

Canning Basics - Hot Water Bath



Howdy one and all. This "little" ditty is about canning – mainly hot water bath canning. I was taught canning by both my grandmothers. One Italian in Chicago and the other a Scott/Irish "Shilo" farmer in New York state.



Now my grandmothers knew all kinds of food preservation techniques and utilized them regularly. Although I must admit that I do not use pressure canning; probably because my Grandma's used that mostly for milk, soups, stews and meat, and I did not like canned meat. Oh I ate it – it was that or not eat, didn't like it, but ate it. Sooo, I've never had the inclination as an adult to use pressure canning.



Canning like so many things has changed over the decades, mostly for the good. So here is some information to get a person started with Hot Water Bath Canning. Where I can, I have listed how my Grandma's, a 1960's Betty Crocker Cookbook and an old 1957 Ball Book of Canning said to do things and then what is currently being said.



I must add here that **none of us ever got sick** from our home preserved food stocks. Oh we had some things that just didn't look right so we tossed them, but we never got sick.

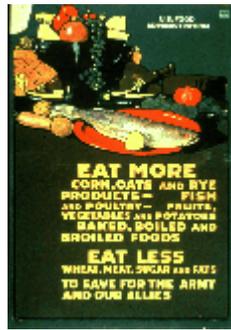


Remember that home preserved foods can look, taste and smell fine even though they have lost their nutritional value. With that in mind consider this: **Commercially and home canned goods can last decades, yet have no nutritional value.** This is why most home canners plan their canning so it is used up in under two years and commercially canned goods don't fair much better.



Why Can Foods?

You know where the food originated and to save money!



Canning is probably the most economical and practical method of preserving food at home. Among other things it is a way to save food that otherwise might be wasted.



Cost of home canning depends on the kinds and sources of food canned as well as the processing methods, containers, and equipment used. Other cost factors - labor, energy, water and added ingredients - make exact cost figures impossible to apply generally, but studies are reporting averages that show canning to be economical.



The wise homemaker will can only the amount to be used within a year. Food held longer will be safe to eat if it has a good seal and no signs of spoilage, but there may be nutrient or quality loss, especially if stored at temperatures above 70 degrees F.



Even the USDA agrees with this despite their “change in tune” between 1917 and 2006.

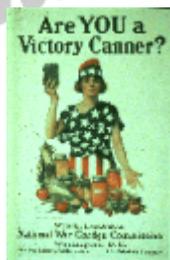


To quote the USDA from “USDA Canning Guide” 2006:

“Canning can be a safe and economical way to preserve quality food at home. Disregarding the value of your labor, canning homegrown food may save you half the cost of buying commercially canned food. ... Many vegetables begin losing some of their vitamins when harvested. Nearly half the vitamins may be lost within a few days unless the fresh produce is cooled or preserved. Within 1 to 2 weeks, even refrigerated produce loses half or more of some of its vitamins. The heating process during canning destroys from one-third to one-half of vitamins A and C, thiamin, and riboflavin. Once canned, additional losses of these sensitive vitamins are from 5 to 20 percent each year. The amounts of other vitamins, however, are only slightly lower in canned compared with fresh food. If vegetables are handled properly and canned promptly after harvest, they can be more nutritious than fresh produce sold in local stores.”



In a USFA Farmer’s Bulletin No. 203 dated 1917 titled Canned Fruit, Preserves, and Jellies: HOUSEHOLD METHODS OF PREPARATION:



“The common fruits, because of their low nutritive value, are not, as a rule, estimated at their real worth as food. Fruit has great dietetic value and should be used generously and wisely, both fresh and cooked. Fruits supply a variety of flavors, sugar, acids, and a necessary waste or bulky material for aiding in intestinal movement. They are generally rich in potash and soda salts and other minerals. Most fresh fruits are cooling and refreshing. The vegetable acids have a solvent power on the nutrients and are an aid to digestion when not taken in excess.

Fruit and fruit juices keep the blood in a healthy condition when the supply of fresh meat, fish, and vegetables is limited and salt or smoked meats constitute the chief elements of diet. Fresh fruit is generally more appetizing and refreshing than cooked. For this reason it is often eaten in too large quantities, and frequently when underripe or overripe; but when of good quality and eaten in moderate quantities it promotes healthy intestinal action and rarely hurts anyone.

If eaten immoderately, uncooked fruit is apt to induce intestinal disturbances. If eaten unripe, it often causes stomach and intestinal irritation; overripe, it has a tendency to ferment in the alimentary canal. Cooking changes the character and flavor of fruit, and while the product is not so cooling and refreshing as in the raw state, it can, as a rule, be eaten with less danger

of causing stomach or intestinal trouble. If sugar be added to the cooked fruit, the nutritive value will be increased. A large quantity of sugar spoils the flavor of the fruit and is likely to make it less easily digested.

Nowhere is there greater need of a generous supply of fruit than on the farm, where the diet is apt to be restricted in variety because of the distance from markets. Every farmer should raise a generous supply of the kinds of fruit that can be grown in his locality.



Wives and daughters on the farms should find pleasure in serving these fruits in the most healthful and tempting form. There are a large number of simple, dainty desserts that can be prepared with fruit and without much labor. Such desserts should leave the pie as an occasional luxury instead of allowing it to be considered a daily necessity.

In the season when each kind of fruit is plentiful and at its best a generous supply should be canned for the season when both fruit and fresh vegetables are scarce. A great deal of the fruit should be canned with little or no sugar, that it may be as nearly as possible in the condition of fresh fruit. This is the best condition for cooking purposes. A supply of glass jars does cost something, but that item of expense should be charged to future years, as with proper care the breaking of a jar need be a rare occurrence. If there be an abundance of grapes and small, juicy fruits, plenty of juice should be canned or bottled for refreshing drinks throughout the year. Remember that the fruit and juice are not luxuries, but an addition to the dietary that will mean better health for the members of the family and greater economy in the cost of the table.



FRESH AND PRESERVED FRUIT FOR THE MARKET.

If the supply of fruit is greater than the family needs, it may be made a source of income by sending the fresh fruit to the market, if there is one near enough, or by preserving, canning, and making jelly for sale. To make such an enterprise a success the fruit and work must be first class. There is magic in the word "Homemade," when the product appeals to the eye and the palate; but many careless and incompetent people have found to their sorrow that this word has not magic enough to float inferior goods on the market.

As a rule large canning and preserving establishments are clean and have the best appliances, and they employ chemists and skilled labor. The home product must be very good to compete with the attractive goods that are sent out from such establishments. Yet for first-class homemade products there is a market in all large cities. All first-class grocers have customers who purchase such goods.

... To secure a market get the names of several first-class grocers in some of the large towns."



How canning preserves foods

Fresh foods spoil for a variety of reasons. Bacteria, molds, and yeasts cause damage, and so do food enzymes and contact with air. Microorganisms live and multiply quickly on the surfaces of fresh food and inside bruised, insect-damaged, and diseased food. In fact, some of the very elements needed in the garden to grow food: air, moisture and sunlight; are the very things that speed up food spoilage when preserving and storing foods.



Canning is a method of preserving food in which the food contents are processed and sealed in an airtight container. Canning provides a typical shelf life ranging from one to five years, although under specific circumstances a freeze-dried canned product can last as long as 30 years in an edible state. The process was first developed as a French military discovery by Nicolas Appert in 1810. The packaging prevents microorganisms from entering and proliferating inside.

To prevent the food from being spoiled before and during containment, a number of methods are used: pasteurisation, boiling (and other applications of high temperature over a period of time), refrigeration, freezing, drying, vacuum treatment, antimicrobial agents that are natural to the recipe of the foods being preserved, a sufficient dose of ionizing radiation, submersion in a strong saline solution, acid, base, osmotically extreme (for example very sugary) or other microbe-challenging environments.

Other than sterilization, no method is perfectly dependable as a preservative. For example, the microorganism *Clostridium botulinum* (which causes botulism), can only be eliminated at temperatures above the boiling point.

From a public safety point of view, foods with low acidity (a pH more than 4.6) need sterilization under high temperature (116-130 °C). To achieve temperatures above the boiling point requires the use of a pressure canner. Foods that must be pressure canned include most vegetables, meat, seafood, poultry, and dairy products. The only foods that may be safely canned in an ordinary boiling water bath are highly acidic ones with a pH below 4.6, such as fruits, pickled vegetables, or other foods to which acidic additives have been added.

The term “pH” is a measure of acidity; the lower its value, the more acid the food.

In short canning preserves food by using heat to destroy the microorganisms that cause spoilage. Heat forces air out of the jar. As the jar cools, a seal (vacuum) forms. Proper canning techniques will stop the growth and activity of microorganisms and can prevent spoilage and quality loss.

Home processing can be done in a water bath canner or a pressure canner, depending on the food's acidity.

Most canning equipment and supplies may be purchased at hardware stores, housewares departments, from mail order companies and even the larger grocery stores. Jars and lids are available in many retail stores.



As a beginning canner you need to know something about **micro-organisms, including yeasts, molds and bacteria**, on the food, in water, air and soil, as causes of spoilage in foods. Knowing about these minute forms of life, which are so abundant everywhere, will help make the work safer as well as more interesting.

In addition to the action of these minute organisms, the spoiling of fruits and vegetables is hastened by natural changes in color, flavor and texture of the food. These changes result from the action of enzymes or micro-organisms found in nature which break down and decompose foodstuffs.

Bacteria are the most serious foes to combat in canning because they are more difficult to kill by heat than either molds or yeasts. Acid in canned food is expressed as pH value. Foods having a pH of 4.5 or lower are called high-acid foods, and those with a value of 4.6 or higher are termed low-acid foods.

The following are some common low-acid vegetables: asparagus, beans (snap or shelled), beets, carrots, corn, potatoes, pumpkin, squash, and sweet potatoes.

Apples, apricots, berries, cherries, grapefruit, peaches, pineapple, rhubarb, and tomatoes are examples of high-acid fruits and vegetables.

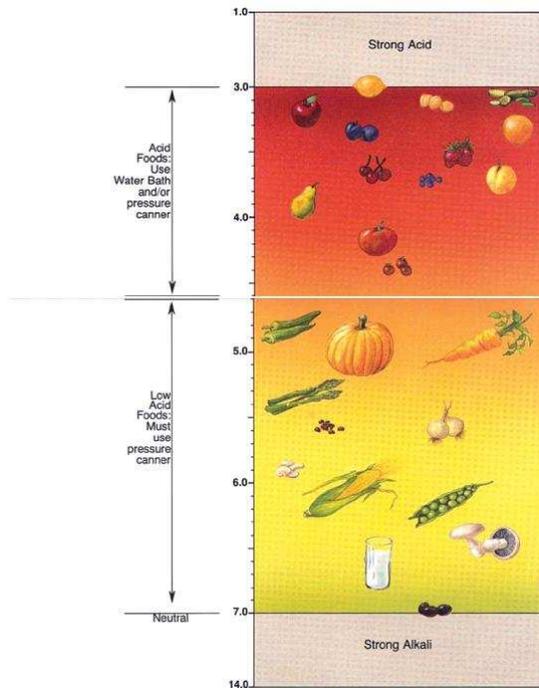
Since few bacteria thrive in acids, their destruction is less difficult in fruits than in vegetables (with the exception of tomatoes).

Botulism is a deadly poison caused by a toxin from the growth of spores (seeds) of the bacteria, *Clostridium botulinum*. These spores will produce a deadly toxin in low-acid foods in the absence of air (oxygen) inside a sealed jar. Therefore, the spores must be destroyed by processing under pressure at 240 degrees F. The length of time has been determined by scientists for each individual food.

The term “pH” is a measure of acidity; the lower its value, the more acid the food.

Clostridium botulinum will not grow in foods with a pH of 4.5 or lower, so high-acid foods may be processed safely in boiling water at 212 degrees F.

Yeasts, mold and non-spore forming bacteria are readily controlled by processing at 212 degrees F.



Acid & Low Acid Foods



The acidity level in foods can be increased by adding lemon juice, citric acid, or vinegar.

Acid foods (all fruits except un-acidified figs) can be safely processed in a water bath canner. Acidified tomatoes and figs can also be safely processed in a water bath canner. Microorganisms in or on acid foods are easily killed at 212 degrees F (the temperature of boiling water). Acidic foods contain enough acid to block their growth, or destroy them more rapidly when heated.

Low-acid foods (vegetables and tomatoes and figs that are not acidified) must be processed in a pressure canner or you can acidify them during your hot water bath canning process. The bacteria that produces botulinum toxin cannot grow in acid foods but can grow in low acid foods. These bacteria (*Clostridium botulinum*) have spores that survive hours of boiling water temperature. However, these spores are destroyed within a reasonable time at 240oF (the temperature reached inside a pressure canner set at 10 pounds pressure).

Low-acid foods have pH values higher than 4.6. They include red meats, seafood, poultry, milk, and all fresh vegetables except for most tomatoes. Most mixtures of low-acid and acid foods also have pH values above 4.6 unless their recipes

include enough lemon juice, citric acid, or vinegar to make them acid foods. Acid foods have a pH of 4.6 or lower. They include fruits, pickles, sauerkraut, jams, jellies, marmalades, and fruit butters.

If low-acid food is processed in a water bath canner, without acidifying the product - *botulinum* spores on the food will survive.

In the absence of air, a condition found inside a jar after processing, the spores become living bacteria. As the bacteria grow, they form toxin. Eating even a drop of this potent toxin can be fatal to humans and animals. Over 70% of the cases of *botulism* have been caused by low-acid foods that were improperly canned at home.

Although tomatoes usually are considered an acid food, some are now known to have pH values slightly above 4.6. Figs also have pH values slightly above 4.6. Therefore, if they are to be canned as acid foods, these products must be acidified to a pH of 4.6 or lower with lemon juice or citric acid. Properly acidified tomatoes and figs are acid foods and can be safely processed in a boiling-water canner.

