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Food for Health

Canning Fruits, Tomatoes and Vegetables

Division of Nutritional Sciences, Cornell University, Reviewed May, 2006

Canning is an important, safe method of food preservation if practiced properly. In the canning process foods are placed in jars and heated to a temperature that inactivates enzymes and destroys microorganisms that could make people sick or cause the food to spoil. Air is driven from the jar during heating. As the jars cool a vacuum seal is formed. This vacuum seal prevents air from getting back into the product bringing with it microorganisms to re-contaminate the food.

SELECTING EQUIPMENT

The acidity of a food determines which canning method must be used. Vegetables (except tomatoes) are low-acid foods that have a pH of 4.6 or higher. *Clostridium botulinum*, the bacteria that causes botulism, can survive and grow in low-acid vegetables when they are sealed in airless jars that are not properly processed. Botulism can be fatal.

If you are canning fruits or properly acidified tomatoes, you may safely use a boiling water canner which reaches 212° F at sea level. These foods are acid enough to keep dangerous bacteria from growing. At altitudes of more than 1000 feet, a longer processing time is required.

If you are canning vegetables (or meats), you must use a pressure canner. Only pressure canning produces temperatures high enough (240°F, 28 degrees above boiling) to destroy the dangerous bacterium *Clostridium botulinum*. If vegetables are improperly processed, the toxin

that causes botulism could be present even though the canned vegetables appear, smell and taste normal.

Boiling Water Canner - be sure it is deep enough for the water to cover the jars by 1 to 2 inches and still have space to allow for gentle and steady boiling of the water. Purchase a canner with a lid and a rack.

Pressure Canner - a special heavy pot with a lid that can be closed tightly to prevent steam from escaping. The lid is fitted with a vent (or petcock), a safety valve, and a dial gauge or weighted pressure gauge. It may or may not have a rubber gasket. The pressure canner also has a rack. Because each make and model of canner may be different, be sure to read and follow the manufacturer's directions for use. Use up-to-date timetables (based on USDA recommendations dated 1989 or more recent.)

Standard Canning Jars - recommended for canning. Other jars may not be heat-tempered and may break from the temperature fluctuations that occur, especially during pressure canning.

PREPARING FRUITS AND TOMATOES

Select fresh, firm fruit. Gather or purchase only as much as you can practically handle before fruits become overripe. Work quickly throughout preparation and canning. If food is allowed to stand, quality is lowered and food spoilage is more likely to occur.

Revised by Judy Price, Katherine Humphrey, Christina Stark and Donna Scott. 2002.
Original by Mary Lou Tenney, 1987, Division of Nutritional Sciences, Cornell University.

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See the Handy Reference for Canning Fruits chart for approximate amount of fruit needed to yield one quart of canned fruit. Sort for size and ripeness. Wash in cool, running water, or lift in and out of several changes of water. Avoid soaking. Peel (if desired) and trim blemishes after washing the food. Do not can decayed or overripe fruits or tomatoes, as their acidity may be decreased, increasing chances for spoilage or health hazards.

SPECIAL NOTES FOR CANNING TOMATOES

Ripe and under-ripe tomatoes, whether green, red or yellow, may be processed in a boiling water canner. Do not can tomatoes that are over-ripe, moldy or from dead or frost-killed vines. These tomatoes may have an overload of microorganisms that could cause spoilage, or have a lower acidity that could cause a dangerous product.

To prevent spoilage and ensure safety, add bottled lemon juice directly to each jar before filling it (1 tablespoon per pint, 2 tablespoons per quart) or U.S.P. grade citric acid (¼ teaspoon per pint, ½ teaspoon per quart). Two tablespoons of 4 to 6 percent vinegar per pint jar, or 4 tablespoons per quart may be used, however vinegar may cause undesirable flavor changes. In over-ripe tomatoes, the addition of lemon juice, citric acid or vinegar cannot adequately increase the acidity enough to assure safety.

Sugar may be added to tomatoes to mask any sour flavor from lemon juice or citric acid. If desired, add 1 teaspoon of sugar per pint jar, 2 teaspoons per quart jar.

Tomatoes may be canned in a boiling water canner or a pressure canner, using up-to-date methods and timetables to assure adequate heat penetration for either hot or raw pack.

PACKING THE JARS

Follow up-to-date directions for either hot pack or raw pack. In the hot pack method, food is briefly boiled in water, syrup or juice and

packed hot into hot jars. Then the cooking liquid or boiling water is added. In the raw pack method, raw foods are packed in jars and covered with boiling water, syrup or juice. For tomatoes and some fruits, process time will be longer for raw packed food than for hot packed.

