

## Canning Vegetables

Fact Sheet 9.348

Food and Nutrition Series | Food Safety

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Preserving food at home can be a rewarding experience that provides year-round access to seasonal produce. Using tested recipes, following preparation instructions, making necessary high elevation processing adjustments, and maintaining equipment are all important for insuring the safety and quality of home preserved foods.

With renewed interest in locally-grown foods, home gardening, and food preservation, it's important to protect yourself and your family by following safe canning methods.

- Home canned vegetables, which are low-acid foods, must be processed in a pressure canner to supply sufficient heat (240° F) to destroy botulism-causing bacteria. Failure to properly process low-acid foods in a pressure canner can allow the survival of Clostridium botulinum spores and subsequently toxin that can cause severe illness or death.
- Always use tested recipes/instructions and process at the number of pounds and specified time for your elevation.
- Do not take short cuts in recommended preparation or processing procedures!

### *Equipment and Jars*

- Pressure canner. Make sure your pressure canner has a tight-fitting cover, a removable rack, clean exhaust vent (or petcock) and safety valve, and an accurate pressure gauge. Replace a cracked or worn gasket to prevent water leakage and pressure loss.
  - The intense heat of pressure canning can cause the gasket to shrink over time, allowing air and steam to escape under the lid.
- Use a pressure canner that holds at least 4 quart jars.
- Electric multi-cookers and smaller stovetop pressure cookers should NOT be used for home food preservation because they cannot ensure adequate temperature and heat penetration within the jars.

Pressure canners can have one of two types of gauges:

- Weighted gauge- an instrument that is used to both indicate and regulate pressure. The weight should 'jiggle' several times a minute and/or keep rocking gently to maintain the desired processing pressure.
  - Weighted gauges should be cleaned before each use.
- Dial gauge- an instrument designed to indicate the pressure within the canner.
  - Dial gauges should be checked annually for accuracy which is best done in advance of canning season each year. Contact your local Extension office for more information about dial gauge testing.



### Quick Facts

- All instructions in this fact sheet refer to the use of a pressure canner which is designed to reach and maintain 240° F and destroy the botulism toxin.
- Always use a tested recipe for home canned vegetables and make the necessary pressure adjustment for high elevation. At varying elevations, the processing time stays the same, but adjustment to the pounds of pressure is required.
- To ensure safety, use standard canning jars, new canning lids and maintain your canning equipment.
- Use the free Preserve Smart app/website for 24/7 access to tested home food preservation recipes and instructions for over 55 fruits and vegetables!



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Canning Jars. Discard any jars with cracks or chips since defects can prevent an airtight seal.

- Use jars designed specifically for home canning.
  - Do not use jars that are cracked or have any sort of damage (i.e. chipped) on the top edge.
- When canning vegetables, use only pint and quart jars, and then only the size recommended within the tested recipe.
  - Do not use commercial food jars (mayonnaise, pasta sauce, etc.) as they are not heat-tempered and can break easily and/or not seal properly when pressure canned.
- Wash jars in hot, soapy water and rinse well before using. Keep the jars hot until they are filled and placed in the canner to help prevent jar breakage.

Lids and Screw Bands (two-piece set). Discard any screw bands with dents or rust, since defects can prevent an airtight seal.

- Prepare new/unused flat metal lids as directed by the manufacturer.
  - Lids are designed for single-use, and should NOT be used for home canning more than once!
- Screw bands can be cleaned and used multiple times. Store carefully to prevent rusting or denting.

NOTE: One-piece home canning lids have not been researched for safe home food preservation, and are therefore not recommended.

#### Other Useful Canning Tools:

- Air bubble remover, plastic knife, or non-metallic spatula- used to release air bubbles from within the jar
- Canning funnel- funnel made from metal or food-grade plastic with wide, short neck for filling jars
- Headspace ruler- special graduated utensil or plastic ruler for measuring required space at the top of a filled jar
- Jar lifter- used to safely move jars to and from hot water during the canning process
- Magnetic lid wand- helps transfer metal lids to top of jars and prevent contamination
- Timer- necessary for critical timed steps throughout the canning process

## *Prepare Vegetables*

- Select fresh, ripe vegetables for canning. The sooner from harvest to jar, the better.
- Handle produce gently to avoid bruising.
- Wash all vegetables thoroughly.
  - Avoid soaking vegetables as it may cause loss of flavor and nutrients.
- Prepare as specified in a tested recipe (size of pieces, peeled, etc.). See individual directions in Table 1.

