

Safe and Successful Home Canning

Your home-canned products will be only as good as the fresh foods you start with. For high-quality, safe, home-canned foods, select the freshest foods possible. Discard diseased and moldy foods. Don't can foods that you wouldn't serve at your table fresh.

Fruits and vegetables are at peak quality for six to 12 hours after they're picked. For this reason, produce picked from your garden or purchased from you-pick stands or nearby farmers markets is usually good for canning.

Allow apricots, peaches, pears and plums to ripen one or more days between harvest and canning for best results. If you must delay the canning of other fresh produce, keep it refrigerated until you are ready to can.

Chill and can fresh, home-slaughtered red meats and poultry without delay. Do not can meat from diseased animals. Immediately after catching fish, remove guts and put the fish on ice; can within two days.

Tips for keeping food color and flavor

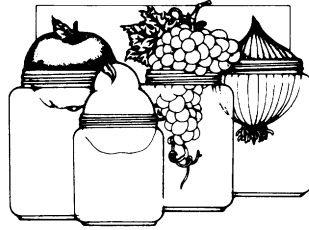
- Use only high-quality foods at their proper maturity, free from diseases and bruises.
- Use the hot-pack method, especially for acid foods that will be processed in a boiling-water or steam canner.
- Prevent darkening of fruits by holding them in an ascorbic acid (vitamin C) solution.
- Fill jars while food is still hot, and use the correct headspace as specified in recipes.
- Lightly tighten screw bands using fingertips only, but not as tightly as possible. Process and cool jars.
- Store the jars in a cool, dark place (50–70 degrees F).
- Can no more food than you will use within a year.

Prevent produce from darkening

Ascorbic acid helps prevent the discoloration of apples, apricots, peaches, pears, mushrooms and potatoes, and stem-end darkening of cherries and grapes. You can find ascorbic acid in several forms:

- Pure powdered ascorbic acid is available where canning supplies are sold. One level teaspoon of

Quality for Keeps



pure powder weighs about 3 grams. Use 1 teaspoon per gallon of water as a treatment solution.

- Vitamin C tablets are economical and available in a variety of locations. Crush and dissolve six 500-milligram tablets in a gallon of water as a treatment solution.
 - Commercially prepared mixtures of ascorbic and citric acid are available where canning supplies are sold. Follow the manufacturer's directions.
- Citric acid powder is often sold in supermarkets, but it is less effective in controlling darkening.

Hot pack for quality canned foods

Home-canned food retains quality longer when air is removed from the food before jars are sealed. Hot packing is the best way to remove air. It also “shrinks” food so that more will fit into each jar, helps keep the food from floating, increases vacuum in sealed jars and improves shelf life.

To hot pack, bring freshly prepared food to a boil and simmer 2 to 5 minutes. Loosely fill jars with the boiled food, followed by boiling liquid.

Hot packing is the preferred pack style for foods processed in a boiling-water or steam canner. At first, the color of hot-packed foods may appear no better than that of raw-packed foods, but within a short storage period, both the color and flavor of hot-packed foods will be superior.

In raw packing, jars are filled tightly with freshly prepared, unheated food, followed by boiling liquid. Some foods, especially fruit, will float in the jars. The trapped air may cause the fruit to discolor in as little as two to three months. Raw packing is more suitable for vegetables processed in a pressure canner.

Whether food has been hot packed or raw packed, you should heat the juice, syrup or water added to the foods to boiling before adding it to the jars.

Headspace is crucial for safety

The unfilled space in a jar between the food and the lid is called headspace (Figure 1). The amount of headspace depends on the type of food being processed. Leave $\frac{1}{4}$ inch for sweet spreads, $\frac{1}{2}$ inch for fruits and tomatoes and between 1 and $1\frac{1}{4}$ inches in low-acid foods. Headspace allows food to expand during processing and forms a vacuum as jars cool.

If the jars are filled too full (leaving too little headspace),

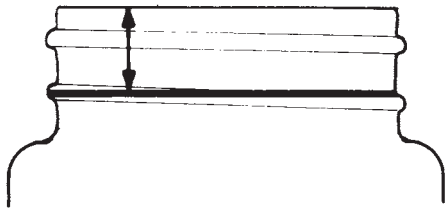


Figure 1. Headspace allows food to expand and forms a vacuum as jars cool.