The hot pack method has several advantages over raw pack. Heated fruits are easier to pack into jars because they are softer. There is less floating fruit because air is drawn out of the tissues by cooking. As a result, more can be put into each jar, and fewer jars are used for the same amount of food. The processing time is usually shorter for hot-packed foods. The color of fruits such as apples or peaches is better protected.

Generally, acid foods such as fruits and tomatoes should be packed leaving ½ inch headspace above the food and liquid. Headspace is the space between the food or liquid and the top of the jar. If the jars are too full, some of the contents bubble out (siphon) during heat processing and leave food on the sealing surfaces so that jars may not seal. Too much headspace requires a longer processing time to exhaust all air from the jar.

Use a jar funnel (either metal or plastic) to fill jars quickly and easily. After filling jars, run a plastic spatula (to prevent scratching jar) around the inside of the jar to remove air bubbles.

Closing Jars - Wipe jar rims and threads with a clean, damp cloth or paper towel to remove any bits of food that might prevent a seal. Follow manufacturer's directions for preheating lids and for tightening screw bands. Cover with a new lid, putting the circle of sealing compound against the glass. Screw on the metal ring (screw band) until it naturally stops. Then give it one hard twist.

SWEETENING FRUIT

Sugar syrup is used to sweeten fruit and to help the fruit hold its shape, color and flavor; however, it does not preserve the fruit.

Make a syrup of sugar and water to use when hot or raw packing fruit. A mild-flavored

honey may replace as much as half the sugar called for in canning. Do not use brown sugar or molasses, sorghum or other strong flavored syrups. Their flavor overpowers the fruit flavor and they may darken the fruit. Sugar syrups of different concentrations are listed on the Handy Reference for Canning Fruits chart.

If using artificial sweeteners, add these just before serving the fruit. Saccharin-based sweeteners can turn bitter during processing. Aspartame-based sweeteners lose their sweetening power when heated.

Canning without Sugar – Sugar adds sweetness and helps fruit hold its shape, color and flavor. Sugar may be omitted because it does not prevent spoilage. To can without sugar, use the fruit's own juice, added water or fruit juice and follow regular processing methods and time.

Preventing Fruit from Darkening – When canning light colored fruits, such as apples, pears and peaches you may:

⌚ Use a commercial ascorbic acid mixture. (Read the label on the container for the amount to use.)

or

⌚ Drop the fruit into a solution made by using 1 teaspoon crystalline ascorbic acid (vitamin C) or 3000 mg. crushed tablets to 1 gallon of cool water.

or

⌚ Immerse the peeled fruit in a sugar syrup.

or

⌚ Drop fruit into a citric acid or lemon juice solution (1 teaspoon U.S.P. grade citric acid per gallon water or ¾ cup lemon juice per gallon water).

PROCESSING IN A BOILING WATER CANNER

1. Use a rack to keep jars from touching canner bottom and to allow heat to reach all sides of the filled jars.
2. Put jars into canner that is half filled with boiling water.

3. Add additional boiling water, if needed, to bring water to 1 to 2 inches above the jar tops. Pour water between jars, not directly on them. Place a well-fitting cover on canner. If a pressure canner is used for boiling water canning, leave the cover unfastened and the petcock open to prevent buildup of pressure.

4. Bring water back to a gentle rolling boil. Then, set a timer for recommended processing time. Watch closely to keep water boiling gently and steadily. Add boiling water, if necessary, to keep jars covered with at least 1 inch of water.

5. When timer sounds, remove jars from canner immediately. Spoilage could occur if jars are left in hot water. For additional information, see the section on FINISHING THE JOB on page 4.

PREPARING VEGETABLES

Select young, tender vegetables. Gather or purchase only as much as you can practically handle in 2 or 3 hours. Work quickly. If food is allowed to stand, quality is lowered and food spoilage is more likely to occur.

Yield will depend on quality, ripeness, size and variety. See the Handy Reference for Canning Vegetables chart for approximate amounts of vegetables needed to yield one quart of canned vegetables. Sort for size and maturity. Wash in cool, running water or lift in and out of several changes of water. Avoid soaking. Trim blemishes and peel, if desired. Do not can decayed food.

Packing the Jars - Follow either hot pack or raw pack directions using water as the liquid. For details, see section on PACKING THE JARS on page 2.

Adding Salt - Salt is added to vegetables for flavor, not to preserve them. Exceptions are pickles and sauerkraut. If you choose to use salt, add ½ teaspoon to each pint jar, 1 teaspoon to each quart jar.