## *Fill Jars*

There are two approved packing methods available for safely canning vegetables. Depending on the method used, both the vegetable preparation and the approved jar size for that method need to be noted before beginning the canning process. ( For example, some vegetables cannot be safely canned in quart jars.)

- The hot-pack method is preferred for all low-acid foods, including vegetables.
  - Heat prepared vegetables in water or steam as directed by recipe before packing.
  - Loosely pack jars with prepared vegetables and cover with the boiling cooking liquid or water.
- Some vegetables can be safely processed using the raw-pack method if indicated by a tested recipe. (See individual vegetable canning directions in Table 1 to determine which method to use.)
  - Add prepared, raw vegetables to jars and cover with boiling water.
    - Firmly pack most raw vegetables (except starchy ones) into the jars.
    - Loosely pack starchy vegetables, such as corn, peas, and lima beans, because they expand during processing.

#### For both hot- and raw-pack:

- Salt may be added to each jar, if desired. Salt is added only for seasoning and does not help preserve the food. If salt is used, canning salt is recommended to prevent the liquid from turning cloudy. Use 1/2 tsp salt per pint/1 tsp per quart jar.



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- Remove trapped air bubbles by inserting a plastic knife or non-metallic bubble remover between the food and the jar. Slowly turn the jar and move the tool up and down to allow air bubbles to escape.
- Read the directions for each vegetable for the amount of space to leave between the top of the food and the top of the jar (headspace).
  - This headspace is important to obtain a good seal and allow for expansion of the jar contents.
  - Measure headspace and add or remove liquid, as necessary.
- Wipe the jar rim with a clean damp paper towel to remove any food particles.
- Place prepared lid on the jar. Screw on the band until fingertip tight. Avoid over-tightening!
  - It is necessary for air inside the jars to be forced out from under the lids during the canning process, creating a vacuum and a proper seal.
- Regulate heat under the canner to maintain a steady pressure at or slightly above the correct gauge pressure.
  - Avoid quick and large pressure variations during processing which can cause unnecessary liquid losses from jars.
  - Weighted gauges should jiggle or rock slowly throughout the canning process.
- When the timed canning process is complete, turn off the heat, carefully remove the canner from the heat if possible, and let the canner depressurize undisturbed. For safety, follow manufacturer's guidelines.
  - Do not force-cool the canner by pouring cold water over it or manually quick-releasing steam. Forced cooling can result in breakage of the jars and/or failed seals.
- After the canner is depressurized (when the pressure gauge registers zero or the weighted gauge is no longer moving), cautiously remove the weight from the vent pipe or open the petcock.
  - Wait 10 minutes; then unfasten the lid and tilt away from you so that steam does not burn your face.

## *Process in Pressure Canner*

Read the manufacturer's instructions for your pressure canner. General directions for using pressure canners are as follows:

- Add 2 to 3 inches of hot water to the canner. Keeping filled jars level, place in the canner on the rack using a jar lifter.
- Lock canner lid into place. Leave vent pipe (steam vent) uncovered, or manually open the petcock on some older models.
- Heat canner on high until water boils and generates steam that can be seen escaping through the open vent pipe or petcock. Set a timer for 10 minutes to allow the canner to continuously vent steam during this time.
- After the 10 minutes is complete, place the weight on the vent port or close the petcock. The canner will pressurize in the next 3 to 10 minutes.
- Wait to start timing the canning process (per instructions in the recipe) until the pressure reading on the dial gauge indicates the recommended pressure has been reached, or when the weighted gauge begins to jiggle or rock.

## *Post-Canning*

- Using a jar lifter and keeping the jars level, carefully remove each jar from canner and place a few inches apart on a rack, dry towels, or newspapers. Allow jars to cool untouched, away from drafts, for a minimum of 12 but not more than 24 hours before testing seals.
  - Do not remove or re-tighten bands.
- After 12 to 24 hours, test the seals on the jar lids. Press flat metal lids at the center of the lid. Lids should be slightly concave and not move when pressed. Lids should not be buckled or damaged.

**VERY IMPORTANT:** Treat any jars that failed to seal as perishable (not shelf-stable).

- The food should either be eaten immediately, refrigerated, frozen or reprocessed.
- The processed food can safely be reprocessed if the unsealed jar is discovered within 24 hours.
  - You must repeat the entire canning process, using a new lid to ensure a safe product.
  - Be sure to check top edge of jars for nicks or cracks and replace, if necessary.



