



# Pressure Canning Project Manual

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## 4-H Home Food Preservation Series

The home food preservation series contains four manuals:

Freezing for ages 8–18

Drying for ages 8–18

Boiling water canning for ages 8–18

Pressure canning for ages 14–18

The manuals may be used by anyone in these age groups regardless of their prior knowledge of home food preservation.

Each manual lists the objectives for the project, and each activity includes a short lesson followed by hands-on activities and questions for further learning. In addition, each manual includes an achievement program to help youth identify their goals and keep track of their accomplishments.

These manuals were written using USDA food preservation guidelines. When preserving food at home, be sure to always follow current USDA canning recipes and guidelines. Contact your local Extension office for a list of these resources.

### Acknowledgments

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Special acknowledgments go to the following authors and universities for use of their material:

United States Department of Agriculture. 2009. *Complete Guide to Home Canning*. Agriculture Information Bulletin No. 539. Washington D.C.: National Institute of Food and Agriculture.

### Washington State University

Powers-Hammond, Lizann. 2011. *Canning Vegetables*. PNW 172. Pullman, WA: Washington State University Extension Service.

## Resources

So Easy to Preserve,  
University of Georgia  
<http://www.soeasytopreserve.com>

Ball Blue Book Guide to Preserving,  
2011 or most current edition

Canning Vegetables, PNW 172  
<http://cru.cahe.wsu.edu/CEPublications/PNW172/PNW172.pdf>

Using and Caring for Your Pressure  
Canner, PNW 421  
<http://www.cals.uidaho.edu/edcomm/pdf/PNW/PNW0421.pdf>

USDA Complete Guide to  
Home Canning  
[http://nchfp.uga.edu/publications/publications\\_usda.html](http://nchfp.uga.edu/publications/publications_usda.html)

Ball website  
<http://www.freshpreserving.com>

National Center for Home Food  
Preservation website  
<http://www.uga.edu/nchfp>

### Abbreviations

**tsp, TSP = teaspoon**

**tbsp, TBSP = tablespoon**

**lb = pound**

**ft = feet**

**min = minutes**

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## Contents

<b>Notes to project helper</b> .....	4	Preparing lids.....	17
<b>My plans</b> .....	5	Headspace .....	17
<b>Exploring MyPlate</b> .....	6	Filling jars .....	17
10 tips for healthy eating.....	6	Tightening screw bands .....	17
Food groups .....	6	Checking for a seal in processed jars .....	17
MyPlate worksheet .....	7	Storing canned food .....	18
Reading food labels .....	9	Labeling .....	18
How much should you eat?.....	10	<b>Using your pressure canner</b> .....	18
Let's plan a menu .....	11	<b>Activity 1: Let's can vegetables:</b>	
<b>Kitchen and food safety basics</b> .....	12	Raw pack vs. hot pack.....	19
Kitchen safety .....	12	<b>Activity 2: Let's can vegetables:</b>	
Food safety .....	12	Mixed vegetables .....	22
Food preservation safety.....	13	<b>Activity 3: Let's can vegetables:</b>	
<b>Types of food preservation</b> .....	13	Spaghetti sauce without meat.....	23
<b>Pressure canning basics</b> .....	14	<b>Activity 4: Let's can dry beans</b> .....	24
Project objectives.....	14	<b>Activity 5: Let's can meats, poultry, and fish</b> .....	26
Why can foods? .....	14	<b>Activity 6: Let's can combinations</b> .....	29
Canning low-acid vs. high-acid foods.....	14	<b>Activity 7: Conduct a taste test</b> .....	32
Making altitude adjustments .....	15	<b>Activity 8: Label your product</b> .....	33
Hot packing vs. raw (cold) packing.....	15	<b>Activity 9: Going further: Create your own activity</b> .....	34
<b>Getting ready to pressure can</b> .....	15	<b>Activity 10: Make a menu plan</b> .....	35
Selecting a pressure canner .....	15	<b>Show what you have learned</b> .....	36
Selecting produce.....	17	<b>Reflections on pressure canning</b> .....	36
Selecting meats, poultry, and fish.....	17		
Washing and peeling produce .....	17		
Preparing jars.....	17		

# Notes to project helper

This manual is for youth who want to learn about home food preservation. They can't do it without your help. You play a key role in helping them learn the basic information, skills, and safety practices behind food preservation. With your help they will set goals, find resources, and evaluate their own progress as they complete this manual.

