

# Canning Vegetables

FOOD PRESERVATION HOME STUDIES SERIES • HS0006E



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 EXTENSION



# Canning Vegetables

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## INTRODUCTION

When you can vegetables at home, it is extremely important to do it safely. Vegetables are low-acid foods (pH above 4.6), susceptible to the growth of harmful bacteria unless they are processed correctly in a pressure canner. No shortcuts or variations are allowed! You must follow the procedures exactly. For more information, refer to Extension publication PNW0172, *Canning Vegetables*.

## TERMS YOU SHOULD KNOW

**LOW-ACID FOODS**—have a pH above 4.6. These include vegetables as well as meats, poultry and fish. To can them safely, use a pressure canner.

**RAW/COLD PACK**—food is packed raw and cold into jars, filled with boiling water and then processed.

**HOT PACK**—food is heated through to boiling before being placed in jars, filled with boiling water and then processed.

**HEADSPACE**—amount of space left between food or liquid and top of jar. If too little headspace, contents bubble out during processing. If too much, there may be excess air and the jar may not seal. Check recommended headspace for each food.

**PRESSURE CANNER**—a special kettle that confines steam until it builds up pressure, thus raising the temperature above boiling.

## ACID CONTENT OF FOOD

The acidity of a food is very important in home canning. Harmful bacteria can grow in foods that are low in acid. On the pH scale, which is how acidity is measured, low-acid foods have a pH above 4.6 and include vegetables as well as meats, poultry and fish. These foods can support the growth of bacteria that cause human diseases (like *Clostridium botulinum*).

These bacteria are also quite heat-resistant. It takes temperatures higher than boiling to destroy them. The only way to obtain these temperatures is to use a pressure canner. In order to reach the 240°F temperature needed, low-acid foods must be processed at 10 pounds in a weighted gauge pressure canner or 11 pounds with a dial gauge.

**ALL LOW-ACID FOODS MUST BE PROCESSED IN A PRESSURE CANNER SO THAT TEMPERATURES ARE SIGNIFICANTLY ABOVE THE BOILING POINT FOR A SPECIFIC TIME TO DESTROY HEAT-RESISTANT BACTERIA LIKE *CLOSTRIDIUM BOTULINUM*.**

High-acid foods (with a pH below 4.6) are sufficiently acid to inhibit the growth of harmful bacteria. These foods, including fruits, tomatoes and pickled products, can be safely processed in a boiling-water canner.

## BUYING A PRESSURE CANNER

You must use a pressure canner to can vegetables. Its parts include:

- **BODY**—a heavy kettle with a rack in the bottom and a cover that can be locked down.

- **SAFETY VENT**—a petcock, safety valve or weight on the vent to control the escape of air or steam.
- **GASKET**—a seal around cover to keep steam from leaking out.
- **PRESSURE GAUGE**—registers the amount of steam in the canner and controls pressure. Two types are available:
  - **DIAL GAUGE**—the amount of pressure is shown on dial attached to canner cover. Look at the gauge needle to see that the pressure is maintained. It is fragile and must be checked yearly for accuracy (ask at local Extension office to find out where to have it checked).
  - **WEIGHTED GAUGE**—amount of pressure is regulated by setting control with holes for 5, 10 or 15 pounds pressure on vent or placing weights on vent. Listen for jiggles to hear the pressure is maintained. Does not need to be checked since it has no breakable parts.

Both are safe and accurate when used and cared for according to the manufacturer's instructions.

## QUESTIONS ABOUT GAUGES

### WHY DO I HAVE TO OPERATE MY DIAL GAUGE CANNER AT 11 (INSTEAD OF 10) POUNDS PRESSURE?

New research indicates that to reach the recommended 240°F temperature it takes 11 pounds on a dial gauge canner (from sea level to 2000 feet) and 10 pounds on a weighted gauge canner (from sea level to 1000 feet). Since it's important to reach 240°F to assure correct processing, low-acid foods that were processed at only 10 pounds pressure with a dial gauge would be underprocessed.

## **IF I LIVE AT AN ALTITUDE ABOVE 2000 FEET, WHY DO I HAVE TO INCREASE THE PRESSURE WHEN USING A PRESSURE CANNER?**

As elevations increase, the atmospheric pressure is reduced. In order to achieve the correct temperature inside the canner, the pressure must be increased. Since we use 11 pounds pressure at 0 to 2000 feet, it must be increased to 12 pounds at elevations from 2001 to 4000 feet. At 4001 to 6000 feet, 13 pounds should be used. If you have a weighted gauge, the 10-pound weight is used at elevations from sea level to 1000 feet. Above 1000 feet, the 15-pound weight is used.

## **HOW CAN I FIND OUT MY ALTITUDE?**

Check with your local Soil Conservation office.