- If jars are satisfactorily sealed, remove screw bands and wipe jars with a clean, damp cloth.
  - Jars may be safely stored without bands.
  - To store with screw bands on and to avoid rusting during storage, remove, dry and re-attach bands on jars before storing.
- Label sealed jars with contents, canning method, and date.
- Store on sturdy shelving in a clean, cool, dry, dark place.

## *On Guard Against Foodborne Illness*

Canned foods may spoil if you:

- Fail to use and follow a tested recipe/instructions
- Fail to use the proper equipment and supplies
- Fail to adhere to the proper processing time for a specific altitude/elevation
- Fail to exhaust a canner properly
- Process at lower pressure or for fewer minutes than a tested recipe specifies
- Force-cool the canner with water

Low-acid canned vegetables can contain botulism toxin without showing signs of spoilage:

- Bulging lids or leaking jars are spoilage signs for home canned foods.
- When opening a jar, look for other signs, such as spurting liquid, an off odor, or mold.
- If food looks spoiled, foams, or has an off odor during heating, discard it.

Given the challenges of high elevation food preservation and as an additional safety precaution, boil in a saucepan for 10 minutes all home-canned, low-acid vegetables and meats before tasting or serving.

- Cook 1 additional minute for each 1,000 feet above sea level (for example, boil 15 minutes at 5,000 feet).

**DISPOSE OF ALL SPOILED HOME-CANNED FOOD WHERE IT WILL NOT BE EATEN BY PEOPLE, PETS OR WILDLIFE.**

## **Table 1: Preparation methods and processing times for canning in a pressure canner**

**IMPORTANT:** Using a boiling water bath canner is NOT a safe method for home processing of low-acid vegetables.

- All instructions in this fact sheet refer to the use of a pressure canner which is designed to reach and maintain 240° F and destroy botulinum spores.

### Critical Processing Adjustments for High Altitude/Elevation Home Canning:

- The processing times and pressures given in the table below are those recommended by the U.S. Department of Agriculture.
- **DO NOT DECREASE** the processing times or pressures given!
  - At varying elevations, the processing TIME stays the same, but you must make the following PRESSURE adjustments:

### **In a Dial Gauge Pressure Canner**

- At elevations of 0-2000 feet, process at **11 pounds pressure**
- At elevations of 2001-4000 feet, process at **12 pounds pressure**
- At elevations of 4001-6000 feet, process at **13 pounds pressure**
- At elevations of 6001-8000 feet, process at **14 pounds pressure**
- At elevations of 8001-10,000 feet, process at **15 pounds pressure**

### **In a Weighted Gauge Pressure Canner**

- At elevations of 0-1000 feet, process at **10 pounds pressure**
- At elevations 1001 feet and above, process at **15 pounds pressure**



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**Table 1: Preparation methods and processing times for canning in a pressure canner (cont.)**

Vegetable	Preparation and Packing	Processing Time (min.)	
		Pints	Quarts
Asparagus, spears or pieces	Use tender, tight-tipped spears, 4-6 inches long. Wash and trim off tough scales. Break off tough stems and wash again. Cut in 1-inch pieces or can whole.		
	<u>Raw Pack</u> — Fill jars with raw asparagus. Pack as tightly as possible, without crushing, to 1 inch of jar tops. Add boiling water, leaving 1-inch headspace.	30	40
	<u>Hot Pack</u> — In a saucepan, cover asparagus with boiling water. Boil 2 or 3 minutes. Loosely fill jars with hot asparagus to 1 inch of jar tops. Add boiling water, leaving 1-inch headspace.	30	40
Beans or peas, dry (all varieties)	Sort and wash dry seeds. Cover with cold water and let stand 12-18 hours in the refrigerator. Rinse with fresh water and drain.		
	<u>Hot Pack Only</u> — In a saucepan, cover soaked beans with fresh water and boil 30 minutes. Fill jars with beans or peas and cooking water, leaving 1-inch headspace.	75	90
Beans, fresh lima, butter or shell beans	Can only young, tender beans. Shell beans and wash thoroughly.		
	<u>Raw Pack</u> — Pack raw beans loosely into jars. For small beans, fill 1 inch from top for pints and 1 1/2 inches for quarts. For large beans, fill 1 inch from top for pints and 1 1/4 inches for quarts. Do not press or shake down. Fill jars with boiling water, leaving 1-inch headspace.	40	50
	<u>Hot Pack</u> — In a saucepan, cover beans with boiling water, bring to a boil. Pack hot beans loosely in jars to 1 inch of jar tops. Cover with boiling water, leaving 1-inch headspace.	40	50
Beans, green, snap, wax, Italian; pieces	Wash; trim ends. Leave whole or cut or snap into 1-inch pieces.		
	<u>Raw Pack</u> — Pack beans tightly into jars to 1 inch of jar tops. Add boiling water, leaving 1-inch headspace.	20	25
	<u>Hot Pack</u> — In a saucepan, cover beans with boiling water; boil 5 minutes. Fill jars loosely to 1 inch of jar tops. Add boiling water, leaving 1-inch headspace.	20	25