## Your responsibilities

- Become familiar with the material in this book.
- Assist youth in selecting and completing food preservation activities appropriate for their skills.
- Guide youth through thinking about why something happens or why it doesn't.
- Encourage youth to complete difficult tasks to expand their skills.
- Help youth learn about their strengths and weaknesses.
- Help youth evaluate the quality of their completed activities. Questions at the end of each activity will help youth think through the steps in the project and how to apply their new skills in their everyday lives.
- Be an example with kitchen and food safety rules.

## Using experiential learning

Experiential learning is the process of "do, reflect, apply." It is an inquiry-based approach to learning. Rather than being provided with information, learners experience, share, process, generalize, and apply what they are learning.

**Do.** Experience the activity, perform, do it. This could be a group activity or experience. It involves doing, it may be unfamiliar, and it pushes the learner to a new level.

**Reflect.** Share reactions and observations. Learners talk about their experiences while doing the activity. They share their reactions and observations and freely discuss their feelings.

**Apply.** Generalize to connect the experience to real-world examples. Learners identify general trends and real-life examples of when they could use what they have learned.

## Developing life skills

The Iowa State Life Skills Model helps identify the life skills that youth attain through the experiential learning process. The life skills targeted in this manual include:

### Head

- Wise use of resources
- Planning/organizing
- Goal setting
- Critical thinking

### Heart

- Communication

### Hands

- Marketable skills
- Self-motivation

### Health

- Healthy lifestyle choices
- Disease prevention

# Pressure canning basics

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## Project objectives

- Learn how to safely preserve tomato products, vegetables, meats, and combinations of meats and vegetables.
  - Learn how to use your home-canned foods in healthy recipes.
  - Show others how to preserve foods by pressure canning.
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## Why can foods?

Canning food at home can be safe and economical. We can foods to prevent food spoilage and to have an abundant supply of a variety of foods when fresh produce isn't available. When you can at home, you can control the quality of the food you're preserving.

Canning destroys the microorganisms that may be present in the food by exposing them to heat in either a pressure canner or boiling water canner. Canning methods NOT recommended are these:

- Open-kettle canning
- Oven canning
- Microwave oven canning
- Dishwasher canning
- Steam canners



## Canning low-acid vs. high-acid foods

Foods are processed either in a pressure canner or boiling water canner to control bacteria that can be present in foods. The most dangerous and difficult bacteria to destroy are those that cause botulism (these are not the only pathogens we are concerned about, just the most dangerous). Whether food should be processed in a pressure canner or boiling water canner depends on the acidity or pH of the food. The term "pH" is a measure of acidity; the lower its value, the more acid in the food.

Low-acid foods are not acidic enough to prevent the growth of these bacteria. Low-acid foods have a pH of higher than 4.6. These foods include:

- Meats (bear, beef, lamb, pork, veal and venison)
- Seafood
- Poultry
- All fresh vegetables

High-acid foods contain enough acid to block the growth of bacteria or to destroy them more rapidly when they are heated. Acid foods have a pH of 4.6 or lower. These foods include:

- Fruits
- Pickles
- Sauerkraut
- Jams
- Jellies
- Marmalades
- Fruit butters
- Salsas
- Tomatoes (after acid is added)

All low-acid foods must be canned at a temperature of 240°F to 250°F to destroy botulism spores. These temperatures are attainable only in pressure canners. The exact time needed in the pressure canner depends on the type of food being canned, the way it is packed into the jars, and the size of the jars. Use only USDA-approved recipes for canning.