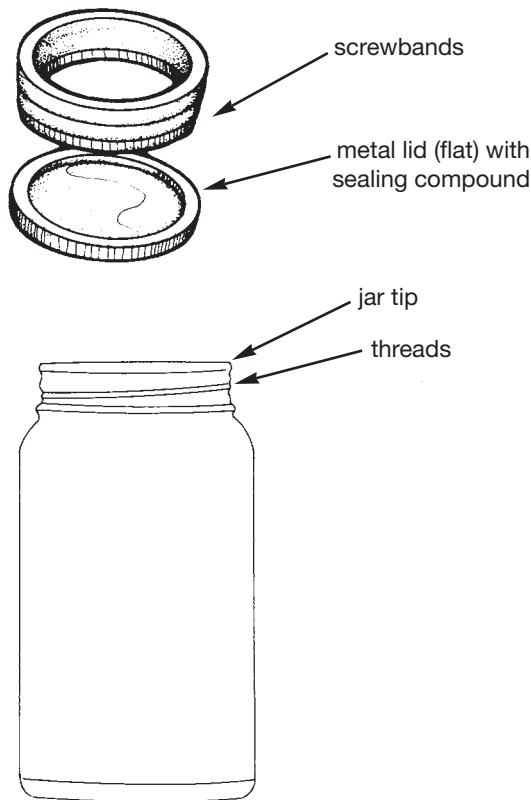


Figure 2. Canning jar with two-piece lid.

the contents may boil out during processing. Solids or seeds may be caught under the sealing compound and prevent the jar from sealing.

If too much headspace is left at the top of the jar, the processing time may not be long enough to drive out all the extra air from the top of the jar. This would mean that a tight vacuum seal may not be formed. Also, the air left inside the jar could cause the food to discolor.

For the correct headspace for each food, check the processing directions for each specific food.

Use recommended jars and lids

Regular and wide-mouth, threaded jars with two-piece self-sealing lids are the recommended choice for home canning (Figure 2.). They are available in ½-pint, 12-ounce, 1½-pint, quart and ½-gallon sizes. The regular jar mouth opening is about 2¾ inches. Wide-mouth jars have openings of about 3 inches, which makes them easier to fill and empty. Use half-gallon jars only for canning high acid juices.

With careful handling, canning jars and screw bands may be reused many times. You will need to use new lids (flats) each time; after the first use the lid will no longer seal effectively. After jars have cooled, remove screw bands. Wash and dry screw bands, and store in a dry area. If left on stored jars, screwbands become hard to remove and often rust, which makes them unsuitable for further use. If using other types of lid systems with rubber rings, follow that manufacturer's advice precisely.

When you use jars and lids properly, the results are quality seals and vacuums and little or no jar breakage.

The first step to safe food is clean jars

Before every use, wash empty jars in hot water and detergent and rinse well by hand, or wash in a dishwasher. Unrinsed detergent may cause unnatural flavors and colors in home-canned food. Remove scale or hard-water film on jars by soaking jars several hours in a solution containing 1 cup of vinegar (5 percent acidity) per gallon of water. These washing methods do not sterilize jars.

Sterilizing jars

Sterilize jars to be used for sweet spreads and pickled products processed less than 10 minutes. Place empty jars right-side-up on the rack in a boiling-water canner or large stockpot. Fill the canner and jars with hot (not boiling) water to 1 inch above the tops of the jars. Boil 10 minutes at altitudes of less than 1,000 feet. If you live above 1,000 feet, add one minute for each 1,000 feet above sea level. Remove hot, sterilized jars one at a time, and drain. Save the hot water for processing filled jars. Fill jars with food, adjust lids and process product according to research-based recommendations.

Jars used for vegetables, meats and fruits that will be processed in a pressure canner do not need to be sterilized. It is also unnecessary to sterilize jars for fruits, tomatoes and pickled or fermented foods that will be processed 10 minutes or longer in a boiling-water or steam canner.

Top with the recommended lid

The two-piece, self-sealing lid is recommended for home canning. It consists of a flat metal lid held in place during processing by a metal screw band. The flat lid is crimped around the 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.

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, used or warped lids, or lids with gaps or other defects in the sealing gasket.

After filling jars with food, release air bubbles by inserting a flat plastic spatula between the food and the jar. Don't use a metal spatula or knife because these may scratch and weaken the jar. Slowly turn the jar and move the spatula up and down to allow air bubbles to escape. Adjust

the headspace and clean the jar rim (sealing surface) with a damp, clean paper towel.

