitude	**Temperature**
Sea level	212°F (100°C)
2,000 ft > sea level	208°F (98°C)
4,000 ft > sea level	204°F (96°C)
6,000 ft > sea level	201°F (94°C)
8,000 ft > sea level	197°F (92°C)
10,000 ft > sea level	194°F (90°C)

Other Factors Affecting Processing Time

Processing time also depends on other factors, including:

- The type of food being canned
- Pack style (raw pack or hot pack)
- Jar size
- Canning method used

Even when canning the same food, changes in any of these factors require different processing times. The example below illustrates how processing times for peaches vary based on pack style, jar size and altitude when using a boiling water canner.

Peaches in a Boiling Water Canner					
Style of Pack	**Jar Size**	**Process times (min) at altitudes of:**			
		0-1000 ft	1,001-3,000 ft	3,001-6,000 ft	Above 6,000 ft
Hot	Pint	20	25	30	35
	Quart	25	30	35	40
Raw	Pint	25	30	35	40
	Quart	30	35	40	45

After Canning

Testing the vacuum seal:

- Allow jars to cool for 12 to 24 hours.
- Press the center of the lid to see if it flexes (is concave).
- If the center does not flex up and down and the lid cannot be lifted off after the band has been removed, the lid has a proper vacuum seal.

Storing Canned Goods:

- Remove screw bands from jars and wash jars before storing.
- Label with contents, date, and lot number for higher-volume canning.
- Store in a cool, dry place: 50 to 70°F (10 to 21°C).
- Store in a dark place or boxes if cupboards are not available.

Food Spoilage:

Inadequate processing times or temperatures needed to destroy or control microorganisms cause food spoilage in canning.

- If the product is not properly prepared or the lid seal breaks during storage, fuzzy clumps of mold may form inside the jar.
- Yeast reacts with sugar, which can cause slime, scum, murkiness or gas bubbles.
- Bacteria can cause a variety of damage, with or without visible evidence.
- Thus, if in doubt, toss the food out.

References

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Mr. Mohak Koirala, Graduate Research Assistant
Dr. Sujan Acharya, Assistant Professor of Food Science

LINCOLN UNIVERSITY
MISSOURI

College of Agriculture,
Environmental and Human Sciences

For More information:
820 Chestnut Street | Jefferson City, MO 65101
573-681-5212 | AcharyaS@LincolnU.edu