## Making altitude adjustments

To destroy microorganisms in low-acid foods in a pressure canner, you must process jars at the correct pounds of pressure, cool the jars at room temperature, and adjust for altitudes above 1,000 feet. To adjust for altitudes above 1,000 feet, you need to increase the pounds of pressure. Foods may spoil if you fail to add to the processing pressure for elevations above 1,000 feet, process for fewer minutes than specified, or cool jars in cold water.

The table below indicates the pounds of pressure to use when processing jars at different altitudes.

**Pressure canner altitude adjustments**

Altitude (feet)	Weighted gauge	Dial gauge
0 to 1,000	10	11
1,001 to 2,000	15	11
2,001 to 4,000	15	12
4,001 to 6,000	15	13
6,001 to 8,000	15	14
8,001 to 10,000	15	15

## Hot packing vs. raw (cold) packing

Hot packing is the practice of heating prepared food to boiling, simmering it for 2 to 5 minutes, and promptly filling jars loosely with the hot food. It is the best way to remove air from food. Also, the color and flavor of hot-packed foods will last longer than those of raw-packed foods.

Raw (cold) packing is the practice of filling jars tightly with freshly prepared, but unheated food. Some foods processed this way may float. The air that was not released before processing can cause food to discolor within 2 to 3 months. Raw packing is more suitable for vegetables processed in a pressure canner.

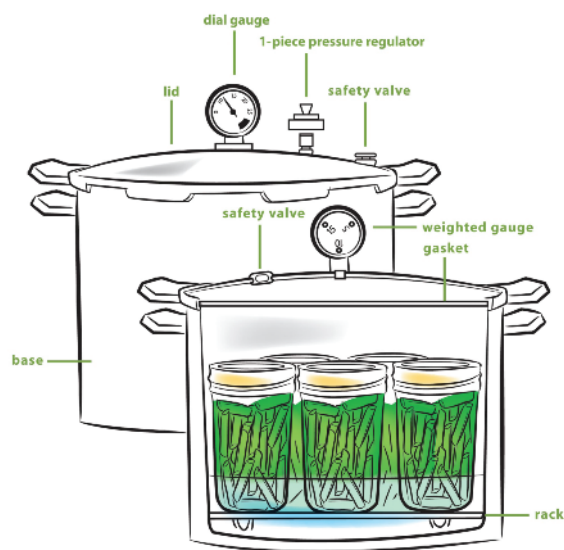
With both practices the food is covered with boiling juice, syrup, or water. This helps to remove air in the food. This practice will help shrink the food, keep food from floating, increase the vacuum seal, and prolong shelf life of the canned foods.

## Getting ready to pressure can

### Selecting a pressure canner

Make sure to use a pressure canner that has a jar rack, dial or weighted gauge, automatic vent/cover lock, vent port (steam vent) to be closed with a counterweight or weighted gauge, a petcock on certain models, and a safety fuse. Vent ports control the escape of air or steam and petcocks release steam and air when open and hold steam in when closed. *If using a dial-gauge canner, be sure to have the gauge and gasket checked each year before using.* Check with the local Extension office for testing locations.

A weighted-gauge canner exhausts tiny amounts of air or steam each time the gauge rocks or jiggles during processing. The sound of the weight rocking or jiggling indicates that the canner is maintaining pressure. To know how many times your gauge should rock or jiggle per minute, consult your owner's manual or contact the manufacturer.