When using two-piece metal lids, place the lid on the filled jar, center it and hold it in place with your fingers. Using the other hand, screw the band down until it is fingertip tight, which means the first full resistance is felt using just your fingertips. Do not use the full force of your hand or wrist or jar-tightening utensils when applying the lids. Today's lids do not require forceful tightening. Tightening the screw band too tight will prevent the air from escaping as is necessary during processing. Trapping the air can result in buckled lids that have been deformed by air trying to force its way out. Buckled lids may not seal properly. Overtightening screw bands can also cut through the sealing compound and may cause the lids to not seal properly. These lids will not require further tightening after processing.

Follow the manufacturer's directions when applying and tightening other types of lids.

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.

Follow the manufacturer's directions precisely when applying and tightening other types of lids.

Types of canners

There are two main types of canners for home canning: boiling-water canners and pressure canners. Most hold seven quart jars or eight to nine pint jars. Small pressure canners hold four quart jars; some large pressure canners hold 18 pint jars in two layers, but only seven quart jars. Never use a pressure cooker that will not hold at least four quart jars for home canning purposes. This also applies if you plan to process pint jars. If the cooker does not have the capacity to hold at least four quarts, it does not have the structural capability to pressure process low-acid foods safely.

You must process low-acid foods, such as vegetables, meat, poultry and fish, in a pressure canner to prevent botulism, an often fatal type of foodborne illness. Although pressure canners may also be used for processing some acid foods, such as fruits, boiling-water or steam canners are recommended for this purpose because they are faster.

Please refer to MU Extension publication [GH1451, The Basics of Safe Canning](#) for more information on safe home canning.

Canners for processing high-acid foods

A boiling-water canner or atmospheric steam canner will safely can high-acid foods. Acidity might be natural, as in most fruits, or added, such as in pickled foods. High-acid foods contain enough acid to block the growth of botulinum bacteria or destroy them more rapidly when heated. PH is a measure of acidity; the lower the pH, the more acidic the substance. The temperature reached in a boiling-water canner or steam canner is effective for destroying yeast and

mold. Do not process low-acid foods in a boiling-water or atmospheric steam canner. A pressure canner process is required to ensure low-acid canned foods such as vegetables, meat, poultry and fish are safe to eat.

Boiling-water canners

Boiling-water canners are made of aluminum or porcelain-covered steel. They have removable perforated racks and fitted lids. The canner must be deep enough so that at least 1 inch of briskly boiling water will cover the tops of filled, sealed jars during processing. Boiling-water canners with ridged bottoms can be used only on a gas range. Boiling-water canners with flat bottoms can be used on either a gas or electric range. To ensure uniform processing of all jars with an electric range, the canner should be no more than 4 inches wider than the burner (meaning that when centered over the burner, the canner would overhang the burner by no more than 2 inches all the way around).

You can also use a flat-bottomed stockpot with a bottom rack inserted for boiling-water canning. The stockpot used as a canner must be large enough to have plenty of water boiling freely around the jars, and at least 1 to 2 inches over the tops of jars.

Boiling-water canning step by step

1. Fill the canner halfway with water and preheat water to 140 degrees F for raw-packed foods, and to 180 degrees F for hot-packed foods.
2. Load filled jars, fitted with lids, onto the canner rack, and use the handles to lower the rack into the water; or fill the canner, one jar at a time, with a jar lifter.
3. Add more boiling water, if needed, so the water level is at least 1 inch above jar tops. Do not pour directly on jar tops.
4. Turn range heat to its highest position until water boils vigorously.
 - Start tracking processing time by setting a timer for the minutes required for processing the food. Be sure to use the correct time for your altitude.
5. Cover the canner with lid and lower the heat setting to maintain a gentle boil throughout the process schedule.
6. Add more boiling water, if needed, to keep the water level at least 1 inch above the jars. If the water stops boiling at any time during the process, turn the heat on its highest setting, bring the water back to a vigorous boil and begin the timing of the process over from the beginning (using the total original process time).
7. When jars have been processed for the recommended time, turn off the heat and remove the canner lid. Wait 5 minutes before removing jars.
8. Use a jar lifter to remove the jars, and place them on a towel. Leave at least 1 inch of space between the jars during cooling. Let the jars sit undisturbed for 12 to 24 hours.