## **DO I REALLY HAVE TO GET MY DIAL GAUGE TESTED YEARLY?**

Yes, a dial pressure gauge is quite fragile and should be checked at the beginning of the canning season (more often if it is used frequently or dropped). It is possible for the dial to read 11 pounds pressure, but not actually be operating at this pressure. If the gauge is inaccurate by more than 1 pound when tested, buy a new one.

## **OTHER EQUIPMENT**

Except for needing a pressure canner instead of a boiling-water canner, all the rest of the utensils needed for canning vegetables are similar to those used for canning fruits.

Standard canning jars

- check for cracks or chips
- use quart jars or smaller

Standard lids

- use a new lid each time
- check manufacturer's directions for pretreatment of lid before use

Screwbands (rings)

- discard any with rust or dents
- after processed jars have cooled and you've tested the seal, remove the rings before storing jars

Knives, cutting board, towels, funnel, jar lifter

Bubble remover, a plastic knife or spatula to remove air bubbles before putting on lid

Paper towels, to wipe jar rims before putting on lid to remove bits of food that might prevent a seal

Timer. When weighted gauge reaches 10 pounds or dial gauge reaches 11 pounds, immediately set a timer for the required canning time. Adjust for altitude if using a weighted gauge pressure canner above 1000 ft. or a dial gauge above 2000 ft.

## EQUIPMENT QUESTIONS

### **CAN I USE HALF-GALLON JARS FOR CANNING VEGETABLES?**

No, low-acid foods should never be canned in jars larger than a quart. No canning times have been developed for canning vegetables in half-gallon jars.

### **WHAT SHOULD I DO IF I HEAR A JAR BREAK IN THE PRESSURE CANNER?**

Remove the canner from the stove immediately. Let the gauge drop to 0; open the canner and retrieve all the broken glass and food particles. Be sure no glass or food is lodged in the safety vent. Put fresh water in the canner and process the jars again for the full length of time specified.

### **CAN I USE A PRESSURE SAUCEPAN FOR CANNING?**

No. Although this was done in the past by increasing the process time, it is no longer recommended. Newer research indicates this processing method is not completely safe.

## **CAN I DO TWO LAYERS AT A TIME WHEN CANNING VEGETABLES?**

Yes. For two layers of jars it's best to use a second rack to separate the layers. Process as usual.

## **CAN A PRESSURE CANNER BE USED ON A SMOOTH-TOP RANGE?**

If your canner bottom is flat and in good contact with the range top, it may work successfully. Lay a ruler across the canner bottom; if it's indented more than 1/8 inch, the canner is not flat enough to heat effectively. Check the owner's manual of your range to determine if it may be used for canning.

## **PRESSURE CANNING ERRORS**

Follow manufacturer's instructions for your canner. Review them each time you use it. General directions are available in Extension publication PNW0172, *Canning Vegetables*. Avoid these three possible errors.

### **1. FAILURE TO EXHAUST**

You must vent the pressure canner for 10 minutes before building up the pressure to 10 pounds. This removes all the air. If there are air pockets trapped in the canner, the jars won't get hot enough. All the air must be vented from the canner to insure the proper temperature and uniform steam pressure. It is recommended you manually vent even self-venting canners instead of trusting the automatic venting.

### **2. PRESSURE ALLOWED TO FLUCTUATE**

Watch the canner continuously to be sure the pressure stays constant. If the pressure fluctuates, regulate it immediately by adjusting the heat. If the pressure falls below 11 pounds on a dial gauge, or if the 10-pound weight on a weighted canner stops its rocking or jiggling, the jars must



be reprocessed for the entire length of time. Fluctuating pressure may also cause liquid to be drawn out of the jars.

### **3. PROCESSING TIME SHORTENED**

Never shorten the processing time recommendations for the specific vegetables you are canning. If foods are underprocessed, harmful bacteria may survive.

## **BOTULISM**

The reason why there is so much emphasis on using up-to-date, reliable methods when canning vegetables is because if vegetables are improperly processed, *Clostridium botulinum* can survive to produce a deadly toxin in the sealed jar. Toxin can be present even though the canned vegetable looks, smells and tastes normal.

Most of the outbreaks of food-borne botulism in Washington have been caused by improperly canned foods, primarily fish and vegetables such as asparagus, chili peppers, green beans, beets and corn.

### **CONDITIONS THAT CAUSE BOTULISM**

- Botulism spores present. Since the bacteria are common in soil, spores may be on the vegetables.
- Low acid level. Botulism grows at a pH range above 4.6—this is the pH of vegetables; they can support botulism growth.
- Temperatures lower than 240°F. Botulism spores are extremely heat-resistant. A temperature of 240°F, achievable only with a pressure canner, is required to destroy these spores.
- Oxygen-free conditions. Botulism organisms cannot grow if air or oxygen is available. When a vegetable is canned, there is no oxygen in the sealed jar.