Alkaline & Acid Forming Foods Chart

Most Alkaline	Alkaline	Lowest Alkaline	FOOD CATEGORY	Lowest Acid	Acid	Most Acid
		Raw Honey, Raw Sugar	SWEETENERS	Processed Honey, Molasses	White Sugar, Brown Sugar	NutraSweet, Equal, Aspartame, Sweet 'N Low
Lemons, Watermelon, Limes, Grapefruit, Mangoes, Papayas	Dates, Figs, Melons, Grapes, Papaya, Kiwi, Berries, Apples, Pears, Raisins	Oranges, Bananas, Cherries, Pineapple, Peaches, Avocados	FRUITS	Plums, Processed Fruit Juices	Sour Cherries, Rhubarb	Blueberries, Cranberries, Prunes
Asparagus, Onions, Vegetable Juices, Parsley, Raw Spinach, Broccoli, Garlic	Okra, Squash, Green Beans, Beets, Celery, Lettuce, Zucchini, Sweet Potato, Carob	Carrots, Tomatoes, Fresh Corn, Mushrooms, Cabbage, Peas, Potato Skins, Olives, Soybeans, Tofu	BEANS VEGETABLES LEGUMES	Cooked Spinach, Kidney Beans, String Beans	Potatoes (without skins), Pinto Beans, Navy Beans, Lima Beans	Chocolate
	Almonds	Chestnuts	NUTS SEEDS	Pumpkin Seeds, Sunflower Seeds	Pecans, Cashews	Peanuts, Walnuts
	Flax Seed Oil	Canola Oil	OILS	Corn Oil		
		Amaranth, Millet, Wild Rice, Quinoa	GRAINS CEREALS	Sprouted Wheat Bread, Spelt, Brown Rice	White Rice, Corn, Buckwheat, Oats, Rye	Wheat, White Flour, Pastries, Pasta
			MEATS	Venison, Cold Water Fish	Turkey, Chicken, Lamb	Beef, Pork, Shellfish
	Breast Milk	Soy Cheese, Soy Milk, Goat Milk, Goat Cheese, Whey	EGGS DAIRY	Eggs, Butter, Yogurt, Buttermilk, Cottage Cheese	Raw Milk	Cheese, Homogenized Milk, Ice Cream
Herb Teas, Lemon Water	Green Tea	Ginger Tea	BEVERAGES	Tea	Coffee	Beer, Soft Drinks

This is why many hot water bath home canners add vinegar and lemon juice (citric acid) to low acid foods – they are adding acid to kill bacteria.

Altitude Matters

Using the process time for canning food at **sea level** may result in spoilage if you live at altitudes of 1,000 feet or more. Water “boils” at lower temperatures as altitude increases. Lower boiling temperatures are less effective for killing bacteria.

HIGH ALTITUDE PROCESSING TIME

Attitude in feet	The increase in Processing time required
1,001 to 3,000 feet	10-12 minutes
3,001 to 6,000 feet	12-14 minutes
6,001 to 8,000 feet	14-16 minutes
8,001 to 10,000 feet	16-18 minutes

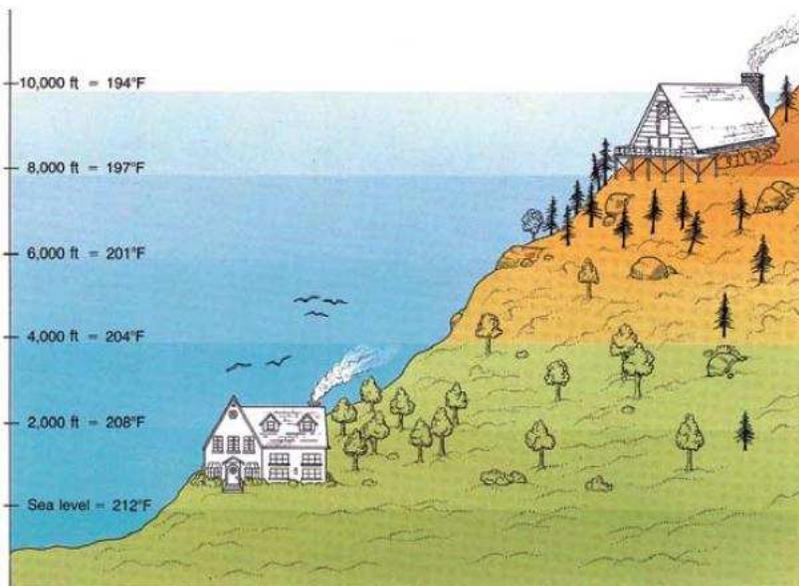
What this really means is that at higher altitudes water *looks like* it is boiling when it has NOT reached 212 degrees. **Looks alone DO NOT determine if water is at boiling temperatures!**



Use a candy or jelly thermometer to check the water temperature.

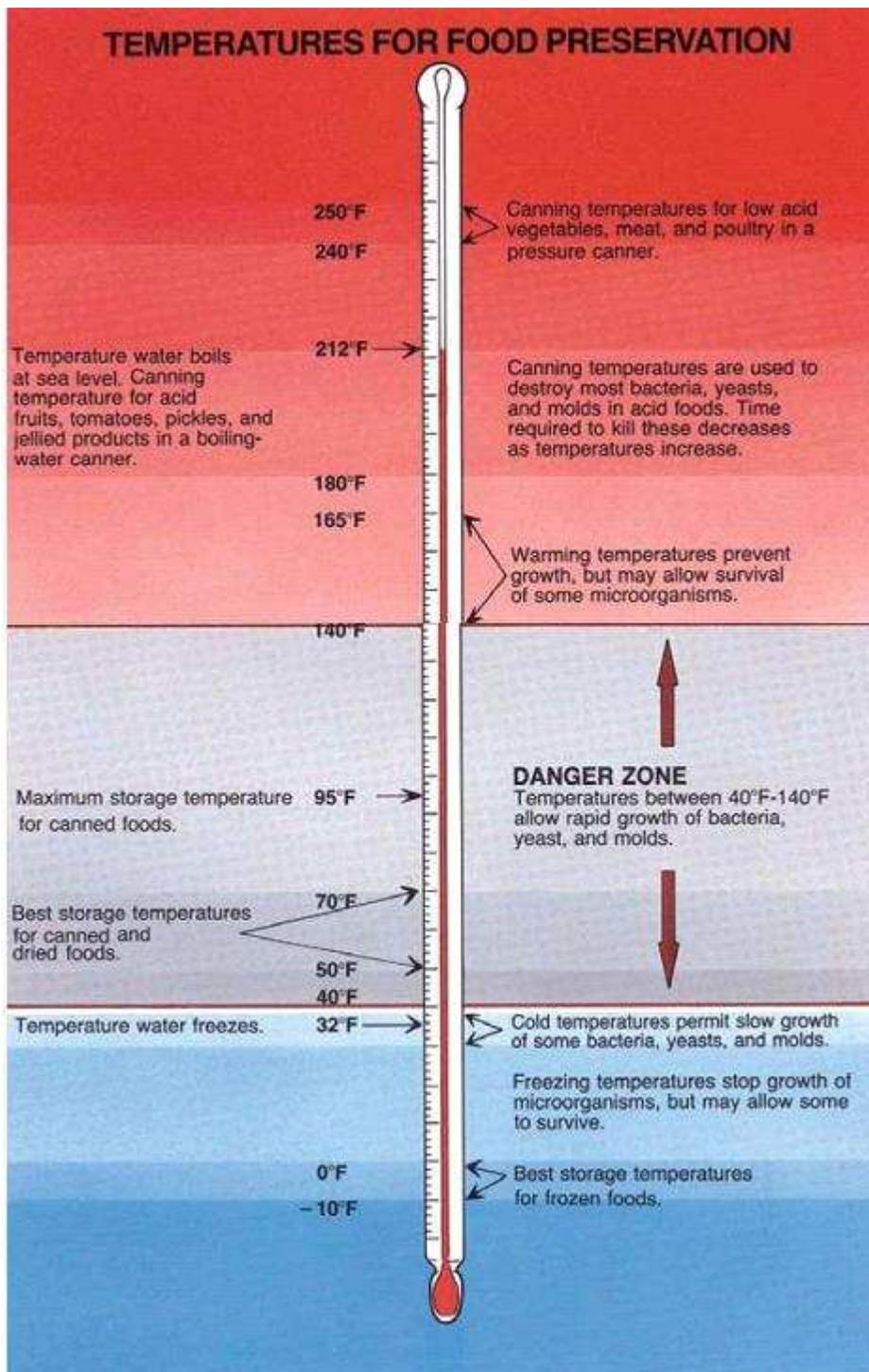
Old school canning called for increasing the process time or canner pressure to compensate for lower boiling temperatures. However, if you have a candy or jelly thermometer, all you need do is ensure that the water reaches a temperature of 212 degrees (boiling) before canning your food.

The chart below shows you at what temperature water *looks like* it is boiling in regards to altitude.



Storage Temperature Makes a Difference

Storing jars at 50° to 70°F enhances retention of quality. This is true for your food storage area in general too.



Recap

The high percentage of water in most fresh foods makes them very perishable. They spoil or lose their quality for several reasons:

- growth of undesirable microorganisms—bacteria, molds, and yeasts
- activity of food enzymes
- reactions with oxygen
- moisture loss

Microorganisms live and multiply quickly on the surfaces of fresh food and on the inside of bruised, insect-damaged, and diseased food. Oxygen and enzymes are present throughout fresh food tissues.

Food borne organisms are aided by:

- a moist, low-acid food
- a temperature between 40° and 120°F
- less than 2 percent oxygen

In general the acidity of the food item when canned, the temperature of the water during canning, temperature of the storage area and the accuracy of the method used to can the food item will have a major affect on the overall quality, color, taste, nutritional value and safety of the item canned.

General Safety Tips

Do not use canning jars in conventional ovens, microwaves or rely solely on dishwasher “sanitized” sterilization of canning jars. Due to the lack of scientific research Steam Canners are not recommended by the USDA at this time. These methods do not kill microorganisms that cause food spoilage and/or foodborne illness. I think this is why my Grandma’s stopped using their ovens during canning, they threw out too much food when they did.

So-called **canning powders are useless as preservatives** and do not replace the need for proper heat processing. **Items like Fruit Fresh and Citric Acid are NOT preservatives**, they merely stop food from browning during the preservation process or increase acidity in low acid foods.

Jars with wire bails and glass caps make attractive antiques or storage containers for dry food ingredients but are not recommended for use in canning.

An early 1960’s Betty Crocker Cookbook stated : “If you have jars with bail wire clamps, sometimes called "lightening" type jars, be sure they are not in the "antique" class. Lids for these jars are all glass, and rubber rings are used between the jar and lid for sealing. A wire clamp holds the lid in place during processing; after processing, the short spring wire of the clamp is snapped down to complete the seal.”

I save bailing wire jars (old or new) for my dehydrated foods.



One-piece zinc porcelain-lined caps are also no longer recommended by the FDA as both glass and zinc caps use flat rubber rings for sealing jars, but too often fail to seal properly.

A 1957 Ball Book of Canning stated: “One-piece zinc caps lined with white porcelain, with rubber rings, may be used. The caps may be reused if they have not cracked, spread or bent at the edges and are clean, like new. The rubber rings are effective only once because they tend to dry and deteriorate with age, often become porous, and sometimes crack.”



One-trip jars from purchased canned foods should not be used because they generally are not tempered to withstand the high heat required for home canning, and may break when subjected to the heat. Tops of these jars may not fit standard canning lids, thus preventing a good seal.



Properly sterilized canned food will be free of spoilage if lids seal and jars are stored below 95°F.



When using new pressure canning equipment it is not recommended that pressure processes be in excess of 15 PSI.



Canner Types

There are two types of canners.



Use a **water bath canner** to process acid foods. A water bath canner is a large deep kettle that has a cover and a rack to hold jars. Several styles are available on the market.

You can also use a big, covered pot that is deep enough to allow water to extend 1 to 2 inches over the tops of the jars with enough room for the water to boil briskly. Also add a rack to keep the jars off the bottom of the pot.

The container must be deep enough for a rack to hold the jars off the bottom of the canner. The depth allows water to be over the jars of food by at least 1 to 2 inches. Keep 1 to 2 inches of space above the water to allow for boiling; this prevents water from boiling over.

The canner must have a tight-fitting lid. Or you can use a large kettle with a tight-fitting lid, and a wooden or wire rack to hold jars off the bottom. There should be free circulation of water to every part of the surface of the jar and lid.

If you are going to buy a water bath canner, check the height, and the lid to be sure it is tight-fitting. The rack preferably should have dividers so jars will not touch each other or fall against the sides of the canner or each other during processing.

Use a **pressure canner** to process low acid foods, such as vegetables and meats. A pressure canner is a deep, heavy kettle that has a rack on the bottom for jars to stand on. It also has a tight-fitting lid with a gasket, and a pressure gauge. The gasket keeps steam from leaking out around the cover. If the gasket is worn, stretched, or hardened, replace it.

Ten pounds pressure is used for processing food in standard canning jars at sea level. This pressure corresponds to 240 degrees F.

The steam pressure canner is made of heavy metal that withstands high pressure developed by steam. It consists of a kettle with a tight-fitting lid equipped with an accurate weight or dial gage to register the pounds of pressure in the canner. The lid must lock or seal to prevent escape of steam.

The canner must have a safety valve petcock or steam vent that can be opened or closed to permit exhausting (venting), and a pressure gage. It must have a rack to hold jars at least one-half inch from the bottom of the canner. A dial gage indicates pressure on a numbered instrument.

A weighted gage has no dial, but automatically limits pressure with weights preset for 5, 10, and 15 pounds pressure.