Atmospheric steam canner

An atmospheric steam canner can be used for canning naturally acidic foods — such as fruits, sweet spreads such as jam and jelly and some tomato products, or acidified foods such as salsa or pickles — as long as all the following criteria are met:

- Foods must be high in acid, with a pH of 4.6 or lower.
- Jars must be heated before filling, and filled with hot liquid for a raw or hot pack.
- A research-tested recipe developed for a boiling-water canner must be used in conjunction with the steam canner. Steam canners can be used with recipes approved for half-pint, pint or quart jars. Do not rely on the booklet accompanying a steam canner to provide safe processing time instructions.
- Processing time must be limited to 45 minutes or less, including any modification for altitude. The processing time is limited by the amount of water in the canner base.

Steam canning step by step

1. Place the appropriate amount of water in the base of the canner, as indicated in the canner manual. Place the perforated cover over the base and bring water to a low boil.
2. Load filled jars with fitted lids onto the base. As long as you follow research-tested methods, the canner can be operated full or nearly empty.
3. Place the dome lid onto the base and over 4 to 5 minutes increase temperature setting of the stove until a column of steam 8 to 10 inches is evident from the small vent hole at the base of the dome. Venting is crucial to purge all air from the canner, so heat can be transferred as efficiently as possible.
4. Maintain the column of steam and begin timing the process, following the boiling-water canning processing time recommendations, adjusted for altitude.

5. Adjust the heat setting to maintain a boiling temperature (212 degrees F at sea level to 1,000 feet). If the steam canner does not have a built-in temperature sensor in the dome lid, insert a calibrated dial-stem or digital thermometer into the vent hole.
6. Do not open the dome lid during processing to add more water, as that would allow steam to escape and cause the jars to be processed at an incorrect temperature. If the canner boils dry, the food is considered underprocessed and unsafe to consume.
7. When jars have been processed for the recommended time, turn off the heat and remove the canner dome lid. Wait five minutes before removing the jars.
Caution: Turn the dome away from your face and body before opening it to avoid burns.
8. Use a jar lifter to remove the jars, and place them on a towel. Leave at least 1 inch of space between jars during cooling. Let the jars sit undisturbed for 12 to 24 hours.

Use a pressure canner to process low-acid foods

Low-acid foods must be processed with a pressure canner. Pressure canners for use in the home have been extensively redesigned in recent years. Models made before the 1970s were heavy-walled kettles with clamp-on or turn-on lids. They were fitted with a dial gauge, a vent port in the form of a petcock or counterweight and a safety fuse.

Modern pressure canners are lightweight, thin-walled kettles; most have twist-on lids. They have a jar rack, gasket, dial or weighted gauge, an automatic vent/cover lock, a vent port (steam vent) to be closed with a counterweight or weighted gauge and a safety valve (Figure 3).

To be absolutely certain you are getting a true reading of the temperature inside your pressure canner, you must:

1. Operate the canner at the pressure and time specified in the map of altitudes in Missouri found in MU

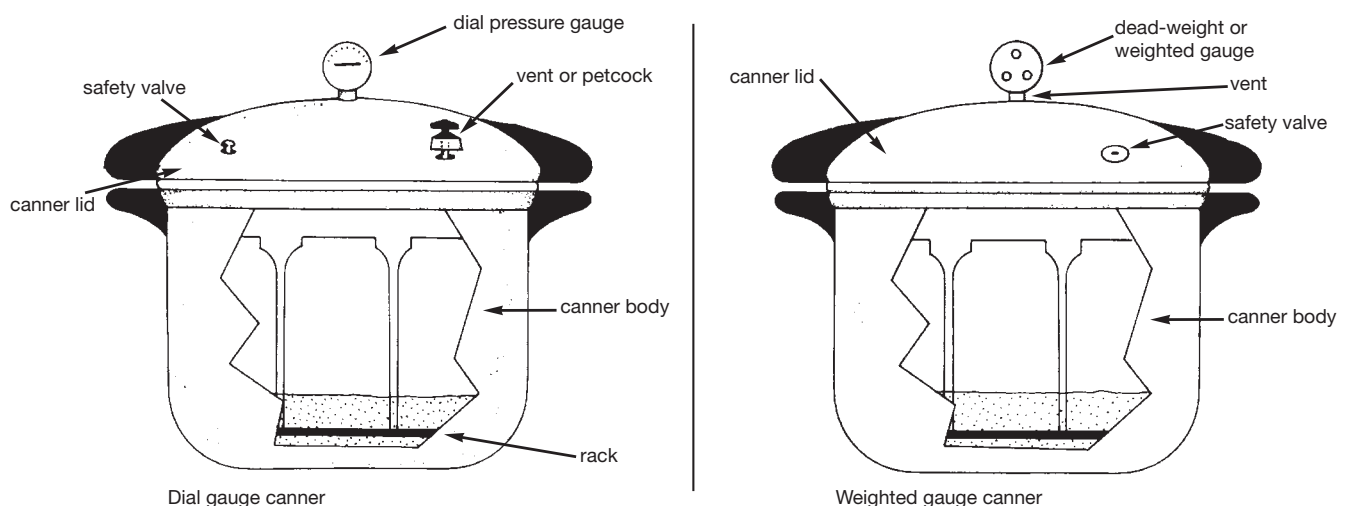


Figure 3. Two types of pressure canners.

Extension publication [GH1451, The Basics of Safe Canning](#). Temperatures inside pressure canners are lower at higher altitudes.

2. Get rid of air trapped inside the pressure canner by venting. Air trapped inside the canner lowers the temperature obtained at 5 pounds, 10 pounds and 15 pounds of pressure, and results in underprocessing.

No matter what the manufacturer's directions say, to be safe, you should vent all types of pressure canners 10 minutes before pressurizing.

To vent a canner, leave the vent port uncovered on newer models or manually open petcocks on some older models. Then heat the filled canner with its lid locked into place until the water boils and generates a strong funnel of steam that escapes through the petcock or vent port. Start the timing process once you see the funnel.

After venting 10 minutes, close the petcock, or place the counterweight or weighted gauge over the vent port to pressurize the canner.

Weighted-gauge models exhaust tiny amounts of air and steam each time their gauge rocks or jiggles during processing. They control pressure precisely and do not need watching during processing.

The sound of the weight rocking or jiggling indicates that the canner is maintaining the recommended pressure. Weighted gauges do not have to be checked for accuracy.

The single disadvantage of weighted-gauge canners is that they cannot correct precisely for higher altitudes. At altitudes above 1,000 feet, they must be operated at canner pressures of 10 psi instead of 5 psi, or 15 psi instead of 10 psi.

Check dial gauges for accuracy before use each year, and replace them if they read high by more than 2 pounds at 5, 10 or 15 pounds of pressure.

Low readings cause overprocessing and also indicate that the gauge should be replaced. Gauges may be checked at many local MU Extension centers.

Handle canner lid gaskets carefully, and clean them according to the manufacturer's directions. Nicked or dried gaskets will allow steam leaks during pressurization of canners. Keep gaskets clean between uses.

Gaskets on older-model canners may require a light coat of vegetable oil once each year. Gaskets on newer-model canners are prelubricated and do not need oiling. To find out if your canner gasket has been prelubricated, check the instruction manual.

Lid safety valves are thin metal inserts or rubber plugs that relieve excess pressure in the canner. Do not pick at or scratch valves while cleaning lids. Use only canners that have the Underwriters Laboratory (UL) approval for safety.

Replacement gauges and other parts for canners are often available at stores that sell canning equipment or from canner manufacturers. When ordering parts, be sure to give your canner model number and describe the parts needed.

Pressure canning step by step

1. Put 2 to 3 inches of hot water in the canner. Place filled jars on the rack using a jar lifter. Fasten canner lid securely.
2. Leave weight off vent port or open petcock. Heat at the highest setting until steam flows freely from the petcock or vent port.
3. Maintain high heat setting, let steam vent 10 minutes and then place weight on vent port or close petcock. The canner will pressurize during the next 3 to 5 minutes.
4. Start timing the process when the pressure reading on the dial indicates that the recommended pressure has been reached or when the weighted gauge begins to jiggle or rock.
5. Regulate heat under the canner to maintain a steady pressure at or just slightly above the correct gauge pressure. Quick and large pressure changes during processing may cause jars to lose liquid. Weighted gauges on Mirro canners should jiggle about two or three times per minute. On Presto canners, they should rock slowly throughout the process.
6. When the timing process is completed, remove the canner from heat and let it depressurize. Do not force-cool the canner. Forced cooling may result in food spoilage. Cooling the canner with cold running water or opening the vent port before the canner is fully depressurized will cause liquid to escape from jars and may cause seal failures. Force-cooling may also warp the canner lid, causing steam leaks. Standard-size heavy-walled canners require about 30 minutes to cool when loaded with pints and 45 minutes with quarts. Newer thin-walled canners cool more rapidly. They are equipped with vent locks that drop to a normal position, allowing the canner to be opened when the canner is depressurized.
7. After the canner is depressurized, remove the weight from the vent port or open the petcock. Wait 10 minutes and then unfasten the lid and carefully remove it, tilting it away from you so the steam does not burn your face.
8. Use a jar lifter to remove the jars and place them on a towel. Leave at least 1 inch of space between the jars during cooling.