## **BOTULISM POISONING**

### **SYMPTOMS:**

- They usually appear 12 to 36 hours after the contaminated food is eaten.
- Common symptoms are blurred double vision, difficulty in swallowing and speaking and progressive respiratory paralysis.
- May have nausea, vomiting and cramps.

### **WHAT TO DO:**

- Contact physician and/or health department immediately.
- Antitoxin is available but must be administered as soon as possible—recovery is slow; may be put on respirator.
- Death from respiratory failure is possible.

### **PREVENTION:**

- Follow reliable up-to-date canning instructions step by step.
- Before using home-canned foods, automatically look for spoilage signs.
- Never taste questionable foods.

Although the *Clostridium botulinum* spore is heat-resistant, the toxin it produces is destroyed by boiling.

An added measure of safety is obtained if you boil home-canned vegetables for 10 minutes before eating at altitudes below 1000 feet. Add an additional minute of boiling time for each additional 1000-foot elevation.

## **WHEN YOU PICK UP A JAR OF CANNED VEGETABLES:**

Automatically check for:

- broken seal
- bulging lid
- mold, even a speck
- small bubbles (gas)
- spurting liquid or unusual pressure when the jar is opened
- cloudy or yeasty liquid
- unnatural or unpleasant odor
- mushy, slimy food

If a jar of food has any of these symptoms, consider it unsafe to eat. **DO NOT TASTE**—not even a little taste. Spoiled low-acid food may have different kinds of spoilage evidence or very little evidence. Therefore, all suspect containers of spoiled low-acid foods should be treated as having produced botulinum toxin and handled carefully in one of two ways:

1. If the suspect glass jars are still sealed, label each jar “Danger: Do Not Eat.” Place the jars in a heavy garbage bag. Close and place the bag in a regular trash container or take it to a landfill.
2. If the glass jars are unsealed, open, or leaking, they should be detoxified before disposal, using the following procedure:

Carefully place the suspect containers and lids on their sides in an 8-quart volume or larger stock pot, pan, or boiling-water canner. Wash your hands thoroughly. Add water to the pot. The water should completely cover the containers by at least one inch. Avoid splashing the water. Cover the pot and heat the water to boiling. Boil 30 minutes to detoxify the food and the containers. Cool and discard

the containers, their lids, and food in the trash or bury in soil.

Thoroughly scrub all counters, containers, and equipment, including clothing and hands, that may have contacted the food or containers. Put sponges or washcloths used in the cleanup in a plastic bag and discard.

## PROBLEMS AND SOLUTIONS

<b>PROBLEM</b>	<b>SOLUTION</b>
Off-odor (putrid, rancid, sour etc.)	Discard carefully — could be dangerous. To avoid, wash vegetables well; process properly; don't store at high tem- peratures.
Cloudy Liquid	Discard carefully if food is soft and liquid is murky. Otherwise, food with cloudiness from starchy vegetables, min- erals in water or anti-caking ingredients in salt may still be safe. Al- ways boil 10 minutes before tasting.
White beets	Safe. To avoid, use varieties best for can- ning; leave on the root and 1-inch stem when cooking prior to canning.
Brown corn	Safe. To avoid, use corn of proper maturity and variety. Maintain constant pressure in canning.
Yellow Crystals in asparagus	Safe. Rutin crystals form naturally. May also be gray or black.

<b>PROBLEM</b>	<b>SOLUTION</b>
White crystals in spinach	Safe. Calcium oxalate crystals form naturally.
Jar does not seal	If broken seal is detected within 24 hours of canning, food can be refrigerated and used, or reprocessed with new lid for full time. Discard carefully if more than 24 hours have passed.

## OTHER QUESTIONS

### **WHY CAN'T I JUST PROCESS MY VEGETABLES FOR 4 OR 5 HOURS IN A BOILING-WATER CANNER? THE LIDS SEALED.**

No! Discard vegetables processed in a boiling-water canner. They could be dangerous. To destroy *Clostridium botulinum*, vegetables must be processed at temperatures above that of boiling water. All you did was seal the bacteria in the jar and give them a perfect place to grow and produce deadly toxin. A sealed jar is not necessarily a safe jar.

### **WHY NOT PROCESS VEGETABLES IN A BOILING-WATER CANNER, THEN BOIL BEFORE EATING TO DESTROY THE TOXIN?**

What if someone else cooks and doesn't boil it completely? What if a child tastes before boiling is completed? What if the jar's liquid contains impurities or other bacteria that cause spoilage? What if you forget? Play it safe. Can all vegetables in a pressure canner. Then, as an added safety precaution, boil them before tasting.