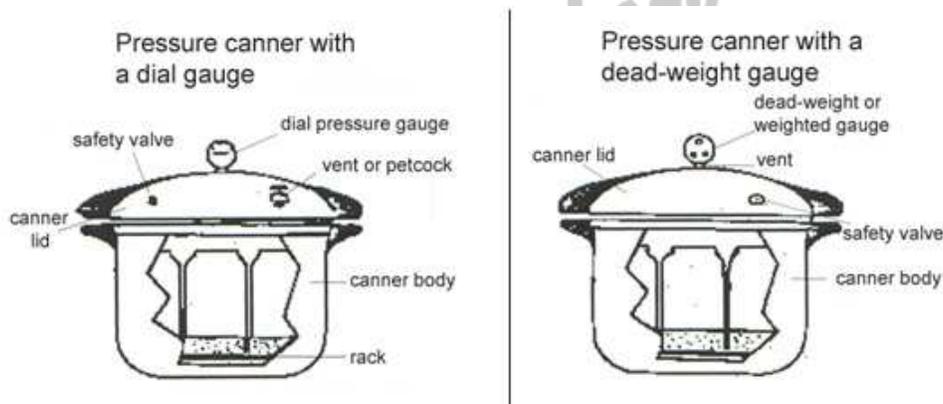
This pressure is adjusted for high altitude. For information on high altitude canning, check with your county extension office.

To insure the canner's proper working condition, check the dial gage for accuracy each year - or if a canner or lid has been roughly handled or dropped, the dial gage glass broken, or any parts are rusty. The manufacturer or your county Extension office can give information on testing availability. Study and follow the manufacturer's directions for using your pressure canner.

Run through the process of operating the pressure canner on your range in a trial run before you get into the canning season, to be sure everything is working properly. Make a note of the dial setting of the range if you use an electric range for holding pressure steady.

Trying to use a pressure canner obtained from garage, rummage, or auction sales or handed down to you from someone's attic may prove dangerous. You may not have any idea as to the care, handling, or storage of the canner. A manufacturer manual on care, use and replaceable parts usually is not available. Old-old canners did not have complete information - manufacturer's name, address or model number - on the appliance.

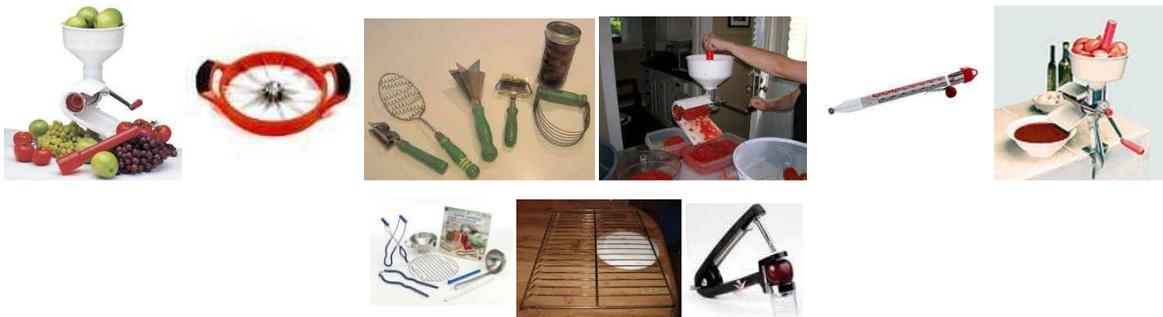
There are two types of pressure measuring gauges, dial gauge and weighted gauge.



A dial gauge has a needle that moves along a numbered scale to indicate the pressure inside the canner. Each year check the dial gauge, old or new, for accuracy and during the canning season if heavily used. Call your extension agent, Family and Consumer Sciences, to find out where testing can be done.

A weighted gauge fits over the air vent tube. It permits pressure in the canner to rise to the desired point and then releases excess steam by "jiggling" or "rocking" to keep the pressure from going higher. Weighted gauges do not need testing for accuracy, but they do need to be kept clean. Check the vent tube to be sure it hasn't been bent or damaged during use.

Other Helpful Equipment & Tools



General kitchen equipment is helpful in any needed washing, peeling, coring and slicing in the preparation of fruits and vegetables. Examples are, a vegetable brush for cleaning vegetables, a blancher or wire basket for scalding fruits and



Jars: Use only standard canning jars (also called Mason jars) with the manufacturer's name printed on the side. These jars can withstand the temperature extremes of canning. And, the sealing edge is smooth and flat so lids will seal properly.

Never use commercial jars, such as mayonnaise and pickle jars, for home canning. These jars are not very resistant to temperature extremes; they break easily. Also, lids may not seal on these jars because their sealing edge may be rounded rather than flat. Finally, the neck of the jar may be so short that the screw band will not hold the lid firmly in place during processing.

Canning jars must be in perfect condition. Check all jars, new and used, for hairline cracks, chips or nicks on the sealing edge. Such defects can result in breakage or failure to seal.

Wash jars well with soap and hot water. Place them, filled with water, either upright or sideways, well apart in a deep pan of cold water. Bring the water slowly to the boil. Boil for 15 minutes. Keep the jars hot until ready for use for your next home canning.

Lids, Gaskets & Screw Rings:

Select lids appropriate for the jars being used. You may find the two-piece units (flat lid with sealing composition and ring), one-piece lids, or flats with separate gaskets made of metal or plastic. Always follow the instructions for pretreatment as indicated on the box or container by the manufacturer. If no name is indicated on the lid, use a black wax marking pencil or crayon and mark the identity on each lid. If there are problems, contact the manufacturer whose name and address is on the box or container.

Jar lids and rings come with new canning jars. The sealing compound of lids recommended for one use only will not hold a seal effectively after the first use.

Screw ring bands may be reused if kept clean and dry in a protective container with a tight-fitting lid. Never use bands with rust, or pried up or bent edges. If you have extra lids, store them protected in a dry, cool place.

According to the USDA, the only safe way to seal a canning jar is with a **two-piece canning lid**. The set consists of a flat metal lid and a screw band. The lid has a sealing compound around the edge and is enameled on the under side to prevent food from reacting with the metal. The screw band holds the lid in place during processing. A vacuum seal forms during cooling, after the jar is removed from the canner. Screw bands that are in good condition may be reused, but always use new lids. Do not use screw bands that are bent or badly rusted.

Wash all lids in hot, soapy water. Place zinc and glass tops in very hot water for 5 minutes. Invert them to drain. Keep them hot until ready to use. Prepare lids that have a sealing composition by pouring hot water over them. Allow to stand until ready for use.

Rubber Seals: Scald the rubber seals quickly. Do not boil them as this will weaken the rubber.

Utensils: Sterilize all other utensils that will be used in your home canning process. Wash them first in hot, soapy water, and then place them in a pan of boiling water.

Recap of Proper Canning Practices:

- Carefully selecting and washing fresh food
- Peeling some fresh foods
- Hot packing many foods
- Adding acids (lemon juice or vinegar) to some foods
- Using acceptable jars and self-sealing lids
- Processing jars in a boiling-water or pressure canner for the correct period of time
- Processing jars in boiling-water based on temperature and not looks
- Careful and detailed examination of the sealing edge of jars for nicks, cracks, or sharp edges that would prevent a seal. Discard any with these imperfections.
- Cleaning and sterilization of canning jars, screw rims and gasket disks before use
- Utilizing new gasket discs for each canning batch
- Clean preparation and canning areas

Collectively, these practices remove oxygen; destroy enzymes; prevent the growth of undesirable bacteria, yeasts, and molds; and help form a high vacuum in jars. Good vacuums form tight seals which keep liquid in and air and microorganisms out.

Storing Canned Foods

Light, Water, Air and Temperature are all factors in growing your own food as well as in food preservation. When it comes to preserving your canned goods the general rule of thumb is: Low light, no extreme temperature changes, dry and as insect and rodent proof as possible.

Up until about the 1930's Root Cellars were often under the Smoke House. The smoke tended to keep insects and rodents at bay. Even today Root Cellars are below ground level as the temperatures are more even no matter what the season.

If lids are tightly vacuum sealed on cooled jars, you can remove the screw bands.

No matter if you are storing with the screw lids or not do wash the lid and jar to remove food residue; then rinse and dry jars.

Label and date the jars and store them in a clean, cool, dark, dry place. Remember to use older canned goods first.

Do not store jars above 95°F or near hot pipes, a range, a furnace, under a sink, in an uninsulated attic, or in direct sunlight. Under these conditions, food will lose quality in a few weeks or months and many will spoil.

Dampness may corrode metal lids, break seals, and allow recontamination and spoilage.

Accidental freezing of canned foods will not cause spoilage unless jars become unsealed and recontaminated. However, freezing and thawing may soften food. If jars must be stored where they may freeze, wrap them in newspapers, place them in heavy cartons, and cover with more newspapers and blankets.

How much should you can for your family?

Well golly gee, this will depend on the size of your family and how much food overall, not just canned, you want to store for your family and for what timeframe. Add to this the shelf life of various food preservation methods, the condition of the food storage area and a whole slew of other variables.

As with any food preservation method or food storage plan consider the following:

- What your family routinely eats
- Storage space available for food storage
- Rotation of food stuffs in your food storage “vault” to avoid shelf life expiration. Remember shelf life is not just about the contamination or taste of food stores, it is also about its nutritional value.
- Canned, dehydrated or frozen foods should be stored in single to double serving sizes. These smaller “containers” can be stored in a larger container to facilitate food storage organization.
- How long a time frame you wish to feed your family from food stores – weeks, months, years.

To ensure high-quality canned foods consider the following rules of thumb:

Select high quality, unblemished fruits and vegetables for canning. Canning will not improve quality. Can them as soon as possible after harvesting. If you must hold foods before canning, keep them in the refrigerator. If you buy fruits or vegetables to can, get them fresh from local farmer's markets, roadside stands or pick-your-own farms.



Thoroughly wash fruits and vegetables before canning even if they will be peeled. Garden soil contains bacteria. **NOTE:** Potatoes must be peeled before canning. Potato skins contain a high bacteria count increasing the chance of *botulinum* toxin formation.



Wash by scrubbing with a vegetable brush and rinsing thoroughly. Or, if more practical, soak in water for several minutes. Lift out of the water so the soil that has been washed off won't settle back on the food. Peel, pit, and/or slice only as much food as you can process at one time.

Some fruits and vegetables (apples, apricots, nectarines, peaches, pears and potatoes) darken when cut. To prevent darkening, keep raw, prepared produce in a solution of 1 teaspoon **ascorbic acid** to one gallon of cold water. Check among the canners' supplies in the supermarket to get this product.



- Good-quality fresh foods. Quality varies among varieties of fruits and vegetables.
- Many county Extension offices can recommend varieties best suited for canning.
- Examine food carefully for freshness and wholesomeness. Discard diseased and moldy food. Trim small diseased lesions or spots from food.
- Fruits and vegetables picked from your garden or purchased from nearby producers when the products are at their peak of quality should be canned within 6 to 12 hours after harvest for most vegetables.
- Apricots, nectarines, peaches, pears, and plums should be ripened 1 or more days between harvest and canning.
- If you must delay the canning of other fresh produce, keep it in a shady, cool place.
- Slaughtered red meats and poultry should be chilled and canned without delay.
- Ice fish and seafoods after harvest, eviscerate immediately, and can them within 2 days.

Maintaining color and flavor in canned food



Sugar helps retain the color, shape and texture of canned fruits. Sugar is usually added as a syrup. To make syrup, pour 4 cups of water into a saucepan and add:

- 2 cups of sugar to make 5 cups of **thin syrup**
- 3 cups of sugar to make 5-1/2 cups of **medium syrup**
- 4-3/4 cups of sugar to make 6-1/2 cups of **heavy syrup**

Heat until the sugar dissolves. Make 1 to 1-1/2 cups of syrup for each quart of fruit. Up to half the sugar used in making syrup can be replaced with light corn syrup or mild-flavored honey.

Fruits also can be safely canned without sugar. Pack the fruit in extracted juice, in juice from another fruit (such as bottled apple juice, pineapple juice, or white grape juice) or in water.

Salt may be added to vegetables and tomatoes before canning. Since its only function is flavor, it can be safely omitted.

Canning fruits and vegetables without adding sugar or salt does not affect processing times or microbiological safety.



Anti-Browning Agents

You can get ascorbic acid in several forms:

- Pure powdered form—seasonally available among canners' supplies in supermarkets. One level teaspoon of pure powder weighs about 3 grams. Use 1 teaspoon per gallon of water as a treatment solution.
- Vitamin C tablets—economical and available year-round in many stores. Buy 500-milligram tablets; crush and dissolve six tablets per gallon of water as a treatment solution.
- Commercially prepared mixes of ascorbic and citric acid—seasonally available among canners' supplies in supermarkets. Sometimes citric acid powder is sold in supermarkets, but it is less effective in controlling discoloration. If you choose to use these products, follow the manufacturer's directions.

Lemon juice on fruit or vegetables not only raises the acidity of foods, it helps prevent browning during canning and storage. Some people will use any acidic juice; orange, lime, grapefruit, etc.



Ball® Fruit-Fresh® Produce Protector prevents browning of fresh-cut produce for up to 8 hours. Just sprinkle on your freshly-cut fruit or veggies and protect the color and flavor of your signature creations. It also adds vitamin C and is only 5 calories per serving as well as Kosher Certified. It can be used on potatoes and avocados too.



Use only high-quality foods which are at the proper maturity and are free of diseases and bruises.

Use the hot-pack method, especially with acid foods to be processed in boiling water.

Don't unnecessarily expose prepared foods to air. Can them as soon as possible.

While preparing a canner load of jars, keep peeled, halved, quartered, sliced, or diced apples, apricots, nectarines, peaches, and pears in a solution of 3 grams (3,000 milligrams) ascorbic acid to 1 gallon of cold water. This procedure is also useful in maintaining the natural color of mushrooms and potatoes, and for preventing stem-end discoloration in cherries and grapes.



Other tips to maintaining good natural color and flavor in stored canned food, you must:

- Remove oxygen from food tissues and jars
- Quickly destroy the food enzymes
- Obtain high jar vacuums and airtight jar seals

How Can I tell if the Home Canned Food is Spoiled or Not?