Beets, whole, cubed or sliced	Sort for size. Cut off tops, leaving tap root and 1 inch of stem. Wash.		
	Hot Pack Only — In a saucepan, cover beets with boiling water. Boil until skins slip easily — 15-25 minutes, depending on size. Cool, remove skins, trim off stems and roots. Can baby beets whole. Cut medium and large beets in 1/2-inch slices or cubes, or halve or quarter. Fill jars with hot beets and fresh hot water, leaving 1-inch headspace.	30	35
Carrots, sliced or diced	Select small carrots, preferably less than 1 1/4" in diameter. Wash, peel and rinse. Slice or dice.		
	Raw Pack — Pack carrots tightly into jars to 1 inch of jar tops. Add boiling water, leaving 1-inch headspace.	25	30
	Hot Pack — In a saucepan, cover carrots with boiling water. Simmer 5 minutes. Fill jars to 1 inch of jar tops. Add hot cooking liquid, leaving 1-inch headspace.	25	30
Corn, cream-style	Husk corn, remove silk and wash. Blanch ears 4 minutes in boiling water. Cool in ice water. Cut corn from cob at about the center of kernel. Scrape cob.		
	Hot Pack — In a saucepan, for each quart of corn and scrapings, add 2 cups boiling water. Bring to a boil. Fill pint jars with hot corn mixture, leaving 1-inch headspace.	85	not recommended
Corn, whole-kernel	Husk corn, remove silk and wash. Blanch 3 minutes in boiling water. Cool in ice water. Cut from cob at about 3/4 depth of kernel. Do not scrape cob.		
	Raw Pack — Pack corn in jars, leaving 1-inch headspace. Do not shake or press down. Add fresh boiling water, leaving 1-inch headspace.	55	85
	Hot Pack — In a saucepan, for each quart of kernels add 1 cup hot water. Heat to boil and simmer 5 minutes. Fill jars with corn and cooking liquid, leaving 1-inch headspace.	55	85
Greens, including spinach	Sort and wash thoroughly. Cut tough stems and midribs.		
	Hot Pack Only — In a saucepan, steam greens, 1 lb. at a time, for 3-5 minutes or until wilted. Fill jars loosely with greens. Add fresh boiling water, leaving 1-inch headspace.	70	90
Mixed vegetables	Hot Pack Only — Select your favorite mixture of vegetables, except leafy greens, dried beans, cream-style corn, winter squash or sweet potatoes. Equal portions of carrots, whole kernel sweet corn, green beans, lima beans, tomatoes and diced zucchini make a good mix.) --Continued on next page--	75	90