## Pressure canning equipment

Equipment	Use
Dry measuring cups	Used to measure dry and solid ingredients. They usually come in a nesting set of 1 cup, ½ cup, ⅓ cup, and ¼ cup.
Liquid measuring cups	Clear measuring cups used to measure liquids. You can see through the cup to measure, and there is headspace.
Measuring spoons	Used to measure dry and liquid ingredients. They usually come in a nesting set of 1 tbsp, ½ tbsp, 1 tsp, ½ tsp, and ¼ tsp. When you measure liquid ingredients, measure carefully to avoid spills.
Sharp knives and cutting boards	Used to cut food to desired size. Wash knives and cutting boards after each use in warm soapy water.
Potholders	Used to protect hands when working with hot pans.
Rubber spatula	Used to scrape the sides of bowls or pans. You can use the flat side to level dry or solid ingredients when measuring.
Large pans	Heavy-duty pans are best for cooking. Don't use aluminum pans.
Long-handled spoons	Choose spoons that are tall enough that they will not fall down into the ingredients.
Mixing bowls	Made of pottery, glass, metal, or plastic, they come in different sizes.
Funnel	Used to pour liquids into jars.
Colander	Used to drain foods after washing.
Timer	For timing food preparation and processing.
Food chopper, blender, or processor	Equipment that will chop, blend, and puree items for food preservation. These optional items can cut back on preparation time. Handle them under the supervision of an adult.
Labels, permanent markers	Used to identify the type of food, pretreatment step, and date.
Pressure canner	Made of heavy-gauge stainless steel or aluminum with a lid that locks onto the base, a vent pipe, and safety valve. They are fitted either with a weighted or dial gauge.
Jars and lids	Mason-type, threaded, home canning jars with 2-part lids. Recommended sizes: ½ pint, 1½ pints, quart, and ½ gallon (only for juice).
Jar lifter	Used to safely lift hot jars from canners. These large, sure-grip tongs work with regular and wide-mouth canning jars.
Bubble remover and headspace measurer	Has graduations on one end to accurately measure headspace and a tapered tip on the other end to remove bubbles from the jar. Only use plastic versions.
Lid wand	Plastic utensil with a magnetic tip for removing lids from simmering water.
Peeler	Used to remove the skin from vegetables.
Cheesecloth/Jelly bag	Very thin cloth or bag used to hold spices for some canned products.
Scale	Used to weigh vegetables and meat.

# Activities

## 1. Let's Can Vegetables: Raw Pack vs. Hot Pack

Select a vegetable from the chart on the following two pages. Prepare the vegetable by washing, draining, peeling if necessary, and cutting into uniform pieces. Process this vegetable as a raw pack and a hot pack according to the instructions in the chart, remembering to adjust pressure for altitude.

**Canning method:** Vegetables must be processed in a pressure canner. Begin counting processing time after the canner has vented for 10 minutes and been brought up to pressure. The canner must maintain pressure for the entire processing time. If the canner goes below pressure, you must bring the canner back up to pressure and begin the processing time over.

**Headspace:** Leave 1 inch headspace for both the vegetable and the liquid, unless stated otherwise in the chart.

**Salt:** If desired, add 1 teaspoon salt per quart.



## Journaling

What vegetables did you choose to can?

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What challenges did you have with this activity?

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What will you do differently next time? Why?

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## 2. Let's Can Vegetables: Mixed Vegetables

Vegetables may be canned individually such as in activity 1, or as a mixed vegetable. When making mixed vegetables, you may change the suggested proportions or substitute other favorite vegetables *except* leafy greens, dried beans, cream-style corn, squash, and sweet potatoes.

**Procedure:** Except for zucchini and tomatoes, wash and prepare vegetables as described in the chart on the previous two pages. Wash, trim, and slice or cube zucchini.

Select firm, underripe-to-ripe tomatoes. Use of decayed or overripe tomatoes may result in spoilage of canned products. To prepare tomatoes, remove skins by dipping the tomatoes in boiling water for 30–60 seconds or until the skins split. Dip them in cold water, then slip off the skins and remove the cores. Leave whole or crush.

Combine all vegetables in a large pot or kettle, and add enough water to cover the pieces. Add 1 teaspoon of salt per quart to the jar, if desired. Boil 5 minutes.