This is really an easy question to answer. We do not purchase dented or bulging canned goods from the store, so we should suspect any gasket disc that is bulging or can be compressed and pop back up or is loose. We don't eat food from a store bought can if it smells or looks funny, so don't eat any home canned good that looks or smells funny. We don't purchase bottles, boxes or cans that have "gunk" runoff on them.

Black deposits on the underside of a lid are **not** a sign of spoilage. The underside of a canning lid is coated with enamel. If there are imperfections, such as tiny scratches or pinholes in the enamel, natural compounds in food can react with the metal in the lid to form harmless brown or black deposits.

Of course **never** taste food from a jar with an unsealed lid or food that shows signs of spoilage. Some types of spoilage can be more easily detect in jars stored without screw bands. Growth of spoilage bacteria and yeast produces gas which pressurizes the food, swells lids, and breaks jar seals.

As each stored jar is selected for use, examine its lid for tightness and vacuum. Lids with concave centers have good seals. If the lid "pops" back at you, discard the contents of this jar.

While holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar.

Look at the contents for rising air bubbles and unnatural color.

Look for separation of items and for strange particles that are not spices or herbs floating around.

If you canned with clear liquid and it is now cloudy suspect this jar.

While opening the jar, smell for unnatural odors and look for spurting liquid and cotton-like mold growth (white, blue, black, or green) on the top food surface and underside of lid.

Do Your Canned Foods Pass This Test?

- Overall appearance
- Good proportion of solid to liquid
- Full pack with proper headspace
- Liquid just covering solid
- Free of air bubbles
- Free of imperfections—stems, cores, seeds
- Good seals
- Practical pack that is done quickly and easily
- Fruit and vegetables
- Pieces uniform in size and shape
- Characteristic, uniform color
- Shape retained-not broken or mushy
- Proper maturity
- Liquid or syrup
- Clear and free from sediment

Recap

- Check that nothing has leaked from the jar.
- Check that no liquid spurts out when jar is opened.
- Check for unnatural or “off” odors.

So what do you do with food that you suspect is spoiled?

According to the FDA, USDA, CDC and WHO we should treat spoiled home canned goods like a toxic spill by:

- Wear disposable rubber or heavy plastic gloves.
- If the suspect glass jars or swollen metal cans are still sealed, place them in a heavy garbage bag. Close and place the bag in a regular trash container or dispose in a nearby landfill.
- If the suspect glass jars or cans are unsealed, open, or leaking, they should be detoxified
- Before disposal: Wear disposable rubber or heavy plastic gloves. 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 with gloves thoroughly. Carefully add water to the pot and avoid splashing the water. The water should completely cover the containers with a minimum of a 1-inch level above the containers. Place a lid on the pot and heat the water to boiling. Boil 30 minutes to ensure detoxifying the food and all container components. Cool and discard the containers, their lids, and food in the trash or dispose in a nearby landfill.
- Cleaning up the area: Contact with botulinum toxin can be fatal whether it is ingested or enters through the skin. Take care to avoid contact with suspect foods or liquids. Wear rubber or heavy plastic gloves when handling suspect foods or cleaning up contaminated work surfaces and equipment. A fresh solution of 1 part

unscented liquid household chlorine bleach (5 to 6% sodium hypochlorite) to 5 parts clean water should be used to treat work surfaces, equipment, or other items, including can openers and clothing, that may have come in contact with suspect foods or liquids. Spray or wet contaminated surfaces with the bleach solution and let stand for 30 minutes. Wearing gloves, wipe up treated spills with paper towels being careful to minimize the spread of contamination. Dispose of these paper towels by placing them in a plastic bag before putting them in the trash. Next, apply the bleach solution to all surfaces and equipment again, and let stand for 30 minutes and rinse. As a last step, thoroughly wash all detoxified counters, containers, equipment, clothing, etc. Discard gloves when cleaning process is complete. (Note: Bleach is an irritant itself and should not be inhaled or allowed to come in contact with the skin.)

Just for S & G's, I did a little search to see what these agencies said for disposing of spoiled or contaminated foods from our refrigerators, freezers and store bought foods. I could find NOTHING even remotely this detailed or specific!

I even wrote (via USPS) the CDC and their reply was to *"Carefully wrap or contain the spoiled food in a non-leaking container and dispose of in the trash."* No mention of rubber gloves, bleach or the like. So I wrote the CDC back (snail mail again) and asked why the different set of instructions? Their reply was word for word identical to the first reply.

Wow - Ok - I'm confused :-{

Either the CDC thinks we citizens take a stupid pill when eating our home preserved foods or they themselves are stupid or they are up to something and it smells downright fishy!



Bottom line is Common Sense Prevails:

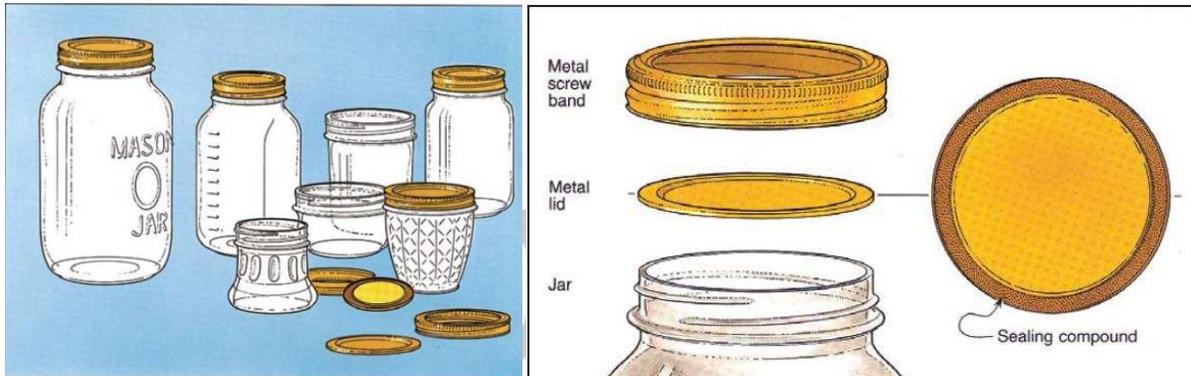
- Do wear rubber gloves to protect your skin from exposure to any contaminated liquid from the food.
- Do NOT pour this spoiled food down your garbage disposal or down a normal sink drain.
- If you are super concerned save an old reusable plastic container to boil the crapola out of it in a microwave. Then dump it in a sealable plastic bag and throw away in your trash. I have known some people that boil it, then burn it and then throw it away.
- Dump it into a sealable plastic bag and pour bleach over it, seal the bag and throw away in your trash.
- After properly disposing of the contents, rinse the jars in a Bleach solution; then boil them in water for 10 minutes. Clean the pots, bowls and sinks used with hot bleach water.
- If you see mold and have asthma or allergies, you may want to wear some kind of face mask. It should be approved by the National Institute for Occupational Safety and Health (NIOSH) and N-95 or higher to prevent the mold spores from being inhaled.
- Be sure your trash is secure from pets, animals and children so there can be no accidental exposure.

Basic Hot Water Bath Canning Procedures

- Fill hot foods into jars and adjust headspace as specified in recipes.
- Tighten screw bands securely, but if you are especially strong, not as tightly as possible.
- Process and cool jars.
- Store the jars in a relatively cool, dark place, preferably between 50° and 70°F.
- Can no more food than you will use within a year or two.

Many fresh foods contain from 10 percent to more than 30 percent air. How long canned food retains high quality and nutritional value depends on how much air is removed from food before jars are sealed.

Jars and Lids



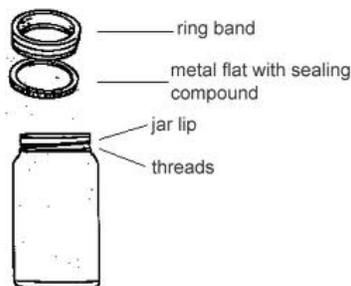
Regular and wide-mouth Mason-type, threaded, home-canning jars with self-sealing lids are the best choice. They are available in 1/2 pint, pint, 1-1/2 pint, quart, and 1/2 gallon sizes.

The standard jar mouth opening is about 2-3/8 inches. Wide-mouth jars have openings of about 3 inches, making them more easily filled and emptied.

Half-gallon jars may be used for canning very acid juices.

Regular-mouth decorator jelly jars are available in 8 and 12 ounce sizes.

Mason jars may be reused many times, requiring only new lids each time. Sterialization of the glass jar must be done after use and before a new canning process.



When jars and lids seal with proper vacuums, they are excellent storage mediums and jar breakage is rare. (In earthquake zones many people have bungie cords stretched across the front of shelves to prevent jars from being shaken off the shelf – much like RV shelves.)

Although it is said that most commercial pint- and quart-size mayonnaise or salad dressing jars may be used with new two-piece lids for canning acid foods, I interviewed only one long time canner who actually tried this and she stated that she had a higher lid seal failure rate so she stopped using them for canning and only uses them for dehydrated foods.

Jar Cleaning and Preparation

Wash, rinse and dry jars well by hand or in a dishwasher. Any residue from soap, etc can cause a funny taste or discoloration of the canned food.



Jars should be kept hot until ready to fill with food or kept a closed dishwasher until needed for filling.

To pre heat the jars, submerge the clean empty jars in enough water to cover them to the neck in a large stockpot or boiling water canner.

Bring the water to a simmer (180°F) and keep the jars in the simmering water until it is time to fill them with food. A dishwasher may be used for preheating jars if they are washed and dried on a complete regular cycle and immediately used.

If you should see a white film on the exterior surface of a used jar, it is caused by mineral deposits. This scale or hard-water film is easily removed by soaking jars several hours in a solution containing 1 cup of vinegar (5 percent acidity) per gallon of water prior to washing and preheating the jars.

It is said that any jams, jellies and pickled foods that are processed less than 10 minutes should be filled into sterile empty jars.

However I am kind of a germ freak so I sterilize almost all my jars before using no matter what I am putting in them. As a result I even wash them in a bleach solution.

To sterilize empty jars after pre washing submerge them, right side up, in a boiling-water canner with the rack in the bottom.



Fill the canner with enough warm water so it is 1 inch above the tops of the jars.

Bring the water to a boil, and boil 10 minutes at altitudes of less than 1,000 ft. At higher elevations, use a thermometer to assure a boiling temperature or boil 1 additional minute for each additional 1,000 ft elevation.

Reduce the heat under the canner, and keep the jars in the hot water until it is time to fill them. Remove and drain hot sterilized jars one at a time, saving the hot water in the canner for processing filled jars.

Fill the sterilized jars with food, add lids, and tighten screw bands.

Contrary to popular belief it is unnecessary to presterilize jars for fruits, tomatoes, and pickled or fermented foods that will be processed 10 minutes or longer in a boiling-water canner. If you are going to pressure can vegetables, meats, and fruits to be processed in a pressure canner is also unnecessary to presterilize the jars.

Lid selection, preparation, and use

The common self-sealing lid consists of a flat metal lid held in place by a metal screw band during processing. The flat lid is crimped around its bottom edge to form a trough, which is filled with a colored gasket compound. When jars are processed, the lid gasket softens and flows slightly to cover the jar-sealing surface, yet allows air to escape from the jar. The gasket then forms an airtight seal as the jar cools. Gaskets in unused lids work well for at least 5 years from date of manufacture. The gasket compound in older unused lids may fail to seal on jars.

Buy only the quantity of lids you will use in a year. To ensure a good seal, carefully follow the manufacturer's directions in preparing lids for use. Examine all metal lids carefully. Do not use old, dented, or deformed lids, or lids with gaps or other defects in the sealing gasket.

Note: The screw band is reusable, the flat seal coated disc or lid gasket is NOT. Screw bands are not needed on stored jars. They can be removed easily after jars are cooled.

It is said that screw bands may be removed, washed, dried and stored in a dry area, then re-used many times. I have never done this, my grandmothers never did this and none of my canning friends have ever done this.

If left on stored jars, they become difficult to remove, often rust, and may not work properly again.

After filling jars with food and adding covering liquid, release air bubbles by inserting a flat plastic (not metal) spatula between the food and the jar. Slowly turn the jar and move the spatula up and down to allow air bubbles to escape. (It is not necessary to release air bubbles when filling jams, jellies or all liquid foods such as juices.) Adjust the headspace and then clean the jar rim (sealing surface) with a dampened paper towel. Place the preheated lid, gasket down, onto the cleaned jar-sealing surface. Uncleaned jar-sealing surfaces may cause seal failures. Then fit the metal screw band over the flat lid. Follow the manufacturer's guidelines enclosed with or on the box for tightening the jar lids properly.

Do not retighten lids after processing jars. As jars cool, the contents in the jar contract, pulling the self-sealing lid firmly against the jar to form a high vacuum.

- If rings are too loose, liquid may escape from jars during processing, and seals may fail.
- Rings are too tight, air cannot vent during processing, and food will discolor during storage. Over tightening also may cause lids to buckle and jars to break, especially with raw-packed, pressure-processed food.

Since I have always stored my jars with the screw lids on, I do tighten them after they are completely cooled and I am putting them on my storage shelf. I also write a canning date on the gasket disc so I always have the youngest items to the back of the shelf and the oldest to the front.

How much water is needed in the canner?

Ok here things get confusing. The government recommends putting the gasket disc and loose screw ring on the jar and submersing it in the boiling water to let the air escape and create the vacuum seal.



When I tried this all I ever got was one huge mess! Both my grandmother's and all my long time canning friends only had the boiling water reach the "neck" of the jar with just the gasket disk on to release the trapped air and vacuum seal the lid. With the lid on the canning pot and temperature boiling water, the "rubber" on the gasket lids did their thing and vacuum sealed the jars. The only time we submersed the jars was for sterilizing. None of us, or our families, have ever suffered from any food borne illness.



With this in mind I am quoting both a 1957 and a 2000 Ball Book of Canning instructions. You decide which you prefer.

Keep in mind low-acid foods must be processed in a pressure canner or acidified to be free of botulism risks.