PROCESSING IN A PRESSURE CANNER

1. Follow manufacturer's directions for use, particularly the instructions for checking the canner before and during use and the instructions regarding audible hissing, jiggling or rocking of the weighted gauge. (Note: USDA does not recommend the use of a pressure saucepan for canning.)
2. Have 2 to 3 inches of boiling water in the canner.
3. Arrange jars on a rack so steam can flow freely around each one.
4. Fasten canner lid securely so no steam escapes around the rim.
5. Watch for steam to escape steadily through the petcock. Let steam escape for 10 minutes. This "venting" (exhausting) step is very important to remove all air from the canner. Air trapped in the canner will cause inadequate or unsafe processing of food by giving inaccurate readings.
6. Close petcock or place weighted gauge on canner. When the correct pressure is reached, immediately set a timer for the required canning time. Pressure canning of most vegetables is done at 11 lbs. in a dial gauge canner and 10 lbs. in a weighted gauge canner. Altitude adjustments must be made in a dial gauge canner operated above 2000 feet, and in a weighted gauge canner operated above 1000 feet above sea level.
7. Be sure that pressure stays constant. If pressure fluctuates, regulate it immediately by adjusting the heat, not by opening the petcock or removing the weight. Fluctuating pressure may cause liquid to be drawn from the jars (siphoning) and cause some jars not to seal. Loss of pressure can result in under-processing or unsafe food. Bring canner back to pressure and begin total process time over again.
8. When timer sounds, remove canner from heat. While canner is cooling, it is also depressurizing. Do not force the canner to cool with water or cold towels or by opening the petcock or removing the weighted gauge. An additional measure of food safety is gained during the cooling phase. When pressure returns to zero, slowly open the petcock or remove the weighted gauge.

9. Unfasten the cover and tilt the far side up (away from you) so that steam does not burn you. Immediately remove jars, using a jar lifter. Spoilage could occur if jars are allowed to stand in the warm canner.

FINISHING THE JOB

The following information applies to both the boiling water canner or pressure canner method of processing.

Cooling Jars – Place hot jars on a cloth or rack so air can circulate freely around them. Keep hot jars out of cold drafts.

Jar lids should not be re-tightened after processing. As jars cool, the contents in the jars contract, pulling the self-sealing lid firmly against the jar to form a high vacuum. Most two-piece lids will seal with a "pop" sound while they're cooling.

Testing for Seal - When jars are completely cool to the touch (about 12 hours), test each jar for a seal. Jars with flat, metal lids are sealed if:

- ⌚ Lid has popped down in center.
- ⌚ Lid does not move when pressed down with a finger.
- ⌚ Tapping the center of the lid with a spoon makes a clear ringing sound. A dull thudding sound may indicate a weak seal or that food is touching the underside of the lid. To determine which, hold the jar up and look at it.

If a jar is not sealed, refrigerate and use it within 2 or 3 days. Other options are to freeze the contents (in a freezer container) or to reprocess the food within 24 hours of the initial processing.

To reprocess, start by removing the lid. Check headspace of food and liquid. Check the jar rim for damage. If no chips or nicks are on the sealing rim, the lid may not have been put on tightly enough or the lid may not have been prepared properly. Clean the sealing surface of the jar or replace the jar if damaged. Use a new

lid and process **for the full raw-pack time**. After reprocessing, the food will be safe, however the quality will be diminished.

STORAGE

Remove, wash, dry and store metal screw bands in a dry place to retard rusting. Wash jars and label each jar with contents, date processed and lot number if more than one canner load was processed on the date. For best quality, store between 50°F and 70° F in a dry place to prevent the lids from rusting and possibly breaking the seal.

Before opening each jar, look for bulging lids, leaks and any unusual appearance of the food. After opening, check for off-odor, mold, foam or spurting liquid.

Never taste questionable foods.

Caution: To prevent the risk of botulism, low-acid and tomato foods not canned according to 1989 or more recent USDA-endorsed recommendations should be boiled even if you detect no signs of spoilage. At altitudes below 1,000 feet, boil foods for 10 minutes before tasting or eating. Add an additional minute of boiling time for each additional 1,000 feet elevation.

For additional information or for a copy of Handy Reference for Canning Fruits or Handy Reference for Canning Vegetables, contact your local Cornell Cooperative Extension office.

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All low-acid foods canned according to the approved recommendations may be eaten without boiling, when you are sure of all the following:

- ⌚ Food was processed in a pressure canner.
- ⌚ The pressure canner gauge was accurate.
- ⌚ Up-to-date researched process times and pressures were used for the size of jar, style of pack, and kind of food being canned.
- ⌚ An approved recipe was used with no changes made in ingredients or proportions of ingredients.
- ⌚ The time and pressure recommended for processing the food at the canning location's altitude were followed.
- ⌚ Jar lid is firmly sealed and concave.
- ⌚ Nothing has leaked from the jar.
- ⌚ No liquid spurts out when jar is opened.
- ⌚ No unnatural or "off" odors can be detected.

References:

USDA's Complete Guide to Home Canning, 1994.
So Easy to Preserve, 4th Edition, Cooperative Extension Service, The University of Georgia, 1999.