Fill hot jars with hot pieces and liquid, leaving 1 inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process.

Recipe source: USDA. 2009. *Complete Guide to Home Canning*. Agriculture Information Bulletin 539.

### RECIPE: MIXED VEGETABLES

#### INGREDIENTS:

6 CUPS SLICED CARROTS  
6 CUPS CUT WHOLE KERNEL SWEET CORN  
6 CUPS CUT GREEN BEANS  
6 CUPS SHELLLED LIMA BEANS  
4 CUPS WHOLE OR CRUSHED TOMATOES  
4 CUPS DICED ZUCCHINI

YIELD: 7 QUARTS



## Journaling

What challenges did you have with this activity?

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What will you do differently next time? Why?

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### Recommended process time for mixed vegetables in a dial-gauge pressure canner

Style of Pack	Jar Size	Process Time	Canner Pressure (PSI) at Altitudes of			
			0-2,000 ft	2,001-4,000 ft	4,001-6,000 ft	6,001-8,000 ft
Hot	Pints	75 min	11 lb	12 lb	13 lb	14 lb
	Quarts	90 min	11 lb	12 lb	13 lb	14 lb

### Recommended process time for mixed vegetables in a weighted-gauge pressure canner

Style of Pack	Jar Size	Process Time	Canner Pressure (PSI) at Altitudes of	
			0-1,000 ft	Above 1,000 ft
Hot	Pints	75 min	10 lb	15 lb
	Quarts	90 min	10 lb	15 lb

### 3. Let's Can Vegetables: Spaghetti Sauce without Meat

Recipe source: USDA. 2009. *Complete Guide to Home Canning*. Agriculture Information Bulletin 539.

#### RECIPE: SPAGHETTI SAUCE W/OUT MEAT

##### INGREDIENTS:

30 LBS TOMATOES  
1 CUP CHOPPED ONIONS  
5 CLOVES GARLIC, MINCED  
1 CUP CHOPPED CELERY OR GREEN PEPPERS  
1 LB FRESH MUSHROOMS, SLICED (OPTIONAL)  
4½ TSP SALT  
2 TBSP OREGANO  
4 TBSP MINCED PARSLEY  
2 TSP BLACK PEPPER  
¼ CUP BROWN SUGAR  
¼ CUP VEGETABLE OIL

YIELD: ABOUT 9 PINTS

**Procedure:** Wash tomatoes and dip in boiling water for 30–60 seconds or until skins split. Dip in cold water and slip off skins. Remove cores and quarter tomatoes. Boil 20 minutes, uncovered, in large saucepan. Put through food mill or sieve. Saute onions, garlic, celery or peppers, and mushrooms (if desired) in vegetable oil until tender. Combine sauteed vegetables and tomatoes and add remainder of spices, salt, and sugar. Bring to a boil. Simmer, uncovered, until thick enough for serving. At this time the initial volume will have been reduced by nearly one-half. Stir frequently to avoid burning.

Fill hot jars, leaving 1 inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process.



## Journaling

What challenges did you have with this activity?

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What will you do differently next time? Why?

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#### Recommended process time for spaghetti sauce without meat in a *dial-gauge* pressure canner

Style of Pack	Jar Size	Process Time	Canner Pressure (PSI) at Altitudes of			
			0-2,000 ft	2,001-4,000 ft	4,001-6,000 ft	6,001-8,000 ft
Hot	Pints	20 min	11 lb	12 lb	13 lb	14 lb
	Quarts	25 min	11 lb	12 lb	13 lb	14 lb

#### Recommended process time for spaghetti sauce without meat in a *weighted-gauge* pressure canner

Style of Pack	Jar Size	Process Time	Canner Pressure (PSI) at Altitudes of	
			0-1,000 ft	Above 1,000 ft
Hot	Pints	20 min	10 lb	15 lb
	Quarts	25 min	10 lb	15 lb