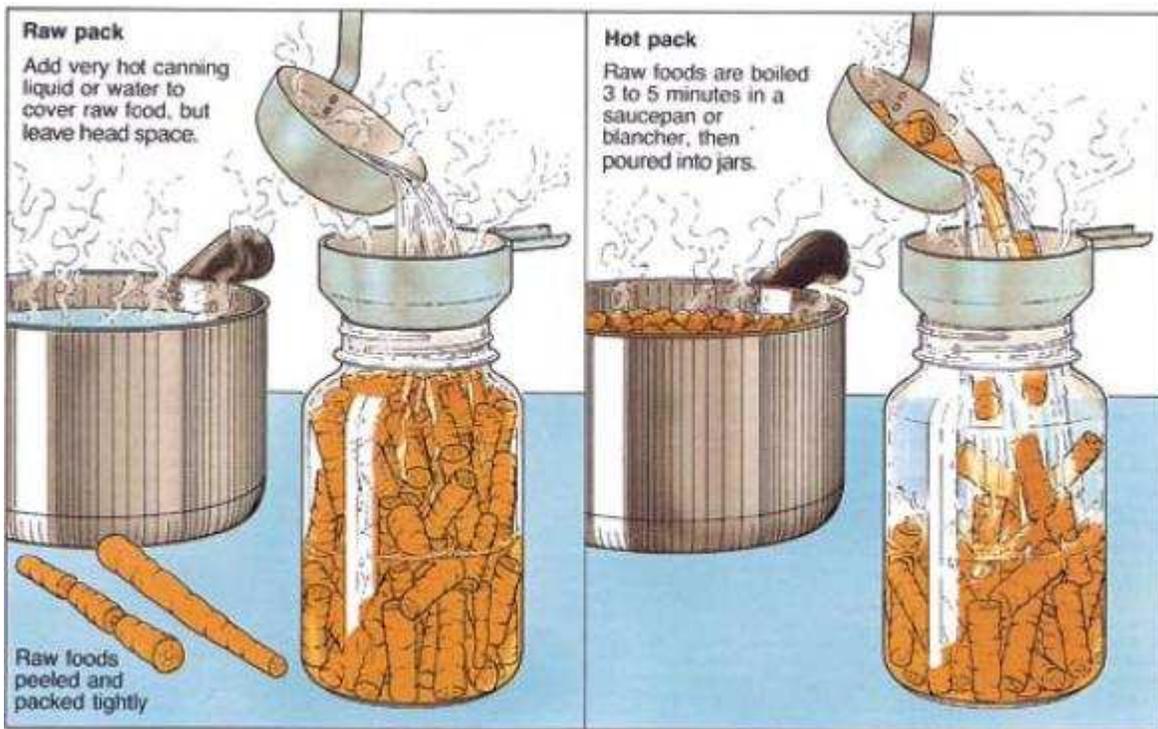
Although pressure canners may also be used for processing acid foods, boiling water canners are recommended for this purpose because they are faster.

- A pressure canner would require from 55 to 100 minutes to process a load of jars; while the total time for processing most acid foods in boiling water varies from 25 to 60 minutes. A loaded pressure canner requires about 12 to 15 minutes of heating before it begins to vent; another 10 minutes to vent the canner; another 5 minutes to pressurize the canner; another 8 to 10 minutes to process the acid food; and, finally, another 20 to 60 minutes to cool the canner before removing jars.
- A boiling-water canner loaded with filled jars requires about 20 to 30 minutes of heating before its water begins to boil.

Jar Packing

Raw-packing is packing raw, prepared food into clean, hot jars and then adding hot liquid. Fruits and most vegetables need to be packed tightly because they will shrink during processing. However, raw corn, lima beans, and peas should be packed loosely, as they will expand. Such foods, especially fruit, will float in the jars. The entrapped air in and around the food may cause discoloration within 2 to 3 months of storage. Raw-packing is more suitable for vegetables processed in a pressure canner.

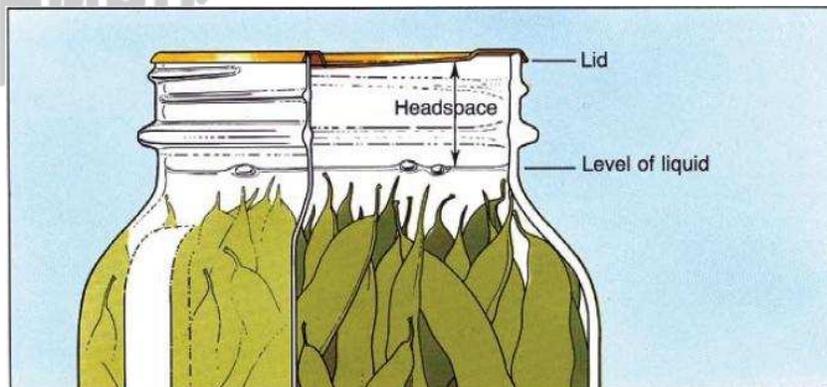
Hot-packing is the practice of heating freshly prepared food to boiling or partially cooking, simmering it 2 to 5 minutes, and promptly filling jars loosely with the boiled food. It should be packed loosely while boiling hot into clean, hot jars. Hot pack takes more time but has been found to result in higher quality canned foods.



Whether food has been hotpacked or raw-packed, the juice, syrup, or water to be added to the foods should also be heated to boiling before adding it to the jars. This practice helps to remove air from food tissues, shrinks food, helps keep the food from floating in the jars, increases vacuum in sealed jars, and improves shelf life. Preshrinking food permits filling more food into each jar.

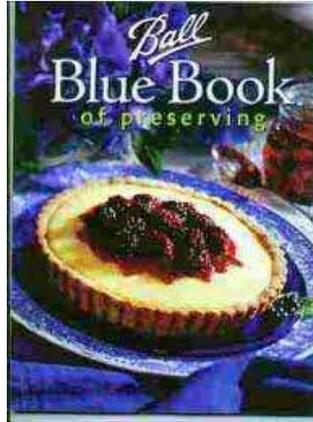
For either packing method, pack acid foods including acidified tomatoes and acidified figs to within 1/2 inch of the top of the jar. Low acid foods to within 1 inch of the top of the jar.

Controlling Headspace



The unfilled space above the food in a jar and below its lid is termed headspace. Directions for canning specify leaving 1/4-inch for jams and jellies, 1/2-inch for fruits and tomatoes to be processed in boiling water, and from 1- to 1-1/4-inches in low acid foods to be processed in a pressure canner. This space is needed for expansion of food as jars are processed, and for forming vacuums in cooled jars. The extent of expansion is determined by the air content in the food and by the processing temperature. Air expands greatly when heated to high temperatures; the higher the temperature, the greater the expansion. Foods expand less than air when heated.

Using boiling-water canners



1957 & 2000 Ball Book of Canning instructions

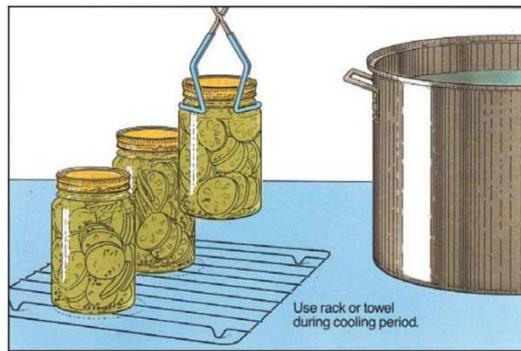
2000 Instructions	1957 Instructions
<p>1. Before you start preparing your food, fill the canner halfway with clean water. This is approximately the level needed for a canner load of pint jars. For other sizes and numbers of jars, the amount of water in the canner will need to be adjusted so it will be 1 to 2 inches over the top of the filled jars.</p>	<p>1. Before you start preparing you food, fill the canner with enough clean water to cover the size jars you will be using to the neck and start the pre-heating process.</p>
<p>2. Preheat water to 140°F for raw-packed foods and to 180°F for hot-packed foods. Food preparation can begin while this water is preheating.</p>	<p>2. Preheat water to 140°F for raw-packed foods and to 180°F for hot-packed foods. Turn the burner down to low and continue to preheat the water to 212°F (boiling). Food preparation can begin while the water is preheating.</p>
<p>3. Load filled jars, fitted with lids (gasket disk and loose screw lid), into the canner rack and use the handles to lower the rack into the water; or fill the canner with the rack in the bottom, one jar at a time, using a jar lifter. When using a jar lifter, make sure it is securely positioned below the neck of the jar (below the screw band of the lid). Keep the jar upright at all times. Tilting the jar could cause food to spill into the sealing area of the lid.</p>	<p>3. Load filled jars into the canner rack and release the air bubbles. Place the gasket discs on the jar tops and use the handles to lower the rack into the water. Keep the jar upright at all times. Tilting the jar could cause food to spill into the sealing area of the lid.</p>
<p>4. Add more boiling water, if needed, so the water level is at least 1 inch above jar tops. For process times over 30 minutes, the water level should be at least 2 inches above the tops of the jars.</p>	<p>4. Add additional boiling water as needed to keep it at the proper level through the entire canning batch.</p>

<p>5. Turn heat to its highest position, cover the canner with its lid, and heat until the water in the canner boils vigorously.</p>	<p>5. Cover and turn the burner to its highest position to maintain the rolling boil.</p>
<p>6. Set a timer for the total minutes required for processing the food.</p>	<p>6. Heat the jars for the total minutes required for processing the food.</p>
<p>7. Keep the canner covered and maintain a boil throughout the process schedule. The heat setting may be lowered a little as long as a complete boil is maintained for the entire process time. If the water stops boiling at any time during the process, bring the water back to a vigorous boil and begin the timing of the process over, from the beginning.</p>	<p>7. Keep the canner covered and maintain a boil throughout the process schedule. The heat setting may be lowered a little as long as a complete boil is maintained for the entire process time. If the water stops boiling at any time during the process, bring the water back to a vigorous boil and begin the timing of the process over, from the beginning.</p>
<p>8. Add more boiling water, if needed, to keep the water level above the jars.</p>	<p>8. After each batch check the water level and add more boiling water as needed to keep jars covered to the neck. Start with your largest jars first, working down to the smallest, to reduce the need to keep adding boiling water.</p>
<p>9. When jars have been boiled for the recommended time, turn off the heat and remove the canner lid. Wait 5 minutes before removing jars.</p>	<p>9. When jars have been boiled for the recommended time, turn off the heat and remove the canner lid. Wait 5 minutes before removing jars.</p>
<p>10. Using a jar lifter, remove the jars and place them on a towel, leaving at least 1-inch spaces between the jars during cooling. Let jars sit undisturbed to cool at room temperature for 12 to 24 hours.</p>	<p>10. Using a jar lifter, remove the jars and place them on a towel, leaving at least 1-inch spaces between the jars during cooling. Let jars sit undisturbed to cool at room temperature for 12 to 24 hours.</p>

Cooling Jars



When you remove hot jars from a canner, do not retighten their jar lids. Retightening of hot lids may cut through the gasket and cause seal failures. Cool the jars at room temperature for 12 to 24 hours. Jars may be cooled on racks or towels to minimize heat damage to counters. The food level and liquid volume of raw-packed jars will be noticeably lower after cooling. Air is exhausted during processing and food shrinks. If a jar loses excessive liquid during processing, do not open it to add more liquid.



Cooling



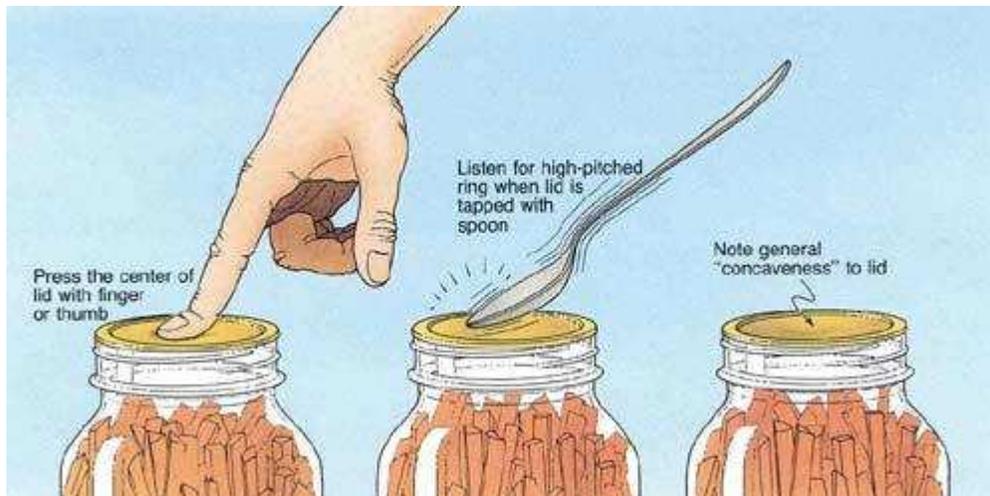
Cool the jars for 12 to 24 hours on a hot plate, wire rack, towels or other heat resistant surface.

Testing the Seal



Checking the seal on the apples

After cooling jars for 12 to 24 hours, remove the screw bands and test seals with one of the following options:



Option 1. Press the middle of the lid with a finger or thumb. If the lid springs up when you release your finger, the lid is unsealed.

Option 2. Tap the lid with the bottom of a teaspoon. If it makes a dull sound, the lid is not sealed. If food is in contact with the underside of the lid, it will also cause a dull sound. If the jar is sealed correctly, it will make a ringing, high-pitched sound.

Option 3. Hold the jar at eye level and look across the lid. The lid should be concave (curved down slightly in the center). If center of the lid is either flat or bulging, it may not be sealed.



Reprocessing unsealed jars

If a lid fails to seal on a jar, remove the lid and check the jar-sealing surface for tiny nicks. If necessary, change the jar, add a new, properly prepared lid, and reprocess within 24 hours using the same processing time. Headspace in unsealed jars may be adjusted to 1-1/2 inches and jars could be frozen instead of reprocessed. Foods in single unsealed jars could be stored in the refrigerator and consumed within several days.

Pickled and Fermented Foods

The many varieties of pickled and fermented foods are classified by ingredients and method of preparation.