### **WHY DO I ALWAYS LOSE LIQUID FROM THE JARS OF VEGETABLES AFTER PROCESSING?**

The most common cause is allowing the pressure to fluctuate during processing. It pulls the liquid right out

of the jars. Do not turn the heat up and down too much. Other causes are filling jars too full, inadequate headspace, air bubbles left in jar, pressure too high, canner cooled too quickly, or vent opened before the pressure dropped. There are lots of possible causes. As long as the pressure did not fall below the recommendations for your gauge and altitude and you got a good seal, use the vegetables. Boiling 10 minutes first is a good safety precaution.

### **DO YOU HAVE A PROCESSING TIME FOR CANNING MASHED OR STRAINED PUMPKIN?**

Never can mashed or strained pumpkin or winter squash. It's too thick for the heat to penetrate to the center and could be dangerous. However, you may cut these foods into 1-inch cubes and can. Check PNW0172, *Canning Vegetables*, for preparation and processing directions. You can mash the canned cubes before using if you wish.

### **WHY CAN'T I FIND A PROCESSING TIME FOR CANNING CREAM-STYLE CORN IN QUART JARS?**

Cream-style corn is canned in half-pints or pints only. Larger jars cannot be used because heat penetrates this thick food very slowly. However, whole kernel corn may be canned in quart jars. If you raw pack whole kernel corn, pack it without shaking or pressing it down. It's a starchy vegetable and when packed raw it will swell during processing. Check PNW0172, *Canning Vegetables*, for preparation and processing times. Also, note that extra headspace is needed.

## A FINAL WORD ON CANNING VEGETABLES SAFELY

Since the major source of botulism poisoning is improperly processed home-canned foods, always follow these preventative measures:

- Use up-to-date home canning instructions. Follow them step by step and adjust for altitude if necessary.
- Be sure pressure canner is working properly. Have dial gauge checked yearly.
- Vent canner 10 minutes to exhaust all air.
- Follow the canning times for the vegetable you are canning including the same type of pack and same size jar.
- Keep pressure steady for entire processing time.
- Before using home-canned vegetables, automatically examine contents for possible spoilage.
- Detoxify spoiled low-acid food in unsealed containers by placing jar, its contents and lid in hot water and boil for 30 minutes. Then, discard or bury.
- Boil all home-canned vegetables (and other low-acid foods) 10 minutes. Add one minute boiling time for each additional 1000 feet.

# CANNING VEGETABLES CHECKLIST

- 1. Select fresh, young vegetables.  
Wash well.  
Do not can over-mature, moldy or decayed food.
- 2. Use reliable, up-to-date instructions.  
(PNW0172, *Canning Vegetables*)
- 3. Use standard canning jars and lids.
- 4. Process in a pressure canner.  
Follow manufacturer's instructions.  
Vent canner 10 minutes.  
Keep pressure steady.  
Process full recommended time.
- 5. Test for seal. Store in cool place.
- 6. Examine closely before using.
- 7. Boil all home-canned vegetables before tasting.
- 8. Never taste questionable home-canned vegetables.



# CANNING VEGETABLES

## SELF-TEST

Read each statement. If you think it is true, write a “T” in the “Before” column. If you think it is false, write an “F.” After reading and studying this publication, test yourself a second time using the “After” column. Check the inside back cover for the correct answers. If you still have questions, call your local Extension office.

- | Before                   |                                                                                                                                                                           | After                    |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <input type="checkbox"/> | 1. A pressure canner is the only safe way to can vegetables.                                                                                                              | <input type="checkbox"/> |
| <input type="checkbox"/> | 2. A dial gauge on a pressure canner should be checked before each use.                                                                                                   | <input type="checkbox"/> |
| <input type="checkbox"/> | 3. The bacteria, <i>Clostridium botulinum</i> , produces a deadly toxin that is destroyed by boiling, even though the bacteria itself is quite heat-resistant.            | <input type="checkbox"/> |
| <input type="checkbox"/> | 4. If you live at an altitude above 2000 feet, you must increase the processing time when canning vegetables.                                                             | <input type="checkbox"/> |
| <input type="checkbox"/> | 5. It is dangerous to process two layers of jars in a pressure canner.                                                                                                    | <input type="checkbox"/> |
| <input type="checkbox"/> | 6. It is recommended you vent all pressure canners for 10 minutes to remove all air from the canner.                                                                      | <input type="checkbox"/> |
| <input type="checkbox"/> | 7. If pressure falls below 10 pounds in a weighted gauge canner or 11 pounds in a dial gauge canner, you must start counting the processing time all over from beginning. | <input type="checkbox"/> |
| <input type="checkbox"/> | 8. <i>Clostridium botulinum</i> can grow in a sealed jar.                                                                                                                 | <input type="checkbox"/> |
| <input type="checkbox"/> | 9. As an extra safety precaution, home-canned vegetables can be boiled before tasting.                                                                                    | <input type="checkbox"/> |







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