Mixed Vegetables (Continued)	Prepare each vegetable as for canning and cut into desired sizes. In a saucepan, mix together, cover with boiling water and bring back to a boil. Boil 5 minutes. Pack hot vegetables into jars, leaving 1-inch headspace. Add 1/2 teaspoon salt to each pint jar, if desired. Fill jar to 1 inch from top with boiling liquid.		
Mushrooms, whole or sliced	Select only high quality, small to medium-size domestic mushrooms with short stems. <u>Do not can wild mushrooms.</u> Trim stems and discolored parts. Soak in cold water for 10 minutes to remove dirt. Wash in clean water. Leave small mushrooms whole; cut large ones.		
	<u>Hot Pack Only</u> — In a saucepan, cover mushrooms with water in a saucepan and boil 5 minutes. Fill jars with hot mushrooms, leaving 1-inch headspace. Add 1/8 teaspoon of ascorbic acid powder or a 500-milligram tablet of vitamin C to each jar to prevent discoloration. Add fresh hot water, leaving 1-inch headspace.	45	not recommended
Okra	<u>Hot Pack Only</u> – Wash and trim pods. Cut in 1 inch pieces or leave whole. In a saucepan, pre-cook okra for 2 minutes in boiling water. Drain. Pack into hot jars, leaving 1-inch headspace. If desired, add 1/2 teaspoon salt per pint. Fill to 1 inch from top with boiling water.	25	40
Peas, green or English; shelled	Select filled pods containing young, tender sweet seeds. Shell and wash peas.		
	<u>Raw Pack</u> — Fill jars with raw peas, add boiling water, leaving 1-inch headspace.	40	40
	<u>Hot Pack</u> — In a saucepan, cover peas with boiling water; boil 2 minutes. Fill jars loosely with hot peas. Add cooking liquid, leaving 1-inch headspace.	40	40
Peppers, hot or sweet	Select firm yellow, green or red peppers. Wash and drain. Small peppers may be left whole. Large peppers may be quartered. Remove cores and seeds. <u>Caution!</u> Wear plastic gloves while handling hot peppers or wash hands thoroughly with soap and water before touching face.		
	<u>Hot Pack Only</u> — Make 2-4 slits in each pepper. Blanch in boiling water or blister skins by placing peppers in hot oven (400 degrees F) or broiler for 6-8 minutes. Place blistered peppers in pan, cover with damp cloth. Let cool several minutes, then peel. Flatten whole peppers. Fill jars loosely with peppers to 1 inch of jar tops. Add boiling water, leaving 1-inch headspace.	35	not recommended
Potatoes, white; cubed or whole	Wash, pare. Leave whole if 1-2 inches in diameter or cut into 1/2-inch cubes. Dip potatoes into solution of 1/2 teaspoon ascorbic acid per quart of water to prevent darkening. Drain. --Continued on next page--		



Potatoes, white; cubed or whole (continued)	<u>Hot Pack Only</u> — Place potatoes in saucepan and cover with boiling water. Boil cut potatoes for 2 minutes, whole for 10 minutes. Drain. Fill jars with hot potatoes and fresh hot water, leaving 1-inch headspace.	35	40
Pumpkin and winter squash, cubed	Wash; remove seeds and pare. Cut into 1-inch cubes.		
	<u>Hot Pack Only</u> — In saucepan, cover with boiling water. Boil 2 minutes. <u>Do not mash or puree</u> . Fill jars with cubes and cooking liquid, leaving 1-inch headspace.	55	90
Sweet potatoes, pieces or whole	Choose small to medium-sized potatoes. Wash well.		
	<u>Hot Pack Only</u> — In a saucepan, boil or steam until partially soft (15-20 minutes). Remove skins. Cut medium potatoes to uniform pieces. Do not mash or puree. Fill jars, leaving 1-inch headspace. Cover with fresh boiling water or syrup, leaving 1-inch headspace.	65	90
Tomatoes	See CSU Extension Fact Sheet <a href="#">9.341 Canning Tomatoes and Tomato Products</a> .		
Vegetable Soup	<u>Hot Pack Only</u> – Choose your favorite vegetable ingredients. Prepare each as you would for a hot pack in canning. Cooked meat or poultry can also be added, if desired. In a saucepan, combine ingredients with hot water, broth, or tomatoes and juice to cover. Boil 5 minutes. If dried beans or peas are used, they <b>MUST</b> be rehydrated first. <b>CAUTION: DO NOT THICKEN OR ADD MILK, CREAM, FLOUR, RICE, BARLEY OR OTHER GRAINS, NOODLES OR OTHER PASTA.</b> These ingredients can slow down the rate of heating and these process times have not been tested for use with soups containing these ingredients. Add salt to taste, if desired. Fill jars halfway with solid mixture. Continue filling with hot liquid, leaving 1-inch headspace.	60	75
	Note: Cooked seafood can also be added. If it is, additional processing time will be needed.	100	100

## Resources

- USDA Complete Guide to Home Canning. U.S. Department of Agriculture. Information Bulletin No. 539, 2009
- So Easy To Preserve, 6th Edition, 2014. University of Georgia Cooperative Extension
- [National Center for Home Food Preservation website](#)
- Colorado State University [Preserve Smart app/website](#)
- Botulism. CSU Extension <https://extension.colostate.edu/topic-areas/nutrition-food-safety-health/botulism-9-305/>

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