Regular dill pickles and sauerkraut are fermented and cured for about 3 weeks. Refrigerator dills are fermented for about 1 week. During curing, colors and flavors change and acidity increases.

Fresh-pack or quick-process pickles are not fermented; some are brined several hours or overnight, then drained and covered with vinegar and seasonings. Fruit pickles usually are prepared by heating fruit in a seasoned syrup acidified with either lemon juice or vinegar. Relishes are made from chopped fruits and vegetables that are cooked with seasonings and vinegar.

Be sure to remove and discard a 1/16-inch slice from the blossom end of fresh cucumbers. Blossoms may contain an enzyme which causes excessive softening of pickles.

Caution: The level of acidity in a pickled product is as important to its safety as it is to taste and texture.

- Do not alter vinegar, food, or water proportions in a recipe or use a vinegar with unknown acidity.
- Use only recipes with tested proportions of ingredients.
- There must be a minimum, uniform level of acid throughout the mixed product to prevent the growth of botulinum bacteria.

Select fresh, firm fruits or vegetables free of spoilage.

Measure or weigh amounts carefully, because the proportion of fresh food to other ingredients will affect flavor and, in many instances, safety.

Use canning or pickling salt. Noncaking material added to other salts may make the brine cloudy. Since flake salt varies in density, it is not recommended for making pickled and fermented foods.

White granulated and brown sugars are most often used. Corn syrup and honey, unless called for in reliable recipes, may produce undesirable flavors.

White distilled and cider vinegars of 5 percent acidity (50 grain) are recommended. White vinegar is usually preferred when light color is desirable, as is the case with fruits and cauliflower.

Caution: Do not attempt to make sauerkraut or fermented pickles by cutting back on the salt required.

Firming Agents

Alum may be safely used to firm fermented pickles. However, it is unnecessary and is not included in the recipes in this publication. Alum does not improve the firmness of quick-process pickles.

The calcium in lime definitely improves pickle firmness. Food-grade lime may be used as a lime-water solution for soaking fresh cucumbers 12 to 24 hours before pickling them.

Excess lime absorbed by the cucumbers must be removed to make safe pickles. To remove excess lime, drain the lime-water solution, rinse, and then resoak the cucumbers in fresh water for 1 hour. Repeat the rinsing and soaking steps two more times. To further improve pickle firmness, you may process cucumber pickles for 30 minutes in water at 180°F. This process also prevents spoilage, **but the water temperature should not fall below 180°F.**



Use a candy or jelly thermometer to check the water temperature.

Pickle products are subject to spoilage from microorganisms, particularly yeasts and molds, as well as enzymes that may affect flavor, color, and texture. Processing the pickles in a boiling-water canner will prevent both of these problems. Standard canning jars and self-sealing lids are recommended.

Processing times and procedures will vary according to food acidity and the size of food pieces.

Butters, Jams, Jellies, and Marmalades

Sweet spreads are a class of foods with many textures, flavors, and colors. They all consist of fruits preserved mostly by means of sugar and they are thickened or jellied to some extent.

Fruit jelly is a semi-solid mixture of fruit juice and sugar that is clear and firm enough to hold its shape.

Other spreads are made from crushed or ground fruit.

Jam also will hold its shape, but it is less firm than jelly. Jam is made from crushed or chopped fruits and sugar. Jams made from a mixture of fruits are usually called preserves, especially when they include citrus fruits, nuts, raisins, or coconut.

Preserves are made of small, whole fruits or uniform-size pieces of fruits in a clear, thick, slightly jellied syrup.

Marmalades are soft fruit jellies with small pieces of fruit or citrus peel evenly suspended in a transparent jelly.

Fruit butters are made from fruit pulp cooked with sugar until thickened to a spreadable consistency.

For proper texture, jellied fruit products require the correct combination of fruit, pectin, acid, and sugar. The fruit gives each spread its unique flavor and color. It also supplies the water to dissolve the rest of the necessary ingredients and furnishes some or all of the pectin and acid.

Good-quality, flavorful fruits make the best jellied products.

Pectins are substances in fruits that form a gel if they are in the right combination with acid and sugar. All fruits contain some pectin. Apples, crab apples, gooseberries, and some plums and grapes usually contain enough natural pectin to form a gel. Other fruits, such as strawberries, cherries, and blueberries, contain little pectin and must be combined with other fruits high in pectin or with commercial pectin products to obtain gels. Because fully ripened fruit has less pectin, one-fourth of the fruit used in making jellies without added pectin should be underripe.

Caution: Commercially frozen and canned juices may be low in natural pectins and make soft textured spreads.

The proper level of acidity is critical to gel formation. If there is too little acid, the gel will never set; if there is too much acid, the gel will lose liquid (weep). For fruits low in acid, add lemon juice or other acid ingredients as directed. Commercial pectin products contain acids which help to ensure gelling.

Sugar serves as a preserving agent, contributes flavor, and aids in gelling. Cane and beet sugar are the usual sources of sugar for jelly or jam. Corn syrup and honey may be used to replace part of the sugar in recipes, but too much will mask the fruit flavor and alter the gel structure. Use tested recipes for replacing sugar with honey and corn syrup. Do not try to reduce the amount of sugar in traditional recipes. Too little sugar prevents gelling and may allow yeasts and molds to grow.

Jellies and jams that contain modified pectin, gelatin, or gums may be made with noncaloric sweeteners. Jams with less sugar than usual also may be made with concentrated fruit pulp, which contains less liquid and less sugar.

Two types of modified pectin are available for home use. One gels with one-third less sugar.

The other is a low-methoxyl pectin which requires a source of calcium for gelling. To prevent spoilage, jars of these products may need to be processed longer in a boiling-water canner.

Recipes and processing times provided with each modified pectin product must be followed carefully. The proportions of acids and fruits should not be altered, as spoilage may result.

Acceptably gelled refrigerator fruit spreads also may be made with gelatin and sugar substitutes.

Such products spoil at room temperature, must be refrigerated, and should be eaten within 1 month.

Even though sugar helps preserve jellies and jams, molds can grow on the surface of these products.

Some research now indicates that the mold which people usually scrape off the surface of jellies may not be as harmless as it seems. Mycotoxins have been found in some jars of jelly having surface mold growth. To date these studies are not conclusive.

Because of possible mold contamination, paraffin or wax seals are no longer recommended for any sweet spread, including jellies. To prevent growth of molds and loss of good flavor or color, fill products hot into sterile Mason jars, leaving 1/4-inch headspace, seal with self-sealing lids, and process 5 minutes in a boiling-water canner. Correct process time at higher elevations by adding 1 additional minute per 1,000 ft above sea level or start the process with the correct boiling temperature utilizing a thermometer. If unsterile jars are used, the filled jars should be processed 10 minutes longer. Use of sterile jars is preferred, especially when fruits are low in pectin, since the added 5-minute process time may cause weak gels.

The two basic methods of making jams and jellies are:

Standard method, which does not require added pectin, works best with fruits naturally high in pectin.

The other method, which requires the use of commercial liquid or powdered pectin, is much quicker. The gelling ability of various pectins differs. To make uniformly gelled products, be sure to add the quantities of commercial pectins to specific fruits as instructed on each package. Overcooking may break down pectin and prevent proper gelling. When using either method, make one batch at a time, according to the recipe. Increasing the quantities often results in soft gels. Stir constantly while cooking to prevent burning. Recipes are developed for specific jar sizes. If jellies are filled into larger jars, excessively soft products may result.

According to the USDA **home canning for special diets, like less sugar or salt, can be obtained**, however, the color, flavor, and texture of these foods may be different than expected and be less acceptable.

The USDA recommends the following:

Without Sugar

In canning regular fruits without sugar, it is very important to select fully ripe but firm fruits of the best quality. Prepare these as described for hot-packs in Guide 2, but use water or regular unsweetened fruit juices instead of sugar syrup. Juice made from the fruit being canned is best. Blends of unsweetened apple, pineapple, and white grape juice are also good for filling over solid fruit pieces. Adjust headspaces and lids and use the processing recommendations given for regular fruits. Splenda® is the only sugar substitute currently in the marketplace that can be added to covering liquids before canning fruits. Other sugar substitutes, if desired, should be added when serving.

Without Salt (reduced sodium)

To can tomatoes, vegetables, meats, poultry, and seafood, use the procedures given in Guides 3 through 5, but omit the salt. In these products, salt seasons the food but is not necessary to ensure its safety. Add salt substitutes, if desired, when serving.

Sugar and Salt Recap

Sugar and Salt are old time preservatives and flavor enhancers.

Sugar helps retain the color, shape and texture of canned fruits. Sugar is usually added as a syrup. To make syrup, pour 4 cups of water into a saucepan and add:

- 2 cups of sugar to make 5 cups of light syrup or
- 3 cups of sugar to make 5 ½ cups of medium syrup or
- 4 ¼ cups of sugar to make 6 ½ cups of heavy syrup.

Heat until the sugar dissolves. Make 1 to 1 ½ cups of syrup for each quart of fruit. Up to half the sugar used in making syrup can be replaced with light corn syrup or mild-flavored honey. Fruits also can be safely canned without sugar. Pack the fruit in extracted juice, in juice from another fruit (such as bottled apple juice, pineapple juice, or white grape juice) or in water.

Salt may be added to vegetables and tomatoes before canning. Because its only function is flavor, it can safely be omitted.

Canning fruits and vegetables without adding sugar or salt does not affect the processing time or the safety of the product.

Quick Instructions from my Grandmothers:

Acid & Non-Acid Foods

Foods for home canning are considered to be in 2 groups: Acid and Non-acid.

Acid Foods: Fruits, including tomatoes, pickled products, ripe pimientos, and rhubarb.

Non-Acid Foods: Vegetables, (the tomato is a fruit), meat, poultry, fish.

Acid foods may be canned using the following methods:

- **Open Kettle Method**
- **Hot Water Bath Method**
- **Oven Method**

Caution: Both my grandmothers stopped using the oven method before I was born, but still had these instructions written down.

If the first two methods are used for home canning, the heat will not exceed the boiling point of 100°C or 212°F. If the third method is used, the food will be somewhat hotter. Either heat is sufficient to destroy all the bacteria in acid foods and if the sterilized utensils are used and rules are followed carefully there should be no subsequent spoilage.

Non-Acid foods must be processed in a **steam pressure canner**, also known as a **pressure cooker**, at 10-15 pounds of steam. This ensures a heat of 240°F to 250°F which is sufficient enough to kill all micro-organisms and bacteria in non-acidic foods. It is impossible to do this at lower degrees of heat.

The addition of lemon juice, vinegar or any other acidic additive does not change the acidity of the food enough to permit processing by any method other than the pressure canner/cooker. The exception is when food is pickled in vinegar, which may be processed with the hot water method.

Non-acid foods should not be used in home canning if you do not have a pressure canner/cooker.

Fruit

Choose fresh, firm perfect fruit that is not over-ripe. Imperfect fruit is best left for making jam.

Wash the fruit. Prepare and peel if necessary. To prevent the discoloration of large fruits after peeling, place them in a brine solution: 2 teaspoons salt to 1 quart water. Drain well.

If cherries or plums are not stoned, prick the fruit with a large pin.

Syrups for home canning can be thick or thin according to the acidity of the fruit and the taste of those who will eat the finished product.

Syrup	Sugar	Water or Fruit Juice	Yield
Thin Syrup	1 Cup	3 Cups	3 1/2 Cups
Medium Syrup	1 Cup	2 Cups	2 1/2 Cups
Thick Syrup	1 Cup	1 Cup	1 1/2 Cups

Combine sugar and water. Stir over heat until sugar dissolves. Bring syrup to boiling point. Allow about 2 cupfuls of syrup to one quart of large fruit (pears, peaches, plums). Allow 1 cupful of syrup to one quart of small fruit (cherries, berries).

Canning with Corn Syrup

There is not satisfactory substitute for sugar, as it intensifies the flavor of the food. A syrup of corn syrup and water without the addition of sugar is subject to mold. Even with sugar and corn syrup, the results are variable. Honey or corn syrup may be substituted in the following proportions:

Syrup	Sugar	Corn Syrup or Honey	Water	Yield
Thin Syrup	1/2 Cup	1/2 Cup	2 Cups	2 3/4 Cups
Medium Syrup	1 Cup	1 Cup	2 Cups	3 1/2 Cups
Thick Syrup	2 Cups	2 Cups	2 Cups	5 Cups

It is unwise to use a higher percentage of Corn Syrup

Water Canning (Without sugar or syrup)

Substituting boiling water for sugar or sugar and syrup; add it to within one-half inch of the top of jars.

When ready to use the fruit, drain it, add sweetening to the water (or juice), bring it to a rolling boil. Pour over the fruit, cool, then chill and serve.

Approximate Yields of Fruits

Fruit	Weight	Units	Yield
Apples	2 1/2 lbs	7-8 #	1 quart
Berries	1 1/4 - 1 1/2 lbs	5 Cups	1 Quart
Cherries	1 1/4 - 1 1/2 lbs	6 Cups	1 Quart
Peaches	12 - 2 1/2 lbs	8 - 10 #	1 Quart
Pears	2 - 2 1/2 lbs	5-6 #	1 Quart
Pineapples	-	15 #	15 Quarts
Plums	1 1/2 - 2 1/2 lbs	24 - 32 #	1 Quart
Tomatoes	2 1/2 - 3 1/2 lbs	8 - 10 #	1 Quart

Various Methods of Home Canning Instructions

1) Open Kettle Method

Prepare as per table. Use: **Fruit**

Add a small quantity of fruit to the boiling syrup, enough for 1 jar. Boil the fruit until tender. For hard fruits such as pineapples, some apples, quinces etc. cook these fruits in boiling water until nearly tender. Drain well. Finish cooking them in syrup. Use the water in which the fruit was cooked for the syrup.

Boil small fruits slowly. Test the fruit with a skewer or cake tester. Boil cherries for 5 minutes. If not stoned, prick cherries several times with a large needle. Have ready hot sterilized jars with a pre-sterilized rubber seal and lid.