Allow time for a slow cooldown of jars

When removing hot jars from a canner, do not retighten their lids. Retightening of hot lids may cut through the gasket and cause seal failures. Also do not push down the center of the flat metal lid until the jar is completely cooled. Cool the jars at room temperature for 12 hours to 24 hours on towels or racks. 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.

Testing for quality jar seals

After cooling jars for 12–24 hours, remove the screw bands and test seals using one of these methods:

- Press the middle of the lid. If it springs up when released, the lid is not sealed.
- Tap the lid with the bottom of a teaspoon. If the jar is sealed correctly, it will make a high-pitched ringing sound. A dull sound means either the lid is not sealed or food is touching the underside of the lid. In the case of a dull sound, test seal by another method.
- Hold the jar at eye level, and look across the lid. The lid should be concave (curved down slightly in the center). If the center of the lid is either flat or bulging, the jar may not be sealed.

How to reprocess unsealed jars

If a lid fails to seal, you must reprocess within 24 hours. Remove the lid, and check the jar-sealing surface for tiny nicks. If necessary, change the jar. Always use a new lid, and reprocess using the same processing time. The quality of reprocessed food is poor.

Instead of reprocessing unsealed jars of food, you can freeze them if headspace is adjusted to 1½ inches and food is in a freezer-safe container. Single unsealed jars can be refrigerated and used within several days.

Storing canned foods

Tightly sealed, cooled jars are ready to be stored. Remove screw bands, wash the lid and jar to remove food residue and rinse and dry jars. Label and date jars, and store them in a clean, cool, dark, dry place — 50 to 70 degrees F is ideal. Do not store jars above 95 degrees F; near hot pipes, a range or a furnace; or in an uninsulated attic or direct sunlight. Under conditions such as these, food will lose quality in a few weeks or months and may spoil. Dampness may

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

Freezing canned foods will not cause spoilage unless jars become unsealed and contaminated. Freezing and thawing will soften food, however. If you must store jars where they may freeze, wrap them in newspapers, place them in heavy cartons and cover the cartons with newspapers and blankets.

Know your cooktop

With kitchen technology advancements, the smooth cooktop has created some challenges for canning. Follow the manufacturer's recommendations for your smooth cooktop. Consider the following:

- The canner bottom must be completely flat to have full contact with the heat source. Some types of boiling-water canners are *not* recommended for use on smooth cooktops because they have uneven bottoms. Always follow manufacturer recommendations for a cooktop.
- Excessive heat reflecting onto the surface can damage the cooktop. Examples include discoloration, burner damage, cracked glass tops and metal fused to the glass top.
- Many of these cooktops have burners with automatic shutdowns when the heat gets excessive. If the burner shuts off during processing, food can be underprocessed and unsafe to consume.

References

- White, Athalie, Ann Ford, Elizabeth L. Andress, and Judy A. Harrison. 2014. *So Easy To Preserve*, 6th ed. University of Georgia Cooperative Extension Service.
- Guidelines for Using an Atmospheric Steam Canner for Home Preservation. University of Wisconsin Extension.
- Willmore, Paola, Mark Etzel, Elizabeth Andress, Barbara Ingham. 2015. Home processing of acid foods in atmospheric steam and boiling-water canners. *Food Protection Trends* 35 (3): 150–160.
- National Center for Home Food Preservation.

ALSO FROM MU EXTENSION PUBLICATIONS

- GH1451 *The Basics of Safe Canning*
- GH1454 *How to Can Fresh Vegetables*
- GH1455 *How to Can Fresh Fruit*
- GH1456 *How to Can Fresh Tomato Products*
- GH1457 *How to Pickle*

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