Working quickly, fill the jar with the fruit. The fill it to overflowing with the boiling syrup. Take care not to burn yourself when home canning. Run the handle of a sterilized spoon around the fruit to release any air bubbles. Wipe the rim of the jar clean. Seal at once and screw down tightly. Set the jars well apart on several thicknesses of cloth. Cool them as rapidly as possible. Avoid cold drafts that may crack the jars. Tighten lids as jars cool, unless they are self-sealing lids, in which case, do not touch again.

In cooking berries (except strawberries), wash them by putting them in a colander and dipping it up and down in water.

Wash 1 quart at a time. Pick them over removing any that are imperfect or that have mold. Add 1-2 cups sugar to 1 quart berries. Permit them to stand for 2 hours. Cook them with as little stirring as possible for 20 minutes. Pack boiling hot into sterilized jars. Use sterilized lids and seals. Complete seal at once.

2) Cold Pack Method

Prepare as per table. Use: **Fruit**

Pack into hot sterilized jars with sterilized seals in place. Prepare Syrup for canning as seen above.

Pour the boiling syrup slowly over the fruit to within 1/2 inch of the top. If the fruit is canned with water, fill the jars to within 1/2 inch of the top too. Run the handle of a sterilized spoon around the fruit to release air bubbles. Screw the lids down, but not too tightly. That is complete the seal, and then turn the lid back 1/4 inch. Allow this leeway to permit the steam in the jar to escape and to avoid breakages. If you are using glass-top jars fasten the bail only halfway. Exception:

If you are using self-sealing jars when home canning, seal these completely. Process the jars at once in a very hot water bath, pressure canner or pressure cooker, or by steaming them in the oven. Instructions as seen below.

3) Hot Packing Method

By this method fruits or vegetables are precooked for a few minutes in an open kettle (large pot). This causes the fruit or vegetables to shrink and eliminates blanching or dipping. Fruits are precooked in boiling syrup, vegetables in water. See charts below for details. Boil only 1 - 2 quarts at a time. Drop the fruit or vegetables gradually into the boiling liquid so as not to disturb the boiling point. Begin counting the time when all the fruit is immersed and the liquid boils freely again.

After cooking, drain the fruit or vegetables. Pack it at once into clean, hot jars with the rubber seals in place. Do not overcrowd the fruit. Fill jars of fruit to within 1/2 inch of the top with hot syrup. Seal the jars only partially, that is complete the seal and then turn 1/4 inch back. Self-sealing jars seal completely. Process immediately in a pressure cooker, (pressure canner), hot water bath or oven. See below for details.

4) Hot Water Bath Method

A wash boiler is good for this purpose. Any large, deep pot with straight sides may be used. Pack jars and seal them as directed for the **cold pack method** or the **hot pack method**.

There is a rack made for the purpose of processing jars, but if you have none, place a wire cake cooler, a wooden rack of similar into the bottom of the boiler so that the jars will be sufficiently elevated to permit the water to circulate beneath them. Partly fill the boiler with boiling water. Place the jars in it, leaving a 2 inch space between them to allow the water to circulate freely. Cover the jars well with boiling water. Place a cloth over the top of the boiler before adding the lid to ensure the steam is kept inside. Bring the water to the boil and allow the time given in the home canning chart below from that moment on. Keep the water, which must at all times cover the jars, at boiling point. Remove the jars and place them on several thickness of cloth. Immediately on removing the jars from the boiler seal the jars completely. Tighten the lids again as the jars cool. Exception: Self-sealing lids. Do not touch these. Cool the jars quickly. Avoid cold drafts.

Test the jar for leakages when cold.

5) Oven Steaming or Processing (not recommended by USDA)

Seal jars completely, then turn back top 1/4 inch. Seal self-sealing lids completely. Place the jars 2 inches apart in a shallow pan of warm water on the center rack of an oven that has been preheated to 275°F. Do not permit the heat to fluctuate. See chart below for cooking details. Immediately upon taking the jars from the oven seal them tightly. Tighten the lids again as the jars cool. Exception: Self-sealing lids. Do not touch these. Place jars on several thicknesses of cloth.

Cool jars quickly. Avoid cold drafts. Test jars for leakages when cold. See below for details.

6) Pressure Canning

Place filled jars on the rack of the pressure canner containing boiling water to the level of the rack. If jars are to be processed more than 30 minutes a little more water will be required. Do not crowd the jars, allowing for 2 inches around each jar for steam to circulate. Clamp the cover in place. Keep the pet cock open until all the air has been forced out of the container (until the steam escapes from it in a steady stream for 4-7 minutes). Close the cock. When the required pressure has been reached begin counting the time given in the charts below for processing the product. Adjust the heat to keep the pressure at a uniform level. This is important when home canning. At the end of the home canning processing period remove the pressure canner at once from the heat. Permit the gauge to drop to zero and to remain there for a further 2 minutes before opening the cock slowly. Remove the cover. Remove the jars and complete the seal.

Exception: Self-sealing jars. Do not touch these. Place the jars on several thicknesses of cloth. Cool jars rapidly. Avoid cold drafts. Test for leakages when cold. See below for details.

7) Cold Water Method (not recommended by USDA)

Use only for rhubarb, gooseberries and cranberries. Pare and cut rhubarb into small pieces. For young, tender rhubarb, pack into a sterilized jar. Place the jar under a cold water tap. Let the water run for 20 minutes, or pack the rhubarb and cover it with cold water. After 10 minutes drain off the water. Fill the jar to overflowing with fresh cold water. Adjust the sterilized rubber seal and lid. Screw the lid down tightly.

Testing Jars for Leakages

Containers calling for rubber rings or seals should be permitted to cool. They are then placed upside down and tested for leakages. Do not invert jars that have self-sealing lids. These should be tapped with a spoon instead. If the sound has a clear ringing tone the jar is well sealed. If the note is dull a good seal has not been formed. Keep jars in a cool place for 10 days. Test them again during this time. Process them again if necessary.

Reprocessing Jars

If jars show any sign of leakage they should be opened and the contents should be examined. If the lid is imperfect use another sterilized lid in its place. If the jar is imperfect, heat the food and repack it in a sterilized jar. If the cover is perfect but the rubber seal is imperfect, replace it with a hot new rubber ring. In any case, reprocess the jar for 10 minutes. In case of a bulging rubber press it back into shape while the jar is still hot. If the jar, when inverted still leaks, use a new hot rubber seal and reprocess the food for 10 minutes. The food, if reprocessed, will be over-cooked. To avoid this, it is better to serve at once.

Spoilage Testing

Inspect every jar opened carefully after your home canning. The odor should be characteristic of the product. Any different odor indicates spoilage. There should be no outbursts of air or spurting of liquid on opening. If you suspect a spoiled jar, discard contents at once.

Timetable for Fruits

Note:

- * These rules are for pint and quart jars.
- * In this chart directions are for home canning processing in boiling water for an altitude of 1000 ft and less. For altitudes more than that the time for processing should be increased 20% for each additional 1000 ft.
- * Place the fruit in boiling syrup. Begin to count the time from the time the syrup boils again.

Canning Basics – Hot Water Bath - Continued

FRUIT	Preparation for Processing of Fruit	Processing time for Hot Water Bath	Processing time for Oven	Processing time for Pressure Canner
APPLE CANNING RECIPE	Pare, core, quarter. To prevent shrinkage, steam or precook in thin boiling syrup for 5 minutes. Pack in jars and cover with thin boiling syrup. Process at once for: (Or can using Open Kettle Method)	20 minutes	75 minutes at 250°F	10 minutes at 5 pounds
APRICOT CANNING RECIPE	Wash, halve, pit or leave whole, pack in jars and cover with thin boiling syrup. Process at once for: (Or can using Open Kettle Method)	20 minutes	68 minutes at 250°F	10 minutes at 5 pounds
BERRY CANNING RECIPE (see strawberries below)	Pick over, wash, hull. Pack in sterilized jars. Cover with boiling syrup. Process at once for:	20 minutes	68 minutes at 250°F	10 minutes at 5 pounds
CHERRY CANNING RECIPE	Wash, stem, and if not stoned, prick with a needle. Pack into jars, cover with medium to thick boiling syrup. Process at once for: (Or can using Open Kettle Method)	25 minutes	68 minutes at 250°F	10 minutes at 5 pounds
PEACH CANNING RECIPE	Pare, halve, pack in jars, covering with boiling medium syrup. Process at once for: (Or can using Open Kettle Method by paring, halving or leave whole)	25 minutes	60 minutes at 275°F	10 minutes at 5 pounds
PINEAPPLE CANNING RECIPE	Peel, remove eyes, cube fruit and pack in jars, cover with boiling thin syrup. Process at once for: (Or can using Open Kettle Method boiling fruit for 10 minutes)	30 minutes	60 minutes at 275°F	10 minutes at 5 pounds
PLUM CANNING RECIPE	Wash, prick, pack in jars, cover with boiling thin syrup. Process at once for: (Or can using Open Kettle Method)	20 minutes	60 minutes at 275°F	10 minutes at 5 pounds
RHUBARB CANNING RECIPE	Wash, cut into small pieces. Pack in jars, cover with boiling thin syrup. Process at once for: (Or can using Cold Water Method)	16 minutes	50 minutes at 275°F	10 minutes at 5 pounds
STRAWBERRY CANNING RECIPE	Wash, stem, add sugar (1 cup to 1 quart). Permit to stand for 2 hrs. Simmer for 5 minutes. Fill jars, seal. Process at once for: (Or can using Open Kettle Method . Add sugar, permit berries to stand 12 hrs. Boil them for 10 minutes.)	20 minutes	68 minutes at 250°F	10 minutes at 5 pounds

Vegetables

Successful home canning calls for fresh, young, tender vegetables. Have them as freshly picked as you can. Look carefully for imperfections and discard if found. Wash and scrub the rest thoroughly so that they are free from soil. Can only a small amount at a time.

Tomatoes, may be cooked using the Open Kettle Method. See above. All other non-acid vegetables must be either blanched or precooked and then processed in a pressure canner. See the chart below for details. The object of blanching is to shrink the vegetables.

To blanch vegetables use a wire basket of sieve and a large pot. Prepare the vegetables for canning. Boil the water in the pot. Place about 4 cups or less of vegetables in the basket at a time. Immerse them in the boiling water. Cook them uncovered. Count the time given on the chart for blanching from the moment the water boils again after the vegetables have been immersed. See that the vegetables are scalded evenly. Spinach and other greens should be steamed until wilted.

To precook vegetables, drop them, a quart at a time, into boiling water.

Drain the vegetables. Have in readiness clean, hot jars with clean rubber seals in place and clean hot lids. Fill only as many containers as will fit into the pressure cooker at one time. Pack the vegetables evenly and attractively into the jars.

Do not crowd or press them. You may shake the jars to get a good pack. Since corn, peas and shell beans are apt to swell, allow about 1 inch space between the liquid and the top for this. Spinach and other greens are apt to shrink. Press them down lightly and cut through them several times with a knife. Cover all vegetables, except those noted above, with boiling water (or with the water they were blanched or cooked in.) to within 1/2 inch of the top. Add 1 teaspoon of salt to 1 quart vegetables and water - 1/2 teaspoon to a pint. Work quickly. Vegetables and water should be boiling hot.

Adjust the lids, screw them down tightly. Allow as short a time as possible between packing and processing when home canning. See Pressure Canning above.

APPROXIMATE YIELD OF VEGETABLES

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Vegetable	Weight	Yield
Asparagus	3 lbs	1 quart
Lima Beans	2 lbs	1 quart
String Beans	1 3/4 lbs	1 quart
Baby Beets	2 1/2 - 3 lbs	1 quart
Corn on the Cob	6-8 small ears	1 quart
Greens, Spinach etc.	2 3/4 - 3 lbs	1 quart
Peas, Green, Shelled	4lbs	1 quart
Tomatoes	3 lbs	1 quart

HOME CANNING INSTRUCTIONS: TIMETABLE FOR CANNING VEGETABLES

*When instructions are given to season vegetables allow 1 teaspoon salt to each quart of vegetables, or 1/2 teaspoon salt to each pint of vegetables.

VEGETABLES	Preparation for Steaming in a Pressure Cooker	Processing Time using Pressure Cooker
Asparagus	Wash, scrape and tie asparagus in bunches, or cut into inch pieces. Drop 1 quart at a time into boiling water. Keep tips above water. Boil 5 minutes. Pack at once in hot	40 minutes at 10 pounds for quart

Canning Basics – Hot Water Bath - Continued

	jars. Add boiling liquid to within 1/2 inch of the top. Season*. Seal. Process at once for:	jars 35 minutes at 10 pounds for pint jars
Beans, Lima	Wash, shell, precook for 3 minutes. Pack loosely to within 1 inch of the top in clean hot jars. Add boiling liquid to within 1 inch of the top. Season*. Seal, Process at once for:	60 minutes at 10 pounds pressure for quart jars 55 minutes at 10 pounds pressure for pint jars
Beans, String	Wash and string beans. Drop 1 quart at a time into boiling water to cover. When water is again boiling, pack at once loosely into hot jars. Add boiling liquid to within 1/2 inch of the top. Season*. Seal. Process at once for:	45 minutes at 10 pounds pressure for quart jars 40 minutes at 10 pounds pressure for pint jars
Beets, young	Level 1 inch of the root and stem, Precook for 3 minutes. Pack at once loosely into hot jars. Add boiling liquid to within 1/2 inch of the top. Season*. Seal. Process at once for:	40 minutes at 10 pounds pressure for quart jars 35 minutes at 10 pounds pressure for pint jars
Broccoli, Brussels Sprouts, Cabbage, Cauliflower	Wash, remove course leaves and stems. Precook for 3 minutes. Pack at once into hot jars. Fill jars with fresh boiling water to within 1/2 inch of the top. Season*. Seal. Process at once for:	40 minutes at 10 pounds pressure for quart jars 40 minutes at 10 pounds pressure for pint jars
Carrots, young	Wash, precook for 5 minutes. Skins, slice or leave whole. Pack at once into hot jars. Add boiling liquid to within 1 inch of the top. Season*. Seal. Process at once for:	40 minutes at 10 pounds pressure for quart jars 35 minutes at 10 pounds pressure for pint jars
Corn, Whole Kernel	Cut from the cob as closely as possible. Do not scrape cobs. Weigh. Add half as much boiling water by weight. Heat to boiling point. Pack at once into hot jars. Add boiling liquid to within 1 inch of the top. Season*. Seal. Process at once for:	75 minutes at 10 pounds pressure for quart jars 65 minutes at 10 pounds pressure for pint jars
Corn, Cream Style	Cut from the cob with a shallow cut. Scrape cob with the back of a knife. Follow the rules for Whole Kernel Process at once for:	75 minutes at 15 pounds pressure for quart jars 65 minutes at 10 pounds pressure for pint jars
Corn, On the cob	Drop ears into boiling water. Precook for 5 minutes. Pack at once into hot jars. Add boiling liquid to within 1 inch of the top. Season*. Seal. Process at once for:	80 minutes at 10 pounds pressure for

Canning Basics – Hot Water Bath - Continued

		quart jars 80 minutes at 10 pounds pressure for pint jars
Mushrooms	Wash thoroughly. Peel mature mushrooms. Drop into boiling water containing 1 tablespoon of white vinegar and 1 teaspoon salt per quart. Drain. Pack at once into hot jars. Cover with fresh boiling water to within 1/2 inch of the top. Season*. Seal. Process at once for:	35 minutes at 10 pounds pressure for quart jars 25 minutes at 10 pounds pressure for pint jars
Okra	Wash thoroughly. Remove stem end. Precook for 3-7 minutes, depending on age. Pack at once into hot jars. Add boiling liquid to within 1/2 inch of the top. Season*. Seal. Process at once for:	40 minutes at 10 pounds pressure for quart jars 35 minutes at 10 pounds pressure for pint jar
Peas	Shell peas, and precook for 3 minutes. Pack loosely at once into hot jars. Add boiling liquid to within 1 inch of the top. Season*. Seal. Process at once for:	60 minutes at 10 pounds pressure for quart jars 50 minutes at 10 pounds pressure for pint jars
Potatoes, new, white	Wash, precook for 5 minutes. Skin, remove eyes. Pack at once into hot jars. Add boiling liquid to within 1/2 inch of the top. Season*. Seal. Process at once for:	70 minutes at 15 pounds pressure for quart jars 70 minutes at 15 pounds pressure for pint jars
Spinach, Greens	Wash thoroughly. Steam in small quantities until thoroughly wilted. Pack at once into hot jars. (See canning of vegetables above). Add boiling liquid to within 1/2 inch of the top. Season*. Seal. Process at once for:	65 minutes at 15 pounds pressure for quart jars 60 minutes at 15 pounds pressure for pint jars
Tomatoes	Scald, dip in cold water, skin. Pack at once into hot jars while hot, whole or in pieces. Cover with boiling tomato juice to within 1/2 inch of the top. Season*. Seal. Process at once for:	45 minutes in an Oven Heated to 275°F. 25 minutes for processing in a Hot Water Bath.

Glossary of Canning Terms

Acid foods Foods which contain enough acid to result in a pH of 4.6 or lower. Includes all fruits except figs; most tomatoes; fermented and pickled vegetables; relishes; and jams, jellies, and marmalades. Acid foods may be processed in boiling water.

Altitude The vertical elevation of a location above sea level.

Ascorbic acid The chemical name for vitamin C. Lemon juice contains large quantities of ascorbic acid and is commonly used to prevent browning of peeled, light-colored fruits and vegetables.

Bacteria A large group of one-celled microorganisms widely distributed in nature. See microorganism.

Blancher A 6- to 8-quart lidded pot designed with a fitted perforated basket to hold food in boiling water, or with a fitted rack to steam foods. Useful for loosening skins on fruits to be peeled, or for heating foods to be hot packed.

Boiling-water canner A large standard-sized lidded kettle with jar rack, designed for heat processing 7 quarts or 8 to 9 pints in boiling water.

Botulism An illness caused by eating toxin produced by growth of *Clostridium botulinum* bacteria in moist, low-acid food, containing less than 2 percent oxygen, and stored between 40° and 120°F. Proper heat processing destroys this bacterium in canned food. Freezer temperatures inhibit its growth in frozen food. Low moisture controls its growth in dried food. High oxygen controls its growth in fresh foods.

Canning A method of preserving food in air-tight vacuum-sealed containers and heat processing sufficiently to enable storing the food at normal home temperatures.

Canning salt Also called pickling salt. It is regular table salt without the anticaking or iodine additives.

Citric acid A form of acid that can be added to canned foods. It increases the acidity of low-acid foods and may improve the flavor and color.

Cold pack Canning procedure in which jars are filled with raw food. “Raw pack” is the preferred term for describing this practice. “Cold pack” is often used incorrectly to refer to foods that are open-kettle canned or jars that are heat-processed in boiling water.

Enzymes Proteins in food which accelerate many flavor, color, texture, and nutritional changes, especially when food is cut, sliced, crushed, bruised, and exposed to air. Proper blanching or hot-packing practices destroy enzymes and improve food quality.

Exhausting Removal of air from within and around food and from jars and canners. Blanching exhausts air from live food tissues. Exhausting or venting of pressure canners is necessary to prevent a risk of botulism in low-acid canned foods.

Fermentation Changes in food caused by intentional growth of bacteria, yeast, or mold. Native bacteria ferment natural sugars to lactic acid, a major flavoring and preservative in sauerkraut and in naturally fermented dills. Alcohol, vinegar, and some dairy products are also fermented foods.

Headspace The unfilled space above food or liquid in jars. Allows for food expansion as jars are heated, and for forming vacuums as jars cool.

Heat processing Treatment of jars with sufficient heat to enable storing food at normal home temperatures.

Hermetic seal An absolutely airtight container seal which prevents reentry of air or microorganisms into packaged foods.

Hot pack Heating of raw food in boiling water or steam and filling it hot into jars.

Low-acid foods Foods which contain very little acid and have a pH above 4.6. The acidity in these foods is insufficient to prevent the growth of the bacterium *Clostridium botulinum*. Vegetables, some tomatoes, figs, all meats, fish, seafoods, and some dairy foods are low acid. To control all risks of botulism, jars of these foods must be (1) heat processed in a pressure canner, or (2) acidified to a pH of 4.6 or lower before processing in boiling water.

Microorganisms Independent organisms of microscopic size, including bacteria, yeast, and mold. When alive in a suitable environment, they grow rapidly and may divide or reproduce every 10 to 30 minutes. Therefore, they reach high populations very quickly. Undesirable microorganisms cause disease and food spoilage. Microorganisms are sometimes intentionally added to ferment foods, make antibiotics, and for other reasons.

Mold A fungus-type microorganism whose growth on food is usually visible and colorful. Molds may grow on many foods, including acid foods like jams and jellies and canned fruits. Recommended heat processing and sealing practices prevent their growth on these foods.

Mycotoxins Toxins produced by the growth of some molds on foods.

Open-kettle canning A non-recommended canning method. Food is supposedly adequately heat processed in a covered kettle, and then filled hot and sealed in sterile jars. Foods canned this way have low vacuums or too much air, which permits rapid loss of quality in foods. Moreover, these foods often spoil because they become recontaminated while the jars are being filled.

Pasteurization Heating of a specific food enough to destroy the most heat-resistant pathogenic or disease-causing microorganism known to be associated with that food.

pH A measure of acidity or alkalinity. Values range from 0 to 14. A food is neutral when its pH is 7.0, lower values are increasingly more acid; higher values are increasingly more alkaline.

Pickling The practice of adding enough vinegar or lemon juice to a low-acid food to lower its pH to 4.6 or lower. Properly pickled foods may be safely heat processed in boiling water.

Pressure Canner A specifically designed metal kettle with a lockable lid used for heat processing low-acid food. These canners have jar racks, one or more safety devices, systems for exhausting air, and a way to measure or control pressure. Canners with 16- to 23- quart capacity are common. The minimum volume of canner that can be used is one that will contain 4 quart jars. Use of pressure saucepans with smaller capacities is not recommended.

Raw pack The practice of filling jars with raw, unheated food. Acceptable for canning low-acid foods, but allows more rapid quality losses in acid foods heat processed in boiling water.

Spice bag A closeable fabric bag used to extract spice flavors in pickling solution.

Style of pack Form of canned food, such as whole, sliced, piece, juice, or sauce. The term may also be used to reveal whether food is filled raw or hot into jars.

Vacuum The state of negative pressure. Reflects how thoroughly air is removed from within a jar of processed food—the higher the vacuum, the less air left in the jar.

Yeasts A group of microorganisms which reproduce by budding. They are used in fermenting some foods and in leavening breads.

General Food Preservation Information / Methods

Common Food Preservation Methods

- Anaerobiosis or Vacuum packing
- Blanching
- Burial in the ground
- Canning and Bottling (Water-bath canning & Pressure canning)
- Cheese-making
- Chemical
- Chiller bags
- Curing
- Curing and Smoking
- Dehydration or Drying
- Drying, Air and Salting
- Drying, sun-drying
- Fermentation and Pickling
- Freezing and Refrigeration
- Gelatine or Jellying
- Jugging
- Live Storage & Root Cellar
- Micro-organism (Controlled use)
- Nitrate (NO₃) & Nitrite (NO₂) (Saltpeter)
- Oil and fat
- Organic Acids
- Osmotic inhibition e.g. use of syrups; Salting & Sugaring
- Pasteurizing or High heat processing
- Pickling
- Potting
- Refrigeration, Pot-in-pot
- Salt & Sugaring
- Smoking
- Sulfite (SO₂) & Vitamin C
- Thermos flask
- Toxic inhibition e.g. smoking, use of carbon dioxide, vinegar, alcohol etc.

Food Preservation Pros / Cons

Method	Advantages	Disadvantages
Drying (e.g. freeze-drying, spray-drying, sun-drying)	Produces concentrated form of food. Inhibits microbial growth & autolytic enzymes. Retains most nutrients.	Can cause loss of some nutrients, particularly thiamin & vitamin C. Sulphur dioxide is sometimes added to dried fruits to retain vitamin C, but some individuals are sensitive to this substance.
Smoking	Preserve partly by drying, partly by incorporation of substances from smoke.	Eating a lot of smoked foods has been linked with some cancers in some parts of the world.
Adding salt or sugar	Makes water unavailable for microbial growth. Process does not destroy nutrients.	Increases salt and sugar content of food.
Canning (involves high heat processing)	Destroys microorganisms & autolytic enzymes. (Water-bath canning & Pressure canning)	Water-soluble nutrients can be lost into liquid in can.
Refrigeration	Slows microbial multiplication. Slows autolysis by enzymes	Slow loss of some nutrients with time

Freezing	Prevents microbial growth by low temperature & unavailability of water. Generally good retention of nutrients.	Blanching of vegetables prior to freezing causes loss of some B-Group vitamins and vitamin C. Unintended thawing can reduce product quality
High heat processing (e.g. pasteurisation)	Inactivates autolytic enzymes Destroys microorganisms.	Loss of heat-sensitive nutrients.
Chemical preservatives	Prevent microbial growth No loss of nutrient.	Some people are sensitive to some chemical preservatives.
Ionizing radiation	Sterilizes foods (such as spices) whose flavor would change with heating. Inhibits sprouting potatoes Extends shelf life of strawberries and mushrooms.	Longer shelf life of fresh foods can lead to greater nutrient losses than if eaten sooner after harvesting.

Live Storage & Root Cellar

This is when fruits and vegetables are placed in either boxes or earth mounds in the garden where temperatures are between 35° - 42° F or placed in a cellar during the winter months. *Draws Rats!* So be sure the box/container or cellar is as rodent proof as possible and check it often. Up until about the 1930's, a Root Cellar was often *under* the smoke house to discourage 4-legged creatures and insects.

An old way of preserving food using live storage is *Clamping*. This is when vegetables like potatoes are lifted and allowed to dry for 2-3 hours. Then they are placed on a thick bed of straw and placed carefully in a triangle shape. More straw is used to cover the potatoes where a couple of days are given to allow the potatoes to finish sweating. After they have stopped sweating the potatoes are then covered with soil, 5-6 inches deep. Allow some of the straw to be seen protruding from the soil so that the vegetables can still breathe.

A *Storage Bin* can be used in a cool, dark place, such as a cellar to store foods for shorter periods of time just relying on the coolness of the room. Additional storage potential can be provided by storing items in bins filled with sand.

Commercial Food Preservation Methods

- Additives, Artificial food
- Antibiotics
- Atmospheres, Controlled/Modified
- Biopreservation
- Canning and Bottling - Pressure canning
- Carbonation
- Chemical
- Curing
- Curing and Smoking
- Dehydration or Drying
- Drying, freeze-drying, spray-drying
- Fermentation and Pickling
- Freeze Drying or Lyophilization
- Freezing and Refrigeration
- Gelatine or Jellying
- Ionizing radiation
- Irradiation
- Micro-organism (Controlled use)
- Nitrate (NO₃) & Nitrite (NO₂) (Saltpeter)
- Oil and fat
- Organic Acids
- Osmotic inhibition e.g. use of syrups; Salting & Sugaring
- Pasteurizing or High heat processing
- Pickling
- Pulsed electric field
- Salt & Sugaring
- Smoking

- Sulfite (SO₂) & Vitamin C
- Toxic inhibition e.g. smoking, use of carbon dioxide, vinegar, alcohol etc.

Note: Potatoes that have been treated to retard sprouting from the “eyes”– do not make good “seed” potatoes as the sprouted roots tend to be sterile and do not produce more spuds.

"Let us be in a position so we are able to not only feed ourselves through home production and storage, but others as well"

Ezra Taft Benson, former U.S. Secretary of Agriculture

TNT

Resources

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